OHIO DEPARTMENT OF TRANSPORTATION

CENTRAL OFFICE, 1980 W. BROAD ST., COLUMBUS, OHIO 43216-0899

July 17, 2015

To: Users of the Bridge Design Manual

From: Tim Keller, Administrator, Office of Structural Engineering

By: Sean Meddles, Assistant Administrator, Office of Structural Engineering

Re: 2015 Third Quarter Revisions

Revisions have been made to the ODOT Bridge Design Manual, January 2004. These revisions shall be implemented on all Department projects that begin Stage 2 plan development date after July 17, 2015. Implementation of some or all of these revisions for projects further along the development process should be considered on a project-by-project basis.

This package contains the revised pages. The revised pages have been designed to replace the corresponding pages in the book and are numbered accordingly. Revisions, additions, and deletions are marked in the revised pages by the use of one vertical line in the right margin. The header of the revised pages is dated accordingly.

To keep your Manual correct and up-to-date, please replace the appropriate pages in the book with the pages in this package.

To ensure proper printing, make sure your printer is set to print in the 2-sided mode.

The January 2004 edition of the Bridge Design Manual may be downloaded at no cost using the following link:

http://www.dot.state.oh.us/Divisions/Engineering/Structures/Pages/default.aspx

Attached is a brief description of each revision.

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Summary of Revisions to the January 2004 ODOT BDM

BDM Section	Affected Pages	Revision Description
201.2.1	2-2	The data for water elevations has been revised for consistency with FEMA terminology.
201.2.2	2-2	The data for water elevations has been revised for consistency with FEMA terminology.
203.4	2-21	For consistency with regulatory definitions, reference is provided to the USACE document defining OHWM.
302.1.4.1	3-11	Our office is eliminating the use of Type D waterproofing for non-composite box beam bridges. The Type D is more labor intensive to install with little to no benefit compared to Type 3 waterproofing.
302.1.4.2	3-12	Our office is eliminating the use of Type D waterproofing for non-composite box beam bridges. The Type D is more labor intensive to install with little to no benefit compared to Type 3 waterproofing.
302.5.1.4	3-41	Our office is eliminating the use of Type D waterproofing for non-composite box beam bridges. The Type D is more labor intensive to install with little to no benefit compared to Type 3 waterproofing.
Figure 320C		The equation for the max height of the #4 supplemental haunch bar was corrected for a math error.
702.7.2	7-5 through 7-6.2	With the release of PSID-1-13, there has been confusion on locating construction joints for diaphragms and decks. These revisions help clarify the placement options for semi-integral diaphragms with regard to skew and phased construction.
Figure 702		This figure has been updated to reflect the replacement of Item 448 with Item 441. Also, the dimensions for intermediate and surface courses has been clarified.

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SECTION 200 - PRELIMINARY DESIGN

201 STRUCTURE TYPE STUDY

201.1 GENERAL

In conformance with Section 1400 of the ODOT Location and Design Manual, Volume Three, a Structure Type Study shall be included in the Preferred Alternative Verification Review Submission for a Major Project or in the Minor Project Preliminary Engineering Study Review Submission. The Structure Type Study is not required for projects classified as Minimal.

The project site should be studied in detail and evaluated to determine the best structure alternative. A site visit should be made. In many cases, it can be readily determined whether a particular bridge or culvert should be chosen for a particular site. If a bridge is the most appropriate structure for a particular site, then the Structure Type Study needs to be performed to determine the appropriate bridge type.

201.2 STRUCTURE TYPE STUDY SUBMISSION REQUIREMENTS

A Structure Type Study submission should include the following:

A. Profile for each bridge alternative .... Section 201.2.1
B. Preliminary Structure Site Plan (for preferred bridge alternative) .... Section 201.2.2
C. Hydrology & Hydraulics (H&H) Report .... Section 201.2.3
D. Narrative of Bridge Alternatives........ Section 201.2.4
E. Cost Analysis .... Section 201.2.5
F. Foundation Recommendation .... Section 201.2.6
G. Preliminary Maintenance of Traffic Plan .... Section 201.2.7

The Structure Type Study shall be included in the review submission made directly to the District Office. A concurrent review submission shall be made to the Office of Structural Engineering if the proposed structure type contains non-standard bridge railing types, non-redundant designs, or fracture critical designs. The Office of Structural Engineering will forward review comments for these items to the responsible District Office.

Additional structural related items that are required at this stage of the review process include:

A. Retaining Wall Justification (L&D Section 1404.2)
B. Noise Wall Justification (ODOT Policy #21-001 and Procedure #417-001)
C. Pedestrian Overpass Justification (L&D Section 1404.4)

201.2.1 PROFILE FOR EACH BRIDGE ALTERNATIVE

The profile for each bridge alternative considered shall generally be drawn to a scale of 1”=20’ and shall generally be taken along the proposed centerline of survey for the full length of the bridge. The profiles shall include: the existing and proposed profile grade lines; existing ground line; the cross-section of channel; an outline of the structure; highest known high water mark; normal water elevation; Ordinary High Water Mark (OHWM); flow line elevation (thalweg); design and 100 year water surface elevations (WSE); overtopping flood elevation and frequency; existing and proposed profile grade elevations at 25 ft increments; and minimum and required vertical and horizontal clearances. Note: normal water elevation is the water elevation in the stream which has not been affected by a recent heavy rain runoff and could be found in the stream most of the year. Refer to BDM Section 203.4 for OHWM definition. Carry WSE in a FEMA Zone out to two decimal places.

