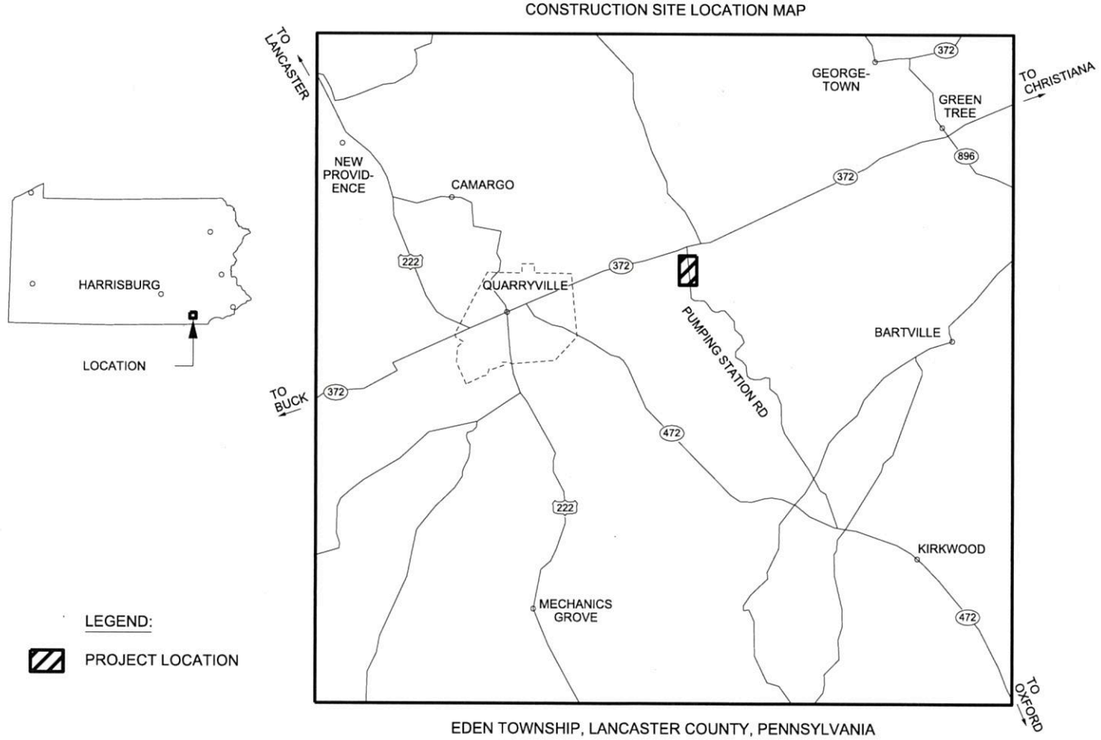
1,957'-9 5/8"

NORFOLK SOUTHERN

PUMPING STATION ROAD, QUARRYVILLE, LANCASTER COUNTY, PA

PUMPING STATION ROAD DRAINAGE IMPROVEMENTS

CONSTRUCTION SITE LOCATION MAP



LEGEND:

PROJECT LOCATION

EDEN TOWNSHIP, LANCASTER COUNTY, PENNSYLVANIA

NOTES:

-THE WORK FOR THIS PROJECT SHALL BE IN ACCORDANCE WITH PENNSYLVANIA SPECIFICATIONS PUBLICATION 408, AND SPECIAL PROVISIONS PROVIDED HEREIN.

-THE CONTRACTOR SHALL SUBMIT TO NS A PROPOSED CONSTRUCTION SCHEDULE PRIOR TO BEGINNING WORK.

-THE CONTRACTOR IS RESPONSIBLE FOR THE INVESTIGATION, LOCATION, SUPPORT, PROTECTION, AND RESTORATION OF ALL EXISTING UTILITIES WHETHER SHOWN ON THESE PLANS OR NOT. NS DOES NOT GUARANTEE ACCURACY OR COMPLETENESS. THE CONTRACTOR SHOULD VERIFY LOCATIONS WITH THE UTILITY COMPANIES NOT LESS THAN 48 HOURS BEFORE STARTING EXCAVATION ACTIVITIES.

-CONTRACTOR SHALL CONTACT PENNSYLVANIA ONE-CALL AT 611 AT LEAST 3 BUSINESS DAYS PRIOR TO BEGINNING WORK.

-ALL CONSTRUCTION WORK WILL BE PERFORMED IN SUCH A MANNER AS TO CONTROL EROSION AND PREVENT SEDIMENTATION FROM LEAVING THE SITE. EROSION CONTROL MEASURES AND PRACTICES SHALL BE INSTALLED PRIOR TO OR CONCURRENT WITH LAND-DISTURBING ACTIVITIES.

-RIGHT OF WAY LINES, IF SHOWN, WERE OBTAINED FROM VALUATION MAPS. ALL RIGHT OF WAY AND PROPERTY LINES ARE SHOWN FOR INFORMATION PURPOSES ONLY AS THEY HAVE NOT BEEN VERIFIED IN THE FIELD.

-THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY LOCAL CONSTRUCTION PERMITS THAT MAY BE REQUIRED FOR CONSTRUCTION OF THIS PROJECT.

-THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FIELD LAYOUT AND CONSTRUCTION STAKING.

-THE CONTRACTOR SHALL OBTAIN ANY TEMPORARY CONSTRUCTION ENTRANCE AND/OR DRIVEWAY PERMITS FROM THE APPROPRIATE GOVERNING AGENCY.

-ON SITE AND GENERATED CONSTRUCTION DEBRIS IS TO BE DISPOSED OF IN COMPLIANCE WITHIN LOCAL REGULATIONS. IF SUSPECTED ENVIRONMENTAL PROBLEMS ARE ENCOUNTERED, CONTACT THE NS ENVIRONMENTAL PROTECTION DEPARTMENT TO ASSIST IN PROPER HANDLING AND REMOVAL.

TABLE OF CONTENTS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MATHEW ALAN FLETCHER
ENGINEER
PE083505

12/29/2015

HANSON

7625 N. University St., Suite 200
Peoria, Illinois 61614
309-691-0902
Offices Nationwide

I, MATHEW A. FLETCHER, DO HEREBY CERTIFY PURSUANT TO THE PENALTIES OF 18 PA. C.S.A. SEC. 4904 TO THE BEST OF MY KNOWLEDGE, INFORMATION CONTAINED IN THE ACCOMPANYING PLANS, SPECIFICATIONS AND REPORTS HAS BEEN PREPARED IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICE, IS TRUE AND CORRECT, AND IS IN CONFORMANCE WITH CHAPTER 105 OF THE RULES AND REGULATIONS OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

CONSTRUCTION SET

NORFOLK SOUTHERN

OWNING COMPANY

OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
COVER AND INDEX

DGN GCN | PID No. | VPI | MILE POST 11.68
DWN JRW | FILE No. C-001-COVER | DRAWING NUMBER
CHK GCN | DATE 12/22/2015

MODEL NAME: Default
DATE PRINTED: 12/22/2015
CADD FILE: I:\14_jobs\14RRE184\CAD\Rail\Sheet\C-001-Cover.dgn
LAST SAVED: 12/22/2015

GENERAL:

1. ANY CHANGE-ORDER REQUEST MUST BE PRESENTED IN WRITING TO NORFOLK SOUTHERN AND APPROVED PRIOR TO PROCEEDING WITH THE REQUESTED CHANGE. DOCUMENTATION CONCERNING ANY CHANGE AND ALL CHANGE ORDERS WILL BE REDUCED TO FORMAL RECORD, FILED WITH THE NORFOLK SOUTHERN REPRESENTATIVE, AND BE MADE AVAILABLE FOR FUTURE REFERENCE.

2. THE ENGINEER, OWNER, AND NORFOLK SOUTHERN WILL NOT BE RESPONSIBLE NOR ASSUME ANY LIABILITY FOR NEGLIGENT ACTS OR ERRORS OR OMISSIONS OF ANY CONTRACTOR, ANY SUBCONTRACTOR, OR ANY OF THE CONTRACTOR'S OR SUBCONTRACTOR'S AGENTS OR EMPLOYEES OR ANY OTHER PERSONS (EXCEPT ENGINEER'S OWN EMPLOYEES) AT THE PROJECT SITE OR OTHERWISE PERFORMING ANY OF THE WORK OF THE PROJECT. ANY CONTRACTOR OR SUBCONTRACTOR, AS WELL AS THE ENGINEER, WILL BE RESPONSIBLE FOR HIS OR HER OWN SAFETY PROGRAM. NEITHER THE PROFESSIONAL ACTIVITIES OF THE ENGINEER, NOR THE PRESENCE OF THE ENGINEER OR HIS OR HER EMPLOYEES AND SUB-CONSULTANTS AT THE CONSTRUCTION SITE, SHALL RELIEVE ANY CONTRACTOR OF HIS OR HER OBLIGATIONS, DUTIES AND RESPONSIBILITIES INCLUDING BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCE, TECHNIQUES OR PROCEDURES NECESSARY FOR PERFORMING, SUPERINTENDING OR COORDINATING ALL PORTIONS OF THE WORK OF CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ANY HEALTH OR SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES. THE ENGINEER AND HIS OR HER PERSONNEL HAVE NO AUTHORITY TO EXERCISE ANY CONTROL OVER ANY CONSTRUCTION CONTRACTOR OR OTHER ENTITY OR THEIR EMPLOYEES IN CONNECTION WITH ANY HEALTH AND SAFETY PRECAUTIONS.

3. THE CONTRACTOR SHALL OBTAIN ANY TEMPORARY CONSTRUCTION ENTRANCE AND/OR DRIVEWAY PERIMITS FROM THE APPROPRIATE GOVERNING AGENCY.

4. THE CONTRACTOR SHALL OBTAIN ALL PERMITS AND COMPLY WITH THE REQUIREMENTS OF ALL AGENCIES HAVING JURISDICTION OVER THE WORK.

5. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH LOCAL AND STATE AGENCIES (PENN DOT DISTRICT 8-0 AND EDEN TOWNSHIP).

6. THE CONTRACTOR SHALL NOTIFY THE ENGINEER WHEN FIELD CONDITIONS VARY FROM THE APPROVED PLANS OR THE METHOD OF GRADING ATTACHMENT CANNOT BE ACCOMPLISHED AS SHOWN.

7. WHERE THE CONTRACTORS WORK REQUIRES INSPECTION BY THE ENGINEER PRIOR TO COMPLETION OR AS NOTED IN THE PLANS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST TWO (2) WORKING DAYS IN ADVANCE OF THE SITE INSPECTION TO ARRANGE A TIME FOR THE ADDITIONAL INSPECTION.

MATERIALS:

8. JOB SITE MATERIAL WILL BE DELIVERED TO AND MAINTAINED AT WORK AREAS IN A WELL MANAGED MANNER, TO MINIMIZE CONGESTION OR INCONVENIENCE TO OTHER WORKERS, OR CONTRACTORS WORKING UNDER ALTERNATE PERMITS.

UTILITY:

9. THE CONTRACTOR SHALL CONTACT PENNSYLVANIA ONE CALL AT 611 AT LEAST 3 BUSINESS DAYS PRIOR TO BEGINNING WORK.

10. THE CONTRACTOR IS RESPONSIBLE FOR THE INVESTIGATION, LOCATION, SUPPORT, PROTECTION, AND RESTORATION OF ALL EXISTING UTILITIES WHETHER SHOWN ON THESE PLANS OR NOT. NS DOES NOT GUARANTEE PLAN ACCURACY OR COMPLETENESS. THE CONTRACTOR SHOULD VERIFY LOCATIONS WITH THE UTILITY COMPANIES NOT LESS THAN 48 HOURS PRIOR TO STARTING EXCAVATION ACTIVITIES.

PROPERTY:

11. THE CONTRACTOR SHALL VERIFY EXISTING STREET RIGHT OF WAYS TO THE EXTENT NECESSARY TO VERIFY PROPOSED WORK REMAINS WITHIN THESE RIGHT OF WAYS AND DOES NOT INFRINGE ONTO PRIVATE PROPERTY NOT OWNED BY THE OWNER.

MAINTENANCE OF TRAFFIC:

T1. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST TWO WEEKS PRIOR TO MODIFYING THIS TRAFFIC CONTROL PLAN. ANY MODIFICATIONS MUST BE APPROVED BY PENNDOT DISTRICT 8-0 PRIOR TO PUTTING THE CHANGE INTO OPERATION.

T2. THESE PLANS ARE BEING REVIEWED FOR COMPLIANCE WITH STANDARDS PRESCRIBED IN CHAPTER 212 OF THE 67 PA CODE AS CURRENTLY AMENDED. THIS TRAFFIC CONTROL PLAN DOES NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY AS SPECIFIED IN SECTION 901.3A OF THE PUBLICATION 408 (CURRENT VERSION).

T3. CLOSE SR 2015 (PUMPING STATION ROAD) TO THROUGH TRAFFIC IN ACCORDANCE WITH THE TRAFFIC CONTROL PLAN FOR THE DURATION OF CONSTRUCTION. CONTACT THE LOCAL MUNICIPALITIES, LOCAL SCHOOL DISTRICTS, AMBULANCE SERVICES, THE COUNTY EMERGENCY CONTROL, PENNDOT PERMITS UNIT, PENNDOT COMMUNITY RELATIONS COORDINATOR, AND THE POST OFFICE TWO (2) WEEKS PRIOR TO DETOURING TRAFFIC. PROVIDE DOCUMENTATION OF NOTIFICATION TO THE INSPECTOR-IN-CHARGE. CONTACT TELEPHONE NUMBERS ARE AS LISTED:

EDEN TOWNSHIP	(717) 755-7915
PA STATE POLICE, TROOP J	(717) 299-7650
LANCASTER COUNTY POLICE DISPATCH	(717) 664-1180 (TOLL FREE BELOW)
LANCASTER COUNTY FIRE/EMS DISTRICT	(717) 664-1190 (TOLL FREE BELOW)
QUARRYVILLE POST OFFICE	(717) 785-2420
SOLANCO SCHOOL DISTRICT	(717) 786-8401
PENNDOT DISTRICT 8-0 SPECIAL HAULING PERMITS OFFICER	(717) 787-5918
PENNDOT DISTRICT 8-0 COMMUNITY RELATIONS COORDINATOR	(717) 787-1446
LANCASTER COUNTY-WIDE COMMUNICATIONS	
PO BOX 457, MANHEIM, PA 17545-0487	
MAINTENANCE MANAGER	(717) 299-7621
ADMINISTRATION	(717) 664-1100
	(800) 297-5292
COMMUNICATIONS (FIRE/EMS)	(800) 691-3473
COMMUNICATIONS (POLICE)	(800) 957-2677

T4. COORDINATE ALL WORK WITH THE PENNDOT DISTRICT 8-0 RAILROAD GRADE CROSSING COORDINATOR, AHMED LASLOUDJI (717) 787-4732

T5. NOTIFY THE ENGINEER THREE (3) DAYS IN ADVANCE OF ROAD CLOSURE AND THIRTY (30) MINUTES PRIOR TO THE START OF WORK. THE ENGINEER WILL NOTIFY THE PENNDOT DISTRICT 8-0 TRAFFIC MANAGEMENT CENTER (TMC) TWO (2) DAYS IN ADVANCE OF THE ROAD CLOSURE AND FIFTEEN (15) MINUTES PRIOR TO THE START OF WORK. THE ENGINEER WILL NOTIFY THE TMC (15) DAYS PRIOR TO THE ROAD RE-OPENING AND WHEN THE ROAD IS RESTORED TO NORMAL OPERATION. THE PENNDOT DISTRICT 8-0 TMC CONTACT NUMBER IS (717) 265-7800.

T6. THE TRAFFIC CONTROL PLAN SHEETS NO. 10 AND 11 CONTAINED IN THIS PLAN SET ARE INTENDED TO GUIDE THE CONTRACTOR IN DIVERTING THE EXISTING TRAFFIC FLOWS IN AN EFFICIENT MANNER DURING THE COURSE OF THE PROJECT. ADDITIONALLY, ANY TRAFFIC CONTROL SCHEME EMPLOYED BY THE CONTRACTOR MUST BE APPROVED BY NORFOLK SOUTHERN AND PENNDOT DISTRICT 8-0.

T7. THE CONTRACTOR(S) SHALL BE RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ADEQUATE TRAFFIC CONTROL DEVICES TO INFORM AND PROTECT THE PUBLIC.

T8. THE M-937R ROUTE/BRIDGE RESTRICTION FORM IS TO BE COMPLETED AND SUBMITTED TO THE DISTRICT 8 HAULING PERMITS OFFICE (RA-PDDIST8HAULINGPER@PA.GOV) A MINIMUM OF TWELVE (12) WORKING DAYS PRIOR TO THE CLOSURE. FOR ANY QUESTIONS REGARDING THE PERMIT, CONTACT JAMIE ZARR AT (717) 785-5138.

T9. REGULATORY TRAFFIC CONTROL DEVICES SHOULD BE MODIFIED AS NEEDED FOR THE DURATION OF THE DETOUR.

T10. THE M-937RO ROUTE/BRIDGE RESTRICTION OPENING FORM IS TO BE COMPLETED AND SUBMITTED TO THE DISTRICT 8-0 HAULING PERMITS OFFICE (RA-PDDIST8HAULINGPER@STATE.PA.US) A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO THE RE-OPENING OF THE ROADWAY. FOR ANY QUESTIONS REGARDING THE PERMIT, CONTACT JAMIE ZARR AT (717) 785-5138.

T11. ONE (1) W23-1 SIGN IS TO BE PLACED IN EACH DIRECTION OF THE CLOSURE READING "THIS ROAD TO BE CLOSED FOR CONSTRUCTION STARTING (DATE)" FOURTEEN (14) CALENDAR DAYS PRIOR TO THE CLOSURE.

T12. UNLESS OTHERWISE SPECIFIED, ALL TRAFFIC CONTROL DEVICES FOR THE DETOUR SHALL BE FURNISHED, ERECTED, MODIFIED, MAINTAINED, AND SUBSEQUENTLY REMOVED BY THE CONTRACTOR FOR CONTRACT OPERATIONS.

T13. FURNISH, ERECT, PLACE, AND MAINTAIN TRAFFIC CONTROL SIGNS AND DEVICES AND MAINTAIN TRAFFIC DURING HOURS OF CONSTRUCTION AND AT ALL OTHER TIMES IN ACCORDANCE WITH THE METHODS INDICATED ON THESE DRAWINGS AND:

- ☐THE SPECIAL PROVISIONS OF THE CONTRACT
- ☐THE MANUAL UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)
- ☐PUBLICATION 212, OFFICIAL TRAFFIC CONTROL DEVICES, SUB-CHAPTER E.
- ☐PUBLICATION 213, TEMPORARY TRAFFIC CONTROL GUIDELINES (PATA 306).
- ☐ PUBLICATION NO. 35, APPROVED CONSTRUCTION MATERIALS (BULLLETIN 15).
- ☐PUBLICATION 408, SPECIFICATIONS.
- ☐PUBLICAITON 111M, TRAFFIC CONTROL PAVEMENT MARKINGS AND SIGNING STANDARDS, TC-8600 AND TC-8700 SERIES.

T14. THE DURATION OF ROAD CLOSURE SHALL BE 60 DAYS.

HANSON

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MATHEW ALAN FLETCHER
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PE083505

12/29/2015

NS NORFOLK SOUTHERN

OWNING COMPANY

OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
GENERAL NOTES

DSN GCN	PID No.	VRN	MILE POST 11.68
DWN JRW	FILE No. C-102-GENERAL NOTES	DRAWING NUMBER	
CHK GCN	DATE 12/22/2015		

MODEL NAME: Typicall
DATE PRINTED: 12/22/2015
CADD FILE: I:\14_jobs\14RR\84\CAD\Rail\Sheets\C-102-General_Notes.dgn
LAST SAVED: 12/22/2015

SUMMARY OF QUANTITIES

ITEM NUMBER	ITEM NAME	UNITS	QTY
	CONTRACTOR BID ITEMS		
A	MOBILIZATION	LS	1
B	CLEARING AND GRUBBING	ACRE	0.16
C	EXCAVATION, CLASS 1	CY	295
D	EXCAVATION, CLASS 3	CY	188
E	ASPHALT PAVEMENT	TON	29
F	AGGREGATE SUBBASE	SY	20
G	CAST-IN-PLACE CONCRETE SHOULDER	CY	3
H	CAST-IN-PLACE CONCRETE	CY	89
I	REINFORCING STEEL	LB	11,185
J	STEEL GRATING	EA	133
K	STEEL CLOSURE PLATE	EA	4
L	OUTLET PROTECTION: ROCK	SY	32
M	PERMIT COMPLIANCE AND EROSION CONTROL	LS	1
N	MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	LS	1

PAVEMENT MARKING (BY OTHERS)

ROADWAY	STATION	STATION	LT/RT	WHITE SOLID, 4" (FT)	YELLOW DOUBLE, 4" (FT)	YIELD LINE, 12"x18" (FT)
PUMPING STATION ROAD	0+30.00	4+67.00		874		
PUMPING STATION ROAD	0+80.00					10
PUMPING STATION ROAD	4+17.00					10
PUMPING STATION ROAD	0+30.00	0+80.00			50	
PUMPING STATION ROAD	4+17.00	4+67.00			50	
		TOTAL		874	100	20

TRAFFIC CONTROL SIGNS (BY OTHERS)

ROADWAY	DESCRIPTION	EXISTING SIGN TO REMAIN	EXISTING SIGN TO BE REMOVED	SIGN TO BE INSTALLED	SIGN TO BE RESET OR RELOCATED	NEW MARKER
		EACH	EACH	SQ. FT.	EACH	EACH
PUMPING STATION RD	DELINEATION, TYPE GM-1					4
PUMPING STATION RD	OM-3L 12"x36"				2	
PUMPING STATION RD	OM-3R 12"x36"				2	
PUMPING STATION RD	R1-2 36"x36"			18.0		
PUMPING STATION RD	R1-2A 24"x18"			6.0		
PUMPING STATION RD	R2-1 30"x36"	1	1		1	
PUMPING STATION RD	SEGMENT MARKER 10"x10"				2	
PUMPING STATION RD	W3-2 36"x36"			18.0		
PUMPING STATION RD	W5-2A 36"x36"		2			
PUMPING STATION RD	W5-3A 36"x36"			18.0		
PUMPING STATION RD	W12-2 36"x36"				2	
TOTALS		1	3	60.0	9	4

MAINTENANCE OF TRAFFIC SIGNS

SIGN DESCRIPTION	EACH	AREA (SQ. FT)	TOTAL AREA (SQ. FT)
M4-9L 30"x24" TYPE B	6	5.0	30
M4-9R 30"x24" TYPE B	4	5.0	20
M4-9S 30"x24" TYPE B	2	5.0	10
M4-9SL 30"x24" TYPE B	2	5.0	10
M4-9SR 30"x24" TYPE B	1	5.0	5
M4-10L	2	6.0	12
M4-10R 48"x18" TYPE III	2	6.0	12
R11-2 48"x30" TYPE III	2	10.0	20
R11-3A 60"x30"	4	12.5	50
W16-8P VARIABLE	4	16.0	64
W20-2 48"x48" TYPE B	4	16.0	64
W20-3 48"x48" TYPE B	2	16.0	32
W23-101 96"x48"	2	16.0	32
TOTALS	37	123.5	361

EARTHWORK

EARTHWORK TYPE	CY
EXCAVATION CLASS 1	295
EXCAVATION CLASS 3	188
EMBANKMENT	89
EMBANKMENT BACKFILL	15
EMBANKMENT BEDDING	81

EMBANKMENT COST INCLUDED WITH EXCAVATION, CLASS 1.
EMBANKMENT (BACKFILL) COST INCLUDED WITH EXCAVATION, CLASS 1.
EMBANKMENT (BEDDING) COST INCLUDED WITH EXCAVATION, CLASS 3.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
MATHEW ALAN FLETCHER
PE083506
12/29/2015

NS NORFOLK SOUTHERN
OWNING COMPANY
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

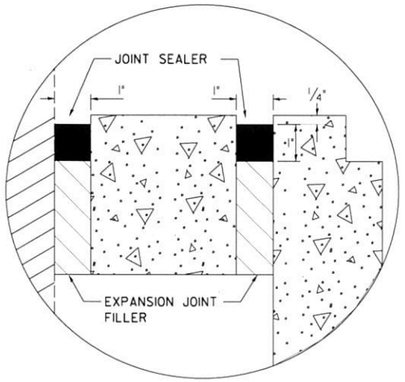
CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
SUMMARY OF QUANTITIES

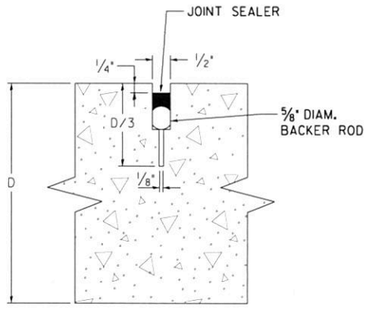
DGN GCN | PID No. | VAN | MILE POST 11.68
DWN JRW | FILE No. C-104-QUANTITIES | DRAWING NUMBER
CHK GCN | DATE 12/22/2015

MODEL NAME: Typical
DATE PRINTED: 12/22/2015
CADD FILE: J:\14_jobs\14R0184\CAD\Rail\Sheet\C-104-Quantities.dgn
LAST SAVED: 12/22/2015



DETAIL 1 - CONCRETE SHOULDER

LONGITUDINAL JOINT
N.T.S.

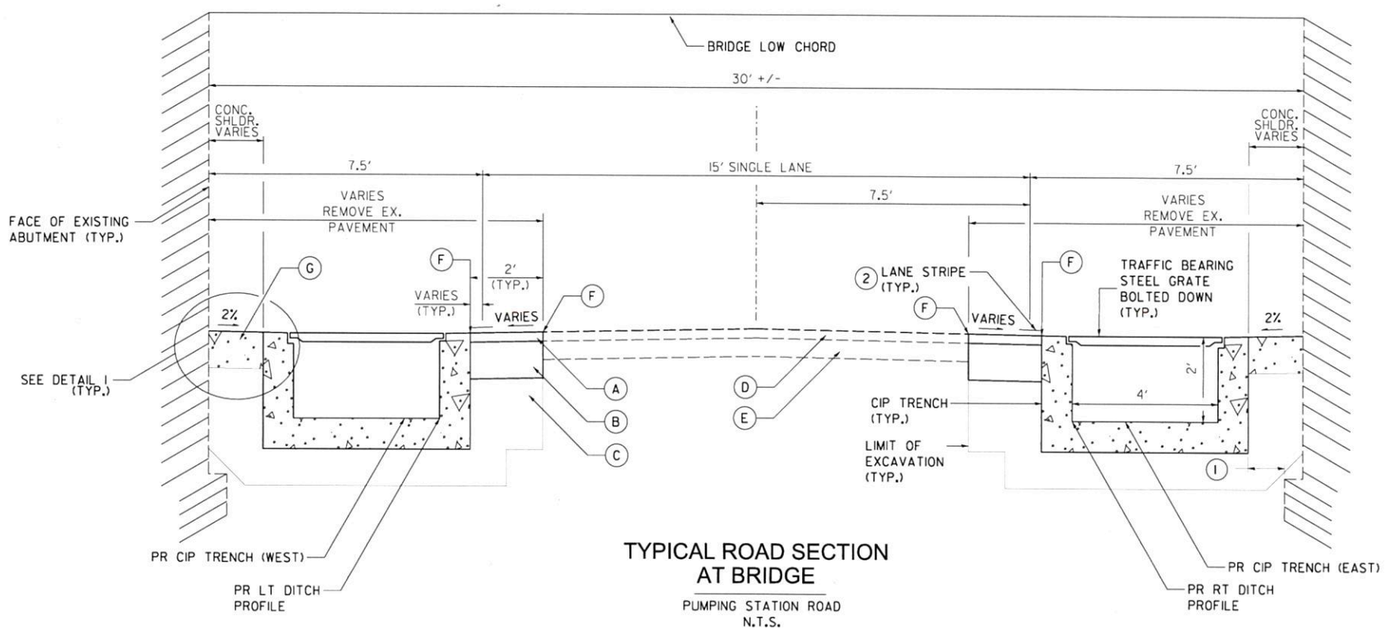


DETAIL 2 - CONCRETE SHOULDER

TRANSVERSE JOINT
N.T.S.

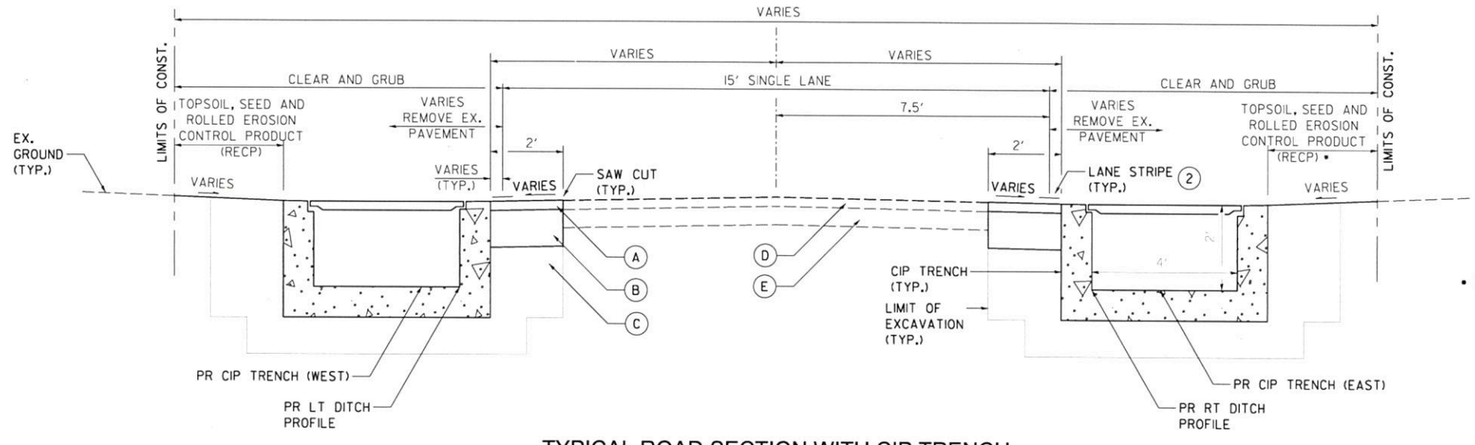
NOTES:

1. TRANSVERSE JOINTS SHALL BE PLACED EVERY 15' AND ALIGNED WITH STUCTURE JOINTS.



TYPICAL ROAD SECTION AT BRIDGE

PUMPING STATION ROAD
N.T.S.



TYPICAL ROAD SECTION WITH CIP TRENCH

PUMPING STATION ROAD
N.T.S.

• PLACE 12" AGGREGATE SUBBASE, TYPE C NO. 2A COMPACTED TO 95% MODIFIED PROCTOR FROM STA. 1+70 TO STA. 2+00.

(1) 1' MIN. CLEARANCE FROM EXISTING FOOTING

(2) PAVEMENT MARKINGS BY OTHERS.

(A) 2" WEARING COURSE OF FJ-1 WITH PG-64-22 BINDER.

(B) 6" BASE COURSE OF FJ-1 WITH PG-64-22 BINDER.

(C) FOR CIP TRENCH BEDDING AND BACKFILL, SEE SHEET TYPICAL SECTION, JOINTING PLAN, AND DETAILS.

(D) EX. BITUMINOUS WEARING COURSE.

(E) EX. BASE COURSE.

(F) SEAL JOINTS WITH ASPHALT SEALER.

(G) CONCRETE SHOULDERS SHALL BE 6" PLAIN CEMENT CONCRETE PAVEMENT.

HANSON

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12/29/2015

NS NORFOLK SOUTHERN

OWNING COMPANY
OPERATING DIVISION: OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

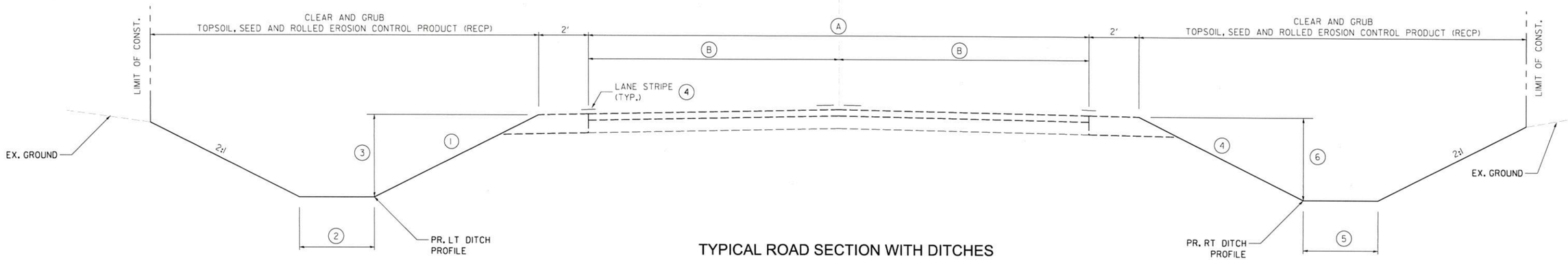
MODEL NAME: Typical1
DATE PRINTED: 12/22/2015
CADD FILE: I:\14_jobs\14RIB84\CAD\Rail\Sheet\C-301-Typical.dgn
LAST SAVED: 12/22/2015

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
TYPICAL SECTIONS (1)

DGN	GCN	PID No.		MILE POST 11.68
DWN	JRW	FILE No. C-301-TYPICAL		DRAWING NUMBER
CHK	GCN	DATE 12/22/2015		



PR. LT DITCH

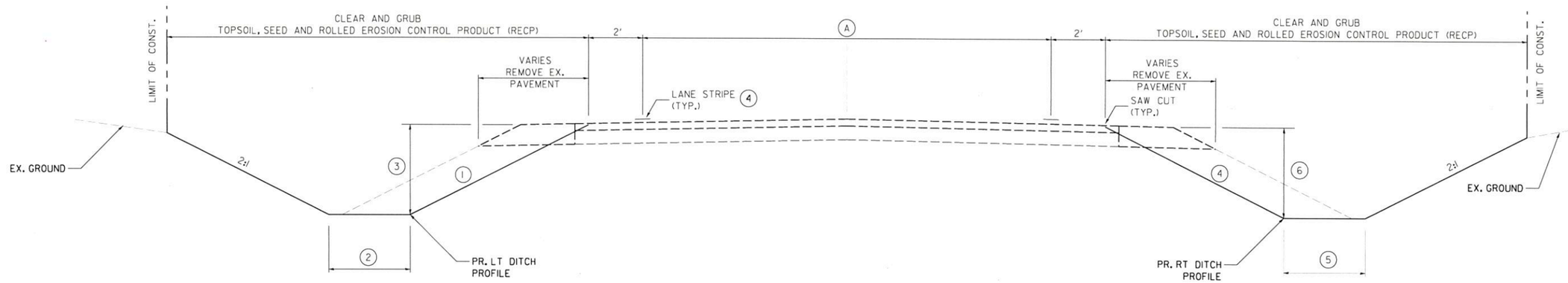
STA. 0+72 TO STA. 0+80

TYPICAL ROAD SECTION WITH DITCHES

PUMPING STATION ROAD

PR. RT DITCH

STA. 0+00 TO STA. 0+80



PR. LT DITCH

STA. 0+80 TO STA. 1+79.15 AND
STA. 3+05.75 TO STA. 3+40

TYPICAL ROAD SECTION WITH DITCHES

PUMPING STATION ROAD

PR. RT DITCH

STA. 0+80 TO STA. 1+61.68 AND
STA. 3+25.04 TO STA. 3+78

(1) LT FRONT SLOPE:
3:1 FROM STA. 0+72 TO STA. 1+60.
TRANSITION 3:1 TO 2:1 FROM
STA. 1+60 TO STA. 1+70.
TRANSITION FROM 2:1 TO 1.75:1 FROM
STA. 1+70 TO STA. 1+79.15.

2:1 FROM STA. 3+05.75 TO STA. 3+10.
TRANSITION FROM 2:1 TO 4:1 FROM
STA. 3+10 TO STA. 3+50.

(2) LT DITCH WIDTH:
3' FROM STA. 0+72 TO STA. 1+79.15.
3' FROM STA. 3+05.75 TO 3+50.

(3) SEE PROFILE SHEET FOR LT DITCH PROFILE.

(4) PAVEMENT MARKINGS BY OTHERS.

(A) TRAVELWAY WIDTH:
20' FROM BEGIN TO STA. 0+80.
TRANSITION FROM 20' TO 15'
FROM STA. 0+80 TO STA. 1+55.
15' FROM STA. 1+55 TO STA. 3+42.
TRANSITION FROM 15' TO 20'
FROM STA. 3+42 TO STA. 4+17.
20' FROM STA. 4+17 TO END.

(B) LANE WIDTH:
10' FROM BEGIN TO STA. 0+80.

(4) RT FRONT SLOPE:
4:1 FROM STA. 0+00 TO STA. 1+20.
TRANSITION 4:1 TO 2.25:1 FROM
STA. 1+20 TO STA. 1+40.
2.25:1 FROM STA. 1+40 TO STA. 1+61.68.

1.75:1 FROM STA. 3+25.04 TO STA. 3+35.
TRANSITION FROM 1.75:1 TO 3:1 FROM
STA. 3+35 TO STA. 3+78.
3:1 FROM STA. 3+50 TO STA. 3+78.

(5) RT DITCH WIDTH:
2' FROM STA. 0+00 TO STA. 1+20.
TRANSITION 2' TO 3' FROM
STA. 1+20 TO STA. 1+40.
3' FROM STA. 1+40 TO STA. 1+61.68

3' FROM STA. 3+25.04 TO STA. 3+78.

(6) SEE PROFILE SHEET FOR RT DITCH PROFILE.

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OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

CONSTRUCTION SET

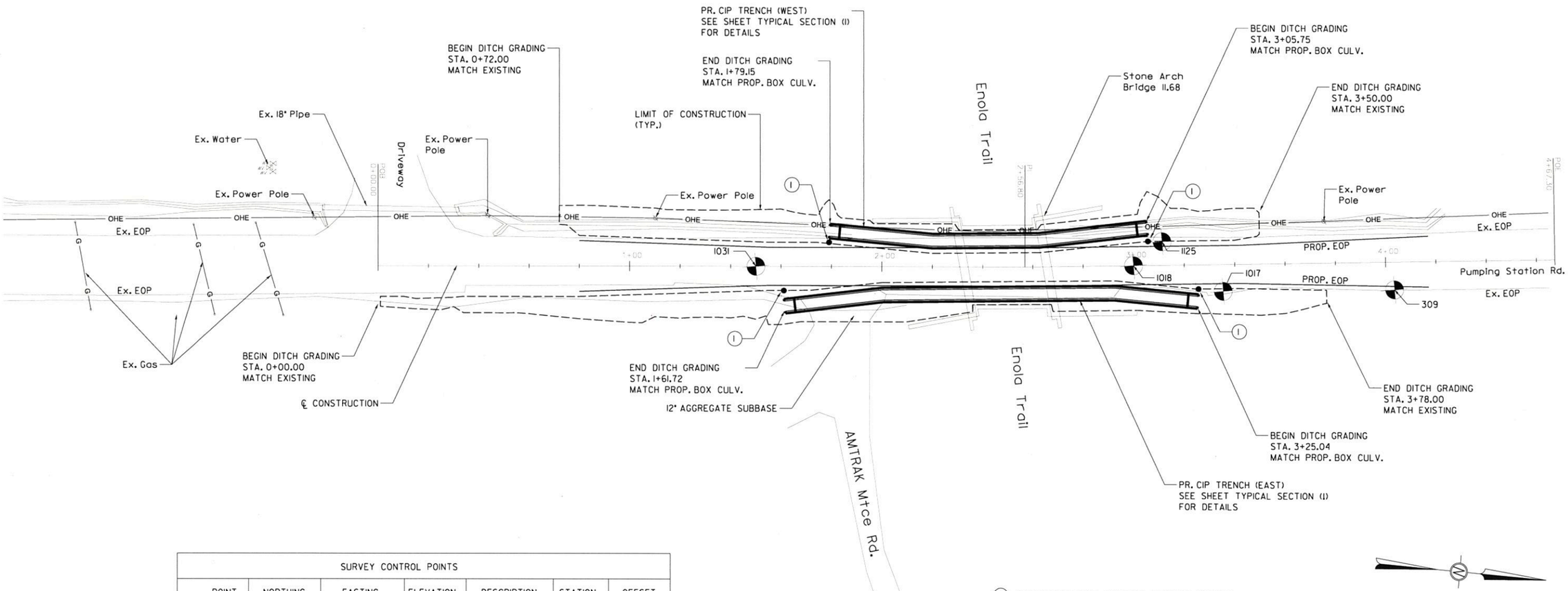
REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
TYPICAL SECTIONS (2)

DGN GCN | PID No. | VPI | MILE POST 11.68
DWN JRW | FILE No. C-301-TYICAL | DRAWING NUMBER
CHK GCN | DATE 12/22/2015

MODEL NAME: Typical2
DATE PRINTED: 12/22/2015
CADD FILE: I:\14jobs\14RBIB4\CAD\Rail\Sheet\C-301-Typical.dgn
LAST SAVED: 12/22/2015

℄ CONSTRUCTION ALIGNMENT				
POINT	STATION	NORTHING	EASTING	BEARING
POB	0+00.00	211,319.2680	2,424,674.8503	
PI	2+56.80	211,574.9347	2,424,650.7341	N 5° 23'18.85" W
POE	4+67.30	211,784.1261	2,424,627.3324	N 6° 22'58.81" W



SURVEY CONTROL POINTS						
POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION	STATION	OFFSET
1031	211,468.6341	2,424,660.7611	513.83	MAGNETIC NAIL	1+50.03	0.00'
1018	211,617.8652	2,424,645.9316	515.57	MAGNETIC NAIL	3+00.00	0.00'
1125	211,628.1653	2,424,635.4224	515.96	MAGNETIC NAIL	3+11.40	9.30' LT
1017	211,654.1219	2,424,652.4702	516.42	MAGNETIC NAIL	3+33.30	10.53' RT
309	211,721.8700	2,424,645.2640	518.49	MAGNETIC NAIL	4+03.43	10.90' RT

STATIONING AND OFFSET ARE BASED ON EXISTING ROAD ALIGNEMENT HORIZONTAL DATUM NAD83. VERTICAL DATUM NAVD88. TOPOGRAPHIC SURVEY PERFORMED BY URBAN ENGINEERS, INC. ON JULY 8-9, 2015.

(1) DELINEATOR, TYPE GM-1PER PENNDOT DRAWING TC-8604 SHALL BE PLACED AT:
STA. 1+61, 9.5' RT.
STA. 1+79, 9.5' LT.
STA. 3+06, 9.5' LT.
STA. 3+26, 9.5' RT.

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ENGINEER
PE083505
12/29/2015

SCALE: 1"=40'
10' 0 20' 40' 60'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

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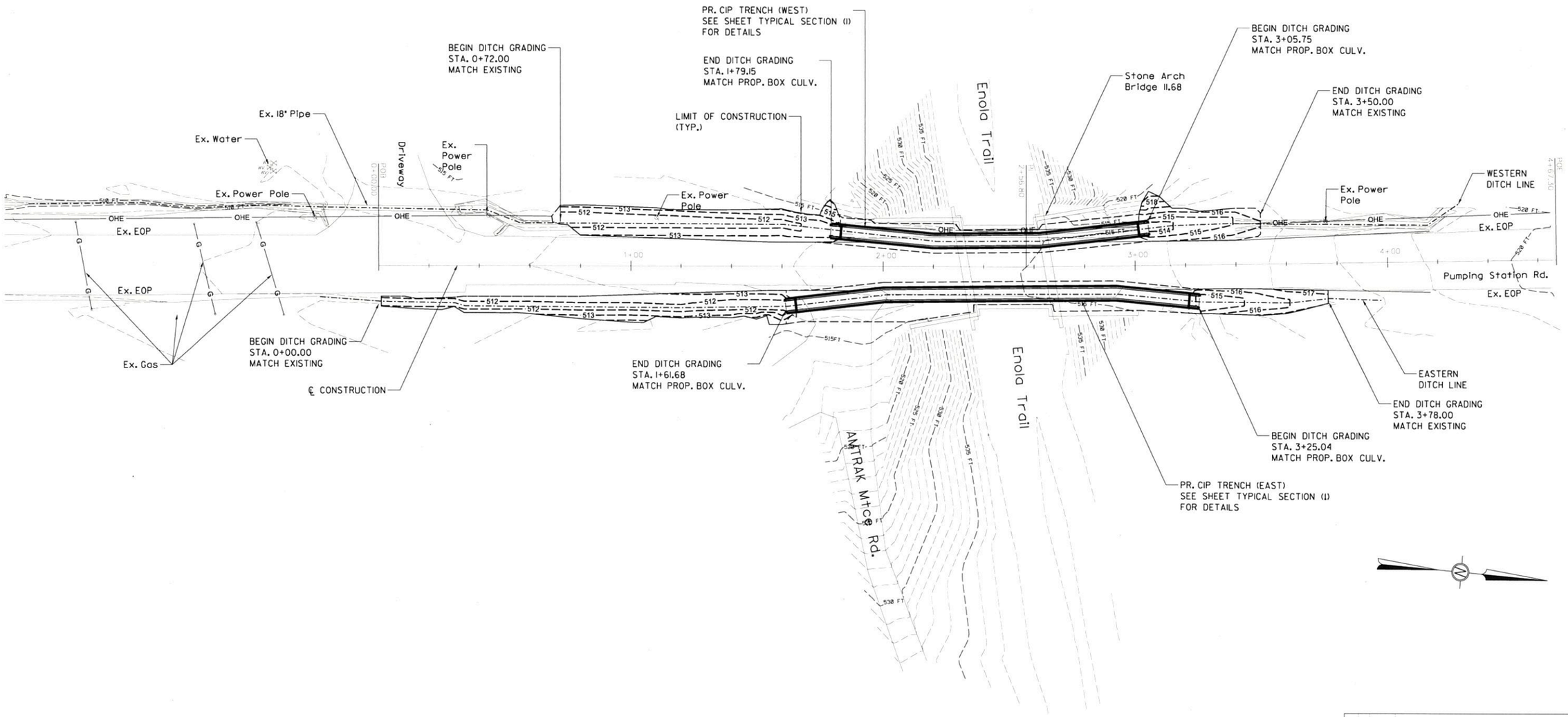
MODEL NAME: Default
DATE PRINTED: 12/22/2015
CADD FILE: I:\NA_jobs\184180\84\CADD\Rail\Sheets\C-101-Plan.dgn
LAST SAVED: 12/22/2015

CONSTRUCTION SET

REV.	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS PLAN

DSN	GCN	PID No.	MILE POST 11.68
DWN	ROH	FILE No. C-101-PLAN	DRAWING NUMBER
CHK	GCN	DATE 12/22/2015	



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12/29/2015

SCALE: 1"=40'
10' 0 20' 40' 60'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS GRADING

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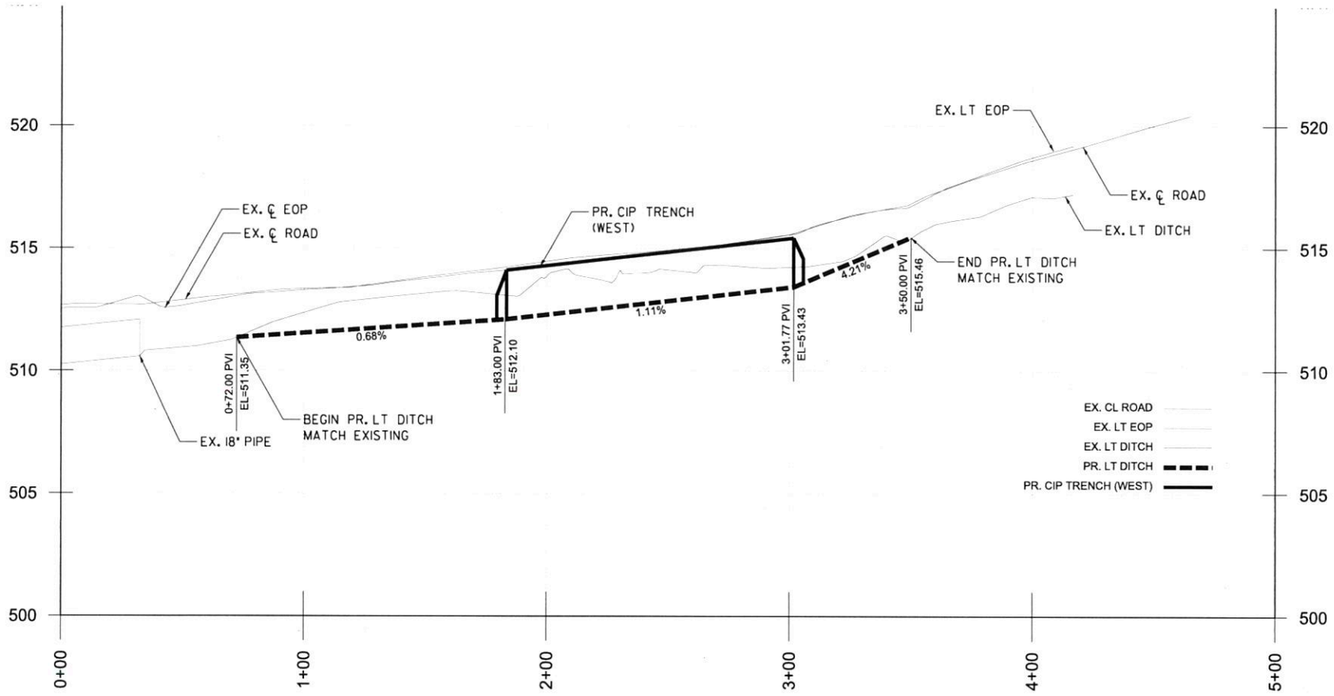
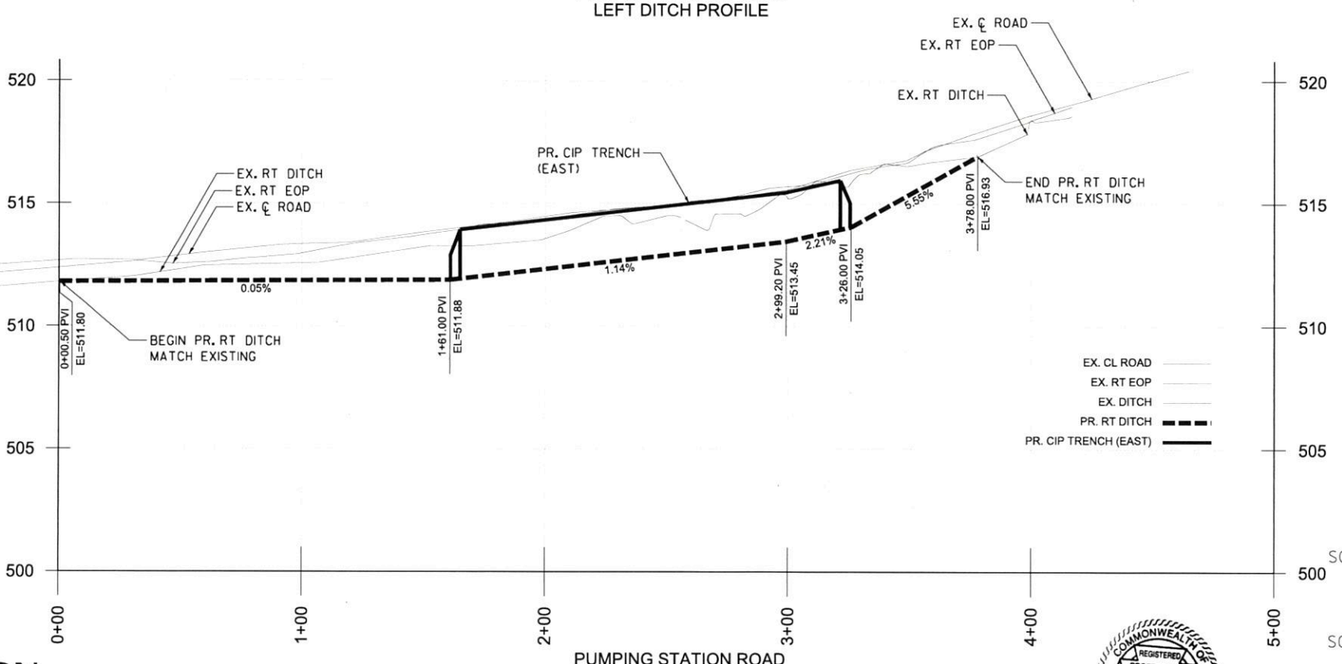
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

DSN	GCN	PID No.		VRN		MILE POST	11.68
DWN	JRW	FILE No.	C-103-GRADING	DRAWING NUMBER			
CHK	GCN	DATE	12/22/2015				

MODEL NAME: Default
DATE PRINTED: 12/22/2015
CADD FILE: I:\14jobs\14RBI84\CAD\Rail\Sheets\C-103-Grading.dgn
LAST SAVED: 12/22/2015



PUMPING STATION ROAD
LEFT DITCH PROFILE



PUMPING STATION ROAD
RIGHT DITCH PROFILE

VERTICAL SCALE

SCALE: 1"=6'

1.5' 0 3' 6' 9'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

HORIZONTAL SCALE

SCALE: 1"=60'

15' 0 30' 60' 90'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

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PE083505

12/29/2015

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

NORFOLK SOUTHERN

OWNING COMPANY

OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

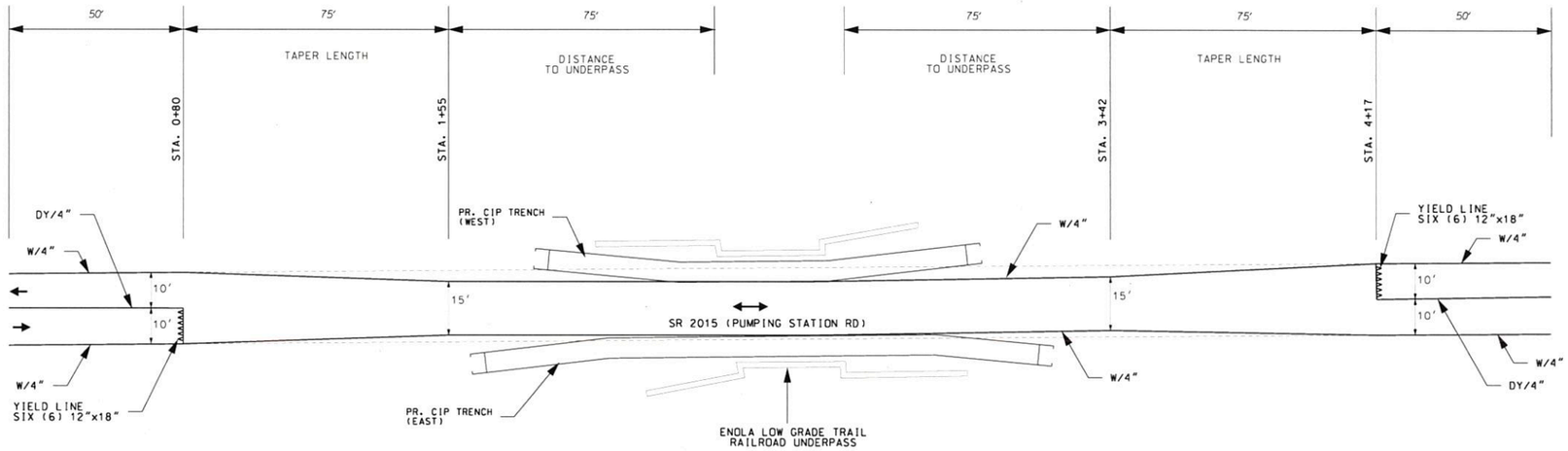
LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
DITCH PROFILE

DGN	GCN	PID No.	MILE POST 11.68
DWN	JRW	FILE No. C-201-PROFILE	DRAWING NUMBER
CHK	GCN	DATE 12/22/2015	

MODEL NAME: Default
DATE PRINTED: 12/22/2015

CADD FILE: I:\14_jobs\14RBIB4\CAD\Rail\Sheets\C-201-Profile.dgn
LAST SAVED: 12/22/2015

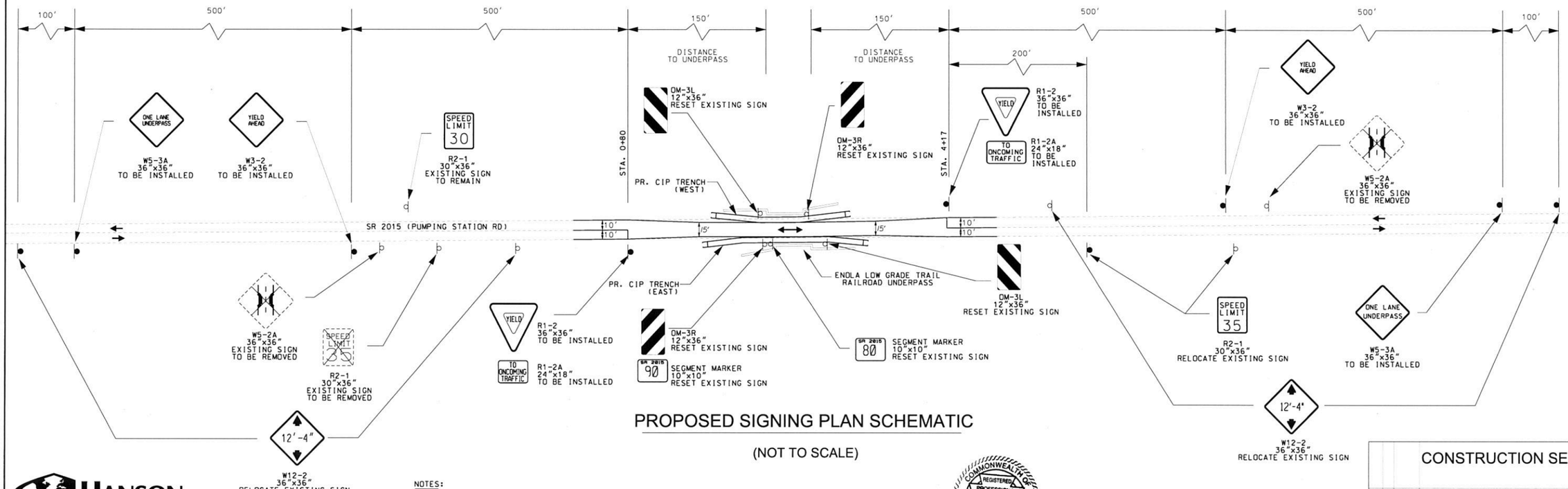


LEGEND

- EXISTING SIGN
- PROPOSED SIGN
- EXISTING SIGN TO BE REMOVED
- DIRECTION OF TRAVEL
- W/4" SOLID WHITE LINE/WIDTH
- DY/4" DOUBLE YELLOW LINE/WIDTH
- YIELD LINE, SIX (6) 12"x18"

PROPOSED PAVEMENT MARKING PLAN SCHEMATIC

(NOT TO SCALE)



PROPOSED SIGNING PLAN SCHEMATIC

(NOT TO SCALE)

NOTES:

1. PROPOSED PAVEMENT MARKING PLAN SCHEMATIC AND PROPOSED SIGNING PLAN SCHEMATIC ARE BASED ON TRAFFIC CONTROL STUDY FOR SINGLE LANE OPERATIONS AT RR UNDERPASS BY MICHAEL BAKER INTERNATIONAL ON FEBRUARY 24, 2015 AND MODIFIED BY PADOT.
2. REMOVE EXISTING PAVEMENT MARKINGS FROM STA. 0+30 TO STA. 4+67.
3. SIGNING AND PAVEMENT MARKING BY OTHERS.

