OHIO DEPARTMENT OF TRANSPORTATION

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

October 21, 2011

To: Users of the Bridge Design Manual

From: Tim Keller, Administrator, Office of Structural Engineering

By: Sean Meddles, Bridge Standards Engineer

Re: 2011 Fourth Quarter Revisions

Revisions have been made to the ODOT Bridge Design Manual, January 2004. These revisions shall be implemented on all Department projects with a Stage 2 plan submission date after October 21, 2011.

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/HighwayOps/Structures/standard/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
302.1.4.3	3-12 through 3-13	The 9-inch width of sealing on the bridge deck surface has been eliminated. The epoxy-urethane sealer at this location has a history of poor performance. Since this area is already sealed with HMWM in accordance with C&MS 511.22, the application of epoxy-urethane sealer is not necessary.
304.3.4	3-86	This section was revised with the release of new Standard Bridge Drawing, TBR-1-11.
Figure 310		Refer to BDM Section 302.1.4.3 description above.
Figure 311		Refer to BDM Section 302.1.4.3 description above.
Figure 310M		Refer to BDM Section 302.1.4.3 description above.
Figure 311M		Refer to BDM Section 302.1.4.3 description above.
606.3		Note [31] was retired when the information was added to C&MS 507.09 and the Department's Approved List.
611.2	6-30 through 6-31	Notes [93A] & [93B] were retired when the information was added to SS898.01 and SS898.15.
611.3	6-32	Note [51] was retired when the information was added to C&MS 516.04 & 516.05 and the Department's Qualified Products List (QPL).
701.2	7-1	Notes [57] & [58] were retired when the information was added to C&MS 518.05.
701.5	7-2	Note [62] was retired when the information was added to C&MS 511.10.
701.7	7-2	Note [92] was retired when the information was added to C&MS 516.07.
702.5	7-3	Note [69] was retired when the information was added to C&MS 516.07.
702.6	7-3	Note [70] was retired when the information was added to C&MS 516.07.
702.23	7-14	Note [91] was retired when the information was added to C&MS 513.22.
904	9-1	Personnel qualification requirements for the load rating analysis were clarified.

BDM Section	Affected Pages	Revision Description
905	9-3	Definitions for “Load Rater” and “MBE” were added.
906	9-4 through 9-5.4	The Ohio legislative changes effective June 29, 2011 were added.
907.12	9-8	Added rescinded actions to the Posting History requirements.
908	9-8	A cross-reference to BDM Section 928 was added.
911	9-9	Clarified the requirements for load rating substructures.
912	9-9	Revised the language for load rating procedure to help clarify responsibilities.
918.1	9-13	Provided information relative to non-ODOT bridges.
918.3	9-14 Through 9-15	Revised the procedure for bridge posting specific to each of Ohio’s legal loads.
918.5	9-15	Requirements for new inspection reports were added when posting or rescinding a load posting.
925.3	9-25 through 9-26	References have been added and information revised to Tables 925.3-1, 925.3-2 & 925.3-3.
Figure 905		New Bridge Weight Limit Signs have been provided
ARN-27	Appendix-109.14 through Appendix 109.15	Retired Note [31] for Steel Pile Points
ARN-28	Appendix 109.15	Retired Notes [93A] & [93B] for QC/QA Concrete for approach slabs
ARN-29	Appendix 109.15 through Appendix 109.17	Retired Note [51] for Semi-integral abutment expansion joint seal
ARN-30	Appendix 109.17	Retired Notes [57] & [58] for Porous Backfill with Filter Fabric
ARN-31	Appendix 109.17	Retired Note [62] for Backfill Concrete
ARN-32	Appendix 109.17 Through Appendix 109.18	Retired Note [92] for Sealing of Beam Seats

BDM Section	Affected Pages	Revision Description
ARN-33	Appendix 109.18	Retired Note [69] for controlling weld temperature on elastomeric bearing load plates
ARN-34	Appendix 109.18	Retired Note [70] for bearing repositioning
ARN-35	Appendix 109.18	Retired Note [91] for welded shear connectors on galvanized steel

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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 either Type D Waterproofing, CMS 512 or 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

be sealed with an epoxy-urethane sealer.

F. Concrete decks on prestressed I-beam 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; 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 be sealed with an epoxy-urethane sealer.

G. Concrete decks on prestressed I-beam superstructures with deflector parapets:

The inside face, top and outside face of parapet; 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 be sealed with either an epoxy-urethane sealer.

Concrete surfaces that include patches should be sealed with an epoxy-urethane sealer so the concrete color will remain uniform.

The designer should include in the plans actual details showing the position, location and area required to be sealed. A plan note should not be used to describe the location as there can be both description and interpretation problems.

The designer has the option to select a specific type of sealer, epoxy-urethane or non-epoxy. The designer may also use a bid item for sealer, with no preference, and allow the contractor to choose based on cost.

Due to poor performance, epoxy-only sealers shall not be used.

In areas where concrete surfaces have a history of graffiti vandalism, the designer may add a sacrificial or permanent graffiti coating meeting the requirements of Supplement 1083 on top of the epoxy-urethane or non-epoxy sealer. A plan note is available in BDM Section 600. The designer should limit the concrete surfaces that are treated with sacrificial or permanent graffiti coatings to those reachable by easy climbing and visible to the traveling public.

302.2 REINFORCED CONCRETE DECK ON STRINGERS

302.2.1 DECK THICKNESS

Bridge deck concrete thickness shall meet the requirements of AASHTO, this Manual and Standards.

For reinforced concrete decks on steel or concrete stringers the deck thickness shall be computed by the following formula:

T_{min} (inches) = $(S + 17)(12) \div 36 \geq 8\frac{1}{2}''$

T_{min} (mm) = $(S + 5200) \div 36 \geq 215$ mm

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Where S is the effective span length in feet [millimeters]. Tmin shall be rounded up to the nearest one-quarter inch [5 mm].

The one inch [25 mm] wearing thickness, Section 302.1.3.1, is included in the calculations for minimum concrete deck thickness but not in the calculations during actual structural design of the deck slab.

For transversely reinforced concrete deck slabs supported on steel stringers the effective span length "S" shall be considered equal to the distance center-to-center of stringers minus 6 inches [150 mm].

For concrete I-beam stringers the effective span length shall meet the requirements of AASHTO 3.24.1.2.

302.2.2 CONCRETE DECK DESIGN

The concrete deck design shall be in conformance with AASHTO, latest edition, and additional requirements in this Manual. The design live load shall be HS25 for decks on new superstructures and HS20 for decks on existing superstructures.

For continuous slabs on three or more supports a continuity factor of 0.80 shall be applied to the simple span bending moments for both live load and dead load.

See Figures 312 & 313 for an illustration of a method of design for a reinforced concrete deck slab. Design data tables for HS25 (Fig. 314A) and HS20-44 (Fig. 314B) live loads are also provided.

Upon completing the concrete deck design from the example shown in Figure 312 & 313, or similar method, the designer should assure any cantilevered deck overhang will not over stress the initial deck design due to the dead load and the greater live load of either the vehicle wheel loads or the railing live loads. See relevant AASHTO sections for live load application requirements. See example Figures 315 & 316.

Transverse spacing of the top and bottom reinforcing in a deck design shall meet section 302.2.4.2.

302.2.3 DECK ELEVATION REQUIREMENTS

302.2.3.1 SCREED ELEVATIONS

Screed elevations are control elevations for concrete deck finishing machines that account for dead load deflections to ensure that the bridge deck is completed to the correct elevation. To establish screed elevations, the final surface elevations are adjusted for non-composite

structures where protection against oncoming headlight glare is required. The structure's barrier height and type shall match the design of the adjoining roadway median barrier.

For each of the above listed barrier types, designers are required to confirm the structural adequacy of the concrete deck slab as described in the "Concrete Deck Design" Section 302.2 of this manual.

All concrete parapet type barriers shall be designed and detailed as follows:

A. All horizontal reinforcing steel shall be detailed as continuous for the total length of the structure.

B. Crack control joints shall be sawed into the concrete parapets. The distance between the saw-cut joints on the structure shall be between 6'-0" and 10'-0". The detailed locations of the crack control joints and vertical reinforcing bars shall be shown in the contract plans for all parapet types.

C. The saw-cut crack control joint shall be detailed as 1 ¼ inch deep and shall be filled with a polyurethane or polymeric material conforming to ASTM C920, Type S. The bottom one-half inch of both the inside and outside face shall be left unsealed to allow any water that enters the joint to escape. This requirement is established in the Standard Bridge Drawings; however, a plan note is required for special designs. See Section 600.

304.3.2 DEEP BEAM BRIDGE GUARDRAIL (DBR-2-73)

This railing configuration does not meet the Department's minimum NCHRP 350 or MASH acceptance criteria (i.e. TL-3) for use on any project described in Section 304.1 of this manual. In no case, shall this railing system be used on an overpass structure or a project where the finished deck surface is greater than 25 feet above the normal water surface elevation or final ground line.

When a structure is included in a project, as defined in Section 304.1 of this manual, existing Deep Beam Bridge railing shall be upgraded in accordance with Standard Bridge Drawing, DBR-3-11.

The standard configuration for this rail type does not meet the minimum requirements specified by AASHTO for pedestrian and bicycle railings and shall not be used where pedestrian or bicycle traffic is expected. A modified railing design meeting these requirements and using the Type 1 post design may be justified.

Use of Type A anchors, as detailed on the Standard Bridge Drawing, is not recommended. The Type B alternative is recommended because they are easier to install in a deck or box beam and easier to replace if damaged in a collision.

Designers should recognize that variable post lengths may be required along the length of a

structure due to beam camber. A design data sheet is available from the Office of Structural Engineering to address these concerns.

304.3.3 TWIN STEL TUBE BRIDGE RAILING (TST-1-99)

This railing configuration was developed as a replacement to the Deep Beam Bridge Guardrail system on projects requiring a higher NCHRP acceptance level. The Twin Steel Tube Bridge Railing is for use over rural stream crossings on two (2) lane routes with an ADTT in one direction less than 2500 where the finished deck surface is less than 25 feet above the normal water surface elevation or final ground line. This system shall not be used on an overpass structure.

The standard configuration for this rail type does not meet the minimum requirements specified by AASHTO for pedestrian and bicycle railings and shall not be used where pedestrian or bicycle traffic is expected. A modified railing design meeting these requirements may be justified.

The required bridge terminal assembly section used to transition from Type 5 or 5A approach roadway guardrail to the bridge railing is detailed on Standard Construction Drawing GR-3.6.

The typical post spacing is 6'-3". The standard drawing enables the designer to reduce the first, last and one additional post spacing per span on each side of the bridge to account for construction clearances. The designer should carefully review the position of the posts that are near the corner of a structure for possible interference with wingwalls, tie rods, etc. For box beam bridge types, post spacing dimensions shall be referenced to each box beam end.

The site plan shall show the station of the center of the first inlet-mounted post on each corner of the bridge.

304.3.4 BRIDGE RETRO-FIT RAILING, THRIE BEAM BRIDGE RAILING FOR BRIDGES WITH SAFETY CURBS (TBR-1-11)

Thrie beam railing, as described on Standard Bridge Drawing TBR-1-11, is for use as a provisional upgrade on structures with safety curb and parapets where a safety upgrade is required under Section 304.1, and the structure will be rehabilitated or replaced in the near future.

The Office of Structural Engineering does not generally recommend this alternative because of the potential for high maintenance costs. A more suitable alternative is concrete refacing of existing safety curb and parapets to either a New Jersey or Single Slope shape. See Section 400 of this Manual for additional information on refacing of safety curb and parapets.

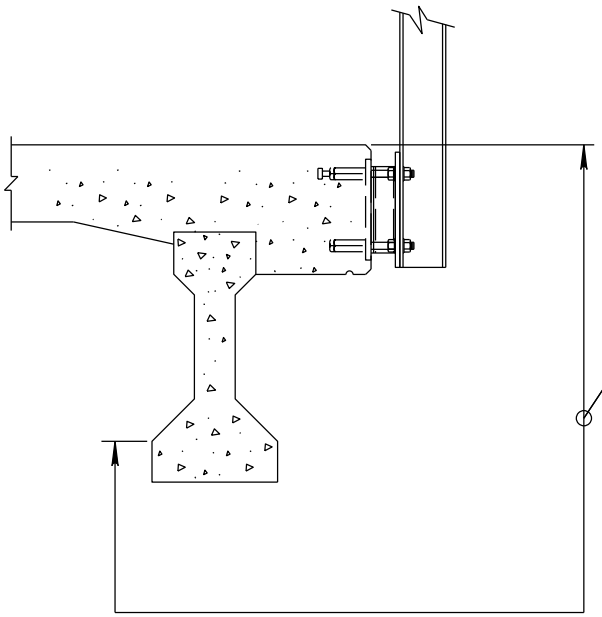
304.3.5 PORTABLE CONCRETE BARRIER (PCB-91)

This system is for use on construction projects to protect project personnel and to provide a

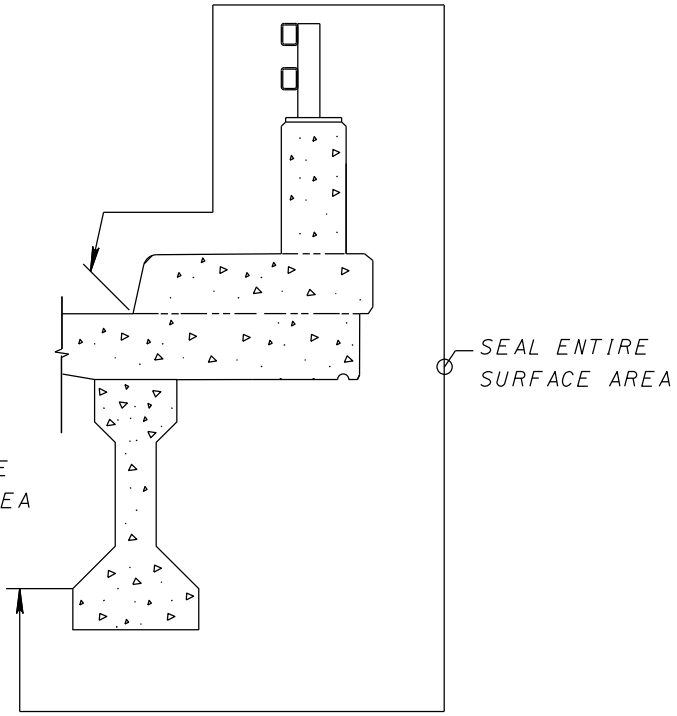
STD. BAR LENGTH DEDUCTIONS FOR COMMON BENDS. (IN)								
BAR NO.	STANDARD BEND (DEGREES)							
	D	45	D	90	D	135	D	180
#3	1 1/2"	1/4"	2 1/4"	1"	1 1/2"	1"	2 1/4"	1 7/8"
#4	2"	1/4"	3"	1"	2"	1 1/4"	3"	2 1/2"
#5	2 1/2"	3/8"	3 3/4"	1 1/2"	2 1/2"	1 5/8"	3 3/4"	3 1/8"
#6	3"	3/8"	4 1/2"	2"	3"	2"	4 1/2"	3 3/4"
#7	3 1/2"	1/2"	5 1/4"	2"	3 1/2"	2 1/4"	5 1/4"	4 3/8"
#8	4"	1/2"	6"	2 1/2"	4"	2 1/2"	6"	5"
#9	6 3/8"	5/8"	9 1/2"	3 1/2"	6 3/8"	3 3/8"	9 1/2"	6 7/8"
#10	7 1/8"	3/4"	10 3/4"	4"	7 1/8"	3 3/4"	10 3/4"	7 3/4"
#11	8"	3/4"	12"	4"	8"	4 1/4"	12"	8 5/8"
#14	12 1/8"	1"	18 1/4"	6"	12 1/8"	5 5/8"	18 1/4"	12"
#18	16"	1 3/8"	24"	8"	16"	7 1/2"	24"	15 3/4"