201.2.2 PRELIMINARY STRUCTURE SITE PLAN

The Site Plan scale generally should be 1” = 20’ [1 to 200]. For some cases to get the entire bridge on one sheet a smaller scale may be provided, if all details can be clearly shown. For bridges where the 1” = 20’ [1 to 200] scale is too small to clearly show the Site Plan details, a 1” = 10’ [1 to 100] scale may be considered. The following general information should be shown on the Preliminary Structure Site Plan:

A. The plan view should show the existing structures (use dashed lines); contours at 2 foot [0.5 meter] intervals showing the existing surface of the ground (for steep slopes contours at 5 foot [2.0 meter] or greater intervals may be used); existing utility lines and their disposition; proposed structure; proposed temporary bridge; proposed channel improvements; a north arrow; and other pertinent features concerning the existing topography and proposed work in an assembled form.

   In case of a highway grade separation or a highway-railway grade separation, the required minimum and actual minimum horizontal and vertical clearances and their locations shall be shown in the plan and profile views.

   For a bridge over a railway, the vertical clearance shall be measured from a point level with the top of the highest rail and 6 feet [2 meters] from the centerline of those tracks, or greater if specified by the individual railroad. Reference shall be made to Chapter 15, Section 1.2.6(a), AREMA Specifications for increased lateral clearances required when tracks are on a horizontal curve.

B. A profile as described in Section 201.2.1. The profile scale shall be the same as the plan view.

C. Horizontal and vertical curve data.

D. Size of drainage area. The elevation, discharge and stream velocity through the structure and the backwater elevation for the 100-year frequency base flood, the design year flood and if necessary the overtopping flood. Label discharge as “FIS” when taken from a FEMA Flood Insurance Study. The clearance from the lowest elevation of the bottom of the superstructure to the design year water surface elevation (freeboard) should be provided.

203.4 BRIDGE AND WATERWAY PERMITS

Impacts to bridges or waterways may require legal authorization in the form of permits or certifications issued by various regulatory agencies, including:

A. U.S. Army Corps of Engineers ....Section 404 and/or Section 10 Permit
B. U.S. Coast Guard ....Section 9 Bridge Permit
C. Ohio EPA .... Section 401 Water Quality Certification and/or Isolated Wetland Permit

The jurisdictional limit of the U.S. Army Corps of Engineers (USACE) is termed the "Waters of the United States" and, as noted in ODOT CMS 101.03, includes: rivers, streams, lakes and wetlands. For rivers and streams, the jurisdiction begins below the Ordinary High Water Mark (OHWM). The OHWM is defined by the USACE Regulatory Letter No. 05-05 which is available at: www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/GuidanceLetters.aspx.

The ODOT Office of Environmental Services – Waterway Permits Unit (OES-WPU) assumes the responsibility for determining project eligibility for different types of waterway permits, such as, but not limited to, Nationwide Permits (NWP) or ODOT's Regional General Permit (RGP). The designer and project manager shall coordinate with the DEC and the OES-WPU throughout the permit determination process to ensure that the final waterway permit applications are indicative of the final project design. For more information refer to the Waterway Permits Manual available from the ODOT Office of Environmental Services.

Special Provisions are the method ODOT uses to attach the waterway permits and certifications to the project construction plans. The waterway permits Special Provisions Package (SPP) is prepared by the Office of Environmental Services – Waterway Permits Unit and may contain the following:

A. All pertinent waterway permits, certifications and related conditions
B. Drawings and/or mapping submitted with a permit application
C. Specialized conditions associated with the waterway permits

The designer and the project manager shall confirm that the bridge design plans meet the requirements in the project waterway SPP (e.g. Sections 404 and 401 conditions, and infrequently Sections 9 and 10) and shall ensure the project waterway SPP is submitted with the Final Plan Package.

203.5 TEMPORARY ACCESS FILLS

A Temporary Access Fill (TAF) is a fill or structure that allows a contractor access to work on roads or bridges located within bodies of water. TAF's are work-type specific and are not required on every project. Examples of TAF's include: cofferdams; temporary structures for maintaining traffic; causeways and workpads; and demolition debris. The placement of all TAF's in "Waters of the United States" must be performed in accordance with the special provisions for waterway permits.

A contractor's means and methods of construction will dictate the TAF required for a project. However, the Department must estimate the potential impacts to "Waters of the United States" during project development to ensure all permits are in-place during contract letting. Furthermore, it is incumbent upon the Department that these permits provide all bidding contractors the ability to construct the project without resulting in expensive delays, change orders or fines. To that end, the Department partnered with the Ohio Contractor's Association to develop the following guidance to estimate the size of TAF's:

A. The TAF shall provide access to all piers located within the Ordinary High Water Mark (OHWM) of the waterway from at least one bank of the waterway.

   Access may be provided by construction staging of the TAF. When considering the constructability of staged TAF's, typical superstructure erection plans for lifting lengths of 50-ft or more require two cranes. Unless the access for member delivery is from an adjacent structure, the TAF must provide access to each end of the lift from one bank. In the case of staging, the permit application shall reflect the construction stage that impacts the largest area of the wearing surface shall be composed as follows:

1. Two separate 1½ inch [38 mm] minimum lifts of Item 441 Asphalt Concrete Surface Course, Type 1, PG70-22M. The first lift shall be variable thickness to accommodate beam camber. The second lift shall be a uniform 1½ inch [38 mm] thickness.

