

SECTION 7

Technical Provisions (Standard)

Required

C.S. Davidson, Inc. Technical Provisions (Standard) are contained herein, current printing January 2010.

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TO: All Document Holders

RE: SUMMARY OF REVISIONS TO SECTION VII-TECHNICAL PROVISIONS (STANDARD),

DATE: January, 2010

All Sections

Updated ACI, PennDOT, ASTM, AWWA and Federal Specifications references.

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01151	Measurement and Payment 2.03.B - Clarify bored laterals without casing pipe 2.06.B - Add County Conservation District stamped "Approved" plans. 2.09.B - Add Detail 02221-5 2.10.B - Revise Detail 02221-7 2.12 A&B - Clarify core samples 2.16 - Add wetland crossing 2.71- Add Fencing 2.80 - Add Landscape Plantings 3.05.B - Clarify complete in place 5.01.A - Add regardless of depth 7.03 - Change Bituminous to Superpave 7.04 - Change Bituminous to Superpave 7.05 - Change Bituminous to Superpave 7.08.B - Clarify removal and disposal of existing curb 7.09.B - Clarify removal and disposal of existing sidewalk 7.10 - Add curb ramps 7.13 - Add pavement markings 7.30 - Add Guide Rail 7.31 - Add End Treatments	
02100	Clearing and Grubbing 2.01.A.1 - Add light weight orange polyethylene barricade fence	
02150	Boring and Jacking 2.01.D - Delete interior and exterior bituminous cover 2.06 - Add Type D flowable fill 2.07 - Add bored lateral piping	02150-1- Delete 1 mm bituminous coating, both sides and add Type D flowable fill
02210	Site Excavation and Placement of Fill Material 1.02.A.1 - Change reference to Publication 213 and delete Publication RR-459 1.02.A.4 - Add reference to Pennsylvania Code, Title 67 1.04.B.1 - Change reference to Publication 213	
02221	Trenching, Backfilling and Compacting 1.02.A.1 - Delete reference to Publication RR-459 and change reference to Publication 213 1.02.A.3 - Add reference to Pennsylvania Code, Title 67 1.02.B.1 - Delete reference to PennDOT and require CONTRACTOR to pay for compaction testing 1.04.C.1 - Change reference to Publication 213 1.04.E - Add Site Inspection 2.01.A & B - Require AASHTO No. 8 course aggregate	All details renumbered 02221-1 - Clarify bedding limits over pipe 02221-2 - Clarify bedding limits over pipe 02221-3 - Increase Type IV bedding limits below invert and above pipe 02221-4 - Add new Detail 02221-5 - Add new Detail 02221-6 - Add new Detail 02221-7 - Clarify depth of clay dike

TO: All Document Holders

RE: SUMMARY OF REVISIONS TO SECTION VII-TECHNICAL PROVISIONS (STANDARD),

DATE: January, 2010

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02221	Trenching, Backfilling and Compacting (continued)	
	2.02.B.2 - Add Type D flowable fill 2.02.D.1 - Stone size maximum changes to 6" 3.04.C - Length of open trench- Deleted 3.07.A - Add references to Section 02270 3.08.E - Add driveways and shoulders 3.11.A - Add references to Detail 02221-3 3.15.C - Add limits of work confined to rights-of-way 3.15.D - Add prohibit use of private driveways	
02230	Roadway Excavation, Fill and Compaction	
	1.03.A.1 - Add reference to CS-4171 1.04.B - Add control of traffic 2.01.D - Add coarse aggregate 2.02.A&B - Add Geotextiles 3.01.B.4 - Add geotextile layer 3.01.D.2 - Add references to ASTM D698 or D1557 3.01.E.5 - Add references to ASTM D698 or D1557 3.02.A.1 - Add references to ASTM D698 or D1557 3.02.C.2 - Add material substitution shall be approved by ENGINEER 3.03.A - Revise paragraph numbers	
02270	Soil Erosion and Sedimentation Control	All Details renumbered
	1.01.C - Revised list of applicable standard details 1.02.A.2 - Change PA DEP Reference 2.03.B - Add compost filter sock 2.08 - Revise paragraph title to Pumped Water Filter Bag 2.09 - Delete inlet on sediment control device 3.01 - Revise execution section 3.02 - Revise execution section 3.03 - Revise execution section 3.04 - Revise execution section 3.05 - Delete section 3.06 - Delete section 3.07 - Delete section	02270-1 - Revise Residential Site Detail 02270-2 - Revise Stabilized Rock Construction Entrance 02270-3 - Revise Silt Barrier Fence Detail 02270-4 - Revise Super Filter Fabric Fence and add Silt Sock Details 02270-5 - Revise Rock Filter Outlet Detail 02270-6 - Revise Straw Bale Barrier Detail 02270-7 - Add new detail for Pumped Water Filter Bag
02500	Bituminous Paving and Surfacing	
	1.02.A.1 - Change reference to Publication 213 and delete Publication RR-459 1.02.3 - Add reference to Pennsylvania Code, Title 67 1.03.A.3 - Add reference to CS-4171 and note as required by ENGINEER 1.04.A.2 - Change reference to Publication 213 1.04.A.3 - Add notification of lane closures 1.04.B.2 - Add reasonable access 2.01.B - Use of PG 64-22 3.01.A - Delete BCBC and add Superpave Asphalt 3.01.B - Revise executions section and Pub. 408 reference 3.01.C - Add bituminous paver specifications	

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DATE: January, 2010

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02500	Bituminous Paving and Surfacing (continued)	
	3.02.C - Add sealing of cracks 3.02.D - Delete ID-2 and add Superpave HMA19mm 3.02.E - Delete ID-2, add minimum 8" CSBC and add 2" minimum of Superpave HMA 19mm 3.02.G.2 - Add sweeping of milled surface 3.02.G.5 - Add transition of milled to non-milled surfaces 3.02.H - Add scratch and leveling course 3.02.I - Add proof rolling of subgrade 3.03.A.1 - Add aggregate size and Pub. 408 reference 3.03.A.2 - Add aggregate size and Pub. 408 reference 3.03.A.3 - Add tack coat and Pub. 408 reference 3.03.A.4 - Add compaction testing and density requirements 3.03.A.5 - Add prohibition of vehicular traffic 3.03.A.6 - Add bituminous paver specifications 3.03.B.3 - Add prohibition of vehicular traffic 3.03.B.4 - Add bituminous paver specifications 3.04.A - Delete E-6 & E-8 painting and add PG 64-22 3.04.B- Delete AC-20, Class E-6 or E-8 and add PG 64-22 3.05.A - Add proof of product and re-letter remaining paragraphs 3.05.B - Add binder course 3.05.B.3 - Limit surface irregularities to 1/2"	
02525	Cement Concrete Curb and Sidewalk	
	1.01.A.3 - Add construction of handicap ramps 1.01.A.4 - Add construction of standard (patterned) or colored concrete sidewalks 1.01.D - Expand list of applicable standards details 1.02.A.1 - Change reference to Publication 213 1.02.A.1 - Add reference to ADA regulations 2.02.D - Add curbing repairs (less than 10 feet) 2.06.A - Add brand names for curing compounds 2.07 - Add stamped color concrete materials 3.01- Revise curb construction execution section 3.02 - Revise sidewalk construction execution section 3.03 - Add stamped and colored concrete sidewalk execution section	02525-1 - Vertical Concrete Curb Details added 02525-2 - Slant Concrete Curb Details show WWF 02525-3 - Concrete Sidewalk Detail added 02525-4 - Concrete Sidewalk at Driveway Detail added 02525-5 - Type 1 Double Curb Ramp Detail added 02525-6 - Type 1 Double Curb Ramp Details (Alternate) added 02525-7 - Type 1 Curb Ramp Detail added 02525-8 -Type 1A Curb Ramp Detail added 02525-9 - Type 2 Curb Ramp Detail added 02525-10 - Type 3 Parallel Curb Ramp Detail added 02525-11 - Type 3 Perpendicular Curb Detail added 02525-12 - Type 4 Combination Curb Ramp Detail added 02525-13- Type 4A Combination Curb Ramp Detail added 02525-14- Detectable Warning Surface Detail added 02525-15 -Roof Leader Under Sidewalk dowel rod added

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RE: SUMMARY OF REVISIONS TO SECTION VII-TECHNICAL PROVISIONS (STANDARD),

DATE: January, 2010

Section	Title and Description of Changes	Detail Revisions Dated 9/15/2009
02575	Trench Paving and Restoration	
	1.02.A.1 - Change reference to Publication 213 and delete publication RR-459 1.02.A.3 - Add reference to Pennsylvania Code, Title 67 1.03.A.1 - Add reference to CS-4171 and renumber paragraphs 1.04.A.2 - Change reference to Publication 213 2.01.B - Add Trench Types 1 & 4 and delete existing driveway 2.02.B - Add Trench Types 1 & 2 2.02.C - Add Trench Type 3 3.01.A - Expand temporary trench paving requirements in State Highways 3.01.B - Add tack coat 3.01.C - Add reference to Standard Detail 02757-3 3.02.A - Delete trench types 2a and 2b and Publication RR-459. Add reference to PA Code 67 3.02.B - Add new Trench Type 2, reference to Standard Detail 02575-4 and re-letter remaining paragraphs 3.02.C - Add reference to collector or arterial streets on Standard Detail 02575-4 3.02.D - Add concrete trench restoration 3.02.E - Re-letter paragraph 3.03.B - Add restoration requirements 3.05.A - Add trench roller pressure specifications 3.05.C - Delete 2RC and add 2A 3.05.E - Delete 2RC and add 2A Backfill and Surface Restoration Requirements Table was revised for overlays, bituminous surface course, backfill, temporary, final surface restoration and add footnote (10)	02575-3 Add temporary Trench Paving 02575-4 Add permanent Trench Paving
02601	Manholes	
	1.01.D - Add reference to applicable Standard Details 02601-6 and 02601-7 1.02.A.1 - Change reference to Publication 213 and delete Publication RR-459 1.02.A.2 - Add reference to ASTM M306 Specification 1.02.A.3 - Add reference to Federal Specifications CID A-A-60005 1.02.A.4 - Add reference to Title 67, Transportation Chapter 459 2.01.A - Add AASHTO No. 8 2.09.E - Add unless approved by the ENGINEER 2.09.I - Precast concrete bases are not permitted with pipe grades over 10.00% unless approved by the ENGINEER 2.10 - Delete Glass Fiber-Reinforced Polyester Manholes and add Casting Materials specification 2.13.B - Require 24" clear opening for standard and heavy duty frames and covers 2.13.D - Lugs and lettering to be flush with frame 2.13.E - Rewrite specifications for standard frame and Cover	02601-1 - Add drain to stone and add AASHTO #8 02601-2 - Add AASHTO #8 02601-3 - Revise base detail, clarify methods of adjustments, and add step spacing 02601-4 - Revise bedding requirements and add step spacing 02601-5 - Clarify limits of coverage and bedding 02601-6 - Add new detail 02601-7 - Add new detail

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02601	Manholes (continued) 2.13.F - Rewrite specification for heavy duty frame and cover and re-letter remaining paragraphs 2.13.G - Rewrite specifications for water tight frame and cover 2.15.B - Delete acceptance of PVC or HDPE adjustable rings 2.15.C - Add acceptance of Infra Riser rubber rings 2.15.D - Add poured in place concrete adjustment 2.16 - Clarify use of wall penetration seals 2.17 - Add Structural Concrete bonding agent 3.05.D - Add unless approved by ENGINEER 3.05.F - Increase projection from 2" to 3" 3.05.H - Delete rubber gaskets 3.05.J.1 - Decrease distance from step to manhole floor from 24" to 20" 3.05.J.3 - Add unless approved by ENGINEER 3.05.J.6 - Delete HDPE and add Infrastructure risers 3.05.M - Add water tight connections and as approved by ENGINEER	
02602	Storm Inlets, Catch Basins, Endwalls 1.02.A.3 - Add reference to Pennsylvania Code Title 67 2.01.A.1 - Add AASHTO No. 8 and delete crushed stone or gravel aggregate 2.03.D.2 - Delete brick adjustments 2.03.D.3 - Add Infra Risers Adjustments rubber rings 3.02.A.1 - Decrease compacted crushed aggregate depth from 12" to 4" 3.02.A.2 - Delete undisturbed earth and add 4" crushed aggregate base 3.02.A.3 - Clarify poured channels 3.02.A.4 - Delete brick adjustments and add Infra Risers 3.02.C - Increase pipe projection from 2" to 3"	02602-1 - Add Inlet Storm Pipe Installation detail
02610	Sanitary Sewer Pipe 1.02.A.1 - Delete ASTM C700 for ESVC piping 1.03.C - Add CONTRACTOR to analyze flows and provide pumps with sufficient capacity 1.05.B.3 - Add place on surface with proper support 2.01.A & B - Delete Vitrified Clay Gravity Sewer Pipe pipe and re-number Part 2 2.06 - Add as approved by ENGINEER 2.07.B.1 - Update cleanout cap specifications 2.07.B.1 - Delete PVC cleanout caps 2.11 - Add Cast/Ductile Couplings 3.02.a - Increase notice from 24 to 72 hours 3.02.B - Add 25' maximum interval for batter boards 3.02.D - Add unless approved by ENGINEER 3.02.H.c - Add discussion about reference mark 3.02.H.d - Add pipe gaps in excess of 1/4" will not be acceptable	02610-1 - Clarify depth of cover, stake depth, add 2 bends at wye and minimum pipe slopes 02610-2 - Clarify depth of cover, cleanout depth, add 2 bends at wye, and minimum pipe slopes 02610-3 - Increase depth of bedding, revise aggregate and add note 02610-4 - Add drain to stone and add AASHTO #8

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02610	Sanitary Sewer Pipe (continued)	
	3.02.O.1 - Add approved by the ENGINEER 3.02.Q - Delete written authorization and add disposal of accumulated water 3.03.A - Add tee wye 3.03.B - Revise method of connection to existing pipe 3.04.A - Add unless approved by ENGINEER 3.04.D - Lateral shall extend 5' past right-of-way unless approved by ENGINEER 3.04.E - Prohibit use of drop cleanout 3.10.A - Add references to Standard Detail 02221-5 and Contract Drawings 3.10.C - Add wetland crossing 3.13 - Add requirements to bypass pumping	
02615	Water Mains	
	1.05.B.1 - Correct misspelling of "Staking" to "Stacking" 2.01.A.1.b - Change DI pipe to Class 52 minimum 2.02.A.3 - Add flared couplings 3.05.A - Add unless approved by ENGINEER 3.06.A - Exclude 11 ¼° bends 3.06.B - Add Stream Crossing Standard Detail 02221-6 3.07.C - Add wetland crossings	
02618	Storm Drain Pipe	
	3.02.D - Change uniform line to uniform grade	
02640	Valves and Fire Hydrants	
	3.02.B - Add concrete block under valve and re-letter remaining paragraphs	02640-2 - Add block under valve box and concrete thrust block note 02640-3 - Add concrete block under valve box
02642	Water Service Connections	
	2.03.B.3 - Add as approved by ENGINEER 3.02.C - Add filling of DI pipe, pretest of main, and re-letter paragraph 3.02.D - Require tap 2' from bell 3.02.G - Clarify removal of top taps 3.03.B - Prohibit limestone based masonry sand	02642-1 - Delete top tap also acceptable with required cover note
02651	Sanitary Sewer Testing	
	2.03.A - Delete furnished by OWNER and add as approved by ENGINEER 3.02.A - Add if required by ENGINEER 3.02.B - Increase air pressure from 4.0 to 5.0 psig 3.02.B.3 - Clarify stabilization of pressure 3.02.B.4.d - Allow vacuum testing of laterals 3.02.B.4.e - All tests subject to 5 minutes minimum; delete 5 lbs no substitute 5 psig 3.02.E.3 - Delete approved by OWNER and add approved by ENGINEER	

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DATE: January, 2010

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02651	Sanitary Sewer Testing (continued)	
	3.02.E.5 - Clarify responsibility for 12 th month deflection testing 3.04.C - Add including frame and cover 3.04.E.1 - Add at top of manhole frame 3.04.F - Add all tests subject to 10" HG for 60 seconds	
02653	Testing and Disinfecting Water Mains 1.02.A.1 - Clarify testing responsibilities 3.02.A - Clarify Hydrostatic Pressure Test 3.02.A.5 - Add formula and notes 3.03.F.1 - Clarify wasting of water 3.03.F.2 - Add no flushing without testing 3.03.G.4 - Add testing option from hydrant if approved by ENGINEER	
02760	Pavement Markings- Section Added	
02830	Chain Link Fence- Section Added	
02852	Guide Rail- Section Added	
02901	Landscape Planting- Section Added	
03000	Plain and Reinforced Cement Concrete 1.01.E - Add reference to ACI 301-05 1.02.A.1 - Update titles for ASTM standards 1.03.A.6 - Add submittal for form coating materials 1.03.A.7 - Add submittal for concrete curing compounds	
03050	Cement Concrete for Utility Construction	03050-4 - Add notes to prohibit flowable fill and allow for increased rebar spacing

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SECTION 01151

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 APPLICABILITY OF SECTION

The provisions of this Section apply to all work completed under these Contract Documents, unless modified in the Section VIII - Technical Provisions (Detailed).

1.02 MEASUREMENT OF QUANTITIES

- A. All work completed under the Contract shall be measured according to the standards of weights and measures recognized by the U.S. Bureau of Standards.
- B. The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the Contract will be those methods generally recognized as conforming to good engineering practice.
- C. Unless otherwise specified, measurements for area computations will be made on the surface. Pay measurements for area computations will not exceed the neat dimensions shown on the Drawings, unless otherwise ordered in writing by the ENGINEER.
- D. Structures will be measured according to neat lines shown on the Drawings or as altered to fit field conditions. No payment will be made for length, width, or depth, in excess of that shown on the Drawings or specified in the Specifications for any construction, unless otherwise approved by the ENGINEER in writing.
- E. All items which are measured by the linear foot will be measured parallel to the base or foundation upon which such structures are placed, unless otherwise shown on the Drawings or specified.
- F. In computing volumes of excavation, the average end area method based on horizontal measurements will be used.
- G. The term "each", when used as an item of payment, will mean complete payment for the Work described in the Contract.
- H. The term "lump sum", when used as an item of payment, will mean total payment for the Work described in the Contract, complete in place.
- I. The term "complete in place", means the completion of the Contract item or portions thereof as determined by the ENGINEER including the furnishing of all materials, equipment, tools, labor, testing, and work incidental thereto.
- J. When rounding to the nearest whole unit for payment, quantities of 0.01 to 0.49 shall be adjusted downwards, and quantities of 0.50 to 0.99 shall be adjusted upwards.

1.03 SCOPE OF PAYMENT

- A. The CONTRACTOR will receive and accept compensation provided for in the Contract as full payment for furnishing all materials, labor, tools, and equipment and for performing all Work under the Contract in a complete and acceptable manner and for all risk, loss, damage, or expense of whatever character arising out of the nature of the Work or the prosecution thereof, subject to the provisions of the General Conditions.
- B. If any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the Specifications.

PART 2 MISCELLANEOUS/SITE WORK PAYMENT ITEMS

2.01 MOBILIZATION (SEE SECTION BELOW)

- A. This work shall consist of the assembling and setting up for the project, the CONTRACTOR's necessary general plant, including CONTRACTOR's offices, ENGINEER's field office, shops, plants, storage areas, sanitary and any other facilities, as required by the Specifications and special requirements of the Contract, as well as by local or State law and regulation. The determination of the adequacy of the CONTRACTOR's facilities, except as noted above shall be made by the CONTRACTOR. The cost of required insurance and bonds and/or any other initial expense required for the start of Work will be included in this item.
- B. Mobilization will be paid for at the lump sum bid price for mobilization. The lump sum bid price for this item shall be payable to the CONTRACTOR in accordance with the following schedule:
 - 1. On the first monthly application for progress payment, the amount bid for mobilization or 5% of the total Contract Price excluding the bid price for this item, whichever is less, will be paid.
 - 2. Whenever Work performed equals 25% of the total Contract Price excluding the bid price for this item, any remaining amount bid for mobilization, or an additional 2% of the total Contract Price excluding the bid price for this item, whichever is less, will be paid.
 - 3. Upon completion of the project, any remaining amount bid for mobilization will be paid.
- C. No measurement will be made for maintenance and protection of traffic. Payment for maintenance and protection of traffic will be made at the lump sum price bid, complete in place.

2.02 CLEARING AND GRUBBING (SEE SECTION 02100)

- A. No measurement will be made.
- B. Payment for clearing and grubbing will be made at the lump sum price bid, complete in place, as shown on the Contract Drawings.

2.03 BORING AND JACKING (SEE SECTION 02150)

- A. Measurement of bored crossings will be along the centerline of the pipeline between the limits specified.
- B. Payment for bored crossings will be made at the unit price bid per linear foot, complete in place. Payment shall include casing pipe, excavation, backfill, and all other work incidental to the bored crossing. Carrier pipe will be paid separately under the appropriate item. Bored laterals without casing pipes will be paid separately under the appropriate item.
- C. If it becomes impossible to complete the crossing as specified, the CONTRACTOR will discontinue work and obtain written approval from the ENGINEER for an alternate method of accomplishing the crossing. Payment will be made for work already completed at the unit price bid per linear foot. This payment will be in addition to payment granted for the alternate method selected to complete the crossing.

2.04 SITE EXCAVATION AND PLACEMENT OF FILL MATERIAL (SEE SECTION 02210)

- A. No measurement will be made.
- B. Payment for site excavation and placement of fill material will be made at the lump sum price bid, complete in place, as shown on the Contract Drawings.

2.05 SELECT MATERIAL STONE BACKFILL (SEE SECTION 02221)

- A. Measurement will be in accordance with Standard Detail 02221-1.
- B. Payment will be in accordance with the unit price bid per ton for select material stone backfill. No payment will be made for select material stone backfill placed as a result of native material becoming unsuitable due to acts of the CONTRACTOR.

2.06 SOIL EROSION AND SEDIMENTATION CONTROL (SEE SECTION 02270)

- A. No measurement will be made.
- B. Soil erosion and sedimentation control will be paid for at the lump sum price bid, complete in place, as shown on the Contract Drawings/County Conservation District stamped "Approved" plans. The lump sum bid price for this item shall be payable to the CONTRACTOR in accordance with the following schedule:
 - 1. On the first monthly application for progress payment after installation of the specified controls, 50% of the amount bid for soil erosion and sedimentation control or 5% of the total Contract Price excluding the bid price for this item, whichever is less, will be paid.
 - 2. Whenever Work performed equals 25% of the total Contract Price excluding the bid price for this item, any remaining amount bid for soil erosion and sedimentation control, or an additional 2% of the Total Contract Price excluding the bid price for this item, whichever is less, will be paid.
 - 3. Upon completion of the project, any remaining amount bid for soil erosion and sedimentation control will be paid.

2.07 RIP RAP (SEE SECTION 02270)

- A. Measurement of rip rap will be by the 2-dimensional method along the surface of the rip rap placed to the limits shown on the Contract Drawings. The total quantity will be rounded to the nearest whole square yard.
- B. Payment for rip rap will be made at the unit price bid per square yard, complete in place.

2.08 FINISH GRADING, SEEDING OR SODDING (SEE SECTION 02485)

- A. No measurement will be made for finish grading. Measurement of seeding or sodding will be by the 2-dimensional method along the surface of the seeding or sodding placed to the limits shown on the Contract Drawings, rounded to the nearest whole unit.
- B. Payment for finish grading will be made at the lump sum price bid, complete in place. Payment for seeding or sodding will be made at the unit price bid per square yard, complete in place.

2.09 STREAM CROSSINGS (SEE SECTION 02221)

- A. No measurement will be made.
- B. Payment for stream crossings will be made at the lump sum price bid, complete in place, in accordance with Standard Details 02221-4 and 02221-5.

2.10 CLAY DIKES (SEE SECTION 02221)

- A. No measurement will be made.
- B. Payment for clay dikes will be made at the unit price bid per each installation, complete in place, as shown on Standard Detail 02221-7.

2.11 SHEETING AND SHORING LEFT IN PLACE (SEE SECTION 02221)

- A. Measurement of sheeting and shoring left in place with the approval of the ENGINEER will be the material actually left in place. Each wood member will have its nominal dimensions measured and the sum total of all members converted to thousand board feet (MBF).
- B. Payment will be in accordance with the unit price bid per MBF.

2.12 TEST PIT EXCAVATION (SEE SECTION 02221)

- A. Test pit excavation, when directed by the ENGINEER, will be measured by the three-dimensional method, rounded to the nearest whole cubic yard. Measurement for core samples will be on the basis of each sample bored.
- B. Payment for test pit excavation will be at the unit price bid per cubic yard, complete in place. Payment for core samples will be at the unit price bid for each boring, including surface restoration, complete in place.

2.13 HAND EXCAVATION (SEE SECTION 02221)

- A. Hand excavation, when approved by the ENGINEER will be measured by the three-dimensional method, rounded to the nearest whole cubic yard.
- B. Payment for hand excavation will be at the unit price bid per cubic yard. No additional payment will be made for hand excavation required to uncover existing utilities.

2.14 CRUSHED AGGREGATE (SEE SECTION 02221)

- A. Measurement for crushed aggregate, when specifically identified as a pay item, will be based on the net certified scale weight of the shipment from the plant.
- B. Payment for crushed aggregate will be made at the unit price bid per ton, complete in place.

2.15 FLOWABLE FILL (SEE SECTION 02221)

- A. Measurement for flowable fill, when specifically identified as a pay item, will be based on the volume shown on the certified batch slips delivered to the site.
- B. Payment for flowable fill will be made at the unit price bid per cubic yard, complete in place.

2.16 WETLAND CROSSING

- A. No measurement will be made.
- B. Payment for wetland crossing will be made at the lump sum price bid, complete in place, in accordance with detail 02221-6.

2.71 FENCING (SEE SECTION 02830)

- A. Measurement for chain link fence will be made along the fence centerline, post to post, rounded to the whole foot, including gates.
- B. Payment will be made at the unit price bid per linear foot of fence installed, complete in place. No separate payment will be made for gates.

2.80 LANDSCAPE PLANTINGS (SEE SECTION 02901)

- A. No measurement will be made.
- B. Payment for landscaping plantings will be made at the lump sum price bid complete in place, as shown on the Contract Drawings.

PART 3 STORM SEWER PAYMENT ITEMS

3.01 STORM DRAIN PIPE (SEE SECTION 02618)

- A. Measurement of storm drain pipe will be made along the finished ground surface over the centerline of the pipeline from center to center of inlet or manhole or face of headwall, to the limits of payment shown on the Contract Drawings.

- B. Payment for storm drain pipe will be made at the unit price bid per linear foot for each size and class of pipe, complete in place.

3.02 FITTINGS (SEE SECTION 02618)

- A. Measurement for fittings will be on the basis of the number of each size and type installed.
- B. Payment for fittings will be at the unit price bid per each size and type of fitting, complete in place.

3.03 MANHOLES (SEE SECTION 02601)

- A. Measurement for manholes will be on the basis of the number of each size installed, as shown on the Contract Drawings.
- B. Payment for manholes will be at the unit price bid per each size, complete in place.

3.04 MANHOLE FRAMES AND COVERS (SEE SECTION 02601)

- A. Measurement for installation of frames and covers will be on the basis of the number of frame and cover sets installed. Measurement for grade adjustments of frames will be on the basis of the number of frames adjusted.
- B. Payment for manhole frame and cover sets will be at the unit price bid for each set, complete in place. Payment for grade adjustments of frames will be at the unit price bid for each frame adjusted, complete in place.

3.05 PRECAST INLETS (SEE SECTION 02602)

- A. Measurement for precast inlets will be on the basis of the number of each type installed, as shown on the Contract Drawings. Measurement for grade adjustments of frames and grates will be on the basis of the number of frames adjusted.
- B. Payment for precast inlets will be at the unit price bid, per type, complete in place. Payment for inlet frame adjustments will be at the unit price bid for each frame adjusted, complete in place.

3.06 OTHER PRECAST STRUCTURES (SEE SECTION 02602)

- A. Measurement for structures will be on the basis of each type installed, as shown on the Contract Drawings.
- B. Payment for structures will be at the unit price bid, per type, complete in place.

PART 4 WATER PAYMENT ITEMS

4.01 WATER PIPE (SEE SECTION 02615)

- A. Measurement for water pipe shall be made along the finished trench surface over the centerline of the pipeline to the limits shown on the Contract Drawings. No deduction in length will be made for valves and fittings.

- B. Payment for water pipe will be made at the unit price bid per linear foot for each size and class of pipe, complete in place, including testing and disinfection.

Pipe fittings and valves will be paid separately.

4.02 FITTINGS (SEE SECTION 02615)

- A. Measurement of water main fittings will be on the basis of the number installed multiplied times the weight in pounds for each fitting, excluding bolts and accessories. The total quantity will be rounded to the nearest whole pound.
- B. Payment for water main fittings will be made at the unit price bid per pound. Payment will include fitting, bolts, accessories and installation complete in place.

Thrust blocks will be paid separately as mass concrete.

4.03 VALVES (SEE SECTION 02640)

- A. Measurement of valves will be on the basis of the number of each size and type installed.
- B. Payment for valves will be made at the unit price bid for each size and type valve, complete in place including valve box.

4.04 FIRE HYDRANTS (SEE SECTION 02640)

- A. Measurement of fire hydrants will be on the basis of the number installed.
- B. Payment for fire hydrants will be made at the unit price bid for each hydrant installed, complete in place. Payment will include hydrant, excavation and backfill, installation, stone for drain, tie rods and thrust restraint.

4.05 SERVICE CONNECTION PIPE AND TUBING (SEE SECTION 02642)

- A. Measurement of service connection pipe or tubing will be made along the ground surface over the centerline of the pipe or tubing to the limits shown on the Contract Drawings.
- B. Payment for service connections installed in an open cut trench will be paid for at the unit price per linear foot for each size complete in place. Payment will include pipe or tubing, excavation, backfill installation, and testing and disinfection. Restoration will be paid separately at the unit price bid for the appropriate item.

4.06 SERVICE CONNECTIONS (SEE SECTION 02642)

- A. Measurement of service connections will be on the basis of the number installed.
- B. Payment for service connections will be made at the unit price bid for each service connection, complete in place. Payment will include corporation stop, curb stop, and curb box excluding pipe or tubing.

4.07 METERS (SEE SECTION 02642)

- A. Measurement for meters will be on the basis of the number installed.

B. Payment for meters will be made at the unit price bid for each size meter, complete in place.

4.08 AIR RELEASE VALVES (SEE SECTION 02640)

A. Measurement for air release valves will be on the basis of the number installed.

B. Payment for air release valves will be made at the unit price bid for each type and size, complete in place, including valve vault.

4.09 BLOWOFFS (SEE SECTION 02640)

A. Measurement for blowoffs will be on the basis of the number installed.

B. Payment will be made at the unit price bid for each size blowoff, complete in place.

PART 5 SANITARY SEWER PAYMENT ITEMS

5.01 GRAVITY SEWER PIPE (SEE SECTION 02610)

A. Measurement for payment of gravity sewer pipe of each size and type will be made horizontally along the pipeline from center to center of manholes. Measurement of gravity sewer laterals of each size and type will be made horizontally along the lateral regardless of depth from the centerline of main pipeline to the beginning of the wye fitting under the cleanout, or stopper if no cleanout is required.

No deduction in measurement will be made for lengths of fittings or manholes.

B. Payment for gravity pipe will be made for completed manhole sections at the unit price bid per linear foot for each size, complete in place. Payment for all gravity pipes shall include testing in accordance with Section 02651.

5.02 FITTINGS (SEE SECTION 02610)

A. Measurement of fittings will be on the basis of the number of each size and type installed.

B. Payment for fittings will be made at the unit price bid for each, complete in place, including temporary plug.

5.03 PLUGS AND CAPS (SEE SECTION 02610)

A. Measurement of plugs or caps will be on the basis of the number of each size and type permanently installed.

B. Payment for plugs or caps will be made at the unit price bid for each, complete in place.

5.04 FORCE MAIN PIPE (SEE SECTION 02610)

A. Measurement for force main pipe shall be made along the finished trench surface over the centerline of the pipeline to the limits shown on the Contract Drawings. No deduction in length will be made for valves and fittings.

B. Payment for force main pipe will be made at the unit price bid per linear foot for each size and class of pipe, complete in place, including testing and warning tape.

5.05 FORCE MAIN FITTINGS (SEE SECTION 02610)

- A. Measurement of force main fittings will be on the basis of the number installed multiplied times the weight in pounds for each fitting, excluding bolts and accessories. The total quantity will be rounded to the nearest whole pound.
- B. Payment for fittings will be made at the unit price bid per pound. Payment will include fitting, bolts, accessories and installation, complete in place.

Thrust blocks will be paid separately as mass concrete.

5.06 VALVES (SEE SECTION 02610)

- A. Measurement of valves will be on the basis of the number of each size and type installed.
- B. Payment for valves will be made at the unit price bid for each size and type valve, complete in place, including valve box.

5.07 AIR RELEASE/VACUUM VALVES (SEE SECTION 02610)

- A. Measurement for air release vacuum valves will be on the basis of the number installed.
- B. Payment for air release vacuum valves will be made at the unit price bid for each type and size air release vacuum valve, complete in place, including valve vault.

5.08 MANHOLES (SEE SECTION 02601)

- A. Measurement for manholes will be from the elevation of the manhole invert at the lowest point in the channel to the elevation of the top of the casting, based on the grade sheet elevations unless approved by the ENGINEER prior to installation.
- B. Payment for manholes will be made at the unit price bid for each size, complete in place, and include all testing as specified in Section 02651, Paragraph 3.04.

Separate payment will be made for manhole frames and covers, drop connections, and stubs.

Payment for manholes 6-feet deep and under, and the first 6 feet of manholes over 6-feet deep will be at the unit price bid for each, complete in place.

Payment for manhole depth over 6 feet shall be at the unit price bid per vertical foot, complete in place.

5.09 MANHOLE FRAMES AND COVERS (SEE SECTION 02601)

- A. Measurement for installation of frames and covers will be on the basis of the number of frame and cover sets installed. Measurement for grade adjustments of frames will be on the basis of the number of frames adjusted.
- B. Payment for installation of manhole frame and cover sets will be at the unit price bid for each set, complete in place. Payment for grade adjustments of frames will be at the unit price bid for each frame adjusted, complete in place.

5.10 MANHOLE DROP CONNECTIONS (SEE SECTION 02610)

- A. Measurement for drop connections will be based on the vertical distance from the manhole invert at the centerline to the invert of the upper invert pipe as shown on the approved grade sheets.
- B. Payment for the drop connections will be at the unit price bid per vertical foot for each size of drop connection, complete in place.

5.11 MANHOLE STUBS (SEE SECTION 02610)

- A. Measurement for stubs shall be made on the basis of the number of each of each size installed.
- B. Payment for stubs will be made at the unit price bid for each size and class of pipe, complete in place.

5.12 CONNECTION TO EXISTING FACILITIES (SEE SECTION 02610)

- A. Measurement for connections to existing facilities will be on the basis of the number of each connection completed.
- B. Payment for connections to existing mains will be made at the lump sum price bid for each complete in place, including temporary plugs.
- C. Payment for connections to existing manholes will be made at the lump sum price bid for each, complete, including testing, any channel reconfiguration, temporary flow diversions and patching manhole wall.

5.13 CLEANOUTS (SEE SECTION 02610)

- A. Measurement for cleanouts will be on the basis of the number of each installed.
- B. Payment for cleanouts will be at the unit price bid for each unit, complete in place, including wye, elbow, reducer, riser pipe, cleanout cap, plug, backfill, testing, and site restoration.

PART 6 CAST-IN-PLACE CEMENT CONCRETE PAYMENT ITEMS

6.01 MASS CONCRETE (SEE SECTION 03050)

- A. Measurement for concrete not requiring formwork or finishing will be by the volume shown on the certified batch slips.
- B. Payment for concrete will be made at the unit price bid per cubic yard, complete in place.

6.02 STRUCTURES (SEE SECTION 03000)

- A. Measurement for cast-in-place structures will be made by the 3-dimensional method, based on the dimensions on the Contract Drawings, rounded to the nearest tenth of a cubic yard. No deduction for reinforcing or penetrations displacing a volume less than ½ cubic yard will be made.

- B. Payment for cast-in-place structures will be made at the unit price bid per cubic yard, complete in place. No separate payment will be made for reinforcing.

6.03 CONCRETE ENCASUREMENT OF PIPES (SEE SECTION 03050)

- A. Measurement of concrete encasement of pipes will be along the centerline of the pipeline between limits of encasement specified.
- B. Payment for concrete encasement of pipes will be made at the unit price bid per linear foot of each size of pipe encased, regardless of type of pipe material, complete in place, in accordance with Standard Detail 03050-1. Pipe will be paid separately under appropriate item.

PART 7 ROADWAY PAYMENT ITEMS

7.01 ROAD EXCAVATION, FILL AND COMPACTION (SEE SECTION 02230)

- A. No measurement will be made.
- B. Payment for road excavation, fill, and compaction will be made at the lump sum bid, complete in place.

7.02 CRUSHED AGGREGATE BASE COURSE (SEE SECTION 02230)

- A. Measurement of crushed aggregate base course will be made by the 2-dimensional method over the surface of the base after placement, rounded to the nearest whole square yard.
- B. Payment for crushed aggregate base course will be made at the unit price bid per square yard, complete in place.

7.03 SUPERPAVE BASE COURSE (SEE SECTION 02500)

- A. Measurement for Superpave base course will be based on net certified scale weight of the shipment from the batch plant. Weights will be determined from scales approved by PennDOT.
- B. Payment for Superpave base course will be made at the unit price bid per ton, complete in place.

7.04 SUPERPAVE BINDER OR LEVELING COURSE (SEE SECTION 02500)

- A. Measurement for Superpave binder/leveling course will be based on net certified scale weight of the shipment from the batch plant. Weight will be determined from scales approved by PennDOT.
- B. Payment for Superpave binder/leveling course will be made at the unit price bid per ton, complete in place.
- C. Measurement for milling will be by the 2-dimensional method at the applicable depth along the surface of the pavement to the limits of the milling, rounded to the nearest whole square yard. Payment for milling will be made at the unit price square yard.

- 7.05 SUPERPAVE WEARING COURSE (SEE SECTION 02500)
- A. Measurement for wearing course will be based on net certified scale weight of the shipment from the batch plant. Weight will be determined from scales approved by PennDOT.
 - B. Payment for wearing course will be made at the unit price bid per ton, complete in place.
- 7.06 SEAL COAT (SEE SECTION 02500)
- A. Measurement for seal coat will be by the two-dimensional method along the surface of the pavement to the limits of the coat placed, rounded to the nearest whole square yard.
 - B. Payment for seal coat will be made at the unit price bid per square yard, complete in place.
- 7.07 SURFACE TREATMENT (SEE SECTION 02500)
- A. Measurement for surface treatment will be by the two-dimensional method along the surface of the pavement to the limits of the treatment, rounded to the nearest whole square yard.
 - B. Payment for surface treatment will be made at the unit price per square yard, complete in place.
- 7.08 CURBS (SEE SECTION 02525)
- A. Measurement for curbs will be made along the finished surface over the centerline of the curbing, rounded to the nearest whole foot.
 - B. Payment for curbs will be made at the unit price bid per linear foot, complete in place. Payment shall include removal and disposal of existing curb which conflicts with the new curb.
- 7.09 SIDEWALKS (SEE SECTION 02525)
- A. Measurement for sidewalk construction will be made by the two-dimensional method along the surface of the sidewalk to the limits of the sidewalk placed, rounded to the nearest whole square foot.
 - B. Payment for sidewalks will be made at the unit price bid per square foot, complete in place. Payment shall include removal and disposal of existing sidewalk which conflicts with the new sidewalk.
- 7.10 CURB RAMP (SEE SECTION 02525)
- A. Measurement for curb ramp shall be made on the basis of the number installed.
 - B. Payment for curb ramps will be based on the number of each curb ramp installed, complete in place and include all activities associated with the placement, including but not limited to saw cutting, excavation, disposal of material, providing 6" thick reinforced concrete and 6" thick stone base, providing detectable warning domes, replacement of OWNER furnished signs and restoration of structures required to be temporarily disturbed, such as fences, posts, mail boxes or trash cans.

7.13 PAVEMENT MARKINGS (SEE SECTION 02760)

- A. Measurement of pavement markings for each type installed will be made horizontally along the centerline of the marking, rounded to the nearest whole foot; double yellow striping shall be considered one strip. Measurement of arrow will be made based on the number of each placed.
- B. Payment will be made at the unit price bid per linear foot for all single white lines and double yellow lines of the specific marking, complete in place, including all labor, materials, and removal conflicting, existing pavement markings. Payment will be made for all arrows and works at the unit price bid for each installed of the specific marking, complete in place, including all labor, materials and removal of conflicting, existing pavement marking.

7.30 GUIDE RAIL (SEE SECTION 02852)

- A. Measurement of guide rail will be made along the ground surface under the guide rail to the limits shown on the Contract Drawings.
- B. Payment for guide rail includes posts and mounting and will be paid for at the unit price per linear foot for each type, complete in place. Payment will include excavation, backfill, and installation, restoration of surface and connection to existing facilities. Removal of existing guide rail is considered incidental.
- C. Separate payment will be made for end treatments.

7.31 END TREATMENTS (SEE SECTION 02852)

- A. Measurement for end treatments will be made on the basis of the type and the number installed shown on the Contract Drawings.
- B. Payments for end treatments include posts and mounting and will be paid on at the unit price bid for each type, complete in place. Payment will include excavation, foundation, backfill, surface restoration and guide rail connection, complete in place.

PART 8 TRENCH RESTORATION PAYMENT ITEMS

8.01 TRENCH PAVING (SEE SECTION 02575)

- A. Measurement for trench paving will be made along the finished ground surface over the centerline of the trench. Paving will be measured to the maximum limits of payment specified on Standard Details 02575-1 and 02575-2 or to the limit of paving actually placed, whichever is less, rounded to the nearest whole square yard.
- B. Payment for trench paving will be made at the unit price bid per square yard, complete in place.

8.02 UNPAVED AREAS (SEE SECTION 02221)

- A. Measurement for restoration of unpaved areas over trenches will be made as specified for the various types of pipelines (excluding cleanouts). Unpaved surface restoration will be measured to the limits of payment specified or to the limits of the restoration actually constructed, whichever is less, rounded to the nearest whole linear foot.

- B. Payment for unpaved surface restoration will be made at the unit price bid per linear foot of pipeline (excluding cleanouts) for each type or class of unpaved surface restoration, complete in place.

8.03 TEMPORARY PAVING (SEE SECTION 02575)

- A. Measurement for temporary paving will be made along the finished ground surface over the centerline of the paving. Paving will be measured to the limits of payment specified or to the limits of paving actually placed, whichever is less, rounded to the nearest whole square yard.
- B. Payment for temporary paving will be made at the unit price bid per square yard, complete in place.

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. Site excavation and placement of fill material: | Section 02210 |
| 2. Trenching, backfilling and compacting: | Section 02221 |
| 3. Roadway excavation, fill, and compaction: | Section 02230 |
| 4. Soil erosion and sedimentation control: | Section 02270 |
| 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, guiderail, 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 utilized

1.03 SUBMITTALS

A. Permits:

1. Submit two copies of each on-site burning permit if such permits are required.
2. For off-site disposal, submit two copies of the agreement with each property OWNER releasing the OWNER and ENGINEER from responsibility in connection with the disposal of the debris, and permits or approvals from regulatory agencies.

1.04 JOB CONDITIONS

A. The CONTRACTOR may clear all obstructions within the construction limits or permanent and construction rights-of-way except those specifically designated to be saved or restored on the Contract Drawings or Specifications.

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 or light weight orange polyethylene barricade fence with 1"-2" by 3"- 4" openings.
2. Soil-set fence posts, studded "T" type, 6' high.

B. Tree Wound Dressing:

1. Antiseptic and waterproof, asphalt base.

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify the ENGINEER and regulatory agencies at least 72 hours prior to beginning any clearing work.
- B. Protect benchmarks, utilities, existing trees, shrubs and other landscape features designated for preservation with temporary fencing or barricades satisfactory to the ENGINEER. No material shall be stored or construction operation carried on within 4-feet of any tree to be saved or within the tree protection fence.
- C. When a private enclosure fence encroaches on the work area, notify the property OWNER at least 5 days in advance of the clearing/grubbing operations to permit the OWNER to remove it, construct a supplemental fence, or make such other arrangements as may be necessary for security purposes. Upon failure of the property OWNER to reasonably proceed with the work required to secure his property, carefully remove the fence, in whole or in part and neatly pile the materials onto the OWNER's property.

3.02 UTILITY RELOCATIONS

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

3.03 CLEARING

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

3.04 GRUBBING

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

3.05 STRIPPING AND STOCKPILING TOPSOIL

- A. Strip topsoil to whatever depth it may occur from areas to be excavated, filled, or graded and stockpile.
- B. The topsoil is the property of the OWNER and shall not be used as backfill or removed from the site.

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. Do not deposit or bury on the site debris resulting from the clearing and grubbing work unless authorized in writing by the OWNER.
- C. Debris may be burned on-site if required permits are obtained, and if burning operations are conducted in compliance with all regulations.
- D. Discarded materials within the right-of-way limits necessary to perform the work shall be removed and properly disposed of at the CONTRACTOR's expense.

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 during the life of the Contract and warranty period as a result of construction operations with like species acceptable to the OWNER.
- C. Remove protective fences, enclosures and guards upon the completion of the project.
- D. Restore guard posts, guiderail, signs and other interferences to the condition equal to that existing before construction operations.
- E. Fences, mail boxes, and signs within the line of work shall be carefully removed, stored, and upon completion of backfill, reset or replaced to their original condition and location, at the CONTRACTOR's expense.

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. Trenching, backfilling and compacting: Section 02221

C. Definitions: NONE

D. Applicable Standard Details:

02150-1 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 (PennDOT), latest revisions, Publication 408 Specifications.
3. American Railway Engineering Association, Manual for Railway Engineering.

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 of the ENGINEER. 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.
- C. If boring is obstructed, relocate or jack or tunnel crossing as approved by the ENGINEER.

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 Contract Drawings.

2.02 CASING SPACERS

A. Non-metallic:

1. High density polyethylene (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. Spacers shall provide constant projections around entire circumference of carrier pipe. Projections must have minimum height to pipe bells, similar to RACI type spacers as manufactured by RACI Spacers of North America, Vernon, British Columbia, or approved equal.

B. Stainless Steel (bolt on):

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

C. 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. Provide with notches to accommodate fastening. Treat notches at time of pipe installation.

2.03 STEEL STRAPPING: ASTM A36

2.04 SAND (Fine aggregate)

- A. Section 703.1, 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 – Type D as specified in Section 02221, Table 1.

2.07 BORED LATERAL PIPING

- A. Gravity sewer pipe and fitting for 4” or 6” PVC bored laterals shall meet ASTM D3034, minimum SDR-21.
- B. Solvent cemented joints shall meet ASTM D2855 specifications.
- C. Solvent cement shall meet ASTM D2564 specifications.
- D. Solid wall coupling shall be provided to make pipe transition from SDR-21 to SDR-35 or Schedule 40 piping.
- E. All laterals shall be air tested with cleanouts in place.

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. Grouting to fill voids will be at the expense of the CONTRACTOR.

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 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 02150-1. 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 two (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 stainless steel weep hole.
- E. Completely fill annular space between carrier pipe and casing pipe with limestone screenings. If in a State highway right-of-way, fill annular space with flowable fill.

3.04 CARRIER PIPE INSTALLATION WITHOUT CASING PIPE

- A. Bore the opening with a boring auger to the determined vertical and horizontal alignment.
- B. Do not overcut boring excavation by more than 1" greater than the outside diameter of the lateral pipe.
- C. Carefully guide the lateral pipe and joints through the opening, assembling joints prior to inserting into the boring.

END OF SECTION

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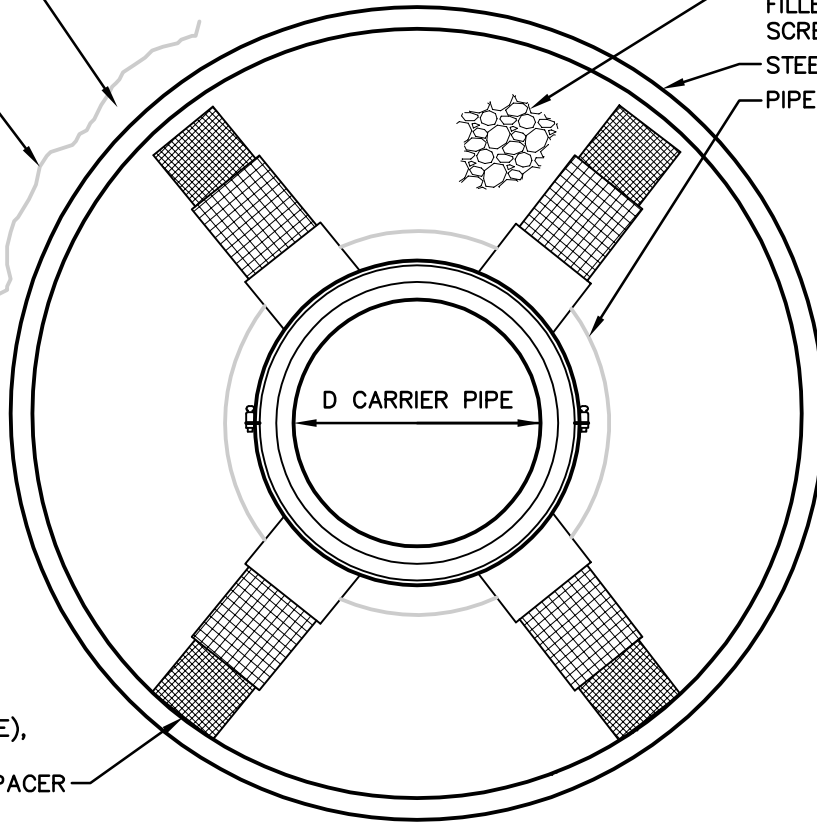
PUMP GROUT BETWEEN CASING AND EXCAVATION IF GREATER THAN 1"

EXCAVATION

ANNULAR SPACE TO BE FILLED WITH LIMESTONE SCREENINGS *

STEEL CASING PIPE

PIPE BELL



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

D CARRIER PIPE

NOTE:

DO NOT SUPPORT CARRIER PIPE ON BELLS

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

NOTE: NOT TO SCALE



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WWW.CSDAVIDSON.COM

CASING INSTALLATION

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02150-1

SECTION 02210

SITE EXCAVATION AND PLACEMENT OF FILL MATERIAL

PART 1 GENERAL

1.01 DESCRIPTION

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

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

B. Related work specified elsewhere:

- | | |
|---|---------------|
| 1. Clearing and grubbing: | Section 02100 |
| 2. Trenching, backfilling and compacting: | Section 02221 |
| 3. Roadway excavation, fill and compaction: | Section 02230 |
| 4. Soil erosion and sedimentation control: | Section 02270 |
| 5. Finish grading, seeding, and 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 408, Specifications
Publication 213, Temporary Traffic Control Guidelines
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 Determine In-Place Density and Moisture Content of Construction Materials by Use of Nuclear Gauges

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

D698	Test Method of Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf./ft ³)
D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lbf./ft ³)
D2922	Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

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

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

4. Pennsylvania Code

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

B. Testing Agency:

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

C. Compaction Testing:

1. Determine compaction by the testing procedure contained in ASTM D698 or ASTM D1557 at the locations and frequencies specified in Section VIII - Technical Provisions (Detailed).

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

B. Control of Traffic:

1. Employ traffic control measures in accordance with Publication 213, "Temporary Traffic Control Guidelines".

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 has been approved by the ENGINEER.
- F. Flowable Fill. As defined in Section 02221 and approved in advance by the ENGINEER.

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. Provide and maintain signs, flashing warning lights, barricades, markers, and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with State and local codes, permits and regulations.

3.02 SALVAGE TOPSOIL

- A. Within the areas indicated for grading, strip topsoil to the depth of suitable topsoil material and stockpile for subsequent 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 ENGINEER and recompacted. Suitable fill material shall be spread in layers of not more than 8 inches (loose) over the full area of the fill, and compacted to the required density by the use of compaction equipment. All fill material shall be compacted to not less than 95% of its maximum dry weight density at its optimum moisture content, plus or minus 2%, as determined by ASTM D698, under roadways, shoulders, driveways, curbs, sidewalks, gravel and sand parking areas and not less than 90% in yards, fields and sand areas.

When the material is too coarse to satisfactorily use these methods, compaction will be determined by the ENGINEER 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 ENGINEER, 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 or floodway area of any stream.
- 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 ENGINEER.