NOTE:
"D" IS THE DIAMETER OF THE BEND PER CONSTRUCTION AND MATERIAL SPECIFICATIONS ITEM 509.05

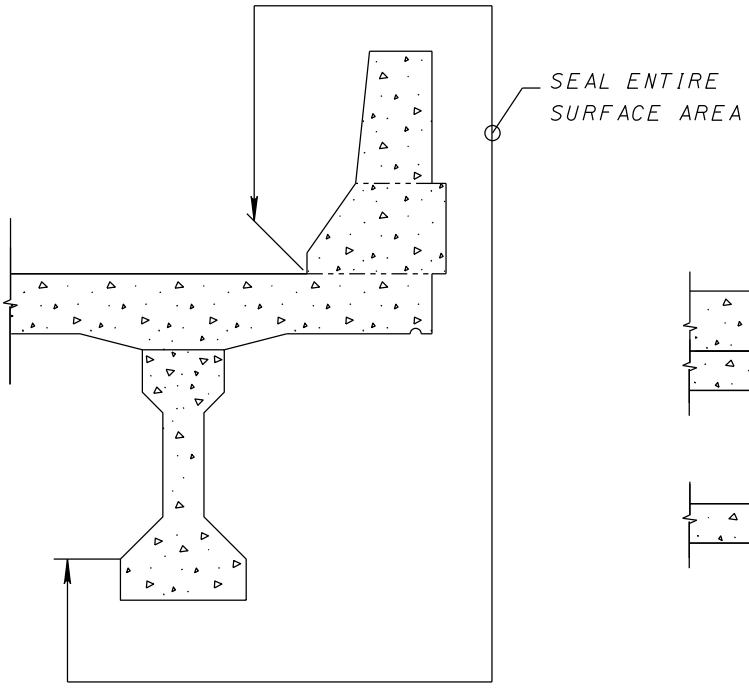
Figure 309



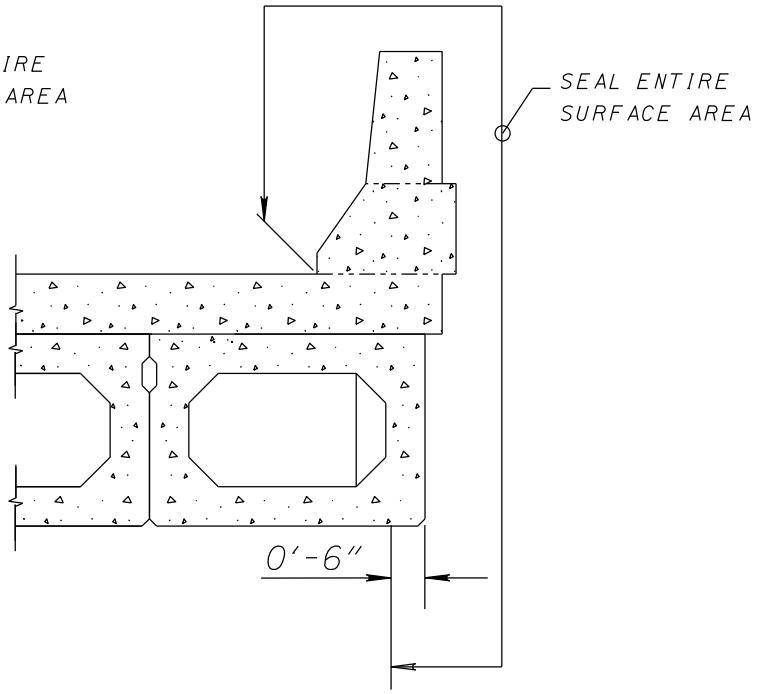
CONCRETE DECKS WITH
OVER THE SIDE DRAINAGE



CONCRETE DECKS WITH CURBS,
SIDEWALKS AND PARAPET



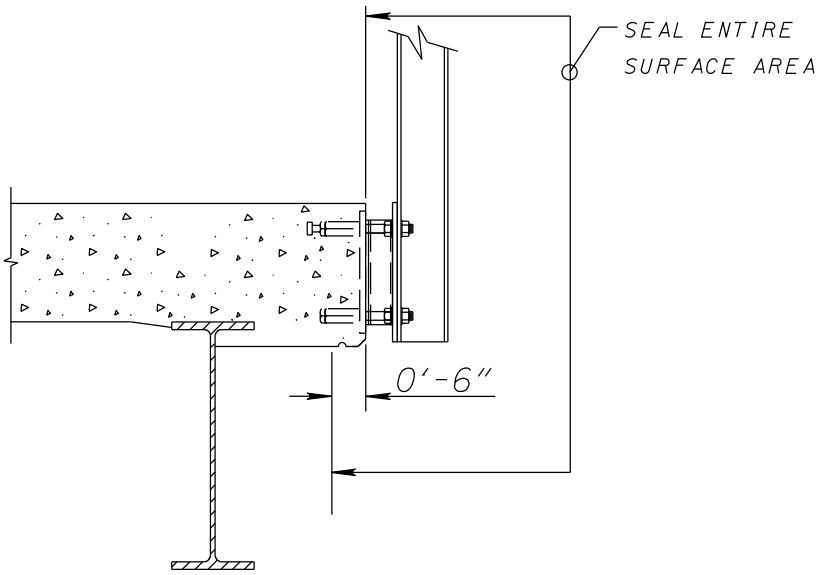
CONCRETE DECK WITH
DEFLECTOR PARAPET



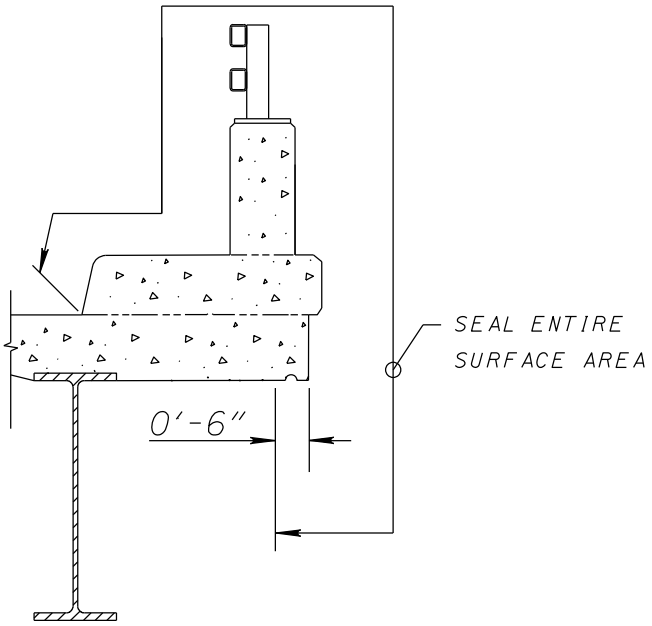
PRESTRESSED BOX BEAM DECK
WITH DEFLECTOR PARAPET

SEALING OF CONCRETE SURFACES, SUPERSTRUCTURE

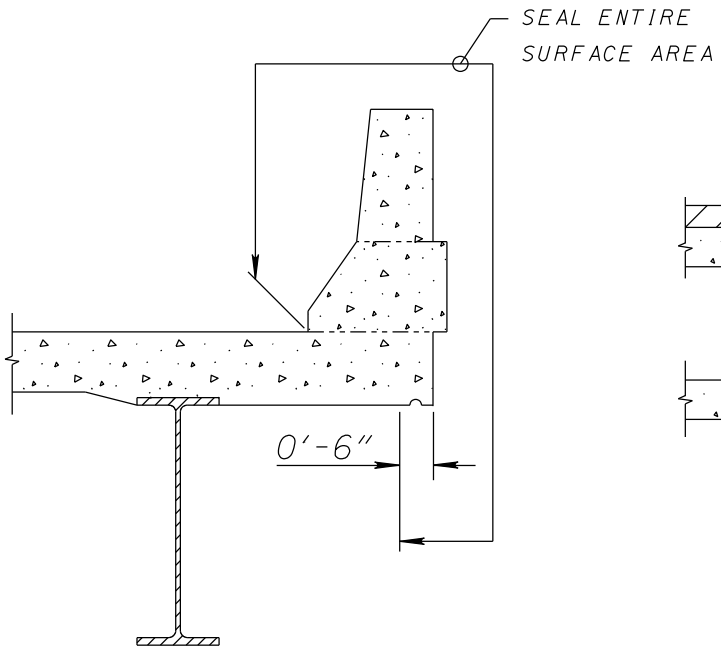
Figure 310



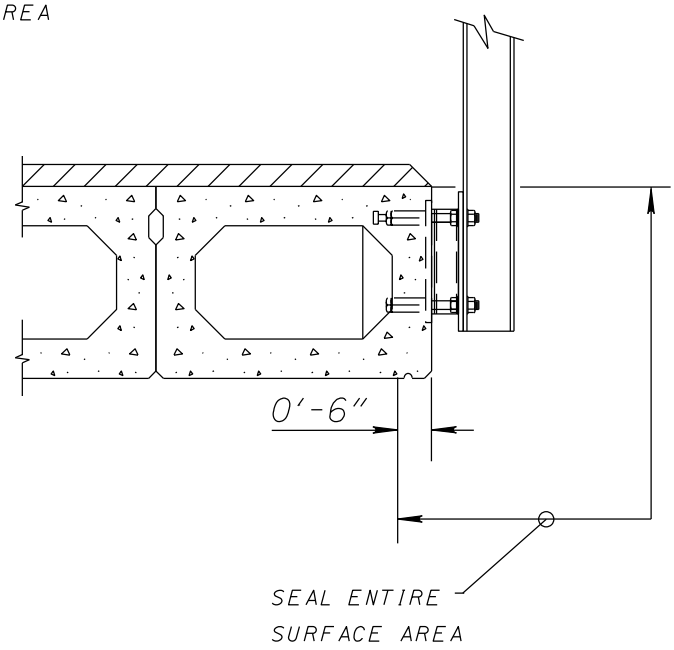
CONCRETE DECKS WITH
OVER THE SIDE DRAINAGE



CONCRETE DECKS WITH CURBS,
SIDEWALKS AND PARAPET



CONCRETE DECK WITH
DEFLECTOR PARAPET



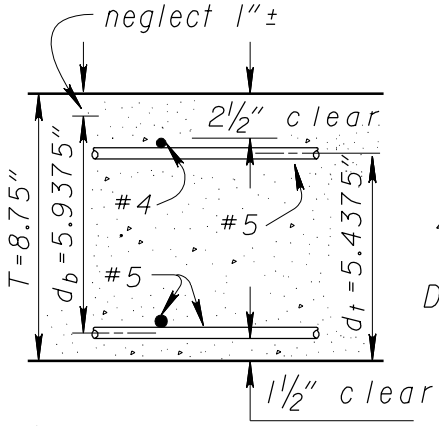
PRESTRESSED BOX BEAM DECK
WITH OVER THE SIDE DRAINAGE

SEALING OF CONCRETE SURFACES, SUPERSTRUCTURE

Figure 311

TRANSVERSE SLAB DESIGN COMPUTATIONS

Sample problem : Using load factor design procedures determine the slab thickness and main reinforcement for a deck slab with an 9'-6" stringer spacing and an HS25-44 loading.



S = 9'-6" minus 6" = 9'-0"
Tmin. = (S+17)/(36) = 0.72' = 8.67" ⩾ 8½", use 8¾"
f_c' = 4500 psi
f_y = 60000 psi
ϕ = 0.9 (8.16.1.2.2)
Z = 130 k/in(top), 170 k/in(bottom) (8.16.8.4)
n = 8 Impact = 30%

Dead load W :
Slab = (0.73')(1.0')(0.15 k/ft^2) = 0.110 k/ft
FWS = 60 p.s.f.(1.0') = 0.060 k/ft
TOTAL DEAD LOAD (W) = 0.170 k/ft

Design Moments :

DL = (0.125)(W)(S^2)(0.8) = (0.125)(0.170)(9.0^2)(0.8) = 1.38 ft-k
LL + I = (S+2)(20)(1.3)(0.8)/32 = 7.15 ft-k (3.24.3.1)
Mu = 1.3[DL+1.67(LL+I)] = 1.3[1.38+1.67(7.15)] = 17.32 ft-k (3.22)
Mw = Service load moment = DL + LL+I = 8.53 ft-k

$$\rho = \frac{(0.85)f_c'}{f_y}\left[1-\sqrt{1-\frac{2R}{(0.85)f_c'}}\right] \qquad K = [2\rho n+(\rho n)^2]^{1/2}-\rho n \qquad j = 1-(K/3)$$

Top Reinforcement	Bottom Reinforcement
$R = Mu/\phi bd^2$	
$R = (17.32)(1000)/(0.9)(1)(5.438^2)$ = 650.77 psi	$R = (17.32)(1000)/(0.9)(1)(5.938^2)$ = 545.79 psi
ρ = 0.01196	ρ = 0.00985
As = (0.01196)(12)(5.438) = 0.78 in^2/ft	As = (0.00985)(12)(5.938) = 0.70 in^2/ft
Try #5 bars at 4.75" in (As=0.78 in^2/ft)	Try #5 bars at 5.25" in (As=0.71 in^2/ft)

Check steel spacing (8.16.8.4)

f_s (all.) = $z/(d_c A)^{1/3} \leqslant 0.6f_y$

d_c = 2+(0.625/2) = 2.312 in	d_c = 1.5+(0.625/2) = 1.812 in
A = 2(2.312 x 4.75) = 21.96 in^2/ft	A = 2(1.812 x 5.25) = 19.03 in^2/ft
f_s (all.) = $130/[(2.312)(21.96)]^{1/3} \leqslant 0.6(60)$ = 35.11 ksi ⩽ 36.0 ksi	f_s (all.) = $170/[(1.812)(19.03)]^{1/3} \leqslant 36.0$ ksi = 52.23, use 36.0 ksi max.

