Road & Bridge Design Publications

Monthly Update – November 2015

Revisions for the month of **November** are listed and displayed below. New special details will be included in projects submitted for the **February** letting as is stated on the special detail index sheets. E-mail questions related to the road changes to MDOT-Road-Design-Standards@michigan.gov. E-mail Bridge related questions to MDOT-Bridge-Design-Standards@michigan.gov.

Special Details

R-83-C: Utility Trenches: In the details, the term "undercut" was replaced with "Bedding, Granular Material Class IIIA". The bedding area was darkened and extended across the full width of the trench. Details A, B, C, & D were broken down into A1 & A2, B1 & B2, C1 & C2, & D1 & D2. In detail A1, the amount of Class III material was reduced, only being required from the top of bedding to the center of pipe. In detail A2, the label "Class III" was revised and broken down into "Class III (metal)" and "Class IIIA (plastic)". In details C & D, the ¼ circumference of pipe in 2" of undercut was replaced with 4" minimum of bedding. In the note section, the first three notes were eliminated since they were backfill specs which are in or will be added to the spec book. The note section was moved to sheet five. The reference to the "Current Standard Specification" in the notes, was revised to "Standard Specification".

Road Design Manual

7.01.70: Temporary Barrier Adjacent to a Precipitous Drop Off: Added a paragraph distinguishing the measuring of barrier offset from the toe of barrier on construction side versus toe on traffic side.

14.07: Project Numbers: Under "funding identity", the list of funding codes in Appendix C was eliminated in favor of a link which will provide an updated list of codes.

Bridge Design Manual

7.02.01 (LFD & LRFD): Added requirement to add Special Provision when complex steel erection is present on a project.

7.02.31 C. (LFD & LRFD): Added clarification for bridge rail offset (shoulder widths). Derived from A Policy on Geometric Design of Highways and Streets, 2004, published by AASHTO. The traveled way and roadway widths do not include clearances for MDOT offset criteria (generally 2').

Road & Bridge Design Publications

Monthly Update – November 2015

7.03.09 B.2. (LRFD only): Chart updated for Resistance Factor (φ_{dyn}) for Static Load Test to correspond to current AASHTO practice.

7.03.12 F.4. (LFD & LRFD): Updated concrete approach slab lengths to correspond to road Standard plan R-45-Series.

8.07.07 L. (LFD & LRFD): Updated note

Bridge Design Guides

6.06.05A: Updated note.

Updates to MDOT Cell Library, Bridge Auto Draw Program, etc., may be required in tandem with some of this month's updates. Until such updates to automated tools can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

Index to Special Details

11-23-2015

⑥

SPECIAL DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
21	2	GUARDRAIL AT INTERSECTIONS	5-24-01
24	5	GUARDRAIL ANCHORED IN BACK SLOPE TYPES 4B & 4T	7-22-02
99	2	CHAIN LINK FENCE WITH WIRE ROPE	9-22-14
R-1-G	9	DRAINAGE STRUCTURES	7-28-15
R-53-A	22	TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION	8-14-15
R-62-H	5	GUARDRAIL APPROACH TERMINAL TYPES 2B & 2T (SKT)	10-28-14
*R-83-C	5	UTILITY TRENCHES	9-4-15
R-126-I	5	PLACEMENT OF TEMPORARY CONCRETE & STEEL BARRIER	8-25-15

*** Denotes New or Revised Special Detail to be included in projects for (beginning with) the February letting.**

Note: Former Standard Plans IV-87, IV-89, IV-90, and IV-91 Series, used for building cast-in-place concrete head walls for elliptical and circular pipe culverts, are now being replaced with plans that detail each specific size. The Municipal Utilities Unit will provide these full sized special details for inclusion in construction plans for MDOT jobs. To assure prompt delivery, requests ***must*** be made in advance.

Former Standard Plans IV-93 and IV-94 series have been replaced with precast concrete box & three-sided culverts as per the 2012 Standard Specifications for Construction.

Index to Bridge Detail Sheets

11-23-2015

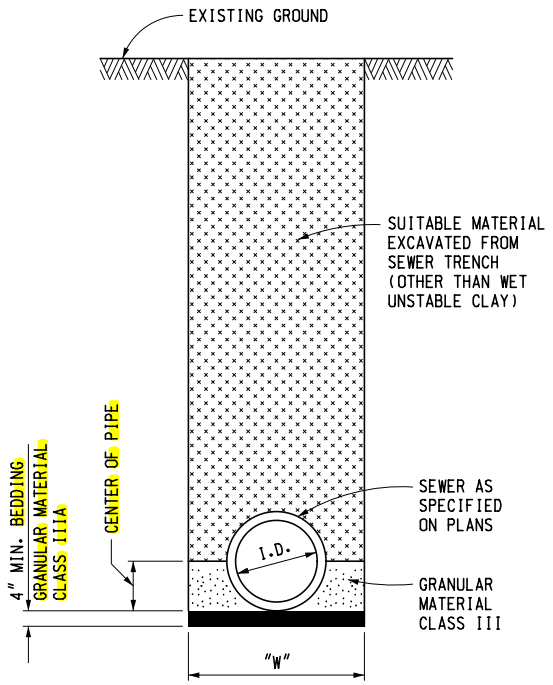
⑦

DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
EJ3AA	1 or 2	EXPANSION JOINT DETAILS	6-16-14
EJ4N	1 or 2	EXPANSION JOINT DETAILS	6-16-14
PC-2G	1	70" PRESTRESSED CONCRETE I-BEAM DETAILS	3-31-06
PC-4E	1	PRESTRESSED CONCRETE 1800 BEAM DETAILS	3-31-06
PC-1L	1	PRESTRESSED CONCRETE I-BEAM DETAILS	7-12-06

*** Denotes New or Revised Special Detail to be included in projects for (beginning with) the February letting.**

Note: Details EJ3AA & EJ4N are interactive, i.e. designers and detailers choose details based upon railing type and angle of crossing. Place all details appropriate for the project, structure specific information, and the Expansion Joint Device quantity on the sheet. The sheet shall then be added to the plans as a normal plan sheet.

Detail PC-1L, PC-2G and PC-4E shall have structure specific information and quantities added to the sheet. The sheet shall then be added to the plans as a normal plan sheet.

