Road & Bridge Design Publications

Monthly Update – November 2014

Revisions for the month of **November** are listed and displayed below. The special detail index for October will remain in effect. E-mail any questions related to these revisions to MDOT-Bridge-Design-Standards@michigan.gov.

Bridge Design Manual

7.01.03, 7.02.03 A. & 8.02 G. (LFD & LRFD)**:** Increased prestressed concrete strengths and introduced release strengths (7000 psi max) for concrete beams.

7.02.18 B.4, 7.02.18 C.2 & 8.07.04 T. (LFD & LRFD)**:** Added requirement to use sole plates on all I-beams and box beams. This will reduce bottom of beam cracking.

7.02.18 B.7 & 8.07.04 Z. (LFD & LRFD)**:** Updated the possible (alternate) use of Grade 60 (ksi) steel reinforcement on 17" and 21" box beams. Beams are designed with Grade 40 (ksi) reinforcement because of bar lap requirements, but Grade 60 can be substituted at beam fabrication with spacing according to Grade 40 designs.

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.

MICHIGAN DESIGN MANUAL
BRIDGE DESIGN

CHAPTER 7

DESIGN CRITERIA - NEW AND RECONSTRUCTION PROJECTS

7.01

GENERAL

7.01.01

Design Specifications

In general, bridges in Michigan carrying vehicular traffic are designed according to the current edition of the Standard Specifications for the Design of Highway Bridges published by the American Association of State Highway and Transportation Officials (AASHTO). The exceptions to changes in AASHTO requirements are presented in this volume of the Design Manual.

The AASHTO specifications are also applied in the design of pedestrian bridges and major structures such as retaining walls and pumphouses.

Bridges carrying railroads are designed according to the current specifications of the American Railway Engineering and Maintenance-of-Way Association Specifications (AREMA).

7.01.02

Design Method

In general, elastomeric pad designs, as well as footing pressure and pile load determinations, are done by the Allowable Stress Method. All other elements of the structure are designed by the Load Factor Method. (12-5-2005)

7.01.03

Design Stresses (12-5-2005)

Concrete: Grade S2	f'_c = 3000 psi
Concrete: Grade D	f'_c = 4000 psi
Steel Reinforcement	f_y = 60,000 psi
Steel Reinforcement:	
Stirrups for	
Prestressed Beams	f_y = 60,000 psi
Stirrups for	
17” & 21” Box Beams	f_y = 40,000 psi
Structural Steel:	
AASHTO M270	
Grade 36	F_y = 36,000 psi
Grade 50	F_y = 50,000 psi
Grade 50W	F_y = 50,000 psi
Structural Steel Pins:	
ASTM A276	
UNS Designation	
S20161 or S21800	F_y = 50,000 psi
Temp Support Hanger Rods:	
ASTM A 193 Grade B7(AISI 4140)	
2 ½” and under	F_u =125,000psi
	F_y =105,000 psi
Over 2 ½” to 4”	F_u =115,000psi
	F_y = 95,000 psi
Over 4” to 7”	F_u =100,000psi
	F_y = 75,000 psi
Prestressed Concrete *	f'_c = 5000 - 8000 psi
Prestressed Concrete Compressive	
Strength at Release	f'_{ci} = 7000 psi (max)
Prestressing Strands	f'_s = 270,000 psi
High Strength Bolts:**	
Organic zinc rich primer (Class B)	
(Type 4 coating system)	F_s = 32,000 psi

* See Subsection 7.02.03.

** Value of F_s is Design Slip Resistance for Slip-Critical Connections with faying surfaces coated. (12-5-2005)
(11-28-2011) (11-24-2014)

CHAPTER 7- LRFD

DESIGN CRITERIA - NEW AND RECONSTRUCTION PROJECTS

7.01

GENERAL

7.01.01

Design Specifications (8-20-2009)

In general, bridges in Michigan carrying vehicular traffic are designed according to the current edition of the LRFD Bridge Design Specification published by the American Association of State Highway and Transportation Officials (AASHTO). The exceptions to changes in AASHTO requirements are presented in this volume of the Design Manual.

The AASHTO specifications are also applied in the design of pedestrian bridges and major structures such as retaining walls and pumphouses.

Bridges carrying railroads are designed according to the current specifications of the American Railway Engineering and Maintenance-of-Way Association Specifications (AREMA).