3.04 EXCAVATION

- A. Perform excavation of borrow material in a manner satisfactory to the ENGINEER. 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 borrowing operations are complete, re-grade area, if necessary, to prevent erosion.

3.05 BLASTING

- A. Blasting is the sole responsibility of the CONTRACTOR and no duty is assumed or to be exercised by OWNER or ENGINEER relative thereto.
- B. Blasting work shall be supervised by licensed and experienced personnel and performed in conformance with applicable Federal, State and local codes.

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. Comply with requirements of Section 02270- Soil Erosion and Sedimentation Control.

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.

3.08 TOPSOILING

- A. Top soiling as specified in Section 02485, Finish Grading, Seeding and Sodding.

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.

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. Clearing and grubbing: | Section 02100 |
| 2. Boring and jacking: | Section 02150 |
| 3. Soil erosion and sedimentation control: | Section 02270 |
| 4. Finish grading, seeding and sodding: | Section 02485 |
| 5. Paving and resurfacing: | Section 02575 |

C. Definitions: NONE

D. Applicable Standard Details:

- 02221-1 Select Material Stone Backfill Pay Quantities
- 02221-2 Payment Limits - Pipe Payment by Depth
- 02221-3 Pipe Bedding Details
- 02221-4 Stream Crossing (Flumed) Detail
- 02221-5 Stream Crossing (Bypass) Detail
- 02221-6 Clay Dike Detail
- 02221-7 Wetland Crossing 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 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	Test Method of Laboratory Compaction Characteristics of Soil Using Standard Effort
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 ENGINEER.

C. Compaction Testing:

1. Conduct compaction tests as directed in Section VIII - Technical Provisions (Detailed) at locations as directed by the ENGINEER during backfilling operations.
2. Determine compaction in state highways and shoulders by the testing procedure contained in PTM No. 106, Method B or PTM No. 402.
3. Determine compaction in areas other than state highways and shoulders by the testing procedure contained in ASTM D698 or ASTM D2922.

1.03 SUBMITTALS

A. Certificates:

1. Submit certification from aggregate suppliers attesting that the pipe bedding and select material stone backfill materials conform to the specifications herein.

B. Compaction Equipment List:

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

1.04 JOB CONDITIONS

A. Classification of Excavation:

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

B. Compaction of Backfill:

1. The degree of compaction required at each location is indicated in the Backfill and Surface Restoration Requirements Table in Section 02575.

C. Control of Traffic:

1. Employ traffic control measures in accordance with Publication 213, "Temporary Traffic Control Guidelines".

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 ENGINEER any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of premises of any emergency created or discovered.
4. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.

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 the ENGINEER, at which time the ENGINEER 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 condition 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 coarse aggregate, Table C, Section 703.2, Publication 408 Specifications. 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 Provision 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 (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

D. Suitable Backfill Material (Other than highways, driveways, and shoulders):

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.

Table 1 - Flowable Fill

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 **
Flow Cone (seconds) ASTM C939	30-60	–	–	30-60****
Slump (inches) PTM No. 600	–	7-11	7-11	7-11****
Density (pcf) PTM No. 613	95-110***	120-135***	125 min. ***	30-70 or as specified ***

Water Absorption of Aggregate, PTM No. 506	–	–	–	20 (max %)
Compressive Strength (psi) PTM No. 604				
• 3 days (minimum)	25	25	300	40
• 28 days (range)	50-125	50-125	800 min.	90-400

* Quantities may be varied or alternate designs submitted to adapt mix to meet density and strength requirements or to adapt to specific site conditions.

** Requires the use of 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 lightweight aggregate or air entraining admixture is used to obtain lightweight properties.

PART 3 EXECUTION

3.01 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Maintain traffic in one or more unobstructed lanes and provide access to all streets and private drives.
- B. Provide and maintain protective devices as required by 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. Blasting is the sole responsibility of the CONTRACTOR and no duty is assumed or to be exercised by OWNER or ENGINEER relative thereto.
- B. 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 from the main pipeline to the right-of-way line (in accordance with Section 02610), plus that excavation necessary for placement of pipe bedding material.

2. Pressure Pipelines:

- a. Excavate trenches to the minimum depth necessary to place required pipe bedding material and to provide a minimum of 42" from the top of the pipe to the finished ground elevation, except where specific depths are otherwise shown on the Contract Drawings.
3. Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material.
4. Where the CONTRACTOR, by error or intent, excavates beyond the minimum required depth, backfill the trench to the required pipeline grade with pipe bedding material.

B. Width of Excavation:

1. Excavate trenches, including laterals, to a width necessary for placement and jointing of the pipe, and for placing and compacting pipe bedding and trench backfill around the pipe, but not less than 16" or more than 24" plus the pipe outside diameter from the bottom of the trench to a point 12" above the crown of the pipe.
2. Shape trench walls completely vertical from trench bottom to at least 2' above the top of the pipe. Trench walls from 2' above the top of the pipe to grade to be benched and sloped, or shaved, to comply with Federal and State laws and codes.
3. For pressure pipeline fittings, excavate trenches to a width that will permit placement of concrete thrust blocks. Provide earth surfaces for thrust blocks that are perpendicular to the direction of thrust and are free of loose or soft material.

3.05 SUPPORT OF EXCAVATION

- A. The adequacy of the design of sheeting, shoring and bracing installations relative to the nature of the material to be encountered and retained is the sole responsibility of the CONTRACTOR and no duty is assumed or to be exercised by OWNER or ENGINEER 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 the CONTRACTOR's expense.
- D. Removal of sheeting, shoring and bracing as backfilling proceeds is the CONTRACTOR's responsibility.

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 Section 02270, Soil Erosion and Sedimentation Control.

3.07 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work. Comply with Section 02270, Soil Erosion and Sedimentation Control.
- 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. Type III Bedding:
 - 1. Depth of pipe bedding aggregate as shown on Standard Detail 02221-3.
 - 2. Provide Type III bedding when installing reinforced concrete storm drain pipe.

B. Type IV Bedding:

1. Depth of pipe bedding aggregate as shown on Standard Detail 02221-3.
2. Provide Type IV bedding when installing all other pipes larger than 2" diameter.

C. Type V Bedding:

1. Depth of pipe bedding aggregate as shown on Standard Detail 02221-3.
2. Provide Type V bedding when installing piping 2" diameter and smaller.

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

E. Pipe embedment material shall be placed, worked by hand or compacted until a minimum density of 90% in yards and 95% under driveways, shoulders, roadways and sidewalks is achieved (at optimum moisture content, $\pm 2\%$, standard proctor), unless otherwise specified in Section VIII - Technical Provisions (Detailed).

3.09 PIPE LAYING

- A. Provide required pipe bedding placed in accordance with the Standard Details.
- 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 or use restrained joint fittings at all bends, tees, valves, and changes in direction, in accordance with the Standard Details.

3.11 BACKFILLING TRENCHES

- A. After pipe installation and inspection, backfill trenches to 12" above the crown of the pipe with specified backfill material, as per Pipe Bedding Detail (02221-3), 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:

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 ENGINEER 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 ENGINEER.

D. Uncompacted Backfill:

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

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.

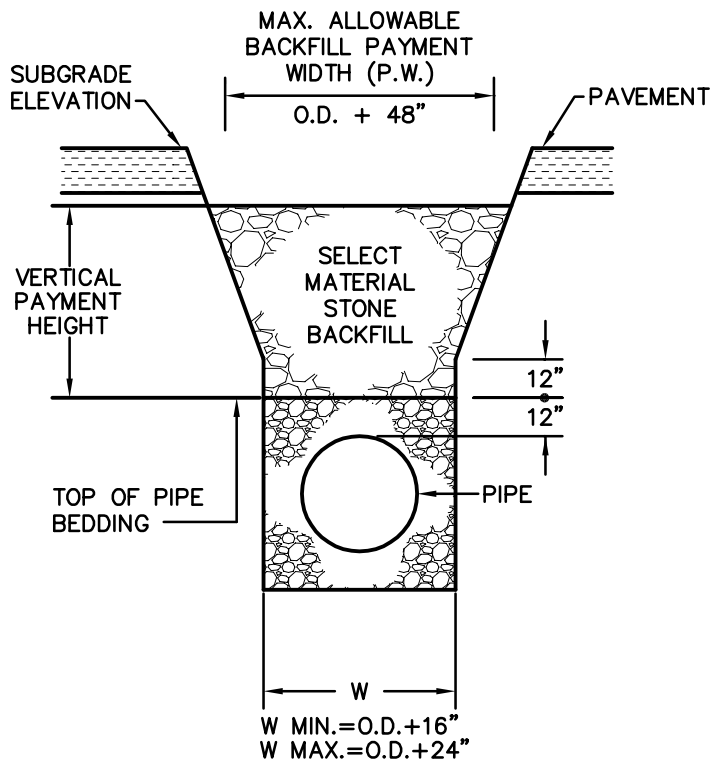
- B. Restore grassed areas in accordance with Section 02485, Finish Grading, Seeding and Sodding.

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 on 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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_Trenching,_Backfilling_&_Compacting.doc



PAY QUANTITIES

P.W. (FT.)	TON PER VERT. FT. PER LIN. FT.
2.00	.128
2.25	.144
2.50	.160
2.75	.176
3.00	.192
3.25	.208
3.50	.224
3.75	.240
4.00	.256
4.50	.288
5.00	.320
5.50	.352
6.00	.384
6.50	.416
7.00	.448
8.00	.512
8.50	.544
9.00	.576
9.50	.608

NOTES:

- A. PAYMENT TO BE MADE PER VERTICAL FOOT PER LINEAR FOOT OF PIPE ACCORDING TO PAY QUANTITY TABLE SHOWN.
- B. VERTICAL PAYMENT HEIGHT TO BE MEASURED FROM THE TOP OF PIPE BEDDING TO THE SUBGRADE ELEVATION.
- C. VOLUME OF SELECT MATERIAL STONE BACKFILL TO BE CALCULATED AT AVERAGE STATION DEPTH AND STANDARD STATION LENGTHS AS SHOWN ON GRADE SHEET.
- D. NO ADDITIONAL PAYMENT WILL BE MADE FOR EXTRA WIDTH AT MANHOLES OR OTHER APPURTENANCES.
- E. MEASUREMENTS OF LENGTH TO BE PER GRADE SHEET FROM CENTERLINE TO CENTERLINE OF MANHOLE OR CENTERLINE TO END OF LATERALS. MEASUREMENT OF LENGTH SAME AS PIPE.
- F. UNIT WEIGHT FOR PAYMENT IS 128 POUNDS PER CUBIC FOOT.

NOTE: NOT TO SCALE

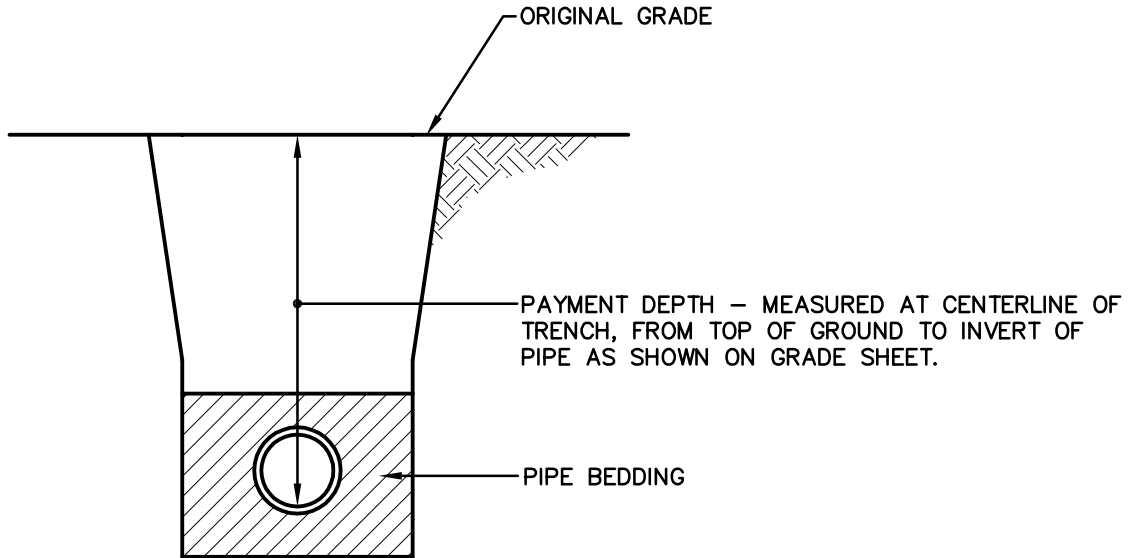


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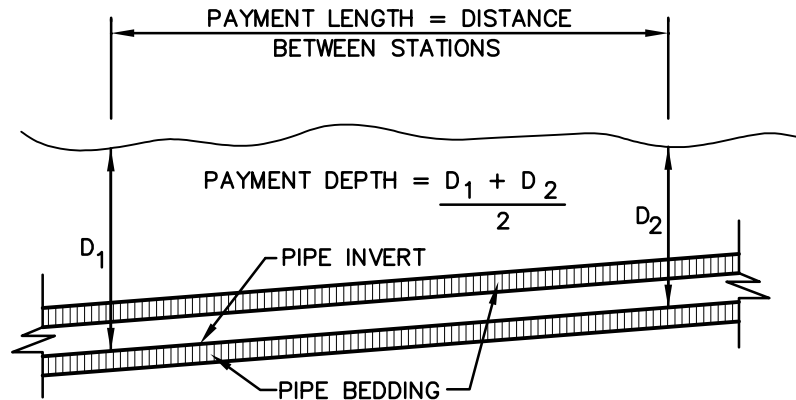
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SELECT MATERIAL STONE BACKFILL PAY QUANTITIES

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02221-1



SECTION



PROFILE

PAYMENT SHALL BE MADE AT UNIT COST PER LINEAR FOOT AT AVERAGE OF DEPTHS AT STATIONS SHOWN ON GRADE SHEETS.

PAYMENT LENGTH WILL BE MEASURED TO CENTERLINE OF MANHOLES OR TERMINATION.

NOTE: NOT TO SCALE

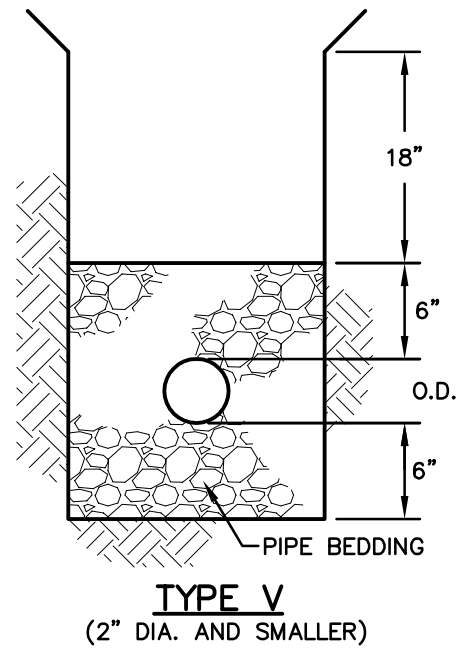
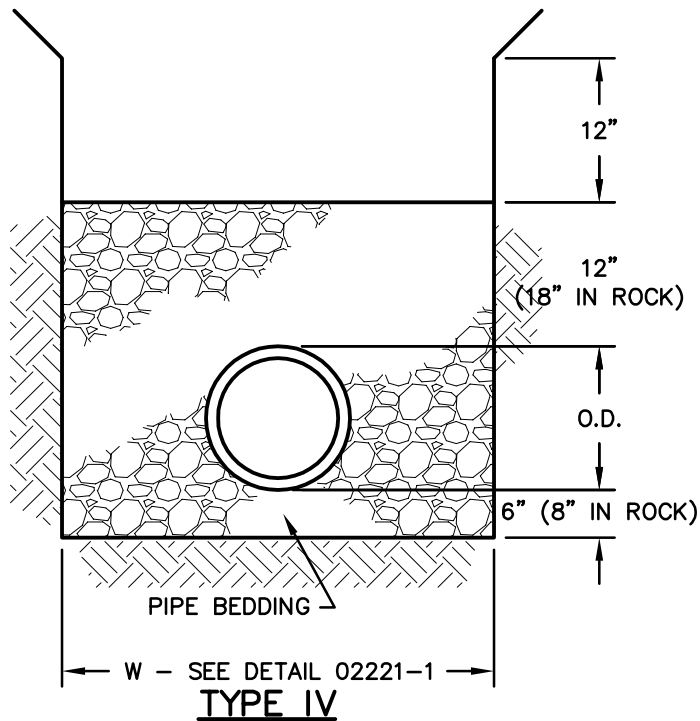
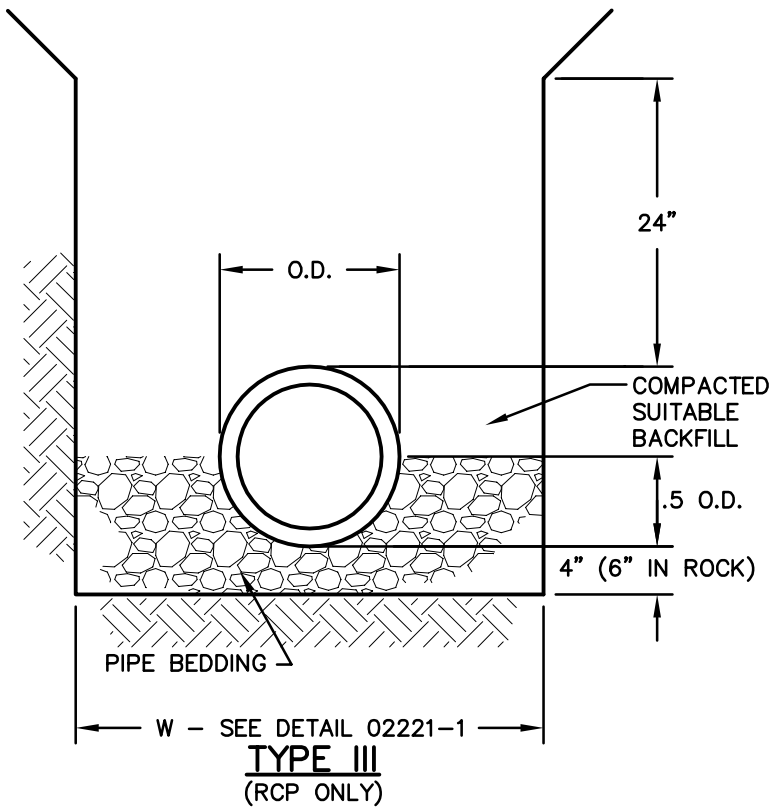


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PAYMENT LIMITS –
 PIPE PAYMENT BY DEPTH

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02221-2



NOTE: TYPE I AND II NOT PERMITTED.

NOTE: NOT TO SCALE



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PIPE BEDDING DETAILS

DATE: 9/15/2009

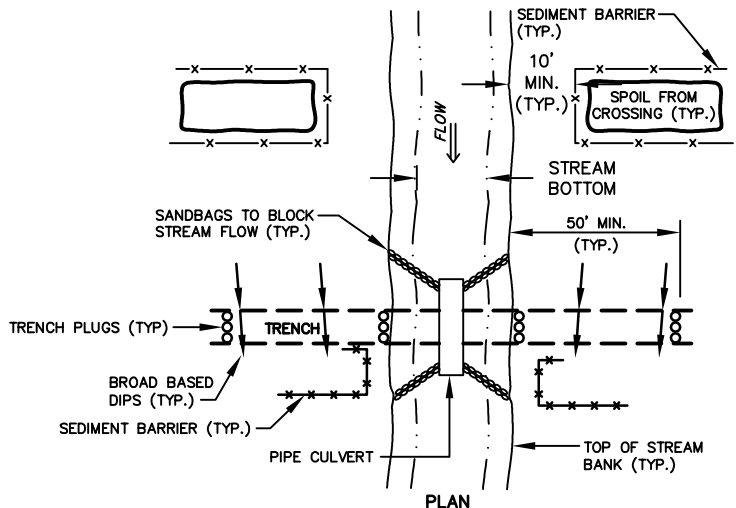
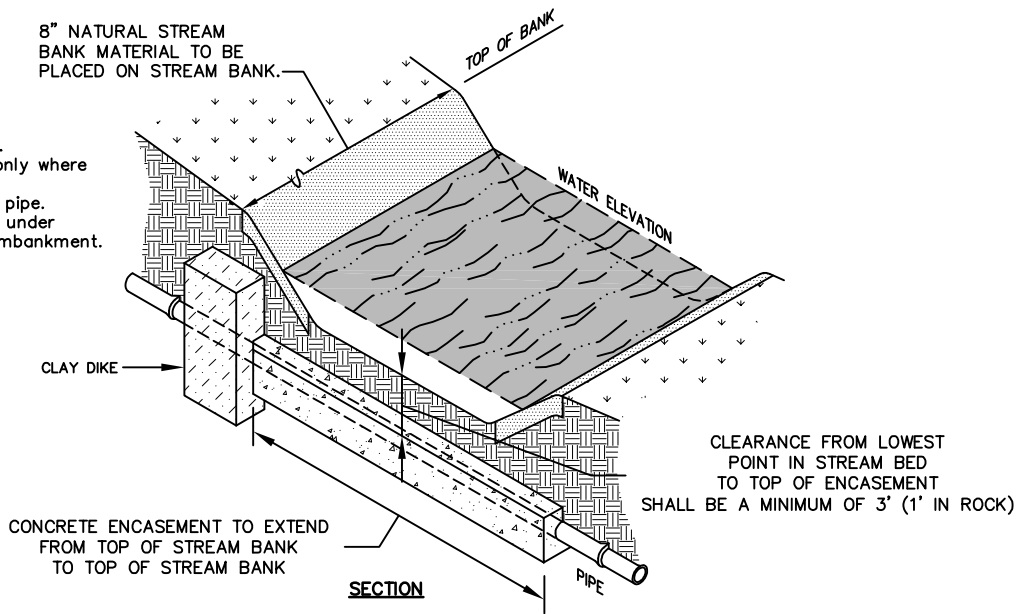
DRAWN BY: CRP

CHK. BY:

NO. 02221-3

Notes:

1. Concrete to be 3,000 psi.
2. Encasement to be used only where specified on plans.
3. Pipe shall be ductile iron pipe.
4. Filter fabric to be placed under rip-rap and keyed into embankment.



NOTES:

1. All work within the stream area must follow the requirements for all applicable permits obtained for this project. All work within the stream, including the trench backfilling, stabilization of the stream banks must be completed within 72 hours.
2. Install broad based dips at 50' from the top of bank and 10' from the top of bank.
3. Construct sediment barriers and direct runoff from the broad based dips into them.
4. Install temporary pipe culvert in the stream. Size and number of culverts to be determined on site or adequately convey baseflow. Minimum culvert diameter to be 12".
5. Install pipe with trench plugs.
6. Once entire pipe is installed between corresponding manholes install clay dikes and concrete encasement.
7. Remove trench plugs and backfill trench. Place minimum 8" of natural stream bed material at existing grades.
8. Remove sandbags and temporary pipe.
9. Install sediment barrier at top of stream banks. Grade out broad base dips and all disturbed area in accordance with seeding restoration table.
10. Stream Crossing bid item includes excavation, backfill, trench plugs, and other work incidental to the stream crossing construction as shown on contract drawings.
11. Pipe, concrete encasement, clay dike are to be paid under their respective bid items.
12. Provide pinning to anchor pipe.

NOTE: NOT TO SCALE



Excellence in Civil Engineering

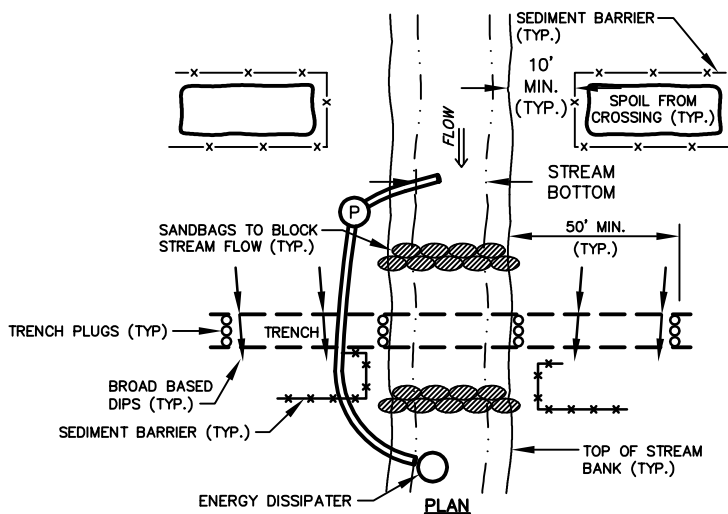
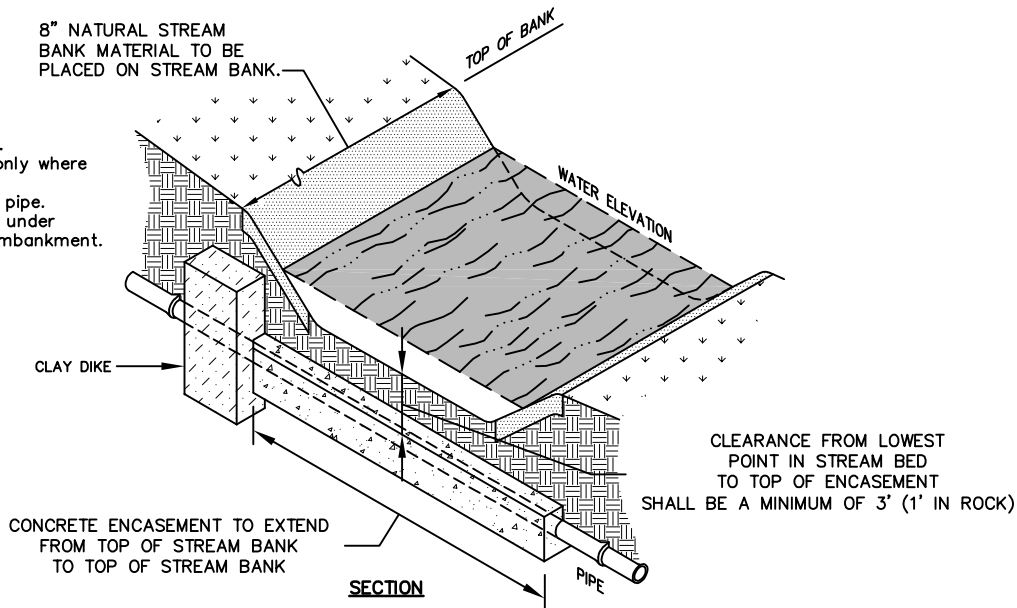
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UTILITY LINE
 STREAM CROSSING
 (FLUMED) DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02221-4

Notes:

1. Concrete to be 3,000 psi.
2. Encasement to be used only where specified on plans.
3. Pipe shall be ductile iron pipe.
4. Filter fabric to be placed under rip-rap and keyed into embankment.



NOTES:

1. All work within the stream area must follow the requirements for all applicable permits obtained for this project. All work within the stream, including the trench backfilling, stabilization of the stream banks must be completed within 72 hours.
2. Install broad based dips at 50' from the top of bank and 10' from the top of bank.
3. Construct sediment barriers and direct runoff from the broad based dips into them.
4. Install temporary pipe culvert in the stream. Size and number of culverts to be determined on site or adequately convey baseflow. Minimum culvert diameter to be 12".
5. Install pipe with trench plugs.
6. Once entire pipe is installed between corresponding manholes install clay dikes and concrete encasement.
7. Remove trench plugs and backfill trench. Place minimum 8" of natural stream bed material at existing grades.
8. Remove sandbags and temporary pipe.
9. Install sediment barrier at top of stream banks. Grade out broad base dips and all disturbed area in accordance with seeding restoration table.
10. Stream Crossing bid item includes excavation, backfill, trench plugs, and other work incidental to the stream crossing construction as shown on contract drawings.
11. Pipe, concrete encasement, clay dike are to be paid under their respective bid items.
12. Provide pinning to anchor pipe.

NOTE: NOT TO SCALE



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UTILITY LINE
 STREAM CROSSING
 (BYPASS) DETAIL

DATE: 9/15/2009

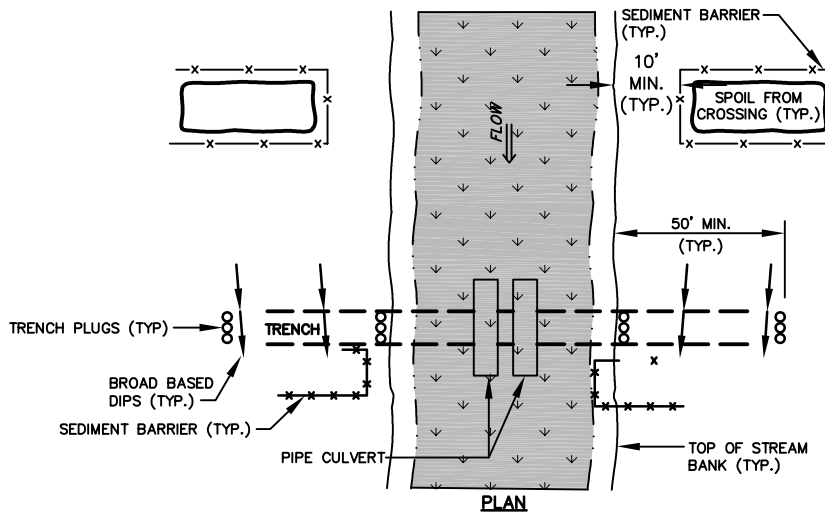
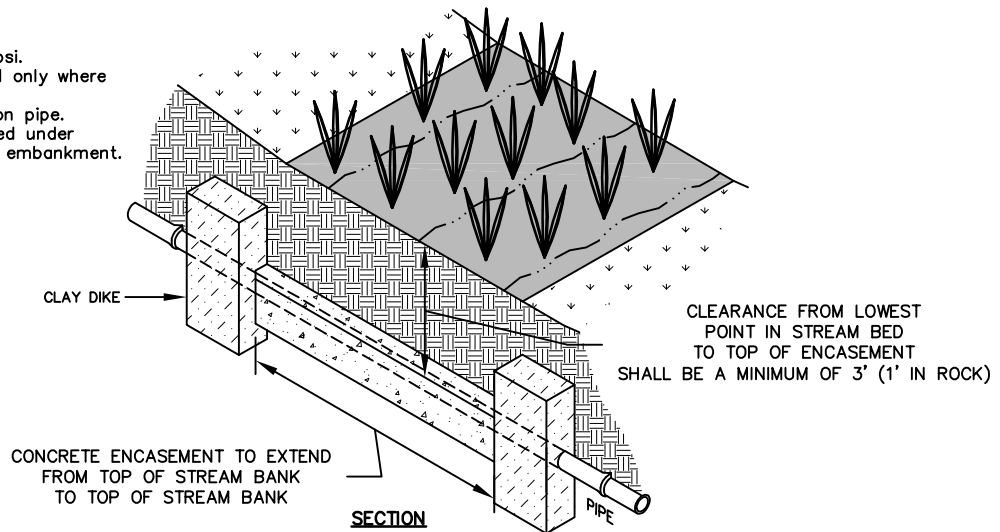
DRAWN BY: CRP

CHK. BY:

NO. 02221-5

Notes:

1. Concrete to be 3,000 psi.
2. Encasement to be used only where specified on plans.
3. Pipe shall be ductile iron pipe.
4. Filter fabric to be placed under rip-rap and keyed into embankment.



NOTES:

1. All work within the wetland area must follow the requirements for all applicable permits obtained for this project. All work within the stream, including the trench backfilling, stabilization of the stream banks must be completed within 72 hours.
2. Install broad based dips at 50' from the top of bank and 10' from the top of bank.
3. Construct sediment barriers and direct runoff from the broad based dips into them.
4. Install temporary pipe culverts in the wetland. Size and number of culverts to be determined on site to adequately convey baseflow. (Mats, pads, or other similar devices shall be installed where crossing of wetland areas by construction equipment cannot be avoided.)
5. Install pipe with trench plugs.
6. Once entire pipe is installed between corresponding manholes install clay dikes and concrete encasement.
7. Remove trench plugs and backfill trench with native wetland material. Original grades through wetland must be restored. Any excess material must be removed from the wetland. Mounding of fill material to allow for settlement in the trench will be permitted in accordance with best construction methods.
8. Remove temporary pipe.
9. Woodchips from clearing and grubbing of wetland area should be spread over all disturbed areas. Do not reseed the disturbed areas of the wetland.
10. Install sediment barrier at top of wetland banks. Grade out broad base dips and all disturbed areas in accordance with Seeding Restoration Table.
11. Wetland Crossing bid item includes excavation, backfill, trench plugs, and other work incidental to the stream crossing construction as shown on Contract Drawings.
12. Pipe, concrete encasement, and clay dike are to be paid under their respective bid items.
13. Provide pinning to anchor pipe.

NOTE: NOT TO SCALE

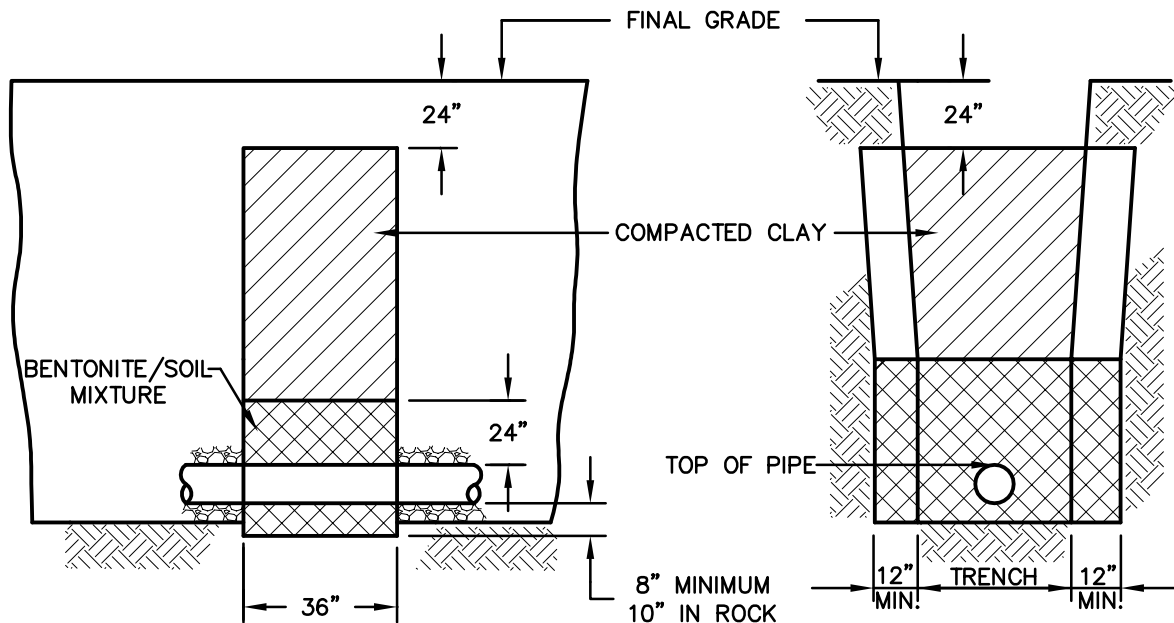


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UTILITY LINE
 WETLAND CROSSING
 (FLUMED) DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02221-6



NOTES:

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

NOTE: NOT TO SCALE



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**CLAY DIKE
DETAIL**

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02221-7

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. Clearing and grubbing: | Section 02100 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Finish grading, seeding and sodding: | Section 02485 |
| 4. Bituminous paving and surfacing: | Section 02500 |
| 5. Soil erosion and sedimentation control: | Section 02270 |

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:

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):

T99Moisture-Density Relations of Soils, Using a 5.5-lb. Rammer and a 12-in. Drop
T191Standard Method of Test for Density of Soil In-Place by the Sand Cone Method.

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

D2167 Test Method for Density and Unit Weight of Soil in Place by the Rubber-Balloon Method.

D2922 Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

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

Publication 408, Specifications

B. Inspections:

1. Inspection by the ENGINEER will, at a minimum, be made of the subgrade prior to placement of the base course, and of the base course prior to placement of the binder surface.

1.03 SUBMITTALS

A. Certificates:

1. Submit certification from aggregate suppliers attesting that materials conform to PennDOT specifications herein. PennDOT certification (CS-4171) shall be provided with each load of crushed aggregate delivered to the job site.

1.04 JOB CONDITIONS

A. As specified in Section 02210.

B. Control of traffic:

1. Reasonable access must be maintained for adjacent property OWNERS and commercial properties.
2. All excavations in access drive, driveways, and state highway rights-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, Paragraph 2.01A or 2.01B.
- 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. Course Aggregate: Hard, tough, durable and uncoated inert particles reasonably free from clay, silt, vegetation other deleterious substances. Course aggregate shall be obtained from an approved source.

2.02 GEOTEXTILES:

- A. For all areas of wet subgrade – Class 4 Type B as defined in PennDOT Publication 408, Section 735, and as approved by the ENGINEER.

- B. For pavement base drains – Class 1 as defined in PennDOT Publication 408, Section 735, and as approved by the ENGINEER.

PART 3 EXECUTION

3.01 SUBGRADE

- A. Perform soil erosion control work in accordance with requirements of the Contract Drawings and Section 02270: Soil Erosion and Sedimentation Control.
- B. Roadway Excavation: Excavate or otherwise remove and satisfactorily dispose of materials located within the limits indicated on the Contract Drawings for roadways.
 - 1. Excavate to roadway subgrade depths required, and cut drainage channels and waterways as detailed on the Contract Drawings. Proof roll subgrade to the satisfaction of the ENGINEER.
 - 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 ENGINEER.
- 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, Paragraph 2.01A or 2.01B 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, Paragraph 2.01A or 2.01B.
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 ENGINEER.
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 Contract Drawings and/or shown in the "Backfill and Surface Restoration Requirements Table" in Section 02575, construct subbase in accordance with Publication 408 Specifications, Section 350.

B. Crushed Aggregate Base Course - Type A

1. Compaction shall be achieved by means of approved static or vibratory equipment as specified in Publication 408, Section 108.05(c) 3. 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.
2. On prepared subgrade (or subbase if required), spread limestone screenings (AASHTO No. 10) to a depth of one inch and compact.
3. Construct stone base of AASHTO No. 1 aggregate to the compacted depth specified in the "Backfill and Surface Restoration Requirements Table" in Section 02575.
4. 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.

5. 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 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 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.
6. Application of Fine Material: After the coarse material has been set and keyed by compaction, dry limestone screenings (AASHTO No. 10), in an amount equal to approximately 50% of that required to fill the voids in the coarse material shall be spread uniformly over the surface. The vibratory compaction equipment shall then be operated over the surface to cause the screenings to settle into the voids. The remaining screenings shall be spread and vibrated in one or more applications to satisfactorily fill the voids; however, the quantity of screenings used and the operation of filling shall not cause floatation of the coarse aggregate. Areas not completely filled, in the foregoing operations, shall be filled by manual methods and need not be further vibrated.
7. 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.
8. 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 OWNER.

C. Crushed Aggregate Base Course - Type B

1. 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.

2. On prepared subgrade (or subbase if required), construct stone base of PennDOT 2A coarse aggregate to the compacted depth specified in the "Backfill and Surface Restoration Requirement" Table in Section 02575. Material substitutions shall be approved by the ENGINEER.
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 OWNER.

D. Crushed Aggregate Shoulders

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

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. 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 ENGINEER and unsatisfactory work shall be repaired, corrected, or replaced. The OWNER will not be liable for payment for any excess depth of base course. The initial layer of fine material placed as a bed and filler will be measured and considered as part of the base course in determining the compacted depth of the finished base course.

1. The depth will be determined by cutting or digging holes to the full depth of the completed base course. One depth measurement shall be made for each 3000 square yards, or less, of completed base course. Any section in which the depth is ½ inch or more deficient in specified depth shall be satisfactorily corrected at no expense to the OWNER.
2. 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 ENGINEER who will check the depth for record purposes.

C. Field Moisture-Density Tests:

Conduct such tests as specified under Site Excavation and Placement of Fill Material: Section 02210.

END OF SECTION

SECTION 02270

SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 DESCRIPTION

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

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

B. Related work specified elsewhere:

- | | |
|--|---------------|
| 1. Clearing and grubbing: | Section 02100 |
| 2. Site excavation and placement of fill material: | Section 02210 |
| 3. Finish grading, seeding, sodding: | Section 02485 |
| 4. Storm drain pipe: | Section 02618 |

C. Applicable Standard Details:

- | | |
|---------|--|
| 02270-1 | General Soil Erosion Control For Residential Sites |
| 02270-2 | Stabilized Rock Construction Entrance |
| 02270-3 | Silt Barrier Fence Detail |
| 02270-4 | Super Filter Fabric Fence and Silt Sock Details |
| 02270-5 | Rock Filter Outlet |
| 02270-6 | Straw Bale Barrier |
| 02270-7 | Pumped Water Filter Bag |

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

Publication 408, Specifications
Publication 72M, Roadway Construction Standards (RC 0-99)

2. Pennsylvania Department of Environmental Protection (PA DEP):

Erosion and Sediment Pollution Control Program Manual Document No. 363-2134-008, Effective April 15, 2000 or latest revisions thereof as released in accordance with PA Code 25 Chapter 102.

3. Asphalt Institute Specifications

1.03 SUBMITTALS

- A. Soil Erosion and Sedimentation Control plan for this project is included in The Contract Drawings. The CONTRACTOR shall regard this plan as a minimum standard. This plan may not be adjusted by the CONTRACTOR without prior approval of the County Conservation District and other regulatory agencies as applicable, and by means of a Contract Change Order.

1.04 JOB CONDITIONS: Section Not Utilized.

PART 2 MATERIALS

2.01 STONE FOR RIP-RAP

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

2.02 MATTING FOR EROSION CONTROL

- A. The CONTRACTOR shall furnish a certification from the manufacturer that the matting conforms to the requirements prescribed hereinafter.

- B. Jute matting for erosion control:

- 1. As specified in Publication 408, Section 806.2(a).

- C. Excelsior matting:

- 1. As specified in Publication 408, Section 806.2(b).

- D. Nylon matting:

- 1. As specified in Publication 408, Section 806.2(d).

2.03 EROSION CONTROL DEVICES

- A. Silt Barrier Fence:

- 1. Geotextiles, Class 3: As specified in Publication 408, Section 735.1 (a) (b) (c) (d) and Section 865.2 (a).

- 2. Mesh Support: As specified in Publication 408, Section 865.2(b).

- 3. Post:

- a. Wood or steel or acceptable plastic with equivalent section and sufficient length for height of fence required.

- b. As specified in Publication 408, Section 865.2 (c).

- 4. Fasteners: As specified in Publication 408, Section 865.2(d).
 - 5. Ground Anchors, Guy Wires: As specified in Publication 408, Section 865.2 (e) (f).
- B. Compost Filter Sock:
- 1. Sock: High-density polyethylene (HDPE) expandable, tubular, biodegradable or photodegradable, 3 mil to 5 mil, 3/8 inch knitted meshes netting. Size as specified on Contract Drawings, as specified in Publication 408, Section 866.2.b
- C. Compost: Well-decomposed, stable, weed-free, organic compost meeting AASHTO MP-9 as specified in Publication 408 Section 866.2.a.
- D. Stakes 2 inch x 2 inch wood or equivalent steel stakes, length provided to ensure a minimum embedded depth of 18 inches and 3-4 inches extended above the top of the sock.
- 2.04 TEMPORARY COVER
- A. Seed: As specified in Section 02485.
 - B. Seed Mixtures: As specified in Section 02485.
 - C. Inoculant: As specified in Section 02485.
- 2.05 SOIL SUPPLEMENT MATERIALS
- A. Fertilizer: As specified in Section 02485.
 - B. Agricultural Lime: As specified in Section 02485.
- 2.06 MULCHING MATERIALS
- A. Straw: As specified in Section 02485.
 - B. Wood Cellulose Fiber: As specified in Section 02485.
 - C. Mulching Binder:
 - 1. Emulsified Asphalt: SS-1, CSS-1, CMS-1, MS-2, RS-1, RS-2, CRS-1, or CRS-2. Designations from Asphalt Institute Specifications.
 - D. Wood Chips: Wood chips, recovered from clearing and grubbing operation will be acceptable as mulch for seeding and shall be used at a rate of 35 cubic yards per acre.
- 2.07 STORM DRAIN PIPE
- A. As specified in Section 02618.
- 2.08 PUMPED WATER FILTER BAG
- A. As specified in Standard Detail 02270-7.

PART 3 EXECUTION

3.01 CONSTRUCTION SEQUENCE

- A. All earth disturbance activities shall proceed in accordance with the following sequence. Each stage shall be completed and immediately stabilized before any following stage is initiated.
 - 1. Clearing
 - 2. Grubbing
 - 3. Topsoil stripping shall be limited only to those areas described in each stage.
- B. At least seven (7) days before starting any earth disturbance activities, the OWNER and/or operator shall invite all contractors involved in those activities, (the landowner, all appropriate municipal officials, the erosion and sediment control plan preparer), and a representative of the County Conservation District to an on-site pre-construction meeting.
- C. At least three (3) days before starting any earth disturbance activities, all contractors involved in those activities shall notify the Pennsylvania One Call System Incorporated at 1-800-242-1776 for the location of existing underground utilities.
- D. The CONTRACTOR shall clear and grub areas only required to be cleared by the proposed construction. The detailed construction sequence listed on the allowed plan shall be strictly followed.
- E. Immediately upon discovering unforeseen circumstances posing the potential for accelerated erosion and/or sediment pollution, the operator shall implement appropriate best management practices to eliminate the potential for accelerated erosion and/or sediment pollution.
- F. The OWNER shall field mark the limits of disturbance for all work and all waters of the Commonwealth boundaries (ex. stream buffers, wetland boundaries, spring seeps, and floodway) prior to the start of construction.
- G. Upon completion of all earth disturbance activities and permanent stabilized of all disturbed areas, the OWNER and/or operator shall contact the County Conservation District for an inspection prior to the removal of the Best Management Practice (BMP's) facilities.
- H. Upon completion of all earth disturbance activities, removal of all temporary BMP's and permanent stabilization of all disturbed areas, the OWNER and/or operator shall contact the County Conservation District for a final inspection.

3.02 SOIL EROSION AND SEDIMENTATION CONTROL

- A. Topsoil stockpile heights shall not exceed 35 feet. Stockpile side slopes must be 2:1 or flatter.
- B. A copy of the approved erosion and sediment control plan must be available at the project site at all times.
- C. All pumping of sediment laden water shall be through a sediment control BMP, such as a pumped water filter bag or equivalent sediment removal facility, over undisturbed vegetated areas.

- D. All building materials and wastes must be removed from the site and recycled or disposed of in accordance with the PA DEP's solid waste management regulations at (PA Code 2501 et seq. 271.1 and 287,1 et seq). No building materials, water or unused building material shall be burned, buried, dumped or discharged at the site.
- E. The CONTRACTOR shall be responsible for the removal of any excess material and shall ensure that the site(s) receiving the excess has an approved erosion and sediment control plan that meets the conditions of PA Code 25, Chapter 102 and/or other State or Federal regulations.
- F. Clean Fill is defined as: uncontaminated, non-water soluble, non-decomposable, inert, solid material. The term includes: soil, rock, stone, dredged material, used asphalt, brick, block or concrete from construction and demolition activities that is separate from other waste and is recognizable as such. The term does not include materials placed in or on the waters of the Commonwealth unless otherwise authorized. (The term "used asphalt" does not include milled asphalt or asphalt that has been processed for re-use).
- G. Any placement of clean fill that has been affected by a spill or release of a regulated substance must use Form FP-001 to certify the origin of the fill materials and the results of the analytical testing to qualify the material as clean fill. Form FP-001 must be retained by the OWNER of the property receiving the fill.
- H. Environmental due diligence must be performed to determine if the fill materials associated with the project qualify as clean fill. Environmental due diligence is defined as: investigative techniques, including but not limited to, visual property inspections, electronic database searches, review of property ownership, review of property use history, sanborn maps, environmental questionnaires, transaction screens, analytical testing, environmental assessments or audits. Analytical testing is not a required part of due diligence unless visual inspection and/or review of the past land use of the property indicates that the fill may have been subject to a spill or release of a regulated substance. If the fill may have been affected by a spill or release of a regulated substance, it must be tested to determine if it qualifies as clean fill. Testing should be performed in accordance with Appendix A of the PA DEP's policy Management of Clean Fill.

3.03 STABILIZATION SPECIFICATIONS

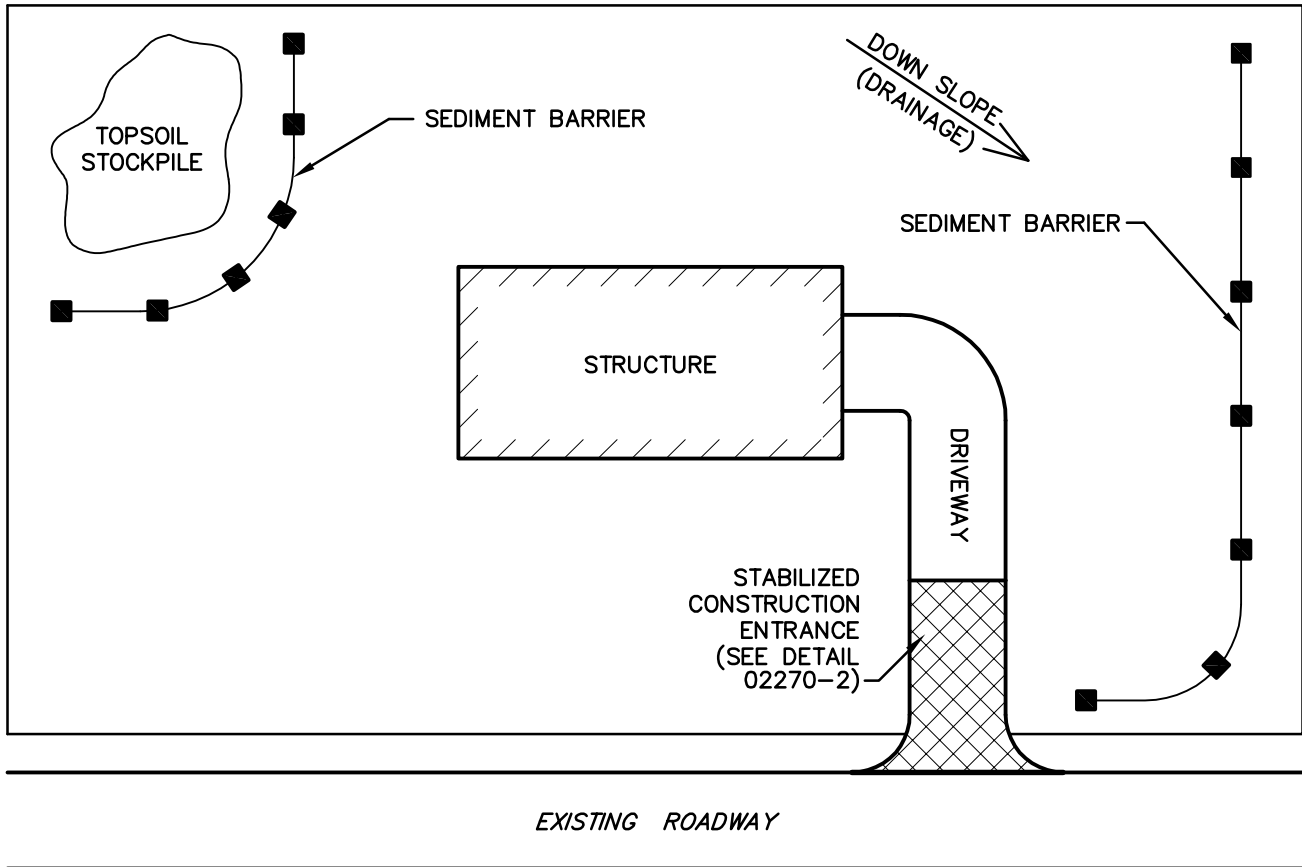
- A. Permanent stabilization is defined as a minimum uniform 70% perennial vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated surface erosions and subsurface characteristics sufficient to resist sliding and other movements.
- B. Immediately after disturbance activities cease, the operator shall stabilize the disturbed areas. During non-geminating periods, mulch must be applied at the specified rates. Disturbed areas which are not at finished grade and which will be re-disturbed within 1-year must be stabilized in accordance with the temporary vegetative stabilization specifications. Disturbed areas which are at final grade or which will not be re-disturbed within 1-year must be stabilized in accordance with the permanent vegetative stabilization specifications.
- C. An erosion control blanket will be installed on all disturbed slopes steeper than 3:1, all areas of concentrated flows, and disturbed areas within 50' of waters of the Commonwealth.

