



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

July 20, 2018

To: Users of the Bridge Design Manual

From: Tim Keller, Administrator, Office of Structural Engineering

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

Re: 2018 Third Quarter Revisions

Revisions have been made to the ODOT Bridge Design Manual, January 2004. These revisions shall be implemented on all Department projects that begin Stage 2 plan development date after July 20, 2018. Implementation of some or all of these revisions for projects further along the development process should be considered on a project-by-project basis.

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

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

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

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

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

Attached is a brief description of each revision.

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Summary of Revisions to the January 2004 ODOT BDM

BDM Section	Affected Pages	Revision Description
203.5	2-21.2	The determination of the design flow to be maintained for a TAF has been moved to the L&D Vol. 2, Section 1012.
305.2	3-88	Bridges that carry freeways as defined in the Ohio Revised Code have been exempted from fencing. Bridges carrying non-freeway routes over county and township routes will require fencing.
305.6	3-90 through 3-91	This new section provides design information related to temporary vandal protection fencing.
611.11	6-35	This new section provides a plan note to install permanent fencing for bridges built with phase construction before opening each phase to traffic. Since the same note is now included on VPF-1-90, this note is intended for non-standard fence configurations.
611.12	6-35	This new section provides a plan note for allowing a precast concrete option for cast-in-place wingwalls and headwalls for 4-sided box culverts, 3-sided flat top culverts, arch culverts and circular arch culverts.

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or more require two cranes. Unless the access for member delivery is from an adjacent structure, the TAF must provide access to each end of the lift from one bank. In the case of staging, the permit application shall reflect the construction stage that impacts the largest area of the waterway.

- B. The TAF shall be located directly beneath the superstructure. The surface width of the TAF shall be equal to the out-to-out width of the superstructure plus 50'-0" outboard on one side of the structure and 20'-0" outboard on the other side of the structure.
- C. The TAF shall extend at least 40'-0" beyond the furthest pier accessed by the TAF.
- D. Side slopes of the TAF shall be no steeper than 1.5:1 (H:V).
- E. The top surface of the TAF shall be located 1'-0" above the OHWM.
- F. The TAF shall be designed to maintain the Waterway Permit Discharge (WPD) as detailed in L&D, Volume 2, Section 1012.

This information is intended for permit application purposes only and should not be included in the project plan set. However, to assist the OES-WPU in the determination process, Designers should use the guidance above to develop a plan view and cross-section and determine waterway impacts of a TAF. An example plan view and cross-section are shown in Figure 208. These details should be provided to the DEC along with a completed copy of the checklist shown in Figure 209. The minimum flow to be maintained during construction should be calculated according to item F above. Designers will need to estimate whether this flow can be maintained through conduits or if open channels will be required.

204 SUBSTRUCTURE INFORMATION

204.1 FOOTING ELEVATIONS

Substructure footing elevations shall be shown on the Final Structure Site Plan. Refer to BDM 202.2.3.1 for Spread Footing elevation requirements. The top of footing (e.g. pile and drilled shaft caps) shall be a minimum of one foot below the finished ground line and shall be at least one foot below the bottom of any adjacent drainage ditch. The bottom of footing (e.g. pile and drilled shaft caps) shall not be less than four feet below and measured normal to the finished groundline.

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305 FENCING

305.1 GENERAL

The primary purposes of protective fencing are to provide for the security of pedestrians and to discourage the throwing or dropping of objects from bridges onto traffic below.

The Vandal Protection Fencing Standard Bridge Drawing provides standard details for fencing attached to bridges. The designer may need to enhance this standard to deal with requirements for the specific structure.

305.2 WHEN TO USE

Fencing shall be installed on all bridges over vehicular and pedestrian traffic except as noted herein. Fencing shall be installed on bridges over rail traffic if required in an agreement with the affected railroad. Bridges that carry freeways as defined in the ORC 4511.01 where pedestrians are prohibited per ORC 4511.051 shall be exempt from fencing, unless otherwise specified in the Scope of Services. For facilities not defined as freeways by the ORC, use the table below. For existing bridges, fencing shall be provided when new concrete or refaced concrete barriers are installed. At locations where fencing will adversely affect public safety (e.g. reduced sight distance), submit a written request for exemption to the Administrator of the Office of Structural Engineering. An exemption request form is available as a Design Data Sheet on the Office of Structural Engineering web page. The request for exemption shall include supporting documentation.

Under Bridge Feature	Fence Required
Interstate	Yes
US Route	Yes
State Route	Yes
County\Township Route	Yes
City Route	Yes
Railroad	Yes/No (Based on RR agreement)
Waterway	No
Bike/Walking path	No

305.3 FENCING CONFIGURATIONS

For structures without sidewalks, the top of fence shall be a minimum height of 8-ft above the pavement surface. For structures with sidewalks, the top of fence shall be a minimum height of 8-ft above the sidewalk. For a greater degree of protection against objects being thrown from the bridge, the fence may be curved to overhang the sidewalk. For curved fence the posts shall be vertical for at least 8-ft above the sidewalk before curving inward over the sidewalk. The overhang shall be at least 1-ft less than the width of the sidewalk. See Figures 326 & 327.

