NOTICE

The Standard Plans are intended to support the various engineering processes for construction operations on the State Highway System. They are established to ensure the application of uniform standards in the preparation of contract plans for construction of roadways and structures. These Standard Plans may be used for maintenance operations or adopted by other authorities for use on projects under their jurisdiction.

It is the responsibility of the Engineer of Record using these Standard Plans to determine the fitness for a particular use of each standard in the design of a project. The inappropriate use of and adherence to these standard Plans does not exempt the engineer from the professional responsibility of developing an appropriate design.

PATENTED DEVICES, MATERIALS AND PROCESSES

The use of any design, method, process, material or device either expressed or implied by these standards that are covered by patent, copyright, or proprietary privilege is the sole responsibility of the user. Any infringement on the rights of the inventor, patentee, assignee or licensee shall be the sole responsibility of the user. For additional information refer to Subsection 7-3 of the FDOT Standard Specifications for Road and Bridge Construction.

DISTRIBUTION OF EXEMPT PUBLIC DOCUMENTS:

It is the policy of the Department to protect the State Highway System’s infrastructure by defining the responsibilities for disclosure and use of sensitive documents showing the structural elements used in the design and construction of Department structures. Section 119.071(3)(b), Florida Statute (F.S.), provides that these sensitive documents are exempt from Chapter 119, F.S., Florida’s public records law. In accordance with Section 119.071(3)(b), F.S., the Department has adopted Procedure 050-020-026, Distribution of Exempt Public Documents Concerning Department Structures and Security System Plans, to define the method and responsibilities for disclosure and use of these sensitive documents.

Structure is defined in Section 334.032(7), F.S., as “a bridge, viaduct, tunnel, causeway, approach, ferry slip, culvert, toll plaza, gate, or other similar facility used in connection with a transportation facility” which would include related pipes and pipe systems. However, for the purpose of the public records law and Procedure 050-020-026, the Department has determined that the term “structure” includes “bridges with an opening of more than 20 feet between undercroppings of abutments or spring lines of arches or extreme ends of openings for multiple boxes, and those other bridges subject to safety inspection under Section 335.074, F.S.” A roadway is not otherwise a structure for the purposes of Procedure 050-020-026.

Therefore, plans, blueprints, schematic drawings, and diagrams of structures owned by the Department are exempt from the public records provisions of Chapter 119, F.S. This exemption includes draft, preliminary, and final formats as described in Procedure 050-020-026 and includes paper, electronic, and other formats. The Department has provided for the limited release of such documents in Procedure 050-020-026.

Entities or persons outside the Department requesting or receiving copies of any portion of plans or other documents considered Exempt Documents under Procedure 050-020-026 must complete and submit a request form (Form No. 050-020-026). The form also advises the requester that the entity or person receiving the documents shall maintain their exempt status. This procedure applies to all Department internal or contracted staff who have access to such Exempt Documents in their Department work. Refer to Procedure 050-020-026 for additional requirements.

CERTIFICATION STATEMENT

I hereby certify that these Standard Plans were prepared by me or under my responsible charge, compiled from designs prepared, examined, adopted and implemented by the Florida Department of Transportation in accordance with established procedures, and as approved by the Federal Highway Administration.

Derwood C. Sheppard, Jr. M.Eng., P.E.
State Standard Plans Engineer

The official version of the Standard Plans is the PDF version and can be found at:

http://www.fdot.gov/design/standardplans
October 24, 2019

James Christian  
Division Administrator  
Federal Highway Administration  
3500 Financial Plaza, Suite 400  
Tallahassee, Florida 32312

Re: Office of Design  
FY 2020-21 Standard Plans for Road and Bridge Construction

Dear Mr. Christian:

In accordance with the Stewardship and Oversight Agreement on Project Assumption and Program Oversight by and between the Federal Highway Administration, Florida Division, and the State of Florida Department of Transportation the Department has provided the FY 2020-21 Standard Plans for Road and Bridge Construction (Standard Plans) for review. Copies of all revised Indexes for the FY 2020-21 Standard Plans were provided to the Florida Division Office in three different submittal packages between August 22nd and September 19th and all comments have been addressed to the satisfaction of the reviewer(s). Consequently, the Department is requesting approval of the FY 2020-21 Standard Plans for use on federal-aid projects.

Sincerely,

Derwood Sheppard, P.E.  
State Standard Plans Engineer

For FHWA Florida Division Office use:

Approved for Use on Federal Aid Projects:

Bren George-Nwabugwu Sr. 10/28/19

For James Christian, P.E.  
Division Administrator

www.fdot.gov
<table>
<thead>
<tr>
<th>Abbreviation</th>
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<td>Traffic Railing – (Thrie Beam Retrofit) Wide Curb Type 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>476 460-476</td>
<td></td>
<td>Traffic Railing – (Thrie Beam Retrofit) Wide Curb Type 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>477 460-477</td>
<td></td>
<td>Thrie-Beam Panel Retrofit (Concrete Handrail)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A 460-490</td>
<td></td>
<td>Traffic Railing – (Rectangular Tube Retrofit)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Structures (Cont.)

**Post-Tensioning**
- 21B01 462-001 Post-Tensioning Vertical Profiles
- 21B02 462-002 Post-Tensioning Anchorage Protection
- 21B03 462-003 Post-Tensioning Anchorage and Tendon Filling Details

**Fiber Reinforced Polymer Fender Systems**
- 21930 471-030 Fender System - Prestressed Concrete Piles and FRP Wales

**Incidental Construction**

**Navigation Lights for Fixed Bridges**
- 21220 510-001 Navigation Light System Details (Fixed Bridges)

**Metal Pedestrian/Bicycle Railings, Guiderails and Handrails**
- 821 515-021 Pedestrian/Bicycle Bullet Railing for Traffic Railing
- 822 515-022 Pedestrian/Bicycle Bullet Railing Details
- 851 515-051 Bridge Pedestrian/Bicycle Railing (Steel)
- 861 515-061 Bridge Pedestrian/Bicycle Railing (Aluminum)

**Concrete Barriers, Traffic Railing and Parapets**
- 404 521-404 Guardrail Transitions - Existing Post & Beam Bridge Railings (Narrow & Recessed Curbs)
- 405 521-405 Guardrail Transitions - Existing Post & Beam Bridge Railings (Wide Curbs)
- 422 521-422 Traffic Railing - (42” Vertical Shape)
- 423 521-423 Traffic Railing - (32” Vertical Shape)
- 426 521-426 Traffic Railing - (Median 36” Single-Slope)
- 427 521-427 Traffic Railing - (36” Single-Slope)
- 428 521-428 Traffic Railing - (42” Single-Slope)
- 480 521-480 Traffic Railing - (Vertical Face Retrofit) Typical Details & Notes
- 481 521-481 Traffic Railing - (Vertical Face Retrofit) Narrow Curb
- 482 521-482 Traffic Railing - (Vertical Face Retrofit) Wide Curb
- 483 521-483 Traffic Railing - (Vertical Face Retrofit) Intermediate Curb
- 484 521-484 Traffic Railing - (Vertical Face Retrofit) Spread Footing Approach
- N/A 521-509 Traffic Railing/Noise Wall (8’-0”) - Bridge
- 21220 521-660 Light Pole Pedestal - Bridge
- 820 521-820 27” Concrete Parapet Pedestrian/Bicycle with Bullet Railing
- 825 521-825 42” Concrete Pedestrian/Bicycle Railing

**Fencing - Type R**
- 810 550-010 Bridge Fencing (Vertical)
- 811 550-011 Bridge Fencing (Curved Top)
- 812 550-012 Bridge Fencing (Enclosed)
- N/A 550-013 Bridge Fencing (Over Railroad)
<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Erosion Control and Water Quality</strong></td>
<td></td>
<td></td>
<td><strong>Drainage (cont.)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104 570-001</td>
<td></td>
<td>Permanent Erosion Control</td>
<td>261 430-011</td>
<td></td>
<td>U-Type Concrete Endwalls-Baffles and Grates Optional - 15” To 30” Pipe</td>
</tr>
<tr>
<td>105 570-010</td>
<td></td>
<td>Shoulder Sodding and Turf on Existing Facilities</td>
<td>264 430-012</td>
<td></td>
<td>U-Type Concrete Endwall-Energy Dissipator - 30” to 72” Pipe</td>
</tr>
<tr>
<td><strong>Drainage</strong></td>
<td></td>
<td></td>
<td>266 430-040</td>
<td></td>
<td>Winged Concrete Endwalls - Single Round Pipe: <strong>Renamed:</strong> Winged Concrete Endwalls</td>
</tr>
<tr>
<td>200 425-010</td>
<td></td>
<td>Structure Bottoms - Type J and P</td>
<td>268 430-040</td>
<td></td>
<td>Deleted U-Type Sand-Cement Endwalls</td>
</tr>
<tr>
<td>201 425-001</td>
<td></td>
<td>Supplementary Details for Manholes and Inlets</td>
<td>270 430-020</td>
<td></td>
<td>Flared End Section</td>
</tr>
<tr>
<td>206 436-001</td>
<td></td>
<td>Trench Drain</td>
<td>272 430-021</td>
<td></td>
<td>Cross Drain Mitered End Section</td>
</tr>
<tr>
<td>210 425-020</td>
<td></td>
<td>Curb Inlet Tops - Types 1, 2, 3 and 4</td>
<td>273 430-022</td>
<td></td>
<td>Side Drain Mitered End Section</td>
</tr>
<tr>
<td>211 425-021</td>
<td></td>
<td>Curb Inlet Tops - Types 5 and 6</td>
<td>280 430-001</td>
<td></td>
<td>Miscellaneous Drainage Details</td>
</tr>
<tr>
<td>212 425-022</td>
<td></td>
<td>Curb Inlet - Type 7</td>
<td>281 524-001</td>
<td></td>
<td>Ditch Pavement and Sodding</td>
</tr>
<tr>
<td>213 425-023</td>
<td></td>
<td>Curb Inlet - Type 8</td>
<td>282 425-060</td>
<td></td>
<td>Back of Sidewalk Drainage</td>
</tr>
<tr>
<td>214 425-024</td>
<td></td>
<td>Curb Inlet Top - Type 9</td>
<td>283 520-010</td>
<td></td>
<td>Median Opening Flume</td>
</tr>
<tr>
<td>215 425-025</td>
<td></td>
<td>Curb Inlet Top - Type 10</td>
<td>284 520-005</td>
<td></td>
<td>Concrete Shoulder Gutter Spillway</td>
</tr>
<tr>
<td>216 425-061</td>
<td></td>
<td>Closed Flume Inlet</td>
<td>285 443-001</td>
<td></td>
<td>French Drain</td>
</tr>
<tr>
<td>217 425-030</td>
<td></td>
<td>Median Barrier Inlets Types 1 and 2</td>
<td>286 440-001</td>
<td></td>
<td>Underdrain</td>
</tr>
<tr>
<td>218 425-031</td>
<td></td>
<td>Shoulder Barrier Inlet: <strong>Renamed:</strong> Adjacent Barrier Inlet</td>
<td>287 446-001</td>
<td></td>
<td>Concrete Pavement Subdrainage</td>
</tr>
<tr>
<td>219 425-032</td>
<td></td>
<td>Curb and Gutter Barrier Inlet</td>
<td>288 444-701</td>
<td></td>
<td>Deep Well Injection Box</td>
</tr>
<tr>
<td>220 425-040</td>
<td></td>
<td>Gutter Inlet - Type 5</td>
<td>289 400-289</td>
<td></td>
<td>Concrete Box Culvert Details (LRFD)</td>
</tr>
<tr>
<td>221 425-041</td>
<td></td>
<td>Gutter Inlet - Type V</td>
<td>291 400-291</td>
<td></td>
<td>Supplemental Details for Precast Concrete Box Culverts</td>
</tr>
<tr>
<td>230 425-050</td>
<td></td>
<td>Ditch Bottom Inlet - Type A</td>
<td>292 400-292</td>
<td></td>
<td>Standard Precast Concrete Box Culverts</td>
</tr>
<tr>
<td>231 425-051</td>
<td></td>
<td>Ditch Bottom Inlet - Type B</td>
<td>293 425-090</td>
<td></td>
<td>Safety Modifications for Inlets in Box Culverts</td>
</tr>
<tr>
<td>232 425-052</td>
<td></td>
<td>Ditch Bottom Inlet - Type C, D, E and H</td>
<td>295 430-090</td>
<td></td>
<td>Safety Modifications for Endwalls</td>
</tr>
<tr>
<td>233 425-053</td>
<td></td>
<td>Ditch Bottom Inlet - Type F and G</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>234 425-054</td>
<td></td>
<td>Ditch Bottom Inlet - Type J</td>
<td>300 520-001</td>
<td></td>
<td>Curb &amp; Curb and Gutter (Renamed: Curb and Gutter)</td>
</tr>
<tr>
<td>235 425-055</td>
<td></td>
<td>Ditch Bottom Inlet - Type K</td>
<td>301 425-055</td>
<td></td>
<td>Turn Lanes [*Content moved to the FDM]</td>
</tr>
<tr>
<td>240 425-070</td>
<td></td>
<td>Skimmer For Outlet Control Structures</td>
<td>302 520-020</td>
<td></td>
<td>Traffic Separators</td>
</tr>
<tr>
<td>241 443-002</td>
<td></td>
<td>Skimmers For French-Drain Outlets</td>
<td>303 425-024</td>
<td></td>
<td>Curb Return Profiles</td>
</tr>
<tr>
<td>245 440-002</td>
<td></td>
<td>Underdrain Inspection Box</td>
<td>304 522-002</td>
<td></td>
<td>Detectable Warnings and Sidewalk Curb Ramps</td>
</tr>
<tr>
<td>250 430-030</td>
<td></td>
<td>Straight Concrete Endwalls - Single And Multiple Pipe</td>
<td>305 350-001</td>
<td></td>
<td>Concrete Pavement Joints</td>
</tr>
<tr>
<td>251 430-031</td>
<td></td>
<td>Straight Concrete Endwalls - Single And Double 60” Pipe</td>
<td>306 370-001</td>
<td></td>
<td>Bridge Approach Expansion Joint - Concrete Pavement: <strong>Renamed:</strong> Bridge Approach Expansion Joint - Concrete Pavement with Special Select Soil Base</td>
</tr>
<tr>
<td>252 430-032</td>
<td></td>
<td>Straight Concrete Endwalls - Single And Double 66” Pipe</td>
<td>307 125-001</td>
<td></td>
<td>Miscellaneous Utility Details</td>
</tr>
<tr>
<td>253 430-033</td>
<td></td>
<td>Straight Concrete Endwalls - Single And Double 72” Pipe</td>
<td>307 423-080</td>
<td></td>
<td>NEW: Utility Conflicts thru Drainage Structures (Note: Index 307, Sheet 2 of 3)</td>
</tr>
<tr>
<td>255 430-034</td>
<td></td>
<td>Straight Concrete Endwalls - Single 84” Pipe</td>
<td>308 353-001</td>
<td></td>
<td>Concrete Slab Replacement</td>
</tr>
<tr>
<td>258 Deleted Straight Sand-Cement Endwalls</td>
<td></td>
<td></td>
<td>310 522-003</td>
<td></td>
<td>Concrete Sidewalk</td>
</tr>
<tr>
<td>260 430-010</td>
<td></td>
<td>U-Type Concrete Endwalls With Grates - 15” To 30” Pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>Index Title</td>
<td>Design Standards Index</td>
<td>Standard Plans Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
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<td>------------------------</td>
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</tr>
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<td>400</td>
<td>Guardrail</td>
<td>538-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>402</td>
<td>Guardrail Transitions and Connections for Existing Bridges</td>
<td>536-002</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>404</td>
<td>Guardrail Transitions - Existing Post &amp; Beam Bridge Railings (Narrow &amp; Recessed Curbs)</td>
<td>521-404</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>405</td>
<td>Guardrail Transitions - Existing Post &amp; Beam Bridge Railings (Wide Curbs)</td>
<td>521-405</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>410</td>
<td>Concrete Barrier</td>
<td>521-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>412</td>
<td>Low Profile Barrier</td>
<td>102-120</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>414</td>
<td>Type K Temporary Concrete Barrier System</td>
<td>102-110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>415</td>
<td>Temporary Concrete Barrier</td>
<td>102-100</td>
<td></td>
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<tr>
<td>420</td>
<td>Traffic Railing - (32” F Shape)</td>
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<td>Traffic Railing - (Median 32” F Shape)</td>
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<td>Traffic Railing - (42” Vertical Shape)</td>
<td>521-422</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>423</td>
<td>Traffic Railing - (32” Vertical Shape)</td>
<td>521-423</td>
<td></td>
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<td>Traffic Railing - (Coral Shape)</td>
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<td>Traffic Railing - (42” F Shape)</td>
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<td>426</td>
<td>Traffic Railing - (Median 36” Single-Slope)</td>
<td>521-426</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>427</td>
<td>Traffic Railing - (36” Single-Slope)</td>
<td>521-427</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>428</td>
<td>Traffic Railing - (42” Single-Slope)</td>
<td>521-428</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>430</td>
<td>Crash Cushion Details</td>
<td>544-001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>461</td>
<td>Opaque Visual Barrier</td>
<td>521-010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>470</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) General Note &amp; Details</td>
<td>460-470</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>471</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Narrow Curb</td>
<td>460-471</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>472</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Strong Curb Type 1</td>
<td>460-472</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>473</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Strong Curb Type 2</td>
<td>460-473</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>474</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Intermediate Curb</td>
<td>460-474</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>475</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Curb Type 1</td>
<td>460-475</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>476</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Curb Type 2</td>
<td>460-476</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>477</td>
<td>Thrie-Beam Panel Retrofit (Concrete Handrail)</td>
<td>460-477</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480</td>
<td>Traffic Railing - (Thrie-Beam Retrofit) General Note &amp; Details</td>
<td>521-480</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>481</td>
<td>Traffic Railing - (Vertical Face Retrofit) Narrow Curb</td>
<td>521-481</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>482</td>
<td>Traffic Railing - (Vertical Face Retrofit) Wide Curb</td>
<td>521-482</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>483</td>
<td>Traffic Railing - (Vertical Face Retrofit) Intermediate Curb</td>
<td>521-483</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>484</td>
<td>Traffic Railing - (Vertical Face Retrofit) Spread Footing Approach</td>
<td>521-484</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Design Standards Index**

<table>
<thead>
<tr>
<th>Index</th>
<th>Index Title</th>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>Removal of Organic and Plastic Material (Renamed: Subsoil Excavation)</td>
<td>120-002</td>
<td></td>
</tr>
<tr>
<td>505</td>
<td>Embankment Utilization</td>
<td>120-001</td>
<td></td>
</tr>
<tr>
<td>506</td>
<td>Miscellaneous Earthwork Details</td>
<td>160-001</td>
<td></td>
</tr>
<tr>
<td>510</td>
<td>Supererelevation - Rural Highways, Urban Freeways and High Speed Urban Highways</td>
<td>000-510</td>
<td></td>
</tr>
<tr>
<td>511</td>
<td>Supererelevation - Urban Highways and Streets</td>
<td>000-511</td>
<td></td>
</tr>
<tr>
<td>515</td>
<td>Turnouts</td>
<td>330-001 522-003</td>
<td></td>
</tr>
<tr>
<td>516</td>
<td>Turnouts - Resurfacing Projects</td>
<td>330-001 522-003</td>
<td></td>
</tr>
<tr>
<td>517</td>
<td>Raised Rumble Strips</td>
<td>546-001</td>
<td></td>
</tr>
<tr>
<td>518</td>
<td>Shoulder Rumble Strips</td>
<td>546-010</td>
<td></td>
</tr>
<tr>
<td>521</td>
<td>Concrete Steps</td>
<td>400-021</td>
<td></td>
</tr>
<tr>
<td>525</td>
<td>Ramp Terminals</td>
<td>000-525</td>
<td></td>
</tr>
<tr>
<td>526</td>
<td>Roadway Transitions (*Content moved to the FDM)</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>527</td>
<td>Directional Median Opening (*Content moved to the FDM)</td>
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</tr>
<tr>
<td>530</td>
<td>Rest Area Pavilion</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>532</td>
<td>Mailboxes</td>
<td>110-200</td>
<td></td>
</tr>
<tr>
<td>535</td>
<td>Tractor Crossing</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>540</td>
<td>Settlement Plate</td>
<td>141-T01</td>
<td></td>
</tr>
<tr>
<td>542</td>
<td>Tree Protection and Preservation</td>
<td>110-100</td>
<td></td>
</tr>
<tr>
<td>544</td>
<td>Landscape Installation</td>
<td>580-001</td>
<td></td>
</tr>
<tr>
<td>546</td>
<td>Landscape Irrigation Sleeves</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>548</td>
<td>Sight Distance at Intersections [*Content moved to the FDM]</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>560</td>
<td>Railroad Crossings</td>
<td>830-T01</td>
<td></td>
</tr>
</tbody>
</table>

**Traffic Control Through Work Zones**

<table>
<thead>
<tr>
<th>Index</th>
<th>Index Title</th>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>General Information for Traffic Control Through Work Zones, New Index 102-000</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>601</td>
<td>Two-Lane, Two-Way, Work Outside Shoulder, New Index 102-005</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>602</td>
<td>Two-Lane, Two-Way On Shoulder, New Index 102-010</td>
<td>Deleted</td>
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</tr>
<tr>
<td>603</td>
<td>Two-Lane, Two-Way Within The Travel Way, New Index 102-025</td>
<td>Deleted</td>
<td></td>
</tr>
<tr>
<td>604</td>
<td>Two-Lane, Two-Way, Work in Intersection - See MUTCD.</td>
<td>Deleted</td>
<td></td>
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<tr>
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<td>Two-Lane, Two-Way, Work Near Intersection - See MUTCD.</td>
<td>Deleted</td>
<td></td>
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<td>606</td>
<td>Two-Lane, Two-Way, Work Within the Travel Way - Signal Control, New Index 120-30 and 102-035</td>
<td>Deleted</td>
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<td>Two-Lane, Two-Way, Mobile Operation, Work On Shoulder and Work Within the Travel Way</td>
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<td>Two-Lane, Two-Way, Temporary Diversion Connection, New Index 102-040</td>
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<td>611</td>
<td>Multilane, Work Outside Shoulder, New Index 102-005</td>
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<td>Multilane, Work on Shoulder, New Index 102-010</td>
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### Traffic Control Through Work Zones (Cont.)

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>613</td>
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<td>Multilane, Work Within Travel Way-Median or Outside Lane, New Index 102-045</td>
</tr>
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<td>Multilane, Work Within Travel Way-Center Lane – See Index 102-050 or MUTCD TA-38 for interior lane closures. See Index 102-055 for lane shifts.</td>
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<td>Multilane Undivided, Temporary Diversion Connection, New Index 102-060</td>
</tr>
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<td>Multilane, Work Near Intersection – Temporary Diversion Connection 35mph or Less – See MUTCD or Index 102-060</td>
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<td>Multilane, Work Within the Travel Way Double Lane Closure, New Index 102-050</td>
</tr>
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<td>Deleted</td>
<td>Temporary Road Closure - 5 Minutes or Less, New Index 102-020</td>
</tr>
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<td>Deleted</td>
<td>Two Way Left Turn Lane Closure</td>
</tr>
<tr>
<td>630</td>
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<td>Crossover for Paving Train Operations, Rural</td>
</tr>
<tr>
<td>631</td>
<td>Deleted</td>
<td>Temporary Crossover</td>
</tr>
<tr>
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<td>Converting Two-Lanes to Four-Lanes Divided, Rural</td>
</tr>
<tr>
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<td>Converting Two-Lanes to Four-Lanes Divided, Urban</td>
</tr>
<tr>
<td>642</td>
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<td>Transitions for Temporary Concrete Barrier Wall on Freeway Facilities</td>
</tr>
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<td>Two-Lane Two-Way, Rural Structure Replacement</td>
</tr>
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<td>Multilane Divided, Maintenance and Construction, New Index 102-060</td>
</tr>
<tr>
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<td>Traffic Pacing, New Index 102-070</td>
</tr>
<tr>
<td>660</td>
<td>Deleted</td>
<td>Pedestrian Control for Closure of Sidewalks, New Index 102-075</td>
</tr>
<tr>
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<td>Limited Access, Temporary Opening, New Index 102-065.</td>
</tr>
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<td>Toll Plaza, Traffic Control Standards</td>
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<tr>
<td>670</td>
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<td>Motorist Awareness System – See Index 102-000 for MAS detail.</td>
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### Fencing and Pedestrian Railings

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>550-004</td>
<td>Fence Location</td>
</tr>
<tr>
<td>801</td>
<td>550-001</td>
<td>Fence - Type A</td>
</tr>
<tr>
<td>802</td>
<td>550-002</td>
<td>Fence - Type B</td>
</tr>
<tr>
<td>803</td>
<td>550-003</td>
<td>Cantilever Slide Gate - Type B Fence</td>
</tr>
<tr>
<td>810</td>
<td>550-010</td>
<td>Bridge Fencing (Vertical)</td>
</tr>
<tr>
<td>811</td>
<td>550-011</td>
<td>Bridge Fencing (Curved Top)</td>
</tr>
<tr>
<td>812</td>
<td>550-012</td>
<td>Bridge Fencing (Enclosed)</td>
</tr>
<tr>
<td>820</td>
<td>521-820</td>
<td>27&quot; Concrete Parapet with Pedestrian/Bicycle Bullet Railing</td>
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<td>Design Standards Index</td>
<td>Standard Plans Index</td>
<td>Index Title</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Signing and Marking (Cont.)</td>
<td>Traffic Signal and Equipment (Cont.)</td>
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</tr>
<tr>
<td>11320 700-041</td>
<td>11733 634-002</td>
<td>Span Sign Structure</td>
</tr>
<tr>
<td>11860 700-010</td>
<td>11736 639-002</td>
<td>Single Column Ground Signs</td>
</tr>
<tr>
<td>11861 700-011</td>
<td>11743 649-030</td>
<td>Single Column Cantilever Ground Mounted Sign</td>
</tr>
<tr>
<td>11862 700-120</td>
<td>11745 649-031</td>
<td>Roadside Flashing Beacon Assembly</td>
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<tr>
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<td>11748 700-050</td>
<td>Rectangular Rapid Flashing Beacon Assembly</td>
</tr>
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<td>11764 653-001</td>
<td>Single Post Bridge Mounted Sign Support</td>
</tr>
<tr>
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<td>11781 660-001</td>
<td>Single Post Median Barrier Mounted Sign Support</td>
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<tr>
<td>13417 700-110</td>
<td>11784 665-001</td>
<td>Mounting Exit Number Panels To Highway Signs</td>
</tr>
<tr>
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<td>11784 665-001</td>
<td>Typical Sections For Placement of Single &amp; Multi-Column Signs</td>
</tr>
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<td>11787 671-001</td>
<td>Typical Signing for Truck Weigh &amp; Inspection Stations</td>
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<td>17882 509-070</td>
<td>Interchange Markings</td>
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<td>17890 508-071</td>
<td>Pavement Markings</td>
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<td>17900 693-001</td>
<td>Bicycle Markings</td>
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<td>17900 693-001</td>
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<td>17900 693-001</td>
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<td>18110 659-020</td>
<td>Conventional Lighting</td>
</tr>
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<td>18111 649-020</td>
<td>High Mast Lighting</td>
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<tr>
<td>17504 639-001</td>
<td>18113 641-020</td>
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<tr>
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<td>18300 700-090</td>
<td>External Lighting For Signs</td>
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<td>N/A 700-091</td>
<td>Standard Aluminum Lighting</td>
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<td>Prestressed Concrete Beams</td>
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<td>Pull &amp; Splice Box</td>
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<td>20036 450-036</td>
<td>Conduit Installation Details</td>
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<tr>
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<td>Steel Strain Pole</td>
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<td>20054 450-054</td>
<td>Concrete Poles</td>
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<td>Signal Cable &amp; Span Wire Installation Details</td>
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<td>Standard Plans Index</td>
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<td>450-078</td>
<td>Florida-I 78 Beam - Standard Details</td>
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<td>450-084</td>
<td>Florida-I 84 Beam - Standard Details</td>
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<td>450-096</td>
<td>Florida-I 96 Beam - Standard Details</td>
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<td>450-210</td>
<td>Typical Florida-U Beam Details and Notes</td>
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<td>450-248</td>
<td>Florida-U 48 Beam - Standard Details</td>
</tr>
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<td>20254</td>
<td>450-254</td>
<td>Florida-U 54 Beam - Standard Details</td>
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<td>450-263</td>
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<td>Florida-U 72 Beam - Standard Details</td>
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<td>450-502</td>
<td>Beveled Bearing Plate Details - Prestressed Florida-U Beams</td>
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<td>Composite Elastomeric Bearing Pads - Prestressed Florida-I &amp; AASHTO Type II Beams</td>
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<td>Bearing Plates (Type I) - Prestressed Florida-I &amp; AASHTO Type II Beams</td>
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<td>Bearing Plates (Type II) - Prestressed Florida-I &amp; AASHTO Type II Beams</td>
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<td>Notes and Details For Square Prestressed Concrete Piles</td>
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<td>455-002</td>
<td>Square Prestressed Concrete Pile Splices</td>
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<td>455-003</td>
<td>EDC Instrumentation For Square Prestressed Concrete Piles</td>
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<td>455-012</td>
<td>12&quot; Square Prestressed Concrete Pile</td>
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<td>455-024</td>
<td>24&quot; Square Prestressed Concrete Pile</td>
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<td>455-030</td>
<td>30&quot; Square Prestressed Concrete Pile</td>
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<td>455-031</td>
<td>High Moment Capacity 30&quot; Square Prestressed Concrete Pile</td>
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<td>455-054</td>
<td>54&quot; Precast/Post-Tensioned Concrete Cylinder Pile</td>
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<td>455-060</td>
<td>60&quot; Prestressed Concrete Cylinder Pile</td>
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<td>Approach Slabs</td>
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<td>20900</td>
<td>400-090</td>
<td>Approach Slabs (Flexible Pavement Approaches)</td>
</tr>
<tr>
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<td>400-091</td>
<td>Approach Slabs (Rigid Pavement Approaches)</td>
</tr>
<tr>
<td>Bridge Expansion Joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21100</td>
<td>458-100</td>
<td>Strip Seal Expansion Joint</td>
</tr>
<tr>
<td>21110</td>
<td>458-110</td>
<td>Poured Joint With Backer Rod Expansion Joint System</td>
</tr>
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<td>Description</td>
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</tr>
<tr>
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<tr>
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</tbody>
</table>
| 430-012             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
Sheet 2: Dimension Details.  
Sheet 3: Reinforcing Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-020             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved payment information to Specifications; Added General Note on quantities for estimating purposes only.  
Sheet 2: Straight Flare and Optional Shape. |
| 430-021             | Reorganized Index; Moved payment information to Specifications.  
Sheet 1: General Notes and Overview and Slope And Ditch Transitions. Design Notes to the Drainage Manual; Added General Note on Saddle Slope; Added General Note on quantities for estimating purposes only.  
Sheet 2: Combined details for Round and Elliptical Concrete Pipe; Added Section A-A “Pipe/Slab Fillet”; Added DETAIL “A”.  
Sheet 3: Combined Tables of Quantities for Round and Elliptical Concrete Pipe.  
Sheet 4: Combined details for Arched and Round Corrugated Metal Pipe.  
Sheet 5: Combined Tables of Quantities for Arched and Round Corrugated Metal Pipe.  
Sheet 6: Moved Connection and Anchor Details. |
| 430-022             | Reorganized Index; Moved payment information to Specifications.  
Sheet 1: General Notes and Overview and Ditch Transitions; Moved Design Notes to the SPI; Deleted information already in the Drainage Design Guide; Added General Note on Saddle Slope; Added General Note on quantities for estimating purposes only.  
Sheet 2: Combined details for Round and Elliptical Concrete Pipe; Added Section A-A “Pipe/Slab Fillet”; Added DETAIL “A”.  
Sheet 4: Combined details for Arched and Round Corrugated Metal Pipe.  
Sheet 5: Combined Tables of Quantities for Arched and Round Corrugated Metal Pipe.  
Sheet 6: Moved Connection and Anchor Details.  
Sheet 7: Moved Fastener and Grate Details. |
| 430-030             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and overall view; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
Sheet 2: Concrete Endwall Details; Added Steel, Offsets, Locators, and Openings.  
Sheet 3: Combined Quantities Tables; Elliptical Concrete and Elliptical/Arched Corrugated Metal Pipe tables.  
Sheet 4: Moved Spacing for Multiple Pipes Details. |
| 430-031             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
Sheet 2: Single 60” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
Sheet 3: Double 60” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-032             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
Sheet 2: Single 66” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
Sheet 3: Double 66” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-033             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
Sheet 2: Single 72” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
Sheet 3: Double 72” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-034             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
Sheet 2: Single 84” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
Sheet 3: Endwalls With U-Type Wings and Endwall With 45 Degree Wings. |
| 430-035             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
Sheet 2: General Notes and Overview; Updated Notes.  
Sheet 3: Steel Grate Details. |
| 430-036             | Reorganized Index; Added additional Sheet.  
Sheet 2: Type I – Nonremovable Grate.  
Sheet 3: Type II – Removable Grate. |
| 430-037             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to General Notes and Overview.  
Sheet 2: Type I, II, and III Underdrains.  
Sheet 3: Type Va, Vb, Underdrains and Cleanout. |
| 430-038             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Updated Notes.  
Sheet 2: Typical Inspection Box Installation.  
Sheet 3: Typical Urban, Slope, and Adjustment Installations. |
| 430-039             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
Sheet 2: French Drain System.  
Sheet 3: Concrete Slotted Pipe Options. |
| 430-040             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
Sheet 2: Type I Skimmers.  
Sheet 3: Type II Skimmers. |
| 430-041             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
Sheet 2: Type I Skimmers.  
Sheet 3: Type II Skimmers. |
| 430-042             | Reorganized Index; Added additional Sheet.  
Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
Sheet 2: Type I Skimmers.  
Sheet 3: New Construction.  
Sheet 4: Rehabilitation. |
STANDARD PLANS
FY 2020-21 REVISIONS LOG

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
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</tr>
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</tr>
<tr>
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<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
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<td>Sheet 3: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>455-440</td>
<td>Sheet 2: Changed bend diameter of GRP stirrups; Added new Note 5 and renumbered Notes.</td>
</tr>
<tr>
<td>458-100</td>
<td>Changed Elastomeric Seal to Strip Seal throughout Index.</td>
</tr>
<tr>
<td>460-470</td>
<td>Sheet 1: Changed Barrier Delineator note.</td>
</tr>
<tr>
<td>515-052</td>
<td>Sheet 8: Changed embedment depths and anchor lengths for Case I and Case IIb.</td>
</tr>
<tr>
<td>515-062</td>
<td>Sheet 9: Changed embedment depths and anchor lengths for Case I and Case IIb.</td>
</tr>
<tr>
<td>521-001</td>
<td>Sheets 15 &amp; 16: Changed &quot;Shoulder Barrier Inlet&quot; to &quot;Adjacent Barrier Inlet&quot; callout.</td>
</tr>
<tr>
<td>521-002</td>
<td>Sheet 1: Updated Note 4 to refer to Index 425-031 for &quot;Adjacent Barrier Inlets&quot; (number correction and Index name update).</td>
</tr>
<tr>
<td>521-004</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-005</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-027</td>
<td>Sheets 1 - 4: Renumbered.</td>
</tr>
<tr>
<td></td>
<td>Sheet 5: (NEW SHEET) Drainage Slot Details.</td>
</tr>
<tr>
<td>521-028</td>
<td>Sheet 3: Added reference to drainage slot detail.</td>
</tr>
<tr>
<td></td>
<td>Sheet 4: (NEW SHEET): Added full TL-2 Approach Connection layout for both curb continuation options; show guardrail tapers.</td>
</tr>
<tr>
<td>521-040</td>
<td>Sheet 1: Removed Barrier Delineator Spacing table; Changed Barrier Delineator note to refer to specification 705 instead of table.</td>
</tr>
<tr>
<td>521-050</td>
<td>Sheet 1: Changed 10' maximum spacing for 1/2&quot; V-Groove in consideration of 12' precast sections.</td>
</tr>
<tr>
<td>521-060</td>
<td>Sheet 1: Added organic felt band breaker on surfaces of wall between C-I-P coping to prevent cracking of the coping and wall.</td>
</tr>
<tr>
<td></td>
<td>Sheet 2: Added bond breakers between face of wall and C-I-P coping.</td>
</tr>
<tr>
<td>521-070</td>
<td>Sheet 1: Corrected Note referenced in Partial Plan View for Approach Slab.</td>
</tr>
<tr>
<td></td>
<td>Sheet 2: Clarified Note 4; Added Overbuild to Typical Section; Changed Title to End Transition Details.</td>
</tr>
<tr>
<td>521-080</td>
<td>Sheet 3: Changed Detail &quot;A&quot; to Details &quot;B&quot;; Clarified alternate construction joint for Detail &quot;B&quot;.</td>
</tr>
<tr>
<td>521-090</td>
<td>Sheet 1: Corrected reference to Approach Slab Note in Partial Plan View; Changed maximum spacing of 3/4&quot; expansion joints.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>521-040</td>
<td>Added Note 7 and renumbered Notes; Locate Open Joints in Barrier &amp; Coping a minimum of 5'-0 from CL of Barrier Wall Inlet.</td>
</tr>
<tr>
<td>521-060</td>
<td>Sheets 1, 2 &amp; 4: Removed notes to slope concrete pedestal surface.</td>
</tr>
<tr>
<td>522-002</td>
<td>Deleted General Note 2 regarding parallel grade break; Renumbered General Notes based on the deletion of Note 2.</td>
</tr>
<tr>
<td>524-001</td>
<td>Removed Sodding information from Sheet 2 and Added to new Sheet 3 in Index 570-001.</td>
</tr>
<tr>
<td>534-200</td>
<td>Sheet 1: Changed Note 6.C.1.</td>
</tr>
</tbody>
</table>

All Sheets: Renumbered for additional Sheets 14 and 16. |
Sheet 1: Added Trailing End Transition Connection to Rigid Barrier to Table of Contents; Added Sheets 14 & 16 to TOC and renumbered; Removed flared approach terminal from TOC; Note 10, allow for single-reduced post spacing for connections to existing guardrail. |
Sheets 2 & 3: Changed Note 7 and renumbered Notes; Locate Open Joints in Barrier & Coping a minimum of 5'-0 from CL of Barrier Wall Inlet. |
Sheet 5: Removed modified thrie beam details and Note 5; Added single-faced to double-faced guardrail connection detail. |
Sheet 6: Removed modified thrie beam section and post information from table. |
Sheet 7: Changed approach terminal callout at begin/end guardrail location; Added new information to Note 5 to allow substitution for miscellaneous asphalt pavement placed upstream of post 1. |
Sheet 8: Renumbered Note 7 to Note 9 and deleted reference to flared; Added a new Note "Clear Area Requirement"; Added approach terminal callout at begin/end guardrail location; Added new Note 8 to allow substitution for miscellaneous asphalt pavement placed upstream of post 1. |
Sheet 9: Added trailing anchorage callout to begin/end guardrail station location. |
Sheets 11 & 12: Added CRT End Treatment callout to Begin/End Guardrail Station location. |
Sheet 13: Changed default curb option shown to "Flush Shoulder Option"; Added TL-3 approach transition callout at begin/end GR. location. |
Sheet 14: (NEW SHEET): Added full TL-3 Approach Transition Connection layout for both curb continuation options; show guardrail tapers. |
Sheet 15: (Previously Sheet 14): Changed default curb option shown to "Flush Shoulder Option"; added TL-2 approach transition callout at begin/end GR. Location. |
Sheet 16: (NEW SHEET): Added full TL-2 Approach Transition Connection layout for both curb continuation options; show Guardrail tapers. |
Sheet 17: (Previously Sheet 15): Updated alignment curb dimensions for best fit; Changed "Flat No Curb" option to "Flush Shoulder Option". |
Sheet 19: (Previously Sheet 17): Terminal updated from flared to parallel in Plan View; Added approach transition callout at begin/end guardrail location. |
Sheet 20: (Previously Sheet 18): Added approach transition callout at begin/end guardrail location. |
Sheet 21: (Previously Sheet 19): Updated terminal from flared to parallel in Plan View. |
Sheet 23: (Previously Sheet 21): Updated Flangeable Leave-out details to show steel post; Changed Note 1 to explain that only steel posts are permitted. |
Sheet 24: (Previously Sheet 22): Removed modified-thrie beam from Button-Head Bolt Length table. |

Sheet 1: Updated Note 2 to remove trailing end transition information; Reference Index 536-001 for new trailing end transition connection details on New Sheet 28. |
Sheet 2: Removed Detail K references in details (typo from old Standard version). |
Sheet 3: Changed approach terminals from flared to parallel. |
Sheet 27: Removed Payment Information; Updated detail title to sync with Pay Item Title; "Guardrail Approach Transition Connections". |
Sheet 28: (NEW SHEET): Developed for Trailing End Transition Connections.
<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
</table>
| 544-001              | **Sheet 1:** Added callout notes to rigid barrier connection detail to include traffic railing and concrete barrier standards.  
**Sheet 3:** (NEW SHEET) Added Thrie Beam retrofit connection detail; Short guardrail extension options from crash cushion to rigid barrier.                                                                                                                                   |
| 570-001              | **All Sheets:** Renumbered for additional New Sheet.  
**Sheet 3:** (NEW SHEET) Added sodding information from Index 524-001.                                                                                                                                                                                                                                         |
| 580-001              | Updated bracing Detail; overall clarifications; Clarified that bracing is intended for plant establishment purposes only; Clarified on lumber grade; Clarified band strength.                                                                                                                                                                         |
| 591-001              | **NEW INDEX** – Previously Developmental Standard Plan D591-001.                                                                                                                                                                                                                                                                           |
| 639-001              | Corrected TYPICAL DISTRIBUTION POINT SCHEMATIC DETAIL Callout and “OFF” position location.                                                                                                                                                                                                                                               |
| 649-010              | **Sheet 2:** Change “jam nut” to anchor nut to match spec language.  
**Sheet 5:** Clarified that the luminaire arms are galvanized steel.                                                                                                                                                                                                             |
| 649-031              | **Sheet 2:** Change “jam nut” to anchor nut to match spec language.  
**Sheet 5:** Clarified that the luminaire arms are galvanized steel.                                                                                                                                                                                                             |
| 695-001              | **Sheet 5:** Changed the PVC Conduit or Non-Metallic Flexible Conduit from 1.5” to 3”.                                                                                                                                                                                                                                              |
| 700-010              | **All Sheets:** Renumbered.  
**Sheet 6:** Note 5: Clarified number of wind beams required.  
**Sheet 7:** (NEW SHEET) – WIND BEAM CONNECTION FOR FLIP UP SIGN.                                                                                                                                                                                                   |
| 700-041              | **Sheet 1:** Added information to Note 5B and Note 5C.                                                                                                                                                                                                                                                                             |
| 700-090              | Deleted Catwalk Notes and references and added to New Index 700-091.                                                                                                                                                                                                                                                                  |
| 700-091              | **NEW INDEX** – Catwalk Details.                                                                                                                                                                                                                                             |
| 700-101              | Changed lateral offsets to more closely correspond with the MUTCD.                                                                                                                                                                                                                                                                     |
| 700-104              | **Note 4:** Updated terminology for sign posts to match current naming.                                                                                                                                                                                                        |
| 700-110              | Deleted 30 degree cut of Z mounting beams and added bolt diameters to drawing (See Index 700-030).                                                                                                                                                                          |
| 706-001              | Changed striping (limits in detail).                                                                                                                                                                                                                                        |
| 711-001              | **Sheet 1:** Clarified "Notes for Pavement Message".  
**Sheet 2:** Changed "Contrast Markings with Alternating Skip Pattern" to "10’-30’ Skip Line with Shadow Markings"; Added "Dotted Line with Alternating Shadow Markings" with detail.  
**Sheet 5 & 6:** Deleted the 6” Yellow marking from the nose of the Traffic Separator.  
**Sheet 8:** Revised right turn lane details.  
**Sheet 11:** Revised all details and notes.                                                                                                                                                                      |
| 715-002              | **Sheet 1:** Changed Note 4C.  
**Sheet 2:** Added 20’ & 22’ mounting heights.  
**Sheet 3:** Changed Strut weld size in ARM ELEVATION Detail.  
**Sheet 4:** Added Pole PG.                                                                                                                                                                                                                                           |
| 715-010              | **Sheet 3:** Updated handhole ring and door dimensions to allow variation/increase in handhole size; increase distance from baseplate to bottom of handhole.                                                                                                                                 |
| 830-001              | **Sheet 2:** Added a line indicating the curb continuing to the junction with the crossing; Removed the label about shoulder pavement in lieu of curb; Added a label for drop curb; Modified label “shoulder pavement” to “asphalt pavement” on the left half; Added “or trail” label to sidewalk on right half; Changed “shoulder pavement” on right to asphalt or concrete pavement to match adjacent surface.|

**STANDARD PLANS**  
**FY 2020-21 REVISIONS LOG**
GENERAL NOTES:

This Index is only applicable to the current FDOT inventory of temporary bridge components which are manufactured in accordance with Acrow Series 300, Double Wide design.