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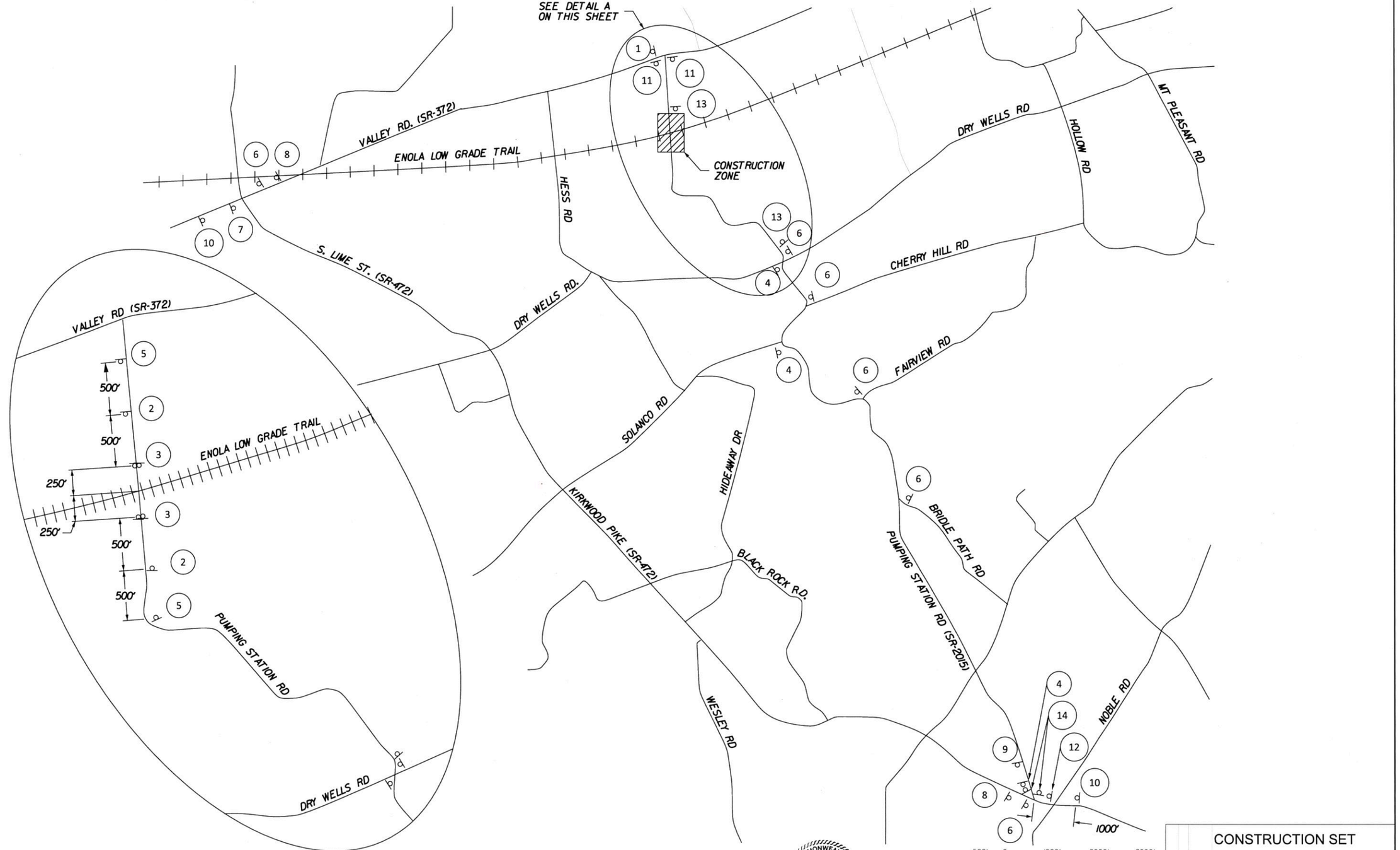
CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS TRAFFIC SIGNING AND MARKING

DSN	GCN	PID No.	MILE POST 11.68
DWN	JRW	FILE No. C-601-SIGN-MARK	DRAWING NUMBER
CHK	GCN	DATE 12/22/2015	

MODEL NAME: Default
DATE PRINTED: 12/22/2015
CADD FILE: I:\14jobs\14RIB\84\CAD\Resil\Sheets\C-601-Sign-Mark.dgn
LAST SAVED: 12/22/2015



DETAIL A
NOT TO SCALE

NOTES:

1. PROPOSED DETOUR IS BASED ON TRAFFIC CONTROL PLANS BY HBK ENGINEERING DATED APRIL 20, 2011.
2. FOR TRAFFIC SIGN TYPE, SEE SHEET 11.

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SCALE: 1"=2000'
500' 0 1000' 2000' 3000'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS TRAFFIC CONTROL PLAN (1)

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DSN	GCN	FID No.	MILE POST 11.68
DWN	JRW	FILE No. C-6001-DETOUR	DRAWING NUMBER
CHK	GCN	DATE 12/22/2015	

MODEL NAME: Default
DATE PRINTED: 12/22/2015
CADD FILE: I:\14_jobs\14RB1B4\CAD\Rail\Sheet\C-6001-Detour.dgn
LAST SAVED: 12/22/2015

1

M4-9S
30" x 24"
TYPE B

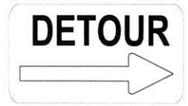
2

W20-3
TYPE B

3

R11-2
48" x 30"
TYPE III

4

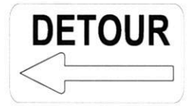


M4-9R
30" x 24"
TYPE B

5

W20-3
TYPE B

6



M4-9L
30" x 24"
TYPE B

7

W16-8P
VARIABLE
(SEE NOTE
BELOW)

M4-9R
30" x 24"
TYPE B

8

M4-9SL
30" X 24"
TYPE B

9

M4-9SR
30" X 24"
TYPE B

10

W16-8P
VARIABLE
(SEE NOTE
BELOW)

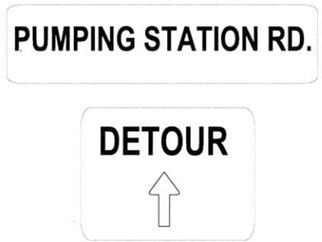
W20-2
TYPE B

11

R11-3A
60" x 30"

M4-10R
48" x 18"
TYPE III

12



W16-8P
VARIABLE
(SEE NOTE
BELOW)

M4-9S
30" x 24"
TYPE B

13

W23-101
96" x 48"

14

W23-101
96" x 48"

M4-10R
48" x 18"
TYPE III

NOTE:
FOR W16-8P SIGNS, CHOOSE 6" HIGH UPPER/LOWER CASE CLEARVIEW HWY FONT FOR BEST FIT.
(PENNDOT PUB 236M, W16-8P)

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CONSTRUCTION SET

REV.	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
TRAFFIC CONTROL PLAN (2)

DSN	GCN	PID No.		MILE POST	11.68
DWN	JRW	FILE No.	C-6002-DETOUR	DRAWING NUMBER	
CHK	GCN	DATE	12/22/2015		

MODEL NAME: Default
DATE PRINTED: 12/22/2015
CADD FILE: D:\14jobs\14R0184\CAD\Rail\Sheets\C-6002-Detour.dgn
LAST SAVED: 12/22/2015

EROSION AND SEDIMENT CONTROL CONSTRUCTION NOTES:

E1. DISTURBED AREA IS DEPENDENT ON FINAL FINISHED GRADING. TOTAL DISTURBED AREA SHOWN ON THESE PLANS IS 0.16 ACRES.

E2. CONDUCT ALL OPERATIONS AS SPECIFIED IN THE EROSION AND SEDIMENT POLLUTION CONTROL PLAN AND IN SUCH A MANNER TO MINIMIZE TURBIDITY IN RECEIVING STREAMS. DO NOT DISCHARGE WATER CONTAINING SEDIMENTS OR POLLUTANTS INTO STREAMS.

E3. TAKE STEPS TO PREVENT SPILLS OF FUELS OR LUBRICANTS. IF A SPILL DOES OCCUR, IT SHALL BE CONTROLLED IMMEDIATELY TO PREVENT ENTRY INTO THE WATERWAYS, AND THE LANCASTER COUNTY CONSERVATION DISTRICT WILL BE NOTIFIED IMMEDIATELY.

E4. DIRECT FLOWING WATER AWAY FROM THE PROJECT CONSTRUCTION AREAS AND SEPARATE ALL WATER ORIGINATING OUTSIDE THE PROJECT (CLEAN WATER) FROM WATER ORIGINATING WITHIN THE PROJECT.

E5. CONTROL THE ENTIRE GRADING AREA AT ALL TIMES DURING CONSTRUCTION BY PLACING THE EROSION AND SEDIMENT POLLUTION CONTROL DEVICES THAT CAN BE INSTALLED BEFORE EARTHMOVING BEGINS.

E6. STABILIZE SLOPES, DITCHES, CHANNELS, AND OTHER DISTURBED AREAS AS SOON AS THEY REACH FINAL GRADE. UPON COMPLETION OR SUSPENSION OF EARTH MOVING ACTIVITY FOR MORE THAN 3 (THREE) DAYS, THE PROJECT SITE MUST BE STABILIZED IMMEDIATELY.

E7. CONSTRUCT DRAINAGE FACILITIES FROM DOWNSTREAM TO UPSTREAM, BUILDING ONLY AS MUCH AS CAN BE STABILIZED ON THE SAME DAY. EMPLOY CONTROL MEASURES AS NECESSARY TO ENSURE THAT DRAINAGE FACILITIES ARE BUILT IN DRY CONDITIONS. IF DE-WATERING OF TRENCHES IS REQUIRED, REMOVE THE SEDIMENT FROM THE WATER IN ACCORDANCE WITH THE PADEP "EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL," CHAPTER 3, PAGE 53 "DEWATERING WORK AREAS."

E8. CLEAN THE SEDIMENT CONTROL DEVICES DURING CONSTRUCTION AS SPECIFIED IN PUBLICATION 408, SECTION 861. DISPOSE OF SILT FENCE, ROCK BARRIER, AND SEDIMENT REMOVED FROM PROJECT, AS DIRECTED BY THE ENGINEER.

E9. THE FOLLOWING SPECIFICATIONS (PENNDOT PUBLICAITON 408) ARE APPLICABLE TO EROSION AND SEDIMENT POLLUTION CONTROL:

SECTION 107.27 - WATERWAY REGULATIONS AND WATER POLLUTION CONTROL.
SECTION 107.28 - EROSION AND SEDIMENT POLLUTION CONTROL PLANS AND PERMITS.
SECTION 203 - CLASS 1, CLASS 1A, AND CLASS 1B EXCAVATION
SECTION 204 - CLASS 2, CLASS 3, AND CLASS 4 EXCAVATION
SECTION 212 - GEOTEXTILES
SECTION 804 - SEEDING AND SOIL SUPPLEMENTS
SECTION 805 - MULCHING
SECTION 806 - ROLLED EROSION CONTROL PRODUCTS
SECTION 845 - UNFORSEEN WATER POLLUTION CONTROL
SECTION 850 - ROCK LINING
SECTION 855 - PUMPED WATER FILTER BAG
SECTION 861 - CLEANING SEDIMENTATION STRUCTURES
SECTION 865 - SILT BARRIER FENCE
SECTION 867 - COMPOST FILTER SOCK

PERMANENT EROSION AND SEDIMENT CONTROL MEASURES:

E10. PERMANENT SEED AND MULCH WHEN PROJECT AREAS ARE CONSTRUCTED TO FINISH GRADE, FOLLOW PUBLICATION 408 , SECTION 804 AND 805 FOR FINAL PLACEMENT OF SEED AND MULCH. USE FORMULA D IN ALL AREAS. STRAW MULCH SHALL BE USED IN ALL AREAS NOT OTHERWISE PROTECTED BY MULCH BLANKET, EROSION CONTROL MATTING, OR ROCK LINING.

E11. ROCK PROTECTION - WILL BE INSTALLED AROUND THE WING WALLS AS INDICATED ON THE PLANS. PLACEMENT WILL BE IN ACCORDANCE WITH PUBLICATION 408, SECTION 850 AND DETAILS SHOWN ON THE PLANS.

E12. EROSION CONTROL MULCH BLANKET - SHALL BE PLACED ON EXPOSED SLOPES AND OTHER AREAS AS DIRECTED BY THE ENGINEER. INSTALL THE BLANKETS ACCORDING TO THE MANUFACTURER'S PUBLISHED INSTALLATION RECOMMENDATIONS. STAKES OR STAPLES FOR SECURING THE EROSION CONTROL BLANKETS TO THE SOIL MUST BE AT LEAST 6" LONG. EROSION CONTROL MULCH BLANKETS MUST CONFORM TO THE REQUIREMENTS IN PENNDOT PUBLICATION 408 SECTION 806.

TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES:

E13. TEMPORARY CONTROL MEASURES ARE REQUIRED UNTIL FINAL VEGETATIVE COVER HAS REACHED A UNIFORM COVERAGE OR DENSITY OF 70% ACROSS THE DISTURBED AREA. THE ENGINEER WILL INSPECT STABILIZATION AND APPROVE THE REMOVAL OF TEMPORARY DEVICES.

E14. TEMPORARY SEED AND MULCH - UPON SUSPENSION OF GRADING ACTIVITIES IN ANY AREA FOR MORE THAN 3 (THREE) DAYS, EXPOSED EARTH WILL BE STABILIZED WITH GROUND COVER IMMEDIATELY UPON COMPLETION OF ANY STAGE OF EARTHMOVING. TEMPORARY MULCH WILL BE APPLIED TO ALL AREAS, AND WILL CONSIST OF STRAW OR TEMPORARY EROSION CONTROL MULCH BLANKET. TEMPORARY SEED WILL BE APPLIED TO AREAS THAT WILL REMAIN EXPOSED FOR MORE THAN 10 DAYS. TEMPORARY SEED AND MULCH WILL BE IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 804, 805, AND 806.

E15. SILT BARRIER FENCE - WILL BE PLACED AS INDICATED ON THE PLANS. FENCES WILL BE INSTALLED AS THE DETAILS INDICATE AND FOLLOW RC STANDARD 70M, AND PUBLICATION 408 SECTION 865.

E16. COMPOST FILTER SOCK - WILL BE PLACED AS INDICATED ON THE PLANS. FILTER SOCKS WILL BE INSTALLED AS THE DETAILS INDICATE AND FOLLOW RC STANDARD 70M, AND PUBLICATION 408 SECTION 867.

E17. STORMWATER BYPASS - SANDBAG DIVERSION DAMS AND A PUMP BYPASS SYSTEM MAY BE USED TO DIVERT STORMWATER. DEVICES ARE TO BE INSTALLED ACCORDING TO PADEP STANDARD CONSTRUCTION DETAILS 3-15 AND FIGURE 3.11. THE LOCATION OF THE DEVICES WILL BE PLACED AS INDICATED ON THE PLANS.

E18. PUMPED WATER FILTER BAGS - MAY BE USED FOR DEWATERING TRENCHES OR PITS DURING EXCAVATION. DEVICES ARE TO BE INSTALLED ACCORDING TO RC STANDARD RC-75M AND PUBLICATION 408 SECTION 855. THE LOCATION OF THE DEVICES WILL BE LEFT TO THE CONTRACTOR AND WITH ENGINEER'S APPROVAL.

EROSION AND SEDIMENT CONTROL MAINTENANCE:

E19. TEMPORARY AND PERMANENT FACILITIES SHALL BE INSPECTED WEEKLY AND AFTER EACH STORM EVENT.

MAINTENANCE OF TEMPORARY FACILITIES:

E20. SILT BARRIER FENCE - REMOVE ACCUMULATED SEDIMENTS AS REQUIRED TO KEEP THE FENCE FUNCTIONAL. DEPOSITS WILL BE REMOVED IN ALL CASES WHEN THEY REACH HALF OF THE HEIGHT OF THE FENCE. IMMEDIATELY REPAIR UNDERCUTTING OR EROSION OF THE TOE ANCHOR WITH COMPACTED BACKFILL MATERIALS. ADHERE TO MANUFACTURER'S RECOMMENDATIONS FOR REPLACING FILTER OUTLETS ALONG THE SILT FENCE AT POINTS OF FREQUENT FAILURES.

E21. COMPOST FILTER SOCK - REMOVE ACCUMULATED SEDIMENTS AS REQUIRED TO KEEP THE FILTER SOCK FUNCTIONAL. DEPOSITS WILL BE REMOVED IN ALL CASES WHEN THEY REACH HALF THE HEIGHT OF THE FILTER SOCK. IMMEDIATELY REPAIR OR REPLACE DAMAGED AREAS.

E22. TEMPORARY SEEDING AND MULCH - TEMPORARY MULCH THAT HAS BEEN WORN, WASHED, OR BLOWN OUT WILL BE REPAIRED OR REPLACED IMMEDIATELY. EROSION CONTROL MULCH BLANKETS MAY BE USED IN PLACE OF STRAW MULCH THAT REQUIRES FREQUENT REPLACEMENT. TEMPORARY SEEDED AREAS THAT HAVE NOT GERMINATED SHOULD BE RESEEDED ONCE. FAILURE TO GERMINATE A SECOND TIME MAY REQUIRE THE INSTALLATION OF TEMPORARY EROSION CONTROL BLANKETS.

E23. STORMWATER BYPASS - INSPECT DIVERSION DAM AND REPLACE OR REPAIR IF DAMAGED. INSPECT PUMPS AND PIPING FOR PROPER OPERATION.

E24. PUMPED WATER FILTER BAG - REPLACE BAG WHEN COLLECTED DEBRIS REACHES OF MANUFACTURER'S RECOMMENDED MAXIMUM. REPLACE IF BAG IS RIPPED OR TORN.

MAINTENANCE OF PERMANENT FACILITIES:

E25. CHECK ALL PERMANENT FACILITIES AS NOTED IN CONSTRUCTION CONTRACT. REPAIR AND REPLACE PERMANENT FACILITIES AS NEEDED OR AS NOTED IN CONSTRUCTION CONTRACT. RE-SEED AREAS THAT DO NOT SHOW ESTABLISHED GROWTH AFTER 30 (THIRTY) DAYS OF PLANTING.

E26. EROSION CONTROL MULCH BLANKET - MONITOR AREAS WHERE EROSION CONTROL BLANKETS ARE INSTALLED. INSURE THAT BLANKETS MAINTIAN INTIMATE GROUND CONTACT. REPAIR ANY DAMAGED AREAS IMMEDIATELY BY RESTORING SOIL FINISHED GRADE, REAPPLYING SOIL AMENDMENTS AND SEED, AND REPLACING EROSION CONTROL BLANKET.

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12/29/2015

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OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
EROSION AND SEDIMENT CONTROL NOTES

DGN	GCN	PID No.		MILE POST	11.68
DWN	JRW	FILE No.	C-700-EROSION_NOTES	DRAWING NUMBER	
CHK	GCN	DATE	12/22/2015		

MODEL NAME: Typical1
DATE PRINTED: 12/22/2015
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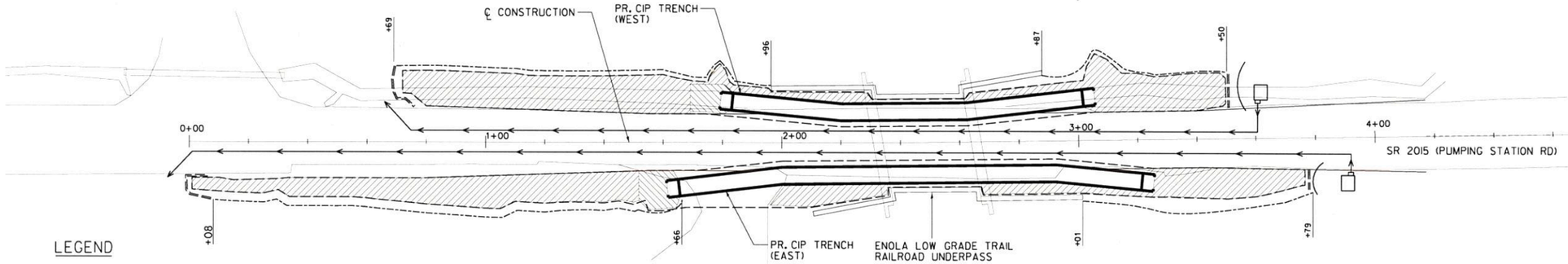
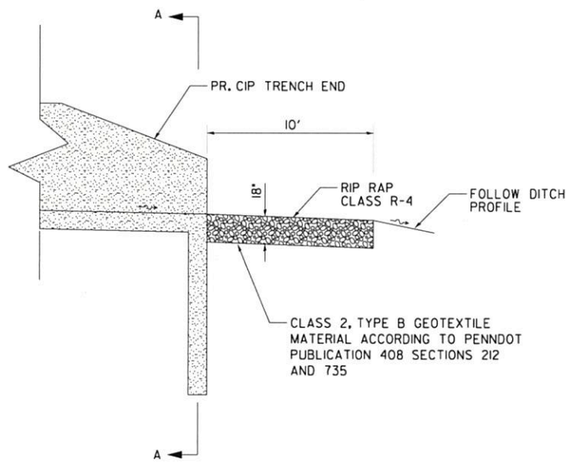


LEGEND

- ROLLED EROSION CONTROL PRODUCT, PENNDOT STD. DWG. RC-73M
- SILT BARRIER FENCE, PENNDOT STD. DWG. RC-70M
- 18" COMPOST FILTER SOCK, PENNDOT STD. DWG. RC-70M
- OUTLET PROTECTION - ROCK APRON, PENNDOT STD. DWG. RC-72M
- SANDBAG DIVERSION DAM, PADEP ESCP PROGRAM MANUAL STANDARD CONSTRUCTION DETAIL 3-15
- PUMP BYPASS AROUND IN-CHANNEL WORK AREA, PADEP ESCP PROGRAM MANUAL FIGURE 3.11

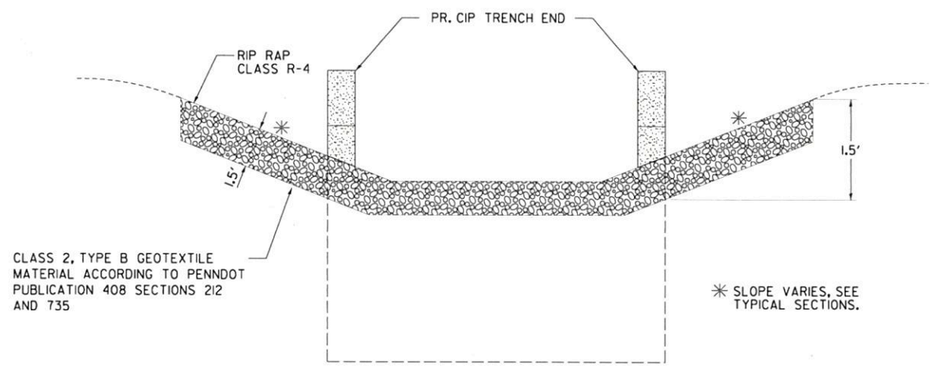
EROSION AND SEDIMENT CONTROL PLAN VIEW

NOT TO SCALE



OUTLET PROTECTION - ROCK APRON

SIDE VIEW
NOT TO SCALE



OUTLET PROTECTION - ROCK APRON

SECTION A-A
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OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

CONSTRUCTION SET

REV.	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS EROSION AND SEDIMENT CONTROL PLAN

DSN GCN	PID No.	VPN	MILE POST 11.68
DWN JRW	FILE No. C-701-EROSION		DRAWING NUMBER
CHK GCN	DATE 12/22/2015		

MODEL NAME: Default
DATE PRINTED: 12/22/2015
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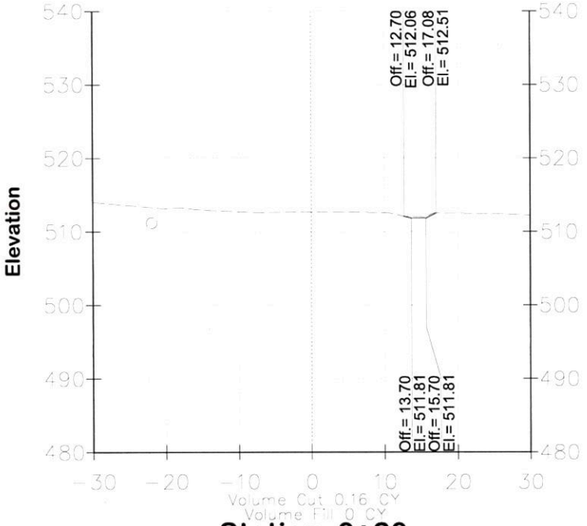

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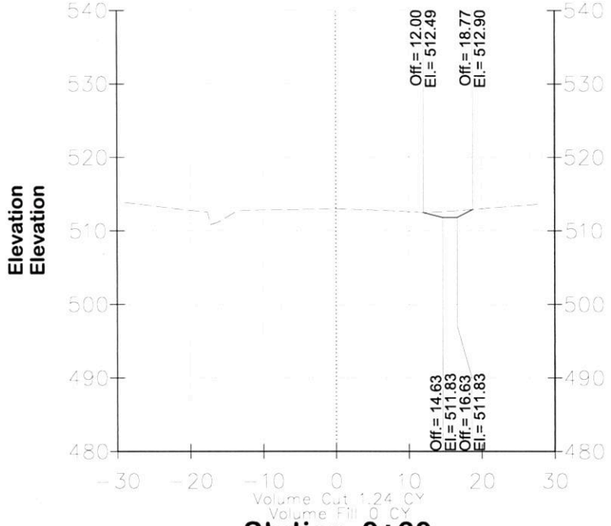

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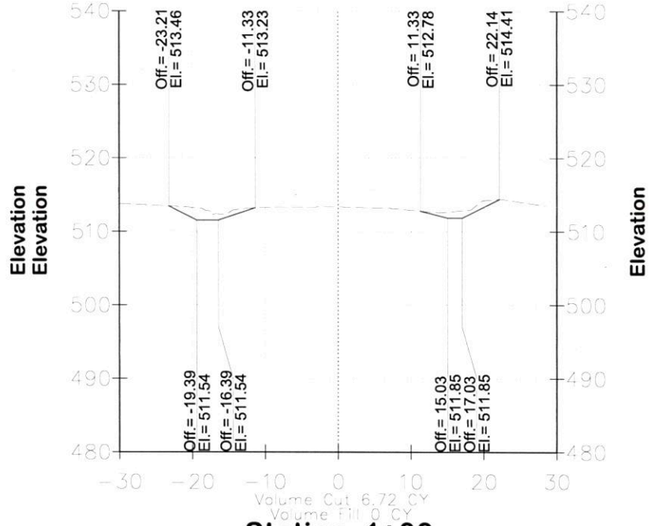

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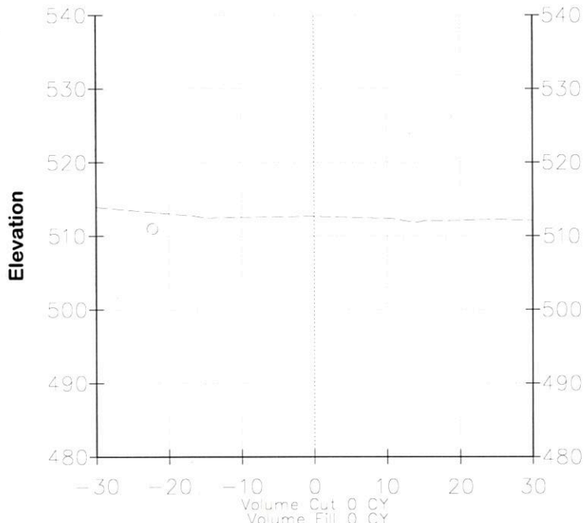

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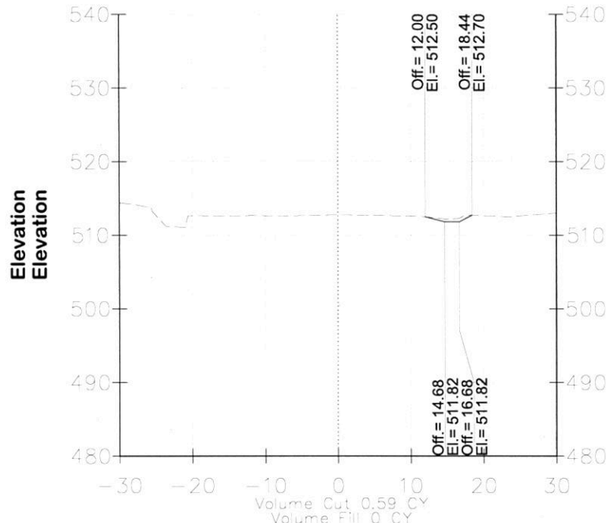

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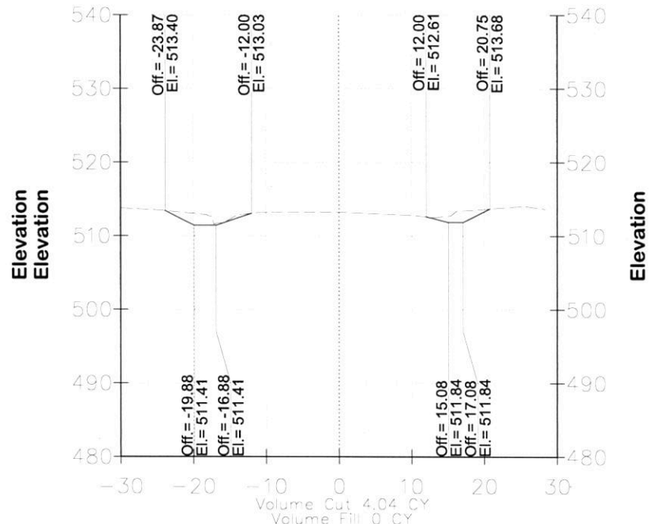

Station 0+80

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SCALE: 1"=50'

50' 0 100' 200' 300'

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MODEL NAME: Sheet 1
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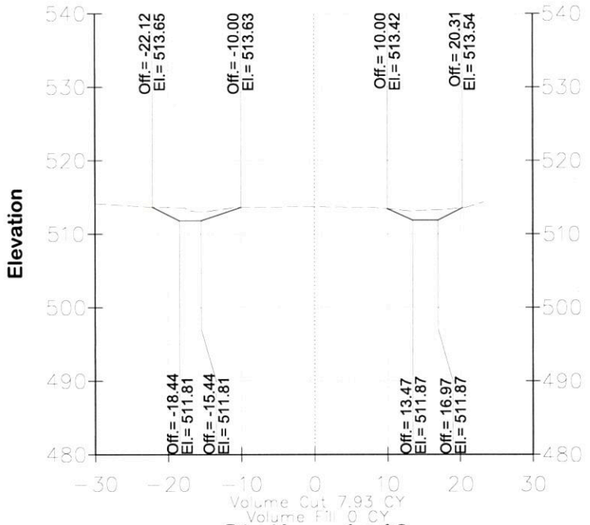
CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
CROSS SECTIONS
STATIONS 0+00 THRU 1+00

DSN	SCN	PID No.	MILE POST 11.68
DWN	TRA	FILE No. C-300-XSECTIONS	DRAWING NUMBER
CHK	SCN	DATE 12/22/2015	



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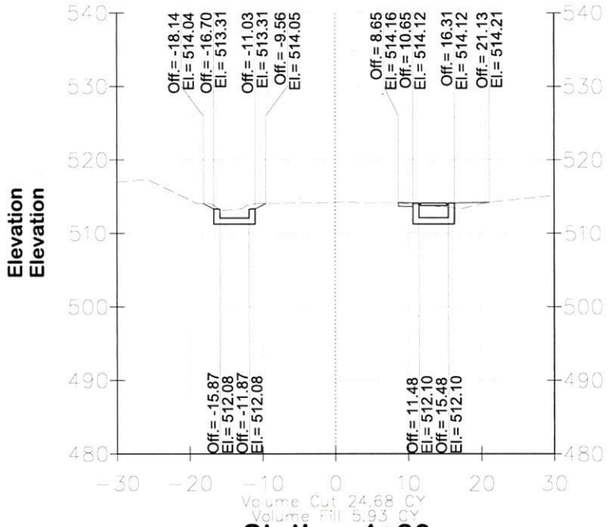

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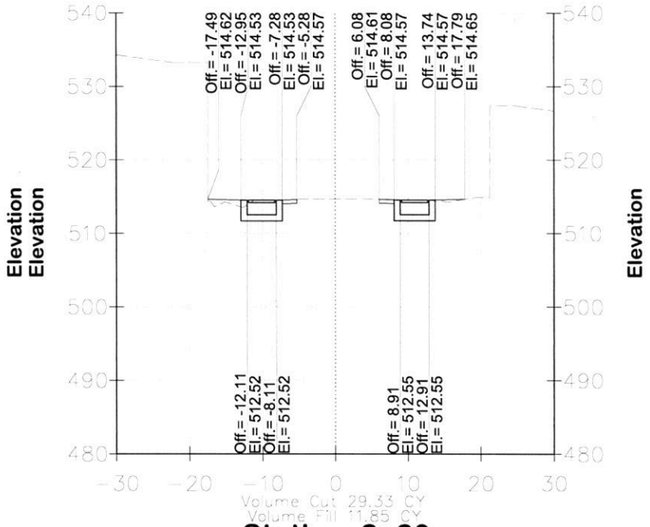
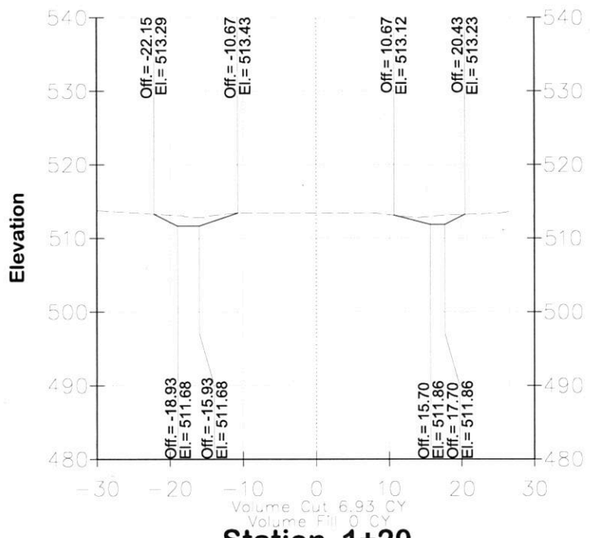


Station 2+20



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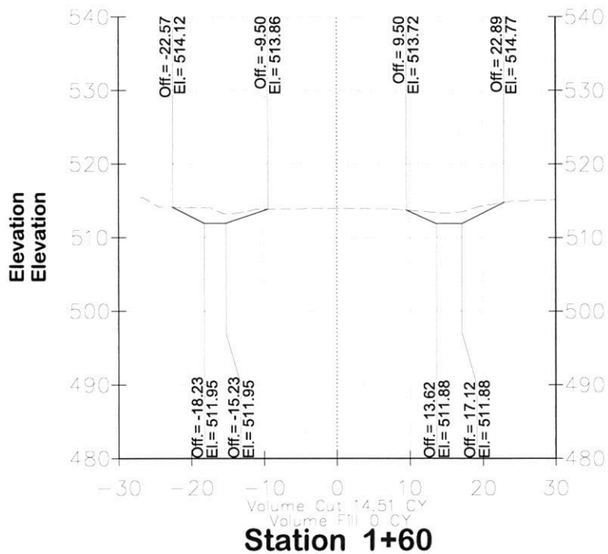

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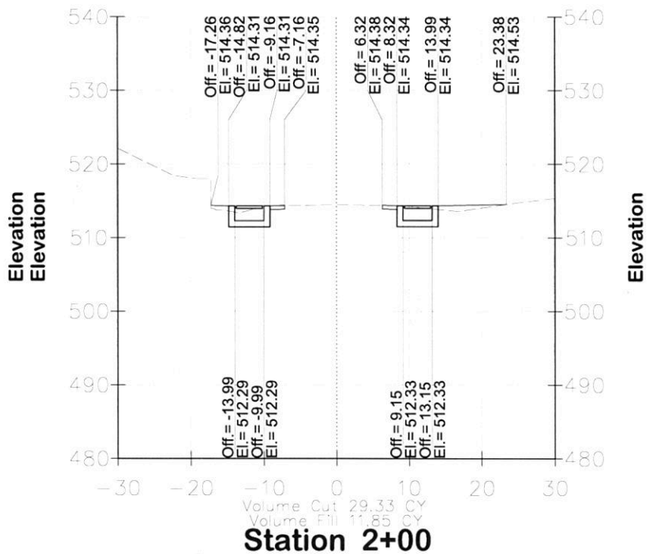

Station 2+00

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MODEL NAME: Sheet 2
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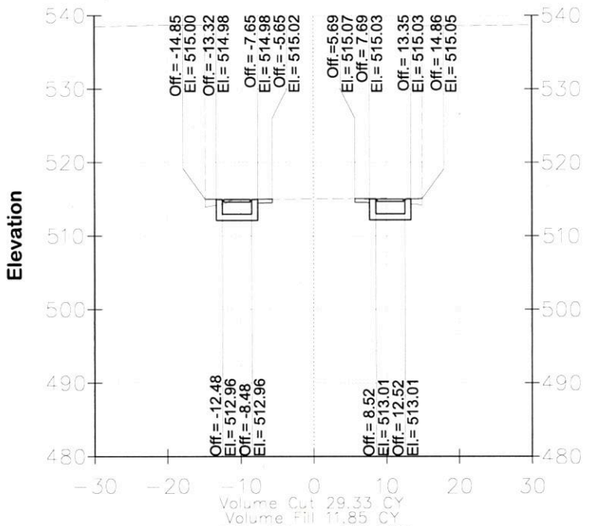
CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
CROSS SECTIONS
STATIONS 1+20 THRU 2+20

DSN: SCN | PID No.: | MILE POST 11.68
DWN: TRA | FILE No.: C-300-XSECTIONS | DRAWING NUMBER
CHK: SCN | DATE: 12/22/2015



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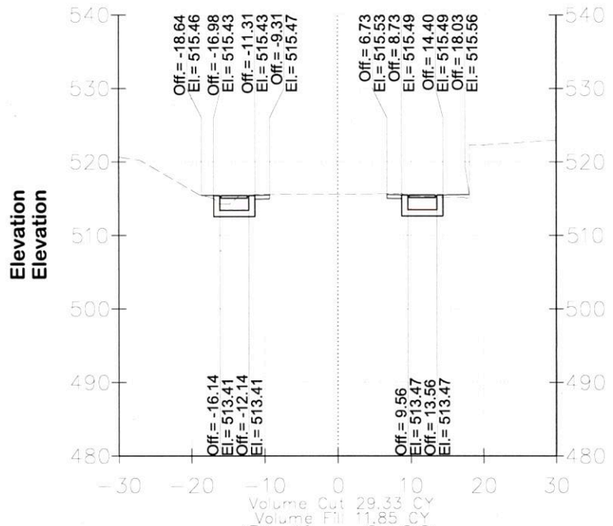

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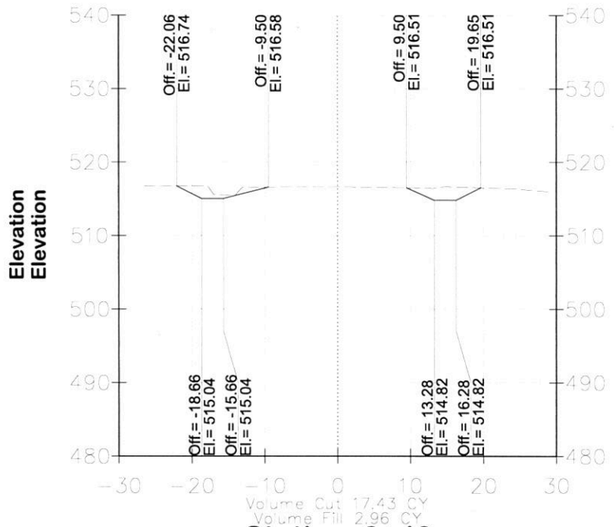

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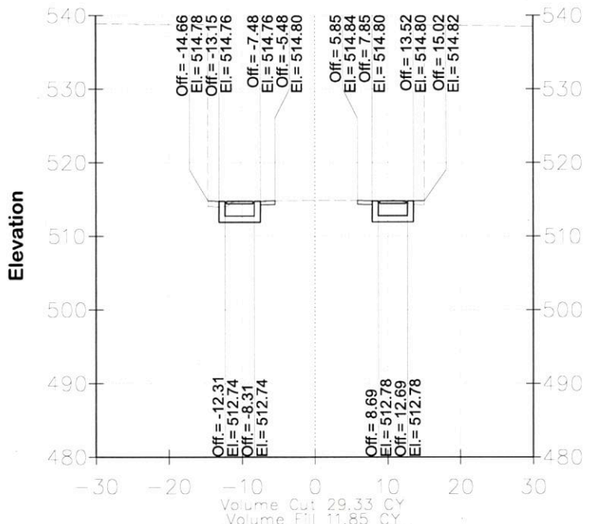

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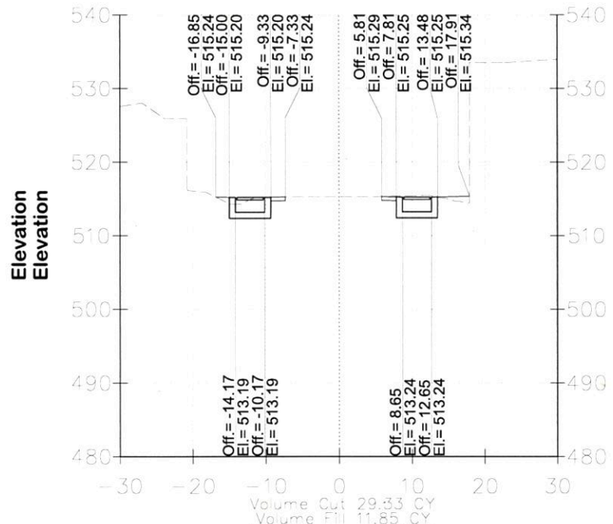

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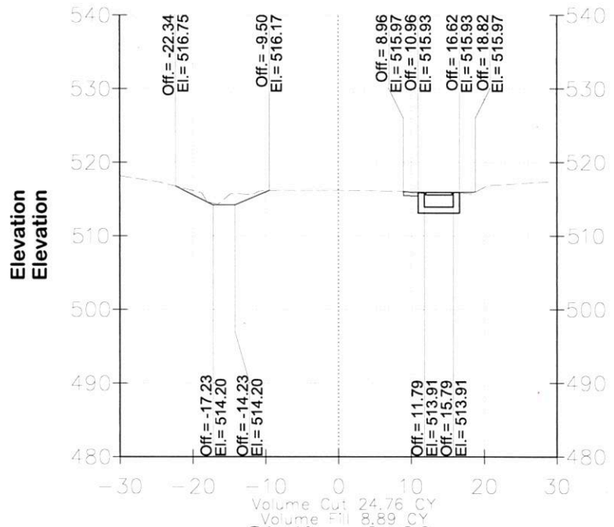

Station 3+20

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MODEL NAME: Sheet 3
DATE PRINTED: 12/22/2015

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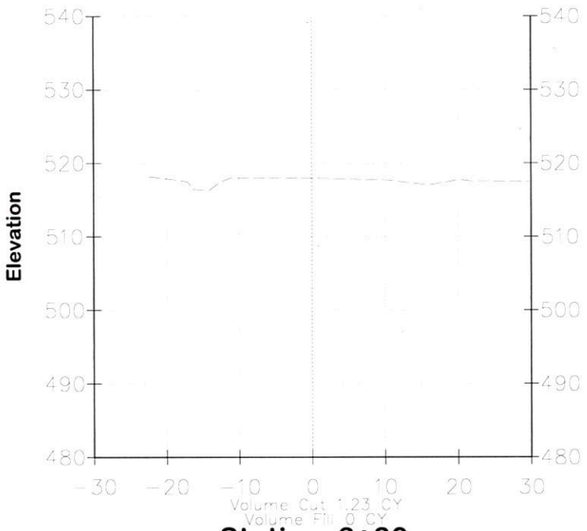
CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
CROSS SECTIONS
STATIONS 2+40 THRU 3+40

DSN	GCN	PID No.		VAN	MILE POST 11.68
DWN	JRW	FILE No.	C-380-XSECTIONS	DRAWING NUMBER	
CHK	GCN	DATE	12/22/2015		



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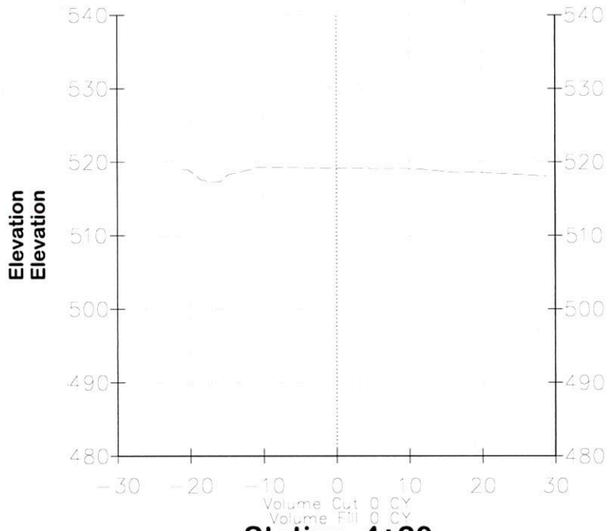

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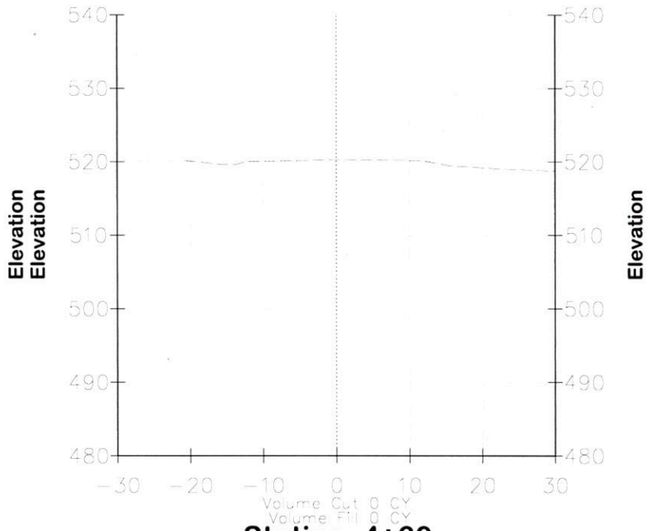

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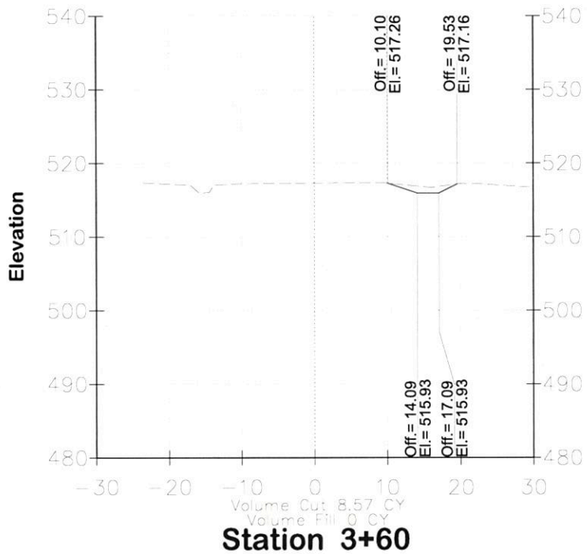

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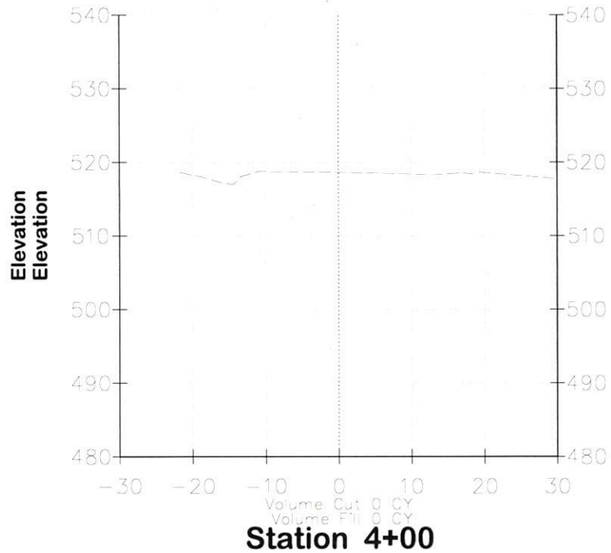

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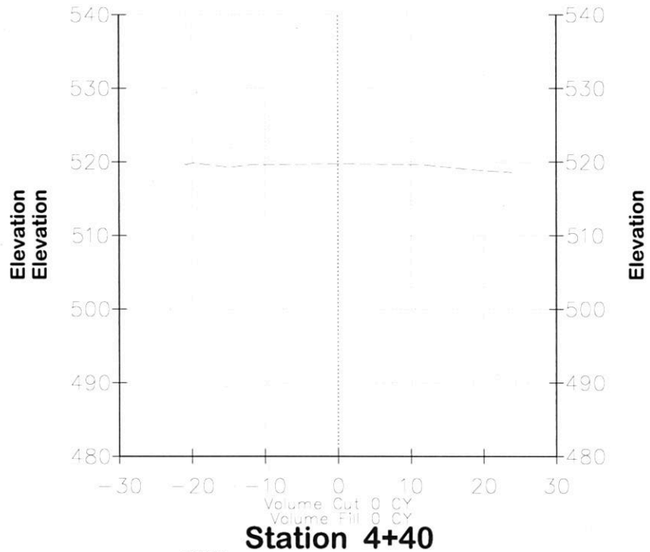

Station 4+40

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MODEL NAME: Sheet 4
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CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
CROSS SECTIONS
STATIONS 3+60 THRU 4+60

DSN GCN	PID No.	VAN	MILE POST 11.68
DWN JRW	FILE No. C-300-XSECTIONS		DRAWING NUMBER
CHK GCN	DATE 12/22/2015		

STRUCTURE NOTES:

GENERAL: PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE APPROPRIATE SPECIFICATIONS AS OUTLINED IN THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT) PUBLICATION 408.

STRUCTURAL EXCAVATION: ALL STRUCTURAL EXCAVATION SHALL BE TO THE LIMITS SHOWN ON PENNDOT STANDARD DRAWING RC-11M AND IN ACCORDANCE WITH PENNDOT PUB. 408 SECTION 203.1(a) AND SECTION 204.1(b). THE STRUCTURAL EXCAVATION LIMITS SHALL BE MODIFIED AS SHOWN ON THE PLANS IN THE TYPICAL SECTION ON SHEET 4.

EMBANKMENT: CONSTRUCT FOUNDATION AS SPECIFIED IN PENNDOT PUB. 408 SECTION 206.2(a) OR 206.2(b). IF UNSUITABLE FOUNDATION MATERIAL OR ROCK IS ENCOUNTERED, REMOVE ALL UNSUITABLE MATERIAL OR ROCK TO AT LEAST 12 INCHES BELOW BOTTOM SLAB AND BACKFILL WITH NO. 2A OR AASHTO NO. 8 COARSE AGGREGATE, AS SHOWN ON THE PENNDOT STANDARD DRAWINGS, GRADED IN CLOSE CONFORMITY WITH THE STRUCTURE GRADE TO PROVIDE PROPER BEDDING CONDITIONS. BACKFILL STRUCTURE TO LIMITS SHOWN ON PENNDOT STANDARD DRAWING RC-12M.

REINFORCEMENT: STEEL BARS FOR REINFORCEMENT SHALL BE DEFORMED BARS THAT MEET THE REQUIREMENTS OF ASTM A 615, GRADE 60 IN ACCORDANCE WITH PENNDOT PUB. 408, SECTION 709.

ALL REINFORCEMENT BARS SHALL BE EPOXY COATED IN ACCORDANCE WITH PENNDOT PUB. 408, SECTION 709.1(c).

