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, July 2007. 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 July 2007 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 July 2007 ODOT BDM

BDM Section	Affected Pages	Revision Description
302.1.4.3	3-11 through 3-12	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.
Figure 302.1.4.3-1		Refer to BDM Section 302.1.4.3 description above.
Figure 302.1.4.3-2		Refer to BDM Section 302.1.4.3 description above.
606.3	6-16	Note [606.3-1] was retired when the information was added to C&MS 507.09 and the Department's Approved List.
610.1	6-22 through 6-23	Notes [610.1-1] & [610.1-2] were retired when the information was added to SS898.01 and SS898.15.
610.2	6-22 through 6-23	Note [610.2-1] 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 [701.2-1] & [701.2-2] were retired when the information was added to C&MS 518.05.
701.5	7-2	Note [701.5-1] was retired when the information was added to C&MS 511.10.
701.7	7-3	Note [701.7-1] was retired when the information was added to C&MS 516.07.
702.4	7-4	Note [702.4-1] was retired when the information was added to C&MS 516.07.
702.5	7-4	Note [702.5-1] was retired when the information was added to C&MS 516.07.
702.19	7-14	Note [702.19-1] was retired when the information was added to C&MS 513.22.
805.1	8-5	The minimum acoustic requirements were updated to Sound Transmission Class in lieu of minimum decibel loss.

BDM Section	Affected Pages	Revision Description
ARN-2	Appendix-2 Through Appendix-3	Retired Note [606.3] for Steel Pile Points
ARN-3	Appendix-3	Retired Notes [610.1-1] & [610.1-2] for QC/QA Concrete for approach slabs
ARN-4	Appendix-3 through Appendix-4	Retired Note [610.2-1] for Semi-integral abutment expansion joint seal
ARN-5	Appendix-5	Retired Notes [701.2-1] & [701.2-2] for Porous Backfill with Filter Fabric
ARN-6	Appendix-5	Retired Note [701.5-1] for Backfill Concrete
ARN-7	Appendix-5 through Appendix-6	Retired Note [701.7-1] for Sealing of Beam Seats
ARN-8	Appendix-6	Retired Note [702.4-1] for controlling weld temperature on elastomeric bearing load plates
ARN-9	Appendix-6	Retired Note [702.5-1] for bearing repositioning
ARN-10	Appendix-6	Retired Note [702.19-1] for welded shear connectors on galvanized steel

considered monolithic as defined above. Also see Section 302.5.1.3.

302.1.3.2 FUTURE WEARING SURFACE

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

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

302.1.4 CONCRETE DECK PROTECTION

302.1.4.1 TYPES

A. Epoxy Coated Reinforcing Steel - CMS 709.00

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

C. Class S Concrete

D. Class HP Concrete

E. Drip Strips

F. CMS 512, Type D, Waterproofing or CMS 512 Type 3 Waterproofing

G. Asphaltic concrete wearing surface

302.1.4.2 WHEN TO USE

All reinforcing steel shall be epoxy coated.

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 302.1.4.3-1 & 302.1.4.3-2)

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.

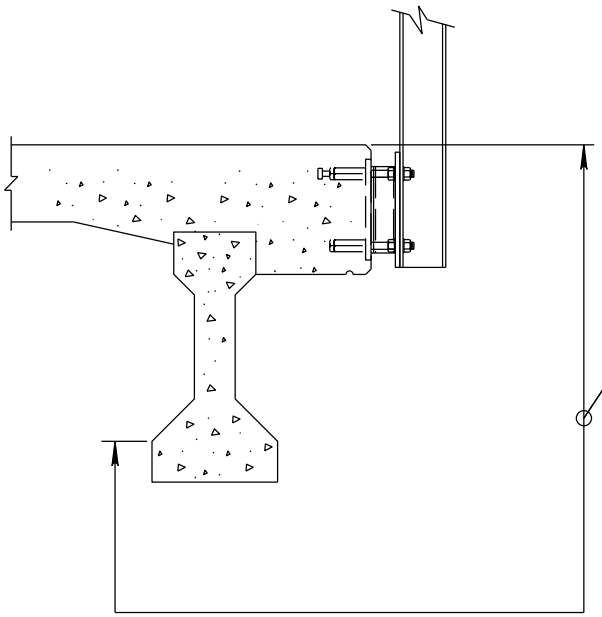
G. Concrete decks on prestressed I-beam superstructures with deflector parapets:

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.

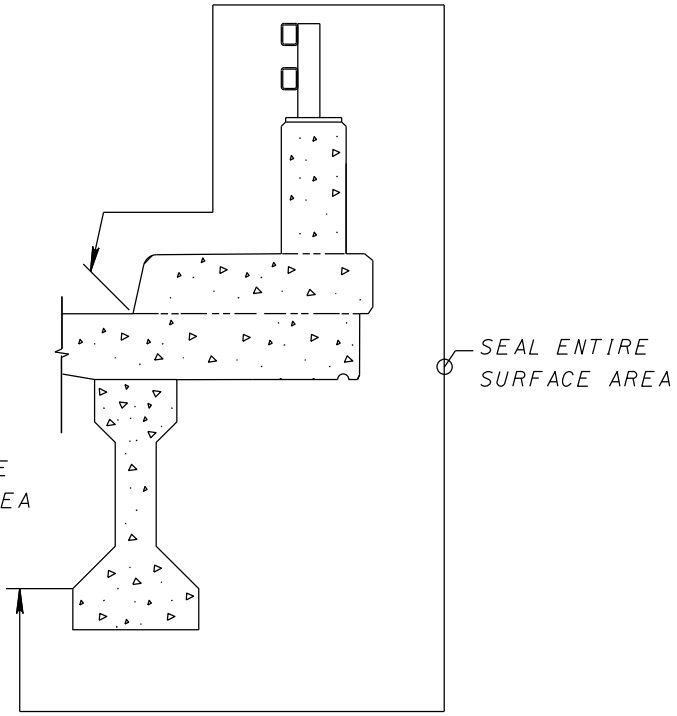
STD. BAR LENGTH DEDUCTIONS FOR COMMON BENDS. (IN)								
BAR NO.	STANDARD BEND (DEGREES)							
	D	45	D	90	D	135	D	180
#3	1 1/2"	1/4"	2 1/4"	1"	1 1/2"	1"	2 1/4"	1 7/8"
#4	2"	1/4"	3"	1"	2"	1 1/4"	3"	2 1/2"
#5	2 1/2"	3/8"	3 3/4"	1 1/2"	2 1/2"	1 5/8"	3 3/4"	3 1/8"
#6	3"	3/8"	4 1/2"	2"	3"	2"	4 1/2"	3 3/4"
#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