Work this Index with Index 102-210, 102-220, 102-230 and 102-240.

STRUCTURAL STEEL:

Steel Plates and Rolled Sections shall be ASTM A709 Grade 36.

Pipe piles shall be ASTM A252 Grade 2, Fy = 35 ksi.

BOLTS, LAG SCREWS AND THREADED BOLT STOCK:

Furnish high strength bolts in accordance with ASTM F1554 Grade 5, Type 1, ASTM F3125 Grade A325 Type 1. Furnish Threaded Stock in accordance with ASTM A193. Furnish Lag Screws in accordance with ASTM A307.

Furnish steel washers and nuts compatible with Bolts, Threaded Stock and Lag Screws.

TIMBER AND LAGGING:

Timber and Lagging shall be No. 1 Southern Yellow Pine.

BACKWALL BENT PILES:

Timber Piles:

10 Minimum Embedment into compacted backfill or into soil having a blow count greater than 6 (N>6).

Ultimate Capacity greater than 18 tons.

Splices are not allowed on any timber piles.

H-Piles:

12 Minimum Embedment into compacted backfill or into soil having a blow count greater than 6 (N>6).

Ultimate Capacity greater than 18 tons.

Shims admissible between backwall pile and cap.

Test piles are not required for backwall piles.

EXPANSION BEARINGS:

Inspect the PTFE (Teflon) layer and stainless steel plate prior to installation.

Do not use bearings that have a severely damaged or unbonded PTFE layer.

Clean PTFE of all grit and grime prior to installation.

Do not use bearings that have a severely damaged or unbonded PTFE layer.

Clean Stainless steel plate of all grit and grime prior to installation and finish to a smooth buffed surface.

DISTRIBUTING BEAMS:

Longitudinal stops restraining the distributing beams may be lengthened or shortened to center the distributing beam bearing on the cap beam.

The longitudinal stops are to be bear on the distributing beam end frame.

EXPANSION JOINT SETTINGS:

Install the expansion joint considering the total continuous bridge length, location of fixed bearings and ambient temperature at the time of installation, assume a 1' expansion joint opening at 70 degrees F.

CONCRETE:

Concrete for Transition Blocks shall be Class II (Bridge Deck).

Concrete for Decking and transitions shall be Class III (Class III = Light Traffic, Class IV = Heavy Traffic).

Steel and Wood Plates and Rolls Sections shall be ASTM A709 Grade 36.

Steel Plates and Rolled Sections shall be manufactured in accordance with Acrow Series 300, Double Wide Design.

FACTORs INDEX:

This Index is only applicable to the current FDOT inventory of temporary bridge components which are manufactured in accordance with Acrow Series 300, Double Wide design.

Work this Index with Index 102-210, 102-220, 102-230 and 102-240.

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Pipe piles shall be ASTM A252 Grade 2, Fy = 35 ksi.

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Furnish high strength bolts in accordance with ASTM F1554 Grade 5, Type 1, ASTM F3125 Grade A325 Type 1. Furnish Threaded Stock in accordance with ASTM A193. Furnish Lag Screws in accordance with ASTM A307.

Furnish steel washers and nuts compatible with Bolts, Threaded Stock and Lag Screws.

TIMBER AND LAGGING:

Timber and Lagging shall be No. 1 Southern Yellow Pine.

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The longitudinal stops are to be bear on the distributing beam end frame.

EXPANSION JOINT SETTINGS:

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CONCRETE:

Concrete for Transition Blocks shall be Class II (Bridge Deck).

Concrete for Decking and transitions shall be Class III (Class III = Light Traffic, Class IV = Heavy Traffic).

Steel and Wood Plates and Rolls Sections shall be ASTM A709 Grade 36.

Steel Plates and Rolled Sections shall be manufactured in accordance with Acrow Series 300, Double Wide Design.

FACtORS INDEX:

This Index is only applicable to the current FDOT inventory of temporary bridge components which are manufactured in accordance with Acrow Series 300, Double Wide design.

Work this Index with Index 102-210, 102-220, 102-230 and 102-240.

STRUCTURAL STEEL:

Steel Plates and Rolled Sections shall be ASTM A709 Grade 36.

Pipe piles shall be ASTM A252 Grade 2, Fy = 35 ksi.

BOLTS, LAG SCREWS AND THREADED BOLT STOCK:

Furnish high strength bolts in accordance with ASTM F1554 Grade 5, Type 1, ASTM F3125 Grade A325 Type 1. Furnish Threaded Stock in accordance with ASTM A193. Furnish Lag Screws in accordance with ASTM A307.

Furnish steel washers and nuts compatible with Bolts, Threaded Stock and Lag Screws.

TIMBER AND LAGGING:

Timber and Lagging shall be No. 1 Southern Yellow Pine.

BACKWALL BENT PILES:

Timber Piles:

10 Minimum Embedment into compacted backfill or into soil having a blow count greater than 6 (N>6).

Ultimate Capacity greater than 18 tons.

Splices are not allowed on any timber piles.

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Ultimate Capacity greater than 18 tons.

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Test piles are not required for backwall piles.

EXPANSION BEARINGS:

Inspect the PTFE (Teflon) layer and stainless steel plate prior to installation.

Do not use bearings that have a severely damaged or unbonded PTFE layer.

Clean PTFE of all grit and grime prior to installation.

Do not use bearings that have a severely damaged or unbonded PTFE layer.

Clean Stainless steel plate of all grit and grime prior to installation and finish to a smooth buffed surface.

DISTRIBUTING BEAMS:

Longitudinal stops restraining the distributing beams may be lengthened or shortened to center the distributing beam bearing on the cap beam.

The longitudinal stops are to be bear on the distributing beam end frame.

EXPANSION JOINT SETTINGS:

Install the expansion joint considering the total continuous bridge length, location of fixed bearings and ambient temperature at the time of installation, assume a 1' expansion joint opening at 70 degrees F.

CONCRETE:

Concrete for Transition Blocks shall be Class II (Bridge Deck).

Concrete for Decking and transitions shall be Class III (Class III = Light Traffic, Class IV = Heavy Traffic).

Steel and Wood Plates and Rolls Sections shall be ASTM A709 Grade 36.

Steel Plates and Rolled Sections shall be manufactured in accordance with Acrow Series 300, Double Wide Design.
**ELEVATION VIEW**

(TIMBER PILES SHOWN, STEEL H PILES AND STEEL PIPE PILES SIMILAR)

(Three Beam Panel not shown for clarity, See Index 102-240)
Timber Bent shown for illustration purposes. See Plans for actual Bent Designs, including Pile sizes and spacing, bent cap and bracing requirements.

AB22 Distributing Beams with AB23 Distributing Beam End Frame (Typ.)

AB306 Transom DW (Typ.)

AB13 Swaybrace Standard (Typ.)

AB51 Panel Pins (Top & Bottom Typ.)

AB305C Distributing Beam Stop (Typ.)

Steel Grid Deck & Curb

AB1 Truss Panels (Typ.)

AB7 & AB8 Bearings (Expansion Bearing shown, Fixed Bearing similar) (Typ.)

AB3 Bracing Frame (Typ.)

TYPICAL SECTION THRU DETOUR BRIDGE AT INTERIOR BENTS (TYPICAL SECTION AT END BENTS SIMILAR WITHOUT DISTRIBUTING BEAMS) (TIMBER PILES SHOWN, STEEL H PILES AND STEEL PIPE PILES SIMILAR)

F DOT supplied Temporary Bridge Components including Fixed & Expansion Bearings, Guardrail and associated components not included. Contractor supplied Foundation components, including Pile Cap & Pile Dowel Bars, Steel Lug Bolts & Nuts.

DESCRIPTION:

REV: 07/01/15

REV: FY 2020-21

STANDARD PLANS

TEMPORARY DETOUR BRIDGE

GENERAL NOTES AND DETAILS

INDEX

102-200

4 of 7
ELEVATION VIEW OF DISTRIBUTING BEAM
(FIXED BEARING SHOWN, EXPANSION BEARING SIMILAR)
(Timber Intermediate Bent shown, Steel Intermediate Bents similar)

Note:
$\xi$ Bearing may be shifted from $\xi$ Truss Pins as shown, $\xi$ Intermediate Bent may be shifted from $\xi$ Bearing an additional 3" to allow for pile placement tolerances.

ABS05C Distributing Beam Stop
ABS05C Distributing Beam Stop (Typ.)
Truss Retainer Plates (location, number and type vary)

Bracing Bolts
Bracing Bolts

Revised Beam End Frame
AB23 Distributing Beam End Frame

End Frame
$1'-6'' (\xi$ to $\xi$ Trusses)

Elevation View of Distributing Beam, Fixed Bearing shown, Expansion Bearing similar
Timber Intermediate Bent shown, Steel Intermediate Bents similar

Note: $\xi$ Bearing may be shifted from $\xi$ Truss Pins as shown, $\xi$ Intermediate Bent may be shifted from $\xi$ Bearing an additional 3" to allow for pile placement tolerances.

AB22 Distributing Beam shown dashed
Bottom of Bearing, Top of Bent Cap or Shim Plate

Intermediate Bent (see Note)

Bent Cap & Bearing Plate shown dashed
GRADE BEAM DETAILS

PLAN VIEW

ELEVATION VIEW

ANCHOR PLATE DETAIL

OPTIONAL THROUGH BOLT DETAIL (MAY BE USED IN LIEU OF STRAPS)
**TEMPORARY DETOUR BRIDGE DETAILS**

**STEEL H PILE FOUNDATIONS**

**FIXED BEARING DETAILS**

- Steel Bent Cap
- Expansion Bearing Assemblies shown dashed
- 1/4" x 1/2" Fixed Bearing Keeper Bar (Typ.)
  - (to bear on face of Bearing Plates)
- AB7 & AB8 Bearings shown dashed
- 1/6" Min. x 11" x 2-9/16" Shim Plate when required
- & Bearing (shift as required within tolerance)

**EXPANSION BEARING DETAILS**

- Steel Bent Cap
- Expansion Bearing Assemblies shown dashed
- 1/2" x 1/2" Expansion Bearing Keeper Bar (Typ.)
  - (to bear on face of Bearing Plates)
- Steel Bent Cap
- Expansion Bearing Assemblies shown dashed
- 1/2" x 1/2" Expansion Bearing Keeper Bar (Typ.)
  - (to bear on face of Bearing Plates)

**DIMENSIONS:**

- 1" x 2"
- 2-3/4" x 2-3/4"
Note: Use Shim Plates as required to provide equal bearing seat elevations across the bent. Vary thickness of Shim Plate across the pile cap plate to provide a level bearing area in the transverse direction.

**AB7 & AB8 Bearings** shown dashed

**PARTIAL PLAN VIEW**

**PARTIAL ELEVATION VIEW**

**FIXED BEARING KEEPER BAR DETAIL**
Note:
Use Shim Plates as required to provide equal bearing seat elevations across the bent. Vary thickness of Shim Plate across the pile cap plate to provide a level bearing area in the transverse direction.

ABUTMENT AND INTERMEDIATE EXPANSION BEARING DETAILS

END VIEW

EXPANSION BEARING KEEPER BAR DETAIL

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW
DESCRIPTION:

REV 02

STANDARD PLANS

F Y 2 0 2 0 - 2 1

TEMPORARY DETOUR BRIDGE

THRIE-BEAM GUARDRAIL

INDEX

1 0 2 - 2 4 0

SHEET

2 of 6
DESCRIPTION:

TEMPORARY DETOUR BRIDGE
THREE-BEAM GUARDRAIL

PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

ELEVATION OF TRANSITION BLOCK
(GUARDRAIL AND POSTS NOT SHOWN FOR CLARITY)

ESTIMATED QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Class NS</td>
<td>CY</td>
<td>3.4</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>61</td>
</tr>
<tr>
<td>Guardrail (Reset)</td>
<td>LF</td>
<td>122.5</td>
</tr>
</tbody>
</table>

NOTES:

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60.

ANCHOR RODS: Steel Anchor Rods shall be ASTM A36, ASTM A709 Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance with Specification Section 962.
GENERAL NOTES

1. SURFACE TREATMENT: As an option to Class 4 Floor Finish (Bridge Floor Grooving) per Section 400 a hand tined or heavy broomed finish may be permitted on the concrete portion of the riding surface. Sidewalk areas shall receive a broomed finish. The top surface of the concrete beneath the asphalt overlay shall be raked.

2. CONDUIT: If required, see Structures Plans for Conduit Details.

3. When a longitudinal construction joint is necessary or allowed by the Engineer, the transverse steel shall be extended as shown in the Longitudinal Construction Joint Detail.

4. The plan view for CASE 1 applies when the skew angle (Ø) = 0°. Relevant details also apply to CASE 2.

5. The plan view for CASE 2 applies where the skew angle (Ø) > 0°.

6. Deformed WWR for the edge of Approach Slabs shown in Plan View Cases 1 and 2 represent a typical approach slab with edge barriers and no sidewalks. Provide railings, parapets and raised sidewalks as detailed in the Contract Plans.

7. The slab shown represents a skew to the right for an approach slab at begin bridge; approach slab at the end of bridge or a left skew shall be treated similarly.

8. Approach slabs shown in Plan View Cases 1 and 2 represent a typical approach slab with edge barriers and no sidewalks. Provide railings, parapets and raised sidewalks as detailed in the Contract Plans.

9. PAYMENT: Deformed WWR for the edge of Approach Slabs on retaining walls is not included in the estimated quantity for reinforcing steel and is considered incidental to the work. See Roadway Plans for Asphalt Overlay and Optional Base details and quantities.

CROSS REFERENCES:

For Section B-B, Longitudinal Construction Joint Detail and Approach Slab Details see Sheet 2.

INDEX

APPROACH SLABS (30 FT.)

STANDARD PLANS

FY 2020-21

400-090

1 of 2
**GENERAL NOTES**

1. **SURFACE TREATMENT:** Apply a Class 4 Floor Finish (Grooved) to the riding surface from begin or end approach slab joint to begin or end bridge. See Bid Item Notes. Apply a broomed finish to sidewalk areas.

2. **CONDUIT:** If required, see Structures Plans for Conduit details.

3. When a longitudinal construction joint is necessary or allowed by the Engineer, the transverse steel shall be extended as shown in the Longitudinal Construction Joint Detail.

4. The plan view for CASE 1 applies when the skew angle $(\theta)$ = 0°. Relevant details also apply to CASE 2.

5. The plan view for CASE 2 applies where the skew angle $(\theta)$ is in 0°. The slab shown represents a skew to the right for an approach slab at begin bridge; approach slab at the end of bridge or a left skewed shall be treated similarly. The shown reinforcement shall be utilized, and Dowels provided in accordance with Index 350-001 and 370-001.

6. Deformed WWR must meet the requirements of Specification Section 933.

7. **PROFILOGRAPH:** If profilograph requirements apply, planing may be required. The permitted construction joint shown in Section 933 will facilitate the placement of the expansion joint.

8. Approach slabs shown in Plan View Cases 1 and 2 represent a typical approach slab with edge barriers and no sidewalks. Provide railings, parapets, traffic separators and sidewalks as detailed on the approach slab sheets.

9. **PIVEMENT:** Deformed WWR for the edge of Approach Slabs on retaining walls is not included in the estimated quantity for reinforcing steel and is considered incidental to the work. See Roadway Plans for Option Base details and quantities.

1. **SURFACE TREATMENT:** Apply a Class 4 Floor Finish (Grooved) to the riding surface from begin or end approach slab joint to begin or end bridge. See Bid Item Notes. Apply a broomed finish to sidewalk areas.

2. **CONDUIT:** If required, see Structures Plans for Conduit details.

3. When a longitudinal construction joint is necessary or allowed by the Engineer, the transverse steel shall be extended as shown in the Longitudinal Construction Joint Detail.

4. The plan view for CASE 1 applies when the skew angle $(\theta)$ = 0°. Relevant details also apply to CASE 2.

5. The plan view for CASE 2 applies where the skew angle $(\theta)$ is in 0°. The slab shown represents a skew to the right for an approach slab at begin bridge; approach slab at the end of bridge or a left skewed shall be treated similarly. The shown reinforcement shall be utilized, and Dowels provided in accordance with Index 350-001 and 370-001.

6. Deformed WWR must meet the requirements of Specification Section 933.

7. **PROFILOGRAPH:** If profilograph requirements apply, planing may be required. The permitted construction joint shown in Section 933 will facilitate the placement of the expansion joint.

8. Approach slabs shown in Plan View Cases 1 and 2 represent a typical approach slab with edge barriers and no sidewalks. Provide railings, parapets, traffic separators and sidewalks as detailed on the approach slab sheets.

9. **PIVEMENT:** Deformed WWR for the edge of Approach Slabs on retaining walls is not included in the estimated quantity for reinforcing steel and is considered incidental to the work. See Roadway Plans for Option Base details and quantities.

**APPENDIX SLABS (50 FT.)**

**RIGID PAVEMENT APPROACHES**

**INDEX**

**400-091**

**1 of 2**

**REV 01/01/17**

**DESCRIPTION:**

**FY 2020-21**

**STANDARD PLANS**

**CROSS REFERENCES:**

For Section B-B, Longitudinal Construction Joint Detail and Approach Slab Details see Sheet 2.
TABLE 1 - MINIMUM BAR SPLICE LENGTHS FOR LONGITUDINAL REINFORCING

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>CLASS II</th>
<th>CLASS IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>#5</td>
<td>7'-0&quot;</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>#6</td>
<td>6'-10&quot;</td>
<td>6'-10&quot;</td>
</tr>
<tr>
<td>#8</td>
<td>4'-8&quot;</td>
<td>4'-8&quot;</td>
</tr>
</tbody>
</table>

NOTE: Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.

LIVE LOAD, HL-93.

CONSTRUCTION LOADING: It is the construction Contractor's responsibility to provide for supporting construction loads that exceed AASHTO HL-93, and any construction load applied prior to 2 feet of compacted fill placed above the top slab.

SURFACE FINISH: All concrete surfaces shall receive a general surface finish.

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

GENERAL NOTES:

LEFT END WINGWALL

RIGHT END WINGWALL

LEFT BEGIN WINGWALL

RIGHT BEGIN WINGWALL

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

GENERAL NOTES:

SURFACE FINISH: All concrete surfaces shall receive a general surface finish.

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

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REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

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LEFT END WINGWALL

RIGHT END WINGWALL

LEFT BEGIN WINGWALL

RIGHT BEGIN WINGWALL

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

GENERAL NOTES:

LEFT END WINGWALL

RIGHT END WINGWALL

LEFT BEGIN WINGWALL

RIGHT BEGIN WINGWALL

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

GENERAL NOTES:

LEFT END WINGWALL

RIGHT END WINGWALL

LEFT BEGIN WINGWALL

RIGHT BEGIN WINGWALL

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

GENERAL NOTES:

LEFT END WINGWALL

RIGHT END WINGWALL

LEFT BEGIN WINGWALL

RIGHT BEGIN WINGWALL

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

GENERAL NOTES:

LEFT END WINGWALL

RIGHT END WINGWALL

LEFT BEGIN WINGWALL

RIGHT BEGIN WINGWALL

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.
TYPICAL SECTION THRU SINGLE BARREL CULVERT

CULVERT BARREL NOTES:
1. Space Bars 110 and 112 with a bar in each corner, and at the 1/6 of interior walls (for multiple barrel culverts only), and the remaining bars placed at equal spacing shown in the Contract Plans. Adjust last bar spacing when required.
2. Place Bars 113 and 114 at spacing shown in the Contract Plans evenly between Bars 109 and 111.
3. Locate the first transverse bar from the ends of the culvert at one half the bar spacing, but provide the minimum reinforcement cover and not greater than 4" clear.

TYPICAL SECTION THRU MULTIPLE BARREL CULVERT

WINGWALL ELEVATION - Variable Height
(Left End shown - other corners similar)

WINGWALL NOTES:
1. Align construction joint perpendicular to wingwall.
2. In the vicinity of the construction joint, field bend reinforcement as necessary to maintain minimum reinforcement cover.
3. For constant height wingwalls, variable length Bars 403, 405 & 408 are not required, and as such the limits of Bars 401 & 407 extend the full length of the wingwall, and the limits of Bars 402 & 404 extend to the full height of the wingwall.

CONCRETE BOX CULVERT DETAILS
Slab Reinforcing Steel within these limits apply for the non-skewed portion of slabs.

WP (See Note 2)

Bars 101 (Top mat of Top Slab), Bars 102 (Bottom mat of Top Slab), Bars 103 (Top mat of Bottom Slab), Bars 104 (Bottom mat of Bottom Slab).

Bars 201 (Top mat, Left Skew), Bars 202 (Bottom mat, Left Skew), Bars 301 (Top mat, Right Skew), Bars 302 (Bottom mat, Right Skew).

Bars 201 & 202 (Left Skew)
Bars 301 & 302 (Right Skew) (Typ.)

Bars 801 (Left Headwall), Bars 804 (Right Headwall).

Bars 101 (Top mat), Bars 102 (Bottom mat), Bars 202 (Bottom mat, Left Skew), Bars 302 (Bottom mat, Right Skew), Bars 201 (Top mat, Left Skew), Bars 301 (Top mat, Right Skew).

Bars 103 (Top mat, Right Skew), Bars 303 (Top mat, Right Skew), Bars 203 (Top mat, Left Skew), Bars 304 (Bottom mat, Right Skew), Bars 204 (Bottom mat, Left Skew).

Bars 303 & 304 (Right Skew)
Bars 203 & 204 (Left Skew) (Typ.)

WP (See Note 2)

Bars 812 (Right Cutoff Wall), Bars 809 (Left Cutoff Wall).

Bars 109 (Top mat), Bars 112 (Bottom mat), Bars 209 (Top mat), Bars 212 (Bottom mat).

Bars 110 (Top mat), Bars 111 (Bottom mat).

NOTES:

2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail C (Sheet 5).
NOTES:
1. For small angles, the Contractor may elect to fill the area between the box and the wingwall footing with unreinforced concrete. For wingwall skew angles less than 90 degrees, field bend wingwall reinforcement as necessary while maintaining cover. No additional payment will be made for this work.
2. Location of Construction joint determined by WP at theoretical intersection of:
   - Soil side face of Headwall and outside face of Box Exterior Wall, for SW ≤ 90°;
   - Outside face of Wingwall and outside face of Box Exterior Wall, for SW > 90°.
3. Provide 6" chamfer when angle 'A' is greater than 45°. Maintain minimum wall thickness. Field adjust reinforcing to maintain cover.
4. Wingwall Skew Angles (SW) are measured from the adjacent box exterior wall to the wingwall.
5. Turn or extend Wingwall Cutoff Wall as necessary to meet Box Cutoff Wall.
6. Provide additional reinforcement in the top of the top slab below traffic railings to ensure a minimum area of 0.80 sq. in./ft. transverse reinforcing.

DETAIL "C" - PLAN VIEW
WINGWALL TO BOX CONNECTION
(Left Begin Corner Shown, Other Corners Similar)

DETAIL "D"

DETAIL "E"

DETAIL "F"

DETAIL "G"

SECTION H-H

DETAIL "K" - LEFT CUTOFF WALL SECTION
(Right Cutoff Wall Similar)

DETAIL "L" - LEFT HEADWALL SECTION
(Right Headwall Similar)

PROVIDE ADDITIONAL 3" Ø WEEP HOLES @ 10'-0" SPACING WHEN BASE OF WINGWALL IS EXPOSED.

CROSS REFERENCE:
See Sheet 3 for locations of Details "D, E, F, G, H, K".
See Sheet 4 for locations of Detail "C".

TYPE I CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS

OUTSIDE WALLS OF BOXES

SECTION A-A

- 2'-0" Straight Transition
- 2'-0" Tapered Transition

FLARED WINGWALL

- Existing Side Slope
- Existing Wingwall
- Proposed Side Slope
- Remove Portion of Wingwall less than 1'-0" below Proposed Side Slope Surface

OUTSIDE WALLS OF BOXES

SECTION B-B

- 2'-0" Straight Transition
- 2'-0" Tapered Transition

STRAIGHT WINGWALL

- Existing Headwall
- Wingwall & Footing

SECTION C-C

- 2'-0" Straight Transition
- 2'-0" Tapered Transition

INTERIOR DOUBLE WALLS OF BOXES

- Existing Slab or Wall Thickness
- 3" Min. Cl.
- Face of Existing Headwall or Wingwall

INTERIOR SINGLE WALLS OF BOXES

- 2'-0" Min.
- 1'-0" Min.
- 3 Min. - 3 Max.
- Inside Face of Wall/Slab
- Longitudinal Reinforcing

DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION

(Interior Single Walls Similar)

- Section of Existing Box Culvert to be removed and replaced, for Type I Connection

DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS

- Existing Headwall
- 2'-0" Transition
- 2'-0" (See Note 3)

NOTES:

1. The Box Culvert Data Tables and Reinforcing Bar List do not include the additional quantities needed for dowel connections or transitions from double walls of existing concrete box culverts, the cost for additional reinforcement and the thickened concrete wall in the transitional area shall be included in the costs for concrete and steel in the culvert extension.

2. Cost for removal and disposal of material from existing headwalls, wingwalls and box, and cost of cleaning, straightening and extending or doweling longitudinal reinforcing steel shall be included in the cost for concrete and steel of the culvert extension.

3. Remove existing concrete while avoiding damage to existing reinforcement. Clean and straighten existing reinforcement, lap and tie onto extension reinforcement.

4. Dowel in #4 Bars @ 1'-0" max. spacing into wall/slab when there is a single mat of existing reinforcing steel, otherwise splice 1'-6" as shown for inside reinforcement. Use an Adhesive Bonding Material System in accordance with Specifications Section 416 & 937.

5. Provide additional transverse bars for top and bottom slab, parallel and full width of any skewed joint connection when shown in the Plans.

6. See Box Culvert Data Table notes in Plans for Connection Types allowed.

DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION

(Interior Single Walls Similar)
FLARED WINGWALL

STRAIGHT WINGWALL

INTERIOR SINGLE WALLS OF BOXES

SECTION C-C

DETAIL "N" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION

DETAIL "N" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS

TYPE II CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS

(adhesive dowel to existing concrete)
Concrete Box Culvert

Filter Fabric (both sides)

2'-0" 1'-0"

Coarse Aggregate

Bottom of Base

Use Extra Base When This Dimension is Less Than 12"

The cost of furnishing and installing extra friable base material shall be included in the cost of the Box Culvert.

Friable Base Material

Concrete Box Culvert

FRIABLE BASE

20' or more

Bridge Culvert Number Location

Black Plastic Figures 3" in height as approved by the Engineer may be used in lieu of numbers formed by 3/8" V-Grooves. V-Grooves shall be formed by preformed figures.

ASPHALTIC CONCRETE BASE

NOTE: Extra base is required when cross box culverts are located on facilities subject to high speed traffic (>45 mph) or high traffic volumes (>1600 ADT) and the cover is within the range specified in the notation above.

EXTRA BASE FOR BOX CULVETS CROSSING UNDER FLEXIBLE PAVEMENT
**GENERAL NOTES:**

1. **Specifications:**
   - General: FDOT Standard Specifications for Road and Bridge Construction, Section 410 (current edition, and supplements thereto). Concrete (Precast):
     - Class III or Class II Modified (5,000 psi) for slightly aggressive environments.
     - Class IV (5,500 psi) for moderately to extremely aggressive environments.

   Concrete (Cast-In-Place):
   - Class II (3,400 psi) for slightly aggressive environments.
   - Class IV (5,500 psi) for moderately to extremely aggressive environments.

   Reinforcing Steel:
   - Maintain minimum clearance of 2" for slightly and moderately aggressive environments, unless otherwise shown. Equal area substitution of welded wire (WWR) reinforcement is permitted.

   2. Work this Index with the Cast-In-Place Concrete Box Culvert Details and Data Tables shown in the plans. Index 400-289 and the Precast Concrete Box Culverts shown in the shop drawings.

   3. All joints between precast sections must be tongue & groove with joint sealant. Joints between cast-in-place & precast sections shall have longitudinal reinforcing extending from top, bottom & both side slabs of the precast box tied to the precast headwalls cast integrally with the end segment when approved by the Engineer.

   4. Extension of existing multiple barrel box culverts with multiple single cell precast box culverts is not permitted unless approved by the District Structures Engineer. Full transition details must be shown in the shop drawings when approved.

   5. Culverts larger than the specified size may be substituted by the District Structures Engineer. Substitution must be approved by the Engineer, minimum earth cover and invert elevations shown in the Contract Documents must be maintained.

---

**INDEX:**

- **A** Single Cell Monolithic (Four Sided)
  - Designer
  - Index 400-292
  - Contractor Design

- **B** Single Cell Two-Piece (Four Sided)
  - Three sides, bottom section
  - Contractor Design

- **C** Multicell Monolithic
  - Not Applicable
  - Contractor Design

---

**DETAIL E:
PICTORIAL VIEW OF EXTERIOR WALL/SLAB TRANSITION**

(As shown in the shop drawings)

**EXPLODED VIEW OF CONNECTIONS AT END OF CULVERT**

(Double Barrel Culvert shown, Single or Multiple Barrel Culvert similar)
ALTERNATE BOTTOM SLAB TRANSVERSE JOINT
TYPICAL SECTION
(DOUBLE-SIDED TONGUE & GROOVE JOINT)
(All reinforcing not shown for clarity)

NOTE:
Bottom Slab Joints in Type B Boxes may be single tongue & groove joints as shown in Section A-A when the Top Slab Joints are oriented as shown in Schematic "A".

SCHEMATIC "A"

TYPE B BOX SECTION PLACEMENT
FOR SINGLE TONGUE & GROOVE JOINTS

TWO-PIECE PRECAST SEGMENT
ADDITIONAL JOINT DETAILS
(TYPE B BOX)
New Precast Box Culvert

Filter Fabric wrapped around construction joint

Outside Face of Wall/Slab

Longitudinal reinforcing

Mechanical couplers or 2'-0" extension of precast box reinforcing

Equivalent reinforcing to C-I-P design shown in plans

Cast-In-Place (C-I-P) Transition

4'-0" (Typ.)

Splice

Existing Box Culvert to remain

Inside Face of Wall/Slab

Cutoff wall reinforcing (Typ.)

(As per Plans)

Fault bend & trim bottom bar extension as shown to maintain cover

Face of Wingwall or Headwall

C-I-P End Section

(As per Plans)

#4 Stirrups @ 1'-0" Max. spacing

4½" Bend Diagram

** Provide adequate width to satisfy shear strength requirements at joint

H lc w  +  6 " ( Index  400 -289 )*

Circumferential bottom slab reinforcing

Mechanical couplers or 3'-0" bar extension (full length bar extension or adhesive bonded dowel bars with 1'-0" embedment permitted)

1'-3" Min. Lap Splice (when reqd.)

Top slab C-I-P reinforcing or extension of precast reinforcing

Face of C-I-P Wingwall/Headwall

1'-0" Min. standard hook or WWR anchorage

Section B-B

Top Slab to Wall Joint (KEYED JOINT)

Type D-3 Filter Fabric (full length of horizontal joint)

Top slab C-I-P reinforcing or extension of precast reinforcing

Equivalent reinforcing to C-I-P design shown in plans

Mechanical couplers or 2'-0" extension of precast box reinforcing

New Precast Box Culvert

Cutoff wall reinforcing (Typ.)

(See C-I-P design in plans)

See Index 400-291 for C-I-P Transition details

Existing Box Culvert to remain

Splice

CAST-IN-PLACE (C-I-P) Transition

4'-0" (Typ.)

** Provide adequate width to satisfy shear strength requirements at joint

Typ. Cover

C-I-P End Section

(As per Plans)

Precast Box Culvert

As per Plans

Precast Box Culvert

Type B Box Longitudinal Joints

EXTERIOR WALL/SLAB TRANSITION DETAIL FOR PRECAST EXTENSION

(As per Plans)

Section E-E

Section of Existing Box Culvert to be removed and replaced, for Type I Connection similar

** Provide adequate width to satisfy shear strength requirements at joint

TYPE B BOX TOE SLAB & CUTOFF WALL DETAILS AND CONNECTION TO PRECAST BOX

C-I-P HEADWALL DETAILS AND CONNECTION TO PRECAST BOX

** Provide additional 6" depth of cutoff wall at no additional cost

PRECAST CONCRETE BOX CULVERTS - SUPPLEMENTAL DETAILS

INDEX

400-291

STANDARD PLANS

FY 2020-21

REVISION

DESCRIPTION:

REV

REV

DATE

SHEET

3 of 5

Due to lack of whitespace, the text is more difficult to read than if it were formatted correctly. However, the content is still generally clear and conveyable.
PIPE BLOCKOUT NOTES:
1. Cut box culvert reinforcement as required to maintain 2" cover.
2. For Precast Sections construct opening a minimum of 1'-6" away from any box to box joint, except opening may be a minimum of 1'-0" away from joint when at least 2'-0" of clearance to the box to box joint is provided on the opposite side of the pipe opening.
3. Pipe blockout diameter to be 6" greater than pipe outside diameter.
4. See Drainage Plans for size, placement, and invert elevation.

#4 BAR END CAP ANCHOR BAR BEND DIAGRAM

VIEW G-G
(Headwall, Toe Slab and Cutoff Wall Reinforcing not shown for clarity)

SECTION H-H
(Showing additional blockout reinforcing only)
Provide 50% of vertical reinforcing cut by blockout on each side of pipe at each face (Typ.)

SECTION I-I
(FY 2020-21)

C-I-P END CAP DETAILS AND CONNECTION TO PRECAST BOX
**DIFFERENTIAL SETTLEMENT COUNTERMEASURES FOR PRECAST BOX CULVERTS**

**LINK SLAB NOTES:**

1. Provide a Cast-In-Place Link Slab to ensure uniform joint opening of precast box culverts when the differential settlement shown in the plans exceeds the following limits, except that a Link Slab is not required for differential settlements less than $\frac{1}{8}$'.

\[ \Delta Y = \frac{\Delta \gamma}{760 \times R \times W} \]

Where:
- $\Delta Y$ = Maximum Long-Term Differential Settlement (ft.)
- $R$ = Exterior height of Box Culvert (ft.)
- $W$ = Length of Box Culvert Segments (ft.)
- $L$ = Effective length for single curvature deflection (ft.)

2. Extend Link Slab to back face of headwalls and to limits of existing box culverts for extensions.

**NOTE:** Estimated quantities are based on the plan area of precast box slabs, and are provided for information only. No additional payment will be made for Link Slabs where these are required for the precast box culverts.