7.01.02

Design Method (8-20-2009)

The design of all structural elements shall satisfy Service Limit State and/or Strength Limit State requirements of the AASHTO LRFD Bridge Design Specifications.

7.01.03

Design Stresses (12-5-2005)

Concrete: Grade S2	f'_c = 3000 psi
Concrete: Grade D	f'_c = 4000 psi
Steel Reinforcement	f_y = 60,000 psi
Steel Reinforcement:	
Stirrups for	
Prestressed Beams	f_y = 60,000 psi
Stirrups for	
17” & 21” Box Beams	f_y = 40,000 psi
Structural Steel:	
AASHTO M270	
Grade 36	F_y = 36,000 psi
Grade 50	F_y = 50,000 psi
Grade 50W	F_y = 50,000 psi
Structural Steel Pins:	
ASTM A276	
UNS Designation	
S20161 or S21800	F_y = 50,000 psi
Temp Support Hanger Rods:	
ASTM A 193 Grade B7(AISI 4140)	
2 ½” and under	F_u =125,000psi
	F_y =105,000 psi
Over 2 ½” to 4”	F_u =115,000psi
	F_y = 95,000 psi
Over 4” to 7”	F_u =100,000psi
	F_y = 75,000 psi
Prestressed Concrete *	f'_c = 5000 - 8000 psi
Prestressed Concrete Compressive	
Strength at Release	f'_{ci} = 7000 psi (max)
Prestressing Strands	f'_s = 270,000 psi
High Strength Bolts:**	
Organic zinc rich primer (Class B)	
(Type 4 coating system)	F_s = 32,000 psi

* See Subsection 7.02.03.

** Value of F_s is Design Slip Resistance for Slip-Critical Connections with faying surfaces coated. (12-5-2005) (11-28-2011) (11-24-2014)

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)

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'.

7.02.03 (continued)

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".

C. New Structures

The choice of girder material is generally to be governed by the economics of design and expected span lengths. For structures over depressed freeways or other areas where there is a high concentration of salt spray or atmospheric corrosion, concrete is preferred.

D. Reconstruction of Existing Structures

The new portions are to be similar in appearance to the existing structure. Current materials and construction procedures are to be used with considerations given to matching the beam deflections of the existing structure. (5-6-99)

E. False Decking

False decking shall be erected prior to deck removal or repair on reconstruction projects and after beam erection on new or reconstruction projects. (12-5-2005)

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)

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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)

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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".

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C. New Structures

The choice of girder material is generally to be governed by the economics of design and expected span lengths. For structures over depressed freeways or other areas where there is a high concentration of salt spray or atmospheric corrosion, concrete is preferred.

8.02 (continued)

TITLE SHEET

G. The design of the structural members is based on material of the following grades and stresses:

Concrete: Grade S2 f'_c = 3,000 psi
Concrete: Grade D f'_c = 4,000 psi
Steel Reinforcement f_y = 60,000 psi
Steel Reinforcement:
(Stirrups for Prestressed Beams f_y = 60,000 psi)
(Stirrups for (17") (21") Box Beams f_y = 40,000 psi)
Structural Steel:
AASHTO M270
Grade 36 F_y = 36,000 psi
Structural Steel:
AASHTO M270
Grade 50 F_y = 50,000 psi
Structural Steel:
AASHTO M270
Grade 50W F_y = 50,000 psi
Structural Steel Pins:
ASTM A276
UNS Designation
S20161 or S21800 F_y = 50,000 psi
Temp Support Hanger Rods:
ASTM A 193 Grade B7 (AISI 4140)
2½" and under F_u =125,000 psi
F_y =105,000 psi
Over 2½" to 4" F_u =115,000 psi
F_y = 95,000 psi
Over 4" to 7" F_u =100,000 psi
F_y = 75,000 psi
Prestressed Concrete f'_c = _____ psi
Prestressed Concrete Compressive
Strength at Release f'_{ci} = _____ psi
[7000 psi max]
Prestressing Strands f'_s = 270,000 psi
(12-5-2005) (11-28-2011)(11-24-2014)

H. (year) Estimated Traffic Distribution
0000 Average Daily Traffic
(000) Design Hourly Volume
% Commercial
0000 Commercial Directional Design Hourly Volume
0000 Directional Traffic
0000 Total Traffic
[Use on Rehabilitation jobs where there is no plan of site or structure.] (9-18-98)