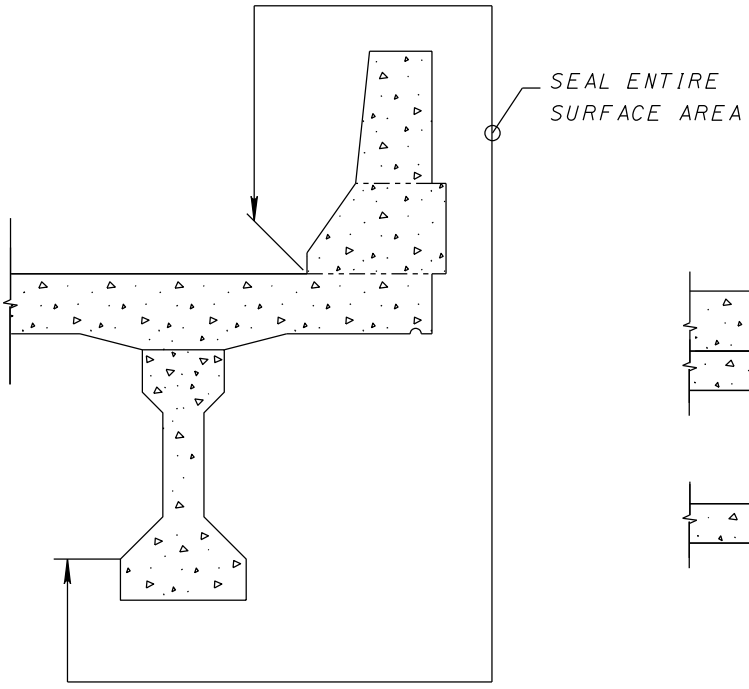
Figure 301.5.4-3



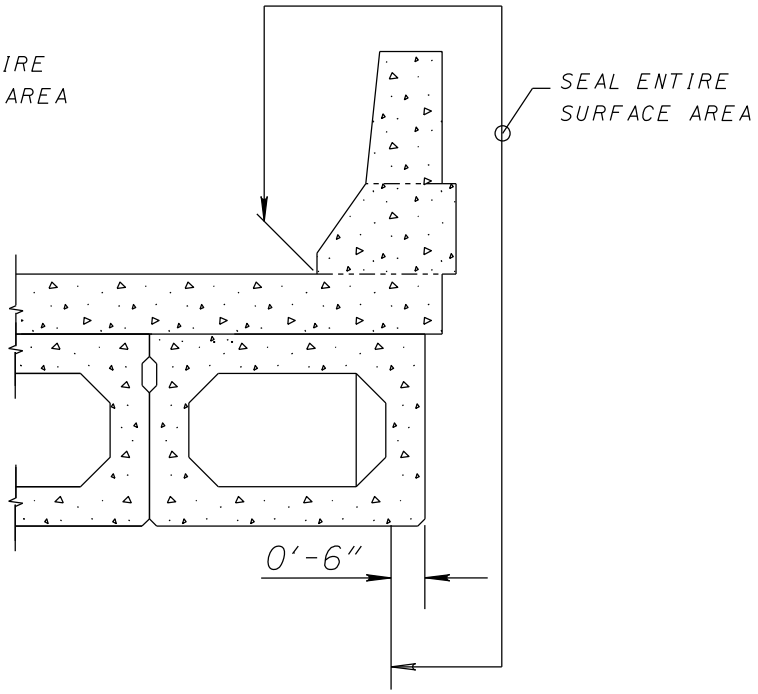
CONCRETE DECKS WITH
OVER THE SIDE DRAINAGE