**DOWEL BARS 4L**

- Install dowels with an Adhesive Bonding Material System in accordance with Specification Section 416. The Contractor may substitute mechanical couplers in lieu of adhesive bonded dowels. Shift dowels to clear box culvert reinforcing.

**ESTIMATED LINK SLAB QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class II or IV Concrete (Culvert)</td>
<td>CY/SF</td>
<td>0.0216</td>
</tr>
<tr>
<td>Reinforcing Steel (Roadway)</td>
<td>Lb./SF</td>
<td>1.52</td>
</tr>
</tbody>
</table>

**DESIGN NOTE:**

1. Provide a Cast-In-Place Link Slab to ensure uniform joint opening of precast box culverts when the differential settlement shown in the plans exceeds the following limits, except that a Link Slab is not required for differential settlements less than $\frac{1}{8}$'.

Where:
- $\Delta Y$ = Maximum Long-Term Differential Settlement (ft.)
- $R$ = Exterior height of Box Culvert (ft.)
- $W$ = Length of Box Culvert Segments (ft.)
- $L$ = Effective length for single curvature deflection (ft.)

2. Extend Link Slab to back face of headwalls and to limits of existing box culverts for extensions.

**NOTE:** Estimated quantities are based on the plan area of precast box slabs, and are provided for information only. No additional payment will be made for Link Slabs where these are required for the precast box culverts.
**GENERAL NOTES:**
1. These precast designs may be substituted for cast-in-place box culverts designed to ASHHTA LRFD Bridge Design Specifications, 4th Edition. Designs are based on the design criteria shown in FDOT Structures Design Guidelines.

2. Loading: HL-93 & any fill heights between the minimum & maximum shown.

3. Only one design of precast box culvert is to be used for any installation.

4. Reinforcement steel must consist of smooth or deformed welded wire reinforcement (WWR) meeting the requirements of Specification Section 931. Longitudinal reinforcement may consist of reinforcing bars meeting the requirements of Specification Section 931. Minimum cover must be 2" for slightly or moderately aggressive environments or 3" for extremely aggressive environments, unless otherwise shown. The spacing of circumferential wires must not be less than 2", nor more than 4". The spacing of longitudinal wires or bars must not be more than 8".

5. As9 longitudinal wires must have a minimum cross-sectional area of 40% of the circumferential wires, but not less than a #2.5 or #4.0 for WWR, or #3 bars for deformed bars.

6. Welding of reinforcement must be limited to the locations shown in ASTM C1577 and in accordance with ANSI/AWS D1.4 "Structural Welding Code - Reinforcing Steel".

7. For alternate reinforcing configuration options 2 and 3 shown in Detail "A" and "B" (Sheet 1), As1 may be extended to the middle of either slab and lap spliced with As7 and As8. As4 may be lap spliced at any location or connected to As2 or As3 at corners by welding.

8. Haunch dimensions may vary between the minimum and maximum dimensions shown in the Design Tables but only one haunch dimension must be used within the full length of the box culvert installation.

9. Submittal of redesign calculations are not required for any increase to the slab or wall thickness when the minimum reinforcement areas shown in the Design Tables are provided.

10. For Design Earth Cover greater than 10 feet, the Contractor may interpret the required areas of reinforcement and slab or wall thickness. Interpolated areas of reinforcement, slab or wall thickness must be approved by the Engineer.

11. Minimum length of precast box segments is 4 feet and maximum length is 16 feet.

12. See Index 400-291 for connections to wingwalls, headwalls and other general details.

---

**TABLE 1A - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS**

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>RISE (R)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER</th>
<th>REINFORCEMENT AREAS (sq. in./ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS1</td>
<td>AS2</td>
</tr>
<tr>
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<td>4 x 7</td>
<td>7 7 7 10</td>
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</tbody>
</table>

**TABLE 1B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS**

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>RISE (R)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER</th>
<th>REINFORCEMENT AREAS (sq. in./ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AS1</td>
<td>AS2</td>
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<td>4 x 4</td>
<td>8 8 8 10</td>
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</tr>
</tbody>
</table>

---

**SCHEMATIC OF LAP SPlice LOCATIONS FOR OPTION 2 & 3 REINFORCING CONFIGURATIONS**

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**NOTES:**
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 14 for WWR Bending Diagram.
### TABLE 2A - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 5' & 6' SPANS

| Span (ft) | Top Riser (in.) | Bottom Riser (in.) | Side Wall Thickness (in.) | Reinforcement Areas (sq. in./ft.) | As1 | As2 | As3 | As4 | As5 | As6 | As7 | As8 | As9 | As10 | As11 | As12 | As13 | As14 | As15 | As16 | As17 | As18 | As19 |
|-----------|-----------------|-------------------|--------------------------|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5' x 3    | 7               | 7                 | 2                        | 0.33 - <2                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5' x 4    | 7               | 7                 | 2                        | 0.33 - <2                        | 0.30| 0.51| 0.17| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6' x 6    | 8               | 8                 | 8                        | 0.33 - <7                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6' x 8    | 8               | 8                 | 8                        | 0.33 - <7                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |

### TABLE 2B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 5' & 6' SPANS

| Span (ft) | Top Riser (in.) | Bottom Riser (in.) | Side Wall Thickness (in.) | Reinforcement Areas (sq. in./ft.) | As1 | As2 | As3 | As4 | As5 | As6 | As7 | As8 | As9 | As10 | As11 | As12 | As13 | As14 | As15 | As16 | As17 | As18 | As19 |
|-----------|-----------------|-------------------|--------------------------|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5' x 3    | 8               | 8                 | 8                        | 0.33 - <7                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5' x 4    | 8               | 8                 | 8                        | 0.33 - <7                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6' x 6    | 8               | 8                 | 8                        | 0.33 - <7                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6' x 8    | 8               | 8                 | 8                        | 0.33 - <7                        | 0.31| 0.48| 0.17| 0.21| 0.23| 0.31|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
### TABLE 3 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 7' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S) x (R)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT. LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 x 4</td>
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</tbody>
</table>

### TABLE 4 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 8' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S) x (R)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT. LENGTH (m)</th>
</tr>
</thead>
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<tr>
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<td>8</td>
<td>8</td>
</tr>
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</table>

**NOTES:**
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
### TABLE 5 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 9' SPANS

<table>
<thead>
<tr>
<th>SPAN (S) (Ft)</th>
<th>9 x 5</th>
<th>9 x 6</th>
<th>9 x 7</th>
<th>9 x 8</th>
<th>10 x 5</th>
<th>10 x 6</th>
<th>10 x 7</th>
<th>10 x 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 x 5</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
</tr>
<tr>
<td>9 x 6</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
</tr>
<tr>
<td>9 x 7</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
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### TABLE 6 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 10' SPANS

<table>
<thead>
<tr>
<th>SPAN (S) (Ft)</th>
<th>10 x 5</th>
<th>10 x 6</th>
<th>10 x 7</th>
<th>10 x 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 x 5</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
<td>0.33 - &lt;2</td>
</tr>
<tr>
<td>10 x 6</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
</tr>
<tr>
<td>10 x 7</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
</tr>
<tr>
<td>10 x 8</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
<td>0.32 - &lt;2</td>
</tr>
</tbody>
</table>

### Notes:
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
3. See Sheet 14 for Wall Bending Diagram.
| SPAN x RISE (Ft.) | SLAB / WALL THICKNESS | DESIGN EARTH COVER ABOVE TOP SLAB | REINFORCEMENT AREAS (sq. in./Ft.) | AS1 | AS2 | AS3 | AS4 | AS5 | AS6 | AS7 | AS8 | AS9 |
|------------------|-----------------------|----------------------------------|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 11 x 4           | 11 11 11 11          | 4                               | 0.37 - <2                       | 0.51 | 0.37 | 0.47 | 0.27 | 0.27 | 0.45 | 0.48 | 0.48 |
|                  | 10                    | 2                               | 0.57 - 0.70                     | 0.57 | 0.57 | 0.67 | 0.47 | 0.47 | 0.67 | 0.67 | 0.67 |
|                  | 5 10                  | 2                               | 0.70 - 0.99                     | 0.70 | 0.70 | 0.99 | 0.70 | 0.70 | 0.99 | 0.99 | 0.99 |
|                  | 12                    | 2                               | 0.82 - 1.15                     | 0.82 | 0.82 | 1.15 | 0.82 | 0.82 | 1.15 | 1.15 | 1.15 |
|                  | 11 11 11 11          | 8                               | 0.92 - 1.30                     | 0.92 | 0.92 | 1.30 | 0.92 | 0.92 | 1.30 | 1.30 | 1.30 |
|                  | 13 13 11 11          | 12                               | 0.94 - 1.30                     | 0.94 | 0.94 | 1.30 | 0.94 | 0.94 | 1.30 | 1.30 | 1.30 |
|                  | 13 13 11 11          | 8                               | 0.94 - 1.30                     | 0.94 | 0.94 | 1.30 | 0.94 | 0.94 | 1.30 | 1.30 | 1.30 |
|                  | 13 13 11 11          | 12                               | 0.94 - 1.30                     | 0.94 | 0.94 | 1.30 | 0.94 | 0.94 | 1.30 | 1.30 | 1.30 |
|                  | 11 11 11 11          | 8                               | 0.94 - 1.30                     | 0.94 | 0.94 | 1.30 | 0.94 | 0.94 | 1.30 | 1.30 | 1.30 |
|                  | 13 13 11 11          | 12                               | 0.94 - 1.30                     | 0.94 | 0.94 | 1.30 | 0.94 | 0.94 | 1.30 | 1.30 | 1.30 |

**NOTES:**
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
### TABLE 9A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>3 x 3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>3 x 3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>3 x 3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>3 x 3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>3 x 3</td>
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<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
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<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>3.3 - &lt;7</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
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</table>

### TABLE 9B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 3</td>
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<td>10</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>0.33 - &lt;7</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>3 x 3</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>0.33 - &lt;7</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
</tr>
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<td>10</td>
<td>10</td>
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<tr>
<td>4</td>
<td>0.33 - &lt;7</td>
<td>0.24</td>
<td>0.24</td>
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<tr>
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<td>0.24</td>
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NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### Table 10A - Standard Precast Box Culvert Designs (3" Cover) - 5' & 6' Spans

<table>
<thead>
<tr>
<th>Span (Ft)</th>
<th>Rise (Ft)</th>
<th>Top Slab (in)</th>
<th>Stem (in)</th>
<th>Wall (in)</th>
<th>Slab (in)</th>
</tr>
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<tbody>
<tr>
<td>6' x 6'</td>
<td>0.33' - &lt;2'</td>
<td>3' - &lt;5'</td>
<td>2' - &lt;3'</td>
<td>5' - 10'</td>
<td>15' - 30'</td>
</tr>
<tr>
<td>6' x 5'</td>
<td>0.33' - &lt;2'</td>
<td>3' - &lt;5'</td>
<td>2' - &lt;3'</td>
<td>5' - 10'</td>
<td>15' - 30'</td>
</tr>
<tr>
<td>6' x 3'</td>
<td>0.33' - &lt;2'</td>
<td>3' - &lt;5'</td>
<td>2' - &lt;3'</td>
<td>5' - 10'</td>
<td>15' - 30'</td>
</tr>
</tbody>
</table>

See General Note 5
### TABLE 11A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE ( Ft )</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER (sq. in./Ft)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7' x 4</td>
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<td>9</td>
<td>4</td>
<td>10</td>
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<tr>
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### TABLE 11B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

<table>
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<th>SPAN x RISE ( Ft )</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER (sq. in./Ft)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
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<td>7' x 4</td>
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<td>9</td>
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<td>0.46</td>
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<td>0.53</td>
<td>0.72</td>
<td>0.63</td>
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<tr>
<td></td>
<td>0.53</td>
<td>0.54</td>
<td>0.74</td>
<td>0.66</td>
</tr>
</tbody>
</table>

**NOTES:**
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### TABLE 12A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 8' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft)</th>
<th>SLAB / WALL THICKNESS (in.)</th>
<th>MAUNICH (in.)</th>
<th>DESIGN EARTH COVER ABOVE SLAB (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8' x 4</td>
<td>4</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.66</td>
<td>0.57</td>
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<tr>
<td></td>
<td>3</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.66</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.22</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>0.15</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8' x 5</td>
<td>4</td>
<td>0.33 - &lt;2</td>
<td>0.51</td>
<td>0.69</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.33 - &lt;2</td>
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<td>0.69</td>
<td>0.66</td>
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<tr>
<td></td>
<td>5</td>
<td>0.22</td>
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</tr>
<tr>
<td>8' x 6</td>
<td>4</td>
<td>0.33 - &lt;2</td>
<td>0.51</td>
<td>0.72</td>
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<tr>
<td></td>
<td>3</td>
<td>0.33 - &lt;2</td>
<td>0.51</td>
<td>0.72</td>
<td>0.64</td>
</tr>
<tr>
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<td>10</td>
<td>0.15</td>
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</tr>
<tr>
<td>8' x 7</td>
<td>4</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.74</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.74</td>
<td>0.67</td>
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<td>5</td>
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<td>10</td>
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</tr>
<tr>
<td>8' x 8</td>
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<td>0.33 - &lt;2</td>
<td>0.55</td>
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<td>0.33 - &lt;2</td>
<td>0.55</td>
<td>0.77</td>
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### TABLE 12B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 8' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft)</th>
<th>SLAB / WALL THICKNESS (in.)</th>
<th>MAUNICH (in.)</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8' x 4</td>
<td>4</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.66</td>
<td>0.57</td>
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<tr>
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<td>3</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.66</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.22</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td></td>
<td>10</td>
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</tr>
<tr>
<td>8' x 5</td>
<td>4</td>
<td>0.33 - &lt;2</td>
<td>0.51</td>
<td>0.69</td>
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</tr>
<tr>
<td></td>
<td>3</td>
<td>0.33 - &lt;2</td>
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<tr>
<td></td>
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<td>-</td>
</tr>
<tr>
<td>8' x 6</td>
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<td>0.33 - &lt;2</td>
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<td>0.72</td>
<td>0.64</td>
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<td>0.72</td>
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<td>8' x 7</td>
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<td>0.74</td>
<td>0.67</td>
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</tr>
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<td>8' x 8</td>
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<td>0.33 - &lt;2</td>
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<td></td>
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### TABLE 13A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

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<th>SLAB / WALL THICKNESS</th>
<th>DESIGN</th>
<th>REINFORCEMENT AREAS</th>
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<td><strong>(sq. in./ft.)</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>AS1</strong></td>
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<tr>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>AS6</strong></td>
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<td></td>
<td></td>
<td></td>
<td><strong>AS7</strong></td>
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<td></td>
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<td></td>
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<table>
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<th>10'</th>
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### TABLE 13B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

<table>
<thead>
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<th>SPAN x RISE</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN</th>
<th>REINFORCEMENT AREAS</th>
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<td>9' x 9'</td>
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<td></td>
<td></td>
<td></td>
<td><strong>(sq. in./ft.)</strong></td>
</tr>
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<td></td>
<td></td>
<td><strong>AS1</strong></td>
</tr>
<tr>
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<td></td>
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<td><strong>AS6</strong></td>
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<td></td>
<td></td>
<td><strong>AS7</strong></td>
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<tr>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td><strong>AS9</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>AS4</th>
<th>9' x 10'</th>
<th>10'</th>
</tr>
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<tbody>
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</tbody>
</table>

**NOTES:**
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and Dimension Locations.
3. See Sheet 14 for WRR Bending Diagrams.
### TABLE 14 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 10' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER (sq. in./Ft.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS4 EXT. LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 x 5 4 to 12</td>
<td>0.33 &lt; 2</td>
<td>0.60</td>
<td>0.73</td>
<td>0.61</td>
</tr>
<tr>
<td>3 &lt; 2</td>
<td>0.61</td>
<td>0.74</td>
<td>0.63</td>
<td>0.24</td>
</tr>
<tr>
<td>5 &lt; 10</td>
<td>0.65</td>
<td>0.66</td>
<td>0.60</td>
<td>0.12</td>
</tr>
<tr>
<td>20</td>
<td>1.24</td>
<td>1.27</td>
<td>1.19</td>
<td>0.12</td>
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<tr>
<td>11.5 x 10 8 to 12</td>
<td>10</td>
<td>1.39</td>
<td>1.47</td>
<td>1.42</td>
</tr>
<tr>
<td>12.5 x 10 12 to 15</td>
<td>1.38</td>
<td>1.46</td>
<td>1.44</td>
<td>0.12</td>
</tr>
</tbody>
</table>

### TABLE 15 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 11' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER (sq. in./Ft.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS4 EXT. LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 x 4 11 to 12</td>
<td>0.33 &lt; 2</td>
<td>0.60</td>
<td>0.66</td>
<td>0.54</td>
</tr>
<tr>
<td>2 &lt; 2</td>
<td>0.60</td>
<td>0.66</td>
<td>0.54</td>
<td>0.27</td>
</tr>
<tr>
<td>5 &lt; 10</td>
<td>0.70</td>
<td>0.63</td>
<td>0.62</td>
<td>0.14</td>
</tr>
<tr>
<td>20</td>
<td>1.34</td>
<td>1.11</td>
<td>1.06</td>
<td>0.14</td>
</tr>
<tr>
<td>12 x 11 11 to 12</td>
<td>11</td>
<td>1.32</td>
<td>1.27</td>
<td>1.23</td>
</tr>
<tr>
<td>13.5 x 11 11 to 12</td>
<td>1.70</td>
<td>1.37</td>
<td>1.34</td>
<td>0.14</td>
</tr>
</tbody>
</table>

### Notes:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### TABLE 16 - STANDARD PRECAST BOX CULVERT DESIGNS (3' COVERS - 12 SPANS)

#### Type 1: Box Section (Design Earth Cover Less Than 2')

<table>
<thead>
<tr>
<th>Type</th>
<th>Cover Width (Ft.)</th>
<th>Cover Depth (Ft.)</th>
<th>Spacing (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWR</td>
<td>12 x 12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12 x 10</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12 x 8</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>12 x 6</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

#### Type 2: Box Section (Design Earth Cover 2' or Greater)

<table>
<thead>
<tr>
<th>Type</th>
<th>Cover Width (Ft.)</th>
<th>Cover Depth (Ft.)</th>
<th>Spacing (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWR</td>
<td>12 x 12</td>
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<td>12</td>
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<td>12 x 10</td>
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<tr>
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<td>12 x 8</td>
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<td>12</td>
</tr>
<tr>
<td></td>
<td>12 x 6</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**
1. See Sheet 2 of 14 for general notes.
2. See Sheet 7 of 14 for reinforcing details and dimension locations.
4. See Figures 1耀4 for the requirements of detail on Sheets 1 and 7.

---

### WELDED WIRE REINFORCEMENT BENDING DIAGRAMS

- **WWR PIECE NO. 1**: 2 Req'd per segment
- **WWR PIECE NO. 2**: 4 Req'd per segment
- **WWR PIECE NO. 3**: 2 Req'd per segment
- **WWR PIECE NO. 4**: 2 Req'd per segment

**As2 or As3 (Typ.)**
- S or S to Sheets 1 & 7
- Option 2 or 3 (See Sheets 1 & 7)

**As4 (Typ.)**
- S or S to Sheets 1 & 7

**As5 (Top Slab)**
- Sheeted 1 & 7 (Typ.)

**As6 (Bot. Slab)**
- Sheeted 1 & 7 (Typ.)

**As7 (Typ.)**
- As9 (Typ.)

**As8 (Bot. Slab)**
- As9 (Typ.)

**As9 (Typ.)**
- As9 (Typ.)
1. Neoprene in Type D, E, F & AA bearing pads shall have a shear modulus (G) of 110 psi. Neoprene in Type G, H, J, K & AB bearing pads shall have a shear modulus (G) of 150 psi.

2. Steel Plates in bearing pads shall conform to ASTM A1011 Grade 36.

3. See Bearing Pad Data Table in the Structures Plans for quantities of Type D, E, F, G, H, J, K, AA and/or AB Bearing Pads.

** Work this sheet with the appropriate type Bearing Plate Detail and BEARING PLATE DATA TABLE in the Structures Plans. See TABLE OF BEAM VARIABLES and BEARING PLATE DATA TABLE in the Structures Plans for locations where beveled bearing plates are required.

** Offset to End of Beam is reduced to 3" for Type K Pad.
SCHEMATIC PLAN VIEWS AT BEAM ENDS

SCHEMATIC END ELEVATIONS OF BEAMS

Showing Vertical Bevel of Beam End
**Skewed Beam End Details for Widening Existing Bridges**

(Wood-I 36 Beam shown, others similar)

**Description:**

- Bars 5K spaced perpendicular to end of beam @ 3½".
- Skewed Bars 5J, 3M1 or 3M2 placed with Bars 5K.
- 6" Chamfer

**Additional Details:**

- Rotate and flare Bars 4M1 or 4M2 and additional Bar 4M1 or 4M2 equally as required to maintain a 1'-0" max. spacing along end of bars.
- Clip to maintain cover.

**Notes:**

- For number of Bars, spacing and placement details see Index 450-036 thru 450-096. See Sheet 1 for Conventional Reinforcement, Sheet 2 for WWR.

**Epoxy Coating:**

- (1½" minimum thickness) See Note 12, Sheet 1

**Strand Cutting and Protecting Detail**

- End of Beam
- Ultrahigh Performance Fiber Reinforced Concrete (UHPC) Bridge Bearing
- End of Beam

**Typical Section Showing Cut Strand Recess Limits**

- End of Beam
- Strand Recess (formed by cutting or grinding)
- Recessed Strand
- Epoxy Coating

**Partials Plan View (Showing Top Flange)**

- (End 1 Shown, End 2 Similar)

**Partial Section Thru Web (Showing Bottom Flange)**

- (End 1 Shown, End 2 Similar)

**FLORIDA-I BEAM - TYPICAL DETAILS & NOTES**

INDEX

450-010

SHEET

2 of 2

REV

11/01/19

REV

11/01/19
ALTERNATE REINFORCING STEEL (WWR) DETAILS

PLAN VIEW

PIECE M-1
(2 Required)

- Piece M-1 ties to Piece K-2
- Match spacing of adjacent Piece S-1, S-2, S-3 or S-4

PIECE M-3
(2 Required)

- S1 ~ D25's @ V1 sp. (Piece S-1 shown)
- S2 ~ D25's @ 9" sp. (Piece S-2)
- S3 ~ D25's @ 1'-0" sp. (Piece S-3)
- S4 ~ D25's @ 1'-6" sp. (Piece S-4)

END VIEW

PIECES S-1, S-2, S-3 or S-4
(2 Required Each Piece)

- S1 ~ D25's @ V1 sp. (Piece S-1 shown)
- S2 ~ D25's @ 9" sp. (Piece S-2)
- S3 ~ D25's @ 1'-0" sp. (Piece S-3)
- S4 ~ D25's @ 1'-6" sp. (Piece S-4)

SECTION A-A
FOR WELDED WIRE REINFORCEMENT

PARTIAL BEAM END VIEW

NOTES:

a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.

b. Place Conventional Reinforcement Bars 5A & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.

c. Pieces may be fabricated in multiple length sections.

d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.

FLORIDA-1 36 BEAM - STANDARD DETAILS

INDEX
450-036

SHEET
2 of 2

REV
11/01/16
**FLORIDA-I 54 BEAM - STANDARD DETAILS**

**BAR BENDING DETAILS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>LETTER</th>
<th>BARS 5A, 4M1, 4M2, 4M3 &amp; 5Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td>54 &amp; 12 &amp; Ø Strand</td>
</tr>
<tr>
<td>2B</td>
<td>4 &amp; 12 &amp; Ø Strand</td>
</tr>
<tr>
<td>2C</td>
<td>5 &amp; 12 &amp; Ø Strand</td>
</tr>
<tr>
<td>2D</td>
<td>6 &amp; 12 &amp; Ø Strand</td>
</tr>
</tbody>
</table>

**ELEVATION AT END OF BEAM**

(End 1 Shown, End 2 Similar)

**SECTION A-A FOR CONVENTIONAL REINFORCING**

(Showing Bars SK, SY & SZ Only)

**END VIEW**

**DIMENSIONS**

- **£** Component Dimensions are measured perpendicular to the end of beam

**NOTES:**

A. Work this Index with Index 450-010 - Typical Florida-I Beam Details and Notes and the Florida-I Beam - Table of Beam Variables

B. For referenced notes, see Index 450-010

C. For Dimensions A, B, C, D, L, & V1 and number of bars, see Florida-I Beam - Table of Beam Variables in Structures Plans.

**REVISION**

01/01/19

**INDEX**

450-054

**SHEET**

1 of 2

**FLYER 2020-21 STANDARD PLANS**

**DESCRIPTION:**

**CONVENTIONAL REINFORCING**

**BAR BENDING DETAILS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>LETTER</th>
<th>MARK</th>
<th>NOTE NUMBERS</th>
<th>SIZE</th>
<th>NUMBER REQUIRED</th>
<th>LENGTH (NOTE 2)</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>C/1</td>
<td>5</td>
<td>14 (End 1)</td>
<td>Varies</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>C/2</td>
<td>5</td>
<td>14 (End 2)</td>
<td>Varies</td>
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<tr>
<td>D1</td>
<td>7, 8 &amp; 9</td>
<td>10 (End 1)</td>
<td>Varies</td>
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<td></td>
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<tr>
<td>D2</td>
<td>7, 8 &amp; 9</td>
<td>10 (End 2)</td>
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<tr>
<td>D3</td>
<td>9 &amp; 10</td>
<td>5</td>
<td>See Table 4-5</td>
<td></td>
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</tr>
<tr>
<td>K</td>
<td>6, 8, 9 &amp; 10</td>
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<td>See Table 5-8</td>
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<tr>
<td>M1</td>
<td>7 &amp; 9</td>
<td>4</td>
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<td>7 &amp; 9</td>
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<td></td>
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<tr>
<td>F</td>
<td>9 &amp; 9</td>
<td>5</td>
<td>10 5-2</td>
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<td></td>
</tr>
</tbody>
</table>

**BENDING DIAGRAMS**

(See Note 2)

**NOTES:**

A. Work this Index with Index 450-010 - Typical Florida-I Beam Details and Notes and the Florida-I Beam - Table of Beam Variables

B. For referenced notes, see Index 450-010

C. For Dimensions A, B, C, D, L, & V1 and number of bars, see Florida-I Beam - Table of Beam Variables in Structures Plans.
PIECES D

1. 2" Cover
2. Pieces D-1 & D-2
3. Pieces D-3
4. Pieces M-1
5. Pieces M-2

PIECES K & S

1. Pieces K-1 & S-1
2. Pieces K-2 & S-2
3. Pieces K-3 & S-3
4. Pieces K-4 & S-4

PIECES M

1. Pieces M-1 & M-2
2. Pieces M-3 & M-4

PIECES K-1

1. Pieces K-1 (Aligned EF)
2. Pieces K-1 (FF Shown Solid, BF Shown Dashed)

PIECES K-2

1. Pieces K-2 (FF Shown Solid, BF Shown Dashed)
2. Pieces K-2 & S-2

PIECES S

1. Pieces S-1, S-2, S-3 or S-4

NOTES:

a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.

b. Place Conventional Reinforcement Bars 5A & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.

c. Pieces may be fabricated in multiple length sections.

For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used, Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.
LEGEND:

EF = Each Face
FF = Front Face
BF = Back Face

End of Beam

PLAN VIEW PIECE M-1 (2 Required)

Match spacing of adjacent Piece S-1, S-2, S-3 or S-4

PLAN VIEW PIECE M-3 (2 Required)

PARTIAL BEAM END VIEW

Part Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.

b. Place Conventional Reinforcement Bars 6A & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.

c. Pieces may be fabricated in multiple length sections.

d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.
**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

**PLAN VIEW**

**PIECE M-3**
- (2 Required)

**PLAN VIEW**

**PIECE M-1**
- (2 Required)

**END VIEW**

**PIECES M**

**END VIEW**

**PIECE M-1 tied to Piece K-2**

**PIECE M-1**

**PLAN VIEW**

**PIECE M-3**
- (2 Required)

**END VIEW**

**PIECES K & S**

**END VIEW**

**PIECE D-1**
- (4 Required ~ 2 Pairs)

**PIECE D-2**
- (4 Required ~ 2 Pairs)

**PIECE D-3**
- (4 Required ~ 2 Pairs)

**END VIEW**

**PIECE D**
- (4 Required ~ 2 Pairs)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**PLAN VIEW**

**PIECE K-1**
- (Aligned EF)

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**PIECE S-1, S-2, S-3 or S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S**
- (4 Required ~ 2 Pairs)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE K-1**
- (Aligned EF)

**END VIEW**

**PIECE K-2**
- (FF Shown Solid, BF Shown Dashed)

**END VIEW**

**PIECE S-1**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-2**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-3**
- (2 Required ~ Each Piece)

**END VIEW**

**PIECE S-4**
- (2 Required ~ Each Piece)
1. Work this Index with the Table of Beam Variables in Structures Plans.
2. All bar bend dimensions are out to out.
3. Concrete cover: 2 inches minimum.
4. Strands N: #8 Ø minimum, stressed to 10,000 lbs. each.
5. Place one (1) bar 4K or 5Z at each location. Alternate the direction of the ends for each bar.
6. Tie Bars 4K and 5Z to the fully bonded strands in the bottom or center row (see "STRAND PATTERN" on the Table of Beam Variables sheet in Structures Plans).
7. Place Bars 3D1 in beam END 1, and Bars 3D2 in beam END 2.
8. For beams with vertically beveled end conditions:
   A. Place first row of Bars 3D1, 3D2, 4K, 4Y and 5Z parallel to the end of the beam. Progressively rotate remaining bars within the limits of Bars 5Z until vertical by adjusting the spacing at the top of beam up to a maximum of 1".
   B. For deformed WWR, cut top cross wire and rotate bars as required or reduce end cover at top of the beam to minimum 1".
9. For beams with skewed end conditions:
   A. WWR is not permitted for end reinforcement Bars 3D1, and 3D2 on skewed ends; use bar reinforcement.
   B. Place end reinforcement parallel to the skewed end of the beam. End reinforcement is defined as Bars 3D1, 3D2, 4K, 4Y and 5Z placed within the limits of the spacing for Bars 3D in "ELEVATION AT END OF BEAM".
   C. Beyond the limits of the spacing for Bars 3D, place Bars 4K perpendicular to the longitudinal axis of the beam. For placement see "SKEWED BEAM END DETAILS FOR WIDENING EXISTING BRIDGES" (Sheet 2).
10. Contractor Options:
    A. Deformed WWR may be used in lieu of Bars 3D, 4K, and 5Z as shown on Sheet 4; except at skewed ends (See Note 9).
    B. Bars 3D1 and 3D2 may be fabricated as a two-piece bar with a 1'-0" minimum lap splice of the bottom legs.
    C. For deformed WWR, supplemental transverse #4 bars are permitted to support Pieces K & S under the cross wires on the bottom row of strands or above Strands N.
11. Embedment of Safety Line Anchorage Devices are permitted in the top flange to accommodate fall protection systems. See shop drawings for details and spacing of required anchorage devices.
12. For beams with ends that will not be encased in concrete diaphragms, cut wedges and recess Prestressing Strands at the end of the beam without damaging the surrounding concrete. See "STRAND CUTTING AND PROTECTING DETAIL" on Sheet 2.
13. Holes in the beam web for temporary bracing or shipping devices must be formed prior to casting. Fill holes not meeting all the following criteria in accordance with Specification Section 450:
   A. The superstructure environmental classification is slightly or moderately aggressive
   B. Clear cover to adjacent steel reinforcing is 3" or greater
   C. Hole inside diameter is 2" maximum
   D. Non-metallic, non-water absorbing forming materials such as PVC, may be left in place permanently.

Schematic Plan Views at Beam Ends

Schematic End Elevations of Beams
(Showing Vertical Bevel of Beam End)
PARTIAL PLAN VIEW (SHOWING TOP FLANGE)
(End 1 Shown, End 2 Similar)
(Bars 5A, 4Y & Strands N not shown for clarity)

* For number of Bars, spacing and placement details see Sheet 3. See Sheet 3 for Conventional Reinforcement, Sheet 4 for WWR.

PARTIAL SECTION THRU WEB (SHOWING BOTTOM FLANGE)
(End 1 Shown, End 2 Similar)
(Bars 4Y & Strands not shown for clarity)

SKEWED BEAM END DETAILS FOR WIDENING EXISTING BRIDGES

TYPICAL SECTION SHOWING CUT STRAND RECESS LIMITS

TYPICAL SECTION AFTER PROTECTING

DETAILS AND NOTES
**BUILD-UP DIAGRAM FOR TANGENT SPANS**
(ALONG Q BEAM) (CASE 1)

**BUILD-UP DIAGRAM FOR SAG VERTICAL CURVE & HORIZONTAL CURVE SPANS**
(ALONG Q BEAM) (CASE 2)

**BUILD-UP DIAGRAM FOR CREST VERTICAL CURVE SPANS**
- CONTROL AT Q SPAN
(ALONG Q BEAM) (CASE 3)

**BUILD-UP DIAGRAM FOR CREST VERTICAL CURVE SPANS**
- CONTROL AT BEGIN OR END SPAN
(ALONG Q BEAM) (CASE 4)

**BEAM CAMBER AND BUILD-UP NOTES:**
The build-up values given in the Data Table* are based on theoretical beam cambers. The Contractor shall monitor beam cambers for the purpose of predicting camber values at the time of the deck pour. If the predicted cambers based on field measurements differ more than +/− 1/8" from the theoretical "Net Beam Camber @ 120 Days" shown in the Data Table*, obtain approval from the Engineer to modify the build-up dimensions as required. When the measured beam cambers create a conflict with the bottom mat of deck steel, notify the Engineer a minimum of 21 days prior to casting.

Dim. "A" includes the weight of the Stay-In-Place Formwork.

*NOTE:
Work this Index with the Build-up and Deflection Data Table for Florida-I and AASHTO Type II Beams in Structures Plans.
1. Work this Index with the Florida-U Beam Standard Details (Index 450-248, 450-254, 450-263 and 450-272) and the Table of Beam Variables in Structures Plans.
2. All bar bend dimensions are out-to-out.
3. Concrete cover: 2 inches minimum. Maximum aggregate size is No. 67.
4. Concrete face may be sloped with a maximum 1:24 draft to facilitate formwork removal.
5. Strands N: 1/4" Ø minimum, stressed to 10,000 lbs. each.
6. The bars SK to the fully bonded strands in the bottom row (see "STRAND PATTERN" on the Table of Beam Variables sheet in Structures Plans).
7. For beams without skewed ends or vertically beveled end conditions (see Note B) the Engineer may approve the use of deformed WWR in lieu of Bars 4K, 4E, 5K, 4L, 4C, 5D, 4E, 4K, 4N, 5K, 5L, 5M, 4M, and 4N. The spacing and sizes of deformed WWR must match the reinforcing sizes shown on the Florida-U Beam Standard Details sheets.
8. For Beams with vertically beveled end conditions, where "Dim. P" exceeds 1", place Bars SE, and the first Bars 4F and SK parallel to the end of the beam. Fan the remaining Bars 4F and SK within the limits of "Dim. P" (End Diaphragm) at equal spaces until vertical.
9. Embedment of Safety Line Anchorage Devices are permitted in the top flange to accommodate fall protection systems. See shop drawings for details and spacing of any anchorage devices or other required embedded hardware.
10. Intermediate diaphragms must be cast and concrete release strength obtained prior to removing the beam from casting bed.
11. Place drains pipes adjacent to each web at each beam end (four drains per beam).
   A. Drain Pipe: 2" NPS Schedule 80 PVC.
   B. Cover, wrap and secure wire screen around the end of the pipe prior to casting. Extend screen a minimum of 1" down the pipe sides.
   C. Provide removable pipe plugs during casting. Remove plugs from the inside of pipes after casting.
12. Protection of Strands:
   A. Provide a 2" deep recess around all strands (including dormant) or strand groups. Extend the recessed blockout to the web face and bottom of the flange for the bottom row of strands.
   B. After dethreading, cut strands 1/2" from recessed surface and fill the blockout to protect strands with Type F-2 or Epoxy Compound in accordance with Specification Section 926.
13. Use Stay-In-Place metal deck forms inside the beams.
14. Prior to deck placement, provide temporary blocking under each web at both ends of every beam. Ensure the temporary blocking is adequate to resist movements and rotations during deck placement. Leave temporary blocking in place for a minimum of four days after the deck is placed.
15. Based on the deck forming system and certain placement sequence, evaluate and provide any required temporary bracing between the U Beams.

BEAM NOTES

CASE 1

CASE 2

CASE 3
**CONDITION 1**

*(P = 0.0)*

**CONDITION 2**

**CONDITION 3**

**SCHEMATIC END ELEVATIONS OF BEAMS**

*(Showing Vertical Bevel of Beam End)*

**TEMPORARY BLOCKING OF BEAM ENDS**
3/4 Chamfer along the Vertical Face of the Top Flange and Web and Underside of the Top Flange (Typ.)

Bars SE (NS) and Bars SB (FS)

Bars 4F - Bars 5K

Bars 4F and 4M are Paired with Bars 5K as shown

Bars 4C (Typ.)

Bars 5K (Typ.)

Bars 4C (Typ.)

Bars 4M (Typ.)

Bars 5L (NS) and Bars 4C (FS)

Strand N

Galv. Screen Wire Drain Cover with 6" Mesh

Drain Pipe (Typ.) (See Note 11)

End of Beam

1½" x 3½" Chamfer

3 sp. @ 6" = 3'-4" (Along ¥ of Beam)

Bars 5L (NS) and Bars 4C (FS)

1'-4" Min. Lap

Void Face

Circular Screen Wire (Typ.)

75° ≤ Ø ≤ 90°

TOP VIEW OF SKEWED END DIAPHRAGM AND STIRRUP TRANSITION ZONE

(Bars 3D2 Not Shown For Clarity)

TOP VIEW OF END DIAPHRAGM

(Bar 301 And 302 Not Shown For Clarity)
End View at End Diaphragm

Section C-C

Notes:
For referenced notes see Index 450-210.

Top View of Skewed End Diaphragm
And Stirrup Transition Zone
(Bars 3D2 Not Shown For Clarity)
**TYPICAL SECTION**

* Reinforcing steel is symmetrical about $\xi$ Beam for Half Sections A-A and B-B.

Bars 3D1 lap with Bars 3D2 and 5K as shown (Typ.)

$\frac{1}{2}$ Chamfer (Typ. bottom of bottom flange only)

** Intermediate Diaphragms shall be provided:
1. At midspan.
2. At 30'-0" Max. from midspan when beam length (L) exceeds 80 Ft.

### NOTES:

Work this Index with Index 450-210 - Typical Florida-U Beam Details and Notes and the Florida-U Beam - Table of Beam Variables in Structures Plans.

For referenced notes see Index 450-210.

** End Face (Typ.)**

*** Void Face (Typ.)

** Intermediate Diaphragm (when required) **

### ELEVATION AT END OF BEAM

$\frac{1}{16}$ x $\frac{3}{16}$ Chamfer

Note: Bars A are shown as ( )

Omit these Bars 4A2 only as required when strands are provided at or above their locations (Typ.).

$\frac{1}{16}$ Beam

### ELEVATION

** Begin or end Bars 4M (see "ELEVATION AT END OF BEAM" above)

( Symmetrical about $\xi$ @ top of Beam)
**BEAM CAMBER AND BUILD-UP NOTES:**

The build-up values given in the Data Table* are based on theoretical beam cambers. The Contractor shall monitor beam cambers for the purpose of predicting camber values at the time of the deck pour. If the predicted cambers based on field measurements differ more than ±1/8” from the theoretical “Net Beam Camber @ 120 Days” shown in the Data Table*, obtain approval from the Engineer to modify the build-up dimensions as required. When the measured beam cambers create a conflict with the bottom mat of deck steel, notify the Engineer a minimum of 21 days prior to casting.