For pedestrian bridges, use bent pipe frames with pipe bend radii of 24" at the upper corners and the start of the radii about 8-ft above the sidewalk surface. The fabric shall start at the deck line, top of curb or parapet and may stop at the upper end of the bent portion of the frame. Fabric on the top horizontal area of the frame is not required to prevent an individual from walking on the top of the enclosure. See Figure 328 for an illustration of this configuration. Alternatively, the frame may be designed to form a peak at the center of the structure, similar to a house roofline.

The maximum gap at the bottom of the fence shall be 1-in. A detail to close the bottom of a fencing section is included on the standard bridge drawing.

Posts and frames may be either plumb or perpendicular to the longitudinal grade of the bridge, subject to considerations of aesthetics or practicality of construction. Complete details of base plates, pipe inserts or other types of base anchorage shall be provided on the plans. If applicable to the specific project, details from the standard bridge drawing may be referred to in the project plans.

Fencing on the bridge shall extend between its End Posts placed at the locations selected from the following list that creates the shortest length:

- A. 30-ft \pm 2.5-ft beyond the under bridge route's edge of traveled way nearest the fence terminal
- B. The centerline of the abutment expansion joint (-2.5-ft, +0-ft)
- C. The end of the bridge barrier (-2.5-ft, +0-ft)

Designers shall also place fence on structures parallel to traffic and that carry sidewalks located 30-ft or less from the nearest edge of the traveled way below.

For bridges where a snoop truck will be used for inspection, use only straight fence with the top of the fence located 10-ft or less above the deck.

305.4 SPECIAL DESIGNS

The design loading for non-standard fence designs shall be in accordance with LRFD 15.8.

For fence installation projects on new structures, the installation of a traffic railing (steel tubing) is not required if the top concrete parapet or concrete wall is 36-in above roadway for structures without sidewalks or 36-in above the top of sidewalk for structures with sidewalks. See Figure 326.

Where the standard gray chain link fence mesh detracts from a project's aesthetic enhancements, designers may select an optional color from the following: green, olive green, brown and black. Designers shall consider the welded wire fabric, BDM Section 305.5.B, for additional color options. Color coating of posts and rails shall utilize a two coat shop applied epoxy/urethane system in accordance with C&MS 708.02. Plan notes for this coating system are available from OSE upon request.

For special fence designs, plan notes shall be required to define non-standard color, materials,

traffic maintenance, construction procedures and other requirements. The designer should follow the example of standard bridge drawing for development of required notes.

305.5 FENCE DESIGN GENERAL REQUIREMENTS

Fencing mesh should consist of either of the following materials:

- A. Chain-link wire mesh with one inch diamonds. The core wire shall be 11 gage with a Polyvinyl chloride coating. (C&MS 710.03)
- B. Welded wire fabric with ½” x 3” opening size. The core wire shall be 10.5 gage; galvanized after welding (1.2 oz zinc/ft²), and PVC coated (10 mil).

Brace and bottom rails shall be clamped to posts or post frames.

The top rail, if any, of a free-standing fence should be continuous over two or more posts and suitable cap fittings provided.

Bent pipe frames for narrow pedestrian bridges are permitted. Bent pipe frames for narrow pedestrian bridges should be fabricated in two or more sections and field spliced at the top with sleeves bolted to the frame sections.

To prevent pipe blow-ups during galvanizing, both ends of pipe should be open. Therefore base plates should have holes in them almost equal to the pipes' inside diameter.

305.5.1 WIND LOADS

The design wind loading for non-standard fence designs shall be in accordance with *LRFD* 15.8.2.

The projected area for wind forces on 11 gage polyvinyl chloride coated one inch wire mesh shall be 20% of the gross horizontally projected area.

Additional area for posts, rails and other hardware need not be considered.

305.6 TEMPORARY VANDAL PROTECTION FENCING

The intent of temporary vandal protection fencing is to discourage pedestrians from dropping or throwing heavy objects off the side of the bridge onto traffic below during construction. Use the Design Data Sheet, TVPFDD-1-18, Temporary Vandal Protection Fencing to determine the fencing requirements on bridges during construction.

Standard Bridge Drawing, TVPF-1-18, Temporary Vandal Protection Fencing, provides details for:

- A. Type A – Fencing installed on existing barrier systems and on the existing deck surface near the phased construction joint
- B. Type B – Fencing installed on the back side of the PCB. Refer to BDM Section 304.3.4 for PCB anchoring requirements. As a minimum, provide at least one anchor per PCB segment on the traffic side of the barrier.
- C. Type C – Fencing installed along the phased construction joint side of a newly constructed deck.