2. Two applications of Item 407 Tack Coat - one prior to placement of the first lift of surface course and one prior to placement of the second lift of surface course. Refer to the ODOT Pavement Design Manual, Section 400 for application rates.

C. 6 inches [155 mm] cast-in-place composite deck - defined as the minimum thickness of concrete slab for composite prestressed box beams. The top 1 inch [25 mm] shall be considered monolithic as defined above. Also see Section 302.5.1.3.

302.1.3.2 FUTURE WEARING SURFACE

All bridges shall be designed for a future wearing surface (FWS) of 60 psf [2.87 kPa].

The future wearing surface is considered non-structural and shall not be used in design to increase the strength of the superstructure. The presence of a future wearing surface does not exclude the use of the 1 inch [25 mm] monolithic wearing surface as defined above.

302.1.4 CONCRETE DECK PROTECTION

302.1.4.1 TYPES

A. Epoxy Coated Reinforcing Steel - CMS 709.00

B. Minimum concrete cover of 2½ inches [65 mm]

C. Class QC2 Concrete

D. Drip Strips

E. CMS 512, Type 3 Waterproofing

F. Asphaltic concrete wearing surface

302.1.4.2 WHEN TO USE

All reinforcing steel shall be epoxy coated.

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All cast-in-place concrete decks shall have minimum concrete top cover of 2½ inches [65 mm].

A drip strip may be used on decks with over the side drainage.

Non-composite box beam bridges, with over the side drainage, shall have an asphalt concrete overlay. The overlay shall be placed over Type 3 Waterproofing, CMS 512. Minimum thickness of overlay is 3 inches [75 mm] - See Section 302.1.3.1.

302.1.4.3 SEALING OF CONCRETE SURFACES SUPERSTRUCTURE

Specifications for sealing material are defined in CMS 512. Concrete surfaces shall be sealed with an approved concrete sealer as follows: (See Figures 310 & 311)

A. Concrete slabs or concrete decks on steel superstructures with over-the-side drainage:

   The deck fascia and a 6 inch [150 mm] (minimum) width under the deck shall be sealed with either an epoxy-urethane or non-epoxy sealer.

B. Concrete slabs, composite prestressed box beam superstructures or concrete decks on steel superstructures with sidewalks:

   The vertical face of curb; the top of the curb/sidewalk; the inside face, top and outside face of the parapet; the deck fascia; and a 6 inch [150 mm] (minimum) width under the deck shall be sealed with either an epoxy -urethane or non-epoxy sealer.

C. Concrete slabs, composite prestressed box beam superstructures or concrete decks on steel superstructures with deflector parapets:

   The inside face, top and outside face of parapet; the deck fascia; and a 6 inch [150 mm] (minimum) width under the deck shall be sealed with either an epoxy-urethane, or non-epoxy sealer.

D. Non-composite prestressed concrete box beam decks with over-the-side drainage:

   The fascia of the outside beams and a minimum 6 inch [150 mm] width under the beam shall be sealed with an epoxy-urethane or a non-epoxy sealer.

E. Concrete decks on prestressed I-beam superstructures with over-the-side drainage:

   The deck fascia; the underside of the deck to the edge of the top flange; the exterior fascia of the beam; the underside of the bottom flange; and the inside face of the bottom flange shall

When designing the deck reinforcement for a multiple span structure, unless a more precise method of analysis is performed, the composite structure shall be conservatively modeled as a continuous beam on a single support centered on the pier.

Composite box beam structures with concrete parapets or sidewalks should not incorporate fit-up tolerances in the finished roadway width. To compensate for fit-up tolerances the composite deck and barrier and/or sidewalk should be designed to cantilever or overhang the boxbeam units by 2" [50 mm] to 8" [200 mm] each side with the fit-up being absorbed in the overhang. A mixture of 48" [1220 mm] and 36" [915 mm] boxbeam units may be necessary to meet this requirement.

See Figure 320 for a sketch of the cross-section of the composite deck superstructure.

302.5.1.4 NON-COMPOSITE WEARING SURFACE

Non-composite box beam bridges with asphalt overlays shall have Type 3 Waterproofing as specified in CMS 512 placed on the boxes before the 1½ inch minimum layers of CMS type 441 asphaltic concrete is applied. See section 302.1.3.1. The Type 3 Waterproofing is preferred.

Non-composite box beam bridges with asphalt overlays shall be limited to a 4 percent combined grade. Combined grades greater than 4 percent require a composite deck design. Combined grade includes both the longitudinal and transverse structure grades calculated as follows:

Combined Grade (Cg) = $([\text{deck slope}]^2 + [\text{transverse grade}]^2)^{1/2}$

302.5.1.5 CAMBER

The topping thickness on prestressed box beam superstructures will vary along the length of the beams to account for beam camber and other vertical elevation adjustments. Proper determination of the topping thickness is crucial in order to properly establish beam seat elevations.