Dim. "A" includes the weight of the Stay-In-Place Formwork.

---

* Dimensions are along slope.

**NOTE:**
Work this Index with the Build-up and Deflection Data Table for Florida-U Beams in Structures Plans.
1. Work this sheet with Index 400-510 - Composite Elastomeric Bearing Pads, and the BEARING PLATE DATA TABLE in the Structures Plans.

2. Embedded Bearing Plates A are required for all Florida-I beams. Beveled Bearing Plates B with Embedded Bearing Plates A are required for beams as scheduled in the BEARING PLATE DATA TABLE in the Structures Plans.

3. Bearing plate material shall conform to ASTM A 386 or ASTM A 2091, Grade 36 or 50. Headed Concrete Anchor Studs shall conform to Specification Section 502. Cold-dip galvanize Bearing Plates A and B after fabrication except that Galvanized Caps may be welded in place after hot-dip galvanizing. Drill Bearing Plates A and B as an assembled unit, thread Bearing Plate A only. Holes are not required in Plate A when Plate B is not required. Drill and thread holes perpendicular to Embedded Plate A and prior to plates being galvanized (ASTM A 123).

4. Provide Electroplated, Flat Head Cap Screws in accordance with ASTM F 183. Electroplating shall be ASTM B633, SC 2, Type 1. Provide screws long enough to maintain a 0.25 minimum embedment into Embedded Bearing Plate A and Galvanized Cap. Provide steel Galvanized Caps with 0.25 Min. to 1.0 Max. height and nominal 1" inside diameter.

5. Include the cost of Bearing Plates in the pay item for Prestressed Beams.

6. For Pad Type and Dimensions C, D, E, F and G, see the BEARING PLATE DATA TABLE in the Structures Plans.

7. All details and dimensions shown are along g Beam, except for dimensions of 0.25 Dia. Screws and 0.125 Dia. x 25/32 Anchor Studs, which are along Screws or Anchor Studs. Positive Slope shown, Negative Slope similar.

8. When Skew = 0°, F = D = 3'-0" (Florida-I Beams) or 1'-4" (AASHTO Type II Beams) E = C, and G = 1'-1.5".

9. Slope is determined along g Beam at Bearing. See BEARING PLATE DATA TABLE in the Structures Plans for Slope and Angle B.

CROSS REFERENCE: See Sheet 2 for Detail 4-1.

INDEX

SHEET

FY 2020-21
STANDARD PLANS

BEARING PLATES (TYPE 1) - PRESTRESSED FLORIDA-I AND AASHTO TYPE II BEAMS

450-511 1 of 2

DESCRIPTION:

LAST REVISION 07/01/19
BEVELED BEARING PLATE B
(Along Q Beam)
(Positive Slope shown; Negative Slope similar)

1. Work this sheet with Index 400-510 - Composite Elastomeric Bearing Pads, and "BEARING PLATE DATA TABLE" in the Structures Plans.

2. Embedded Bearing Plates A are required for all Florida-I beams. Beveled Bearing Plates B with Embedded Bearing Plates A are required for beams as scheduled in the "BEARING PLATE DATA TABLE" in the Structures Plans.

3. Bearing plate material shall conform to ASTM A36 or ASTM A709 (Grade 25 or 36). Headed Concrete Anchor Studs shall conform to Section 302. Hot-dip galvanizing Bearing Plates A & B after fabrication except that Galvanized Caps may be welded in place after hot-dip galvanizing. Drill Bearing Plates A and B as an assembled unit; thread Bearing Plate A only. Holes are not required in Plate A when Plate B is not required. Drill and thread holes perpendicularly to Embedded Plate A and prior to placing being galvanized (AASHTO A123).

4. Provide Electroplated, Flat Head Cap Screws in accordance with ASTM F 835. Electroplating shall be ASTM D633. SC 2, Type 1. Provide screws long enough to maintain a 3/8" minimum embedment into Embedded Bearing Plate A and Galvanized Cap. Provide steel Galvanized Caps with 1/2" Min. to 1 1/2" Max. height and nominal 1" inside diameter.

5. Include the cost of Bearing Plates in the pay item for Prestressed Beams.

6. For Pad Type and Dimension C, see the "BEARING PLATE DATA TABLE" in the Structures Plans. For Dimensions J, K1 and K2, see "TABLE OF BEAM VARIABLES" in the Structures Plans.

7. All details and dimensions shown are along Q Beam. Positive Slope shown; Negative Slope similar.

8. Slope is determined along Q Beam at Q Bearing. See "BEARING PLATE DATA TABLE" in the Structures Plans for Slope.

CROSS REFERENCE:
See Sheet 2 for Detail "A"
CROSS REFERENCE: See Sheet 1 for Notes.
PRESTRESSED CONCRETE PILE NOTES:

1. Work this Index with the Square Prestressed Concrete Pile Splices (Index 455-002), the Prestressed Concrete Pile Standards (Index 455-012 thru 455-030), the High Moment Capacity Square Prestressed Concrete Pile (Index 455-031) and the Pile Data Table in the Structures Plans.

2. Concrete:
   A. Piles: Class V (Special), except use Class VI for High Moment Capacity Pile (Index 455-031).
   B. High Capacity Splice Collar: Class V (Special).
   C. Silica Fume: See "GENERAL NOTES" in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.

3. Concrete strength at time of prestress transfer:
   A. Piles: 4,000 psi minimum.
   B. High Moment Capacity Piles: 6,500 psi minimum.

4. Carbon-Steel Reinforcing:
   A. Bars: Meet the requirements of Specification Section 415.
   B. Prestressing Strands: Meet the requirements of Specification Section 933.
   C. Protect all strands permanently exposed to the environment and not embedded under final conditions in accordance with Specification Section 450.

5. Spiral Ties:
   A. Tie each wrap of the spiral strand to a minimum of two corner strands.
   B. One full turn required for spiral splices.

6. Pile Splices: Fill dowel holes and form the joint between pile sections with a Type AB Epoxy Compound in accordance with Specification Section 962. Use an Epoxy Bonding Compound or an Epoxy Mortar as recommended by the Manufacturer.

TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS

<table>
<thead>
<tr>
<th>D = Square Pile Size (inches)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2, 3, or 4 point</td>
<td>3 Point</td>
</tr>
<tr>
<td>14</td>
<td>2, 3, or 4 point</td>
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<tr>
<td>16</td>
<td>2, 3, or 4 point</td>
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<td>20</td>
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<td>24</td>
<td>2, 3, or 4 point</td>
<td>3 Point</td>
</tr>
<tr>
<td>30</td>
<td>2, 3, or 4 point</td>
<td>3 Point</td>
</tr>
</tbody>
</table>

TYPICAL PILE SHAPE
FOR MOLD FORMS

TYPICAL COVER

SHEET: 1 of 1
INDEX: 455-001

FY 2020-21
STANDARD PLANS

SQUARE PRESTRESSED CONCRETE PILES
- TYPICAL DETAILS & NOTES

REVISED 11/01/16
DESCRIPTION:

LAST REVIEW: 11/01/16

11/18/2019 4:06:57 PM

REVISION

REVISED

PREVIOUS

PREVIOUS
1. For Sections D-D, E-E, & F-F see Index 455-012 thru 455-030 for applicable concrete pile size and Pile Splice Reinforcement Details.

2. Prestressing strands, spiral ties and/or reinforcement are not shown for clarity.

3. In cases where pile splices are desired due to length limitations in shipping and/or handling, the "Drivable Preplanned Prestressed Precast Splice Detail" shall be used. Mechanical Pile Splices contained on the Approved Products List (APL) may also be used.

4. When preformed dowel holes are utilized, the 1" spiral tie pitch shall be continued to 4'-0" below the head of the pile. See Index 455-018, 455-020 & 455-024. Preformed holes shall utilize either removable preforming material or stay-in-place corrugated galvanized steel ducts. Stay-in-place ducts shall be fabricated from galvanized sheet steel meeting the requirements of ASTM A653. Coating Designation G90, 26 gauge. Ducts shall be 2" diameter with a minimum corrugation (rib) height of 0.12 in. Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of welded seams will not be required.

5. For tension piles where top of Prestressed Pile is less than 3 feet below Pile Cut-off Elevation, extend No. 10 Dowels into cap beyond Pile Cut-off Elevation to achieve development as approved by the Engineer.
Face of Concrete

Bottom surfaces of enclosure to be epoxy coated just prior to concrete casting per manufacturer's installation procedures.

Dataport Interface Cable (to radio module assembly)

3

10"

Top Gauge

3" Cover (Typ.)

Antenna (centered over Top Gauge)

HEAD OF PILE

SECTION A-A

(Strip Pattern with odd number of strands per face)

D/2

D

Tip Gauge

Top Gauge

SECTION B-B

(Showing Voided Pile, Solid Pile Similar)

D/2

D

Tip Gauge

Top Gauge

ELEVATION

SECTION A-A

(Strip Pattern with even number of strands per face)

D/2

D

Tip Gauge

Top Gauge

NOTES:

1. For piles 18" and larger installed for bridge foundations, provide EDC Instrumentation in accordance with Specification Section 455.

2. Attach Tip Gauge extension cable to the underside of the strand shown in Section A-A. Secure cable to strand with nylon wire ties spaced a maximum of 6ft. along cable.
**ALENTERATE STRAND PATTERNS**

- **4 ~ 0.6" Ø, Grade 270 LRS, at 44 kips**
- **8 ~ ½" Ø (Special), Grade 270 LRS, at 25 kips**
- **8 ~ ¾" Ø, Grade 270 LRS, at 24 kips**
- **8 ~ ⁵⁄₈" Ø, Grade 270 LRS, at 23 kips**
- **12 ~ ¾" Ø, Grade 270 LRS, at 16 kips**

**NOTES:**

1. Work this Index with Index 450-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.
ALTERNATE STRAND PATTERNS

- 8 - 0.6" Ø, Grade 270 LRS, at 33 kips
- 8 - 1/2" Ø (Special), Grade 270 LRS, at 31 kips
- 8 - 1/2" Ø, Grade 270 LRS, at 31 kips
- 12 - 7/16" Ø, Grade 270 LRS, at 21 kips
- 16 - 3/8" Ø, Grade 270 LRS, at 16 kips

NOTES:

1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.
** ALTERNATE STRAND PATTERNS **

ALTERNATE STRAND PATTERNS

- 12 ~ 0.6" Ø, Grade 270 LRS, at 35 kips
- 12 ~ 0.6" Ø (Special), Grade 270 LRS, at 34 kips
- 16 ~ 0.6" Ø, Grade 270 LRS, at 26 kips
- 20 ~ 0.6" Ø, Grade 270 LRS, at 21 kips
- 24 ~ 0.6" Ø, Grade 270 LRS, at 17 kips

NOTES:

1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

** SEE NOTE 4 ON INDEX 455-002 **
** See Note 4 on Index 455-002

**See Alternate Strand Patterns**

- **SECTION A-A**
  - 12 - 0.6" Ø, Grade 270 LRS, at 42 kips
  - 16 - ½" Ø (Special), Grade 270 LRS, at 31 kips
  - 16 - ½" Ø, Grade 270 LRS, at 31 kips
  - 24 - ¾" Ø, Grade 270 LRS, at 21 kips

**NOTES:**

1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
   - The strands shall be located as follows:
     - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
     - The total strand pattern shall be concentric with the nominal concrete section of the pile.
** See Note 4 on Index 455-002

ALTERNATE STRAND PATTERNS

16 ~ 0.6" Ø, Grade 270 LRS, at 44 kips
20 ~ 0.8" Ø (Special), Grade 270 LRS, at 34 kips
24 ~ 0.8" Ø, Grade 270 LRS, at 31 kips

NOTES:

1. Work this index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.

2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   a. Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   b. The total strand pattern shall be concentric with the nominal concrete section of the pile.
**ALTERNATE STRAND PATTERNS**

20 – 0.6" Ø, Grade 270 LRS, at 41 kips
24 – 0.5" Ø (Special), Grade 270 LRS, at 34 kips
28 – 0.4" Ø, Grade 270 LRS, at 29 kips

**NOTES:**
1. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands. The local strand pattern shall be concentric with the nominal concrete section of the pile.
2. CONTRACTOR OPTION: The 30" pile may be cast SOLID by omitting the 18" Ø void. In this event, the Contractor shall submit calculations for approval and a proposed strand configuration that provide net prestressing after losses equal to 1000 psi. Alternate configurations for the Diagonal Ties, to maintain the position of the 4 – #8 Bars, may be approved by the Engineer.
3. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 – Square Prestressed Concrete Pile Splices.

**PRESSTRESSING STRANDS, see Alternate Strand Patterns**

**SECTION B-B**

(See Pile Splice Reinforcement Details)

**SECTION C-C**

(See Pile Splice Reinforcement Details)

**SECTION D-D**

(See Non-Drivable Unforeseen Reinforced Precast Pile Splice Detail)

**SECTION E-E**

(See Drivable Prestressed Precast Pile Splice Detail)

**SECTION F-F**

(See Drivable Preplanned Pile Splice Detail)

**PILE SPlice DETAILS**
NOTES:
1. After the pile is driven and cut to grade, the top 8'-0" of the 18" Ø Void shall be filled with concrete. Prior to filling the top 8'-0" of the 18" Ø Void with concrete, strip the cardboard form material from the void and sand/water blast all interface surfaces. Seal void and fill with potable water for 4-5 hours. Remove water to a surface-saturated-dry condition prior to making the concrete pour. In lieu of the cardboard form material and the surface preparation requirements described above, a stay-in-place corrugated thin wall galvanized pipe may be used. The concrete fill material shall be of the same type and strength as called for in the pile cap and paid for as substructure concrete.
2. Collar concrete shall reach a strength of 6,000 psi before pile driving is resumed.
3. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles.

**DETAIL OF PILE COLLAR FOR HIGH MOMENT CAPACITY 30" SQUARE PRESTRESSED PILE -PILE SPLICE DETAIL**

**SECTION D-D**

**SECTION THRU PILE COLLAR**

**SECTION THROUGH PILE AT PILE CAP**

**W4.0 DIAGONAL TIE DETAIL**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**STRAND PATTERN**

28 - 0.6" Ø, Grade 270 LRS, at 29.5 kips
**NOTES**

1. Work this Index with the Pile Data Table in the Structures Plans.
2. Concrete:
   - Piles: Class V (Special).
   - Splice: Class IV.
   - Silica Fume: See "GENERAL NOTES" in Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.
3. Concrete Strength at time of prestress transfer:
   - Piles: 6,000 psi minimum.
4. Carbon-Steel Reinforcing:
   - Bars: Meet the requirements of Specification Section 415.
   - Prestressing Strands: Meet the requirements of Specification Section 933.
   - Tendons: Two seven-wire ½" dia. (Special) Grade 270, low-relaxation strands tensioned to 33.8 kips.
   - Protect all carbon-steel strands permanently exposed to the environment and not embedded under final conditions in accordance with Specification Section 450.
   - Spiral Ties:
     - One half turn is required for carbon-steel spiral splice.
     - One full turn is required at the pile head and tip.
5. Pile Splices:
   - Epoxy: Type AB Epoxy Compound or Mortar must meet the requirements of Specification Section 926.
     - Use a Type AB Epoxy Bonding Compound or Epoxy Mortar, as recommended by the Manufacturer, to form the joint between pile sections
   - Driving: Resume pile driving after splice concrete reaches a minimum strength of 5,000 psi.
6. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.

---

**TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS**

<table>
<thead>
<tr>
<th>Maximum Pile Length (Feet)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
</tr>
<tr>
<td>170</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
</tr>
</tbody>
</table>
**54" Precast/Post-Tensioned Concrete Cylinder Pile**

**SECTION A-A**

- **4" Longitudinal Spacers** (No. 3 Bars or W11 wire) for Spiral Ties @ Equal Spaces
- **W11 Spiral Wire Ties**
- **3" Min. Cover (Typ.)**
- **24 - No. 11 Bars @ Equal Spaces**

**SECTION B-B**

- **4" Longitudinal Spacer Bars** (No. 3 Bars or W11 wire) for Spiral Ties @ Equal Spaces
- **W11 Wire Spiral Ties**
- **1"-0" Void, Lap Splice**
- **3" Min. Cover (Typ.)**
- **24 - 1½" Ø Formed Holes for Tendons @ Equal Spaces**

**DETAIL "A"**

- **Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")**
- **1½" Ø Formed Hole (1 tendon per hole; 2 - ½" Ø (Special) strands per tendon shown as (*); Grout per Specification 938)**

**DESCRIPTION:**

*For Spun Cast Cylinder Piles, the following requirements for concrete cover apply:

1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.
2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in² per year or less; otherwise, a 3-inch concrete cover is required.*
### TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS

<table>
<thead>
<tr>
<th>Maximum Pile Length</th>
<th>Required Storage and Transportation Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Point Pick-Up</td>
<td>174</td>
</tr>
<tr>
<td>1 Point Pick-Up</td>
<td>122</td>
</tr>
<tr>
<td>2, 3, or 4 Point</td>
<td>2, 3, or 4 point</td>
</tr>
</tbody>
</table>

**STORAGE AND TRANSPORTATION SUPPORT DETAILS**

<table>
<thead>
<tr>
<th>2-POINT SUPPORT</th>
<th>ELEVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick-up Points</td>
<td>0.055L</td>
</tr>
<tr>
<td>Tie Down and Support Points</td>
<td>0.145L</td>
</tr>
</tbody>
</table>

**TIE DOWN AND SUPPORT POINTS**

- **Head and Tip of Pile**
  - 14'-10" (4.57 m)

**PICK-UP DETAIL**

- **Required Storage and Transportation Detail**
  - Maximum Pile Length
  - Pick-Up Pick-Up
  - 2-Point Pick-Up
  - 1-Point Pick-Up
  - 3-Point Support
  - 4-Point Support

**NOTES**

1. Work this Index with the Pile Data Table in the Structures Plans.
2. Concrete:
   - A. Piles: Class V (Special)
   - B. Splice Collar: Class IV
   - C. Silica Fume: See "GENERAL NOTES" in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.
3. Concrete Strength at time of prestress transfer:
   - A. Piles: 4,000 psi minimum.
4. Carbon-Steel Reinforcing:
   - A. Bars: Meet the requirements of Specification Section 415
   - B. Prestressing Strands: Use 0.6 dia. carbon-steel, Grade 270, low-relaxation strand stressed to 44.0 kips that meets the requirements of Specification Section 933.
   - C. Protect all carbon-steel strands permanently exposed to the environment and not embedded under final conditions in accordance with Specification Section 450.
5. Spiral Ties:
   - A. One half turn is required for carbon-steel spiral splices
   - B. One full turn is required at the head and tip of each pile
6. Pile Splices:
   - A. Epoxy: Type AB Epoxy Compound or Epoxy Mortar must meet the requirements of Specification Section 926.
   - a. Use a Type AB Epoxy Bonding Compound or Epoxy Mortar as recommended by the Manufacturer to form the joint between pile sections.
   - b. Use a Type AB Epoxy Bonding Compound as a bonding agent on internal pile surfaces.
   - A. Splices: Resume pile driving after the splice concrete reaches a minimum strength of 5,500 psi.
7. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.

**Revision Information**

- 11/01/16
- 11/18/2019
- Sheet 1 of 2
- 455-060
- Index
- FY 2020-21
- Standard Plans
- 60" Prestressed Concrete Cylinder Pile
Concrete Seal

2'-0" M in. Cover Drive

Prestressed Pile

10'-6"

10'-6"

Closed No. 4 Bars or W20 Wire Ties @ 1'-0" ± (Typ.)

Spiral Ties W11 Wire

3" Min. Cover (Typ.)

24 ~ No. 11 Bars @ Equal Spaces

36 ~ 0.6" Ø Strands @ Equal Spaces

Spiral Ties W11 Wire

60" Ø

1'-0" Ø Void

2" Min. Cover (Typ.)

Cast in Place Plug

36 ~ 0.6" Ø Strands @ Equal Spaces

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

Clean inside surface of 60" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

Roughen inside surface of 60" Ø Pile to 1/8" amplitude for Spliced Pile Section

1'-0" Ø Void, open top and bottom to allow through venting of sections

45" Ø Void

DRIVABLE UNFORESEEN FIELD SPLICE DETAIL (Cast in Place Plug)

 SECTION A-A

 SECTION B-B

DETAIL "A"

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

Form to retain epoxy compound

Inside Pile Wall

Gasket

Outside Pile Wall

F Y  2 0 2 0 - 2 1

S T A N D A R D  P L A N S

6 0 °  P R E S T R E S S E D  C O N C R E T E  C Y L I N D E R  P I L E
PRESTRESSED CONCRETE PILE NOTES:

1. Work this Index with the Square Prestressed Concrete Pile Splices (Index 455-102), the Prestressed Concrete Pile Standards (Index 455-112, 455-114, 455-118, 455-124, 455-130, and the Pile Data Table in the Structures Plans.

2. Concrete:
   A. Piles: Class V (Special)
   B. Silica Fume: See "GENERAL NOTES" in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required for options using stainless steel strand and reinforcing.

3. Concrete strength at time of prestress transfer:
   A. Piles: 4,000 psi minimum.

4. Reinforcing:
   A. Bars:
      a. Stainless Steel: Meet the requirements of Specification Section 931 for Type 304, Grade 75.
      b. Carbon FRP: Meet the requirements of Specification Section 932.
   B. Prestressing Strands:
      a. Stainless Steel: Seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
      b. Carbon FRP: Meet the requirements of Specification Section 933.

5. Spiral Ties:
   A. Tie each wrap of the spiral strand to a minimum of two corner strands.
   B. One full turn required for spiral splices.

6. Pile Splices: Fill dowel holes and form the joint between pile sections with a Type AB Epoxy Compound in accordance with Specification Section 926. Use an Epoxy Bonding Compound or an Epoxy Mortar as recommended by the Manufacturer.

---

TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS

<table>
<thead>
<tr>
<th>D = Square Pile Size (inches)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
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<td>12</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
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<tr>
<td>14</td>
<td>2, 3, or 4 point</td>
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<td>87</td>
<td>1 Point</td>
</tr>
<tr>
<td>30</td>
<td>98</td>
<td>2 Point</td>
</tr>
</tbody>
</table>

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SQUARE CFRP & SS PRESTRESSED CONCRETE PILES

- TYPICAL DETAILS & NOTES
NOTES:
1. For Sections D-D, E-E, see Index 455-112, 455-114, 455-124 or 455-130 for applicable concrete pile size and Pile Splice Reinforcement Details.
2. Prestressing strands, spiral ties, and/or reinforcement are not shown for clarity.
3. In cases where pile splices are desired due to length limitations in shipping and/or handling, the "Drivable Preplanned Prestressed Precast Splice Detail" shall be used.
4. When preformed dowel holes are utilized, the 1" spiral tie pitch shall be continued to 4'-0" below the head of the pile. See Index 455-118, 455-124. Preformed holes shall utilize either removable preforming material or stay-in-place corrugated galvanized steel ducts. Stay-in-place ducts shall be fabricated from galvanized sheet steel meeting the requirements of ASTM A653, Coating Designation G90, 26 gauge. Ducts shall be 1/2" diameter for CFRP Bars, and 2" diameter for SS Bars with a minimum corrugation (rib) height of 0.12 in. Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of welded seams will not be required.
5. For tension piles where top of Prestressed Pile is less than 3 feet below Pile Cut-off Elevation, extend No. 6 CFRP Bars or No. 10 SS into cap beyond Pile Cut-off Elevation to achieve development as approved by the Engineer.

TYPICAL SPLICE
BEFORE BONDING

SQUARE CFRP & SS PRESTRESSED CONCRETE PILE SPLICES
Prestressing Strands
3" Cover (Typ.)

Spiral Ties @ 6" pitch, full length

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E
(See Drivable Unforeseen Reinforced Precast Pile Splice Detail)

ALTERNATE STRAND PATTERNS
4 ~ 0.6" Ø, CFRP 7-Strand, at 42 kips
4 ~ 0.6" Ø, CFRP Single-Strand, at 41 kips

CFRP PILE SPLICE REINFORCEMENT DETAILS

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
SS PRESTRESSED PILE DETAILS

NOTES:

1. Work this Index with Index 455-101 – Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 – Square CFRP & SS Prestressed Concrete Pile Splices.

2. Any of the given Strand Patterns may be utilized.

The strands shall be located as follows:
- Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
- The total strand pattern shall be concentric with the nominal concrete section of the pile.

See Strand Pattern

SECTION A-A

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E
(See Drivable Unforeseen Prestressed Precast Pile Splice Detail)

SS PILE SPLICE REINFORCEMENT DETAILS

STRAND PATTERN

8 – 3/8" Ø, HSS @ 24 kips

3" Cover (Typ.)

W4.0 Spiral Ties

8- 3" Ø, HSSS at 24 kips

12" COVER

4 ~ No. 10 SS Dowels (Full Length)

4 ~ No. 6 SS Bars

8- No. 10 SS Bars

6- Turning Strands

16 Turns @ 3" Pitch

5 Turns @ 1" Pitch

See Strand Pattern

SECTION A-A

12" SQUARE CFRP & SS PRESTRESSED CONCRETE PILE

INDEX

455-112

2 of 2
ELEVATION

ALTERNATE STRAND PATTERNS

- 8 ~ 0.6" Ø, CFRP 7-Strand, at 31.5 kips
- 8 ~ 0.6" Ø, CFRP Single-Strand, at 30.5 kips

3' Cover

0.2" Ø CFRP Strand

Spiral Ties

SECTION A-A

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and equally space the remaining strands between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

CFRP PRESTRESSED PILE DETAILS

SECTION D-D

(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E

(See Drivable Unforeseen Prestressed Precast Pile Splice Detail)

3" Cover (Typ.)

4 ~ No. 6 CFRP Bars (Full Length)

CFRP PRESTRESSED PILE DETAILS

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and equally space the remaining strands between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

CFRP PILE SPLICE REINFORCEMENT DETAILS

- 8 ~ 0.6" Ø, CFRP 7-Strand, at 31.5 kips
- 8 ~ 0.6" Ø, CFRP Single-Strand, at 30.5 kips

3' Cover (Typ.)

0.2" Ø CFRP Strand

Spiral Ties

SECTION A-A

3" Cover (Typ.)

0.2" Ø CFRP Strand

Spiral Ties

SECTION A-A

1/18/2019
4:07:19 PM
STRAND PATTERN

12 – ⅞ Ø, HSS at 23 kips

SS PILE SPLICE REINFORCEMENT DETAILS

NOTES:
1. Work this Index with Index 455-101 – Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 – Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.

The strands shall be located as follows:
- Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
- The total strand pattern shall be concentric with the nominal concrete section of the pile.
ALTERNATE STRAND PATTERNS

12 ~ 0.6" Ø, CFRP 7-Strand, at 34 kips
12 ~ 0.6" Ø, CFRP Single-Strand, at 33 kips

NOTES:
1. Work this Index with Index 455-101 – Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 – Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized.
   - The strands shall be located as follows:
     - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)
SS PRESTRESSED PILE DETAILS

18" SQUARE CFRP & SS PRESTRESSED CONCRETE PILE

INDEX 455-118

ELEVATION

** See Note 4 on Index 455-102

SECTION A-A

STRAND PATTERN

16 – ½" Ø, HSSS, @ 26 kips

NOTES:

1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.

2. Any of the given Strand Patterns may be utilized.

The total strand pattern shall be concentric with the nominal concrete section of the pile.

SEE STRAND PATTERN

W4.0 Spiral Ties

3" Cover (Typ.)

SEE STRAND PATTERN

SECTION D-D

(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E

(See Drivable Prestressed Precast Pile Splice Detail)

SECTION F-F

(See Drivable Preplanned Prestresses Precast Pile Splice Detail)
** SPIRAL TIE ELEVATION **

** See Note 4 on Index 455-102 

ALTERNATE STRAND PATTERNS

16 – 0.6" Ø, CFRP 7-Strand, at 42 kips
16 – 1/2" Ø, CFRP Single-Strand, at 41 kips

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFMP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.
SS PRESTRESSED PILE DETAILS

** See Note 4 on Index 455-102

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFMP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E
(See Drivable Prestressed Precast Pile Splice Detail)

SECTION F-F
(See Drivable Preplanned Pile Splice Detail)

SS PILE SPLICE REINFORCEMENT DETAILS
**ALTERNATE STRAND PATTERNS**

20 - 0.6" Ø, CFRP 7-Strand at 30 kips
20 - 0.6" Ø, CFRP Single-Strand at 37 kips

20 ~ No. 6 CFRP Bars (Full length)

16 ~ No. 6 CFRP Bars (8'-6" long)

12 ~ No. 6 CFRP Bars (8'-6" long) (shift as required to clear strands)

NOTES:

1. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands. The local strand pattern shall be concentric with the nominal concrete section of the pile.
2. CONTRACTOR OPTION. The 30" pile may be cast SOLID by omitting the 18" Ø void. In this event, the Contractor shall submit calculations for approval and a proposed strand configuration that provide net prestressing after losses equal to 1000 psi. Alternate configurations for the Diagonal Ties, to maintain the position of the 4 ~ #6 Bars, may be approved by the Engineer.
3. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.

**SECTION B-B**

SEE ALTERNATE STRAND PATTERNS

SEE PILE SPICE REINFORCEMENT DETAILS

**SECTION C-C**

SEE PILE SPICE REINFORCEMENT DETAILS

**SECTION D-D**

SEE NON-DRIVABLE UNFORESEEN REINFORCED PRECAST PILE BUILD-UP DETAIL

**SECTION E-E**

SEE DRIVABLE PRESTRESSED PRECAST PILE SPICE DETAIL

**SECTION F-F**

SEE DRIVABLE PREPLANNED PRESTRESSED PRECAST PILE SPICE DETAIL

**CFRP PILE SPICE DETAILS**

**CFRP PRESTRESSED PILE DETAILS**

**DESCRIPTION:**

FA 2020-21

STANDARD PLANS

INDEX 455-130

11/01/16

REV 11-01-16
NOTES:
1. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands. The local strand pattern shall be concentric with the nominal concrete section of the pile.
2. CONTRACTOR OPTION: The 30" pile may be cast SOLID by omitting the 18" Ø void. In this event, the Contractor shall submit calculations for approval and a proposed strand configuration that provide net prestressing after losses equal to 1000 psi. Alternate configurations for the Diagonal Ties, to maintain the position of the 4 ~ #8 Bars, may be approved by the Engineer.
3. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.

STRAND PATTERN
32 ~ 1/2 Ø, HSSS at 26 kips

SECTION B-B
(See Pile Splice Reinforcement Details)

SECTION C-C
(See Pile Splice Reinforcement Details)

** Omit 4 ~ No. 8 Bars and Diagonal Ties in pre-planned mechanical splice.

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION F-F
(See Drivable Preplanned Prestressed Precast Pile Splice Detail)

SS PILE SPLICE DETAILS

SS PRESTRESSED PILE DETAILS

30° SQUARE CFRP & SS PRESTRESSED CONCRETE PILE
1. Work this Index with the Pile Data Table in the Structures Plans.
2. Concrete:
   A. Piles: Class V (Special)
   B. Splice: Class IV
   C. Silica Fume: See "GENERAL NOTES" in Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required for options using stainless steel strands and reinforcing.
3. Concrete Strength at time of prestress transfer:
   A. Piles: 6,000 psi minimum.
4. Reinforcing:
   A. Bars:
      a. Stainless Steel: Meet the requirements of Specification Section 931 for Type 304, Grade 75.
      b. Carbon FRP: Meet the requirements of Specification Section 932.
   B. Prestressing Strands:
      a. Stainless Steel: Seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
      b. Carbon FRP: Meet the requirements of Specification Section 933.
   C. Spiral Ties:
      a. One half turn is required for carbon steel spiral splice.
      b. One full turn is required at the pile head and tip.
5. Pile Splices:
   A. Epoxy: Type AB Epoxy Compound or Mortar must meet the requirements of Specification Section 926.
      a. Use a Type AB Epoxy Bonding Compound or Epoxy Mortar, as recommended by the manufacturer, to form the joint between pile sections.
      b. Use a Type AB Epoxy Bonding Compound as a bonding agent on internal pile surfaces.
   B. Driving: Resume pile driving after splice concrete reaches a minimum strength of 5,500 psi.
6. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.

### TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS

<table>
<thead>
<tr>
<th>Maximum Pile Length (Feet)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
</tr>
<tr>
<td>170</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
</tr>
</tbody>
</table>
**Outside Pile Wall**

**Form to retain epoxy compound**

**Inside Pile Wall**

**Temporary Blocking**

**Form to retain epoxy compound**

**Gasket**

**Cover (Typ.)**

1'-0" Min.

**Lap Splice**

**Cast in Place Plug**

**Cover (Typ.)**

**Cover (Typ.)**

24 ~ 1" Ø Formed Holes for Tendons @ Equal Spaces

1'-0" Ø Void

1'-0" Ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 54" Ø Pile to 1/8" amplitude for Spliced Pile Section

Closed No. 4 CFRP Bars or 0.3" Ø CFRP Strand Spiral Ties @ 1'-0" ± (Typ.)

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

24 ~ No. 6 CFRP Bars

1½" Ø Formed Hole for Tendons @ Equal Spaces

**SECTION A-A**

**ALTERNATE STRAND PATTERNS**

48 ~ 0.5" Ø, Single-Strand, at 28 kips

48 ~ 0.6" Ø, 7-Strand, at 29 kips

Clean inside surface of 54" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

Concrete Seal

**DETAIL "A"**

**Inside Pile Wall**

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

**Outside Pile Wall**

Form to retain epoxy compound

* For Spin Cast Cylinder Piles, the following requirements for concrete cover apply:

1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.

2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in per year or less; otherwise, a 3-inch concrete cover is required.

**SECTION B-B**

**CFRP POST-TENSIONED PILE DETAILS**

No. 3 CFRP Bars or 0.3" Ø CFRP Strand Spiral Ties

4 ~ Longitudinal Spacers (No. 3 CFRP Bars) for Spiral Ties @ Equal Spaces

0.3" Ø CFRP Strand Spiral Ties

24 ~ No. 6 CFRP Bars @ Equal Spaces

1½" Min. Cover (Typ.)

1½" Ø Formed Holes for Tendons @ Equal Spaces

24 ~ No. 6 CFRP Bars

0.3" Ø CFRP Strand Spiral Ties

4 ~ Longitudinal Spacers (No. 3 CFRP Bars) for Spiral Ties @ Equal Spaces

0.3" Ø CFRP Strand Spiral Ties

1½" Min. Cover (Typ.)

1½" Ø Formed Holes for Tendons @ Equal Spaces

24 ~ No. 6 CFRP Bars

1½" Min. Cover (Typ.)

1½" Ø Formed Hole (1 tendon per hole; 2 ~ CFRP Strands per tendon shown as (*)&

Grout per Specification 938

**ALTERNATE STRAND PATTERNS**

48 ~ 0.5" Ø, Single-Strand, at 28 kips

48 ~ 0.6" Ø, 7-Strand, at 29 kips

1½" Ø Formed Hole (1 tendon per hole; 2 ~ CFRP Strands per tendon shown as (*)& Grout per Specification 938

24 ~ No. 6 CFRP Bars

Closed No. 4 CFRP Bars or 0.3" Ø CFRP Strand Spiral Ties @ 1'-0" ± (Typ.)

**ALTERNATE STRAND PATTERNS**

48 ~ 0.5" Ø, Single-Strand, at 28 kips

48 ~ 0.6" Ø, 7-Strand, at 29 kips

Clean inside surface of 54" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

Concrete Seal

**DETAIL "A"**

* For Spin Cast Cylinder Piles, the following requirements for concrete cover apply:

1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.

2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in per year or less; otherwise, a 3-inch concrete cover is required.

**DRIVABLE UNFORESEEN FIELD SPLICE DETAIL**

(No. 3 CFRP Bars) for Spiral Ties @ Equal Spaces

24 ~ No. 6 CFRP Bars

3" Min. *

3" Min. *

3" Min. *

3" Min. *

* For Spin Cast Cylinder Piles, the following requirements for concrete cover apply:

1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.

2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in per year or less; otherwise, a 3-inch concrete cover is required.

**DESCRIPTION:**

**FY 2020-21 STANDARD PLANS**

**INDEX**

**SHEET**

**REV ISIO N**

**LAST REVISION:**

**01/01/16**

**STANDARD PLANS**

**54" PRECAST/POST-TENSIONED CFRP & SS CONCRETE CYLINDER PILE**

**INDEX**

**455-154**

2 of 3
1'-0" Ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 54" Ø Pile to 3/8" amplitude for Spliced Pile Section

Closed No. 4 Bars or W20 Wire Ties @ 1'-0" ± (Typ.)

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "R")

24 ~ No. 10 Bars

Clean inside surface of 54" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

4" Longitudinal Spacers (No. 3 Bars or W11 wire) for Spiral Ties @ Equal Spaces

W11 Spiral Wire Ties

Cast in Place Plug

1½" Ø Formed Holes for Tendons @ Equal Spaces

Inside Pile Wall

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

Gasket

Cover (Typ.)

3" Min. *

3" Min. *

3" Min. *

* For Spun Cast Cylinder Piles, the following requirements for concrete cover apply:
1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.
2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in/year or less; otherwise, a 3-inch concrete cover is required.
### Table of Maximum Pile Pick-up and Support Lengths

<table>
<thead>
<tr>
<th>Maximum Pile Length (Feet)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>122</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
</tr>
<tr>
<td>174</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
</tr>
</tbody>
</table>

### Notes

1. Work this Index with the Pile Data Table in the Structures Plans.
2. Concrete:
   - A. Piles: Class V (Special)
   - B. Splice Collar: Class IV
   - C. Silica Fume: See “GENERAL NOTES” in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.
3. Concrete Strength at time of prestress transfer:
   - A. Piles: 4,000 psi minimum.
4. Reinforcing:
   - A. Bars:
     - a. Stainless Steel: Meet the requirements of Specification Section 931 for Type 304, Grade 75.
     - b. Carbon FRP: Meet the requirements of Specification Section 932.
   - B. Prestressing Strands:
     - a. Stainless Steel: Seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
     - b. Carbon FRP: Meet the requirements of Specification Section 933.
   - C. Spiral Ties:
     - a. One half turn is required for carbon steel spiral splice.
     - b. One full turn is required at the pile head and tip.
5. Pile Splices:
   - A. Epoxy: Type AB Epoxy Compound or Epoxy Mortar must meet the requirements of Specification Section 926.
     - a. Use a Type AB Epoxy Bonding Compound or Epoxy Mortar, as recommended by the Manufacturer, to form the joint between pile sections.
     - b. Use a Type AB Epoxy Bonding Compound as a bonding agent on internal pile surfaces.
   - B. Splices: Resume pile driving after the splice concrete reaches a minimum strength of 5,000 psi.
6. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.
Concrete Seal

2'-0" M in. Cover

Driven Prestressed Pile

10'-6" Spliced Prestressed Pile Section

10'-6" ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 60" ø Pile to $\frac{1}{4}$ amplitude for Spliced Pile Section

Closed No. 4 CFRP Bars or 0.3" ø CFRP Strand Ties @ 1'-0" ± (Typ.)

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

24 – No. 6 CFRP Bars

Clean inside surface of 60" ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

Concrete Seal

DRIVABLE UNFORESEEN FIELD SPLICE DETAIL (Cast in Place Plug)

SECTION A-A

60" ø

No. 3 Bars or 0.3" ø CFRP Strand Spiral Ties

45" ø Void

3" Min. Cover (Typ.)

36 – CFRP Strands @ Equal Spaces

SECTION B-B

60" ø

No. 3 Bars or 0.3" ø CFRP Strand Spiral Ties

24 – No. 6 CFRP Bars @ Equal Spaces

1'-0" ø Void

1'-0" Min. Lap Splice

2" Min. Cover (Typ.)