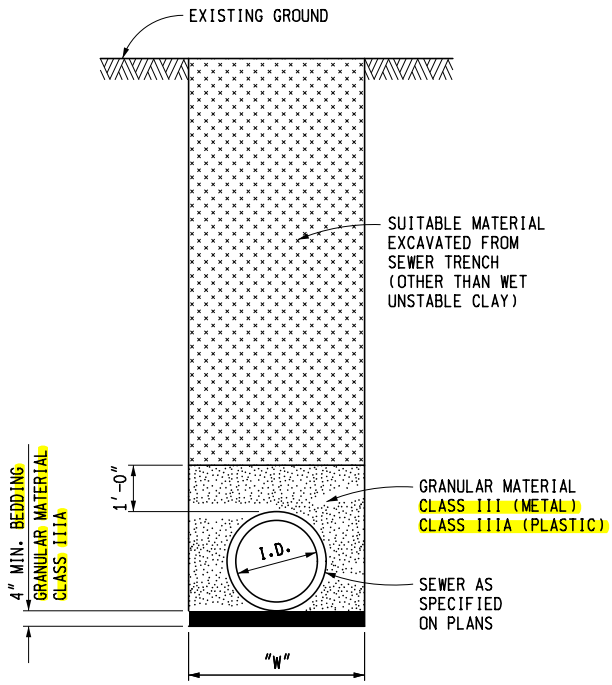


SEWER NOT UNDER ROADBED

CONCRETE

NOTE: FOR "W" SEE NOTES ON SHEET 5

A1

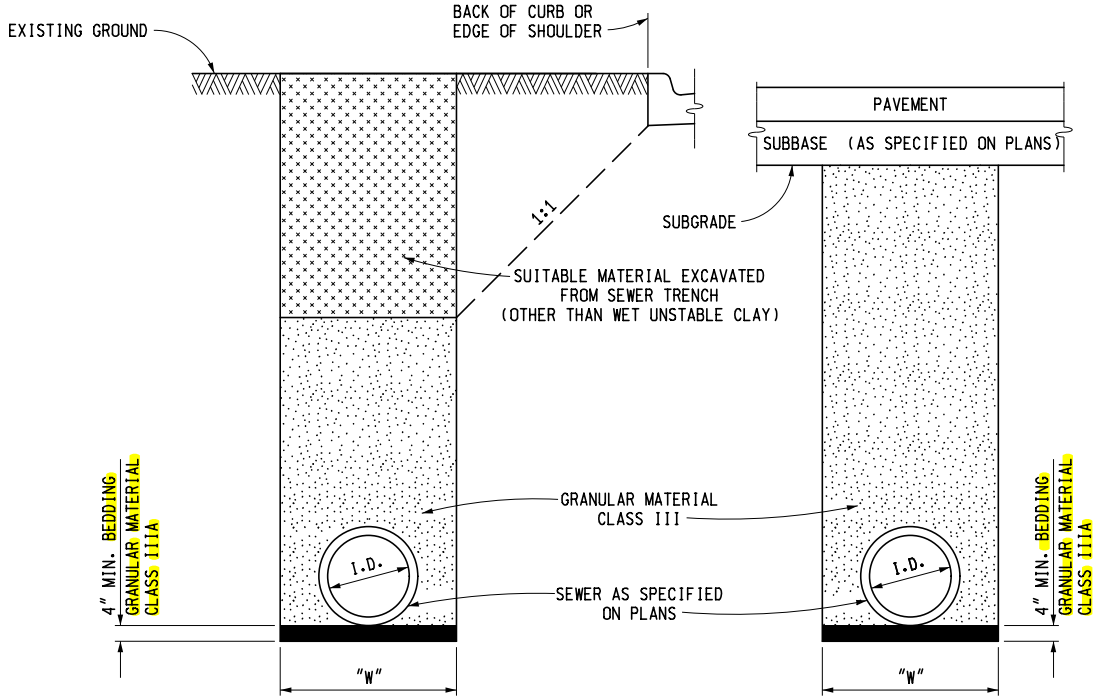


SEWER NOT UNDER ROADBED

METAL & PLASTIC

NOTE: FOR "W" SEE NOTES ON SHEET 5

A2



SEWER UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED

CONCRETE & METAL PIPE

B1

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

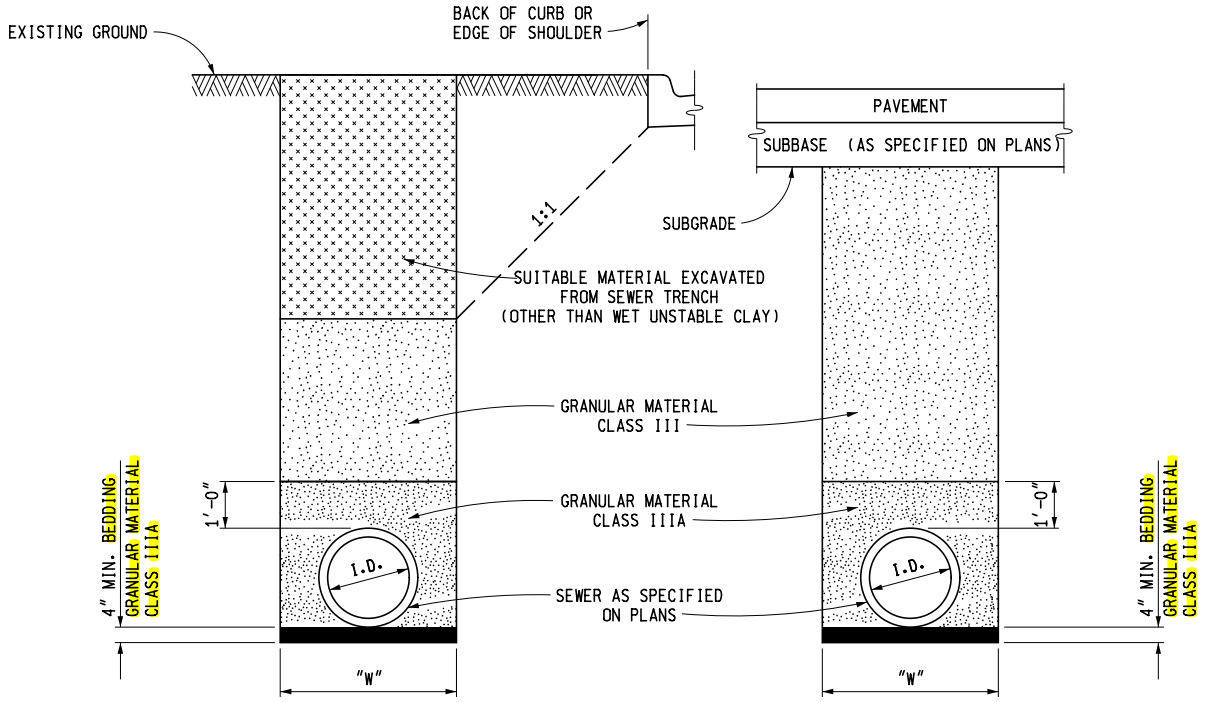
APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