As shown in Figure 320A, the topping thickness (T_x) at any point, x, along the length of a prestressed box beam superstructure shall be determined as:

$$T_x = A + B_x + C + D_{t,x} - E$$

Where:

A = Design deck thickness

B_x = Vertical grade adjustment

C = Sacrificial haunch depth

$D_{t,x}$ = Beam camber adjustment at member age equal to Day t

E = Haunch adjustment

302.5.1.5.a DESIGN DECK THICKNESS (*A*)

The design deck thickness shall be in accordance with BDM Section 302.5.1.3 or BDM Section 302.5.1.4.

302.5.1.5.b VERTICAL GRADE ADJUSTMENT (B_x)

The Vertical Grade Adjustment accounts for any elevation differences between a non-linear profile grade and the linear grade connecting the centerline of beam supports. The value of the Vertical Grade Adjustment depends on many geometric factors such as vertical curvature, skew, cross-slope transitions, etc. Designers should attempt to minimize the vertical grade adjustment along the length of the bridge by setting the linear grade between the beam ends parallel to the tangent of the vertical grade at the midpoint of the beam span (see Figure 320A).

302.5.1.5.c SACRIFICIAL HAUNCH DEPTH (*C*)

The purpose of the Sacrificial Haunch Depth is to account for camber in excess of that calculated in the Beam Camber Adjustment above and account for the roadway cross-slope.

For multiple span box beam bridges with design speeds exceeding 45 mph, the minimum thickness of the Sacrificial Haunch Depth (*C*) shall be 2-inches. For all other box beam bridges, the minimum thickness of Sacrificial Haunch Depth (*C*) shall be 0-in.

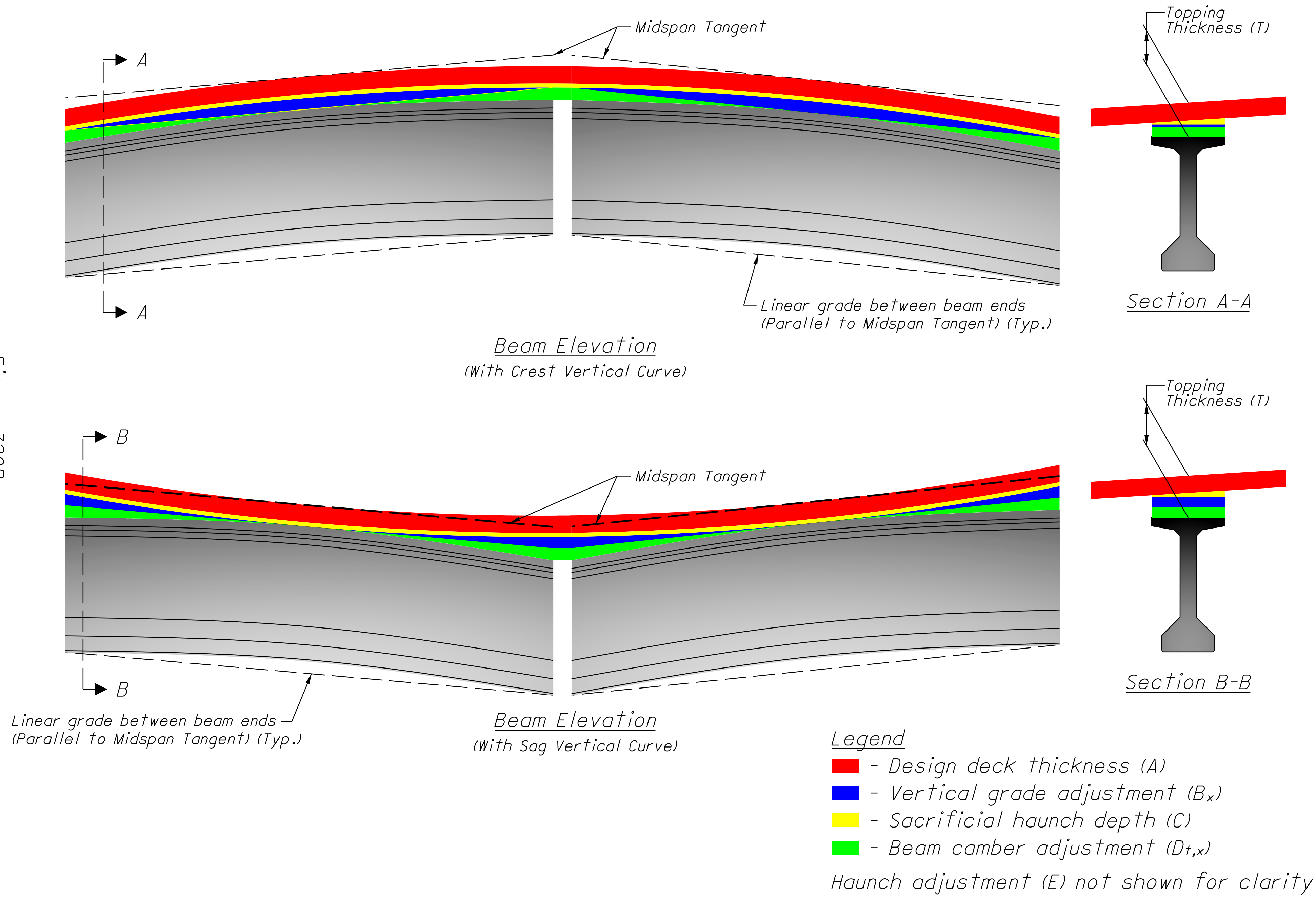
Because box beams are set on sloping seats that approximate the cross-slope, the sacrificial haunch depth is typically constant. If, however, the cross slopes are different at the beam bearings as noted in BDM Section 302.5.1, the difference between the cross slope and the beam seat slope will be accommodated by the sacrificial haunch depth. The minimum thickness, *C*, will occur at the outside edge of the fascia beam on the low side of the cross slope.

