Effective for Projects with Lettings in the Fiscal Year (FY) from

July 1, 2018 through June 30, 2019

State of Florida Department of Transportation
Office of Design
Mail Station 32
605 Suwannee Street
Tallahassee, Florida 32399-0450
The Standard Plans are intended to support the various engineering processes for construction and maintenance 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**

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**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 334.03(27), 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 undercopings 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. 050-020-26). 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.

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

http://www.fdot.gov/design/standardplans
CERTIFICATION STATEMENT

I hereby certify that these Standard Plans were compiled under my responsible charge 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.

Manager, Traffic Data Section
Transportation Statistics Office
Steven J. Benz
P.E. No. 70606

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Standard Plans Index
695-001

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P.E. No. 53552

State Transportation Landscape Architect
Jeffrey J. Casser
LACPO011

State Roadway Design Engineer
Michael Sheppard
P.E. No. 36500

State Structures Design Engineer
Robert V. Robertson, Jr.
P.E. No. 36160

Approved For Use On Federal Aid Projects
James Christian, Division Administrator
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<tr>
<th>Abbreviation</th>
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<tr>
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<td>Americans With Disabilities Act</td>
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<td>Automated Flagger Assistance Device</td>
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<td>District Traffic Operations Engineer</td>
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<td>EA or Ea.</td>
<td>Each</td>
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<td>Electronic Industries Alliance</td>
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<td>GFI</td>
<td>Ground Fault Interrupter</td>
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<td>GFRP</td>
<td>Glass Fiber Reinforced Polymer</td>
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<td>High Density Polyethylene</td>
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<td>Horsepower or H-Pile</td>
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<td>HSHV</td>
<td>High Strength Horizontal Vertical</td>
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<td>High Strength Horizontal Vertical</td>
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<td>Intelligent Transportation Systems</td>
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<td>i/d, i.d.</td>
<td>Inside Diameter or Identification</td>
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<td>k</td>
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<td>kips</td>
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<td>lb/sy</td>
<td>Pounds Per Square Yard</td>
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<td>L</td>
<td>Length</td>
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<td>Lime rock Bearing Ratio</td>
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<td>Linear Foot (Feet)</td>
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<td>LSD</td>
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<tr>
<td>LS</td>
<td>Lump Sum</td>
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ABBREVIATIONS
FY 2018-2019 - FDOT STANDARD PLANS
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<th>Abbreviation</th>
<th>Meaning</th>
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<td>m</td>
<td>Meter</td>
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<tr>
<td>m²</td>
<td>Meter Square</td>
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<td>Mach.</td>
<td>Machine</td>
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<tr>
<td>MAS</td>
<td>Motorist Awareness System</td>
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<tr>
<td>HASH</td>
<td>Manual for Assessing Safety Hardware (AASHTO)</td>
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<tr>
<td>Max.</td>
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<td>MES</td>
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<tr>
<td>N.H.</td>
<td>Handrail or Mounting Height</td>
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<tr>
<td>NMHW</td>
<td>Mean High Water</td>
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<tr>
<td>Wid.</td>
<td>Middle</td>
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<tr>
<td>Mil or Mils</td>
<td>One-Thousandth Of An Inch</td>
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<td>WCMRP</td>
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<td>NDCBU</td>
<td>Neighborhood Delivery And Collection Box Unit</td>
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### Standard Plans
#### FY 2018-19 Revisions Log