- D. Straw and hay mulch should be anchored immediately after application to prevent being windblown. A tractor-drawn implement may be used to “crimp” the straw or hay into the soil. This method is limited to slopes no steeper than 3:1. The machinery should be operated on the contour. (Note: Crimping of hay or straw by running over it with tracked machinery is not recommended.)
- E. Asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, uniformly applied at the rate of 31 gallons per 1000 sq. yd. may be used to tack mulch.
- F. Synthetic Binders (chemical binders) may be used as recommended by the manufacture to anchor mulch provided sufficient documentation is provided to show they are non-toxic to native plant and animal species.
- G. Lightweight plastic, fiber, or paper nets may be stabled over the mulch according to manufacturer’s recommendations.
- H. Tracking slopes is required by running tracked machinery up and down the slope, leaving tread marks parallel to the contour. (Note: If a bulldozer is used, the blade shall be up.) Care should be exercised on soils having a high clay content to avoid over-compaction.

3.04 MAINTENANCE PROGRAM

- A. Until the site is stabilized, all erosion and sediment control BMP’s must be maintained properly. Maintenance must include inspections of all erosion and sediment control BMP’s after each runoff event and on a weekly basis. All preventative and remedial maintenance work, including cleanest, repair replacement, re-grading, reseeding, re-mulching and re-netting must be performed immediately. If erosion and sediment control BMP’s fail to perform as expected, replacement BMP’s or modifications of those installed will be required.
- B. The permittee and co-permittee must ensure that visual site inspections are conducted weekly, and after each measurable precipitation event by qualified personnel, trained and experienced in erosion and sediment control, to ascertain that Erosion and Sediment Control (E&S) BMP’s are operational and effective in preventing pollution to the waters of the Commonwealth. A written report of each inspection shall be kept, and include:
 - 1. A summary of the site conditions, E&S BMP’s, and compliance; and
 - 2. The date, time, and the name of the person conducting the inspection.
- C. Any sediment removed from BMP’s during construction will be returned to upland areas on site and incorporated into site grading.

END OF SECTION



TYPICAL CONSTRUCTION SEQUENCE

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

NOTE: NOT TO SCALE

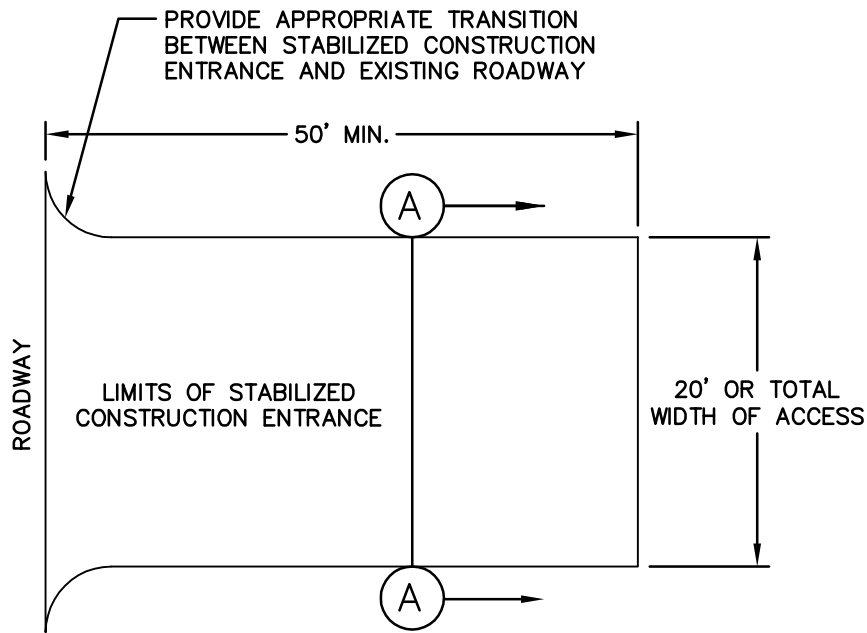


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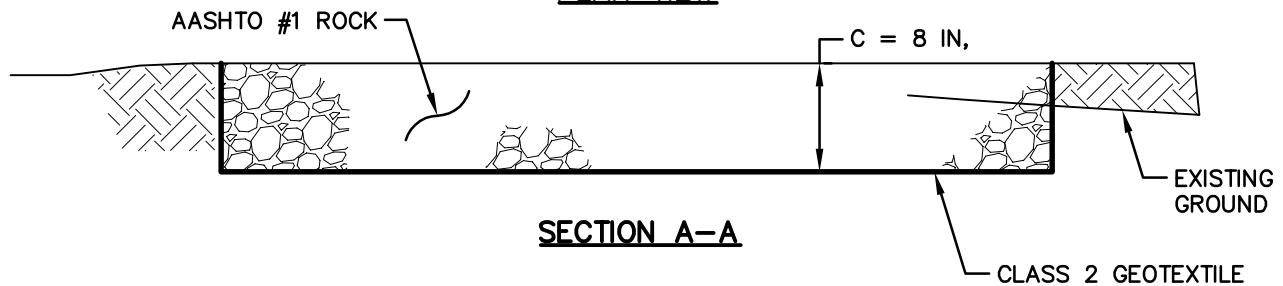
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GENERAL SOIL EROSION
 CONTROL FOR
 RESIDENTIAL SITES

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02270-1



PLAN VIEW



SECTION A-A

1. **Stone Size** – AASHTO #1.
2. **Length** – As required to be effective, but not less than 50’
3. **Thickness** – Not less than 8”.
4. **Width** – Full width of all points of ingress or egress, but not less than 20’.
5. **Washing** – Wheels shall be clean prior to entrance onto existing roadway. When washing is required it shall be done on an area stabilized with crushed stone which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through use of sand bags, gravel, boards, or other approved methods.
6. **Maintenance** – The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto existing roadway; this may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto existing roadways must be removed immediately.

NOTE: NOT TO SCALE



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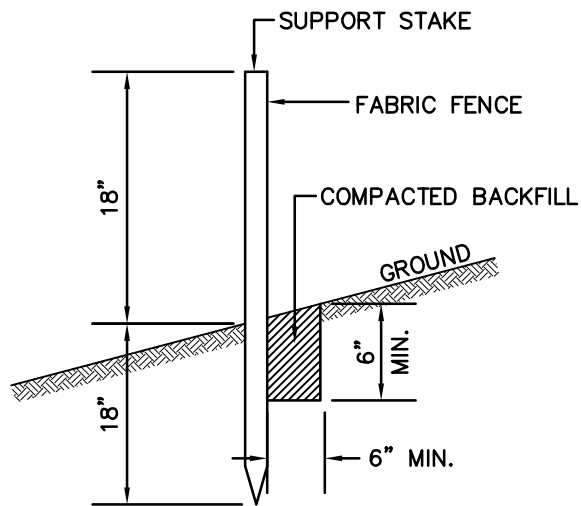
STABILIZED ROCK CONSTRUCTION ENTRANCE

DATE: 9/15/2009

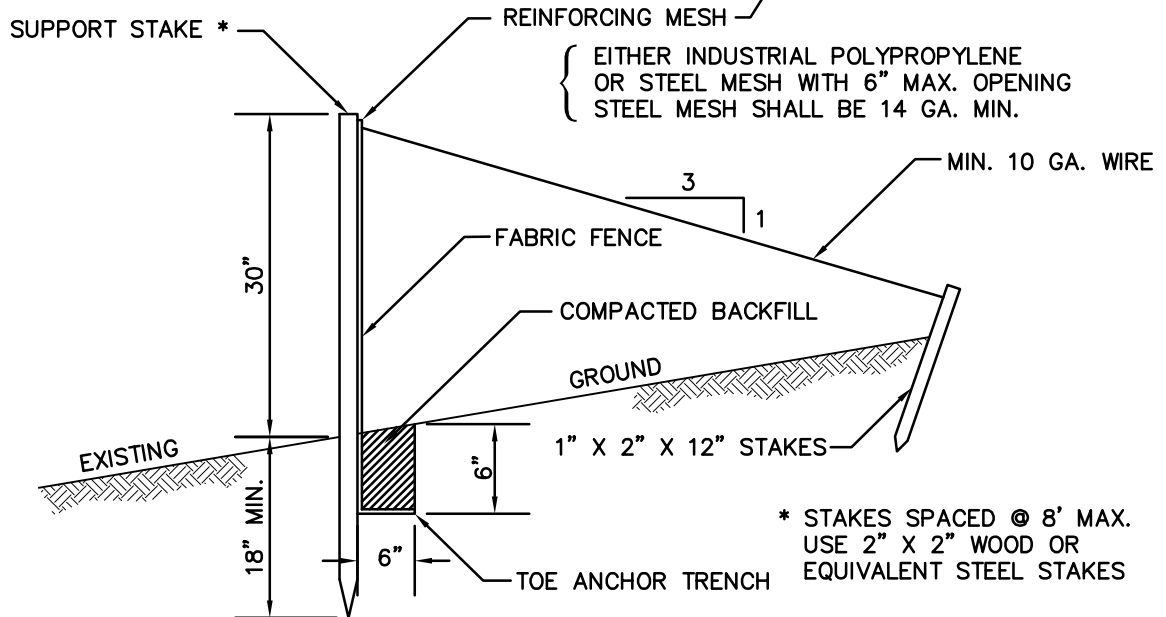
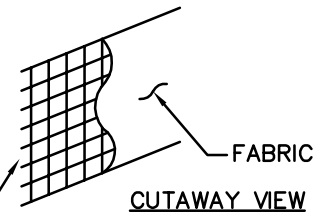
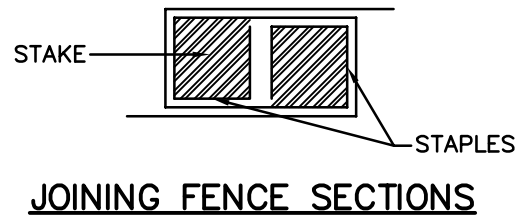
DRAWN BY: CRP

CHK. BY:

NO. 02270-2



18" SILT FENCE DETAIL



30" SILT FENCE DETAIL

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

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

ANY FENCE SECTION WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET. STANDARD DETAIL, 02270-5.

NOTE: NOT TO SCALE

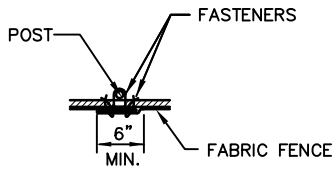


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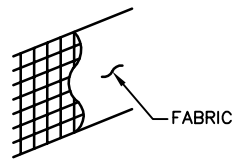
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SILT BARRIER
 FENCE DETAIL

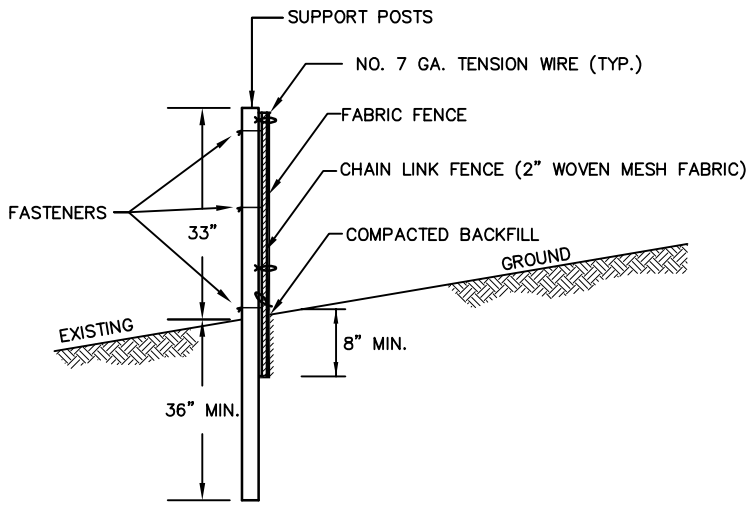
DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02270-3



JOINING FENCE SECTIONS



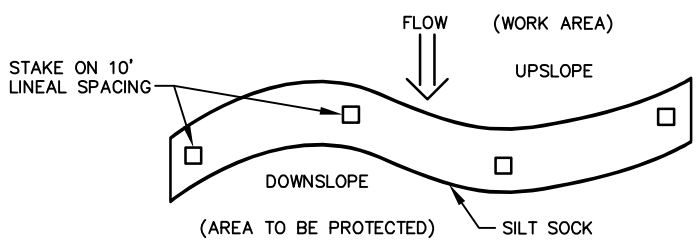
CUTAWAY VIEW



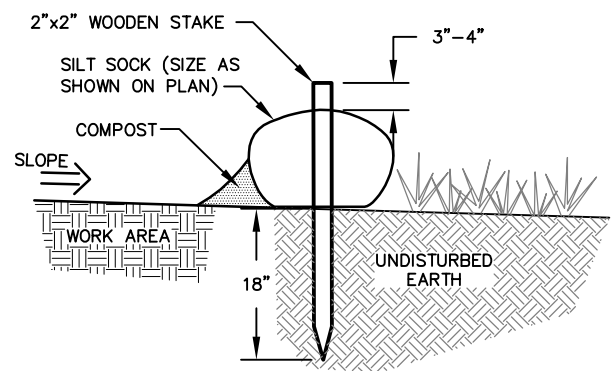
Notes:

1. Posts spaced @ 10' max. Use 2 1/2" dia. galvanized or aluminum posts. Chain Link to Post Fasteners spaced @ 14" max. Use No. 6 Ga. aluminum wire or No. 9 galvanized steel pre-formed clips.
2. Chain Link to Tension Wire Fasteners spaced @ 60" max. Use No. 10 Ga. galvanized steel wire. Fabric to Chain Fasteners spaced @ 24" max. C to C.
3. No. 7 Ga. Tension Wire installed horizontally at top and bottom of chain-link fence.
4. Filter Fabric Fence must be placed at existing level grade. Both ends of the barrier must be extended at least 8 feet upslope at 45 degrees to the main barrier alignment.
5. Sediment must be removed when accumulations reach 1/2 the above ground height of the fence.

SUPER FILTER FABRIC FENCE DETAIL



PLAN VIEW



SECTION VIEW

Notes:

1. Silt sock is to be installed on undisturbed ground.
2. The contractor shall maintain the compost silt sock in a functional condition at all times and it shall be routinely inspected.
3. Where silt sock requires repair, it will be routinely repaired.
4. The contractor shall remove sediments collected at the base of the silt sock when they reach 1/3 of the exposed height of the sock, or as directed by the engineer.
5. The compost silt sock will be dispersed on site when no longer required, as determined by the engineer.
6. In instances where silt sock installation is on ground sloped along the length of the sock, an eight (8) foot "turn out" shall be installed for every one vertical foot of elevation difference.
7. As site grading changes from existing to proposed conditions, it is the contractor's responsibility to relocate and/or replace the silt sock as required to ensure that the silt sock is parallel to site contours and all sediment laden water is prevented from leaving the site.
8. Sock size based on measured width after filled with material.

SILT SOCK DETAIL

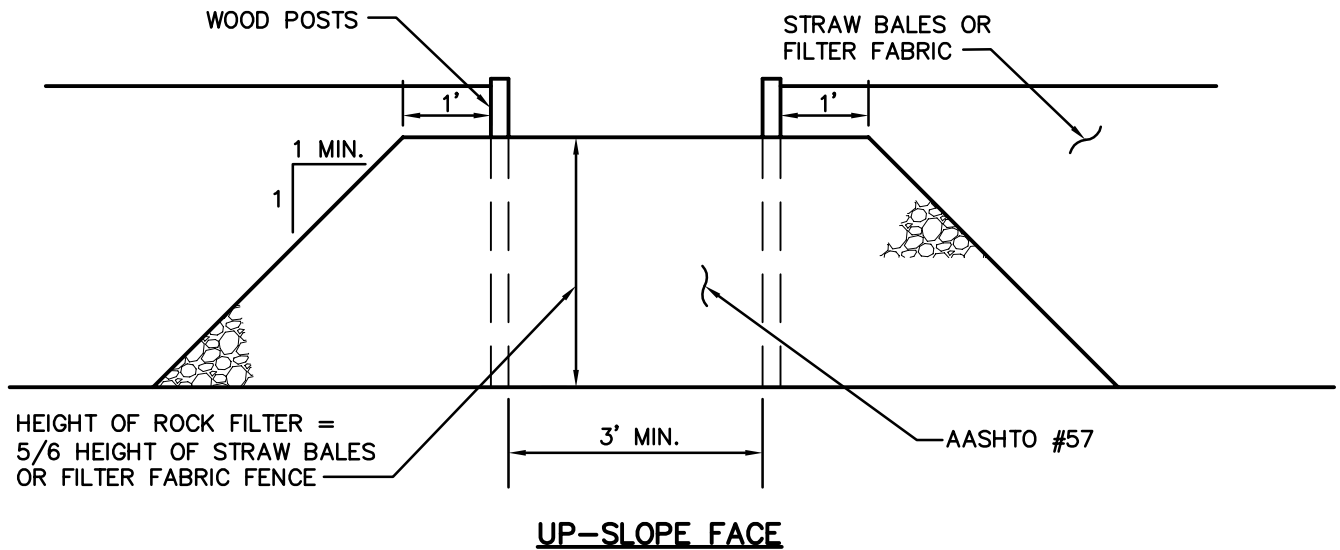
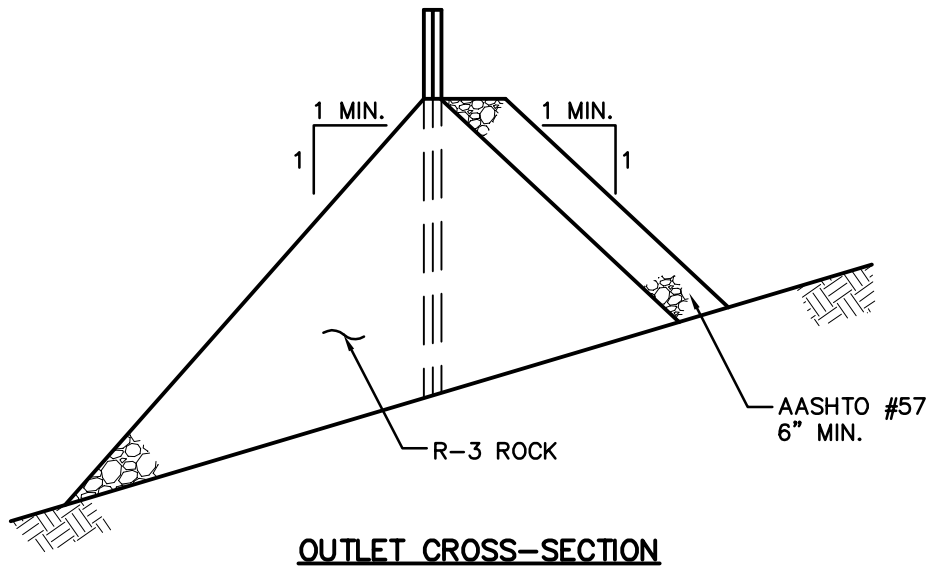
NOTE: NOT TO SCALE



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SUPER FILTER FABRIC FENCE AND SILT SOCK DETAILS

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02270-4



Note:
Sediment shall be removed when accumulations reach 1/3 the height of the outlet.

NOTE: NOT TO SCALE



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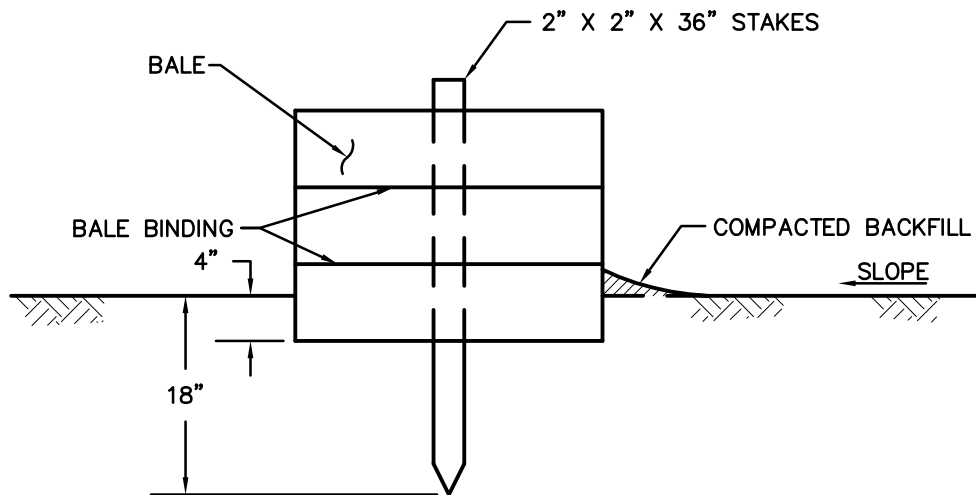
ROCK FILTER OUTLET

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02270-5



Notes:

1. Straw Bale Barriers shall not be used for more than 3 months.
2. Straw Bale Barriers shall be placed at existing level grade. Both ends of the barrier shall be extended at least 8 feet up slope at 45 degrees to the main barrier alignment.
3. Sediment shall be removed when accumulations reach $\frac{1}{3}$ the above ground height of the barrier.
4. Any section of Straw Bale Barrier which has been undermined or topped shall be immediately replaced with a Rock Filter Outlet. See Standard Detail 02270-5.

NOTE: NOT TO SCALE



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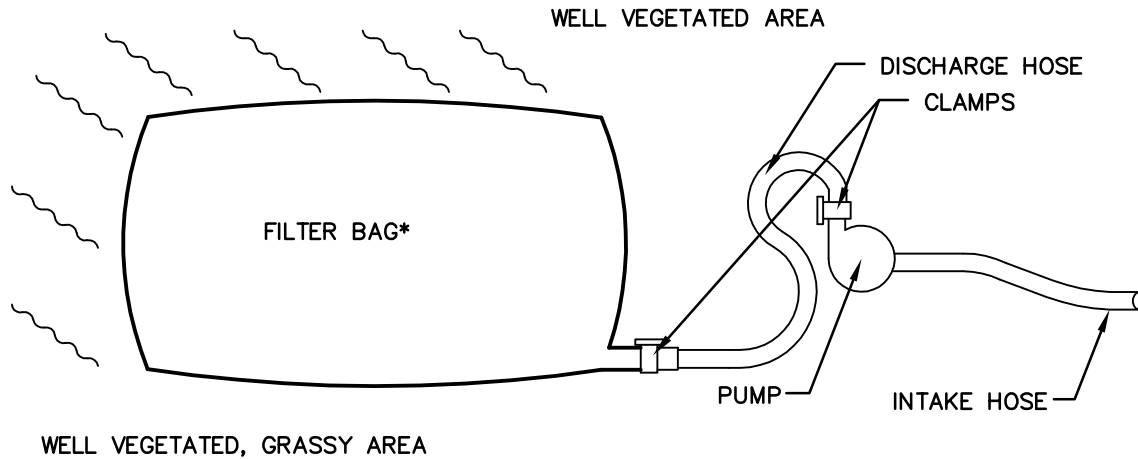
STRAW BALE BARRIER

DATE: 9/15/2009

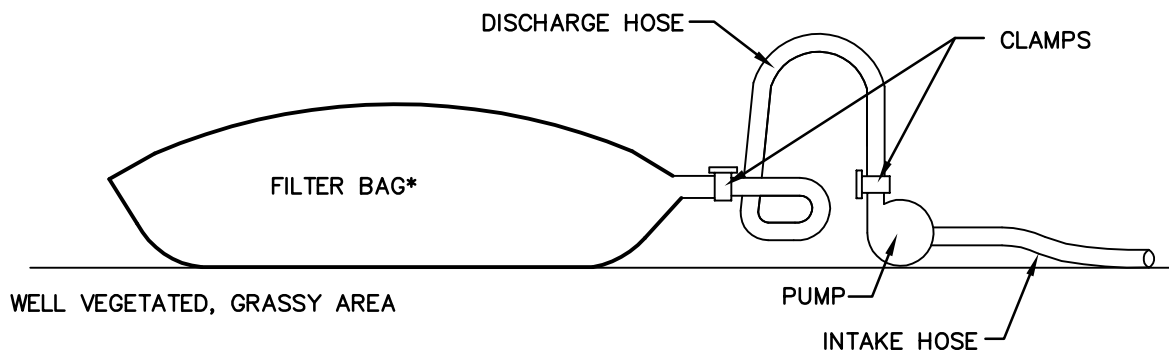
DRAWN BY: CRP

CHK. BY:

NO. 02270-6



PLAN VIEW



ELEVATION VIEW

Notes:

1. Filter bags shall be made from non-woven geotextile material sewn with high strength, double stitched "J" type seams. They shall be capable of trapping particles larger than 150 microns.
2. A suitable means of accessing the bag with machinery required for disposal purposes must be provided. Filter bags shall be replaced when they become 1/2 full. Spare bags shall be kept available for replacement of those that have failed or are filled.
3. Bags shall be located in well-vegetated (grassy) area, and discharge onto stable, erosion resistant areas. Where this is not possible, a geotextile flow path shall be provided. Bags shall not be placed on slopes greater than 5%. The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped.
4. The pumping rate shall be no greater than 750 gpm or 1/2 the maximum specified by the manufacturer, whichever is less. Pump intakes should be floating and screened. Maximum pump size shall be a 6"Ø pump.
5. Discharge from pump shall be located a minimum of 50 feet from any stream or stable water course. Discharge shall be onto gravel or stone bedding where possible, or a minimum of permanently stabilized grass.
6. Silt fence shall be placed downslope of discharge prior to reaching any stream or water course.

NOTE: NOT TO SCALE



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**PUMPED WATER
 FILTER BAG**

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02270-7

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 and compacting: Section 02221

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT), latest revision:
Publication 408, Specifications
2. American Association of State Highway Transportation Officials (AASHTO):
T194Determination of Organic Matter in Soils by Wet Combustion
3. Pennsylvania Department of Agriculture
4. Others:

Agricultural Liming Materials Act of 1978, P.L.15
Pennsylvania Seed Act of 1965, Act 187, as amended
Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1,
1977, P.L. 258 No. 86 (3P.S. 68.2) as amended
Rules for Testing Seeds of the Association of Official Seed Analysts
Federal and State pesticide acts and registration requirements

B. Sod Producer - Company specializing in sod production and harvesting with a minimum of 5 years experience.

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

1.03 SUBMITTALS

A. Samples:

1. Unless otherwise directed, furnish three strips of sod, 4-1/2 feet long by 12" wide, laid on 3" of topsoil and tamped in place. The samples shall be representative of the sod and workmanship to be provided. Include sod source location.
2. Advise the ENGINEER of the location of the field, and area within the field, from which the sod is to be taken for approval.

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

TABLE 1 - GRASS AND AGRICULTURAL SEEDS

<u>Species</u>	Minimum	Maximum Guaranteed Purity (Percent)	Minimum Weed Seed (Percent)	Guaranteed Germination (Percent)
Kentucky Bluegrass (<i>Poa pratensis</i>) Domestic origin; min. twenty-one pounds per bushel		98	0.20	80
Perennial Ryegrass (<i>Lolium perenne</i> , var. Pennfine)		98	0.15	90
Tall Fescue (<i>Festuca arundinacea</i>), var. Kentucky 31)		98	0.15	85
Crownvetch (<i>Coronilla varia</i>)		99	0.10	65
Pennlawn Red Fescue (<i>Festuca rubra</i> , var. Pennlawn)		98	0.15	85
Annual Rye Grass (<i>Lolium multiflorum</i>)		98	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% \pm 3%
Organic Matter:	98.6% \pm 0.2% on the oven dried basis.
Ash Content:	1.4% \pm 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 permitted.

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. Do not deliver more sod than can be laid within 24 hours.
- 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. Hand rake 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 starter 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 re-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 Contract 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.

3.04 SODDING

- A. Prior to sod placement, complete finish grading and moisten prepared surface to received 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 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 Contract 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

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. Bituminous concrete base course construction.
2. Placement and compaction of bituminous binder and wearing surface.
3. Placement of bituminous seal coat and surface treatment.
4. Surface preparation.

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 |

C. Definitions: NONE

D. Applicable Standard Details:

The "Backfill and Surface Restoration Requirements" Table in Section 02575 lists the specific paving requirements.

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 Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

3. Pennsylvania Code

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

B. Inspections:

1. Inspection by the ENGINEER will, at a minimum, be made of the subgrade prior to placement of the base course, and of the base course prior to placement of the binder surface.

1.03 SUBMITTALS

A. Certification:

1. Submit certification from bituminous and aggregate suppliers attesting that materials conform to Publication 408, Specifications.
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 ENGINEER).

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 in accordance with Publication 213 "Temporary Traffic Control Guidelines".
3. OWNER, ENGINEER and all appropriate emergency services (police, fire and ambulance) shall be notified by the CONTRACTOR a minimum of 36 hours in advance of any temporary lane enclosure.

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 at the expense of CONTRACTOR.
2. Reasonable access must be maintained for adjacent property owners and commercial properties.

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 Publication 408 Specifications. The coarse aggregate used in bituminous wearing surfaces or the fine aggregate in the case of FJ-1 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 asphalt mixtures shall conform to applicable sections of Publication 408 Specifications. Aggregate shall be provided by approved sources and have the SRL designation as specified above. Mixture shall have the specified Petroleum Grade (PG) as indicated on Contract Drawings. If no PG is indicated in Section VIII - Technical Provisions (Detailed), the bituminous mixture shall be PG 64-22.

PART 3 EXECUTION

3.01 BASE COURSES

- A. Superpave Asphalt - Where indicated on the Contract Drawings, construct HMA base course to compacted depth in accordance with Publication 408, Section 309.
- B. Bituminous Concrete - Where indicated on the Contract Drawings and/or shown in the "Backfill and Surface Restoration Requirements Table", construct bituminous concrete base course to compacted depth in accordance with Publication 408 Specifications, Section 305. Proof roll base course to satisfaction of the ENGINEER. ENGINEER shall approve crushed aggregate base course prior to placement of Bituminous Concrete base course.
- C. Bituminous paver shall be self-propelled with activated screed and shall have a minimum paving width of 18'. All exceptions must be approved by the OWNER and ENGINEER.

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 Contract Drawings. Where the existing base is judged inadequate by the ENGINEER, construct new base of the required type as specified in the "Backfill and Surface Restoration Requirements Table" in Section 02575.

- C. Seal all cracks in accordance with Publication 408 Specification; Section 469 with ENGINEER approval, cracks may be filled with PG 64-22.
- D. Patch holes and depressions greater than one inch and less than four inches with Superpave HMA 19mm binder material, compacted in layers not exceeding two inches after compaction.
- E. 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.
- F. When required by the "Backfill and Surface Restoration Requirements Table", apply tack coat in accordance with Publication 408 Specifications, Section 460.
- G. Milling of existing bituminous pavement shall be performed in accordance with Publication 408, Section 491 to the depth and limits specified in the Contract 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 will become the property of the CONTRACTOR and must be disposed of properly, unless otherwise specified in Section VIII - Technical Provisions (Detailed).
 - 3. Supply all water as needed.
 - 4. Cutting, depth, width and minimum hp rating will be as specified in Section VIII - Technical Provisions (Detailed).
 - 5. CONTRACTOR shall provide transitions from milled surfaces to non-milled surfaces to allow vehicular traffic during non-working hours.
- H. Construct scratch or leveling courses as directed by the ENGINEER.
- I. Proof roll subgrade before base course placement. If precipitation occurs, then subgrade must be proof rolled again prior to bituminous material placement.

3.03 SURFACE COURSES

- A. Superpave Asphalt
 - 1. HMA Binder Course - Construct HMA binder course with aggregate size, Design ESAL's and PG specified and to the compacted depth shown on the Contract Drawings, in accordance with Publication 408 Specifications, Section 409.
 - 2. HMA Wearing Course - Construct HMA wearing course with aggregate size, Design ESAL's and PG specified and to the compacted depth shown on the Contract Drawings, in accordance with Publication 408 Specifications, Section 409.
 - 3. Tack coat shall be applied to ensure bonding between courses and shall conform to Publication 408 Specifications, Section 460.

4. Compaction testing for in-place density shall be conducted during placement of the material, in accordance with PennDOT Publication 408, Section 409. Alternatively, pavement cores, in accordance with Section 409.4, may be substituted. Acceptable density shall be within 90-97% of the maximum theoretical density, as per ASTM D698.
5. Do not allow vehicular traffic on newly compacted Superpave HMA materials until the temperature cools below 140°F.
6. Bituminous paver shall be self-propelled with activated screed and shall have a minimum paving width of 18'. All exceptions to paver requirement shall be approved by the OWNER and ENGINEER.

B. Bituminous Surface Course (ID-2)

1. Construct binder course meeting the requirements of Publication 408 Specifications, Section 421 to compacted depth specified in the "Backfill and Surface Restoration Requirements Table".
2. Construct wearing surface meeting the requirements of Publication 408 Specifications, Section 420 to the compacted depth specified in the "Backfill and Surface Restoration Requirements Table".
3. Do not allow vehicular traffic on newly compacted bituminous material until the temperature cools below 140°F.
4. Bituminous paver shall be self-propelled with activated screed and shall have minimum paving width of 18'. All exceptions to paver requirements shall be approved by the OWNER or ENGINEER.

C. Compaction

1. Compact by rolling with steel-wheel, vibration or pneumatic tire rollers 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 are specified in Section VIII - Technical Provisions (Detailed).
2. The roller pattern and speed shall be monitored by the CONTRACTOR and ENGINEER to avoid roller marks, pattern segregation and displacement of hot mixtures.

D. Bituminous Seal Coat (single application)

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

E. Bituminous Surface Treatment (double application)

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

3.04 JOINTS

A. Notch

Where specified in Section VIII - Technical Provisions (Detailed), the edge of the 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 PG 64-22 or the same asphalt material used in mix design (Publication 408, Section 401.3(j)).

B. Sealing

All joints shall be sealed rubberized joint sealing material. 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 ENGINEER.

3.05 FIELD QUALITY CONTROL

A. Proof of Product

At the time of material delivery to the site, the OWNER's Representative or ENGINEER shall be furnished with a delivery ticket indicating material specifications. The tickets shall include, but not limited to, vehicle identification, date, time, product identification, product quantity (Petroleum Grade, Equivalent Single, Axle Loading (ESAL's), aggregate size and Skid Resistance Level (SRL) (for bituminous wearing course).

B. Surface Tolerance of Base and Binder Course.

After the base course has been completed as specified, the surface smoothness shall be checked with approved templates, string lines, or straightedges.

1. 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.
2. 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.
3. Straightedges. Approved straightedges 10 feet in length shall also be furnished and used for testing longitudinal irregularities in the surface of the base course.

Any surface irregularities that exceed 1/2 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.

During the progress of the work, the depth of the base course will be measured by the ENGINEER and unsatisfactory work shall be repaired, corrected, or replaced. The OWNER will not be liable for payment for any excess depth of base course.

1. 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 OWNER.
2. 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 ENGINEER who will check the depth for record purposes.

D. Surface Tolerance of Wearing Course.

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

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

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.

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

1. 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 OWNER. 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 OWNER.
2. 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 ENGINEER who will check the depth for record purposes.

END OF SECTION

SECTION 02525

CEMENT CONCRETE CURB AND 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:

- | | |
|----------|---|
| 02525-1 | Vertical Concrete Curb Details |
| 02525-2 | Slant Concrete Curb Details |
| 02525-3 | Concrete Sidewalk Detail |
| 02525-4 | Concrete Sidewalk at Driveway Details |
| 02525-5 | Type 1 Double Curb Ramp Detail |
| 02525-6 | Type 1 Double Curb Ramp Details (Alternate) |
| 02525-7 | Type 1 Curb Ramp Detail |
| 02525-8 | Type 1A Curb Ramp Detail |
| 02525-9 | Type 2 Curb Ramp Detail |
| 02525-10 | Type 3 Parallel Curb Ramp Detail |
| 02525-11 | Type 3 Perpendicular Curb Detail |
| 02525-12 | Type 4 Combination Curb Ramp Detail |
| 02525-13 | Type 4A Combination Curb Ramp Detail |
| 02525-14 | Detectable Warning Surface Detail |
| 02525-15 | Roof Leader Under Sidewalk 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

Department of Justice, Code for Regulations, ADA Standards for Accessible Design

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

- A185 Standard Specification for Welded Steel Wire Reinforcement, Plain, for Concrete
- A615 Standard Specification for Deformed and Plain Biller-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 Testing and/or Inspection of Materials used in Construction

B. Inspections:

1. Inspection by the ENGINEER will at a minimum be made of the subgrade, formwork, and any steel prior to placement of the concrete.
2. ENGINEER will observe all on-site testing of concrete.

C. Testing:

1. CONTRACTOR shall test concrete strength, slump, air content and temperature on site as specified in Section 03000, Paragraph 3.09.
2. 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 all operations. Do not allow traffic on newly placed concrete until adequate strength has been attained.
2. Employ traffic control measures in accordance with Publication 213, Temporary Traffic Control Guidelines.

B. Protection of work area or 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, at the CONTRACTOR's expense.

2. CONTRACTOR shall notify property OWNERS to refrain from applying deicing materials on new sidewalks; however, damage as a result of salting is the responsibility of the property OWNER.

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.

PART 2 PRODUCTS

2.01 CONCRETE

- A. Portland cement concrete shall be air-entrained and have a minimum 28 day compressive strength shall be 3,300 psi, unless specified higher in Section VIII- Technical Provisions (Detailed).
- 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
- C. For slip formed curb, same as above except with a maximum 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 ENGINEER.

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 – Pre-molded 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 oil 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, Sealtight 1100, Klear Seal R-75 or Enviocure Clear 500, or similar material.

2.07 STAMPED COLORED CONCRETE

- A. Concrete, reinforcement, joint material and forms – see above paragraphs
- B. Template Pattern – “old brick running board” by Matcrete (1-800-777-7063), or equal
- C. Pigment – Brick Red #10160 by David Colors, Beltsville, MD 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, including existing curbs, and compact the subgrade material to a firm, even surface.
- B. Saw cut existing pavement a minimum of 12" 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). Forms shall be securely braced to limit deflection during placement of concrete.
- D. Provide openings through curb for drainage pipes. Install one, 2'-0" long, #4 reinforcing bar in the middle of curb centered above the pipe as per Standard Detail.

- E. Concrete shall be placed in accordance with Section 03000, Paragraph 3.05.
- F. Variation of more than 1/8" from the established line and grade shall be cause for rejection of that portion of the work.
- G. 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.
- H. 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.
- I. The last three feet of curb shall be tapered to a 1-1/2" reveal with expansion joint at the beginning of taper.
- J. Finish top surface with wood floats. Provide depressions for drainage, driveways, and ramps for the handicapped as directed by the ENGINEER. Tool all exposed edges to the specified radius.
- K. Do not remove forms until concrete has set. Begin proper curing immediately after placement.
- L. Reapply curing compound 30 days following first application.
- M. 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.
- N. Correct minor irregularities with a carborundum stone or mortar comprised of two parts fine aggregate to one part cement.

3.02 SIDEWALK CONSTRUCTION

- A. Excavate to required depth, remove and dispose of material, including any existing sidewalks, 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 persons at all street crossings (as required by ADA regulations and as indicated in Section 3.04) and as directed by the ENGINEER. Handicap ramps shall be 6" thick concrete. All handicap ramps shall have detectable warning domes as shown on drawing CT-02525-14.
- D. Sidewalks across sanitary sewer or storm sewer easements shall be 8" thick.
- E. Spread AASHTO N. 57 aggregate and compact to the thickness shown on the Standard Details.
- F. Concrete shall be placed in accordance with Section 03000, Paragraph 3.05. Hand float to desired line and grade.

- 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 ENGINEER. 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. Place 1/2" expansion joint material at adjacent curbs, poles, hydrants, walls, and other permanent structures.
- I. Apply light broom finish immediately after float finish as specified in Section 03000, Paragraph 3.07.C.
- J. Provide depressions for driveways, downspouts, and drainage as directed by the ENGINEER or shown on the Contract Drawings. Reapply curing compound 30 days following first application.
- K. Begin proper curing in accordance with Section 03000, Paragraph 3.08, and immediately following placement.
- L. Monolithic sidewalk and curb will be allowed at a radius curb ramp only. Mid-block ramps must have separate curbs.
- M. If specified in Section VIII - Technical Provisions (Detailed), provide visual or textural additions to curb ramps.
- N. Apply curing compound.

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.

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.

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.

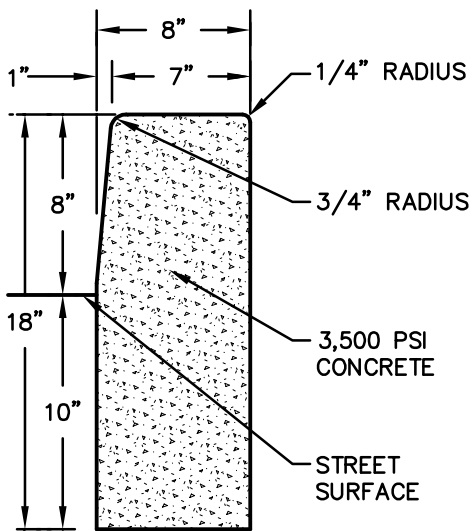
F. Landing Areas

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 be a minimum 5' X 5' area, clear of any obstructions, with a maximum slope of 2% in any direction. 4' X 4' landing with a 60" clear turning diameter maybe be permitted if a written report of noncompliance is submitted for each location proposed and approved by the Engineer.
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.

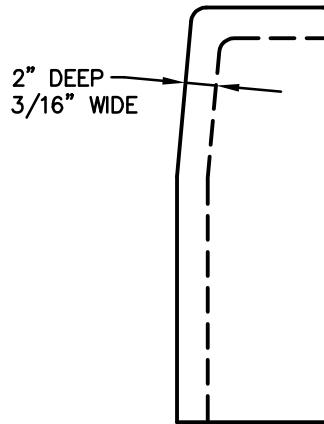
3.05 BACKFILLING AND RESTORATION

- A. Temporary backfill at curbs shall consist of select granular material front and back, to within 8" of top of curb.
- B. Restore adjacent areas as indicated in the "Backfill and Surface Restoration Requirements Table".

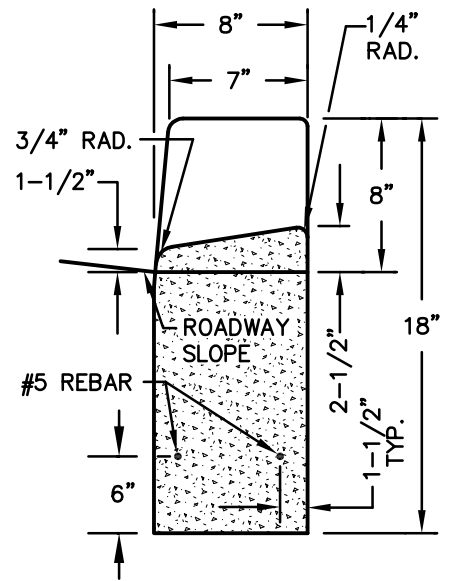
END OF SECTION



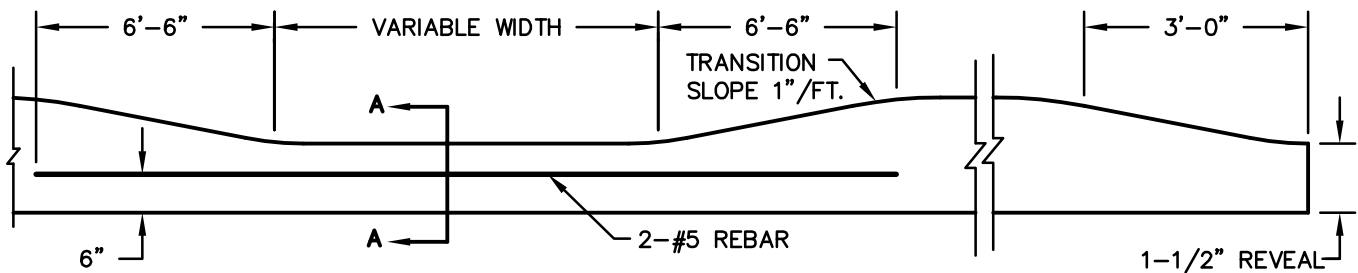
TYPICAL CROSS SECTION



CONTRACTION JOINT



SECTION A-A



DEPRESSED CURBS FOR DRIVES

TERMINAL SECTION

NOTE: NOT TO SCALE



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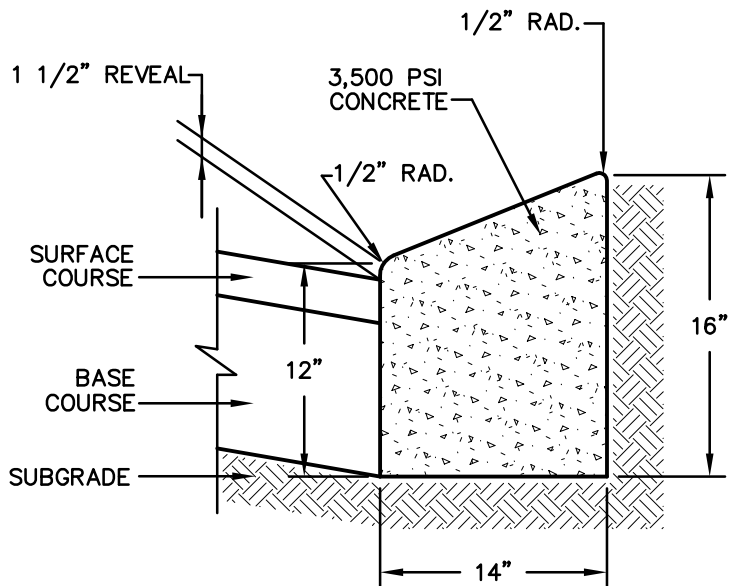
VERTICAL CONCRETE CURB DETAILS

DATE: 9/15/2009

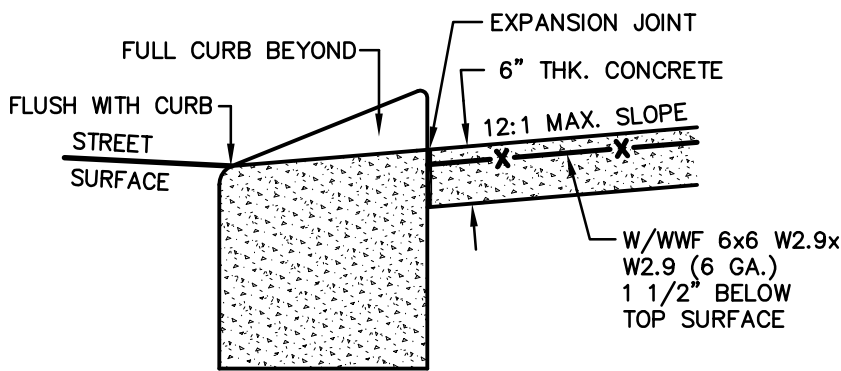
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NO. 02525-1



TYPICAL CROSS SECTION



CROSS SECTION AT HANDICAP RAMPS

NOTE: NOT TO SCALE

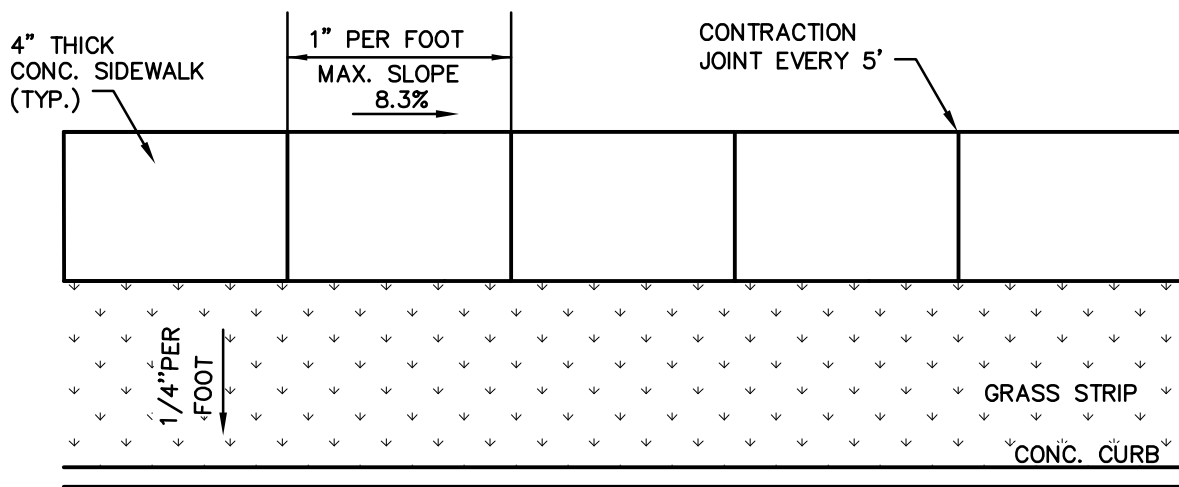


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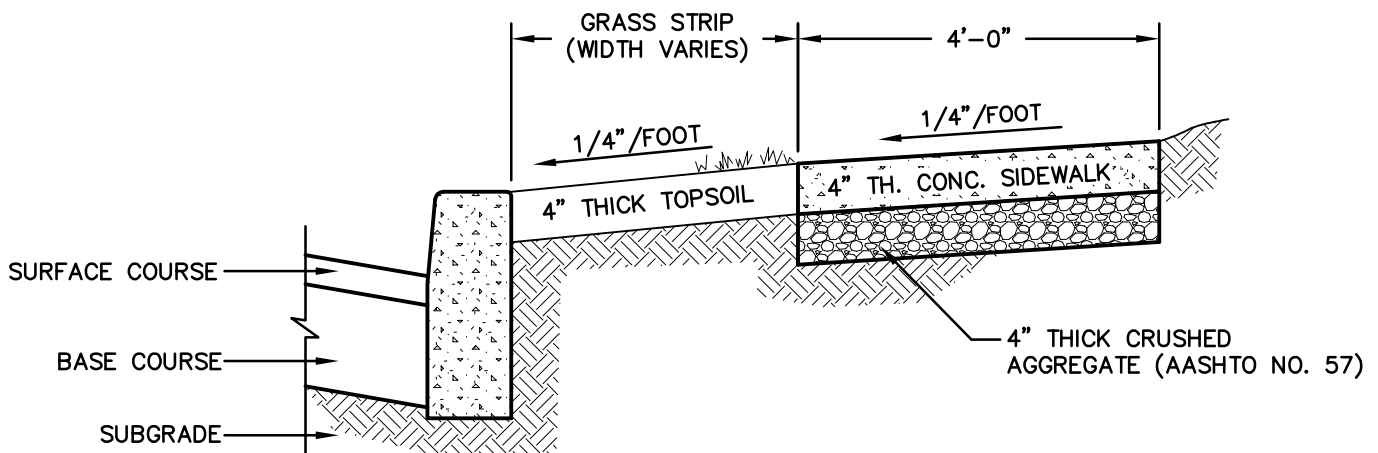
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SLANT CONCRETE CURB DETAILS

DATE:	9/15/2009
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NO.	02525-2



PLAN



TYPICAL SECTION

NOTE: NOT TO SCALE



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**CONCRETE SIDEWALK
DETAIL**

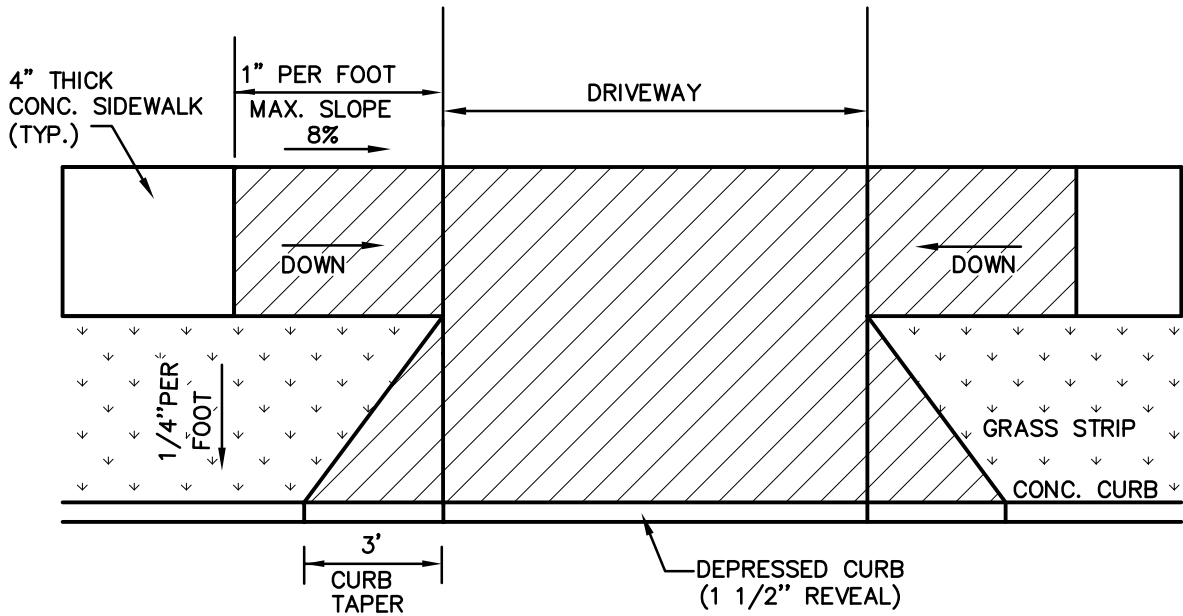
DATE: 9/15/2009

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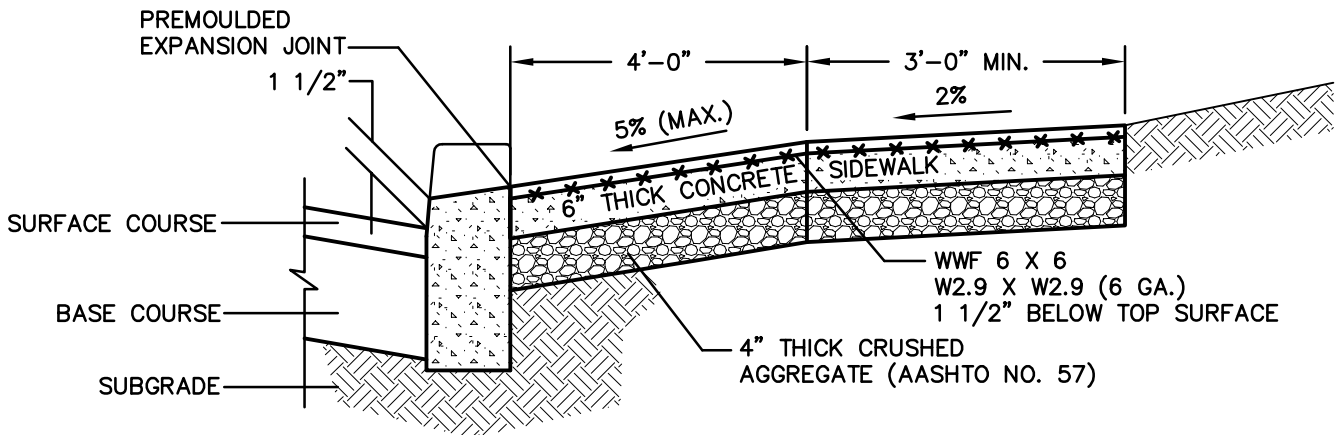
CHK. BY:

NO. 02525-3

 6" THICK, REINF. CONCRETE SIDEWALK



PLAN



TYPICAL SECTION

NOTE: NOT TO SCALE



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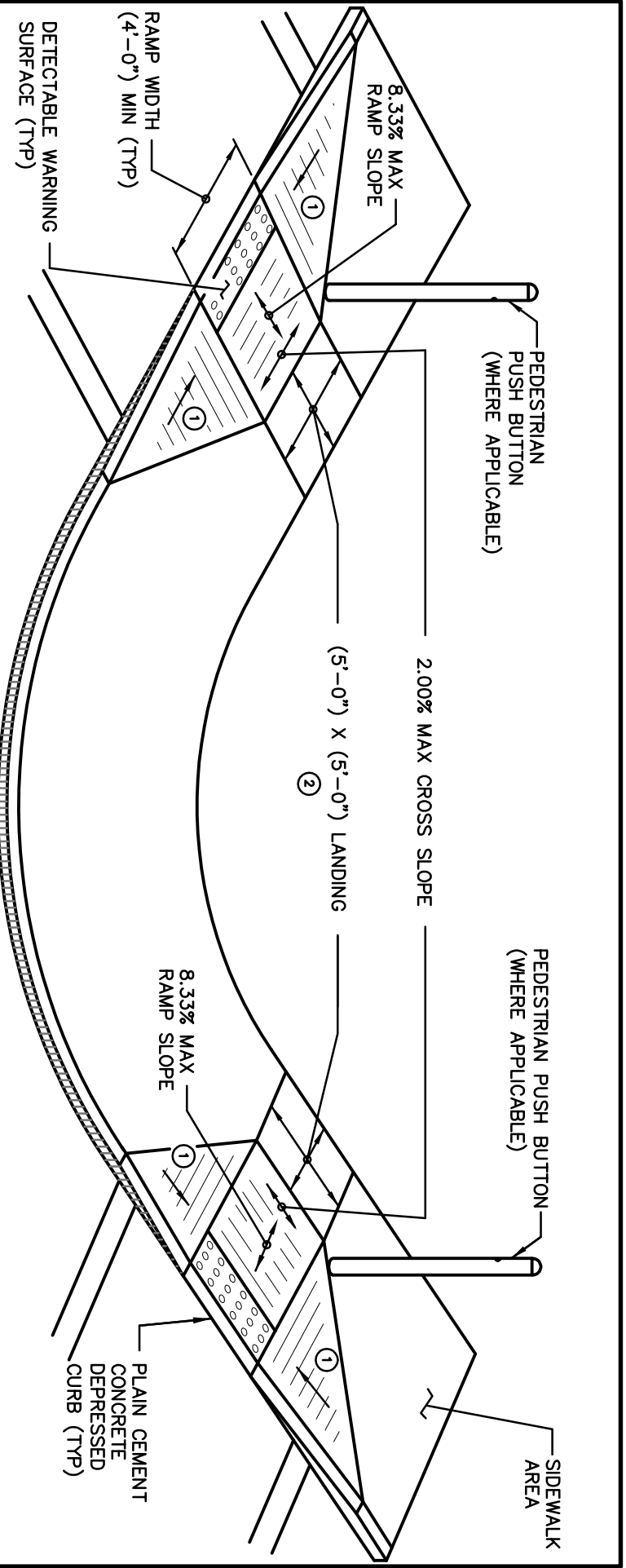
CONCRETE SIDEWALK
 AT DRIVEWAY DETAILS

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02525-4



- 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.