f_s (act.) = Mw/As jd

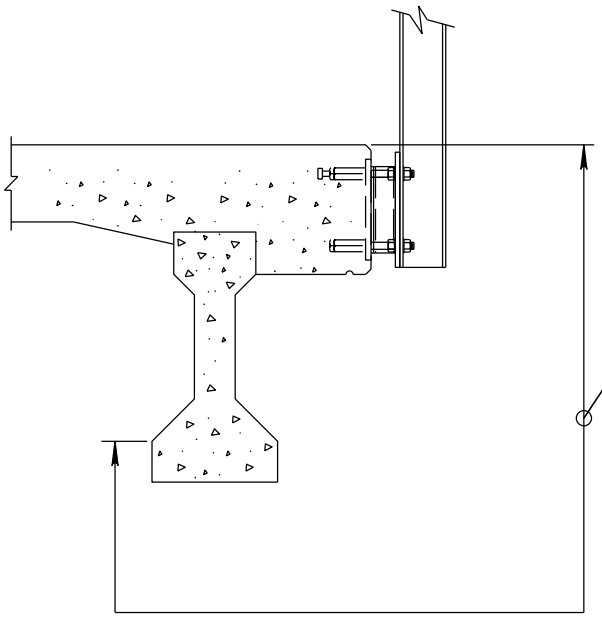
f_s (act.) = (8.53)(12)/(0.78)(0.89)(5.438) = 27.11 ksi (OK)	f_s (act.) = (8.53)(12)/(0.71)(0.89)(5.938) = 27.28 ksi (OK)
✡Use #5 bars @ 4.75"c/c (As=0.78 in^2/ft)	✡Use #5 bars @ 4.75"c/c (As=0.78 in^2/ft)

Prepared	Checked	Traced	Date
RZ	SAM	RZ	12-08-99

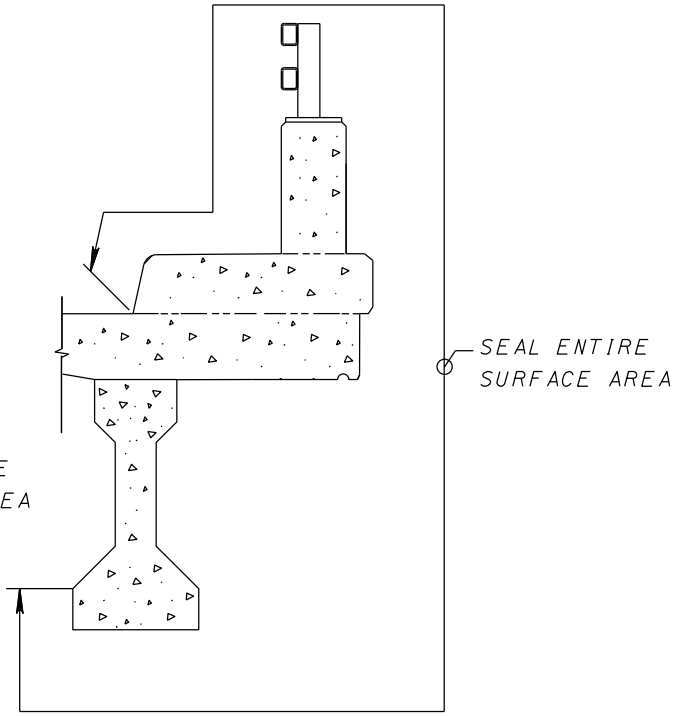
AASHTO

✡Top and bottom bars shall coincide based on BDM Section 302.2.4.2

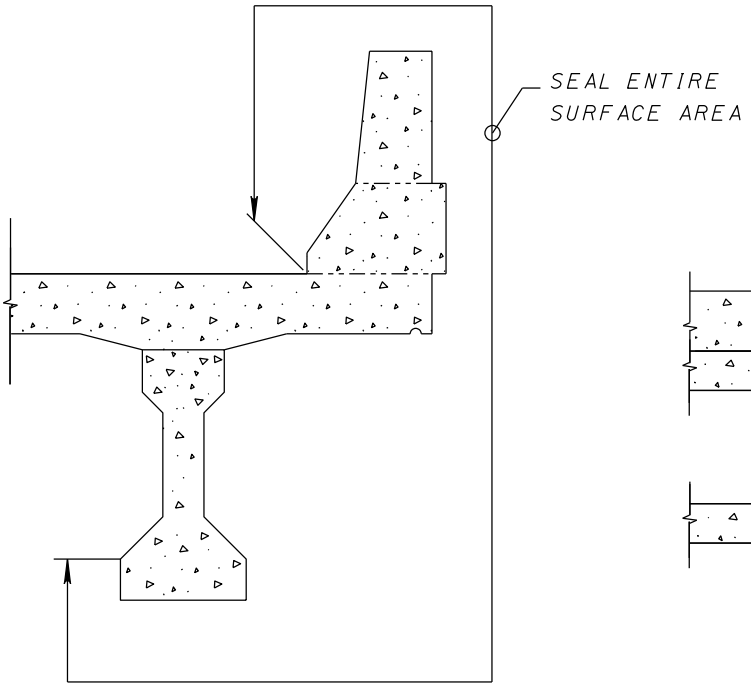
Figure 312



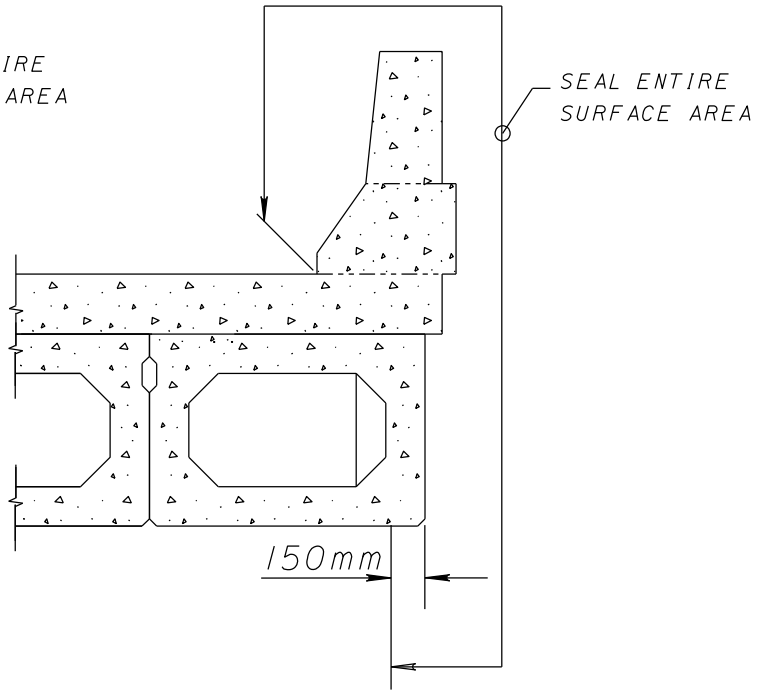
CONCRETE DECKS WITH
OVER THE SIDE DRAINAGE



CONCRETE DECKS WITH CURBS,
SIDEWALKS AND PARAPET



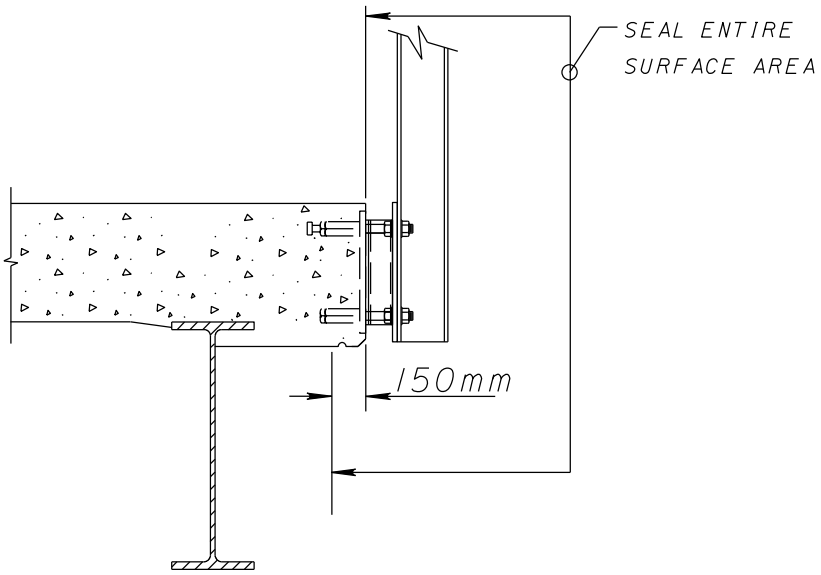
CONCRETE DECK WITH
DEFLECTOR PARAPET



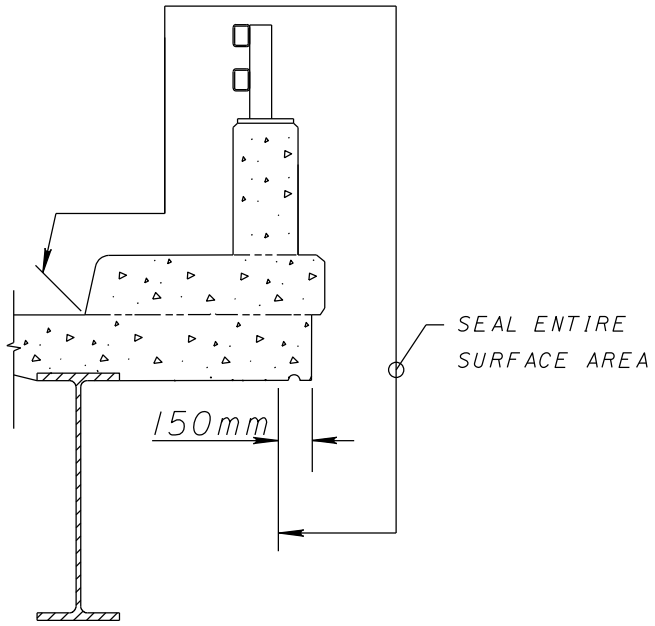
PRESTRESSED BOX BEAM DECK
WITH DEFLECTOR PARAPET

SEALING OF CONCRETE SURFACES, SUPERSTRUCTURE

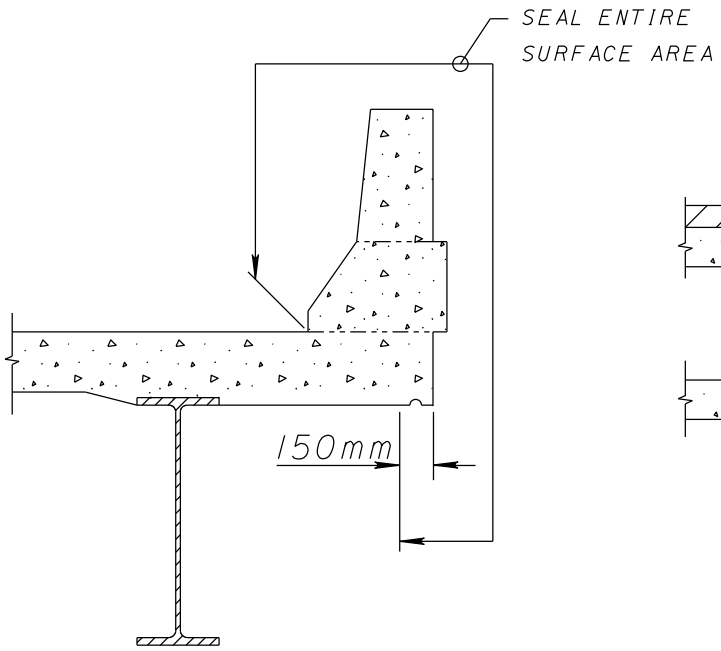
Figure 310M



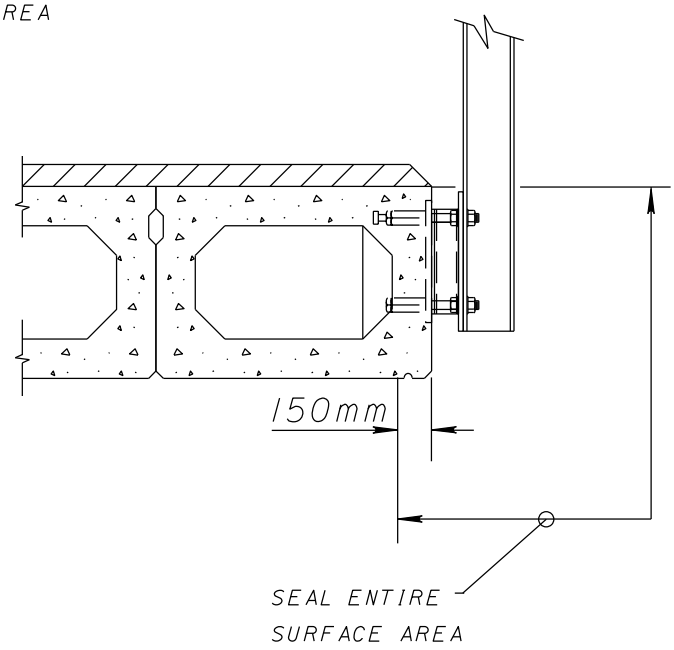
CONCRETE DECKS WITH
OVER THE SIDE DRAINAGE



CONCRETE DECKS WITH CURBS,
SIDEWALKS AND PARAPET



CONCRETE DECK WITH
DEFLECTOR PARAPET



PRESTRESSED BOX BEAM DECK
WITH OVER THE SIDE DRAINAGE

SEALING OF CONCRETE SURFACES, SUPERSTRUCTURE

Figure 311M

for the remaining piling represented by the testing. Submit all test results to the Office of Structural Engineering.

For subsequent static load tests, upon completion of a 10,000 ft [3000 m] increment of driven length, repeat the above procedure for the initial static load test. If necessary, the Engineer will revise the driving criteria for the remaining piling accordingly.

When performing the restrike, if the pile has not reached the blow count determined for the plan specified Ultimate Bearing Value, continue driving the pile until this capacity is achieved.

Provide the following note when battered piles are specified.

[30d] BATTERED PILES: The blow count for battered piles shall be the blow count determined for vertical piles of the same Ultimate Bearing Value divided an efficiency factor (D). Compute the efficiency factor (D) as follows:

$$D = \frac{1 - UG}{\sqrt{\left(1 + G^2\right)}}$$

U = Coefficient of friction, which is estimated at 0.05 for double-acting air operated or diesel hammers; 0.1 for single-acting air operated or diesel hammers; and 0.2 for drop hammers.