PROVIDE 2" CONCRETE COVER ON REINFORCEMENT BARS EXCEPT AS NOTED.

PLACE MAIN CIRCUMFERENTIAL REINFORCEMENT NORMAL TO CENTERLINE OF CULVERT.

DO NOT WELD REINFORCEMENT STEEL.

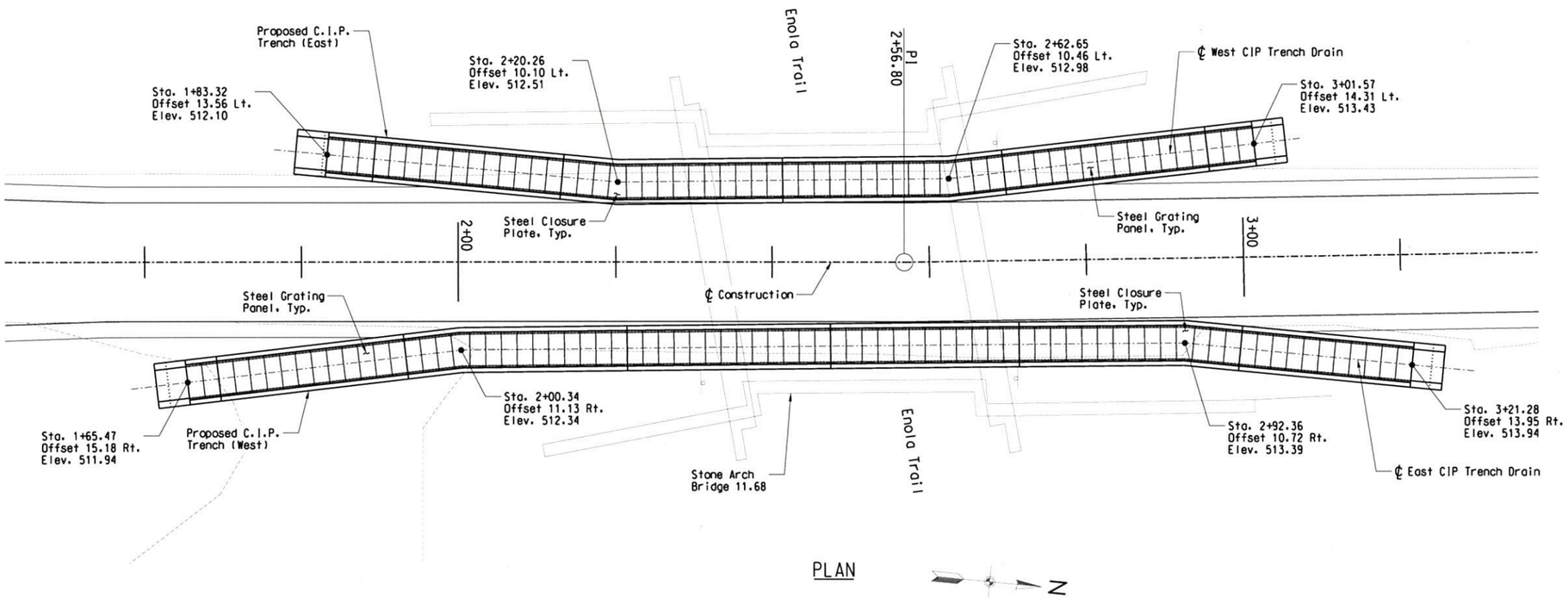
CAST-IN-PLACE CONCRETE: ALL CAST-IN-PLACE CONCRETE SHALL BE CLASS A IN ACCORDANCE WITH PENNDOT PUB. 408, SECTION 704. CHAMFER EXPOSED EDGES $\frac{1}{2}$" x $\frac{1}{2}$", EXCEPT AS NOTED.

PROVIDE EXPANSION JOINTS AT APPROXIMATELY 90' INTERVALS AND CONSTRUCTION JOINTS AT APPROXIMATELY 30' INTERVALS.

FOR JOINT DETAILS SEE BC-735M. WHEN EXPANSION JOINTS ARE USED, WATERSTOPS ARE REQUIRED IN THE BOTTOM SLAB AND THE WALLS.

PROVIDE COMPACTED NO. 2A COARSE AGGREGATE BACKFILL OR TYPE B FLOWABLE BACKFILL AT INLET END OF C.I.P. TRENCHES FOR MINIMUM LENGTH OF 10'-0" PLUS WINGWALLS. HEIGHT OF COMPACTED NO. 2A COARSE AGGREGATE OR FLOWABLE BACKFILL IS A MINIMUM OF 2'-0" ABOVE NORMAL STREAM. ELEVATION EXTENDING TO THE BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICHEVER IS DEEPER, 3'-6" MINIMUM.

USE 4" DIA. FORMED WEEP HOLES AT 15'-0" MAXIMUM CENTERS PLACED AT A MINIMUM 1'-9" ABOVE BOTTOM SLAB. FOR DETAILS SEE BC-751M. FOR WEEP HOLES LOCATED IN THE COMPACTED NO. 2A COARSE AGGREGATE AREAS OR FLOWABLE BACKFILL AREAS, PROVIDE PREFORMED DRAIN CONFORMING TO PUB. 408 SECTION 623.2(a), WHICH IS 2" MINIMUM THICK x 4'-0" WIDE CENTERED HORIZONTALLY ON WEEP HOLE. SEE PREFORMED DRAIN DETAIL ON SHEET BD-632M.



PLAN

N

DESIGN DATA FOR CAST-IN-PLACE TRENCH DRAIN:

1. 2014 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION AND AS SUPPLEMENTED BY THE 2015 PENNDOT DESIGN MANUAL, PART 4, STRUCTURES.
2. LOADING: HL-93 WITH DYNAMIC LOAD ALLOWANCE
3. MAXIMUM GROSS SOIL BEARING PRESSURE UNDER STRUCTURE: 1,790 PSF
4. f'c = 3000 P.S.I. FOR CLASS A CEMENT CONCRETE.
5. fy = 60,000 P.S.I. FOR REINFORCEMENT BARS.

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50' 0 100' 200' 300'
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OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
STRUCTURE PLAN

DSN	MJW	PID No.		MILE POST 11.68
DWN	GTJ	FILE No. S-101-PLAN		DRAWING NUMBER
CHK	MAF	DATE 12/22/2015		

MODEL NAME: Default
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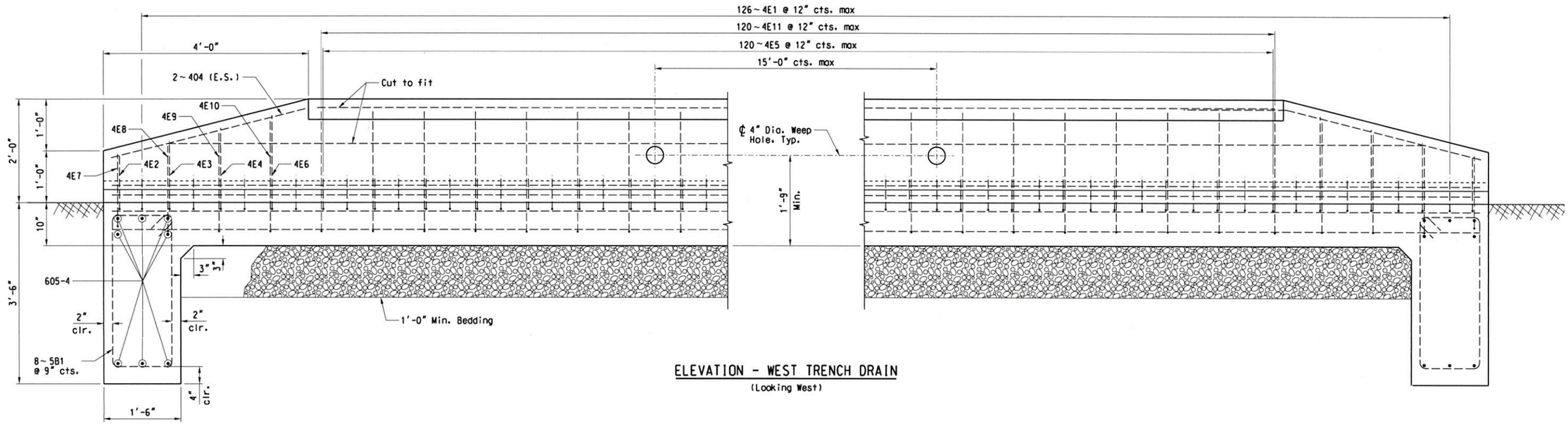
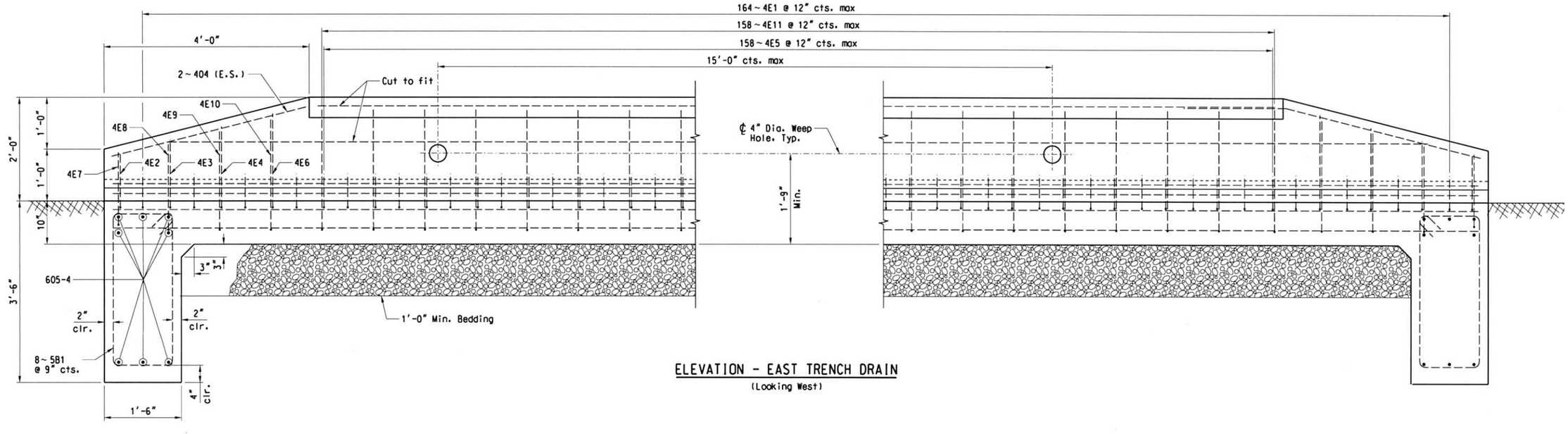


ELEVATION - WEST TRENCH DRAIN

(Looking West)



ELEVATION - EAST TRENCH DRAIN

(Looking West)

NOTES:

1. PROVIDE 2'-1 MINIMUM LAP SPLICE LENGTH FOR #4 BARS.
2. REINFORCING AND DIMENSIONS ON SOUTH END OF STRUCTURES ARE CALLED OUT. NORTH END OF STRUCTURES ARE SIMILAR.
3. SEE JOINTING & LONGITUDINAL BAR LOCATION PLAN AND TYPICAL SECTION ON SHEET 19 FOR LONGITUDINAL REINFORCING.

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CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
CIP TRENCH ELEVATION AND DETAILS

DGN MJW	PID No.	MRN	MILE POST 11.68
DWN GTJ	FILE No. S-201-ELEV		DRAWING NUMBER
CHK MAF	DATE 12/22/2015		

MODEL NAME: Default
DATE PRINTED: 12/22/2015

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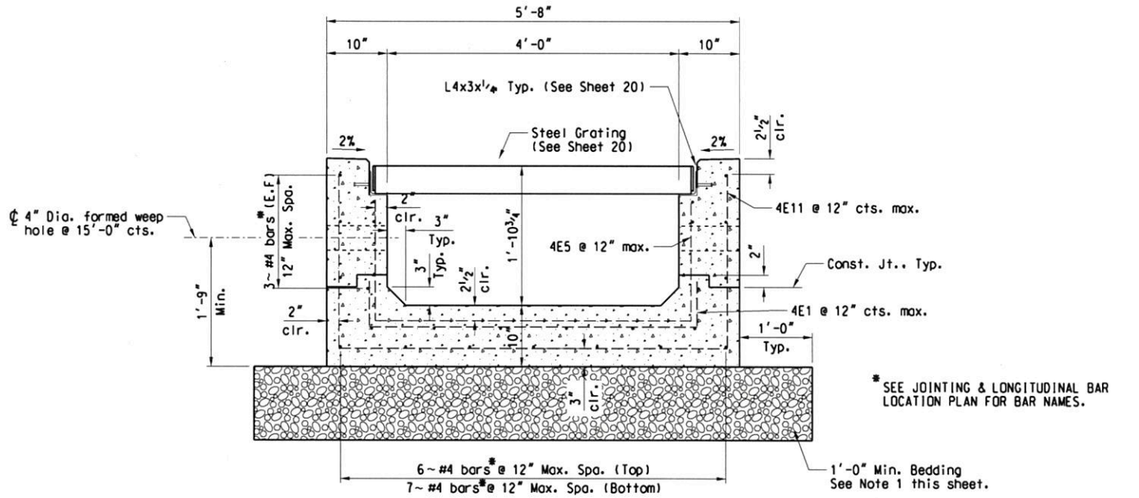


*SEE JOINTING & LONGITUDINAL BAR LOCATION PLAN FOR BAR NAMES.

TYPICAL SECTION

(See Joint & Longitudinal Bar Location Plan)

NOTES:

1. ADDITIONAL EXCAVATION FOR BEDDING MATERIAL BELOW BOTTOM OF C.I.P. R.C. TRENCH DRAIN WITH LIMITS AS SHOWN. BACKFILL SPACE WITH 2A OR #8 COARSE AGGREGATE.

LIST OF REINFORCING FOR WEST TRENCH DRAIN

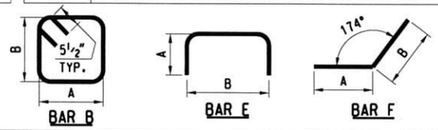
NO.	MARK	SIZE	TYPE	A	B	LENGTH
8	404	4	STR.	-	-	4'-0"
100	404-8	4	STR.	-	-	4'-8"
50	406-7	4	STR.	-	-	6'-7"
50	409-8	4	STR.	-	-	9'-8"
50	420-7	4	STR.	-	-	20'-7"
25	423-8	4	STR.	-	-	23'-8"
25	425-8	4	STR.	-	-	25'-8"
16	605-4	6	STR.	-	-	5'-4"
16	5B1	5	B	1'-2"	2'-11"	9'-1"
126	4E1	4	E	0'-8"	4'-5"	5'-9"
4	4E2	4	E	1'-1"	4'-5"	6'-7"
4	4E3	4	E	1'-4"	4'-5"	7'-1"
4	4E4	4	E	1'-7"	4'-5"	7'-7"
120	4E5	4	E	1'-8"	4'-5"	7'-9"
4	4E6	4	E	1'-10"	4'-5"	8'-1"
4	4E7	4	E	1'-5"	5'-4"	8'-2"
4	4E8	4	E	1'-8"	5'-4"	8'-8"
4	4E9	4	E	1'-11"	5'-4"	9'-2"
4	4E10	4	E	2'-2"	5'-4"	9'-8"
120	4E11	4	E	2'-4"	5'-4"	10'-0"
50	4F1	4	F	2'-10"	2'-10"	5'-8"
4940	Reinf. Steel, Epoxy Coated (Lbs.)					
38.6	Cast-in-Place Concrete, 3,000 psf (Cu. Yd.)					

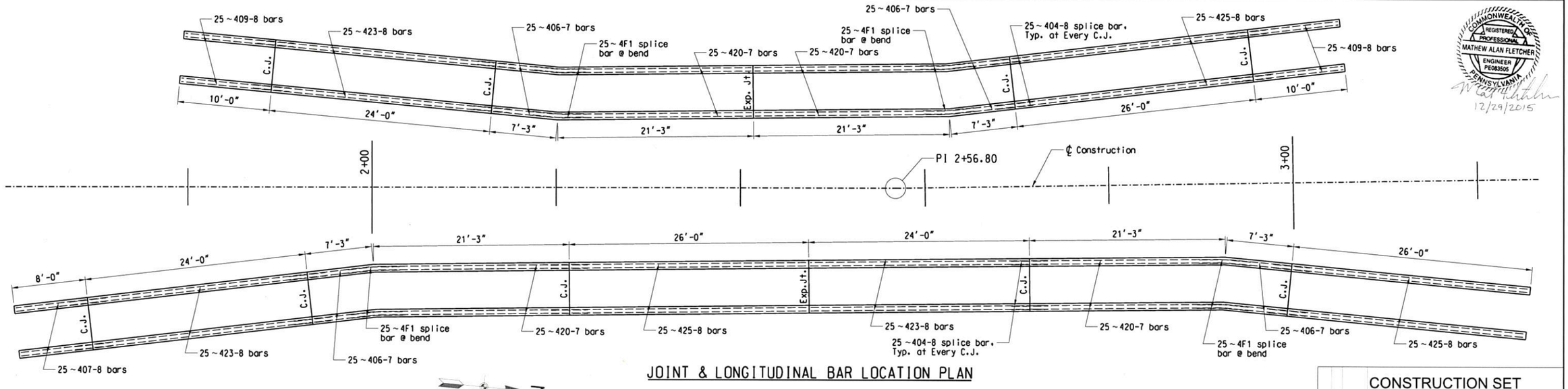
LIST OF REINFORCING FOR EAST TRENCH DRAIN

NO.	MARK	SIZE	TYPE	A	B	LENGTH
8	404	4	STR.	-	-	4'-0"
125	404-8	4	STR.	-	-	4'-8"
50	406-7	4	STR.	-	-	6'-7"
25	407-8	4	STR.	-	-	7'-8"
50	420-7	4	STR.	-	-	20'-7"
50	423-8	4	STR.	-	-	23'-8"
50	425-8	4	STR.	-	-	25'-8"
16	605-4	6	STR.	-	-	5'-4"
16	5B1	5	B	1'-2"	2'-11"	9'-1"
164	4E1	4	E	0'-8"	4'-5"	5'-9"
4	4E2	4	E	1'-1"	4'-5"	6'-7"
4	4E3	4	E	1'-4"	4'-5"	7'-1"
4	4E4	4	E	1'-7"	4'-5"	7'-7"
158	4E5	4	E	1'-8"	4'-5"	7'-9"
4	4E6	4	E	1'-10"	4'-5"	8'-1"
4	4E7	4	E	1'-5"	5'-4"	8'-2"
4	4E8	4	E	1'-8"	5'-4"	8'-8"
4	4E9	4	E	1'-11"	5'-4"	9'-2"
4	4E10	4	E	2'-2"	5'-4"	9'-8"
158	4E11	4	E	2'-4"	5'-4"	10'-0"
50	4F1	4	F	2'-10"	2'-10"	5'-8"
6245	Reinf. Steel, Epoxy Coated (Lbs.)					
49.7	Cast-in-Place Concrete, 3,000 psf (Cu. Yd.)					

REINFORCING STEEL DETAILS

All dimensions shown are out to out of bars.





JOINT & LONGITUDINAL BAR LOCATION PLAN

NOTES:

1. ABBREVIATIONS:

   C.J. = CONSTRUCTION JOINT
   EXP. JT. = EXPANSION JOINT

2. PROVIDE 2'-1" MINIMUM LAP SPLICE LENGTH FOR #4 BARS.

SCALE: 1"=50'

50' 0 100' 200' 300'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

NORFOLK SOUTHERN

OWNING COMPANY

OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

MODEL NAME: Default
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LAST SAVED: 12/22/2015

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MATHEW ALAN FLETCHER
ENGINEER
PE083505

12/29/2015

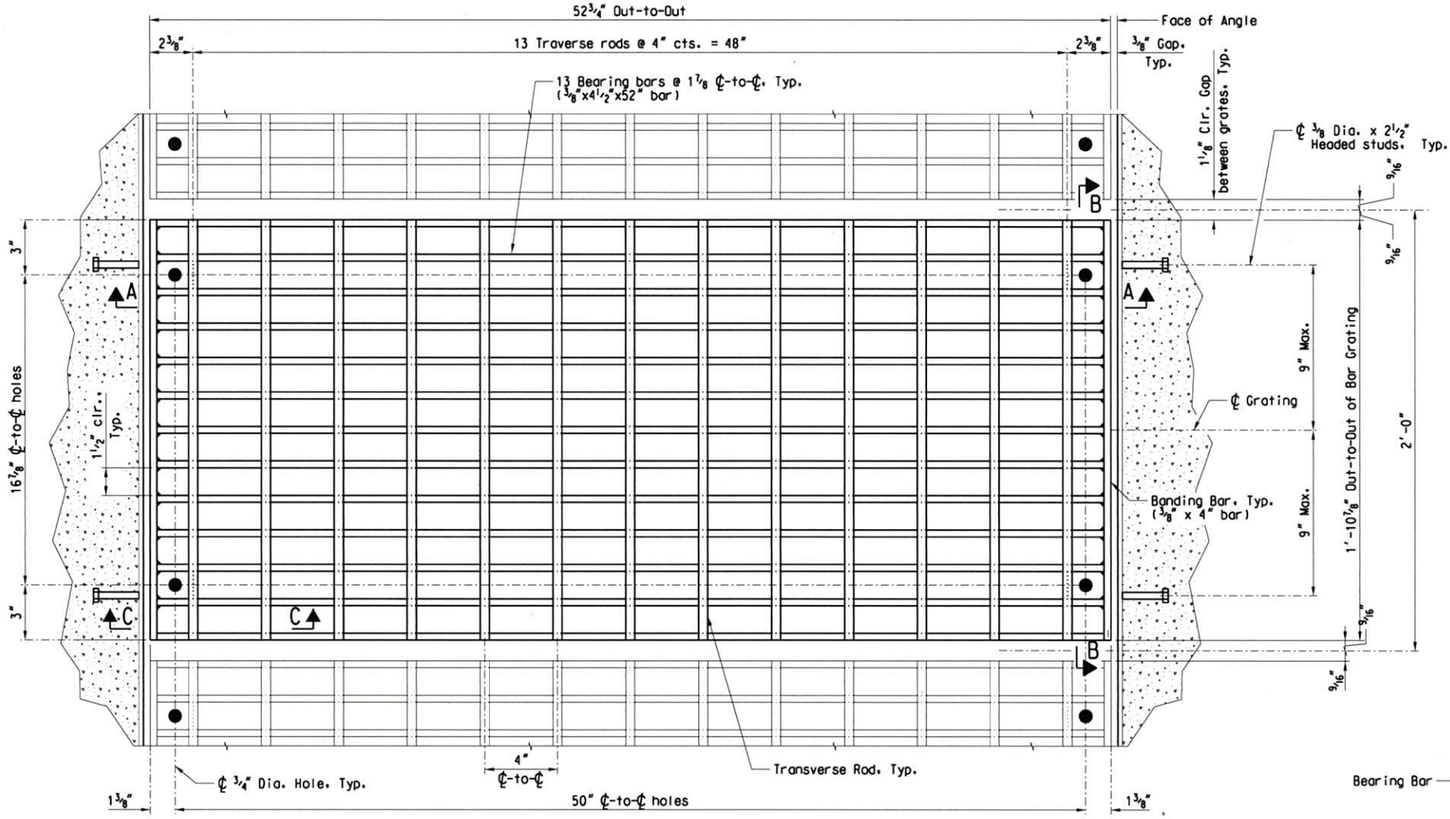
CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA

TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
TYPICAL SECTION, JOINTING PLAN & DETAILS

DSN MJW	PID No.	ARN	MILE POST 11.68
DWN GTJ	FILE No. S-501-TYPSEC	DRAWING NUMBER	
CHK MAF	DATE 12/22/2015		

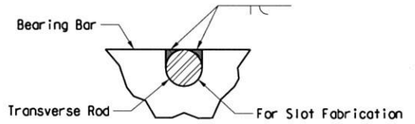


PLAN - STRUCTURAL STEEL GRATE - 133 REQ'D

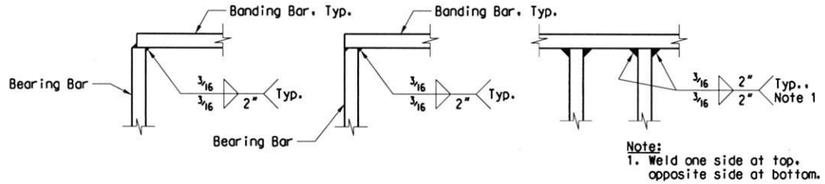
Weight = 383 lbs. (Per Assembly)
Galvanize after fabrication

STRUCTURAL STEEL GRATE NOTES:

1. PROVIDE MATERIAL AND WORKMANSHIP IN ACCORDANCE WITH PENNDOT PUB 408 AND AASHTO/AWS BRIDGE WELDING CODE.
2. FABRICATION OF HEAVY DUTY W-30-4 ($4\frac{1}{2}$ X $\frac{3}{8}$) STEEL BAR GRATING SHALL BE IN ACCORDANCE WITH THE PLANS AND NAAMM MBG 532 AND MBG 533. BEARING BARS, BANDING BARS AND WELD LUGS SHALL BE OF NOMINAL SIZE AS SHOWN IN THE PLANS, AND CONFORM TO ASTM A36. TRANSVERSE RODS SHALL HAVE A 0.150 IN^2 MINIMUM CROSS SECTIONAL AREA AND CONFORM TO ASTM A510.
3. BOLTS SHALL BE ASTM A193 GRADE B8 CLASS 2 HEAVY HEX STAINLESS STEEL BOLTS. BOLTED CONNECTIONS SHALL USE ASTM A194, GRADE 8 HEAVY HEX NUTS AND SS304 STAINLESS STEEL WASHERS.
4. LOCATE TRANSVERSE BARS FLUSH WITH TOP OF SURFACE OF THE GRATE.
5. EMBEDDED ANGLES SHALL CONFORM TO ASTM A36.
6. GALVANIZE GRATES AND EMBEDDED ANGLES IN ACCORDANCE WITH PENNDOT PUBLICATION 408, SECTION 1105.02(s).
7. GRATING ASSEMBLY CONSISTING OF BAR GRATING BOLTED TO BASE ANGLES SHALL BE FULLY ASSEMBLED WITH ALL 4 BOLTS WHEN CAST INTO CONCRETE TRENCH DRAIN.
8. WELDED STUDS SHALL CONFORM TO ASTM A108.



DETAIL 'C'

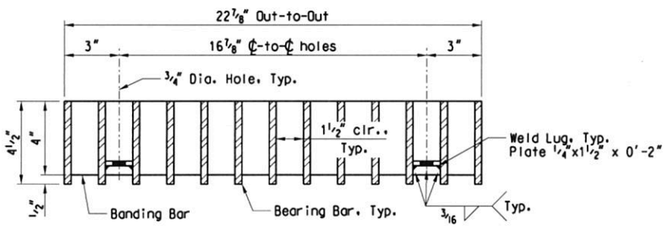


Note:
1. Weld one side at top, opposite side at bottom.

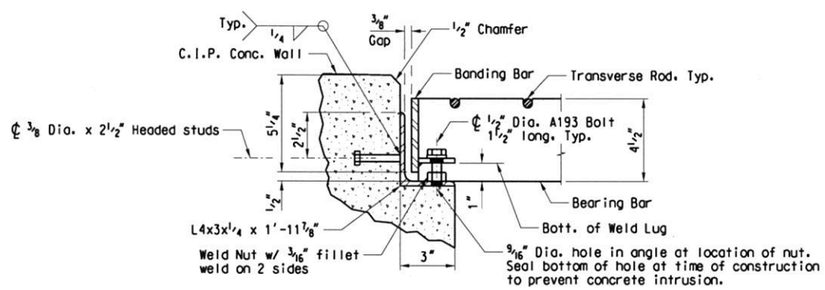
TYPICAL CORNER DETAILS

TYPICAL INTERIOR DETAIL

SECTION A-A



SECTION B-B



GRATING ATTACHMENT DETAIL - SECTION C-C

HANSON

7625 N. University St., Suite 200
Peoria, Illinois 61614
309-691-0902
Offices Nationwide

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MATHEW ALAN FLETCHER
ENGINEER
PE083505
12/29/2015

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

NS NORFOLK SOUTHERN

OWNING COMPANY

OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
STEEL GRATING PLAN & DETAILS

DGN MJW | PID No. | VPI | MILE POST 11.68
DWN GTJ | FILE No. S-502-GRATE | DRAWING NUMBER
CHK MAF | DATE 12/22/2015

MODEL NAME: Default
DATE PRINTED: 12/22/2015
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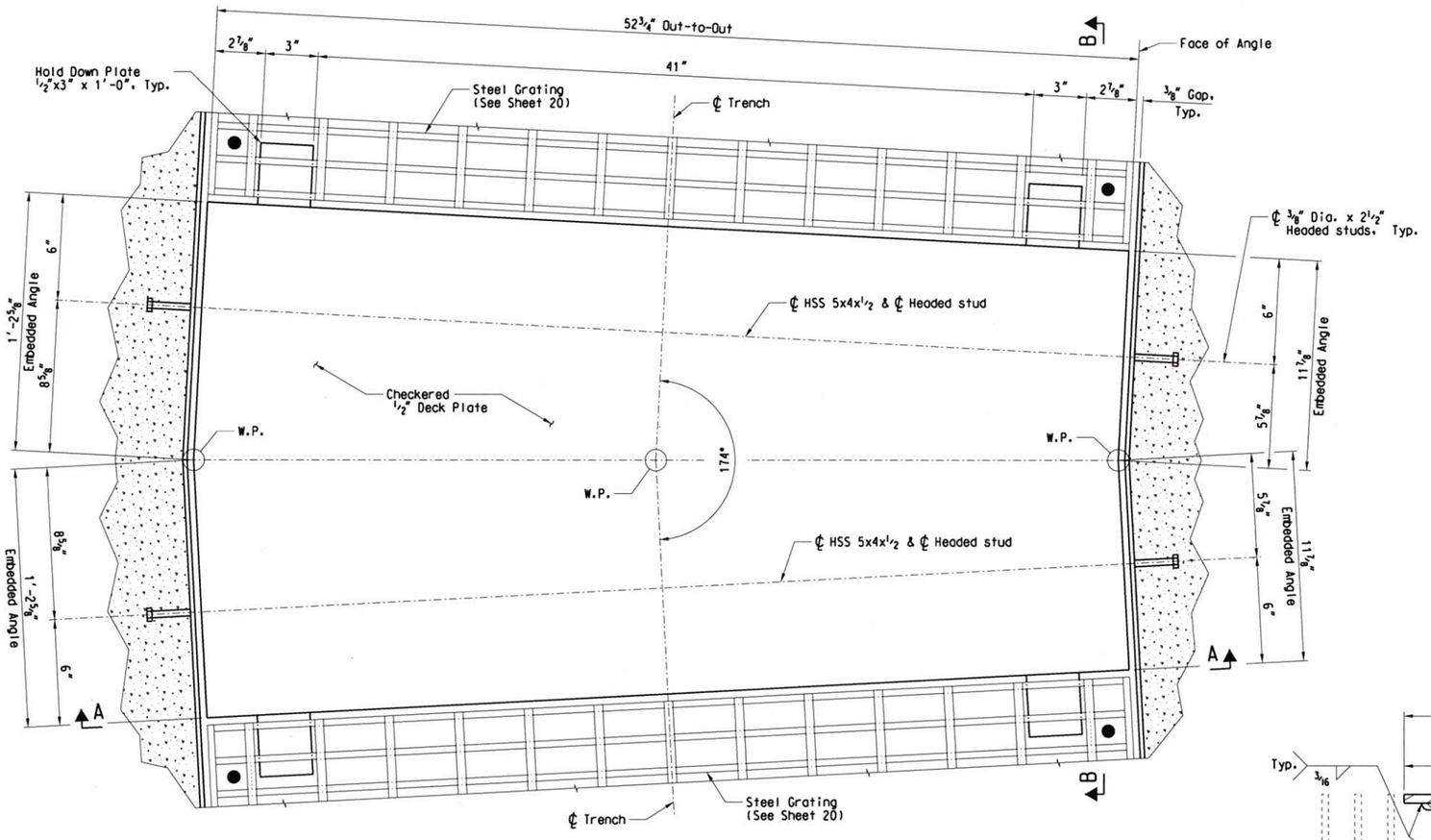
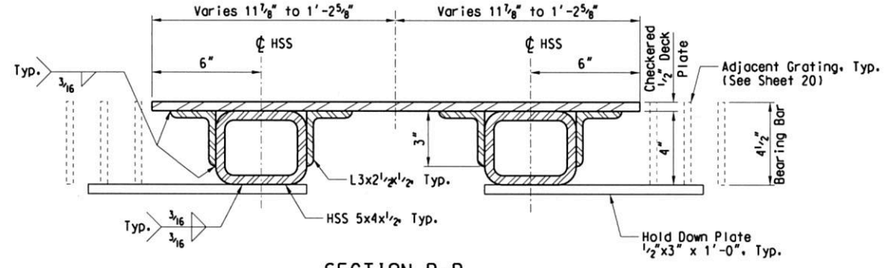
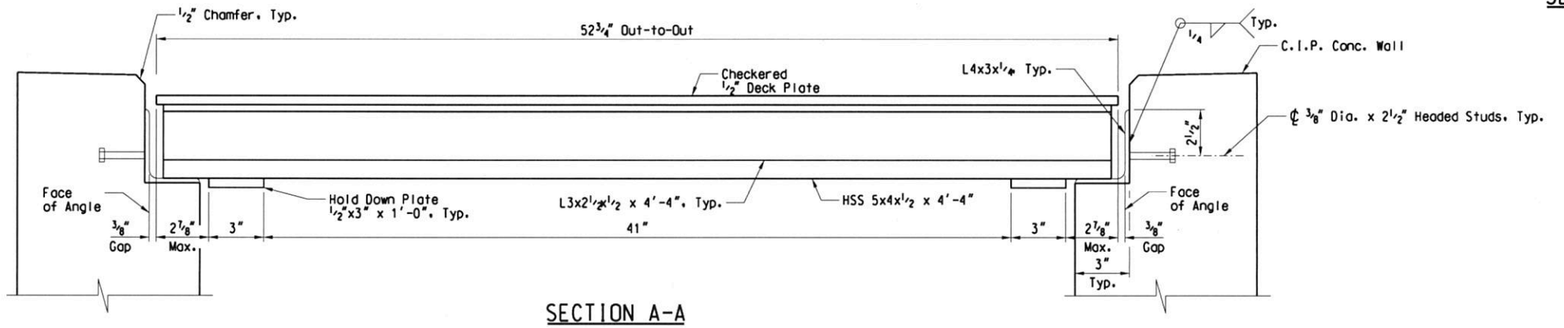


PLAN - CLOSURE PLATE (SKEWED) - 4 REQ'D.

Weight = 615 lbs. (Per Assembly)
Galvanize after fabrication



SECTION B-B



SECTION A-A

STEEL CLOSURE PLATE NOTES:

1. PROVIDE MATERIAL AND WORKMANSHIP IN ACCORDANCE WITH PENNDOT PUB 408 AND AASHTO/AWS BRIDGE WELDING CODE.
2. ANGLES AND PLATES SHALL CONFORM TO ASTM A36. HSS SHALL CONFORM TO ASTM A500, GRADE B.
3. GALVANIZE STEEL CLOSURE PLATES AND EMBEDDED ANGLES IN ACCORDANCE WITH PENNDOT PUBLICATION 408, SECTION 1105.02(s).
4. STEEL CLOSURE PLATE ASSEMBLY CONSISTING OF THE CLOSURE PLATE AND EMBEDDED ANGLES SHALL BE FULLY ASSEMBLED WHEN CAST INTO CONCRETE TRENCH DRAIN TO ENSURE FIT.
5. ADJACENT STEEL GRATES MUST BE UNBOLTED AND REMOVED IN ORDER FOR THE STEEL CLOSURE PLATE TO BE REMOVED.
6. WELDED STUDS SHALL CONFORM TO ASTM A108.

HANSON

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COMMONWEALTH OF PENNSYLVANIA
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PE083505
12/29/2015

NORFOLK SOUTHERN
OWNING COMPANY
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER - DESIGN AND CONSTRUCTION - ATLANTA, GA.

CONSTRUCTION SET

REV	BY	DATE	DESCRIPTION

LOCATION: QUARRYVILLE, LANCASTER COUNTY, PA
TITLE: PUMPING STATION ROAD DRAINAGE IMPROVEMENTS
STEEL CLOSURE PLATE PLAN & DETAILS

DGN MJW	PID No.	MRN	MILE POST 11.68
DWN GTJ	FILE No. S-503-CLOS_PLATE		DRAWING NUMBER
CHK MAF	DATE 12/22/2015		

MODEL NAME: Default
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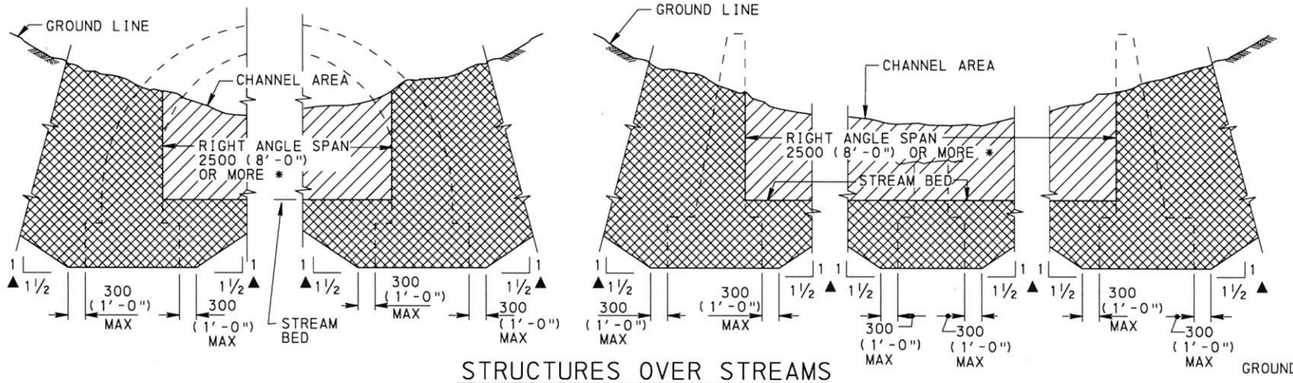
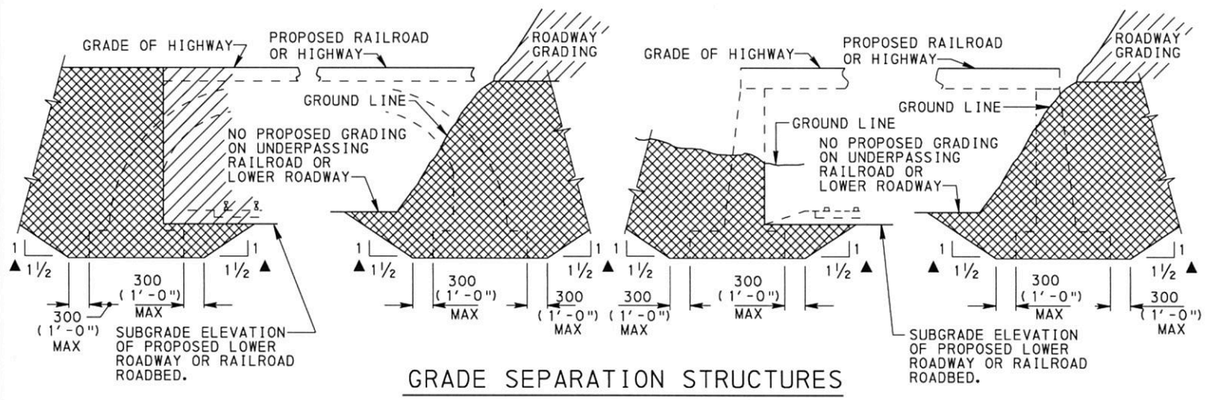


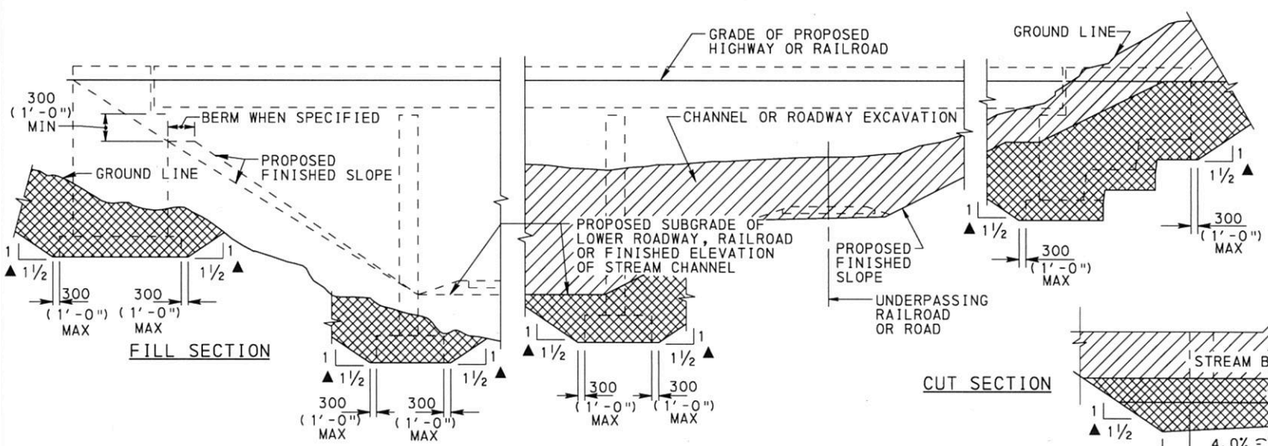
STRUCTURES OVER STREAMS

INCLUDING METAL PLATE ARCH WITH FOOTING

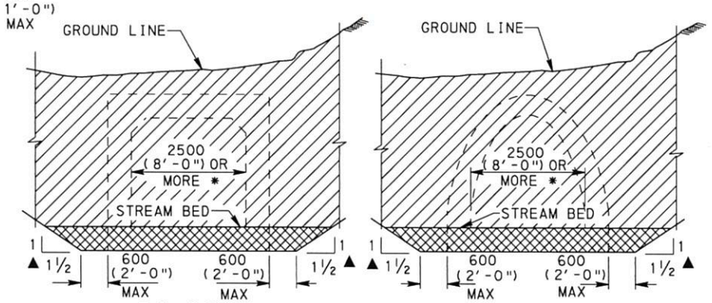
* WHEN RIGHT ANGLE SPAN IS LESS THAN 2500 (8'-0"), ALL EXCAVATION IS CLASS 3.



GRADE SEPARATION STRUCTURES



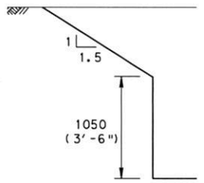
TYPICAL STRUCTURE SECTION



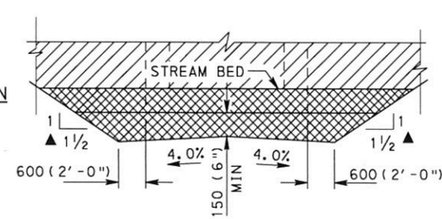
RC BOX CULVERTS

RC TIED ARCH CULVERTS

* WHEN LESS THAN 2500 (8'-0"), ALL EXCAVATION IS CLASS 3.



DETAIL A



EXTRA DEPTH EXCAVATION FOR RC BOX AND ARCH CULVERTS ON FINE GRAIN SOIL

NOTES

1. FOLLOW OSHA SAFETY REQUIREMENTS IN ALL UNSHORED EXCAVATION AREAS. USE DETAIL 'A' FOR COHESIVE SOILS ONLY AS DEFINED IN OSHA 29 CFR SECTION 1926.652 AND DETERMINED BY APPROPRIATE SOILS REPORT:
   1500 (5'-0") MAXIMUM FOR VERTICAL CUT, OTHERWISE 1050 (3'-6") MAXIMUM FROM BOTTOM OF EXCAVATION TO START OF 1:1.5 (1½:1) LAYBACK SLOPE. IF THE TOTAL EXCAVATION DEPTH EXCEEDS 3600 (12'-0"), DO NOT USE DETAIL 'A'.
2. NO PAYMENT WILL BE ALLOWED FOR EXCAVATION IN EXCESS OF SPECIFIED LIMITS AND FOR ADDITIONAL BACKFILL MATERIAL REQUIRED.
3. DEFINE SPECIAL SITUATIONS (SUCH AS ROCK EXCAVATION, SHORED CONSTRUCTION, ETC.) INVOLVING EXCAVATION NOT ENTIRELY COVERED BY THIS STANDARD, ON THE DESIGN DRAWING BY SKETCHES AND/OR DESCRIBE IN THE SPECIAL PROVISIONS.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESES.

LEGEND

CLASS 1 EXCAVATION

ROADWAY ITEM

(TO BE INCLUDED IN ROADWAY QUANTITIES)

CLASS 3 EXCAVATION

STRUCTURE ITEM

(TO BE INCLUDED IN STRUCTURE QUANTITIES)

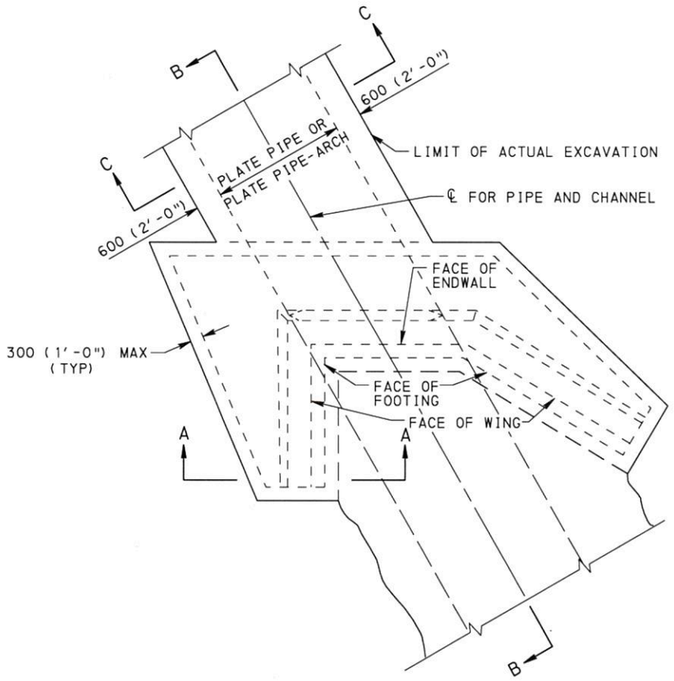
▲ CONTINUE 1:1.5 (1½:1) SLOPE FOR THE APPROPRIATE CLASS OF EXCAVATION TO FINISHED GRADE OR GROUND LINE, WHICHEVER COMES FIRST.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

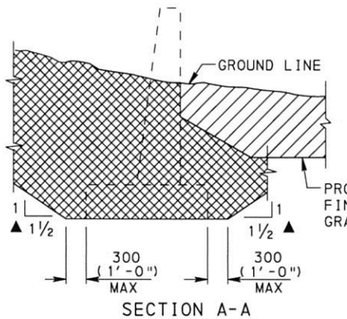
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK FOR STRUCTURES

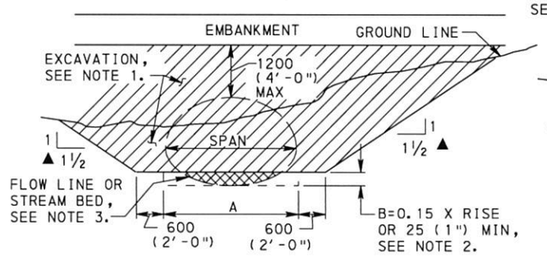
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 1 OF 2
R. Wyatt Dilley	Bruce E. Thomas	RC-11M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	



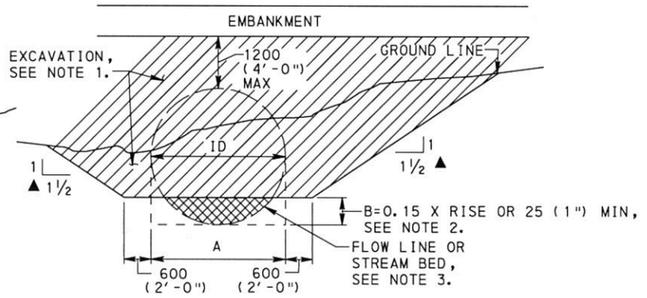
PLAN VIEW



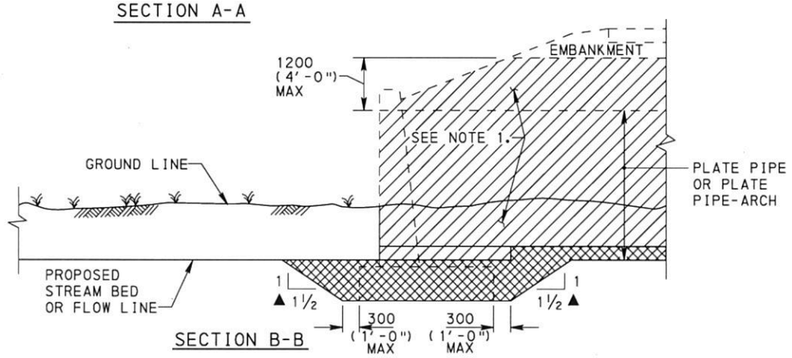
SECTION A-A



SECTION C-C
(METAL PLATE PIPE-ARCH)



SECTION C-C
(METAL PLATE PIPE)



SECTION B-B

METAL PLATE PIPE AND METAL PLATE PIPE-ARCH CULVERTS WITH ENDWALL

NOTES

1. PROVIDE EXCAVATION, INCLUDING THE PORTIONS OF ENDWALLS ABOVE THE FLOW LINE AND TO A MAXIMUM OF 1200 (4'-0") ABOVE THE TOP OF THE PIPE OR PIPE-ARCH, AS CLASS 4 EXCAVATION FOR PIPE OR PIPE-ARCH LESS THAN 1200 (4'-0") INSIDE DIAMETER OR SPAN, RESPECTIVELY, AND CLASS 1 EXCAVATION FOR PIPE OR PIPE-ARCH 1200 (4'-0") OR GREATER INSIDE DIAMETER OR SPAN, RESPECTIVELY.
2. FOR PLATE PIPE OR PLATE PIPE-ARCH WITH 1200 (4'-0") OR GREATER INSIDE DIAMETER OR SPAN, RESPECTIVELY, PROVIDE EXCAVATION BETWEEN THE FLOW LINE AND THE LOWER LIMIT OF CLASS 1 EXCAVATION CONFORMING TO THE AREA SHOWN WITH THE CLASS 3 EXCAVATION SYMBOL.
3. WHEN DEEMED NECESSARY TO EXCAVATE BELOW THE BOTTOM OF THE FLOW LINE, PAY ALL EXCAVATION WITHIN THE LIMITS OF THE BOTTOM OF THE EXCAVATED TRENCH AND THE TOP OF THE EXISTING GROUND AS CLASS 1 EXCAVATION FOR PLATE PIPE OR PLATE PIPE-ARCH WITH 1200 (4'-0") OR GREATER INSIDE DIAMETER OR SPAN, RESPECTIVELY, AND AS CLASS 4 EXCAVATION FOR PLATE PIPE OR PLATE PIPE-ARCH LESS THAN 1200 (4'-0") INSIDE DIAMETER OR SPAN, RESPECTIVELY. PLACE AND SHAPE BACKFILL MATERIAL FOR THE UNDERCUT AREA CONFORMING TO THE BOTTOM OF THE CULVERT AND CONSIDER INCIDENTAL TO THE CLASS SPECIFIED.
4. MEASURE AND PAY EXCAVATION AS SHOWN IN SECTION A-A, SECTION B-B AND SECTION C-C.
5. SEE RC-30M, SHEET 4 OF 5, NOTE 1.

LEGEND

CLASS 1 OR 4 EXCAVATION
ROADWAY ITEM
(TO BE INCLUDED IN ROADWAY QUANTITIES)

CLASS 3 EXCAVATION
STRUCTURE ITEM
(TO BE INCLUDED IN STRUCTURE QUANTITIES)

▲ CONTINUE 1:1.5 (1½:1) SLOPE FOR CLASS 3 EXCAVATION TO FINISH GRADE OR GROUND LINE, WHICHEVER COMES FIRST.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

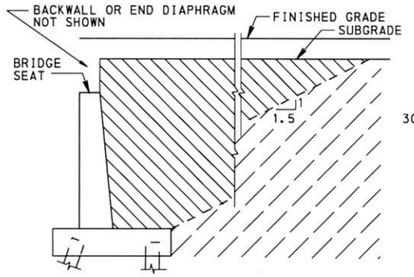
CLASSIFICATION OF EARTHWORK FOR STRUCTURES

RECOMMENDED JUN. 1, 2010
R. Wade Willy
CHIEF, HWY. QA DIVISION

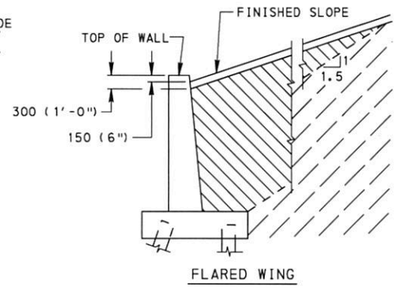
RECOMMENDED JUN. 1, 2010
DIRECTOR, BUREAU OF DESIGN

SHT 2 OF 2

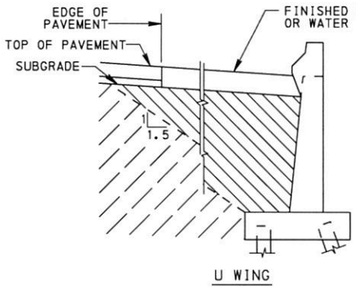
RC-11M



ABUTMENT

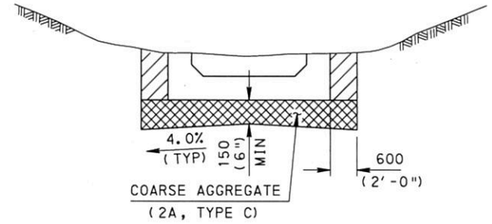


FLARED WING



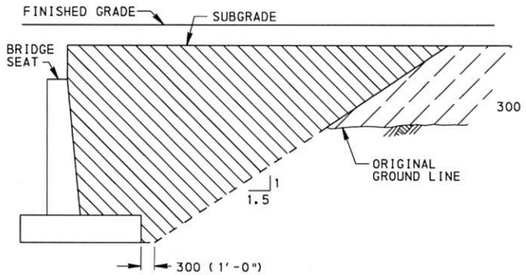
U WING

TYPICAL CROSS SECTIONS - ABUTMENTS ON FILL

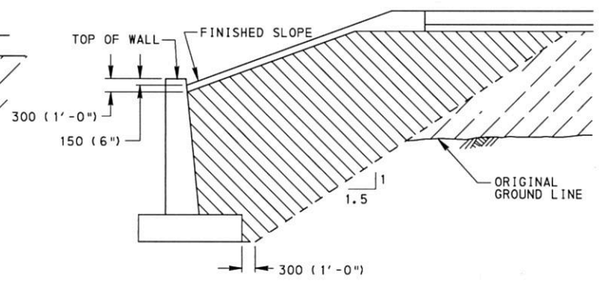


FOUNDATION PREPARATION FOR RC BOX AND ARCH CULVERTS ON FINE GRAIN SOIL ONLY

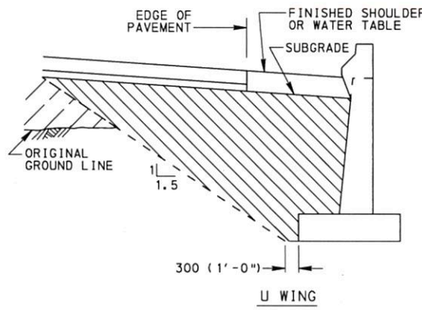
NOTE: EXCAVATE THE LAST 600 (2'-0") WITH BUCKET WITHOUT TEETH TO KEEP THE FOUNDATION FIRM.
FOR CULVERTS WITH SPANS LESS THAN 2500 (8'-0"), BOTTOM MAY BE SLOPED IN ONE DIRECTION.