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<td>515</td>
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<td><strong>Sheet 5:</strong> Updated to remove reference to 5' turnout construction limit in callout within the Plan detail and DRIVE ENTRANCE NOTES (See Index 000-516).</td>
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<td><strong>Sheet 1:</strong> Deleted 5' Turnout Construction limit in all Section AA's and in the Plan view; Updated Note 4 (Old Note 3) and Added Note 3 to reflect matching paved shoulders widths &lt;= to 4', or 5' Min.</td>
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<td><strong>All Sheets:</strong> Updated detail titles to be consistent with New &quot;Free-standing&quot; vs. &quot;Anchored&quot; barrier usage policy; Deleted options for &lt;45mph. <strong>New Sheet 1:</strong> Changed Notes and Table; Deleted PERMITTED BARRIER UNIT END VIEWS detail; Updated the MEDIAN AND ROADSIDE INSTALLATION details. <strong>Old Sheets 2 thru 4:</strong> Deleted design layout information (See Standard Plans Instructions for Length of Need requirements). <strong>Old Sheets 5 thru 7:</strong> Deleted Type K Barrier information (Moved to Index 102-110). Deleted Temporary Crash Cushion requirements (Moved to Specification 102).</td>
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<td>102-110</td>
<td><strong>All Sheets:</strong> Updated detail titles to be consistent with New &quot;Free-standing&quot; vs. &quot;Anchored&quot; barrier usage policy; Deleted options for &lt;45mph; Updated &quot;Setback&quot; callouts to reference Index 102-100. <strong>New Sheet 1:</strong> Updated &quot;Notes for All Installations&quot; into General Notes; Deleted Payment information and consolidated repetitive notes from other sheets; Added 3-3-2-1 Transition Detail. <strong>New Sheet 4:</strong> Changed Backfill height to allow tolerance between 0&quot; to 3&quot;. <strong>New Sheet 13:</strong> Added Type K Concrete Barrier overlapping details from Old Design Standards, Index 415, Sheets 5 &amp; 6. <strong>New Sheet 14:</strong> Added Crash Cushion details from Old Design Standards, Index 415, Sheet 7. <strong>New Sheets 15 thru 17:</strong> Moved all fabrication details to end of Index (previously Sheets 1 thru 3).</td>
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<td>102-600</td>
<td><strong>Sheet 1:</strong> Updated Table of Contents; Changed Note 1; Added Note 2; Deleted Symbols. <strong>Sheet 3:</strong> Added 70 MPH Minimum Radii for Normal Crown; Changed Length of Lane Closures Note 1. <strong>Sheet 5:</strong> Clarified Temporary Sign Support Notes. <strong>Sheet 6:</strong> Clarified the Bolt callout in the SIGN ATTACHMENT DETAIL. <strong>Sheet 9:</strong> Changed Drop-off Condition Notes and Drop-off Condition Detail; Deleted Warning Device Notes; Updated Pedestrian Drop-off Condition Notes. <strong>Sheet 11:</strong> Changed Channelizing Device Details for Type I, Type II, and Type III Barricades; Added Temporary Barrier Notes. <strong>Sheet 12:</strong> Deleted Temporary Substitution of RPM's for Paint or Removable Tape; Updated Notes for Raised Pavement Markers.</td>
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<td>102-603</td>
<td><strong>Sheet 1:</strong> Changed Distance Between Signs for speeds 55 thru 70 mph in Table 1. <strong>Sheet 2:</strong> Changed Rumble Strip Set Option - 2 from 10' Spacing to 20' Spacing.</td>
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<td>606</td>
<td>102-606</td>
<td><strong>Sheet 1:</strong> Changed Notes 1, 2, 6, and 9; Deleted Notes 3, 4, 7, and 8. <strong>Sheet 2:</strong> Changed sign spacings; Deleted Reverse Curve &amp; Keep Right signs. <strong>Sheet 3:</strong> Changed sign spacings; Deleted Reverse Curve &amp; Keep Right signs; Corrected Single Lane Closure - Short Bridges detail.</td>
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<td><strong>Sheet 3:</strong> Updated Notes to require adjustments be made prior to placing Friction Course and placing joints outside of wheel path.</td>
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<td><strong>Sheet 1:</strong> Changed &quot;DOWELS&quot; table Pavement Thickness for 1&quot; and 1 1/4&quot; Diameter Dowels.</td>
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<td>20900</td>
<td>400-090</td>
<td><strong>All Sheets:</strong> Changed Title: Approach Slabs (Flexible Pavement Approaches). <strong>Sheet 1:</strong> Corrected referenced note No. for Optional Base. <strong>Sheet 2:</strong> Changed F Shape to Single-Slope; Corrected referenced note for Optional Base from 7 to 9.</td>
