



<b>To:</b> <b>SUPERSEDED BY MODIFIED</b> <u>EB 05-057</u> BY EI 04-002 <b>EFFECTIVE</b> <u>09/07/06</u> <b>EFFECTIVE</b> 1/13/04		New York State Department of Transportation <b>ENGINEERING  INSTRUCTION</b>	<b>EI</b> 02-036
<b>Title: HIGHWAY DESIGN MANUAL CHAPTER 19  REINFORCED CONCRETE BOX CULVERTS AND SIMILAR STRUCTURES  SECTION 19.6.1 CONTRACT PLANS AND SECTION 19.8 GUIDE RAILING</b>			
<b>Distribution:</b> <input type="checkbox"/> Manufacturers (18) <input type="checkbox"/> Surveyors (33) <input checked="" type="checkbox"/> Main Office (30) <input checked="" type="checkbox"/> Consultants (34) <input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Contractors (39) <input checked="" type="checkbox"/> Regions/Agencies (32) <input type="checkbox"/> _____ ( )		<b>Approved:</b>  J. Clark, Deputy Chief Engineer, Design <u>12/9/02</u> Date	

### ADMINISTRATIVE INFORMATION

- **Effective Date.** This Engineering Instruction (EI) is effective with projects submitted for the letting of September 11, 2003. Regions are encouraged to utilize the guidance transmitted with this EI sooner as project schedules permit (e.g., the guidance regarding guide railing).
- **Superseded Issuances.** This EI supersedes Highway Design Manual (HDM) Chapter 19, Section 19.6.1 Contract Plans (dated 1/9/96) and Section 19.8 Guide Railing (dated 1/9/96).
- **Disposition of Issued Materials.** The guidance transmitted with this EI will be incorporated into a future revision to the HDM Chapter 19. In the interim, users of the HDM should update their manual as indicated in this EI under TECHNICAL INFORMATION.

### PURPOSE

This EI issues updated guidance regarding HDM Chapter 19, Section 19.6.1 Contract Plans and Section 19.8 Guide Railing.

### TECHNICAL INFORMATION

#### Designer Information

- The guidance provided on the first three pages attached to this EI is to be used in lieu of the guidance found in HDM Chapter 19, Section 19.6.1 (dated 1/9/96). This guidance pertains to contract plans preparation and is the result of work undertaken in coordination with the Design Standards Committee. Users of HDM Chapter 19 are encouraged to file these pages between HDM pages 19-10 and 19-11.
- The guidance provided on the last two pages attached to this EI is to be used in lieu of the guidance found in HDM Chapter 19, Section 19.8 (dated 1/9/96). This guidance pertains to the use of guide railing (i.e., new installations of two-rail curbless railing systems are no longer allowed) and is the result of a request made by the Structures Design and Construction Division to transmit guidance at this time. Users of HDM Chapter 19 are encouraged to file these pages between HDM pages 19-28 and 19-29.

### CONTACT

Direct questions regarding this Engineering Instruction to Norman Schips in the Design Quality Assurance Bureau at (518) 485-8611 (e-mail nschips@dot.state.ny.us).

Make the following changes to the *Highway Design Manual*.

Chapter 19 Section 19.6.1 dated 1/9/96 **delete** and **replace** with the following:

### 19.6.1 Contract Plans

The contract plans should include these minimum design details if applicable: Refer to the *Bridge Manual* for information on plan standards for bridge size culverts.

- A Plan View showing:
  - ▶ Grid North Arrow
  - ▶ Scale Bar
  - ▶ Existing highway boundaries including existing ROW monuments
  - ▶ New right of way line(s) (indicate W/A or WO/A) including proposed ROW monuments
  - ▶ Individual ROW parcels, map and parcel numbers, and type of acquisition
  - ▶ Culvert or Bridge Identification Number
  - ▶ Culvert and Highway Alignment
  - ▶ Survey baseline: transit stations, ties, azimuths, and relation to new centerline
  - ▶ Stream Channel Alignment
  - ▶ Stream Flow Direction
  - ▶ Skew Angle of the Culvert Relative to a Line Perpendicular to the Centerline of Roadway
  - ▶ Stationing along the Culvert Centerline, Including Beginning and End Station
  - ▶ Equality Stations for the Intersection of the stream alignment with the Highway Centerline
  - ▶ Length of Culvert
  - ▶ Subsurface Exploration Locations (e.g., boring locations)
  - ▶ Culvert Item Number and Description
  - ▶ Culvert End Treatment (End Unit or Wingwall Orientation)
  - ▶ Scour Protection
  - ▶ Slope Protection
  - ▶ Limit of Stream Work
  - ▶ Utility facilities (aboveground and underground)
  - ▶ Railing or Barrier type
  - ▶ Limits of pavement work (e.g., resurfacing, reconstruction, shoulder widening)
  - ▶ Limits of grading