302.5.1.5.d BEAM CAMBER ADJUSTMENT ($D_{t,x}$)

As prestressed concrete beams age, beam camber will increase due to concrete creep under the constant loading from the prestressing force. Although designers cannot accurately predict the girder age when the deck is placed, general assumptions can be made to prevent camber growth from becoming an issue during construction.

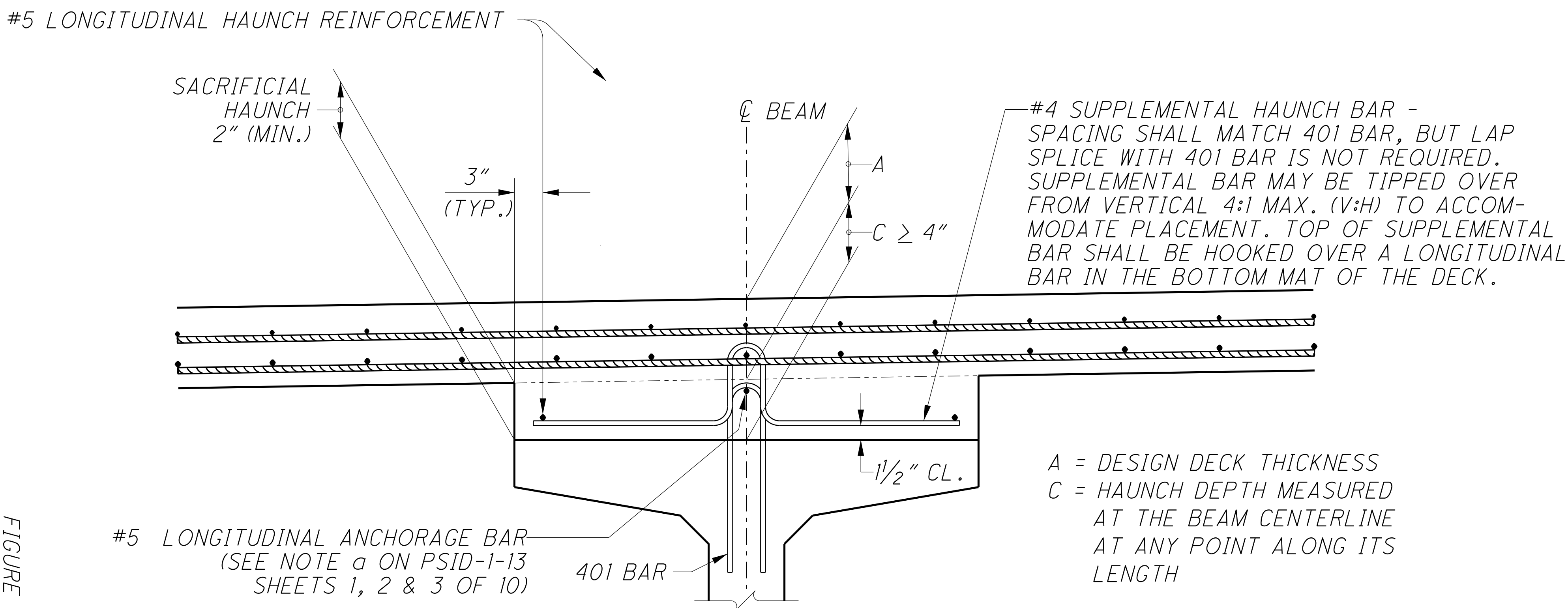
The design plans shall show two values for camber at midspan which the contractor can use to establish seat elevations according to C&MS 511.07 and tolerance according to C&MS 515.17: camber at Day 0 (D_0) and camber at Day 30 (D_{30}). These values shall represent the midspan camber in the beams before application of dead load other than self-weight.

To determine these camber values, Designers shall calculate the creep coefficient, $\psi(t,t_i)$, according to *LRFD 5.4.2.3.2* with humidity (H) equal to 70%; age of concrete at release (t_i) equal to 0.75 days; and V/S and f'_{ci} according to the project requirements. To calculate the creep coefficient at Day 0 and Day 30, use a maturity of concrete (t) equal to 0 days and 30 days



Midspan Tangent
A
A
Topping Thickness (T)
Linear grade between beam ends (Parallel to Midspan Tangent) (Typ.)
Section A-A
Beam Elevation
(With Crest Vertical Curve)
Midspan Tangent
B
B
Topping Thickness (T)
Linear grade between beam ends (Parallel to Midspan Tangent) (Typ.)
Section B-B
Beam Elevation
(With Sag Vertical Curve)
Legend
- Design deck thickness (A)
- Vertical grade adjustment (B_x)
- Sacrificial haunch depth (C)
- Beam camber adjustment ($D_{t,x}$)
Haunch adjustment (E) not shown for clarity