NOTE: NOT TO SCALE

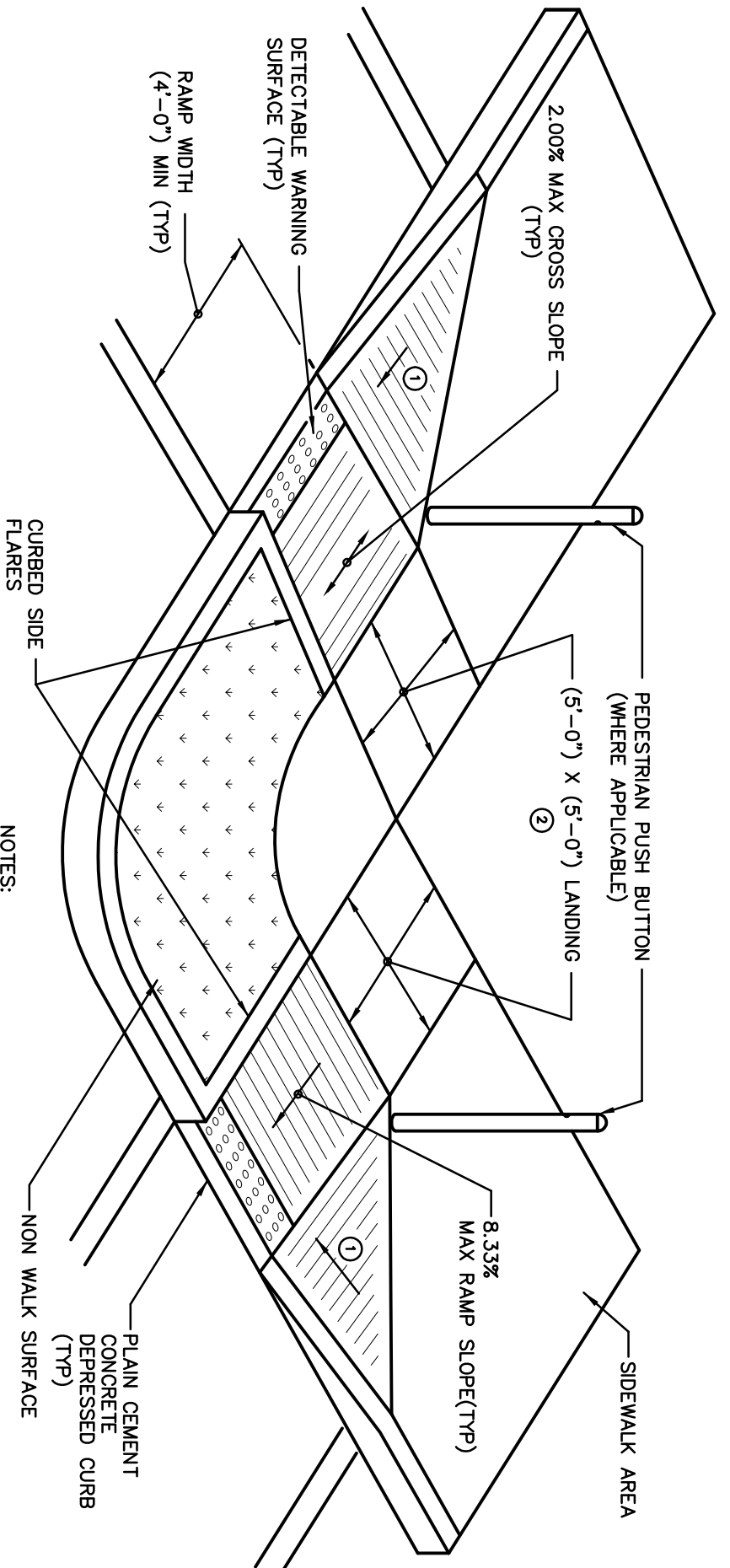


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TYPE 1 DOUBLE CURB RAMP DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-5



- 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.

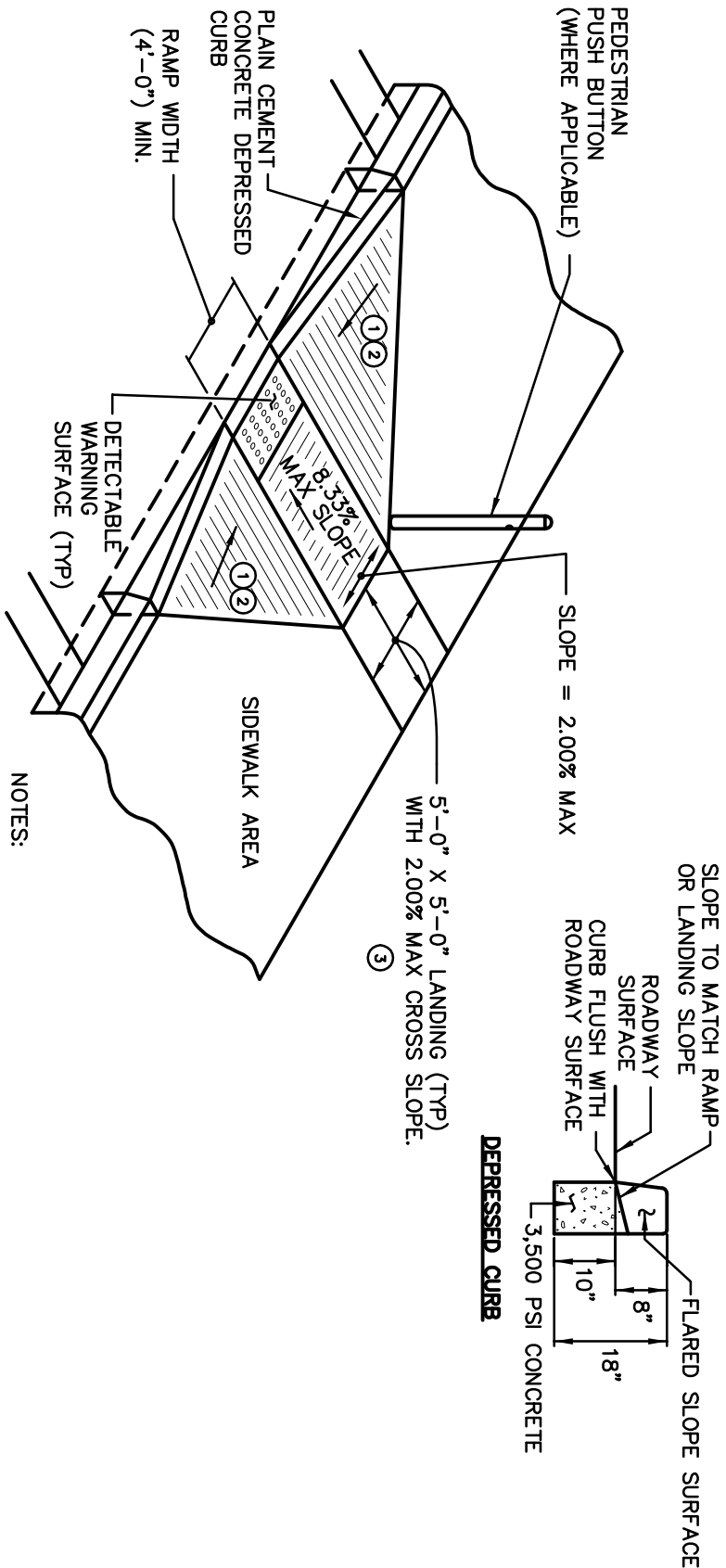
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TYPE 1 DOUBLE CURB
 RAMP DETAIL (ALTERNATE)

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-6



- 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.

NOTE: NOT TO SCALE



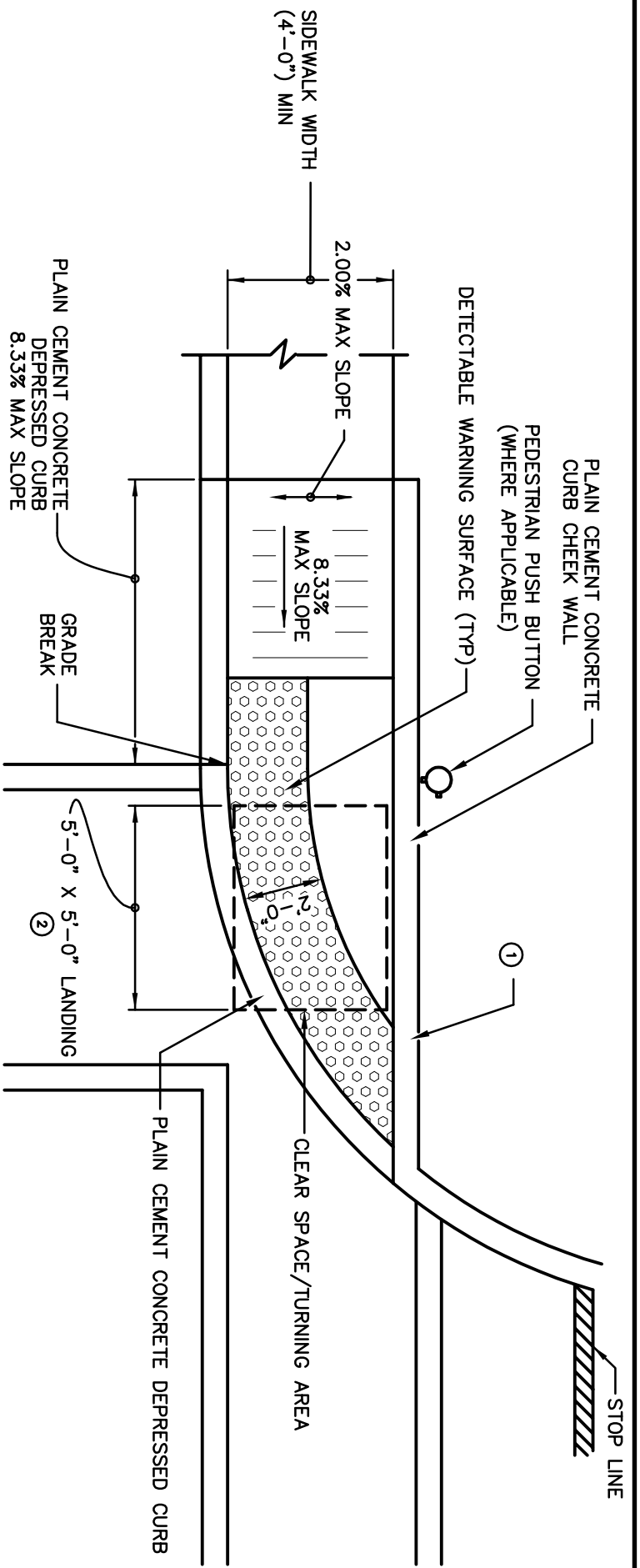
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TYPE 1 CURB RAMP DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-7



- 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.

NOTE: NOT TO SCALE

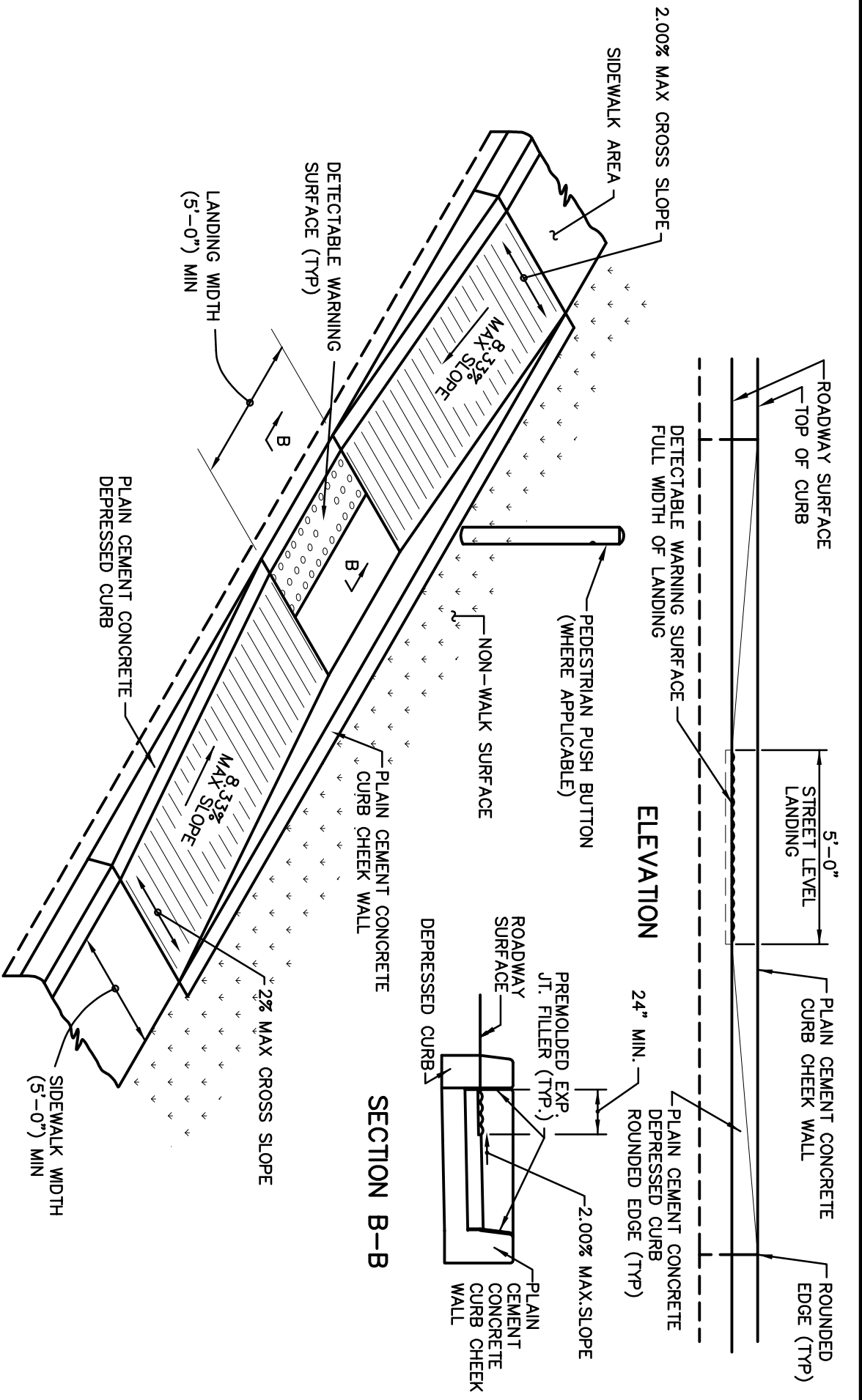


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TYPE 1A CURB RAMP DETAIL

DATE:	9/15/2009
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NO.	02525-8



NOTE: NOT TO SCALE

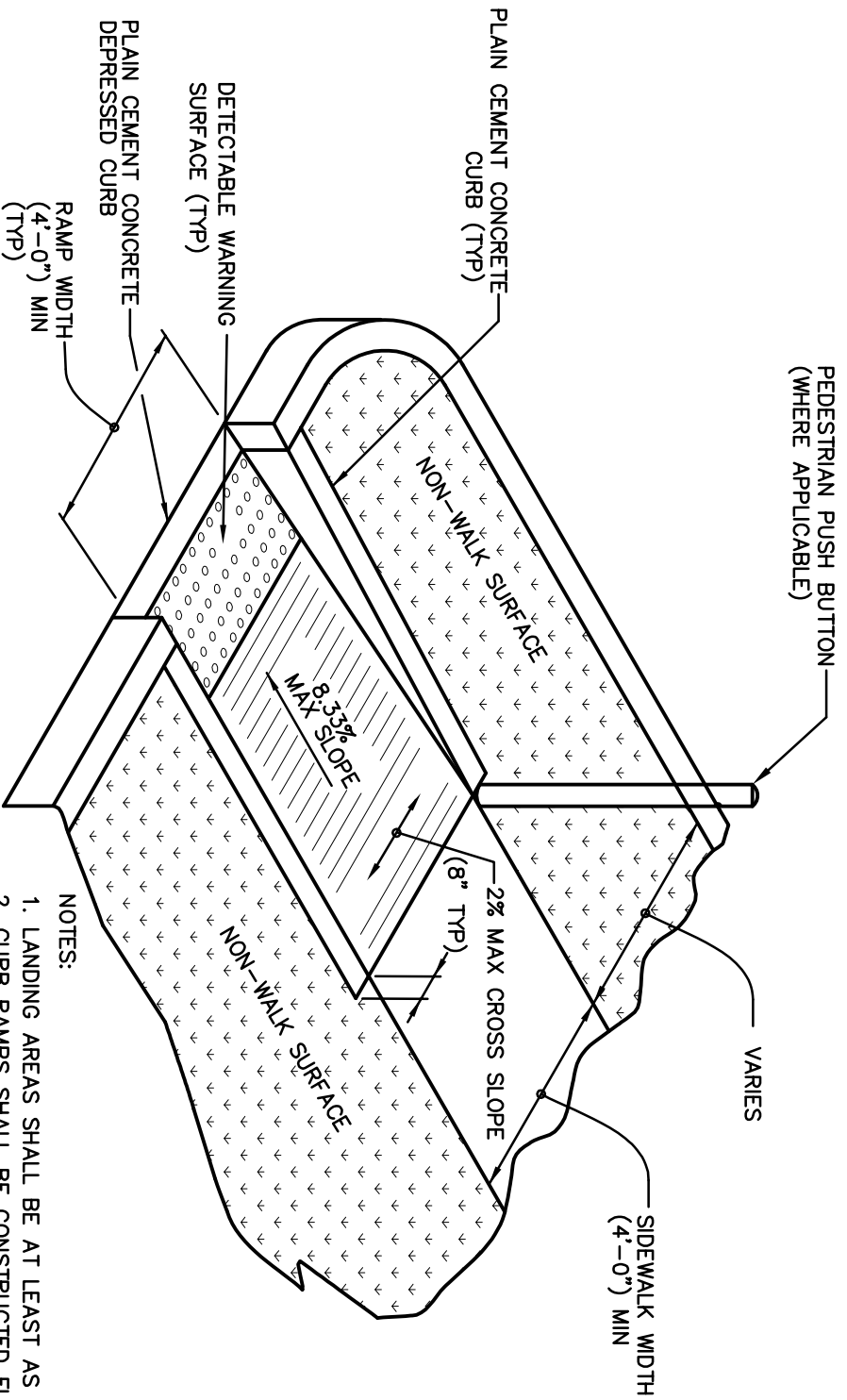
TYPE 2 CURB RAMP DETAIL



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DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-9



- 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.

NOTE: NOT TO SCALE



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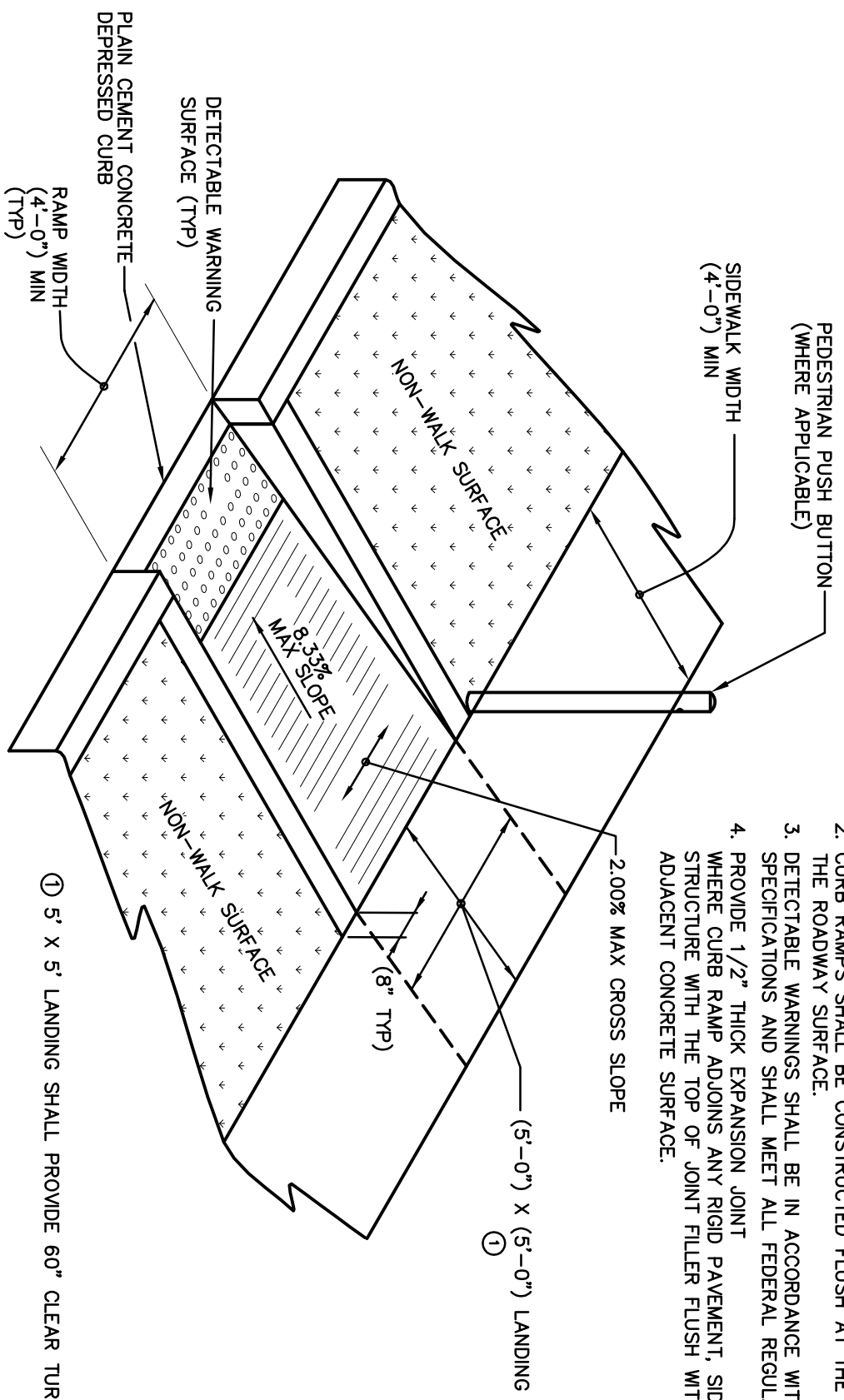
TYPE 3 PARALLEL CURB RAMP DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02525-10



PEDESTRIAN PUSH BUTTON
(WHERE APPLICABLE)

SIDEWALK WIDTH
(4'-0") MIN

- 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.

2.00% MAX CROSS SLOPE

(5'-0") X (5'-0") LANDING

(8" TYP)

8.33%
MAX SLOPE

DETECTABLE WARNING SURFACE (TYP)

PLAIN CEMENT CONCRETE DEPRESSED CURB

RAMP WIDTH (4'-0") MIN (TYP)

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

NOTE: NOT TO SCALE



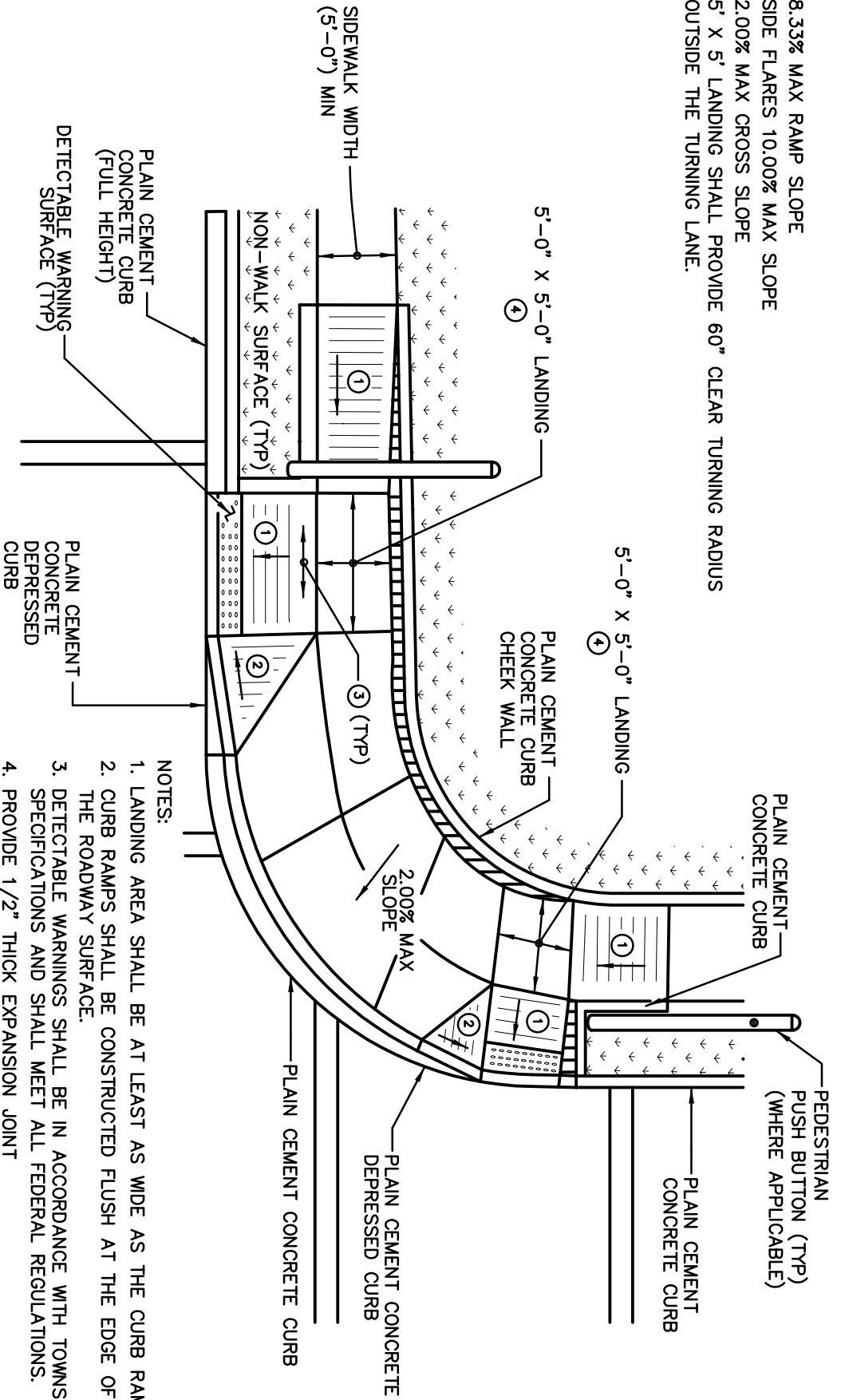
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TYPE 3 PERPENDICULAR CURB DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-11

- 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.

NOTE: NOT TO SCALE

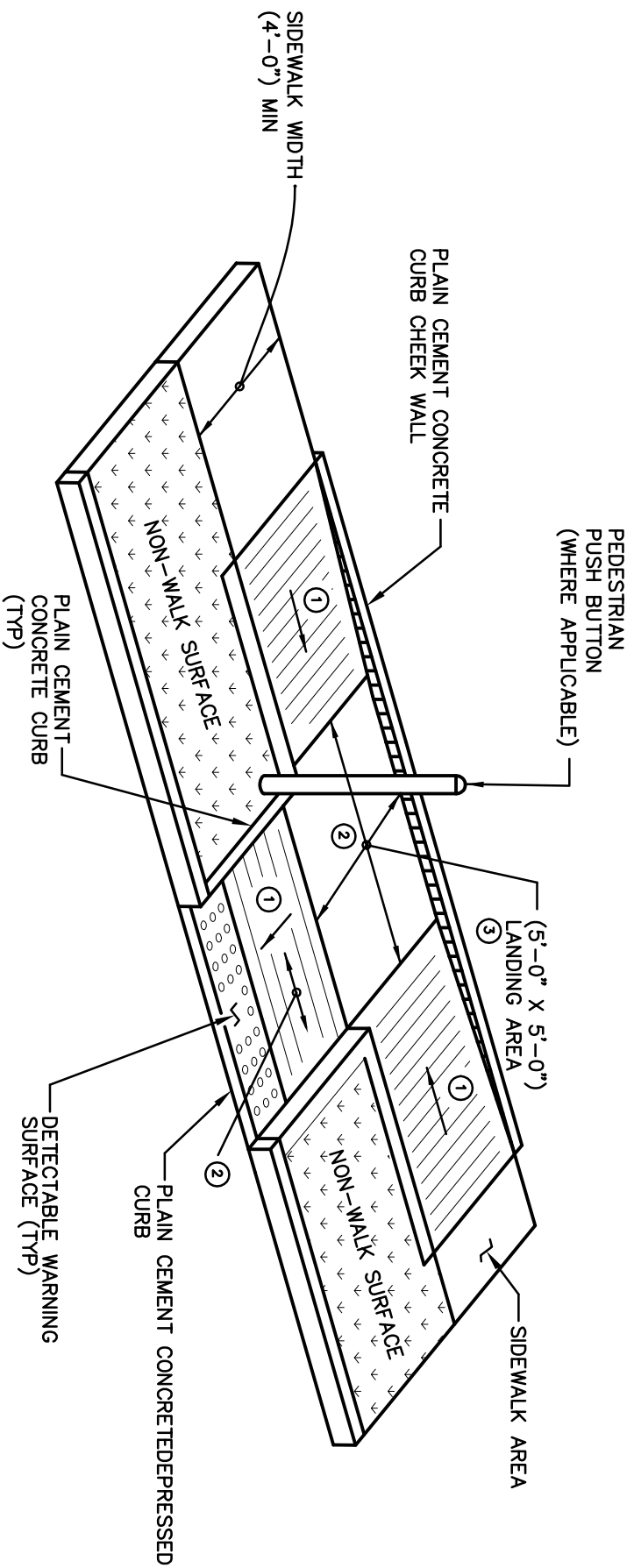


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TYPE 4 COMBINATION CURB RAMP DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-12



- ① 8.33% MAX RAMP SLOPE
- ② 2.00% MAX GROSS 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.

NOTE: NOT TO SCALE



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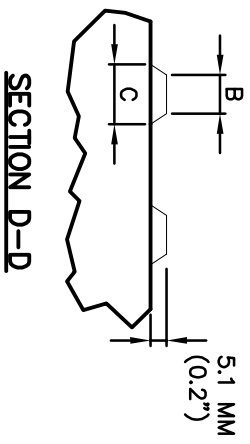
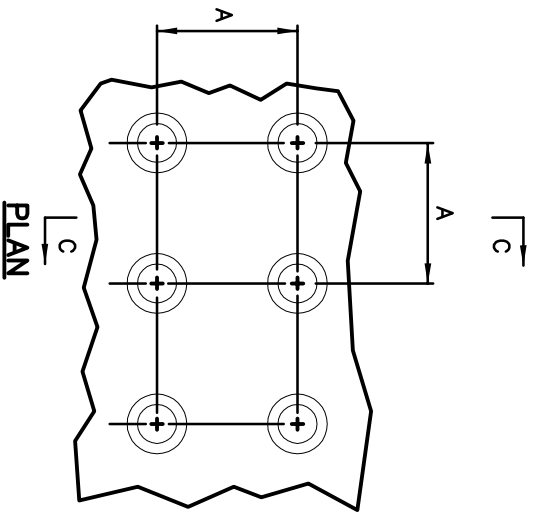
TYPE 4A COMBINATION
CURB RAMP DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02525-13



- NOTES:
1. THE B DIMENSION IS TYPICALLY 50% TO 65 % OF THE C DIMENSION.
 2. DETECTABLE WARNINGS SHALL MEET ALL FEDERAL REGULATIONS.

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

NOTE: NOT TO SCALE

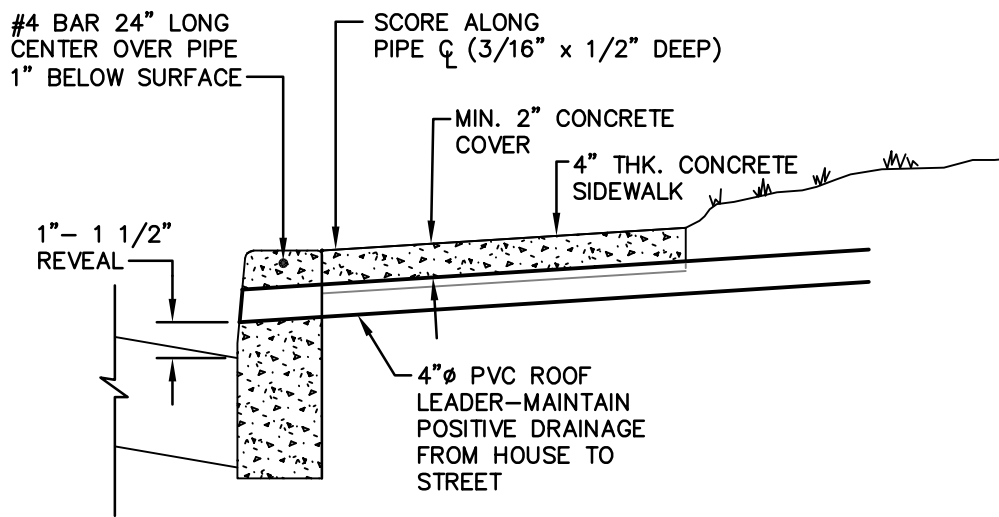


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DETECTABLE WARNING SURFACE DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02525-14



NOTE: USE ROOF LEADER WITH STANDARD VERTICAL CURBS ONLY

NOTE: NOT TO SCALE



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ROOF LEADER UNDER SIDEWALK DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02525-15

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
5. Concrete restoration

B. Related work specified elsewhere:

- | | |
|---|---------------|
| 1. Trenching, backfilling, and compacting: | Section 02221 |
| 2. Roadway excavation, fill and compaction: | Section 02230 |
| 3. Finish grading, seeding and sodding: | Section 02485 |
| 4. Bituminous paving and surfacing: | Section 02500 |
| 5. Plain and reinforced cement concrete: | Section 03000 |

C. Definitions: NONE

D. Applicable Standard Details:

02575-1 Pavement Payment Limits
02575-2 Trench Paving Payment Limits
02575-3 Temporary Trench Paving
02575-4 Permanent Trench Paving

"Backfill and Surface Restoration Requirements Table".

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 Test Method for Density of Bituminous Concrete in Place by Nuclear Method

3. Pennsylvania Code

Title 67 Transportation, Chapter 459, Occupancy of Highways by Utilities

Inspections:

1. Inspection by the ENGINEER will, at a minimum, be made of the subgrade prior to placement of the base course, and of the base course prior to placement of the binder surface.

1.03 SUBMITTALS

A. Certificates:

1. Submit certification from bituminous and aggregate suppliers attesting that materials conform to Publication 408, Specifications.
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 ENGINEER).

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 in accordance with Publication 213, Temporary Traffic Control Guidelines.

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 at the expense of CONTRACTOR.

PART 2 PRODUCTS

2.01 CONCRETE

- A. As specified in Section 03000.
- B. For Trench Type 1 and Trench Type 4, use air-entrained, PennDOT Class HES (High Early Strength).

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 Publication 408 Specifications.

- B. For Trench Type 1 and Trench Type 2, minimum pavement design shall be PG 64-22, 0 to <0.3 million ESAL's. Skid resistance levels for wearing course shall be a minimum of SRL-L.
- C. For Trench Type 3, minimum pavement design shall be PG 64-22, 0.3 to <3.0 million ESAL's. Skid resistance level shall be a minimum of SRL-M.

PART 3 EXECUTION

3.01 TEMPORARY TRENCH PAVING

- A. Place temporary paving immediately upon completion of trench backfilling. Trenches shall not remain unpaved longer than five working days; nor over weekends and holidays; unless construction activities are restricted by PennDOT to restore after backfill.
- B. Shape and compact subgrade material, then place and compact base course to the required thickness. Apply tack coat to vertical trench sides, in accordance to Publication 408, Section 460.
- C. Place temporary paving material. Compact to required minimum thickness with trench roller having a minimum 300 pounds pressure per inch-width of compaction. Restore temporary trench paving in accordance with the Standard Detail No. 02575-3.
- D. Continuously maintain temporary paving.

3.02 PERMANENT TRENCH PAVING

- A. For Bituminous Surface (Trench) Type 1, saw existing paving in accordance with PA Code 67, Chapter 459. This restoration shall be used when the final surface must be established immediately.
- B. For Bituminous Surface (Trench) Local Type 2, the trench restoration shall be for all trenched within the roadway surfaces on roads that are classified as local roadways. The pavement restoration design parameters shall be determined in Section VIII - Technical Provisions (Detailed). If not specified in Section VIII - Technical Provisions (Detailed), refer to Standard Detail No. 02575-4.
- C. For Bituminous Surface (Trench) Collector or Arterial, Type 3, trim existing paving to remove damaged areas. Cut straight joint lines and right angle offsets. This restoration shall be used for any trench restoration on a road surface where the road is classified as a collector or an arterial. The pavement restoration design parameters shall be determined in Section VIII - Technical Provisions (Detailed). If not specified in Section VIII - Technical Provisions (Detailed), refer to Standard Detail No. 02575-4.
- D. For concrete (trench) Type 4, trench restoration for all trenched areas within the roadway surfaces that are concrete. Design parameters shall be determined in Section VIII - Technical Provisions (Detailed). If not specified, a minimum pavement design was provided on the Standard Detail No. 02575-4.
- E. Construct permanent base and surface courses to the required compacted thicknesses shown in the "Backfill and Surface Restoration Requirements Table", and in accordance with Publication 408 Specifications. Seal all joints.

F. 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 in accordance with the "Backfill and Surface Restoration Requirements Table".

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 1½" 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 material (2A).

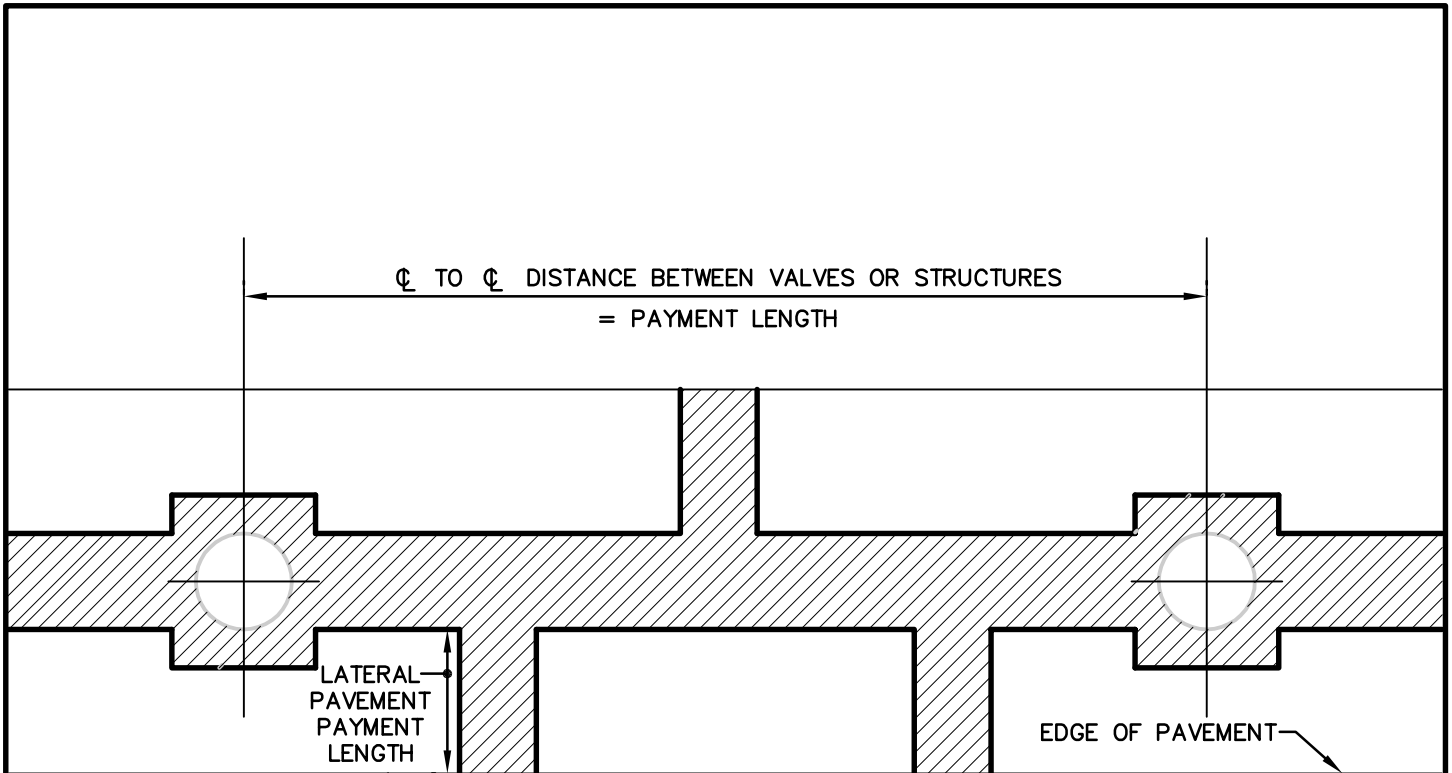
F. Restore brick driveways with like bricks placed on a 4" thick wet sand bed. Place bricks in like pattern and spacing.

BACKFILL AND SURFACE RESTORATION REQUIREMENTS TABLE

Trench Surface	Trench Type	Purpose	Reference Section
Bituminous Surface (Trench)	1	Immediate Final Surface	02500 03000
Bituminous Surface (Trench) Local	2	Local Roadway Classification	02500
Bituminous Surface (Trench) Arterial/Collector	3	Arterial or Collector Roadway Classification	02500
Concrete Surface	4	Concrete Roadway	03000
Bituminous Surface	5	State Routes	02500
Stone Surface	6	Stone Surfaces	02230
Vegetative Surface	7	Vegetative Surface	02485

END OF SECTION

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NOTE:

1. PAYMENT FOR PAVEMENT BETWEEN CENTERLINES OF VALVES OR STRUCTURES WILL INCLUDE ALL REQUIRED PAVEMENT AROUND VALVES OR STRUCTURES. NO ADDITIONAL PAYMENT WILL BE MADE FOR REPAVEMENT OF AREAS EXCAVATED FOR VALVES OR STRUCTURES.
2. REFER TO STANDARD DETAIL 02575-2 FOR TRENCH PAVING PAYMENT LIMITS.

NOTE: NOT TO SCALE



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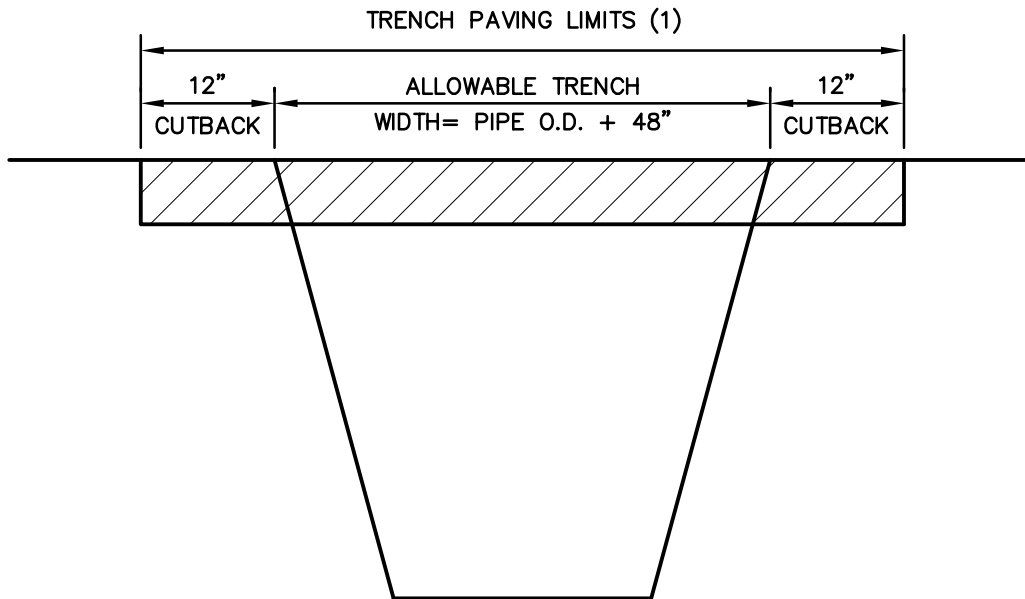
PAVEMENT
PAYMENT LIMITS

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02575-1



(1) NOTE: TRENCH PAVING LIMITS FOR PAYMENT = ALLOWABLE TRENCH + CUTBACKS (IF REQUIRED) OR LIMIT OF PAVING ACTUALLY PLACED, WHICHEVER IS LESS.