- A Longitudinal Section along the culvert centerline showing:
  - ▶ Culvert or Bridge Identification Number
  - ▶ Invert elevations
  - ▶ Existing stream bottom or original ground
  - ▶ Culvert stationing including beginning and end station
  - ▶ Typical highway section, including rail treatment
  - ▶ Any membrane waterproofing or wash including any protective overlay for membrane protection (see Section 19.12)
  - ▶ Earth Cover: measured from the top of the top slab to the top of pavement.
  - ▶ Foundation treatment (footing on rock or piles, 4-sided box with cut-off walls)
  - ▶ Scour protection including any keyways or geotextile lining
  - ▶ Channel work
  - ▶ All pertinent foundation details including bedding material.
  - ▶ Culvert end treatments
  - ▶ Any utility facilities attached to the fascia, in the embankment, barrier, or sidewalk
  - ▶ End units or wingwalls, headwalls, and cutoff walls with elevations and dimensions
  
- A Culvert Section showing:
  - ▶ All pertinent foundation details including bedding material
  - ▶ Chamfers
  - ▶ Any membrane waterproofing or wash (see Section 19.12)
  - ▶ Excavation and backfill payment limits and items
  
- Miscellaneous Details showing the following, if not shown on the plans or sections:
  - ▶ Maintenance & Protection of Traffic including provisions for pedestrians
  - ▶ Construction Staging Information (determines lengths of segments and potential need for skewed segments) including appropriate support and protections systems (e.g., excavation protection system and/or support (e.g., sheeting)
  - ▶ Railing Details: Locate the railing on the culvert and indicate how it is to be attached. See Section 19.8 and current BD Sheets.
  - ▶ End Unit Treatment: Provide details for square, skewed, beveled or open end units, if applicable.
  - ▶ Headwall, Cut-off Wall, Wingwall, Apron Slab and Nosing Information: Provide geometry, reinforcement, location on culvert, keyway details, and connection details.
  - ▶ Wingwall sections showing excavation and backfill items and pay limits and appropriate excavation protection.
  - ▶ Slope and/or stream bank protection
  - ▶ Channel section detail
  - ▶ Culvert End Safety Grate details
  - ▶ Removal of existing culverts
  - ▶ Temporary detour location including type, size, and loading requirements for any necessary detour structures
  - ▶ Cofferdams or water diversion
  - ▶ Any other necessary information which can not be clearly presented in the culvert plans, longitudinal section, or culvert section.

- Notes indicating:

- ▶ Live Loading Requirements: MS-23 unless another loading is required.
- ▶ Hydraulic Data: All culverts should show 50 year design flow (Q50) or the design flow used. A table of hydraulic data and the minimum hydraulic area perpendicular to flow below Design High Water shall be shown for culverts that are categorized by definition as bridges. (Note: If floodplains and/or floodways are involved, the Regional Hydraulics Engineer should be consulted.)
- ▶ Erosion and Sediment Control Requirements
- ▶ Restrictions for work in streams
- ▶ Precast Culvert Requirements: See General Notes for Precast Culverts listed in Section 19.7.5. In addition, include a Draw Connector note which states: "*If Draw Connectors are to be left in place they should be galvanized in accordance with §719-01 of the Standard Specifications.*"
- ▶ Electrical Safety Requirements: See *Bridge Manual*.
- ▶ Assumed wall, top, and bottom thickness
- ▶ Culvert Identification Number Plate. Note to Designer: If a culvert has an identification number, a plate shall be placed or maintained in a similar fashion to a Bridge Identification Number (BIN) plate. Cost of the plate shall be included in the various items in the contract. Include BIN special note in contract.

- Tables

- ▶ Tables as shown on current BD sheets.
- ▶ An additional table may be helpful for projects which involve multiple culverts. The information in the tables should include:
  - Culvert or Bridge Identification Number
  - Mainline stationing
  - Length
  - Item number and description
  - Remarks

Make the following changes to the *Highway Design Manual*.  
Chapter 19 Section 19.8 dated 1/9/96 **delete and replace** with the following:

## 19.8 GUIDE RAILING

The anchorage of the guide railing is determined by the amount of fill over the top of the unit. If there is less than 900 mm of fill, guide railing shall be anchored into the headwall, edge beam or individual concrete pedestals. If there is more than 900 mm of fill (i.e., enough for standard length post embedment) regular highway guide rail can be used. The offset from the end of culvert to the back of the guide rail should be considered when choosing the type of highway guide rail, i.e., the guide rail deflection characteristics should be reviewed.

When the recommended offsets from the back of the posts to the shoulder break can not be achieved or the embankment slopes away from the normal shoulder break steeper than a 1:2 slope, extra long posts are required. In these situations, the 900 mm criteria is no longer valid. See Chapter 10 for guidance on the required length of posts.

When the guide rail is anchored to the headwall, edge beam or pedestal, either culvert rail, bridge rail, or equivalent can be used. **The use of culvert rail is only acceptable if a curb is being used. Bridge rail (3, 4, or 5 rail) must be used in curbless situations. As a result of recent crash tests, new installations of two-rail curbless railing systems are no longer allowed.** Bridge rail is recommended for culvert spans over 6 m. The choice may be made on the basis of types of railings being used in the project or Regional preference. For example, Region 10 prefers using heavy post blocked-out corrugated beam guide railing.