8.02 (continued)

I. All exposed concrete corners shown square on the plans shall be beveled with ½" triangular moldings except as otherwise noted. (8-20-99)

J. Bidders will be furnished with scanned images of plan sheets of the existing structure if requested. [Use on all projects where existing structure plans are known to exist.] (11-28-2011)

K. Old plans do not exist for this structure. [Use on all projects where the designer is unable to verify that existing structure plans exist.] (11-28-2011)

L. The bridge paint may contain lead. [Use on all projects with existing painted structural steel regardless of work type. If no bridge Title Sheet is present with project place note on road Note Sheet. Also place on existing structural steel sheets (see note 8.09.07 D.)] (11-28-2011)

M. Note skipped

N. Unless otherwise shown on the plans provide minimum concrete clear cover for reinforcement according to the following:

Concrete cast against earth:	3 in.
Prestressed Beams:	1 in.
All other unless shown on plans:	2 in.

(11-28-2011)

O. The bridge deck surface has an HMA overlay, HMA cap or HMA patches. Removal of HMA as a result of removal of other superstructure items shall be included in the removal of those items. (11-28-2011)

8.02 (continued)

TITLE SHEET

D. The stationing as shown on these plans for the intersection of the centerline of bridge and roadway (and the railroad) centerline is believed to be correct. It shall, however, be checked at the time of starting construction, and if the stationing shown on the plans is incorrect, it shall be reported to the Design office in Lansing, and the structure shall be staked out using the actual intersection of the centerline of bridge and roadway (and the railroad) centerline as the control point.

E. This contract is for "Structural Steel, ____, Furn and Fab" only. Other items of work indicated on these plans are not a part of this contract. [Use when structural steel furnishing and fabricating must be done early in project to ensure timely delivery for construction.] (12-5-2005)

F. The Regulated Waste Activity Identification Numbers for this project are as follows:

Control Section	Number
_____	_____

[Use when cleaning or working on painted steel structure constructed prior to 1978. Place note directly above title block and use lettering twice the size of the other notes.] (9-18-98)

8.02 (continued)

G. The design of the structural members is based on material of the following grades and stresses:

Concrete: Grade S2 f'_c = 3,000 psi
Concrete: Grade D f'_c = 4,000 psi
Steel Reinforcement f_y = 60,000 psi
Steel Reinforcement:
(Stirrups for Prestressed Beams f_y = 60,000 psi)
(Stirrups for (17") (21") Box Beams f_y = 40,000 psi)
Structural Steel:
AASHTO M270
Grade 36 F_y = 36,000 psi
Structural Steel:
AASHTO M270
Grade 50 F_y = 50,000 psi
Structural Steel:
AASHTO M270
Grade 50W F_y = 50,000 psi
Structural Steel Pins:
ASTM A276
UNS Designation
S20161 or S21800 F_y = 50,000 psi
Temp Support Hanger Rods:
ASTM A 193 Grade B7 (AISI 4140)
2½" and under F_u =125,000 psi
F_y =105,000 psi
Over 2½" to 4" F_u =115,000 psi
F_y = 95,000 psi
Over 4" to 7" F_u =100,000 psi
F_y = 75,000 psi
Prestressed Concrete f'_c = _____ psi
Prestressed Concrete Compressive
Strength at Release f'_{ci} = _____ psi
[7000 psi max]
Prestressing Strands f'_s = 270,000 psi
(12-5-2005) (11-28-2011)(11-24-2014)

H. (year) Estimated Traffic Distribution

0000	Average Daily Traffic
(000)	Design Hourly Volume
%	Commercial
0000	Commercial Directional Design Hourly Volume
0000	Directional Traffic
0000	Total Traffic

[Use on Rehabilitation jobs where there is no plan of site or structure.] (9-18-98)

7.02.18 (continued)

Prestressed Concrete Design

B. Prestressed Concrete Box Beam Design

1. Skew Bridges

   The ends of the box beams shall be skewed to be parallel to the reference line.

2. Spacing

   The spacing of side by side prestressed concrete box beams is to be the nominal width of the beam plus 1½".