Figure 320B

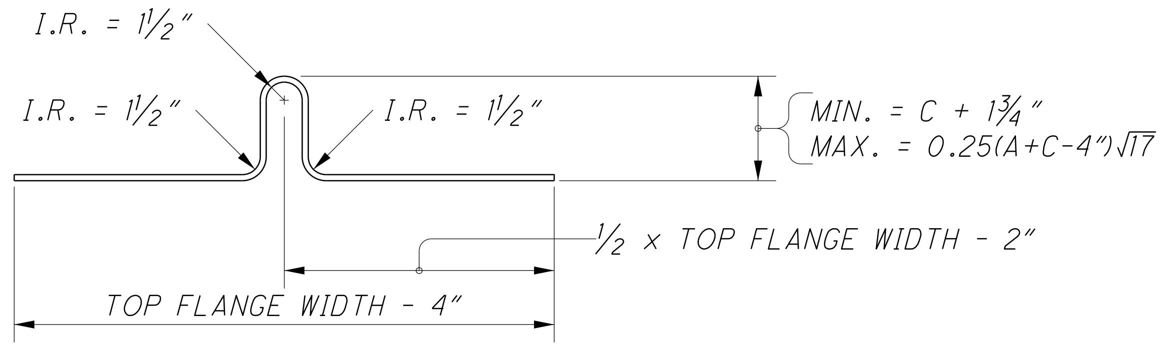


A = DESIGN DECK THICKNESS

C = HAUNCH DEPTH MEASURED AT THE BEAM CENTERLINE AT ANY POINT ALONG ITS LENGTH

HAUNCH REINFORCEMENT

NOTE - THE SUPPLEMENTAL HAUNCH BAR IS NOT REQUIRED WHERE C < 4".



#4 SUPPLEMENTAL HAUNCH BAR

FIGURE 320C

[71] INTERMEDIATE DIAPHRAGMS: Do not place the deck concrete until all intermediate diaphragms have been properly installed. If concrete diaphragms are used, complete the installation of the intermediate diaphragms at least 48 hours before deck placement begins. Concrete shall conform to C&MS 511 with a design strength of 4.5 ksi.

702.7.2 SEMI-INTEGRAL OR INTEGRAL ABUTMENT CONCRETE PLACEMENT FOR DIAPHRAGMS

Hardened concrete end diaphragms restrain the movement and rotation of beam/girder ends that occur during deck placement. This restraint will increase stress in both the beam/girder and diaphragm. Factors that can contribute to detrimental stress increases include large structure skew and phased construction. When these factors exist, hardened diaphragms should be avoided during the deck placement. The following table provides guidelines for concrete diaphragm placement options.

Description of Superstructure	Note
No phased construction, and Steel superstructures with skew < 30º, or I-beam superstructure with skew < 10º	[71a]
No phased construction, and Steel superstructures with skew ≥ 30º, or I-beam superstructure with skew ≥ 10º	[71b]
Phased construction with closure pour, and Steel superstructures with skew < 30º, or I-beam superstructure with skew < 10º	[71c]
Phased construction with closure pour, and Steel superstructures with skew ≥ 30º, or I-beam superstructure with skew ≥ 10º	[71d]
Phased construction without closure pour, and Steel superstructures with skew < 30º, or I-beam superstructure with skew < 10º	[71e]
Phased construction without closure pour, and Steel superstructures with skew ≥ 30º, or I-beam superstructure with skew ≥ 10º	[71f]

Designers should consider the absence of restraint at the diaphragm location and when calculating the unbraced length of beam/girder flanges. If necessary, temporary bracing details should be included in the plans. Temporary end bracing should be oriented perpendicular to beam/girder webs.

Use the following notes as prescribed in the table above:

[71a] ABUTMENT DIAPHRAGM CONCRETE: Place the diaphragm concrete encasing the structural member ends with the deck concrete or at least 48 hours before placement of the deck concrete. If placed separately, locate a horizontal construction joint in the diaphragm as shown on PSID-1-13, sheet 7 of 10 and place remaining diaphragm concrete with the deck.

[71b] ABUTMENT DIAPHRAGM CONCRETE: Place the diaphragm concrete encasing the structural member ends after the deck placement in the adjacent span is complete. Procedures that place the abutment diaphragm with the deck concrete may be approved by the Engineer if the placement submittal can assure that the deck concrete in the adjacent span will be placed before concrete in the diaphragm has reached its initial set.

NOTE TO DESIGNER: (Applies only to [71b])
Locate the deck construction joint parallel to the centerline of the abutment offset 1-ft from the face of the diaphragm toward the span.

[71c] ABUTMENT DIAPHRAGM CONCRETE, PHASED CONSTRUCTION: Place the diaphragm concrete encasing the structural member ends of an individual phase with the deck concrete or at least 48 hours before placement of the deck concrete. If placed separately, locate a horizontal construction joint in the diaphragm as shown on PSID-1-13, sheet 7 of 10 and place remaining diaphragm concrete with the deck. Place closure pour concrete in the diaphragm and deck concurrently.

NOTE TO DESIGNER: (Applies only to [71c])
If a closure pour is required in the deck per BDM Section 302.2.9, provide a closure pour in the diaphragm as well. Locate the closure pour in the diaphragm, as near as practical, to mid-bay and orient the vertical construction joints parallel to the centerline of the adjacent beam/girders. Provide 3-in chamfers at the acute corners.