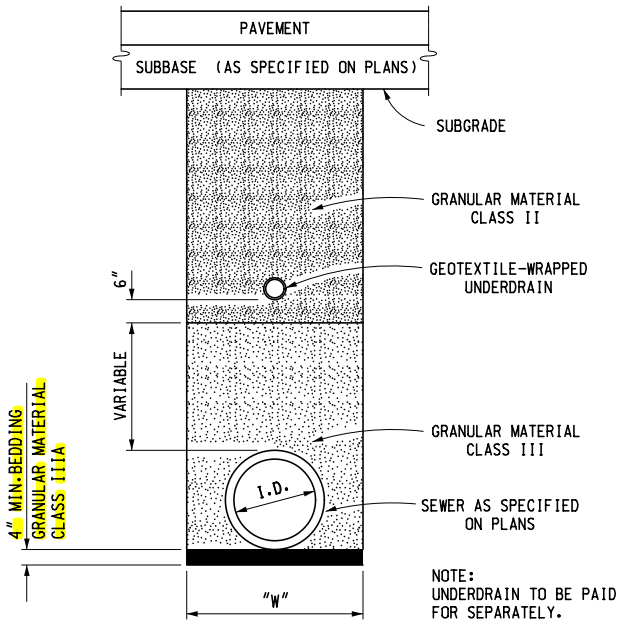
F.H.W.A. APPROVAL	9-4-2015 PLAN DATE	R-83-C	SHEET 1 OF 5



SEWER UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED

PLASTIC PIPE

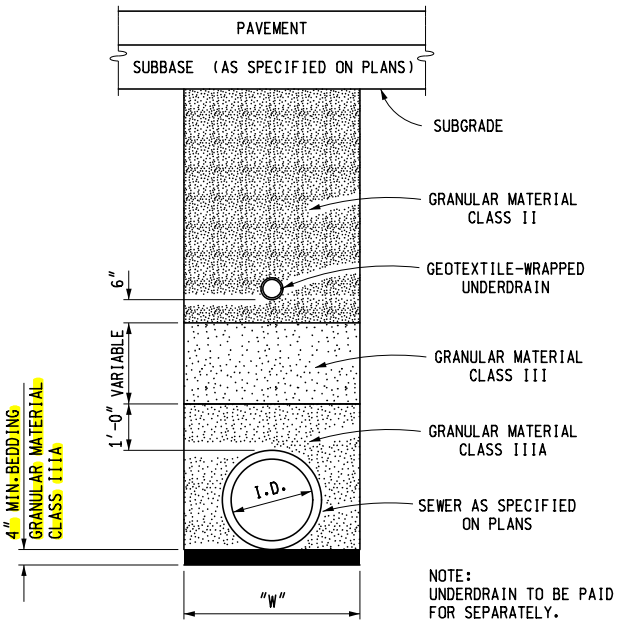
B2



SEWER WITH UNDERDRAIN UNDER ROADBED

CONCRETE & METAL PIPE

C1



SEWER WITH UNDERDRAIN UNDER ROADBED

PLASTIC PIPE

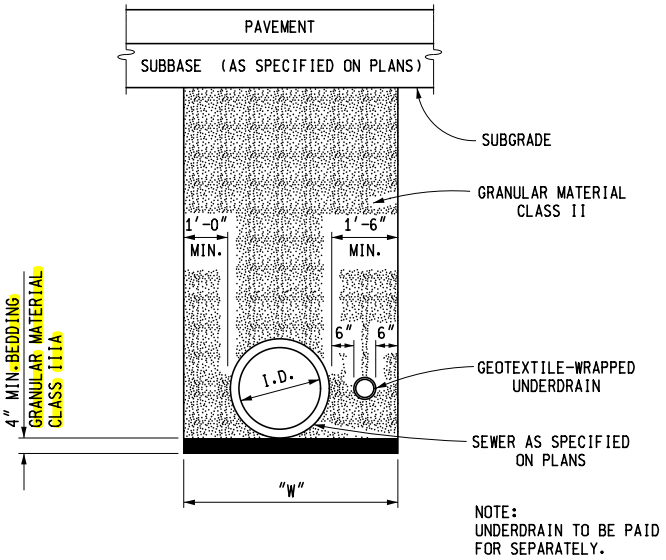
C2

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

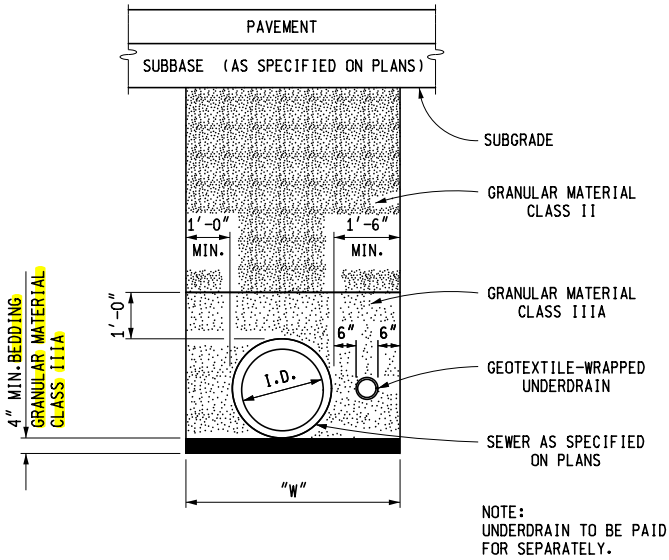
F.H.W.A. APPROVAL	9-4-2015 PLAN DATE	R-83-C	SHEET 2 OF 5



SEWER WITH UNDERDRAIN UNDER ROADBED

CONCRETE & METAL PIPE
(FOR SHALLOW SEWERS)