CONCRETE DECKS WITH CURBS,
SIDEWALKS AND PARAPET



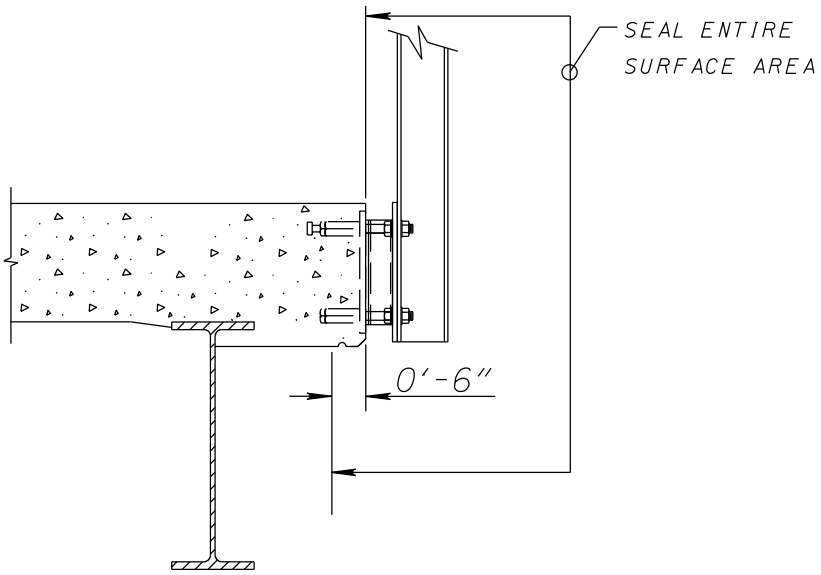
CONCRETE DECK WITH
DEFLECTOR PARAPET



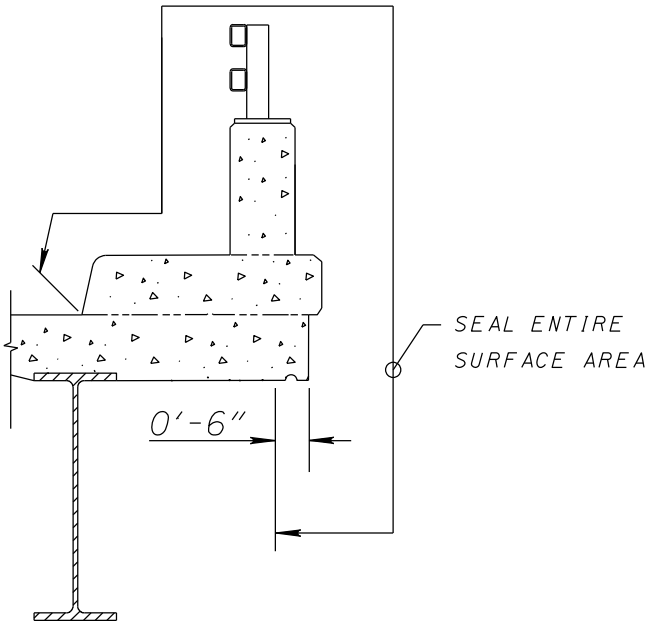
PRESTRESSED BOX BEAM DECK
WITH DEFLECTOR PARAPET

SEALING OF CONCRETE SURFACES, SUPERSTRUCTURE

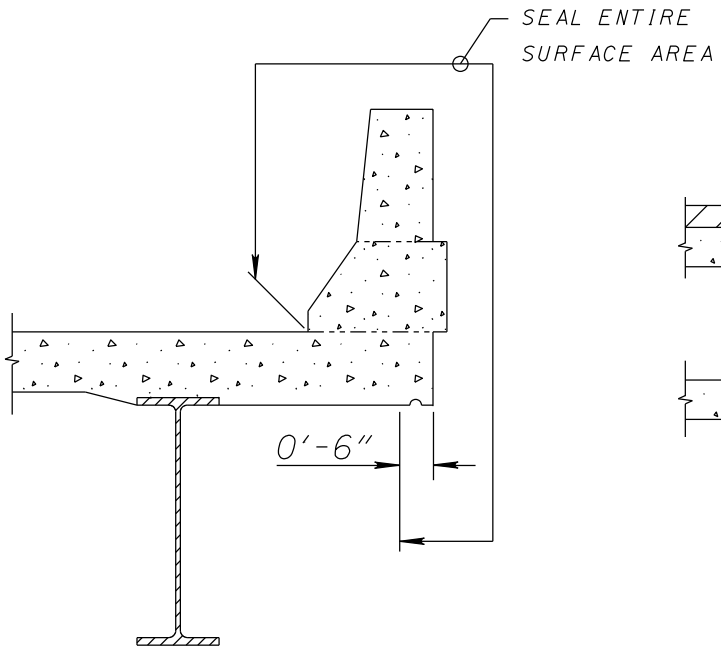
Figure 302.1.4.3-1



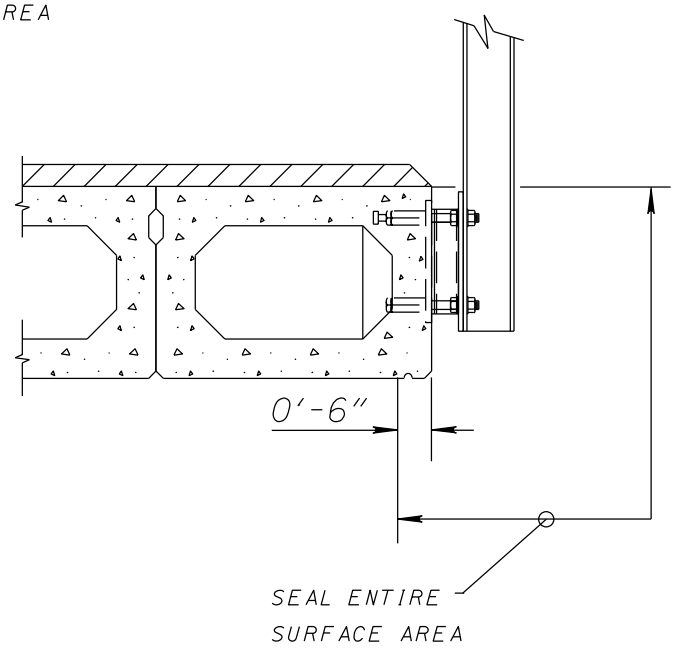
CONCRETE DECKS WITH
OVER THE SIDE DRAINAGE



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 302.1.4.3-2

Concrete Deck Design Aid

Effective Span Length (ft.)	Deck Thickness (in.)	Overhang Deck Thickness (in.)	Transverse Steel						Longitudinal Steel			
			Top Bars				Bottom Bars		Top Bars		Bottom Bars	
			Size	Spa. (in.)	Additional Overhang Bar Size	Cutoff Length (in.)	Size	Spa.	Size	Spa.	Size	Spa.
7.0	8.50	10.50	#5	6.50	#5	50.0	#5	6.50	#4	12.50	#5	13.00
7.5	8.50	10.50	#5	6.25	#5	50.0	#5	6.25	#4	12.00	#5	12.25
8.0	8.50	10.50	#5	6.00	#5	50.0	#5	6.00	#4	11.50	#5	11.50
8.5	8.75	10.75	#5	6.00	#4	50.0	#5	6.00	#4	11.50	#5	11.25
9.0	8.75	10.75	#5	5.75	#4	50.0	#5	5.75	#4	11.00	#5	10.75
9.5	9.00	11.00	#5	5.75	#4	50.0	#5	5.75	#4	11.00	#5	10.50
10.0	9.25	11.25	#5	5.50	#4	50.0	#5	5.50	#4	10.50	#5	10.50
10.5	9.25	11.25	#5	5.25	#4	50.0	#5	5.25	#4	10.00	#5	10.00
11.0	9.50	11.50	#5	5.00	#4	38.0	#5	5.00	#4	9.50	#5	10.00
11.5	9.75	11.75	#5	5.00	#4	38.0	#5	5.00	#4	9.50	#5	9.75
12.0	9.75	11.75	#6	6.00	#4	38.0	#5	6.00	#4	8.00	#5	9.50
12.5	10.00	12.00	#6	6.00	#4	21.0	#5	6.00	#4	8.00	#5	9.25
13.0	10.25	12.25	#6	6.00	#4	21.0	#5	6.00	#4	8.00	#5	9.25
13.5	10.25	12.25	#6	5.75	#4	21.0	#5	5.75	#4	7.75	#5	9.00
14.0	10.50	12.50	#6	5.75	#4	21.0	#5	5.75	#4	7.75	#5	9.00