NOTE: NOT TO SCALE



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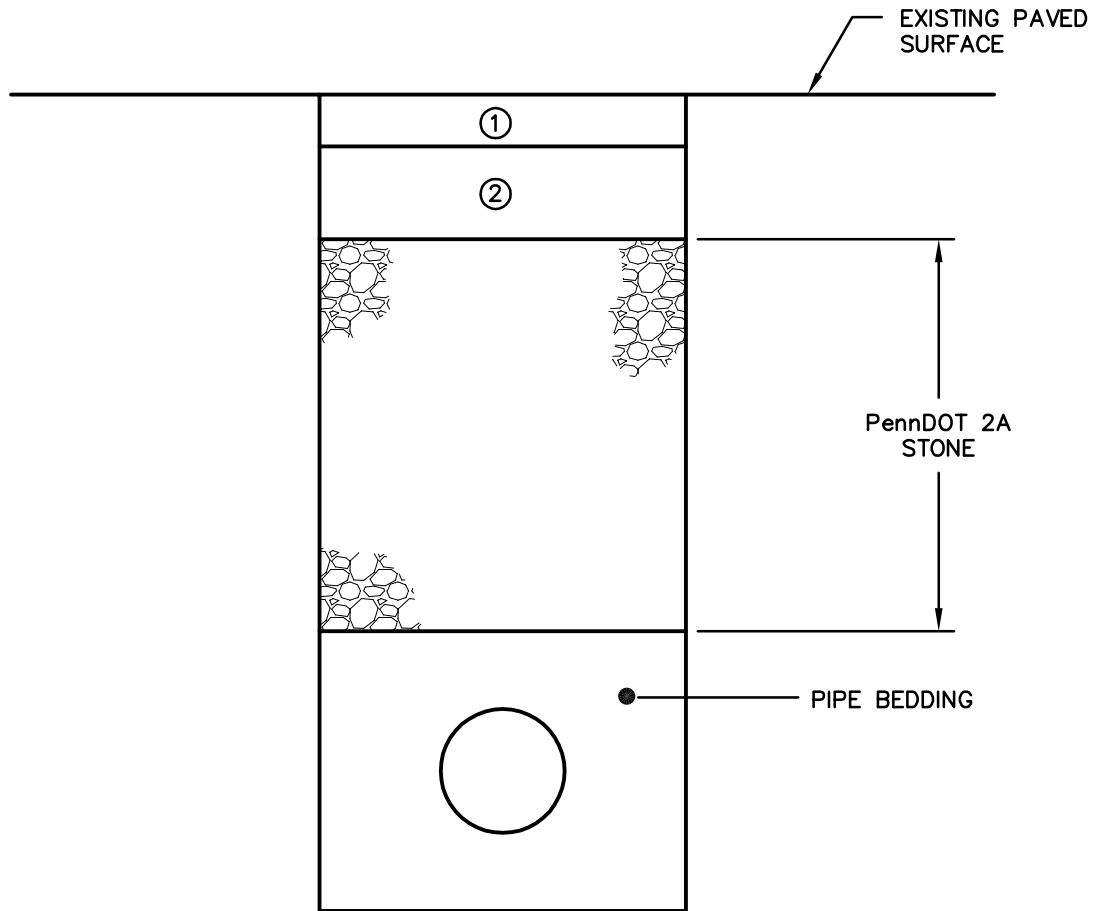
TRENCH PAVING PAYMENT LIMITS

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02575-2



TRENCH TYPE	STREET CLASSIFICATION	①	②
1	-	2" SUPERPAVE BINDER (19mm)	6" TYPE B, HIGH EARLY STRENGTH CONCRETE
2	LOCAL	2" SUPERPAVE BINDER (19mm)	4½" SUPERPAVE BASE (25mm)
3	ARTERIAL/COLLECTOR	2" SUPERPAVE BINDER (19mm)	6½" SUPERPAVE BASE (37.5mm)
4	CONCRETE	-	6" TYPE B, HIGH EARLY STRENGTH CONCRETE
5	STATE ROUTE	SEE APPROVED PERMIT	SEE APPROVED PERMIT

NOTES:

1. MAINTAIN TEMPORARY PAVING UNTIL PERMANENT PAVING IS PLACED.
2. TEMPORARY RESTORATION SHALL REMAIN IN PLACE FOR 90 DAYS.
3. REMOVE TEMPORARY RESTORATION PRIOR TO CONSTRUCTION OF FINAL BASE.
4. SEE SECTION 02221 FOR PIPE BEDDING AND BACKFILLING.
5. ALL THICKNESSES ARE THE MINIMUM COMPACTED THICKNESS.
6. SEE CONTRACT DOCUMENTS FOR STREET CLASSIFICATIONS.

NOTE: NOT TO SCALE



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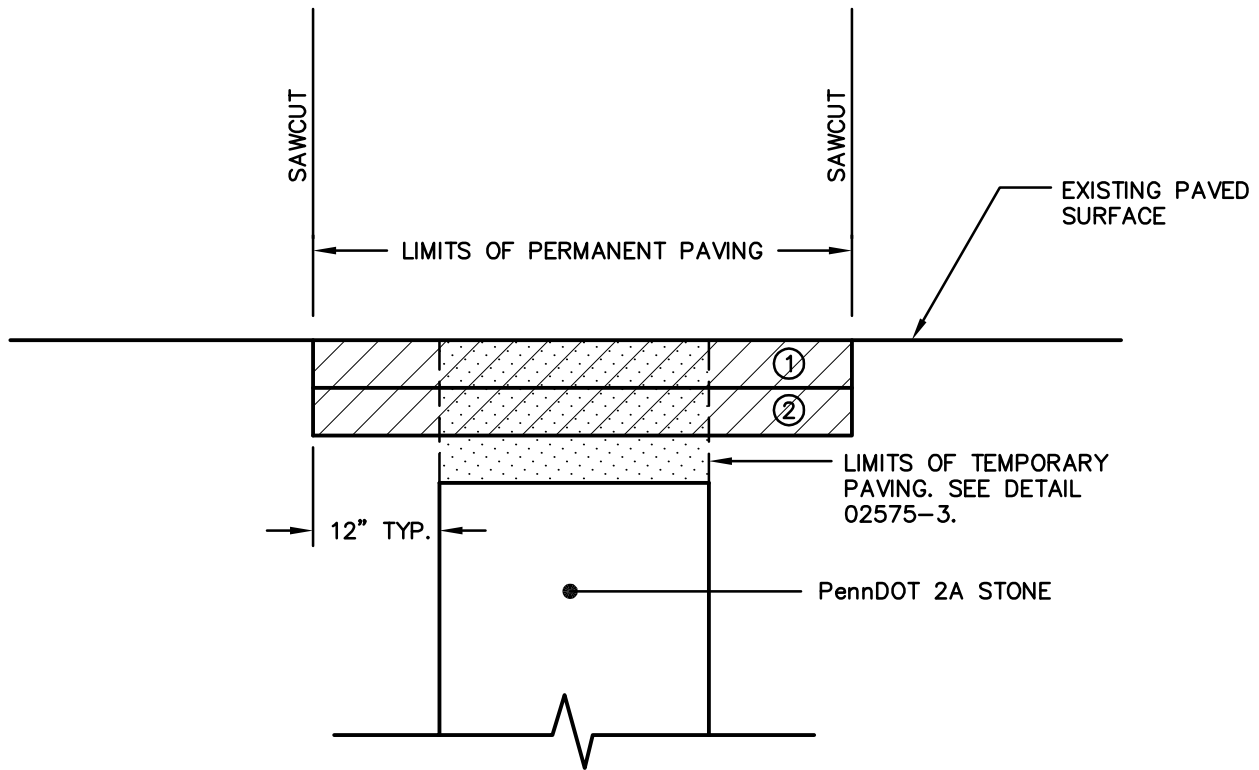
TEMPORARY TRENCH PAVING

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02575-3



TRENCH TYPE	STREET CLASSIFICATION	①	②
1	-	1½" SUPERPAVE WEARING (9.5mm)	6" TYPE B, HIGH EARLY STRENGTH CONCRETE
2	LOCAL	1½" SUPERPAVE WEARING (9.5mm)	2" SUPERPAVE BINDER (19mm) 4½" SUPERPAVE BASE (25mm)
3	ARTERIAL/COLLECTOR	1½" SUPERPAVE WEARING (9.5mm)	2" SUPERPAVE BINDER (19mm) 6½" SUPERPAVE BASE (25mm)
4	CONCRETE	-	8" TYPE B HIGH EARLY STRENGTH CONCRETE
5	STATE ROUTE	SEE APPROVED PERMIT	SEE APPROVED PERMIT

NOTES:

1. SEE SECTION 02500 FOR BITUMINOUS PAVING.
2. SEE SECTION 02221 FOR BEDDING AND BACKFILLING REQUIREMENTS.
3. ALL THICKNESSES ARE THE MINIMUM COMPACTED THICKNESS.
4. SEE CONTRACT DOCUMENTS FOR STREET CLASSIFICATIONS.

NOTE: NOT TO SCALE



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PERMANENT TRENCH PAVING

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02575-4

SECTION 02601

MANHOLES

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Precast concrete manhole sections
2. Precast concrete manhole bases
3. Cast-in-place concrete manhole bases
4. Manhole steps
5. Manhole frames and covers and adjusting rings

B. Related Work Specified Elsewhere:

- | | |
|--|---------------|
| 1. Trenching, backfilling and compacting: | Section 02221 |
| 2. Soil erosion and sedimentation control: | Section 02270 |
| 3. Finish grading, seeding and sodding: | Section 02485 |
| 4. Bituminous paving and surfacing: | Section 02500 |
| 5. Sanitary sewer pipe: | Section 02610 |
| 6. Storm drain pipe: | Section 02618 |
| 7. Sewer testing: | Section 02651 |
| 8. Plain and reinforced cement concrete: | Section 03000 |
| 9. Cement concrete for utility construction: | Section 03050 |

C. Definitions:

1. Standard Manhole - manhole with vertical height from top of base (invert) to top of rim greater than five feet (5').
2. Shallow Manhole - manhole with vertical height from top of base to top of rim less than five feet (5').

D. Applicable Standard Details:

- | | |
|---------|--|
| 02601-1 | Cast-in-Place Manhole Base Detail |
| 02601-2 | Precast Manhole Base Detail |
| 02601-3 | Standard Manhole Detail |
| 02601-4 | Shallow Manhole Detail |
| 02601-5 | Drop Connection Detail |
| 02601-6 | Manhole Channel Configurations |
| 02601-7 | Poured in Place Concrete Adjustment 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 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

Publication 72M, Roadway Construction Standards (RC-39)

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

- A48 Specification for Gray Iron Castings
- A185 Specification for Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
- A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- B221 Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
- C139 Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
- C270 Specification for Mortar for Unit Masonry
- M306 Specifications for Drainage, Sewer, Utility and Related Castings
- C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- C478 Specification for Precast Reinforced Concrete Manhole Sections
- C923 Specification for Resilient Connectors between Reinforced Concrete Manholes Structures, Pipes and Laterals
- D1248 Specification for Polyethylene Plastics Molding and Extrusion Materials

3. Federal Specifications (FS):

- CID A-A-60005 Frame, Covers, Grating, Steps, Sump and Catch Basin Manholes
- SS-S-00210 Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe

4. Pennsylvania Code

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

B. Inspections:

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

- b. Defects that indicate incorrect proportioning, mixing, and molding.
- c. Surface defects larger than ½" diameter indicating honey-combed or open texture.
- d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
- e. Any continuous crack having a surface width of 0.01 inches or more and extending for a length of 6 inches or more, regardless of position in the section wall.

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

1.03 SUBMITTALS

A. Certificates:

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

B. Shop Drawings:

1. Submit details of manhole sections, and precast bases if used.
2. Submit details of manhole frames and covers, including required lettering as specified in Section VIII - Technical Provisions (Detailed).
3. Submit details of adjusting rings.
4. Submit details of manhole steps.
5. Submit manufacturer's descriptive literature for the pipe to manhole flexible connections.
6. Submit manufacturer's descriptive literature for joint sealant compounds.

1.04 JOB CONDITIONS

A. As specified in Section 02221.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

1. After fabrication and curing, transport the manhole and components 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.

PART 2 PRODUCTS

2.01 CRUSHED STONE BASE

A. AASHTO No. 57 or AASHTO No. 8 crushed aggregate, Section 703.2, Publication 408, Section 703.2. Do not use slag or cinders.

- 2.02 MANHOLE BRICK: Not Permitted
- 2.03 CONCRETE MASONRY UNITS: Not Permitted
- 2.04 CEMENT MORTAR: ASTM C270, Type S
- 2.05 CEMENT CONCRETE: Section 03050.
- 2.06 RUBBER GASKETS: ASTM C443
- 2.07 RESILIENT PIPE-TO-MANHOLE CONNECTION: ASTM C923
- A. PSX gaskets as manufactured by Press-Seal Gasket Corporation, Fort Wayne, Indiana or approved equal.
- 2.08 NON-SHRINK GROUT: Fastsetting, cement-based mortar such as Waterplug, manufactured by Thoro Division of ChemRex, Shakopee, MN, or approved equal.
- 2.09 PRECAST CONCRETE MANHOLE BASES AND SECTIONS: ASTM C478
- A. 5.5% \pm 1.5% air-entrained cement concrete.
- B. Eccentric cone or flat slab top sections; minimum 24" access opening.
- C. Precast riser sections of length to suit.
- D. Precast bases of a design similar to the precast riser sections.
- E. Precast drop connections, and precast lampholes are not permitted, unless approved by the ENGINEER.
- F. Manholes shall have a 4' inside diameter unless otherwise noted on the Contract Drawings.
- G. Precast manhole bases shall be manufactured in accordance with the elevations shown on the ENGINEER's grade sheets and shall accommodate lateral hookups as marked in the field.
- H. Precast manhole bases and precast concrete channels shall be constructed specifically for the work intended.
- I. Precast manhole bases are not permitted with pipes greater than 10.00% unless approved by the ENGINEER.
- 2.10 CASTING MATERIALS
- A. Gray Iron Castings shall conform to the requirements of AASHTO M105 Class 35B or ASTM A 48 Class 35B.
- B. Castings shall be manufactured true to pattern and component parts shall fit together in a satisfactory manner. They shall be smooth and well cleaned by shot blasting. Circular manhole frames, covers and grates shall be furnished with machined horizontal bearing surfaces unless otherwise specified in Section VIII - Technical Provisions (Detailed).

C. All shipments shall include appropriate certification from the producing foundry. The certification shall state that the castings have been produced in facilities operating in accordance with the applicable laws and regulations of the United States and the appropriate state, province, or local unit of government. This certification shall also state that all samples representing each lot have been tested, inspected, and have been found to meet the requirements of this specification and the applicable ASTM material specification listed in Section 3. Certification shall also state country of origin of the castings. If specified in the order, a report of the test results shall be furnished.

D. Markings

A. Each individual casting shall be identified by the foundry showing the following:

1. Name of producing foundry and country of manufacture preceded by the words "Made In", such as "Made in USA".
2. AASHTO designation or ASTM designation number.
3. Class by a number followed by a letter indicating the minimum tensile strength and size of test bar.
4. Heat identification and cast date (MM/DD/YY).
5. Casting lettering as required by the OWNER.
6. Any markings as required to meet Federal requirements.

E. Records

1. All test results by this specification shall be maintained by the producing foundry for seven years and shall be made available to the purchaser upon request.
2. Records of casting certifications issued by a producing foundry shall be maintained by the producing foundry for seven years and shall be made available upon request.

2.11 JOINT SEALANT COMPOUND

A. FS SS-S-00210, preformed, flexible, self-adhering, cold-applied. Joints between manhole base and riser, between risers, between riser and cone, between cone and adjusting rings and cast iron frame, shall be made of RUB'R-NEK, a flexible plastic gasket-type sealant manufactured by K. T. Snyder Company, Inc., of Houston, Texas, or approved equal.

2.12 MANHOLE STEPS

A. Manhole steps shall be made of non-corrosive aluminum, or steel reinforced fiberglass or polypropylene materials. Steps in precast walls shall terminate 1" from outer surface and shall be cast in place wherever possible or grouted with a waterproof, non-shrink grout.

1. Aluminum alloy steps (Alloy 6061-T6) shall be Model No. F-140 manufactured by Washington Aluminum Company, Inc., of Baltimore, MD, or approved equal and shall have a protective coating consisting of asphalt coating conforming to AASHTO M-190 requirements applied to the portion to be embedded in the concrete.
2. Steel reinforced fiberglass steps shall be Model No. 115 manufactured by R.J. Manufacturing, Inc. of San Antonio, Texas, or approved equal.

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

2.13 MANHOLE FRAMES AND COVERS

- A. Domestic soft, gray cast iron castings shall be free of bubbles, sand and air holes, and other imperfections. Castings shall be furnished unpainted.
- B. Standard and Heavy Duty frames and covers shall be capable of withstanding an AASHTO HS-25 loading and shall have about a 24" clear opening. Watertight frames and covers shall meet AASHTO HS-20 loading requirements.
- C. Frame and cover shall have machined bearing surfaces and matched to insure against rocking.
- D. Cover shall be lettered or marked in accordance with Section VIII - Technical Provisions (Detailed). Lugs and lettering shall be flush with frame.
- E. Standard frames and covers shall be similar to Model No. 1040, manufactured by East Jordan Iron Works, Inc., East Jordan, Michigan, or approved equal. Solid covers shall be self-sealing, have two (2) concealed watertight pick holes, and shall have two (2) lifting rings or bars, and no openings to permit surface water entry. Covers shall be 1 1/2" thick, and frames shall have a 24" diameter minimum clear opening and a minimum height of 7".
- F. Heavy duty frames and covers shall be similar to Model No. 1545 manufactured by East Jordan Iron Works, East Jordan, Michigan, or approved equal. Solid cover shall be self-sealing, have two (2) concrete pick holes and shall have two (2) lifting rings or bars and no openings to permit surface water entry. Cover shall be 2 1/2" thick and frames shall have a 23 15/16" diameter clear opening and a minimum height of 7".
- G. Watertight frames and covers shall have suitable clamp, employing a rubber gasket seal, similar to Model No. 1893, manufactured by East Jordan Iron Works, Inc. East Jordan, Michigan, or approved equal. Exterior cover shall be 1 3/8" thick. Frames shall have 24 1/2" diameter clear openings and a minimum height of 7".

2.14 REINFORCING STEEL: Section 03000

2.15 ADJUSTING RINGS

- A. Precast cement concrete grade adjustment rings shall be cast from 4000 psi concrete (28-day compressive strength). Circumferential reinforcement shall be in conformance with ASTM C478. Split concrete rings are not permitted.
- B. Plastic or High Density Polyethylene (HDPE) rings are not permitted.
- C. Infra-Riser Adjustment rubber rings, manufactured by East Jordan Iron Works, East Jordan Michigan or approved equal, may be substituted for concrete rings, if approved by the ENGINEER.
- D. Poured in place concrete adjustments shall conform to Standard Detail 02601-7.

2.16 WALL PENETRATION SEALS FOR FORCE MAIN CONNECTIONS

- A. Concrete wall penetration seals shall be “link-seal”, as manufactured by Thunderline Corporation, Houston, TX or approved equal.
- B. Use appropriate wall sleeve type as recommended by manufacturer to provide watertight seal/connection.

2.17 STRUCTURAL CONCRETE BONDING AGENT

- A. The epoxy bonding agent shall be Nitrobond EP, as manufactured by Fosroc Limited, Coleshill Road, Tamworth, Staffordshire, UK. The bonding agent shall be a two-component, solvent-free epoxy resin. The two components shall be differentially pigmented in order to ensure visually that correct mixing has taken place prior to the application. The product shall achieve 70 N/mm² compressive strength, 36 N/mm² tensile strength, 30% elongation, and 14 N/mm² bond strength and water absorption of 0.05%, when tested in accordance to ASTM C881: Type I, II, III, IV and V, grade 2 class E & F. Nitrobond shall be installed per manufacturer’s recommendation.

PART 3 EXECUTION

3.01 MAINTENANCE AND PROTECTION OF TRAFFIC: Section 02221

3.02 CUTTING PAVED SURFACE PRIOR TO EXCAVATION: Section 02221

3.03 BLASTING: Section 02221

3.04 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 invert of the manhole plus that excavation necessary for placement of base material.

3.05 STANDARD MANHOLE CONSTRUCTION

- A. All manholes greater than 5' in vertical height from top of base to top of rim.
- B. Install a minimum of 4" thick compacted crushed stone base. Provide cast-in-place concrete or precast concrete bases.
 - 1. Construct cast-in-place bases as shown on Standard Detail 02601-1.
 - a. Cast-in-place bases may be constructed with a special form for a joint to match the manhole cylinder sections.
 - 2. Install precast bases as shown on Standard Detail 02601-2.
 - a. Set the precast base on the crushed stone base.
 - b. Provide a sealed, flexible resilient connection between pipe and precast base section.

- C. Install the proper diameter watertight manholes on precast concrete or poured-in-place concrete bases shown on the Contract Drawings.
- D. Construct drop connections shown on Standard Detail 02601-5. Encase drop connection in concrete, unless approved by ENGINEER.
- E. Form flow channels in manhole bases. Slope channels uniformly from influent invert to effluent invert, minimum 0.1' drop. Construct bends of the largest possible radius. Form channel sides and invert smooth and uniform, free of cracks, holes or protrusions.
- F. Do not permit pipe to project more than 3" into the manhole.
- G. Where special gaskets or water stops are recommended by pipe manufacturers for connections at manhole walls, these facilities shall be provided. All pipe connection joints shall be watertight.
- H. Seal joints between precast concrete manhole sections with preformed joint sealant compound. Place joint sealant compound on lower section to be compressed by the weight of the upper section.
- I. Step placement:
 - 1. Install manhole sections with steps in proper vertical alignment. Distance from top of rim to top step shall not be greater than 30". Distance from floor of manhole to bottom step shall not be greater than 20".
 - 2. Manhole steps shall be placed perpendicular to the mainline channel. Do not locate steps over channels, unless approved by ENGINEER.
- J. Install manhole frames and covers.
 - 1. In all streets and private roadways the top rim elevation or the entire circumference of all manhole frames and covers shall be depressed 1/4" below the elevation of the adjacent street surface.
 - 2. Seal joint between manhole frame and manhole with joint sealant compound.
 - 3. All manholes shall be adjusted to finished street grade utilizing no more than two (4" maximum thickness) adjusting rings. Brick and stone adjustments are not permitted. The use of metal extension rings is not permitted, unless approved by the ENGINEER.
 - 4. If the proper adjustment cannot be achieved by the use of two rings, the cone section shall be removed and the proper barrel section inserted.
 - 5. All concrete adjusting rings shall be parged and plastered on the inside and outside with cement mortar one-half (1/2") inch in thickness, carefully spread and thoroughly troweled to a smooth surface on the inside only.
 - 6. Install Infra Riser adjusting rings in accordance with manufacturer's recommendations using approved butyl sealant between cone and ring and between rings.

K. New manholes constructed on existing pipelines:

1. Only cast-in-place manhole bases shall be installed over existing sanitary sewers, unless approved by the ENGINEER.
2. Carefully excavate around existing pipeline for placement of the new manhole base.
3. Take all measures necessary to control flow through the existing pipeline and to prevent leakage into the new base.
4. After completion of the manhole, carefully saw and remove the top portion of the existing pipeline.
5. No materials, construction debris, or ground and surface water shall enter the existing pipelines.
6. Upon completion of the connections, a properly sized plumber's stopper shall be placed in the new line and be adequately braced to prevent a "blow-out".
7. The stopper shall not be removed until written permission is granted by the ENGINEER.

- L. Concrete wall penetration shall be cored at the sizes and locations indicated on the Contract Drawings or as recommended by the seal manufacturer. Place approved water-tight connectors in the concrete walls in accordance with manufactures requirements as approved by the ENGINEER.

3.06 SUPPORT OF EXCAVATION: Section 02221

3.07 CONTROL OF EXCAVATED MATERIAL: Section 02221

3.08 DEWATERING: Section 02221

3.09 SHALLOW MANHOLES

- A. All manholes less than five (5') feet in vertical height shall have a flat top section without a cone transition section and shall be constructed in accordance with Standard Detail 02601-4.

3.10 BACKFILLING

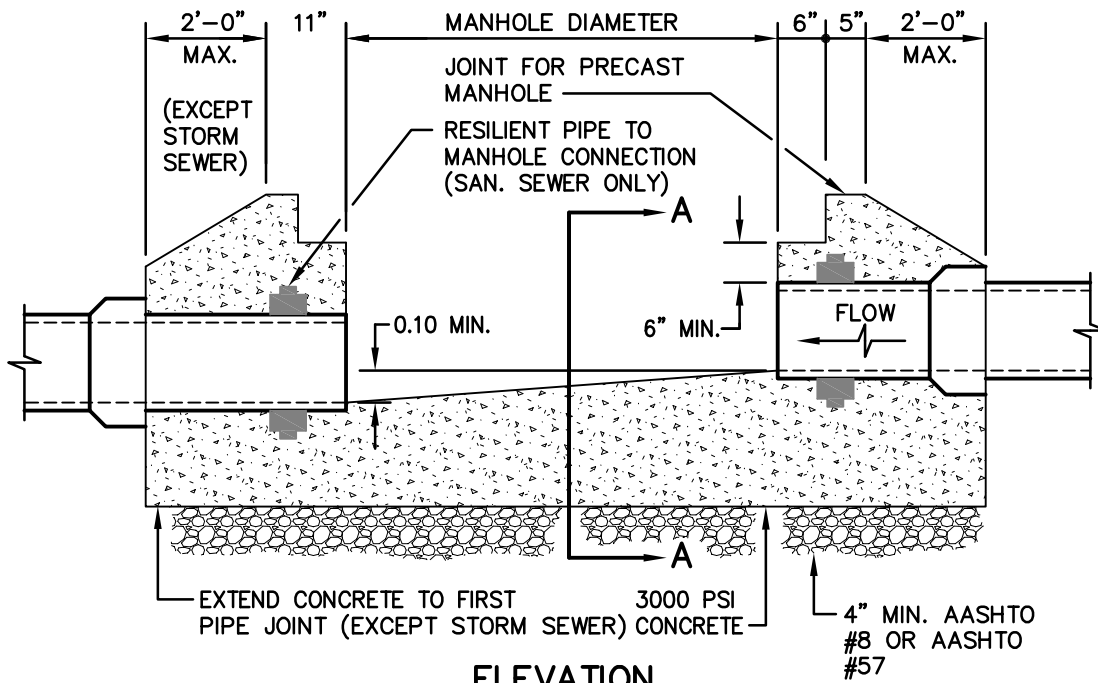
- A. Backfill only after examination of the manhole by the ENGINEER.
B. Perform backfilling as specified in Section 02221

3.11 DISPOSAL OF EXCAVATED MATERIAL: Section 02221

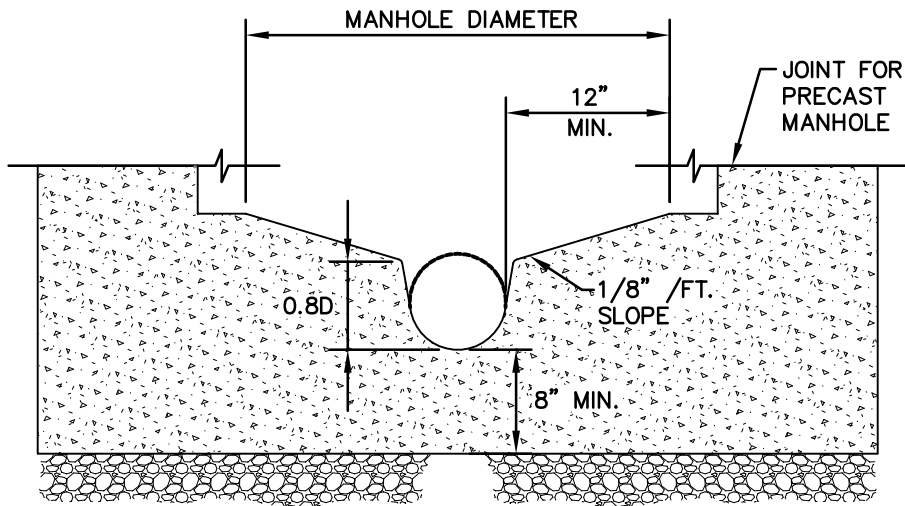
3.12 RESTORATION OF SURFACE AREAS

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

END OF SECTION



ELEVATION



SECTION A-A

D = PIPE INSIDE DIAMETER

NOTE: NOT TO SCALE



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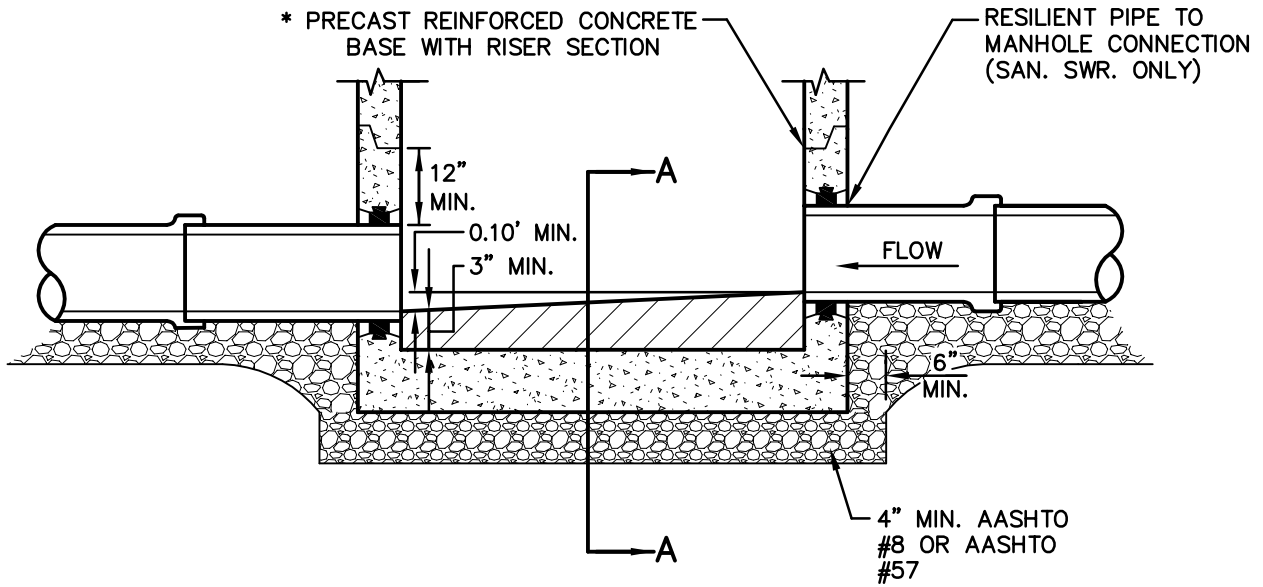
**CAST-IN-PLACE
 MANHOLE BASE DETAIL**

DATE: 9/15/2009

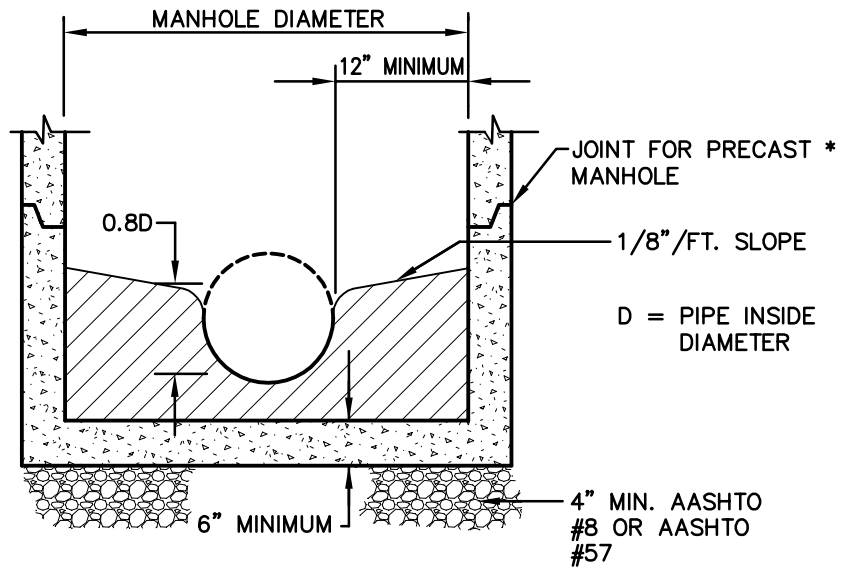
DRAWN BY: CRP

CHK. BY:

NO. 02601-1



ELEVATION



SECTION A-A

* DOUBLE RAMNECK BETWEEN ALL MH SECTIONS

NOTE: NOT TO SCALE



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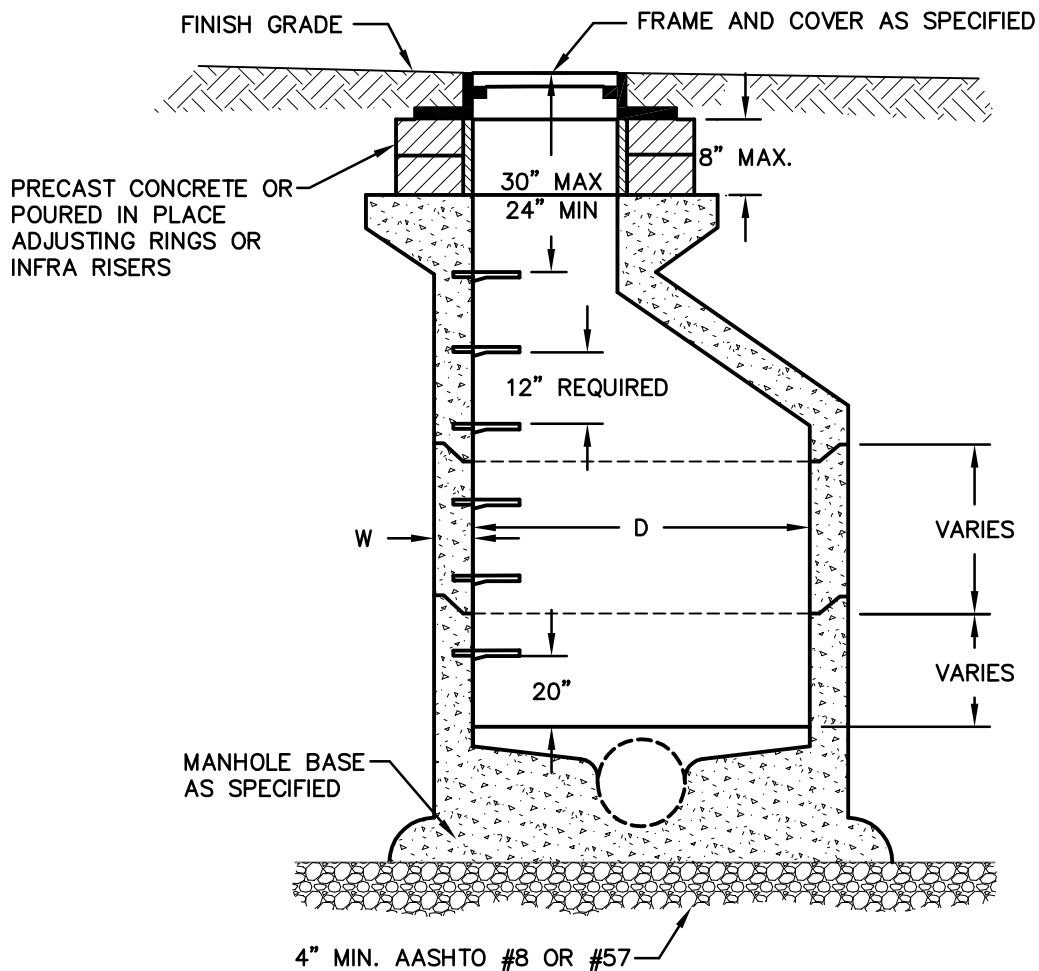
PRECAST MANHOLE
 BASE DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02601-2



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

* DOUBLE RAMNECK BETWEEN ALL ADJUSTMENTS AND FRAME

NOTE: NOT TO SCALE



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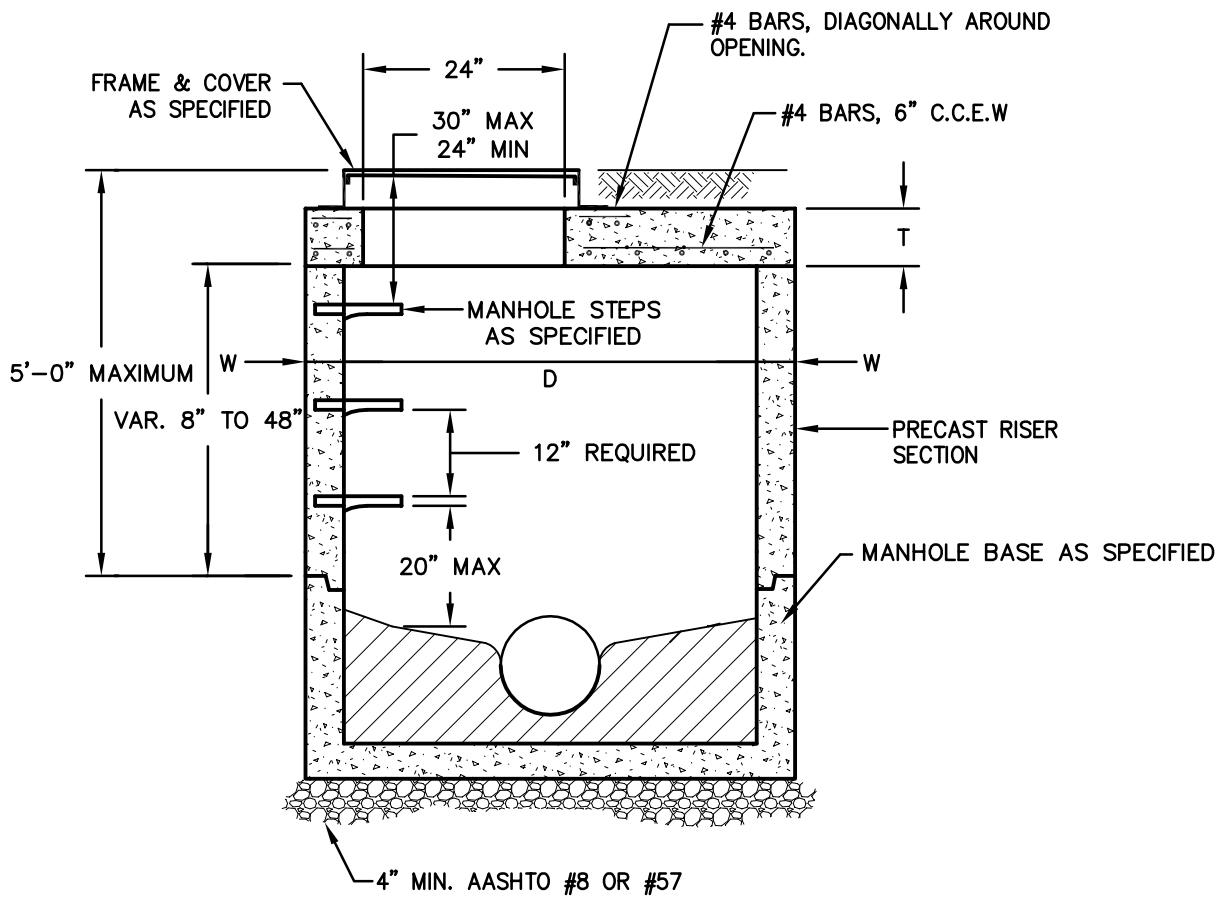
STANDARD
MANHOLE DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02601-3



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

NOTE: NOT TO SCALE



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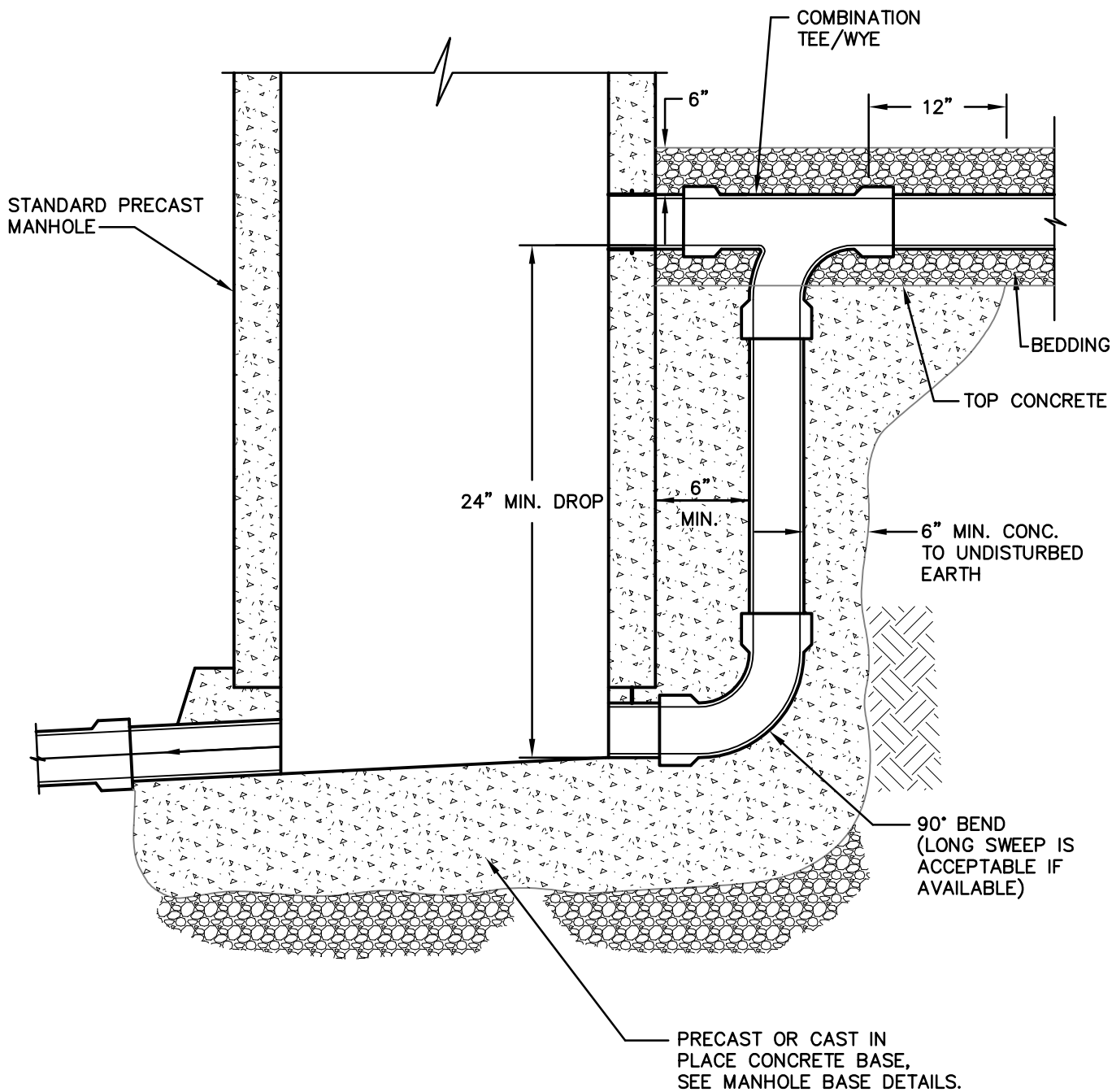
STANDARD SHALLOW MANHOLE DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02601-4



NOTE: NOT TO SCALE

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

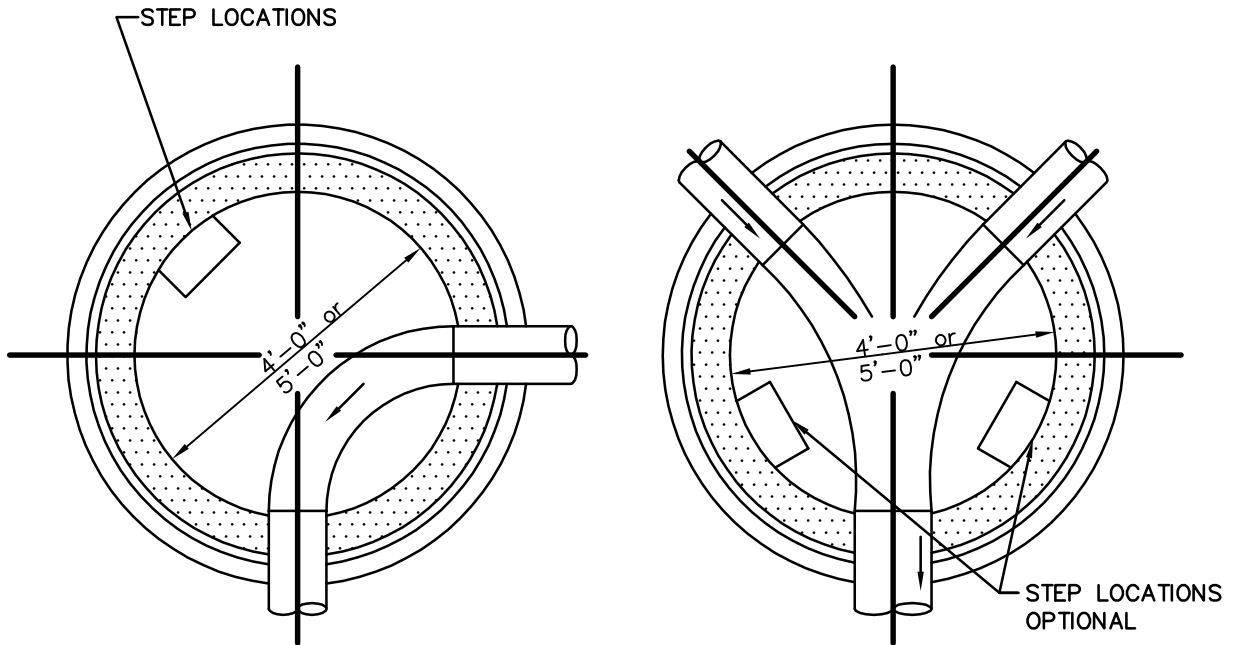
NO. 02601-5



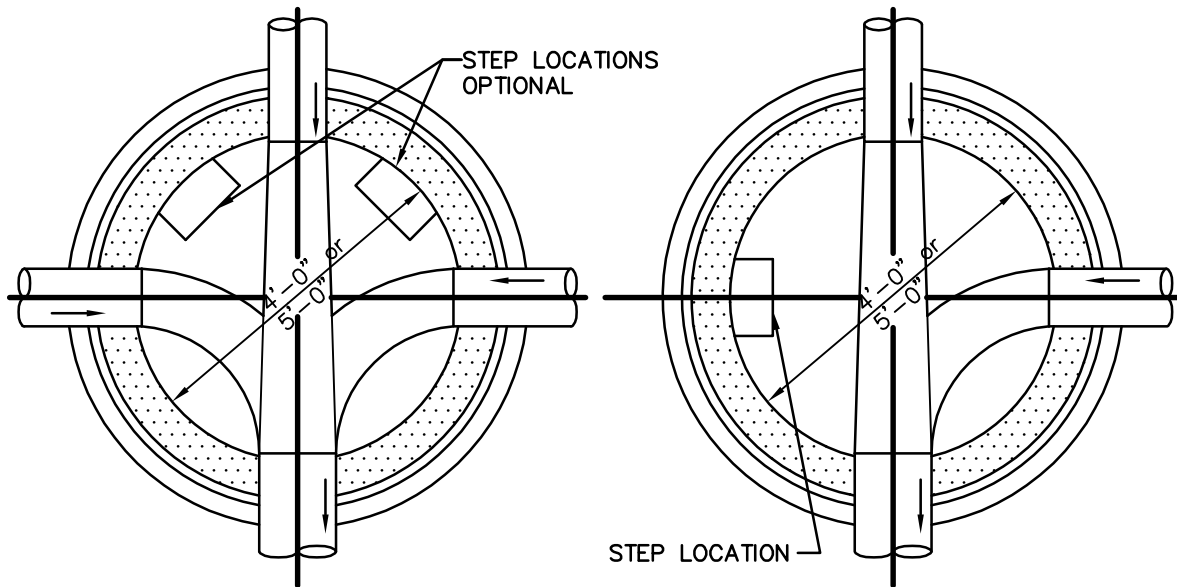
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DROP CONNECTION DETAIL



NOTE: ALL BENCHES SHALL
SLOPE @ 1/8" / 1' TOWARD
FLOW CHANNEL



PLANS OF MANHOLES
TYPICAL

NOTE: NOT TO SCALE



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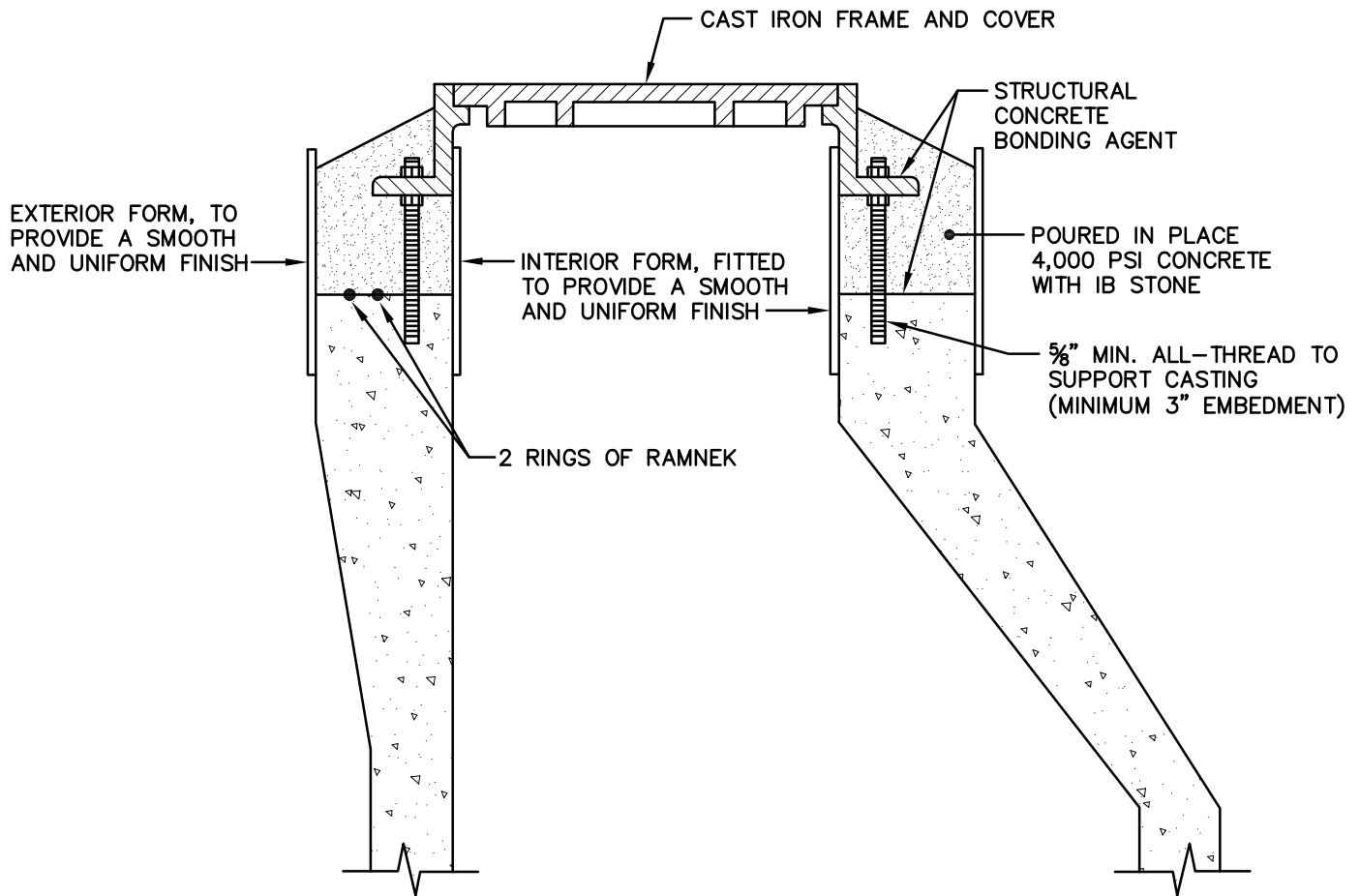
MANHOLE CHANNEL CONFIGURATIONS

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02601-6



NOTE: NOT TO SCALE



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POURED IN PLACE CONCRETE ADJUSTMENT DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02601-7

SECTION 02602

STORM INLETS, CATCH BASINS, ENDWALLS

PART 1 GENERAL

1.01 DESCRIPTION

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

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

B. Related work specified elsewhere:

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

C. Definitions: NONE

D. Applicable Standard Details:

02602-1- Inlet/Storm Pipe Installation Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

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

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

A36 Specification for Carbon Structural Steel
A47 Specification for 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

3. Pennsylvania Code

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

1.03 SUBMITTALS

A. Certificates:

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

B. Shop Drawings:

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

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

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

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

B. Inspections

1. Inspection by the ENGINEER will, at a minimum, be made of materials upon delivery to the job site; of the subgrade, prior to construction or placement; and of the completed structure, prior to backfill.
2. Precast cement concrete products shall be subject to rejection for failure to conform with these specifications or if any one of the following conditions is noted:
 - a. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
 - b. Defects that indicate incorrect proportioning, mixing, and molding.
 - c. Surface defects larger than 1/2" diameter indicating honey-combed or open texture.
 - d. Damaged or cracked ends, where such damage would prevent making a satisfactory joint.
3. Concrete Testing (For Cast-In-Place Work): Section 03000, Paragraph 3.09.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Stone Subbase:

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

B. Brick: ASTM C32 Grade SS, solid.

C. Masonry Mortar: ASTM C270, Type S.

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

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

F. Structural Grade Carbon Steel: ASTM A36.

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

H. Cast Gray Iron Castings: ASTM A48.

2.02 FABRICATIONS

A. Precast Cement Concrete Units:

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

B. Pipe Culvert End Sections:

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

C. Inlet Grates:

1. Comply with the requirements of Publication 72M, RC-34 PennDOT approved diagonal or bicycle safe grates only as specified in Section VIII - Technical Provisions (Detailed).
2. 6' inlet grates shall be similar in all respects to standard inlet grates except that the longitudinal dimension shall be increased by 24".

3. Inlet grates in traffic areas shall be capable of handling HS-25 loading.
4. Welded structural steel grates and frames shall be coated with bituminous paint. All iron castings shall be furnished unpainted.

D. Adjustments

1. Precast cement concrete grade adjustment risers: Shall be cast from 4000 psi concrete (28-day compressive strength), shall be a maximum of 2" thick, and shall be reinforced in accordance with ASTM A478.
2. Brick adjustments are not permitted.
3. Infra-Riser adjustment rubber rings manufactured by East Jordan Iron Works, East Jordan Michigan or approved equal, may be substituted for concrete rings if approved by the ENGINEER.