G = Rate of batter (1/3, 1/4, etc.)

606.3 STEEL PILE POINTS

[31] Note retired - see appendix

606.4 PILE SPLICES

Provide the following note when H-piles are specified.

[100] PILE SPLICES: In lieu of using the full penetration butt welds specified in CMS 507.09 to splice steel H-piles, the Contractor may use a manufactured H-pile splicer. Furnish splicers from the following manufacturer:

Associated Pile and Fitting Corporation

8 Wood Hollow Rd. Plaza 1

Parsippany, New Jersey 07054

Install and weld the splicer to the pile sections in accordance with the manufacturer's written assembly procedure supplied to the Engineer before the welding is performed.

606.5 MINIMUM HAMMER SIZE

[33] Note retired - see appendix

606.6 PILE ENCASEMENT

The following note shall be used where capped pile piers and steel "H" piles are being used for a bridge structure crossing a waterway. The exposed steel piling corrodes at the waterline, or near there. The note should not be used if the capped pile pier standard drawing is being used as standard drawing already specifies pile encasement methods.

[34] ITEM SPECIAL - PILE ENCASEMENT

Encase all steel H-piles for the capped pile piers in Class C concrete. Provide a concrete slump between 6 to 8 inches with the use of a superplasticizer. Place the concrete within a form that consists of polyethylene pipe (707.33), or PVC pipe (707.42). The encasement shall extend from 3 feet [1 meter] below the finished ground surface up to the concrete pier cap. Position pipe so that at least 3 inches [75 mm] of concrete cover is provided around the exterior of the pile.

In lieu of encasing the pile in concrete, galvanize the piles according to 711.02. The galvanizing shall be continuous from a minimum of 3 feet below the finish ground surface up to the concrete pier cap. The galvanized coating thickness shall be a minimum of 4 mils [100 μm]. Repair all gouges, scrapes, scratches or other surface imperfections caused by the handling or the driving of the pile to the satisfaction of the Engineer.

The Department will measure pile encasement by the number of feet. The Department will determine the sum as the length measured along the axis of each pile from the

610.7 RAILING

Use the following note where the existing parapet is to be refaced. Modify the note accordingly for each specific project.

[48] ITEM 517 - RAILING FACED, AS PER PLAN

DESCRIPTION: This work consists of facing curb style parapets, using cast in place concrete, to obtain the deflector shape as shown in the plans.

REMOVAL: Carefully remove the existing aluminum railing, posts, curb plates, existing concrete curb and bulb angle gutter. Remove all loose or unsound concrete. Remove sound concrete, as necessary, to obtain a minimum 4 inch [100 mm] thickness of new concrete.

NOTE TO DESIGNER: Modify the list of items in the above removal portion of this note as necessary to fit the actual conditions of your particular project.

DOWEL HOLES AND REINFORCING STEEL: Drill dowel holes where shown in the plans. Install reinforcing steel according to Item 510 using epoxy grout, 705.20. Prior to drilling dowel holes, locate all existing reinforcing steel bars in the area of the hole with the aid of a reinforcing steel bar locator (pachometer). If an existing bar is encountered at the same location as a proposed dowel hole, move the dowel hole to either side of the existing bar. The Department will pay for all reinforcing steel, dowel holes and grouting with Item 517.

SURFACE PREPARATION: Thoroughly clean the parapet surface in contact with the refacing with detergent to remove surface contaminants. After detergent cleaning and within 24 hours of placing concrete, blast clean and air broom or power sweep all surfaces in contact with the refacing to remove all spalls, laitance, curing compounds, concrete sealers and other contaminants detrimental to the achievement of an adequate bond. Acceptable blast cleaning methods are high-pressure water blasting with or without abrasives in water, abrasive blasting with containment or vacuum abrasive blasting. Use hand tools as necessary to remove scale from any exposed reinforcing steel. Materials: Concrete shall be Class _*_ (S or HP) with a compressive strength of 4500 psi [31 MPa]. Furnish reinforcing steel according to 709.00, grade 60 [420], with a minimum yield strength of 60,000 psi [420 MPa].

CONTROL JOINTS: Sawcut 1 1/4 inch [32 mm] deep control joints along the perimeter of the parapet as soon as the saw can be operated without damaging the concrete. Place the joint saw cuts at the same location as the existing deflection joints. Use an edge guide, fence or jig to ensure that the cut joint is straight, true and aligned on all faces of the parapet. The joint width shall be the width of the saw blade, a nominal width of 1/4 inch [6 mm]. Seal the perimeter of the control joint to a minimum depth of one inch [25

mm] with a polyurethane or polymeric material conforming to ASTM C920, Type S. Leave the bottom one-half inch [12 mm] of both the inside and outside faces of the parapet unsealed to allow any water which may enter the joint to escape.

METHOD OF MEASUREMENT: The Department will measure this item in feet by the actual length of railing faced between the ends of the existing concrete parapet.

BASIS OF PAYMENT: Payment for this item includes all costs of removal, dowel holes, reinforcing steel, concrete, shrinkage control joints, epoxy injection and inspection platforms. The Department will pay for accepted quantities at the contract price for Item 517, Railing Faced, As Per Plan.

NOTE TO DESIGNER: Include the reinforcing steel in the bar list with appropriate bending diagrams, as necessary, even though the reinforcing steel is included with item 517 for payment. Modify the method of measurement and items of work included in this pay item as necessary to fit your specific project.

611 MISCELLANEOUS GENERAL NOTES

611.1 DOWEL HOLES

[49] Note Retired - See appendix

611.2 APPROACH SLABS

[50] Note Retired - See Appendix

[50A] Note Retired - See appendix

[93A] Note Retired - See appendix

[93B] Note Retired - See appendix

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611.3 INTEGRAL AND SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEALS

[51] Note Retired - See Appendix

611.4 BACKWALL DRAINAGE

[52] Note Retired - See Appendix

[53] Note Retired - See Appendix

611.5 CONCRETE PARAPET SAWCUT JOINTS

Include the following note in the Structural General Notes when a concrete parapet or railing is used and standard drawings do not cover the below requirements.

[54] CONCRETE PARAPETS: As soon as a concrete saw can be operated without damaging the freshly placed concrete, sawcut 1 1/4" [32 mm] deep control joints into the perimeter of the concrete parapet starting and ending at the elevation of the concrete deck. Place the sawcuts at a minimum of 6 feet [2 meter] and a maximum of 10 feet [3 meter] centers. Use an edge guide, fence, or jig to ensure that the cut joint is straight, true, and aligned on all faces of the parapet. The joint width shall be the width of the saw blade, a nominal width of 1/4 inch [32 mm]. Seal the perimeter of the deflection control joint to a minimum depth of 1 inch [25 mm] with a polyurethane or polymeric material conforming to ASTM C920, Type S. Leave the bottom ½ inch [13 mm] of the inside and outside face unsealed to allow water to escape.

611.6 BEARING PAD SHIMS, PRESTRESSED

Add the following note to ensure proper seating of prestressed concrete box beams for skewed bridges.

[55] BEARING PAD SHIMS: Place 1/8" [3 mm] thick preformed bearing pad shims, plan area ___ inches by ___ inches, under the elastomeric bearing pads where required for

SECTION 700 – TYPICAL DETAIL NOTES

701 SUBSTRUCTURE DETAILS

701.1 STEEL SHEET PILING

Place the following note on the substructure or retaining wall sheet with the details of steel sheet piling that is to be left in place.

[56] STEEL SHEET PILING left in place shall have a minimum section modulus of_____ in^3 per foot of wall.

[56M] STEEL SHEET PILING left in place shall have a minimum section modulus of_____ mm^3 per meter of wall.

701.2 POROUS BACKFILL

[57] Note Retired - See Appendix

[58] Note Retired - See Appendix

701.3 BRIDGE SEAT REINFORCING

For structures that contain bearing anchors, place one of the two following notes on an appropriate abutment or pier detail sheet near the "Bearing Anchor Plan". Where the Contractor is allowed the option of presetting bearing anchors (or formed holes), or of drilling bearing anchor holes, provide the first note. Where drilling of anchors into the bridge seat is required, provide the second note. (Formed holes are not practical for prestressed concrete box beam bridges.)

[59] BRIDGE SEAT REINFORCING, SETTING ANCHORS: Accurately place reinforcing steel in the vicinity of the bridge seat to avoid interference with the drilling of bearing anchor holes or the pre-setting of bearing anchors.

[60] BRIDGE SEAT REINFORCING, SETTING ANCHORS: Accurately place reinforcing steel in the vicinity of the bridge seat to avoid interference with the drilling of anchor bar holes.

701.4 BRIDGE SEAT ELEVATIONS FOR ELASTOMERIC BEARINGS

Where bridge seats have been adjusted to compensate for the vertical deformation of elastomeric bearings, place the following note with the necessary modifications on the appropriate

substructure detail sheet.

[61] BRIDGE SEAT ELEVATIONS have been adjusted upward _____ inches [mm] at abutments and _____ inches [mm] at piers to compensate for the vertical deformation of the bearings.

701.5 PROPER SEATING OF STEEL BEAMS AT ABUTMENTS

[62] Note Retired - See Appendix

For a steel beam bridge with concrete backwalls and sealed deck joints employing superstructure support or armor steel of considerable stiffness where there is a possibility of individual beams being lifted off of their bearings in a clamping operation, a note similar to the following shall be provided:

[63] INSTALLATION OF SEAL: During installation of the support/armor for the superstructure side of the expansion joint seal, observe the seating of beams on bearings to assure that positive bearing is maintained.

701.6 BACKWALL CONCRETE PLACEMENT FOR PRESTRESSED BOX BEAMS

For prestressed concrete box beam bridges where the placement of the wingwall concrete above the bridge seat needs to occur after the beams have been erected to allow for the tolerances of the beam fit-up and for beam erection clearances, provide the following note:

[64] ABUTMENT CONCRETE: Do not place the abutment concrete above the bridge seat construction joint until the prestressed concrete box beams have been erected.

701.7 SEALING OF BEAM SEATS

[92] Note Retired - See Appendix

702 SUPERSTRUCTURE DETAILS

702.1 STEEL BEAM DEFLECTION AND CAMBER

For steel beam or built-up girder bridges provide a table similar to Figure 701 on a structural steel detail sheet. Tabulation is required regardless of the amount of deflection and is required for all beams or girders, if the deflection is different.

Show the deflection and camber data as described in Section 302.4.1.8. The table is to include bearing points, quarter points, center of span, splice points, and maximum 30 foot [10.0 meter]

increments. Unique geometry may require an even closer spacing.

702.2 STEEL NOTCH TOUGHNESS REQUIREMENT (CHARPY V-NOTCH)

CVN material is a requirement to help assure fracture toughness of main material. Designers using this note should understand not only why CVN is specified but what is a main member. Section 302.4.1.10 helps with the definition of main members and specially highlights that crossframes of curved steel structures, because they are actual designed members carrying liveload forces, are also main members. Designers are reminded they must indicate specific pieces, members, shapes, etc. that are main members.

Place the following note on a structural steel detail sheet for bridges having main load-carrying members that must meet minimum notch toughness requirements:

[65] CVN: Where a shape or plate is designated (CVN), furnish material that meets the minimum notch toughness requirements as specified in 711.01.

702.3 HIGH STRENGTH BOLTS

For all structural steel superstructures, place the following note on the structural detail sheet:

[66] HIGH STRENGTH BOLTS shall be _____ diameter A325 unless otherwise noted.

[67] Note retired - see appendix

702.4 SCUPPERS

[68] Note retired - see appendix

702.5 ELASTOMERIC BEARING LOAD PLATE

[69] Note retired - see appendix

702.6 BEARING REPOSITIONING

[70] Note retired - see appendix

702.7 CONCRETE PLACEMENT SEQUENCE NOTES

Also see section 701.5 notes.

702.7.1 CONCRETE INTERMEDIATE DIAPHRAGM FOR PRESTRESSED CONCRETE I-BEAMS

If the design plans do not reference Standard Bridge Drawing PSID-1-99, provide the following note.

702.17 STEEL DRIP STRIP

[84] Note retired - see appendix
[85] Note retired - see appendix

702.18 REINFORCING STEEL FOR REHABILITATION

[86] Note retired - see appendix

702.19 ELASTOMERIC BEARING MATERIAL REQUIREMENTS

[87] ELASTOMERIC BEARINGS: The elastomer shall have a hardness of ____ durometer. The bearings were designed under Division I, Section 14.6.___ (Method ___) of the AASHTO Standard Specifications for Highway Bridges.

NOTE TO DESIGNER: Design Method A is Section 14.6.6 and Method B is Section 14.6.5.

702.20 BEARING SEAT ADJUSTMENTS FOR SPECIAL BEARINGS

Provide the following plan note in project plans that specify specialized bearings such as pot, spherical or disc. This note is intended to ensure that the contractor builds the bearing seats to the proper elevation in the event that the bearing manufacturer adjusts the height of the bearing from the height assumed in the design plans.

[88] The pier and abutment beam seat elevations are based on bearing heights provided in the table below. If the Contractor's selected bearing manufacturer has a design that does not conform to the heights provided in the table, adjust the bearing seat elevations at no additional cost to the state. Adjust the location of reinforcing steel horizontally as necessary to avoid interference with the bearing anchor bolts. Maintain the minimum concrete cover and minimum spacing required by the project plans. If the reinforcing steel cannot be moved to provide the required position for the anchor bolts, the Contractor's bearing manufacturer shall re-design the bearings to accommodate an acceptable anchor bolt configuration.

	Rear Abutment	Pier No #	Forward Abutment
Member Line 1			
Member Line 2			
Member Line 3			
Member Line 4			

702.21 HAUNCHED GIRDER FABRICATION NOTE

For steel haunched girders, add the following note on the design plan sheet that shows an elevation view of the typical haunched girder section defining web size, flange size, depth of member, CVN, etc.

[89] HAUNCHED GIRDERS: Near the bearing, at the intersection of the horizontal bottom flange with the curved (haunched) portion of the bottom flange, the Contractor's fabricator shall hot bend the flange in accordance with AASHTO Division II, Section 11.4.3.3.3 or provide a full penetration weld, with 100% radiographic inspection.

702.22 FRACTURE CRITICAL FABRICATION NOTE

For structures that contain fracture critical components and members, place the following note in the design plans.

[90] FCM: All items designated FCM (, including _____)* are Fracture Critical Members and Components and shall be furnished and fabricated according to the requirements of Section 12 of the AASHTO/AWS Bridge Welding Code D1.5.

* - Include this additional wording if there exists fracture critical components such as welds, attachments, etc. that are not easily or clearly identified in the plan details. Write descriptions of such components as specific as necessary to prevent any possible confusion during fabrication.