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<td>20910</td>
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<td>Changed Title: Approach Slabs (Rigid Pavement Approaches); Changed F Shape to Single-Slope Traffic Railing.</td>
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<td>289</td>
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<td>291</td>
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<td>217</td>
<td>425-030</td>
<td><strong>Sheet 1:</strong> Updated barrier to new Single-Slope shape; Removed upstream and downstream throats; Updated notes for usage. <strong>Sheet 2:</strong> Relocated ‘Inset A’ to Sheet 1; Rearranged sheet contents to show Type 1 Inlet on left and Type 2 Inlet on right.</td>
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<td>218</td>
<td>425-031</td>
<td><strong>All Sheets:</strong> Updated Barrier to new Single-Slope shape; Updated notes for usage.</td>
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<td>219</td>
<td>425-032</td>
<td><strong>Sheet 1:</strong> Updated Barrier to new Single-Slope shape; Updated notes for usage; Removed upstream throat. <strong>Sheet 2:</strong> Replaced Drainage Slot with PVC Pipes.</td>
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<td><strong>Sheet 1:</strong> Changed GENERAL NOTE 1 – “clearance/gap from 1” to 5/8” to be consistent with Index 425-031.</td>
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<td><strong>Sheet 1:</strong> Updated the Notes for the “DISSIMILAR TYPES” detail.</td>
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<td>22600</td>
<td>455-101</td>
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<td>22440</td>
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<td>460-470</td>
<td><strong>All Sheets:</strong> Changed Title: Traffic Railing - (Thrie Beam Retrofit) Typical Details and Notes. <strong>Sheet 1:</strong> Changed BARRIER DELINEATORS and BEARING PADS Notes; Deleted BARRIER DELINEATOR SPACING Table.</td>
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<td>490</td>
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<td>21930</td>
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<td>21220</td>
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<td><strong>Sheet 1:</strong> Added Channel Edge Dimension <strong>Sheet 2:</strong> Change from 32° F Shape to 36° Single-Slope; Changed conduit to match Index 630-010.</td>
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<td>821</td>
<td>515-021</td>
<td>Changed Title: Pedestrian/Bicycle Bullet Railing for Traffic Railing; Changed 32” F Shape to 36” Single-Slope; Changed Notes 1 &amp; 2; Changed Post names.</td>
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<td>822</td>
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<td><strong>All Sheets:</strong> Changed Title: Pedestrian/Bicycle Bullet Railing Details. <strong>Sheet 1:</strong> Changed from 32” F Shape to 36” Single-Slope; Changed Post Heights/Names and dual dimensioned as necessary. <strong>Sheet 3:</strong> Added Note 3c.</td>
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<td>851</td>
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<td><strong>Sheet 1:</strong> Corrected Note 3D. <strong>Sheet 2:</strong> Changed 32” F-Shape to 36” Single-Slope.</td>
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<td>300</td>
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<td>302</td>
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<td><strong>All Sheets:</strong> Reorganized to add MEDIAN CURB AND TRAFFIC SEPARATOR JUNCTURE DETAILS from deleted Design Standards, Index 301, Turn Lanes.</td>
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<td>410</td>
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<td><strong>All Sheets:</strong> Updated Concrete Barrier to the New Single Slope shape.</td>
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<td>404</td>
<td>521-404</td>
<td><strong>Sheet 1:</strong> Changed BARRIER DELINEATOR Note; Deleted BARRIER DELINEATOR SPACING Table.</td>
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<td>405</td>
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<td><strong>Sheet 1:</strong> Changed BARRIER DELINEATOR Note; Deleted BARRIER DELINEATOR SPACING Table.</td>
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<td>422</td>
<td>521-422</td>