ABUTMENT



FLARED WING



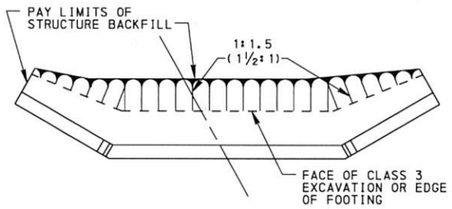
U WING

LEGEND

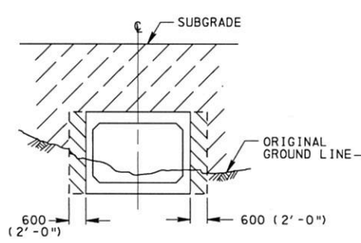
STRUCTURE BACKFILL

EMBANKMENT MATERIAL

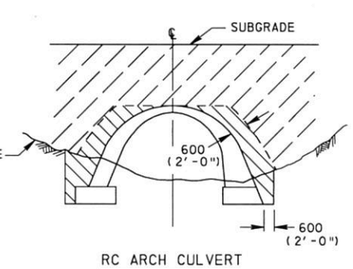
TYPICAL CROSS SECTIONS - ABUTMENTS IN CUT



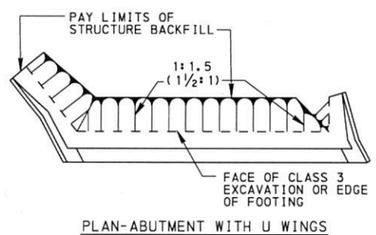
PLAN-ABUTMENT WITH FLARED WINGS



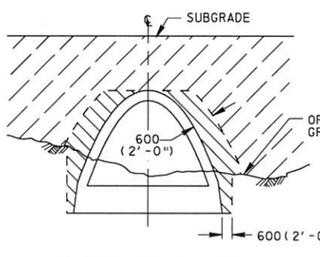
RC BOX CULVERT



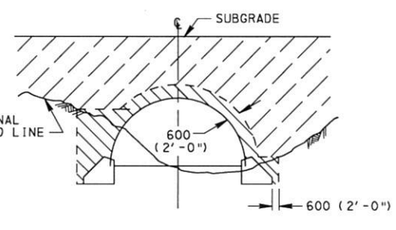
RC ARCH CULVERT



PLAN-ABUTMENT WITH U WINGS



RC TIED ARCH CULVERT



METAL PLATE ARCH CULVERT

BACKFILL & EMBANKMENT CONSTRUCTION AT STRUCTURES

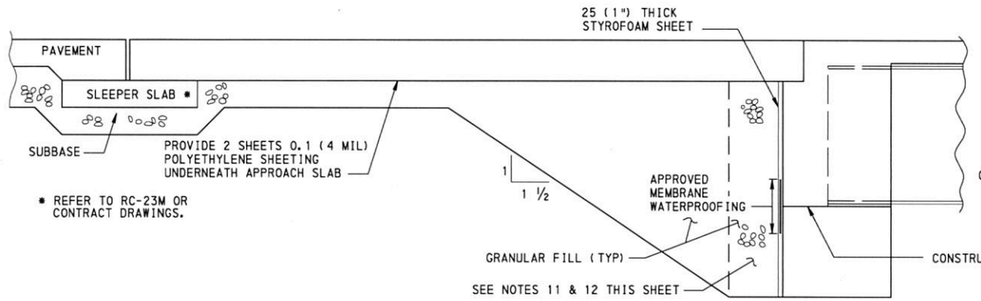
NOTE:
SEE SHEET 2 FOR GENERAL NOTES.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

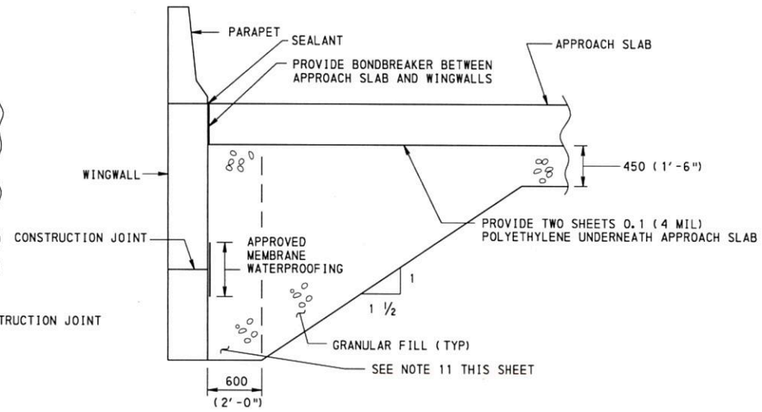
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BACKFILL AT STRUCTURES

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 1 OF 2
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	RC-12M



LIMITS OF BACKFILL
INTEGRAL ABUTMENT



LIMITS OF BACKFILL
WINGWALLS OF INTEGRAL ABUTMENTS

GENERAL NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUB 408. PLACE BACKFILL AND EMBANKMENT IN ACCORDANCE WITH THIS STANDARD DRAWING UNLESS OTHERWISE SHOWN ON THE STRUCTURE DRAWINGS.

2. USE ONLY R-3 ROCK LINING, MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 850.2(a); AASHTO NO. 1, 3, 5 OR 57 COARSE AGGREGATES, MEETING AT LEAST THE TYPE C QUALITY REQUIREMENTS IN PUBLICATION 408, SECTION 703.2, TABLE B; OR TYPE OGS COARSE AGGREGATE, MEETING AT LEAST THE TYPE C QUALITY REQUIREMENTS IN PUBLICATION 408, SECTION 703.2, TABLE B. MEASURE AND PAY STRUCTURE BACKFILL AS SELECTED BORROW EXCAVATION-STRUCTURE BACKFILL. DO NOT USE R-3 FOR STRUCTURE BACKFILL FOR ANY TYPE RC OR METAL PLATE CULVERT. PLACE A CLASS 2, TYPE B GEOTEXTILE BLANKET AS A BARRIER BETWEEN THE STRUCTURE BACKFILL AND EXCAVATION/EMBANKMENT MATERIAL. PLACE A CLASS 2, TYPE B GEOTEXTILE BLANKET ON ENTIRE TOP OF THE COMPLETED STRUCTURE BACKFILL PRIOR TO PLACING ANY SUBBASE MATERIAL FOR THE ROADWAY. THE GEOTEXTILE IS CONSIDERED INCIDENTAL TO THE SELECTED BORROW EXCAVATION STRUCTURE BACKFILL AND WILL NOT BE PAID FOR SEPARATELY.

3. TREAT BACKFILL LIMITS AT RETAINING WALLS AND WINGWALLS FOR CULVERTS THE SAME AS FLARED ABUTMENT WINGWALLS.

4. TREAT BACKFILL CONSTRUCTION AT RC BOX CULVERTS WITH THE TOP SLAB AT ROADWAY GRADE THE SAME AS ABUTMENTS.

5. TREAT BACKFILL CONSTRUCTION AT CULVERTS, WHERE THE TOP OF THE CULVERT IS NEAR SUBGRADE, AS SHOWN ON THE STRUCTURE DRAWINGS OR AS DIRECTED BY THE ENGINEER.

6. PLACE STRUCTURE BACKFILL AND ADJOINING EMBANKMENT SIMULTANEOUSLY UNLESS OTHERWISE PERMITTED BY THE ENGINEER.

7. REPLACE MATERIAL REMOVED BEYOND THE SPECIFIED LIMITS OF CLASS 1, 2 OR 3 EXCAVATION WITH STRUCTURE BACKFILL. CONSIDER MATERIAL REMOVED OR STRUCTURE BACKFILL PLACED BEYOND THE SPECIFIED LIMITS OF CLASS 1, 2 OR 3 EXCAVATION AS INCIDENTAL TO THE CLASS OF EXCAVATION SPECIFIED.

8. REFER TO STRUCTURE DRAWINGS FOR DRAINAGE DETAILS, WEEP HOLES, ETC.

9. INDICATE STRUCTURE BACKFILL QUANTITIES ON THE STRUCTURE DRAWINGS.

10. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
U.S. CUSTOMARY UNITS IN () PARENTHESES.

*11. PLACE BACKFILL WITHIN 600 (24") FROM THE REAR FACE OF THE ABUTMENT AND THE WINGWALL IN LOOSE LIFTS OF 150 (6") FOR TYPE OGS, AASHTO NO. 3, 5 OR 57 COARSE AGGREGATE; 225 (9") AASHTO NO.1; 300 (1'-0") FOR R-3 ROCK LINING. COMPACT EACH LAYER WITH TWO PASSES OF A WALK-BEHIND VIBRATORY PLATE SOIL COMPACTOR.

*12. BACKFILL SIMULTANEOUSLY BEHIND BOTH ABUTMENTS. KEEP THE DIFFERENCE BETWEEN THE FILL HEIGHT AT BOTH ENDS OF THE BRIDGE BELOW 300 (12") AT ALL TIMES DURING BACKFILLING.

LEGEND

* IDENTIFIES NOTES THAT APPLY ONLY TO INTEGRAL ABUTMENTS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

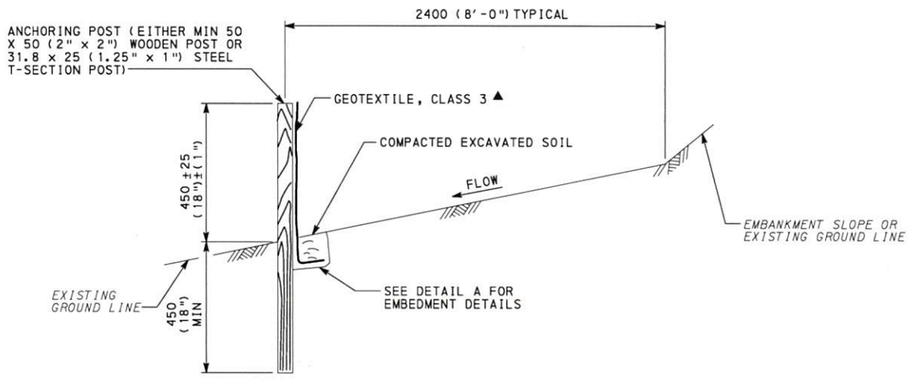
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BACKFILL AT STRUCTURES

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 2 OF 2
R. Wyatt Dilley	Gene E. Thomas	RC-12M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

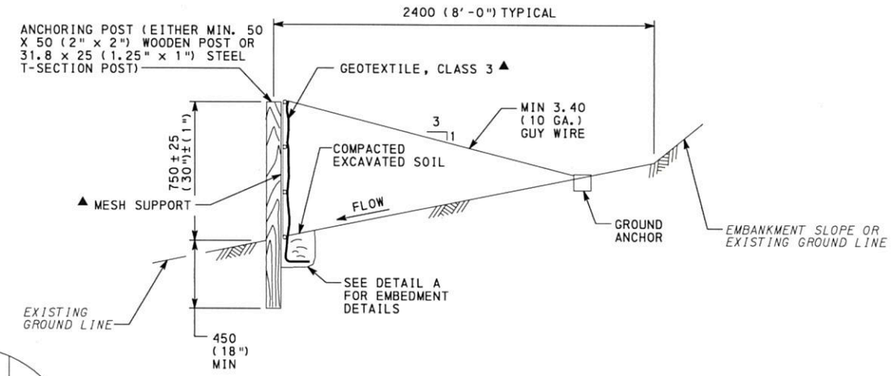
NOTES

1. REMOVE DEPOSITS WHEN SEDIMENT ACCUMULATION IS ONE-HALF THE ABOVE GROUND HEIGHT OF THE SILT FENCE.
2. ADHERE TO THE MANUFACTURER'S RECOMMENDATIONS RELATIVE TO REQUIRED GEOTEXTILE REPLACEMENT DUE TO WEATHERING.
3. PLACE SILT FENCE ON LEVEL GRADE. EXTEND BOTH ENDS OF THE FENCE AT LEAST 2400 (8'-0") UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
4. REPLACE UNDERCUT AND OVERTOPPED SECTIONS OF THE FENCE WITH A ROCK FILTER OUTLET (SEE SHEET 2). ROCK FILTER OUTLETS SHOULD BE INSTALLED ALONG THE SILT BARRIER FENCE AT POINTS OF FREQUENT FAILURES AND WHERE REQUIRED BY THE EROSION AND SEDIMENT POLLUTION CONTROL PLAN.
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN ( ) PARENTHESES.



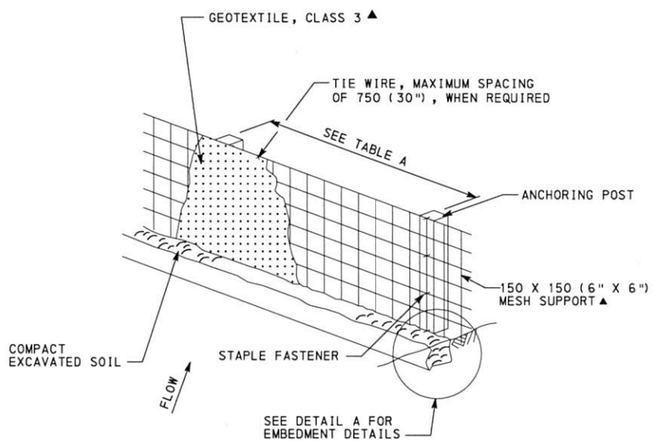
SILT BARRIER FENCE, 450 (18") HEIGHT

▲ SEE TABLE A



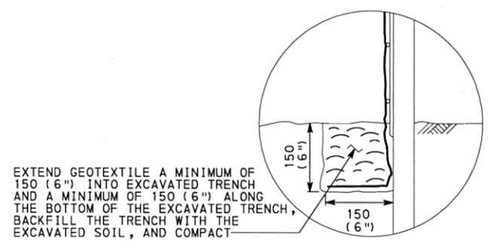
SILT BARRIER FENCE, 750 (30") HEIGHT

▲ SEE TABLE A

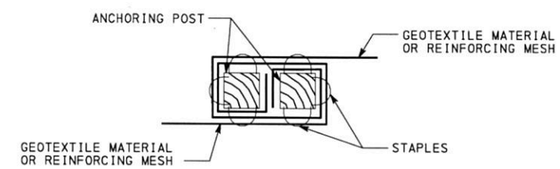


SILT BARRIER FENCE

▲ SEE TABLE A



DETAIL A



SILT BARRIER FENCE JOINING DETAIL

TABLE A
SILT BARRIER FENCE GEOTEXTILE SELECTION

SILT BARRIER FENCE, HEIGHT	TYPE OF CLASS 3 GEOTEXTILE MATERIAL	NOMINAL GEOTEXTILE HEIGHT	POST SPACING WITHOUT MESH SUPPORT	MAX POST SPACING WITH MESH SUPPORT
450 (18")	3A	750 (30")	2.4 m (8'-0")	NA
750 (30")	3A	1050 (42")	NA	2.4 m (8'-0")
450 (18")	3B	750 (30")	1.2 m (4'-0")	NA
750 (30")	3B	1050 (42")	NA	1.2 m (4'-0")

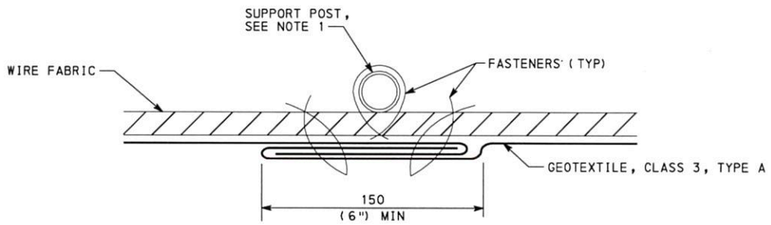
NA = NOT APPLICABLE

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

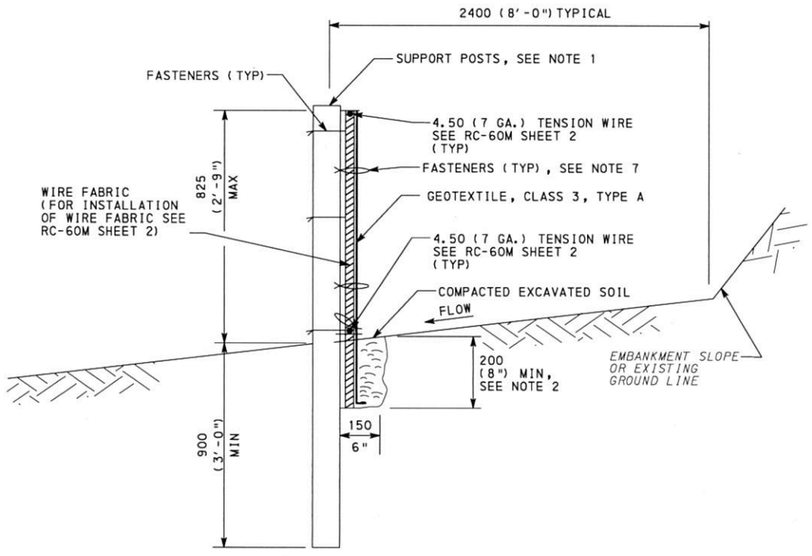
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PERIMETER CONTROL DEVICES

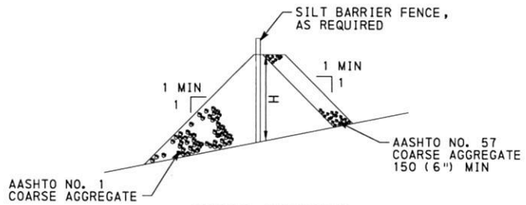
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 1 OF 3
R. Wyatt Dilley	Bruce E. Thomas	RC-70M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	



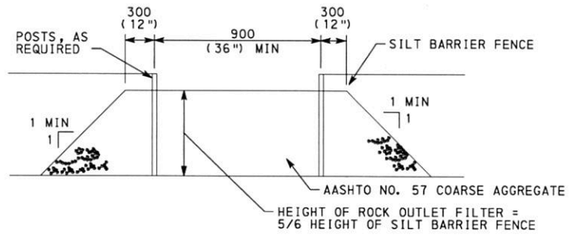
GEOTEXTILE OVERLAP DETAIL



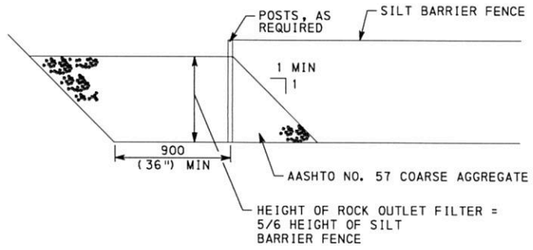
HEAVY DUTY SILT BARRIER FENCE



CROSS SECTION



FILTER AT INTERSECTION
OF SILT BARRIER FENCE
UPSLOPE FACE



FILTER AT TOE OF SLOPE

ROCK FILTER OUTLET

NOTES

1. SPACE POSTS AT 3000 (10'-0") MAXIMUM. USE 64 (2.5") DIAMETER GALVANIZED STEEL OR ALUMINUM POSTS.
2. EXTEND GEOTEXTILE AND WIRE FABRIC 200 (8") MIN INTO EXCAVATED TRENCH.
3. PLACE HEAVY DUTY SILT BARRIER FENCE ON LEVEL GRADE. EXTEND BOTH ENDS OF THE FENCE AT LEAST 2400 (8'-0") UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
4. REMOVE DEPOSITS WHEN SEDIMENT ACCUMULATION IS ONE-HALF THE ABOVE GROUND HEIGHT OF THE SILT FENCE.
5. ADHERE TO THE MANUFACTURER'S RECOMMENDATIONS RELATIVE TO REQUIRED GEOTEXTILE REPLACEMENT DUE TO WEATHERING.
6. REPLACE UNDERCUT AND OVERTOPPED SECTIONS OF THE FENCE WITH A ROCK FILTER OUTLET. ROCK FILTER OUTLETS SHOULD BE INSTALLED ALONG THE SILT BARRIER FENCE AT POINTS OF FREQUENT FAILURES AND WHERE REQUIRED BY THE EROSION AND SEDIMENT POLLUTION CONTROL PLAN.
7. SPACE GEOTEXTILE TO WIRE FABRIC FASTENERS AT 600 (24") MAX CENTER TO CENTER.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

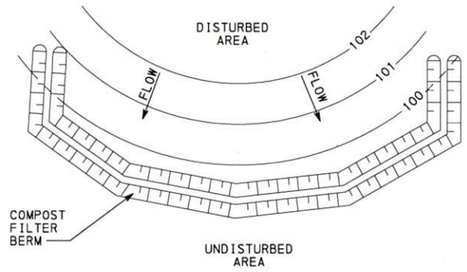
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PERIMETER CONTROL DEVICES

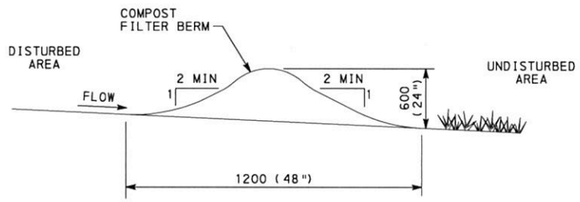
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 2 OF 3
R. Wyatt Dilley	Bruce E. Thomas	RC-70M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

NOTES

1. REMOVE DEPOSITS WHEN SEDIMENT ACCUMULATION IS ONE-THIRD THE HEIGHT OF THE EXPOSED COMPOST FILTER BERM OR ONE-HALF OF THE EXPOSED COMPOST FILTER SOCK.
2. PLACE COMPOST FILTER SOCK/BERM ON LEVEL GRADE. EXTEND BOTH ENDS OF THE COMPOST FILTER SOCK/BERM AT LEAST 2400 (8'-0") UPSLOPE AT 45 DEGREES TO THE MAIN ALIGNMENT.
3. REPLACE BIODEGRADABLE FILTER SOCK AFTER 6 MONTHS; PHOTODEGRADABLE AFTER 12 MONTHS.

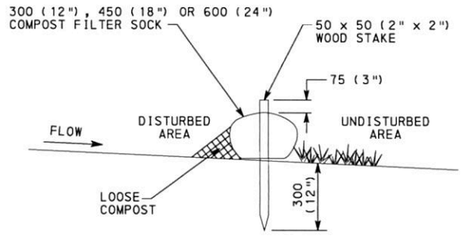


PLAN VIEW

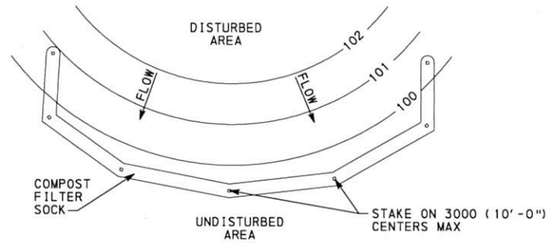


SECTION VIEW

COMPOST FILTER BERM



SECTION VIEW



PLAN VIEW

COMPOST FILTER SOCK

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

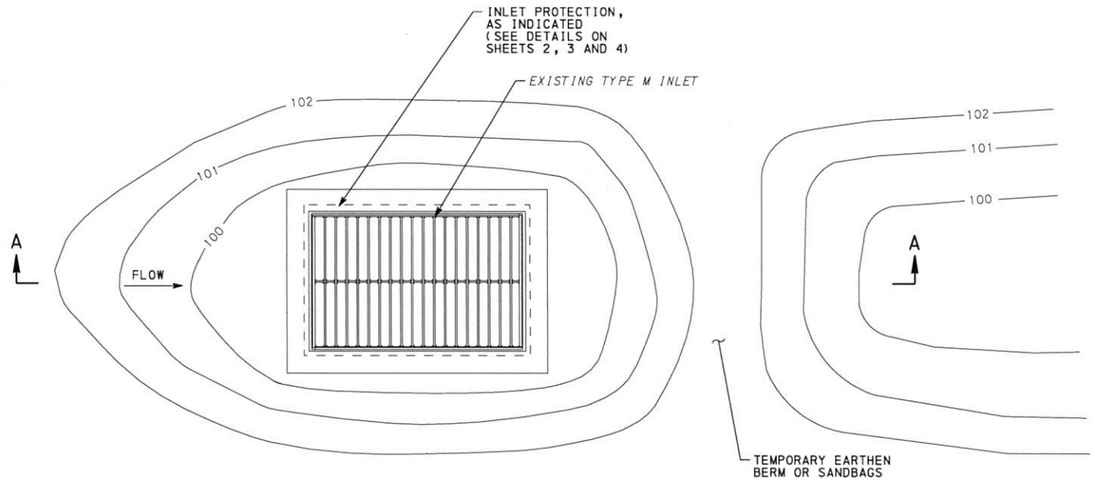
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PERIMETER CONTROL DEVICES

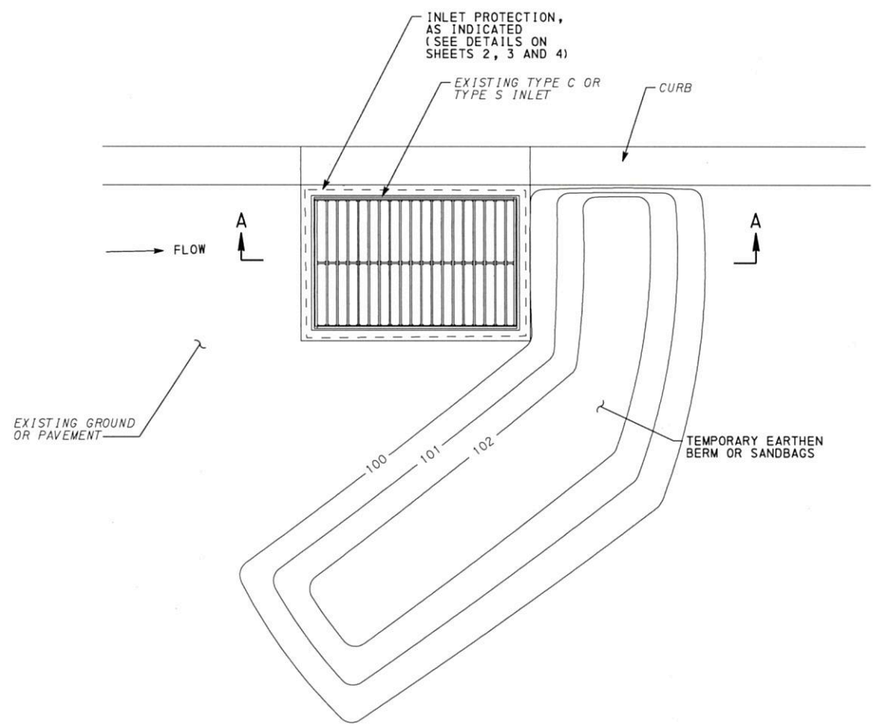
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 3 OF 3
R. Hunt Kelly	Thomas B. Hyson	RC-70M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

NOTES

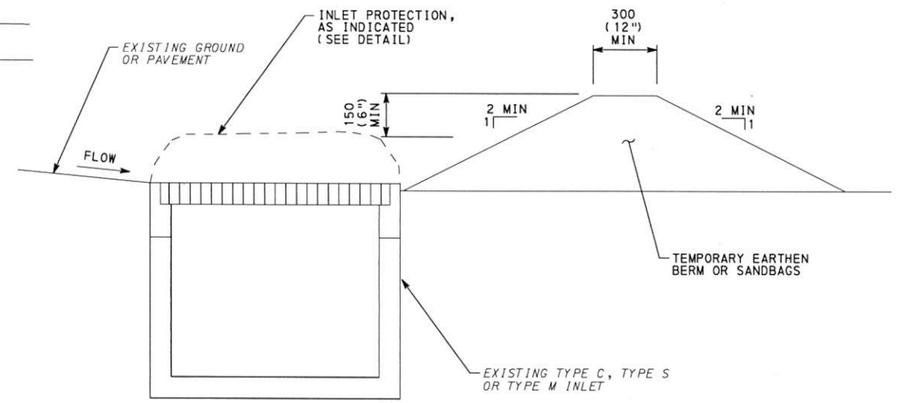
1. TEMPORARY EARTHEN BERMS OR SANDBAGS CAN BE USED FOR ALL INLET PROTECTION.
2. USE BERMS AS REQUIRED.
3. DO NOT USE INLET PROTECTION ON ROADWAYS WHERE PONDING WATER OR INLET PROTECTION MAY BE HAZARDOUS TO VEHICULAR TRAFFIC.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESES.



TYPE M INLET PROTECTION



TYPE C OR TYPE S INLET PROTECTION



SECTION A-A

TYPE C, TYPE S OR TYPE M INLET PROTECTION SIDE VIEW

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

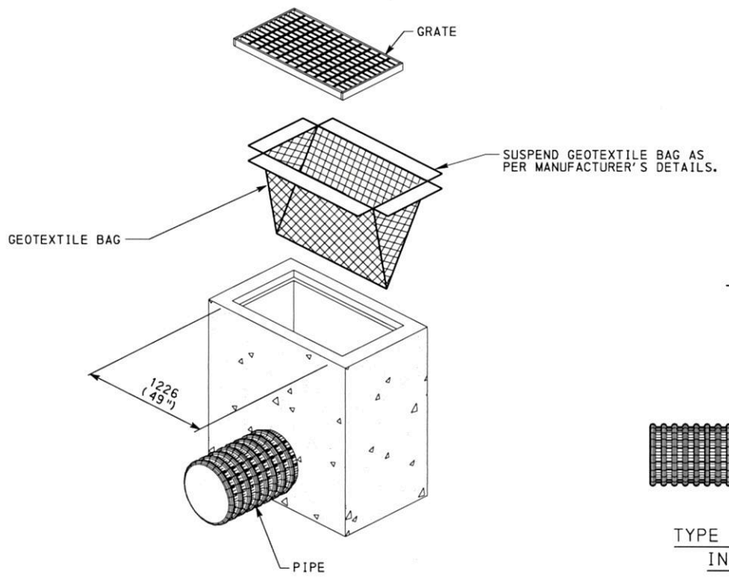
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLET AND OUTLET PROTECTION

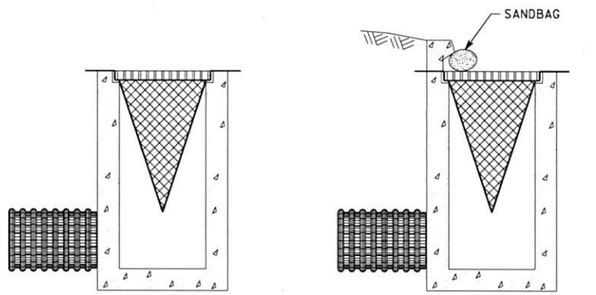
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 1 OF 7
R. Wyatt Willy	Bruce E. Hyson	RC-72M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

NOTES

1. INSPECT INLET FILTER BAG AFTER EACH RUNOFF EVENT. MAINTAIN AS REQUIRED TO ENSURE PROPER FUNCTIONING OF THE BAG.
2. REMOVE ACCUMULATED SEDIMENT/DEBRIS WHEN THE INLET FILTER REACHES ONE-HALF MAXIMUM CAPACITY.
3. REPLACE FILTER BAG IF RIPPED OR TORN.
4. PROVIDE DOWN GRADIENT BERM AS INDICATED ON SHEET 1. DO NOT USE IN SAG/SUMP CONDITIONS.
5. USE SANDBAGS AT TYPE C INLET CURB OPENINGS TO TO PREVENT BYPASS FLOW.
6. REMOVE AND PROPERLY DISPOSE OF INLET FILTER BAG WHEN NO LONGER NEEDED.



ISOMETRIC VIEW



TYPE M OR TYPE S INLET INSTALLATION (TYP)

TYPE C INLET INSTALLATION (TYP)

SIDE VIEW

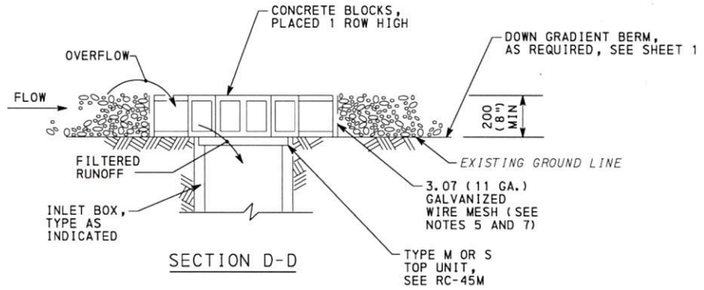
INLET FILTER BAG

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

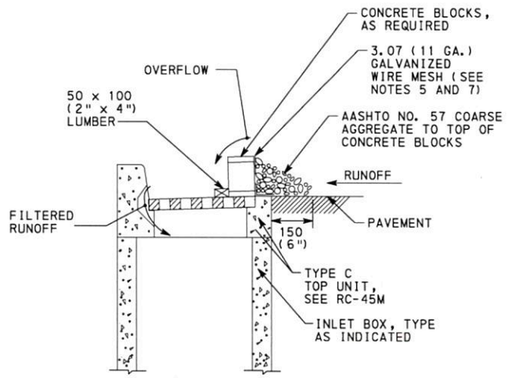
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLET AND OUTLET PROTECTION

RECOMMENDED JUN. 1, 2010 CHIEF, HWY. QA DIVISION	RECOMMENDED JUN. 1, 2010 DIRECTOR, BUREAU OF DESIGN	SHT 2 OF 7 RC-72M



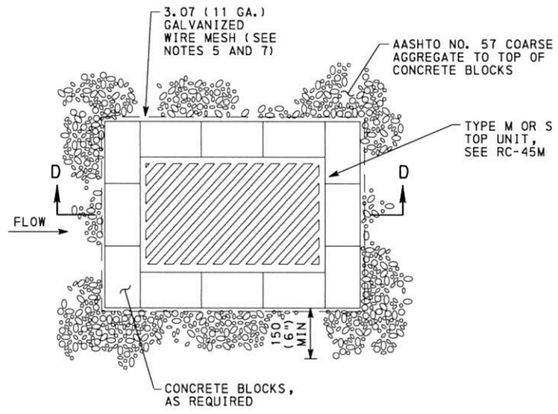
SECTION D-D



SECTION C-C

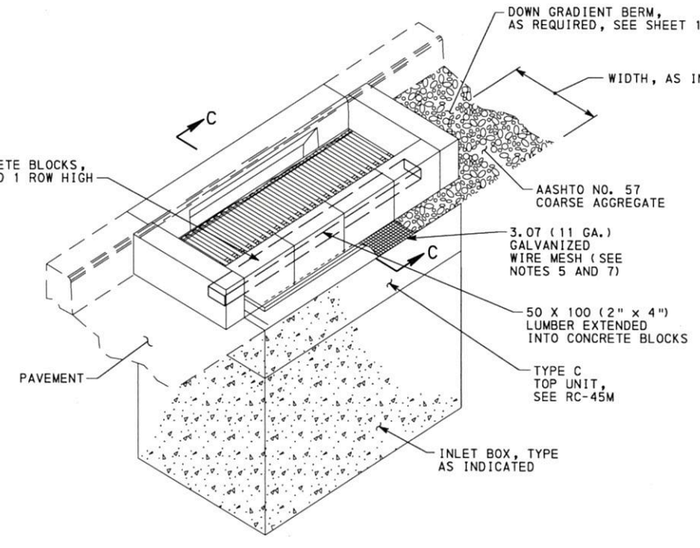
NOTES

1. INSPECT AND REPAIR CONCRETE BLOCK/GRAVEL INLET FILTER AFTER EACH RUNOFF EVENT. REMOVE ACCUMULATED SEDIMENT AS NECESSARY. REMOVE AND DISPOSE OF SEDIMENT IN ACCORDANCE WITH PUBLICATION 408, SECTION 860.
2. REMOVE SEDIMENT AS REQUIRED OR WHEN DIRECTED FROM TRAVELED ROADWAYS.
3. REPLACE AND SATISFACTORILY DISPOSE OF CLOGGED FILTER STONE (AASHTO NO. 57 COARSE AGGREGATE). RAKE PERIODICALLY TO INCREASE INFILTRATION.
4. PLACE 3.07 (11 GA.) GALVANIZED WIRE MESH AROUND PERIMETER OF CONCRETE BLOCKS TO PREVENT MOVEMENT OF GRAVEL.
5. UPON APPROVAL, 6.25 (1/4") MAX PLASTIC MESH MAY BE SUBSTITUTED FOR GALVANIZED WIRE MESH.
6. PLACE CONCRETE BLOCKS MEETING THE REQUIREMENTS OF PUBLICATION 408 AROUND INLET PERIMETER.
7. PLACE 3.07 (11 GA.) GALVANIZED WIRE MESH OVER EXPOSED GRATE AREA OF TYPE C INLETS ONLY. PLACE WIRE MESH ALONG PERIMETER OF CONCRETE BLOCKS PRIOR TO PLACING AASHTO NO. 57 COARSE AGGREGATE, ALL INLET TYPES.
8. PROVIDE DOWN GRADIENT BERM AS INDICATED ON SHEET 1. DO NOT USE IN SAG/SUMP CONDITIONS.
9. DO NOT USE INLET PROTECTION ON ROADWAYS WHERE PONDING WATER OR INLET PROTECTION MAY BE HAZARDOUS TO VEHICULAR TRAFFIC.



PLAN

CONCRETE BLOCK/GRAVEL INLET PROTECTION
(TYPE M OR TYPE S INLETS)



PLAN

CONCRETE BLOCK/GRAVEL INLET PROTECTION
(TYPE C INLET)

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
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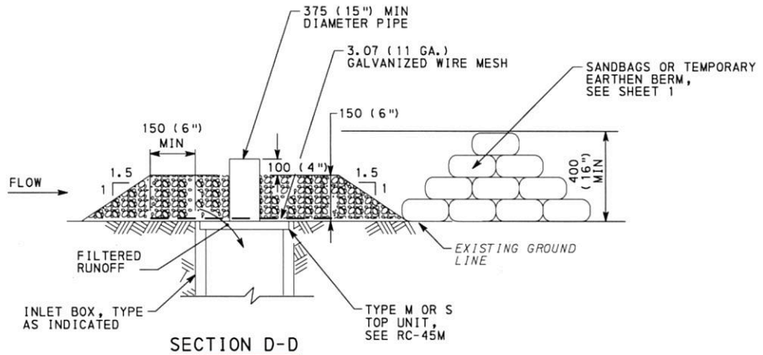
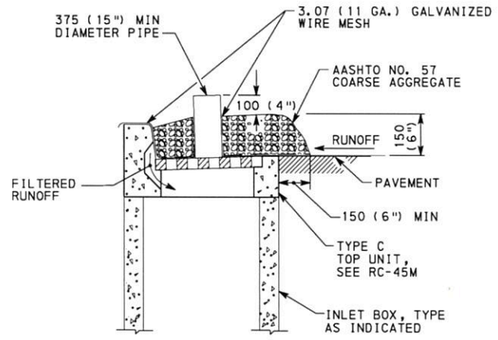
INLET AND OUTLET PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 3 OF 7
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	RC-72M



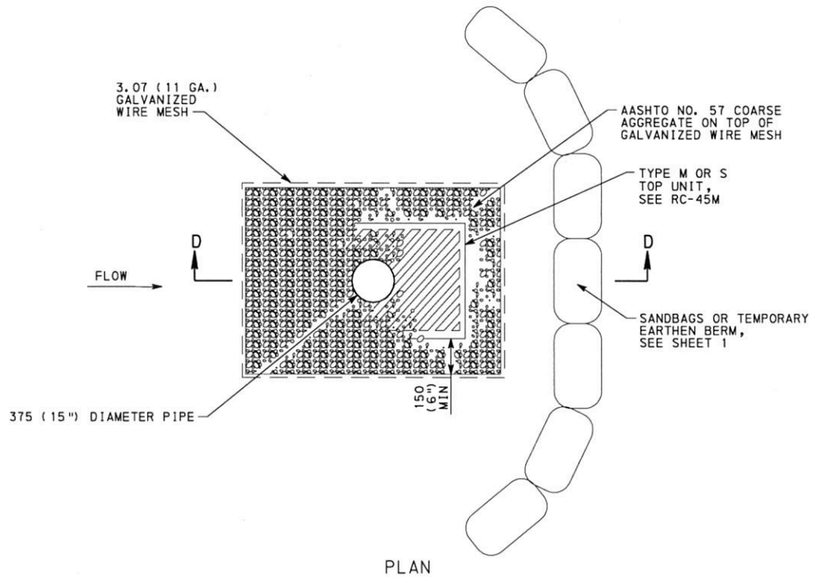
SECTION D-D



SECTION C-C

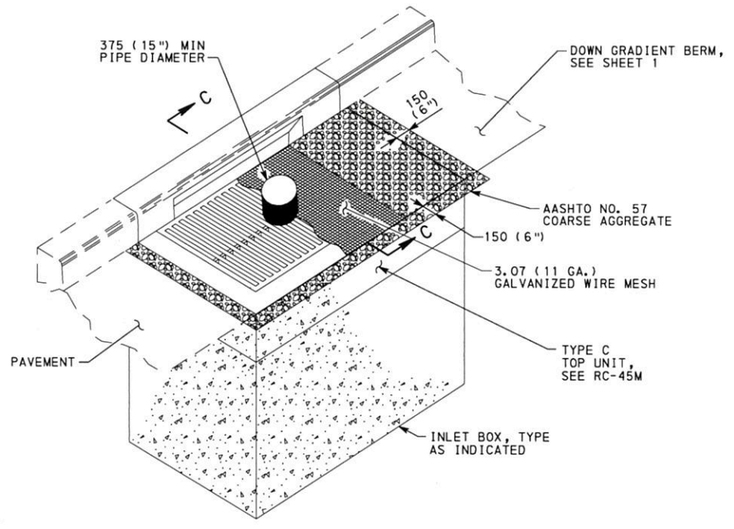
NOTES

1. INSPECT AND REPAIR PIPE/GRAVEL INLET FILTER AFTER EACH RUNOFF EVENT. REMOVE ACCUMULATED SEDIMENT AS NECESSARY. REMOVE AND DISPOSE OF SEDIMENT IN ACCORDANCE WITH PUBLICATION 408, SECTION 860.
2. REMOVE SEDIMENT AS REQUIRED OR WHEN DIRECTED FROM TRAVELED ROADWAYS.
3. REPLACE AND SATISFACTORILY DISPOSE OF CLOGGED FILTER STONE (AASHTO NO. 57 COARSE AGGREGATE). RAKE PERIODICALLY TO INCREASE INFILTRATION.
4. PLACE 3.07 (11 GA.) GALVANIZED WIRE MESH ON TOP OF INLET.
5. PLACE 375 (15") DIAMETER PIPE ON WIRE MESH AS INDICATED AND IN ACCORDANCE WITH PUBLICATION 408, SECTION 860.
6. DO NOT USE INLET PROTECTION ON ROADWAYS WHERE PONDING WATER OR INLET PROTECTION MAY BE HAZARDOUS TO VEHICULAR TRAFFIC.



PLAN

PIPE/GRAVEL INLET PROTECTION
(TYPE M OR TYPE S INLET)



PLAN

PIPE/GRAVEL INLET PROTECTION
(TYPE C INLET)

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
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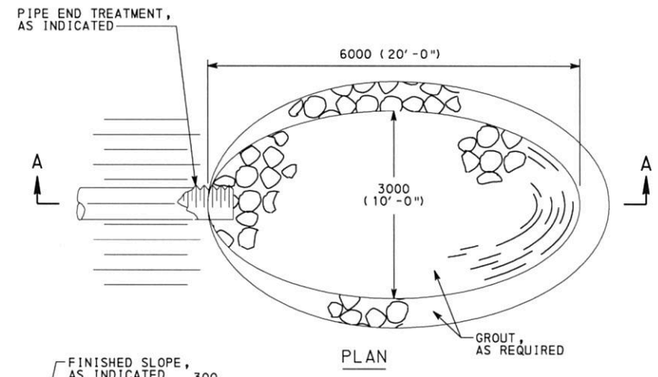
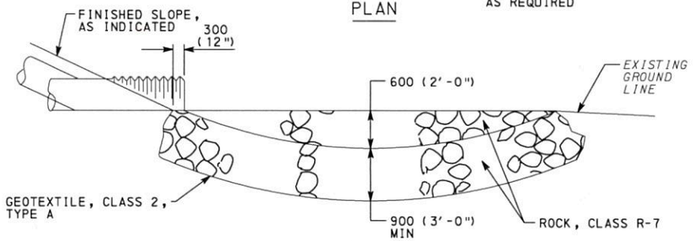
BUREAU OF DESIGN

INLET AND OUTLET PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 4 OF 7
R. Hyatt Silley	Bruce E. Thomas	RC-72M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

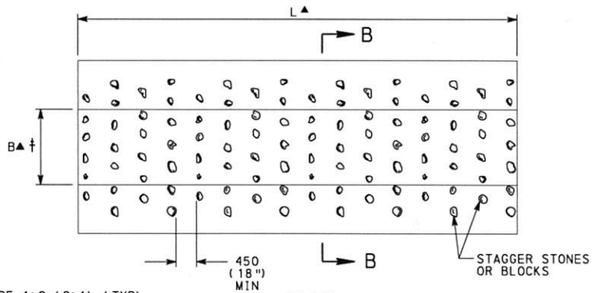


PLAN

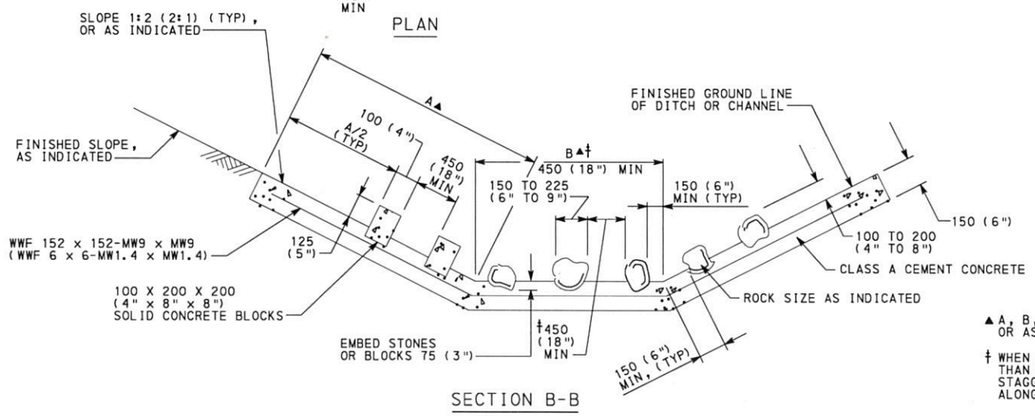


SECTION A-A

ROCK BASIN



PLAN

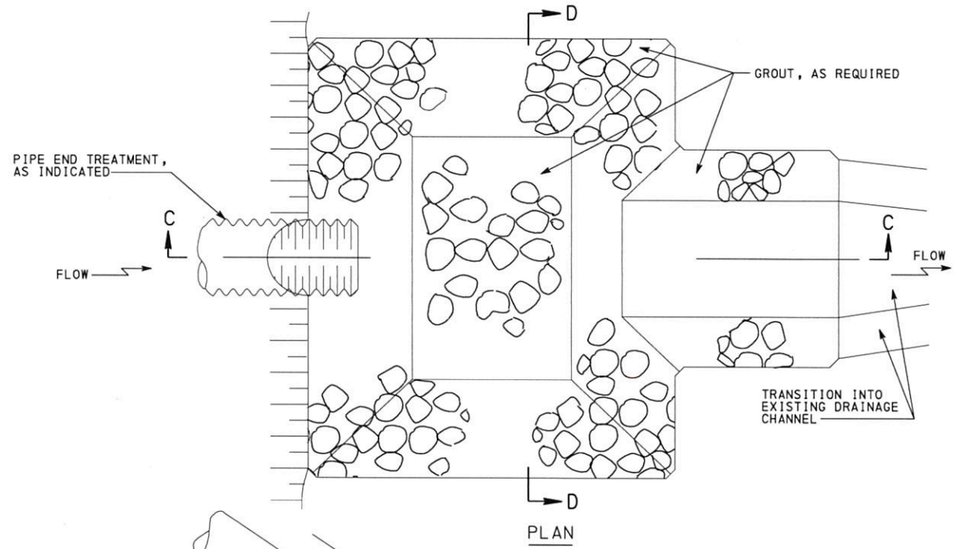


SECTION B-B

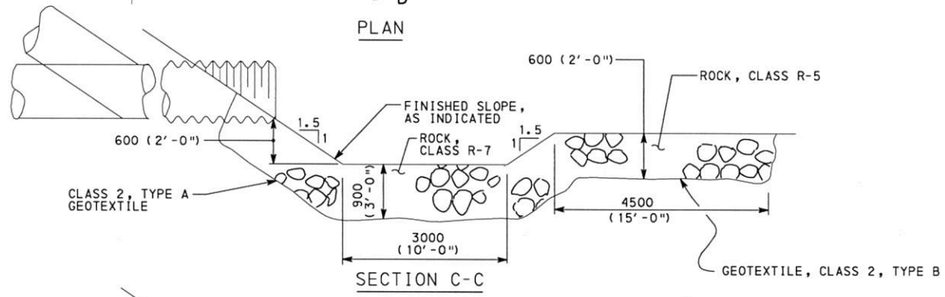
PAVED ENERGY DISSIPATOR

▲ A, B, AND L AS INDICATED OR AS DIRECTED

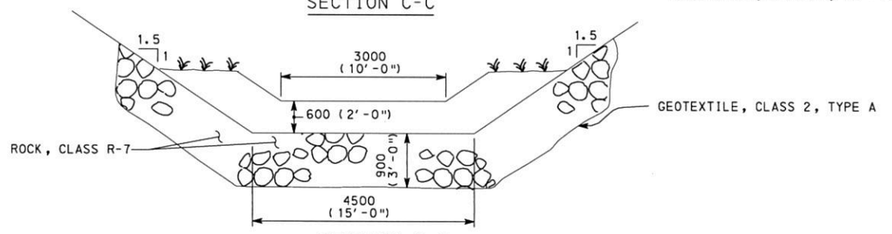
‡ WHEN CHANNEL BOTTOM WIDTH IS LESS THAN 900 (3'-0"), USE A SINGLE, STAGGERED ROW OF STONES OR BLOCKS ALONG CHANNEL BOTTOM



PLAN



SECTION C-C



SECTION D-D

ROCK ENERGY DISSIPATOR

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

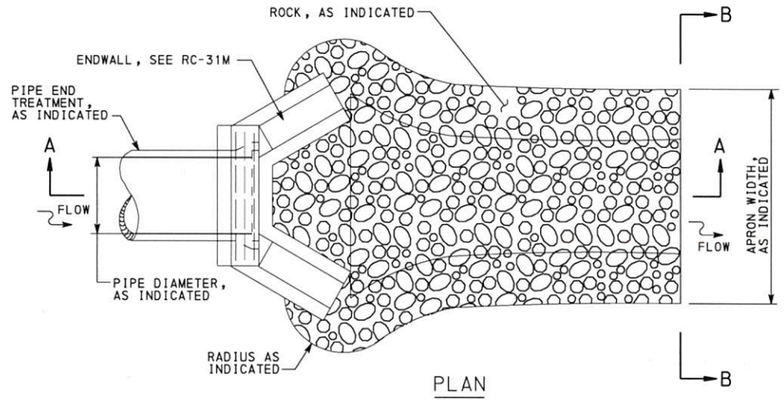
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLET AND OUTLET PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 5 OF 7
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	RC-72M

NOTES

1. PROVIDE GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.
2. SLOPE SHOULD BE LEVEL OR AS CLOSE TO LEVEL AS REASONABLY POSSIBLE BASED ON SITE CONDITIONS.