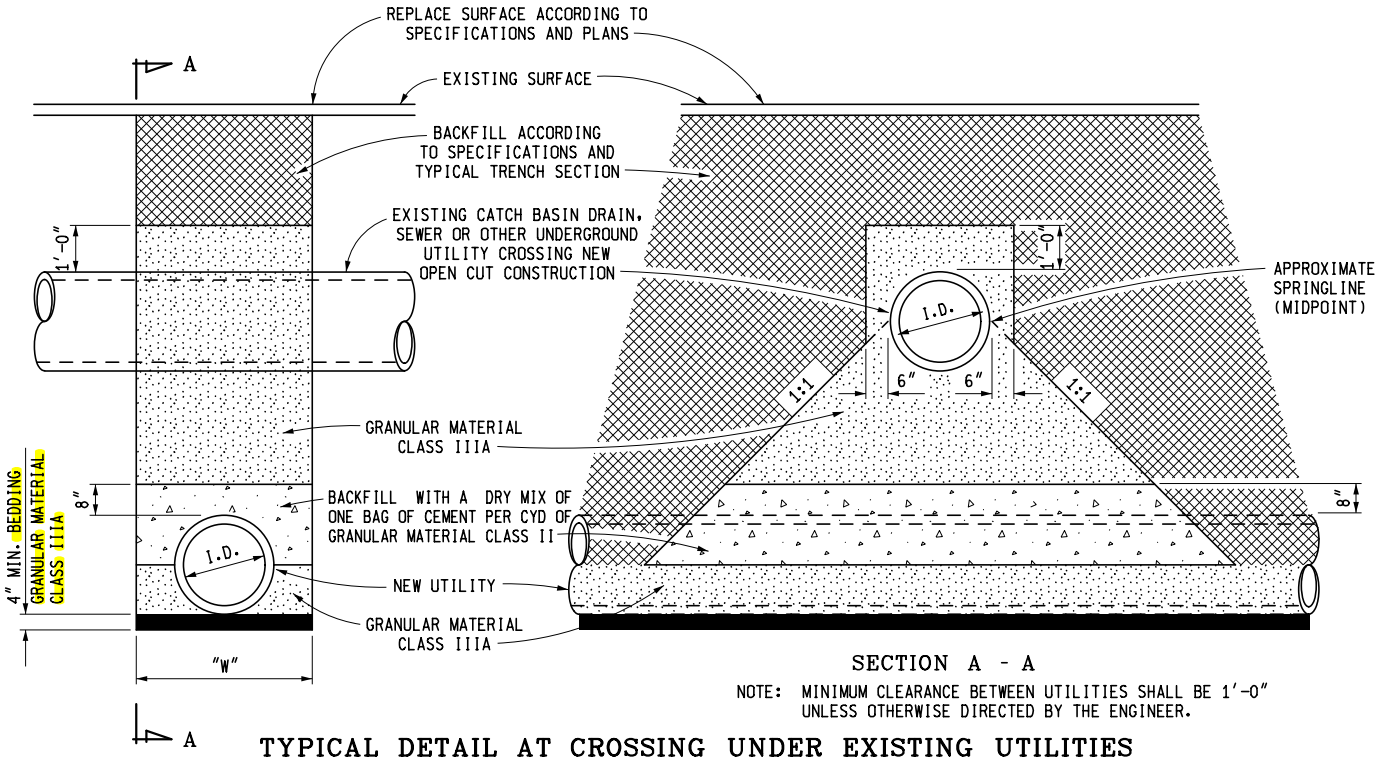
D1



SEWER WITH UNDERDRAIN UNDER ROADBED

PLASTIC PIPE
(FOR SHALLOW SEWERS)

D2



SECTION A - A

NOTE: MINIMUM CLEARANCE BETWEEN UTILITIES SHALL BE 1'-0" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

TYPICAL DETAIL AT CROSSING UNDER EXISTING UTILITIES

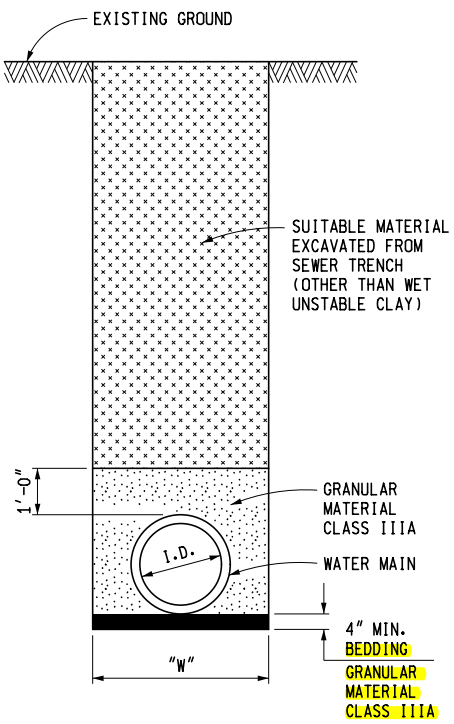
PAYMENT FOR THIS TRENCH DETAIL WILL BE INCLUDED WITH THE ADJACENT TRENCH DETAILS