Notes:

1. Designs in accordance with AASHTO LRFD Bridge Design Specifications and the 2007 ODOT Bridge Design Manual
2. Design Assumptions:
   a. Four or more beam/girder lines
   b. Transverse steel is placed perpendicular to beam/girder lines
   c. Normal weight concrete with f'c = 4.5 ksi
   d. Reinforcing steel with fy = 60 ksi
   e. Monolithic Wearing Surface = 1.0 in.
   f. Future Wearing Surface = 0.06 ksf
   g. *LRFD 5.7.3.4* - Exposure Factor (γ_e) = 0.75
   h. Top cover = 2.50 in.; Bottom cover = 1.50 in.
   i. Maximum overhang width = 4.0 ft. (measured from cl. of fascia beam/girder to deck edge)
   j. Valid for BR-1 (36" & 42"), SBR-1-99, BR-2-98, and TST-1-99 barrier systems
3. Calculate Effective Span Length according to *LRFD 9.7.3.2* and round up to the nearest 0.5 ft. increment
4. Minimum Deck Thickness in accordance with BDM Section 302.2.1
5. Cutoff Length = length beyond the centerline of the fascia beam/girder where additional overhang bars are no longer required for strength.
6. Longitudinal bar spacing does not include additional reinforcing required for negative moments in accordance with *LRFD 5.7.3.2* (for prestressed beams) and *LRFD 6.10.1.7* (for steel beams/girders)
7. Refer to Figure 302.2.2-2 and Figure 302.2.2-3 for more information

Figure 302.2.2-1

(5) Specify the order length according to BDM Section 202.2.3.2.c and 303.4.2.1.

(6) Specify the number of dynamic load testing items according to BDM Section 303.4.2.7.

Provide the following note when Static Load Testing is required according to Section 303.4.2.5. Modify the note as necessary to fit the specific condition.

[606.2-4] STATIC LOAD TEST: Perform dynamic testing on the first two production piles to determine the required blow count for the specified Ultimate Bearing Value. Perform the static load test on either pile. Do not over-drive the selected pile. Drive the third and fourth production piles to 75% and 85% of the determined blow count, respectively and perform dynamic testing on each. The test piles and the reduced capacity piles shall not be battered. After installation of the first four production piles, cease all driving operations on piling represented by the static load testing for a minimum of 7 days. After the waiting period, perform pile restrikes on the four piles (two restrike test items). The Engineer will review the results of the pile restrikes and establish the driving criteria 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 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 friction piles are specified.

[606.2-5] BATTERED PILES: The blow count for battered piles shall be the blow count determined for vertical piles of the same Ultimate Bearing Value divided by 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.)

The following note, modified to fit the specific conditions for the foundation required, will apply when uplift loads control the design of the pile. In this case, the piles are typically driven to a pile tip elevation and dynamic load testing of the pile is not performed.

[606.2-6] PILES DRIVEN TO TIP ELEVATION FOR UPLIFT: Drive the piles to the pile tip elevation shown on the plans. Do not perform dynamic load testing on piles driven to a tip elevation. Select the hammer size to achieve the required depth. Provide plain cylindrical casings with a minimum pile wall thickness of (1) inch for piles driven to a tip elevation.

Abutment piles:

(2) piles (3) feet long, order length

NOTE TO DESIGNER:

(1) Specify the minimum pile wall thickness for cast-in-place reinforced concrete piles. Determine the minimum pile wall thickness from a pile drivability analysis. Remove this sentence if the piles are H-piles.

(2) Specify the size of pile (e.g. HP 10 x 42 or 12 inch diameter).

(3) Specify the order length according to BDM Section 202.2.3.2.b and 303.4.2.1.

606.3 STEEL PILE POINTS

[606.3-1] Note Retired – See Appendix

606.4 PILE SPLICES

Provide the following note when H-piles are specified.

plans.

608 RAILROAD GRADE SEPARATION PROJECTS

608.1 CONSTRUCTION CLEARANCE

Obtain the actual dimensions used in the text of this note from the "Agreement" (a legal document signed by the Director and Railroad). To help limit project construction problems, validate those dimensions with the district railroad coordinator before the note is considered complete. Revise the note to define the agreed upon restraints, including items such as short term clearances, if different than the construction clearances; maximum period of time for restricted clearances; or other project specific controls.

[608.1-1] CONSTRUCTION CLEARANCE: Maintain a construction clearance of _*_ feet horizontally from the center of tracks and _*_ feet vertically from a point level with the top of the higher rail, and _*_ feet from the center of tracks, at all times.

NOTE TO DESIGNER:

* The Designer shall fill in the dimensions.

608.2 RAILROAD AERIAL LINES

Modify the note below to match the specific requirements of the "Agreement" (a legal document signed by the Director and Railroad). Contact the District railroad coordinator to confirm whether the railroad will move, maintain, or re-construction their lines or other cable systems attached to the bridge or whether the note must specify this scope of work as part of the project.

[608.2-1] RAILROAD AERIAL LINES will be relocated by the Railroad. Use all precautions necessary to see that the lines are not disturbed during the construction stage and cooperate with the Railroad in the relocation of these lines. The cost of the relocation will be included in the railroad force account work.

609 UTILITY LINES

The District Utility Coordinator shall coordinate utilities. The District utilities coordinator shall be contacted for required notes. If existing utilities contain asbestos or other hazardous materials, plan notes will be required to identify the location of the utility and identify the material. The Designer shall assure any plan notes added are coordinated with the bid item descriptions to assure the Contractor properly bids the item.

610 MISCELLANEOUS GENERAL NOTES

610.1 APPROACH SLABS

[610.1-1] Note Retired – See Appendix

[610.1-2] Note Retired – See Appendix

610.2 INTEGRAL AND SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEALS

[610.2-1] Note Retired – See Appendix

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610.3 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.

[610.3-1] CONCRETE PARAPETS: As soon as a concrete saw can be operated without damaging the freshly placed concrete, sawcut 1 1/4" 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 and a maximum of 10 feet 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. Seal the perimeter of the deflection control joint to a minimum depth of 1 inch with a polyurethane or polymeric material conforming to ASTM C920, Type S. Leave the bottom ½ inch of the inside and outside face unsealed to allow water to escape.