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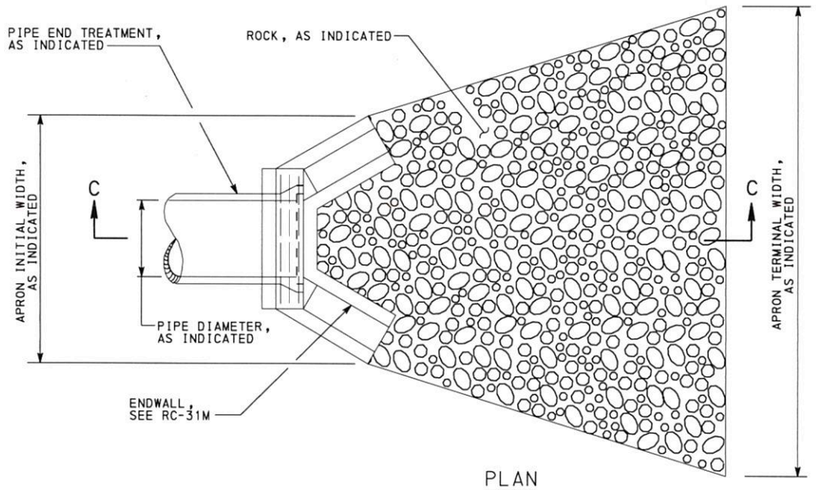

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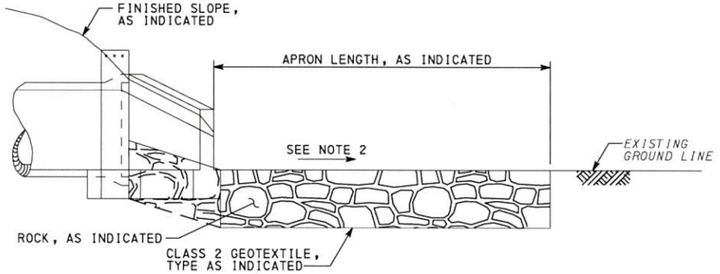
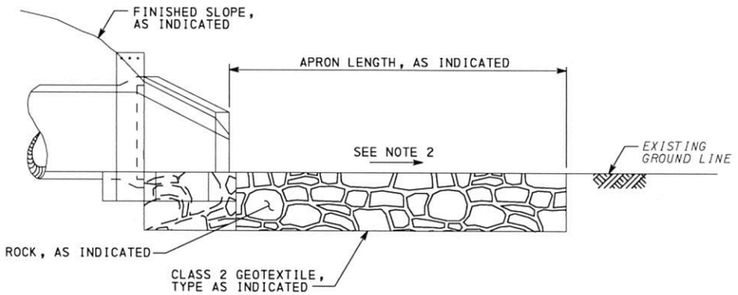
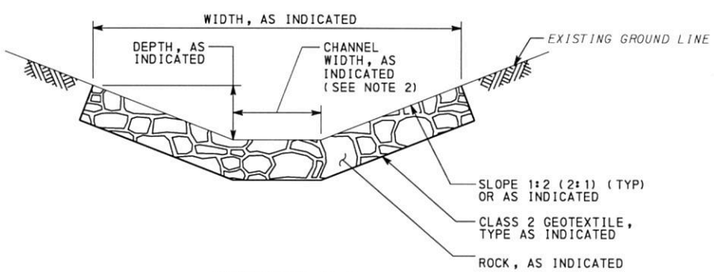


SECTION A-A



SECTION C-C

ROCK APRON (FLAT AREA)



SECTION B-B

ROCK APRON (DEFINED CHANNEL)

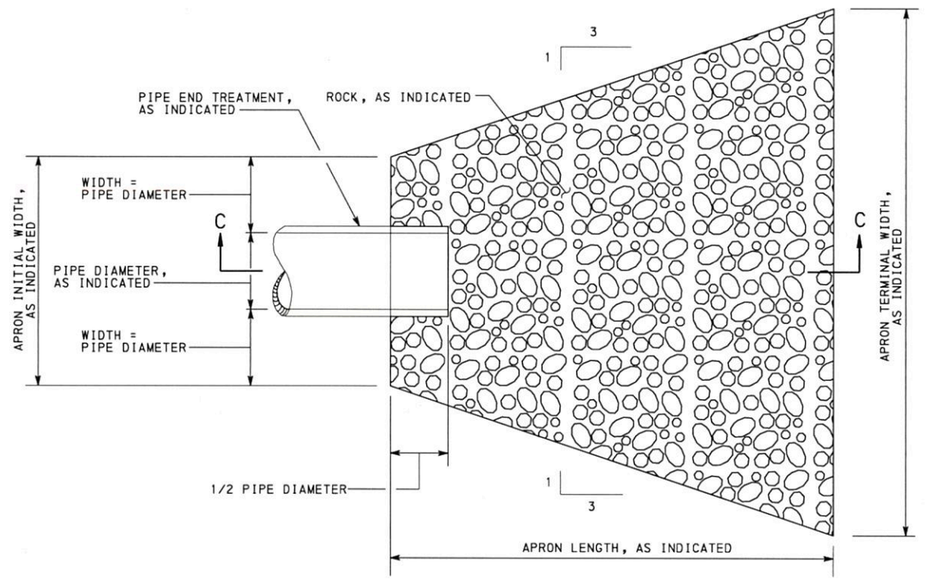
NOT TO SCALE

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

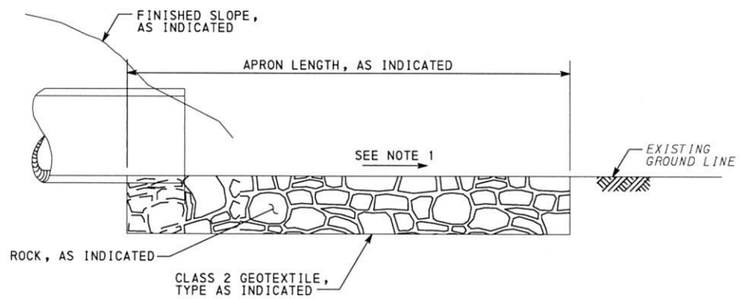
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLET AND OUTLET PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 6 OF 7
R. Wyatt Willy	Bruce E. Thomas	RC-72M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	



PLAN



SECTION C-C

ROCK APRON (FLAT AREA)

NOTE

1. SLOPE SHOULD BE LEVEL OR AS CLOSE TO LEVEL AS REASONABLY POSSIBLE BASED ON SITE CONDITIONS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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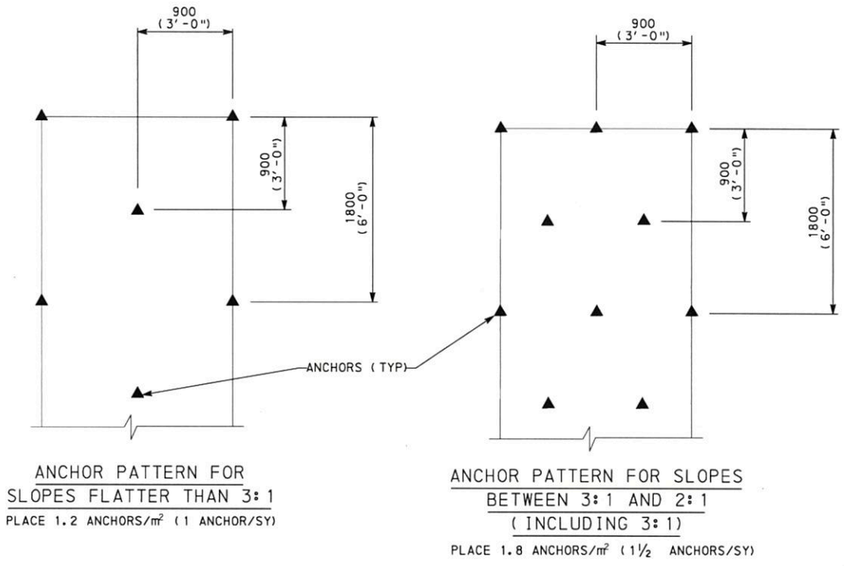
INLET AND OUTLET PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 7 OF 7
R. Wyatt Billy	Bruce E. Thomas	RC-72M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

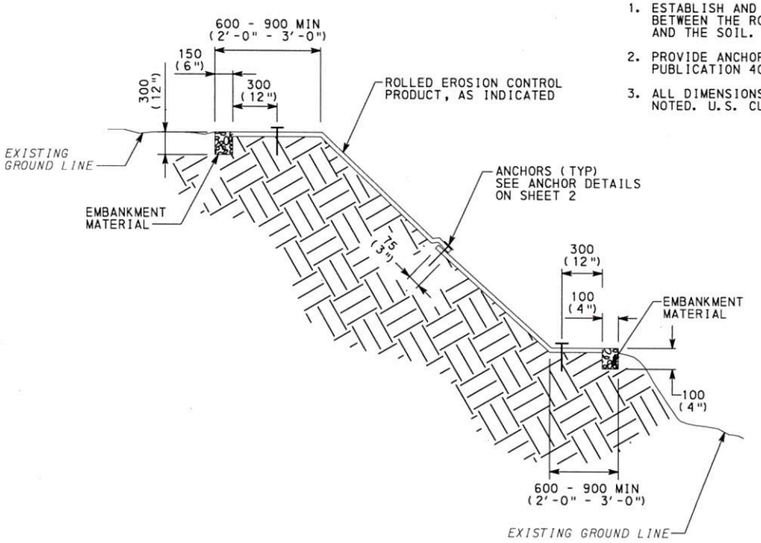


ANCHOR PATTERN FOR SLOPES FLATTER THAN 3:1

PLACE 1.2 ANCHORS/m² (1 ANCHOR/SY)

ANCHOR PATTERN FOR SLOPES BETWEEN 3:1 AND 2:1 (INCLUDING 3:1)

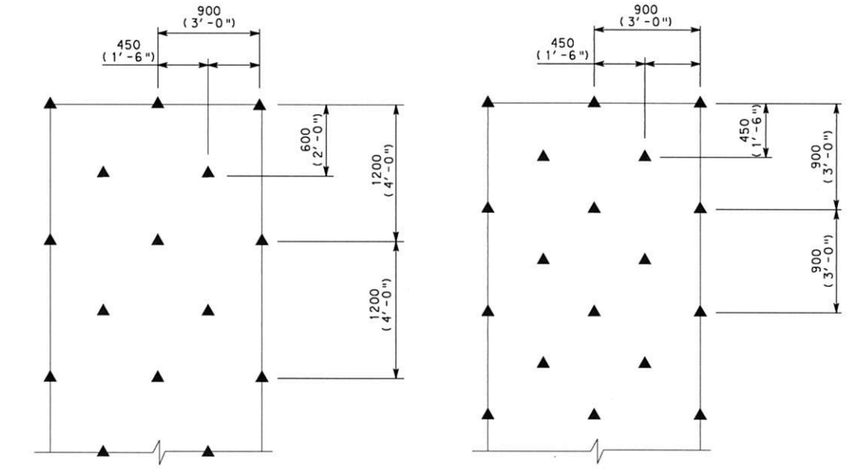
PLACE 1.8 ANCHORS/m² (1½ ANCHORS/SY)



TYPICAL SLOPE CROSS-SECTION

NOTES

1. ESTABLISH AND MAINTAIN CONTINUOUS CONTACT BETWEEN THE ROLLED EROSION CONTROL PRODUCTS AND THE SOIL.
2. PROVIDE ANCHORING DEVICES IN ACCORDANCE WITH PUBLICATION 408, SECTION 806.2(d).
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESES.



ANCHOR PATTERN FOR SLOPES BETWEEN 2:1 AND 1:1 (INCLUDING 2:1)

PLACE 2.5 ANCHORS/m² (2 ANCHORS/SY)

ANCHOR PATTERN FOR 1:1 OR STEEPER

PLACE 3 ANCHORS/m² (2½ ANCHORS/SY)

ANCHOR PATTERNS FOR SLOPES

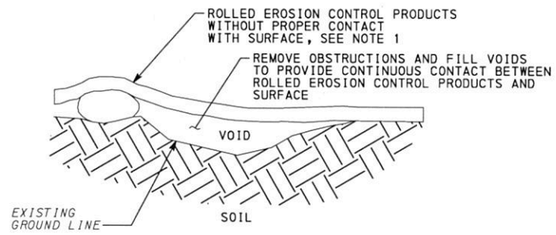


FIGURE 1

LACK OF CONTINUOUS CONTACT

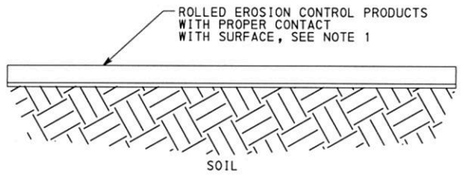


FIGURE 2

CONTINUOUS CONTACT

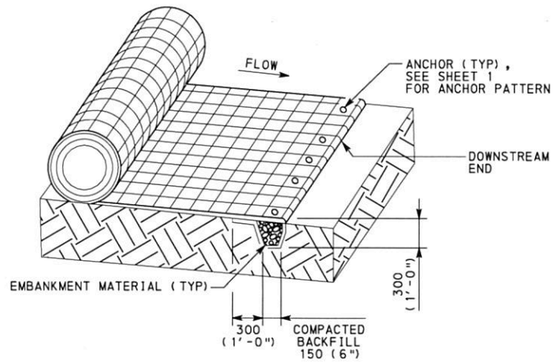
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

ROLLED EROSION CONTROL PRODUCTS (RECP)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

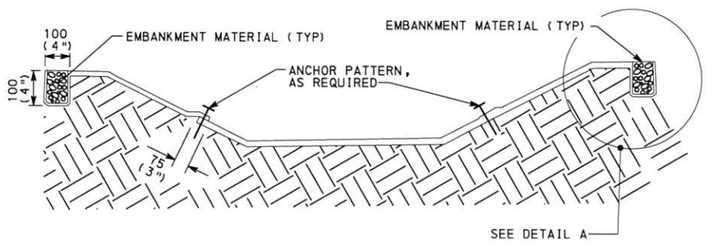
CHANNEL AND SLOPE PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 1 OF 4
R. Wyatt Dilley	Bruce E. Thomas	RC-73M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	



INITIAL ANCHOR TRENCH

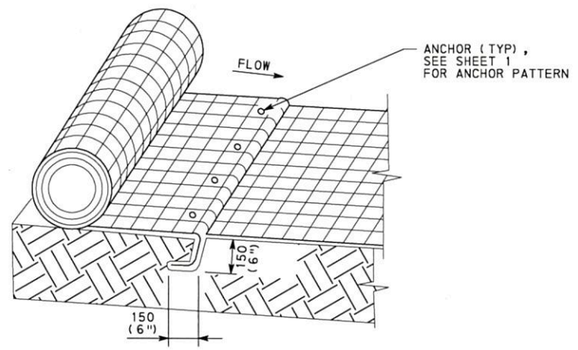
SEE NOTE 1



TYPICAL TRAPEZOIDAL CHANNEL CROSS-SECTION

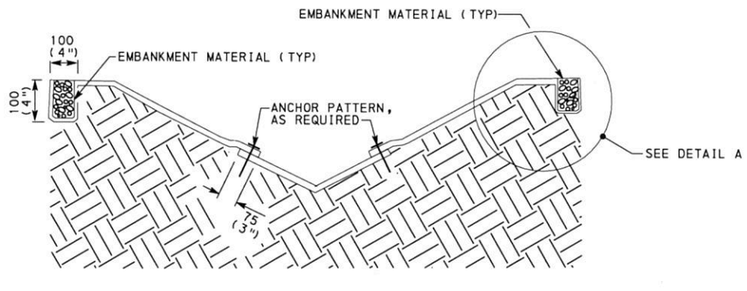
NOTES

1. EXCAVATE INITIAL ANCHOR TRENCH 300 (1'-0") DEEP AND 150 (6") WIDE ACROSS THE WIDTH OF THE CHANNEL TO PREVENT UNDERMINING OF THE ROLLED EROSION CONTROL PRODUCTS.
2. EXCAVATE INTERMITTENT CHECK SLOT 150 (6") DEEP AND 150 (6") WIDE ACROSS THE WIDTH OF THE CHANNEL AT 7000 TO 9000 (25'-0" TO 30'-0") ALONG THE LENGTH OF THE ROLLED EROSION CONTROL PRODUCTS TO PREVENT LOOSE SOIL FROM BEING TRANSPORTED DOWNSTREAM BENEATH THE ROLLED EROSION CONTROL PRODUCTS.
3. EXCAVATE TERMINAL ANCHOR TRENCH 300 (1'-0") DEEP AND 150 (6") WIDE ACROSS THE WIDTH OF THE CHANNEL TO ENSURE WATER FLOW TRANSITIONS SMOOTHLY ONTO THE ROLLED EROSION CONTROL PRODUCTS WITHOUT SEPARATION FROM THE SOIL.
4. EXTEND ROLLED EROSION CONTROL PRODUCTS 600 - 900 (2'-0" - 3'-0") ABOVE THE CREST OF CHANNEL SIDE WHENEVER POSSIBLE.
5. PLACE 3 ANCHORS/m^2 (2½ ANCHORS/SY).
6. PROVIDE ANCHORING DEVICES IN ACCORDANCE WITH SECTION 806.2(d) OF PUBLICATION 408.

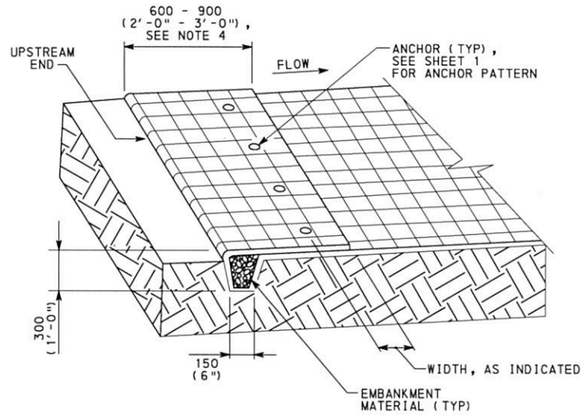


INTERMITTENT CHECK SLOT

SEE NOTE 2

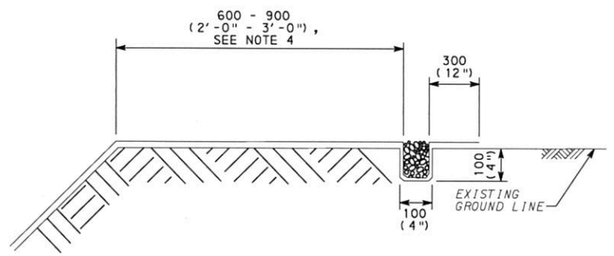


TYPICAL V-DITCH CROSS-SECTION



TERMINAL ANCHOR TRENCH

SEE NOTE 3



DETAIL A

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

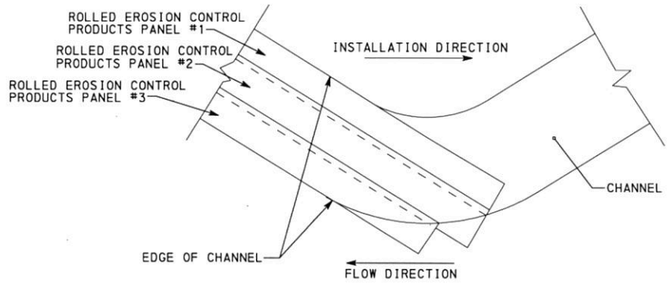
CHANNEL AND SLOPE PROTECTION

ROLLED EROSION CONTROL PRODUCTS (RECP)

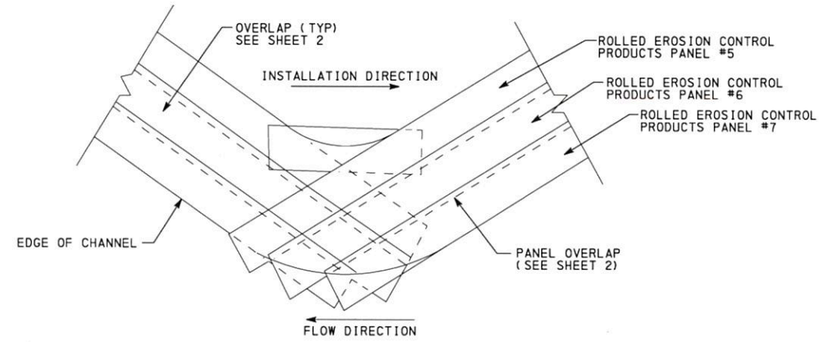
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 2 OF 4
R. Wade Willy	Bruce E. Thomas	RC-73M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

NOTES

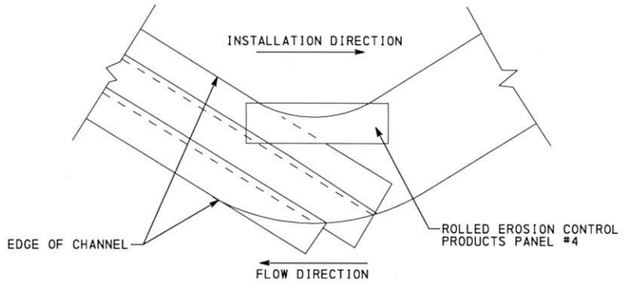
1. INSTALL ROLLED EROSION CONTROL PRODUCTS IN STRAIGHT SECTIONS AROUND CHANNEL BEND TO AVOID CURLING OF MAT EDGES. INSTALL ROLLED EROSION CONTROL PRODUCTS STARTING WITH PANEL #1.
2. ESTABLISH AND MAINTAIN CONTINUOUS CONTACT BETWEEN THE ROLLED EROSION CONTROL PRODUCTS AND SOIL SURFACE.
3. INSTALL ROLLED EROSION CONTROL PRODUCTS AS INDICATED AND AS SHOWN ON SHEET 2.
4. TERMINATE PANELS AT CHANNEL EDGE OR AS DIRECTED BY THE REPRESENTATIVE.



ROLLED EROSION CONTROL PRODUCTS PANELS 1, 2 & 3



ROLLED EROSION CONTROL PRODUCTS PANELS 5, 6 & 7



ROLLED EROSION CONTROL PRODUCTS PANEL 4

INSTALLATION FOR CHANNEL BENDS
ROLLED EROSION CONTROL PRODUCTS (RECP)

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

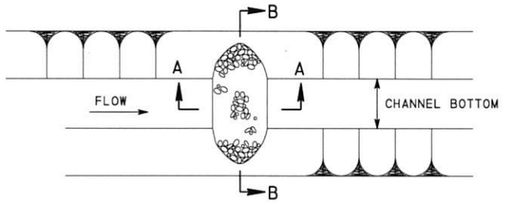
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CHANNEL AND SLOPE PROTECTION

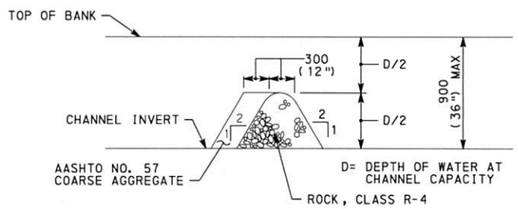
RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 3 OF 4
R. Wyatt Dilley	Bruce E. Thomas	RC-73M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	

NOTES

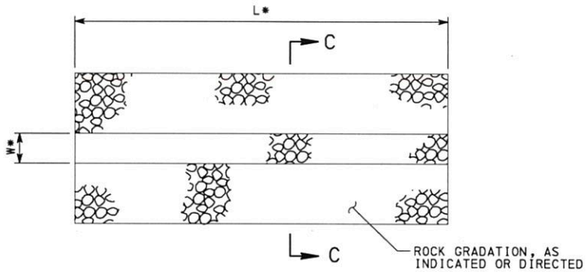
1. REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES ONE-HALF THE HEIGHT OF THE ROCK BARRIER. REPLACE CLOGGED FILTER STONE. REMOVE AND DISPOSE OF SEDIMENT IN AN APPROVED MANNER.
2. PROVIDE GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.



PLAN VIEW

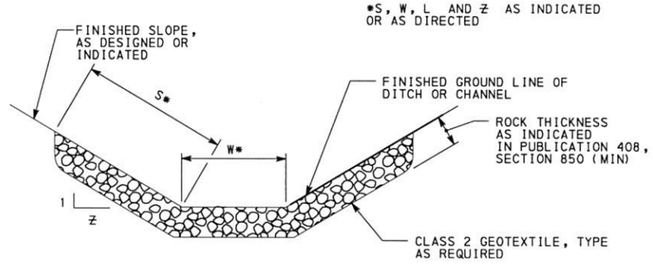


SECTION A-A



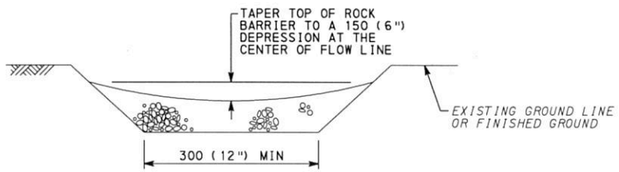
PLAN

*S, W, L AND ⧾ AS INDICATED OR AS DIRECTED



SECTION C-C

ROCK LINING FOR CHANNELS



SECTION B-B

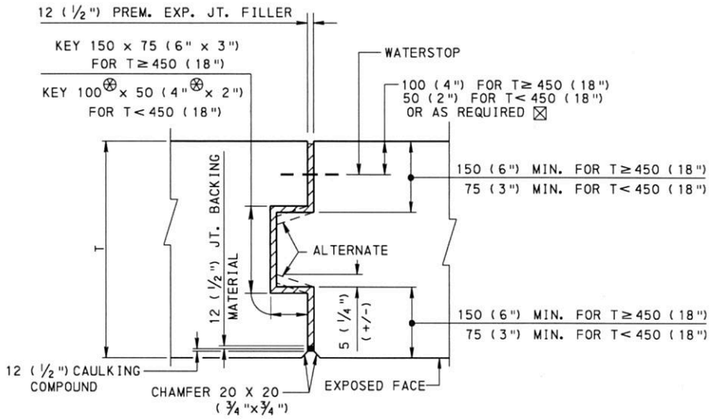
ROCK BARRIER

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

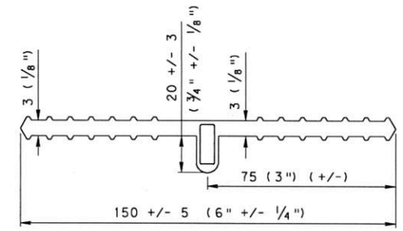
CHANNEL AND SLOPE PROTECTION

RECOMMENDED JUN. 1, 2010	RECOMMENDED JUN. 1, 2010	SHT 4 OF 4
R. Wyatt Willey	Gene E. Hyatt	RC-73M
CHIEF, HWY. QA DIVISION	DIRECTOR, BUREAU OF DESIGN	



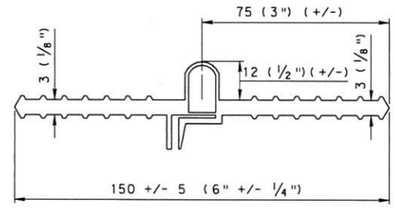
KEYED EXPANSION JOINT

(FLUSH EXPANSION JOINT SIMILAR EXCEPT OMIT KEY)
CHAMFER DIMENSIONS ARE NOMINAL AND MAY VARY 5 (¼ ") (+/-).



POLYVINYL CHLORIDE

TYPE E1



POLYVINYL CHLORIDE

TYPE E2

WATERSTOPS FOR EXPANSION JOINTS

NOTE:
PROVIDE HOLES OR SLOTS IN WATERSTOP, AS REQUIRED, WHEN NECESSARY TO ACCOMMODATE REINFORCEMENT BARS, BUT DO NOT COMPROMISE SEAL.

GENERAL NOTES:

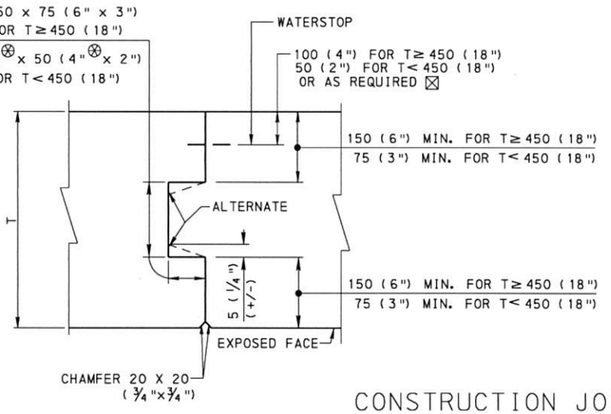
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN ( ) PARENTHESES.
2. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH PUB. 408.
3. WHEN TYPE C2 WATERSTOP IS USED TO FACILITATE INSTALLATION, JOIN THE SPLIT-FLANGE TOGETHER USING PVC SOLVENT CEMENT MEETING THE REQUIREMENTS OF ASTM D 2564, AFTER THE FORMS FOR THE FIRST PLACEMENT OF CONCRETE ARE REMOVED.
4. CONTRACTOR HAS THE OPTION TO SELECT ANY OF THE WATERSTOPS SHOWN.

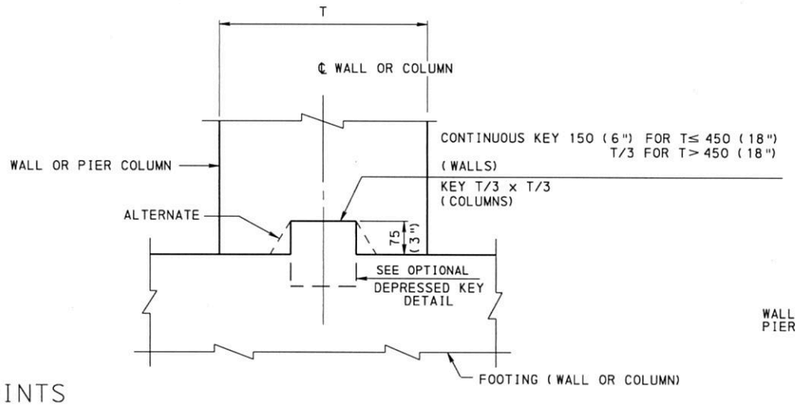
LEGEND:

☒ PLACE WATERSTOP INSIDE OF REINFORCEMENT BARS.

⊛ 100 (4") MINIMUM, T/3 MAXIMUM

T IS THICKNESS OF WALL OR DIAMETER OF COLUMN.
T IS THE LEAST DIMENSION.

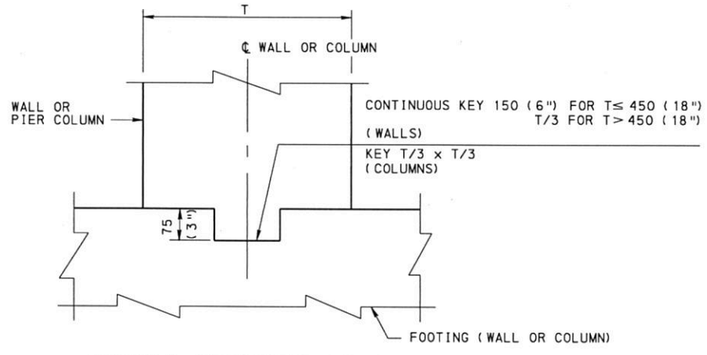




CONSTRUCTION JOINTS

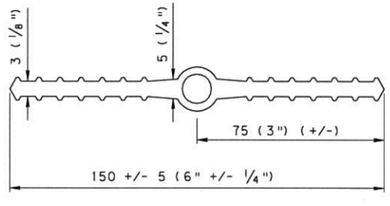
NOTES:

1. KEY DIMENSIONS ARE NOMINAL AND MAY VARY 12 (½ ") (+/-).
2. STOP KEYED JOINTS IN TOP OF EXPOSED WALL FLUSH TO A DEPTH OF 300 (12").
3. STOP WATERSTOP 300 (12") FROM TOP OF WALL.



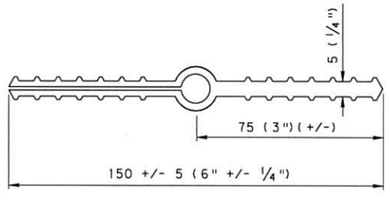
OPTIONAL DEPRESSED KEY DETAIL

NOTE: OPTIONAL DEPRESSED KEY DETAIL IS TO BE USED ONLY WHEN SHOWN ON CONTRACT DRAWINGS. SURFACES OF DEPRESSED KEY MUST BE ROUGHENED TO ENSURE ADEQUATE BOND WITH NEW CONCRETE.



POLYVINYL CHLORIDE

TYPE C1



POLYVINYL CHLORIDE

TYPE C2

WATERSTOPS FOR CONSTRUCTION JOINTS

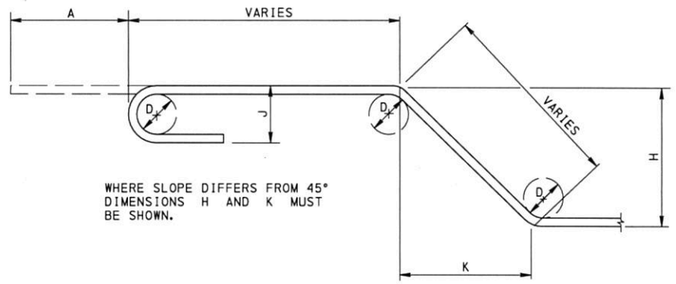
NOTE:
PROVIDE HOLES OR SLOTS IN WATERSTOP, AS REQUIRED, WHEN NECESSARY TO ACCOMMODATE REINFORCEMENT BARS, BUT DO NOT COMPROMISE SEAL.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD
WALL CONSTRUCTION & EXPANSION JOINT DETAILS

RECOMMENDED JAN. 21, 2003	RECOMMENDED JAN. 21, 2003	RECOMMENDED JAN. 21, 2003	SHEET 1 OF 1
R. Scott Christy	Dean A. Sicha	Gary L. Hoffman	BC-735M
CHIEF BRIDGE ENGINEER	DIR., BUREAU OF DESIGN	CHIEF ENG., HWY. ADMIN.	



BAR BENDING DETAILS

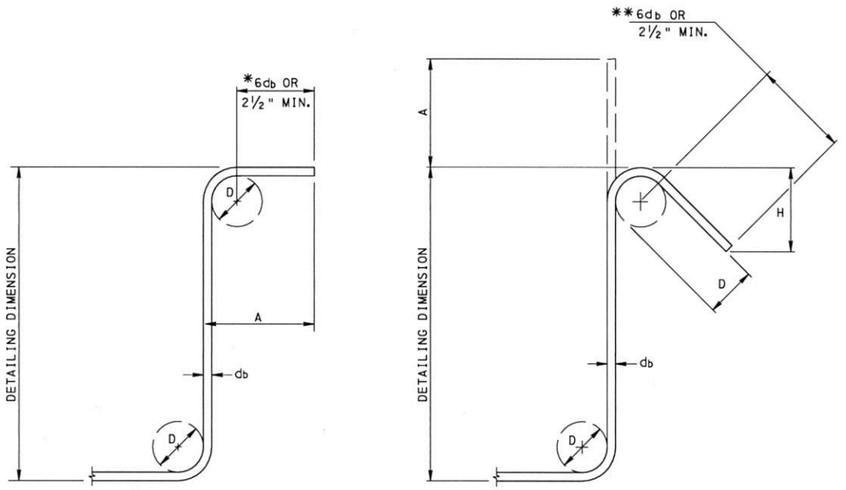
UNLESS OTHERWISE NOTED, DIAMETER D IS THE SAME FOR ALL BENDS AND HOOKS ON A BAR.

STANDARD REINFORCEMENT BARS

BAR SIZE	WEIGHT (LBS./FT.)	NOMINAL DIAMETER (INCHES)	NOMINAL CROSS SECTIONS AREA (SQ. IN.)	NOMINAL PERIMETER (INCHES)
#3	.376	.375	.11	1.178
#4	.668	.500	.20	1.571
#5	1.043	.625	.31	1.963
#6	1.502	.750	.44	2.356
#7	2.044	.875	.60	2.749
#8	2.670	1.000	.79	3.142
#9	3.400	1.128	1.00	3.544
#10	4.303	1.270	1.27	3.990
#11	5.313	1.410	1.56	4.430
#14	7.650	1.693	2.25	5.320
#18	13.600	2.257	4.00	7.090

GENERAL NOTES:

1. ALL REINFORCEMENT STEEL BARS SHOWN MEET THE REQUIREMENTS OF ASTM A 615M, A 996M OR A 706M.
2. DESIGNATE REINFORCEMENT BARS AS FOLLOWS TO AVOID ANY MISINTERPRETATION.
   (A) REFER DEFORMED REINFORCEMENT BAR SIZES BY NUMBER, FOR EXAMPLE, #3, #4, #5, ETC.
   (B) INDICATE PLAIN REINFORCEMENT BAR SIZES BY DIAMETER IN FRACTIONS OF AN INCH, FOR EXAMPLE, 3/8"ø, 1/2"ø, 5/8"ø, ETC.
   (C) INDICATE STEEL WIRE FABRIC BY A LETTER (W FOR SMOOTH WIRE, D FOR DEFORMED WIRE) FOLLOWED BY A NUMBER WHICH INDICATES THE AREA OF THE WIRE IN HUNDREDTHS OF A SQUARE INCH, FOR EXAMPLE, W16 OR D16.
   (D) INDICATE SMOOTH STEEL WIRE FABRIC THUS: WWF6x9-W10xW12 (DENOTES LONGITUDINAL WIRES ARE 6 INCHES ON CENTERS, TRANSVERSE WIRES ARE 9 INCHES ON CENTERS). THE AREA OF THE LONGITUDINAL WIRE IS 0.10 SQUARE INCHES AND THE AREA OF THE TRANSVERSE WIRE IS 0.12 SQUARE INCHES.) FOR DEFORMED WELDED WIRE FABRIC, DESIGNATE WWF6x9-D10xD12.
   (E) ALL REINFORCEMENT DIMENSIONS ARE MEASURED OUT-TO-OUT OF THE BAR EXCEPT THE "A" DIMENSION ON STANDARD 180° AND 135° HOOKS.
3. SPLICING & LAPPING:
   (A) SPLICE BARS ONLY AS SHOWN ON THE DESIGN DRAWINGS OR AS AUTHORIZED BY THE ENGINEER. WHEN LAP SPLICING IS SHOWN ON THE DESIGN DRAWINGS, LAP THE REINFORCEMENT BARS FOR A LENGTH ACCORDING TO AASHTO LRFD ARTICLE 5.11.5 AND SECURELY WIRE TOGETHER.
   (B) SPLICE WELDED WIRE FABRIC IN ACCORDANCE WITH AASHTO LRFD ARTICLE 5.11.6.
   (C) INCREASE THE BAR LAPS BY 20% FOR A THREE BAR BUNDLE. ADD 33% FOR A FOUR BAR BUNDLE. DO NOT OVERLAP INDIVIDUAL BAR SPLICES WITHIN THE BUNDLE.
4. CONFORM REINFORCEMENT BARS TO THE DIMENSIONS SHOWN ON THE DRAWINGS AND WITHIN THE FABRICATION TOLERANCES AS SHOWN IN THE CURRENT "MANUAL OF STANDARD PRACTICE FOR REINFORCED CONCRETE CONSTRUCTION" AS PUBLISHED BY THE CONCRETE REINFORCING STEEL



90° HOOKS 135° HOOKS

STIRRUPS
(TIES SIMILAR)

D = 4d_b FOR #3 THROUGH #5 BARS
D = 6d_b FOR #6 BARS

RECOMMENDED STIRRUP AND TIE HOOK DIMENSIONS

* 6d_b FOR #3, #4, AND #5
12d_b FOR #6.
** FOR SEISMIC HOOKS USE 6d_b OR 3" MIN.

GRADES 40 AND 60 KSI

BAR SIZE	D	90° HOOK A	135° HOOK A	135° HOOK APPROXIMATE H
#3	1½"	4"	4"	2½"
#4	2"	4½"	4½"	3"
#5	2½"	6"	5½"	3¾"
#6	4½"	1'-0"	8"	4½"

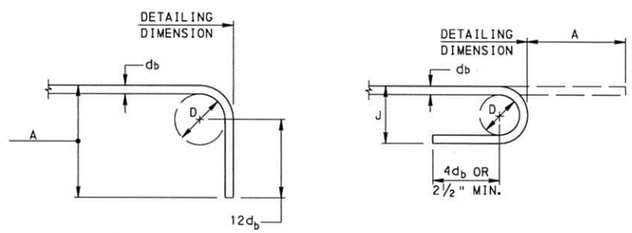
GRADES 40 AND 60 KSI

SEISMIC STIRRUP AND TIE			
BAR SIZE	D	135° HOOK A	135° HOOK APPROXIMATE H
#3	1½"	4¼"	3"
#4	2"	4½"	3"
#5	2½"	5½"	3¾"
#6	4½"	8"	4½"

RECOMMENDED END HOOK DIMENSIONS

ALL GRADES

BAR SIZE	90° HOOKS D	90° HOOKS A	180° HOOKS D	180° HOOKS A	180° HOOKS J
#3	2¼"	6"	2¼"	5"	3"
#4	3"	8"	3"	6"	4"
#5	3¾"	10"	3¾"	7"	5"
#6	4½"	1'-0"	4½"	8"	6"
#7	5¼"	1'-2"	5¼"	10"	7"
#8	6"	1'-4"	6"	11"	8"
#9	9½"	1'-7"	9½"	1'-3"	11¾"
#10	10¾"	1'-10"	10¾"	1'-5"	1'-1¼"
#11	12"	2'-0"	12"	1'-7"	1'-2¾"
#14	18¼"	2'-7"	18¼"	2'-3"	1'-9¾"
#18	24"	3'-5"	24"	3'-0"	2'-4½"



90° HOOKS 180° HOOKS

D = 6d_b FOR #3 THROUGH #8
D = 8d_b FOR #9, #10, AND #11
D = 10d_b FOR #14 AND #18

BARS THAT ARE REQUIRED TO BE BENT TO A LARGER RADIUS THAN SHOWN IN THE FOLLOWING TABLE MAY BE BENT IN THE FIELD.

#4	15 FT.	#8	80 FT.
#5	25 FT.	#9	110 FT.
#6	40 FT.	#10	130 FT.
#7	60 FT.	#11	150 FT.

#14 & #18 - ALL BENDING PREFABRICATED.

COMMON STOCK STYLES OF WELDED WIRE FABRIC

STYLE DESIGNATION	STEEL AREA SQ. IN. PER FT. LONGIT.	STEEL AREA SQ. IN. PER FT. TRANS.	WEIGHT APPROX. LBS. PER 100 S.F.
ROLLS			
6x6-W1.4xW1.4	.028	.028	21
6x6-W2.0xW2.0	.040	.040	29
6x6-W2.9xW2.9	.058	.058	42
6x6-W4.0xW4.0	.080	.080	58
4x4-W1.4xW1.4	.042	.042	31
4x4-W2.0xW2.0	.060	.060	43
4x4-W2.9xW2.9	.087	.087	62
4x4-W4.0xW4.0	.120	.120	85
SHEETS			
6x6-W2.9xW2.9	.058	.058	42
6x6-W4.0xW4.0	.080	.080	58
6x6-W5.5xW5.5	.110	.110	80
4x4-W4.0xW4.0	.120	.120	85

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD REINFORCEMENT BAR FABRICATION DETAILS

RECOMMENDED OCT. 26, 2010
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED OCT. 26, 2010
Bruce E. Thomas
DIRECTOR, BUREAU OF DESIGN

SHEET 1 OF 3

BC-736M

DEVELOPMENT LENGTH AND LAP SPLICE LENGTH OF DEFORMED BARS IN TENSION

AASHTO LRFD SPECIFICATIONS,
ARTICLES 5.11.2.1.1, 5.11.2.1.2 AND 5.11.5.3.1

TABLE A

f'c = 3000 PSI (CLASS A)

BAR SIZE	BAR CROSS SECTION SQ. IN. A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	12	12	12	12	15	12	12	12	16	13	13	17	22
#4	0.20	12	12	12	14	12	12	15	20	12	12	16	21	17	17	22	29
#5	0.31	12	12	13	17	14	14	19	24	15	15	20	26	21	21	28	36
#6	0.44	13	13	17	22	18	18	24	31	20	20	25	33	27	27	35	46
#7	0.60	18	18	23	30	25	25	32	42	26	26	34	45	37	37	48	62
#8	0.79	23	23	30	39	32	32	42	55	35	35	45	59	48	48	63	82
#9	1.00	29	29	38	50	41	41	53	69	44	44	57	74	61	61	79	104
#10	1.27	37	37	48	63	52	52	67	88	55	55	72	94	77	77	101	131
#11	1.56	46	46	59	77	64	64	82	108	68	68	88	115	95	95	123	161
#14	2.25	63				88				94				131			
#18	4.00	81				114				122				170			

f'c = 3500 PSI (CLASS AA)

BAR SIZE	BAR CROSS SECTION SQ. IN. A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	12	12	12	12	15	12	12	12	16	13	13	17	22
#4	0.20	12	12	12	14	12	12	15	20	12	12	16	21	17	17	22	29
#5	0.31	12	12	13	17	14	14	19	24	15	15	20	26	21	21	28	36
#6	0.44	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#7	0.60	17	17	21	28	23	23	30	39	25	25	32	41	34	34	44	58
#8	0.79	22	22	28	36	30	30	39	51	32	32	42	54	45	45	58	76
#9	1.00	27	27	35	46	38	38	49	64	41	41	53	69	57	57	73	96
#10	1.27	34	34	45	58	48	48	62	81	51	51	67	87	72	72	93	122
#11	1.56	42	42	55	71	59	59	76	100	63	63	82	107	88	88	114	149
#14	2.25	58				81				87				122			
#18	4.00	75				105				113				158			

f'c = 4000 PSI (CLASS AAA)

BAR SIZE	BAR CROSS SECTION SQ. IN. A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	12	12	12	12	15	12	12	12	16	13	13	17	22
#4	0.20	12	12	12	14	12	12	15	20	12	12	16	21	17	17	22	29
#5	0.31	12	12	13	17	14	14	19	24	15	15	20	26	21	21	28	36
#6	0.44	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#7	0.60	15	15	20	26	21	21	28	36	23	23	30	39	32	32	41	54
#8	0.79	20	20	26	34	28	28	36	47	30	30	39	51	42	42	54	71
#9	1.00	25	25	33	43	35	35	46	60	38	38	49	64	53	53	69	90
#10	1.27	32	32	42	54	45	45	58	76	48	48	62	81	67	67	87	114
#11	1.56	39	39	51	67	55	55	71	93	59	59	77	100	82	82	107	140
#14	2.25	54				76				81				114			
#18	4.00	70				98				105				147			

f'c = 4500 PSI

BAR SIZE	BAR CROSS SECTION SQ. IN. A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	12	12	12	12	15	12	12	12	16	13	13	17	22
#4	0.20	12	12	12	14	12	12	15	20	12	12	16	21	17	17	22	29
#5	0.31	12	12	13	17	14	14	19	24	15	15	20	26	21	21	28	36
#6	0.44	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#7	0.60	15	15	19	25	20	20	26	34	22	22	28	37	30	30	39	51
#8	0.79	19	19	25	32	27	27	34	45	28	28	37	48	40	40	51	67
#9	1.00	24	24	31	41	33	33	43	57	36	36	46	61	50	50	65	85
#10	1.27	30	30	39	51	42	42	55	72	45	45	59	77	63	63	82	107
#11	1.56	37	37	48	63	52	52	67	88	56	56	72	94	78	78	101	132
#14	2.25	51				72				77				107			
#18	4.00	66				93				99				139			

DEVELOPMENT LENGTH AND LAP SPLICE LENGTH OF DEFORMED BARS IN COMPRESSION

AASHTO LRFD SPECIFICATIONS,
ARTICLES 5.11.2.2.1 AND 5.11.5.5.1

BAR SIZE	DIA. OF BAR d_b (IN.)	f'c =3,000 PSI (CLASS A)				f'c =3,500 PSI (CLASS AA)				f'c =4,000 PSI (CLASS AAA)				f'c =4,500 PSI			
		f_y=40KSI (GRADE 40)		f_y=60KSI (GRADE 60)		f_y=40KSI (GRADE 40)		f_y=60KSI (GRADE 60)		f_y=40KSI (GRADE 40)		f_y=60KSI (GRADE 60)		f_y=40KSI (GRADE 40)		f_y=60KSI (GRADE 60)	
		DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)	DEVELOP. LENGTH (IN.)	SPLICE LENGTH (IN.)
#3	0.375	8	12	9	12	8	12	8	12	8	12	8	12	8	12	8	12
#4	0.500	8	12	11	15	8	12	11	15	8	12	10	15	8	12	9	15
#5	0.625	10	13	14	19	9	13	13	19	8	13	12	19	8	13	12	19
#6	0.750	11	15	17	23	11	15	16	23	10	15	15	23	9	15	14	23
#7	0.875	13	18	20	27	12	18	18	27	12	18	17	27	11	18	16	27
#8	1.000	15	20	22	30	14	20	21	30	13	20	19	30	12	20	18	30
#9	1.128	17	23	25	34	16	23	23	34	15	23	22	34	14	23	21	34
#10	1.270	19	26	28	39	18	26	26	39	16	26	24	39	16	26	23	39
#11	1.410	21	29	31	43	19	29	29	43	18	29	27	43	17	29	26	43
#14	1.693	25	34	37	51	23	34	35	51	22	34	32	51	21	34	31	51
#18	2.257	33	46	50	68	31	46	46	68	29	46	43	68	28	46	41	68

NOTE: A FACTOR OF 0.75 CAN BE APPLIED IF THE REINFORCEMENT IS ENCLOSED WITHIN A SPIRAL COMPOSED OF BARS NOT LESS THAN 1/4" IN DIAMETER AND SPACED AT NOT MORE THAN 4" PITCH. BUT THE DEVELOPMENT LENGTH CANNOT BE LESS THAN 8" AND SPLICE LENGTH CANNOT BE LESS THAN 12".

GUIDELINES FOR USE OF DEVELOPMENT LENGTH AND SPLICE LENGTH OF DEFORMED BARS IN TENSION

- UNCOATED REBARS
  - USE TABLE A
- EPOXY COATED REBARS
  - USE TABLE B WHEN :
    - COVER IS < 3x BAR DIA. OR
    - CLEAR SPACING BETWEEN BARS IS < 6x BAR DIA.

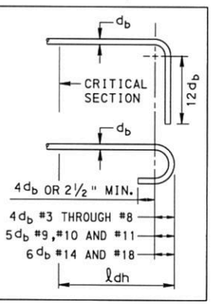
    (INCLUDES 50% INCREASE IN LAP SPLICE LENGTH)
  - USE TABLE C FOR ALL OTHER CASES

    (INCLUDES 20% INCREASE IN LAP SPLICE LENGTH)

DEVELOPMENT LENGTH OF STANDARD HOOKS IN TENSION

FOR REINFORCING STEEL GRADES 40 AND 60
AASHTO LRFD SPECIFICATION, ARTICLE 5.11.2.4.1

BAR SIZE	DIA. OF BAR d_b (IN.)	f'c =3,000 PSI ALL BARS ℓ_{dh} (IN.)	f'c =3,500 PSI ALL BARS ℓ_{dh} (IN.)	f'c =4,000 PSI ALL BARS ℓ_{dh} (IN.)	f'c =4,500 PSI ALL BARS ℓ_{dh} (IN.)
#3	0.375	9	8	8	7
#4	0.500	11	11	10	9
#5	0.625	14	13	12	12
#6	0.750	17	16	15	14
#7	0.875	20	18	17	16
#8	1.000	22	21	19	18
#9	1.128	25	23	22	21
#10	1.270	28	26	25	23
#11	1.410	31	29	27	26
#14	1.693	38	35	33	31
#18	2.257	50	46	43	41



NOTE:
1. A FACTOR OF 0.7 CAN BE APPLIED FOR #11 BAR AND SMALLER, IF THE SIDE COVER (NORMAL TO PLANE OF HOOK) IS NOT LESS THAN 2½", AND FOR 90° HOOK, COVER ON BAR EXTENSION BEYOND HOOK IS NOT LESS THAN 2".
2. INCREASE THE DEVELOPMENT LENGTH, ℓ_{dh}, BY 1.2 FOR EPOXY COATED HOOKS IN TENSION.