[71d] ABUTMENT DIAPHRAGM CONCRETE, PHASED CONSTRUCTION: Place the diaphragm concrete encasing the structural member ends of an individual phase after the deck placement in the adjacent span is complete. Procedures that place the abutment diaphragm with the deck concrete may be approved by the Engineer if the placement submittal can assure that the deck concrete in the adjacent span will be placed before concrete in the diaphragm has reached its initial set. Place closure pour concrete in the diaphragm and deck concurrently.

NOTE TO DESIGNER: (Applies only to [71d])
If a closure pour is required in the deck per BDM Section 302.2.9, provide a closure pour in the diaphragm as well. Locate the closure pour in the diaphragm, as near as practical, to mid-bay and orient the vertical construction joints parallel to the centerline of the adjacent beam/girders. Locate the deck construction joint parallel to the centerline of the abutment offset 1-ft from the face of the diaphragm toward the span. Provide 3-in chamfers at the acute corners.

[71e] ABUTMENT DIAPHRAGM CONCRETE, PHASED CONSTRUCTION: Place the diaphragm concrete encasing the structural member ends of an individual phase with the deck concrete.

NOTE TO DESIGNER: (Applies only to [71e])
Do not use this note where a deck closure pour is required per BDM Section 302.2.9.

[71f] ABUTMENT DIAPHRAGM CONCRETE, PHASED CONSTRUCTION: Place the diaphragm concrete encasing the structural member ends of an individual phase after the deck placement in the adjacent span is complete. Procedures that place the abutment diaphragm with the deck concrete may be approved by the Engineer if the placement submittal can assure that the deck concrete in the adjacent span will be placed before concrete in the diaphragm has reached its initial set.

NOTE TO DESIGNER: (Applies only to [71f])
Do not use this note where a deck closure pour is required per BDM Section 302.2.9. Locate the deck construction joint parallel to the centerline of the abutment offset 1-ft from the face of the diaphragm toward the span.

702.8 CONCRETE DECK SLAB DEPTH AND PAY QUANTITIES

For all steel beam and girder bridges with a concrete deck, provide the following note that describes how the quantity of deck concrete was calculated.

[72] DECK SLAB CONCRETE QUANTITY: The estimated quantity of deck slab concrete is based on the constant deck slab thickness, as shown, plus the quantity of concrete that forms each beam/girder haunch. The estimate assumes a constant haunch thickness of inches [mm] and a constant haunch width outside the edge of each beam/girder flange of 9 inches [230 mm]. Deviate from this haunch thickness as necessary to place the deck surface at the finished grade. The allowable tolerance for the haunch width outside the edge of each beam/girder flange is ± 3 inches [75 mm].

The haunch thickness was measured at the centerline of the beam/girder, from the surface of the deck to the bottom of the top flange minus the deck slab thickness. The area of all embedded steel plates has been deducted from the haunch quantity in accordance with 511.24.

NOTE TO DESIGNER: The note above applies to new structures with beams/girders placed parallel to the profile grade line. A constant depth haunch may not be practical for existing structures or new structures whose beams/girders are not placed parallel to the profile grade line. In these special cases, the note shall be modified to fit the exact conditions.

[73] Note retired – see appendix

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STRUCTURAL STEEL DEFLECTION & CAMBER TABLE								
DEFLECTION AND CAMBER								
	SPAN NUMBER (1)							
Point (2)	Bearing Pt	1/4 Pt	Pt (3)	Mid Span	Pt (3)	1/4 Pt	Splice Pt	Bearing Pt
Deflection due to weight of steel								
Deflection due to remaining deadload (4)								
Adjustment required for vertical curve								
Adjustment required for horizontal curve								
Adjustment required for heat curving (5)								
Required Shop Camber								

(1) Table is only an example. For multiple span structures include each span and the bearing points in a single table.