Cast in Place Plug

36 – CFRP Strands @ Equal Spaces

ALTERNATE STRAND PATTERNS

0.3" ø, CFRP Single-Strand, at 39 kips
0.6" ø, CFRP 7-Strand, at 40 kips

24 ~ No. 6 CFRP Bars @ Equal Spaces

ALTERNATE STRAND PATTERNS

0.5" ø, CFRP Single-Strand, at 39 kips
0.6" ø, CFRP 7-Strand, at 40 kips

36 ~ CFRP Strands @ Equal Spaces

DETAIL "A"

FULL EPOXY COMPOUND Joint around cylinder pile wall only (See Detail "A")

In Pile Wall

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

Gasket

Form to retain epoxy compound

Outside Pile Wall

455-160
Concrete Seal

2' - 0" M in . C ov e r D riv e n P re s t re ss e d P i le

10' - 6"

Spliced Prestressed Pile Section

Clean inside surface of 60" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

2' Min. Cover (Typ.)

Roughen inside surface of 60" Ø Pile to $\text{W}^{10}$ amplitude for Spliced Pile Section

Closed No. 4 SS Bars or W20 SS Wire Ties @ 1'-0" ± (Typ.)

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

44 - No. 10 SS Bars

24 - No. 10 SS Bars

24 - No. 10 SS Bars @ Equal Spaces

ALTERNATE STRAND PATTERNS

44 - 0.6" Ø, HSSS Strands, at 36 kips

36 - 0.6" Ø, HSSS Strand, at 36 kips

SECTION A-A

SECTION B-B

Inside Pile Wall

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

Gasket

Form to retain epoxy compound

Outside Pile Wall

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

Concrete Seal

DRIVABLE UNFORESEEN FIELD SPLICE DETAIL (Cast in Place Plug)
Seal
Weld
Grind Flush

60°

5/16 (5/16)

5/8 (M in.)

3/8 Min.

1 4 " R Tooled Edge (Typ. as required)

Front Face of Backwall
Approach Slab

Face of Edge Rails
Rail top offset to face of rail

Dimension B (Dimension A plus or minus adjustment for temperature plus 2 times rail top offset to face of rail)

Face of Traffic Railing, Parapet or Post

Line Perpendicular to Joint

NOTE:
Skew Angle and a measured positive in clockwise direction from a line perpendicular to the joint. See Structures Plans, Expansion Joint Data Table.

Dimension A @ 70° F

Thickened Slab End

Left Side Skew Angle (Varies)

Right Side Skew Angle (Varies)

Dimension B

Direction of Movement

70° (Typ.)

90°

Direction of Striation in Face of Traffic Railing, Parapet or Post

NOTE:
Skew Angle and a measured positive in clockwise direction from a line perpendicular to the joint. See Structures Plans, Expansion Joint Data Table.

GENERAL NOTES:
1. Furnish Strip Seal Expansion Joint Systems in accordance with Specification Section 458.
2. Shape of Edge Rail shown is representative, minor variations depending on manufacturer are permitted.
3. Recess the Edge Rail below the concrete surface in accordance with Specification Section 458.
4. Refer to the Expansion Joint Data Table in the Structures Plans for joint movement and Dimension A.
5. Refer to Specification Section 458 for installation and fabrication requirements.
PARTIAL PLAN VIEW OF NONSKEWED JOINTS

PARTIAL PLAN VIEW OF SKewed JOINTS

PARTIAL SECTION ALONG Q JOINT

JOINT TREATMENT AT HIGH SIDE OF DECK (Sidewalk Cover Plate where applicable not shown for clarity)

JOINT TREATMENT AT LOW SIDE OF DECK & HIGH SIDE OF DECK WITH SLOPE ≤ 1% (Sidewalk Cover Plate where applicable not shown for clarity)
Expansion Joint Assemblies

- Sidewalk
- Dimensions
- Various Top of Sidewalk
- Down Grade
- Ø x 2 Long Sleeve Anchors
- Beveled to edge @ 1:2 Slope & round over bottom edge Ø radius (Typ.)
- Sidewalk Cover Plate
- Expansion Joint Assembly
- Field Butt Joint (Seal with Caulk)
- Anchor Studs (Typ.)
- Match skew angle of Joint as required (Typ.)
- Field Butt Joint
- Anchor Studs (Typ.)
- Match slope of Deck
- Upturn
- Match slope of Sidewalk Expansion Joint
- 1'-3" Dim.
- Variance
- Shop Splice
- Shop Splice
- Match Slope of Deck
- Blockout
- Strip Seal
- Front Face of Railing
- Sleeve Anchor spacing - 6" centers Max.
- 11/18/2019 4:07:40 PM

* Distance from Ø Sleeve Anchor to edge of concrete is 2 inches minimum, 3 inches maximum.
GENERAL NOTES:
1. Furnish and install Poured Joint With Backer Rod Expansion Joint Systems in accordance with Specification Sections 458 and 932 using Type D silicone sealant material.
2. Refer to the Structures Plans, Poured Expansion Joint Data Table for Dim. A @ 70°F.
PARTIAL PLAN VIEW OF SKEWED JOINTS

PARTIAL PLAN VIEW OF NON-SKEWED JOINTS

PARTIAL SECTION ALONG Q. JOINT

RAISED SIDEWALK DETAIL

NOTE:
- Sleeve Anchors are required at the two outside corners of the Sidewalk Cover Plate. Space Sleeve Anchors uniformly between the corner anchors.
5. All exposed edges of plates and openings shall be ground smooth.
6. Place Ladder Brace near the End Bents exclusively and only when the height is reasonable for access by a Ladder.
7. See Framing Plan sheets for locations of Access Hatch Openings.
8. Coat structural steel in accordance with Specification Section 560.
9. Include the cost of the Access Hatch Assembly and incidental items in the cost of the Steel Box Girders. No separate payment will be made for coating structural steel.

NOTES:
1. All Structural Steel material in Access Hatch Assemblies shall conform to ASTM A709 Grade 36.
2. 3/4" Ø Pipe Grab Rail shall be in accordance with ASTM A53 Grade B for standard weight pipe (Schedule 40).
3. 0.5" Ø Hatch Handle Bar, Hitch Pin and 1" Ø Ladder Brace shall be in accordance with ASTM A36.
4. All bolts shall conform to ASTM A307 or A449. All nuts shall conform to ASTM A563 and all washers shall conform to ASTM F-436.
5. All bolts shall conform to ASTM A307 or A449. All nuts shall conform to ASTM A563 and all washers shall conform to ASTM F-436.
6. Place Ladder Brace near the End Bents exclusively and only when the height is reasonable for access by a Ladder.
7. See Framing Plan sheets for locations of Access Hatch Openings.
8. Coat structural steel in accordance with Specification Section 560.
9. Include the cost of the Access Hatch Assembly and incidental items in the cost of the Steel Box Girders. No separate payment will be made for coating structural steel.
Hinge Note:
1. Orient the Access Hatch so that the hinges are located down-grade.

Notes:
1. All Structural Steel material in Access Hatch Assemblies shall conform to ASTM A709 Grade 36.
2. 1½ Ø Pipe Grab Rail shall be in accordance with ASTM A53 Grade B for standard weight pipe (Schedule 40).
3. 1½ Ø Hatch Handle Bar and Hitch Pin shall be in accordance with ASTM A36.
4. All bolts shall conform to ASTM A307 or A499. All nuts shall conform to ASTM A563 and all washers shall conform to ASTM F-436.
5. All exposed edges of plates and openings shall be ground smooth.
6. See Framing Plan sheets for locations of Access Hatch Openings.
7. Coat structural steel in accordance with Specification Section 560.
8. Include the cost of the Access Hatch Assembly and incidental items in the cost of the Concrete Box Section. No separate payment will be made for coating structural steel.
**ACCESS DOOR ASSEMBLY**

**STANDARD PLANS**

**FOR STEEL BOX SECTIONS**

**INDEX**

**FY 2020-21**

**PRELIMINARY DRAFT**

**DESCRIPTION:**

**ACCESS DOOR NOTES:**

Fabricate Door Assemblies using structural steel in accordance with Specification 962, any grade. Grind all exposed edges and burrs smooth. Non-destructive testing of welds is not required. See Plans for details of Diaphragm, Stiffeners and Top and Bottom Plates.

**EXPANDED METAL MESH:**

Expanded metal mesh shall be 1/2" No. 10 expanded carbon steel mesh in accordance with ASTM F1267, Type I or II, Class 2, Grade A.

**BOLTS, NUTS AND STEEL WASHERS:**

Bolts shall be stainless steel hex head bolts meeting the requirements of ASTM F593, Type 316. Nuts shall be ASTM F594, Type 316. Steel washers shall be stainless steel compatible with the bolts and nuts.

**PTFE WASHERS:**

PTFE washers shall be 1/2" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with 1/8" or 1/4" diameter bolts as shown.

**COATING:**

Coat All Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blast cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.

**DOOR HINGE LOCATION:**

Place door hinges on the transverse downward side of the access opening.

**PADLOCKS:**

Provide a suitable keyed commercial grade, weather resistant padlock with a 2" shackle for each Access Door Assembly located at Bridge Abutments. Key all padlocks for Access Door Assemblies and Access Hatches (if present) on an individual bridge alike.

**PTFE WASHERS:**

PTFE washers shall be 1/2" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with 1/8" or 1/4" diameter bolts as shown.

**COATING:**

Coat All Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blast cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.

**DOOR HINGE LOCATION:**

Place door hinges on the transverse downward side of the access opening.

**PADLOCKS:**

Provide a suitable keyed commercial grade, weather resistant padlock with a 2" shackle for each Access Door Assembly located at Bridge Abutments. Key all padlocks for Access Door Assemblies and Access Hatches (if present) on an individual bridge alike.

**PTFE WASHERS:**

PTFE washers shall be 1/2" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with 1/8" or 1/4" diameter bolts as shown.

**COATING:**

Coat All Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blast cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.
This Traffic Railing Retrofit has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested in accordance with NCHRP Report 350 TL-4 criteria.

**CONCRETE:** Concrete for Transition Blocks and Curbs shall be Class II (Bridge Deck).

**REINFORCING STEEL:** Reinforcing steel shall be ASTM A615, Grade 60.

**THREE-BEAM GUARDRAIL:** Steel Three-Beam Elements shall meet the requirements for Class B (10 Gauge) Guardrail of AASHTO M 180, Type II (Zinc coated). The minimum panel length for Three-Beam Elements shall be 12'-6". Field drilled holes for Post connections shall be \( \frac{3}{8} \) by 2\( \frac{1}{2} \) slotted holes.

**GUARDRAIL BOLTS:** Guardrail bolts, nuts and washers shall be in accordance with AASHTO M180.

**GUARDRAIL POSTS AND BASE PLATES:** Posts and Base Plates shall be in accordance with ASTM A96 or ASTM A709 Grade 36.

**ANCHOR BOLTS, NUTS AND WASHERS:** Adhesive-Bonded Anchors and Anchor Bolts shall be fully threaded rods in accordance with ASTM F1554 Grade 105 or ASTM A193 Grade B7. At the Contractor's option, Anchor Bolts for through bolting may be in accordance with ASTM A449. All Nuts shall be single self-locking hex nuts and in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A490 or ASTM A709 Grade 36. After the nuts have been snug tightened, the anchor bolt threads shall be distorted to prevent removal of the nuts. Distorted threads and the exposed trimmed ends of anchors shall be coated with a galvanizing compound in accordance with the Specifications.

**COATINGS:** All Nuts, Bolts, Anchors, Washers, Guardrail Posts, Anchor Plates and Base Plates shall be hot-dip galvanized in accordance with the Specifications. Guardrail Post Assemblies shall be hot-dip galvanized after fabrication.

**ADHESIVE-BONDED ANCHORS AND DOWELS:** Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 15,000 lbs. for \( \frac{3}{8} \) of an anchor bolt; 35,000 lbs. for the 1\( \frac{1}{2} \) anchor bolt with 1\( \frac{1}{2} \) embedment; and 30,500 lbs. for the 1\( \frac{1}{2} \) anchor bolt with 5\( \frac{1}{2} \) embedment.

**BRIDGES ON CURVED ALIGNMENTS:** The details presented in these Indexes are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

**POST SPACING:** Posts shall be located along the length of the bridge at typical 6'-3" or 3'-10" spaces. Utilize the Modified Post Spacing at Intermediate Deck Joints Details as required to clear deck joints. Establish post spacing along the bridge and Roadway Guardrail Transition beginning with the Key Post. The variable post spacings located near begin and end bridge may be utilized to optimize the typical post spacing. Variable lengths of guardrail overlap are also permitted to optimize the typical post spacing. Symmetry of post spacing is not necessary.

**THREE-BEAM EXPANSION SECTION:** Three-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 2\( \frac{1}{2} \) slots in three beam expansion sections. Nuts shall fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening. Tighten guardrail bolts in 2\( \frac{1}{2} \) slots at guardrail posts so that lie between the slotted expansion splice and bridge deck joint so that the bolt heads are in full contact with three-beam elements, but not so tight as to impede movement due to expansion.

**BEARING PADS:** Provide plain Neoprene pads with a durometer hardness of 60 or 70 and meeting the requirements of Specification Section 932, for ancillary structures.

**ELEVATION MARKERS:** Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing elevation markers are removed.

**BARRIER DELINEATORS:** Install Barrier Delineators at the top of the guardrail offset blocks in accordance with Specification Section 705. Match the Barrier Delineators color (white or yellow) to the near edgeline.

**PEDESTRIAN SAFETY TREATMENTS:** Pedestrian Safety Treatment is required when called for in the Plans. See Index 536-001 for details.

**BRIDGE NAME PLATE:** If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and or date, or if the installation of the Traffic Railing (Three Beam Retrofit) will obscure the bridge name, number and or date, then replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the (top of the adjacent guardrail). The information must be clearly visible from the right side of the approaching travel lane. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise of individual decals of letters and numbers.

**PAYMENT:** Payment will be made under Metal Traffic Railing (Three Beam Retrofit) which shall include all materials and labor required to fabricate and install the barrier and lapped guardrail where necessary to maintain post spacing. Transition Blocks and Curves, Bridge Name Plate and Barrier Delineators and Installation of Elevation Markers, where required, will not be paid for directly but shall be considered as incidental work.
PARTIAL PLAN
INTERMEDIATE JOINT SKEW DETAIL

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
MODIFIED POST SPACING AT INTERMEDIATE DECK JOINTS DETAIL
FOR INDEX 460-471, 460-475 & 460-476

THRIE-BEAM EXPANSION SECTION

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
MODIFIED POST SPACING AT INTERMEDIATE DECK JOINTS DETAIL
FOR INDEX 460-472, 460-473 & 460-474
### Post Dimension Table

<table>
<thead>
<tr>
<th>POST</th>
<th>CURB HEIGHT (DIM. A)</th>
<th>DIM. X</th>
<th>DIM. Y</th>
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</table>
| Post "A" | 5" to 7"              | 11\(\frac{1}{2}\)" | 2' 0"
| Post "B" | > 7" to 10"           | 9\(\frac{1}{2}\)" | 1' 10"
| Post "C" | > 10" to 1' 0"        | 7\(\frac{1}{4}\)" | 1' 8"

Note: Dim. A is equal to the exposed curb height. For location of Dim. A see Index 460-471 thru 460-476, Sheet 1.

### Offset Block Assembly Detail

<table>
<thead>
<tr>
<th>5(\frac{1}{2})&quot; Min.</th>
<th>5(\frac{1}{2})&quot; Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Offset Block</td>
<td>Standard Offset Block</td>
</tr>
<tr>
<td>Special Offset Block</td>
<td>Special Offset Block</td>
</tr>
</tbody>
</table>

### Offset Block Notes:

1. Offset blocks shall be timber or Approved Alternate. Uniformity of block size and alignment of guardrail shall be maintained along length of retrofit.
2. Post bolt holes in offset blocks to be centered (± 1/8").
3. Timber offset blocks shall be dressed on all four sides (545).
4. Block assemblies for Special Offset Blocks can be made up of 2 or 3 Special or Standard Offset Blocks, field dressed as required.

### Anchor Plate Detail

| 1\(\frac{1}{8}\)" x 3\(\frac{1}{4}\)" Long Slotted Holes for Anchor Bolts with Plate Washers (Typ.)

### Plate Washer Detail

| 9\(\frac{3}{4}\)" x 8" x 1\(\frac{1}{8}\)" Recess (Both Sides)

### TYPICAL SECTION THRU THRIE-BEAM GUARDRAIL (EXPANSION SECTION SIMILAR)

| 1\(\frac{1}{4}\)" x 1\(\frac{1}{2}\)" Deep Recess (Both Sides)

### THREAD LENGTH

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<tr>
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<tr>
<td>Varies (8&quot; Min.)</td>
<td>4&quot; Min.</td>
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<tr>
<td>Post Bolt for Index 460-472, 460-473, 460-474, 460-475 &amp; 460-476</td>
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### FDOT STANDARD PLANS

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### TRAFFIC RAILING - (THRIE-BEAM RETROFIT)

TYPICAL DETAILS & NOTES
CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index 460-470.

NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Details, Index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
SECTION A-A
TYPICAL SECTION THRU RAILING ON BRIDGE DECK

BILL OF REINFORCING STEEL

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<tr>
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<td>AS REQUIRED</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>1'-11&quot;</td>
</tr>
<tr>
<td>L</td>
<td>4</td>
<td>4'-1&quot;</td>
</tr>
</tbody>
</table>

NOTES:
1. All bar dimensions are out to out.
2. The 1'-2" vertical dimension shown for Bar 4D is based on a curb height of 9".
   If curb height is less or more than 9", decrease or increase this dimension by an amount equal to the difference in curb height.

Dowel Bar 4D
(Standard 180° Hook)

NOTES:
1. Shim with washers around Anchors as required to maintain tolerance.
2. Offset may vary ± 1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

SECTION B-B
TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB
(SCHEME 2 SHOWN, SCHEME 3 SIMILAR)

TYPICAL SECTION THRU EXISTING TRAFFIC RAILING SHOWING LIMITS OF REMOVAL
(BRIDGE DECK SHOWN, WING WALL SIMILAR)

CROSS REFERENCES:
For location of Section A-A see Sheets 1, 3 & 4.
For location of Section B-B see Sheets 3 & 4.
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.
SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2” top and side clearance and 3” bottom clearance.

SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2” top and side clearance and 3” bottom clearance.
SCHEME 3 NOTES:

1. Provide Cast-In-Place Curb as shown. Shape and height of Transition Block and Curb shall match existing bridge curb.
2. Field cut and bend Bars 4A and rotate Dowel Bars 4B within Curb and Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
3. A single 3/8" Ø x 8" Adhesive-Bonded Anchor may be omitted as shown when 2" clear cover cannot be provided.
**CROSS REFERENCES:**

For Section A-A see Sheet 2.

For Traffic Railing Notes and Details see Index 460-470.

**NOTES:**

1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burnished off 1" below existing concrete and grouted over.

**DESCRIPTION:**

Partial Plan of Railing

- 6'-3" spacing (Typ. except as noted along Bridge, see Note 2)
- 1'-6" Min. for non skewed joints. For treatment of skewed Intermediate Deck Joints see Skew Detail Index 460-470, Sheet 2 (Typ.)
- 1/4" Post Bolts and Match Line (Approach End) (See Sheets 3 and 4)

**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

- Partial Elevation of Inside Face of Railing
- Existing Traffic Railing (Type Varies)
- Intermediate Deck Joint
- Existing Bridge Coping
- Guardrail Post Assembly with Offset Block (Typ.)
- Existing Bridge Deck
- Existing Curb
- Direction of Traffic

**NOTES:**

1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burnished off 1" below existing concrete and grouted over.
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curbs.

2. Field bend or tilt Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
PARTIAL PLAN OF RAILING

Varies (6'-3" Max., 3'-1" Min.)

Existing Curb

Existing Traffic Railing (Type Varies)

Traffic Railing (Thrie-Beam Retrofit) Limits of Payment

Front Face of Curb

Front Face of Backwall & Begin or End Bridge

Front Face of Railing

Existing Bridge Deck

Guardrail Post Assembly with Offset Block (Typ.)

Guardrail Post Assembly

Existing Approach Slab

Existing Traffic Railing (Type Varies)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEMES 3 AND 4

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

Varies (6'-3" Max., 3'-1" Min.)

(Place 3 Bars Min. Top and 1 Bar Min. Bottom), shift to clear Post Anchor Bolts (See Note 2)

Dowel Bars 4L (10" Embedment) (Place 3 Bars Min. Top and 1 Bar Min. Bottom), shift to clear Post Anchor Bolts (See Note 2)

Roadway Guardrail Transition (See Note 1, Sheet 1)

Transition Block

(See Note 1)

(Place 3 Bars Min. Top and 1 Bar Min. Bottom)

THREE-BEAM GUARDRAIL

Front Face of Backwall & Begin or End Bridge

Front Face of Backwall & Begin or End Bridge

Front Face of Curb

Front Face of Bridge Deck

Front Face of Bridge Deck

Guardrail Post Assembly with Offset Block (Typ.)

Guardrail Post Assembly

Existing Approach Slab

Existing Traffic Railing (Type Varies)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEMES 5 AND 6

RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

Varies (6'-3" Max., 3'-1" Min.)

(Place 3 Bars Min. Top and 1 Bar Min. Bottom), shift to clear Post Anchor Bolts (See Note 2)

Dowel Bars 4L (10" Embedment) (Place 3 Bars Min. Top and 1 Bar Min. Bottom)

Roadway Guardrail Transition (See Note 1, Sheet 1)

Transition Block

(See Note 1)

(Place 3 Bars Min. Top and 1 Bar Min. Bottom)

THREE-BEAM GUARDRAIL

Front Face of Backwall & Begin or End Bridge

Front Face of Backwall & Begin or End Bridge

Front Face of Curb

Front Face of Bridge Deck

Front Face of Bridge Deck

Guardrail Post Assembly with Offset Block (Typ.)

Guardrail Post Assembly

Existing Approach Slab

Existing Traffic Railing (Type Varies)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEMES 5 AND 6 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
NOTES:

1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans. 

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required. 

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

11/18/2019

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Traffic Railing not shown for clarity)

PARTIAL PLAN OF RAILING

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index 460-470.
**SCHEME 1 NOTES:**
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

**SCHEME 2 NOTES:**
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curb.

2. Field bend or tilt Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

**TRAFFIC RAILING - (THRIE-BEAM RETROFIT) WIDE STRONG CURB TYPE 2**

**INDEX 460-473**

**Sheet 1 of 4**

**DESCRIPTION:**

FY 2020-21

STANDARD PLANS
NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
SECTION A-A
TYPICAL SECTION THRU RAILING ON BRIDGE DECK

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>4'-1&quot;</td>
</tr>
</tbody>
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BAR BENDING DIAGRAM

DOWEL BAR 4L

NOTE: All bar dimensions are out to out.

SECTION B-B (SCHEME 2)
TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

* Shin with washers around Anchor Bolts and Anchors as required to maintain tolerance.

** Offset may vary ± 1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

CROSS REFERENCES:
For location of Section A-A see Sheet 1 and 3.
For location of Section B-B see Sheet 3
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.
SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

DESCRIPTION:
FY 2020-21
STANDARD PLANS
TRAFFIC RAILING - (THRIE-BEAM RETROFIT)
INTERMEDIATE CURB
INDEX 460-474
SHEET 3 of 4

LAST REV: 01/01/08
01/01/09

REV: 460-474
NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans.
   For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at
   Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by
   grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing
   concrete and grouted over.
Dowel Bars 4D (10" Embedment)
(See Note 2, Sheet 3)

**NOTE:** All bar dimensions are out to out.

Thrie-Beam Guardrail

Asphalt Overlay when present (Varies)

3' Cover Min.

**Varies 1'-9" to 2'-0"**

1'-2" x 10" x 1"/8" Thick Neoprene Pad

**Varies 1'-2" x 10" x 1"/8" Thick Neoprene Pad**

Existing Bridge Deck

**Varies 1'-9" to 2'-0"**

Final Riding Surface

Slope

**Varies**

Existing Curb Overhang

2 - 3'/8" Ø x 1'-4" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-1" Max. Depth)

2 - 3'/8" Ø x 8" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-1" Min. Embed. Schemes 3 & 5)

Existing Wing Post

2 - 3'/8" Ø x 8" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-1" Min. Embed. Schemes 3 & 5)

2 - 5" Ø Post Bolts (length varies)

Slope: Varies

Existing Wing Wall

Offset Block(s) as required

Guardrail Post Assembly "A", "B" or "C" (See Roadway Plans)

Existing Curb Overhang

3" Cover Min.

2 - 3'/8" Ø x 1'-4" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-1" Max. Depth)

2 - 3'/8" Ø x 8" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-1" Min. Embed. Schemes 3 & 5)

Existing Curb Overhang

2 - 3'/8" Ø x 8" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (1'-1" Min. Embed. Schemes 4 & 6)

Asphalt Overlay when present (Varies)

Control Line (Schemes 5 & 6)

SECTION A-A

TYPICAL SECTION THRU RAILING ON BRIDGE DECK

SECTION B-B

TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

(SCHEMES 5 AND 6 SHOWN, SCHEMES 3 AND 4 SIMILAR)

FIG. 460-475

TRAFFIC RAILING - (THRIE-BEAM RETROFIT) 
WIDE CURB TYPE 1

NOTE: All bar dimensions are out to out.
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEME 1

SCHEME 2

RAILING END TREATMENT FOR PARALLEL OR FLARED CURBS WITH DETACHED SIDEWALKS OR INTEGRAL SIDEWALKS LESS THAN 6" THICK

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 2" bottom clearance.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post and Traffic Railing not shown for clarity)

THREE-BEAM RETROFIT

TRAFFIC RAILING - WIDE CURB TYPE 1

INDEX 460-475

460-475

3 of 4

FY 2020-21
NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING (Existing Traffic Railing not shown for clarity)
**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

**BILL OF REINFORCING STEEL**

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<tr>
<td>M</td>
<td>4</td>
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**BAR BENDING DIAGRAMS**

- **Dowel Bar 4D**
  - 2'-0" 3/16" 5/8"
  - 2'-8" 3/8" 2'-8"

- **Dowel Bar 4L**
  - 3'-8" 3/16" 5/8"
  - 4'-0" 3/8" 2'-8"

**NOTE:** All bar dimensions are out to out.

**SECTION B-B**

**TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB**

(SCHEMES 5 AND 6 SHOWN, SCHEMES 3 AND 4 SIMILAR)

**DESCRIPTION:**

- **Shim with washers around Anchors as required to maintain tolerance.**
- **Offset may vary ± 1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.**

**MATCH FRONT FACE OF THRIE-BEAM GUARDRAIL ALONG BRIDGE**

- **Offset Block(s) as required (Schemes 3 and 4 only)***
- **Slopes:**
  - **Existing Curb Overhang:** 5" Min. Embedment
  - **Existing Bridge Deck:** 3" Cover Min.

**NOTE:** All bar dimensions are out to out.

**VIEW C-C**

For location of Section A-A see Sheet 1, 3 & 4.
For location of Section B-B see Sheet 4.
For location of Section C-C see Sheet 3.
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curbs.

2. Field bend Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

Asphalt Overlay (Typ.)

Transition Block (See Note 1)

SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

Asphalt Overlay (Typ.)

Transition Block (See Note 1)

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing curb bridge. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curbs.

2. Field bend Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

Asphalt Overlay (Typ.)

Transition Block (See Note 1)
**PARTIAL PLAN OF RAILING**

2 ~ Variable Spaces

- Varies (3'-1½" Max. spacing)
- (Typ. along Approach Slab)
  - Post Spacing Scheme 3 as measured to ̂ Post Bolts

- Varies (2'-1" Max. spacing)
- (Typ. along Approach Slab)
  - Post Spacing Scheme 4 as measured to ̂ Post Bolts

Asphalt Overlay when present

Guardrail Post Assembly (Typ.)

Existing Curb

Front Face of Backwall & Begin or End Bridge

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

*(Existing Wing Post and Traffic Railing not shown for clarity)*

**SCHEMES 3 AND 4**

**RAILING END TREATMENT FOR FLARED INTEGRAL CURBS**

**SCHEMES 5 AND 6**

**RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS**

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

**TRAFFIC RAILING - (THRIE-BEAM RETROFIT)**

**WIDE CURB TYPE 2**

**INDEX** 460-476

**SHEET** 4 of 4

FY 2020-21

STANDARD PLANS
TRAFFIC RAILING RETROFIT NOTES

See Index 536-001 for component details, geometric layouts and associated notes not fully detailed herein.

CONCRETE: Concrete For Transition Blocks shall be Class II (Bridge Deck).

THRIE-BEAM PANEL: Steel Thrie-Beam Elements shall meet the requirements for Class B (10 Gauge) Guardrail of AASHTO M 180, Type II (Zinc coated). The minimum panel length for Thrie-Beam Elements shall be 12'-6". Field drilled holes for Post connections shall be 3/16" by 21/2" slotted holes.

BOLTS, NUTS AND WASHERS: Bolts, nuts and round washers shall be in accordance with AASHTO M180. Plate Washers shall be in accordance with ASTM A36 or ASTM A709 Grade 36.

COATINGS: All Nuts, Bolts, Anchors, and Washers shall be hot-dip galvanized in accordance with the Specifications.

BRIDGES ON CURVED ALIGNMENTS: The details presented herein are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

THRIE-BEAM EXPANSION SECTION: Thrie-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 21/2" slots in thrie-beam expansion sections. Nuts shall fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening. Tighten bolts in 3/16" slots at guardrail post(s) that lie between the slotted expansion splice and bridge deck junt so that the bolt heads are in full contact with thrie-beam elements, but not so tight as to impede movement due to expansion.

WOOD BLOCKS: All wood blocks, including required wedge shaped blocks shall be Pressure Treated lumber in accordance with Specifications Section 933. Bolt holes in blocks to be centered (+/-g).

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and or date, or if the installation of the Traffic Railing (Thrie-Beam Retrofit) will obscure the bridge name, number and or date, then replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the top of the adjacent guardrail. The information must be clearly visible from the right side of the approach travel lane. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise of individual decals of letters and numbers.

PAYMENT: Payment will be made under Thrie-Beam Panel Retrofit which shall include all materials and labor required to fabricate and install the retrofit railing, Transition Blocks and Curbs, Bridge Name Plate and Barrier Delineators, where required, will not be paid for directly but shall be considered incidental work.

TRAFFIC RAILING RETROFIT

THRIE-BEAM PANEL SPlice

NOTE: All Thrie Beam Panels shall be lapped in the direction of adjacent traffic. At the Contractor’s option, laps may be extended. Field drill holes in Trailing Thrie-Beam Panel as required.

THRIE-BEAM PANEL RETROFIT

(Concrete Handrail)
NOTES:

1. Dimensions and elevations for existing guardrails to be verified by the Contractor before beginning construction.

2. Provide Transition Block as shown or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of the traffic face of Transition Block or Curb shall match existing bridge curb. See Sheet 4 for Transition Block details. Block may be omitted on trailing ends with no opposing traffic.

3. Do not bolt nested rails to the blocks and posts at posts (a), (c) & (e).

FY 2020-21

STANDARD PLANS

THREE-BEAM PANEL RETROFIT
(CONCRETE HANDRAIL)

INDEX

460-477

2 of 4
ELEVATION VIEW A-A
(At Double Posts)
(View at Intermediate Double Posts shown; View at Expansion Joints similar)

ELEVATION VIEW A-A
(At Single Post)

ELEVATION VIEW A-A
(At End Post)

NOTES:
1. Post Bolts shall be 5/8" x 14" long set in 7/8" core drilled holes, see Sheet No. 1.
2. Shift Post Bolt holes minimally inward toward center of posts if existing reinforcement is encountered during drilling of holes. If reinforcement is still encountered, notify the Engineer before proceeding with drilling.
3. Post Bolt spacing not to exceed 8'-0" (± 1').
New Guardrail Posts, positioned as required to clear Transition Block (Typ.)

Top of Existing Curb

Top of Existing Approach Slab or Bridge Deck

1'-6"

1'-3"

2'-3"

2'-3"

1'-3"

Edge of Existing Approach Slab (Location varies)

#3 Stirrups (Field Bend) (Typ.)

#4 Adhesive-Bonded Dowels (6 Required)

Match existing curb height and slope at traffic face

1' ø Anchor Rods 3'-0" long driven into ground prior to casting concrete

1 4" tool edge

1 2"

1 3"

1 4"

TOP VIEW

PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

ELEVATION OF TRANSITION BLOCK
(GUARDRAIL AND POSTS NOT SHOWN FOR CLARITY)

#3 STIRRUP (FIELD BEND)

NOTES:

ANCHOR RODS: Steel Anchor Rods shall be ASTM A36, ASTM A709
Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance
with Specification Section 962.

ADHESIVE-BONDED DOWELS: Adhesive Bonding Material Systems
for Dowels shall comply with Specification Section 937 (Type HV)
and be installed in accordance with Specification Section 416.

Adhesive Bonded Dowels are shown installed in an existing curb
or sidewalk integrally reinforced with Approach Slab, Wingwall or
Bridge Deck. For installations in existing detached curbs or
sidewalks, install dowels in available sound concrete.

Shift bars (as needed) to install six dowels into existing bridge
or approach slab mounted curb.

ESTIMATED QUANTITIES PER TRANSITION BLOCK

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<td>Reinforcing Steel</td>
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<td>Guardrail (Reinset)</td>
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### GENERAL NOTES

**HSS TUBES**: HSS Tubes shall be ASTM A500 Grade B.

**END CAPS AND END TAPER ASSEMBLIES**: Steel plate for End Caps and End Taper Assemblies shall be ASTM A709 Grade 36.

**ANCHOR RODS, NUTS AND WASHERS**: Adhesive Bonded anchors shall be fully threaded rods in accordance with ASTM F1554 Grade 36 or ASTM A193 Grade B7. All Nuts shall be single self-locking hex nuts and in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436. After the nuts have been snug tightened, distort the anchor rod threads to prevent removal of the nuts. Coat distorted threads and the exposed trimmed ends of anchor rods with a galvanizing compound in accordance with the Specifications.

**COATINGS**: Galvanize all Anchor Rods, Nuts, Bolts, Washers and HSS Tube Assemblies in accordance with the Specifications. Hot-dip HSS Tubes and Tube Assemblies after fabrication.

**ADHESIVE-BONDED ANCHORS AND DOWELS**: Adhesive Bonding Material Systems for Anchor Rods shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 10,000 lbs.

**INSTALLATIONS ON CURVED ALIGNMENTS AND GRADES**: The details presented in this Standard are shown for installations on tangent alignments and constant grades except as shown in the Offset Detail for Retrofit Installations on Horizontally Curved Alignments. Details for installations on horizontally curved alignments and or vertically curved profiles are similar. Straight sections of HSS Tube may be installed in a chorded manner within the offset limit shown in the Offset Detail for Retrofit Installations on Horizontally Curved Alignments. Shop bend HSS Tubes for use on horizontally curved alignments where the offset limit shown cannot be met using straight sections of HSS Tube. Straight and horizontally curved sections of HSS Tube may be field bent during installation for use on vertically curved profiles.

**SHOP DRAWINGS**: Submit shop drawings and obtain approval prior to fabrication in accordance with Specification Section 5. Show project specific geometry (line and grade) and bolt hole, expansion joint and splice locations. Include other project specific details as required.

**PAYMENT**: Payment will be made under Metal Traffic Railing (Rectangular Tube Retrofit) which shall include all materials and labor required to fabricate and install the Rectangular Tube Retrofit.

---

**PLAN (Reinforcing Steel in Existing Railing not shown for clarity)**

(Railing on Bridge Deck shown, Railing on Approach Slab and Retaining Wall similar)

---

**ELEVATION (Reinforcing Steel in Existing Railing not shown for clarity)**

(Railing on Bridge Deck shown, Railing on Approach Slab and Retaining Wall similar)
DESCRIPTION:

Revision of Standard Plans FY 2020-21

Sheet Index

Post-Tensioning Tendon Profiles

TYPICAL PROFILES FOR TENDONS WITH FLEXIBLE FILLER

Profile F1
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile F2
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile F3
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile F4

Profile F5

Profile F6

Profile F7

Profile F8

Profile F9

Profile F10

Profile F11

Profile F12

Profile F13

Profile F14

LEGEND:

- Strand, Wire or Bar Tendon
- Anchorage with Filler Inlet at lower end of Tendon
- Anchorage with Filler Outlet at higher end of Tendon
- Alternate tendon profile immediately adjacent to Anchorage
- Supplementary Filler Inlet
- Filler Port / Outlet
- Drain (See Specifications Section 462 for additional Drain location requirements)
- Direction of Filler Flow
- Inspection Location

* Adjust location to coincide with the true high or low point(s) of the tendon.

Profile F8

Profile F9

Profile F10

Profile F11

Profile F12

Profile F13

Profile F14

(2 Span Profile shown; Profiles for 3 or more Spans similar)
TYPICAL PROFILES FOR TENDONS WITH GROUT FILLER

Profile G1
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile G2
(Profile for Single Cell Box shown; Profiles for Multiple Cell Boxes similar)

Profile G3

Profile G4

Profile G5

Profile G6

Note: See Sheet 1 of 2 for Typical Profiles for Tendons with Flexible Filler and for Legend of Symbols.

Profile Index

Post-Tensioning Tendon Profiles
FY 2020-21
Standard Plans

INDEX
462-001

Sheet
2 of 2
1. Meet the requirements of Specification Section 975-5.  
2. Extend top coat 1" beyond limits of Elastomeric Coating.
PROCEDURE:
1. After filler injection is completed, remove pocket forming material and rigid filler pipe.
2. Inspect tendon for voids as necessary.
3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
4. Clean threads and rethread as required.
5. Install threaded plug into outlet to form a tight fit.
6. Clean and roughen sides of pocket.
7. Fill pocket with epoxy grout.

1. FILLER OUTLET CONNECTION TO DUCT
2. POCKET PREPARATION
3. FILLING POCKET
4. FILLER OUTLET DETAIL AT HORIZONTAL SURFACES

NOTES:
1. Holes used for the inspection and filler inlets/outlets may be formed using tapered pipes or mandrels.
2. Where a vacuum system is connected to an anchorage, connect both the anchorage outlet and the cap outlet to the vacuum system.

FILLER INLET INSTALLATION, FILLER INJECTION, INSPECTION & PROTECTION

1. TOP INSPECTED ANCHORAGE WITH FILLER INLET INSTALLATION, FILLER INJECTION, INSPECTION & PROTECTION
2. INSTALLATION & SHIPPING
3. INSPECTION
4. PROTECTION

NOTE:
Where a vacuum system is connected to an anchorage, connect both the anchorage outlet and the cap outlet to the vacuum system.
**POST-TENSIONING ANCHORAGE AND TENDON FILLING DETAILS**

**DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2020-21**

**INDEX**

**SHEET**

1. **FILLER OUTLET CONNECTION TO TENDON**

2. **POCKET PREPARATION**

   **PROCEDURE:**
   1. Remove Rigid Filler Pipe or drill Grout in flexible pipe.
   2. Inspect tendon for voids.
   3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
   4. Install Threaded Plug into Outlet to form a tight fit.
   5. Over-ream hole (1/4" Ø over-ream). Clean and roughen sides.
   6. Fill pocket with epoxy grout.

**NOTES:**

1. Anchor or Nut to allow for flow of Filler into Cap.
2. Where a vacuum system is connected to an anchorage, connect both the anchorage outlet and the cap outlet to the vacuum system.

**TENDONS AT HIGH POINTS AND 3' FROM HIGH POINTS (FILLER OUTLET)**

**FILLER INLET AND OUTLET DETAILS FOR I-GIRDERS**

**DETAILS FOR C.I.P. BOXES WITH INTERNAL TENDONS SIMILAR. WEB REINFORCING NOT SHOWN FOR CLARITY.**
GENERAL NOTES:

U.S. COAST GUARD NOTIFICATION: Notify the local office of the U.S. Coast Guard at least 30 days prior to beginning of construction of the Fender System.