The length of each type of temporary vandal protection fencing installation shall be in accordance with the minimum tolerance lengths defined in BDM Section 305.3.

The Department will utilize permanent vandal protection fencing where possible to minimize costs for temporary fencing. Therefore, new permanent fence installations shall be placed prior to shifting traffic onto that phase of construction. Temporary vandal protection fencing installed on existing barrier shall be left in place until the barrier is removed from the bridge. All other types of temporary vandal protection fencing shall remain in place until the Engineer determines that it is no longer necessary. Once removed, reinstallation of temporary vandal protection fencing is not required.

The plans shall provide pay item(s) in the Estimated Quantities; shall show the limits and location of each temporary vandal protection fencing installation; and shall show the appropriate temporary vandal protection fencing type on the Maintenance of Traffic Transverse Sections. If necessary, the plans shall also provide all non-standard connection and fence details; address special installation sequencing; and include all other special notes. Provide details for temporary vandal protection fencing across intermediate expansion joints.

306 EXPANSION DEVICES

306.1 GENERAL

Expansion devices should provide a total seal against penetration and moisture. Standard bridge drawings are available for expansion devices for typical bridge superstructure types.

Expansion devices as shown in the standard bridge drawings and their support systems are designed for an HS25 [MS22.5] loading with 100% impact. Special expansion devices including finger joints and modular joints and their support systems shall also be designed for an HS25 [MS22.5] loading with 100% impact.

For fabricated steel expansion devices, the designer should specify the type of steel required. Type of steel should be included as a plan note if requirements in the plans are not covered by a selected standard bridge drawing.

To protect steel expansion devices, metallizing of the exposed surfaces with a 100% zinc coating shall be specified. Standard bridge drawings define the requirements for metallizing. The design agency will need to develop plan notes for special expansion devices, such as finger joints and modular joints. Use the note for shop-applied metallizing located in the appendix as a guideline. Consult the Office of Structural Engineering for recommendations prior to completion of the project plans.

306.1.1 PAY ITEM

Expansion devices, except as specifically listed in this section, shall be paid for as Item 516.

For sealed expansion devices the elastomeric seal, either strip or compression, shall be included in the pay Item 516.

The plans shall clearly show what components are included with the expansion devices, Item 516. As an example, cross frames, which are field welded to both the superstructure girders and the expansion devices, are part of the 513 structural steel item. The seal is considered part of the expansion device and should be included in the 516 pay item.

306.1.2 EXPANSION DEVICES WITH SIDEWALKS

On structures with sidewalks, the expansion devices shall be the same type as furnished for main bridge deck expansion joint.

A maximum distance from the centerline of the fascia girder to the face of the safety handrail of 65”.

NOTE TO DESIGNER:

Refer to BDM Section 302.2.7.2.c for design information regarding finishing machine loads.

611.11 VANDAL PROTECTION FENCING

For bridges where non-standard vandal protection fencing is provided in accordance with BDM Section 305.6 and the bridge is constructed in phases, provide the following plan note:

[107] VANDAL PROTECTION FENCING

Install fencing for each construction phase prior to opening that phase to vehicular and/or pedestrian traffic.

611.12 PRECAST WALLS

Use note [108] for 4-sided box culverts (C&MS 706.05), 3-sided flat top culverts (C&MS 706.051), arch culverts (C&MS 706.052) and circular arch culverts (C&MS 706.053) where the angle between the centerline of the waterway and the exposed face of the wall is 30 degrees or more.

[108] ITEM 511, CLASS QC1 CONCRETE, RETAINING/WINGWALL NOT INCLUDING FOOTING, AS PER PLAN:

The Department will permit the use of precast concrete in lieu of cast-in-place concrete for headwalls and wingwalls in accordance with C&MS 602.03. The Department will pay for the wingwall and headwall concrete in Square Yard as determined from plan dimensions using the wall heights above the footing and length along the exterior faces of the walls. The Department will consider the reinforcing steel in the wingwalls and headwalls, including the reinforcement that extends into the footings, as incidental to the retaining/wingwall concrete. The total quantity of cast-in-place wingwall and headwall concrete is ____ Cu Yd. The total quantity of cast-in-place wingwall and headwall reinforcing steel is ____ Lbs.

NOTE TO DESIGNER: Where note [108] applies, the Department will pay for the concrete and reinforcing steel in wingwalls and headwalls on a Square Yard basis to avoid the need to non-perform multiple work items associated with the change from cast-in-place to precast concrete. For informational purposes only, include the reinforcing steel for the cast-in-place wingwalls and headwalls in the plan's Reinforcing Steel List and include bending diagrams. The Department will pay for concrete and reinforcing steel in the footings as Item 511 (Cu Yd) and Item 509 (Lb) respectively. The Department will consider the bars that extend from the footing into the wingwalls as wingwall reinforcement. Do not locate foundations for other roadway items (e.g. sign supports) in the soils retained behind wingwalls.

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