<td><strong>Sheet 1:</strong> Added End Transitions note; Clarified End treatments; Changed Bars 5V; Changed Delineator Note; Deleted BARRIER DELINEATOR SPACING Table; Changed reference for skewed bridges; Updated Design Criteria. <strong>Sheet 2:</strong> Changed VIEW B-B; Changed approach slab detail.</td>
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<tr>
<td>423</td>
<td>521-423</td>
<td><strong>Sheet 1:</strong> Changed reference for skewed bridges; Clarified End treatments; Changed Delineator Note; Deleted BARRIER DELINEATOR SPACING table; Updated design criteria. <strong>Sheet 2:</strong> Clarified Notes; Corrected VIEW B-B approach slab.</td>
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<td>426</td>
<td>521-426</td>
<td><strong>Sheet 1:</strong> Added Height Transition; Changed BARRIER DELINEATORS, JOINTS and END TRANSITION Notes; Changed Detail “B” to Detail “C”; Deleted BARRIER DELINEATOR SPACING table. <strong>Sheet 2:</strong> Added DETAIL “B” and VIEW C-C; Changed Notes; Changed Toe Transition dimension. <strong>Sheet 4:</strong> Added bend diameters to Bar 5R and 5W; Changed Detail “B” to Detail “C”.</td>
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<td>427</td>
<td>521-427</td>
<td><strong>Sheet 1:</strong> Changed End Transition and Barrier Delineator Notes; Changed Detail “B” to Detail “C”; Deleted BARRIER DELINEATOR SPACING table. <strong>Sheet 2:</strong> Added Detail “B”; Added View C-C; Changed Bar 4V; Changed “Note”; Changed Detail “A” and View B-B toe transition dimension. <strong>Sheet 3:</strong> Changed Note 3 in Partial Plan with pedestrian/bicycle railing; Corrected title of Partial Plan View. <strong>Sheet 4:</strong> Changed Bars 4V and 4P; Changed Detail “B” to Detail “C”; Deleted Reinforcing Steel Note #3.</td>
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| 428                    | 521-428              | **Sheet 1**: Changed JOINT, DELINEATOR and END TRANSITION notes; Changed Detail "B" to Detail "C"; Changed note for trailing end requirements; Clarified Railing End Transition for guardrail connections; Deleted BARRIER DELINEATOR SPACING table; Deleted "RAILINGS ON RETAINING WALLS" Note.  
**Sheet 2**: Changed End Transitions (Detail "A", View C-C and View B-B); Changed Note (end transitions); Changed Bars 5V, 6T1 & 6T2.  
**New Sheet 3**: Sheet-Height transition details to Barrier Height.  
**Sheet 4**: Renumbered (was Sheet 3); Changed Bars 5V, 6T1, 6T2 and estimated quantities; Changed Detail "B" to "C"; Deleted Reinforcing Steel Note 2. |
| 480                    | 521-480              | Changed Title: Traffic Railing - (Vertical Face Retrofit) Typical Details and Notes. |
| N/A                    | 521-509              | New Index. |
| 5210                   | 521-510              | **All Sheets**: Changed Title: Concrete Barrier/Noise Wall (8'-0"); Changed 32" F-shape to 36" Single-Slope; Deleted bridge and approach slab details.  
**Sheet 2**: Changed Delineator Note; Deleted Delineator spacing table. |
| 5211                   | 521-511              | **All Sheets**: Changed Title: Concrete Barrier/Noise Wall (14'-0"); Changed 32" F-shape to 36" Single-Slope. |
| 5212                   | 521-512              | **All Sheets**: Changed Title: Concrete Barrier/Noise Wall (8'-0") Junction Slab; Changed 32" F-shape to 36" Single-Slope. |
| 5213                   | 521-513              | **All Sheets**: Changed Title: Concrete Barrier/Noise Wall T-Shaped Spread Footing; Changed 32" F-shape to 36" Single-Slope. |
| 5214                   | 521-514              | Changed Title: Concrete Barrier/Noise Wall L-Shaped Spread Footing; Changed 32" F-shape to 36" Single-Slope. |
| 5215                   | 521-515              | Changed Title: Concrete Barrier/Noise Wall Trench Footing; Changed 32" F-shape to 36" Single-Slope; Changed foundation sizes and reinforcing. |
| 6110                   | 521-610              | **All Sheets**: Changed Title: Concrete Barrier/Junction Slab - Wall Coping.  
**Sheets 1, 2 & 3**: Changed to Single-Slope Traffic Railings, (coping height increased).  
**Sheet 1**: Deleted Note 11.  
**Sheet 2**: Added transition detail; Changed Note 8.  
**Sheet 3**: Changed Note 3 & 5.  
**Sheets 4, 5 & 6**: Deleted (Corral Shape Traffic Railing). |
| 6120                   | 521-620              | **All Sheets**: Changed Title: Concrete Barrier/Raised Sidewalk - Wall Coping.  