   Spread box beams may be used and shall be treated similar to prestressed concrete I-beams. Space spread box beams such that the center to center distance is not less than 6'-0". The slab shall be according to Bridge Design Guide 6.41.01. (5-6-99) (11-28-2011)

3. Bridge Seats (5-6-99)

   The bridge seats of substructures shall be made parallel to the crown slopes of the roadway. For spread box beams the bridge seat shall be bolstered and level.

4. Bearings

   Where the pressure is less than 100 psi, ½" joint filler may be used for a bearing pad. Where bearing pressures are greater than 100 psi, 4" minimum (generally 6") by 33" elastomeric pads shall be used (¾" minimum thickness, increase in ¼" increments). Cast steel sole plate (3/4" generally) in all beams. When the calculated bevel exceeds 1%, tilt sole plate as required. All position dowels for doweling beam to the substructure will be placed by drilling as described in the Standard Specifications. (8-20-2009) (11-28-2011) (11-24-2014)

7.02.18 (continued)

5. Transverse Post-tensioning

   Box beams which are less than 33" deep will have transverse post-tensioning tendons placed at middepth. Beams which are 33" deep or deeper will have transverse tendons installed in pairs with a tendon placed at each third point of the beam depth. The transverse tendons will be spaced longitudinally as shown on Bridge Design Guide 6.65.13. (11-28-2011)

6. Wearing Course

   a. MDOT Projects

      The surfacing over a side by side box beam deck shall be a 6" thick reinforced concrete slab as shown in Bridge Design Guide 6.29.06A. Stirrups shall project from the beams into the slab to provide a composite section. (5-6-99)

   b. Local Agency Projects

      A 6" thick reinforced concrete slab is to be used in all cases on local agency projects as described above except a hot mix asphalt, HMA, wearing surface may be used for side by side, pre-stressed concrete box beam bridges where the average daily traffic, ADT, is less than 500 vehicles and where the commercial traffic is less than 3% of the ADT. HMA (typically 2-3") shall be placed after placement of preformed waterproofing membrane as per Standard Specifications section 710.03. (11-28-2011)

   Spread box beams shall use a slab according to Bridge Design Guide 6.41.01.

7. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi) for all box beams except 17" & 21" box beams. For 17" & 21" box beams the design of transverse beam steel reinforcement, stirrups and slab ties (ED & D bars) is based on Grade 40 (ksi); the use of either Grade 40 or Grade 60 is allowed in construction of the beam. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 for 17" & 21" box beams. See note 8.07.04 Z. (11-24-2014)

7.02.18 (continued)

Prestressed Concrete Design

B. Prestressed Concrete Box Beam Design

1. Skew Bridges

   The ends of the box beams shall be skewed to be parallel to the reference line.

2. Spacing

   The spacing of side by side prestressed concrete box beams is to be the nominal width of the beam plus 1½".

   Spread box beams may be used and shall be treated similar to prestressed concrete I-beams. Space spread box beams such that the center to center distance is not less than 6'-0". The slab shall be according to Bridge Design Guide 6.41.01. (8-20-2009)

3. Bridge Seats (5-6-99)

   The bridge seats of substructures shall be made parallel to the crown slopes of the roadway. For spread box beams the bridge seat shall be bolstered and level.

4. Bearings

   Where the pressure is less than 100 psi, ½" joint filler may be used for a bearing pad. Where bearing pressures are greater than 100 psi, 4" minimum (generally 6") by 33" elastomeric pads shall be used (¾" minimum thickness, increase in ¼" increments). Cast steel sole plate (3/4" generally) in all beams. When the calculated bevel exceeds 1%, tilt sole plate as required. All position dowels for doweling beam to the substructure will be placed by drilling as described in the Standard Specifications. (8-20-2009) (11-28-2011) (11-24-2014)

7.02.18 (continued)

5. Transverse Post-tensioning

   Box beams which are less than 33" deep will have transverse post-tensioning tendons placed at mid-depth. Beams which are 33" deep or deeper will have transverse tendons installed in pairs with a tendon placed at each third point of the beam depth. The transverse tendons will be spaced longitudinally as shown on Bridge Design Guide 6.65.13. (8-20-2009)

6. Wearing Course

   a. MDOT Projects

      The surfacing over a side by side box beam deck shall be a 6" thick reinforced concrete slab as shown in Bridge Design Guide 6.29.06A. Stirrups shall project from the beams into the slab to provide a composite section. (5-6-99)

   b. Local Agency Projects (8-20-2009)

      A 6" thick reinforced concrete slab is to be used in all cases on local agency projects as described above except a hot mix asphalt, HMA, wearing surface may be used for side by side, pre-stressed concrete box beam bridges where the average daily traffic, ADT, is less than 500 vehicles and where the commercial traffic is less than 3% of the ADT. HMA (typically 2-3") shall be placed after placement of preformed waterproofing membrane as per Standard Specifications section 710.03.