E. Outlet Structures

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

PART 3 EXECUTION

3.01 EXCAVATION

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

3.02 CONSTRUCTION

- A. Construct inlets and catch basins of either precast cement concrete sections or of cast-in-place cement concrete, and of the type indicated on the Contract Drawings.
 1. Place precast units on a minimum 4" compacted crushed aggregate base.
 2. Construct cast-in-place units on a minimum 4" compacted crushed aggregate base.
 3. Pour channels in inlet boxes to channel the flow of water to the outlet pipe and to prevent water from standing in box.
 4. Unless units are cast-in-place, use precast cement concrete grade adjustment risers or Infra Risers to adjust to grade. Mortar concrete risers in place.
 5. Place bicycle safe grates in all paved (present or future) areas.

- B. Construct endwalls to the dimensions and design indicated on Standard Drawing RC-31, Publication 72M, and of the type shown on the Contract Drawings. Construct endwalls of monolithically cast reinforced concrete.
- C. Do not permit pipes to project more than 3" into inlets. Do not expose end of pipe through faces of endwalls.
- D. Where indicated on the Contract Drawings, provide pipe culvert end sections of the design and dimensions of Standard Drawing RC-33, Publication 72M.
- E. Install polyethylene end sections in accordance with manufacturer's instructions, bedded and anchored as required.
- F. Construct basin outlet structures with inverts, grates and openings at the required elevations shown on the Contract Drawings. Connect to new or existing outlet pipes, relaying or adding pipe as needed to meet the structure.
- G. At junction of different sized pipes, the pipe crowns should match.

3.03 BACKFILLING

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

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

3.05 RESTORATION OF SURFACE AREAS

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

END OF SECTION

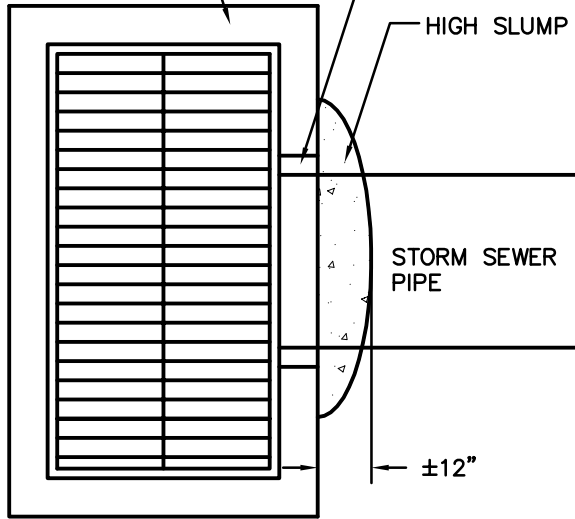
4' OR 6' INLET

VOIDS AROUND STORM PIPE & INLET WALL SHALL BE SEALED WITH CONCRETE AND A CLEAN SMOOTH FINISH PROVIDED ON INTERIOR WALL OF INLET.

HIGH SLUMP CONCRETE

STORM SEWER PIPE

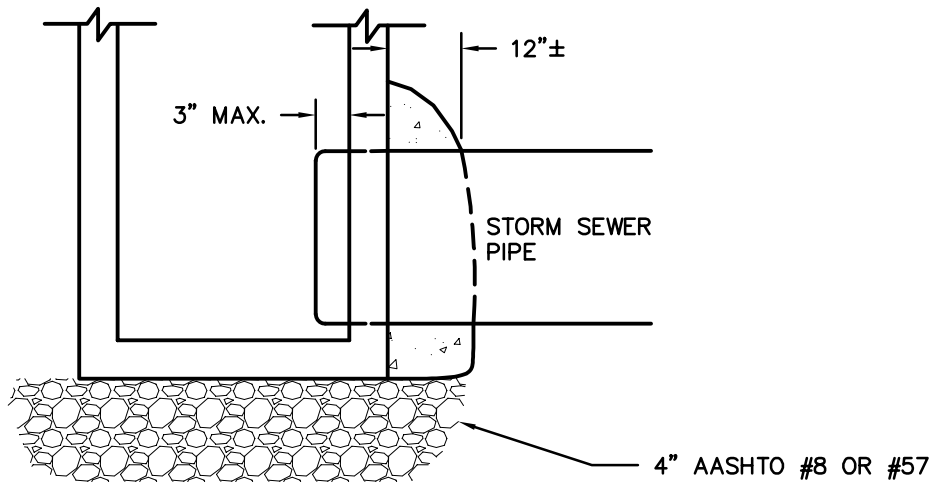
±12"



PLAN VIEW

NOTE:

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



ELEVATION

NOTE: NOT TO SCALE



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INLET/STORM PIPE
INSTALLATION DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02602-1

SECTION 02610

SANITARY SEWER PIPE

PART 1 GENERAL

1.01 DESCRIPTION

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

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

B. Related work specified elsewhere:

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

C. Definitions:

1. Dimension Ratio (DR) - Constant ratio between outside pipe diameter and wall thickness.
2. Standard Dimension Ratio (SDR) - Constant ratio based on Renard numbers and rated for pressure.

D. Applicable Standard Details:

- | | |
|---------|-------------------------------|
| 02610-1 | Lateral Detail |
| 02610-2 | Lateral Detail with Cleanout |
| 02610-3 | Subbase Drain Detail |
| 02610-4 | Combination Air Release Valve |

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American National Standards Institute (ANSI):

- | | |
|--------|--|
| A21.4 | Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings |
| A21.10 | Gray-Iron and Ductile-Iron Fittings |
| A21.11 | Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings |
| A21.51 | Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or other liquids |

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

A53	Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
A74	Specification for Cast Iron Soil Pipe and Fittings
C14	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C425	Specification for Compression Joints for Vitrified Clay Pipe and Fittings
C443	Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets
C564	Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
D1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
D1869	Specification for Rubber Rings for Asbestos-Cement Pipe
D2241	Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR series)
D2321	Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
D2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
D2855	Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D3139	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
F679	Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

3. American Water Works Association (AWWA):

C301	Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
C504	Rubber Seated Butterfly Valves
C507	Ball Valves, 6" through 48"
C900	Poly (Vinyl Chloride) PVC Chloride (PVC) Pressure Pipe, 4" through 12" for Water Distribution

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

1.03 SUBMITTALS

A. Certificates:

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

B. Manufacturer's Literature:

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

C. Details of bypass pumping operation and pump curves. The CONTRACTOR shall analyze the existing flow rate and provide pumps with enough capacity to handle daily fluctuations.

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling:

1. Do not place materials on private property without written permission of the property OWNER.
2. During loading, transporting and unloading, exercise care to prevent damage to materials.
3. Do not drop pipe or fittings. Avoid shock or damage at all times.
4. Take measures to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

1. Do not stack pipe higher than recommended by the pipe manufacturer.
2. Store PVC pipe and gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.
3. Place on flat surface with proper support.

PART 2 PRODUCTS

2.01 CEMENT CONCRETE SEWER PIPE

A. Reinforced Gravity Sewer Pipe and Fittings:

1. ASTM C76.
2. Provide in load class indicated on Contract Drawings, minimum Class II.

B. Prestressed Concrete Pressure Pipe and Fittings:

1. AWWA C301
2. Design internal pressure 150 psi unless indicated otherwise on the Contract Drawings.

C. Joints:

1. Tongue and groove
2. Bell and spigot

D. Gaskets: Solid circular cross-section O-ring, ASTM C443.

2.02 DUCTILE IRON PIPE

A. Pipe:

1. ANSI A21.51, Thickness Class as indicated on the Contract Drawings, minimum Class 52.
2. Standard cement-mortar lining, ANSI A21.4.
3. Standard bituminous coating, interior and exterior.

B. Fittings:

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

C. Joints:

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

D. Rubber gaskets, lubricants, gland, bolts and nuts: ANSI A21.11

2.03 POLY (VINYL CHLORIDE) (PVC) SEWER PIPE

A. Gravity Sewer Pipe, Fittings and Couplings:

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

4. Where specifically approved by OWNER, pipe 15" and smaller: ASTM F789 may be substituted.

B. Pressure Sewer Pipe and Fittings:

1. Pressure-Rated:

- a. ASTM D2241, Pressure rating as indicated on the Contract Drawings, 125 psi minimum.

2. Schedule-Rated:

- a. ASTM D1785, Schedule rating as indicated on the Contract Drawings, Schedule 40 minimum.

3. Dimension-Rated:

- a. AWWA C900, DR 18 minimum (150 psi), for 4" diameter and larger.
- b. AWWA DR 21 minimum (200 psi), for 2" diameter and smaller.

4. Flexible Elastomeric Seals: ASTM D3139
Seal Material: ASTM F477

2.04 CAST IRON SOIL PIPE (PLUMBING)

A. Pipe and Fittings: ASTM A74, Service Class

1. Hub and spigot or double hub

B. Joints

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

2.05 STEEL CASING PIPE: Section 02150

2.06 FLEXIBLE COUPLINGS: Leak proof, PVC compound with stainless steel clamps suitable for the pipe materials as manufactured by Fernco, Inc., Davison, MI, or approved equal, as approved by ENGINEER.

2.07 CLEANOUTS

A. Cleanout riser pipe and fitting shall be PVC SDR 35.

B. Cleanout caps:

1. All cleanout PLUGS shall be brass, counter sunk, designed for 4" riser pipe and meeting Southern Code service weight standards. Use General Engineering Company (GENECO), Frederick, MD or approved equal.

2.08 DETECTABLE WARNING TAPE

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

2.09 VALVES

A. Plug valves

1. Plug valves shall be of the non-lubricated, eccentric type, and shall be designed for a working pressure of 175 psi for valves 12" and smaller. Valves shall be of round port design. If a rectangular style design is employed, port area shall be a minimum of 100% of the corresponding pipe area.
2. Valves shall provide tight shut-off with rated pressure from either direction, where required. The plug valves shall be manufactured by Dezurik of Sartell, MN, Keystone Valve of Houston, TX, or approved equal.
3. Plug valves shall be furnished with replaceable permanently lubricated sleeve-type 18-8 stainless steel bearings in the upper and lower journals. Valve seats shall be nickel with raised surface completely covered to ensure that the plug face contacts only nickel.
4. Manual gear operators shall be totally enclosed worm and gear type, permanently lubricated. Manual operator components shall withstand, without damage, a pull of 80 to 200 lbs. on the handwheel, with buried service gear units capable of withstanding input torque on the operating nut as required by AWWA C504, Section 3.8.3 and AWWA C507, Section 11, Paragraph 11.9. Gear segment shall be of ductile iron, ASTM A536, Grade 56-45-12 supported on bronze bushings.
5. Plug valves shall be tested in accordance with AWWA C504, Section 5. The leakage test shall be applied to the face of the plug tending to unseat the valve. Certified copies of reports covering proof of design testing as described in Section 5.5 shall be provided to the ENGINEER.

B. Combination Air Release Valves

1. Cast iron body and cover, stainless steel float, orifice and linkage mechanism, mountings and trim. Buna-N orifice valve. 150 psi minimum rated working pressure.
2. Orifice size as indicated on Contract Drawings.

2.10 CAST/DUCTILE COUPLINGS:

1. For joining steel, cast iron, ductile iron, extra strength vitrified clay or asbestos cement pipe to PVC materials, use cast couplings Model CC-441 manufactured by Smith Blair, Inc., PO Box 5337, Teyallana, TX 79505. Model No. Nylon 242 manufactured by JCM Industries, PO Box 1220, Nashville, TN, 75569 or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

- A. Perform trench excavation as specified in Section 02221, Paragraph 3.04.
- B. Unless otherwise required by the ENGINEER, provide for a minimum cover of 4 feet above the top of pipe laid in trenches in non-traffic areas, and 5 feet in traffic areas.
- C. Provide Type IV bedding as specified in Section 02221, Paragraph 3.08. Place so that the pipe can be laid to the required tolerances in accordance with ASTM D2321.
- D. Provide Type V bedding for 2" dia. and smaller pressure sewers, unless otherwise specified in Section VIII - Technical Provisions (Detailed).

3.02 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER in advance of pipe laying operations, minimum seventy-two hours.
- B. Maintain no less than three batter boards, at 25' maximum interval, or their equivalent between adjoining manholes during pipe laying operations, or use laser alignment instruments.
- C. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe or fittings.
- D. Lay pipe proceeding up-grade with the bell or groove pointing upstream, unless approved by the ENGINEER.
- E. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
- F. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- G. Clean and inspect each section of pipe before joining to mark on pipe. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Use lubricant recommended by the pipe and fitting manufacturer for making joints. If unusual joining resistance is encountered or if the pipe cannot be fully inserted into the bell, disassemble joint, inspect for damage, reclean joint components, and reassemble joint.

H. Assemble joints in accordance with recommendations of the manufacturer.

1. Push-on joints:

- a. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
- b. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe, or both.
- c. Insert the spigot ends of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket using reference mark at the spigot end of the pipe as a guide. Mark Pipe that is not furnished with a reference mark before assembly to assure that the spigot is fully inserted.
- d. Pipe gaps in excess of 1/4" in length will not be accepted.

2. Mechanical joints:

- a. Wash the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180 degrees apart, alternately.

Torque Required:

<u>Bolt Size, In.</u>	<u>Torque, Ft.-Lbs.</u>
5/8	45 - 60
3/4	75 - 90
1	100 - 120

3. Solvent cemented joints:

- a. Chamfer and deburr pipe. Clean socket and plain end. Measure and mark the socket depth on the outside of the pipe.
- b. Apply primer to inside socket surface using a scrubbing motion to ensure penetration. Repeated applications may be necessary. Soften surface of male end of pipe to depth of fitting socket by applying a liberal brush coat of primer. Do not pour primer on. Assure entire surface is well softened.
- c. Repeat application of primer to inside socket surface, and then apply cement to pipe while surfaces are still wet with primer. Apply cement uniformly taking care to keep excess cement out of socket.

- d. Immediately after applying the last coat of cement to the pipe, and while both the inside socket surface and outside pipe surface are soft and wet, forcefully seat the pipe into the socket. Turn the pipe 1/4 -turn during assembly to distribute cement evenly. Assembly should be completed within 20 seconds after the last application of cement. Insert pipe with a steady, even motion. Do not use hammer blows.
 - e. Hold joint in place until cement has set. Wipe excess cement from the pipe.
4. Coupled joints:
- a. Assemble in accordance with the manufacturer's recommendations.
- I. Disassemble and remake improperly assembled joints using a new gasket.
- J. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the Contract Drawings, or deflection of pipe joints, will be cause for rejection.
- K. Place sufficient compacted backfill on each section of pipe, as it is laid, to hold firmly in place.
- L. Clean interior of the pipe as work progresses. Where cleaning after laying is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.
- M. Keep trenches and excavations free of water during construction.
- N. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- O. Joint Deflection:
- 1. When it is approved by the ENGINEER to deflect pressure sewer mains from a straight alignment horizontally or vertically, do not exceed the following limits:
 - a. Ductile Iron Pipe: <12" diameter - 5° maximum deflection per joint
>12" diameter - 3° maximum deflection per joint
 - b. PVC Pipe: 4 degree maximum deflection per joint.
 - c. Reinforced Concrete Pipe: 1-degree maximum deflection per joint.
- P. Make connections in accordance with the Contract Drawings, and perform any adjustments and ensure a watertight installation. Connections to the existing sewers shall be made under the direct observation of the ENGINEER or his authorized representative. Do not permit any water, earth, debris or other materials to enter the existing sewer system.

- Q. As soon as connections are completed, install an adequately sized screw-in plug in the existing manhole, tie-off with rope and brace to prevent a “blowout”. The stopper is to prevent flow from the new line from entering the existing system and it shall not be removed until authorization to do so is given by the ENGINEER. Routinely remove any accumulated ground and surface water from the line upstream and dispose of properly.

3.03 WYE BRANCHES AND TEES

- A. Install wye branches or pipe tee wye at locations designated concurrent with pipe laying operations. Use standard fittings of the same material and joint type as the pipeline into which they are installed.
- B. For connections into an existing pipeline, where permitted by the ENGINEER, install a wye or tee wye with Smith Blair or JCM Industries couplings if connecting to vitrified clay or ductile iron pipe. Use PVC solid wall sleeve with gasket if connecting to PVC pipe.
- C. Where specifically approved by the OWNER, for taps into an existing pipeline, use a saddle wye or tee with stainless steel clamps or core drill pipe and install watertight resilient boot. Mount saddles with gasket and secure with metal bands. Lay out holes with a template and cut holes with a mechanical hole cutter.
- D. Where lateral is not to be installed, install an approved water-tight plug, braced to withstand pipeline test pressure thrust.

3.04 LATERALS

- A. Construct laterals from the wye branch to a terminal point in accordance with Standard Detail 02610-1, 02610-2 or 02610-5, as specified. Vertical risers are not permitted unless approved by the ENGINEER.
- B. Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the lateral. Install a temporary marker stake (minimum 2" x 2") extending from the end of the lateral to 1 foot above finished grade.
- C. Laterals shall be installed at a slope of 1/4"/ft. (4" diameter) or 1/8"/ft. (6" diameter) from the main to the cleanout or plug. The minimum depth under streets shall be 5'. Any deviations must be approved by the ENGINEER prior to installation.
- D. Lateral lengths to extend 5' past right of way line, unless approved by ENGINEER.
- E. Drop cleanouts are not permitted.
- F. Cleanouts in driveways are not permitted.

3.05 CAST-IN-PLACE CONCRETE CONSTRUCTION

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

3.06 CRADLES AND ENCASEMENT

- A. Provide concrete cradles and encasement for pipeline where indicated on the Contract Drawings, or as directed by the ENGINEER, and in accordance with Standard Detail 03050-1.

3.07 THRUST RESTRAINT FOR PRESSURE PIPELINES

- A. Provide all valves, tees, bends, caps, and plugs with concrete thrust blocks in accordance with Standard Detail 03050-3. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair.
- B. Furnish and install, tie rods, clamps, set screw retainer glands, or restrained joints if indicated on the Contract Drawings or required by the ENGINEER. Protect metal restrained joint components against corrosion by applying a bituminous coating.

3.08 COMBINATION AIR VALVES

- A. Orient, locate and install air release or combination air release valves on force mains where shown on the Contract Drawings.
- B. Construct air release valves including valve vault as shown on Standard Detail 02610-4. Valve and valve vault shall be vertical and plumb.
- C. During project start-up, verify that there are no leaks in saddle or plumbing. Verify correct function of valves.
- D. Pipe penetrations shall have a manhole boot-type seal.

3.09 CARRIER PIPE IN CASINGS: Section 02150

3.10 STREAM CROSSINGS

- A. Construct sanitary sewer pipeline stream crossings in accordance with Standard Detail Nos. 02221-4 and/ or 02221-5 as shown on the Contract Drawings.
- B. Provide concrete encased ductile iron pipe backfilled with minimum 3" size stone to the level of the stream bed, between the limits of the stream crossing.
- C. Wetland crossings: See Standard Detail 02221-6.

3.11 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe by the ENGINEER.
- B. Backfill trenches as specified in Section 02221, Paragraph 3.11.
- C. Install the detectable warning tape along the entire length of PVC force main on top of the pipe bedding but no deeper than 48 inches below finished grade. The pipe bedding (12" cover) shall maintain sufficient separation between the tape and the line.

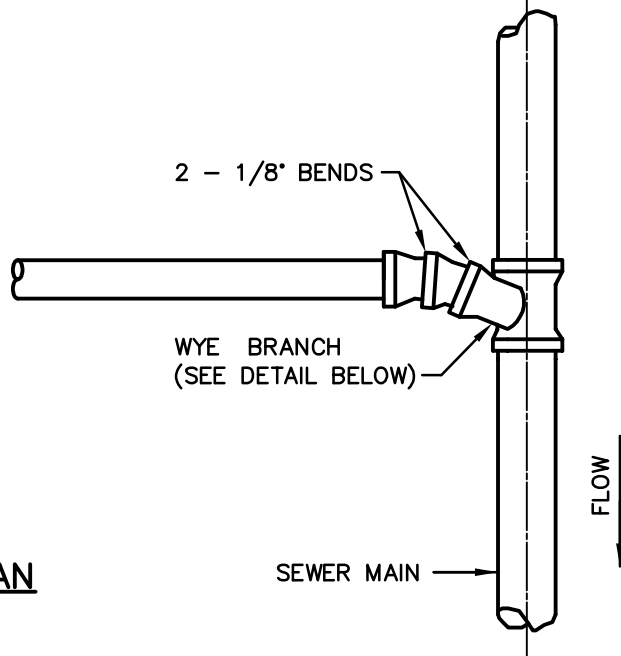
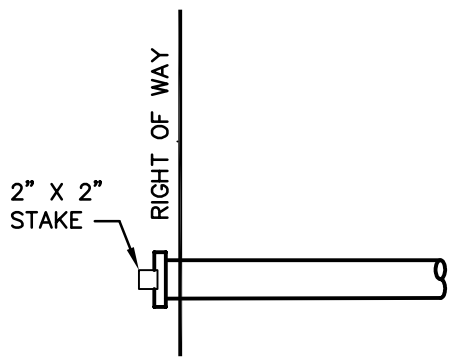
3.12 SURFACE RESTORATION

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

3.13 BYPASS PUMPING

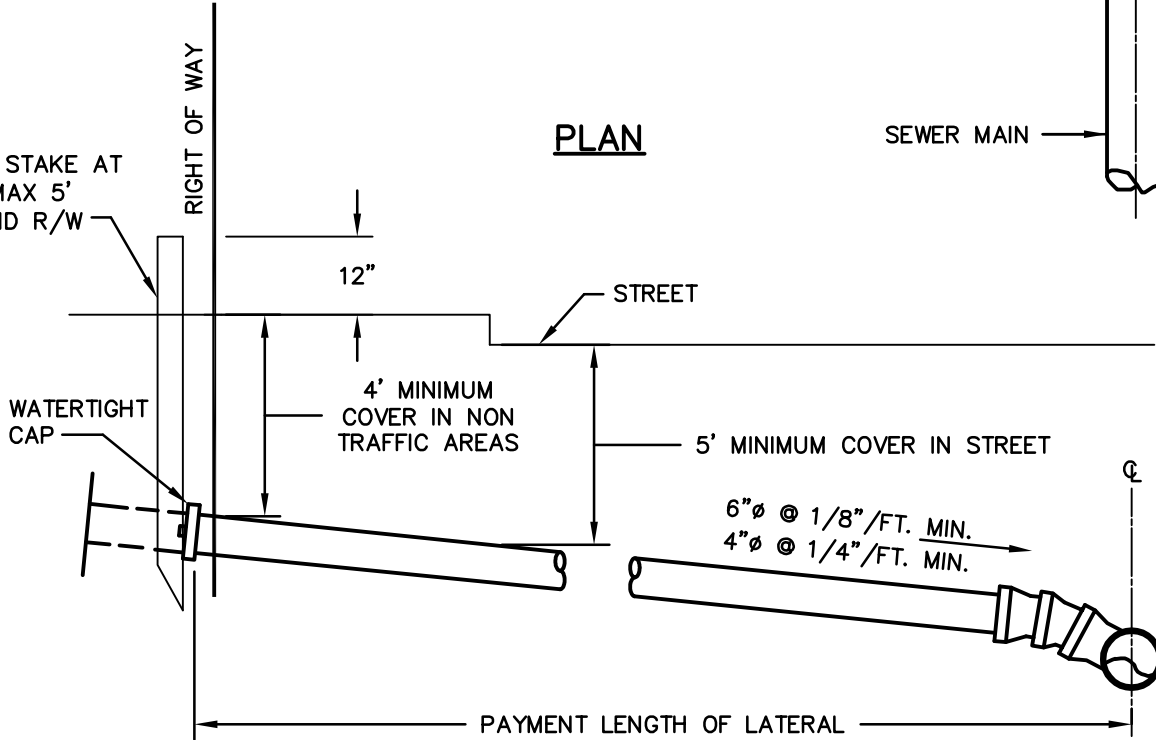
- A. Provide one (1) reliable pump capable of handling the existing wastewater flows and daily fluctuations and enough discharge piping to bypass pump from upstream manhole to downstream manhole. Provide one (1) backup pump on-site or provide evidence of ability to obtain backup pump within 30 minutes in case of pump failure. Bypass pumping system shall not allow backup in collection system beyond two (2) manholes. Bypass piping shall be watertight and not allow any discharge to the surface. Any leaks in the system will be just cause to discontinue bypass operation and pipe installation and tie piping back into gravity flow.
- B. At the end of each workday, the bypass pumping shall stop and the new PVC piping shall be connected to the existing piping with a watertight flexible coupling. All trenches shall be properly backfilled and compacted except in the immediate area of the tie-in. Open trenches in traffic areas shall be protected with jersey barriers and steel plating and all trenches shall be protected with construction fencing.
- C. The CONTRACTOR shall supply necessary equipment for bypassing operations; and inform the ENGINEER of such. Bypassing of service connections to be reconnected is not necessary, however; the CONTRACTOR will be responsible for notifying customers that their services will be interrupted. Service shall be restored at the end of each working day.
- D. CONTRACTOR is responsible for design, installation and operation of all bypass pumping. CONTRACTOR's plan for proposed bypass pumping system shall include, but not be limited to the staging area for pumps, pump sizes and number to be used; power source and standby power source and schedule for installation and maintaining of bypass pumping lines. CONTRACTOR shall size pumps for wastewater flow bypass according to normal flows in the system. CONTRACTOR shall reconnect the sanitary sewer pipe at the end of each workday to prevent system overload caused by potential storm events.
- E. Plugging the upstairs pipe to prevent flow into the construction area is not acceptable in lieu of bypass pumping.

END OF SECTION

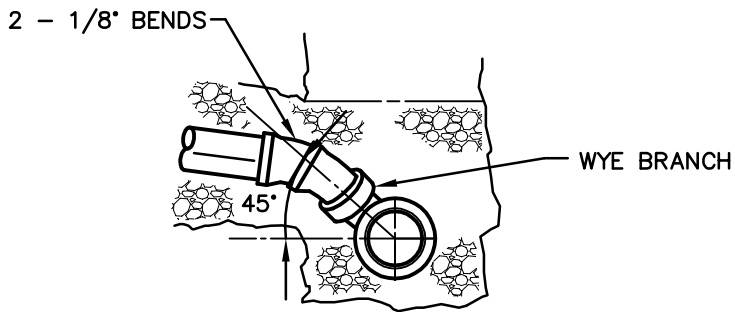


PLAN

2"x2" STAKE AT
CAP MAX 5'
BEYOND R/W



ELEVATION



DETAIL

NOTE: NOT TO SCALE



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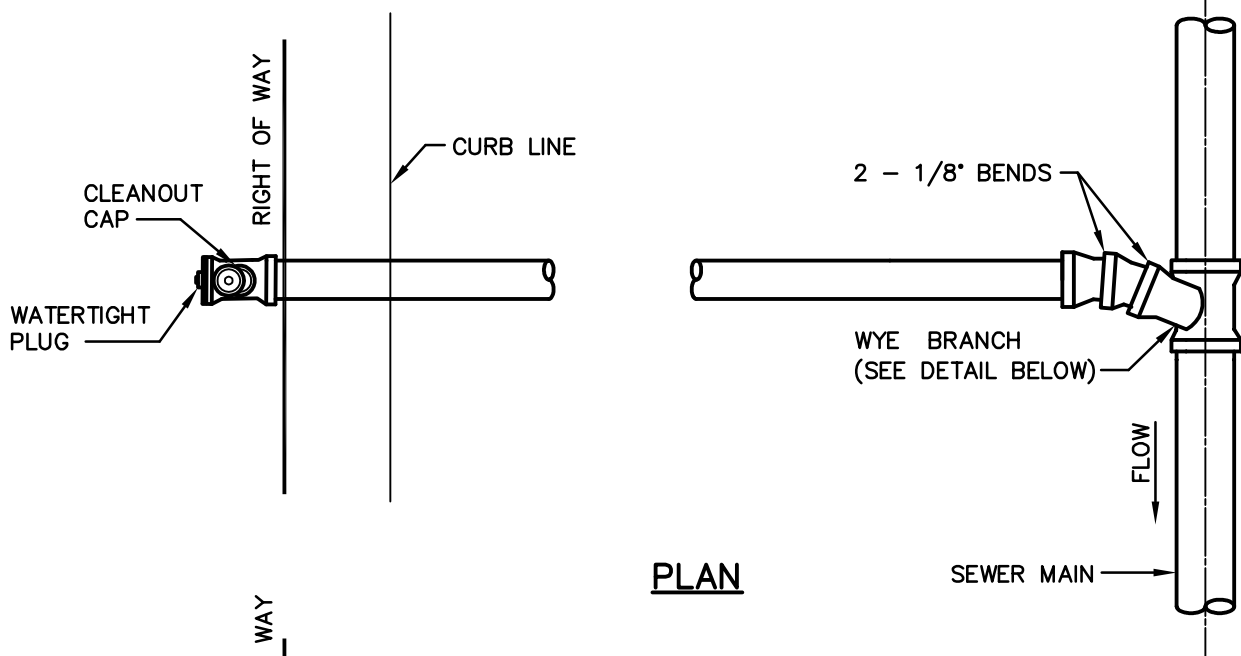
LATERAL DETAIL

DATE: 9/15/2009

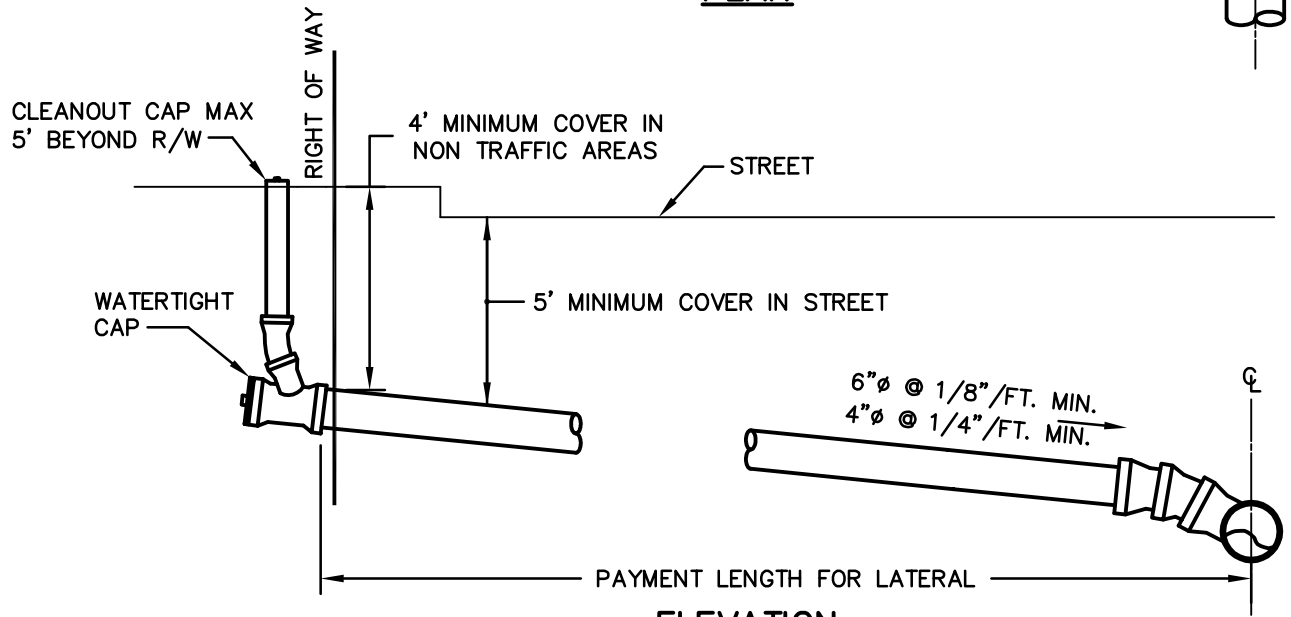
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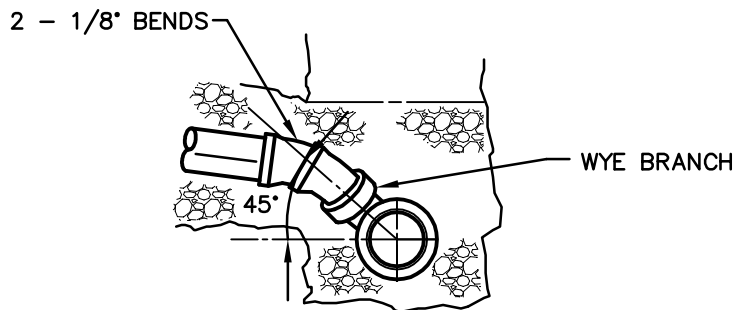
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PLAN



ELEVATION



DETAIL

NOTE: NOT TO SCALE



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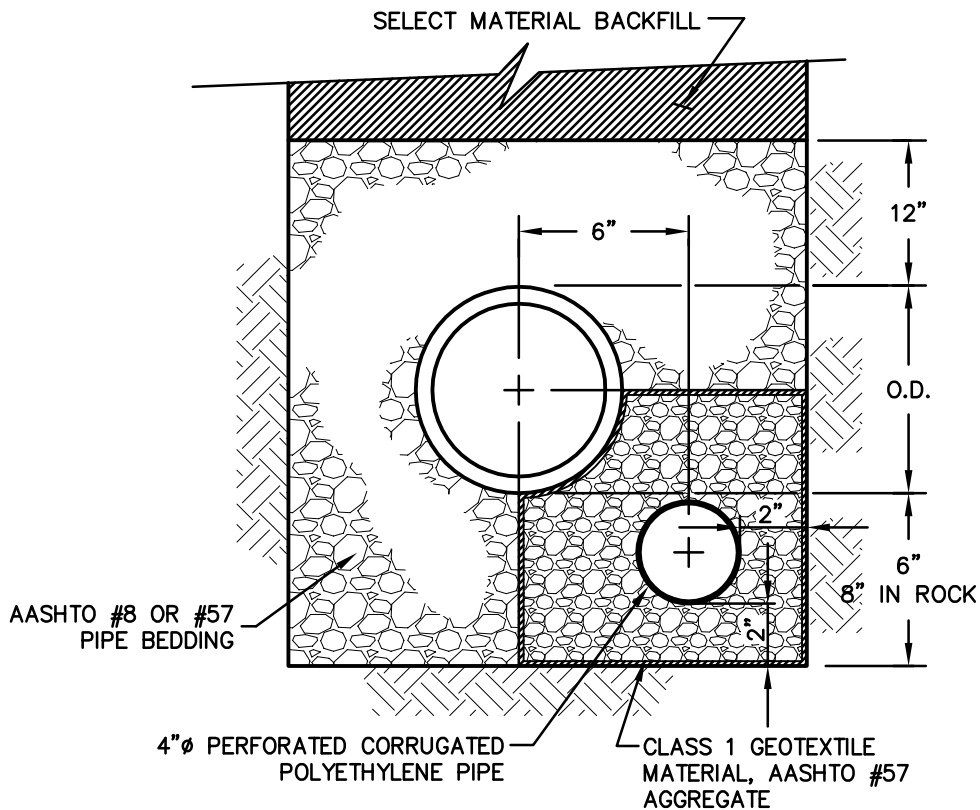
LATERAL DETAIL WITH CLEANOUT

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02610-2



NOTES:

1. LOCATION OF SUBBASE DRAIN IN TRENCH TO BE MODIFIED TO SUIT FIELD CONDITIONS AND TIE INTO INLETS MANHOLES, OR OTHER EXISTING PIPING. POSITIVE FLOW MUST BE MAINTAINED.
2. SUBBASE DRAIN TO BE USED WITH TYPE IV BEDDING ONLY.

NOTE: NOT TO SCALE



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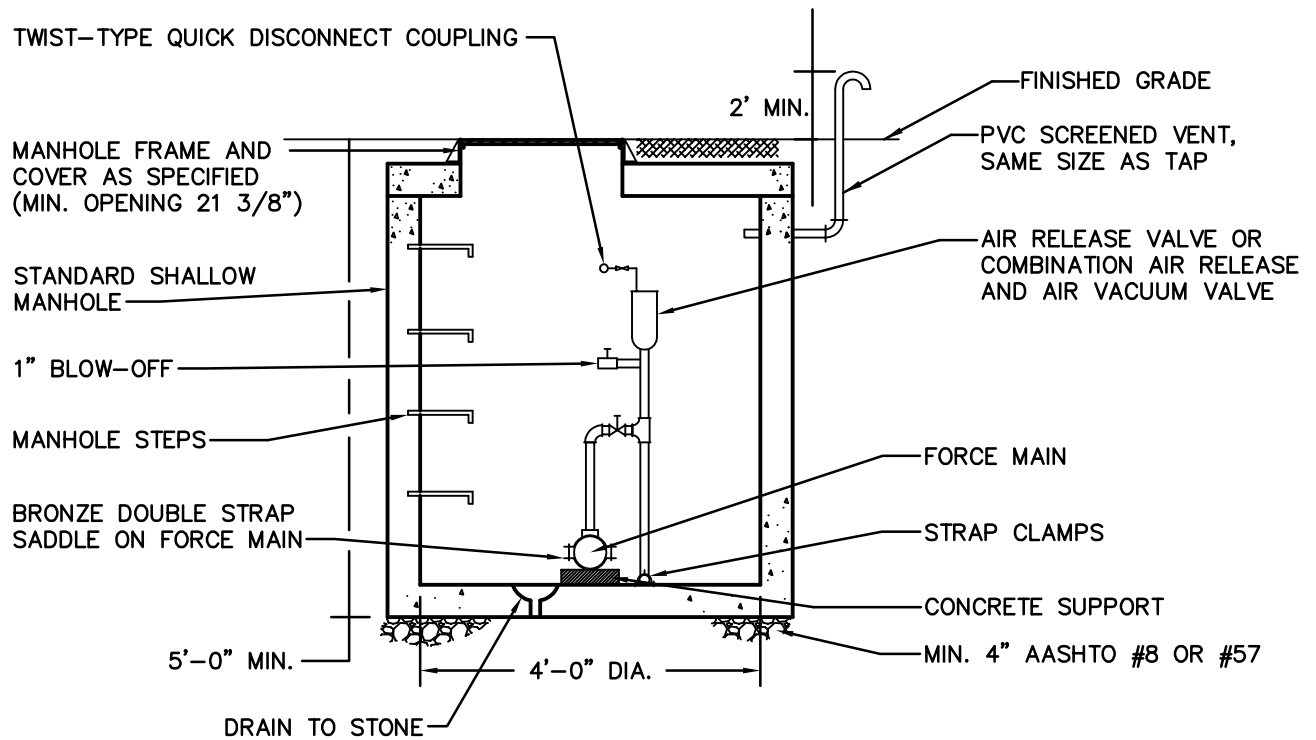
SUBBASE DRAIN DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02610-3



NOTE: NOT TO SCALE



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COMBINATION AIR RELEASE VALVE

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02610-4

SECTION 02615

WATER MAINS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Installing and repairing water mains and fittings, in excess of 2" diameter.

B. Related work specified elsewhere:

- | | |
|--|---------------|
| 1. Boring and jacking: | Section 02150 |
| 2. Trenching, backfilling and compacting: | Section 02221 |
| 3. Soil erosion and sedimentation control: | Section 02270 |
| 4. Finish grading, seeding and sodding: | Section 02485 |
| 5. Trench paving and restoration: | Section 02575 |
| 6. Valves and fire hydrants: | Section 02640 |
| 7. Water service connections: | Section 02642 |
| 8. Testing and disinfecting water mains: | Section 02653 |
| 9. Cement concrete for utility construction: | Section 03050 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Water Works Associations (AWWA) most recent revisions:

- C104 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe Fittings for Water
- C105 Polyethylene Encasement for Ductile Iron Pipe Systems
- C110 Gray Iron and ductile Iron Fittings 3-inch through 48 inches
- C111 Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
- C115 Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges
- C116 Protective Fusion-Bonded Epoxy Coatings for Interior & Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Supply Service
- C150 Thickness Design of Ductile Iron Pipe
- C151 Ductile Iron Pipe for Water or other Liquids
- C153 Ductile Iron Compact Fittings, 3 inch through 24 inch for Water Service
- C200 Steel Water Pipe 6 inches and Larger
- C203 Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape Hot Applied
- C205 Cement Mortar Protective Lining and Coating for Steel Water Pipe 4 inch and Larger - Shop Applied

- C206 Field Welding of Steel Water Pipe
- C207 Steel Pipe Flanges
- C300 Reinforced Concrete Pressure Pipe, Steel Cylinder Type
- C301 Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and other Liquids
- C302 Reinforced Concrete Pressure Pipe, Non-Cylinder Type, for Water and other Liquids
- C303 Reinforced Concrete Water Pipe, Steel Cylinder Type, Pretensioned
- C304 Design of Prestressed Concrete Cylinder Pipe Asbestos-Cement Pipe
- C400 Asbestos-Cement Pressure Pipe, 4 inch through 16 inch for Water Distribution Systems
- C401 Selection of Asbestos-Cement Pressure Pipe 4 inch through 16 inch
- C402 Asbestos-Cement Transmission Pipe, 18 inch through 42 inch for Potable Water & Other Liquids
- C403 Selection of Asbestos-Cement Transmission & Feeder Main Pipe, sizes 18 inch through 42 inch
- C600 Installation of Ductile Iron Water Mains and Appurtenances
- C900 Poly (Vinyl Chloride) (PVC) Pressure Pipe, 4 inches through 12 inches, for water distribution

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

- D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Plastic Pipe (SDR Series)
- D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

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

1.03 SUBMITTALS

A. Manufacturers' Literature:

1. Submit two copies of manufacturers' catalog information for each type of pipe, fittings, couplings, adapters, gaskets and assembly of joints for approval of the ENGINEER. Include manufacturers' recommendations for deflection in pipe joints.

B. Certificates:

1. Submit two copies of 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: Section not utilized.

1.05 PRODUCTS DELIVERY, STORAGE AND HANDLING

A. Delivery and Handing:

1. Do not place materials on private property without written permission from the property OWNER.
2. During loading, transporting and unloading, exercise care to prevent damage to materials.
3. Do not drop pipe or fittings. Avoid shock or damage at all times.
4. Use padded slings, hooks and tongs to prevent damage to the exterior surface or internal lining of the pipe.

B. Storage:

1. Do not stack higher than Maximum Stacking Heights shown in AWWA C600 or as recommended by the pipe manufacturer.
2. Keep interior of pipe and fittings free from dirt, water or other foreign matter.
3. Store gaskets for mechanical and push-on joints in cool location out of direct sunlight and not in contact with petroleum products.

PART 2 PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

A. Ductile Iron (DI):

1. Ductile Iron Pipe: AWWA C150 and C151:
 - a. Cement mortar lined in accordance with AWWA C104.
 - b. Class, as indicated on the Contract Drawings, minimum Class 52.
2. Ductile Iron and Cast Iron Fittings: AWWA C110:
 - a. Cement mortar lined in accordance with AWWA C104.
 - b. Pressure rating as indicated on the Contract Drawings, minimum 350 psi for mechanical joint; 250 psi for flanged joint.
3. Joints:
 - a. Mechanical or push-on joints conforming with AWWA C111.
 - b. Flanged joints conforming with AWWA C110 and AWWA C115.

B. Reinforced Concrete (RC):

1. Reinforced concrete pressure pipe, steel cylinder type: AWWA C300.
2. Prestressed concrete pressure pipe, steel cylinder type: AWWA C301.
3. Reinforced concrete pressure pipe, non-cylinder type: AWWA C302.
4. Reinforced concrete pressure pipe, steel cylinder type, pretensioned: AWWA C303.
5. Fittings: Type B

6. Joints: Rubber gasket and steel bell and spigot joint rings.
7. Minimum steel cylinder thickness: 16 gauge.

C. Poly (Vinyl Chloride) (PVC) Plastic Pipe:

1. Pipe:
 - a. Outside diameter dimension pipe: AWWA C900, pressure class and dimension ratio as indicated on the Contract Drawings.
2. Manufactured from Poly (Vinyl Chloride) 1120 or 1220.
3. National Sanitation Foundation Seal of Approval for use with potable water required.
4. Joints: Push-on: ASTM D3139.
5. Fittings: Cast or ductile iron fittings for PVC pressure pipe: AWWA C110.

D. Steel:

1. Pipe: AWWA C200.
 - a. Cement mortar lined in accordance with AWWA C205.
 - b. Coal tar coated in accordance with AWWA C203.
 - c. Internal pressure and minimum wall thickness as indicated on the Contract Drawings.
2. Fittings: AWWA C200.
3. Joints:
 - a. Welded: AWWA C206.
 - b. Flanged: AWWA C207.
 - c. Mechanically coupled: Dresser Style 38, Rockwell 411 or equal.

2.02 REPAIR PRODUCTS

A. Couplings:

1. Threaded Compression ($\frac{1}{2}$ " - 2" nominal diameter pipe)
 - a. Short or long body style.
 - b. Conductive gasket.
 - c. 150 psi pressure rating.
 - d. Ductile iron material.
2. Bolted Compression (4" - 12" nominal diameter pipe)
 - a. Ductile iron material.
 - b. 150 psi pressure rating.
3. Flared Couplings

B. Clamps

1. Gridded gasket
2. Full gasket coverage
3. Stainless steel hardware
4. Stainless steel material

PART 3 EXECUTION

3.01 EXCAVATION

- A. Excavate trenches as specified in Section 02221, Paragraph 3.04. Provide at least 4 ft. of cover from the top of the pipe to the finished grade elevation.

3.02 PIPE BEDDING

- A. Provide Type IV bedding as shown on Standard Detail 02221-3.
- B. Shape recesses for the joints or bell of the pipe by hand. Assure that the pipe is supported for the entire length of the barrel.

3.03 PIPE LAYING

- A. Clean and inspect each length of pipe or fitting before lowering in the trench. Do not lower pipe into the trench except that which is to be immediately installed.
- B. Lay pipe to a uniform line with the barrel of the pipe resting solidly 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.
- C. Lay each section of pipe in such a manner as to form a close concentric joint with adjoining section and to avoid offsets.
- D. Lubricate pipe and gaskets as recommended by the manufacturer. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement.
- E. Check each pipe installed as to line and grade in place. Correct deviations immediately. Deflection of pipe joints in excess of maximum recommended by manufacturer will be cause for rejection.
- F. Install fittings and valves as pipe laying progresses. Do not support weight of fittings and valves from pipe.
- G. When the work is not in progress, and at the end of each work day, securely plug the ends of pipe and fittings to prevent trench water, earth, or other substances from entering the pipes or fittings.
- H. Backfill concurrently with pipe laying to hold installed pipe in place. When pipe laying is terminated for any reason, provide at least 2 feet of backfill over all pipe except the last piece laid.

I. Joint Assembly

1. Push-on Joints:

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

2. Mechanical Joints:

- a. Wash the socket and plain end. Apply a thin film of lubricant. Slip the gland and gasket over the plain end of the pipe. Apply lubricant to gasket.
- b. Insert the plain end of the pipe into the socket and seat the gasket evenly in the socket.
- c. Slide the gland into position, insert bolts, and finger-tighten nuts.
- d. Bring bolts to uniform tightness. Tighten bolts 180 degrees apart, alternately.
Torque Required:

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

3.04 CUTTING

- A. Saw cut pipe full depth without damaging pipe or lining.
- B. Grind cut ends and rough edges smooth. Bevel end for push-on joints.
- C. Do not field cut reinforced concrete pipe. Provide special lengths to make up distance shown.

3.05 DEFLECTION

- A. When it is necessary to deflect water mains from a straight alignment horizontally or vertically, do not exceed limits as follows, unless approved by ENGINEER:
 - 1. Ductile Iron Pipe: <12" dia. - 5° maximum deflection per joint.
>12" dia. - 3° maximum deflection per joint.
 - 2. PVC Pipe: 4 degree maximum deflection per joint.

3. Reinforced Concrete Pipe: 1 degree maximum deflection per joint.

3.06 THRUST RESTRAINT

- A. Provide all valves, tees, bends, (excluding 11 ¼° bend) caps, and plugs with concrete thrust blocks in accordance with Standard Detail 03050-3. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks to contain the resultant force and so pipe and fitting joints will be accessible for repair.
- B. Furnish and install tie rods, clamps, set screw retainer glands, or restrained joints if indicated on the Contract Drawings or required by the ENGINEER. Protect metal restrained joint components against corrosion by applying a bituminous coating.

3.07 SPECIAL CONDITIONS

- A. Connections to existing facilities:
 - 1. Construct connections as shown on the Contract Drawings.
 - 2. For connecting pipe of different materials, use transition fittings as recommended by the manufacturer and approved by the ENGINEER.
- B. Stream Crossings: Standard Details 02221-4 or 02221-5.
- C. Wetland Crossings: Standard Detail 02221-6
- D. Highway and Railroad Crossings:
 - 1. Install water mains crossing under highways and railroads as shown on the Contract Drawings. Comply with Railroad Company, Pennsylvania Department of Transportation, and municipal permits included in the Contract Documents.
 - 2. When casing pipe is indicated, install as specified in Section 02150, Paragraphs 3.02.
- E. Bridge or Aerial Crossings:
 - 1. For aboveground water mains attached to a bridge or other structural supports, furnish and install all supports, hangers and fastenings, as shown on the Contract Drawings.
 - 2. Provide insulation and jacket as indicated on the Contract Drawings.
- F. Wall Sleeves:
 - 1. Provide pipes passing through concrete or masonry construction with sleeves and mechanical seal of the type and size required or as indicated on the Contract Drawings.

3.08 COMPLETION

- A. Test and disinfect water mains as specified in Section 02653, Paragraph 3.03.

3.09 SURFACE RESTORATION

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

END OF SECTION

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SECTION 02618

STORM DRAIN PIPE

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Storm sewer pipelines

B. Related work specified elsewhere:

- | | |
|--|---------------|
| 1. Boring and jacking: | Section 02150 |
| 2. Trenching, backfilling and compacting: | Section 02221 |
| 3. Soil erosion and sedimentation control: | Section 02270 |
| 4. Finish grading, seeding and sodding: | Section 02485 |
| 5. Trench paving and restoration: | Section 02575 |
| 6. Manholes: | Section 02601 |
| 7. Storm inlets, catch basins, endwalls: | Section 02602 |
| 8. Cement concrete for utility construction: | Section 03050 |

C. Definitions:

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

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

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

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

C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C507 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR series)

- D2321 Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
- F405 Specification for Corrugated Polyethylene (PE) Tubing and Fittings
- F667 Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings

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

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

1.03 SUBMITTALS

A. Certificates:

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

B. Manufacturer's Literature:

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

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CORRUGATED GALVANIZED STEEL PIPE AND PIPE ARCH

A. Pipe and Coupling Bands:

1. Section 601.2, Publication 408 Specifications.
2. AASHTO M36, Type I or AASHTO M218, Type I or AASHTO M274, Type II.
3. Metal sheet thickness and corrugation size as indicated on the Contract Drawings.

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 POLYETHYLENE PIPE

A. Tubing and Fittings - 3" to 6"

1. AASHTO M252
2. ASTM F405

B. Pipe and Fittings - 12" to 48"

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

C. Pavement Base Drains - 4", 6"

1. AASHTO M304

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

A. Pipe and Fittings

1. AASHTO M278
2. ASTM D3034

PART 3 EXECUTION

3.01 PREPARATION

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

3.02 LAYING PIPE IN TRENCHES

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

3.03 BACKFILLING TRENCHES

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

3.04 PAVEMENT BASE DRAINS AND PIPE UNDERDRAINS

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

3.05 SURFACE RESTORATION

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

END OF SECTION

SECTION 02640

VALVES AND FIRE HYDRANTS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Water valves
2. Fire hydrants

B. Related work specified elsewhere:

1. Trenching, backfilling and compacting: Section 02221
2. Water mains: Section 02615
3. Water service connections: Section 02642

C. Definitions: NONE

D. Applicable Standard Details:

- 02640-1 Air Release Valve
- 02640-2 Fire Hydrant Setting Detail
- 02640-3 Blow-off Detail

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Water Works Association (AWWA):

- C500 Gate Valves, 3" through 48", for Water and Other Liquids
- C502 Dry-Barrel Fire Hydrants
- C504 Rubber-Seated Butterfly Valves
- C509 Resilient Seated Gate Valves for Water and Sewerage Systems
- C512 Air-Released, Air/Vacuum, and Combination Air Valves for Waterworks Service

1.03 SUBMITTALS

A. Certificates:

1. Submit two copies of manufacturer's certification attesting that valves, hydrants, and accessories meet or exceed AWWA Standards and specification requirements.