702.23 WELDED SHEAR CONNECTORS ON GALVANIZED STRUCTURES

[91] Note retired - see appendix

703 SITE PLAN REQUIREMENTS FOR SECTION 401 AND 404 OF THE CLEAN WATER ACT

For waterway crossing projects, include the following information on the Preliminary Structure Site Plan. Refer to Section 201.2.2 for additional information.

SECTION 900 – BRIDGE LOAD RATING

901 PURPOSE

The purpose of this Section is to provide consistency and uniformity in procedures, guidelines and policies for determining safe live load carrying capacity or load rating of the highway bridges in the State of Ohio.

902 SCOPE

The guidelines, policies and recommendations provided in this Section are meant to assist Bridge Owners and bridge raters by establishing evaluation practices that meet the Ohio Revised Code (ORC), the National Bridge Inspection Standards (NBIS), ODOT Bridge Design Manual (BDM) and American Association of State Highway Transportation Officials (AASHTO). The intent is to establish standardized load rating procedures to conform FHWA reporting requirements and posting of bridges throughout the State of Ohio.

903 APPLICABILITY

The provisions of this Section apply to all highway structures in Ohio, which qualify as bridges in accordance with the definition for a bridge set in this Section. These provisions may be applied to smaller structures which do not qualify bridges, as such.

904 QUALITY MEASURES

To maintain the accuracy and consistency of load rating, the bridge owners should implement appropriate quality assurance and quality control (QA/QC) measures. Typical quality control procedures include the use of checklists to ensure uniformity and completeness, the review of reports and computations by a person other than originating individual and periodic field review of the inspection teams and their work.

Each load rating analysis shall be performed under the supervision of an Ohio registered professional engineer (i.e. the Load Rater) that will sign and stamp (seal) the final load rating report before submission to the bridge owner.

905 DEFINITIONS AND TERMINOLOGY

ASR: Allowable Stress Rating (also known as Working Stress Rating)

ADTT: Average Daily Truck Traffic volume in one direction

Bridge: A structure including supports over a depression or an obstruction such as water,

highway, or railway; having a roadway to carry vehicular traffic and having an opening measured along the centerline of the roadway of 10 ft. [3.048 m] or more between under-copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes. It may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

Bridge Management System (BMS): A system designed to optimize the use of available resources for the inspection, maintenance, rehabilitation, and replacement of bridges

Bridge Owner: A public or private entity that has jurisdiction over the bridge

Buried structure: A structure, including a flat slab, an arch, a frame, a box section, etc., that has a fill or pavement material of 2 ft. [600 mm] or more on top of it

Collapse: A major change in the geometry of the bridge rendering it unfit for its intentional use

Condition Rating: The result of the assessment of the functional capability and the physical condition of bridge components by considering the extent of deterioration and other defects. Generally, Condition Rating is evaluated on a scale "0" through "9" (where "9" is the best) and also referred to as General Appraisal

Exemption List: A list of structures exempt from the requirements of load rating given in this section

Failure: A condition where a limit state is reached or exceeded. This may or may not involve collapse or other catastrophic occurrences

FHWA: Federal Highway Administration – U.S. Department of Transportation

Inventory Rating: Load ratings based on the inventory level allow comparisons with the capacity for new structures and, therefore result in a live load, which can safely utilize a structure for an indefinite period of time

Health Index: An indicator of the structural health of an element, a bridge or a group of bridges expressed as a value (0 to 100), where 0 corresponds to the worst possible condition and 100 corresponds to best possible condition

LFR: Load Factor Rating

Limit State: A condition beyond which a bridge or a component ceases to satisfy the criteria for which it was designed.

Load Effect: The response (axial force, shear force, bending moment, torque, etc.) in a member or an element due to the loading

Load Factor: A load multiplier accounting for the variability of the loads, the lack of accuracy in analysis, and the probability of simultaneous occurrence of different loads

Load Rater: Individual responsible for the load rating of a bridge. The Load Rater shall be a professional engineer registered in the State of Ohio.

Load Rating: The determination of the live-load carrying capacity of a bridge

Long span bridge: Any single or multi span bridge that has at least one span greater than 200 ft. [61 m]

LRFD: Load and Resistance Factor Design

LRFR: Load and Resistance Factor Rating

MBE: AASHTO Manual for Bridge Evaluation

NBI: National Bridge Inventory, the aggregation of structure inventory and appraisal data collection to fulfill the requirements of National Bridge Inspection Standards (NBIS)

NBIS: National Bridge Inspection Standards, Federal regulations establishing requirements for inspection procedures, frequency of inspection, a bridge inspection organization, qualification of personnel, inspection reports, and preparation and maintenance of bridge inventory records. The NBIS applies to all structures defined as NBIS bridges located on or over all public roads.

NBIS Bridge: A structure including supports over a depression or an obstruction such as water, highway, or railway; having a roadway to carry vehicular traffic and having an opening measured along the centerline of the roadway of more than 20 ft. [6.01 m] between under-copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes. It may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

Nominal Resistance: Resistance of a component or connection to load effect, based on its geometry, permissible stresses, or specific strength of materials

Non-buried Structure: A structure, including a flat slab, an arch, a frame, a box section, etc., that have a fill or pavement material of less than 2’-0” [600 mm] on top of it.

ODOT: Ohio Department of Transportation

ODOT Bridge: A bridge in which ODOT has jurisdiction

Operating Rating: Load ratings based on the operating rating level generally describe the maximum permissible live load to which the structure may be subjected. Allowing unlimited numbers of vehicles to use the bridge at operating level may shorten the life of the bridge.

OPI: Organizational Performance Indices, A set of Indicators to measure the overall condition of bridges at the District or network level based on the several appraisal ratings

ORC: Ohio Revised Code (as amended and adopted)

OSE: ODOT Office of Structural Engineering

Owner: Agency having jurisdiction over the bridge

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Pavement of a roadway: The pavement of a roadway includes all the paved or unpaved portions of a roadway including graded shoulders that may support vehicular traffic

PDF: Portable Document Format, a type of industry standard, electronic file format developed by the Adobe Corporation

Posting: Signing a bridge for load restriction

Preliminary Design Date: The date when Federal-aid funds are obligated for the studies or design activities related to identification of the type, size, and/or location of bridges. For ODOT projects following the Project Development Process (PDP), this date corresponds to the initiation of Step 1 for a Minimal Project, Step 3 for a Minor Project or Step 6 for a Major Project.

Quality Assurance: The use of sampling and other measures to assure the adequacy of quality control procedures in order to verify and measure the quality level of the entire bridge inspection and load rating program

Reliability Index: A computed quantity defining the relative safety of a structural element or structure expressed as the number of standard deviations that the mean of the margin of safety falls on the safe side.

Resistance Factor: A resistance multiplier accounting for the variability of material properties, structural dimensions, workmanship and the uncertainty in the prediction of resistance

RF: Rating Factor, an indicator of live load carrying capacity of a member or a bridge

Safe Load Capacity: A live load that can safely utilize a bridge repeatedly over the duration of a specified inspection cycle

Service Limit State: Limit state related to stress, deformation and cracking

Serviceability: A term that denotes restrictions on stress, deformation, and crack opening under regular service conditions

Serviceability Limit State: Collective term for service and fatigue limit states

Strength Limit State: Safety limit state relating to strength and stability

Superload: In Ohio, a Superload is any highway vehicular load with the total gross load equal to or more than 120,000 pounds (60 tons) or [54,431 kg].

Target Reliability: A desired level of reliability in a proposed evaluation

906 REFERENCES FROM OHIO REVISED CODE

References from the ORC related to bridge load rating, posting are given below:

5577.042 [Effective Until 6/29/2011] Weight provisions for farm, log and coal trucks and farm machinery.

(A) As used in this section:

(1) "Farm machinery" has the same meaning as in section 4501.01 of the Revised Code.

(2) "Farm commodities" includes livestock, bulk milk, corn, soybeans, tobacco, and wheat.

(3) "Farm truck" means a truck used in the transportation from a farm of farm commodities when the truck is operated in accordance with this section.

(4) "Log truck" means a truck used in the transportation of timber from the site of its cutting when the truck is operated in accordance with this section.

(5) "Coal truck" means a truck transporting coal from the site where it is mined when the truck is operated in accordance with this section.

(6) "Solid waste" has the same meaning as in section 3734.01 of the Revised Code.

(7) "Solid waste haul vehicle" means a vehicle hauling solid waste for which a bill of lading has not been issued.

(B) Notwithstanding sections 5577.02 and 5577.04 of the Revised Code, a coal truck transporting coal, a farm truck or farm machinery transporting farm commodities, a log truck transporting timber, or a solid waste haul vehicle hauling solid waste, from the place of production to the first point of delivery where the commodities are weighed and title to the commodities, coal, or timber is transferred, or, in the case of solid waste, from the place of production to the first point of delivery where the solid waste is disposed of or title to the solid waste is transferred, may exceed by no more than seven and one-half per cent the weight provisions of sections 5577.01 to 5577.09 of the Revised Code and no penalty prescribed in section 5577.99 of the Revised Code shall be imposed. If a coal truck so transporting coal, a farm truck or farm machinery so transporting farm commodities, a timber truck so transporting timber, or a solid waste haul vehicle hauling solid waste, exceeds by more than seven and one-half per cent the weight provisions of those sections, both of the following apply without regard to the seven and one-half per cent allowance provided by this division:

(1) The applicable penalty prescribed in section 5577.99 of the Revised Code;

(2) The civil liability imposed by section 5577.12 of the Revised Code.

(C)(1) Division (B) of this section does not apply to the operation of a farm truck, log truck, or farm machinery transporting farm commodities during the months of February and March.

(2) Regardless of when the operation occurs, division (B) of this section does not apply to the operation of a coal truck, a farm truck, a log truck, a solid waste haul vehicle, or farm machinery transporting farm commodities on either of the following:

(a) A highway that is part of the interstate system;

(b) A highway, road, or bridge that is subject to reduced maximum weights under section 4513.33, 5577.07, 5577.071, 5577.08, 5577.09, or 5591.42 of the Revised Code.

Effective Date: 03-31-2003; 09-16-2004

This section is set out twice. See also § 5577.042, as amended by 129th General Assembly File No. 7, HB 114, § 101.01, eff. 6/29/2011.

5577.042 [Effective 6/29/2011] Weight provisions for farm, log and coal trucks and farm machinery

(A) As used in this section:

(1) "Farm machinery" has the same meaning as in section 4501.01 of the Revised Code.

(2) "Farm commodities" includes livestock, bulk milk, corn, soybeans, tobacco, and wheat.

(3) "Farm truck" means a truck used in the transportation from a farm of farm commodities when the truck is operated in accordance with this section.

(4) "Log truck" means a truck used in the transportation of timber from the site of its cutting when the truck is operated in accordance with this section.

(5) "Coal truck" means a truck transporting coal from the site where it is mined when the truck is operated in accordance with this section.

(6) "Solid waste" has the same meaning as in section 3734.01 of the Revised Code.

(7) "Solid waste haul vehicle" means a vehicle hauling solid waste for which a bill of lading has not been issued.

(B)(1) Notwithstanding sections 5577.02 and 5577.04 of the Revised Code, the following vehicles under the described conditions may exceed by no more than seven and one-half per cent the weight provisions of sections 5577.01 to 5577.09 of the Revised Code and no penalty prescribed in section 5577.99 of the Revised Code shall be imposed:

(a) A coal truck transporting coal, from the place of production to the first point of delivery where title to the coal is transferred;

(b) A farm truck or farm machinery transporting farm commodities, from the place of production to the first point of delivery where the commodities are weighed and title to the commodities is transferred;

(c) A log truck transporting timber, from the site of its cutting to the first point of delivery where the timber is transferred;

(d) A solid waste haul vehicle hauling solid waste, from the place of production to the first point of delivery where the solid waste is disposed of or title to the solid waste is transferred.

(2) In addition, if any of the vehicles listed in division (B)(1) of this section and operated under the conditions described in that division does not exceed by more than seven and one-half per cent the gross vehicle weight provisions of sections 5577.01 to 5577.09 of the Revised Code, no wheel or axle-load limits shall apply and no penalty prescribed in section 5577.99 of the Revised Code for a wheel or axle overload shall be imposed.

(C) If any of the vehicles listed in division (B)(1) of this section and operated under the conditions described in that division exceeds by more than seven and one-half per cent the weight provisions of sections 5577.01 to 5577.09 of the Revised Code, both of the following apply without regard to the seven and one-half per cent allowance provided by division (B) of this section:

(1) The applicable penalty prescribed in section 5577.99 of the Revised Code;

(2) The civil liability imposed by section 5577.12 of the Revised Code.

(D)(1) Division (B) of this section does not apply to the operation of a farm truck, log truck, or farm machinery transporting farm commodities during the months of February and March.

(2) Regardless of when the operation occurs, division (B) of this section does not apply to the operation of a vehicle on either of the following:

(a) A highway that is part of the interstate system;

(b) A highway, road, or bridge that is subject to reduced maximum weights under section 4513.33, 5577.07, 5577.071, 5577.08, 5577.09, or 5591.42 of the Revised Code.

Amended by 129th General Assembly File No. 7, HB 114, § 101.01, eff. 6/29/2011.

Effective Date: 03-31-2003; 09-16-2004

This section is set out twice. See also § 5577.042, effective until 6/29/2011.

5577.043 [Effective 6/29/2011] Permissible weight variations for certain vehicles.

(A) Notwithstanding sections 5577.02 and 5577.04 of the Revised Code, the following vehicles under the described conditions may exceed by no more than five per cent the weight provisions of sections 5577.01 to 5577.09 of the Revised Code and no penalty prescribed in section 5577.99 of the Revised Code shall be imposed:

(1) A surface mining truck transporting minerals from the place where the minerals are loaded to any of the following:

(a) The construction site where the minerals are discharged;

(b) The place where title to the minerals is transferred;

(c) The place of processing.

(2) A vehicle transporting hot mix asphalt material from the place where the material is first mixed to the paving site where the material is discharged;

(3) A vehicle transporting concrete from the place where the material is first mixed to the site where the material is discharged;

(4) A vehicle transporting manure, turf, sod, or silage from the site where the material is first produced to the first place of delivery;

(5) A vehicle transporting chips, sawdust, mulch, bark, pulpwood, biomass, or firewood from the site where the product is first produced or harvested to first point where the product is transferred.

(B) In addition, if any of the vehicles listed in division (A) of this section and operated under the conditions described in that division does not exceed by more than five per cent the gross vehicle weight provisions of sections 5577.01 to 5577.09 of the Revised Code, no wheel or axle load limits shall apply and no penalty prescribed in section 5577.99 of the Revised Code for a wheel or axle overload shall be imposed.

