C3.2.6 Superstructures

C3.2.6.1 Type and span

C3.2.6.1.1 CCS J-series

C3.2.6.1.2 Single-span PPCB HSI-series

C3.2.6.1.3 Two-span BT-series

C3.2.6.1.4 Three-span PPCB H-series

C3.2.6.1.5 Three-span RSB-series

C3.2.6.1.6 PPCB

Methods Memo No. 159: Policy on Bulb Tee Use
1 June 2008

Preliminary haunch for all Prestressed Beam Bridges

Note: The calculations provide a haunch thickness estimate (X) value, which does not~~n't~~ include the nominal haunch thickness.

$S := 111.5\,ft$ Longest Span (feet)

$e := 0.0$ Superelevation (feet/feet)

$G_1 := -1.6$ Grade 1 vertical curve [+ increasing, - decreasing] (%)

$G_2 := 2.1$ Grade 2 vertical curve [+ increasing, - decreasing] (%)

$A := \frac{G_2 - G_1}{100}$ $A = 0.038$

$L := 984\,ft$ Length vertical curve (feet)

$D_c := 1.75\,deg$ Degree of Horizontal Curvature (degree)

$C := 0.337\,ft$ Final Beam Camber (feet) - From prestressed concrete beam standards

$D := 0.19\,ft$ Dead load deflection - Elastic + 1/2 Plastic (feet) - From prestressed concrete beam standards

$T := 1.667\,ft$ Top flange width (feet)

X = Haunch estimate along the centerline of the beam.

$$X := (C - D) + \frac{S \cdot e}{2} \cdot \left(\frac{1}{\sin\left(\frac{D_c}{2}\right)} - \frac{1}{\tan\left(\frac{D_c}{2}\right)} \right) + \left(\frac{S}{L}\right)^2 \cdot A \cdot \frac{L}{8}$$