NOTES FOR DEFORMED BARS IN TENSION (TABLES A, B AND C):

1. DEVELOPMENT LENGTH:
   - REFER TO AASHTO/LRFD FOR APPLICABLE MODIFICATION FACTORS.
   - TABLES ARE BASED ON NORMAL-WEIGHT CONCRETE.
   - TOP HORIZONTAL OR NEARLY HORIZONTAL REINFORCEMENT HAVE MORE THAN 12 INCHES OF FRESH CONCRETE CAST BELOW THE REINFORCEMENT.
   - INCREASE THE DEVELOPMENT LENGTH, ℓ_d, BY 2.0 FOR BARS WITH A COVER OF BAR DIAMETER OR LESS, OR WITH A CLEAR SPACING OF 2x BAR DIAMETER OR LESS.
   - DECREASE THE DEVELOPMENT LENGTH, ℓ_d, BY 0.8 FOR BARS SPACED LATERALLY AT LEAST 6 IN. ON CENTER WITH AT LEAST 3 IN. CLEAR COVER FROM FACE OF MEMBER TO EDGE OF BAR MEASURED IN THE DIRECTION OF THE SPACING, BUT THE SPLICE CANNOT BE LESS THAN 12 IN.
2. LAP SPLICE LENGTH:
   - CLASSES OF TENSION LAP SPLICES:

RATIO OF (A_s AS PROVIDED) / (A_s AS REQUIRED)	PERCENT OF A_s SPLICED WITH REQUIRED LAP LENGTH		
	50%	75%	100%
≥ 2	A	A	B
< 2	B	C	C

   - ASSUME CLASS C SPLICES IN THE ABSENCE OF DESIGN ANALYSIS.
   - A_s IS THE AREA OF REINFORCEMENT REQUIRED BY ANALYSIS AT THE SPLICE LOCATION
3. FOR TABLES B AND C, SEE SHEET 3.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD REINFORCEMENT BAR FABRICATION DETAILS

RECOMMENDED OCT. 26, 2010	RECOMMENDED OCT. 26, 2010	SHEET 2 OF 3
Thomas D Macioce CHIEF BRIDGE ENGINEER	Brian S Thompson DIRECTOR, BUREAU OF DESIGN	BC-736M

DEVELOPMENT LENGTH AND LAP SPLICE LENGTH OF DEFORMED BARS IN TENSION

AASHTO LRFD SPECIFICATIONS, ARTICLES 5.11.2.1.1, 5.11.2.1.2 AND 5.11.5.3.1

TABLE B

f'c = 3000 PSI (CLASS A)

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	16	12	12	14	18	14	14	18	23	16	16	20	27
#4	0.20	12	12	16	21	14	14	18	24	18	18	24	31	21	21	27	35
#5	0.31	15	15	20	26	17	17	23	29	23	23	30	39	26	26	34	44
#6	0.44	20	20	25	33	22	22	29	37	29	29	38	49	33	33	43	56
#7	0.60	26	26	34	45	30	30	39	51	39	39	51	67	45	45	58	76
#8	0.79	35	35	45	59	39	39	51	66	52	52	67	88	59	59	76	99
#9	1.00	44	44	57	74	50	50	64	84	65	65	85	111	74	74	96	126
#10	1.27	55	55	72	94	63	63	82	106	83	83	108	141	94	94	122	159
#11	1.56	68	68	88	115	77	77	100	131	102	102	132	173	115	115	150	196
#14	2.25	94				106				141				159			
#18	4.00	122				138				182				207			

f'c = 3500 PSI (CLASS AA)

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	16	12	12	14	18	14	14	18	23	16	16	20	27
#4	0.20	12	12	16	21	14	14	18	24	18	18	24	31	21	21	27	35
#5	0.31	15	15	20	26	17	17	23	29	23	23	30	39	26	26	34	44
#6	0.44	18	18	24	31	21	21	27	35	27	27	36	46	31	31	40	53
#7	0.60	25	25	32	41	28	28	36	47	37	37	47	62	41	41	54	70
#8	0.79	32	32	42	54	36	36	47	62	48	48	62	81	54	54	70	92
#9	1.00	41	41	53	69	46	46	60	78	61	61	79	103	69	69	89	116
#10	1.27	51	51	67	87	58	58	76	99	77	77	100	130	87	87	113	148
#11	1.56	63	63	82	107	71	71	93	121	94	94	122	160	107	107	139	181
#14	2.25	87				99				130				148			
#18	4.00	113				128				169				191			

f'c = 4000 PSI (CLASS AAA)

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	16	12	12	14	18	14	14	18	23	16	16	20	27
#4	0.20	12	12	16	21	14	14	18	24	18	18	24	31	21	21	27	35
#5	0.31	15	15	20	26	17	17	23	29	23	23	30	39	26	26	34	44
#6	0.44	18	18	24	31	21	21	27	35	27	27	36	46	31	31	40	53
#7	0.60	23	23	30	39	26	26	34	44	34	34	44	58	39	39	50	66
#8	0.79	30	30	39	51	34	34	44	58	45	45	58	76	51	51	66	86
#9	1.00	38	38	49	64	43	43	56	73	57	57	74	96	64	64	83	109
#10	1.27	48	48	62	81	54	54	71	92	72	72	93	122	81	81	106	138
#11	1.56	59	59	77	100	67	67	87	113	88	88	115	150	100	100	130	170
#14	2.25	81				92				122				138			
#18	4.00	105				119				158				179			

f'c = 4500 PSI

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	16	12	12	14	18	14	14	18	23	16	16	20	27
#4	0.20	12	12	16	21	14	14	18	24	18	18	24	31	21	21	27	35
#5	0.31	15	15	20	26	17	17	23	29	23	23	30	39	26	26	34	44
#6	0.44	18	18	24	31	21	21	27	35	27	27	36	46	31	31	40	53
#7	0.60	22	22	28	37	25	25	32	41	32	32	42	55	37	37	47	62
#8	0.79	28	28	37	48	32	32	42	54	42	42	55	72	48	48	62	81
#9	1.00	36	36	46	61	41	41	53	69	54	54	69	91	61	61	79	103
#10	1.27	45	45	59	77	51	51	67	87	68	68	88	115	77	77	100	130
#11	1.56	56	56	72	94	63	63	82	107	83	83	108	141	94	94	122	160
#14	2.25	77				87				115				130			
#18	4.00	99				113				149				169			

TABLE C

f'c = 3000 PSI (CLASS A)

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	13	12	12	14	18	12	12	15	19	16	16	20	26
#4	0.20	12	12	13	17	14	14	18	23	15	15	19	25	21	21	27	35
#5	0.31	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#6	0.44	16	16	20	26	22	22	28	37	23	23	30	39	32	32	42	55
#7	0.60	21	21	28	36	30	30	38	50	32	32	41	53	44	44	57	75
#8	0.79	28	28	36	47	39	39	50	66	42	42	54	70	58	58	75	98
#9	1.00	35	35	46	59	49	49	64	83	52	52	68	89	73	73	95	124
#10	1.27	44	44	58	75	62	62	81	105	66	66	86	113	93	93	121	158
#11	1.56	55	55	71	92	76	76	99	129	82	82	106	138	114	114	148	193
#14	2.25	75				105				113				158			
#18	4.00	97				136				146				204			

f'c = 3500 PSI (CLASS AA)

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	13	12	12	14	18	12	12	15	19	16	16	20	26
#4	0.20	12	12	13	17	14	14	18	23	15	15	19	25	21	21	27	35
#5	0.31	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#6	0.44	15	15	19	25	21	21	27	35	22	22	29	37	31	31	40	52
#7	0.60	20	20	26	33	27	27	36	46	29	29	38	50	41	41	53	69
#8	0.79	26	26	33	44	36	36	47	61	38	38	50	65	54	54	70	91
#9	1.00	33	33	42	55	45	45	59	77	49	49	63	82	68	68	88	115
#10	1.27	41	41	53	70	58	58	75	97	62	62	80	104	86	86	112	146
#11	1.56	51	51	66	86	71	71	92	120	76	76	98	128	106	106	137	179
#14	2.25	70				97				104				146			
#18	4.00	90				126				135				189			

f'c = 4000 PSI (CLASS AAA)

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	13	12	12	14	18	12	12	15	19	16	16	20	26
#4	0.20	12	12	13	17	14	14	18	23	15	15	19	25	21	21	27	35
#5	0.31	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#6	0.44	15	15	19	25	21	21	27	35	22	22	29	37	31	31	40	52
#7	0.60	18	18	24	31	26	26	33	43	27	27	36	46	38	38	50	65
#8	0.79	24	24	31	41	34	34	44	57	36	36	47	61	50	50	65	85
#9	1.00	30	30	39	51	42	42	55	72	45	45	59	77	63	63	82	108
#10	1.27	39	39	50	65	54	54	70	91	58	58	75	98	81	81	105	137
#11	1.56	47	47	61	80	66	66	86	112	71	71	92	120	99	99	128	168
#14	2.25	65				91				98				137			
#18	4.00	84				118				126				177			

f'c = 4500 PSI

BAR SIZE	BAR CROSS SECTION AREA (SQ. IN.) A_b	f_y=40 KSI (GRADE 40)								f_y=60 KSI (GRADE 60)							
		ALL BARS EXCEPT TOP BARS				TOP BARS				ALL BARS EXCEPT TOP BARS				TOP BARS			
		DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)			DEVELOP. LENGTH ℓ_d (IN.)	LENGTH OF LAP SPLICE (IN.)		
			A	B	C		A	B	C		A	B	C		A	B	C
#3	0.11	12	12	12	13	12	12	14	18	12	12	15	19	16	16	20	26
#4	0.20	12	12	13	17	14	14	18	23	15	15	19	25	21	21	27	35
#5	0.31	12	12	16	21	17	17	22	29	18	18	24	31	26	26	33	43
#6	0.44	15	15	19	25	21	21	27	35	22	22	29	37	31	31	40	52
#7	0.60	17	17	23	29	24	24	31	41	26	26	34	44	36	36	47	61
#8	0.79	23	23	30	38	32	32	41	54	34	34	44	57	47	47	61	80
#9	1.00	29	29	37	49	40	40	52	68	43	43	56	73	60	60	78	101
#10	1.27	36	36	47	62	51	51	66	86	54	54	71	92	76	76	99	129
#11	1.56	45	45	58	75	62	62	81	106	67	67	87	113	93	93	121	158
#14	2.25	62				86				92				129			
#18	4.00	80				111				119				167			

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD REINFORCEMENT BAR FABRICATION DETAILS

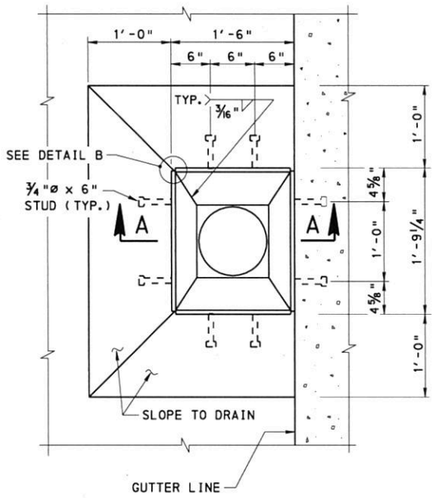
RECOMMENDED OCT. 26, 2010
Thomas P Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED OCT. 26, 2010
Brian S. Thompson
DIRECTOR, BUREAU OF DESIGN

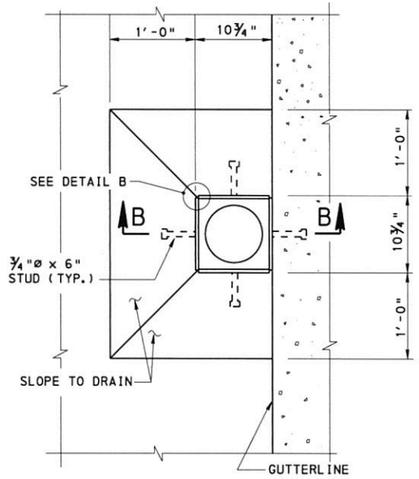
BC-736M

CHANGE 1

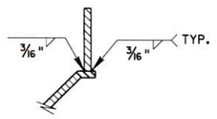
CHANGE 2



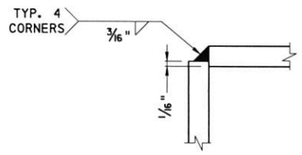
PLAN



PLAN



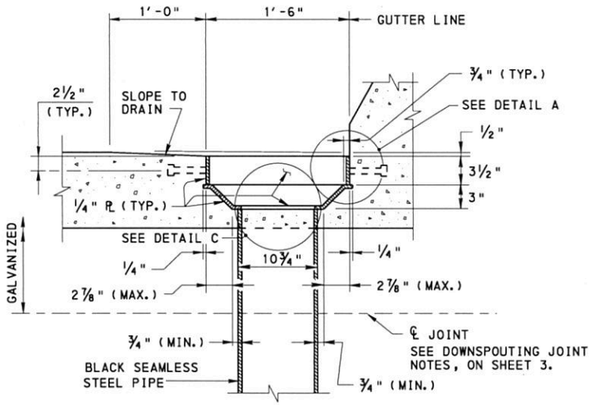
DETAIL A



DETAIL B

NOTES:

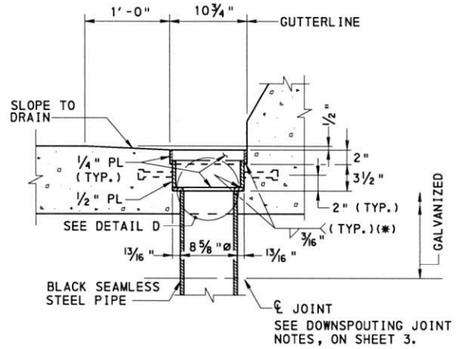
1. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE CURRENT VERSIONS OF THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PUBLICATION 408, AASHTO/AWS BRIDGE WELDING CODE D1.5, AND CONTRACT SPECIAL PROVISIONS. USE AWS D1.1 FOR WELDING NOT COVERED IN AASHTO/AWS D1.5.
2. DO NOT USE TYPE 2 SCUPPER UNLESS TYPE 1 SCUPPER CANNOT BE ACCOMMODATED.
3. WELDED CONSTRUCTION: USE STRUCTURAL STEEL M 270, GR. 36, (ASTM A 709, GR. 36).
4. PROVIDE WELDED STUDS CONFORMING TO PUB. 408, SECTION 1105.02(e).
5. GALVANIZE ALL MATERIALS IN ACCORDANCE WITH PUB. 408, SECTION 1105.02(s)1, AFTER FABRICATION.
6. REPAIR ALL DAMAGED GALVANIZED SURFACES IN ACCORDANCE WITH PUB. 408, SECTION 1105.02(s)2.
7. CAST GRATES: CONSTRUCT GRATES OF MALLEABLE IRON CONFORMING TO ASTM A47, GRADE 32510, CAST STEEL CONFORMING TO ASTM A27, GRADE 65-35, OR DUCTILE IRON CONFORMING TO ASTM A536, GRADE 60-40-18.
8. DO NOT WELD CAST MATERIAL.
9. PROVIDE EITHER STANDARD 8"ø OR 10"ø NPS STEEL PIPE (ASTM A 53) AS INDICATED. PROVIDE PIPE JOINTS OF SCREWED MALLEABLE IRON (ASTM A 338) OR STEEL WELDING FITTINGS (ASTM A 234) FOR USE WITH STEEL PIPE. PROVIDE EQUIVALENT SIZE FIBERGLASS OR PVC PIPE BELOW JOINT WHEN SPECIFIED BY THE DISTRICT BRIDGE ENGINEER.
10. TACK WELD ALL FOUR CORNERS OF GRATES.
11. ALL REINFORCEMENT STEEL BARS SHOWN MEET THE REQUIREMENTS OF ASTM A 615 OR A 706.
12. ALL DIAMETERS SPECIFIED ARE NOMINAL.
13. MANUFACTURE METAL CURB DRAIN PER PUB.408, SECTION 1052.
14. METAL CURB DRAINS DESIGNED AND MANUFACTURED IN ACCORDANCE WITH THIS STANDARD DRAWING DO NOT REQUIRE SHOP DRAWINGS.
15. PROVIDE FLOOR DRAINS OF EITHER GALVANIZED STEEL OR ALUMINUM PIPE AS INDICATED UNLESS FIBERGLASS OR PVC PIPE IS SPECIFIED BY THE DISTRICT BRIDGE ENGINEER.
16. ALUMINUM CURB OR FLOOR DRAINS IN CONTACT WITH CONCRETE SHALL BE THOROUGHLY COATED WITH AN ALKALINE-RESISTANT BITUMINOUS PAINT.



SECTION A-A

TYPE 1 SCUPPER

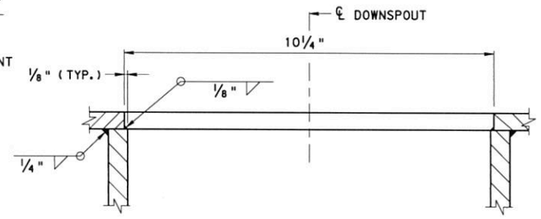
SHOWN WITHOUT GRATE, SEE TYPE 1 GRATE DETAIL THIS SHT.



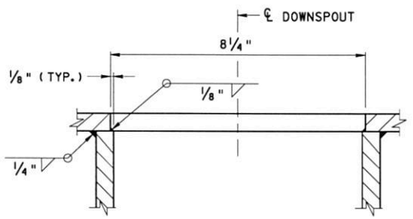
SECTION B-B

TYPE 2 SCUPPER

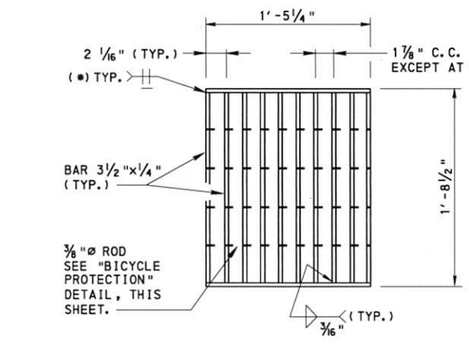
SHOWN WITHOUT GRATE, SEE TYPE 2 GRATE DETAIL THIS SHT.



DETAIL C

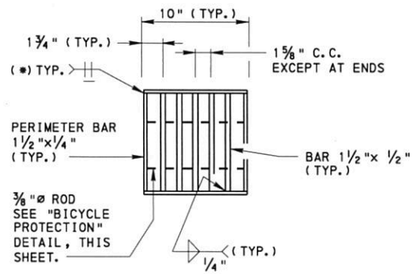


DETAIL D



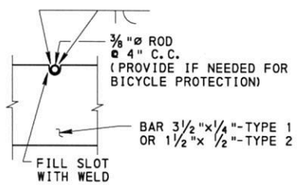
PLAN

TYPE 1 GRATE



PLAN

TYPE 2 GRATE



BICYCLE PROTECTION

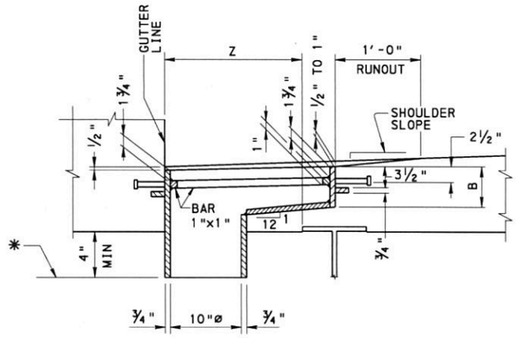
(UNLESS DELETED BY CONTRACT DRAWINGS)

(*) = OR EQUIVALENT FULL PENETRATION WELD.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

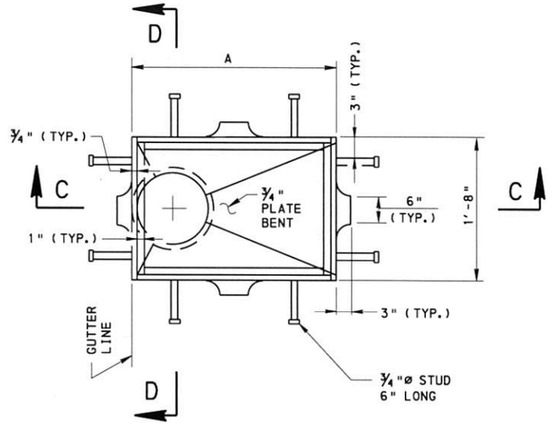
STANDARD BRIDGE DRAINAGE SCUPPER DETAILS TYPE 1 & TYPE 2

RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 1 OF 6
Thomas P Macioce		
CHIEF BRIDGE ENGINEER	ACTING DIR. BUR. OF PROJECT DELIVERY	BC-751M



NOTES:
1. USE CONTINUOUS FILLET WELD FOR INSIDE AND OUTSIDE. ¼" MIN. SIZE.
2. GRATING NOT SHOWN

SECTION C-C
(TYPE A OR B SCUPPER)



PLAN

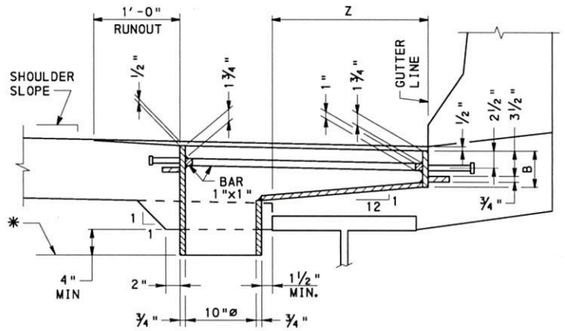
NOTE:
THE SCUPPERS DETAILED ON THIS SHEET ARE FOR GUIDANCE ONLY IN REHABILITATION PROJECTS. DO NOT USE IN NEW CONSTRUCTION UNLESS SPECIFICALLY APPROVED BY THE DISTRICT BRIDGE ENGINEER.

TABLE I
SPECIFY TYPE A SCUPPER FOR Z UP TO 1'-6"
SPECIFY TYPE B SCUPPER FOR Z OVER 1'-6" TO 3'-0"
SPECIFY TYPE C SCUPPER FOR Z UP TO 1'-10½"
SPECIFY TYPE D SCUPPER FOR Z OVER 1'-10½" TO 2'-8¼"

TABLE II - U.S. CUSTOMARY UNITS

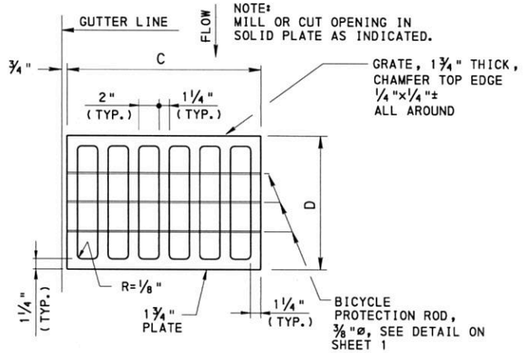
	DIMENSIONS				APPROXIMATE WEIGHT	
	A	B	C	D	SCUPPER	W/ GRATE
TYPE A SCUPPER	1'-10½"	6"	1'-8¾"	1'-6¼"	295 LB	395 LB
TYPE B SCUPPER	2'-8¼"	5"	2'-6½"	1'-6¼"	380 LB	525 LB
TYPE C SCUPPER	2'-11½"	5"	2'-9¾"	1'-6¼"	400 LB	545 LB
TYPE D SCUPPER	3'-9¼"	5"	3'-7½"	1'-6¼"	465 LB	655 LB

SCUPPER WEIGHTS LISTED ARE FOR A SCUPPER ASSEMBLY DEPTH OF 1'-3".



NOTES:
1. USE CONTINUOUS FILLET WELD FOR INSIDE AND OUTSIDE. ¼" MIN. SIZE.
2. GRATING NOT SHOWN

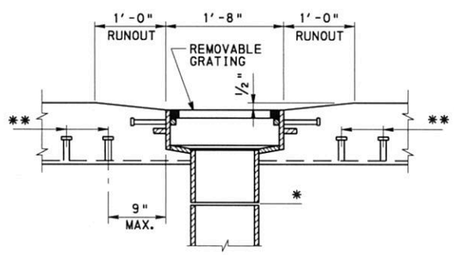
SECTION C-C
(TYPE C OR D SCUPPER)



ALTERNATE
STRUCTURAL STEEL SCUPPER GRATE

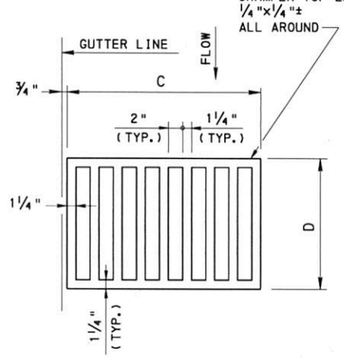
* SEE DOWNSPOUTING JOINT NOTES ON SHEET 3.

** RESPACE SHEAR CONNECTORS ON COMPOSITE CONSTRUCTION TO CLEAR SCUPPERS.



SECTION D-D

WELDED SCUPPER DETAILS



CAST GRATING PLAN

NOTE:
PROVIDE ALTERNATE STRUCTURAL STEEL GRATE WHEN BICYCLE PROTECTION IS REQUIRED, SEE DETAIL THIS SHEET.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

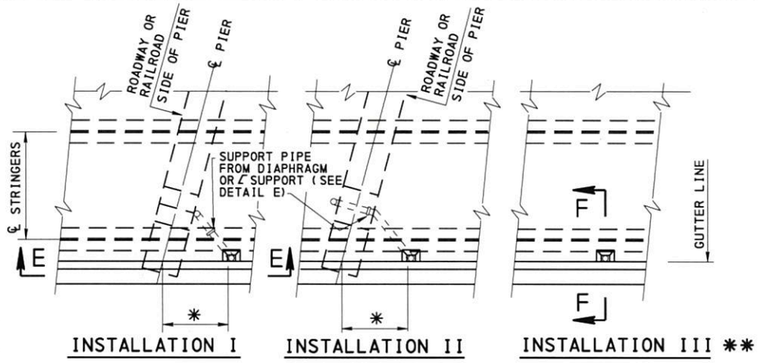
STANDARD BRIDGE DRAINAGE SCUPPER DETAILS TYPE A, B, C & D

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED NOV. 26, 2013
ACTING DIR, BUR. OF PROJECT DELIVERY

SHEET 2 OF 6

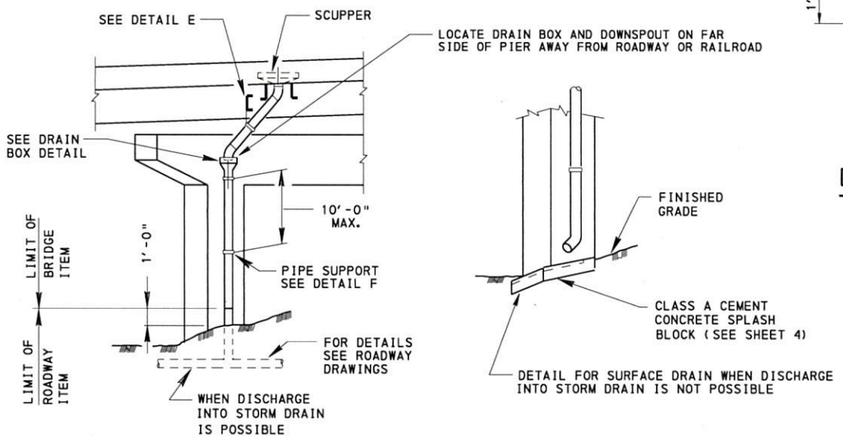
BC-751M



PLAN SHOWING TYPICAL INSTALLATION OF SCUPPERS

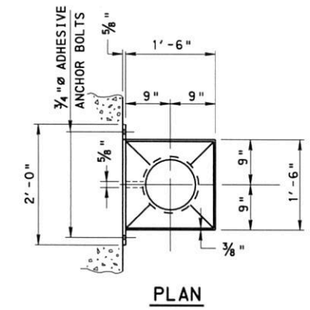
* AS REQUIRED FOR A MIN. 45° DRAIN PIPE SLOPE

** USE INSTALLATION III IN SPANS OVER STREAMS AND OVER GROUND WHERE DISCHARGE IS NOT OBJECTIONABLE.

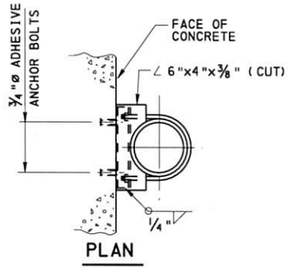


ELEVATION E-E

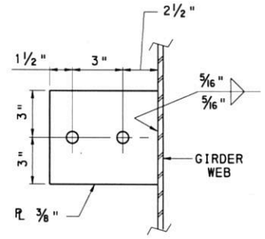
FOR INSTALLATIONS I AND II, CONNECT DOWNSPOUT TO STORM DRAIN, IF PRACTICAL, AND INCLUDE DETAILS OF THE CONNECTION ON ROADWAY DRAWINGS. IF CONNECTION TO STORM DRAIN IS IMPRACTICAL, HAVE DOWNSPOUT DISCHARGE ONTO SPLASH BLOCK.



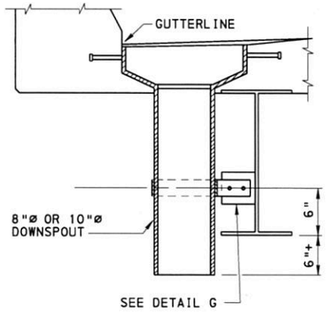
PLAN



PLAN

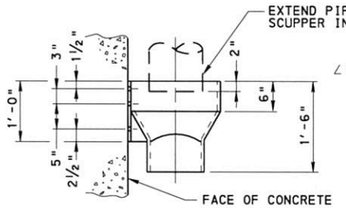


DETAIL G



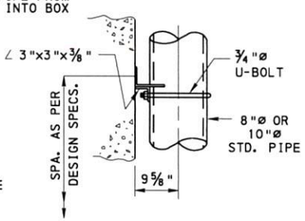
SECTION F-F

STEEL GIRDER



ELEVATION

DRAIN BOX DETAIL



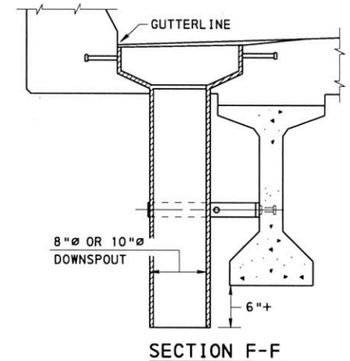
ELEVATION

DETAIL F

DETAILS SHOWN ARE SUITABLE FOR PLANE CONCRETE SURFACES. MODIFY THE DETAILS AS REQUIRED FOR ROUND CONCRETE SURFACES.

DOWNSPOUTING JOINT NOTES:

- FOR STEEL PIPE: PROVIDE MECHANICAL COUPLINGS.
- FOR PVC OR FIBERGLASS PIPE: PROVIDE MECHANICAL COUPLINGS.
- AT THE DISCRETION OF THE ENGINEER, DELETE JOINT FROM INSTALLATION III.
- FOR ALL MECHANICAL COUPLINGS, PROVIDE COUPLING AS PER PIPE MANUFACTURERS RECOMMENDATIONS.

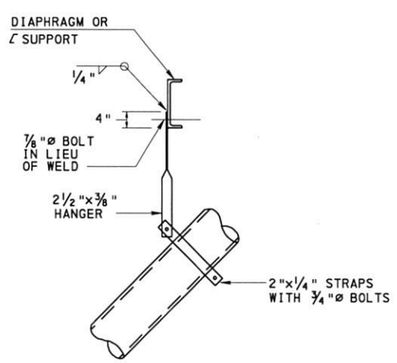


SECTION F-F

PRESTRESSED I-BEAM

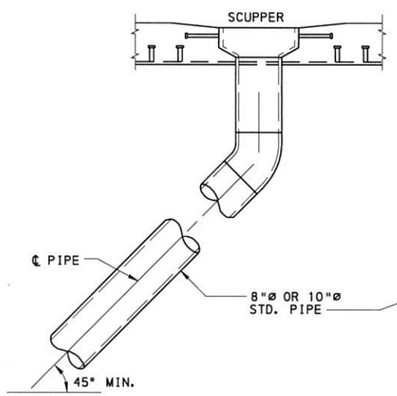
INSTALLATION III

FOR ADDITIONAL INFORMATION SEE DOWNSPOUTING DETAILS ON SHEET 4

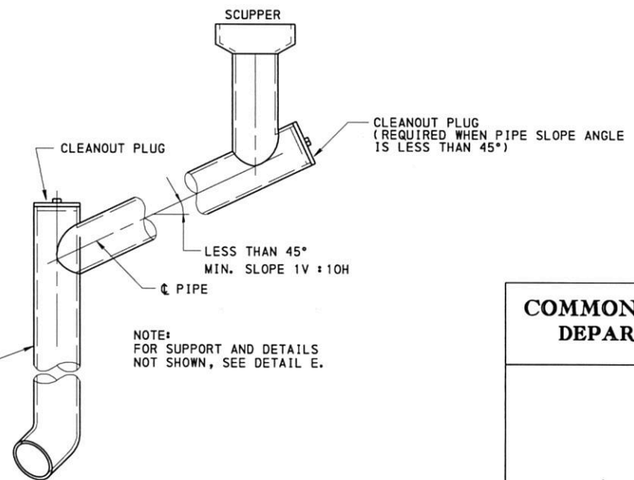


DETAIL E

SPACING OF HANGER SUPPORTS TO BE BASED ON FULL PIPE (SELF WEIGHT, WATER, ICE AND ANTI-SKID DEBRIS).



PIPES SLOPED AT 45° MIN.



PIPES SLOPED LESS THAN 45°

INSTALLATIONS I & II

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

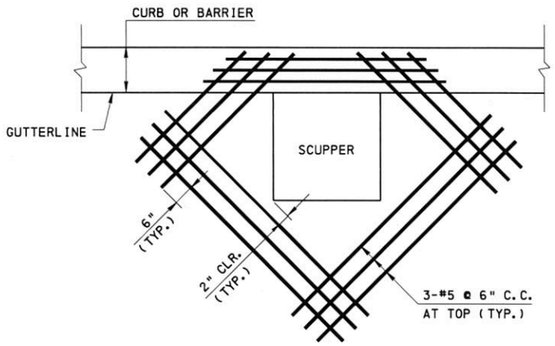
STANDARD
BRIDGE DRAINAGE
DOWNSPOUTING DETAILS

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED NOV. 26, 2013
ACTING DIR., BUR. OF PROJECT DELIVERY

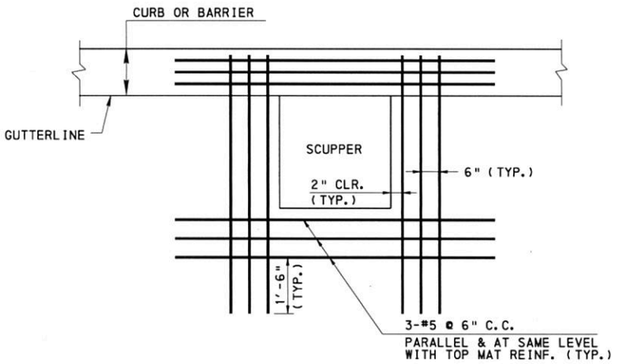
SHEET 3 OF 6

BC-751M



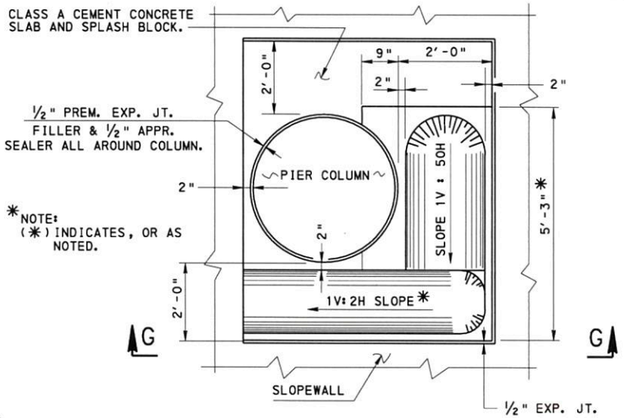
ADDITIONAL DECK REINFORCEMENT AT SCUPPER

CUT AND/OR REPOSITION DECK REINFORCEMENT TO ACCOMMODATE SCUPPERS OR DRAINS

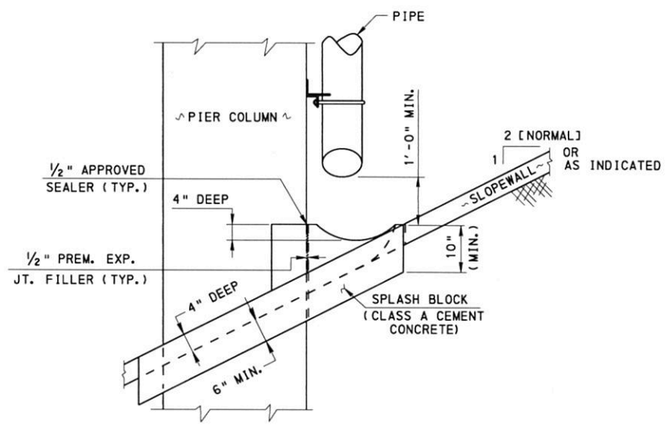


ALTERNATE DECK REINFORCEMENT AT SCUPPER

CUT AND/OR REPOSITION DECK REINFORCEMENT TO ACCOMMODATE SCUPPERS OR DRAINS (ALTERNATE TO DETAIL ABOVE)

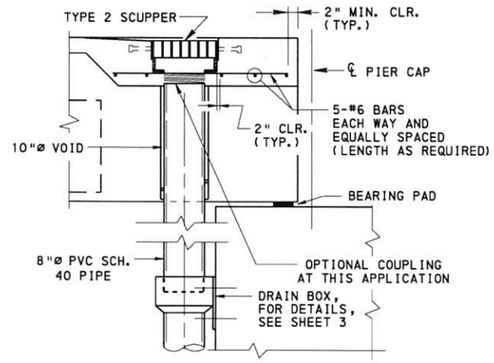


PLAN

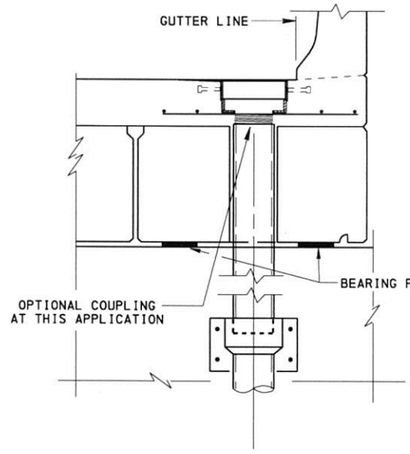


VIEW G-G

SPLASH BLOCK DETAIL



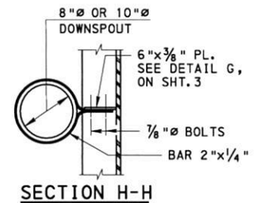
SECTION ALONG ℄ BEAM



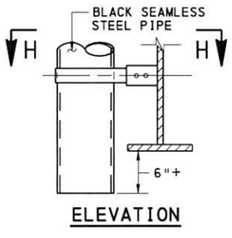
SECTION THRU BEAM

THRU ADJACENT BOX BEAM DETAILS

- LOCATE DRAINS IN BEAM END BLOCKS ONLY.
- FORM VOID IN BOX BEAM USING 10"ø P.V.C. PIPE OR APPROVED EQUAL.
- CUT AND/OR REPOSITION DECK REINFORCEMENT TO ACCOMMODATE SCUPPERS OR DRAINS.
- ONLY 48" WIDE BOX BEAMS CAN BE USED.

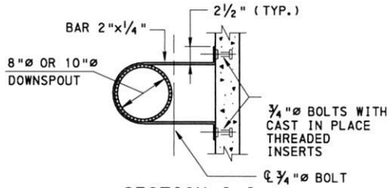


SECTION H-H

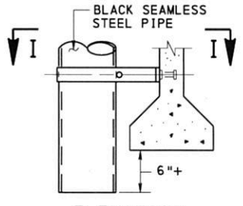


ELEVATION

STEEL GIRDER

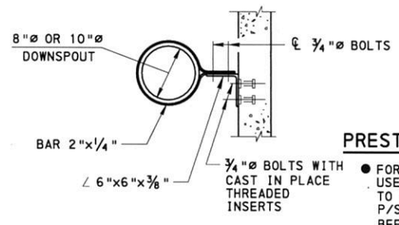


SECTION I-I

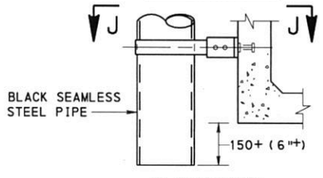


ELEVATION

PRESTRESSED I-BEAM



SECTION J-J



ELEVATION

PRESTRESSED BOX BEAM

PRESTRESSED DRILLING NOTES:

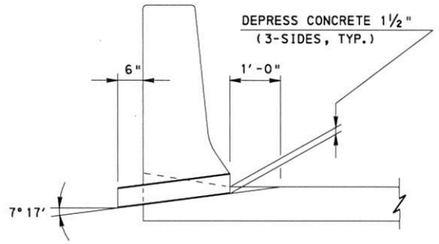
- FOR REHABILITATION PROJECTS ONLY: USE A PACHOMETER (OR EQUIVALENT) TO LOCATE ALL REINFORCEMENT AND P/S STRANDS IN PRESTRESSED I-BEAMS BEFORE DRILLING HOLES THROUGH WEB. NO DRILLING OF PRESTRESSED BOX BEAMS IS PERMITTED.
- ANY DRILLING OF A PRESTRESSED I-BEAM REQUIRES THE PRIOR APPROVAL OF THE DISTRICT BRIDGE ENGINEER.
- CAST IN PLACE THREADED INSERTS ARE TO BE USED IN NEW P/S BEAMS.

DOWNSPOUTING CONNECTION DETAILS

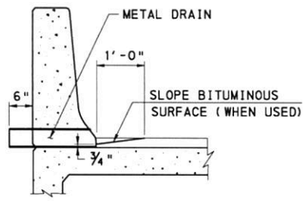
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD BRIDGE DRAINAGE MISCELLANEOUS DETAILS

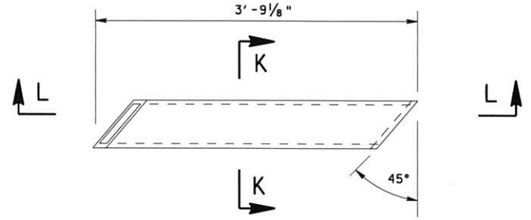
RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 4 OF 6
Thomas P. Macioce, CHIEF BRIDGE ENGINEER	ACTING DIR. BUR. OF PROJECT DELIVERY	BC-751M



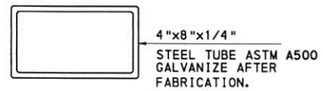
ELEVATION - CONCRETE DECK



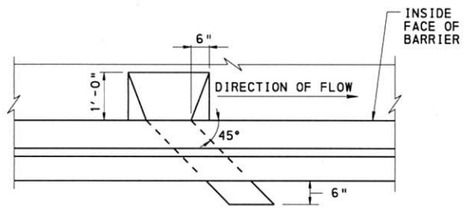
ELEVATION - BITUMINOUS DECK ONLY



PLAN



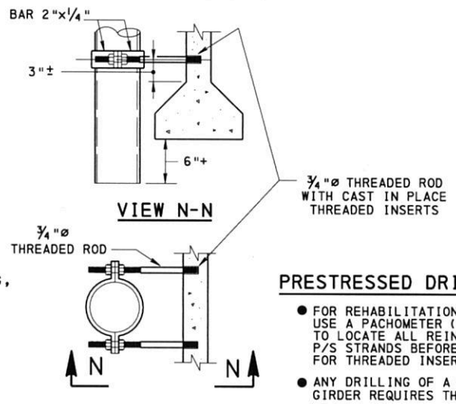
SECTION K-K



PLAN

VIEW L-L

TYPICAL METAL CURB DRAIN DETAILS

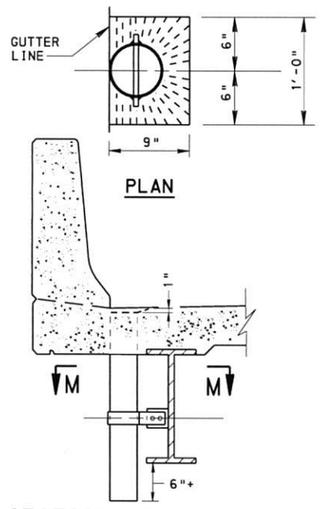


VIEW N-N

PRESTRESSED GIRDER

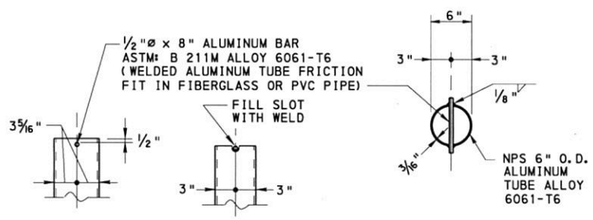
PRESTRESSED DRILLING NOTES:

- FOR REHABILITATION PROJECTS: USE A PACHOMETER (OR EQUIVALENT) TO LOCATE ALL REINFORCEMENT AND P/S STRANDS BEFORE DRILLING HOLES FOR THREADED INSERTS.
- ANY DRILLING OF A PRESTRESSED GIRDER REQUIRES THE PRIOR APPROVAL OF THE DISTRICT BRIDGE ENGINEER



PLAN

SECTION AT BARRIER
(FLOOR DRAIN)

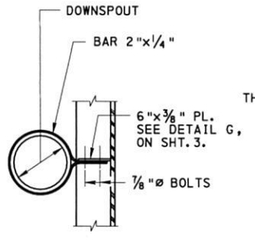


FIBERGLASS OR PVC PIPE

ALUMINUM TUBE

TOP PLAN
(SHOWING ALUMINUM TUBE)

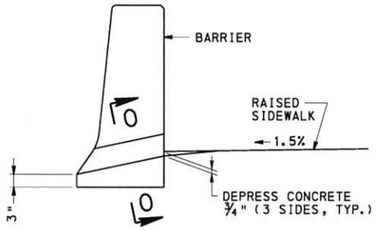
FLOOR DRAIN



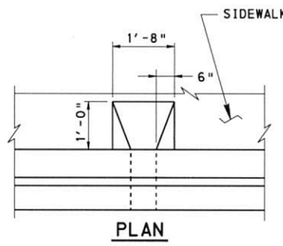
STEEL GIRDER

SECTION M-M

TYPICAL FLOOR DRAIN DETAILS

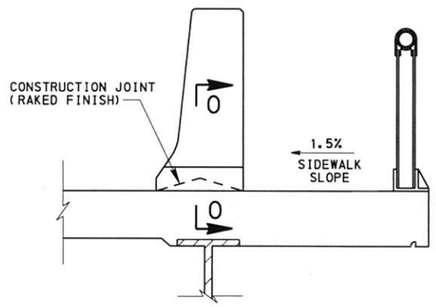


ELEVATION

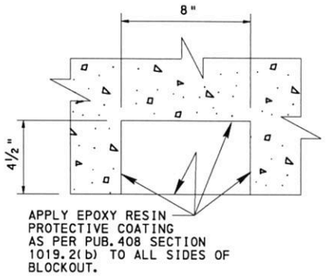


PLAN

RAISED SIDEWALK DRAINAGE DETAIL



TYPICAL SIDEWALK & BARRIER DRAIN



SECTION O-O

BARRIER DRAIN BLOCKOUTS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
BRIDGE DRAINAGE
METAL CURB AND FLOOR DRAINS

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

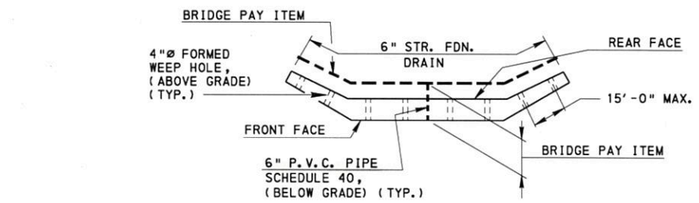
RECOMMENDED NOV. 26, 2013
ACTING DIR. BUR. OF PROJECT DELIVERY

SHEET 5 OF 6

BC-751M

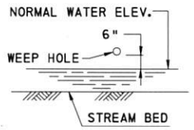
DRAINAGE NOTES:

1. USE SCHEME A IF DISCHARGE AT FRONT OF WALL IS NOT OBJECTIONABLE, OTHERWISE USE SCHEME B.
2. SPACE WEEP HOLES SO AS TO NOT EXCEED 15'.
3. SLOPE 6" STRUCTURE FOUNDATION DRAIN A MINIMUM OF 1/8 "/FT.
4. SHOW PIPES IF USED TO COLLECT WATER AT THE REAR OF ABUTMENTS, WINGWALLS AND RETAINING WALLS ON A PLAN VIEW OF THE BRIDGE DRAWINGS, AND INCLUDE THE QUANTITY IN THE BRIDGE QUANTITIES AS 6" STRUCTURE FOUNDATION DRAIN AND 6" P.V.C. PIPE (SCHEDULE 40).
5. SHOW PIPE UNDERDRAIN OUTLETS CARRYING DRAINAGE COLLECTED FROM THE REAR OF ABUTMENTS, WINGWALLS, AND RETAINING WALLS TO A HIGHWAY DRAINAGE SYSTEM ON A PLAN VIEW OF THE BRIDGE DRAWINGS AND ALSO ON THE ROADWAY PLANS. INDICATE THESE PIPES ON THE BRIDGE DRAWING AS A ROADWAY PAY ITEM. FOR DETAILS SEE DRAINAGE SCHEMES. HOWEVER, INCLUDE PIPES ENCASED IN CONCRETE WALLS OR EXTENDING BEYOND THE FRONT FACE OF STUB ABUTMENTS, AND DISCHARGING INTO A DITCH OR ONTO A PAVED SLOPE IN THE BRIDGE QUANTITIES AS 6" P.V.C. PIPE (SCHEDULE 40).

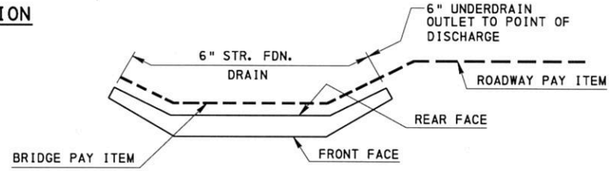


SCHEME A

PROVIDE DRAINAGE BY USE OF EITHER WEEP HOLES OR STRUCTURE FOUNDATION DRAIN, DISCHARGED AT FRONT OF WALL, BASED UPON FIELD CONDITIONS.

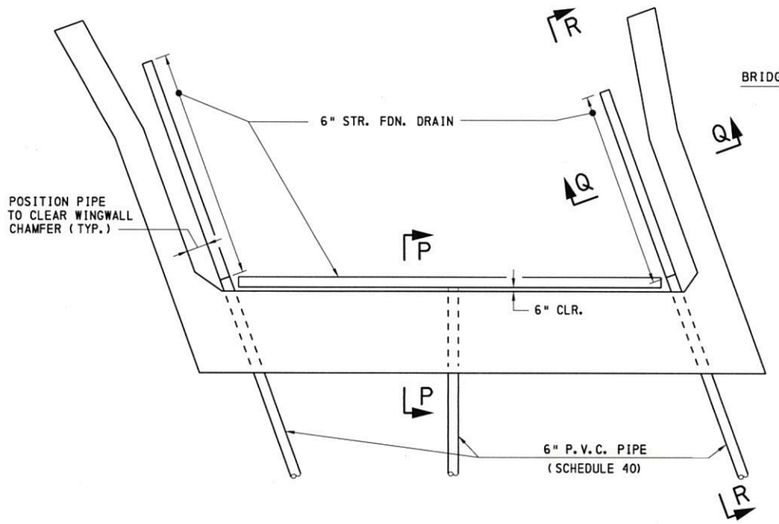


STREAM CONDITION

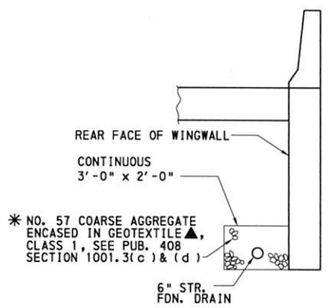


SCHEME B

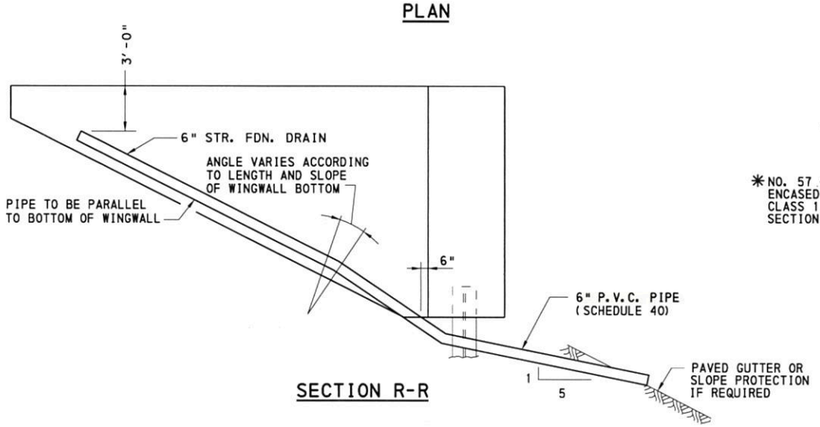
DRAINAGE SCHEMES



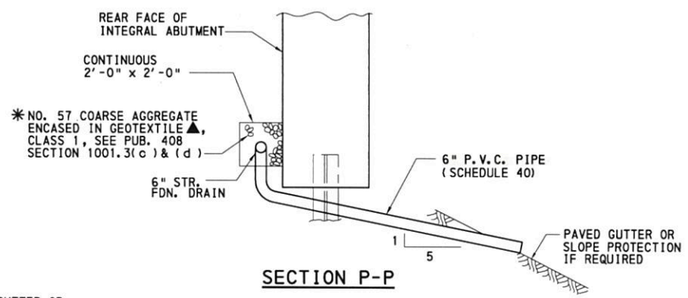
PLAN



SECTION Q-Q

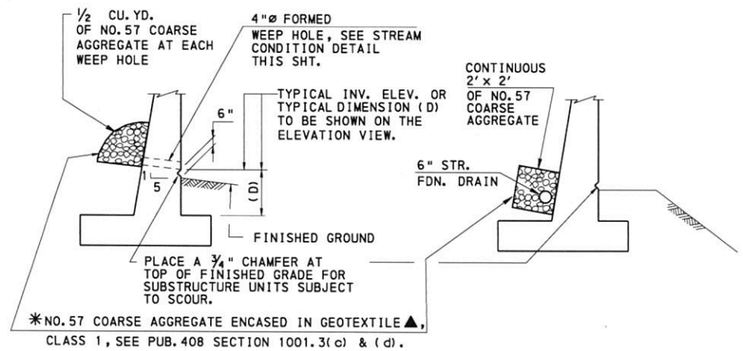


SECTION R-R



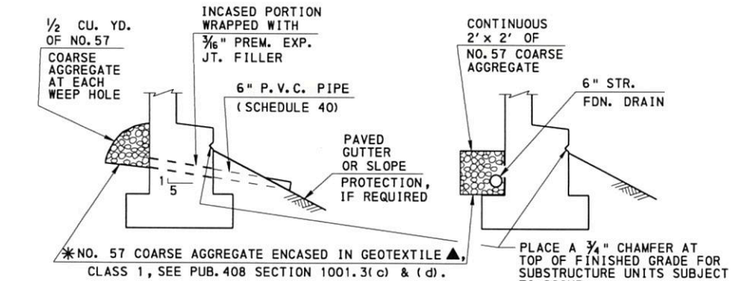
SECTION P-P

INTEGRAL ABUTMENT SUBSTRUCTURE DRAINAGE



SCHEME A SCHEME B

ABOVE GRADE CONDITION



SCHEME A SCHEME B

BELOW GRADE CONDITION

ABUTMENT, WING & RETAINING WALL DRAINAGE DETAILS

* NO. 57 COARSE AGGREGATE ENCASED IN GEOTEXTILE IS NOT REQUIRED IF NO. 57 COARSE AGGREGATE BACKFILL IS USED.

▲ COST OF GEOTEXTILE IS INCIDENTAL TO THE COST OF THE NO. 57 COARSE AGGREGATE.

LEGEND:

STR. FDN. DRAIN = STRUCTURE FOUNDATION DRAIN
P.V.C. = POLYVINYL CHLORIDE (SCHEDULE 40)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

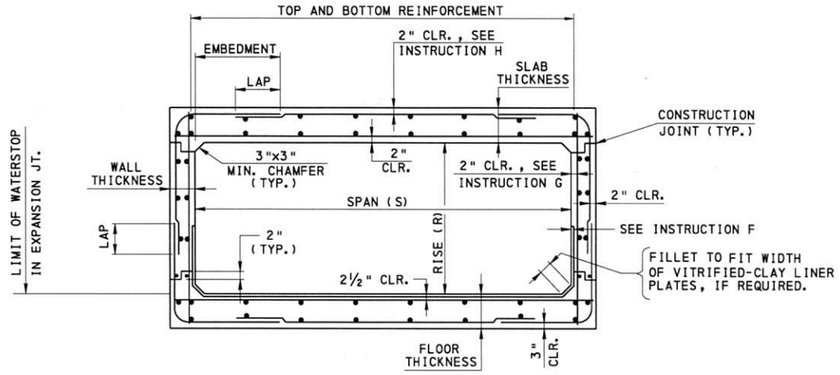
STANDARD BRIDGE DRAINAGE MISCELLANEOUS DETAILS

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED NOV. 26, 2013
ACTING DIR. BUR. OF PROJECT DELIVERY

SHEET 6 OF 6

BC-751M



TYPICAL BOX SECTION

NO SCALE

DESIGN DATA FOR CAST-IN-PLACE BOX CULVERT

1. f'c = 3000 P.S.I. FOR CLASS A CEMENT CONCRETE
2. f'c = 4000 P.S.I. FOR TOP SLAB AT GRADE (CLASS AAAP CEMENT CONCRETE)
3. fy = 60,000 P.S.I. FOR REINFORCEMENT BARS
4. fy = 65,000 P.S.I. FOR WELDED WIRE FABRIC

INSTRUCTIONS

A. MINIMUM SLAB THICKNESS = 10"

B. MINIMUM WALL THICKNESS = 10" FOR RISE < 5'-0"

C. MINIMUM WALL THICKNESS = 1'-0" FOR RISE > 5'-0"

D. ADD 1½" (½" AT THE TOP AND 1" AT BOTTOM) TO THE EFFECTIVE DESIGN THICKNESS OF BOTTOM SLAB OF BOX CULVERTS, FOR THE TOTAL (PROVIDED) THICKNESS.

E. FOR BOX CULVERTS AT GRADE, ADD ½"INTEGRAL WEARING SURFACE TO THE TOP DECK SLAB THICKNESS.

F. IF SPECIFIED, VITRIFIED-CLAY LINER PLATES WITH TYPE B POINTING (INCLUDE COST IN THE PRICE OF CONCRETE TO WHICH ATTACHED.)

G. 3" CLEAR IF LINER PLATES ARE USED

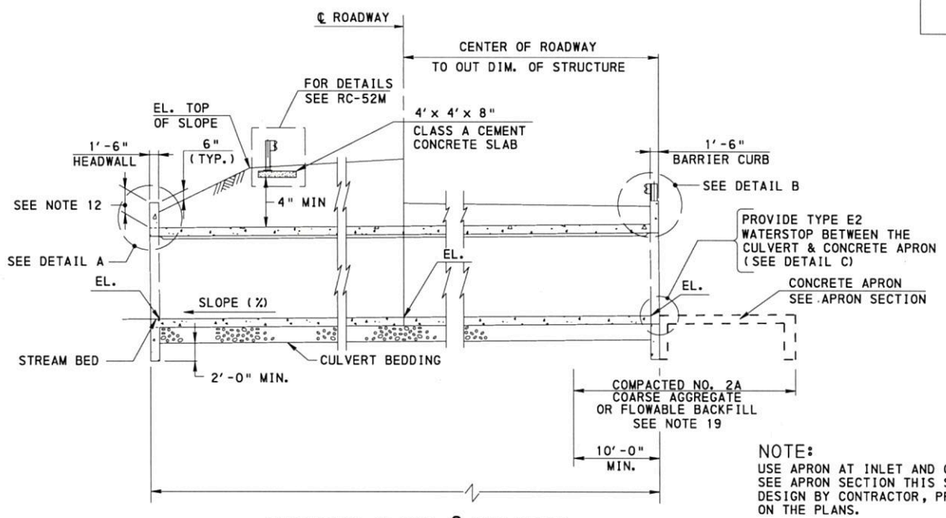
H. 2½" CLEAR IF AT GRADE

I. PLACE MAIN CIRCUMFERENTIAL REINFORCEMENT NORMAL TO THE CENTERLINE OF THE CULVERT.

J. PROVIDE EXPANSION JOINTS AT APPROXIMATELY 90' INTERVALS AND CONSTRUCTION JOINTS AT APPROXIMATELY 30' INTERVALS. PROVIDE EXPANSION JOINTS IN BOTTOM SLAB.