**Sheet 1**: Changed Note 12.  
**Sheet 2**: Added reinforcing details for 32" Vertical; Deleted Note 3; Removed Detail B.  
**Sheet 3**: Added 42" Vertical Face details; Removed Bar Bending Diagrams.  
**New Sheet 4**: Detail B, Bar Bending Diagrams from Sheets 2 & 3. |
| 6130                   | 521-630              | **All Sheets**: Changed Title: Parapet With C-I-P Sidewalk - Wall Coping; Changed 32" F-Shape to Single-Slope Barrier.  
**Sheet 1**: Changed Note 8.  
**Sheet 2**: Added 42" Parapet. |
<p>| 6201                   | 521-640              | Changed Title: Drainage Inlet Openings In Junction Slab - Wall Coping; Changed F-Shape to Single-Slope Traffic Railings. |</p>
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| 6200                   | 521–650              | **All Sheets:** Changed Title: Light Pole Pedestal – Wall Coping; Changed 32” F-Shape to 36” Single-Slope.  
**Sheet 1:** Added TABLE 1; Changed Notes 2 & 6.  
**Sheet 2:** Added Note 9; Clarified Note 3.  
**Sheet 3:** Added coping dimension; Changed Bars J & M. |
| 21200                  | 521–660              | **All Sheets:** Changed 32” F Shape to 36” Single-Slope; Changed Title: Deleted Corral Shape.  
**Sheet 3:** Changed Table 1; Changed Note 4 and 7. |
| 820                    | 521–820              | Changed 32” F Shape to 36” Single-Slope; Changed Post Names; Changed Skew reference to Index 521-427. |
| 825                    | 521–825              | Changed 32” F-Shape to 36” Single-Slope; Changed reference for skewed bridges to Index 521-427. |
| 310                    | 522–001              | **Sheet 1:** Updated General Notes to clarify where 6” thick concrete is required; Clarified Joints in the Curb Ramps in the call outs in the SIDEWALK Plan views; Changed Plan views to clarify where 4” vs. 6” thick concrete should be used. |
| 304                    | 522–002              | **Sheet 1:** Added Note 1.D to the General Notes for Slope Breaks and Joints; Changed Note 3.B to 3.A and added a reference to concrete thickness. |
| 5200                   | 534–200              | **All Sheets:** Changed Title: Precast Noise Walls.  
**Sheet 7:** Changed Note 3; Added texture blockout note.  
**Sheet 8:** Changed cover in SECTION H-H & J-J.  
**Sheet 10:** Corrected note references.  
**Sheet 12:** Corrected Note reference in Section T-T.  
**Sheets 15 & 16:** Changed reinforcing and foundations per AASHTO LRFD Updates. |
| 5250                   | 534–250              | **Sheet 1:** Clarified Note 9; Changed note 13B.  
**Sheet 4:** Corrected dimension line in Typical Plan.  
**Sheet 6:** Changed bar diameters, pile length for 130 mph wind.  
**Sheet 8:** Changed ELEVATION VIEW.  
**Sheet 9:** Changed wind speed categories. |
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<td><strong>STANDARD PLANS FY 2018-19 REVISIONS LOG</strong></td>
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<td>Sheet 1: Updated Note 1 to indicate that the 31&quot; overall height is approximate, actual measurement taken from mid-section of the panel; Added Note 8 to explain Nested W-Beam Concept.</td>
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<td>Sheet 5: Added note to allow for 13/16&quot; bolt hole for steel posts; Corrected section and elevation view to capture corrected 7&quot; dimension to bolt hole.</td>
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<td>Sheets 6, 7, 8, 9, &amp; 11: Clarified that shoulder slope is defined in the Plans and that 1:10 is a maximum for guardrail function.</td>
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<td>Sheet 7: Clarified that APL Approach Terminal drawings supersede Standards; Clarified post type exclusions; Clarified panel splice direction for APL Approach Terminals.</td>
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<td>Sheet 9: Clarified difference between Type II End Treatment and the “End Unit”.</td>
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<td>Sheet 11: Updated elevation view panel to make 15'-7.5&quot; the default; Added 6'-0&quot; CRT post length option.</td>
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<td>Sheets 13, 14, 15, 16, &amp; 18: Updated Index references to include new Single-Slope Traffic Railing – Including new offset block designs.</td>
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<td>Sheets 13, 14, &amp; 15: Updated terminal connector splice bolts to 2&quot; length.</td>
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<td>Sheet 19: Updated to allow use of button head bolt for Bent-Plate Panel Rub rail splices and updated notes for double sided configurations.</td>