610.4 BEARING PAD SHIMS, PRESTRESSED

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

[610.4-1] BEARING PAD SHIMS: Place 1/8" thick preformed bearing pad shims, plan area ___ inches by ___ inches, under the elastomeric bearing pads where required for proper bearing. Furnish two shims per beam. The Department will measure this item by the total number supplied. The Department will pay for accepted quantities at the contract price for Item 516 - 1/8" Preformed Bearing Pads. Any unused shims will become the property of the State.

NOTE TO DESIGNER: The plan area of the shim pad shall be the same as the elastomeric bearing.

610.5 CLEANING STEEL IN PATCHES

Use this note with all concrete patching bid items that refer to the cleaning requirements specified in 519.04

[610.5-1] ITEM 519 - PATCHING CONCRETE STRUCTURES, AS PER PLAN: Prior to the surface cleaning specified in 519.04 and within 24 hours of placing patching material, blast clean all surfaces to be patched including the exposed reinforcing steel. Acceptable methods include high-pressure water blasting with or without abrasives in the water, abrasive blasting with containment, or vacuum abrasive blasting.

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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.

[701.1-1] STEEL SHEET PILING left in place shall have a minimum section modulus of_____ in^3 per foot of wall.

701.2 POROUS BACKFILL

[701.1-1] 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.)

[701.3-1] 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.

[701.3-2] 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.

[701.4-1] BRIDGE SEAT ELEVATIONS have been adjusted upward _____ inches at abutments and _____ inches at piers to compensate for the vertical deformation of the bearings.

701.5 PROPER SEATING OF STEEL BEAMS AT ABUTMENTS

[701.5-1] 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:

[701.5-2] 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:

[701.6-1] 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

[701.7-1] 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 702.1-1 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:

[702.2-1] 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:

[702.3-1] HIGH STRENGTH BOLTS shall be _____ diameter A325 unless otherwise noted.

702.4 ELASTOMERIC BEARING LOAD PLATE

[702.4-1] Note Retired – See Appendix

702.5 BEARING REPOSITIONING

[702.5-1] Note Retired – See Appendix

702.6 CONCRETE PLACEMENT SEQUENCE NOTES

Also see section 701.5 notes.

702.6.1 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.

[702.6.1-1] INTERMEDIATE DIAPHRAGMS: Do not place the deck concrete until all intermediate diaphragms have been properly installed. If concrete diaphragms are used, complete the installation of the intermediate diaphragms at least 48 hours before deck placement begins. Concrete shall be Class S.

702.6.2 SEMI-INTEGRAL OR INTEGRAL ABUTMENT CONCRETE PLACEMENT FOR DIAPHRAGMS

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

(Method B) of the AASHTO LRFD Bridge Design Specifications. Perform the Long-term Compression Proof Load Test in accordance with the AASHTO Standard Specifications for Highway Bridges, Division II, Section 18.7.2.6 and 18.7.4.5.

702.16 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.

[702.16-1] 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			

702.17 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.

[702.17-1] 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 LRFD Bridge Construction Specifications, Section 11.4.3.3.3 or provide a full penetration weld, with 100% radiographic inspection.

702.18 FRACTURE CRITICAL FABRICATION NOTE

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

[702.18-1] 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.

702.19 WELDED SHEAR CONNECTORS ON GALVANIZED STRUCTURES

[702.19-1] 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.

[703-1] For this project, permits for Sections 401 and 404 of the Clean Water Act, are based on the limits of temporary construction fill placed in "Waters of the United States" as shown below. If either of the limits provided are exceeded, then a 404/401 permit modification will be required. If a permit modification is required, refer to Supplemental Specification 832.09 for the application requirements.

Plan Area of Temporary Fill Material = ____ acres

Total Volume of Temporary Fill Material = ____ yd^3

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SECTION 800 – NOISE BARRIERS

801 INTRODUCTION

According to Section 1400 of the ODOT Location and Design Manual, a Noise Wall Justification shall be included in the Preferred Alternative Verification Review Submission for Major Projects or in the Minor Project Preliminary Engineering Study Review Submission. When noise barriers are necessary, the Office of Environmental Services will furnish the required noise barrier height, length and location(s). The detail design for noise barriers shall be included in the Stage 2 Detailed Design Review Submission.

Design specifications for ground mounted precast concrete noise barrier walls are provided in Standard Bridge Drawing NBS-1-09. Associated designer notes are provided in Design Data Sheet NBSDD-1-09. The Department occasionally permits the use of noise barrier walls consisting of material types other than precast concrete. These wall types are pre-approved according to the requirements of the Department's Standard Procedure 27-005(SP) for new products and this Manual. Alternate noise barrier material types currently approved include: metal; fiberglass; brick or masonry; and acrylic. A complete listing of approved noise barrier suppliers for material types other than precast concrete are provided in Figures 801-1 and 801-2.

802 DESIGN CONSIDERATIONS

802.1 NOISE BARRIER FOUNDATIONS

802.1.1 GENERAL

The Design Agency shall perform a subsurface investigation at all noise barrier locations. The subsurface work shall be in accordance with the most current revision of the ODOT Specifications for Geotechnical Explorations. The noise barrier borings shall be included in the plans with the soil profile/foundation investigation sheets.

The standard foundation for noise barrier walls is a 30-inch diameter drilled shaft with a maximum length of 30-ft. Consult the Office of Structural Engineering when specifying longer or larger diameter drilled shafts.

In regions of poor soils or where obstructions (e.g. underground utilities, drainage facilities, mse wall components, etc.) preclude the use of 30-inch diameter drilled shafts as the appropriate foundation type, consult the Office of Structural Engineering for the use of an alternate foundation type (e.g. larger diameter drilled shafts, spread footings, etc.). If bedrock is anticipated within the drilled shaft length required by BDM Section 802.1.2 and the bedrock has an unconfined compressive strength of 7500 psi or better, provide the required shaft length or a reduced length with a 3-ft minimum length rock socket. For weaker bedrock, provide the required shaft length or a reduced length with a 5-ft minimum length rock socket.