NOTES

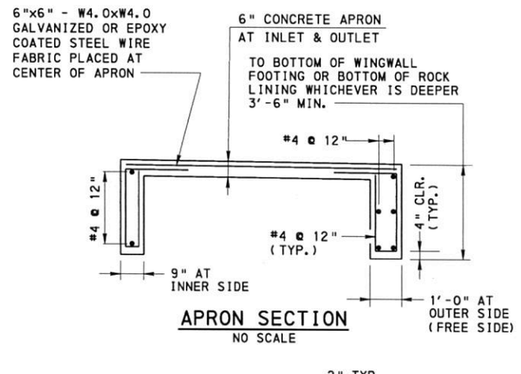
1. PROVIDE GRADE 60 DEFORMED REINFORCING BARS THAT MEET THE REQUIREMENTS OF ASTM A 615, A 996 OR A 706. DO NOT WELD REINFORCEMENT STEEL. DO NOT USE RAIL STEEL (A 996) WHERE BENDING OR WELDING OF REINFORCEMENT BARS IS INDICATED.
2. DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND AS SUPPLEMENTED BY THE DESIGN MANUAL, PART 4, STRUCTURES.
3. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE APPROPRIATE SPECIFICATIONS AS OUTLINED IN THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PUBLICATION 408.
4. DEAD LOADS: INCLUDES SURFACE AREA DENSITY OF 30 P.S.F. FOR FUTURE WEARING SURFACE FOR BOXES AT GRADE.
5. USE EPOXY COATED REINFORCEMENT BARS IN THE FOLLOWING CONDITIONS:
   - TOP SLAB AND HEADWALL WITHIN 2'-0" OF GRADE.
   - ALL CURBS AND BARRIERS.
   - THROUGHOUT THE CULVERT WHEN VITRIFIED CLAY LINER PLATES ARE USED.
   - IN ALL APRON SLABS.
6. PROVIDE 2" CONCRETE COVER ON REINFORCEMENT BARS EXCEPT AS NOTED.
7. FOR HYDRAULIC DESIGN REFER TO DESIGN MANUAL, PART 2.
8. FOR LOW FLOW FISH PASSAGE DESIGN COMMENTARY REFER TO DESIGN MANUAL, PART 2.
9. INDICATE ALLOWABLE AND MAXIMUM DESIGN FOUNDATION PRESSURE ON THE PLANS.
10. PLACE HEADWALLS, APRON WALLS AND WINGWALL FOOTINGS BELOW FROST DEPTH OR 3'-6" WHICH EVER IS GREATER.
11. USE 4" ø FORMED WEEP HOLES AT 15'-0" MAXIMUM CENTERS PLACED AT A MINIMUM 1'-9" ABOVE BOTTOM OF SLAB OR 6" ABOVE NORMAL FLOW LINE, FOR DETAILS SEE BC-751M. FOR WEEP HOLES LOCATED IN THE COMPACTED NO. 2A COARSE AGGREGATE AREAS OR FLOWABLE BACKFILL AREAS, PROVIDE PREFORMED DRAIN CONFORMING TO PUB.408 SECTION 623.2(a), WHICH IS 2" MINIMUM THICK x 4'-0" WIDE CENTERED HORIZONTALLY ON WEEP HOLE, SEE PREFORMED DRAIN DETAIL ON SHEET 5.
12. CONCRETE HEADWALL REINFORCEMENT WILL REQUIRE A SEPARATE DESIGN IF HEIGHT IS GREATER THAN 2'-0".
13. USE THIS STANDARD DRAWING IN CONJUNCTION WITH THE APPLICABLE ROADWAY CONSTRUCTION STANDARDS FOR GUIDE RAIL.
14. REFER TO DESIGN DRAWINGS FOR SPACING OF POSTS.
15. THOROUGHLY COAT ALL SURFACES OF THE BASE PLATES IN CONTACT WITH CONCRETE WITH CAULKING COMPOUNDS PRIOR TO ERECTION. AFTER ERECTION AND ALIGNMENT, SEAL OPENINGS BETWEEN THE METAL SURFACES AND THE CONCRETE WITH CAULKING COMPOUND MEETING THE REQUIREMENTS OF SECTION 705, PUB. 408.
16. FOR JOINT DETAILS SEE BC-735M. WHEN EXPANSION JOINTS ARE USED, WATERSTOPS ARE REQUIRED IN THE TOP AND BOTTOM SLABS AND THE WALLS.
17. FOR SAFETY WING DETAILS, SEE SHEET 3.
18. MODIFIED STRUCTURE MOUNTED GUIDE RAIL BARRIER GRANTED TL3 DESIGNATION BY FHWA.
19. PROVIDE COMPACTED NO. 2A COARSE AGGREGATE BACKFILL OR TYPE B FLOWABLE BACKFILL AT INLET END OF CULVERTS FOR A MINIMUM LENGTH OF 10'-0" PLUS WINGWALLS. HEIGHT OF COMPACTED NO. 2A COARSE AGGREGATE OR FLOWABLE BACKFILL IS A MINIMUM OF 2'-0" ABOVE NORMAL STREAM. ELEVATION EXTENDING TO THE BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICHEVER IS DEEPER, 3'-6" MINIMUM.



SECTION ALONG ℄ CULVERT

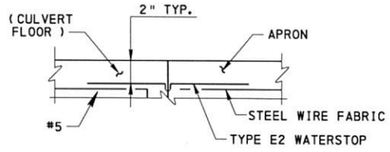
NO SCALE

NOTE:
USE APRON AT INLET AND OUTLET IF WARRANTED. SEE APRON SECTION THIS SHEET. FOR ALTERNATE DESIGN BY CONTRACTOR, PROVIDE THE APRONS ON THE PLANS.



APRON SECTION

NO SCALE

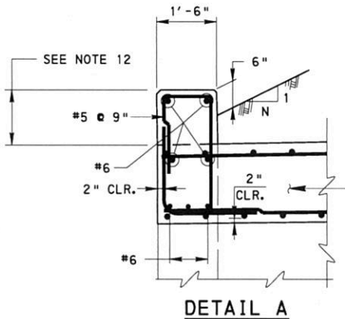


DETAIL C

NO SCALE

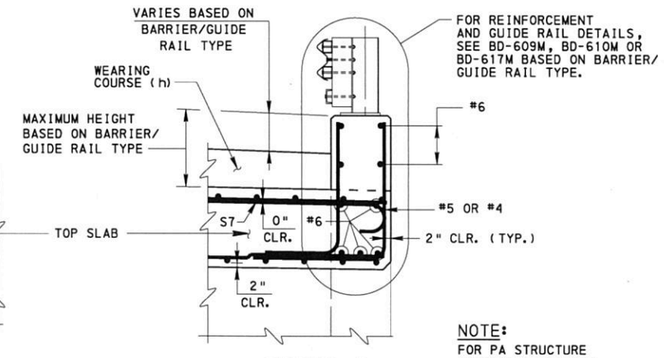
LEGEND

E.F. : DENOTES EACH FACE
F.F. : DENOTES FRONT FACE
R.F. : DENOTES REAR FACE
EL. : DENOTES ELEVATION
C.I.P. : DENOTES CAST IN PLACE
B.B. : DENOTES BACK BATTER



DETAIL A

IMPROVEMENT CONDITION
NO SCALE



DETAIL B

NO SCALE

NOTE:
FOR PA STRUCTURE MOUNTED GUIDE RAIL DETAILS, SEE SHEET 2.

RC-52M	TYPE 2 STRONG POST GUIDE RAIL
BD-601M	CONCRETE DECK SLAB DESIGN & DETAILS
BD-609M	PA STRUCTURE MOUNTED GUIDE RAIL
BD-610M	PA BRIDGE BARRIER
BD-617M	PA TYPE 10M BRIDGE BARRIER
BD-621M	STANDARD REINFORCED CONCRETE ABUTMENTS TYPICAL SECTIONS AND DETAILS
BD-625M	WINGWALL LENGTH
BD-631M	END WALL DETAILS FOR METAL CULVERTS
BC-706M	PA STRUCTURE MOUNTED GUIDE RAIL BARRIER MISCELLANEOUS DETAILS
BC-734M	ANCHOR SYSTEMS
BC-735M	WALL CONSTR. AND EXPANSION JOINT DETAILS
BC-736M	REINFORCEMENT BAR FABRICATION DETAILS
BC-739M	BRIDGE BARRIER TO GUIDE RAIL TRANSITION
BC-751M	BRIDGE DRAINAGE
BC-788M	TYPICAL WATERPROOFING AND EXPANSION DETAILS
BC-798M	PRECAST R.C. BOX CULVERT MECHANICAL CONNECTION DETAILS

REFERENCE DRAWINGS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

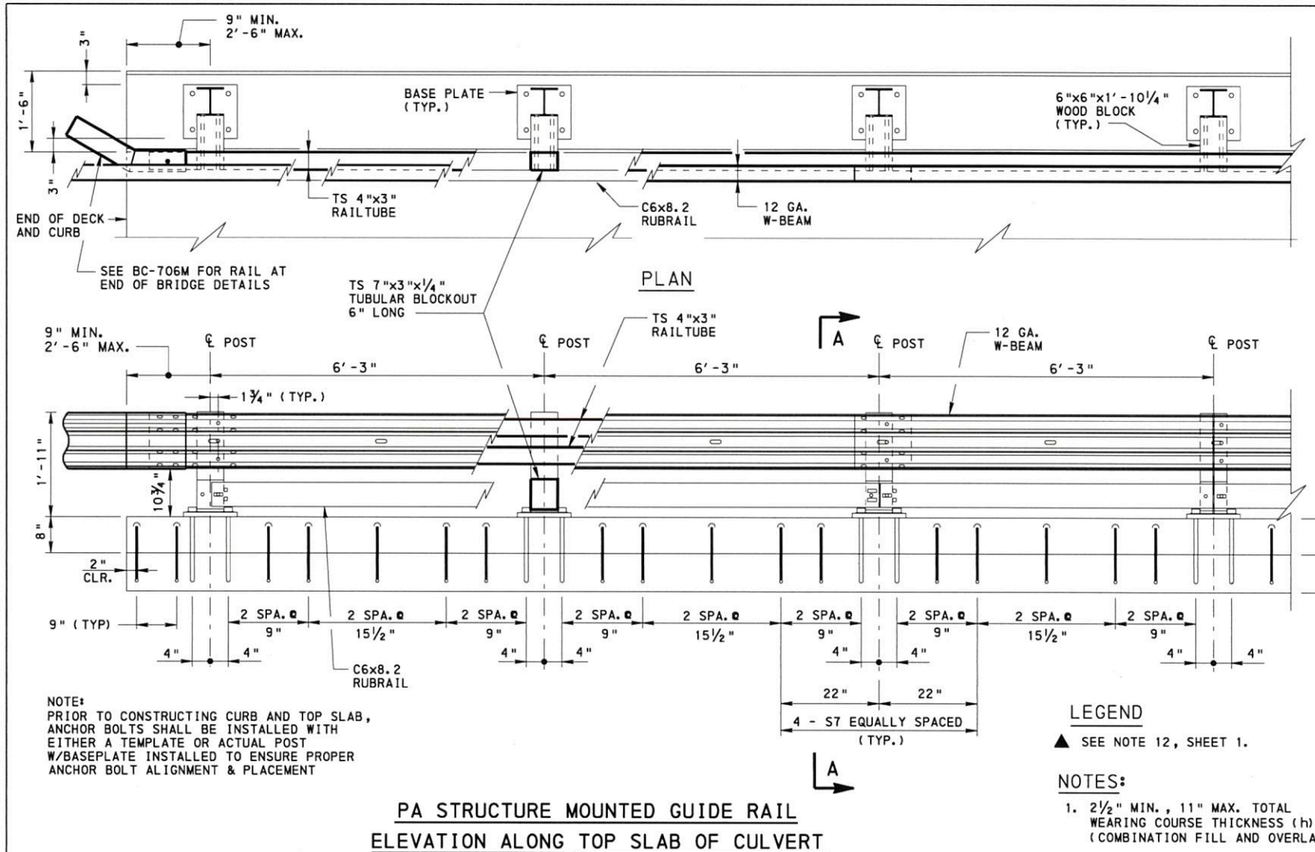
STANDARD R.C. BOX CULVERT CAST-IN-PLACE

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED NOV. 26, 2013
ACTING DIR. BUR. OF PROJECT DELIVERY

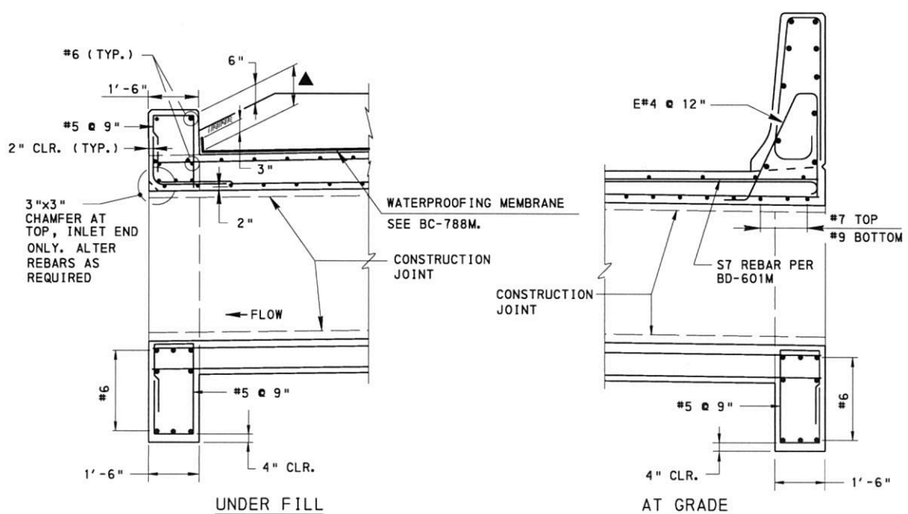
SHEET 1 OF 13

BD-632M

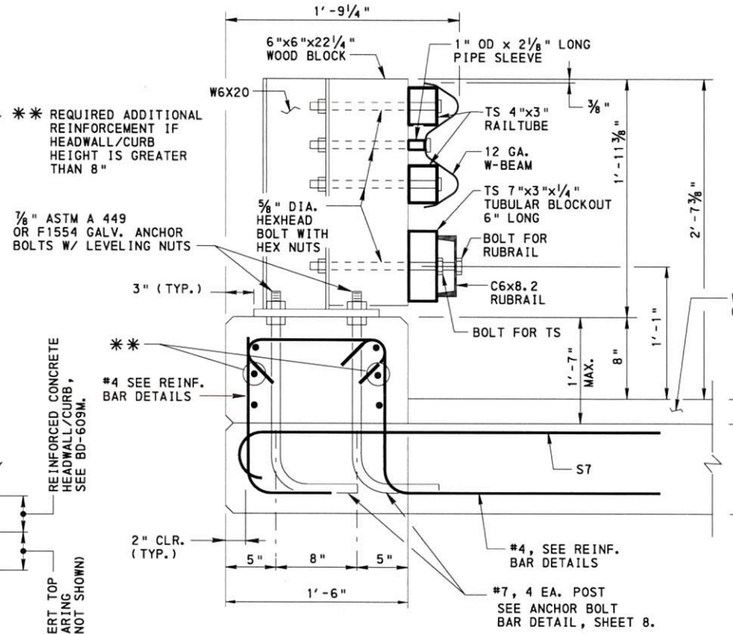


PA STRUCTURE MOUNTED GUIDE RAIL
ELEVATION ALONG TOP SLAB OF CULVERT

- FOR CURB REINFORCEMENT SEE BD-609M.
- TOP SLAB REINFORCEMENT AS DESIGNED.



TYPICAL HEADWALL SECTIONS



SECTION A-A

(SLAB BRIDGES & LIKE STRUCTURES)

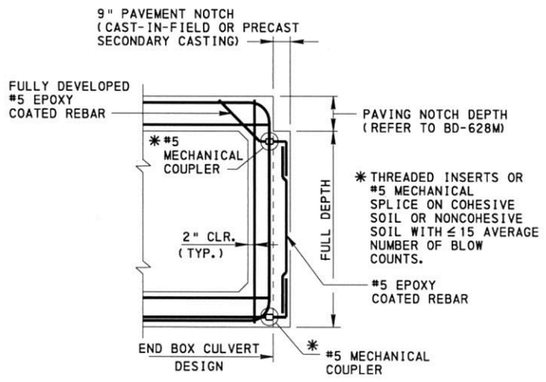
- CURB REINFORCEMENT SHOWN FOR CLARITY, SEE BD-609M.
- SEE RC-52M FOR TYPE 2 STRONG POST GUIDE RAIL DETAILS
- S7 REINFORCEMENT REQUIRED AT POST LOCATIONS ONLY. SEE SHEET 8 FOR SLAB REINFORCEMENT BAR DETAILS.

LEGEND

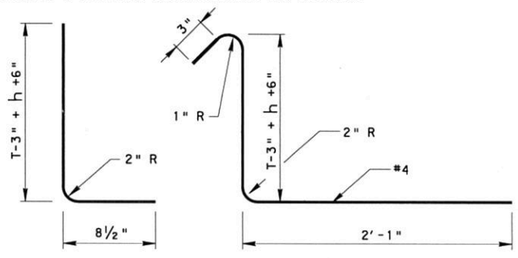
▲ SEE NOTE 12, SHEET 1.

NOTES:

1. 2½" MIN., 11" MAX. TOTAL WEARING COURSE THICKNESS (h) (COMBINATION FILL AND OVERLAY)
2. SEE DETAIL B SHEET 1 FOR ALTERNATE DETAIL.
3. SEE BD-601M FOR BARRIER REINFORCEMENT AND DIMENSION DETAILS.



PAVEMENT NOTCH DETAIL
AT GRADE WHEN APPROACH SLAB IS REQUIRED



SLAB TO CURB
REINFORCEMENT BAR DETAILS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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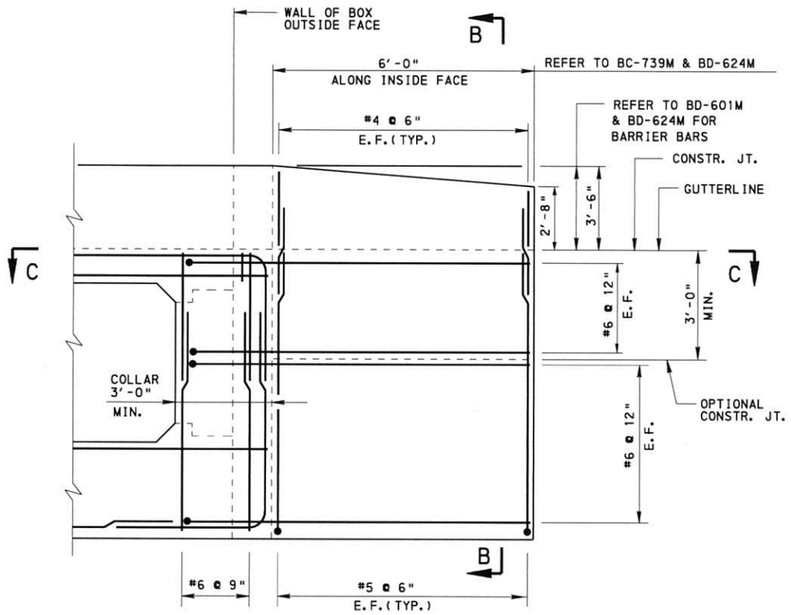
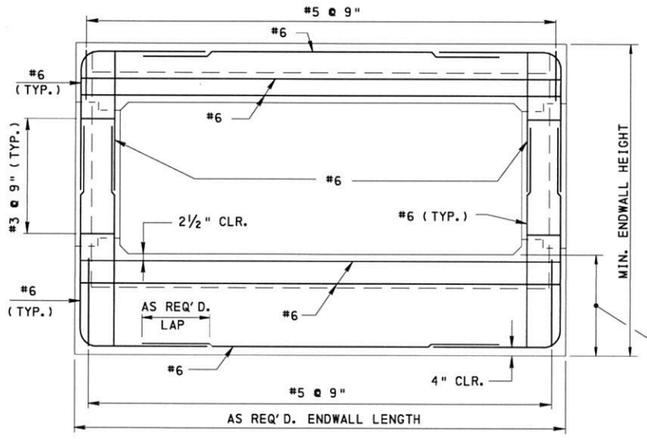
STANDARD
R.C. BOX CULVERT
HEADWALL DETAILS
CAST-IN-PLACE

RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 2 OF 13
Thomas P. Macioce, CHIEF BRIDGE ENGINEER	ACTING DIR., BUR. OF PROJECT DELIVERY	BD-632M



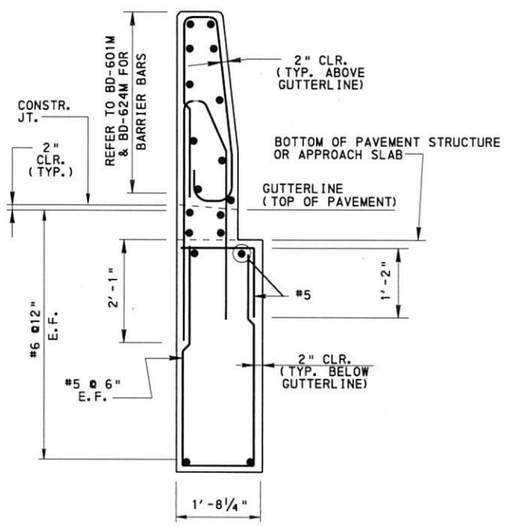
FLARED WING SAFETY WING

NOTE: HOOKS ON BARS EXTENDING FROM BARRIER TRANSITION INTO THE BACKWALL MAY BE TURNED IN ANY DIRECTION.



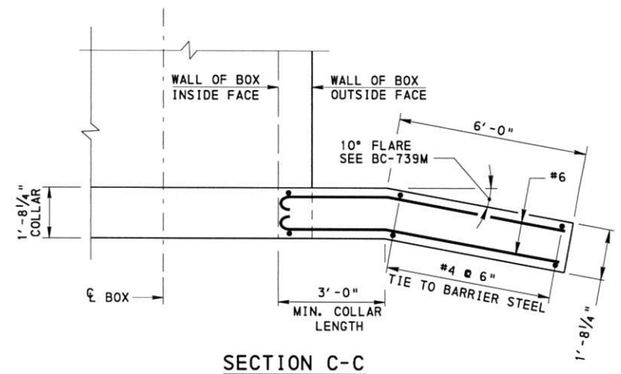
TYPICAL HEADWALL ELEVATION

MINIMUM REINFORCEMENT SHOWN
NO SCALE

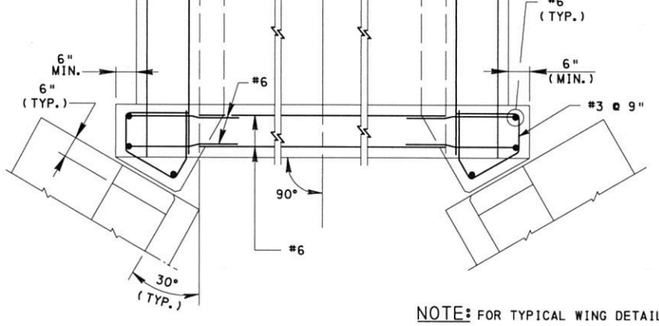


SECTION B-B

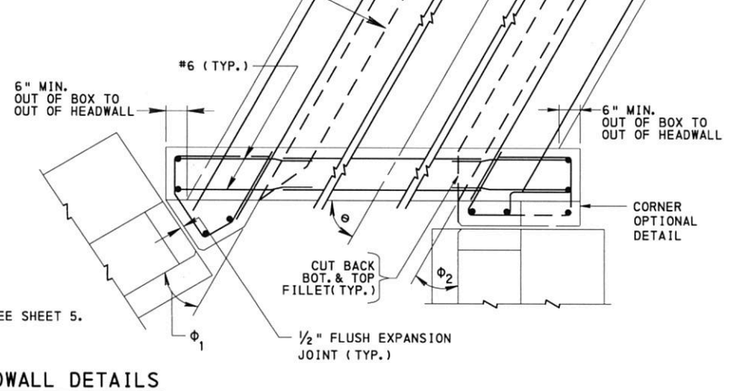
(WITHOUT CURB BLOCK)



SECTION C-C



NOTE: FOR TYPICAL WING DETAILS SEE SHEET 5.



TYPICAL CULVERT HEADWALL DETAILS

LEGEND:

Θ	SKEW ANGLE
ϕ_1	= 30° FOR Θ ≥ 60°
ϕ_1	= Θ/2 FOR Θ < 60°
ϕ_2	= 30° FOR Θ ≥ 60°
ϕ_2	= 90°-Θ FOR Θ < 60°

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD R.C. BOX CULVERT CAST-IN-PLACE

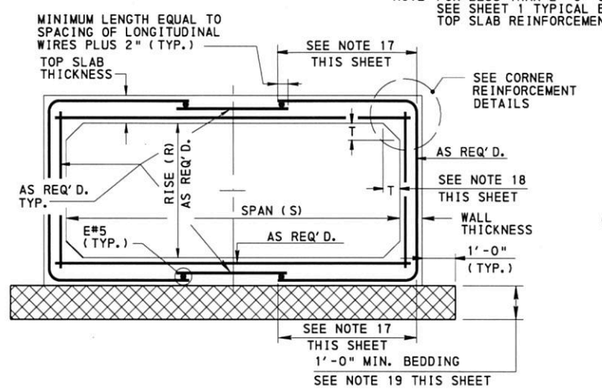
RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED NOV. 26, 2013
ACTING DIR. BUR. OF PROJECT DELIVERY

SHEET 3 OF 13

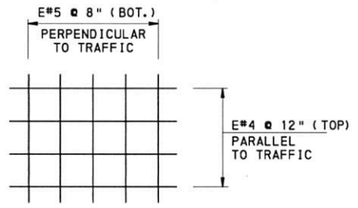
BD-632M

NOTE: FOR LESS THAN 2'-0" OF COVER SEE SHEET 1 TYPICAL BOX SECTION FOR TOP SLAB REINFORCEMENT.

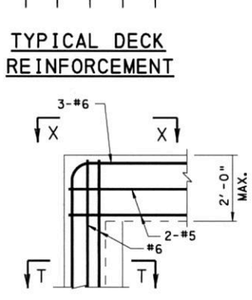


BOX DETAILS - WELDED WIRE FABRIC

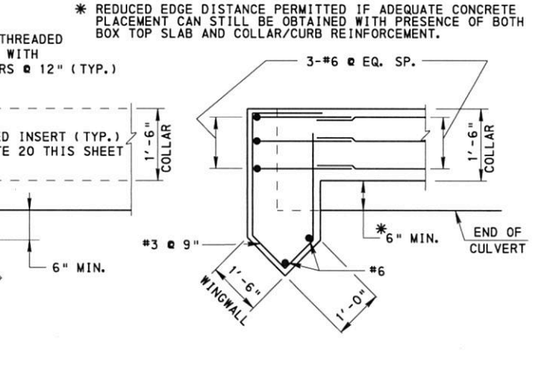
(FOR 2'-0" OR MORE OF COVER)
SEE BC-798M FOR POST TENSION STRAND DETAILS
NO SCALE



TYPICAL DECK REINFORCEMENT



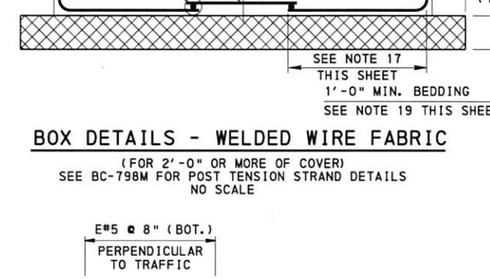
COLLAR CORNER DETAILS



SECTION T-T

SECTION X-X

* REDUCED EDGE DISTANCE PERMITTED IF ADEQUATE CONCRETE PLACEMENT CAN STILL BE OBTAINED WITH PRESENCE OF BOTH BOX TOP SLAB AND COLLAR/CURB REINFORCEMENT.



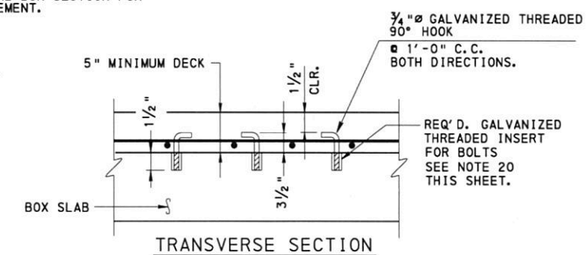
DETAIL OPTION

CORNER REINFORCEMENT DETAILS

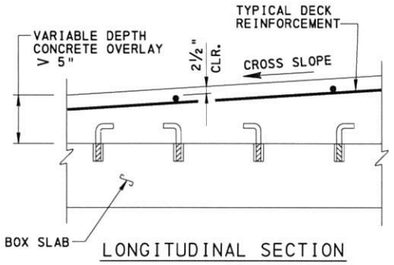
WELDED WIRE FABRIC

NOTES:

- FOR LESS THAN 2'-0" OF COVER SEE SHEET 1 TYPICAL BOX SECTION FOR TOP SLAB REINFORCEMENT.
- FOR POST TENSIONING DETAILS, SEE BC-798M.



TRANSVERSE SECTION



LONGITUDINAL SECTION

DECK CONNECTION DETAILS

DESIGN DATA:

- f'c = 5000 P.S.I. MINIMUM FOR CONCRETE
- fy = 60,000 P.S.I. FOR STEEL REINFORCING BARS
- fy = 65,000 P.S.I. FOR WELDED WIRE FABRIC (IN FLAT SHEET)

INSTRUCTIONS:

- MINIMUM WALL THICKNESS = S/12 FOR S= 8' TO 12'; 13" FOR S >12'
- MINIMUM SLAB THICKNESS = S/12 FOR S= 8' TO 12'; 13" FOR S >12'
- MINIMUM COVER FOR WELDED WIRE FABRIC :
  1. PROVIDE 1½", EXCEPT 2" FOR THE TOP WIRES OF THE TOP SLAB WHERE BOX FILL HEIGHT IS LESS THAN 2'-0".
  2. USE ½" MORE COVER FOR THE TOP WIRES OF THE BOTTOM SLAB.
- MINIMUM COVER FOR CONVENTIONAL REINFORCEMENT BARS: PROVIDE 2" FOR THE TOP BARS OF TOP AND BOTTOM SLABS, AND 1½" FOR ALL OTHER BARS, EXCEPT USE 2½" FOR TOP BARS WHEN SLAB IS AT GRADE.
- FOR WELDED WIRE FABRIC, SPACE CIRCUMFERENTIAL WIRES CENTER TO CENTER NOT LESS THAN 2" OR MORE THAN 4", AND SPACE LONGITUDINAL WIRES CENTER TO CENTER NOT MORE THAN 8".

NOTES

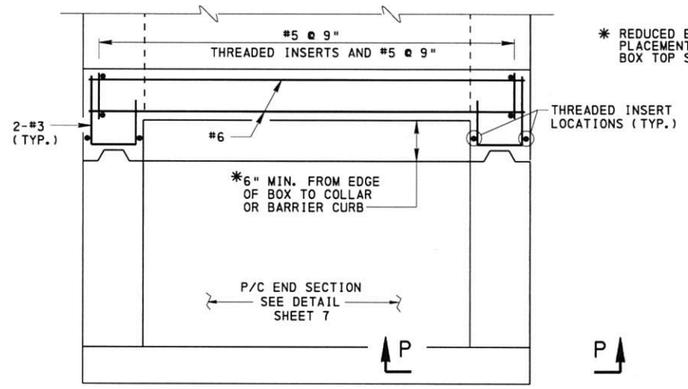
1. PROVIDE GRADE 60 DEFORMED REINFORCING BARS THAT MEET THE REQUIREMENTS OF ASTM A 615, A 996 OR A 706. DO NOT WELD REINFORCEMENT STEEL. DO NOT USE RAIL STEEL (A 996) WHERE BENDING OR WELDING OF REINFORCEMENT BARS IS INDICATED.
2. WELDED WIRE FABRIC WILL MEET THE REQUIREMENTS OF AASHTO M55 ASTM (A185), AND DEFORMED WELDED WIRE FABRIC WILL MEET THE REQUIREMENTS OF AASHTO M221 ASTM (A497).
3. USE EPOXY COATED REINFORCEMENT AND EPOXY OR GALVANIZED WELDED WIRE FABRIC IN THE FOLLOWING CONDITIONS:
   - IN THE CAST IN PLACE DECK AND HEADWALLS IF A DECK IS USED.
   - IN THE TOP SLAB AND HEADWALL WITHIN 2'-0" OF GRADE IF A CAST IN PLACE DECK IS NOT USED.
   - ALL CURBS AND BARRIERS.
   - THROUGHOUT THE CULVERT WHEN VITRIFIED CLAY LINER PLATES ARE USED.
   - IN ALL CAST-IN-PLACE APRON SLABS (SEE SHEET 1)

   IF EPOXY COATED WELDED WIRE FABRIC IS USED IT MUST MEET THE REQUIREMENTS OF ASTM A 884, TYPE I, CLASS A.
4. DESIGN SPECIFICATIONS: AASHTO LRFD "BRIDGE DESIGN SPECIFICATION" AND AS SUPPLEMENTED BY THE DESIGN MANUAL, PART 4, STRUCTURES.
5. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE APPROPRIATE SPECIFICATIONS AS OUTLINED IN THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PUBLICATION 408.
6. DEAD LOADS: INCLUDE A WEIGHT OF 30 P.S.F. FOR FUTURE WEARING SURFACE FOR BOXES AT GRADE.
7. PROVIDE MINIMUM LAP AND EMBEDMENT LENGTH OF REINFORCEMENT IN ACCORDANCE WITH LRFD SPECIFICATIONS: SEE BC-736M.
8. PROVIDE 2" CONCRETE COVER ON REINFORCEMENT BARS EXCEPT AS NOTED IN INSTRUCTIONS BELOW.
9. FOR HYDRAULIC DESIGN REFER TO DESIGN MANUAL, PART 2.
10. FOR LOW FLOW FISH PASSAGE DESIGN REFER TO DESIGN MANUAL, PART 2, AND SEE SHEETS 13 AND 14.
11. INDICATE ALLOWABLE AND MAXIMUM DESIGN FOUNDATION PRESSURE ON PLANS.
12. PLACE HEADWALL AND WINGWALL FOOTINGS BELOW FROST DEPTH OR 3'-6" MINIMUM, WHICH EVER IS GREATER.
13. PROVIDE 2'-0" MIN. WIDTH OF WATERPROOFING MEMBRANE AS PER PUB.408, SECTION 680.2(a) OR 680.2(b) ALONG THE TOP AND SIDE JOINTS. FOR ADDITIONAL DETAILS REFER TO BC-788M.
14. USE 4"ø FORMED WEEPHOLES AT EVERY OTHER SEGMENT PLACED AT A MINIMUM 1'-9" ABOVE THE BOTTOM SLAB OR 6" ABOVE NORMAL FLOW LINE. FOR WEEPHOLE PLACEMENT, THE WEEPHOLE LOCATION MAY BE ADJUSTED BY A MAXIMUM OF 2" IN ANY DIRECTION, OR RELOCATE REINFORCEMENT BY A MAXIMUM OF ½". DO NOT CUT REINFORCEMENT BARS. NO ADDITIONAL WEEPHOLE REINFORCEMENT WILL BE REQUIRED. IF WIRE MESH IS USED, MAY CUT THE MESH TO FIT WEEPHOLE CONDUIT BUT REPLACE EQUIVALENT STEEL WITH ADDITIONAL WIRE MESH PLACED ON EACH SIDE OF WIRE MESH MAT.
15. PRECAST BOX CULVERTS AT GRADE (i.e. ≤ 2'-0" OF FILL) REQUIRE AN ADDITIONAL 5" MINIMUM REINFORCED CONCRETE DECK. THIS 5" DECK WILL BE MAINTAINED FOR ENTIRE BOX CULVERT. REFER TO TYPICAL DECK REINFORCEMENT (THIS SHT.) FOR DETAILS. FOR ADT ≤ 750 AND A.D.T.T. ≤ 25, A BITUMINOUS OVERLAY MAY BE UTILIZED IN LIEU OF A CONCRETE DECK.
16. DESIGN PRECAST REINFORCED CONCRETE BOXES TO HAVE OPENINGS IN 6" INCREMENTS WITH MINIMUM RISE OF 3'-0".
17. REQUIRED DIMENSION FOR BAR LENGTH IS THE TOTAL OF THE THEORETICAL CUT-OFF LENGTH PLUS THE REQUIRED ANCHORAGE.
18. HAUNCH SIZE SHOWN (T) IS BASED ON AASHTO M273. HAUNCH MAY BE MODIFIED IF THE BOX IS CUSTOM DESIGNED TO SATISFY DESIGN, TRANSPORTATION AND CONSTRUCTION REQUIREMENTS, BUT NOT LESS THAN 6" x 6".
19. INDICATES ADDITIONAL EXCAVATION FOR BEDDING MATERIAL BELOW THE BOTTOM OF PRECAST R.C. BOX CULVERT WITH LIMITS AS SHOWN. BACKFILL SPACE WITH 2A OR #8 COARSE AGGREGATE.
20. THREADED INSERTS TO BE INCORPORATED IN PRECAST BOX BY THE FABRICATOR, SEE SPECIAL PROVISIONS.
21. CONCRETE HEADWALL REINFORCEMENT WILL REQUIRE A SEPARATE DESIGN IF HEIGHT IS GREATER THAN 2'-0".
22. IF APPROACH ROADWAY UTILIZES CURB, ADJUST DIMENSION TO MATCH CURB HEIGHT.
23. USE EPOXY BONDING COMPOUND WHERE EVER CAST-IN-PLACE CEMENT CONCRETE COMES IN CONTACT WITH PRECAST CEMENT CONCRETE. THE EPOXY BONDING COMPOUND IS TYPE 2, GRADE 2, AS DESCRIBED IN ASTM-C881-90.
24. THE USE OF PRECAST END SECTION IS NOT PRECLUDED BUT WILL BE REVIEWED ON AN INDIVIDUAL BASIS BY THE DISTRICT BRIDGE ENGINEER. HAUNCH SIZE MUST MATCH THAT OF BOX CULVERT SEGMENTS.
25. POST-TENSIONING DUCTS MAY BE PLACED AT EITHER CORNER OR HAUNCH TO SATISFY DESIGN AND CONSTRUCTION REQUIREMENTS. PROVIDE A 3" CONCRETE CLEARENCE. HAUNCH DUCT MUST BE SECURED TO INSIDE FACE REINFORCEMENT, SEE SHEETS 7 AND 9.
26. FOR DECK CONNECTION DETAIL FOR VARIABLE DEPTH CONCRETE DECKS, THE DECK REINFORCEMENT WILL BE INDEPENDENT OF ANCHOR BOLT AND MUST MAINTAIN CLEARANCE AND FOLLOW CROSS SLOPE.
27. SEE NOTE 19 ON SHEET 1 FOR BACKFILL REQUIREMENTS AT INLET END OF CULVERT AND NOTE 11 ON SHEET 1 FOR TREATMENT OF WEEP HOLES IN BACKFILL AREAS AT INLET END OF CULVERT.
28. SPECIFY 4'-0" MINIMUM SEGMENT LENGTH ON THE CONTRACT DRAWINGS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT
PRECAST

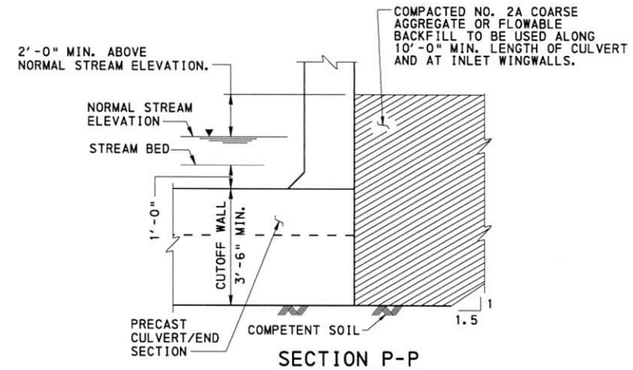
RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 4 OF 13
Thomas P. Macioce CHIEF BRIDGE ENGINEER	ACTING DIR., BUR. OF PROJECT DELIVERY	BD-632M



PLAN

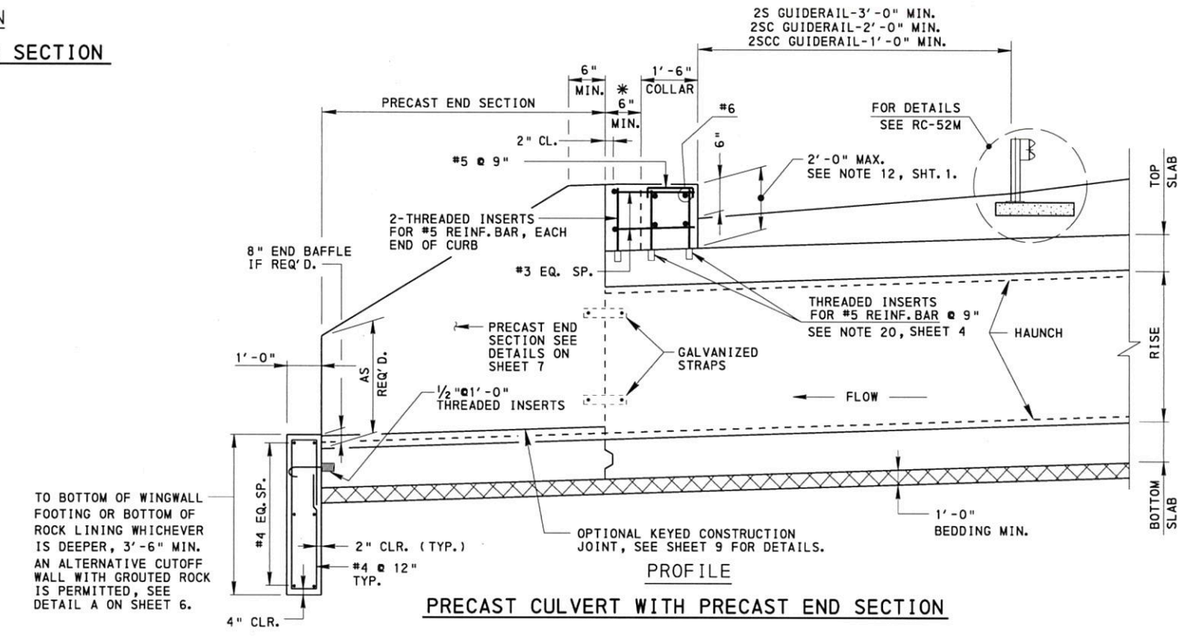
PRECAST END SECTION

* REDUCED EDGE DISTANCE PERMITTED IF ADEQUATE CONCRETE PLACEMENT CAN STILL BE OBTAINED WITH PRESENCE OF BOTH BOX TOP SLAB AND COLLAR/CURB REINFORCEMENT.



SECTION P-P

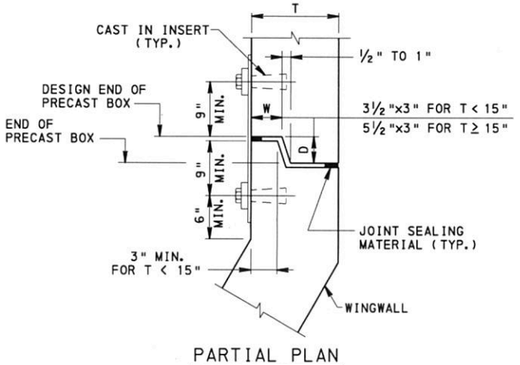
NOTE:
DESIGNER TO MODIFY AMOUNT OF COMPACTED NO. 2A COARSE AGGREGATE OR FLOWABLE BACKFILL TO PROVIDE ADEQUATE PROTECTION AGAINST PIPING OF STREAM FLOW THROUGH FILL AT INLET END OF CULVERT.



PROFILE

PRECAST CULVERT WITH PRECAST END SECTION

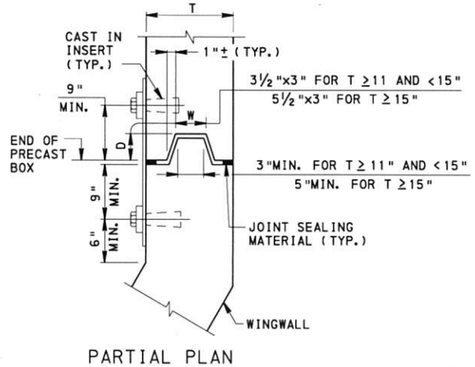
NOTES:
- SEE NOTE 24, SHEET 4.
- FOR ROCK PROTECTION SEE "CULVERT WITH CAST IN PLACE WINGWALLS" DETAIL, ON SHT. 6.
- FOR PRECAST END SECTION CONNECTION SEE BC-798M FOR GALVANIZED STRAP CONNECTION DETAIL.
- POST TENSION BOTTOM SLAB OF END SECTION PRIOR TO INSTALLATION OF CUTOFF WALL.



PARTIAL PLAN

SHIP LAP JOINT

DISCONTINUOUS IF POST TENSIONING IS REQUIRED



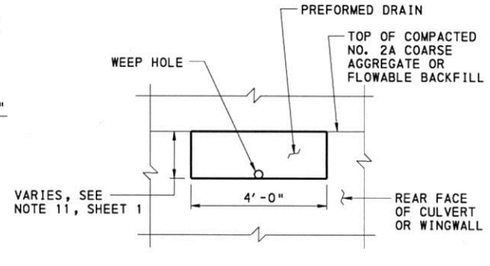
PARTIAL PLAN

KEYED JOINT

DISCONTINUOUS IF POST TENSIONING IS REQUIRED

PRECAST WINGWALL CONNECTION DETAILS

NOTES:
1. NO BOLT THROUGH CONNECTIONS CAN BE USED.
2. EITHER SHIP LAP OR KEYWAY JOINTS CAN BE USED. NO FLUSH BUTT JOINTS.
3. ONE (1) ROW OF JOINT SEALING FLEXIBLE FOAM MATERIAL EACH FACE.
4. FOR T <11", USE SHIP LAP DETAIL.



PREFORMED DRAIN DETAIL

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

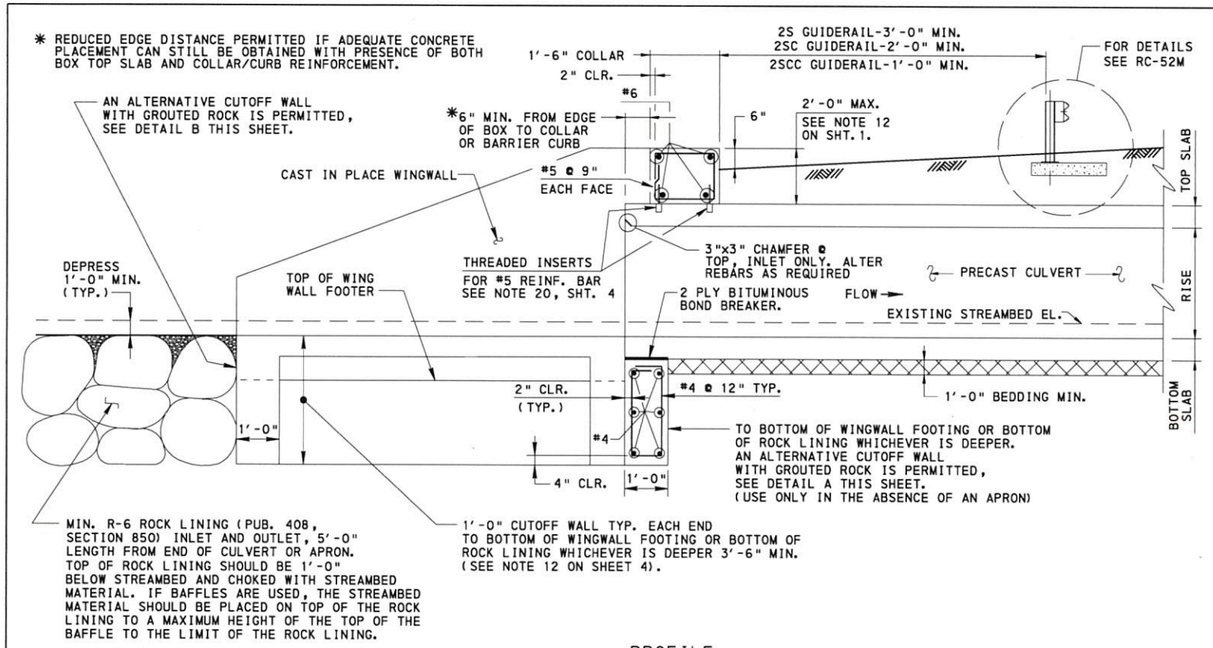
STANDARD
R. C. BOX CULVERT
PRECAST

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

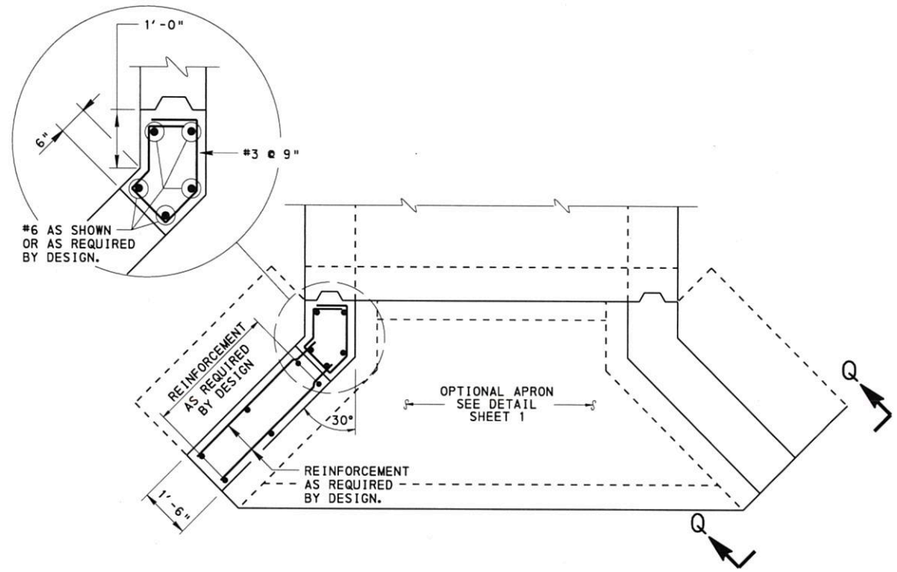
RECOMMENDED NOV. 26, 2013
ACTING DIR., BUR. OF PROJECT DELIVERY

SHEET 5 OF 13

BD-632M



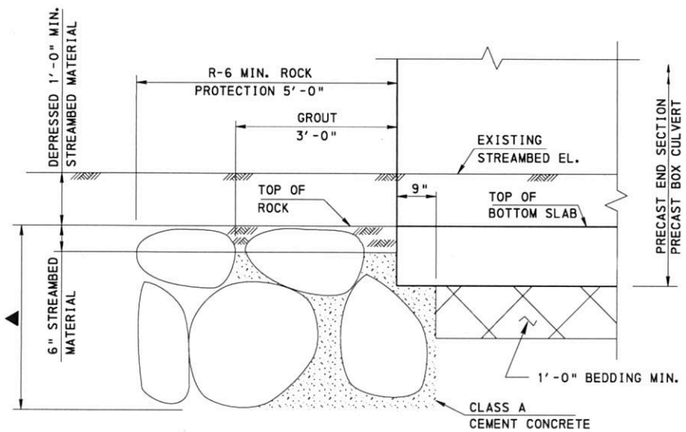
PROFILE



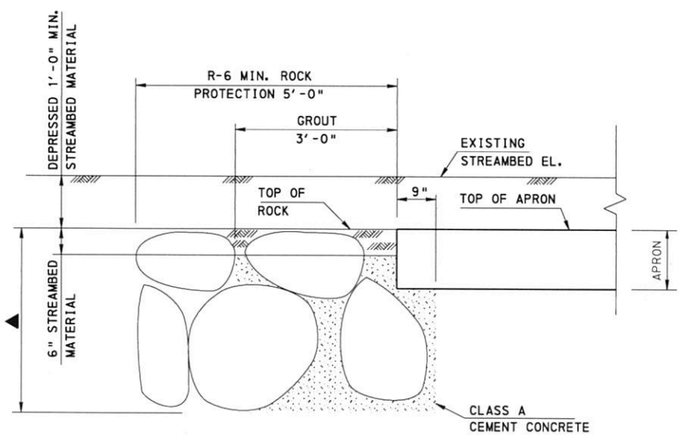
PLAN

(COLLAR OR BARRIER CURB NOT SHOWN)

PRECAST CULVERT WITH CAST IN PLACE WINGWALLS



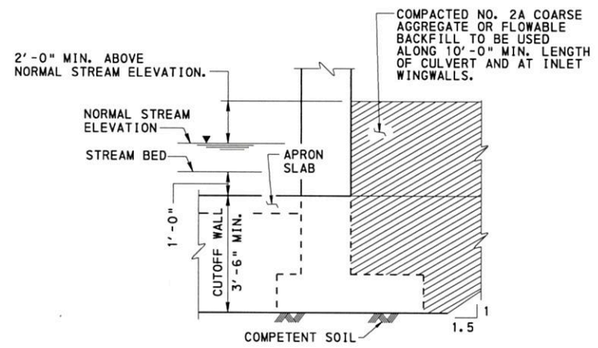
DETAIL A (WITHOUT APRON)



DETAIL B (WITH APRON)

▲ TO BOTTOM OF WINGWALL FOOTING OR BOTTOM OF ROCK LINING WHICH EVER IS DEEPER (3'-6" MIN.). FILL VOIDS IN ROCK WITH VIBRATED CLASS A CEMENT CONCRETE 6" BELOW STREAMBED TO BOTTOM OF ROCK. FILL TOP 6" OF ROCK WITH NATURAL STREAMBED MATERIAL

ALTERNATIVE CUTOFF WALL WITH GROUTED ROCK



SECTION Q-Q

NOTE:
DESIGNER TO MODIFY AMOUNT OF COMPACTED NO. 2A COARSE AGGREGATE OR FLOWABLE BACKFILL TO PROVIDE ADEQUATE PROTECTION AGAINST PIPING OF STREAM FLOW THROUGH FILL AT INLET END OF CULVERT.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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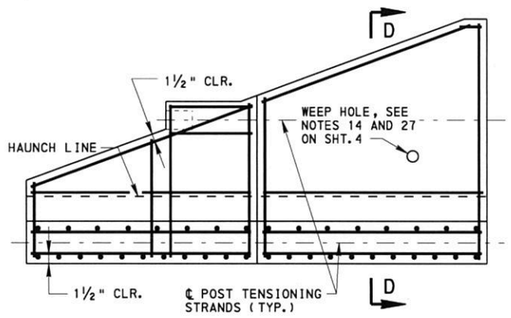
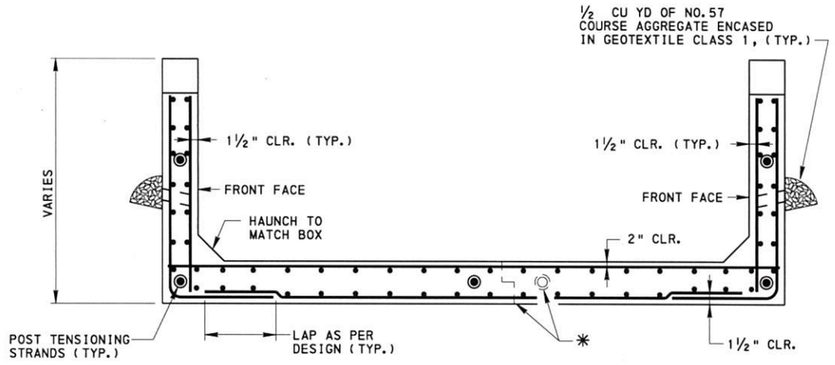
STANDARD
R. C. BOX CULVERT
PRECAST

RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 6 OF 13
Thomas P. Macieza		
CHIEF BRIDGE ENGINEER	ACTING DIR. BUR. OF PROJECT DELIVERY	BD-632M



POST-TENSION END SECTION
SPAN >12 FEET



SECTION D-D

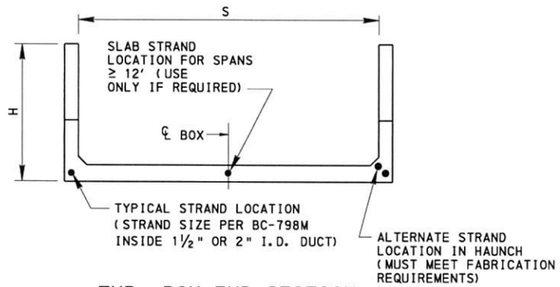
* SPECIFY JOINT AND ADDITIONAL END SECTION POST TENSION STRAND IF WIDTH IS RESTRICTED DUE TO SHIPPING RESTRAINTS.