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<td>Sheet 20: Added details for terminating pipe rail on steel posts.</td>
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<td>Sheets 21 &amp; 7: Clarified use of posts and special posts inside of approach terminals.</td>
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<td>546-010</td>
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<td>Sheet 1: Deleted SHOULDER GROUND-IN RUMBLE STRIP PLACEMENT detail (Moved to FDM 211); Updated details to clarify arrays, offset, and depth; Added notes to clarify begin/end locations and use of Ground-In Rumble strips with Rigid Pavement.</td>
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<td>Sheet 2: Deleted sheet (Content covered on New Sheet 1).</td>
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<td>6020</td>
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<td>Changed 32&quot; F Shape to 36&quot; Single-Slope; Revised Title; Revised Coping Transition; Revised Note 16 references.</td>
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<td><strong>Sheet 1</strong>: Changed Note 4 to address grounding fence.</td>
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<td><strong>Sheet 2</strong>: Changed Detail “A”; Changed Table of Post Attachment Components (spacer thickness, clamp spacing, anchor lengths).</td>
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<td><strong>Sheet 3</strong>: Added Note 3; Added Brace Rails to Expansion Assembly Detail; Changed Note 2.</td>
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<td><strong>Sheet 4</strong>: Changed Notes 2 &amp; 3; Added Note 4; Clarified EXPANSION RAIL DETAIL.</td>
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<td><strong>Sheet 2</strong>: Clarified EXPANSION RAIL DETAIL; Changed Notes.</td>
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<td><strong>Sheet 2</strong>: Clarified EXPANSION RAIL DETAIL; Changed Expansion Rail Notes; Changed spacer thickness and anchor bolt lengths.</td>
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<td><strong>Sheet 3</strong>: Changed spacer thickness and anchor bolt lengths; Changed Notes.</td>
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<td>21210 630-010</td>
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<td><strong>All Sheets:</strong> Changed Title: Conduit Details Embedded; Changed F Shape to Single-Slope traffic railing; Changed number of conduits in railing; <strong>Sheet 1:</strong> Changed Notes; Deleted Notes 2, 4, 5, 6 &amp; 9. <strong>Sheet 2:</strong> Changed supplemental bar length. <strong>Sheet 3:</strong> Changed Note 1 and 3.</td>
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<td>17727 634-001</td>
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<td><strong>Sheet 1:</strong> Updated Notes and detailing for pole Elevation views; Added Plan view for a Steel Strain Pole. <strong>Sheet 2:</strong> Deleted Sheet (i.e. DETAIL 'A'); Relocated &quot;Signal Attachment&quot; detail to Sheet 1.</td>
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<td>18113 641-020</td>
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<td><strong>All Sheets:</strong> Redeveloped Index; Added grounding and other information from Design Standards, Indexes 18101 thru 18108. <strong>Sheet 2:</strong> Added the Additional Shaft Depth Due to Ground Slope Table from the IDS.</td>
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<td><strong>All Sheets:</strong> Redeveloped Index; Added grounding and other information from Design Standards, Indexes 18101 thru 18108. <strong>Sheet 2:</strong> Added the Additional Shaft Depth Due to Ground Slope Table from the IDS.</td>
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<td>17745 649-031</td>
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<td><strong>Sheet 1:</strong> Added separate conduits for lighting to the foundation. <strong>Sheet 2:</strong> Changed foundation reinforcing lap splice to 2'-0&quot; and Backing Ring in DETAIL 'A' from 3&quot; to 2&quot;. <strong>Sheet 6:</strong> Changed the handhole diameter to 5&quot; in the upper MAST ARM HANDHOLE detail.</td>
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<td>17784 665-001</td>
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<td><strong>Sheet 1:</strong> Changed the horizontal reach of pedestrian detector push-button to 10&quot; (Std.) / 15&quot; (Max.); Added tolerance to pushbutton installation height; Updated sheet organization and Notes; Deleted FIGURE E. <strong>Sheet 2:</strong> Deleted Sheet (Signs are included in Index 700-102 or MUTCD).</td>