802.1.2 DRILLED SHAFT DESIGN

The following foundation design procedure applies to only 30-inch diameter drilled shafts. For shafts of other diameter or for design parameters that exceed those herein, the foundation shall be designed in accordance with the AASHTO LRFD Bridge Design Specifications, Section 10.

A. At each noise barrier boring location determine the SPT "N" blow counts from 2.5-ft to 25-ft in 2.5-ft increments. The SPT "N"-value is the total number of blows required to drive the sampler from 6" to 12" and from 12" to 18".

B. Correct the N-values for hammer efficiency and depth. Use the following depth correction factors:

Depth (ft.)	Correction Factor	Depth (ft.)	Correction Factor
2.5	1.6	15.0	1.0
5.0	1.4	17.5	0.96
7.5	1.2	20.0	0.91
10.0	1.1	22.5	0.88
12.5	1.1	25.0	0.84

C. The final design "N"-value used to establish the required minimum shaft length should be based on either average or lowest corrected "N"-values as follows. When the corrected "N"-values are consistent with depth or when the corrected values increase with depth, the final design "N"-value shall be the average of the corrected values along the length of drilled shaft. Otherwise, the final design "N"-value shall be the lowest corrected value along the length of the drilled shaft. The following examples assumes a drilled shaft with a design length of 15-ft.

Depth (ft.)	Corrected "N"-value	
5	8	
10	15	
15	16	Design "N" = (8+15+16)/3=13
20	25	
25	30	

Depth (ft.)	Corrected "N"-value	
5	16	
10	8	
15	15	Design "N" = 8
20	25	
25	30	

D. Establish the soil type as granular or cohesive at each boring. Soil should be considered granular when the plasticity index is less than 7.

E. Select the Granular Soil Foundation Depth Table (Figure 802.1.2-1) or the Cohesive Soil Foundation Depth Table (Figure 802.1.2-2) to determine the required drilled shaft length for the assumed post spacing and wall height at each boring location. Refer to the Design Data

Sheet, NBSDD-1-09, for guidelines for establishing post spacing. Frequently varying plan specified shaft lengths throughout the project should be avoided, and the minimum increment of plan specified shaft length should be 2-ft.

802.2 NOISE BARRIER AESTHETICS

The Department limits standard aesthetic treatments for noise barriers.

Aesthetic limitations include:

A. Concrete wall panels shall use an Ashlar stone pattern form liner, or other approved formliner. The surface treatment detail shall be shown in the project plans. The Office of Environmental Services will approve formliners other than Ashlar stone pattern. Other wall panel materials (steel, fiberglas, etc.) will not require a form liner.

B. Concrete posts shall be used except when mounted on bridges and other structures.

C. Noise barrier panels and posts shall have a cap to create a shadow line. Caps for posts should be of the same material as the posts and shall be integral with or mechanically fastened to the top of the post. Caps for panels shall be integral with the panel.

D. General dimensions for the cap are:

   1. 6 inches high
   2. 4 inches wider than the post and panel selected and centered so the cap horizontally extends 2 inches beyond the panel or posts vertical surfaces. (Other options may be acceptable depending on limits of manufacturing process and final visual effect.)

E. The Department is standardizing color for panels and posts. Color choices should be selected from the Department's acceptable colors. The coating material used to produce the color is to be approved by the Office of Environmental Services. The noise barrier color(s) shall be determined by the designer in conjunction with the District Aesthetic Coordinator. The posts, caps and joints may have a color(s) different from the panels, but the color combination shall be visually appealing.

Color choices may also be limited due to noise panel material types. Agencies and/or designers specifying both color and wall panel material type should assure that the color is available.

Aesthetic treatments beyond these limitations require review and approval by the Office of Environmental Services.

The aesthetic requirements for each project shall be clearly defined in the noise barrier plan general notes. Those notes shall be detailed enough to assure detail finishes, form liners, caps, colors, coatings, application requirements, special design dimensions, etc. are not only adequately specified to assure the visual effect but to also assure quality of construction and materials.

803 DETAIL DESIGN SUBMISSION REQUIREMENTS

803.1 NOISE BARRIER PLAN SHEET ORDER

The noise barrier plan sheets shall be an individually numbered plan subset within the project plans. The plan sheet order should conform to the following:

A. Noise Barrier Schematic Plan

B. Noise Barrier Typical Sections

C. General Notes

D. Noise Barrier Subsummary

E. Plan & Profile Sheets

F. Cross Sections

G. Noise Barrier Data Tables

H. Miscellaneous Noise Barrier Details

Ensure that the soil profile/foundation investigation sheets are included in the project plans.

803.2 NOISE BARRIER PLAN REQUIREMENTS

The noise barrier plans for Stage 2 Detailed Design Review shall include the following:

A. Noise Barrier Schematic Plan

The purpose of the schematic plan is to show the location of each noise barrier wall on the project (using a 1"=200' scale) and provide baseline geometry for the wall. The scale shall be shown in bar format. A north arrow shall be provided. All reference lines (e.g. centerlines of construction, baselines of ramps, etc.) should be shown. Provide roadway stationing tick marks at 100-ft. intervals.

Each noise barrier on the project shall be given a unique designation (e.g. Noise Barrier #1, Noise Barrier #2, etc.) and unique stationing. The noise barrier stationing shall be independent of the roadway stationing. Provide the noise barrier station; the roadway station; and the offset from the roadway reference line for the beginning and ending points for each wall on the project.

The baseline geometry for the wall may be provided in tabular format. At a minimum, the geometry shall provide the noise barrier station; the roadway station and offset; and the bearing from for all points of tangency along the barrier alignment.

B. Noise Barrier Typical Sections

1. Identify the roadway centerline and dimension the outside traffic lanes, paved shoulder

width and graded shoulder width.

2. Dimension the location and identify the type of roadside barrier protection (if required). Noise barrier located within the clear zone requires protection in the form of guardrail or concrete barrier. The clear zone shall be measured to the nearest face of the post.
3. Dimension the location of the noise barrier with respect to the roadway centerline or the face of the roadside barrier protection (if available).
4. Provide the paved shoulder and graded shoulder cross slopes.
5. Provide the limiting stations where the typical section is applicable.
6. Provide typical grading details around the noise barrier in cut sections and fill sections. Include earth berm dimensions and cross slopes, distance from the noise barrier to the ditch centerlines, ditch dimensions, foreslope and backslope rates, and erosion control or seeding details.
7. Provide typical grading details around the noise barrier in a backslope location, including typical drainage and backfill details, and erosion control or seeding details.