POST-TENSIONING NOTES:

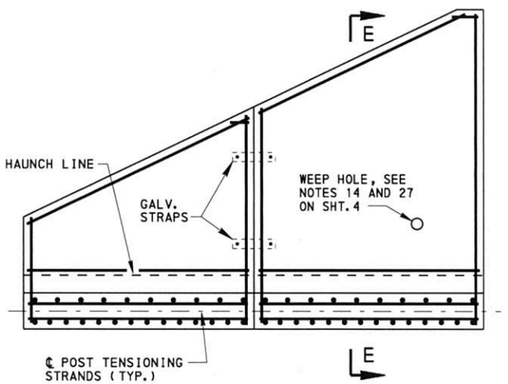
1. EXTEND BOTTOM ROW OF POST-TENSIONING STRANDS THROUGH THE BOTTOM SLAB OF PRECAST CONCRETE INLET AND OUTLET END SECTIONS.
2. BOX SEGMENTS AND END SECTIONS ARE POST-TENSIONED IN STAGES. THE CONTRACTOR IS REQUIRED TO SUBMIT A PLAN FOR POST-TENSIONING SEQUENCE TO THE DEPARTMENT FOR APPROVAL PRIOR TO SETTING ANY SEGMENTS.
3. POST-TENSION BOX SEGMENTS FIRST, THEN PROVIDE:
   - MECHANICAL SPLICERS ON BOTTOM STRANDS TO CONNECT WITH THE INLET\OUTLET END SECTIONS AND POST-TENSION BOTTOM STRANDS THROUGH THE END SECTIONS.
   - STRAPS ON SIDES OF END SECTION AS SHOWN ON BC-798M OR STRANDS IN WALLS, IF APPLICABLE (SPANS ≥ 12' AND 90° WINGWALL).
4. AFTER POST-TENSIONING IS APPROVED, CUT STRANDS TO PROVIDE A MINIMUM OF 2½" CLEAR FROM OUTSIDE FACE OF CONCRETE AND COAT RECESS WITH EPOXY BONDING COMPOUND AND FILL WITH NON-SHRINK GROUT.
5. PRECAST CONCRETE SEGMENT LENGTH TO BE DETERMINED BY THE FABRICATOR.
6. STAGING, SPACING AND POST-TENSION FORCE TO BE SHOWN ON FABRICATOR'S SHOP DRAWINGS.
7. CAST-IN-PLACE CONCRETE IS PERMITTED IN ANY PORTION OF THE PRECAST END SECTIONS, ONLY IF HEIGHT OR WIDTH OF END SECTIONS ARE RESTRICTED DUE TO SHIPPING RESTRAINTS.
8. WALL REINFORCEMENT CAN BE ADJUSTED TO ACCOMMODATE WEEPHOLE. DO NOT CUT REINFORCEMENT.

GENERAL NOTES:

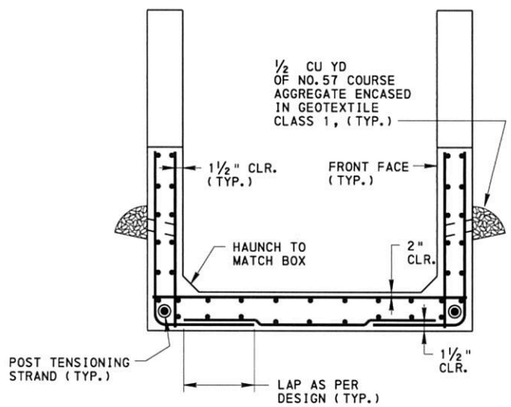
1. EPOXY COAT REINFORCEMENT AS PER R.C. BOX CULVERT DESIGN.
2. REBAR SHOWN IS FOR ORIENTATION ONLY, REBAR SIZE AND SPACING AS PER DESIGN.



TYP. BOX END SECTION
SHOWING STRAND LOCATIONS



POST-TENSION END SECTION
SPAN ≤ 12 FEET

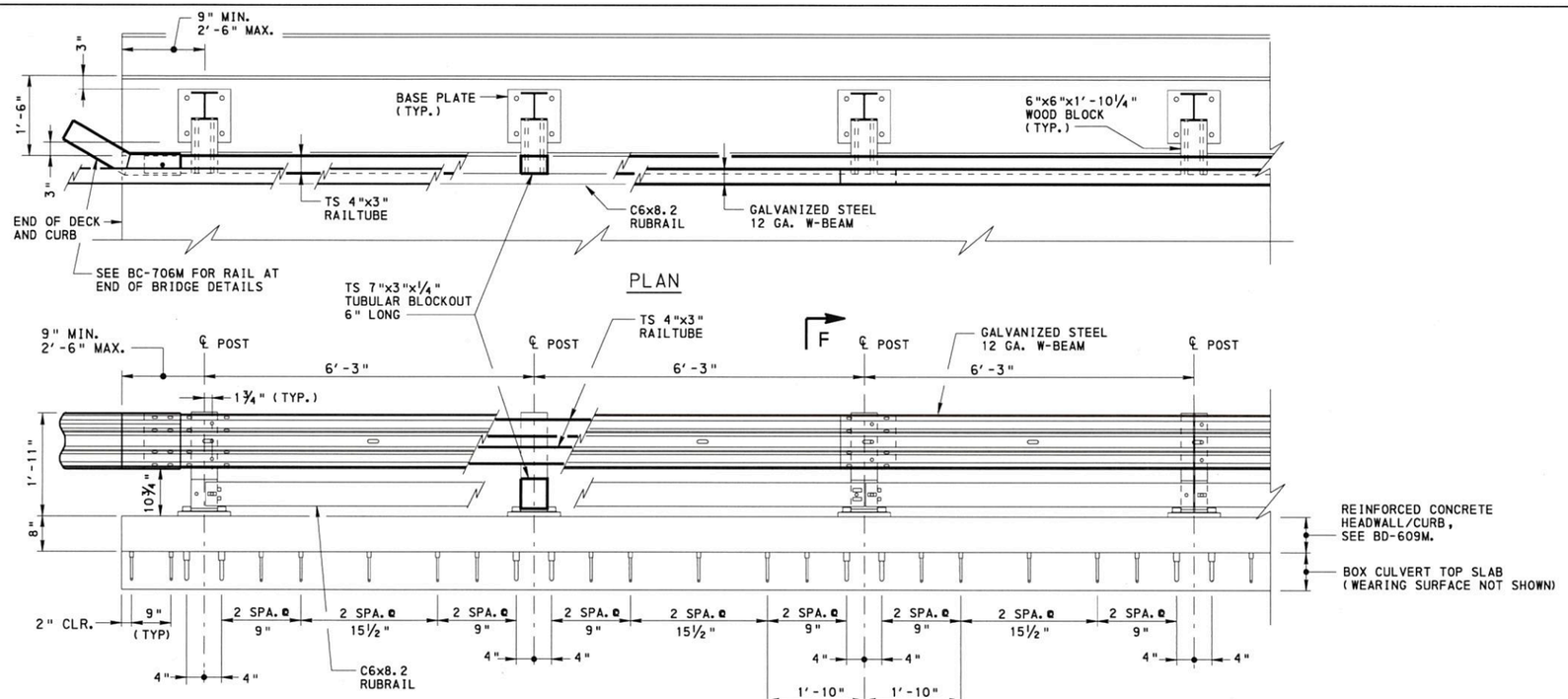


SECTION E-E

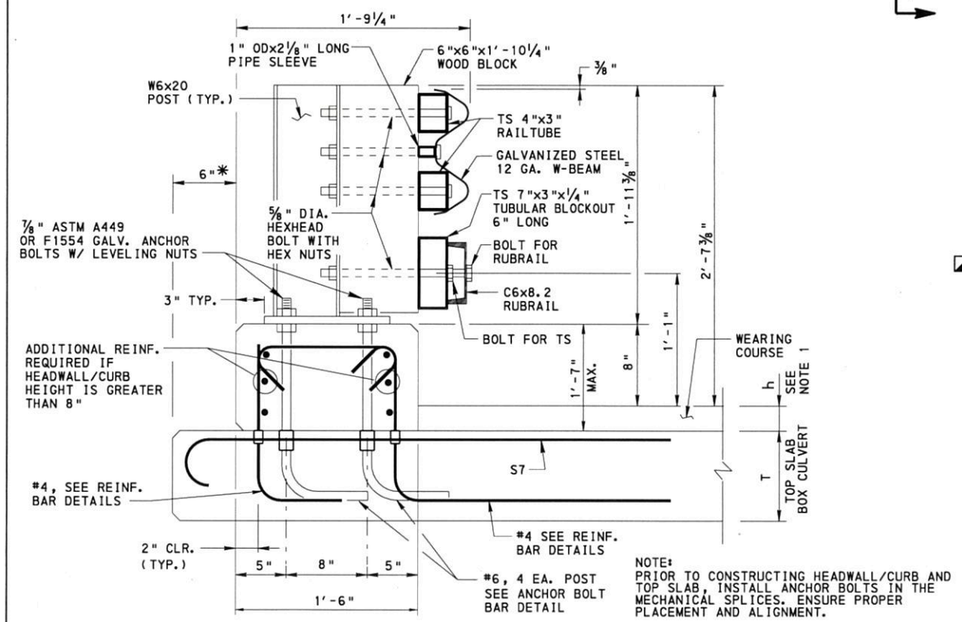
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT
PRECAST
POST-TENSIONED END SECTIONS

RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 7 OF 13
Thomas P. Macioce CHIEF BRIDGE ENGINEER	ACTING DIR. BUR. OF PROJECT DELIVERY	BD-632M



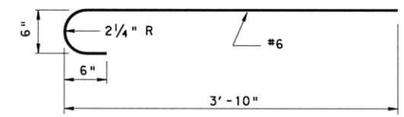
PA STRUCTURE MOUNTED GUIDE RAIL
ELEVATION ALONG TOP SLAB OF CULVERT



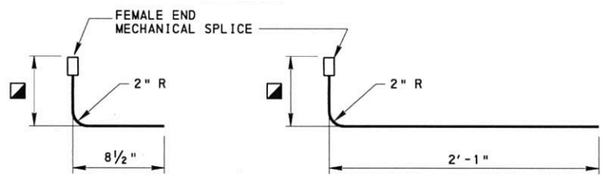
NOTE:
PRIOR TO CONSTRUCTING HEADWALL/CURB AND TOP SLAB, INSTALL ANCHOR BOLTS IN THE MECHANICAL SPLICES. ENSURE PROPER PLACEMENT AND ALIGNMENT.

SECTION F-F
(SLAB BRIDGES & LIKE STRUCTURES)

- CURB REINFORCEMENT SHOWN FOR CLARITY, SEE BD-609M.
- SEE RC-52M FOR TYPE 2 STRONG POST GUIDE RAIL DETAILS
- S7 REINFORCEMENT REQUIRED AT POST LOCATIONS ONLY. SEE SLAB REINFORCEMENT BAR DETAILS THIS SHEET.

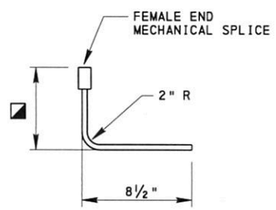


S7 BAR



VERTICAL REINFORCEMENT
ALL VERTICAL REINFORCEMENT #4

SLAB REINFORCEMENT BAR DETAILS
MECHANICAL SPLICE AS PER BULLETIN 15



ANCHOR BOLT BAR DETAIL
MECHANICAL SPLICE AS PER BULLETIN 15

LEGEND

◪ FOR T < 11": T-3"
FOR T ≥ 11": 8" MIN.
(T=TOP SLAB THICKNESS OF BOX CULVERT)

* REDUCED EDGE DISTANCE PERMITTED IF ADEQUATE CONCRETE PLACEMENT CAN STILL BE OBTAINED WITH PRESENCE OF BOTH BOX TOP SLAB AND CURB REINFORCEMENT.

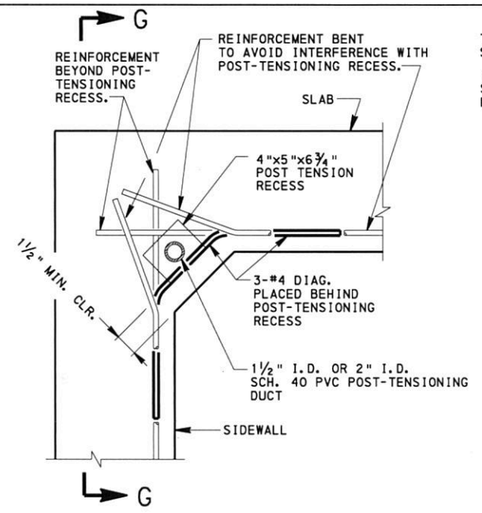
NOTE:

1. 2½" MIN., 11" MAX. TOTAL WEARING COURSE THICKNESS (h) (COMBINATION OF FILL OR 5" MIN. REINF. CONC. DECK AND OVERLAY)

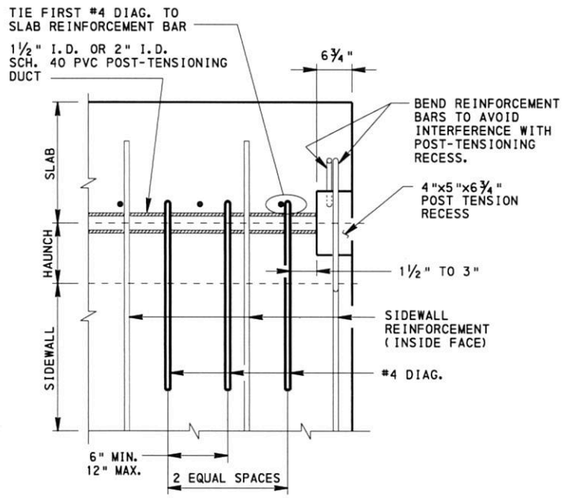
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT
HEADWALL DETAILS
PRECAST

RECOMMENDED NOV. 26, 2013 Thomas P. Macioce CHIEF BRIDGE ENGINEER	RECOMMENDED NOV. 26, 2013 ACTING DIR. BUR. OF PROJECT DELIVERY	SHEET 8 OF 13
		BD-632M

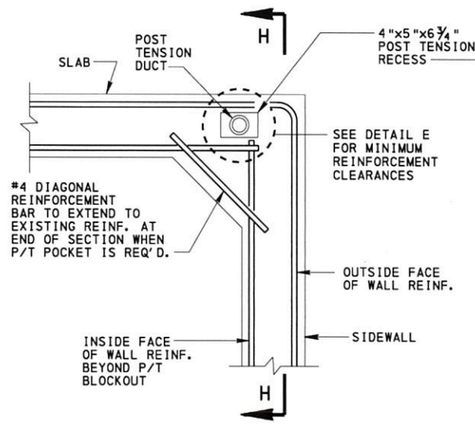


ELEVATION

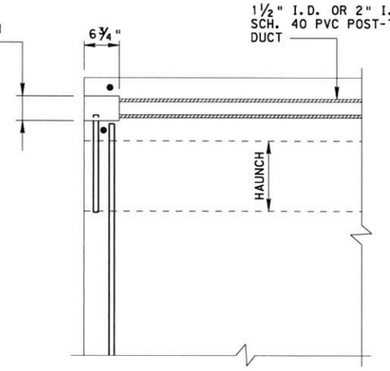


SECTION G-G

ALTERNATE HAUNCH SECTION DETAIL

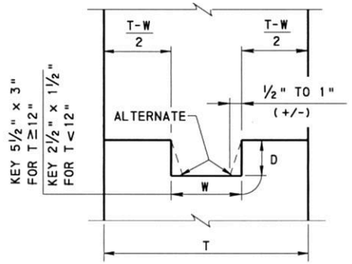


ELEVATION

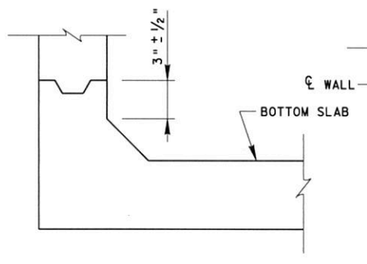


SECTION H-H

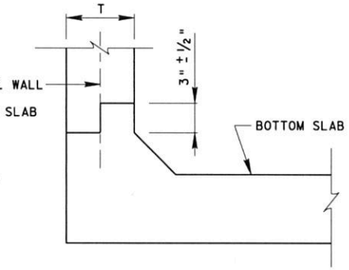
TYPICAL HAUNCH SECTION DETAIL



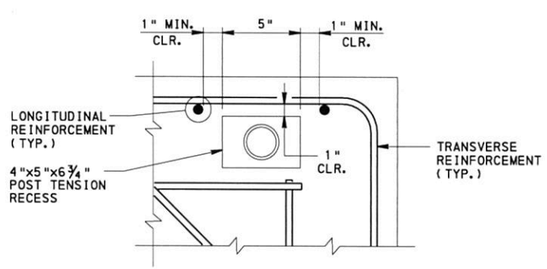
CONSTRUCTION JOINT DETAIL



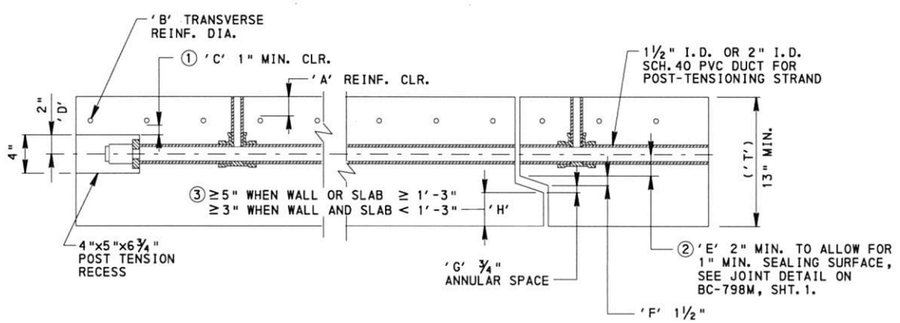
KEYED CONSTRUCTION JOINT



ALTERNATE SHIP-LAP CONSTRUCTION JOINT



DETAIL E



CONFIGURATION FOR SLAB/WALL WITH POST-TENSIONING

MIN. SLAB/WALL THICKNESS ('T') DETERMINED TO ENSURE THE MIN. REQUIREMENTS ①②&③ ARE MET.

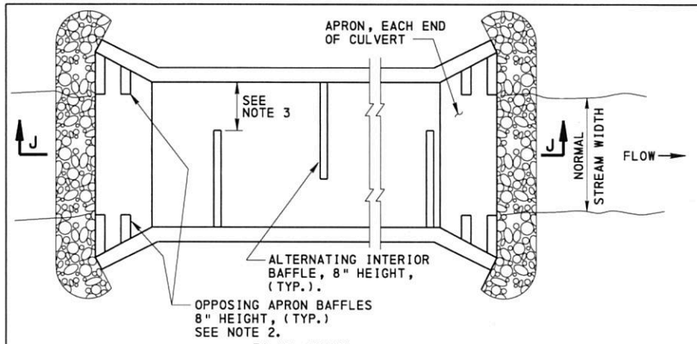
MIN. SLAB/WALL THICKNESS:
T = A + B + C + D + E + F + G + H

NOTE: PLACE POST-TENSIONING DUCTS ONLY IN CORNER HAUNCHES WHEN WALL THICKNESSES ARE <13".

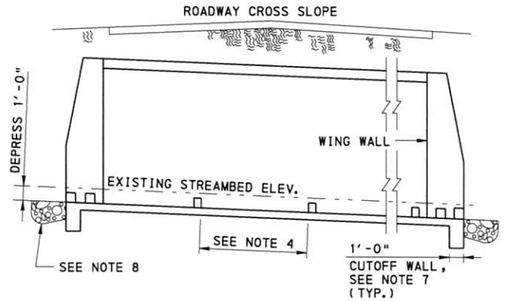
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT
MISCELLANEOUS DETAILS
PRECAST

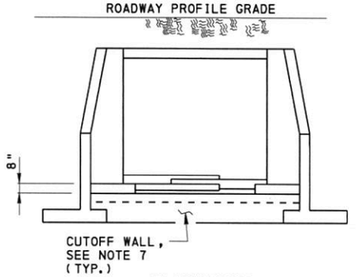
RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 9 OF 13
Thomas P. Macioce, CHIEF BRIDGE ENGINEER	ACTING DIR., BUR. OF PROJECT DELIVERY	BD-632M



PLAN VIEW



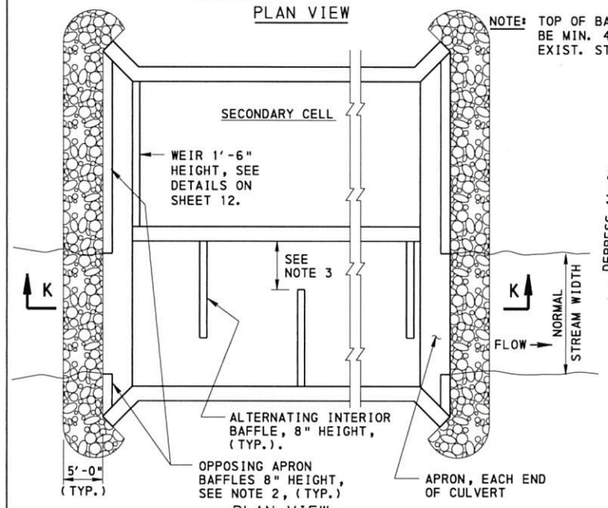
SECTION J-J



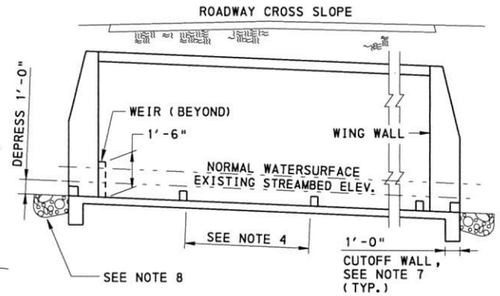
ELEVATION

BOX CULVERTS

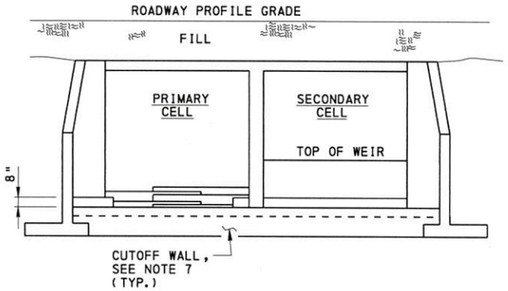
NOTE: TOP OF BAFFLE SHALL BE MIN. 4" BELOW EXIST. STREAMBED ELEV.



PLAN VIEW

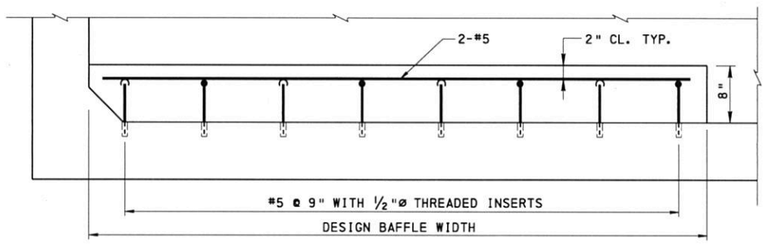


SECTION K-K

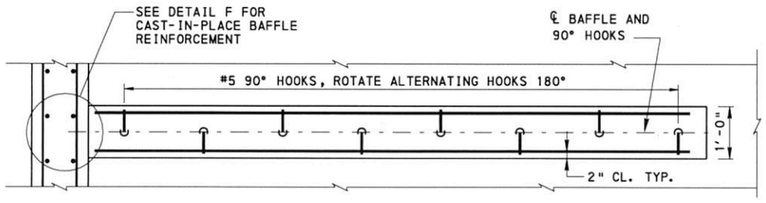


ELEVATION

TWIN CELL BOX CULVERTS



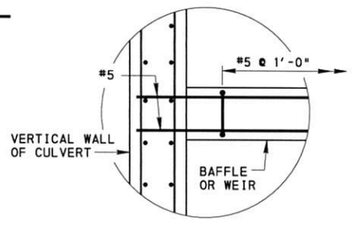
PROFILE



PLAN

TYPICAL BAFFLE

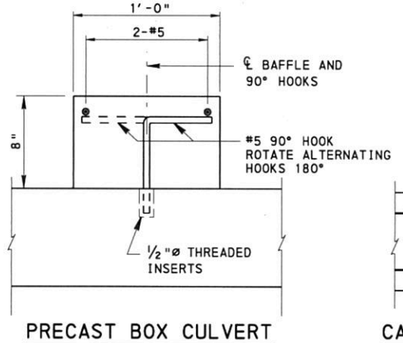
PRECAST REINFORCEMENT SHOWN, CAST-IN-PLACE REINFORCEMENT SIMILAR EXCEPT AS NOTED ON THIS STANDARD.



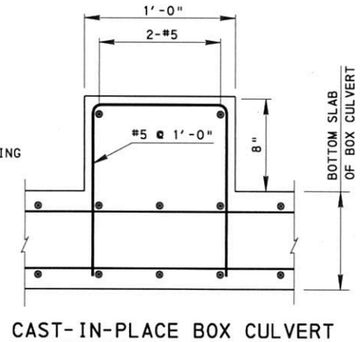
PLAN

DETAIL F

CAST-IN-PLACE BAFFLE/WEIR REINFORCEMENT



PRECAST BOX CULVERT
TYPICAL BAFFLE DETAIL



CAST-IN-PLACE BOX CULVERT
ALTERNATE BAFFLE DETAIL

DESIGN NOTES:

1. THE BAFFLE SPACING AND OPENINGS SHOULD BE BASED ON THE NORMAL CHANNEL WIDTH UPSTREAM AND DOWNSTREAM OF THE STRUCTURE (I.E. EDGE OF WATER TO EDGE OF WATER DURING NORMAL FLOW). AT LEAST THREE (3) MEASUREMENTS SHOULD BE TAKEN UPSTREAM AND DOWNSTREAM OF THE STRUCTURE WHERE THE STREAM EXHIBITS NORMAL, STABLE CONDITIONS. AN AVERAGE OF THOSE SIX (6) MEASUREMENTS SHOULD THEN BE USED FOR THE BAFFLE CONFIGURATIONS.
   - MEASUREMENTS SHOULD NOT BE TAKEN WHERE THE CHANNEL HAS BEEN AFFECTED BY THE STRUCTURE OR SHOW SIGNS OF EROSION. BAFFLE CONFIGUATIONS SHOULD BE BASED ON NORMAL STREAM WIDTH (NOT TOP OF BANK TO TOP OF BANK OR WIDTH OF THE CULVERT).
2. THE OPENING IN THE APRON BAFFLES SHOULD BE EQUAL TO AVERAGE NORMAL WIDTH OF THE STREAM. THE APRON BAFFLES SHOULD CONNECT TO THE WINGWALLS AT EACH SIDE OF THE CULVERT. PLACE THE FIRST SET OF BAFFLES AT THE END OF THE APRON. IF THE APRON IS GREATER THAN 8'-0" LONG, A SECOND SET OF OPPOSING BAFFLES ARE REQUIRED TO BE SET AT ½ THE DISTANCE FROM THE END BAFFLE TO THE FACE OF THE BOX. FOR LONGER APRONS, BAFFLES NOT TO EXCEED 8'-0" SPACING.
3. THE OPENING IN THE INTERIOR BAFFLES SHOULD BE EQUAL TO 1/3 THE AVERAGE NORMAL WIDTH OF THE STREAM.
4. BAFFLES SHOULD BE SPACED AT THE AVERAGE NORMAL STREAM WIDTH OR 8', WHICHEVER IS GREATER. THE FIRST INTERIOR BAFFLE AT THE OUTLET SHOULD BE LOCATED AS CLOSE TO THE DOWNSTREAM END OF CULVERT AS POSSIBLE AND SPACED ACCORDINGLY FROM THAT POINT TO THE INLET.
5. IF BAFFLE SPACING NEEDS ADJUSTED DUE TO BOX SEGMENTS, THE SPACING SHOULD BE SHORTER NOT LONGER THAN CALCULATED SPACING.
6. THERE MAY BE UNUSUAL CIRCUMSTANCES IN WHICH THE STANDARD LAYOUT FOR BAFFLES WILL NOT ADEQUATELY ACCOMMODATE FISH PASSAGE. IN THESE CASES, THE PENNSYLVANIA FISH AND BOAT COMMISSION MUST PROVIDE SPECIFIC DESIGN GUIDANCE DURING PRELIMINARY DESIGN.
7. CUTOFF WALL IS TO ENSURE STREAMFLOW DOES NOT PASS BENEATH THE CULVERT. BOTTOM OF CUTOFF WALL IS TO EQUAL WING WALL FOOTINGS OR ROCK LINING WHICHEVER IS DEEPER 3'-6" MIN.
8. ROCK LINING AT THE INLET AND OUTLET SHOULD BE DEPRESSED THE ENTIRE LENGTH AND CHOKED WITH NATURAL STREAMBED MATERIAL. THE ROCK SHOULD BE FLUSH WITH THE CULVERT BOTTOM, NOT THE TOP OF THE BAFFLES. STREAMBED MATERIAL SALVAGED FROM EXCAVATION FOR THE BOX CULVERT SHOULD BE PLACED ON TOP OF THE ROCK LINING AND APRON TO THE MAXIMUM HEIGHT OF THE TOP OF THE BAFFLE TO THE LIMIT OF THE ROCK LINING TO FACILITATE THE DEVELOPEMENT OF A NATURAL STREAM BOTTOM IF FEASIBLE.
9. THE SLOPE OF THE NEW STRUCTURE SHOULD MATCH THE NATURAL STREAM SLOPE.
10. ADDITIONAL TWIN CELL DETAILS ARE SHOWN ON SHEET 12.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

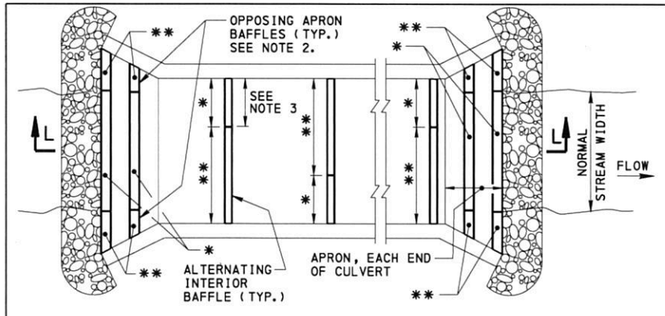
STANDARD
R.C. BOX CULVERT
MISCELLANEOUS DETAILS
STREAM GRADES ≤ 4%

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

RECOMMENDED NOV. 26, 2013
ACTING DIR. BUR. OF PROJECT DELIVERY

SHEET 10 OF 13

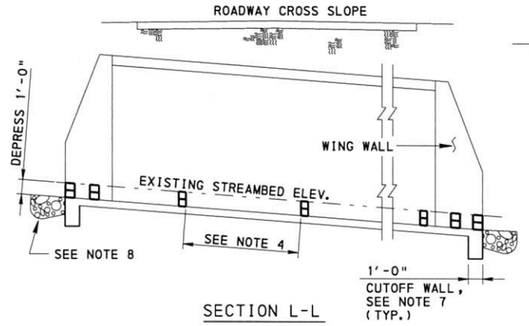
BD-632M



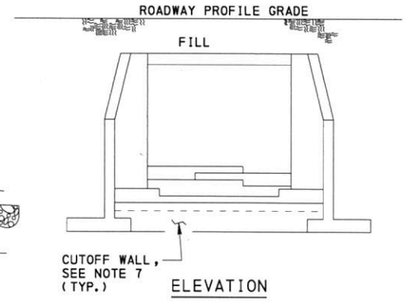
PLAN VIEW

* = 6" BAFFLE HEIGHT AT OPENING

** = 1'-0" BAFFLE HEIGHT

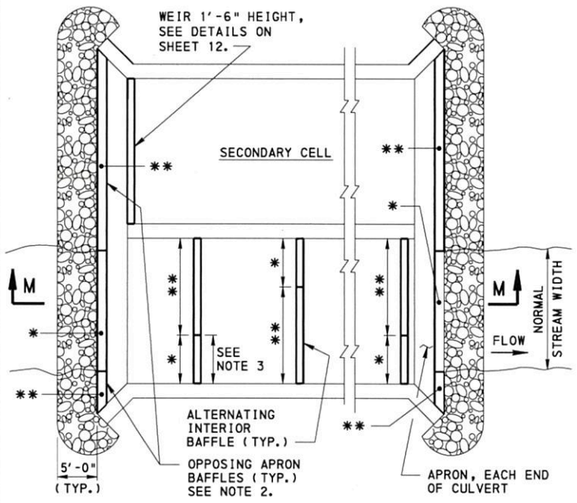


SECTION L-L

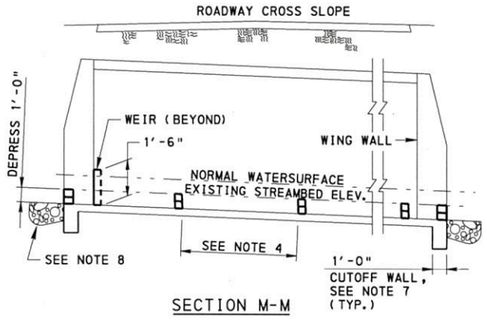


ELEVATION

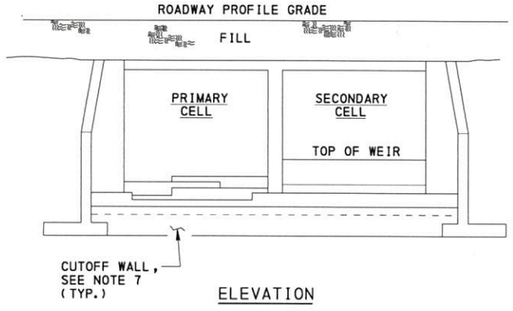
BOX CULVERTS



PLAN VIEW

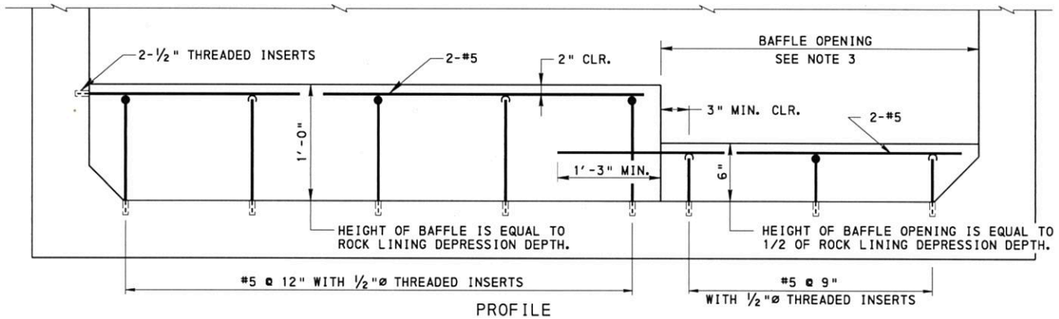


SECTION M-M

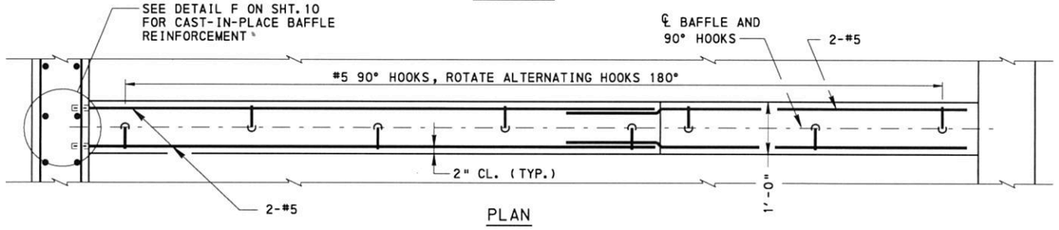


ELEVATION

TWIN CELL BOX CULVERTS



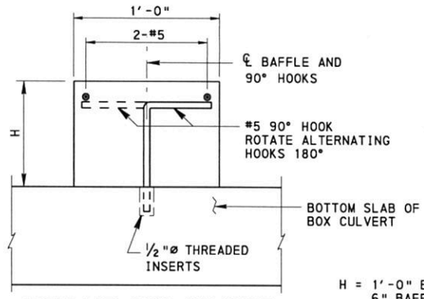
PROFILE



PLAN

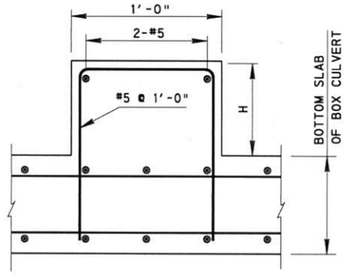
TYPICAL INTERIOR BAFFLE

PRECAST REINFORCEMENT SHOWN, CAST-IN-PLACE REINFORCEMENT SIMILAR EXCEPT AS NOTED ON THIS STANDARD.



PRECAST BOX CULVERT
TYPICAL BAFFLE DETAIL

H = 1'-0" BAFFLE HEIGHT
6" BAFFLE HEIGHT AT OPENING



CAST-IN-PLACE BOX CULVERT
ALTERNATE BAFFLE DETAIL

DESIGN NOTES:

1. THE BAFFLE SPACING AND OPENINGS SHOULD BE BASED ON THE NORMAL CHANNEL WIDTH UPSTREAM AND DOWNSTREAM OF THE STRUCTURE (I.E. EDGE OF WATER TO EDGE OF WATER DURING NORMAL FLOW). AT LEAST THREE (3) MEASUREMENTS SHOULD BE TAKEN UPSTREAM AND DOWNSTREAM OF THE STRUCTURE WHERE THE STREAM EXHIBITS NORMAL, STABLE CONDITIONS. AN AVERAGE OF THOSE SIX (6) MEASUREMENTS SHOULD THEN BE USED FOR THE BAFFLE CONFIGURATIONS.
   - MEASUREMENTS SHOULD NOT BE TAKEN WHERE THE CHANNEL HAS BEEN AFFECTED BY THE STRUCTURE OR SHOW SIGNS OF EROSION. BAFFLE CONFIGUATIONS SHOULD BE BASED ON NORMAL STREAM WIDTH (NOT TOP OF BANK TO TOP OF BANK OR WIDTH OF THE CULVERT).
2. THE OPENING IN THE APRON BAFFLES SHOULD BE EQUAL TO AVERAGE NORMAL WIDTH OF THE STREAM. THE APRON BAFFLES SHOULD CONNECT TO THE WINGWALLS AT EACH SIDE OF THE CULVERT. PLACE THE FIRST SET OF BAFFLES AT THE END OF THE APRON. IF THE APRON IS GREATER THAN 8'-0" LONG, A SECOND SET OF OPPOSING BAFFLES ARE REQUIRED TO BE SET AT ½ THE DISTANCE FROM THE END BAFFLE TO THE FACE OF THE BOX. FOR LONGER APRONS, BAFFLES NOT TO EXCEED 8'-0" SPACING.
3. THE OPENING IN THE INTERIOR BAFFLES SHOULD BE EQUAL TO 1/3 THE AVERAGE NORMAL WIDTH OF THE STREAM.
4. BAFFLES SHOULD BE SPACED AT THE AVERAGE NORMAL STREAM WIDTH OR 8', WHICHEVER IS GREATER. THE FIRST INTERIOR BAFFLE AT THE OUTLET SHOULD BE LOCATED AS CLOSE TO THE DOWNSTREAM END OF CULVERT AS POSSIBLE AND SPACED ACCORDINGLY FROM THAT POINT TO THE INLET.
5. IF BAFFLE SPACING NEEDS ADJUSTED DUE TO BOX SEGMENTS, THE SPACING SHOULD BE SHORTER NOT LONGER THAN CALCULATED SPACING.
6. THERE MAY BE UNUSUAL CIRCUMSTANCES IN WHICH THE STANDARD LAYOUT FOR BAFFLES WILL NOT ADEQUATELY ACCOMMODATE FISH PASSAGE. IN THESE CASES, THE PENNSYLVANIA FISH AND BOAT COMMISSION MUST PROVIDE SPECIFIC DESIGN GUIDANCE DURING PRELIMINARY DESIGN.
7. CUTOFF WALL IS TO ENSURE STREAMFLOW DOES NOT PASS BENEATH THE CULVERT. BOTTOM OF CUTOFF WALL IS TO EQUAL WING WALL FOOTINGS OR ROCK LINING WHICHEVER IS DEEPER 3'-6" MIN.
8. ROCK LINING AT THE INLET AND OUTLET SHOULD BE DEPRESSED THE ENTIRE LENGTH AND CHOKED WITH NATURAL STREAMBED MATERIAL. THE ROCK SHOULD BE FLUSH WITH THE CULVERT BOTTOM, NOT THE TOP OF THE BAFFLES. STREAMBED MATERIAL SALVAGED FROM EXCAVATION FOR THE BOX CULVERT SHOULD BE PLACED ON TOP OF THE ROCK LINING AND APRON TO THE MAXIMUM HEIGHT OF THE TOP OF THE BAFFLE TO THE LIMIT OF THE ROCK LINING TO FACILITATE THE DEVELOPEMENT OF A NATURAL STREAM BOTTOM IF FEASIBLE.
9. THE SLOPE OF THE NEW STRUCTURE SHOULD MATCH THE NATURAL STREAM SLOPE.
10. ADDITIONAL TWIN CELL DETAILS ARE SHOWN ON SHEET 12.

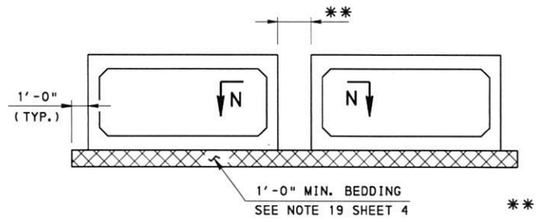
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT
MISCELLANEOUS DETAILS
STREAM GRADES > 4%

RECOMMENDED NOV. 26, 2013
Thomas P. Macioce
CHIEF BRIDGE ENGINEER

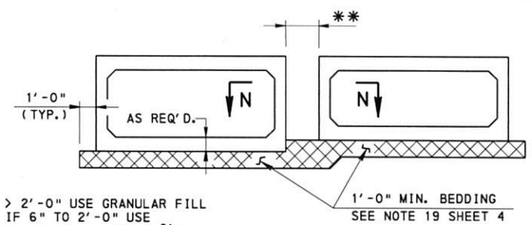
RECOMMENDED NOV. 26, 2013
ACTING DIR. BUR. OF PROJECT DELIVERY

SHEET 11 OF 13
BD-632M



TYP. PRECAST SECTION (NORMAL)

SYMMETRICAL

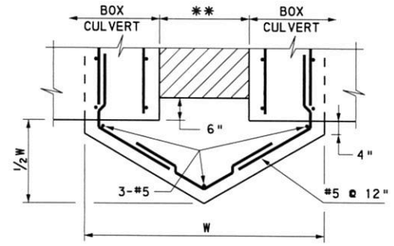


** IF > 2'-0" USE GRANULAR FILL
OR IF 6" TO 2'-0" USE
CLASS A CONCRETE WITH 3/8"
NOMINAL MAX. SIZE AGGREGATE.

NOTE:
DO NOT PLACE R.C. BOX CULVERTS
< 6" APART.

TYP. PRECAST SECTION (NORMAL)

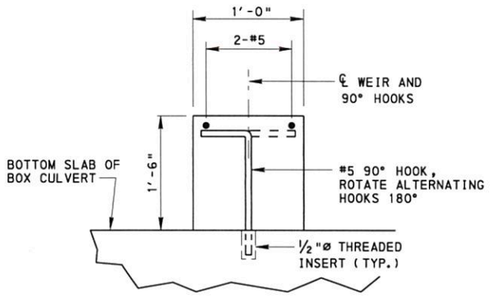
UNSYMMETRICAL - OPTION TO WEIR



NOTE: THREADED INSERTS MAY
BE USED AS AN ALTERNATE TO
BAR LAPS FOR #5 REINFORCEMENT.

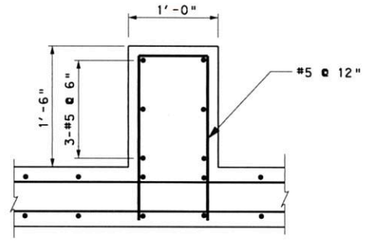
SECTION N-N

CONCRETE PLUG



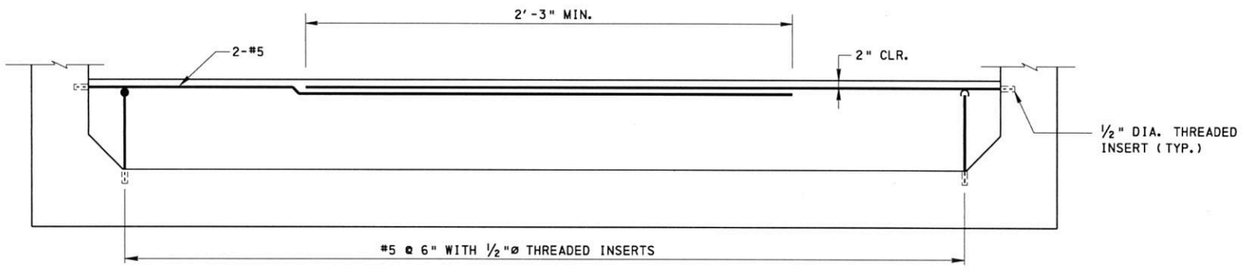
PRECAST BOX CULVERT
TYPICAL WEIR DETAIL

ALL STREAM GRADES

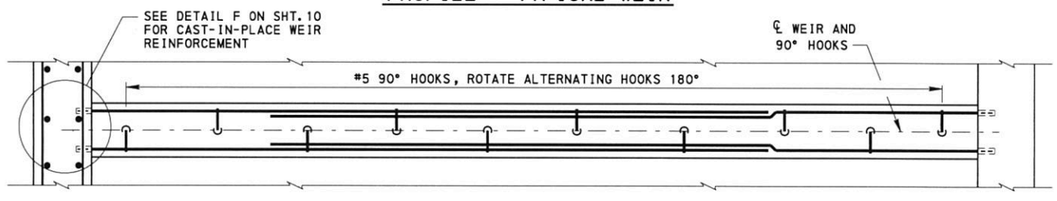


CAST-IN-PLACE BOX CULVERT
ALTERNATE WEIR DETAIL

ALL STREAM GRADES



PROFILE - TYPICAL WEIR



PLAN - TYPICAL WEIR

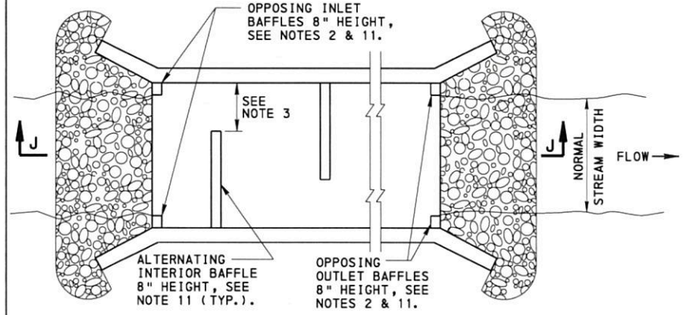
PRECAST REINFORCEMENT SHOWN, CAST-IN-PLACE REINFORCEMENT
SIMILAR EXCEPT AS NOTED ON THIS STANDARD.

DESIGN NOTE:
THERE MAY BE UNUSUAL CIRCUMSTANCES IN WHICH THE STANDARD LAYOUT FOR BAFFLES WILL NOT ADEQUATELY ACCOMMODATE FISH PASSAGE. IN THESE CASES, THE PENNSYLVANIA FISH AND BOAT COMMISSION MUST PROVIDE SPECIFIC DESIGN GUIDANCE DURING PRELIMINARY DESIGN.

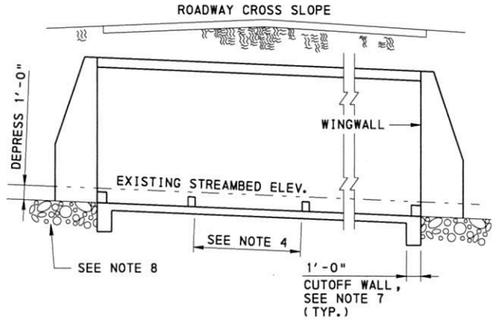
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT
MISCELLANEOUS TWIN CELL DETAILS

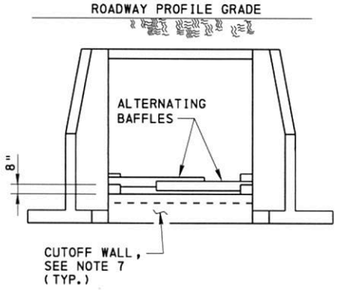
RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 12 OF 13
Thomas P. Macieca		
CHIEF BRIDGE ENGINEER	ACTING DIR. BUR. OF PROJECT DELIVERY	BD-632M



PLAN VIEW



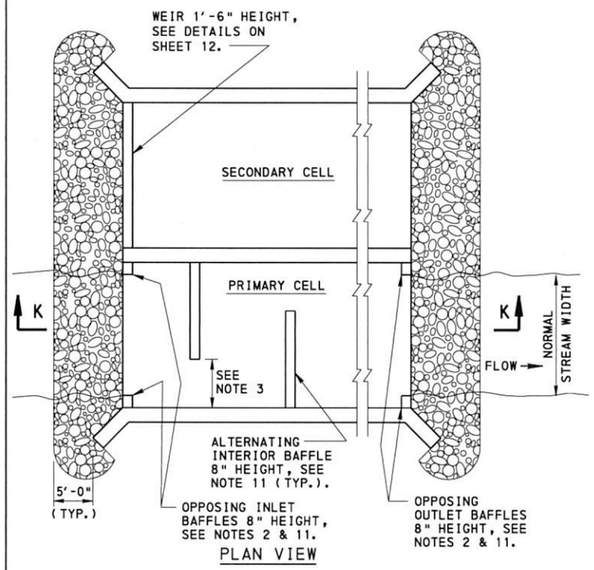
SECTION J-J



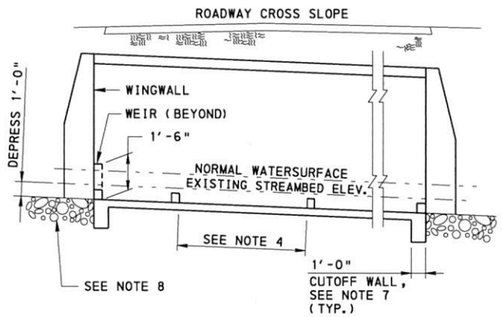
ELEVATION

NOTE: TOP OF BAFFLE SHALL BE MIN. 4" BELOW EXIST. STREAMBED ELEV.

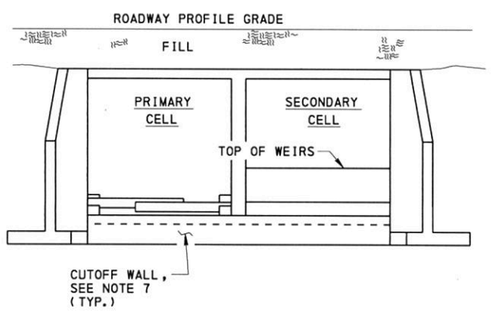
BOX CULVERTS



PLAN VIEW

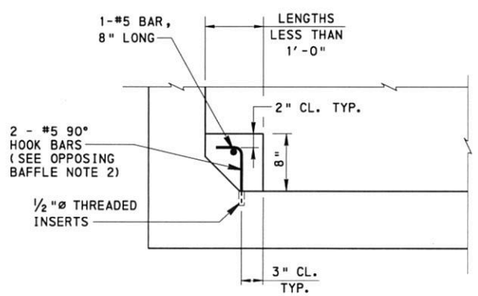


SECTION K-K



ELEVATION

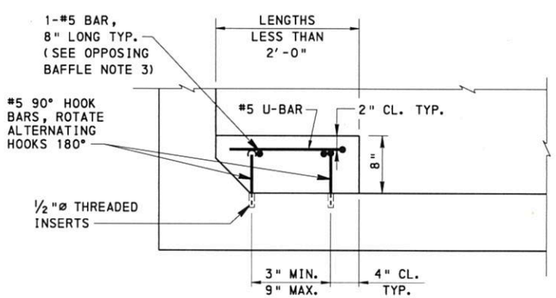
TWIN CELL BOX CULVERTS



OPPOSING BAFFLES LESS THAN 1'-0"

OPPOSING BAFFLE NOTES:

1. PRECAST REINFORCEMENT SHOWN, CAST-IN-PLACE REINFORCEMENT SIMILAR EXCEPT AS NOTED ON SHEET 10.
2. FOR OPPOSING BAFFLES LESS THAN 1'-0", CAST ADJACENT INSERTS 7" ON CENTER FOR THE 2 - #5 90° HOOK BARS.
3. FOR OPPOSING BAFFLES LESS THAN 2'-0", REPLACE 2-#5 BARS WITH A #5 U-BAR SUPPORTED BY 8" LONG #5 BARS TIED TO ALTERNATING #5 90° HOOK BARS.



OPPOSING BAFFLES LESS THAN 2'-0"

DESIGN NOTES:

1. THE BAFFLE SPACING AND OPENINGS SHOULD BE BASED ON THE NORMAL CHANNEL WIDTH UPSTREAM AND DOWNSTREAM OF THE STRUCTURE (I.E. EDGE OF WATER TO EDGE OF WATER DURING NORMAL FLOW). AT LEAST THREE (3) MEASUREMENTS SHOULD BE TAKEN UPSTREAM AND DOWNSTREAM OF THE STRUCTURE WHERE THE STREAM EXHIBITS NORMAL, STABLE CONDITIONS. AN AVERAGE OF THOSE SIX (6) MEASUREMENTS SHOULD THEN BE USED FOR THE BAFFLE CONFIGURATIONS.
   - MEASUREMENTS SHOULD NOT BE TAKEN WHERE THE CHANNEL HAS BEEN AFFECTED BY THE STRUCTURE OR SHOW SIGNS OF EROSION. BAFFLE CONFIGUATIONS SHOULD BE BASED ON NORMAL STREAM WIDTH (NOT TOP OF BANK TO TOP OF BANK OR WIDTH OF THE CULVERT).
2. OPPOSING BAFFLES SHOULD BE PLACED AT THE INLET AND THE OUTLET ENDS OF THE CULVERT. THE BAFFLE OPENING SHOULD BE A DISTANCE EQUAL TO THE AVERAGE NORMAL WIDTH OF THE STREAM.
3. THE OPENING IN THE INTERIOR BAFFLES SHOULD BE A DISTANCE EQUAL TO 1/3 THE AVERAGE NORMAL WIDTH OF THE STREAM.
4. INTERIOR BAFFLES SHOULD BE SPACED AT A DISTANCE EQUAL TO THE AVERAGE NORMAL STREAM WIDTH OR 8', WHICHEVER IS GREATER AND BE SPACED EVENLY BETWEEN THE INLET AND OUTLET BAFFLES.
5. IF BAFFLE SPACING NEEDS ADJUSTED DUE TO BOX SEGMENTS, THE SPACING SHOULD BE SHORTER NOT LONGER THAN CALCULATED SPACING.
6. THERE MAY BE UNUSUAL CIRCUMSTANCES IN WHICH THE STANDARD LAYOUT FOR BAFFLES WILL NOT ADEQUATELY ACCOMMODATE FISH PASSAGE. IN THESE CASES, THE PENNSYLVANIA FISH AND BOAT COMMISSION MUST PROVIDE SPECIFIC DESIGN GUIDANCE DURING PRELIMINARY DESIGN.
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8. ROCK LINING AT THE INLET AND OUTLET SHOULD BE DEPRESSED THE ENTIRE LENGTH AND CHOKED WITH NATURAL STREAMBED MATERIAL. THE ROCK SHOULD BE FLUSH WITH THE CULVERT BOTTOM, NOT THE TOP OF THE BAFFLES. STREAMBED MATERIAL SALVAGED FROM EXCAVATION FOR THE BOX CULVERT SHOULD BE PLACED ON TOP OF THE ROCK LINING TO THE MAXIMUM HEIGHT OF THE TOP OF THE BAFFLE TO THE LIMIT OF THE ROCK LINING TO FACILITATE THE DEVELOPEMENT OF A NATURAL STREAM BOTTOM IF FEASIBLE.
9. THE SLOPE OF THE NEW STRUCTURE SHOULD MATCH THE NATURAL STREAM SLOPE.
10. ADDITIONAL TWIN CELL DETAILS ARE SHOWN ON SHEET 12.
11. FOR TYPICAL BAFFLE PLAN, PROFILE AND REINFORCEMENT DETAILS, SEE SHEET 10.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
R.C. BOX CULVERT WITHOUT APRONS
MISCELLANEOUS DETAILS
STREAM GRADES ≤ 4%

RECOMMENDED NOV. 26, 2013	RECOMMENDED NOV. 26, 2013	SHEET 13 OF 13
Thomas P. Macieca CHIEF BRIDGE ENGINEER	ACTING DIR., BUR. OF PROJECT DELIVERY	BD-632M