E

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

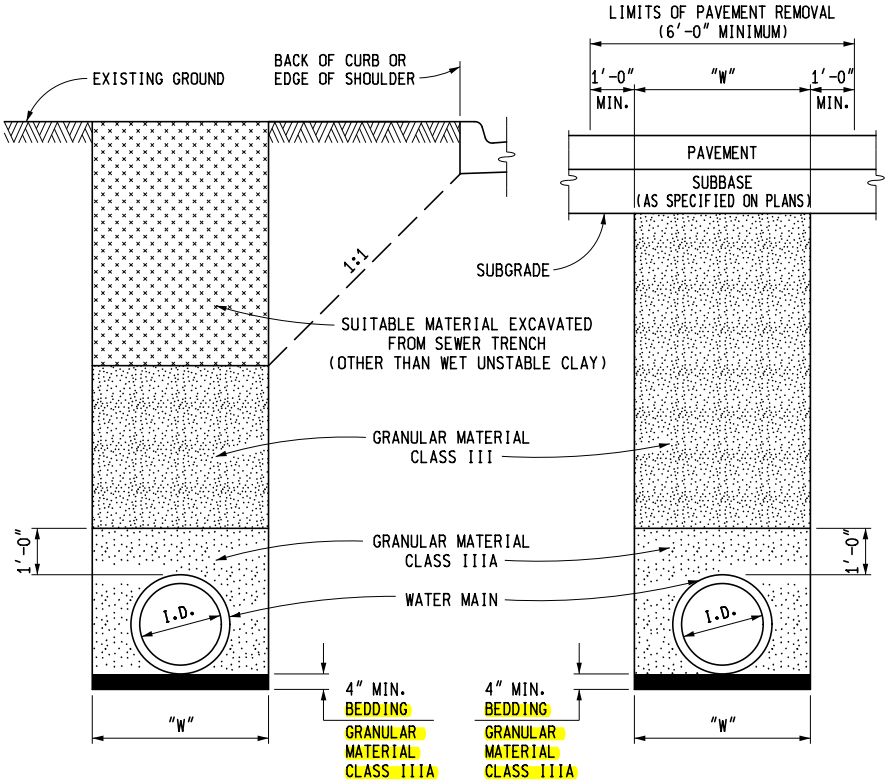
UTILITY TRENCHES

F.H.W.A. APPROVAL	9-4-2015 PLAN DATE	R-83-C	SHEET 3 OF 5



WATER MAINS NOT UNDER ROADBED

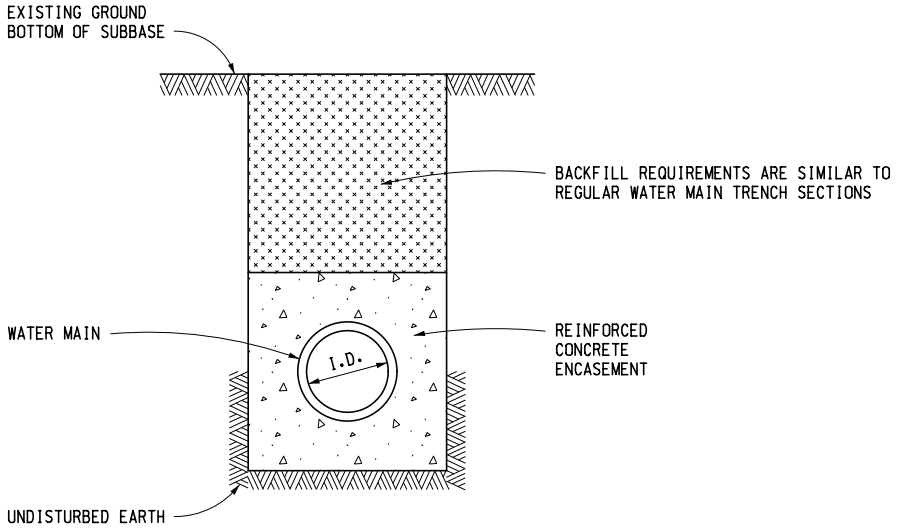
F



NOTE: WHEN WATER MAIN IS PLACED IN PROPOSED ROADBED AREA, IT SHALL BE BACKFILLED WITH SELECTED EXCAVATION MATERIAL ABOVE FUTURE SUBGRADE TO EXISTING GROUND LINE.

WATER MAINS UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED

G



REQUIRED ENCASEMENT SIZE FOR RESPECTIVE PIPE SIZES	
DIAMETER OF PIPE	ENCASEMENT SIZE AND TRENCH WIDTH
6" - 12"	3'-0"
16"	3'-6"
24"	4'-6"
30"	5'-0"
36"	5'-6"
42"	6'-0"
48"	7'-0"
54"	7'-6"
60"	8'-0"
66"	8'-6"
72"	9'-0"

NOTE:
REINFORCEMENT SHALL BE AS SPECIFIED ON PLANS.

WATER MAINS IN REINFORCED CONCRETE ENCASEMENT

H

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

F.H.W.A. APPROVAL	9-4-2015 PLAN DATE	R-83-C	SHEET 4 OF 5

NOTES:

BACKFILLING SHALL BE ACCORDING TO THE STANDARD SPECIFICATION.

SUFFICIENT TRENCH WIDTH SHALL BE PROVIDED TO ALLOW FREE WORKING SPACE AND TO PERMIT COMPACTING THE BACKFILL AROUND THE PIPE.

THE FOLLOWING ARE MINIMUM TRENCH WIDTHS:

I.D. PIPE SIZE (INCHES)	LESS THAN 18	21	24	30	36
"W" TRENCH WIDTH (FEET)	3.0	3.5	4.0	5.0	6.0

I.D. PIPE SIZE (INCHES)	42	48	54	60	66	72
"W" TRENCH WIDTH (FEET)	7.0	8.0	9.5	10.0	10.5	11.0

I.D. PIPE SIZE (INCHES)	78	84	90	96	102	108
"W" TRENCH WIDTH (FEET)	11.5	12.0	12.5	13.0	13.5	14.0

ESTIMATED PAVEMENT REMOVAL WIDTH IS TO BE TRENCH WIDTH "W" PLUS 1'-0" EACH SIDE OF THE TRENCH (6'-0" MINIMUM).

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

F.H.W.A. APPROVAL	9-4-2015 PLAN DATE	R-83-C	SHEET 5 OF 5

7.01.70 (revised 11-23-2015)

Temporary Barrier Adjacent to a Precipitous Drop-off

There are occasions, notably when reconstructing a bridge by part width, when maintaining traffic constraints will force the placement of temporary barrier immediately adjacent to a precipitous drop-off situation. This creates a potential for the line of barrier to be displaced under impact, when there may be inadequate room available for displacement. When this condition occurs, special barrier types and/or hardware are needed to ensure that the barrier will function properly.

Standard temporary barrier is usually adequate when the lateral offset between the toe of the barrier on the construction side and the drop-off is 26" or greater. However, when there is less than 26" laterally between the toe of the barrier on the construction side and the drop-off, limited deflection temporary barrier meeting the requirements of Standard Plan R-53-Series or an approved alternative is required.

If designers reference barrier offset from the toe of the barrier on the *traffic* side to the drop off, then limited deflection temporary concrete barrier should be specified for offsets less than 4'-6", as opposed to the "A" distance specified in Standard Plan R-53-Series. This is required since current MDOT specifications allow a wide variety of standard temporary barriers to be used, and the bottom width of standard temporary barrier can be as wide as 28". Therefore, when referencing barrier offset from the toe of the barrier on the *traffic* side to the drop-off, the 4'-6" minimum offset for standard temporary barrier would ensure that the "A" distance specified in Standard Plan R-53-Series is at least 26" with any standard temporary barrier permitted under current MDOT specifications.

7.01.70 (continued)

Note that any alternatives to Standard Plan R-53-Series must meet current crash testing criteria and must also be adequate for installation at each location taking site-specific features and constraints into consideration, including, but not limited to, proposed barrier offset from the drop-off, underlying surface type, and expansion joints in the underlying surface. In general, portable water filled barrier should not be placed adjacent to or near a precipitous drop-off, unless there is sufficient room between the barrier and the drop-off for the barrier to deflect during an impact.

