

**NDOT STRUCTURES MANUAL  
REVISION 2019-1  
February 2019**

**Revision Summary**

<b>Page(s)</b>	<b>Manual Subsection</b>	<b>Description</b>
16-1	16.1.1	Specify the use of sealers and overlays and clarify the use of epoxy coated bar and Class E/EA concrete to protect new bridge decks.
16-3	16.2.1 - #6	Change the minimum horizontal spacing to 4 in. on center between adjacent bars within each mat. Indicate preference to stagger top and bot mat reinforcement.
16-3	16.2.1 - #7	Specify maximum reinforcement size #6 bar.
16-3	16.2.1 - #8	Clarify sacrificial wearing surface inclusion in design.
16-14	16.2.9.1	Change typical maximum overhang length. Clarify overhang thickness. Specify the use of drip grooves in the deck overhang.
16-22	16.5.1.2	Change the specified shape and height of concrete bridge rails. Clarify the use of 42 in Vertical Concrete Wall. Add Figures 16.5-B and 16.5-C.

Revisions indicated by underscored text.

### 16.1.1 Protection of Reinforcing Steel

Reference: LRFD Articles 2.5.2.1 and 5.14

NDOT practice is to use epoxy-coated reinforcing steel (except in Clark County) for all reinforcing within 12 in of the riding surface. This includes both layers of deck reinforcing and all reinforcing extending into the deck from precast and cast-in-place construction. The epoxy-coated reinforcing steel is combined with a minimum cover of 2½ in from the top surface of the deck to the top layer. In addition, all concrete for deck slabs, approach slabs and barrier rails shall use a high-performance concrete (Class E or EA) having a low water/cement ratio and low permeability. Deck overlays and surface sealants are additional methods available to protect the reinforcing steel in new decks and to retard the rate of corrosion. NDOT practice is to use a surface sealant on the top and traffic face of all concrete bridge rails (except in Clark County). NDOT practice is to use a surface sealant on all bridge decks that do not have a membrane, multi-layer polymer overlay, or polyester overlay. New bridge decks that carry interstate or US 395 in Washoe, Carson City, Douglas, Humboldt, Lander, Eureka, and Elko counties shall have a 3/4 in polyester concrete overlay. Other new bridge decks that carry interstate or US 95 shall have multi-layer polymer overlay.

6. Reinforcing Steel Spacing. Maintain a minimum of 1½ in vertical separation between the top and bottom reinforcing mats. Where conduits are present between mats, the 1½ in must be increased. NDOT typical practice is use an offset or staggered spacing between mats. Maintain a minimum horizontal spacing of 4 in on center (with 6 in preferred) between adjacent bars within each mat. The maximum horizontal reinforcing steel spacing is 8 in for primary (transverse) steel. See Figure 14.3-C for additional information on reinforcing steel spacing.
7. Reinforcing Bar Size. The minimum reinforcing steel size used for bridge deck reinforcement is a #4 bar and the maximum size is a #6 bar.
8. Sacrificial Wearing Surface. The 2½-in top reinforcement concrete cover includes ½ in that is considered sacrificial. For both the deck and superstructure, its weight shall be included as a dead load, but its structural contribution shall not be included in the deck structural design and shall be included in the superstructure design.

### 16.2.9.1 Overhang Width and Thickness

Bridge deck overhang is defined as the distance between the centerline of the exterior girder to the outside edge of the deck. Typically, NDOT practice is that the overhang width will not be more than 50% of the girder spacing. The thickness of the overhang at the outside edge of deck should be the same as the interior deck thickness. The thickness of the overhang at outside edge of girder should be the deck thickness plus the haunch or fillet depth. Continuous ¾ in. drip grooves shall be provided along the underside of the overhang approximately 6 in from the edge of deck.

