RAIL DATA FOR HORIZONTAL CURVES

<table>
<thead>
<tr>
<th>CURVE DEGREE</th>
<th>BARS FACE OF RAIL</th>
<th>MAX CHORD LENGTH</th>
<th>CONSTRUCT OR FABRICATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 2500</td>
<td></td>
<td>29 ft</td>
<td></td>
</tr>
<tr>
<td>Over 1800 thru 2500</td>
<td>12 ft</td>
<td>To required radius or 12 ft shown</td>
<td></td>
</tr>
<tr>
<td>Over 700</td>
<td></td>
<td>Zero</td>
<td>To required radius</td>
</tr>
</tbody>
</table>

CONSTRUCTION NOTES:
- Face of rail, posts, and parapet must be vertical transversely unless otherwise approved by the Engineer. HSS rail end sections and opening shape must be perpendicular to top of adjacent concrete parapet grade. Use epoxy mortar under HSS rail post base plates if gaps larger than 1" exist.
- Provide water barriers or openings running onto underrail roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bridged to the bridge deck with an approved epoxy connect.
- During construction, expansion joint sections must not include less than two posts, and no more than four (4) at 4-bay intervals.
- Rails or centerline expansion of HSS rail and HSS rail posts at approximately 1/2" by grouting.
- Test adhesive anchors in accordance with TxDOT 3.3.7 "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity, if any of the tests do not meet the required test load. Repair damage from testing as directed.
- At the Contractor's option anchor bolts may be cast with the parapet. See "Material Notes". Chamber all exposed corners.

MATERIAL NOTES:
- Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
- Provide Grade 50 reinforcing steel.
- Epoxy coat or galvanize all reinforcing steel if slab bars are coated or galvanized.
- Provide ASTM A500 Gr B or ASTM A520 for all HSS.
- Galvanize all metal components of steel rail system. Apply additional coatings when shown elsewhere on the plans. Where coated rails are used, require the following: 1) all other reinforcing steel in the concrete parapet grade must be epoxy coated and 2) when field painting, Item 446, "Field Painting Steel". Steel must be provided turn-key coated to the Engineer for approval.
- Rail anchorage details shown on this standard may require modification for select structure type.
- This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-3 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
- Do not use this railing in spans with expansion joints providing more than 5' movement.
- Full anchorage details shown on this standard may require modification for select structure types.
- Submit detailed drawings showing plan views, HSS rail post spacing, and anchor bolt setting to the Engineer for approval.
- Average weight of railing with no overlay: 300 lb per total 300 lb (Cov) 30 lb (Each)
- Anchor bolts must be 5/8" dia ASTM A327 or A490 grade bolts. If bolts are used, one hardened steel washer (ASTM D226) and one washer (ASTM A350) must be furnished and fastened for each threaded rod.

**CAST-IN-PLACE ANCHOR BOLT OPTIONS**

- Increase 2" for structures with overlay.
- See "Material Notes" for anchor bolt information.
- For framed sidewalks, add Sidewalk height to total bar height. The Sidewalk height at railroad location.
- At the Contractor's option, Bars V may be replaced by extending Bars U to 2-5" above the roadway/sidewalk level without overlay.

**PLAN OF RAIL AT EXPANSION JOINTS**

Example showing Rail Expansion joints without setbacks.

**COMBINATION RAIL**

**TYPE C233**

**SECT**

**HIGHWAY**

**COUNTY**

**AES**

**CONT**

**JOB**

**SHEET**

**5"**

**7-1/2"**

**10-1/2"**

**12"**

**SHEET 4 OF 4**

**BARS S (#3)**

**BARS SU (#3)**

**BARS V (#5)**

**BARS WU (#5)**

**BARS L (#5)**

**BARS U (#5)**