When using limited deflection temporary barrier meeting Standard Plan R-53-Series, designers will need to select the appropriate detail for use at each location. Designers will need to determine the proposed offset between the barrier and the drop-off at each location, and the underlying surface type and condition at each location. In addition, when placing limited deflection temporary barrier over a bridge deck, designers may need to determine the number of expansion joints in the bridge deck, and the amount of thermal expansion/contraction expected at each joint.

CHAPTER 14 PROCEDURES FOR PLAN PREPARATION INDEX (continued)

14.62 CONTRACTOR INQUIRIES

14.63 ADDENDA

14.64 POSTPONEMENT, WITHDRAWAL OR REJECTION OF PROJECTS FROM LETTING

14.65 REFERENCE INFORMATION DOCUMENTS

14.66 TABULATIONS OF BIDS

14.67 PRE-CONSTRUCTION MEETING

14.68 Section Deleted

14.69 Section Deleted

14.70 DESIGN PROJECT RECORD

14.71 PLAN REVISIONS

14.71.01 Procedure

14.72 POST-CONSTRUCTION MEETING

14.72.01 Recommendations and Authorizations

14.73 MARKED FINAL PLANS

14.73.01 Mark-Up Standards

14.73.02 File Standards and Requirements

14.73.03 As Built Turn in Process

14.73.04 Design Division Review and Approval Process

14.74 DOCUMENT RETENTION

14.74.01 Permanent Records

APPENDIX B – CRITICAL PATH CONSTRUCTION TIME ESTIMATES

APPENDIX D – LIST OF ACRONYMS

14.06

PROJECT ASSIGNMENT

MDOT projects that are ready to be designed are sent to the Engineer of Road Design, who determines whether the project is to be designed by Lansing Road Design, by a Region/TSC design unit or by a consultant. The project is then assigned and authority transmitted through MPINS to the appropriate Design Unit.

The Design Unit should check the Design Division correspondence files for any pertinent documents that may impact the design of the project. Also, the Design Unit should check to see that all information in both MPINS and MFOS is complete and correct on the electronic data screens for the project.

14.07 (revised 11-23-2015)

PROJECT NUMBERS

A project identification system is used to identify projects. A typical project identification would be: NH50022-05675C.

Funding Identity: "NH" Identifies the funding category to which the project is being charged. See the Financial Systems Codes for a list of funds. (MDOT only, consultants contact your Project Manager)

Control Section: "50022" The first two digits identify the county (50-Macomb) and, in conjunction with the last three digits, define a specific section of trunkline, as shown in the Control Section Atlas-Report No. 42.

Job Number: "05675" A number assigned sequentially by MFOS. The digits in the number have no significance.

Phase: A phase letter, or lack of one (blank), identifies the stage of the project development process.

Additional information

1. A job number cannot be charged against until MFOS indicates the "C" phase has been authorized with a chargeable account number.

2. Time spent developing ROW plans is charged against the "B" phase.

3. FHWA has agreed that the "C" phase can be charged against up to one month after the letting date.

4. Charges occurring after the Pre-Construction Meeting should be made against the "A" phase.

The proper use of phases is outlined in the following table.

7.02

SUPERSTRUCTURE

7.02.01

Structure Type (5-6-99)

Whenever possible, multispan steel structures shall be continuous to avoid having expansion joints over piers. Consideration shall also be given to integral or semi-integral structures. Suspended cantilever design shall be avoided. When simple spans of an existing bridge are being replaced, consideration should be given to replacement with continuous beams and continuous for live load superstructure.

Where supporting members are prestressed concrete beams, decks should be cast continuous over piers where possible. Consideration shall also be given to integral or semi-integral structures.

Beam designs with complex layout may require the contractor to provide provisions and design any falsework required to ensure proper erection of beams. (11-28-2011)

Include the special provision, Complex Steel Erection, Shoring and Falsework, when one of the following situations may occur during the erection of structural members:

A. Construction of continuous spans > 200'.

B. Girders with horizontal curvature.

C. Field assembled suspension, movable bridge, cable-stayed, truss, tied arch, or other non-typical spans.

(11-23-2015)

7.02.02

Beam Spacing (5-6-99) (11-28-2011)

Space all beams so that the center to center distance does not exceed 10'-0". If the spacing is exceeded the designer shall perform an analysis to ensure that the structure meets load rating criteria specified in MDOT Bridge Analysis Guide. Space spread box beams such that the center to center distance is not less than 6'-0". (8-20-2009)

7.02.03

Beam Material Selection

The following is a guide for beam or girder material selection:

A. Prestressed Concrete (12-5-2005) (11-24-2014)

1. Side by side box beams, 36" wide, up to 42" deep, 5000-8000 psi concrete - spans up to 120'.

2. Side by side box beams, 48" wide, up to 60" deep, 5000-8000 psi concrete - spans up to 150'.

3. Spread box beams, 36" wide, up to 42" deep, 5000-8000 psi concrete - spans up to 95'.

4. Spread box beams, 48" wide, up to 60" deep, 5000-8000 psi concrete - spans up to 140'.

5. I-beams (Types I thru IV), 5000-8000 psi concrete - spans up to 114'.

6. I-beams (Wisconsin type, 70" deep), 5000-8000 psi concrete - spans up to 120'. Use in Upper Peninsula.

7. I-beams (Michigan 1800 Girder, 70.9" deep), 5000-8000 psi concrete - spans up to 145'. Use in Lower Peninsula.

B. Steel

1. Rolled Beams - spans up to 90'-0".

2. Welded plate girders - spans over 90'-0".

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7.02.31 (11-28-2011)

Deck Replacements

With deck replacements or widening projects (or reconstruction projects), the structural adequacy of the entire structure shall be evaluated. In addition to the criteria listed below, deck replacements shall meet all requirements listed in this chapter (e.g. slopes, shoulder width, stay in place deck forms and approach items).

A. Beams

1. On concrete T-Beam bridges the deck slab is an integral part of the support system and cannot be removed without dismantling the entire superstructure. The cost of deep chipping (or hydrodemolishing) combined with the installation of a cathodic protection system should be weighed against the cost of complete superstructure replacement.

2. On steel stringer bridges, the tops of beams shall be blast cleaned and coated with an organic zinc-rich primer. Shear connectors shall be placed to upgrade the capacity of existing non-composite decks. (12-5-2005)

3. On prestressed concrete box beam decks, the existing wearing course shall be replaced with a 6" reinforced deck.

B. Railings

Railings shall be upgraded when bridge deck replacements are planned. See section 7.02.28.