(C) If any of the vehicles listed in division (A) of this section and operated under the conditions described in that division exceeds by more than five per cent the weight provisions of sections 5577.01 to 5577.09 of the Revised Code, both of the following apply without regard to the allowance provided by division (A) of this section:

(1) The applicable penalty prescribed in section 5577.99 of the Revised Code;

(2) The civil liability imposed by section 5577.12 of the Revised Code.

(D) Divisions (A) and (B) of this section do not apply to the operation of a vehicle listed in division (A) of this section on either of the following:

(1) A highway that is part of the interstate system;

(2) A highway, road, or bridge that is subject to reduced maximum weights under section 4513.33, 5577.07, 5577.071, 5577.08, 5577.09, or 5591.42 of the Revised Code.

Added by 129th General Assembly File No. 7, HB 114, § 101.01, eff. 6/29/2011.

5577.071 Reduction of weight of vehicle or load or speed on deteriorated or vulnerable bridge.

(A) When deterioration renders any bridge or section of a bridge in a county insufficient to bear the traffic thereon, or when the bridge or section of a bridge would be damaged or destroyed by

heavy traffic, the board of county commissioners may reduce the maximum weight of vehicle and load, or the maximum speed, or both, for motor vehicles, as prescribed by law, and prescribe whatever reduction the condition of the bridge or section of the bridge justifies. This section does not apply to bridges on state highways.

(B) A schedule of any reductions made pursuant to division (A) of this section shall be filed, for the information of the public, in the office of the board of county commissioners in each county in which the schedule is operative. A board of county commissioners that makes a reduction pursuant to division (A) of this section shall, at least one day before a reduction becomes effective, cause to be placed and retained on any bridge on which a reduction is made, at both ends of the bridge, during the period of a reduced limitation of weight, speed, or both, signs of substantial construction conspicuously indicating the limitations of weight or speed or both which are permitted on the bridge and the date on which these limitations go into effect. No person shall operate upon any such bridge a motor vehicle whose maximum weight or speed is in excess of the limitations prescribed. The cost of purchasing and erecting the signs provided for in this division shall be paid from any fund for the maintenance and repair of bridges and culverts.

(C) Except as otherwise provided in this division, no reduction shall be made pursuant to division (A) of this section on a joint bridge as provided in section 5591.25 of the Revised Code unless the board of county commissioners of every county sharing the joint bridge agrees to the reduction, the amount of the reduction, and how the cost of purchasing and erecting signs indicating the limitations of weight and speed is to be borne. A board of county commissioners may make a reduction pursuant to division (A) of this section on a section of a joint bridge, without the agreement [of] any other county sharing the bridge, if the section of the bridge on which the reduction is to be made is located solely in that county.

5591.42 Carrying capacity of bridges - warning notice.

The board of county commissioners together with the county engineer or an engineer to be selected by the board, or the director of transportation, may ascertain the safe carrying capacity of the bridges on roads or highways under their jurisdiction. Where the safe carrying capacity of any such bridge is ascertained and found to be less than the load limit prescribed by sections 5577.01 to 5577.12 of the Revised Code, warning notice shall be conspicuously posted near each end of the bridge. The notice shall caution all persons against driving on the bridge a loaded conveyance of greater weight than the bridge’s carrying capacity.

Effective Date: 11-02-1989

907 BRIDGE FILES (RECORDS)

Bridge owners should maintain a complete, accurate and current record of each bridge under their jurisdiction. Complete information, in good usable form, is vital to the effective management of bridges. Such information provides a record that may be important for repair, rehabilitation, replacement and future planning of the bridges.

Items that should be assembled as part of the bridge record are discussed below. Some or all of the information pertaining to a bridge may be stored in electronic format as part of a bridge management system.

907.1 CONSTRUCTION PLANS

Each bridge record should include one clear and readable set of all drawings used to construct, repair and/or rehabilitate the bridge. In lieu of hard copies, the construction plans may be stored in an electronic format in such a way that clear and readable paper copies can easily be reproduced from the electronic records.

907.2 CONSTRUCTION & MATERIAL SPECIFICATIONS

Each bridge record should include the reference to the construction and material specification used during the construction of the bridge. Where general technical specifications were used, only the special technical provisions need to be incorporated in the bridge record.

907.3 SHOP AND WORKING DRAWINGS

One set of all shop and working drawings approved for the construction or repair of a bridge should be saved or preserved as a part of the bridge record.

907.4 AS-BUILT DRAWINGS

Each bridge record should include one set of final drawings showing the “as-built” condition of the bridge, complete with signature of the individual responsible for recording the as-built conditions.

907.5 CORRESPONDENCE

Include all pertinent letters, memoranda, notice of project completion, telephone memo and other related information directly concerning the bridge in chronological order in the bridge record.

907.6 INVENTORY DATA

A complete inventory of a bridge in the ODOT BMS shall be done as soon as a bridge is open to traffic. FHWA mandates an ODOT bridge shall be inventoried within 90 days and a Non-ODOT bridge shall be inventoried within 180 days from the day the bridge was open to traffic. The same rule applies to modifications in the inventory record of replaced bridges or the bridges that have been reopened after the repairs are done. Initial inventory can be completed using the bridge plans. However, a history of dates of physical closing or opening of the traffic on the bridge should be maintained in the bridge record.

907.7 INSPECTION HISTORY

Each bridge record should include a chronological record of the date and the type of all inspections performed on the bridge. When available, scour, seismic, wind and fatigue evaluation studies; fracture critical information; deck evaluations; field load testing; and corrosion studies should be part of the bridge record.

907.8 PHOTOGRAPHS

Each bridge record should at least contain photographs of the bridges showing, top view, approach views and the elevation. Other photos necessary to show major defects, damages, or other important features, such as utilities on or under the bridge, should also be included.

907.9 RATING RECORDS

The bridge record should include a complete record of the determination of the bridge's load-carrying capacity.

907.10 ACCIDENT DATA

Details of accidents or damage occurrences, including date, description of accident, member damage and repairs, supported by photographs and investigation reports should be included in the bridge record.

907.11 MAINTENANCE AND REPAIR HISTORY

Each bridge record should include a chronological record documenting the maintenance and repairs that have occurred since the initial construction of the bridge. Include details such as date, description of project, contractor cost and related data for in-house projects.

907.12 POSTING HISTORY

Each bridge record should include a summary of all load posting and rescinding actions taken for the bridge, including load capacity calculations, date of posting and description of signing used.

908 GENERAL

The provisions of BDM Section 900 apply to ODOT bridges. All provisions of BDM Section 900 may also be applied to Non-ODOT bridges at the discretion of the bridge owner. Refer to BDM Section 928.

For load rating of new bridges, BDM Sections 911 through 926 shall apply.

For load rating of existing bridges, BDM Sections 911 through 925 & 927 shall apply.

909 UNIT WEIGHTS & DENSITIES

The following assumptions should be made while performing the load rating analysis, unless more accurate site information is available:

A. Unit weight of asphalt ..... 145 lb/ft^3 [22.8 kN/m^3]

B. Unit weight of concrete ..... 150 lb/ft^3 [23.6 kN/m^3]

C. Unit weight of latex modified concrete ..... 150 lb/ft^3 [23.6 kN/m^3]

D. Unit weight of soil ..... 120 lb/ft^3 [18.9 kN/m^3]

E. Unit weight of steel ..... 490 lb/ft^3 [77.0 kN/m^3]

F. Water density ..... 62.4 lb/ft^3 [9.8 kN/m^3]

910 STRUCTURES EXEMPT FROM LOAD RATING

Following types of buried structures are exempt from load rating under the provisions of this Section.

A. Circular plastic pipes

B. Concrete pipes (circular, or elliptical)

C. Buried metal frames

D. Junction chambers

E. Manholes

F. Inlets and outlets

911 WHICH PORTION OF BRIDGES SHALL BE LOAD RATED

Any structural member of a bridge that would carry vehicular traffic shall be load rated. Typically, the structural members of only the bridge superstructure are load rated. Substructure elements such as pier caps and columns should be analyzed for their load carrying capacity in situations when they are either scoped to be analyzed or when the bridge owner or the rating engineer has reasons to believe that the capacity of a substructure element may control the capacity of the bridge.

912 PROCEDURE FOR RATING

The load ratings for each bridge shall be determined in the following manner:

A. Load rate new (proposed) bridges at the design stage per BDM Section 926.

B. Perform a careful field inspection of the existing bridge according to the ODOT Manual of Bridge Inspection to determine its condition, and the percent of effectiveness of the various members for carrying load. All information shown in the Bridge Inventory and Inspection Records shall also be carefully checked and revised as necessary to show the current condition of the bridge.

C. If a field inspection of the bridge is not a part of the Scope of Services, as a minimum, review the most current inspection report (and inspection notes, if available).

D. Determine the yield stresses for the construction materials in older bridges, for which plan information is not available, using the date of construction.

E. For a load rating analysis request on an ODOT bridge, the District Bridge Engineer shall submit to the OSE, a complete inspection report (including comments), bridge photographs, field measurements and a copy of the previous rating calculation sheets or computer input data sheets. OSE will review the submitted material, analyze bridge and return a copy of the final calculations or computer output to the District Bridge Engineer, along with any recommendations concerning the proposed ratings.

F. The District Bridge Engineer/Bridge Owner shall keep the final calculations or computer output along with any recommendations concerning the proposed ratings on file.

G. Using pertinent current information & load rating analysis, the District Bridge Engineer/Bridge Owner shall determine and record the Inventory, Operating, and Ohio Legal Load Ratings.

913 WHEN LOAD RATING SHALL BE REVISED

The load rating of a bridge should be revised when:

A. There is a physical change in the condition of a structural member of the bridge

B. Rusting or damage to a slab, beam, girder or other structural element that has resulted in section loss

C. There is structural damage to steel, like a hit by a vehicle, excessive deflection or elongation under temperature or highway loads

D. When the inspection general appraisal rating of the superstructure of a bridge drops below 5

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E. There is an addition of a new beam or girder

F. A new deck is added or the existing deck width is changed

G. There is a change in the dead load on the superstructure, like addition or removal of wearing surfaces, addition or removal of sidewalks, parapets, railings, etc.

The load rating of a bridge does not need to be revised when:

A. The change in the thickness of external wearing surface is less than 1 inch [2.54 cm]

B. The change in the dead load on a beam member is not more than 10 pounds per ft.

914 ANALYSIS OF BRIDGES WITH SIDEWALKS

A pedestrian load of 75 pounds per square feet shall be applied to all sidewalks wider than 2.0 ft. and considered simultaneously with the live load in the vehicle lane.

When pedestrian load is present, the pedestrian load effect should be subtracted from the capacity of the member at the location being investigated while calculating the RF.

For bridges load rated according to the AASHTO Standard Specifications for Highway Bridges, AASHTO Table 3.22.1A applies. For bridges load rated according to the AASHTO LRFD Bridge Design Specifications, refer to BDM Section 925.2.

Pedestrian load shall not be considered in Special or Permit Load Analysis per BDM Section 916.

915 ANALYSIS OF MULTILANE LOADING

Traffic lanes to be used for rating purposes shall be in accordance with AASHTO.

AASHTO reduction factors for multiple lane loadings shall be applied where appropriate.

For rating analysis of floor beams, trusses, non-redundant girders or other non-redundant main structural members, position identical rating vehicles in one or more of the through traffic lanes on the bridge, spaced and shifted laterally on the deck, within the traffic lanes, so as to produce the maximum stress in the member under consideration.

916 ANALYSIS FOR SPECIAL LOAD OR SUPERLOAD

When a structure is required, in the Scope of Services, to be analyzed for special or Superload vehicle, a second analysis shall be performed for a single lane loading of the special or Superload vehicle condition. The special or Superload vehicle shall be placed laterally on the structure to produce maximum stresses in the critical member under consideration.

The analysis for special or Superload vehicle shall be performed at the operating level only.

vehicle and the front axle of trailing vehicle shall be 36 ft. Place as many 5C1 vehicles as necessary to produce the maximum load effect on the component to be rated. No partial 5C1 vehicles shall be used.

If a permit load vehicle is present, apply the following live load:

A. In the right-most lane, place one permit load vehicle positioned to produce the maximum live load effect on the component to be rated.

B. In the other lane, place a series of Ohio 5C1 vehicles. The 5C1 vehicles should be spaced such that the distance between the rear axle of the leading vehicle and the front axle of trailing vehicle shall be 36 ft. Place as many 5C1 vehicles as necessary to produce the maximum load effect on the component to be rated. No partial 5C1 vehicles shall be used.

917.2.3.3 BRIDGES WITH A SINGLE LANE

A. When No Permit Load Is Present:

The live load shall be a series of Ohio 5C1 vehicles. The 5C1 vehicles should be spaced such that the distance between the rear axle of the leading vehicle and the front axle of trailing vehicle shall be 36 ft. Place as many 5C1 vehicles as necessary to produce the maximum load effect on the component to be rated. No partial 5C1 vehicles shall be used.

B. When a Permit Load Is Present:

The live load shall be the one permit vehicle positioned to produce the maximum live load effect on the component to be rated.

918 BRIDGE POSTING FOR REDUCED LOAD LIMITS

918.1 PURPOSE

The Procedure outlined in this section is to be followed for posting or rescinding warnings of bridge strength deficiencies on ODOT bridges. Owners of non-ODOT bridges may modify and adapt the guidelines given in this section to post or rescind warnings of bridge strength deficiencies on their bridges.

A request to post a non-ODOT bridge shall not be submitted to OSE. It shall be handled by the owner of the bridge.

918.2 REFERENCE

Ohio Revised Code, Section 5591.42:

918.3 PROCEDURE FOR BRIDGE POSTING

A. When the calculated RF for each Ohio Legal Load is greater than or equal to 1.00, the bridge shall not be posted. If for any Ohio Legal Load, the calculated RF is less than 1.00 and the bridge cannot be strengthened immediately so that it will produce a calculated RF of 1.00 or above, proceed to BDM Section 918.3.B.

Table 918.3-1: ODOT Bridge Posting Policy (Effective July 1, 2011)

Controlling RF = Min. Calculated RF of Ohio Legal Loads % Ohio Legal Value = Controlling RF x 100		
% Ohio Legal Value	**Reported % Ohio Legal in BMS**	**Posting for Reduced Loads Needed**
≥150%	150%	NO
≥100% and <150%	Actual percentage rounded to the nearest 5 (i.e., 100, 115, etc.)	NO
<100%	**Actual percentage rounded to the nearest 5 (i.e., 95%, 30%, etc.)**	**YES**

B. Use the following equation to establish the safe posting loads for each Ohio Legal Load:

Safe Posting Load = $\frac{W}{0.70}$ [(RF)-0.30] ..... [MBE 6A.8.3-1]

Where:

RF = calculated Load Rating Factor

W = Gross weight of rating vehicle in tons

The Safe Posting Load shall be rounded to the nearest ton.

C. The ODOT District Bridge Engineer shall submit a written bridge posting request according to BDM Section 918.6 to the OSE Bridge Rating Engineer.