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<td>17841 676-010</td>
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<td><strong>Sheet 1:</strong> Updated website address for controller cabinet retrofit installation procedures.</td>
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<td>11860 700-010</td>
<td></td>
<td><strong>Sheet 1:</strong> Updated Notes 3 and 4. <strong>Sheet 3:</strong> Deleted concrete options for posts between 2&quot; and 4&quot; in diameter from the COLUMN (POST) AND FOUNDATION TABLE. <strong>Sheet 4:</strong> Clarified shim requirements in Note 3.D. <strong>Sheet 5:</strong> Deleted the CONCRETE/STUB DETAIL; Changed the Soil Plate Dimensions in the ALUMINUM SOIL PLATE DETAIL; Changed the installation hole diameter to allow a hole from 8&quot; to 1'-6&quot;; Added Plan View to the DRIVEN POST DETAIL; Revise bracket details in Section A-A of the Wind Beam Connection Details; Deleted Note #4 in the Wind Beam Connection Notes.</td>
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<td>11870 700-012</td>
<td></td>
<td><strong>All Sheets:</strong> Updated Traffic Railing to the New Single-Slope shape. <strong>Sheet 1:</strong> Deleted Note 6.E (Sign Not Permitted on Temp. Barriers)</td>
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<td>11871 700-013</td>
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<td><strong>Sheet 1:</strong> Updated Median Barrier/Railing to the New Single-Slope shape.</td>
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<td>11200 700-020</td>
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<td><strong>Sheet 1:</strong> Deleted &quot;8'-0&quot; (Max.) from travel way to sign panel dimension; Added &quot;7'-0&quot; (Min.) for sign post length; Clarified Note 3.C and 3.D. <strong>Sheet 3:</strong> Clarified the callouts for bolt type in the SIGN PANEL SPLICE and in DETAIL 'A'.</td>
</tr>
<tr>
<td>Design Standards Index</td>
<td>Standard Plans Index</td>
<td>Description</td>
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<tr>
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<tr>
<td>11300</td>
<td>700-030</td>
<td>Sheet 1: Changed screw sizes from 3/8” to 1/4”; Changed DETAIL “B” to require lock washers and nuts instead of lock nuts; Added Note 8 for Wind Speed by County.</td>
</tr>
<tr>
<td>11310</td>
<td>700-040</td>
<td>Sheet 1: Changed upright and chord material Note 4.A.a. Sheet 2: Changed foundation reinforcing lap splice to 2'-0&quot;. Sheet 3: Corrected UPRIGHT-TRUSS CONNECTION DETAIL and DETAIL ‘C’ for Centerline placement to Centerline of plate. Sheet 4: Corrected DETAIL “I” for Centerline placement to Centerline of plate.</td>
</tr>
<tr>
<td>11320</td>
<td>700-041</td>
<td>Sheet 1: Changed upright and chord material Note 4.A.a. Sheet 3: Corrected UPRIGHT-TRUSS CONNECTION DETAIL and DETAIL “I” for Centerline placement to Centerline of plate.</td>
</tr>
<tr>
<td>18300</td>
<td>700-090</td>
<td>All Sheets: Consolidated and redeveloped Index; Added grounding and other information from Design Standards, Indexes 18101 thru 18108. Old Sheets 7 thru 9: Deleted Wiring Diagrams and Cabinet Layouts.</td>
</tr>
<tr>
<td>17302</td>
<td>700-101</td>
<td>Sheet 1: Updated Notes and sheet layout; Added Callout and updated the note for CASE II; Added CASE X, Wrong Way Signs.</td>
</tr>
<tr>
<td>17355</td>
<td>700-102</td>
<td>Sheets 2 thru 11: Updated layout to accommodate new signs (see below). Sheet 2: Added two new sign details for FLORIDA’S TURNPIKE. Sheet 3: Updated and Clarified the Notes and Tables for all route markers. Sheet 8: Deleted duplicate sign. Sheet 11: Changed MOT-12-06 to a R &amp; L.</td>
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<tr>
<td>11862</td>
<td>700-120</td>
<td>Sheet 3: Updated TABLE 1 to remove Wind Speed. Sheet 6: Added 15 mph to SPEED LIMIT sign; Added SPEEDING FINES DOUBLE (FTP-38-06) sign; Deleted Note 3. Sheet 7: Added 15 mph to SPEED LIMIT sign. New Sheet 9: OVERHEAD SCHOOL SIGN form old Design Standards, Index 17344.</td>
</tr>
<tr>
<td>17352</td>
<td>706-001</td>
<td>All Sheets: Changed Title: Typical Placement Of Raised Pavement Markers. Sheet 1: Updated labels; Changed Note 1 to &quot;Raised”; Deleted Notes 1, 2, &amp; 5. Sheet 2: Updated labels and layout; Deleted Note 1; Deleted blowup detail. New Sheets 3 &amp; 4: Added details for Placement of RPMs at Median Openings, Islands, and Traffic Separators.</td>
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### DESIGN STANDARDS INDEX