14" SQUARE PRESTRESSED CONCRETE PILES: Provide 14" Square Prestressed Concrete Piles of sufficient length to achieve a minimum embedment of 20' into soil having a blow count greater than or equal to 6 (n = 6). Pile splices and build-ups are not permitted. Use only 14" Square Prestressed Concrete Piles with 0 - 1/2" diameter Low Relaxation Strands fabricated in accordance with Index 455-014.

PLASTIC LUMBER AND STRUCTURAL COMPOSITE LUMBER WALES: Provide only Plastic Lumber (Thermoplastic Structural Shapes) and Structural Composite Lumber (Reinforced Thermoplastic Structural Shapes) Wales in accordance with Specification Section 973. Wales shall be continuous and spliced only at locations shown on the plans.

PLASTIC LUMBER DECKING FOR CATWALKS: Provide Plastic Lumber decking for catwalks when called for in the Plans in accordance with Specification Section 973.

Install Plastic Lumber Decking according to manufacturer’s recommendations using stainless steel #10 x 3" (minimum) deck screws.

FIBERGLASS OPEN GRATING FOR CATWALKS: Provide Fiberglass Open Grating for catwalks when called for in the Plans. Fiberglass Open Grating shall be a heavy duty design suitable for exterior installations. Maximum gap opening on the walkway surface shall be 1/8". Design live loads and deflections shall be a 50 psi uniformly distributed load with a maximum deflection of 3" or L/180 at the center of a simple span and a concentrated load of 750 pounds with a maximum deflection of 3/8" at the center of a simple span. Color of Fiberglass Open Grating shall be gray or black.

Install Fiberglass Open Grating according to manufacturer’s recommendations using stainless steel hardware, screws, bolts, nuts and washers. Attach Fiberglass Open Grating to Wales and Deck Supports at a 2'-0" maximum spacing so as to resist pedestrian live loads and uplift forces from wind, buoyancy and wave action.

CLEARANCE GAUGE AND LIGHT: Clearance Gauge to be furnished and installed by the Contractor. Clearance Gauge width and numeral height is dependent on visibility distance. The required visibility distance shall be determined by the United States Coast Guard District Commander. Provide and install Clearance Gauge Light in accordance with Specification Section 510 and Index 510-001.

NAVIGATION LIGHTS: Provide and install Navigation Lights in accordance with Specification Section 510. Index 510-001 and/or project specific details. Provide and maintain Temporary Navigation Lights during construction until permanent Navigation Lights are operational.

BOLTS, THREADED BARS, NUTS, SCREWS AND WASHERS: Furnish stainless steel Bolts in accordance with ASTM F593 Type 316. Furnish stainless steel threaded bars in accordance with ASTM A193 Grade B8M. Furnish stainless steel Nuts in accordance with ASTM F594 Type 316. Furnish stainless steel Screws in accordance with Index 510-001 and/or project specific details. Provide and maintain Temporary Navigation Lights during construction until permanent Navigation Lights are operational.

SPlice PLATES: Furnish Splice Plates in accordance with ASTM A240 Type 316.

wire ROPE: Provide wire rope meeting one of the following requirements:

1. 1/2" diameter 6x19, 6x25 or 6x37 class IWRC Type 316 stainless steel wire rope with a minimum breaking strength of 18,000 lbs.

2. 1/2" diameter 6x19 galvanized wire rope with ultraviolet ray resistant polypropylene impregnation having an outside diameter of 5/8" with a minimum breaking strength of 22,000 lbs. Protect all ends with heat shrinkable end caps compatible with the rope’s polypropylene that provide an effective water-tight seal.

GENERAL NOTES:
CROSS REFERENCES:
For Sections A-A and B-B see Sheet 4.
For View F-F see Sheet 5.

NOTE:
Plastic Lumber and Composite Lumber Dimensions shown are based on Nominal Lumber Dimensions and may vary depending on Actual Lumber Dimension.

PARTIAL PLAN VIEW (TYPICAL FLARE)
(FLARE AT CONTROL POINT B SHOWN, CONTROL POINTS A, C & D SIMILAR)
(HANDRAIL NOT SHOWN FOR CLARITY)

EXPANDED PARTIAL ELEVATION VIEW

NOTE:
Plastic Lumber and Composite Lumber Dimensions shown are based on Nominal Lumber Dimensions and may vary depending on Actual Lumber Dimension.

PARTIAL PLAN VIEW (TYPICAL FLARE)
(FLARE AT CONTROL POINT B SHOWN, CONTROL POINTS A, C & D SIMILAR)
(HANDRAIL NOT SHOWN FOR CLARITY)

EXPANDED PARTIAL ELEVATION VIEW

NOTE:
Plastic Lumber and Composite Lumber Dimensions shown are based on Nominal Lumber Dimensions and may vary depending on Actual Lumber Dimension.
### *STRUCTURAL COMPOSITE LUMBER BILL OF MATERIALS*

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<td>A1</td>
<td>10&quot; X 10&quot; COMPOSITE LUMBER</td>
<td>32'-0&quot; (STRAIGHT)</td>
<td>266.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>10&quot; X 10&quot; COMPOSITE LUMBER</td>
<td>32'-0&quot;</td>
<td>266.6</td>
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<tr>
<td>A3</td>
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<tr>
<td>A4</td>
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<td>16'-0&quot;</td>
<td>133.3</td>
<td></td>
<td></td>
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<tr>
<td>A5</td>
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<td>16'-0&quot;</td>
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<tr>
<td>A6</td>
<td>10&quot; X 10&quot; COMPOSITE LUMBER</td>
<td>16'-0&quot;</td>
<td>133.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### *PLASTIC LUMBER BILL OF MATERIALS*

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE (NOMINAL)</th>
<th>DIMENSIONS</th>
<th>BOARD FT. PER EACH</th>
<th>NO. REQD.</th>
<th>QUANTITY</th>
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<td>8&quot; (STRAIGHT)</td>
<td>3.6</td>
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<tr>
<td>C</td>
<td>2&quot; X 6&quot; PLASTIC LUMBER</td>
<td>16'-0&quot; (STRAIGHT)</td>
<td>16.0</td>
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<td></td>
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<tr>
<td>D</td>
<td>4&quot; X 6&quot; PLASTIC LUMBER</td>
<td>4'-4&quot; (STRAIGHT)</td>
<td>8.7</td>
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<tr>
<td><strong>E</strong></td>
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<td>F1</td>
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<td>31'-11&quot;</td>
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<td>F3</td>
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<td>19'-11&quot;</td>
<td>79.6</td>
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<tr>
<td>F6</td>
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<td>15'-10&quot;</td>
<td>79.3</td>
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<td>G1</td>
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<tr>
<td>G2</td>
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<td>4'-1&quot; (STRAIGHT)</td>
<td>12.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>4&quot; X 4&quot; PLASTIC LUMBER</td>
<td>PILE CUTOFF ELEV. MINUS NLW OR NLW ELEV. PLUS 5'-6&quot; (STRAIGHT)</td>
<td>1.3 PER EACH</td>
<td></td>
<td></td>
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<tr>
<td>H2</td>
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<td>1'-2&quot; (STRAIGHT)</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* All Plastic Lumber and Composite Lumber Dimensions and Quantities shown are based on Nominal Lumber Dimensions and may vary depending on Actual Lumber Dimension.

** Provide Fiberglass Open Grating in lieu of 2" X 12" Plastic Lumber when called for in the Plans. Mounting hardware shall be Stainless Steel, install per Manufacturer's recommendations. See Structures Plans for Notes and Details.
Use RFL when Pier is at Channel Edge and see CFR, Title 33, part 118 for Mounting Height restrictions. Use RCL otherwise.

Mounted only on the Pier that defines CM, otherwise does not apply.

*** RFL to be located at mid length of straight portion of fender.

**  NAVIGATION LIGHT NOTES:
1. Provide Navigation Light System in compliance with Specifications Section 510.

** FROM POWER SOURCE

NOTE:
Size conduit and conductors per NEC requirements. Do not use conduit smaller than Ø.

** SYMBOL DESCRIPTION

LC Lighting Contactor
PC Photocell Control
Xmer Transformer (If Required)
RFL Red Pier/Fender Light (180° visibility)
RCL Red Channel Margin Light (180° visibility)
CGL Green Center Channel Light (360° visibility)
GCL Clearance Gauge Light
CM Channel Margin or Pier inner surface whichever defines Channel Edge.

** POWER CONDUCTORS

<table>
<thead>
<tr>
<th>DISTANCE (feet)</th>
<th>VOLTS</th>
<th>CONDUCTOR</th>
<th>TRANSFORMER</th>
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<tbody>
<tr>
<td>0 - 75</td>
<td>120</td>
<td>#12 AWG</td>
<td>N/A</td>
</tr>
<tr>
<td>75 - 500</td>
<td>120 or 240</td>
<td>#10 AWG</td>
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<tr>
<td>500 - 1000</td>
<td>240</td>
<td>#10 AWG</td>
<td>2 KVA</td>
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<tr>
<td>1000 - 2000</td>
<td>480</td>
<td>#8 AWG</td>
<td>2 KVA</td>
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<td>2000 - 5000</td>
<td>480</td>
<td>#6 AWG</td>
<td>2 KVA</td>
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<tr>
<td>5000 - 10000</td>
<td>480</td>
<td>#4 AWG</td>
<td>2 KVA</td>
</tr>
<tr>
<td>Over 10000</td>
<td>480</td>
<td>#4 AWG</td>
<td>2 KVA</td>
</tr>
</tbody>
</table>
Install Light Fixture so as to ensure visibility from an approaching vessel.

Traffic Railing or Parapet

2" Ø Conduits

Service Chain

Bottom of Bridge Deck

EJB

Access Fitting

3/4" Ø Min.

Type LB or LR Access Fitting, 3/4" Ø Min., whichever applicable.

* Supplied by Light Fixture Manufacturer

* Light Fixture Swivel Box

* Mounting Box

Bend if required

Coping

Back of Traffic Railing or Parapet

36° Single-Slope Traffic Railing (shown), other railings or Parapet similar

2" Ø Conduits

Mounting Box

Light Fixture Swivel Box

Service Chain

Bottom of Girder

RCL or GCL

Bottom of Girder

GCL or RCL MOUNTING DETAILS (SCHEMATIC)

ELEVATION VIEW

(Traffic Railing (36° Single-Slope) shown, other railings similar)

SECTION B-B

TYPICAL POSITION OF RCL OR GCL RELATIVE TO SUPERSTRUCTURES

CROSS REFERENCES:
1. For Navigation Light System notes and legend, see Sheet 1.
2. See Utility Conduit Detail sheets for Embedded Junction Box (EJB) dimensions & locations.

* Supplied by Light Fixture Manufacturer

GCL OR RCL MOUNTING DETAILS (SCHEMATIC)

VIEW A-A

11/18/2019
4:08:52 PM

REVISION DESCRIPTION:

REVISION LAST

INDEX SHEET

11/01/17 2 2

NAVIGATION LIGHT SYSTEM DETAILS
(FIXED BRIDGES)

STANDARD PLANS

FY 2020-21

2 of 2

510-001
ELEVATION OF INSIDE FACE OF TRAFFIC RAILING WITH PEDESTRIAN/BICYCLE BULLET RAILING

NOTES:

1. A Bullet Railing Tapered End Transition is required for all approach ends of Bullet Railings on Traffic Railings. When Guardrail Connection is required terminate the Bullet Railing Tapered End Transition at beginning of the Traffic Railing End Transition.

2. Where Bullet Railing continues on retaining wall mounted Traffic Railings or Barriers, provide a Bullet Railing Tapered End Transition at the terminus of the Bullet Railing.

CROSS REFERENCES:

Work in conjunction with Index 515-022.

For Traffic Railing Details, Reinforcement and Notes see Index 521-427.
RAILING NOTES:

1. Work this Index with Index 521-423, 521-427, 521-428, 521-820 and 515-021 and Specification Section 515.

2. Shop Drawings: Submit shop drawings prior to fabrication:
   A. Include post and rail splice/expansion assembly location for curved alignments with radii < 40 feet and for all end terminations.

3. Materials:
   A. Supply Aluminum materials in accordance with Specification Section 965 and the following:
      Wrought Aluminum Post: ASTM B221, Alloy 6061-T6 or 6351-T5
      Rail End Cap: ASTM B26 sand cast aluminum alloy 356.0-F
      Plate and Bars: ASTM B209 Alloy 6061-T6 or 6351-T5
      Stop Pins: Press-fit aluminum or stainless steel pins or tubes
      B. Stainless Steel Fasteners: ASTM F-593, Alloy Group 2 (316).
      C. Bearing Pads: Plain or Fiber Reinforced meeting Specification Section 932 for Ancillary Structures.

4. Layout:
   A. Posts shall be uniformly spaced with reasonable consistency.
   B. Tapered End Transitions are required at the terminus of the approach ends of Bullet Railing mounted on a Traffic Railing. Bullet Railings on concrete parapets shielded by a traffic railing do not require Tapered End Transitions unless noted otherwise in the Plans.
   C. Adjust post spacings to avoid parapet obstacles, such as armor expansion plates, by 9 inches minimum.
   D. Rails shall be continuous over a minimum of 3 posts, except that lengths less than 12 feet need only be continuous over 2 posts.
   E. Space splices at 40 feet maximum. Splice all rails in a given railing section at about the same center line.
   F. Provide rail expansion assemblies in panels between posts on either side of a bridge expansion joint. Rail expansion assemblies are similar to the rail splice assemblies with increased space at the expansion assembly to allow for movement equal to 1.5 times the bridge joint opening or 1" greater than the expected joint movement.

5. Installation:
   A. Set rails near bridge expansion joints to allow for expected movement.
   B. Cutting of reinforcing steel is permitted for post installed anchors.

6. Payment: Includes the full cost of installed bullet railing. Cost of the Concrete Parapet or Traffic Railing is separate.
**NOTES:**

1. Shop Drawings are required.
2. Work this Index with Index 515-052 Bicycle/Pedestrian Railing Details (Steel) and Specification Section 515. Refer to the SPI for Design Criteria and limits of use.
3. **Materials:**
   a. Steel: Galvanized after fabrication
   c. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM A36
   d. Bottle-guard (Schemes 1 & 3) L-shape: ASTM A36
   e. Concrete: Same as bridge deck
   f. Pre-cured Silicone Sealant: Specification Section 932
   g. Bearing Pads: Provide 3⁄8" Plain, Fabric Reinforced or Fabric Laminated bearing pads that meet the requirements of Specification Section 932 for Ancillary Structures.
4. See Structures Plans, Superstructure Sheets for bridge information including concrete type, deck expansion joint locations and orientations, and thermal movement.
5. **Railings:**
   a. For thermal movement greater than 4" (up to a maximum of 5"), clear opening between adjacent pickets, or panels at Rail Expansion Joints above Deck Joints must be reduced to 3½".
   b. For treatment of railings on skewed bridges see Index 521-427.
6. **Curbs:**
   a. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
   b. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely. See Concrete Curb Details Sheet 3.
   c. Provide 3⁄8" Intermediate open joints in curbs coinciding with the 3⁄8" joints in the traffic railing.
7. **Payment:** Support bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.
**DETAIL "B" EXPANSION JOINT (FIELD SPICE SIMILAR)**

- **ROUND RAILS - TOP RAIL OR HANDRAIL**
  - 1/2" (± 1/4") Panel Head Stainless Steel (Type 316 or 18-8 Alloy)
  - Set Screws along outside face of railing. Set screws must be
  - **INTERMEDIATE OR BOTTOM RAIL - STEEL SLEEVE DETAIL (Bottom Side Shown)**
    - Steel Sleeve: 2.50 OD x 0.125 Wall for top rail
    - Steel Sleeve: 1.50 OD x 0.125 Wall for intermediate and bottom rails

- **SQUARE RAILS - INTERMEDIATE OR BOTTOM RAIL**
  - 1" NPS (Sch. 40) for handrails

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>P</td>
<td>4</td>
<td>2'-0&quot;</td>
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</tbody>
</table>
| S    | 4    | As Reqd.

**BILL OF REINFORCING STEEL**

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<tr>
<th>ITEM</th>
<th>UNIT</th>
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</thead>
<tbody>
<tr>
<td>Concrete</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>4.01</td>
</tr>
</tbody>
</table>

**INTERMEDIATE OR BOTTOM RAIL - STEEL SLEEVE DETAIL (Bottom Side Shown)**

- Steel Sleeve: 1.50 OD x 0.125 Wall for intermediate and bottom rails

**DETAIL "A" - SECTION AT INTERMEDIATE OPEN JOINT**

- **INTERMEDIATE JOINT SEAL NOTE:**
  - At intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.

**SCHEME 1 - BOTTLE GUARD DETAIL**

- **SCHEME 2 - CONCRETE CURB DETAILS**
  - Estimated Concrete Curb Quantities (Scheme 2)

<table>
<thead>
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<th>ITEM</th>
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<tr>
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<tr>
<td>Reinforcing Steel</td>
<td>4.01</td>
</tr>
</tbody>
</table>

**SCHEME 3 - BOTTLE GUARD DETAIL**

- **CROSS REFERENCE:**
  - See Sheet 1 for Bridge Railing Notes.

**STANDARD PLANS**

**BRIDGE PEDESTRIAN/BICYCLE RAILING (STEEL)**

**INDEX**

515-051
**NOTES:**

1. Shop Drawings are required.

2. Work this Index with Index 515-062 Aluminum Bicycle/Pedestrian Railing Details and Specification Section 515. Refer to the IDS for Design Criteria and Limits of Use.

3. Materials:
   - B. Aluminum:
     - a. Support Bracket (Scheme 3) L-shape and Stiffener Plate: ASTM B209, Alloy 6061-T6
     - b. Bottle-guard (Schemes 1 & 3) L-shape: ASTM B209, Alloy 6061-T6 or 6063-T5
   - C. Concrete: Same as bridge deck
   - D. Pre-cured Silicone Sealant: Specification Section 932
   - E. Bearing Pads: Provide 3/8" thick Plain, Fabric Reinforced or Fabric Laminated pads meeting the requirements of Specification Section 932 for Ancillary Structures.

4. See Structures Plans, Superstructure Sheets for bridge information including concrete type, deck expansion joint locations and orientations, and thermal movement.

5. Railings:
   - A. For thermal movement greater than 4" (up to a maximum of 5"), clear opening between adjacent pickets or panels at Rail Expansion Joints above Deck Joints must be reduced to 3½".
   - B. For treatment of railings on skewed bridges see Index 521-427.

6. Curbs:
   - A. Match open curb joints at Deck Expansion Joint locations to the deck joint dimension.
   - B. Construct Concrete Curb (Scheme 2) vertical with the top surface finished level transversely.
   - C. Provide 3/8" Intermediate open joints in curbs coinciding with the 3/8" joints in the traffic railing.

7. Payment:
   - Support Bracket (Scheme 3) is incidental to the cost of railing. Curb concrete and reinforcing steel (Scheme 2) are included in the bridge deck quantities.
GENERAL NOTES

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit) shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

ADHESIVE-BONDED DOWELS: Adhesive Bonded Material Systems for Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs. for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in this Standard are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing along the entire length of the bridge 2' from the face on the traffic side in accordance with Specification Section 705. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

GUARDRAIL: See Index 536-001 for guardrail component details, geometric layouts and associated notes not fully detailed herein.

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and or date, or if the installation of the Traffic Railing (Thrie Beam Retrofit) will obscure the bridge name, number and or date, then replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the top of the adjacent guardrail. The information must be clearly visible from the right side of the approaching travel lane. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise individual decals of letters and numbers.

PAYMENT: Concrete Traffic Railing-Bridge Retrofit - Post & Beam Railing (EA) includes all material and labor required to demolish a portion of the existing structure where required and to construct the concrete portion of the retrofit railing. Guadrail Approach Transition to rigid Barriers (EA) includes transition block, and necessary hardware to complete the Guardrail transitions shown.
**Revision Description:**

Revision of Standard Plans FY 2020-21

**Sheet Index:**

Guardrail Transitions - Existing Post & Beam Bridge Railings (Narrow & Recessed Curbs)

**Bill of Reinforcing Steel Bending Diagram**

**Estimated Traffic Railing Quantities**

**Conventional Reinforcing Steel Bending Diagram**

**Vertical Face Retrofit Railing Details - Post & Beam Railing with Narrow Curb**

**Last Revision:** 07/01/13

**FY 2020-21**

**Guardsrail Transitions - Existing Post & Beam Bridge Railings (Narrow & Recessed Curbs)**

**Index:** 521-404

**Sheet:** 3 of 8
**Description:**

Revision of Standard Plans FY 2020-21

**Sheet Index:**

Guardrail Transitions - Existing Post & Beam Bridge Railings (Narrow & Recessed Curbs)

**Revision Notes:**

- **Scheme 3 - Approach Ends of Bridges**
  - With Beam or Girder Superstructure
  - 3 or more continuous railing panels on wingwall adjacent to end post
  - 2 continuous railing panels on wingwall adjacent to end post
  - 1 railing panel on wingwall adjacent to end post

- **Scheme 4 - Approach Ends of Bridges**
  - With Flat Slab Superstructure & Parallel Wingwalls (Shown)
  - Or Beam or Girder Superstructure & Parallel or Curved Wingwalls (Similar)

**Limits of Removal of Existing Structure - Post & Beam Railing with Recessed Curb**

**Legend:**

- Limits of Existing Structure to be removed
- Limits shown above

**Sections:**

- **Section A-A**
- **Section B-B**

**Detail A:**

- Remove exposed existing reinforcing steel by burning or grinding to 1" below finished end of saw cut.
- Repair resulting holes and saw cut Railing and Recessed Curb and grind flat to align with edge of post.
SCHEME 3 - APPROACH ENDS OF BRIDGES WITH BEAM OR GIRDER SUPERSTRUCTURE

SCHEME 4 - APPROACH ENDS OF BRIDGES WITH FLAT SLAB SUPERSTRUCTURE & PARALLEL WINGWALLS (SHOWN) OR BEAM OR GIRDER SUPERSTRUCTURE & PARALLEL OR CURVED WINGWALLS (SIMILAR)

ESTIMATED TRAFFIC RAILING QUANTITIES

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<th>UNIT</th>
<th>QUANTITY</th>
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<td>Reinforcing Steel</td>
<td>LB/FT</td>
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CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

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<th>SIZE</th>
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<tbody>
<tr>
<td>D</td>
<td>6</td>
<td>3'-4&quot;</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>AS REQD</td>
</tr>
</tbody>
</table>

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
**GUARDRAIL TRANSITION DETAILS - SHEET 2 OF 2**

**SCHEME 5**
(Narrow Curb shown; Recessed Curb similar)

**PARTIAL PLAN - APPROACH TRANSITION**

- **Existing Bridge Coping**
- **Existing Post & Beam Railing**
- **Existing Solid Section of Railing**
- **Gutter Line**
- **Begin or End Bridge**
- **Transition Block (if shown in Plans)**
- **Guardrail Post (Typ.)**
- **Transition Block (if shown in Plans)**
- **Terminal Connector**
- **Thrie-Beam Panel**

**SCHEME 6**
(Narrow Curb shown; Recessed Curb similar)

**PARTIAL ELEVATION - APPROACH TRANSITION**

- **Existing Bridge Coping**
- **Existing Post & Beam Railing**
- **Existing Solid Section of Railing**
- **Limiting Station of Transition**
- **Begin or End Bridge**
- **Existing Solid Section of Railing**
- **Existing Post & Beam Railing**
- **Trailing End Guardrail Connection**

**PARTIAL ELEVATION - TRAILING END TRANSITION**
(Narrow Curb Scheme 2 shown; All other Schemes similar)

- **Existing End Post**
- **Open Joint (width varies)**
- **Existing Narrow Curb**
- **Flat Slab**
- **Existing Bent Cap**

**DESCRIPTION:**
REVISION
LAST
REVISION
07/01/14
07/01/14
FY 2020-21
STANDARD PLANS
GUARDRAIL TRANSITIONS-EXISTING POST & BEAM BRIDGE RAILINGS (NARROW & RECESSED CURBS)
INDEX
521-404
 SHEET
7 of 8
PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

ELEVATION OF TRANSITION BLOCK
(GUARDRAIL AND POSTS NOT SHOWN FOR CLARITY)

ITEM | UNIT | QUANTITY
--- | --- | ---
Concrete Class II (Bridge Deck) | CT | 0.4
Reinforcing Steel | LB | 0.0

NOTES:
ANCHOR RODS: Steel Anchor Rods shall be ASTM A36, ASTM A709 Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance with Specification Section 962.

ADHESIVE-BONDED DOWELS: Adhesive Bonded Dowels are shown installed in an existing curb or sidewalk integrally reinforced with Approach Slab, Wingwall or Bridge Deck. For installations in existing detached curbs or sidewalks, install dowels in available sound concrete. Shift bars (as needed) to install six dowels into existing bridge or approach slab mounted curb.

ESTIMATED QUANTITIES PER TRANSITION BLOCK

GUARDRAIL TRANSITIONS-EXISTING POST & BEAM
BRIDGE RAILINGS (NARROW & RECESSED CURBS)

INDEX 521-404

FY 2020-21
STANDARD PLANS

REV MSN 07/01/13

LAST REVISION 07/01/13
DESCRIPTION:

REVISION INDEX SHEET

MIN 07/01/13

REV MSN 07/01/13
DESCRIPTION:

REVISION INDEX SHEET
GENERAL NOTES

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit) and replacement curb sections shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60, except Expansion Dowel Bar B which shall be ASTM A36 smooth round bar hot-dip galvanized in accordance with the Specifications.

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe, SDR 13.5. End Cap shall be ASTM D2665 PVC socket fitting. Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible expanded polystyrene plug is required in the opposite end of the assembly for correct dowel positioning during railing casting. Correct dowel positioning is required in order to provide for thermal movement of the deck.

ADHESIVE BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs. for Dowel Bars 6D on the inside face (traffic side) of the railing (1'-0" embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5" min. embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Standards are shown for bridges on straight alignments. Details for bridges on horizontally curved alignments are similar.

BARRIER DELINERATORS: Barrier Delineators shall meet Specification Section 993. Install barrier delineators on top of the Traffic Railing along the entire length of bridge 2" from the face on the traffic side in accordance with Specification Section 705. Barrier Delineator color (white or yellow) shall match the color of the near edgeline.

PAYMENT: Concrete Traffic Railing - Bridge Retrofit - Post & Beam Railing (each) includes all materials and labor required to demolish a portion of the existing structure where required and to construct the concrete portion of the retrofit railings. Guardrail Approach Transition to Rigid Barriers (EA) includes all transition blocks, and necessary hardware to complete the Guardrail transitions shown.

ESTIMATED TRAFFIC RAILING QUANTITIES

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<tr>
<td>Reinforcing Steel</td>
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(Quantities are based on a 9" curb, no curb cross slope and 1'-0" embedment length of Bars 6D. If the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.)

PAYMENT: Concrete Traffic Railing - Bridge Retrofit - Post & Beam Railing (each) includes all materials and labor required to demolish a portion of the existing structure where required and to construct the concrete portion of the retrofit railings. Guardrail Approach Transition to Rigid Barriers (EA) includes all transition blocks, and necessary hardware to complete the Guardrail transitions shown.

PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEMES 2 THRU 5

* Place 1" thick polystyrene blockout over limits of bridge deck expansion joint full width to the end of the Traffic Railing to allow for thermal movement. Seal forms to prevent mortar leakage into the expansion joint.

PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEME 1

(Guardrail Transition not shown for clarity)
**Existing Approach Slab**

1. **Bars 4A, 6D & 5S**
   - Bar 4A: 2'-0"
   - Bar 5S: 1'-3"

2. **Bars 4L, 4M & 4N**
   - Bar 4L: 2'-0"
   - Bar 4M: 3'-10"
   - Bar 4N: 3'-8"

**Existing Curb**

- **BARS 4C**
  - 12 required per open joint

**Retrofit Railing**

1. **Bars 5S**
   - Continuous or spliced at construction joints
   - Minimum cover: 2" on Approach Slab, 1'-3" on Bridge

2. **Expansion Dowel Bars B**
   - ASTM A36 smooth round bar, hot-dip galvanized

**Adhesive Bonding Material System**

- Dowel Sleeve

**Purge**

- Preformed Joint Filler at top of Existing Curb shall extend beyond the joint material (Silicone, poured rubber, armored neoprene seal or sliding plates) as shown to prevent concrete intrusion during railing casting and shall be placed so as not to restrict in any way normal joint movement.

**Dowel Installation Note**

- Shift dowel holes to clear if the existing reinforcement is encountered.

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM**

**BILL OF REINFORCING STEEL**

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<tr>
<td>B</td>
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<td>6</td>
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<td>2 &amp; 3</td>
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<tr>
<td>H</td>
<td>5</td>
<td>AS REGD.</td>
<td>2, 3 &amp; 4</td>
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**REINFORCING STEEL NOTES**

1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Bars 5S may be continuous or spliced at construction joints. Bar splices for Bars 5S shall be a minimum of 2'-0".
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

**OPEN JOINT EXPANSION DOWEL DETAIL**

(Railing Reinforcing Not Shown For Clarity)

**Dowel Installation Note**

- Shift dowel holes to clear if the existing reinforcement is encountered.
Existing Wing Wall Embedment - 1'-0" preferred with 2" Edge Min.

Curb heights vary from 5" Min. to 1'-2" Max.

4 "

PARTIAL PLAN OF RAILING

3rd or 4th Existing Post - Contractor to establish and construct

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

(Typical Section Thru Railing Along Approach Slab)

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2, 3, 4 or 5. Sheets 4, 5 or 6. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

NOTES:

1. Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Stew Detail. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

2. Field cut Bars 5S and Dowel Bars 6D at 60°± under existing Existing Railing and field cut to maintain min. cover for concrete.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

4. Existing Bridge Coping

5. Existing Post & Beam Railing

6. Existing Post Spacing

7. Existing Curb

8. Existing Bridge Deck

9. Existing Curb Top of Transition

10. Existing Post

11. Existing Railing

12. Existing Approach Slab

13. Existing Wing Deck

14. Existing Post Embedment

15. 2" Min. Clear

16. Deck Joint

17. 1" (Min.)

18. 3" (Max.) Preferred

19. 1" (Min.)

20. 3" (Max.) Preferred

21. 2'-10"

22. 2" Min.

23. 2" Min.

24. 2'-6"

25. 1" (Min.)

26. 3" (Max.) Preferred

27. 1" (Min.)

28. 3" (Max.) Preferred

29. 2" Clear of Form at back face of Existing Railing

30. Embedment

31. 5' Min. Embedd

32. Existing Approach Slab

33. Reinforced Curb Integral with Approach Slab or Wing Wall (6" Min. thickness)

34. Existing Wing Wall

35. Asphalt Overlay when present (Variety)

36. Final Riding Surface

37. Top of Bridge Deck

38. Existing Bridge Decks

39. Existing Bridge Curb

40. Existing Bridge Coping

41. Existing Wing Post

42. Existing Wing Post & Beam Railing

43. Existing Post & Beam Railing

44. Direction of Traffic

45. PARTIAL PLAN OF RAILING

46. 3rd or 4th Existing Post - Contractor to establish and construct

47. Limiting Station of Transition

48. Top of Existing Curb

49. Existing Curb

50. Existing Bridge Deck

51. PARTIAL ELEVATION OF INSIDE FACE OF RAILING

52. (Expansion Dowel Assemblies & Bars 4C not shown for clarity)

53. TYPICAL TREATMENT OF RAILING ALONG BRIDGE

54. NOTES:

55. 1. On approach end provide a Roadway Guardrail Transition, Index No. 402 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2, 3, 4 or 5. Sheets 4, 5 or 6. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans.

56. 2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.

57. 3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.
Dowel Bars 4L (10" Embedment) (Place 3 Bars Min. Top and 1 Bar Min. Bottom) (See Note 2)

Existing Approach Slab

Match Existing Curb Height

1'-0"

1'-4" (2'-6" Min.)

Varies

Limiting Station of Transition Existing Curb

Asphalt Overlay when present (Varies) —

Final Riding Surface

Existing Curb

Edge of Existing Approach Slab (See Note 1)

Transition Block

3'-0"

Dowel Bars 6D @ 7" Spacing Max. (Front Face only)

Railing End Transition

Dowel Bars 4L (10" Embedment) (See Note 2)

Transition Block (See Note 1)

Dowel Bars 4C (Typ.)

Vertical Face Retrofit Railing

Bars 4L (Typ.)

Bars 60 @ 75" Spacing Max. (Front Face only)

Bars 55 (Typ.)

Transition Block (See Note 2)

3'-0" Transition Block (See Note 1)

Existing Approach Slab

Place first post 2" clear of Wing Wall

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 3 of 6)

PARTIAL PLAN OF RAILING

SCHEME 1

RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

SCHEME 1 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

PARTIAL ELEVATION OF INSIDE FACE OF GUARDRAIL

(Existing Wing Post not shown for clarity)

Existing Perpendicular Wing Wall shown, Existing Angled Wing Wall similar

Dowel Bars 4L (10" Embedment) (See Note 2)

Transition Block (See Note 1)

Edge of Existing Approach Slab (Location Varies)

Front of Backwall, Begin or End Bridge & Match Line (See Sheet 3 of 6)

PARTIAL PLAN OF RAILING

SCHEME 2

RAILING END TREATMENT FOR PARALLEL CURBS

SCHEME 2 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the Bridge, see Sheet 3 of 6. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
SCHEME 3 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site-specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 3 of 6.

2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
1. See roadway plans for limiting station of road guardrail transition or other site-specific treatment. If limiting station of road guardrail transition is along the wing wall, attach three-beam terminal connector to railing as shown above. If limiting station of road guardrail transition is on the bridge, see sheet 3 of 6.

2. Dowel Bar 4N may be installed on a maximum angle of 45° to the cut edge of the approach slab as shown to facilitate drilling of holes and installation of bars.

3. Provide transition block (as shown) or curb if existing approach slab curb does not extend beyond end of existing end bent wing wall, see roadway plans. Shape and height of transition block or curb shall match existing bridge curb. Railing end transition and transition block may be omitted on trailing ends with no opposing traffic.

4. Field bend Dowel Bar 4N within transition block as required to maintain 2" top and side clearance and 3" bottom clearance.

5. At the contractor's option, along the length of the approach slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an adhesive bonding material system with a 1'-0" minimum embedment.
This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 and MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes.

GUARDRAIL: For Guardrail Connection details, see Index 536-001.

RAILINGS ON RETAINING WALLS: If the Traffic Railing is to be provided on a retaining wall, the railing section will be the same as shown on Sheet 2 Section A-A. All other details such as the End Transition, Guardrail Connection, the maximum spacing of the 2/3" open joints and 1/4" V-Grooves shall apply.

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

V-GROOVES: Construct 1/4" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 2/3" Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall footings.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown.

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver’s right side when approaching the bridge. The Date shall be placed on the driver’s left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/4" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Joint locations matching the dimensions of the Deck Joints. For treatment of Railings on skewed bridges see Index 521-427.

Provide 2/3 Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

This railing has been structurally evaluated to be equivalent or greater in strength to other safety shape railings which have been crash tested to NCHRP Report 350 TL-4 and MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes.

GUARDRAIL: For Guardrail Connection details, see Index 536-001.

RAILINGS ON RETAINING WALLS: If the Traffic Railing is to be provided on a retaining wall, the railing section will be the same as shown on Sheet 2 Section A-A. All other details such as the End Transition, Guardrail Connection, the maximum spacing of the 2/3" open joints and 1/4" V-Grooves shall apply.

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

V-GROOVES: Construct 1/4" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 2/3" Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall footings.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown.

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver’s right side when approaching the bridge. The Date shall be placed on the driver’s left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/4" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Joint locations matching the dimensions of the Deck Joints. For treatment of Railings on skewed bridges see Index 521-427.

Provide 2/3 Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.
Notes:

1. Begin placing Railing Bars 5T and 5X on Approach Slab at the railing end and proceed toward Begin or End Bridge to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars 5T and 5X as required to maintain cover in Railing End Transition.

2. Omit Railing End Transition and Guardrail if Concrete Traffic Railing is used beyond the Approach Slab or Retaining Wall. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Taper and Railing End Transition is omitted, extend Typical Section to end of the Approach Slab or limiting station on Retaining Wall, and space Bars 5T and 5X at 1'-0" (Typ.)

End View of Traffic Railing End Transition
(Approach Slab shown, Retaining Wall Junction Slab similar)
PRE-CURED SILICONE SEALANT (4" wide)

INTERMEDIATE JOINT SEAL NOTES:
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Traffic Railing.

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The 4'-6" vertical dimension shown for Bars 5T and 5X is based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slope vary from the above amounts, adjust this dimension accordingly to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. The reinforcement for the railing on a retaining wall shall be the same as detailed above with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-2".
6. The Contractor may utilize Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

STIRRUP BAR 5T
To Be Field Cut (7 of each required per Railing End Transition)

STIRRUP BAR 5X
To Be Field Cut (7 of each required per Railing End Transition)

SECTION THRU RECESSED 'V' GROOVE
TO FORM INSCRIBED LETTERS AND FIGURES

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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<tr>
<th>BILL OF REINFORCING STEEL</th>
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<td>Concrete</td>
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<td>Reinforcing Steel</td>
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(The above quantities are based on a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and counter 2% sidewalk cross slope)
V-GROOVES: Construct V-Grooves plumb. Space V-Grooves equally between 2” Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall footings.

TRAFFIC RAILING NOTES

RAILINGS ON RETAINING WALLS: If the Traffic Railing is to be provided on a retaining wall, the railing section will be the same as shown on Sheet 2. All other details such as the End Transition, Guardrail Connection, the maximum spacing of the 3/8 open joints and 3/8 V-Groove shall apply.

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver’s right side when approaching the bridge. The Bridge shall be placed on the driver’s left side when approaching the bridge. The Date shall be as shown in the General Notes of the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3” in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 3/8 V-Grooves. V-Grooves shall be formed by preformed letters and figures.


For treatment of Railings on skewed bridges see Index 521-427.

Provide 3/8 Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

CROSS REFERENCE:
For Section 4-4 and View B-B, see Sheet 2.
For Detail “A” see Sheet 3.
NOTES:
1. Begin placing Railing Bars 5T and 5X on Approach Slab at the railing end and proceed toward Begin or End Bridge to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5T and 5X shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars 5T and 5X as required to maintain cover in Railing End Transition.
2. Omit Railing End Transition and Guardrail if Concrete Traffic Railing is used beyond the Approach Slab or Retaining Wall. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Taper and Railing End Transition is omitted, extend Typical Section to end of the Approach Slab or limiting station on Retaining Wall, and space Bars 5T and 5X at 1'-0" (Typ.).

CROSS REFERENCE:
For location of Section A-A and View B-B see Sheet 1.

NOTE: For Bullet Railing Details, see Index 515-022.
REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are cut-to-cut.
2. The 3'-8" vertical dimensions shown for Bars 5T and 5X are based on a bridge deck with a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% raised sidewalk cross slope. If the raised sidewalk thickness, width or cross slopes vary from the above amounts, adjust these vertical dimensions accordingly to achieve a 6" minimum embedment into the bridge deck.
3. The reinforcement for the railing on a Retaining Wall shall be the same as detailed with ØA = 90°.
4. All reinforcing steel at the open joints shall have a 2" minimum cover.
5. Bars 5S may be continuous or spliced at the construction joints. Bar splices for Bars 5S shall be a minimum of 2'-2".
6. The Contractor may utilize Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

INTERMEDIATE JOINT SEAL NOTES:
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Traffic Railings.