B. Product Data:

1. Submit two copies of manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves, hydrants, and accessories for shipment according to AWWA Standards and:
 - 1. Seal valve, hydrant, and meter ends to prevent entry of foreign matter into product body.
 - 2. Box, crate, completely enclose, and protect products from accumulations of foreign matter.
- B. Store products in areas protected from weather, moisture, or possible damage.
- C. Do not store products directly on ground.
- D. Handle products to prevent damage to interior or exterior surfaces.

PART 2 PRODUCTS

2.01 GATE VALVES

- A. AWWA C509
- B. Iron body, bronze trim.
- C. Resilient wedge.
- D. Non-rising stem; O-ring stem seals.
- E. 2" square operating nut; open counterclockwise unless otherwise indicated.
- F. Flanged, mechanical joint or bell end connections.
- G. Provide valves 16" and larger with bypass valves and gear operators.

2.02 BUTTERFLY VALVES

- A. AWWA C504, Class 150B.
- B. Iron body, stainless steel shaft, nylon bearings.
 - 1. Sizes 2" thru 20": 200 psi rated.
 - 2. Sizes 24" thru 48": 150 psi rated.
- C. Flanged, wafer, or mechanical joint end.
- D. Worm gear manual actuators sealed and permanently lubricated.
 - 3. Vertical, right angle, or buried type; hand wheel, crank handle, or square nut, as indicated.
 - 4. Stem extension and valve box for buried valves.
 - 5. Open counterclockwise, unless otherwise indicated.

2.03 VALVE BOXES

A. 12" valves and smaller:

1. Domestic cast iron, two-piece, screw type.

B. Valves larger than 12" and blowoffs:

1. Domestic cast iron, three-piece, screw type.
2. Round base.

C. Cast iron lid.

2.04 AIR RELEASE VALVES

A. AWWA C512.

B. Cast iron body and cover; stainless steel float, orifice seat, linkage mechanism, mountings and trim. Buna-N orifice valve. 150 psi minimum rated working pressure.

C. Provide with orifice size indicated on the Contract Drawings.

2.05 FIRE HYDRANTS

A. Dry-barrel break-away type conforming to AWWA C502.

1. Bury depth: 4'-6", or as indicated on the Contract Drawings.
2. Inlet Connection: 6".
3. Valve Opening: 5-1/4".
4. Mechanical Joint or Ball End.
5. Corrosion resistant bolts and nuts.
6. One pumper, two hose nozzles.

- a. Attach nozzle caps by separate chains.

7. Threads, as specified in Section VIII Technical Provisions (Detailed).

2.06 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:

1. Mechanical joint, or as indicated on the Contract Drawings.
2. 200 psi working pressure, 2" - 12" size.
3. 150 psi working pressure, 14" - 24" size.
4. Outlet flange: ANSI B16.1, Class 125. See Table 1.

B. Tapping Valves:

1. AWWA C500.
2. Inlet flange, Class 125.

TABLE 1 – CLASS 125 PLATE FLANGES (ASME B16.1 – 1989)				
Pipe Size	Outside Diameter	Number of Bolt Holes	Bolt Hole Diameter	Bolt Circle
2"	6"	4	3/4"	4-3/4"
2-1/2"	7"	4	3/4"	5-1/2"
3"	7-1/2"	4	3/4"	6"
3-1/2"	8-1/2"	8	3/4"	7"
4"	9"	8	3/4"	7-1/2"
5"	10"	8	7/8"	8-1/2"
6"	11"	8	7/8"	9-1/2"
8"	13-1/2"	8	7/8"	11-3/4"
10"	16"	12	1"	14-1/4"
12"	19"	12	1"	17"
14"	21"	12	1-1/8"	18-3/4"
16"	23-1/2"	16	1-1/8"	21-1/4"

2.07 TIE RODS

- A. Tie rod restraint system.
- B. Star National Products, 1323 Holly Avenue, P.O. Box 258, Columbus, Ohio 43316.

PART 3 EXECUTION

3.01 GENERAL

- A. Determine the exact location and size of valves and hydrants from the Contract Drawings.
- B. Perform trench excavation, backfilling and compaction in accordance with Section 02221.
- C. Install pipe and tubing in accordance with Sections 02615 and 02642 and the applicable Standard Details.

3.02 GATE AND BUTTERFLY VALVES

- A. Install valves in conjunction with pipe laying. Set valves and valve boxes plumb.
- B. Place concrete block under valve.
- C. Provide buried valves with valve boxes installed flush with finished grade.
- D. Furnish one tee wrench to the OWNER.

3.03 AIR RELEASE VALVES

- A. Orient, locate and install air release valves including valve vault as shown on Standard Detail 02640-1.
- B. Set air release valves and vault plumb.
- C. Verify there are no leaks and that the valve functions correctly.

3.04 FIRE HYDRANTS

- A. Install fire hydrants as shown on Standard Detail 02640-2. Provide support blocking and drainage gravel as shown.
 - 1. Set hydrants plumb with pumper nozzle facing the curb or street.
 - 2. Set hydrants with nozzles at least 12 inches above the ground and the safety flange not more than 6 inches nor less than 2 inches above grade.
 - 3. Do not block drain hole.
 - 4. Paint hydrants in accordance with local color scheme.
- B. After hydrostatic testing, flush hydrants and check for proper drainage.

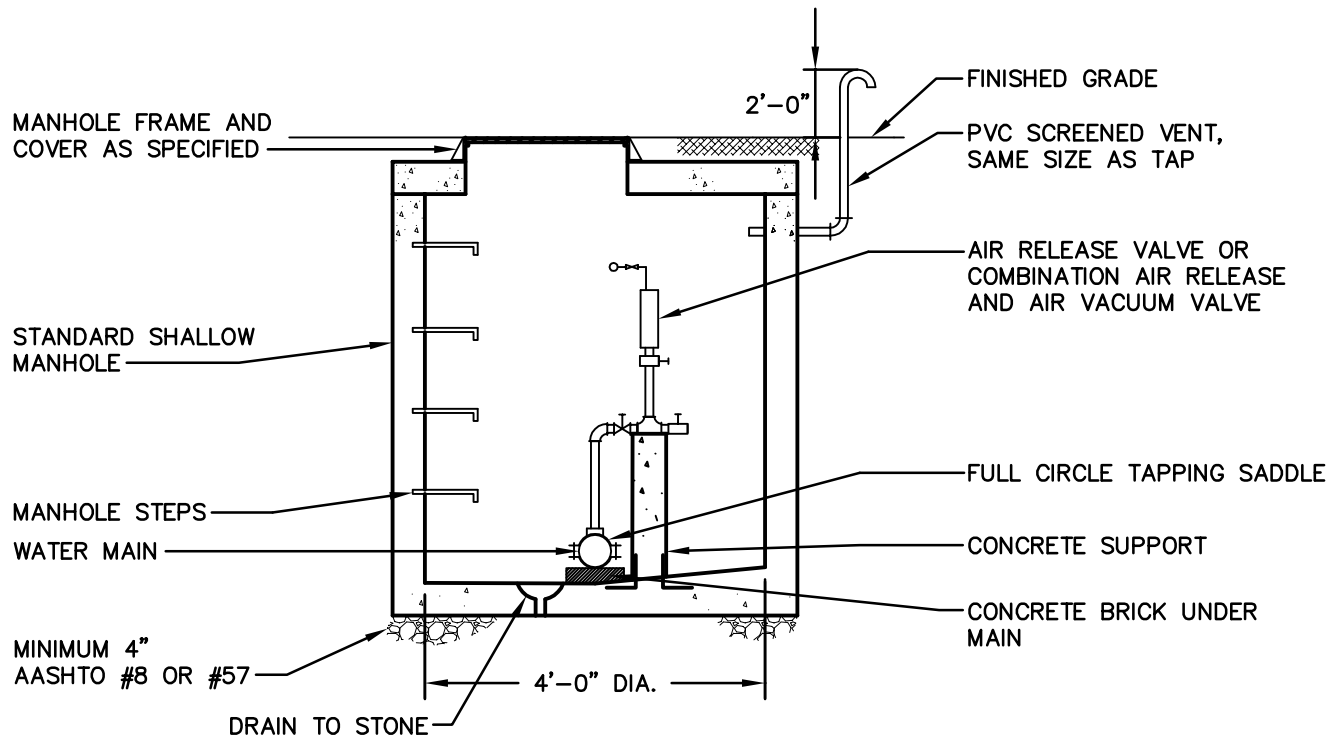
3.05 BLOWOFFS

- A. Install a blowoff on the dead ends of all water mains or where shown on the Contract Drawings.
- B. Construct blowoffs as shown on Standard Detail 2640-3.

3.06 SURFACE RESTORATION

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

END OF SECTION



<u>MAIN SIZE</u>	<u>TAP SIZE</u>
4"-12"	2"
14"-20"	3"
24"-36"	4"

NOTE: NOT TO SCALE

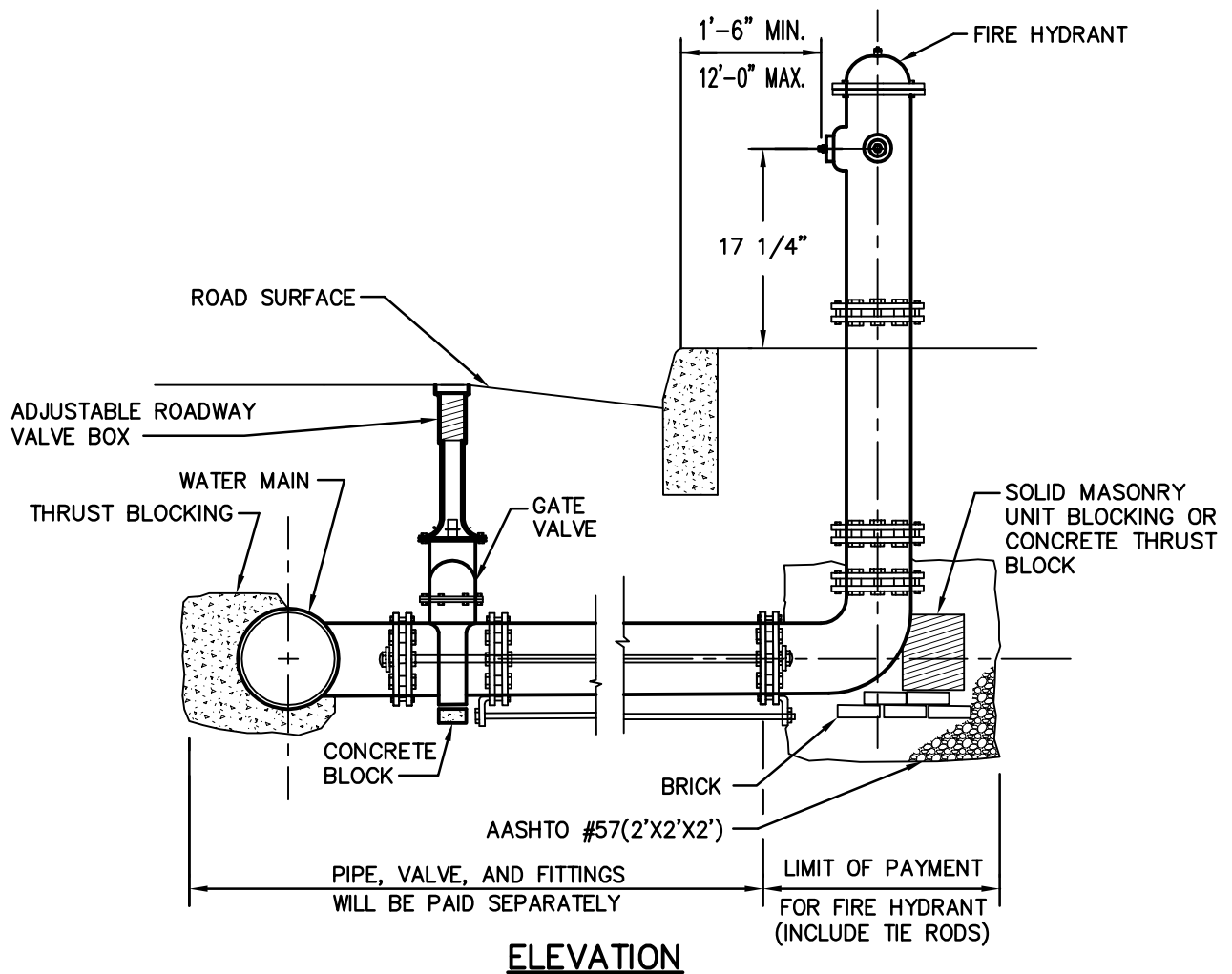
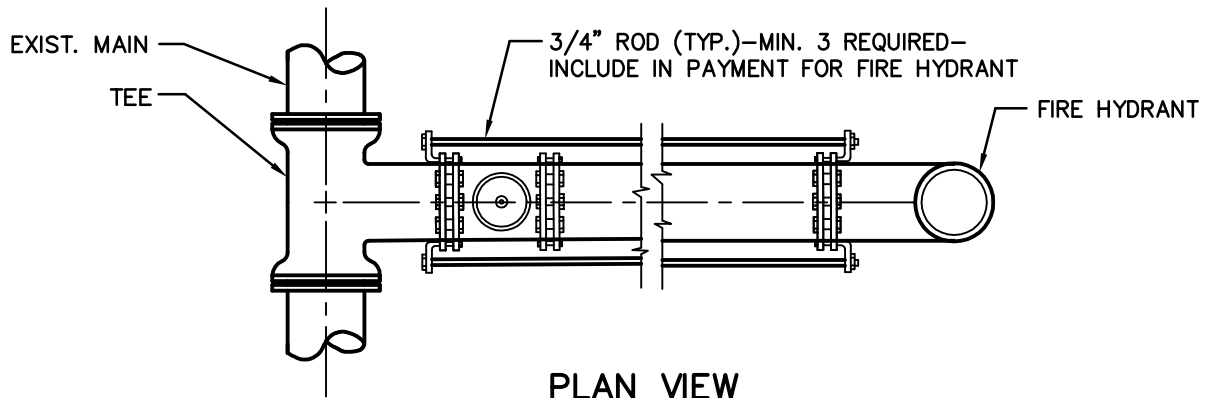


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 50 WEST MIDDLE STREET, GETTYSBURG, PA • PHONE (717) 337-3021 • FAX (717) 337-0782
 315 WEST JAMES STREET, SUITE 102, LANCASTER, PA • PHONE (717) 481-2991 • FAX (717) 481-8690
 WWW.CSDAVIDSON.COM

AIR RELEASE VALVE

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02640-1



NOTE: NOT TO SCALE



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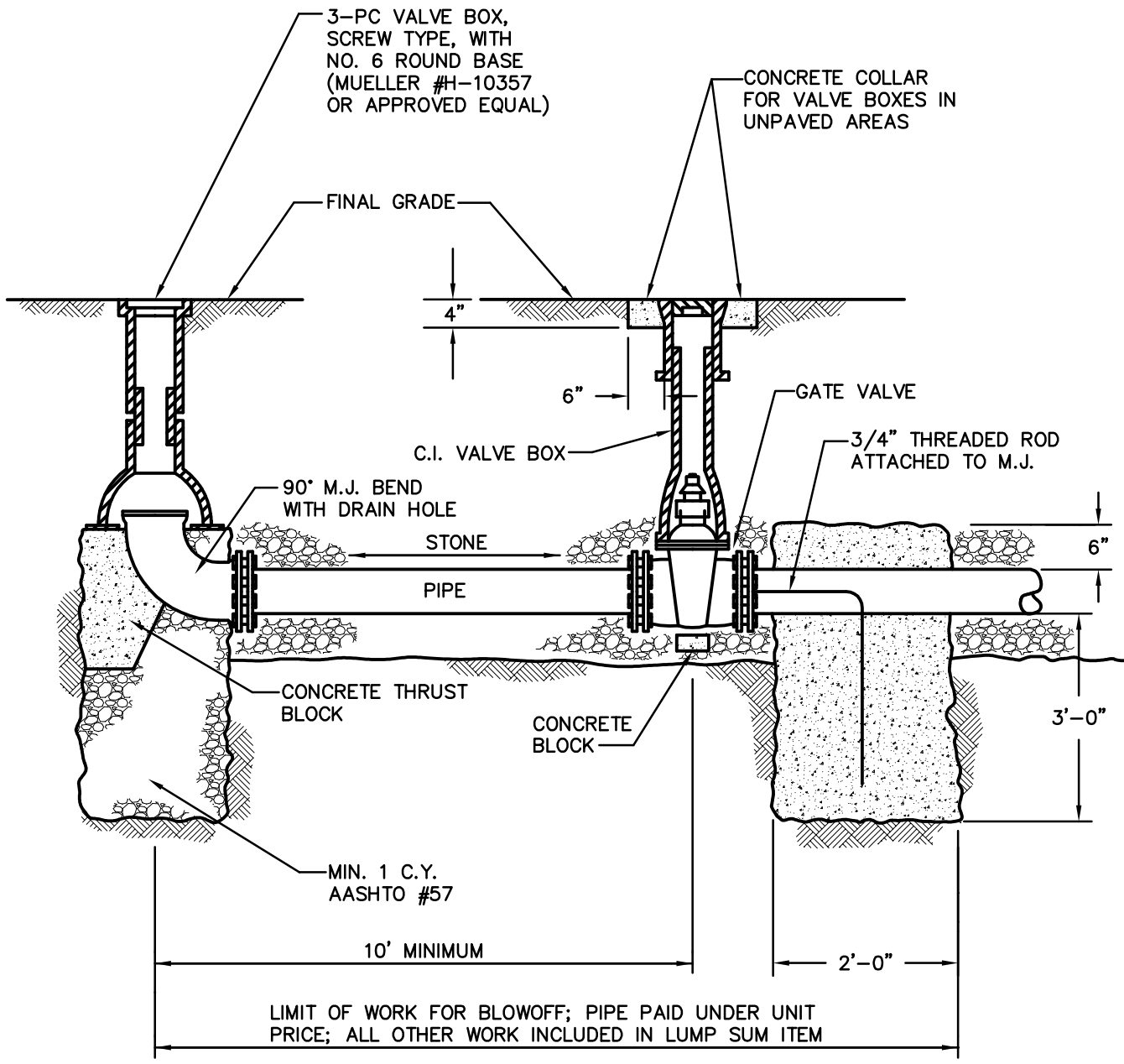
FIRE HYDRANT
SETTING DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

NO. 02640-2



NOTE: NOT TO SCALE



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BLOWOFF DETAIL

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02640-3

SECTION 02642

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Tapping water mains by installation of corporation stops or other suitable fittings or couplings, up to and including 2" diameter.
2. Connection of service pipe and fittings up to curb stops and meter boxes.
3. Installation of meter setting equipment.

B. Related work specified elsewhere:

1. Trenching, backfilling and compacting: Section 02221
2. Paving and restoration: Section 02575
3. Water mains: Section 02615

C. Definitions: NONE

D. Applicable Standard Details:

02642-1 Water Service Installation

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

B62 Specification for Composition Bronze or Ounce Metal Castings
B88 Specification for Seamless Copper Water Tube
C62 Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)

2. American Water Works Association (AWWA):

C700 Cold Water Meters - Displacement Type, Bronze Main Case
C800 Underground Service Line Valves and Fittings

1.03 SUBMITTALS

A. Certificates:

1. Submit two copies each of certificate for pipe and pipe fittings from each manufacturer attesting that each of these meets or exceeds specification requirements.

B. Manufacturers' Literature:

2. Submit two copies each of manufacturers' catalog for each size and type of corporation stop, curb stop, curb box, meter setting and pipe, fitting or coupling.

1.04 JOB CONDITIONS: Section not utilized.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Product Delivery:

1. During loading, transporting and unloading of all materials and products, exercise care to prevent any damage.

B. Storage:

1. Store all products and materials off the ground and under protective coverings and custody, and in a manner to keep products clean and in good condition until used.

PART 2 PRODUCTS

2.01 PIPE OR TUBING AND FITTINGS

A. Copper Water Tubing:

1. ASTM B88, Type K, Seamless
2. Matching bronze fittings of flared or compression type

2.02 CORPORATION STOP ASSEMBLY

A. Corporation Stops:

1. Brass or Red Brass alloy body conforming to ASTM B62.
2. Inlet end threaded for tapping according to AWWA C800.
3. Outlet end suitable for service pipe specified.

B. Service Clamps:

1. Galvanized iron or bronze body.
2. Neoprene, O-ring gasket.
3. Single or double straps with matching hardware.

2.03 CURB STOP ASSEMBLY

A. Curb Stops:

1. Brass or Red Brass alloy body conforming to ASTM B62.
2. Plug type valve.
3. Positive pressure sealing.

B. Curb Boxes and Covers:

1. Cast iron body, extension type or Buffalo type.
2. Minneapolis or arch pattern base.
3. Lid with inscription 'Water', with pentagon plug, or as approved by ENGINEER

2.04 METER SETTING EQUIPMENT

A. Meter Setting:

1. Meter yokes, copper or iron.
2. Inlet and outlet horizontal/vertical setting with matching couplings, fittings and stops.

2.05 METERS

A. Displacement Type: AWWA C700

2.06 BRICK

A. ASTM C62, Grade SW

PART 3 EXECUTION

3.01 PREPARATION

- A. Establish location of curb stops and boxes or meter pits for each service connection.
- B. Perform trench excavation and associated work as specified in Section 02221.

3.02 TAPPING WATER MAINS

- A. Each connection for different kinds of water mains shall be tapped using suitable materials, equipment and methods in accordance with manufacturer's instructions.
- B. Provide service clamps for asbestos cement and PVC water mains.
- C. Fill ductile iron main 24 hours in advance of tapping (no dry tap). Pretesting of main is recommended before tapping.
- D. Screw corporation stops directly into a tapped and threaded iron main at 10 or 2 o'clock positions on the main's circumference. Locate corporation stops at least 12" apart longitudinally and staggered. Tap into main shall be a minimum of 2' from the center of bell.
- E. In case of plastic pipe water mains, provide full support for the service clamp all around the circumference of the pipe, with minimum 2" width of bearing area. Exercise care against crushing or other damage to water mains at the time of tapping or installing the service clamp or corporation stop.
- F. Use proper seals or other devices to ensure that no leaks are left in the water mains at the points of tapping. Do not backfill and cover the service connection until observed by the ENGINEER.
- G. Top taps shall be removed and replaced with taped brass plug.

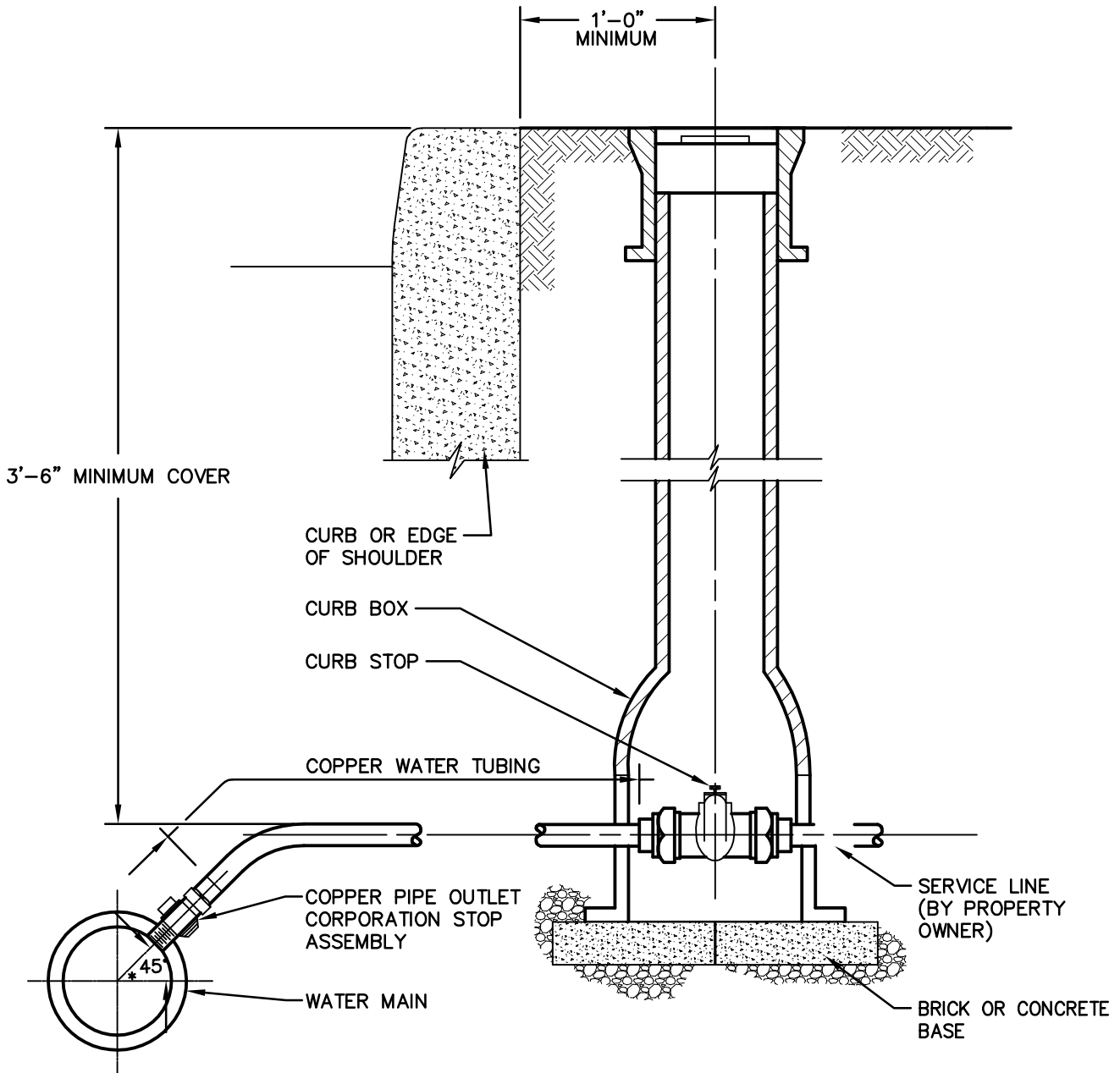
3.03 SERVICE LINE AND FITTINGS

- A. Use bends to connect the service pipe or tubing to the tapping fitting or corporation stops to provide flexibility to counteract the effects of settlement or expansion/contraction in the line.
- B. Lay each section of the service line in a manner to form a tight joint with the adjoining section. Avoid offsets, kinks or awkward bends to ensure a smooth flow line. Provide Type V bedding as specified in Section 02221. Limestone based masonry sand is not permitted.
- C. Clean and inspect each pipe and part of the fitting before installing and assemble to provide a flexible joint.
- D. Install service fittings and appurtenances on suitable brick or concrete supports, as shown on the Contract Drawings and Standard Detail 02642-1. Do not use earth, rocks, wood or other organic materials as supports.
- E. Operate each corporation and curb stop before and after installation.
- F. When the work is not in progress, and at the end of each work day, securely plug the ends of pipe and fittings to prevent any dirt or foreign substances from entering the lines.
- G. Test and disinfect mains and service lines as specified in Section 02653.
- H. Backfill in accordance with Section 02221, Paragraph 3.11.

3.04 SURFACE RESTORATION

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

END OF SECTION



NOTE: NOT TO SCALE



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WATER SERVICE INSTALLATION

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	02642-1

SECTION 02651

SANITARY SEWER TESTING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Testing Gravity Sewer Pipelines:
 - a. Lamping
 - b. Low-pressure air test
 - c. Infiltration test
 - d. Deflection test - PVC pipe only
2. Testing Pressure Pipelines:
 - a. Hydrostatic leakage test
3. Testing Manholes:
 - a. Vacuum test

B. Related work specified elsewhere:

- | | |
|--|---------------|
| 1. Manholes: | Section 02601 |
| 2. Sanitary sewer pipe: | Section 02610 |
| 3. Testing and disinfecting water mains: | Section 02653 |

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Test Acceptance:

1. No test will be accepted until the results are within the specified limits.
2. The CONTRACTOR shall, at his own expense, determine and correct the causes of test failure and retest until successful test results are achieved.

1.03 SUBMITTALS

- A. Testing procedures
- B. List of test equipment
- C. Testing sequence schedule

D. Provisions for disposal of flushing and test water

E. Certificate of test gauge calibration

1.04 JOB CONDITIONS:

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

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

PART 2 PRODUCTS

2.01 AIR TEST EQUIPMENT

A. Air compressor

B. Air supply line

C. Shut-off valve

D. Pressure regulator

E. Pressure relief valve

F. Stop watch

G. Plugs

H. Pressure gauge, calibrated to 0.1 lbs./sq. in.

2.02 INFILTRATION TEST EQUIPMENT

A. Weirs

2.03 DEFLECTION TEST EQUIPMENT

A. Go, No-Go mandrels, as approved by ENGINEER

B. Pull/retrieval ropes

C. Certificate of mandrel gauge calibration

2.04 VACUUM TEST EQUIPMENT

A. Vacuum pump

B. Pipe plugs

C. Vacuum hose

D. Test connections

E. Vacuum gauge

F. Vacuum relief valve

2.05 NON-SHRINK GROUT

A. Fastsetting, cement based mortar such as Waterplug, manufactured by Thoro Division of ChemRex, Shakopee, MN, or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

- A. Backfill trenches in accordance with Section 02221, Paragraph 3.11.
- B. Provide pressure pipeline with concrete reaction support blocking.
- C. Clean and flush pipeline with water to remove debris. Collect and dispose of flushing water and debris in accordance with Federal, State and local regulations.
- D. Plug outlets, wye-branches and laterals. Brace plugs to offset thrust.

3.02 TESTING GRAVITY SEWER PIPELINES

- A. Lamping, if required by ENGINEER:
 - 1. After flushing and cleaning, lamp gravity pipeline in conjunction with the ENGINEER.
 - 2. Assist the ENGINEER in the lamping operation by shining a light at one end of each pipeline section between manholes. The ENGINEER will observe the light at the other end. Pipeline that has not been installed with uniform line and grade will be rejected. Remove and re-lay rejected pipeline sections. Re-clean and lamp until pipeline section achieves a uniform line and grade.

B. Low Pressure Air Test:

- 1. Test each newly installed section of gravity sewer line, including service connections.
- 2. Slowly introduce air pressure to approximately 5.0 psig.
- 3. Once pressure has stabilized, start test.
- 4. Test:
 - a. Determine the test duration for a sewer section with a single pipe size from the table below:

Low Pressure Air Test - Test Times

<u>Nominal Pipe Size(in.)</u>	<u>Time Min./100 Ft.</u>	<u>Nominal Pipe Size(in.)</u>	<u>Time Min./100 Ft.</u>
4	.3	21	3.0
6	.7	24	3.6
8	1.2	27	4.2
10	1.5	30	4.8
12	1.8	33	5.4
15	2.1	36	6.0
8	2.4		

- b. Record the drop in pressure during the test period. If the air pressure has dropped more than 1.0 psig during the test period, the line is presumed to have failed. If the 1.0 psig air pressure drop has not occurred during the test period, the test shall be discontinued and the line will be accepted.
- c. If the line fails, determine the source of the air leakage, make corrections and retest the entire section between manholes.
- d. All laterals installed into manholes shall be air tested or included in vacuum test. Regardless of pipe length, the minimum test times for 4" dia., 6" dia., and 8" dia. pipes are 2 ½, 4 and 5 minutes, respectively.
- e. All tests subject to 5 psig. for 5 minutes, minimum.

C. Testing Pipe Over 36" Diameter:

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

D. Infiltration Test:

- 1. Use only when leakage is visible.
- 2. Maximum Allowable Infiltration: 50-gallons per inch of pipe diameter per mile per day for the section under test.

E. Deflection Testing of Plastic Sewer Pipe:

- 1. Perform vertical ring deflection testing on all portions of PVC sewer piping, in the presence of the ENGINEER, after backfilling.
- 2. The maximum allowable deflection for installed plastic sewer pipe shall be limited to 5% of the original vertical internal diameter.
- 3. Perform deflection testing with a properly sized 'Go, No-Go' mandrel approved by ENGINEER.
- 4. Pipe exceeding the allowable deflection shall be located, excavated, replaced, and retested at the sole expense of the CONTRACTOR, including surface restoration.
- 5. During the 12th month of the warranty period, the OWNER reserves the right to perform a second deflection test at the OWNER's expense.

3.03 TESTING PRESSURE PIPELINES

- A. Hydrostatic Leakage Test: Section 02653, Paragraph 3.02A

3.04 TESTING MANHOLES

- A. Test all new manholes for exfiltration utilizing the vacuum test method and equipment developed by NPC Systems, Inc., Milford, NH, or approved equal.
- B. The CONTRACTOR shall provide the necessary labor, equipment or materials to conduct the vacuum test.

- C. The testing shall be done after complete assembly of the manhole, including frame and cover.
- D. The CONTRACTOR shall plug the pipe openings, taking care to securely brace the plugs and the pipe.
- E. With the vacuum tester set in place:
 - 1. Inflate the compression band to effect a seal between the vacuum base and the structure at top of manhole frame.
 - 2. Connect the vacuum pump to the outlet port with the valve open.
 - 3. Draw a vacuum to 10" of Hg. and close the valve.
- F. All tests subject to 10" of Hg for 60 seconds.
- G. A vacuum of 9 in. of Hg. or more shall be maintained for at least the period of time indicated in the following table in order to successfully complete the test:

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

- H. If the manhole fails the initial test, the CONTRACTOR shall locate the leak and make proper repairs. Leaks and lift holes shall be filled with approved non-shrink grout.

END OF SECTION

SECTION 02653

TESTING AND DISINFECTING WATER MAINS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Testing Pressure Pipelines:
 - a. Hydrostatic leakage testing

A. Disinfecting Water Main Pipelines.

B. Related work specified elsewhere:

1. Water mains: Section 02615
2. Valves and fire hydrants: Section 02640
3. Water service connections: Section 02642

C. Definitions: NONE

D. Applicable Standard Details: NONE

1.02 QUALITY ASSURANCE

A. Testing Agency:

1. Bacteriological (total Chlorine and/or chlorination) testing shall be performed by a testing laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER. CONTRACTOR to provide water samples to testing agency as approved by the ENGINEER.

B. Reference Standards:

1. American Water Works Association (AWWA):
 - B300 Standard for Hypochlorites
 - B301 Standard for Liquid Chlorine
 - C651 Disinfecting Water Mains

C. Test Acceptance:

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

1.03 SUBMITTALS

A. Test Procedures:

1. Submit a testing sequence schedule including a list of testing equipment to be used.

B. Certificates:

1. Submit, prior to starting testing, certification attesting that the pressure gauges to be used have been calibrated and are accurate to the degree specified herein.
2. Submit certification attesting that the chlorine form composition is as specified.

C. Test Reports:

1. Submit two copies each of test reports of chlorine residual and bacteriological tests.

1.04 JOB CONDITIONS: Section not utilized.

PART 2 PRODUCTS

2.01 HYDROSTATIC TEST EQUIPMENT

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

2.02 DISINFECTING CHEMICALS

- A. Liquid chlorine, calcium hypochlorite tablets or granules, or sodium hypochlorite (liquid) conforming to AWWA Standards B300 and B301.

2.03 ADHESIVE

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

PART 3 EXECUTION

3.01 PREPARATION

- A. Backfill trenches in accordance with Section 02221, Paragraph 3.11.

- B. Provide the water line under test with reaction thrust blocking. Hydrostatic testing shall not begin until the concrete thrust blocking has set. Allow 3000 psi 28-day strength concrete to cure for a minimum of 7 days prior to testing. If 3000 psi 3-day high early strength concrete is used, hydrostatic testing may not begin until the concrete has cured for a minimum of 2 days.
- C. Provide water, pumps, piping, tanks, connections, plugs, and appurtenances at no additional expense to the OWNER.

3.02 TESTING PRESSURE PIPELINES

A. Hydrostatic Pressure Test (ASTM C900): 200 psi/30 min

1. Test each newly laid pressure pipeline, including any valved section thereof, hydrostatically at 1.5 times the working pressure of the pipeline based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge. Obtain test pressure from the ENGINEER.
2. Slowly fill the section to be tested with water, expelling air from the pipeline at the high points. Install corporation stops at high points if necessary. After all air is expelled, close air vents and corporation stops and raise the pressure to the specified test pressure.
3. Observe joints, fittings and valves under test. Remove and replace cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
4. After visible deficiencies are corrected, continue testing at the same test pressure for an additional two hours to determine the leakage rate. Maintain pressure within plus or minus 5.0 psi of test pressure. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test.
5. Compute the maximum allowable leakage by the following formula:

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

Where: L is the allowable leakage in gallons/hour
 N is the number of joints in the section tested (does not include services)
 D is the nominal diameter of the pipe in inches
 P is the average test pressure in psig

Note: Perform calculation based on 2 hour test

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

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

3.03 DISINFECTION

A. General:

1. After completion of satisfactory hydrostatic leakage testing, disinfect the water pipelines in accordance with the recommended practice established in AWWA Standard C651. Conduct water line disinfection in the following steps:
 - a. Preliminary flushing
 - b. Chlorine application
 - c. Chlorine residual testing
 - d. Final flushing
 - e. Bacteriologic tests

- B. During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 ft. intervals:

Table 02653-1

Ounces of Calcium Hypochlorite Granules to be Placed at Beginning of Main and at Each 500-ft. Interval

Pipe Diameter (in.)	Calcium Hypochlorite Granules (oz.)
4	1.7
6	3.8
8	6.7
12	15.1
14 and larger	$D^2 \times 15.1$ Where D is pipe diameter in feet

C. Preliminary Flushing:

1. Prior to disinfection, except when the tablet method is used, fill the line to eliminate air pockets and flush the line at a rate of flow of 2.5 feet per second to remove particulates:

Table 02653-2

Flow Required to Produce 2.5 fps (Approx.) Velocity in Main

Pipe Diameter (in.)	Required Flow (gpm)	Size of Tap (in.)			Number of 2½-inch Hydrant Outlets
		1	1½	2	
4	100	1	-	-	1
6	200	-	1	-	1
8	400	-	2	1	1
10	600	-	3	2	1
12	900	-	-	2	2
16	1600	-	-	4	2

2. Dispose of flushing water. Conform with Federal, State, and local laws when discharging the chlorinated solution.

D. Chlorine Form:

1. The chlorine form to be applied to the system shall be either chlorine gas solution, calcium hypochlorite or sodium hypochlorite.

E. Chlorine Application:

1. Continuous Feed Method:

- a. The continuous feed method consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to remove air pockets, flushing to remove particulates, and filling the main with potable water chlorinated so that after a 24-hour holding period in the main, there will be a free chlorine residual of not less than 10 mg/L.
- b. Feed water and chlorine to the line at a constant rate such that the water will have not less than 25 mg/L free chlorine. Chlorine application shall not cease until the entire line is filled with heavily chlorinated water.

Table 02653-3

Chlorine Required to produce 25-mg/L Concentration in 100 feet of Pipe-by Diameter

Pipe Diameter (in.)	100-percent Chlorine (lb.)	1-percent Chlorine Solution (gal.)
4	.013	.16
6	.030	.36
8	.054	.65
10	.085	1.02
12	.120	1.44
16	.217	2.60

- c. During chlorine application, take precautionary measures to prevent the concentrated treatment solution from flowing back into the existing distribution system and/or supply source.

2. Tablet Method:

- a. The tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and then filling the main with potable water when installation is completed.

NOTE: Since the preliminary flushing step must be eliminated, this method may be used only when scrupulous cleanliness has been exercised and only with approval of the ENGINEER. It shall not be used if trench water or foreign material has entered the main, or if the water temperature is below 41° F.

- b. During construction, place sufficient number of 5 gram calcium hypochlorite tablets in each section of pipe, in hydrants, hydrant branches, and other appurtenances to obtain a minimum of 25 mg/L available chlorine. Attach tablets to the invert of pipe sections with adhesive. Apply adhesive only to the broad side of the tablet next to the pipe surface.

Table 02653-4

Number of 5-gram Calcium Hypochlorite Tablets Required for Dose of 25 mg/L

Pipe Diameter (in.)	<u>Length of Pipe Selection (ft.)</u>				
	13 or less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

- c. When pipeline installation is completed, fill the main with water at a maximum velocity of one foot per second. This water shall remain in the pipe for at least 24-hours. Manipulate valves so that the chlorine solution does not flow back into the line supplying the water.
3. During the 24-hour treatment, operate all valves, curb stops, and hydrants in the section treated.
 4. At the completion of the 24-hour treatment, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine.
 5. Repeat the disinfection process until the minimum free chlorine is present at the end of the treatment sequence. The tablet method cannot be used in these subsequent disinfections. No additional compensation will be provided the CONTRACTOR for repeat treatment or testing.
- F. Final Flushing:
1. After completion of the required disinfection, flush the line at a minimum rate of 2.5 fps until the free chlorine residual reduces to the level of the existing water supply or 1 mg/L, whichever is lower. Dispose of flushing water in conformance with Federal, State, and local laws. A neutralizing chemical shall be applied to the water to be wasted to neutralize residual chlorine. Wasted water may be discharged to the public sewer system, if approved by the ENGINEER.
 2. No flushing or bacteriological tests permitted until receipt of passed chlorine residue test results.
- G. Bacteriological Testing:
1. After final flushing is completed and before the water main is placed in service, test the line for bacteriologic quality. Perform two tests, 24-hours between tests.

2. Collect a minimum of one sample at the end of each line for each test, and one sample of the incoming water from the existing water system for comparison.
3. Collect samples in sterile bottles treated with sodium thiosulphate.
4. Sampling tap shall consist of corporation stop installed in the main with copper tube gooseneck assembly. Fire hydrants may be used if approved by ENGINEER.
5. Provide bacteriological test reports to the OWNER and the ENGINEER. The presence of bacteriological contamination will be cause to require the CONTRACTOR to rechlorinate and retest the system, at no additional cost to the OWNER.

END OF SECTION

SECTION 02760

PAVEMENT MARKINGS

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Application of traffic lines, markers or legends on roadway surfaces.
2. Surface preparation.
3. Removal of any conflicting pavement markings.
4. Inlaid thermoplastic pavement markings.

B. Related Work Specified Elsewhere:

1. Bituminous paving and surfacing: Section 02500
2. Trench paving and restoration: Section 02575

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT), latest revision:
Publication 408, Specifications.
Publication 68 Regulations – Traffic Signs, Signals and Markings
Publication 213, Temporary Traffic Control Guidelines
2. American Society for Testing and Materials (ASTM), latest revision:
D868 Standard Method of Evaluating Degree of Bleeding of Traffic Paint
D1309 Standard Test Method for Settling Properties of Traffic Paint During Storage
3. The Institute of Transportation Engineer (ITE):
“A Model Performance Specification for the Purchase of Pavement Marking Paints and Powders”, approved September 25, 1977.
4. American Association of State Highway and Transportation Officials (AASHTO):
M247 Glass Beads Used in Traffic Paints
M249 White and Yellow Reflective Thermoplastic Striping Materials (Solid Form)
5. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), latest edition.

B. Qualifications:

1. Installer shall specialize in application of traffic lines and pavement markings and have five (5) years documented experience in Pennsylvania.
2. CONTRACTOR shall meet PennDOT standards for installing pavement markings.

1.03 SUBMITTALS

- A. Letter of certification from the paint manufacturer stating that traffic line paint supplied meets either PennDOT' spec for Traffic Line Paint (required type) or the referenced ITE spec. This letter shall accompany the delivery of the material and be given to the ENGINEER prior to the installation of pavement markings. CONTRACTOR shall supply certification (CS-4171).
- B. Application method, material and manufacturer's required mixing instruction and surface preparation details.
- C. Schedule of operations.
- D. Inlaid thermoplastic pavement markings:
 1. Product data sheet from manufacturer.
 2. A four (4) square foot pre-cut sample of each lot or batch for each color for testing physical properties, if required.
 3. Certification from manufacturer that the CONTRACTOR has been properly trained in the handling and installation of the product.

1.04 JOB CONDITIONS

- A. Control of Traffic:
 1. Take measures to control traffic during line painting operations. Line painting machine shall not appreciably impede traffic flow in adjacent lanes while painting centerline and one lane shall be left completely open to traffic when painting edge lines.
 2. Employee traffic control measures in accordance with Publication 213, Temporary Traffic Control Guidelines.
- B. Temperature and Weather Restrictions:
 1. Painted traffic lines and markings shall not be placed when the ambient temperature is less than 40 degrees Fahrenheit.
 2. Cold plastic markers or legends shall be applied only when the surface temperature is 60 degrees Fahrenheit or higher, unless otherwise directed by the ENGINEER.
- C. Protection of Markings:
 1. Protect markings during and after application using barrier cones or other devices to keep traffic off newly applied markings until track free.

D. Environmental Requirements:

1. Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings. Schedule coating work to avoid dust and airborne contaminants.

E. Material Storage:

1. If paint is stored for more than two (2) months, invert container several days prior to use.
2. Store glass bead in a cool, dry place.
3. All products shall be protected from weather and freezing.

1.05 WARRANTY

- A. The CONTRACTOR shall guarantee to replace, at his expense, that portion of the pavement marking installed under this Contract which, in the opinion of the ENGINEER, has not remained effective in performing useful daylight and nighttime service for a period of 6 months from the date of installation. The required service is defined as 90% of markings being effective and in place.

PART 2 PRODUCTS

2.01 PAINT

- A. Paint shall be PennDOT Paint Type I, unless otherwise noted, and shall consist of either an alkyd resin type or a combination of alkyd resin type modified with chlorinated rubber ready-mixed white and yellow traffic paints, for use on bituminous and Portland cement concrete pavements. These paints shall be reflectorized for night visibility, if specified, by adding reflective spheres before the paint dries or sets, using the drop-on or pressurized methods.
- B. Traffic paint shall consist of ready-mixed pigmented binder in a one package system. When applied at the wet-film thickness of 15 mils, the paint shall be suitable for application to traffic bearing surfaces such as Portland cement concrete, bituminous pavements, and plain or vitrified brick surfaces of streets, highways, bridges, tunnels and parking lots.
- C. Pigments:
 1. White - Any combination of pigments provided the finished paint meets all the requirements specified herein. Sufficient suspending and dispersing agents shall be used to prevent excessive settling.
 2. Yellow - Any organic yellow pigment provided it does not contain any of the metals listed in EPA Code of Regulations 40. Sufficient suspending and dispersing agents shall be used to prevent excessive settling. Color of dry paint film shall match Color No. 33538 of Federal Standard 595a.
- D. Binder: The supplier may use any combination of ingredients, except tall oil resins, provided the finished paint meets all the requirements herein. Sufficient amounts of anti-skinning agents shall be used to prevent skinning. Sufficient resin solids, compatible thinners and driers, if necessary, shall be used.

2.02 GLASS SPHERES

- A. Glass spheres shall meet the requirements of Publication 408, Section 1103.14 (a) 2. and all current supplements.
- B. Glass beads shall be in units of 50 lbs. and packed in moisture-proof bags. The beads shall be stored in a cool dry place.

2.03 COLD PLASTIC PAVEMENT MARKINGS

- A. Pigmented plastic which contains glass beads and capable of being attached to bituminous and/or cement concrete pavement by means of a factory applied, pressure-sensitive adhesive.
- B. Pigments shall meet requirements in Section 1103.14 (a) 1. in Publication 408.
- C. Glass beads - AASHTO M247.

2.04 HEAT APPLIED THERMOPLASTIC MARKINGS

- A. A durable, retro-reflective pavement marking material suitable for use as roadway, intersection, commercial or private delineation markings. Must be composed of hydrocarbon resin, aggregate, pigments, binders and glass beads which have been factory produced as a finished product, and is designed to meet the requirements of the current edition of the MUTCD. The thermoplastic material conforms to AASHTO M249, with the exception of the relevant differences due to supplying the material in a preformed state.
- B. The markings must be a resilient white or yellow hydrocarbon thermoplastic product with uniformly distributed glass beads throughout the entire cross section area. Lines, legends and symbols are capable of being affixed to bituminous and/or Portland concrete pavements by the use of the normal heat of a propane type of torch. Other colors shall be available as required.
- C. The markings must be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the torch.
- D. The markings must be able to be applied in temperatures down to 32 degrees Fahrenheit without any special storage, preheating or treatment of the material before application.
- E. Pigments:
 - 1. White: Sufficient titanium dioxide pigment is used to ensure a color similar to Federal Highway White, Color No. 17886, as per Federal Standard 595a.
 - 2. Yellow: Sufficient yellow pigment is used to ensure a color similar to Federal Highway Yellow, Color No. 15358, as per Federal Standard 595a. The yellow pigment must be of organic origin only.
- F. Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, oil, gasoline, salt or adverse weather conditions.

2.05 METHYL METHACRYLATE MARKINGS (MMA)

- A. A durable, cold applied, 2 component material composed of resins in reactive monomers, pigment, plasticizer, fillers and/or glass beads and is to be reacted just prior to application with a benzoyl-peroxide catalyst. It shall be suitable for use as roadway intersection, commercial or private delineation markings on asphaltic or Portland cement surfaces.
- B. Color shall be as required by project (white and/or yellow).
- C. MMA shall be lead free and cure to a minimum 99% solids when reacted as per the manufacturer's instructions. All mixed material shall cure to a no track condition within 15 minutes of application at min. 40 mils wet at 77°F.
- D. Applied markings shall not deteriorate due to ultraviolet light, water, oil, pavement oil, salt and adverse weather conditions.
- E. Material shall be capable of conforming to pavement contours, breaks and faults through action of traffic at normal pavement temperatures.

2.06 RAISED PAVEMENT MARKERS

- A. Plowable or non-plowable as per Section 1103.05(c) in Publication 408 and the Contract Drawings.
 - 1. Plowable: Shaped to fit in a depression in the pavement.
 - 2. Non-plowable: Attached to roadway surface by use of pressure sensitive adhesive.
- B. Plastic, retro-reflective surface, color and one-way or two-way marker as indicated on Contract Drawings.
 - 1. Retroreflectors shall be prismatic type, acrylic plastic molded polycarbonate or other suitable material designed to provide strength, abrasion resistance, impact resistance, resilience and adhesion. The retroreflective shall be ultraviolet stabilized grade material which provides resistance to color change over long periods of outdoor exposure.
 - 2. The retroreflective surface shall contain two (2) prismatic reflective faces to reflect light in two (2) directions. The surface of the reflective face shall be protected by a permanently bonded glass face or other transparent, abrasion resistant material. Reflective face colors shall be selected by the ENGINEER.

2.07 INLAID THERMOPLASTIC PAVEMENT MARKINGS

- A. The inlaid thermoplastic pavement markings shall be provided pre-cut in sizes to conform to the specified pattern, widths and shapes shown on the Contract Drawings. The material shall be packaged in accordance with accepted commercial standards and, when stored in cool dry area indoors, shall be suitable for use for one year after the date of purchase. Color for insert and surrounding shall be in accordance to Section VIII - Technical Provisions (Detailed). Pattern shall be in accordance to Section VIII - Technical Provisions (Detailed).

- B. Accepted pre-cut reflectorized inlaid thermoplastic pavement markings materials shall be the thermoplastic material for inlay into hot mix asphalt (HMA). The inlaid thermoplastic material shall have a minimum thickness of 90 mils (2.3mm), and consist of a mixture of high quality polymeric materials, pigments, fibers, and glass beads distributed throughout the cross-section, and with a reflective layer of glass beads bonded to the top surface.
- C. Softening Point: The softening point shall be measured by the Ring and Bell method, as described in ASTM D-36-95 (2000). Acceptable range shall be 210-250° F (100-120° C).
- D. Bond Strength: Thermoplastic bond strength to asphalt substrate shall be measured by Cross-Cut Test, as described in ASTM D-3359. A minimum of 50% of thermoplastic bond surface shall exhibit attached particles of asphalt.
- E. Acceptable manufacturer for inlaid thermoplastic marking is Streetprint Duratherm at (800).688.5653, unless noted on the Contract Drawings.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Clean the surface of the roadway before application of traffic lines or pavement markings to provide a clean, dry roadway surface which is free of loose dirt and other debris, to the satisfaction of the ENGINEER.
- B. The surface cleaning for Cold Plastic markings shall include as a last operation the use of compressed air or a fine bristled broom over the application area to provide a dust-free surface.
- C. New concrete road surfaces shall be cured at least seven (7) days prior to marking. Remove curing compounds prior to applying markings.
- D. MMA markings may be placed on top of existing MMA markings which are in good condition. Other non-MMA markings must be mechanically removed prior to placement of new MMA markings. Remove chipped or flaking MMA markings prior to placing new MMA markings.

3.02 APPLICATION OF PAINTED MARKINGS

- A. Paint: Paint shall be dispensed in a wet film thickness of 15+1 mils. The rate of application of paint on bituminous surface treatment roads may be 25% greater. The ENGINEER will determine whether roadways require an increased application rate.
- B. Glass Beads: Glass beads shall be applied at a rate of six (6) pounds per gallon of paint.
- C. Apply new pavement markings and “touch-up” existing markings within the limits of work. The finished project shall match the Contract Drawings.