   Spread box beams shall use a slab according to Bridge Design Guide 6.41.01.

7. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi) for all box beams except 17" & 21" box beams. For 17" & 21" box beams the design of transverse beam steel reinforcement, stirrups and slab ties (ED & D bars) is based on Grade 40 (ksi); the use of either Grade 40 or Grade 60 is allowed in construction of the beam. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 for 17" & 21" box beams. See note 8.07.04 Z. (11-24-2014)

7.02.18 (continued)

Prestressed Concrete Design

C. Prestressed Concrete I-Beam Design

1. Bearing Pads

   For single-span structures 40'-0" or less in length, use dependant backwalls with 1" elastomeric pads under the beams and joint filler under the backwall.

   For single- and multiple-span structures with spans over 40'-0", allowance for expansion is required in designing the bearing pads.

2. Sole Plates

   Sole plates (3/4" generally) are to be cast in all beams and shall be tilted as required when the calculated bevel exceeds 1%. (11-24-2014)

3. Skew Bridges

   On skewed structures, the ends of the I-beams shall be made square regardless of the angle of skew. The top corners may be blocked out in order to accommodate a straight expansion joint across the structure.

4. Concrete Diaphragms

   End diaphragms are to be set back 10" to 12" from the end of beam in order to permit the removal of the forms after the diaphragms are poured.

   The bottoms of all diaphragms are to bear on the bottom of the lower beam fillet.

   All diaphragms are to be cast separately from slab except with continuous for live load structures (optional construction joint). (5-6-99)

7.02.18 (continued)

5. Steel Diaphragms

   Use steel diaphragms on structures where mobility analysis defines the project as significant and mitigation measures to minimize travel delay are needed (See Work Zone Safety and Mobility Policy).

   Use details from Bridge Design Guide 6.60.12 A. & B. and include Special Provision in proposal. (11-26-2012)

7.02.18 (continued)

Prestressed Concrete Design

C. Prestressed Concrete I-Beam Design

1. Bearing Pads

   For single-span structures 40'-0" or less in length, use dependant backwalls with 1" elastomeric pads under the beams and joint filler under the backwall.

   For single- and multiple-span structures with spans over 40'-0", allowance for expansion is required in designing the bearing pads.

2. Sole Plates

   Sole plates (3/4" generally) are to be cast in all beams and shall be tilted as required when the calculated bevel exceeds 1%. (11-24-2014)

3. Skew Bridges

   On skewed structures, the ends of the I-beams shall be made square regardless of the angle of skew. The top corners may be blocked out in order to accommodate a straight expansion joint across the structure.

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   End diaphragms are to be set back 10" to 12" from the end of beam in order to permit the removal of the forms after the diaphragms are poured.

   The bottoms of all diaphragms are to bear on the bottom of the lower beam fillet.

   All diaphragms are to be cast separately from slab except with continuous for live load structures (optional construction joint). (5-6-99)

7.02.18 (continued)

5. Steel Diaphragms

   Use steel diaphragms on structures where mobility analysis defines the project as significant and mitigation measures to minimize travel delay are needed (See Work Zone Safety and Mobility Policy).

   Use details from Bridge Design Guide 6.60.12 A. & B. and include Special Provision in proposal. (11-26-2012)

8.07.04 (continued)

Prestressed Concrete I-Beam & Box Beam Notes

P. Any holes cast or formed in the beam shall be filled with non-shrinking grout. Included in the bid item "Prest Conc 1800 Beam, Erect." [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

Q. The outer 6" of the top surface of the beam shall be fabricated to a smooth trowel finish, and then coated with a bond breaker as specified in section 708 of the Standard Specifications. [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

R. At the locations shown on these plans, coat the beams using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating in the manner specified in the Special provision for a distance of _____ feet, starting from the beam end at the joint, coating both sides and bottom of beam. [Use on Prestressed I beam and Spread box beam projects with expansion joints on the bridge. Show the locations to be coated on the erection diagram (new) or on existing General Plan of Structure sheet for existing beams.] (10-24-2001) (11-28-2011)