SECTION THRU RECESSED "V" GROOVE 
TO FORM INSCRIBED LETTERS AND FIGURES

ESTIMATED TRAFFIC RAILING QUANTITIES

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<td>Reinforcing Steel</td>
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(The above quantities are based on a 6" thick x 6' wide raised sidewalk at low side of deck, 2% deck cross slope and a counter 2% sidewalk cross slope.)
This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes.

GUARDRAIL: For Guardrail Connection details see Index 536-001.

SUPERELEVATED BRIDGES: At the option of the Contractor the Traffic Railing on superelevated bridges may be constructed perpendicular to the roadway surface. If an adjoining railing is constructed plumb, transition the end of the Traffic Railing from perpendicular to plumb over a minimum distance of 20'-0". The cost of all modifications will be at the Contractor's expense.

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing along the centerline in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.

V-GROOVES: Construct ½ V-Grooves plumb. Space V-Grooves equally between ½ open joints and/or Deck Joints.

JOINTS: See Plans, Superstructure, Approach Slab and Retaining Walls Sheets for actual dimensions and joint orientation. Provide open Railing Joints at Deck Expansion Joint locations matching the dimensions of the Deck Joint. For treatment of Railings on skewed bridges see Sheet 2.

Provide ½ Intermediate Open joints at:

1. Superstructure supports where slab is continuous.
2. Ends of Approach Slabs adjacent to a Roadway Median Barrier.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a Concrete Median Barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".
**NOTES:**

1. When guardrail approaches are shown in the plans, begin placing Railing Bars 5R and 5S on Approach Slab at the railing end and proceed toward Begin or End Bridge to avoid conflict with guardrail bolt holes. Cut, bend and lap bars as shown to maintain cover. If required, adjustments to the bar spacing for Bars 5R and 5S shall be made immediately adjacent to Begin or End Bridge.

2. When a Concrete Barrier is used beyond the Approach Slab form a 5'-0" long Height Transition and raise Bars 5R up to maintain 2" top clearance.
PARTIAL PLAN VIEW OF BRIDGE DECK AND APPROACH SLAB WITH MEDIAN TRAFFIC RAILING

NOTES:
1) Median Traffic Railing reinforcement vertical Bars SW may be shifted up to 1" (Max.) and rotated up to 10 degrees as required to allow proper placement.

2) Transition Stirrup Bars SW shall be used as required at railing ends adjacent to expansion joints to facilitate placement of bars in acute corners. Place Transition Bars SW in a fan pattern to maintain spacing. Rotate bars in 10° (Max.) increments as required.

3) Median Traffic Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. See Structures Plans, Superstructure and Approach Slab Sheets for Details.

4) 3/4" Intermediate Open Joints and V-Grooves in railing shall be placed perpendicular or radial to the centerline of the median railing. See Structures Plans, Superstructure and Approach Slab Sheets for locations.

5) At begin or end approach slab extend slab at the median railing ends 3" (open side) as shown to provide a base for casting of the railing.

6) Work this Sheet with Approach Slab Indexes as applicable.

7) Deck Expansion Joint at begin or end bridge shown. Deck Expansion Joints at Pier or Intermediate Bents are similar.

8) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for skew angles, joint orientation, dimensions and details.

9) If Welded Wire Reinforcement is used in lieu of conventional reinforcement, placement of the WWR vertical elements shall be similar to those shown above. Clipping of horizontal elements to facilitate placement shall be minimized where possible. Where clipping is required, supplement horizontal elements by lap splicing with deformed bars having an equivalent area of steel.
The above quantities are based on a crowned roadway, with a 2% cross slope.

**Reinforcing Steel**

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(The above quantities are based on a crowned roadway, with a 2% cross slope.)

**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

**WELDED WIRE REINFORCEMENT NOTES:**

1. At the option of the Contractor, deformed Welded Wire Reinforcement (WWR) may be utilized in lieu of all Bars 5R, 5S and 5W. WWR must meet the requirements of Specification Section 931.
2. WWR at Railing End Transition shall be field bent inward as required (Figures 1 & 2) to maintain cover. The bottom of Piece 1 shall be cut to allow overlap.
3. Place WWR panels so as to minimize the end overhang of longitudinal wires at Railing Ends and Open Joints. Overhangs greater than 6" are not permitted.

**INTERMEDIATE JOINT SEAL NOTES:**

1. At an intermediate Open Joint, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 342.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. Include the cost of the Pre-cured Silicone Sealant in the Contract Unit Price for the Traffic Railing.

**DETAIL "C" - SECTION AT INTERMEDIATE OPEN JOINT**

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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Length as Required

BAR 5S

**FIELD CUT & REUSE**

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</tr>
</tbody>
</table>

(The above quantities are based on a crowned roadway, with a 2% cross slope.)
This railing has been structurally evaluated to be equivalent or greater in strength to other single-slope railings which have been crash tested to MASH TL-4 Criteria.

CONCRETE AND REINFORCING STEEL: See Structures Plans General Notes.

GUARDRAIL: For Guardrail Connection details see Index 536-001.

SUPERELEVATED BRIDGES: At the option of the Contractor the Traffic Railing on superelevated bridges may be constructed perpendicular to the roadway surface. If an adjoining railing is constructed plumb, transition the end of the Traffic Railing from perpendicular to plumb over a minimum distance of 20'-0". The cost of all modifications will be at the Contractor's expense.

PEDESTRIAN AND BICYCLE RAILING: See Index 515-021 and 515-022 for Notes, Details and post spacings for Traffic Railings with Pedestrian/Bicycle Bullet Railings.

V-GROOVES: Construct 1/2" V-Grooves plumb. Space V-Grooves equally between 1/2" Open Joints and/or Deck joints and at V-Groove locations on Retaining Wall footings.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "A". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

NAME, DATE AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by 1/2" V-Grooves. V-Grooves shall be formed by preformed letters and figures.

BARRIER DELINEATORS: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.


Provide 1/2" Intermediate Open Joints at:
(1) - Superstructure supports where slab is continuous.
(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall junction slabs.

TRAFFIC RAILING - (36" SINGLE-SLOPE)

Traffic Railing Notes

For Railing End Transition see Detail "A" (Typical when Guardrail Connection required)

For Railing Height Transition, see Detail "B" (Typical when Concrete Barrier or Traffic Railing required beyond Approach Slab at approach and/or trailing end)

For Treatment of Railings on skewed bridges see Sheet 3.
*Where railings of adjacent bridges are to be built back to back, the outside vertical plane of the railing and deck/approach slab may coincide along a plane centered 1'-4" from each gutter line. A bond breaker will be required. See Structures Plans, Superstructure Sheets for Details.*

**SECTION A-A**

**TYPICAL SECTION THRU TRAFFIC RAILING**

(Section thru Bridge Deck shown, Section thru Approach Slab and Retaining Walls similar)

- **Bars 4S** (Top) @ 6" sp.
- **Bars 4P** (Typ.) @ 6" sp. (Max.)
- **Bars 4V** (Typ.)
- **Bars 45** (Bottom)
- **Coping**
- **Connector Bolts**
- **Thrie-Beam Terminal**

**PLAN - RAILING END TRANSITION**

(Showing Bars 4V and 4S)

**DETAIL "A"**

NOTE: Omit Detail "A" and provide Detail "B" if Index 521-001 Concrete Barrier or Retaining Wall with 38" Single-Slope Traffic Railing is used beyond the Approach Slab. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Transitions are not required, extend Typical Section to end of the Approach Slab.

---

**VIEW B-B**

**END TRANSITION**

(Section thru Approach Slab shown, Section thru Retaining Walls similar)

**PLAN - RAILING END TRANSITION**

(Showing Bars 4P and 4S)

**DETAIL "A"**

**VIEW C-C**

**HEIGHT TRANSITION**

38" Single-Slope Traffic Railing

**ELEVATION - RAILING HEIGHT TRANSITION**

(Showing Transition to 38" Single-Slope Traffic Railing or Barrier)

**DETAIL "B"**

**NOTE:** Omit Detail "A" and provide Detail "B" if Index 521-001 Concrete Barrier or Retaining Wall with 38" Single-Slope Traffic Railing is used beyond the Approach Slab. See Structures Plans, Plan and Elevation Sheet and Roadway Plans. If Transitions are not required, extend Typical Section to end of the Approach Slab.
GENERAL NOTES:
1) Work this Sheet with Traffic Railing, Pedestrian/Bicycle Railing, and Approach Slab Indexes as applicable.
2) Deck Expansion Joint at begin or end bridge shown. Deck Expansion Joints at 1\(\frac{1}{2}\) Pier or Intermediate Bents are similar.
3) Partial Plan Views shown are intended as guides only. See Structures Plans, Superstructure and Approach Slab Sheets for details.
4) Railings on Raised Sidewalks shall be treated similar to the Partial Plan View of Bridge Deck with Traffic Railing.
5) If Welded Wire Reinforcement is used in lieu of conventional reinforcement, placement of the WWR vertical elements shall be similar to those shown above. Clipping of horizontal elements to facilitate placement shall be minimized where possible. When clipping is required, supplement horizontal elements by lap splicing with deformed bars having an equivalent area of steel.

NOTES:
1) Concrete Parapet reinforcement is not affected by skew angle, see Index 521-820 for details.
2) Parapet expansion joint shall match the deck expansion joint which shall be turned perpendicular or radial to the gutter line. See Structures Plans, Superstructure Sheets for details.
3) Traffic Railing reinforcement vertical Bars 4V & 4P may be shifted up to 1\(\frac{1}{2}\) (Max.) and rotated up to 10 degrees as required to allow proper placement. Bars 4V adjacent to expansion joints shall be field adjusted to maintain clearance and spacing, extra Bars 4V will be required. Cut bottom horizontal portion of 4V Bars to maintain maximum horizontal length to each vertical leg being placed. Discard the remainder of the bar. Rotate cut bars to maintain clearance.
4) Railing ends at deck expansion joints shall follow the deck joint with allowance for joint movement. Expansion joint at the inside face of parapet shall be turned perpendicular or radial to this line. See Structures Plans, Superstructure and Approach Slab Sheets for details.
5) 1\(\frac{1}{2}\) Intermediate Open Joints and V-Grooves in railing and parapet shall be placed perpendicular or radial to the gutter line or inside face of parapet line. See Structures Plans, Superstructure Sheets for locations.
6) At begin or end approach slab extend slab at the railing ends 3' (gutter side or back face of parapet as required) as shown to provide a base for casting of the railing. Field trim toe of Bars 4V by 1 inch as required to maintain concrete cover at edge of deck.
7) When Guardrail is shown on the approach, begin placing Railing Bars 4P and 4V on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guadrail bolt holes. If required, adjustments to the bar spacing for Bars 4P and 4V shall be made adjacent to Begin or End Bridge.
### Estimated Traffic Railing Quantiies

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(The above quantities are based on a 2% deck cross slope; railing on low side of deck.)

### Conventional Reinfocing Steel Bending Diagrams

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<tr>
<td>4&quot;</td>
<td>4</td>
<td>4'-10&quot;</td>
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Length as Required

### Reinforcing Steel Notes:
1. All bar dimensions in the bending diagrams are out to out.
2. The 8½" vertical dimensions shown for Bar 4V is based on a 6" embedment into the bridge deck without a raised sidewalk. If a raised sidewalk is to be provided, increase this dimension to achieve a 6" minimum embedment into the bridge deck. See Structures Plans, Superstructure and Approach Slab Sheets.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 2'-0".

### Intermediate Joint Seal Notes:
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. Include the cost of the Pre-cured Silicone Sealant in the Contract Unit Price for the Traffic Railing.
SECTION A-A

36" Single-Slope Shown
Other traffic railings similar

ELEVATION

DRAINAGE SLOT NOTES:
1. Use only when required for safety. See Plans for locations and size of drainage slots.
2. Maintain 2" minimum cover to all reinforcing. Trim P Bars over drainage slots and raise bottom S bars as necessary to maintain cover.
3. For slots greater than 6" in length, add additional vertical bars (V & P) on each side of the opening.
4. Drainage slot heights are 2" or 3". See the plans for size and location details.
This railing has been structurally evaluated to be equivalent or greater in strength to other single slope railings which have been crash tested to MASH TL-5.

CONCRETE AND REINFORCING STEEL: See Structures Plans, General Notes.

SUPERELEVATED BRIDGES: At the option of the Contractor the Traffic Railing on superelevated bridges may be constructed perpendicular to the roadway surface. If an adjoining railing is constructed plumb, transition the end of the Traffic Railing from perpendicular to plumb over a minimum distance of 20'-0". The cost of all modifications will be at the Contractor’s expense.

GUARDRAIL: For Guardrail connection details, see Index 536-001.

V-GROOVES: Construct Ʌ V-Grooves plumb. Space V-Grooves equally between Ʌ Open Joints and/or Deck Joints and at V-Groove locations on Retaining Wall footings.

END TRANSITIONS: When guardrail approaches are shown in the Plans, provide the Railing End Transition as shown in Detail "B". When a concrete traffic railing or barrier is shown on the approaches, provide the Railing Height Transition as shown in Detail "B".

DRAINAGE SLOTS: When shown in the plans, see Index 521-427 Sheet 3 for details.

NAME, DATE, AND BRIDGE NUMBER: The Name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be placed on the driver's left side when approaching the bridge. The Name shall be as shown in the General Notes in the Structures Plans. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by Ʌ V-Grooves. V-Grooves shall be formed by preformed letters and figures.


Provide Ʌ Intermediate Open Joints shall be provided at:

(1) - Superstructure supports where slab is continuous.

(2) - Ends of approach slabs when adjacent to retaining walls and at expansion joints on retaining wall footings.

GUARDRAIL CONNECTION: Install Barrier Delineators on top of the Traffic Railing 2" from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator to the color (white or yellow) of the near edgeline.
NOTE: Begin placing Railing Bars 5P and 5V on Approach Slab at the railing end and proceed toward Begin or End Bridge to ensure placement of guardrail bolt holes. If required, adjustments to the bar spacing for Bars 5P and 5V shall be made immediately adjacent to Begin or End Bridge. Shift Bars 5P and 5V (see Detail "A") as required to maintain cover in Railing End Transition.

* Where railings of adjacent bridges are to be built back to back, the outside vertical plane of the railing and deck may coincide along a plane centered 1'-6" from each gutter line. A bond breaker will be required. See Structures Plans, Superstructure Sheets for Details.

** See joint orientation note on Sheet 1.

*** Field Cut & Lap Bars 5V in Toe Transition to maintain clearance.

NOTE: Omit Detail "A" and provide Detail "B" if 44" Concrete Barrier or Single-Slope Traffic Railing is used beyond the Approach Slab. See Structures Plan and Elevation Sheet and Roadway Plans. If Transitions are not required, extend Typical Section to end of Approach Slab.

SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING
(Section Thru Bridge Deck shown - Section Thru Approach Slab similar)

VIEW B-B
END TRANSITION
(Section thru Approach Slab shown, Section thru Retaining Walls similar)
NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.

NOTE:
1. Provide Detail "B" height transition where 42" Single-Slope Traffic Railings increase to 44" Barriers beyond flexible pavement approaches.
2. Work Detail "B" with Index 400-090.
3. Provide Detail "C" height transition where 42" Traffic Railings are required on bridge, and 36" or 38" Barriers are shown on approaches.
4. Work Detail "C" with Indexes 400-090 or 400-091, 521-427, and 521-610 as necessary.
5. Field cut 5P Bars as shown to maintain 2" min. (4" max.) cover at top of traffic railing.
Note:
The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.

**Reinforcing Steel Notes:**
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 6S1 may be continuous or spliced at the construction joints. Lap splices for Bars 6S1 and 5S2 shall be a minimum of 3'-0" and 2'-2", respectively.
4. Contractors may utilize deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

**Concrete:**
- CY/LF: 0.143

**Reinforcing Steel:**
- LB/LF: 39.34

Note: The estimated railing quantities are based on a 2% deck cross slope; railing on low side of deck.
TRAFFIC RAILING NOTES

This Traffic Railing Retrofit has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested previously and approved for a NCHRP Report 350 Test Level 4 rating, except for the Tapered End Transition on Index 521-481.

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit), Spread Footing Approaches and replacement curb sections shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60, except Expansion Dowel Bar B which shall be ASTM A36 smooth round bar not dip galvanized in accordance with the Specifications.

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe. SDRI.5. End Cap shall be ASTM D2466 PVC socket fitting. Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible expanded polystyrene plug is required in the opposite end of the assembly for correct dowel positioning during railing casting. Correct dowel positioning is required in order to provide for thermal movement of the deck.

ADHESIVE-BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs. for Dowel Bars 6D in the inside face (traffic side) of the railing (1’-0” embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5’ min. embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Indexes are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

NAME, DATE AND BRIDGE NUMBER: The name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be the year the bridge was constructed. Letters and figures may be 3” tall black plastic as approved by the Engineer or V-Grooves. V-Grooves shall be formed by preformed letters and figures. ELEVATION MARKERS: Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing elevation markers are removed.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing 2” from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator color (white or yellow) to the near edgeline.

PAYMENT: Payment under Traffic Railing (Vertical Face Retrofit) includes all materials and labor required to construct the railing and incident work as required for transition blocks, curbs, spread footing approaches, and Barrier Delineators.

DETAILS FOR BRIDGES ON HORIZONTALLY CURVED ALIGNMENTS:

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60, except Expansion Dowel Bar B which shall be ASTM A36 smooth round bar not dip galvanized in accordance with the Specifications.

CONCRETE: Concrete for the Traffic Railing (Vertical Face Retrofit), Spread Footing Approaches and replacement curb sections shall be Class IV. Concrete for Curb Transition Blocks shall be Class II (Bridge Deck).

EXPANSION SLEEVE ASSEMBLY: Pipe sleeve shall be ASTM D2241 PVC pipe. SDRI.5. End Cap shall be ASTM D2466 PVC socket fitting. Schedule 40. End of Sleeve assembly at railing open joint shall be sealed with silicone to prevent concrete intrusion during railing casting. A compressible expanded polystyrene plug is required in the opposite end of the assembly for correct dowel positioning during railing casting. Correct dowel positioning is required in order to provide for thermal movement of the deck.

ADHESIVE-BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 23,800 lbs. for Dowel Bars 6D in the inside face (traffic side) of the railing (1’-0” embedment) and 18,500 lbs for Dowel Bars 6D along the outside face of the traffic railing (5’ min. embedment).

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Indexes are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

NAME, DATE AND BRIDGE NUMBER: The name and Bridge Number shall be placed on the Traffic Railing so as to be seen on the driver's right side when approaching the bridge. The Date shall be the year the bridge was constructed. Letters and figures may be 3” tall black plastic as approved by the Engineer or V-Grooves. V-Grooves shall be formed by preformed letters and figures. ELEVATION MARKERS: Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing elevation markers are removed.

BARRIER DELINEATORS: Barrier Delineators shall meet Specification Section 993. Install Barrier Delineators on top of the Traffic Railing 2” from the face on the traffic side in accordance with Specification Section 705. Match the Barrier Delineator color (white or yellow) to the near edgeline.

PAYMENT: Payment under Traffic Railing (Vertical Face Retrofit) includes all materials and labor required to construct the railing and incident work as required for transition blocks, curbs, spread footing approaches, and Barrier Delineators.

**ESTIMATED TRAFFIC RAILING QUANTITIES**

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<tbody>
<tr>
<td>Concrete</td>
<td>CF/FT</td>
<td>0.064</td>
<td>0.003 per in. height</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/FT</td>
<td>13.27</td>
<td>0.10 per in. length</td>
</tr>
</tbody>
</table>

(Quantities are based on a 9" curb, no curb cross slope and 1’-0” embedment length of Bars 6D, if the curb height or embedment length differs from that shown, increase or decrease quantity by the given per inch increment.) See Index 521-480, Sheet 4 for Spread Footing Approach Quantities.

**PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT - SCHEMES 2 THRU 5**

* Place 1” thick polystyrene blockout over limits of bridge deck expansion joint full width to the end of the Traffic Railing to allow for thermal movement. Seal forms to prevent mortar leakage into the expansion joint.

**PARTIAL ELEVATION OF RAILING SHOWING FINGER/SLIDING PLATE JOINT AT BEGIN OR END BRIDGE - SCHEME 1**

*Guardrail Transition not shown for clarity.*
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAM

BILL OF REINFORCING STEEL

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed for a bridge deck.
3. All reinforcing steel in the Vertical Face Retrofit Railing shall have a 2" minimum cover.
4. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.
5. Expansion Dowel Bars B shall be ASTM A36 smooth round bar and hot-dip galvanized in accordance with the Specifications.

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) TYPICAL DETAILS & NOTES

PARTIAL PLAN OF RAILING (SKEW ANGLE θ GREATER THAN 20°)
(Skewed Deck Joint at Begin or End Bridge Shown, Skewed Deck Joint at Intermediate Pier or Bent Similar)

PARTIAL PLAN OF RAILING (SKEW ANGLE θ = 20° OR LESS)
(Skewed Deck Joint at Begin or End Bridge Shown, Skewed Deck Joint at Intermediate Pier or Bent Similar)

SKEW DETAIL

Dowel Installation Notes:
1. Shift dowel holes to clear if the existing reinforcement is encountered.
2. See Index 521-481 thru 521-484 for spacing of Bars 6D.

* ½ Preformed Joint Filler at top of Existing Curb shall extend beyond the joint material (Silicone, poured rubber, armored neoprene seal or sliding plates) as shown to prevent concrete intrusion during railing casting and shall be placed so as not to restrict in any way normal joint movement.

** See Index 521-481 thru 521-484 for spacing of Bars 6D.

1'-0" 1'-0" 4'-10"
**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

1. On approach end provide a Roadway Guardrail Transition, Index 536-003 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is not along the Wing Wall, see Schemes 2 or 3, Index 521-481, Sheet 2 and 3. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 for treatment and Details.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and ground over.

**NOTES:**

- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index 521-480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.
- Provide 1/2 Intermediate Open Joints at:
  - (1) Superstructure supports where slab is continuous.
  - (2) Intermediate Open Joints to be as noted for skewed deck joints)
- Provide open Railing Joints at Deck Joint.
- Non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment at skewed deck joints see Skew Detail, Index 521-480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

**TYPICAL SECTION THRU EXISTING TRAFFIC RAILING SHOWING LIMITS OF REMOVAL**

**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON FULL DEPTH CURB (BRIDGE SHOWN, WING WALL SIMILAR)**

**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON FULL DEPTH CURB (BRIDGE SHOWN, WING WALL SIMILAR)**
**SCHEME 1 NOTES:**

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb. See Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

**SCHEME 2 NOTES:**

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, see Index 521-481, Sheet 1. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb. See Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
SCHEME 3 NOTE:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)

SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS
**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index 538-002 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is above the deck, see Schemes 2, 3, 4 or 5, Sheets 3 and 4. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-10" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 for treatment and Details.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2, 3, 4 or 5, & Index No. 521-484, Sheets 2, 3 or 4, & Index No. 521-480. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.

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**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

- **Assemblies & Bars 4C not shown for clarity**
- **Superstructure Supports**
- **Existing Traffic Railing, Expansion Dowel Assemblies & Bars 4C not shown for clarity**

**NOTES:**

1. On approach end provide a Roadway Guardrail Transition, Index 538-002 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is above the deck, see Schemes 2, 3, 4 or 5, Sheets 3 and 4. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-10" minimum dimension shall apply to both the front and back face of the railing. For treatment of trailing end see Roadway Plans. If vertical face retrofit extends beyond bridge and approach slab ends, see Index 521-484 for treatment and Details.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2, 3, 4 or 5, & Index No. 521-484, Sheets 2, 3 or 4, & Index No. 521-480. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1" below existing concrete and grouted over.
SCHEME 1
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS

SCHEME 2 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.
2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

SCHEME 3

SCHEME 4

SCHEME 3 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above.
2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.
3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.

SCHEME 4 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above.
2. Dowel Bars 4N may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.
3. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.

DESCRIPTION:

REVISED

LAST

INDEX

SHEET

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) WIDE CURB

FY 2020-21

STANDARD PLANS

INDEX 521-482

SHEET 3 of 4
PARTIAL PLAN OF RAILING

Front Face of Backwall, Begin or End Bridge & Match Line (See Sheet 1)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post, Railing Reinforcing and Expansion Dowel Assemblies not shown for clarity)

SCHEME 5
RAILING END TREATMENT FOR PARALLEL CURBS

*** Curb heights vary from 3" Min. to 10" Max. Match height and shape of existing curb on bridge.

SCHEME 5 NOTES:

1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.

2. Dowel Bars 4M may be installed on a maximum angle of 45° to the cut edge of the Approach Slab as shown to facilitate drilling of holes and installation of bars.

3. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.

4. Field bend Dowel Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

5. At the Contractor's option, along the length of the Approach Slab curb that is to be replaced, Dowel Bars 6D may be cast in with the new section of curb as shown or they may be installed in drilled holes in the new section of curb using an Adhesive Bonding Material System with a 1'-0" minimum embedment.
**Notes:**

1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (as shown) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is on the bridge, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is along the Wing Wall, see Schemes 2 or 3, Sheets 2 & 3. For treatment of trailing end see Roadway Plans. For non skewed deck joint shown, actual joint dimensions and orientation vary. For treatment of skewed deck joints see Skew Detail, Index 521-480. Provide open Railing Joints at Deck Expansion Joint locations matching the dimension of the Deck Joint.

2. Field cut Bars 5S and Dowel Bars 6D to maintain clearance within Vertical Face Retrofit Railing. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment.

3. Where existing structure has been removed and not encased in new concrete; match adjoining areas and finish flat by grouting or grinding as required. Exposed existing reinforcing steel not encased in new concrete shall be burned off 1” below existing concrete and grouted over.

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**TYPICAL TREATMENT OF RAILING ALONG BRIDGE**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

**TYPICAL SECTION THRU EXISTING TRAFFIC RAILING SHOWING LIMITS OF REMOVAL**

**SECTION A-A**

**SECTION B-B**

**Cross Reference:**

For General Notes, Estimated Quantities, Dowel Details, Expansion Dowel Detail, Reinforcing Steel Notes & Bending Diagram see Index 521-480.

---

**PARTIAL PLAN OF RAILING**

* Partial Elevation of Inside Face of Railing (Expansion Dowel Assemblies and Bars 4C not shown for clarity)

**NOTES:**

- 11/18/2019
- 07/01/13
- V-Groove in both faces and top of Traffic railing
- 2 equal sp. @ 3½" Max.
- V-Groove Spacing = 30'-0" (Max.)
- Limiting Station of Traffic railing
- V-Groove Spacing ~ 30'-0" (Max.)
- Section A-A
- Section B-B
- Roadway Guardrail Transition
- Existing Bridge Deck

**V" Groove Spacing**

1" - Vertical Face Retrofit Railing

**Existing Bridge Deck**

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

* Existing Bridge Deck

---

**TRAFFIC RAILING - (VERTICAL FACE RETROFIT)**

**INTERMEDIATE CURB**

**INDEX**

**SHEET**
SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
3. If a Special Steel Guardrail Post is required for attachment to the top of a sloping Wing Wall, saw cut and remove a wedge shaped portion of the sloping Wing Wall as required to provide a level surface for post installation.

SCHEME 2 NOTES:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1. On skewed bridges, if the skew along the deck joint extends across the width of the railing, the 2'-6" minimum dimension shall apply to both the front and back face of the railing.
2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend beyond end of existing End Bent Wing Wall, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Railing End Transition and Transition Block may be omitted on trailing ends with no opposing traffic.
3. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
SCHEME 3 NOTE:
1. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment. If limiting station of Roadway Guardrail Transition is along the Wing Wall, attach Thrie-Beam Terminal Connector to railing as shown above. If limiting station of Roadway Guardrail Transition is on the bridge, see Sheet 1.
SCHEMATIC PLAN VIEW - NEAR LANE APPROACH

SCHEMATIC PLAN VIEW - OPPOSING LANE APPROACH

CROSS REFERENCES:
For General Notes, Dowel Details, Expansion Dowel Details, Reinforcing Steel Notes and Reinforcing Steel Bending Diagram see Index 521-480.

* Guardrail or Crash Cushion may also be shown in the Contract Plans, in lieu of the Tapered End Transition.
PARTIAL PLAN VIEW

DETAIL "B"
TRANSITION TO NON-CURB APPROACH
(Reinforcing Not Shown For Clarity)

PARTIAL ELEVATION VIEW

TAPERED END TRANSITION
NOTES:
1. On approach end provide a Roadway Guardrail Transition, Index 536-002 (Sheet 16 - Scheme 1) or other site specific treatment. See Roadway Plans for limiting station of Roadway Guardrail Transition or other site specific treatment.
2. Provide Railing & Curb Base Transitions (as shown) if curb does not extend beyond end of Spread Footing Approach, see Roadway Plans. Railing End Transition & Railing & Curb Base Transitions may be omitted on trailing ends with no opposing traffic.
SECTION X-X (TYPICAL CURB, TYPE VARIES, TYPE F SHOWN)  
(See Index 520-001 and Plans for Details)

* Match Cross Slope of high side and low side at begin or end bridge or approach slab.

** Match curb height of adjacent bridge and approach slab. Adjust height in Transition area to match adjoining Roadway curb.
SCHEME 1 – MODIFICATION FOR INDEX 521-481, 521-482 AND 521-483 - SCHEME 1
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLE WITH NARROW CURBS (SHOWN), WIDE CURBS AND INTERMEDIATE CURBS (SIMILAR)

PARTIAL PLAN

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

EXPANSION DOWEL SLEEVE ASSEMBLY

PARTIAL PLAN

EDGE OF EXISTING APPROACH SLAB (LOCATION VARIES)

BARS 5F (TYP.)

BARS 4G (TYP.)

FIELD CUT BARS 5E TO MAINTAIN 2" COVER

TOP OF CURB

1/2" PREFORMED JOINT FILLER

BARS 5F (TYP.)

BARS 4G (TYP.)

EXISTING APPROACH SLAB

FINAL RIDDING SURFACE

NOTES:
** MATCH CURB HEIGHT OF ADJACENT BRIDGE AND APPROACH SLAB.

EDGE OF EXISTING APPROACH SLAB (LOCATION VARIES)

FIELD CUT BARS 5E TO MAINTAIN 2" COVER

TOP OF CURB

1/2" PREFORMED JOINT FILLER

BARS 5F (TYP.)

BARS 4G (TYP.)

EXISTING APPROACH SLAB

FINAL RIDDING SURFACE

Note:
** Match curb height of adjacent bridge and approach slab.
NOTES:
1. Remove existing concrete along saw cut joints. Existing reinforcing steel may be cut at joint or extended into new concrete. Exposed existing reinforcing not encased in new concrete shall be removed 1" below existing concrete surface and grouted over.

PARTIAL PLAN

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 2 ~ MODIFICATION FOR INDEX 521-481 - SCHEME 2
RAILING END TREATMENT FOR PARALLEL WING WALLS WITH NARROW CURBS

CROSS REFERENCES:
For Section A-A see Sheet A.
For Section D-D see Sheet 5.
For Expansion Dowel Assembly and placement of Dowel Bars 6D Details see Index 521-480.

DESCRIPTION:

REV REVIEW

LAST
07/01/09
07/01/09

FY 2020-21

TRAFFIC RAILING - (VERTICAL FACE RETROFIT) SPREAD FOOTING APPROACH

INDEX 521-484

6 of 10

REVISION
4:10:15 PM
11/18/2019
Existing Flared Wing Post to be removed to top of curb
Curb & portion of Approach Slab (when present, shown shaded) to be removed
Approach Slab Transition
Bars 5F @ 8" spacing
Max. (Typ.) Clip bars as reqd. to maintain Cover
Max. (Typ.) tied to Bars 5F

Bars 5E @ 8" spacing Max.
(Varies) tied to Bars 5F (tied minimally as required)

Bars 4G (Typ.)
(Varies)

Bars 5S

Bars 5F @ 8" spacing
Max. (Typ.) Clip bars as
reqd. to maintain Cover

Bars 4G

Bars 5S

Bars 5E @ 8" spacing
Max. (Typ.) tied to Bars 5F

Bars 5S

Bars 5E

Bars 4G

Bars 6D

Bars 4C

Dowel

Expansion Dowel Sleeve Assemblies

Asphalt Overlay when present (Varies)

Note:
** Match curb height at adjoining existing end bent wing.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

SCHEME 3 ~ MODIFICATION FOR INDEX 521-481 SCHEME 3
RAILING END TREATMENT FOR FLARED WING WALLS
WITH NARROW CURBS

PARTIAL PLAN OF RAILING

Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-481, Sheet 9)
SCHEME 6 - MODIFICATION FOR INDEX 521-483 SCHEME 2
RAILING END TREATMENT FOR PARALLEL CURBS AND WING WALLS WITH INTERMEDIATE CURBS

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

Note:
* Match curb height at adjoining existing end bent wing.

CROSS REFERENCES:
For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Expansion Dowel Assembly and placement of Dowel Bars 6D Details see Index 521-480.
**Match curb height at adjoining existing end bent wing.**

3" (Min.)

Bars 5F @ 8" spacing Max. (Typ.) Clip bars as reqd. to maintain Cover

Existing End Bent Wing

**Bars 5E @ 8" spacing Max. (Typ.) tied to Bars 5F (hit bars minimally as required)**

**Organic Felt bond breaker against wing wall only**

**Bars 5S @ 8" spacing Max. (Typ.)**

**Bars 5S**

2" @ 7'/2"

3" Cover (Typ. ends)

**Bars 5S (Typ.)**

3" Cover (Min.)

2'-10" (Min. match Final Riding Surface Asphalt Overlay when present)

**Bars 5S**

Bars 4G (Typ.)

Max. (Typ.) Clip bars as reqd. to maintain Cover

**Bars 5F @ 8" spacing**

Max. (Typ.)

**Bars 5F**

2" Cover

1'-4" ±

**Bars 5E @ 8" sp.**

3" Cover

**Bars 5S (Typ.)**

2" Cover

1'-3" Max. Spacing

Gutter Line

2 @ 1'-0"

Expansion Dowel Sleeve Assembly

35°

**Asphalt Overlay when present (Varies)**

**Asphalt Overlay**

**Front Face of Backwall, Begin or End Bridge & Match Line (See Index 521-483, Sheet 3)**

**Existing Curb**

**Existing Approach Slab**

**Existing End Bent Wing Wall**

**Top of Curb**

**3" Cover (Typ. ends)**

**3" Cover**

**Varies 10" (Min.)**

**Varies**

**Existing Approach Slab**

**Edge of Existing Approach Slab (Location Varies)**

**PARTIAL PLAN OF RAILING**

**PARTIAL ELEVATION OF INSIDE FACE OF RAILING**

(Expansion Dowel Assemblies and Bars 4C not shown for clarity)

**SCHEME 7 ~ MODIFICATION FOR INDEX 521-483 SCHEME 3**

**RAILING END TREATMENT FOR PARALLEL CURBS AND FLARED WING WALLS WITH INTERMEDIATE CURBS**

**CROSS REFERENCES:**

For Section A-A see Sheet 4.
For Section D-D see Sheet 5.
For Section H-H see Sheet 9.
For Expansion Dowel Assemblies and placement of Dowel Bars 6D Details see Index 521-480.
ELEVATION OF INSIDE FACE OF RAILING/NOISE WALL (BRIDGE MOUNTED RAILING/NOISE WALL SHOWN, WALL OR FOOTING MOUNTED RAILING/NOISE WALL SIMILAR) (Reinforcing Steel not shown for clarity)

Notes:
1. Work this with indexes 521-512 through 521-515.
2. Construct Traffic Railing/Noise Wall and joints plumb, not perpendicular to the roadway surface.
3. Concrete:
   A. Class II for slightly aggressive environments.
   B. Class IV for moderately or extremely aggressive environments.
4. Provide open joints every 30 to 90 feet. Align open joints with construction joints in the Junction Slab or footing.
5. Install Barrier Delineators 2'-4" above the riding surface in accordance with Specification Section 505. Match the Delineator color (White or Yellow) to the near edgeline.
6. Slip forming of the traffic railing portion is permitted.

CROSS REFERENCE:
For Detail "B" and V-Groove Lettering Detail see Sheet 4.
For Section A-A see Sheet 3.
For Section C-C and Detail "A" see Sheet 5.

NAME, DATE AND BRIDGE NUMBER: For Railing/Noise Wall on bridges, place the Name as shown in the General Notes in the Structures Plans and Bridge Number on the Traffic Railing so as to be seen on the driver’s right side when approaching the bridge. Place the Date on the driver’s left side when approaching the bridge. The Date shall be the year the bridge is completed. For a widening when the existing railing is removed, use both the existing date and the year of the widening. Black plastic letters and figures 3" in height may be used, as approved by the Engineer, in lieu of the letters and figures formed by Ƅ" V-Grooves. V-Grooves shall be formed by preformed letters and figures.
ELEVATION OF RAILING/NOISE WALL REINFORCING STEEL

(INTERMEDIATE OPEN JOINT SHOWN, DECK JOINT SIMILAR)

(Bars 5S1 in Railing not shown for clarity)

NOTES:

* Field Cut Bars 5S1 to maintain clearance.
** Terminate 3/4" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V only applies when Single-Slope Traffic Railing continues. For transition to guardrail see Sheet 5.

Begin Bars 5R each face, paired with Bars 5V.
4' Spacing (Typ.)

18 sp. @ 4' = 6'-0" (Typical at open joints)

Bars 5S1

Bars 5S2

Bars 5V

3/4" Int. Open Joint

Bridge Deck or Approach Slab

Bars 5S2

Bars 5S2

Bars 5V @ 6" Spacing (Typ.)

ELEVATION OF RAILING/NOISE WALL END TAPER (ADJACENT TO TRAFFIC RAILING SHOWN, GUARDRAIL ATTACHMENT SIMILAR SEE DETAIL "A", SHEET 5)

(Bars 5S1 in Railing not shown for clarity)

NOTES:

* Field Cut Bars 5R & 5S1 to maintain clearance.
** Terminate 3/4" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V only applies when Single-Slope Traffic Railing continues. For transition to guardrail see Sheet 5.
**CROSS REFERENCE:**
For locations of Section A-A see Sheet 1.
For location of View B-B, see Sheet 5.

**NOTES:**
1. Bottom Bars S51 shown are part of the Traffic Railing/Noise Wall reinforcing.

See Superstructure Sheets in the Plans for additional Bridge Deck reinforcing.

---

**SECTION A-A**
TYPICAL SECTION THRU TRAFFIC RAILING/NOISE WALL
(Section Thru Bridge Deck Shown, Section Thru Approach Slab Similar)

**VIEW B-B**
END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT AT END OF APPROACH SLAB
(Flexible Pavement Approach Slab Shown, Rigid Pavement Approach Slab Similar)
Paint Recessed Surfaces Black

**SECTION THRU RECESSED 'V' GROOVE TO FORM INSCRIBED LETTERS AND FIGURES**

**INTERMEDIATE JOINT SEAL NOTES:**
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Traffic Railing.

**DETAIL 'B' - SECTION AT INTERMEDIATE OPEN JOINT**

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>5</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>5'-2½&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>4'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>As Req.</td>
</tr>
<tr>
<td>S2</td>
<td>3</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>V</td>
<td>5</td>
<td>6'-6½&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 5R shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars 5S1 may be continuous or spliced at the construction joints. Lap splices for Bars 5R2 and 5S1 shall be a minimum of 2'-2".
5. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

**ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Railing)</td>
<td>CY/LF</td>
<td>0.107</td>
</tr>
<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
<td>0.136</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/LF</td>
<td>69.86</td>
</tr>
</tbody>
</table>

(The above quantities are based on the bridge mounted typical section, 2% deck cross slope and railing on low side of deck.)