3.03 EQUIPMENT FOR PAINTED MARKINGS

- A. The line painting machine type shall be such that it shall not appreciably impede the traffic flow in adjacent lanes while painting the centerlines of the roadway and one lane shall be left completely open to traffic when painting edge lines.

- B. The line painting machines used on this project shall be capable of a simultaneous application of two parallel lines in either a solid or broken pattern in forming the centerline. It shall also be capable of the automatic dispensing of glass beads onto the painted surface at the required application rate, by the pressurized glass gun method.
- C. The machinery shall also be capable of providing a paint line in 4-inch, 6-inch and 8-inch widths.
- D. Each piece of machinery used to apply centerlines and edge lines shall be equipped with a measuring device which automatically and continuously measures to the nearest foot, the length of each line placed.
- E. Legends shall be applied with equipment approved by the ENGINEER; hand brushes or rollers are not permitted. Glass beads may be hand applied.

3.04 CENTERLINE APPLICATION

- A. Where existing centerlines are visible and properly located, the new centerlines shall be applied directly over the existing pattern. Where centerlines do not exist, or existing centerlines are improperly located, as determined by the ENGINEER, the new centerlines shall be applied at the correct location. If the existing markings have to be removed to allow correct placement of the new markings, such work shall be done in accordance with Section 963 of Publication 408. This work is incidental to the application of the new centerline.
- B. In general, on two-lane roadways, the centerline shall evenly divide the roadway; however, if a portion of the roadway on either or both sides is to be utilized for parking, the centerline shall evenly divide the traveled way.
- C. Apply the centerline in its proper location; any centerline pattern placed more than six (6) inches from the center of the roadway or traveled way shall be removed and replaced by the CONTRACTOR at his own expense.

3.05 EDGELINE APPLICATION

- A. Field-check all roadways shown on the Contract Drawings which require application of edge lines. Only those roadway sections which are 20 feet or greater in width for more than 50 percent of their length shall be painted with edge lines.

3.06 APPLICATION OF COLD PLASTIC MARKINGS

- A. Inlaid: Place material on new bituminous surface just before final compaction. Roll material into new surface to achieve flush finished surface.
- B. Surface applied: Apply onto the existing, cleaned surface of concrete or bituminous roadways.
- C. Use compatible “adhesive activator” or “primer sealer”, if recommended by adhesive manufacturer.

3.07 APPLICATION OF HEAT APPLIED THERMOPLASTIC MARKINGS

- A. Asphalt: The materials shall be applied using the propane torch method recommended by the manufacturer. The material must be able to be applied at ambient and road temperatures down to 32 degrees F. without any preheating of the pavement to a specific temperature. The pavement shall be clean, dry and free of debris. Supplier must enclose application instructions with each box/package.
- B. Portland Concrete: The same application procedure shall be used as described under above Paragraph 3.07A. However, a compatible primer sealer may be applied before application to assure proper adhesion.

3.08 APPLICATION OF METHYL METHACRYLATE MARKINGS

- A. Apply MMA markings using one method chosen from the three listed below, depending on project type and size:
 - 1. Extrude using trowel, drag box, push cart or shoe. (Applicable for all types of markings). Recommended film thickness is 90 mils, drop on glass rate of 10 lbs. /100 sq. ft.
 - 2. Stencil Spray using spray applicator (for all types of markings). Recommended film thickness for transverse markings and symbols is 90 mils; 60 mils for longitudinal markings.
 - 3. Truck Spray using driven vehicle and paint guns to apply longitudinal lines. Recommended film thickness is 40 mils with a double drop of glass beads.

3.09 RAISED PAVEMENT MARKERS

- A. Install markers as per manufacturer's requirements and the Contract Drawings, according to the MUTCD. Installation shall be performed so as not to cause damage to the surrounding pavement. The CONTRACTOR shall be responsible for repairing any damaged pavement surfaces at no additional cost. The edges of pavement markers shall be a minimum of four (4") inches from pavement joints.
 - 1. The pavement shall be cut to the dimensions and depth recommended by the manufacturer.
 - 2. All cutting shall be performed to minimize airborne dust and similar dust. All debris from cutting shall be vacuumed up from the pavement cut and adjacent pavement surfaces and disposed of properly.
 - 3. Only install raised pavement markers when the ambient and pavement temperatures are above 50°F.
 - 4. The epoxy resin adhesive material shall follow manufacturer's recommendations for proportioning, mixing and application.
 - 5. The pavement markers shall be immediately placed into the epoxy-filled pavement cut.
- B. CONTRACTOR shall provide manufacturer PennDOT certification (CS-4171) that all raised pavement markers meet all current Federal and State regulations previously stated.

3.10 INLAID THERMOPLASTIC PAVEMENT MARKINGS

- A. Pre-cut inlaid thermoplastic pavement marking material shall be furnished and installed by the CONTRACTOR at the locations and with the proper dimensions or as directed by the ENGINEER at the appropriate time after the completion of the asphalt surface.
- B. The surface shall be clean and free of all dust, silt, debris and, most importantly, chemical residue from de-icing materials. If de-icing material has been used on the road in the past, cleaning shall be carried out using pressure washing.
- C. Placement shall be in accordance with the Manufacturer's recommendations and the installers shall possess an appropriate Certification of training from the Manufacturer.
- D. Layout and imprinting of the pattern into the surface of the hot mix asphalt (HMA) shall be as per the Contract Drawings or Specifications in Section VIII - Technical Provisions (Detailed). Imprinting shall be carried out after the HMA paving work has been completed. The asphalt surface shall be re-heated to make the upper portion of the asphalt surface pliable enough to accept the imprint of the template. The application of heat to existing asphalt surface shall be done using reciprocating infra-red re-heating equipment.
- E. The asphalt surface temperature shall not exceed 325° F (163°C). The temperature of the asphalt surface shall be regularly monitored during the reheating process, to avoid over heating and degradation of the asphalt cement. Direct flame heaters and non-reciprocating heaters shall not be allowed to be used for this purpose. Once the asphalt has reached imprinting temperature, the templates shall be placed in position and pressed into the surface using vibratory plate compactors.
- F. Supply and install the inlaid thermoplastic panels on completely dry asphalt, in the imprinted area. Heat shall be gently applied to the surface using reciprocating infra red heaters, slowly raising the surface temperature until the thermoplastic material in the panels starts to liquefy and flow, but no higher than 325°F. Once the thermoplastic material has liquefied, the heat source shall be removed and the surface allowed cooling to ambient temperature. Only once the asphalt surface and the thermoplastic have reached ambient temperature may the road be opened to traffic.

END SECTION

SECTION 02830

CHAIN LINK FENCE

PART 1 GENERAL

1.01 DESCRIPTION

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

1. 4' high chain link fencing
2. Vehicular double swing gate
3. Fabric and fence coating

B. Related Work Specified Elsewhere:

- | | |
|--|---------------|
| 1. Finish grading, seeding and sodding: | Section 02485 |
| 2. Plain and reinforced cement concrete: | Section 03000 |

C. Definitions: None

D. Applicable Standard Details: None

1.02 QUALITY ASSURANCE

A. Reference Standards:

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

- A53 – Pipe, steel, black & hot-dipped, zinc coated, welded and seamless
- A121 – Zinc coated (galvanized) steel barbed wire
- A123 – Zinc (hot dipped galvanized) coatings on iron and steel products
- A392 – Zinc coated steel chain-link fence
- F567 – Practice for installation of chain-link fence
- F626 – Fence fittings
- F668 – Poly (vinyl chloride) (PVC) – coated steel chain link fence fabric
- F934 – Standard colors for polymer-coated steel chain fence materials
- F1043 – Strength & protective coatings on metal industrial chain link fence framework
- F1083 – Pipe, steel, hot-dipped zinc coated (galvanized) welded for fence structures

1.03 SUBMITTALS

A. Manufacturer's catalogue cuts indicating material compliance.

B. Color selection chart for PVC coating.

1.04 JOB CONDITIONS

A. Locate and protect existing utilities, as specified in Section 02210, Paragraph 1.04.C.

B. Exact location of fencing will be determined by the CONTRACTOR, in consultation with the ENGINEER.

1.05 PRODUCTS DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.01 CHAIN LINK FENCE FABRIC

- A. Two inch diamond mesh of high quality medium carbon steel core wire, hot-dipped galvanized. Minimum tensile strength shall be 100,000 psi, 9 gage wire size.
- B. PVC coating shall be thermally fused prior to weaving. Coating thickness 7 mils.
- C. Wire shall be imprinted with identification of manufacturer or trade name, country of origin, gage and tensile strength of 12" intervals.
- D. Twist and barb top selvage. Twist and knuckle bottom selvage.

2.02 POSTS

- A. Line posts shall be 2-1/2" O.D. tubular steel pipe, weighing 3.65 lbs per lineal foot, or SS40.
- B. End, corner, angle or pull posts shall be 3" O.D. tubular steel pipe, weighing 5.79 lbs per lineal foot, or SS40.
- C. Gate posts shall be 4" O.D. tubular steel pipe, weighing 9.11 lbs per lineal foot, or SS40.
- D. All posts shall be hot-dipped galvanized. Posts shall have thermally fused PVC coating if used with PVC coated fence fabric.

2.03 FRAMING AND BRACING

- A. Top rail shall be 1-5/8" O.D. tubular steel pipe, weighing 2.27 lbs. per lineal foot, or SS40, hot-dipped galvanized.
- B. Bracing ends (for fastening to posts) shall be formed steel.
- C. Truss rods shall be steel rods with a minimum diameter of 3/8".
- D. All framing shall be hot-dipped galvanized.
- E. All framing shall have thermally fused PVC coating, if used with PVC coated fence fabric.
- F. No bottom rail required.

2.04 CONCRETE BASES

- A. Concrete Minimum 28 Day Compressive Strength of 3,000 PSI.

2.05 BARBED WIRE AND SUPPORTS – NONE REQUIRED

2.06 HARDWARE AND ACCESSORIES

- A. Top Rail Sleeves (for expansion and contraction of top rail) shall be 6" long.
- B. Wire Ties - 9 gauge galvanized steel for line post attachment. Double wrap 13 gauge shall be used for attachments to rails and braces.
- C. Nuts and Bolts shall be galvanized.
- D. Post Caps shall be formed steel, cast malleable iron or aluminum alloy weather tight closure cap.
- E. Tension Wire – 7 gauge core wire, galvanized, with tensile strength of 75,000 psi. Hog ring ties 12-1/2 gauge wire shall be used to tie fabric to tension wire.
- F. Stretcher Bar – 3/16" x 2/4" steel bar or equivalent fiberglass rod. Length shall be 2" less than full height of fabric sheer fabric meets terminal posts.

2.07 SWING GATES

- A. Gate frames shall be 2" O.D. tubular steel pipe weighing 2.72 lbs. per lineal foot, or SS40. Connections shall be welded to form rigid one-piece unit.
- B. Hinges shall be structurally capable of supporting gate leaf and allow 180° of movement without binding. Non-lift-off type hinge design.
- C. Latch - Forked type capable of retaining gate in closed position and have provision for padlock.
- D. Latch shall permit operation from either side of gate.
- E. Keeper – Provide keeper for each leaf over 5' wide. Keeper shall secure free end of gate when fully open until manually released.
- F. For double leaf gates, provide drop rod to hold inactive leaf and gate stop pipe to engage center drop rod.
- G. Padlock – Provide one padlock to lock both gate leaves with 3 keys. Lock shall conform to Federal Specification FF-P- 10 lb Type EPA with chain.
- H. Gate posts shall have heavy ornamental caps.

PART 3 EXECUTION

3.01 GENERAL

- A. Ensure property lines and legal boundaries of work are clearly established.
- B. Grade areas to receive fencing to eliminate surface irregularities to maintain required clearance.

3.02 POSTS

- A. Place terminal post at each fence termination and change in horizontal or vertical direction of 30° or more. Space line posts at equidistant spaces, minimum 8', and 10' maximum on centers.

- B. Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post (or as shown on Contract Documents) and depth approximately 6" deeper than bottom of post (42" minimum depth). Excavate deeper as required for adequate support in soft or loose soils and for posts with heavy lateral loads.
- C. Place concrete around posts in a continuous pour. Top of concrete shall be 2"-3" below surrounding grade and sloped to direct water away from posts. Maintain position of post (vertically and horizontally) during placement operations.

3.03 BRACING

- A. Install horizontal brace at mid-height for fences 6 feet and higher on each side of terminal posts. Install diagonal truss rods, at same posts, adjusting to ensure posts remain plumb.
- B. Connect top rails with sleeves. Install bottom rails, if required.
- C. Install tension wire at bottom of fabric before stretching fabric and attach at each post with ties.
- D. Touch up hardware and accessories with PVC touch up paint provided by manufacturer, as needed.

3.04 FABRIC

- A. Attach fence fabric so that fabric remains in tension after pulling force is released. Allow 2" clean space between finished ground and bottom selvage.
- B. Attach fabric to bracing, rails and line posts with wire ties $\pm 15"$ on center. Attach fabric to tension wire, if any, with hog ties at 24" on center.
- C. Bend ends of wire ties to minimize hazard to persons.
- D. Thread tension bar through taut fabric and attach bar to terminal posts with bands or clips spaced at 15".

3.05 BARBED WIRE – NONE REQUIRED

3.06 SWING GATES

- A. Set posts in concrete, as specified in above Paragraph 3.02 and attach fabric, as specified in Paragraph 3.04. Locate and place gate stops so that drop rod fully engages.
- B. Attach hardware by means which will prevent unauthorized removal. Adjust hardware for smooth operation of gate leaves.
- C. Touch up hardware, as needed, with PVC touch up paint provided by manufacturer to match adjacent finish.

3.07 CLEAN UP

- A. Clean up debris and unused material and remove from the site.

END OF SECTION

SECTION 02852

GUIDE RAIL

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work of this section includes installation of steel guide rail along roadways and bridges 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):
 - a. Publication 408, Specifications
 - b. Publication 72M, Roadway Construction Standards (RC)
 - c. Publication 219M, Bridge Construction Standards (BC)
- B. Qualifications:
 - 1. Guide Rail Installer – shall be a firm that specializes in this work, have a minimum 5 years experience and be PennDOT pre-qualified to perform this work.

1.03 JOB CONDITIONS

- A. Control of traffic shall be in accordance with PennDOT Publication 213, Temporary Traffic Control Guidelines.
- 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 ENGINEER of any damage to a utility line.

PART 2 PRODUCTS

2.01 GUIDE RAIL

- A. All rail elements, post 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, Section 1105 and as shown on Contract Drawings.

2.03 CONCRETE

- A. Concrete for end anchorage shall be Class A cement concrete, in accordance with PennDOT Publication 408, Section 704.

PART 3 EXECUTION

3.01 APPROACH GUIDE RAIL

- A. Ensure property lines and legal boundaries of work are clearly established.
- B. Remove any existing railing, and install new guide rail, in accordance with PennDOT Publication 408, Section 620.
- C. Install guide rail at the post spacing's, lengths and with end treatments, as shown on the Contract Drawings. Restore ground surface to pre-existing conditions.

3.02 STRUCTURE MOUNTED RAILING

- A. Install new guide rail on the structure as shown on the Contract Drawings.

3.03 CLEAN UP

- A. Clean up debris and unused material and remove from the site.

END OF SECTION

SECTION 02901

LANDSCAPE PLANTING

PART 1 GENERAL

1.01 DESCRIPTION

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

1. Furnishing and planting trees, shrubs and grasses.
2. Transporting trees and shrubs.
3. Maintenance.
4. Fertilizing and mulching.

B. Related Work Specified Elsewhere:

1. Finish grading, seeding and sodding: Section 02485

C. Definitions:

1. Weeds - vegetative species other than specified species to be established in a given area. Weeds include dandelion, crabgrass, chickweed, poison ivy, bermuda grass, thistles and similar species.

D. Applicable Standard Details:

1. PennDOT Publication 72M, Standard for roadway construction, latest edition.
2. See Contract Drawings.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Horticultural Standards, Latest edition of rules and grading, adopted by the American Association of Nurserymen.
2. Standardized Plant Names, American Joint Committee on Horticulture Nomenclature.
3. ANSI 260.1 of American Association of Nursery.

B. Qualifications:

1. Nursery: Company specializing in growing and cultivating plants with five (5) years of experience.
2. Installer: Company specializing in installing and planting plants and placing mulch, with five (5) years of experience.

3. CONTRACTOR shall be PennDOT pre-qualified for this work prior to bid opening.

1.03 JOB CONDITIONS

- A. Protect underground utilities and structures. Comply with local and State requirements to locate facilities to avoid damage.
- B. Control of Traffic:
 - 1. Traffic on OWNER's streets may be limited as required with advance approval from the ENGINEER. The CONTRACTOR must notify the ENGINEER three (3) days in advance for traffic limitations.
 - 2. Allowable work hours are as follows: 7:00 a.m. to 7:00 p.m.
- C. Protection of Adjacent Areas:
 - 1. Precautions shall be taken in regard to the damage of OWNER's or State streets by any other heavy equipment.
- D. Coordination with Utilities:
 - 1. The CONTRACTOR will be responsible to place any and all PA One Calls. CONTRACTOR shall provide all serial numbers to ENGINEER prior to commencing work.
 - 2. Coordination with OWNER's maintenance crews will be the responsibility of the ENGINEER; however, the CONTRACTOR will be responsible to notify the ENGINEER of required actions as they become apparent to the CONTRACTOR.
 - 3. Coordination with utility companies for any utility adjustments is the responsibility of the CONTRACTOR.
- E. Safety Precautions:
 - 1. All open trenches, excavation areas, and the perimeter of the project shall be fenced and barricaded during non-construction periods.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with local, State and Federal laws relative to plant material shipment.
- B. CONTRACTOR shall identify any stockpile locations to ENGINEER prior to construction.
- C. During loading, transporting and unloading material, CONTRACTOR shall exercise care to prevent damage.

PART 2 PRODUCTS

2.01 PLANT STOCK

- A. All plant material shall be true to type and name, in accordance with the current edition of Standardized Plant Names. Each plant or plant group shall be labeled with not less than the plants common name and size. Each plant shall be typical of the species or variety specified. All stock shall be free from disease, insect infestations, mechanical injuries, broken branches, or other defects and also meeting the following requirements.
 - 1. Nursery Stock shall have been grown in a certified nursery for a period of at least two (2) full growing seasons. The use of mechanical digging equipment at the nursery will be permitted only when its use is not deemed detrimental to nursery stock survival.
 - 2. Plants shall not be collected from native areas.
 - 3. Balled and Burlapped Plants (B&B) shall have a firm ball composed of original, undisturbed soil, wrapped with untreated burlap and laced with biodegradable lacing to hold the root ball firm and intact. All plants found with broken, loose or manufactured root balls, will be rejected. Trees shall have a well developed root system and a straight stem.
 - 4. Container-Grown Plants shall have been grown for a least one (1) year, but not more than two (2) years, in the same container and shall not exist in a “pot-bound” condition.
 - 5. Bare Root Plants shall have a live, well balanced root system with moist, fibrous root hairs free from rot and mold.
- B. Plant material shall be handled, packed and stored using good nursery practices. Materials shall be available for inspection in the nursery before digging. The ENGINEER reserves the right to tag selected plants, indicating acceptable form, shape and culture practices, in compliance with detailed specifications.
- C. Any plant material which is designated as rejected material shall be segregated and removed from the planting site within 48 hours.
- D. All plant material shall be free of insect, disease and any mechanical injury.
- E. Tree types shall be in accordance with Contract Drawings.

2.02 WRAPPING MATERIAL

- A. Approved wrapping material shall be crinkle-Kraft waterproof paper 30-30-30 in 4” widths or approved equal.

2.03 FERTILIZER

- A. Commercial fertilizer shall conform to the requirements of the Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86 (3P.S.68.2), as amended. Fertilizer shall have an analysis of 0-20-0, 20-10-5 (10 gram tablets) or 16-8-16 and shall be packaged in 4 ounce, individual, heat-sealed, polyethylene envelopes. Add fertilizer to plant pits at the rate recommended by the manufacturer.

- B. Balance root system with moist, fibrous root hairs free from rot and mold.

2.04 MULCH

- A. All mulch shall be free from foreign material, coarse stems, and any substances toxic to plant growth. Material shall be suitable, shredded not decomposed, between 1/4" and 2" in any dimension.
- B. The color of the mulch shall be selected by the OWNER.

2.05 BACKFILL MIX FOR PLANTINGS

- A. Backfill mix, if needed, shall consist of a homogeneous mixture of 20% peat (either shredded reed sedge peat or sphagnum moss peat, or a combination of both from fresh water sites) and 80% topsoil by volume.
- B. Construction debris may not be used as backfill mix.

2.06 STAKES AND GUYS

- A. Where required, stakes shall be rough-sawn, red or white cedar, southern yellow pine, or acceptable hardwoods free from knots, rot, or other defects which may impair the strength of the stake. Steel channel bar posts, rolled from Standard Carbon Steel Rails, and meeting ASTM A499 may be used in lieu of wood stakes.
- B. All wire for bracing and guying trees shall be #12 gage, galvanized, and shall meet ASTM A392, Class II requirements.

2.07 HOSE GUARD

- A. To protect trees and shrubs from guy wire damage, an acceptable hose guard shall be utilized.

2.08 WEED BARRIER MAT

- A. Each area where a tree is proposed to be planted shall have nonwoven 100% polyester fiber fabric manufactured for this specific purpose. The weed barrier mat shall extend to the limits of the planting island.

2.09 TREE PROTECTORS

- A. If shown on the Contract Drawings, all newly planted trees shall have a tree protector device installed around the base. The protector shall be corrugated polyethylene solid pipe (ASTM D1248, ASTM F405) of a minimum diameter of 2X greater than the caliper of the tree, and a length of 18". Galvanized steel or aluminum, perforated protectors may be used but must have a rubber hose guard lining at the top.
- B. Before placing, samples or manufacturers catalog cuts of the devices shall be submitted for review and acceptance.

PART 3 EXECUTION

3.01 TEMPORARY STORAGE

- A. All plant material not planted immediately shall be properly stored. Obtain, provide, and prepare a suitable healing-in site or arrange for a well-ventilated and cool storage shed located near the planting site. Temporarily store container-grown or balled and burlapped plants in a protected area, with containers or balls 6 inches apart. Fill all voids with moist mulch to the top of the container or ball.
- B. Bare root plant material which arrives at the planting site shall be immediately removed from the transport vehicle. Roots shall be covered with wet burlap or mulch to prevent drying. Protect the plant material from sun and wind and keep fresh by fine mist spraying, or by other acceptable methods.
- C. Protect plants at all times. All material left out of the ground, unprotected overnight, with roots exposed to sun and wind, or unprotected during transit, unloading, storage, heating in or during actual planting operations will be rejected.
- D. The planting areas shall be stripped of existing mulch and topsoil, (which can be stored for reuse).

3.02 LAYOUT OF PLANTINGS

- A. Delineate the tree installation locations, bed and planting area outlines. Identify the plants to be placed at the delineated locations. Do not start excavation or cultivation until the locations and outlines have been accepted by the ENGINEER or OWNER.
- B. Should obstructions prevent planting at the indicated locations, alternate locations or deletions will be determined by the ENGINEER.

3.03 BED PREPARATION

- A. For areas indicated for tree installation, prepare the area in the following manner to attain the designed finished grade:
 - 1. Where indicated on Contract Drawings, remove existing tree or stump, including any existing concrete, bricks or blocks. Remove sod and all undesirable growth, add additional topsoil, if required to re-establish grade. Each planting area shall promote positive drainage when complete.
 - 2. Uniformly spread 3 inches of peat, and then thoroughly incorporate it into the soil to a minimum depth of 6 inches. As directed during this blending operation, remove and dispose of undesirable material larger than 2 inches in any dimension.
 - 3. Each planting area shall have a minimum of 3" of settled mulch on top of the plantings.

3.04 PREPARATION OF PLANTS

- A. For bare root shrubs, vines, and seedling transplants, dig pits with vertical sides and flat bottoms large enough to accommodate roots without crowding. For balled and burlapped plants, the pit shall be twice the width of the ball diameter. For common periwinkle, pachysandra, and ivy, provide only four (4) inches of backfill mix beneath and around all sides of the root system.

- B. All plant pits designated for bare root or balled and burlapped plant stock shall be dug prior to removing plants from temporary storage. Immediately before planting, scarify, loosen, or roughen the sides of the plant pit.
- C. If the soil conditions are deemed favorable to healthy plant growth, the ENGINEER may direct the CONTRACTOR to dig the pit up to three (3) times the root spread or balled diameter.

3.05 PRUNING

- A. Broken or badly bruised branches shall be removed with a clean cut. Pruning cuts over 3/4" diameter shall be painted over with approved tree paint.
- B. Root pruning shall only be performed to remove damaged or broken main roots. Cut immediately above the damage with a clean oblique cut.
- C. Typical top pruning, as directed, shall be performed appropriately for each species, variety, size, or planting location. Typical pruning samples will serve as a guide for subsequent pruning throughout the project.
- D. Prune the tops of deciduous shrubs prior to or immediately following planting. Prune according to best horticultural practices regarding natural or desired form and growth characteristics of the individual species. Unless otherwise directed, remove one-fourth to one-third of the potential leaf bearing surface from deciduous plants. Only trim or thin evergreens when and as directed.

3.06 PLANTING OR TRANSPLANTING

- A. Planting shall be performed when soil and climatic conditions are favorable, and according to the following schedule. Where local conditions warrant and at the direction of the ENGINEER, these dates may be extended:
 - 1. Deciduous Trees and Shrubs: October 15- June 15
 - 2. Evergreen Trees: March 1- May 15 and August 1- September 15
 - 3. Seedlings and Seedling Transplants: March 1- May 15
- B. Plants shall be set plumb and at the specified depth. Plant material shall be handled by the packaging material and not by the stem or branches. Remove plant containers or pre-formed root protection devices which restrict root development immediately prior to planting. Balled and burlapped material shall be placed in the plant pits intact. Set the root collar at the finished grade.
- C. Bare root material shall be planted immediately. To prevent root drying, use wet burlap, straw, hay or other protective measures.
- D. Fertilize in accordance with the fertilizer schedule. Cultivate and completely tamp backfill mix around the ball or roots, in a manner that fills voids and eliminates air pockets. Use extreme care to avoid damaging roots during backfilling and tamping operations. When backfilling is two-thirds complete, on balled and burlapped material, cut the lacing around the main stem or trunk then lay the burlap back. Thoroughly water the plant. After absorption of all water, complete the backfill operation and water again.

- E. For each planting area, install the weed barrier mat to match the diameter of the plant pit or other designated area and staple. The weed barrier mat shall be installed to the extent of the planting island. Mulch areas required. The weed barrier mat shall have a minimum of 3" of mulch on top of it.
- F. Wrap deciduous shade flowering tree trunks from the ground line to the lowest main branches, overlapping the wrap. Tie the wrapping at the top middle, and bottom and at a minimum of two other places.
- G. If staking and guying is required, perform that operation immediately after completion of backfilling.
- H. Install tree protectors around the base of deciduous and flowering trees with the bottom of the protector extending through the mulch and being in contact with the backfill material.

3.07 MULCH APPLICATION

- A. All plants shall be mulched with tanbark shredded mulch to a uniform depth of 3", settled depth, placed after planting.
- B. Remove weeds and deleterious materials prior to placing mulch. Place mulch within two (2) days after planting.
- C. Rake mulch surface smooth and even. Soak full depth of mulch thoroughly with water the same day.

3.08 MAINTENANCE OF PLANTING

- A. All plants shall be maintained in a living, healthy condition until the entire project has been accepted. Plants are required to be growing in place at least 60 days prior to project acceptance. During this period of establishment, perform necessary maintenance functions such as weeding, spraying, remulching and watering, as required or directed.
- B. Watering shall be performed during the period of establishment promptly and with sufficient personnel and equipment to complete any directed operation within five (5) calendar days of such direction.
- C. Tighten guys and stakes that may become loosened. At the end of the guarantee period, CONTRACTOR shall remove all guying material.

3.09 CLEAN UP

- A. The planting site shall be left in an acceptable condition, with all debris and undesirable excavated material satisfactorily removed from the site and suitably disposed of. The acceptable condition may also require seeding and mulching of disturbed areas within the limits of work.

3.10 REPLACEMENT AND GUARANTEE

- A. Within the required establishment period and prior to acceptance of the project, all plants determined by the ENGINEER not to be alive or in a healthy condition shall be replaced with plants of the same species, size, and quality as originally indicated and specified. Replacement may be directed to be made at the beginning of the next planting seasons.

- B. CONTRACTOR shall guarantee all plants for a period of one (1) year from the date of acceptance. Date of acceptance is defined as the inspection after the last of total planting is installed. Inspection will be performed by the OWNER and ENGINEER when requested by the CONTRACTOR.
- C. CONTRACTOR shall maintain all plantings for 90 days following project completion and provide maintenance instructions for the OWNER.

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
2. Cement concrete for utility construction: Section 03050

C. Definitions:

1. Exposed construction - Permanently exposed to view.
2. Concrete - Normal weight concrete for which density is not a controlling attribute, made with aggregates of the types covered by ASTM C33, and having unit weights in the range of 135 to 160 lb. per cubic foot.
3. f_c - The design compressive strength of the hardened concrete at an age of 28-days.

D. Applicable Standard Details: NONE

E. Work shall conform to all requirements of ACI 301-05, published by the American Concrete Institute, Farmington Hill, Michigan, except as modified by these Contract Documents.

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. American Concrete Institute (ACI):

- | | |
|---------|--|
| ACI 117 | Standard Specifications for Tolerances 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 Structural Concrete. |

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

- A185 Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- C31 Standard Practice for 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 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- C94 Standard Specification for Ready-Mixed Concrete
- C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
- C150 Standard Specification for Portland Cement
- C171 Standard Specification for Sheet Materials for Curing Concrete
- C172 Standard Practice for Sampling Freshly Mixed Concrete
- C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C192 Standard Practice for 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 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³)
- 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, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

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 ENGINEER at the CONTRACTORS'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.

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 ENGINEER, shall conform to the following Specifications:

1. Air-entraining admixtures - ASTM C260.
2. Water-reducing, retarding and accelerating admixtures - ASTM C494.

2.02 REINFORCEMENT

- A. Reinforcing Bars - All reinforcing bars shall be deformed, except spirals, which may be plain bars. Reinforcing bars shall be Grade 60, plain carbon-steel conforming to the requirements of ASTM A615, including supplementary requirements on Contract Drawings.
- B. Welded Wire Reinforcement - Welded wire reinforcement shall be fabricated from smooth or deformed wire of the size and spacing required on the Contract 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.

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 and the Contract Documents.
- 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 ACI 301 moderate exposure.

3.02 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.

3.03 EMBEDDED ITEMS

- A. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.
- 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, water stops, 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.

3.04 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 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.

3.05 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. Do not use aluminum pipes or chutes.
2. Conveying equipment shall be of a size and design such that detectable settling of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day.
 - a. Truck mixers, agitators and non-agitating 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 Contract 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.
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 so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honey-combing, pitting, or planes of weakness. Internal vibrators used shall be the largest size and the most powerful that can be properly used in the work. They shall be operated by competent workmen. Use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 18 in. apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.

D. Protection:

1. Unless adequate protection is provided, concrete shall not be placed during rain, sleet or snow.
2. Rainwater shall not be allowed to increase the mixing water nor to damage the surface finish.
3. The temperature of the concrete, as placed, shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and should not exceed 90°F. When the temperature of the steel is greater than 120°F, steel forms and reinforcement shall be sprayed with water just prior to placing the concrete.

3.06 FINISHING OF FORMED SURFACES

A. If the finish is not designated on the Contract Drawings, the following finishes shall be used as applicable:

1. Rough form finish - For all concrete surfaces not permanently exposed. Tie holes and defects shall be patched and fins over 1/4" in heights rubbed off.
2. Smooth rubbed finish - For all concrete surfaces permanently exposed. Apply on newly hardened concrete within one day following form removal. Surfaces shall be wetted and rubbed until uniform color and texture are produced.

3.07 SLABS

- A. General - Concrete for slabs shall be as specified in Paragraph 3.01.
- B. Preparation Of Subgrade for Slabs on Ground:
 - 1. The subgrade shall be well drained and of adequate and uniform load-bearing 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 sub-grade nor any muddy or soft spots when the concrete is placed.
- C. Finishes
 - 1. 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 and the slab shall then be refloated immediately to a uniform sandy texture.
 - 2. 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.
 - 3. Unspecified Finish - When type of finish is not specified on the Contract Drawings, use broom finish.

3.08 CURING AND PROTECTION

- A. General - Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete.
- B. Preservation of Moisture:
 - 1. For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing:
 - a. Application of acceptable moisture-retaining covering as approved by the ENGINEER.

- b. Application of a curing compound conforming to ASTM C309 - The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from areas to receive bonded applications.
2. Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured.
 3. Curing shall be continued for at least 7 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the strength, 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 hrs. unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
 2. Hot weather - When necessary, provisions 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.

3.09 TESTING

- A. General - Concrete materials and operations will be tested and inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the ENGINEER 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 specimens shall be tested at 28-days for acceptance and two shall be tested at 7-days for information. The acceptance test results shall be the average of the strengths of the two 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.
 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 ENGINEER, at the CONTRACTOR's expense:
1. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the ENGINEER.
 2. Sample concrete at point of placement and perform required tests.
 3. Review the manufacturer's report for each shipment of cement and reinforcing steel and conduct laboratory tests or spot checks of the materials, as received, for compliance with specifications.
 4. Mold four specimens from each sample (in addition to those required in Section 03000, Paragraph 3.09.B.1.b), 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 and inspection required because of changes in materials or proportions requested by the CONTRACTOR.

2. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements.

E. Duties and Authorities of Designated Testing Agency:

1. Representatives of the agency shall inspect, sample and test the materials and the production of concrete, as required by the ENGINEER. 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 ENGINEER and the CONTRACTOR.
2. The agency shall report all test and inspection results to the ENGINEER 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 Contract 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 the Contract Documents.
3. The CONTRACTOR shall submit to the ENGINEER the concrete materials and the concrete mix designs proposed for use with a written request for acceptance. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the CONTRACTOR has received such acceptance in writing.
4. To facilitate testing and inspection, the CONTRACTOR shall:
 - a. Furnish any necessary labor to assist the testing agency in obtaining and handling samples at the project or other sources of materials.
 - b. Advise the testing agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.
 - c. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24-hrs. as required by ASTM C31.

END OF SECTION

SECTION 03050

CEMENT CONCRETE FOR UTILITY CONSTRUCTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The work of this section includes, but is not limited to cast-in-place cement concrete for:

1. Reaction and support blocking
2. Cradles and encasements
3. Miscellaneous utility related cast-in-place cement concrete construction

B. Related work specified elsewhere:

- | | |
|---|---------------|
| 1. Trenching, backfilling and compaction: | Section 02221 |
| 2. Trench paving and restoration: | Section 02575 |
| 3. Manholes: | Section 02601 |
| 4. Storm inlets, catch basins, endwalls: | Section 02602 |
| 5. Sanitary sewer pipe: | Section 02610 |
| 6. Water mains: | Section 02615 |
| 7. Valves and fire hydrants: | Section 02640 |
| 8. Plain and reinforced cement concrete: | Section 03000 |

C. Definitions: NONE

D. Applicable Standard Details:

- | | |
|---------|---|
| 03050-1 | Concrete Encasement Detail |
| 03050-2 | Concrete Anchor Detail |
| 03050-3 | Thrust Blocking Details |
| 03050-4 | Special Concrete Encasement for Frost Protection Detail |

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation (PennDOT), latest revision:
Publication 408, Specifications

B. Inspections:

1. Inspections by the ENGINEER will, at a minimum, be made of the subgrade, formwork, supports, and reinforcement prior to placement of the concrete; and of the concrete prior to backfilling.

C. Testing:

1. As specified in Section 03000, Paragraph 3.09.

1.03 SUBMITTALS

- A. Submit concrete mix designs, including strength test records, for review and approval.
- B. Submit certified results of compressive strength cylinder tests.
- C. Submit copies of concrete batch slips.

PART 2 PRODUCTS

2.01 CEMENT CONCRETE

- A. As specified in Section 03000.
- B. For work involving a time constraint, use PennDOT Class HES (High Early Strength).

2.02 REINFORCEMENT STEEL

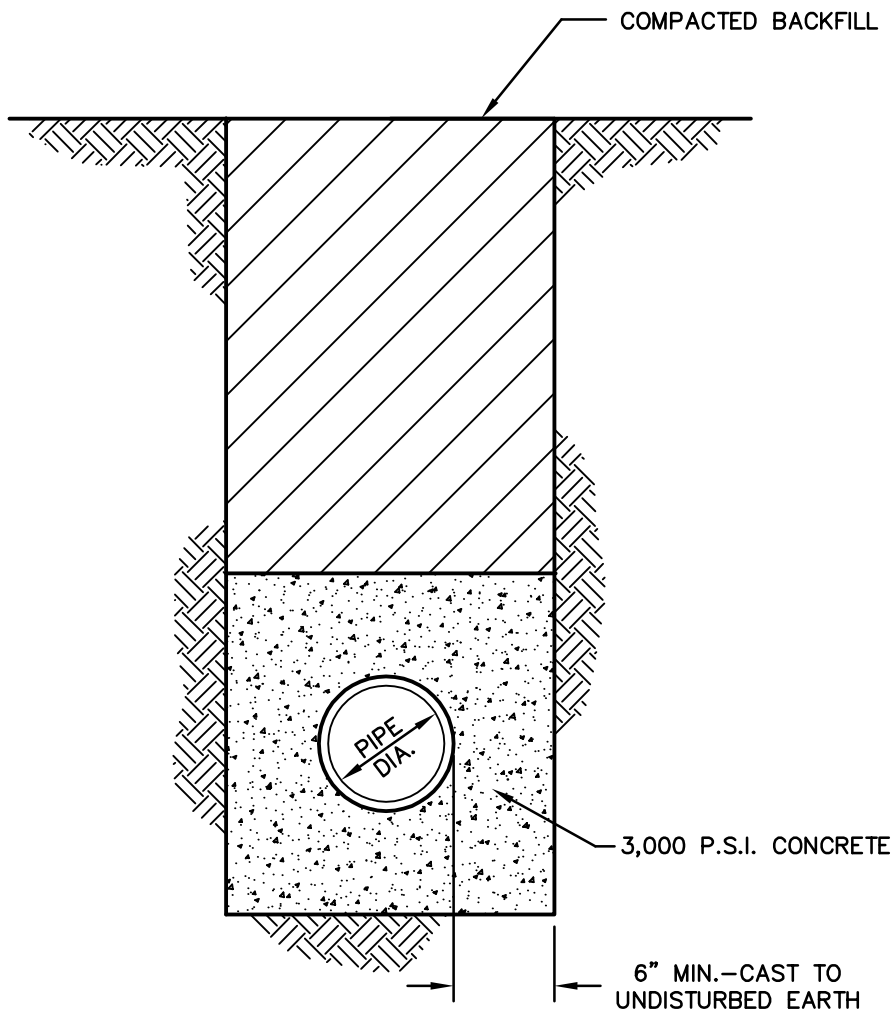
- A. As specified in Section 03000.

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. Comply with Section 03000 for construction requirements including placement, curing, and protection of cement concrete.
- B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasements, manhole bases, drop connections, inlets and vaults.
- C. Support pipes, valves and fittings at the required elevation with brick or concrete block. Do not use earth, rock, wood, or organic materials as supports.
- D. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.
- E. Place concrete utilizing all possible care to prevent displacement of pipes or fittings. Return displaced pipes or fittings to line and grade immediately.
- F. Insure tie rods, nuts, bolts and flanges are free and clear of concrete.
- G. Do not backfill structures until concrete has achieved its initial set and forms are removed.
- H. Perform backfilling and compaction as specified in Section 02221, Paragraph 3.11.

END OF SECTION



NOTE: NOT TO SCALE



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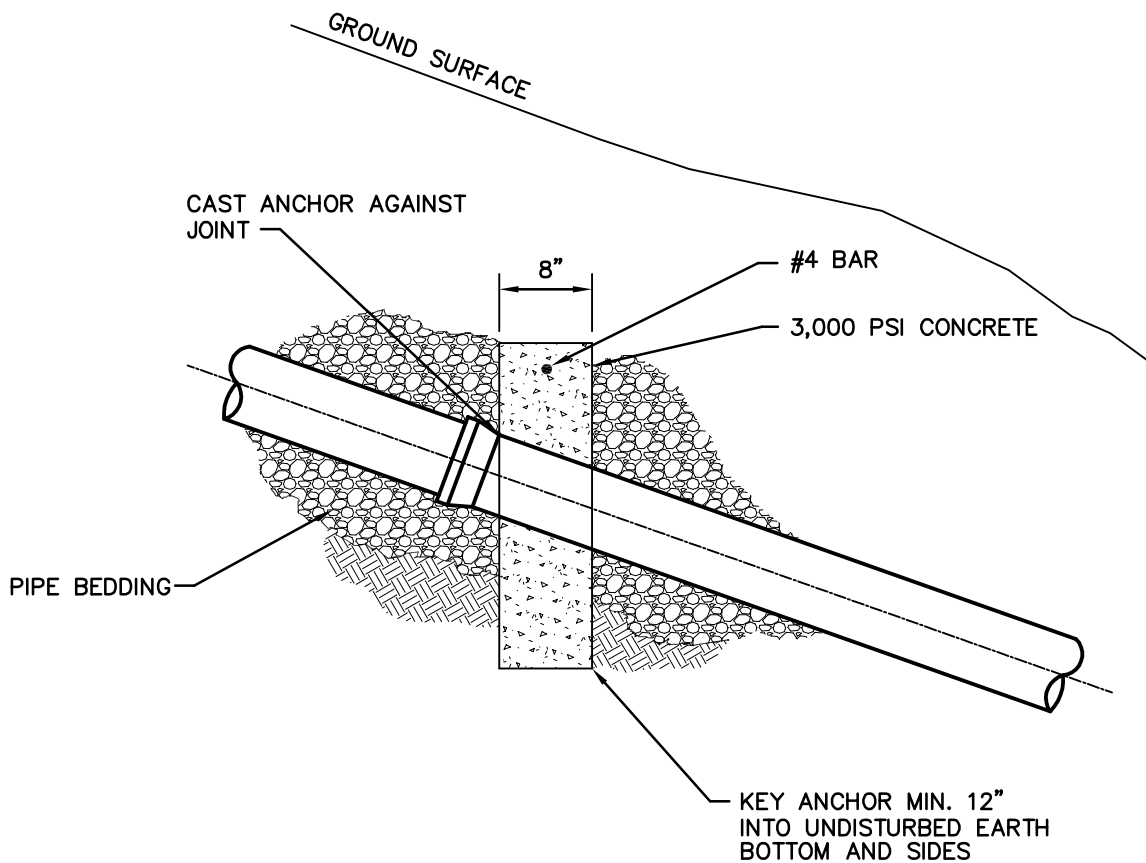
CONCRETE ENCASEMENT DETAIL

DATE: 9/15/2009

DRAWN BY: CRP

CHK. BY:

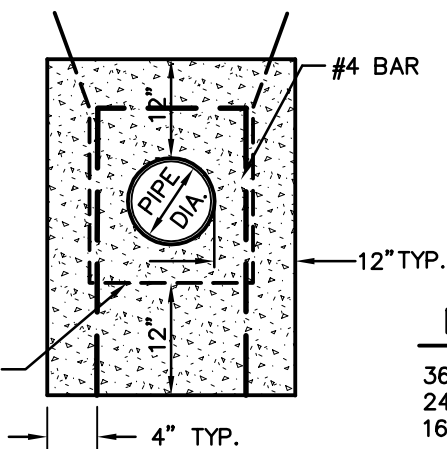
NO. 03050-1



SECTION

NOTE:
CONCRETE ANCHORS
PAID SEPARATELY
FROM PIPE.

MAX. TRENCH WIDTH
ADJACENT TO ANCHOR



MAXIMUM SPACING

36' O.C. 20% TO 35% SLOPES
24' O.C. OVER 35% TO 50% SLOPES
16' O.C. OVER 50% SLOPES

ELEVATION

NOTE: NOT TO SCALE



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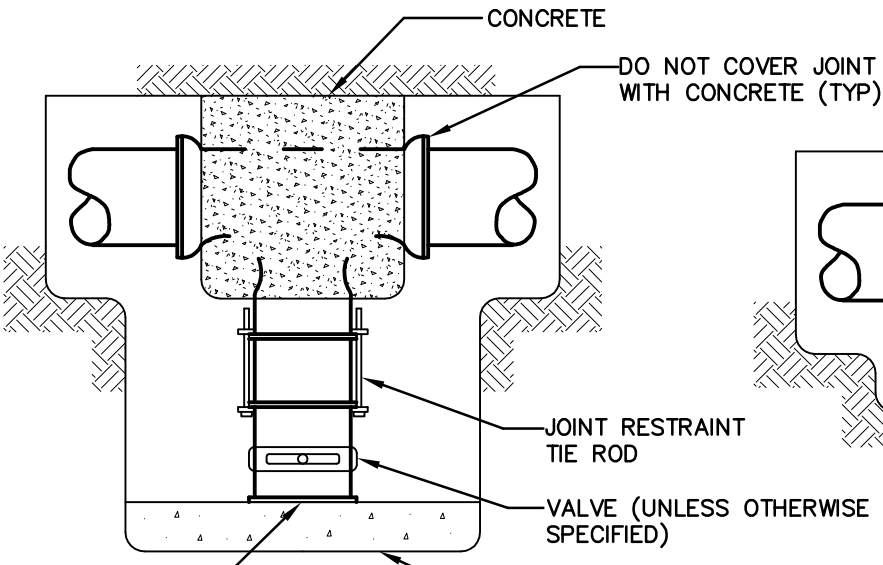
**CONCRETE
ANCHOR DETAILS**

DATE: 9/15/2009

DRAWN BY: CRP

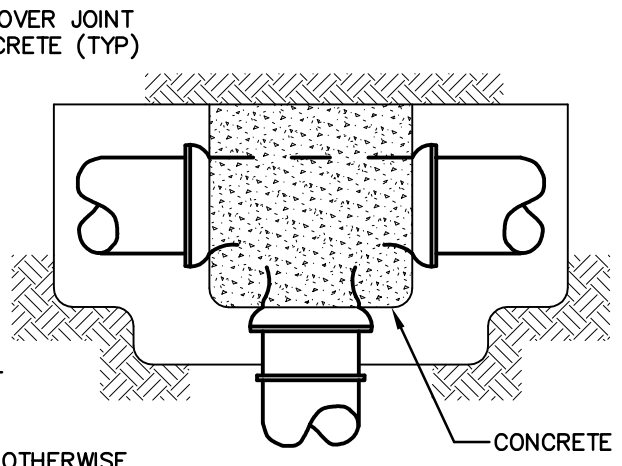
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NO. 03050-2

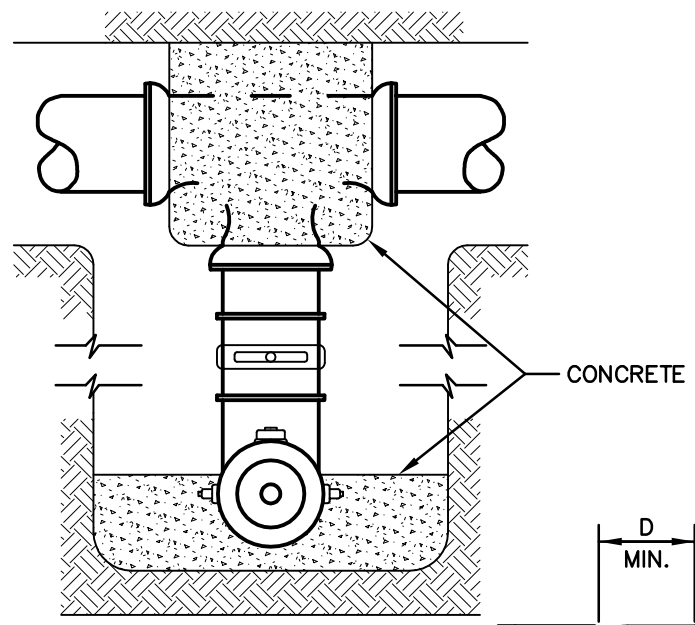


PLAN - CAPPED TEE

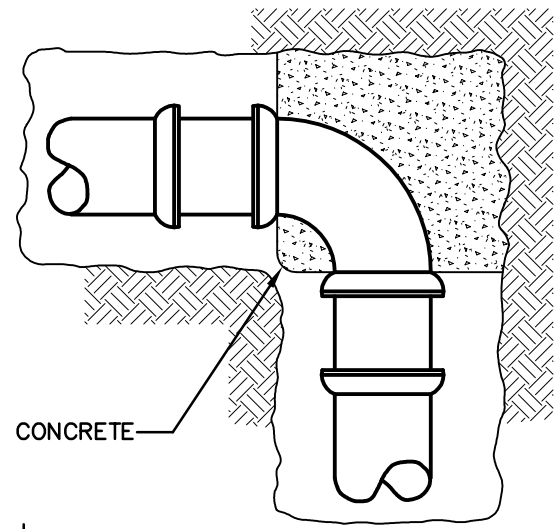
(CAPPED RUN OF TEE SIMILAR)



PLAN - TEE

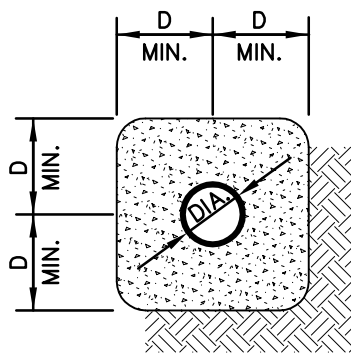


PLAN - HYDRANT



PLAN - 90° BEND

(LESSER BENDS SIMILAR)



TYPICAL SECTION

D = OUTSIDE DIAMETER OF PIPE

NOTE: NOT TO SCALE

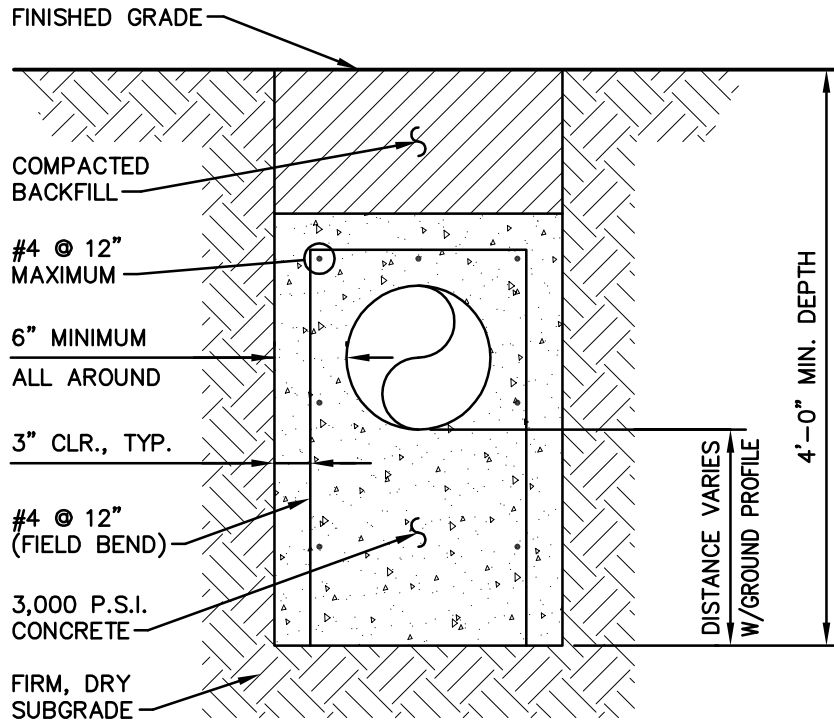


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**THRUST BLOCKING
DETAILS**

DATE:	9/15/2009
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NO.	03050-3



NOTES:

- STABILIZE PIPE & REINFORCEMENT WITHIN EXCAVATION TO PREVENT MOVEMENT DURING CONCRETE PLACEMENT.
- CONCRETE ENCASEMENT PAID SEPARATELY FROM PIPE UNDER ITEM 6.03.
- THE USE OF FLOWABLE FILL WILL NOT BE ALLOWED AS A SUBSTITUTE MATERIAL.
- REBAR SPACING CAN BE INCREASED IF APPROVED BY ENGINEER.

NOTE: NOT TO SCALE



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**SPECIAL CONCRETE
 ENCASEMENT FOR
 FROST PROTECTION
 DETAIL**

DATE:	9/15/2009
DRAWN BY:	CRP
CHK. BY:	
NO.	03050-4