$X = 0.219\,ft$ $X = 66.894\,mm$

~~~~~~~~ ~~~~~~~~

$T \cdot e = 0.6\,in$

If T * e < 1 then X < 4 in. If T * e > 1 then X < 3 in.

Also check maximum offset for horizontal curve < or = 9 in.
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C3.2.6.1.7 CWPG

The ~~AASHTO~~ table below extracted from the AASHTO LRFD Specifications [AASHTO-LRFD 2.5.2.6.3] can be used as a guide to establish minimum girder depths, when 1/25 of the span is not possible due to vertical clearance or profile grade issues.

Traditional Minimum Depths for Constant Depth Superstructures

Superstructure		Minimum Depth (Including Deck) When variable depth members are used, values may be adjusted to account for changes in relative stiffness of positive and negative moment sections.	
Material	Type	Simple Spans	Continuous Spans
Steel	Overall Depth of Composite I-Beam	0.040L	0.032L
	Depth of I-Beam Portion of Composite I-Beam	0.033L	0.027L
	Trusses	0.100L	0.100L

C3.2.6.2 Width

C3.2.6.2.1 Highway

C3.2.6.2.2 Sidewalk, separated path, and bicycle lane

Methods Memo No. 11: Sidewalks on Bridges
21 March 2001

C3.2.6.3 Horizontal curve

C3.2.6.3.1 Spiral curve

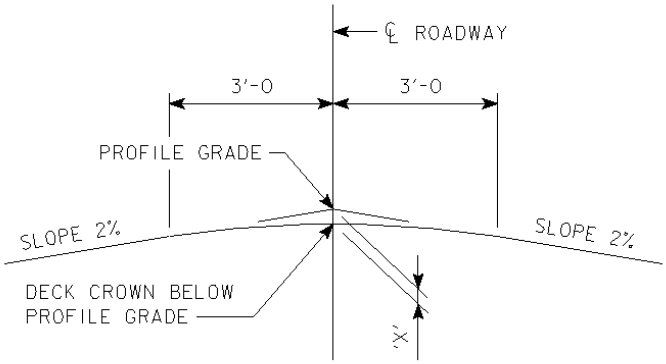
C3.2.6.4 Alignment and profile grade

Methods Memo No. 85: Layout for Bridges on Four Lane Highways
30 January 2004

For situations where the profile grade line is not at the centerline of approach roadway, elevations for the bridge deck will be established taking the bridge deck crown into account. The elevations will be noted on the TS&L as "TOP OF BRIDGE DECK AT CENTERLINE ROADWAY IS 'X' ABOVE (OR BELOW) THE PROFILE GRADE TO ACCOUNT FOR DECK CROSS SLOPE AND PARABOLIC CROWN.

For situations where the profile grade line is at the centerline of approach roadway, elevations for the bridge deck will be established in accordance with Methods Memo No. 222, which is rephrased in BDM 2.5.1.

~~As shown in figure 1, the elevation at the bridge deck crown will be below the roadway profile grade elevation to account for the rounding of the deck with a parabolic template at the cross slope intersection.~~



~~Figure 1 Recommended Values for `X`~~	
~~Slope %~~	~~X, ft~~
~~2%~~	~~0.03~~
~~2.5%~~	~~0.04~~
~~3%~~	~~0.05~~

~~The rounding of the approach roadway surface is not as well defined as the parabolic template established for the bridge deck crown, however some rounding of the roadway surface at the cross slope intercepts is typical during pavement placement and will match reasonably close to the template shown for the bridge deck crown.~~

~~Using this method will ensure the approach roadway surface in the travelled lanes and the outside edge of pavement, match the bridge deck elevations. Elevations shown on the longitudinal section of the TS&L will reflect the top of bridge deck crown elevations along the centerline of approach roadway to the nearest hundredth of a foot (0.0X). These elevations will be noted on the TS&L as "TOP OF BRIDGE DECK CROWN 'X' BELOW PROFILE GRADE".~~

~~NOTE: The designer shall fill in the `X` value based on the specific project cross slopes. This revision should be made to all projects where detailing has not begun.~~

C3.2.6.5 Cross slope drainage

C3.2.6.6 Deck drainage

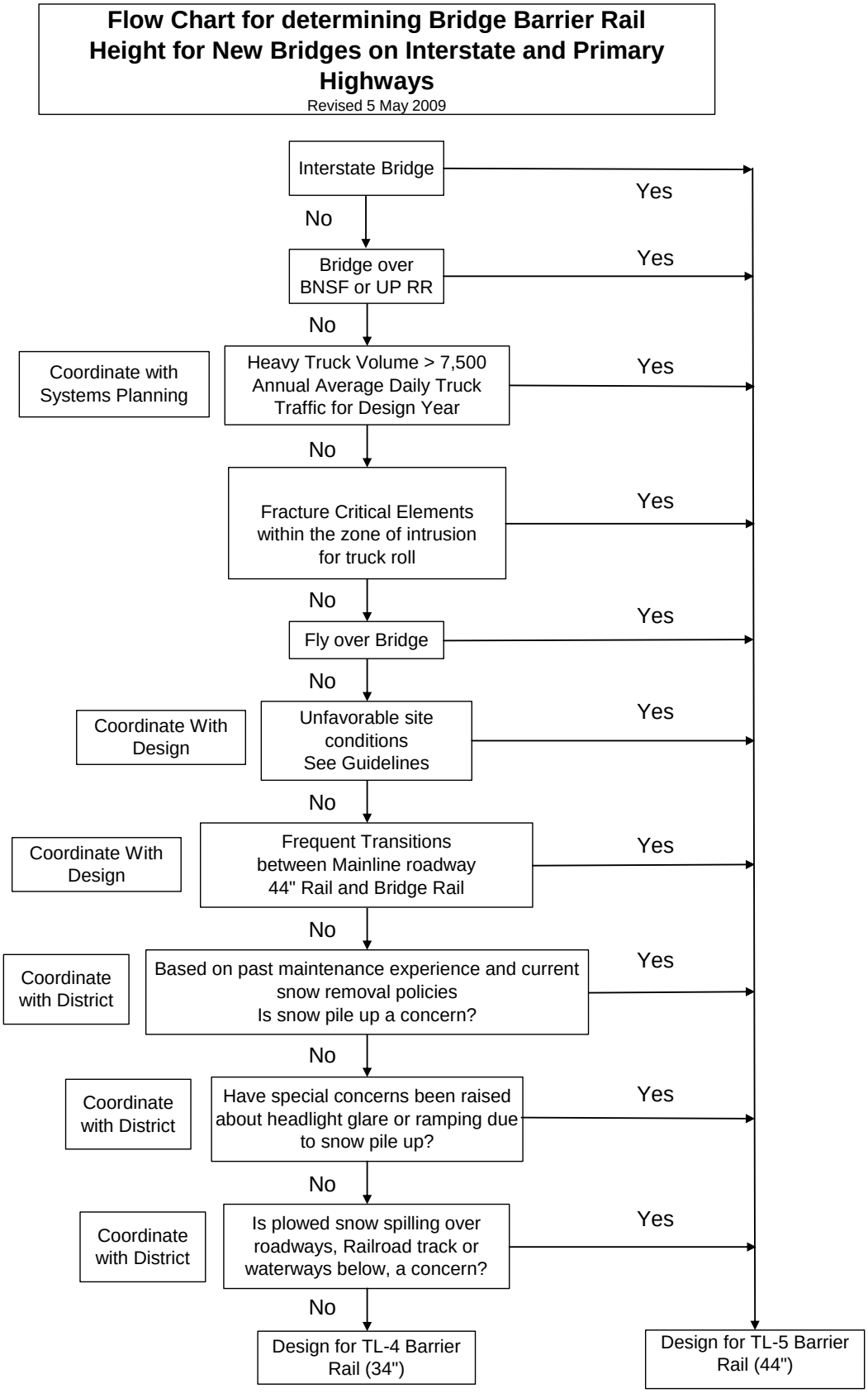
Partially revised: Methods Memo No. 81: Deck Drains
24 March 2005

C3.2.6.7 Bridge inspection/maintenance accessibility

C3.2.6.8 Barrier rails

Partially revised: Methods Memo No. 162: Bridge Railing Selection on Interstate and Primary Highways
29 June 2007

A flow chart is reproduced on the next page [BDM Figure 5.8.1.2.1].


Flow Chart for determining Bridge Barrier Rail Height for New Bridges on Interstate and Primary Highways
Revised 5 May 2009
Interstate Bridge
Yes
No
Bridge over BNSF or UP RR
Yes
No
Coordinate with Systems Planning
Heavy Truck Volume > 7,500 Annual Average Daily Truck Traffic for Design Year
Yes
No
Fracture Critical Elements within the zone of intrusion for truck roll
Yes
No
Fly over Bridge
Yes
No
Coordinate With Design
Unfavorable site conditions See Guidelines
Yes
No
Coordinate With Design
Frequent Transitions between Mainline roadway 44" Rail and Bridge Rail
Yes
No
Coordinate with District
Based on past maintenance experience and current snow removal policies Is snow pile up a concern?
Yes
No
Coordinate with District
Have special concerns been raised about headlight glare or ramping due to snow pile up?
Yes
No
Coordinate with District
Is plowed snow spilling over roadways, Railroad track or waterways below, a concern?
Yes
No
Design for TL-4 Barrier Rail (34")
Design for TL-5 Barrier Rail (44")