**CROSS REFERENCE:**
For locations of Detail "B", see Sheet 1.
DETAIL "A" NOTES:
1. Begin placing Railing Bars 5V at the railing end and proceed toward the guardrail (thrie beam) terminal connector to ensure placement of guardrail bolt holes. Pair Bars 5R with Bars 5V as shown. Clearance of Bars 5R & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if holes are to be drilled. Shift bars locally where conflicts occur.
2. For Guardrail connection details see Index 536-001.
3. Omit Railing End Transition if a 36° Single-Slope Traffic Railing is used beyond the End Taper. See the Plan Sheets.
4. Field cut Bars 5R2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R1 front leg (more plumb) to maintain cover and tie to S1 Bars.
Light Pole Pedestal for Approach Slab or Bridge Deck Thickness at Coping 1'-5\(\frac{1}{2}\)" or Greater
REINFORCING STEEL NOTES:

a. When Pedestal is attached to Pedestrian/Bicycle Railing - Index 521-820 or on an 8" wide concrete curb and the Bridge Deck or Approach Slab thickness is less than 2'-0" Bars 4F3 shall have leg length and bar length shown in parentheses.

b. The number of bars shown in parentheses is for Bars 4F4 when Pedestal is attached to Pedestrian/Bicycle Railing - Index 521-820 or an 8" wide concrete curb and the Bridge Deck or Approach Slab thickness is less than 2'-0". Bars 4F3 shall have leg length and bar length shown in parentheses.

c. Lap Splices for Bars 4F1, 4F2 & 4F3 shall be a minimum of 1'-4".

d. Bars 4J1 and 4J2 are not required when Pedestal thickness is less than 1'-5". Field trim height of bars to maintain cover when Pedestal thickness is less than 2'-0". Field trim length of Bars 4J2 on Retaining Wall Coping to maintain cover. Thickness is less than 2'-0".

3. Lap Splices for Bars 4F1, 4F2 & 4F3 shall be a minimum of 1'-4".

4. Bars 4J1 & 4J2 when Pedestal Thickness is 1'-5" or greater) Field trim height of bars to maintain cover when Pedestal thickness is less than 2'-0". Field trim length of Bars 4J2 on Retaining Wall Coping to maintain cover.

e. All bar dimensions in the bending diagrams are out to out.

LIGHT POLE PEDESTAL NOTES:

1. Concrete and Reinforcing Steel required for the construction of the Pedestal shall meet the same requirements as the Traffic Railing or Pedestrian/Bicycle Railing the Pedestal is attached to.

2. Light Pole Pedestal may be used with the following:
   - Index 521-422 - Traffic Railing (42" Vertical Shape).
   - Index 521-423 - Traffic Railing (42" Vertical Shape).
   - Index 521-820 - Pedestrian/Bicycle Railing.
   - Index 515-021 - Pedestrian/Bicycle Bullet Railing for Pedestal is attached to Pedestrian/Bicycle Railing - Index 521-820 with Bridge Deck or Approach Slab thinner than 1'-1".

3. Unless otherwise noted, Traffic Railing (36" Single-Slope) is shown in all Views and Sections. The Pedestal details for other Traffic Railings shall be included in the Bid Price for the Traffic Railing or Pedestrian/Bicycle Railings are similar.

4. ANCHOR BOLTS:
   - Anchor Bolt design is based on the standard roadway Aluminum Light Pole configurations shown on Index 715-001.
   - Anchor Bolt Diameter: See Table 1
   - Anchor Bolts: ASTM F1554 Grade 55.
   - Washers: ASTM F336 Type 1.
   - Coating: Galvanize all Nuts, Bolts, Washers, in accordance with ASTM F2329.
   - Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index 715-002.

ANCHOR PLATE DETAIL

- 4" (Bolt Dia.) Ø
- 11 3/4" Ø
- Bolt hole circle
- Light Pole Base Plate (Level)
- Washer (Typ.)
- Bottom of Anchor Plate
- Anchor Plate
- Light Pole (See Spec. 649-6)
- Leveling Nut
- Wire Screen (See Spec. 649-6)

TABLE 1 - DESIGN LIMITATIONS FOR ANCHOR BOLTS (1" Dia.)

<table>
<thead>
<tr>
<th>WIND SPEED (MPH)</th>
<th>LENGTH (1&quot;)</th>
<th>DESIGN MOUNTING HEIGHT (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>140</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>160</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>180</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>200</td>
<td>15</td>
<td>75</td>
</tr>
</tbody>
</table>

* Above natural ground or MLW
1. Use 1" Diameter Anchor Bolt for Bridge Deck height greater than shown, in Table 1, up to 75'.

LAP SPlices for Bars 4F1, 4F2 & 4F3 shall be a minimum of 1'-4".

TABLE 1 - DESIGN LIMITATIONS FOR ANCHOR BOLTS (1" Dia.)

<table>
<thead>
<tr>
<th>WIND SPEED (MPH)</th>
<th>LENGTH (1&quot;)</th>
<th>DESIGN MOUNTING HEIGHT (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>140</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>160</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>180</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>200</td>
<td>15</td>
<td>75</td>
</tr>
</tbody>
</table>

* Above natural ground or MLW
1. Use 1" Diameter Anchor Bolt for Bridge Deck height greater than shown, in Table 1, up to 75'.

WASHERS: ASTM F436 Type 1.

REINFORCEMENT STEEL QUANTITIES PER LIGHT POLE PEDESTAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Per Pedestal Thickness</td>
<td>CF/In.</td>
<td>0.040</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>195 (182)</td>
</tr>
</tbody>
</table>

THE REINFORCING STEEL QUANTITY SHOWN IN PARENTHESES IS FOR A PEDESTAL ATTACHED TO PEDESTRIAN/BICYCLE RAILING. FOR CONCRETE AND REINFORCING STEEL SLAB THINNER THAN 1'-1", ADD 59 LBS. FOR 4J1 & 4J2 WHEN PEDESTAL THICKNESS IS 1'-5" OR GREATER.

INDEX 521-660

LIGHT POLE PEDESTAL - BRIDGE
PEDESTRIAN/BICYCLE RAILING NOTES:

CONCRETE PARAPET: Concrete parapet shall be placed vertical and top surface shall be level transversely.

RAIL AND POST DETAILS: For Rail, Post, Rail Splice/Expansion Assembly fabrication and installation details see Index 515-022.

BRIDGE FENCING: For Bridge Fencing see Index 550-010 thru 550-013 in lieu of Posts and Rails on Index 515-022.

PAYMENT: Concrete parapet shall be paid for under the contract unit price for 27" Concrete Parapet (Pedestrian/Bicycle), LF, and Rails shall be paid for under Bullet Railings, LF.

* See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation. Open Parapet Joints at Deck Expansion Joint locations shall match the dimension of the Deck Joint. For treatment of Railings on skewed bridges see Index 521-427. Deck Joint at 1/2 Pier or Intermediate Bent similar.

** 3/4" Intermediate Open Joints shall be provided at locations coinciding with 3/4" Joints for the Traffic Railing.
**Conventional Reinforcing Steel Bending Diagrams**

**Bill of Reinforcing Steel**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>P1</td>
<td>4</td>
<td>9'-6&quot;</td>
</tr>
<tr>
<td>P2</td>
<td>4</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>As Req'd</td>
</tr>
</tbody>
</table>

**Estimates Concrete Parapet Quantities**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.056</td>
</tr>
<tr>
<td>Reinforcing Steel (P1 &amp; S)</td>
<td>LB/FT</td>
<td>6.35</td>
</tr>
<tr>
<td>Reinforcing Steel (P2 &amp; S)</td>
<td>LB/FT</td>
<td>6.60</td>
</tr>
</tbody>
</table>

(The above quantities are based on a deck with a 2% cross slope)

**Intermediate Joint Seal Note:**

1. At intermediate open joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant meeting the requirements of Specification Section R32.
2. Apply sealant prior to any Class V finish coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Concrete Parapet.

**Notes:**

1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the parapet on a retaining wall shall be the same as detailed above for a 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bars 4S may be continuous or spliced at the construction joints. Bar splices for Bars 4S shall be a minimum of 1'-0".
5. Bars 4P2 may be used in lieu of Bars 4P1.
6. At the option of the Contractor deformed WWR may be used in lieu of all Bars 4P or 4P2 and 4S.
ALTERNATE REINFORCING (WELDED WIRE REINF.) DETAILS

NOTE: Place wire panels to ensure vertical wire is within 4" of open joints.

D9.9 or #4 Bar (Lap Splice Each Longitudinal Wire) (Typ.)

BAR 3R

BAR 4S

BAR 4S

BAR 3R

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>R</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>3</td>
<td>3'-2&quot;</td>
<td>As Reqd.</td>
</tr>
</tbody>
</table>

DETAIL "A" - SECTION AT INTERMEDIATE OPEN JOINT

ESTIMATED CONCRETE RAILING QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.079</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>13.12</td>
</tr>
</tbody>
</table>

(All bar dimensions in the bending diagrams are out to out.)

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. The reinforcement for the railing on a retaining wall shall be the same as detailed above for an 8" deck.
3. All reinforcing steel at the open joints shall have a 2" minimum cover.
4. Bar splices for Bars 4S shall be a minimum of 1'-8".
5. In the option of the Contractor deformed WWR may be used in lieu of all Bars 3R and 4S.

INTERMEDIATE JOINT SEAL NOTES:
1. At Intermediate Open Joints, seal the lower 6" portion of the open joint with Pre-cured Silicone Sealant in accordance with Specification Section 932.
2. Apply sealant prior to any Class 5 Finish Coating and remove all curing compound and loose material from the surface prior to application of bonding agent.
3. The cost of the Pre-cured Silicone Sealant shall be included in the Contract Unit Price for the Railing.
FENCING NOTES

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1/2 in). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:
See Superstructure Sheets for Traffic Railing details.

CONCRETE PARAPET DETAILS:
See Index 521-820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-820.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace rails and bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, ties, hog rings, tension bars and bands, post and loop caps, pipe clamps, base plates, anchor rods, bolts, nuts, washers, shim plates, spacers, bearing pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

CROSS REFERENCE:
For Table of Fence Components, Table of Post Attachment Components, View A-A and Detail "A" see Sheet 2.
For Pull Post Assembly Detail for Traffic Railings see Sheet 3.
For Pull Post Assembly Detail for Concrete Parapets and Detail "B" see Sheet 4.
# TABLE OF CHAIN LINK FENCE COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2¾ NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A292</td>
<td>Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>½&quot; (Min. thickness) x ½&quot; (Min. width) x 5'-10&quot; (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 Gage (Min. thickness) x ½&quot; (Min. width) Steel Bands</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>12 Gage (Min. thickness) x ½&quot; (Min. width) Steel Bands (Bleveled or Heavy)</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2½ NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2&quot; NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>½&quot; Ø x 4½&quot; Hex Head Bolts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Nut</td>
<td>A563</td>
<td>Hex Nuts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>A024 &amp; A017</td>
<td>Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating</td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 12 gage</td>
</tr>
<tr>
<td>Brace Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 1½ NPS, Schedule 40 Regular Grade</td>
</tr>
</tbody>
</table>

# TABLE OF POST ATTACHMENT COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A36 or A709 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - ½&quot; Ø x 6&quot; (no spacer) or ½&quot; Ø x 6&quot; + ½&quot; spacer thickness</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A36 or A709 Grade 36</td>
<td>½&quot; Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36</td>
<td>Plate thicknesses as required. Holes in shim plates will be ½&quot; Ø</td>
</tr>
<tr>
<td>Spacers</td>
<td>-</td>
<td>Plate thickness varies based on traffic railing type (See Detail &quot;A&quot;)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - ½&quot; Ø x 6½&quot; (no spacer) or ½&quot; Ø x 6½&quot; + ½&quot; spacer thickness</td>
</tr>
<tr>
<td>C-1-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods - ½&quot; Ø x 6½&quot; (no spacer) or ½&quot; Ø x 14½&quot; (no spacer)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - ½&quot; Ø x 14½&quot;</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>½&quot; Ø x 4½&quot; Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Pipe Clamp and Base Plate Connections</td>
</tr>
<tr>
<td>Bearing Pads (Plain Neoprene)</td>
<td>-</td>
<td>In accordance with Specification Section 932 for Ancillary Structures</td>
</tr>
</tbody>
</table>

# POST ATTACHMENT NOTES

**ANCHOR RODS, NUTS AND WASHERS:**

After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

**COATINGS:**


**ADHESIVE-BONDED ANCHORS AND DOWELS:**

Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 962. Cutting of reinforcing steel is permitted for drilled hole installation.

**WELDING:**

All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be L60XX or E70XX. Nondestructive testing of welds is not required.

**CROSS REFERENCE:**

For location of View A-A and Detail "A" see Sheet 1.
Must be manufactured from an incompressible material (i.e., steel or aluminum).

3 × 1 × 3/8" Thick Bearing Pad

Traffic Railing

Pipe Clamp Connection Detail (Connection without spacer shown, Connection with spacer similar)

Pipe Clamp Detail

Spacer Detail (Must be manufactured from an incompressible material (i.e., steel or aluminum))

NOTES:
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.
Bulge Chain Link Fabric to allow for joint movement

- Pull Post Assembly (required at maximum intervals of 500'-0")
  - Tension Bar (one each side of pull post) (Typ.)
  - Horizontal Rail
  - Tension Bands (5 required per Tension Bar – Space equally @ 1'-3" Maximum Centers) (Typ.)
  - Chain Link Fabric
  - Ties @ 2'-0" Centers (Typ.)

- Expansion Rails
  - Horizontal Rail
  - Concrete Parapet Rail Ends with Brace Bands (shown) or Combination Rail Ends with Brace Bands or Boulevards Clamps (Typ.)
  - Ties @ 2'-0" Centers

- Expansion Joint Opening
  - 1'-6"

- Bridge Deck (shown) or Raised Sidewalk
  - Expansion Joint Opening + 1" (Expansion Rail Length)

**NOTES:**

1. For treatment at the bridge ends, see Index 811 Sheet 1.
2. Expansion Rails are required at expansion joint locations where the total movement exceeds 1". Install expansion rails midway between the fence posts spanning the expansion joint.
3. An Expansion Assembly is required where the total joint movement exceeds 6". Expansion Assembly includes Expansion Rails and two pull posts (as shown). When the Expansion Joint Opening is greater than 9" add an additional length to the free end of the Expansion Rail equal to the difference between the Expansion Joint Opening and 9".
4. Install the post on the fixed (bolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6" from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9". When the Expansion Joint Opening exceeds 9" increase the 1'-6" dimension by the difference between the Expansion Joint Opening and 9".
5. Install nut for the expansion rail finger-tight. The nut will fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening.
**FENCING NOTES**

**FENCE APPLICATION:**
This bridge fence can only be used on sidewalk installations separated from traffic by a traffic railing.

**FENCE INSTALLATION:**
Install posts plumb (within a tolerance of ± 1⁄8") using shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

**CONCRETE PARAPET DETAILS:**
See Index 521-820 - Pedestrian/Bicycle Bullet Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-820.

**LIMITS OF FENCING:**
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

**PAYMENT:**
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, ties, tension bars and bands, post and loop caps, base plates, anchor rods, bolts, nuts, washers, shim plates, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

**CROSS REFERENCE:**
For Table of Fence Components and Pull Post Assembly Detail see Sheet 2.
For Table of Post Attachment Components and Detail "A" see Sheet 3.

---

**ELEVATION OF OUTSIDE FACE OF PARAPET**

NOTES:
1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 2.

---

**FENCE APPLICATION:**
This bridge fence can only be used on sidewalk installations separated from traffic by a traffic railing.

**FENCE INSTALLATION:**
Install posts plumb (within a tolerance of ± 1⁄8") using shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

**CONCRETE PARAPET DETAILS:**
See Index 521-820 - Pedestrian/Bicycle Bullet Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-820.

**LIMITS OF FENCING:**
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

**PAYMENT:**
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, ties, tension bars and bands, post and loop caps, base plates, anchor rods, bolts, nuts, washers, shim plates, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

**CROSS REFERENCE:**
For Table of Fence Components and Pull Post Assembly Detail see Sheet 2.
For Table of Post Attachment Components and Detail "A" see Sheet 3.
**TABLE OF CHAIN LINK FENCE COMPONENTS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 1½” NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Horizontal Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3” NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Expansion Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 2½” NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>3⁄8” x 0.25” Hex Head Bolt for Expansion Rail Connections</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>3⁄8” Hex Nuts for Expansion Rail Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Expansion Rail Connections</td>
</tr>
<tr>
<td>Chain Link Fabric</td>
<td>A92</td>
<td>Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - 9 gage Zinc Coated Wire, Class 2b</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 9 gage</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>12 Gage (Min. thickness) x 0.25” (Min. width) Steel Bands (Beveled or Heavy)</td>
</tr>
<tr>
<td>Tension Bands</td>
<td>F626</td>
<td>14 Gage (Min. thickness) x 0.25” (width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>12 Gage (Min. thickness) x 0.25” (width) Steel Bands</td>
</tr>
</tbody>
</table>

**NOTES:**
1. For treatment at the bridge ends, see Sheet 1.
2. Expansion Rails are required at expansion joint locations where the total movement exceeds 1”. Install expansion rails midway between the fence posts spanning the expansion joint.
3. An Expansion Assembly is required where the total joint movement exceeds 6”. Expansion Assembly includes:
   - Expansion Rails and two pull posts (as shown). When the Expansion Joint Opening is greater than 6” add an additional length to the free end of the Expansion Rail equal to the difference between the Expansion Joint Opening and 6”.
4. Install the post on the fixed (bolted) side of the Expansion Rail 1'-6” from the edge of the expansion joint. Install the post on the slip (unbolted) side of the Expansion Rail 1'-6” from the edge of the expansion joint unless the Expansion Joint Opening is greater than 9”. When the Expansion Joint Opening exceeds 9” increase the 1'-6” dimension by the difference between the Expansion Joint Opening and 9”.
5. Install nut for the expansion rail finger-tight. The nut will fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distant the first thread on the outside of the nut to prevent loosening.

**EXPANSION ASSEMBLY DETAIL**

(Required only at expansion joint locations where total movement exceeds 6”)
### TABLE OF POST ATTACHMENT COMPONENTS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Plates</td>
<td>A36 or A709 Grade 36</td>
<td>3⁄16&quot; Steel Ø</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A709 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5</td>
<td>Plates thickness as required. Holes in shim plates will be 3⁄16&quot; Ø</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods – 3⁄8&quot; Ø x 14&quot;</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods – 3⁄8&quot; Ø x 14&quot;</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Base Plate Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Base Plate Connections</td>
</tr>
<tr>
<td>Bearing Pads (Plain)</td>
<td>–</td>
<td>In accordance with Specification Section 932 for ancillary structures</td>
</tr>
</tbody>
</table>

### POST ATTACHMENT NOTES

**ANCHOR RODS, NUTS AND WASHERS:**

After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

**COATING:**


**ADHESIVE-BONDED ANCHORS AND DOWELS:**

Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

**WELDING:**

All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

**Bearing Pads (Plain)**

In accordance with Specification Section 932 for ancillary structures.
FENCING NOTES

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1/8`). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:
See Superstructure Sheets for Traffic Railing details.

CONCRETE PARAPET DETAILS:
See Index 521-820 - Pedestrian/Bicycle Railing for Concrete Parapet details. Provide fencing in lieu of aluminum bullet railing as shown on Index 521-820.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes posts, horizontal and expansion rails, brace bands, rail ends, combination rail ends, boulevard clamps, chain link fabric, tension wire, ties, hog rings, tension bars and bands, pipe clamps, base plates, anchor rods, bolts, nuts, washers, shim plates, spacers, neoprene pads, miscellaneous fence fittings and hardware and all incidental materials and labor required to complete installation of the fence.

CROSS REFERENCE:
For Table of Fence Components and Table of Post Attachment Components see Sheet 7.
For Pull Post Assembly Detail, View A-A and Detail "A" see Sheet 5.
For Detail "B" and "E" see Sheet 4.
**COMPONENT INFORMATION**

**COMPONENT** | **ASTM DESIGNATION** | **COMPONENT INFORMATION**
--- | --- | ---
Posts | F1083 | Galvanized Steel Pipe - 3" NPS, Schedule 40 Regular Grade
Horizontal Rails and Internal Sleeves | F1083 | Galvanized Steel Pipe - 2½" NPS, Schedule 40 Regular Grade
Expansion Rails | F1083 | Galvanized Steel Pipe - 2" NPS, Schedule 40 Regular Grade

**Chain Link Fabric**

(2 mesh with knucked bottom selavage)

- **Components:**
  - Aluminum Coated Steel - 9 gage (coated wire diameter), Class 1 Coating
  - Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating

**Tension Wire**

A824 & A817

- Type II (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating
- Type I (Aluminum Coated Steel Wire) - 7 gage

**Tie Wires**

F626

- Zinc Coated Steel Wire - 9 gage

**Brace Bands**

F626

- 12 gage (Min. thickness) x ½" (Min. width) Steel Bands (Beveled or Heavy)

**Tension Bars**

F626

- ¾" (Min. thickness) x ½" (Min. width) Variable Height Steel Bars - Height = Tangent or Hoop Length - Barrier or Parapet Height - 2" max.

**Tension Bands**

F626

- 14 gage (Min. thickness) x ½" (Min. width) Steel Bands

**Miscellaneous Fence Components**

F626

- Zinc Coated Steel - (includes horizontal rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings and hardware)

**Bolts**

A307

- ⅜" x 4½" Hex Head Bolts for Internal Sleeve connections
- ⅜" x 4½" Hex Head Bolts for Expansion Rail connections

**Nuts**

A563

- Hex Nuts for Internal Sleeve and Expansion Rail connections

**Washers**

F436

- Flat Washers for Internal Sleeve and Expansion Rail connections

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**COMPONENT INFORMATION**

**COMPONENT** | **ASTM DESIGNATION** | **COMPONENT INFORMATION**
--- | --- | ---
Pipe Clamps | A36 or A709 Grade 36 | ⅜" Steel ¼"
Base Plates | A36 or A709 Grade 36 | ⅜" Steel ¼"
Shim Plates | A36 or A709 Grade 36 or B209 Alloy 6061-T6 or B221 Alloy 6063-T5 | Plate thicknesses as required. Holes in shim plates will be ⅞Ø ¼"

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**Spacers**

- Plate thickness varies based on Traffic Rail type. (See Detail "A")

**Adhesive Anchor Rods**

- F1554 Grade 36 | Fully threaded Headless Anchor Rods - ⅜" Ø x 6" (no spacer) or ⅜" Ø x (6" + spacer thickness)
- F1554 Grade 36 | Hex Head Anchor Rods - ⅜" Ø x 6" (no spacer) or ⅜" Ø x (6" + spacer thickness)
- C-1-P Anchor Rods | F1554 Grade 36 | Fully threaded Headless Anchor Rods - ⅜" Ø x 14½"
- C-1-P Anchor Rods | F1554 Grade 36 | Hex Head Anchor Rods - ⅜" Ø x 14½"

**Bolts**

A307

- ⅜" Ø x 4½" Hex Head Bolts for Pipe Clamp Connections to Posts

**Nuts**

A563

- Hex Nuts for Pipe Clamp and Base Plate Connections

**Washers**

F436

- Flat Washers for Pipe Clamp and Base Plate Connections

**Bearing Pads (Plain)**

- In accordance with Specification Section 932 for Ancillary Structures

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**POST ATTACHMENT NOTES**

**ANCHOR RODS, NUTS AND WASHERS:**

- Coat distorted Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

**CONNECTORS:**


**ADHESIVE-BONDED ANCHORS AND DOWELS:**

- Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 436. Cutting of reinforcing steel is permitted for drilled hole installation.

**WELDING:**

- All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

---

**INDEX**

- 550-012

---

**BRIDGE FENCING (ENCLOSED)**

**INDEX**

- 550-012

---

**BRIDGE FENCING (ENCLOSED)**

**INDEX**

- 550-012

---

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**INDEX**

- 550-012

---

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**INDEX**

- 550-012

---

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**INDEX**

- 550-012

---

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**INDEX**

- 550-012

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**INDEX**

- 550-012

---

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**INDEX**

- 550-012

---

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**INDEX**

- 550-012

---

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**INDEX**

- 550-012

---

**BRIDGE FENCING (ENCLOSED)**

**INDEX**

- 550-012

---

**BRIDGE FENCING (ENCLOSED)**

**INDEX**

- 550-012

---

**BRIDGE FENCING (ENCLOSED)**

**INDEX**

- 550-012

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Pipe Clamp Connection (see Detail) (Typ.)

Traffic Railing (Type varies, 36° Single-Slope shown)

Pipe Clamp Connection Detail (Connection without spacer shown. Connection with spacer similar)

Cross Reference:
For location of View A-A and Detail "A" see Sheet 1.
PIPE CLAMP DETAIL

1½" Ø Spacer
(See Note 3)

1½" Ø Holes for 7/8" Anchors
(Typ.)

SPACER DETAIL
(Must be manufactured from an incompressible material (i.e. steel or aluminum))

1" Ø Holes for 7/8" Anchors
(Typ.)

BASE PLATE DETAIL

DETAIL "B"

1" Ø External Depth

2 - 7/8" C-1-P Anchor Rods or Adhesive-Bonded Anchors (shown) set in drilled holes with Heavy Hex Nuts and Washers

6" x 8" x 3/8" Thick Bearing Pad

DETAIL "C"

DETAIL "D"

DETAIL "E"
(INTERNAL SLEEVE DETAIL)

NOTES:
1. Values shown for Dim. H are for a 5'-0" clear sidewalk width. Adjust as required for clear sidewalk widths greater than 5'-0".
2. For clear sidewalk widths greater than 5'-0" increase radius and height by 6" for every one foot increase in sidewalk width.

SIDEWALK CROSS-SLOPE

<table>
<thead>
<tr>
<th>DIM. H</th>
<th>SEE NOTE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-6&quot;</td>
<td>2% Left</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>2% Right</td>
</tr>
<tr>
<td>5'-3½&quot;</td>
<td></td>
</tr>
</tbody>
</table>

CROSS REFERENCE:
For location of Details "B" and "E" see Sheet 1.
Post Spacing (See Note 1): Equal Spaces @ 10'-0" Max. (Posts may be shifted minimally to meet required clearances)

Approach Slab (Flexible Pavement Approach Slab Shown, Rigid Pavement Approach Slab Similar)

Bridge Deck (shown)
or Raised Sidewalk

Pipe Clamp
Connection (Typ.)

Hog Rings @ 2'-0" Centers

Tension Wire

Chain Link Fabric

Ties @ 1'-0" Centers (Typ.)

Tension Wire

Hog Rings @ 2'-0" Centers

Brace Rail

Tension Bar

FENCING NOTES

1. A Pull Post Assembly is required at maximum intervals of 500'-0". See Sheet 3.

FENCE INSTALLATION:
Install posts plumb (within a tolerance of ± 1\(^\circ\)). Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field. Install chain link fence in accordance with ASTM F567 as applicable.

TRAFFIC RAILING DETAILS:
See Superstructure Sheets for Traffic Railing details.

LIMITS OF FENCING:
Limits of fencing are from begin of approach slab at Begin Bridge to end of approach slab at End Bridge, unless otherwise shown in the plans.

PAYMENT:
Payment will be made under Fencing, Type R. Payment includes all materials and labor required to complete installation of the fence.

CROSS REFERENCE:
For Table of Fence Components, Table of Post Attachment Components, View A-A and Detail "A" see Sheet 2.
For Pull Post Assembly Detail for Traffic Railing see Sheet 3.
ANCHOR RODS, NUTS AND WASHERS:

After the nuts have been tightened, distort the Anchor Rod threads to prevent removal of the nuts. Coat distorted threads and exposed trimmed ends of anchors with a galvanizing compound in accordance with Specification Section 562.

COATINGS:

ADHESIVE-BONDEB ANCHORS AND DOWELS:
Adhesive Bonding Material Systems for Anchors and Dowels will comply with Specification Section 937 and be installed in accordance with Specification Section 416. Cutting of reinforcing steel is permitted for drilled hole installation.

WELDING:
All welding will be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal will be E60XX or E70XX. Nondestructive testing of welds is not required.

Table: Chain Link Fence Components

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 3' NPS, Schedule 40 Regular Grade</td>
</tr>
<tr>
<td>Chain Link Fabric (12 mesh with twisted top and knurled bottom sleeve)</td>
<td>A392</td>
<td>Zinc Coated Steel - 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A401</td>
<td>Aluminum Coated Steel - 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F668</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - 9 gage Class 2b</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 9 gage</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>12 Gage (Min. thickness) x 3/8 (Min. width) Steel Bands (Beaded or Heavy)</td>
</tr>
<tr>
<td>Brace Bands</td>
<td>F626</td>
<td>3/8 (Min. thickness) x 3/8 (Min. width) x 6'-10' (Min. height) Steel Bars</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>14 Gage (Min. thickness) x 3/8 (Min. width) Steel Bands</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc Coated Steel - (Includes post or loop caps, horizontal and brace rail ends, combination rail ends, boulevard clamps and all other miscellaneous fittings &amp; hardware)</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>A824 &amp; A817</td>
<td>Type 1i (Zinc Coated Steel Wire) - 7 gage, Class 4 Coating</td>
</tr>
<tr>
<td>Tension Wire</td>
<td>A824 &amp; A817</td>
<td>Type 1 (Aluminum Coated Steel Wire) - 7 gage</td>
</tr>
<tr>
<td>Hog Rings</td>
<td>F626</td>
<td>Zinc Coated Steel Wire - 12 gage</td>
</tr>
<tr>
<td>Brace Rails</td>
<td>F1083</td>
<td>Galvanized Steel Pipe - 15'/2 NPS, Schedule 40 Regular Grade</td>
</tr>
</tbody>
</table>

Table: Post Attachment Components

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM DESIGNATION</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Clamps</td>
<td>A36 or A209 Grade 36</td>
<td>3/8 Steel ( \Phi )</td>
</tr>
<tr>
<td>Base Plates</td>
<td>A36 or A209 Grade 36</td>
<td>3/8 Steel ( \Phi )</td>
</tr>
<tr>
<td>Shim Plates</td>
<td>A36 or A209 Grade 36</td>
<td>Place thicknesses as required; Holes in shim plates will be 3/8 ( \Phi )</td>
</tr>
<tr>
<td>Spacers</td>
<td>-</td>
<td>Plate thickness varies based on traffic railing type (See Detail &quot;A&quot;)</td>
</tr>
<tr>
<td>Adhesive Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Fully threaded Headless Anchor Rods - ( \frac{3}{8} ) ( \Phi ) x 6&quot; (no spacer) or ( \frac{3}{8} ) ( \Phi ) x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>C-I-P Anchor Rods</td>
<td>F1554 Grade 36</td>
<td>Hex Head Anchor Rods - ( \frac{3}{8} ) ( \Phi ) x 6&quot; (no spacer) or ( \frac{3}{8} ) ( \Phi ) x (6&quot; + spacer thickness)</td>
</tr>
<tr>
<td>Bolts</td>
<td>A307</td>
<td>( \frac{3}{8} ) ( \Phi ) x ( \frac{3}{8} ) Hex Head Bolts for Pipe Clamp Connections to Posts</td>
</tr>
<tr>
<td>Nuts</td>
<td>A563</td>
<td>Hex Nuts for Pipe Clamp Connections</td>
</tr>
<tr>
<td>Washers</td>
<td>F436</td>
<td>Flat Washers for Pipe Clamp</td>
</tr>
<tr>
<td>Bearing Pads (Plain Neoprene)</td>
<td>-</td>
<td>In accordance with Specification Section 932 for Ancillary Structures</td>
</tr>
</tbody>
</table>

Spacer must be manufactured from an incompressible material (i.e., steel or aluminum).
Bridge Deck (shown) or Raised Sidewalk

Tension Wire @ 2'-0" Centers (Typ.)

Hog Rings @ 2'-0" Centers (Typ.)

Ties @ 1'-0" Centers (Typ.)

Ties @ 1'-0" Centers (Typ.)

Tension Bands (6 required per Tension Bar - Space Equally @ 1'-3" Maximum Centers) (Typ.)

Tension Bar (one each side of pull post)

Brace Rail

Chain Link Fabric

Bridge Chain Link Fabric to allow for joint movement

NOTES:
1. For treatment at bridge ends, see Sheet 1.
2. Expansion Joint Opening is the width at the time of fence installation.

PULL POST ASSEMBLY DETAIL FOR TRAFFIC RAILING

PIPE CLAMP CONNECTION DETAIL
(Connection without spacer shown, Connection with spacer similar)

PIPE CLAMP DETAIL

SPACER DETAIL
(Must be manufactured from an incompressible material (i.e., steel or aluminum)
CONDUIT GENERAL NOTES:

1. Furnish and install approved Conduits, Fittings and Embedded Junction Boxes (EJB's) in accordance with Specification Sections 630 and 635, this Standard, the National Electric Code (NEC) and as directed by the Engineer.

2. Furnish and install Embedded Junction Boxes (EJB's) with weatherproof covers sized in accordance with NEC requirements and the maximum size limits shown. Install EJB adjacent to the Begin and End of Bridges. Begin and End of Retaining Walls, (except omit EJB adjacent to the Bridge unless a precast Traffic Railing with junction slab is used), and at other locations as necessary to maintain 300 foot maximum spacing. See Plans for additional locations and details.

3. For Conduit not designated for future use, see Plans for details. For Conduit designated for future use, stub out and cap the Conduit. Drive a 3'-0" long 3/4" (min.) diameter Steel Pipe flush with the ground line adjacent to the End of the Conduit as shown on Sheets 2, 3 or 4. Provide the location of the stub out with Steel Pipe to the Engineer for inclusion on the As-Built Plans.

4. Shift vertical Railing reinforcement symmetrically to provide 2" clearance to EJB. Space shifted vertical reinforcement at minimum 3" centers. Cut horizontal Railing reinforcement to provide 2" clearance to EJB and provide supplemental reinforcement as shown. To facilitate placement of Conduit, Expansion Fittings, and Expansion/Deflection Fittings, shift reinforcing a maximum of 1" but do not cut railing reinforcing to facilitate Conduit or Fittings. Do not bundle Conduits, or Conduit and horizontal reinforcement.
PARTIAL PLAN VIEW OF MEDIAN TRAFFIC RAILING ALONG BRIDGE

Provide 4 ~ 8'-0" long supplemental #5 Bars centered on EJB

PARTIAL ELEVATION VIEW OF MEDIAN TRAFFIC RAILING ALONG BRIDGE

SECTION A-A

Median Traffic Railing (See Note 4)

PARTIAL PLAN VIEW OF MEDIAN TRAFFIC RAILING ALONG APPROACH SLAB

See Conduit Stub-Out Detail below

PARTIAL ELEVATION VIEW OF MEDIAN TRAFFIC RAILING ALONG APPROACH SLAB

NOTES:
1. Work this sheet with Index 521-426.
2. Adjust Conduit horizontally and vertically as necessary to align with EJB "B".
3. When installed in traffic face of a railing, use EJB "B" with a minimum Ƅ" thick galvanized steel cover.
4. Position EJB such that, with gasket and cover plate secured and in place, cover plate is flush with the railing face. Flush is +ƅ" to -ƅ" measured with a horizontal straightedge.

CONDUIT STUB-OUT DETAIL

Bridge and Approach Slab with Median Traffic Railing
**Guardrail Transition Section**

when called for in Plans

**Shoulder Line**

2" Ø PVC Conduits

See Detail "C"

**Retaining Wall Coping**

Top of Coping

See Detail "A"

**Retaining Wall Panels (Typ.)**

6'-0" (Min.)

Concrete Barrier *

2" Ø PVC Conduits

Open Joint in Retaining Wall Coping only

Open Joint at Begin or End Approach Slab

Approach Slab

See Detail "B"

36" Traffic Railing

***PARTIAL ELEVATION VIEW ALONG APPROACH SLAB***

**PARTIAL ELEVATION VIEW ALONG APPROACH**

SLAB WITH CONTINUING Concrete Barrier

(Retaining Wall Mounted Concrete Barrier shown, Traffic Railing similar)

**PARTIAL PLAN VIEW ALONG APPROACH SLAB**

WITH CONTINUING Concrete Barrier

**PARTIAL PLAN VIEW ALONG RETAINING WALL**

**PARTIAL PLAN VIEW ALONG RETAINING WALL**

**APPROACH SLAB AND RETAINING WALL WITH CONCRETE BARRIER**

* Index 521-610 Concrete Barrier/Junction Slab shown, other railings and parapets similar.

** EJB "A" shown EJB "B" similar. See EJB "B" Detail on Sheet 2.
BOX GIRDER MAINTENANCE LIGHTING NOTES:

1. Submit shop drawings to the Engineer detailing the layout of the maintenance lighting system for the entire structure. The shop drawings must include, but not be limited to, the following items:
   a. Conduit layout and installation details through diaphragms, around post-tensioning (PT) ducts, lateral bracing and cross frames as necessary.
   b. Conduit access through box girder end diaphragms with minimum 1" clearance in all directions.
   c. Conduit expansion fitting details.
   d. Fastener details for the interior electrical system.
   e. Single line diagram showing mini power centers, switches, contactors, timers, etc.
   f. Mini power center details including circuit breaker details.
   g. Mini power center mounting details if required.
   h. Feeder schedule.

2. Ensure installation meets all requirements of the latest edition of the National Electrical Code (NEC) and local ordinances. Install grounding in accordance with NEC Article 250. Maintain separation between 480V and 120V Conductors / Conduits throughout.

3. Furnish all labor, equipment, materials, and incidentals required for a complete and functional installation.

4. Use only new, unused and Underwriters Laboratories (UL) listed equipment and materials for outdoor use.

5. Furnish and install polyvinyl chloride (PVC) conduit in conformance with UL Section 651, NEC Section 347 and NEMA TC-2, UV-resistant and schedule 80. Bend conduits as necessary to connect to loads.

6. Provide PVC sleeve 2' larger in diameter than conduit to accommodate construction tolerances.

7. Install a UL labeled expansion fitting for specified PVC conduit at all structure expansion joints. Provide certification that the expansion fitting meets the following minimum requirements: Compatibility with the connected conduits, waterproof, UV protected and allows longitudinal movement equal to that of the Expansion Joint.

8. Use only Alloy 316 stainless steel supporting hardware. Provide minimum 8"Ø fasteners. For concrete or SIP form mounting, provide anchor bolts (expansion, drop-in or adhesive) suitable for dynamic loading due to vibration caused by traffic. Install fasteners to avoid conflicts with reinforcing steel and PT ducts. For structural steel mounting, do not attach fasteners to main members, i.e. webs and flanges.

9. Furnish power distribution at 480V AC, 1 phase, with step down transformers at regular intervals. Furnish 7.5 KVA mini power center with eight 20A breakers as the step down transformer, feeding a maximum of 20 lamps and 20 receptacles. Each mini power center will provide power to no more than 1000' of bridge, preferably 500' on each side of the mini power center, 480V top feed, 120V bottom feed to maintain separation.

10. Furnish and install lighting contactors to switch the 480V AC feeding the mini power centers.

11. Furnish and install copper conductors, Type XHHW. Do not use any conductor larger than # 4 AWG.

12. Provide enough slack in all interior cable terminations to allow for minor shifting of the structure.

13. Furnish and install National Electric Manufacturers Association (NEMA) Type 4X (non-metallic) surface mounted boxes sized in conformance with the NEC.

14. Furnish and install 120V duplex receptacles (GFI, NEMA Type 5-20R), in non-metallic outlet boxes at 50' maximum on centers. Provide each receptacle with a gasketed weather-protective outdoor plate. Maximum wire size to connect to receptacles is # 12 AWG.

15. Furnish and install surface mounted, fully enclosed, incandescent light fixtures with gasketed clear globes and wire guards at 50' maximum on centers. Provide 100 watt, 130 volt, vibration resistant and brass base incandescent lamps.

16. Provide six hour reset timers for each circuit to turn off the lighting system automatically.

CROSS REFERENCES:
1. For Maintenance Light Details, see Sheet 2.
2. For actual bridge section, see Structures Plans.