D. After the Director signs the posting request:

1. The OSE Bridge Rating Engineer shall send a copy to each of the following:
   a. District Bridge Engineer
   b. Manager, Special Hauling Permits, ODOT Office of Maintenance Administration
   c. Superintendent of State Highway Patrol
   d. Executive Director Ohio Trucking Association

e. Board of County Commissioners

f. County Engineer

2. The District Roadway Services Manager shall prepare, erect and maintain all necessary signs according to BDM Section 918.3.E until the bridge is either strengthened or replaced.

3. The District Bridge Engineer shall update all Bridge Inventory and Inspection records to show the latest official posted capacity.

E. Where posting of a bridge is determined necessary and no unusual or special circumstance at the bridge dictates otherwise, Ohio standard regulatory signs (as per the Ohio Manual of Uniform Traffic Control Devices) shall be placed in sufficient numbers and at the specific locations required below.

1. Example of standard wording to be used on signs is given in Figure 905.

2. AHEAD signs shall be erected at intersecting state roads located just prior to the bridge to allow approaching vehicles to by-pass the bridge or turn around safely with a minimum of interference to other traffic.

3. Bridge Weight Limit signs shall be erected at each end of the bridge.

F. When the RF for a Legal Load falls below 0.30, that load configuration shall not be allowed on the bridge. A bridge must be closed to all traffic when the RF for each Ohio Legal Load falls below 0.30, until the bridge is rehabilitated or replaced.

918.4 PROCEDURE FOR RESCINDING POSTING

A. When a posted bridge has been strengthened or replaced and no longer needs posting, the District Bridge Engineer shall forward to the Bridge Rating Engineer a written request to rescind the existing signed posting. The request shall include a complete statement of the reason for the action as specified in BDM Section 918.6.

B. The Bridge Rating Engineer shall review the data submitted by the District Bridge Engineer and upon concurrence shall forward to the Director a request to rescind the posting.

C. The Bridge Rating Engineer shall distribute copies of the rescind notice as described in Section 918.3.A.3.

918.5 PROCEDURE FOR CHANGING POSTING

When the rated capacity of posted bridge changes, so as to require a revised posting level, the procedures in BDM Section 918.3 apply. Additionally, the existing posting must be rescinded as set forth in BDM Section 918.4. A new inspection report (BR86) is required to post a bridge, and change or rescind a load posting.

918.6 REQUIRED INFORMATION FOR POST, RESCIND AND CHANGE REQUESTS

The following minimum information is required on all post, rescind and change requests:

A. Posting Request (Reduction in Load Limits)

1. County in which bridge is located
2. Current Bridge Number
3. Structure File Number
4. Feature intersected (over or under bridge)
5. Safe Posting Load for each Ohio Legal Load (see BDM Section 918.3.B)
6. Existing rating of bridge expressed as a percent of legal load or tons.
7. Explanation as to why posting is required
8. Attach copies of all official documentation for any associated actions by involved agencies other than the state.

B. Rescinding Request (Removal of Existing Load Limits)

1. County in which bridge is located
2. Current Bridge Number
3. Structure File Number
4. Feature intersected (over or under bridge)
5. Existing posting (% reduction or weight limit currently in effect)
6. Date existing posting was effective
7. Explanation as to why posting restrictions can now be removed (include: contract project numbers or indicate force account or other work method used to correct problem)
8. New load rating for the rehabilitated or new structure

C. Change Request (Revision of Existing Posted Limits)

1. County in which bridge is located
2. Current Bridge Number
3. Structure File Number
4. Feature intersected (over or under bridge)
5. Existing posting (weight limit currently in effect)
6. Revised posting request
7. Date of existing posting
8. Explanation as to why posting change is necessary (include project numbers etc.

involved)

919 SOFTWARE TO BE USED FOR LOAD RATING

One of the following computer programs to be used for the load rating of bridges, as applicable.

A. AASHTO Virtis: Virtis is a load rating and analysis product developed and licensed by AASHTO. Virtis can rate the bridges by LRFR and LFR methods. It is one of ODOT's preferred programs to do load rating.

   (http://aashto.bakerprojects.com/virtis/).

B. Bentley LARS: LARS is bridge analysis software maintained and licensed by the Bentley Systems. It can load rate bridges by LRFR and LFR methods. It is one of ODOT's preferred programs to do load rating. (http://www.bentley.com)

C. AASHTO BARS-PC: BARS-PC is the default bridge analysis and load rating program by LFR method for all bridges designed prior to October 1, 2010. BARS-PC program is available from ODOT for a nominal charge of material and shipping. It is one of ODOT's preferred programs to do load rating.

D. BRASS-Culvert: BRASS-Culvert can load rate reinforced concrete flat-topped 3-sided frames and 4-sided boxes buried under the fill by LRFR and LFR methods. BRASS-Culvert software shall be used for the analysis of concrete box sections and three sided concrete frames. BRASS family of programs is developed, maintained and licensed by the Wyoming Department of Transportation. It is one of ODOT's preferred programs to do load rating.

   (http://www.dot.state.wy.us/wydot/engineering_technical_programs/bridge/brass)

E. LARSA 4D: Finite element analysis programs by LARSA, Inc., 105 Maxess Road, Melville Corporate Center, Suite 115N, Melville, NY 11474 (http://www.larsausa.com).

F. DESCUS I: DESCUS I can perform analysis of horizontally curved flanged steel sections which act compositely or non-compositely with a concrete deck. The program can be run using Load Factor or Load and Resistance Factor method.

   (http://best.umd.edu/software/descus-i/)

G. MDX Software: MDX software can be used to design and load rate straight and curved steel bridges. The program can be run using Load Factor or Load and Resistance Factor method.

   (http://www.mdxsoftware.com/)

For the analysis of arches and other special structures that cannot be modeled using any of the programs A through D above, contact the OSE for pre-approval of the software before use.

Also, contact the OSE prior to using any computer program other than A through E above. The Department will not accept load rating performed using any software not pre-approved for that bridge.

920 LOAD RATING REPORT SUBMISSION

The load rating report shall be submitted to the ODOT project manager, ODOT District Bridge Engineer or the respective owner (in case of a non-ODOT bridge). The submission shall include:

A. Two printed copies of the Load Rating Report with the Summary sheet. The Load Rating Reports shall be signed, sealed and dated by an Ohio Registered Engineer.

B. One electronic copy of the Load Rating Report

C. One copy of all electronic input data files

For an ODOT-bridge the District Bridge Engineer will send one printed copy, an electronic copy of the report, the electronic data files and a copy of the final bridge plans to the OSE for review.

The report summary must list final inventory and operating ratings of each main bridge member, overall ratings of each structure unit (mainline, ramps, etc.), and the final ratings of the entire bridge summarized in a tabular form. The ratings of each member and the overall ratings of the structure shall be presented for each Ohio Legal Load and either AASHTO HS20-44 or HL-93 live load.

An example of a Load Rating Report Summary is given as Figure 908.

For existing bridges, the report shall state how the material properties were determined. Any specific details about the current conditions and bridge geometry shall be listed.

All calculations related to the load rating should be a part of the load rating report.

Submit copies of the input & output computer files in electronic format. Input files must be error free and ready to be run. The rating engineer shall incorporate any changes in the input files as a result of ODOT review.

921 LOAD RATING USING AASHTO VIRTIS PROGRAM

921.1 GENERAL

Virtis is a load rating program licensed from AASHTO. Virtis runs on Microsoft Windows and can load rate a variety of bridges by LFR as well as LRFR methods.

Virtis Vehicle library can be customized to include ODOT Legal Loads. Alternatively Virtis library can be requested from OSE.

921.2 VIRTIS LOAD RATING REPORT SUBMISSION

The load rating report shall be submitted to the project manager, District Bridge Engineer or the

respective owner (in case of a non-ODOT bridge). The submission shall include two (2) printed copies and one electronic copy of the Load Rating Report and one copy of the electronic input data files. The Load Rating Reports shall be signed, sealed and dated by an Ohio Registered

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Table 925.3-1: LRFR Design Load Limit States and Load Factors [MBE 6A.4.2.2-1]

Bridge Type	Limit State	Dead Load γ_{DC}	Dead Load γ_{DW}	HL-93 Loading	
				Inventory γ_{LL}	Operating γ_{LL}
Steel	Strength I	1.25	1.50	1.75	1.35
	Service II	1.00	1.00	1.30	1.00
	Fatigue	0.00	0.00	0.75	
Reinforced Concrete	Strength I	1.25	1.50	1.75	1.35
Prestressed Concrete	Strength I	1.25	1.50	1.75	1.35
	Service III	1.00	1.00	0.80	
Wood	Strength I	1.25	1.50	1.75	1.35

For Rating for Ohio Legal Loads, use the following limit states and load factors:

Table 925.3-2: Legal Loads Limit States and Load Factors [MBE 6A.4.4.2.3a-1]

Bridge Type	Limit State	Dead Load γ_{DC}	Dead Load γ_{DW}	Ohio Legal Loads γ_{LL}
Steel	Strength I	1.25	1.50	1.40
	Service II	1.00	1.00	1.30
Reinforced Concrete	Strength I	1.25	1.50	1.40
	Service I	1.00	1.00	------
Prestressed Concrete	Strength I	1.25	1.50	1.40
	Service III	1.00	1.00	1.00
Wood	Strength I	1.25	1.50	1.40

For Rating for Special and Permit Loads, use the following limit states and load factors:

Table 925.3-3: Permit Load Limit States and Load Factors [MBE 6A.4.5.4.2a-1]

Bridge Type	Limit State	Dead Load γDC	Dead Load γDW	Permit or Special Loads γ_{LL}
Steel	Strength II	1.25	1.50	1.35
	Service II	1.00	1.00	1.00
Reinforced Concrete	Strength II	1.25	1.50	1.35
	Service I	1.00	1.00	1.00
Prestressed Concrete	Strength II	1.25	1.50	1.35
	Service I	1.00	1.00	1.00
Wood	Strength II	1.25	1.50	1.35

925.4 DYNAMIC LOAD ALLOWANCE (IM)

A. A dynamic load allowance of 33% shall be used for all non-buried bridges except for fatigue evaluation.

B. For fatigue evaluation a dynamic load allowance of 15% shall be used.

C. Dynamic load allowance shall only be applied to truck or tandem portion of HL-93 loading (dynamic load allowance shall not be provided to lane portion).

D. Dynamic load allowance needs not to be applied to wood components of a bridge.

E. Dynamic allowance may be ignored for slow moving (speed less than 10 mph) special or permit loads under controlled conditions.

F. For buried bridges, dynamic allowance (IM) shall be taken as:

$IM = 33\ (1.0 - 0.125\ DE) \geq 0\%$ ..... [AASHTO 3.6.2.2-1]

Where:

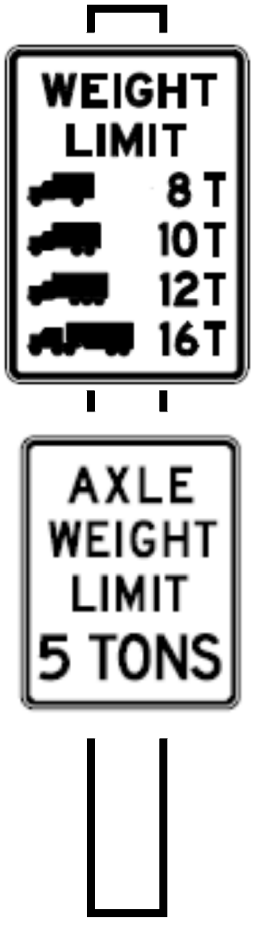
DE = the minimum depth of cover above the structure (ft)

R12-H5
Sec. 2B.49

R12-2
Sec. 2B.49

R3-17a
Sec. 9B.04

Example of WEIGHT & AXLE LIMIT AHEAD Sign



Example of WEIGHT & AXLE LIMIT Sign

Figure 905

CUSTOM ALLOWABLE STRESSES IN BENDING									
		Type of Rating							
Material of Construction	Year of Construction	Fy / Fc' (ksi)	Fy / Fc' (MPa)	Inventory (ksi)	Inventory (MPa)	Operating (ksi)	Operating (MPa)	Posting (ksi)	Posting (MPa)
Structural Steel (SS),(CSC)	< 1900	26.00	179	14.00	97	19.00	131	19.00	131
	1901 To 1930	30.00	207	16.00	110	22.00	152	22.00	152
	1931 To 1965	33.00	228	18.00	124	25.00	172	25.00	172
	1966 To 1990	36.00	248	20.00	138	27.00	186	27.00	186
	1991 To Date	50.00	345	27.00	186	37.50	259	37.50	259
Reinforcing Steel (RC)	< 1935	32.00	221	16.00	110	24.00	165	24.00	165
	1936 To 1950	36.00	248	18.00	124	27.00	186	27.00	186
	1951 To 1983	40.00	276	20.00	138	30.00	207	30.00	207
	1984 To Date	60.00	414	24.00	165	36.00	248	36.00	248
Prestress. Strands (Fs')	All Years	270.0	1862	-	-	-	-	-	-
Cast-in-Place Reinf. Conc. (Compression in Bending) (RC),(CSC)	< 1930	2.00	14	0.70	5	1.30	9	1.30	9
	1931 To 1950	3.00	21	1.00	7	1.50	10	1.50	10
	1951 To 1980	4.00	28	1.30	9	2.00	14	2.00	14
	1981 To Date	4.50	31	1.50	10	2.20	15	2.20	15
Prestressed Concrete (Fc') (PSC),(CPS)	All Years	5.50	38	-	-	-	-	-	-
Cast-in-Place Comp. Slab for Prestress. Conc. (Fc') (CPS)	All Years	4.00	28	-	-	-	-	-	-
Timber (fb) (TMB)	All Years			1.60	11	2.128	15	2.128	15
Cast-in-Place Slab for Composite Reinforced Concrete	< 1930	2.00	14	0.70	5	1.30	9	1.30	9
	1931 To 1950	3.00	21	1.00	7	1.50	10	1.50	10
	1951 To 1980	4.00	28	1.30	9	2.00	14	2.00	14
	1981 To Date	4.50	31	1.50	10	2.20	15	2.20	15

Figure 906

ARN-24 STRUCTURAL SURVEY AND MONITORING OF VIBRATIONS

This proposal note was retired in April 2005.

ITEM SPECIAL - STRUCTURAL SURVEY AND MONITORING OF VIBRATIONS - 04/19/02

1.0 Description. This work consists of conducting a survey of the condition of structures and the monitoring of ground vibrations. The survey work is to be conducted before and after all construction work is performed which could cause undesirable ground vibrations. Ground vibrations and acoustics shall be monitored at the appropriate times during the duration of this project.