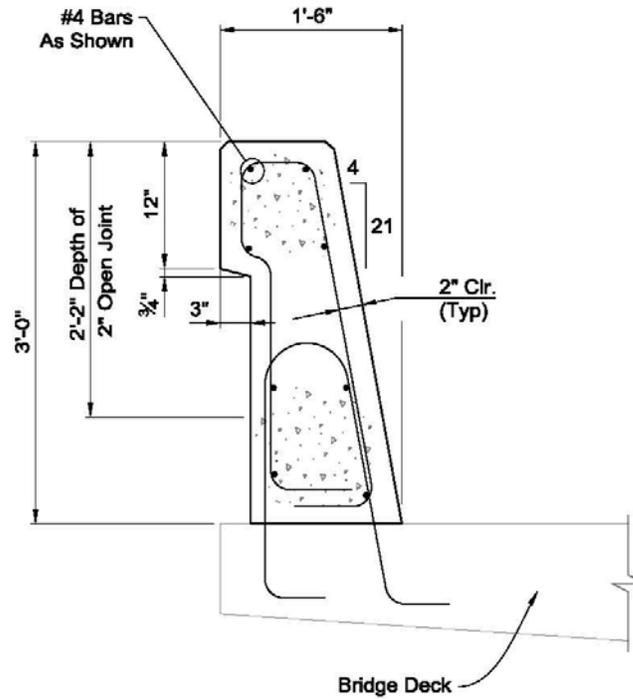
### 16.5.1.2 Bridge Rail Types/Usage

The *NDOT Bridge Drafting Guidelines* presents details for those bridge rail types used by NDOT. The following identifies typical NDOT usage for bridge rails:

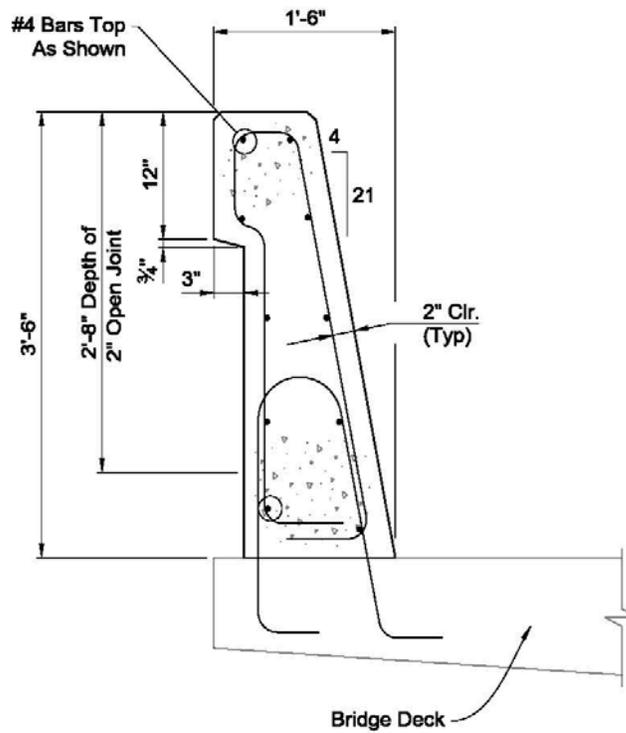
1. 36-in Concrete Single Slope Bridge Rail. NDOT typically uses this bridge rail on all bridges for which the 42-in Concrete Single Slope Bridge Rail and 42-in Vertical Concrete Wall are not applicable; see Items #2 and #3 below. The 36-in Concrete Single Slope Bridge Rail meets the height criteria for a TL-4. See Figure 16.5-B for the 36-in Concrete Single Slope Bridge Rail dimensions and typical reinforcement. The concrete bridge rail's advantages when compared to a metal beam rail include its superior performance when impacted by large vehicles, its relatively low maintenance costs and its better compatibility with the bridge deck system (i.e., the concrete rail can be constructed integrally with the bridge deck). The concrete bridge rail's disadvantages include its higher dead weight.
2. 42-in Concrete Single Slope Bridge Rail. NDOT typically uses this bridge rail:
  - if the roadway approach barrier is 42 in,
  - across railroads,
  - across multiple-use (pedestrian, bicycle) facilities, or
  - curved structures with high degree of curvature.

The 42-in Concrete Single Slope Bridge Rail meets the TL-5 height criteria. See Figure 16.5-C for the 42-in Concrete Single Slope Bridge Rail dimensions and typical reinforcement.

3. 42-in Vertical Concrete Wall. NDOT typically uses this rail where sidewalks are present on the bridge. Its height conforms to the LRFD requirements for pedestrian rails; therefore, its use where sidewalks are present avoids the need to extend the height of a 36-in concrete bridge rail to meet the height requirements of a pedestrian rail or bicycle rail. The 42-in vertical concrete wall meets the TL-5 height criteria.



36" Concrete Single Slope Bridge Rail Typical Section  
Figure 16.5-B



42" Concrete Single Slope Bridge Rail Typical Section  
Figure 16.5-C