S. Coat the entire outside and bottom of the fascia beam using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating according to the Special Provision. [Use on Prestressed I beam and spread box beam projects where the beam ends are being coated and where coating fascia beams will not significantly effect the maintaining traffic scheme of the project.] (10-24-2001) (11-28-2011)

T. Steel for sole plates and other bearing components shall meet the requirements of AASHTO M 270 Grade 36. Sole plates are required in all beam ends. (12-5-2005) (11-24-2014)

8.07.04 (continued)

U. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi). [Use for all I-Beams and all box beams except 17" & 21" box beams.] (12-5-2005) (11-28-2011)

V. Field drilling shall be allowed for sign support anchors only. Location of anchors shall be as detailed on Traffic & Safety Sign Support Special Details. Any damage to the beams shall be repaired at the contractor's expense and approved by the Engineer. (11-28-2011)

W. Items cast into the beams to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. (8-20-2009) (3-18-2013) (6-17-2013)

X. Concrete inserts shall be 1" diameter; Dayton Superior, Type B-1 Standard or Type B-18; Williams Form, Type C 12; Meadow Burke, Type CT-2; or equal. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (11-28-2011)

Y. Adhesive anchors shall use a non-shrink grout (which is cementitious) listed in MDOT's Qualified Products List. [Use for adhesive anchors in sustained, tensile-load-only overhead applications such as traffic signals/sign supports.] (11-28-2011)

Z. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 (ksi). The design of transverse beam steel reinforcement, stirrups and slab ties (ED & D bars) is based on Grade 40 (ksi); the use of either Grade 40 or Grade 60 is allowed in construction of the beam. [Use for 17" & 21" box beams.] (11-28-2011) (11-24-2014)

8.07.04 (continued)

Prestressed Concrete I-Beam & Box Beam Notes

P. Any holes cast or formed in the beam shall be filled with non-shrinking grout. Included in the bid item "Prest Conc 1800 Beam, Erect." [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

Q. The outer 6" of the top surface of the beam shall be fabricated to a smooth trowel finish, and then coated with a bond breaker as specified in section 708 of the Standard Specifications. [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

R. At the locations shown on these plans, coat the beams using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating in the manner specified in the Special provision for a distance of _____ feet, starting from the beam end at the joint, coating both sides and bottom of beam. [Use on Prestressed I beam and Spread box beam projects with expansion joints on the bridge. Show the locations to be coated on the erection diagram (new) or on existing General Plan of Structure sheet for existing beams.] (8-20-2009)

S. Coat the entire outside and bottom of the fascia beam using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating according to the Special Provision. [Use on Prestressed I beam and spread box beam projects where the beam ends are being coated and where coating fascia beams will not significantly effect the maintaining traffic scheme of the project.] (8-20-2009)

T. Steel for sole plates and other bearing components shall meet the requirements of AASHTO M 270 Grade 36. Sole plates are required in all beam ends. (12-5-2005) (11-24-2014)

8.07.04 (continued)

U. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi). [Use for all I-Beams and all box beams except 17" & 21" box beams.] (12-5-2005) (11-28-2011)

V. Field drilling shall be allowed for sign support anchors only. Location of anchors shall be as detailed on Traffic & Safety Sign Support Special Details. Any damage to the beams shall be repaired at the contractor's expense and approved by the Engineer. (8-20-2009)

W. Items cast into the beams to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. (8-20-2009) (3-18-2013) (6-17-2013)

X. Concrete inserts shall be 1" diameter; Dayton Superior, Type B-1 Standard or Type B-18; Williams Form, Type C 12; Meadow Burke, Type CT-2; or equal. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (8-20-2009)

Y. Adhesive anchors shall use a non-shrink grout (which is cementitious) listed in MDOT's Qualified Products List. [Use for adhesive anchors in sustained, tensile-load-only overhead applications such as traffic signals/sign supports.] (8-20-2009)

Z. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 (ksi). The design of transverse beam steel reinforcement, stirrups and slab ties (ED & D bars) is based on Grade 40 (ksi); the use of either Grade 40 or Grade 60 is allowed in construction of the beam. [Use for 17" & 21" box beams.] (11-28-2011) (11-24-2014)