2.0 Personnel Qualifications. A Professional Engineer, registered in the State of Ohio, shall be engaged by the Contractor to be in charge of conducting a structural survey and in charge of monitoring vibrations and acoustics. The engineer in charge of performing the required work under this item is herein referred to as the Monitoring Foreman. The Monitoring Foreman and/or his team of experts shall have collectively worked on two similar projects or shall have collectively accrued not less than two years of successful experience in performing the type of work specified by this note. The monitoring foreman and/or his team of experts shall have expertise in (1) conducting structural surveys by video methods, (2) monitoring vibrations with a seismograph or with other appropriate instrumentation, and (3) assessing sites for potential damage that may occur as a result of the proposed construction. Documentation of this experience shall be furnished at the preconstruction meeting.

2.1 The requirement for the Monitoring Foreman to be an engineer can be waived provided that the Monitoring Foreman's experience or the collective experience of the monitoring team shows substantial expertise in performing the required work.

3.0 Structural Survey. The structural survey shall include but not be limited to the following:

3.1 Documentation of, the integrity of existing building materials and the general overall condition of the structures recorded by written text, photographs, and VHS video cassette recording.

3.2 The establishment of locations and elevations of reference points, chosen by the Monitoring Foreman, for documentation of measurements.

3.3 A detailed on-site inspection conducted in the presence of the Project Engineer, the Contractor, property owners, property tenants if appropriate, and representatives of any involved utility companies.

3.4 Documentation of all structural deficiencies with regard to location, size, type, etc.

4.0 Monitoring of Vibrations and Acoustics. The monitoring of vibrations and acoustics shall include but not be limited to the following:

4.1 Determination and documentation of existing levels of vibrations and noise.

4.2 Monitoring of all construction operations that significantly contribute to the production of vibrations and noise with a special effort made to document the vibration and sound levels associated with blasting and/or pile installation procedures.

4.3 The development of criteria for controlling construction activities so that the Monitoring Foreman's allowable predetermined vibration levels are not exceeded during construction.

5.0 Water Quality. When appropriate, water samples shall be collected from wells, streams or project runoff areas to document before and after construction site conditions regarding the quality of water available in the vicinity of the project.

6.0 Ground Vibration. Vibration monitoring guidelines can be found in FHWA's May 1985 manual entitled "Rock Blasting" and in various other reports.

The peak particle velocity (PPV) of ground vibrations is generally used to monitor the effect of vibrations on structures. When monitoring vibrations consideration must be given to (1) the type of structure being evaluated and (2) the frequency of the vibrations (low frequency 40 Hz). Generally allowable ground vibration peak particle velocities range from 13mm/second (0.5 inches per second) to 50mm/second (2.0 inches per second) depending on the type of structure under consideration. When an allowable PPV is exceeded, the vibration producing operation shall be suspended and alternative construction procedures should be evaluated. The Director shall be consulted whenever the measured magnitude of the vibration level is considered potentially capable of producing structural damage.

7.0 Method of Measurement. The final twenty percent of the payment for this work shall not be made until the Office of Structural Engineering has received and approved three copies of the Monitoring Foreman's final report. The final report shall be typed and contain all measurements, conclusions, and recommendations which resulted from performing the above required work. Included with the reports shall be one copy of all pictures and video recordings. Interim reports shall be furnished to the Project Engineer during construction thereby keeping the Project Engineer informed of the Monitoring Foreman's progress and findings. The original tapes shall remain in the exclusive possession of the Monitoring Foreman for a period of not less than 10 years.

8.0 Method of Payment. Payment for this item will be made at the contract lump sum price for Item Special - “Structural Survey and Monitoring of Vibrations".

ARN-25 RETIRED NOTE 17

Include the following note as part of an Item 202, “As Per Plan” note when protection of traffic is required.

[17] PROTECTION OF TRAFFIC: Prior to demolition of any portions of the existing superstructure, submit plans for the protection of traffic (vehicular, pedestrian, boat, etc.) adjacent to and/or under the structure to the Director at least 30 days before construction begins. These plans shall include provisions for any devices and structures that may be necessary to ensure such protection. Maintain the temporary vertical clearances specified on the plans or in the proposal at all times except as otherwise approved by the Director.

All costs associated with this traffic protection will be included with Item 202 for payment.

HISTORY: Note **[17]** was retired by the release of the 2005 Construction and Material Specifications. The information contained in Note **[17]** is entirely contained in CMS 501.05.

ARN-26 RETIRED NOTE 81

If the differential dead load deflection at each end of the crossframes is greater than ½" [13 mm], provide the following note. (Note - if part of a structure's crossframes have a differential deflection of greater than ½" [13 mm] and part of the structure does not, use the following ERECTION BOLT note.)

[81] ERECTION BOLTS AND CROSS FRAME FIELD WELDING: The hole diameter in the girder stiffeners shall be 3/16" [4 mm] larger than the diameter of the erection bolts. The cross frame members shall have slotted holes, 3/4" [19 mm] longer than the bolt diameter and 1/16" [2 mm] wider than the erection bolt diameter. The slot shall be parallel to the longitudinal dimension of the cross frame member. Erection bolts shall be high strength bolts and shall remain in place. Supply two hardened washers with each high strength bolt. Fully torque the bolts or use a lock washer in addition to the two hardened washers. Furnish erection bolts as part of Item 513.

Do not weld the cross frame members to the stiffeners until the concrete deck has been placed.

HISTORY: Note **[81]** was retired in order to reduce the potential for unanticipated girder deflection during deck placement. All crossframes and lateral bracing shall be permanently fastened before deck placement begins.

ARN-27 RETIRED NOTE 31

Use the following note where steel points are required, and see Section 202.2.3.2.a.

[31] ITEM 507, STEEL POINTS, AS PER PLAN: Use steel pile points to protect the tips of the proposed steel "H" piling. Furnish steel points from the following manufactures/suppliers: Associated Pile and Fitting Corporation, 262 Rutherford Blvd., Clifton, New Jersey 07014, phone: (973)773-8400, (800)526-9047, fax: (973)773-8442; International Construction Equipment, Inc., 301 Warehouse Drive, Matthews, North Carolina 28015, phone: (704)821-8200, (888)423-8721, fax: (704)821-8201; Dougherty Foundation Products, Inc., P.O. Box 688, Franklin Lakes, New Jersey 07417, phone: (201)337-5748, fax: (201)337-9022; Versa Steel Inc., 1618 N.E. First Ave., Portland, Oregon 97232, phone: (503)287-9822, (800)678-0814, fax: (503)287-7483; Versabite

Piling Accessories, 1704 Tower Industrial Dr., Monroe, North Carolina 28110, phone: (800)280-9950, (704)225-1566, fax: (704)225-1567; or by a manufacturer that can furnish a steel point that is acceptable to Director. The material used for the manufacturing of pile points shall conform to ASTM A27/A27M 65/35 [450/240] – Class 2 – Heat Treated or AASHTO M103/M103M 65/35 [450/240] – Heat Treated. Weld the pile points to the pile in accordance with AWS D1.5 or the manufacturer's written welding procedure supplied to the engineer before the welding is performed. Submit a notarized copy of the mill test report to the Engineer.

HISTORY: Note **[31]** was retired when the information was added to C&MS 507.09 and the Department's Approved List.

ARN-28 RETIRED NOTES 93A & 93B

Item 526, Reinforced Concrete Approach Slabs was developed such that the concrete used in the superstructure would also be used for the approach slabs. The new supplemental specification for QC/QA concrete is not included in Item 526.

Provide both of the following notes on projects that specify SS898, QC/QA Concrete for Structures:

[93A] ITEM 898 - QC/QA CONCRETE, CLASS QSC2, SUPERSTRUCTURE (APPROACH SLAB), AS PER PLAN

Furnish approach slabs conforming to CMS 526 except concrete shall be in accordance with Supplemental Specification 898, QC/QA Concrete, Class QSC2. The accepted quantities shall include: concrete, curbs, reinforcing steel, joint fillers, joint sealers, joint seals, and waterproofing. The Department will measure approach slabs by the number of square yards. The Department will initially pay the full bid price to the Contractor upon completing the work. The Department will calculate the final adjusted payment according to 898.17 and include approach slab concrete and deck concrete in the same lot to determine final pay factors.

[93B] ITEM 898 - QC/QA CONCRETE, CLASS QSC2, SUPERSTRUCTURE (DECK), AS PER PLAN

The Department will calculate the final adjusted payment according to 898.17 and include approach slab concrete and deck concrete in the same lot to determine final pay factors.

HISTORY: Notes **[93A]** & **[93B]** were retired when the information was added to SS898.01 and SS898.15.

ARN-29 RETIRED NOTE 51

A neoprene sheet is required for waterproofing of the backside of the joint between the integral backwall and the bridge seat. Include the following note, which contains criteria for the

installation of this seal, for all integral and semi-integral abutments. Plan details will be required to show location and dimensional position for installation.

[51] ITEM 516 SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL, AS PER PLAN: Install a 3 foot wide neoprene sheet at locations shown in the plans. Secure the neoprene sheeting to the concrete with 1 1/4" x #10 gage (length x shank diameter) galvanized button head spikes through a 1 inch outside diameter, #10 gage galvanized washer. Maximum fastener spacing is 9 inches. Use of other similar galvanized devices, which will not damage either the neoprene or the concrete, will be subject to the approval of the Engineer.

Center the neoprene strips on all joints. For horizontal joints, secure the horizontal neoprene strip by using a single line of fasteners, starting at 6 inches, +/-, from the top of the neoprene strip. For the vertical joints secure the vertical neoprene strip by using a single vertical line of fasteners, starting at 6 inches, +/-, from the vertical edge of the neoprene strip nearest to the centerline of roadway. For vertical joints, install 2 additional fasteners at 6 inches, center to center, across the top of the neoprene strip on the same side of the vertical joint as the single vertical row of fasteners is located.

The vertical neoprene strips shall completely overlap the horizontal strips. Lap lengths of the horizontal strips that are not vulcanized or adhesive bonded, shall be at least 1 foot in length, or 6 inches in length if the lap is vulcanized or adhesive bonded. No laps are acceptable in vertically installed neoprene strips.

The neoprene sheeting shall be 3/32" thick general purpose, heavy-duty neoprene sheet with nylon fabric reinforcement. The sheeting shall be “Fairprene Number NN-0003”, by E. I. Dupont De Nemours and Company, Inc., “Wingprene” by the Goodyear Tire and Rubber Company, or an approved alternate. The neoprene sheeting shall conform to the following:

Description of Test	ASTM	Requirement
Thickness, inches	D751	0.094 ± 0.01
Breaking Strength, Grab, lbs, minimum	D751	700 x 700 (Long. x Trans.)
Adhesive Strip, 1" wide x 2" long, lbs, minimum	D751	9
Burst Strength, psi, minimum	D751	1400
Heat Aging, 70 Hr, 212 ^{o}F, 180^{o} bend without cracking	D2136	No cracking of coating
Low temp. brittleness, 1 Hr, −40 ^{o}F, bend around 1/4" mandrel	D2136	No cracking of coating

METHOD OF MEASUREMENT: The Department will measure the total length of joint to be sealed by the number of feet.

BASIS OF PAYMENT: The Department will pay for accepted quantities at the contract price for Item 516, Semi-Integral Abutment Expansion Joint Seal, As Per Plan.

NOTE TO DESIGNER: Change "semi-integral" to "integral" as appropriate.

HISTORY: Note **[51]** was retired when the information was added to C&MS 516.04 & 516.05 and the Department's Qualified Products List (QPL).

ARN-30 RETIRED NOTES 57 & 58

Provide the following porous backfill note on the appropriate detail sheets.

[57] POROUS BACKFILL WITH FILTER FABRIC, 2 feet [0.6 meter] thick shall extend up to the plane of the subgrade, to 1 foot [0.3 meter] below the embankment surface, and laterally to the ends of the wingwalls.

For use when weep holes are specified:

[58] POROUS BACKFILL WITH FILTER FABRIC, 2 feet [0.6 meter] thick shall extend up to the plane of the subgrade, to 1 foot [0.3 meter] below the embankment surface, and laterally to the ends of the wingwalls. Place two cubic feet [0.06 cubic meter] of bagged No. 3 aggregate at each weephole. The Department will include bagged aggregate with porous backfill for payment.

HISTORY: Notes **[57]** & **[58]** were retired when the information was added to C&MS 518.05.

ARN-31 RETIRED NOTE 62

For a structure with concrete backwalls, deck joints and concrete decks supported on beams or girders, show an optional backwall construction joint at the level of the approach slab seat and provide the following note either on the appropriate abutment detail sheet or in the General Notes.

[62] BACKWALL CONCRETE: In addition to 511.10, do not place backwall concrete above the optional construction joint at the approach slab seat until after the deck concrete in the span adjacent to the abutment has been placed.

HISTORY: Note **[62]** was retired when the information was added to C&MS 511.10.

ARN-32 RETIRED NOTE 92

Provide the following note when elastomeric bearings are to be placed on substructures with beam seats sealed with an epoxy or non-epoxy sealer:

[92] SEALING OF BEAM SEATS: If the beams seats are sealed with an epoxy or non-epoxy sealer prior to setting the bearings, do not apply sealer to the concrete surfaces under the proposed bearing locations. If these locations are sealed, remove the sealer to the

satisfaction of the Engineer prior to setting the bearings. The Department will not pay for this removal.

HISTORY: Note **[92]** was retired when the information was added to C&MS 516.07.

ARN-33 RETIRED NOTE 69

Where the load plate of an elastomeric bearing is to be connected to the structure by welding, provide the following note with the pertinent bearing details:

[69] WELDING: Control welding so that the plate temperature at the elastomer bonded surface does not exceed 300º F [150º C] as determined by use of pyrometric sticks or other temperature monitoring devices.

HISTORY: Note **[69]** was retired when the information was added to C&MS 516.07.

ARN-34 RETIRED NOTE 70

Where elastomeric bearing repositioning is required for a steel beam or girder superstructure, provide the following plan note.

[70] BEARING REPOSITIONING: If the steel is erected at an ambient temperature higher than 80ºF [26º C] or lower than 40º F [4º C] and the bearing shear deflection exceeds 1/6 of the bearing height at 60º F (+/-) 10º F [15º C +/- 5º], raise the beams or girders to allow the bearings to return to their undeformed shape at 60º F (+/-) 10º F [15º C +/- 5º].

HISTORY: Note **[70]** was retired when the information was added to C&MS 516.07.

ARN-35 RETIRED NOTE 91

For galvanized structures with welded shear connectors, place the following note on the same plan sheet as the shear connector spacing.

[91] WELDED SHEAR CONNECTORS: Install shear connectors after the decking or other walking/working surface, has been installed. Remove the galvanic coating by grinding at each connector location prior to welding.

HISTORY: Note **[91]** was retired when the information was added to C&MS 513.22.