7.02.31 (continued)

C. Geometrics

Criteria for roadway widths and design loading have been established in ***A Policy on Design Standards - Interstate System***, 2005, and ***A Policy on Geometric Design of Highways and Streets***, 2004, published by AASHTO. These criteria are based on the type of roadway carried by the structure and are summarized in this section Non Interstate structures with deck replacements or widening projects (or reconstruction projects) shall adhere to ***A Policy on Geometric Design of Highways and Streets***, 2004 design criteria (standards). Interstate structures shall adhere to ***A Policy on Design Standards - Interstate System***, 2005. MDOT policy has set bridge (shoulder) widths 2' (offset) greater than AASHTO widths for safety considerations of the traveling public. See Bridge Design Guides 6.05 Series & 6.06 Series.
(11-23-2015)

7.02.31 (11-28-2011)

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(11-23-2015)

7.03.09 (continued)

Piles

B. Nominal Pile Resistance (R_n)
(8-20-2009)

In general, the specified nominal pile resistance shown on the plans and used in the substructure design should be 350 kips. In some cases, the soil profile will indicate that a higher or lower specified nominal pile resistance would be more economical. The recommendation from the Geotechnical Services Section in the Construction Field Services Division will indicate what nominal pile resistance to use. (11-28-2011)

1. Pile Designation/Maximum Nominal Pile Driving Resistance (R_{ndr})

   a. Steel H Piles (11-28-2011)

Pile	(R_{ndr})
HP 10X42	275 kips
HP 10X57	350 kips
HP 12X53	350 kips
HP 12X74	500 kips
HP 12X84	600 kips
HP 14X73	500 kips
HP 14X89	600 kips

   b. Metal Shell Piles
   (11-28-2011)(8-20-2012)

Pile	(R_{ndr})
Metal Shell 12" O.D. w/0.312" Walls	250 kips
Metal Shell 14" O.D. w/0.312" Walls	350 kips
Metal Shell 16" O.D. w/0.375" Walls	500 kips

   c. Timber Piles

Pile	(R_{ndr})
Timber Pile	150 kips

7.03.09 B. (continued)

A wave equation analysis, which uses typical pile types and driving equipment known to be locally available, shall be performed by the Geotechnical Engineer to verify drivability. (11-28-2011)

Steel H-Piles shall be according to AASHTO M270 Grade 50. Metal shell piles for CIP piles shall be according to ASTM A252 Grade 3.

2. In general, the Resistance Factor for Driven Piles (φ_{dyn}) = 0.50 assuming that the Nominal Pile Driving Resistance (R_{ndr}) is verified using the FHWA-modified Gates Dynamic Formula. The Resistance Factor (φ_{dyn}) = 0.65 when dynamic testing with signal matching (P.D.A. testing) is used and (φ_{dyn}) = 0.80 with static load tests. (See AASHTO LRFD Table 10.5.5.2.3-1 Resistance Factors for Driven Piles)
   (11-28-2011) (11-23-2015)

3. In general, Resistance Factor (φ_{dyn}) times the Nominal Pile Resistance (R_n) = Factored Nominal Resistance (R_R).

   $(\varphi_{dyn}) \times (R_n) = (R_R)$

   The above equation does not hold true in the case of possible downdrag, and/or scour.

7.03.12 (continued)

Mechanically Stabilized Earth (MSE) Wall Requirements

F. Drainage around MSE walls

Consideration shall be given to drainage at design phase to decrease the possibility of issues at MSE wall construction.

1. A 30 mil thick PVC Liner (impervious membrane) is required between the roadbed and the soil reinforcement. It should be located a minimum of 8 inches above the soil reinforcement. The liner should extend 6 feet beyond the ends of the soil reinforcement. Place an underdrain 1 foot from the end of the PVC liner running transverse to the road.

2. Foundation underdrains should be used, and located as low as possible to provide positive flow.

3. Curb and gutter at the edge of the roadway with a catch basin should be used to collect the drainage. Locate the catch basin a minimum of 25 feet past the end of the MSE wall reinforcement, if possible. The curb and gutter should continue 10 feet past the catch basin.

4. Use a minimum 20' concrete approach slabs (to reduce voids under approaches) for structures with MSE walls at the abutments. (11-23-2015)

G. Utilities and MSE Walls

1. Avoid utilities through or underneath MSE walls.

2. If utilities cannot be avoided, encase the utility in a protective conduit that extends 10 feet beyond the limits of the Backfill, Select.

3. Pipe culverts through MSE walls should be avoided.

4. Water and sewer lines within 10 feet of an MSE wall should be encased.

7.03.12 (continued)

H. Leveling Pad Dimensions:

1. Minimum length is 10 ft

2. Maximum height change for each step is 3 ft or ½ panel height

I. Miscellaneous Requirements

1. Obstructions, such as footing piles, utilities, catch basins, etc. need to be shown on the plan, elevation, and section drawings for the MSE walls.

2. The limits of the Backfill, Select should extend 1 foot beyond the end of the straps at the bottom of the wall, and slope upward at a 45 degree angle.

3. The Plans should clearly identify the MSE wall horizontal alignment, top of coping elevations, proposed ground line in front of wall, limits of concrete surface coating, texturing notes, design height (H), PVC liner, foundation underdrains, areas where cast-in-place coping is required, moment slab/barrier details, utilities, appurtenances, obstructions to the soil reinforcement and notes from BDM Chapter 8.

4. On return walls, keep the barrier inside of the MSE wall, not on top.

5. The water table must be considered by the geotechnical engineer during his/her investigation. Fluctuations in the water table must be accounted for in the investigation and must also be specified on the Plans (i.e. 100 year flood even should be labeled on the plans).

7.03.12 (continued)

Mechanically Stabilized Earth (MSE) Wall Requirements

F. Drainage around MSE walls

Consideration shall be given to drainage at design phase to decrease the possibility of issues at MSE wall construction.

1. A 30 mil thick PVC Liner (impervious membrane) is required between the roadbed and the soil reinforcement. It should be located a minimum of 8 inches above the soil reinforcement. The liner should extend 6 feet beyond the ends of the soil reinforcement. Place an underdrain 1 foot from the end of the PVC liner running transverse to the road.

2. Foundation underdrains should be used, and located as low as possible to provide positive flow.

3. Curb and gutter at the edge of the roadway with a catch basin should be used to collect the drainage. Locate the catch basin a minimum of 25 feet past the end of the MSE wall reinforcement, if possible. The curb and gutter should continue 10 feet past the catch basin.