The railing transition to box beam guide rail should use the current details in the latest Bridge Detail (BD) sheets. For culvert rail with brush curb details, see Figure 1. An electronic version of Figure 1 is available for use in the nydetls.cel cell library.

The following construction notes, as appropriate, shall be placed on the plans:

### Standard Culvert Railing Construction Notes:

After the nuts on the anchor bolts have been tightened to the satisfaction of the Engineer, the anchor bolts shall be flame cut 25 mm above the nut and the threads above the nut shall be damaged as directed by the Engineer to prevent removal. All other nuts shall be either tack welded in place or have lock washers, as determined by the Engineer. Galvanizing damaged by flame cutting and/or tack welding shall be repaired according to §719-01 of the Standard Specifications.

Rail terminus details shall be in accordance with the latest approved details. (For information see the latest Bridge Detail Sheets.)

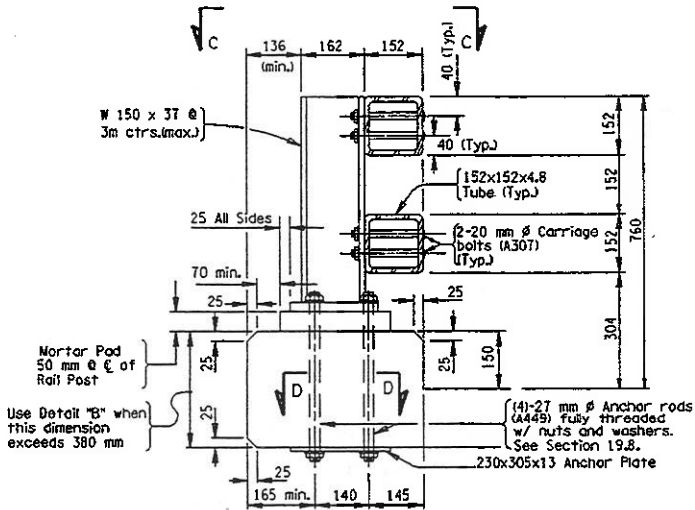
All railing is to be fabricated and erected so that the rails are parallel to the roadway and the posts are truly vertical.

The box beam rail elements shall be long enough to span the entire culvert or be a minimum of 6 m in length.

For material requirements and construction details, see §568 of the Standard Specifications.

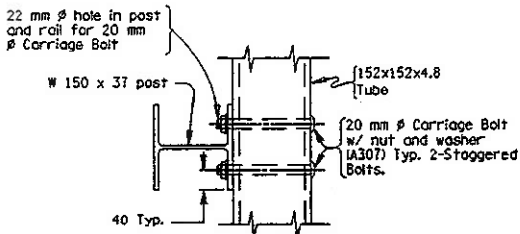
Anchor rods shall be cast into the concrete or grouted into 40 mm  $\phi$  through holes made with a core drill. The grout used shall meet the requirements of the Standard Specifications § 701-05, Concrete Grouting Materials, and appear on the Department's Approved List.

**Figure 1 Culvert Railing Details, Cast-In-Place Connection**

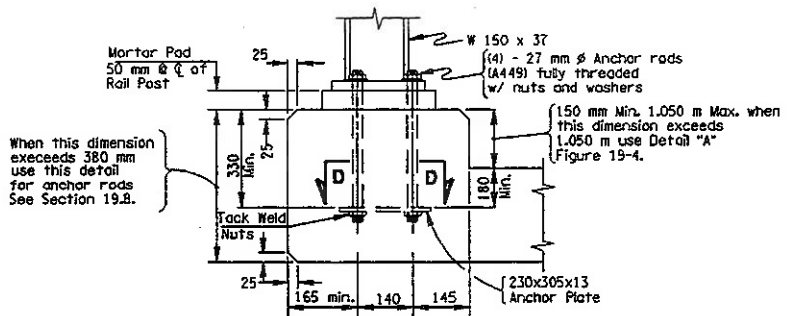


SECTION A-A  
(CURBED CONFIGURATION)

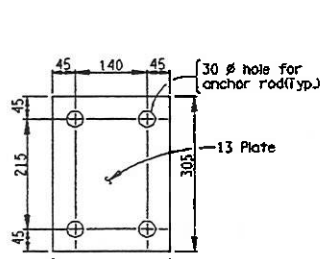
All dimensions are in millimeters (mm) unless otherwise noted.



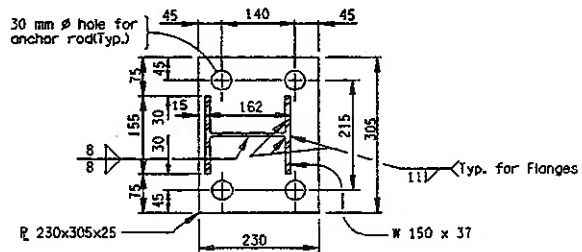
SECTION C-C



DETAIL "B"  
(CURBED CONFIGURATION)



SECTION D-D  
(ANCHOR PLATE)



CULVERT RAIL POST AND BASE PLATE