C. General Notes

Provide general notes, not included in the standard bridge drawings or elsewhere in the project plans, that are necessary to complete the project plans and properly construct the noise barrier. For wall types other than precast concrete, include the approved supplier contact information provided in Figure 801-1 and Figure 801-2.

D. Noise Barrier Subsummary

Provide a noise barrier subsummary as described in Section 1307 of the ODOT Location and Design Manual, Volume 3, which includes all quantities required to construct the noise barriers that are not summarized elsewhere in the project plans.

E. Plan and Profile Sheets

Plan and profile sheets should conform to Section 1309 of the ODOT Location and Design Manual, Volume 3, and should detail the horizontal and vertical alignments of the noise barrier as follows:

1. In addition to the requirements of the L&D Vol. 3, include the following information in the plan view (using a 1”=20’ horizontal scale):
   a. All horizontal alignment data for the noise barrier.

      Provide the noise barrier stationing at the begin point, end point and all intermediate deflection points of the barrier alignment; the bearing direction for all noise barrier segments; the deflection angle at all deflection points.

   b. Graphically accurate representation of the panel segments and post locations including alignment centerline. In order to avoid congestion, post and panel labels should not be shown.

c. All existing and proposed utilities, boundary lines, drainage facilities and other roadway incidentals (e.g. signs, fences, etc.) located within the construction limits of the noise barrier.

d. All soil boring locations and designations.

e. All proposed roadway, erosion control and drainage items and features to be constructed as part of the noise barrier installation.

f. The locations of all existing and proposed reference monuments. Locate all proposed monuments on the roadway side of the noise barrier, and relocate any existing monument as necessary to place it on the roadway side of the barrier. (Provide a pay item to relocate every existing Reference Monument located on the outside of proposed noise walls.)

g. Proposed construction limits encompassing the area that will be disturbed by the noise barrier construction.

2. In addition to the requirements of the L&D Vol. 3, include the following information in the profile view (using a 1"=5' vertical scale and a 1"=20' horizontal scale with vertical gridlines at 10-ft increments, horizontal gridlines at 25-ft increments and no grid subdivisions):

   a. A profile of the existing ground line taken along the centerline of the proposed noise barrier, with elevations provided every 25-ft and at abrupt elevation changes.

   b. All existing and proposed underground utilities and drainage facilities located within the construction limits of the noise barrier. Label the disposition of existing items.

   c. The acoustic profile line and elevations determined from the preliminary data in the project noise analysis report.

   d. The length of all panel spans.

   e. Each panel number or designation.

   f. A profile of the final ground line taken along the centerline of the proposed noise barrier with elevations provided every 25-ft and at abrupt elevation changes.

   g. The top and bottom elevations of each noise barrier panel between adjacent posts.

   h. The locations of noise barrier panels with special architectural surface treatments, form liners or icons that differ from the normal surface treatment for the project.

   i. The locations of drilled shafts with a diameter greater than 30" or other special foundation types.

   j. The approximate top of bedrock elevation at each soil boring location (where applicable).

F. Cross Sections

Provide cross sections along the centerline alignment of each noise barrier. The cross section shall conform to Section 1310 of the ODOT Location and Design Manual, Volume 3 and

include the following:

1. Earth berms or other special grading that is required to construct the noise barrier at the proper elevation.
2. Proposed ditches required to properly convey stormwater runoff around the noise barrier.
3. Profiles of proposed drainage facilities within the construction limits of the noise barrier (not including the noise barrier underdrains) that are not shown elsewhere in the project plans.

Cross sections may be omitted if the project does not require cut and/or fill to construct the noise barrier wall.

The noise barrier cross sections as described above may be shown on the roadway cross sections. If provided with the roadway sections, in addition to the roadway station, provide the noise barrier station at each cross-section. Also include cross-references in the noise barrier plan subset listing the location of the noise barrier cross sections in the overall plan set.

G. Noise Barrier Data Tables

Provide completed data tables for each noise barrier similar to those shown in the sample noise barrier plans.

H. Miscellaneous Noise Barrier Details

Provide details not provided in the standard drawings or elsewhere in the project plans. Examples include: special architectural surface treatments or other aesthetic details; special post or panel cap details; noise barrier transitions at bridges; special panel details to accommodate fire hose connections; etc.

Sample Noise Barrier Plans are available on the Office of Structural Engineering website.

803.3 ADDITIONAL DETAIL DESIGN SUBMISSION REQUIREMENTS

In addition to the project plans, the following information should be provided during the Stage 2 Detail Design Submission:

A. A copy of the Office of Environmental Services requirements for location and height of noise barrier walls.

B. The District Production Administrator should be contacted for the approved noise barrier material types, suppliers, alternate bid requirements, and special features in accordance with the Department's Noise Wall Policy 417-001(P). A copy of the letter from the District Production Administrator stipulating the information in this paragraph should be part of the detailed design submission.

804 NOISE BARRIERS – APPROVAL OF WALL DESIGNS

Individual manufacturers of noise barrier for material types other than precast concrete shall submit panel designs. If approved, those designs will be added to Figure 801-1 or 801-2. A modification to an approved wall design requires a resubmission to the Department for approval. The Department will not allow a modified design to be used on a construction project prior to its approval.

Environmental, structural and acoustic design for the walls shall meet the requirements of 805.1, 805.2 and 805.3 of this manual.

There are two types of noise barriers, reflective and absorptive. Noise barrier manufacturers interested in having their noise barrier wall approved should submit their proposed designs in accordance with 805.

805 NOISE BARRIER SUBMISSION REQUIREMENTS

Manufacturers interested in having their noise barrier design approved shall submit an approval package to the Office of Environmental Services.

As a minimum, the submission package shall show compliance with the following design requirements:

A. Environmental.....Section 805.1

B. Structural.....Section 805.2

C. Material.....Section 805.3

Submit three copies of the complete submission package to the Office of Environmental Services. Include the specific product trade name; company address; and name, phone number, and email address of a technical representative available to answer questions during the product review period. The Department will evaluate the submission and provide a written decision to the manufacturer no later than 60 days after the submission package is received.