4. Use a minimum 20' concrete approach slabs (to reduce voids under approaches) for structures with MSE walls at the abutments. This includes sliding slab approaches (Bridge Design Guide 6.20.03A). (11-23-2015)

G. Utilities and MSE Walls

1. Avoid utilities through or underneath MSE walls.
2. If utilities cannot be avoided, encase the utility in a protective conduit that extends 10 feet beyond the limits of the Backfill, Select.

3. Pipe culverts through MSE walls should be avoided.

4. Water and sewer lines within 10 feet of an MSE wall should be encased.

7.03.12 (continued)

H. Leveling Pad Dimensions:

1. Minimum length is 10 ft

2. Maximum height change for each step is 3 ft or ½ panel height

I. Miscellaneous Requirements

1. Obstructions, such as footing piles, utilities, catch basins, etc. need to be shown on the plan, elevation, and section drawings for the MSE walls.

2. The limits of the Backfill, Select should extend 1 foot beyond the end of the straps at the bottom of the wall, and slope upward at a 45 degree angle.

3. The Plans should clearly identify the MSE wall horizontal alignment, top of coping elevations, proposed ground line in front of wall, limits of concrete surface coating, texturing notes, design height (H), PVC liner, foundation underdrains, areas where cast-in-place coping is required, moment slab/barrier details, utilities, appurtenances, obstructions to the soil reinforcement and notes from BDM Chapter 8.

4. On return walls, keep the barrier inside of the MSE wall, not on top.

5. The water table must be considered by the geotechnical engineer during his/her investigation. Fluctuations in the water table must be accounted for in the investigation and must also be specified on the Plans (i.e. 100 year flood even should be labeled on the plans).

8.07.07

Structural Steel Notes

A. Field connections shall be bolted with ¾" high-strength bolts (except as noted).

B. The beams (in span _____) shall have a parabolic camber with ordinates as shown on the camber diagram. Heating is to be used, if necessary, to provide the camber within a tolerance of +¼" at the center. The camber shown is to be measured with the beam lying on its side. [Use for rolled beams.] (8-6-92)

C. The girders (in span _____) shall be cambered with ordinates as shown on the camber diagram. Heating is to be used, if necessary, to provide the camber within the tolerance specified in the AWS Specifications. The camber shown is to be measured with the girder lying on its side. [Use for plate girders.] (12-5-2005)

D. The quantity Structural Steel includes:
Steel _____lbs.
Bronze _____lbs.
Total _____lbs.

Elastomeric bearing pads(1/8") used under steel masonry plates shall not be paid for separately but included in the quantity for Structural Steel. (9-2-2003)

E. Anchor bolt lengths shown are minimum. Bolts longer than those shown may be furnished at no additional cost.

F. All structural steel shall be coated according to Subsection 716 of the Standard Specifications. The color of the urethane protective coat shall be light gray. Federal Standard 595C color number 16440. [Use with shop or field coating. Check with Roadside Development Unit if other color is desired.] (5-1-2000) (11-28-2011)

G. Structural steel shall conform to AASHTO M270, Grade 50, or AASHTO M270, Grade 50W. (AASHTO M270, Grade 36, steel may be used in lieu of these steels for bearings, diaphragms, and cross frames.) (9-18-98)

8.07.07 (continued)

H. The steel for cross frames shall meet the Charpy test requirements for main structural members shown in Subsection 906.04 of the Standard Specifications. [Use when bridge has horizontally curved girders.]

I. Changes in the number and location of field splices shown will be permitted, subject to approval by the Engineer and at no additional cost to the project. The design of these splices will also be subject to approval by the Engineer.

J. Field splice(s) _____ , if used, is (are) optional and will not be paid for.

K. The protection of work and environment during blast cleaning of existing painted faying surfaces (and structural steel exposed during deck slab removal) shall be according to Subsection 715 of the Standard Specifications. (Included in the bid item, ("Steel Structure, Cleaning, Type 4 (Structure No.)") ("Structures, Rem Portions (Structure No.)"*) ("Structures, Rehabilitation, Rem Portions (Structure No.)"*). [Use when widening steel bridges, even where the contract includes overall field coating.] [*Use when coating is not included in the contract.] (12-5-2005)

L. The following steel bridge members and member components have been designated as fracture critical, regardless of the direction of stress: ___*. Steel and fabrication procedures must conform to the requirements of the Special Provision for Fracture Critical Members. [*Identify component] [Use for structures that have fracture critical members other than pins and link plates.] (8-6-92) (11-23-2015)

M. End diaphragms shall be field drilled and bolted to the existing beams prior to pouring the deck. Intermediate diaphragms shall be field drilled and bolted to the existing beams after pouring the deck. [Use when widening structural steel bridge with diaphragms.] (9-18-98)

8.07.07

Structural Steel Notes

A. Field connections shall be bolted with ¾" high-strength bolts (except as noted).

B. The beams (in span _____) shall have a parabolic camber with ordinates as shown on the camber diagram. Heating is to be used, if necessary, to provide the camber within a tolerance of +¼" at the center. The camber shown is to be measured with the beam lying on its side. [Use for rolled beams.] (8-6-92)

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D. The quantity Structural Steel includes:
Steel _____lbs.
Bronze _____lbs.
Total _____lbs.

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8.07.07 (continued)

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CURVE CORRECTION FACTORS (Kcz)

Radius (ft)	DESIGN SPEED (mph)						
	40	45	50	55	60	65	70
2950	1.1	1.1	1.1	1.2	1.2	1.2	1.2
2300	1.1	1.1	1.2	1.2	1.2	1.2	1.3
1970	1.1	1.2	1.2	1.2	1.3	1.3	1.4
1640	1.1	1.2	1.2	1.3	1.3	1.3	1.4
1475	1.2	1.2	1.3	1.3	1.4	1.4	1.5
1315	1.2	1.2	1.3	1.3	1.4	1.4	
1150	1.2	1.2	1.3	1.4	1.5	1.5	
985	1.2	1.3	1.4	1.5	1.5	1.5	
820	1.3	1.3	1.4	1.5			
660	1.3	1.4	1.5				
495	1.4	1.5					
330	1.5						

$CZ_C = (L_C)(K_{CZ})$

Where:

CZ_C = clear zone on outside of curvature, feet

L_C = clear zone distance, feet (Design Guide 6.06.05)

K_{CZ} = curve correction factor

Note: The curve correction factors (K_{CZ}) shall be applied to horizontal curves with radii less than or equal to 2950 feet. The curve correction factor (K_{CZ}) shall be applied to the outside of curves only. The inside portion of the curve will be treated as a tangent section.