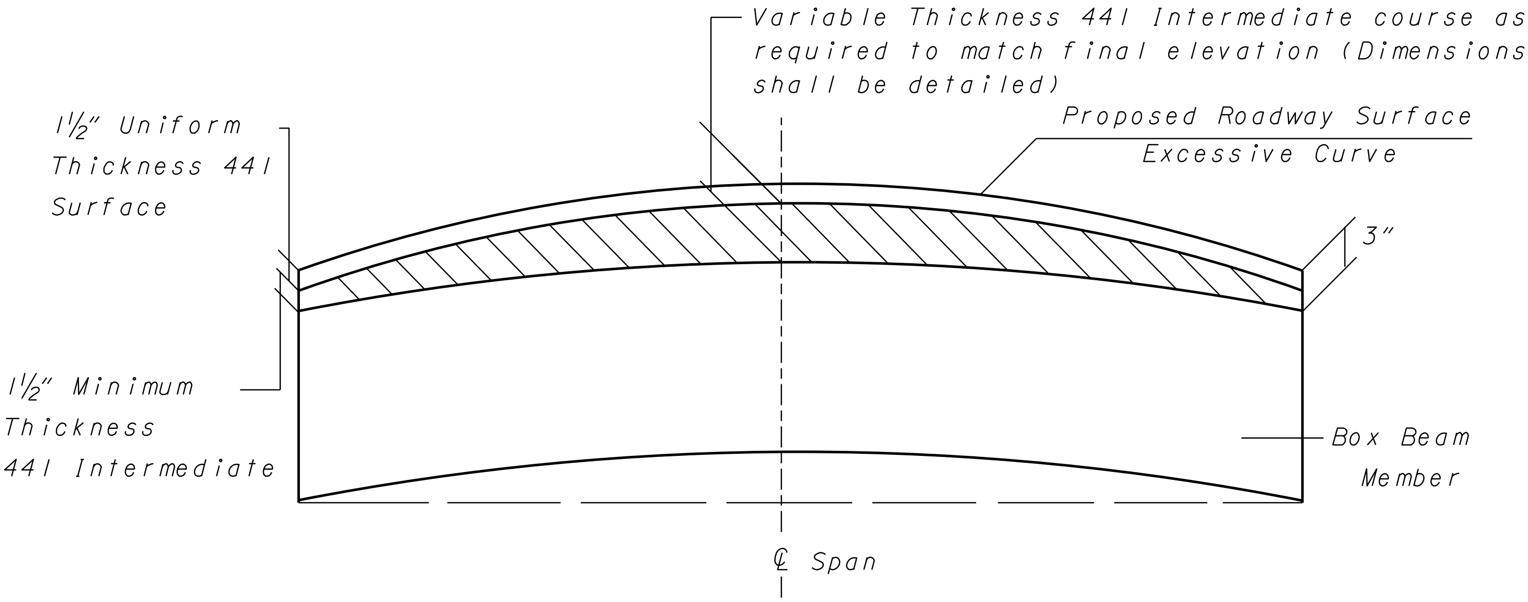
(2) Define distance and position

(3) Additional points required in a span if the distance between bearing points, 1/4 points, mid span and/or splice points exceeds 30 feet. If the distance does exceed 30 feet locate the additional point midway between standard points.

(4) Do not include a separate wearing surface that is not installed during the project

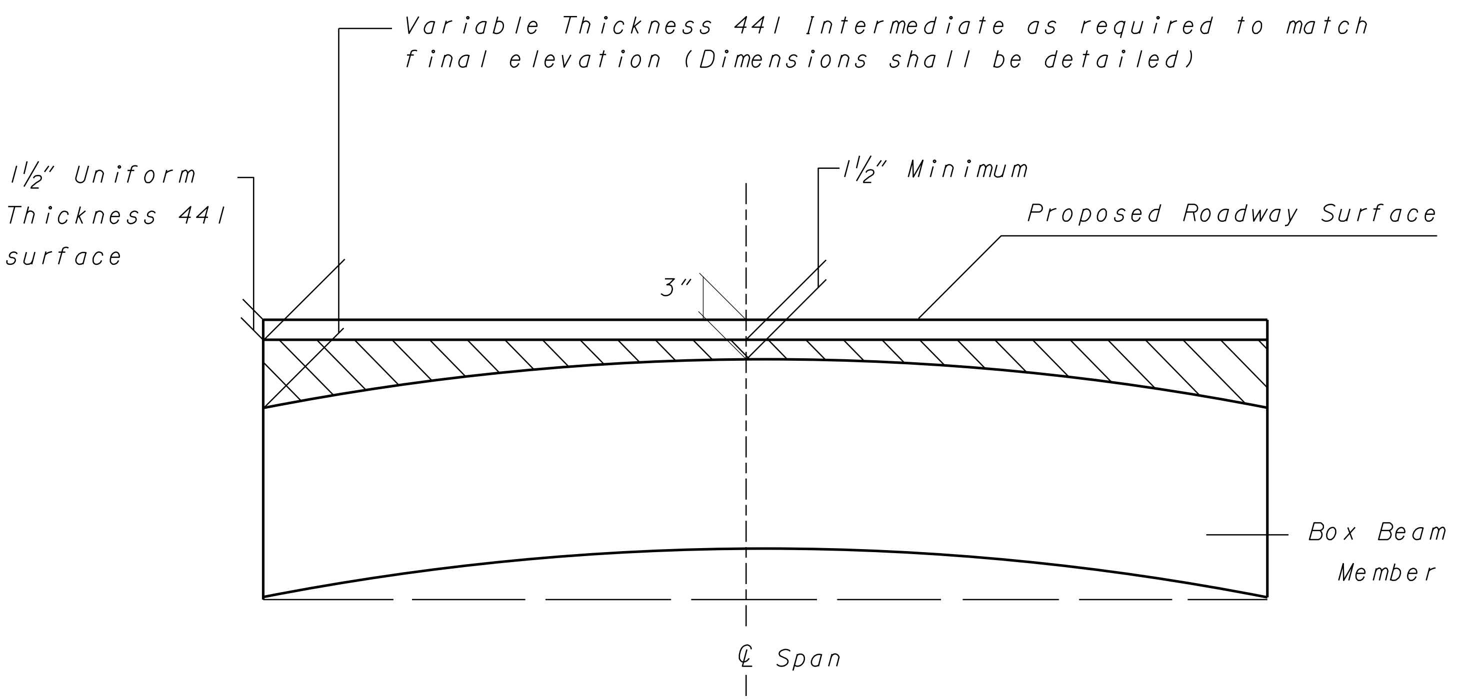
(5) For horizontally curved girders the designer is responsible for establishing the required additional camber to be included in the girder per AASHTO 10.15.3. Include these values.

Figure 701



ASPHALT THICKNESS DIAGRAM

(Crest Vertical Curve)



ASPHALT THICKNESS DIAGRAM

(Straight Grade or Sag Vertical Curve)

Figure 702