805.1 ENVIRONMENTAL DESIGN REQUIREMENTS

The Manufacturer's wall system shall show compliance with the Department's Aesthetic limitations provided in Section 802.2 and the following Acoustic requirements:

A. Reflective noise barriers - Minimum STC (Sound Transmission Class) = 30

B. Absorptive noise barriers:

   1. Minimum STC (Sound Transmission Class) = 30
   2. Minimum NRC (Noise Reduction Coefficient) = 0.70

All barrier material submitted shall be acoustically tested at an independent laboratory capable of performing the following tests:

A. ASTM Standard Test Method for Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method

B. ASTM C423 and E795 (Latest editions)

C. ASTM E90 and E413 (Latest editions)

805.2 STRUCTURAL DESIGN REQUIREMENTS

As a minimum, the structural design of the Manufacturer's wall system shall conform to the 4th Edition of the "AASHTO LRFD Bridge Design Specifications", 2007; the AASHTO "Guide Specifications for Structural Design of Noise Barriers", 1989, including all interims; and this Manual.

The structural design submission shall also include:

A. All design assumptions including:
   1. Physical and mechanical strengths of the component raw materials
   2. Physical and mechanical strengths of the final composite material
   3. Design method(s) and governing specifications used
   4. Design safety factors used including information on why the factors were chosen and how the material's environmental and loading durability affect those factors.

B. Complete design calculations:
   1. Signed, sealed and dated by a registered professional engineer
   2. Using the following minimum wind pressures:
      a. Ground mounted = 25 psf [1.2 kPa]
      b. Structure mounted = 30 psf [1.4 kPa]
   3. Include all fabrication, shipping, handling and erection loads

C. Fabrication and construction drawings showing wall details, dimensions, connections and any other information required to define the wall system.

805.3 MATERIAL DESIGN REQUIREMENTS

The material design submission shall include:

A. Test data documenting the physical and mechanical properties used for structural design.

B. Test data documenting any long term decrease in physical and/or mechanical properties due to fatigue, creep, bond deterioration, etc.

C. Test data documenting material durability to environmental variables including: UV, temperature, moisture, freeze-thaw, fire, salt, petroleum, pH, etc.

D. Test data documenting material's performance to temperature changes expected under service conditions.

E. Test data documenting durability of any applied coatings used to protect material from environmental deterioration.

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APPENDIX – MISC. BRIDGE INFORMATION

APPENDIX PURPOSE

The Bridge Design Manual's appendix serves three purposes.

A. One is to serve as a repository for special plan notes that are infrequently used or subject to frequent revision. These notes are generally large and detailed documents. When a bridge design requires the use of appendix notes one of two methods should be used to incorporate the notes into the project plans. One, the designer transfers the notes to plan sheets for inclusion into the bridge plans. The second method is to treat the note as un-numbered proposal note. This method requires the designer to include with the bid item(s) a reference to the proposal and supply electronic versions, or typed hard copies, of the note with the final plan submission. If the proposal note method is used, the designer shall ensure the notes are presentable, that it is clear what notes are to be used as proposal notes, and that the agency receiving the completed plans understands the notes must be included in the project's actual proposal. The choice of methods is the option of the owner.

B. The second purpose is to serve as a historical archive for old plan notes, old general notes or old proposal notes which are no longer active or not recommended for use.

C. The third purpose is to serve a repository for special bridge policy criteria and other items of similar concept.

ARN-1 RETIRED NOTE 702.12-2

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.)

[702.12-2] 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 **[702.12-2]** 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-2 RETIRED NOTE 606.3-1

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

[606.3-1] 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 **[606.3-1]** was retired when the information was added to C&MS 507.09 and the Department's Approved List.

ARN-3 RETIRED NOTES 610.1-1 & 610.1-2

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:

[610.1-1] 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.

[610.1-2] 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 **[610.1-1]** & **[610.1-2]** were retired when the information was added to SS898.01 and SS898.15.

ARN-4 RETIRED NOTE 610.2-1

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.

[610.2-1] 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 **[610.2-1]** was retired when the information was added to C&MS 516.04 &

516.05 and the Department's Qualified Products List (QPL).

ARN-5 RETIRED NOTES 701.2-1 & 701.2-2

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

[701.2-1] POROUS BACKFILL WITH FILTER FABRIC, 2 feet thick shall extend up to the plane of the subgrade, to 1 foot below the embankment surface, and laterally to the ends of the wingwalls.

For use when weep holes are specified:

[701.2-2] POROUS BACKFILL WITH FILTER FABRIC, 2 feet thick shall extend up to the plane of the subgrade, to 1 foot below the embankment surface, and laterally to the ends of the wingwalls. Place two cubic feet of bagged No. 3 aggregate at each weephole. The Department will include bagged aggregate with porous backfill for payment.

HISTORY: Notes **[701.2-1]** & **[701.2-2]** were retired when the information was added to C&MS 518.05.

ARN-6 RETIRED NOTE 701.5-1

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.

[701.5-1] 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 **[701.5-1]** was retired when the information was added to C&MS 511.10.

ARN-7 RETIRED NOTE 701.7-1

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

[701.7-1] 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 **[701.7-1]** was retired when the information was added to C&MS 516.07.

ARN-8 RETIRED NOTE 702.4-1

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:

[702.4-1] WELDING: Control welding so that the plate temperature at the elastomer bonded surface does not exceed 300° F as determined by use of pyrometric sticks or other temperature monitoring devices.

HISTORY: Note **[702.4-1]** was retired when the information was added to C&MS 516.07.

ARN-9 RETIRED NOTE 702.5-1

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

[702.5-1] BEARING REPOSITIONING: If the steel is erected at an ambient temperature higher than 80°F or lower than 40° F and the bearing shear deflection exceeds 1/6 of the bearing height at 60° F (+/-) 10° F, raise the beams or girders to allow the bearings to return to their undeformed shape at 60° F (+/-) 10° F.

HISTORY: Note **[702.5-1]** was retired when the information was added to C&MS 516.07.

ARN-10 RETIRED NOTE 702.19-1

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

[702.19-1] 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 **[702.19-1]** was retired when the information was added to C&MS 513.22.