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
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<tr>
<td>17346</td>
<td>711-001</td>
<td><strong>STANDARD PLANS FY 2018-19 REVISIONS LOG</strong></td>
</tr>
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</table>

#### Sheet 1: Added dimensions to pavement messages; Added Roundabout Approach Arrow.

#### Sheet 2: Added 2'-2' Dotted 12" wide; Clarified Dotted Lines are similar to Skip pattern shown for Contrast Markings.

**New Sheets 3 & 4:** Added details for Placement of Longitudinal Pavement Markings.

**New Sheets 5 & 6:** Updated labels; Added dimensions of longitudinal solid lines. Deleted left-turn extension.

**New Sheet 7:** Deleted sign details and updated the insert callouts (i.e. new DETAIL ‘A’ and DETAIL ‘B’); Deleted Restricted Left Turn Marking, Typical Intersection 2 Thru Lanes Plus Left Turn Lane, With Crosswalk, and Stop Bars, Crosswalks and Double Center Line Details from Design Standards, Index 17346, Sheet 7.

**New Sheet 8:** Deleted Typical Crosswalk Markings for Curb Ramps; Relocated right turn lanes details from old Design Standards, Index 17346, Sheet 7 and Traffic Channelization At Gore markings from Design Standards, Index 17346, Sheet 8; Deleted One-Way Signs On Divided Highway Intersections from Design Standards, Index 17346, Sheet 8 (Content moved to FDM 230, Exhibit 230-2).

**New Sheet 9:** Deleted sign details (Moved to FDM 230, Exhibit 230-3); Updated labels and tables; Added Traffic Separation pavement marking detail from Design Standards, Index 17346, Sheet 8.

**New Sheet 10:** Design Standards, Index 17346, Sheet 12; Added Dimensions to Crosswalk Markings; Deleted General Notes 1 and 3; Clarified General Note 2; Deleted Design Standards, Index 17346, Sheet 10 (Content moved to Standard Plans, Index 711-003).

**New Sheet 12:** Design Standards, Index 17346, Sheet 11; Updated Railroad Crossing markings for consistency with Standard Plans, Index 509-070.

**New Sheet 13:** Design Standards, Index 17346, Sheet 15; Added Reverse-In Parking details: Updated accessible parking space markings; Deleted Minimum Parking Restriction For Nonsignalized Intersections and Minimum Parking Restriction For Signalized Intersections (Content moved to FDM 212.2.7.5, On-Street parking); Deleted Design Standards, Index 17346, Sheet 13 (Mid-Block Crosswalk details moved to FDM 230, Exhibit 230-1).

**New Sheet 14:** Added SCHOOL marking details from Design Standards, Index 17344 Sheet 1.

**Old Sheet 15:** See New Sheet 13 above.

**Old Sheets 16 & 17:** Deleted Sheets (Content moved to FDM 210.4.6, Audible and Vibratory Pavement Markings, Figure 210.4.4).

#### Sheet 1: Deleted Notes 3 & 4 (Layout Guidance); Added new Note 3 for grid size.

#### New Sheet 2: Relocated “Approach To Intersection Details” and “Far Side of Intersection Detail” from Design Standards, Index 17347, Sheet 3.

**Old Sheet 2 thru 5:** Deleted "Share Lane Markings", "Bus Bay Detail", Adjacent To Parking and “Keyhole Markings” details (Relevant content moved to FDM 223, Exhibits 223-1 & 223-2).

#### Sheets 1 thru 3: Updated gore and edge line pavement marking widths for consistency with other Indexes and Criteria.

**Sheet 1:** Deleted DETAILS A table and standardized spacing of cross hatches for all speeds; Added General Notes.

**New Sheets 4 & 5:** Updated and separated the existing interchange ramp types.

**New Sheet 6:** Added Detail for PARTIAL COVER LEAF/TRUMPET EXIT RAMP.

**New Sheet 7:** Added Sheet 10 from Design Standards, Index 17346.

#### All Sheets: Updated Concrete Barrier/Railing to New Single-Slope shape.

**Sheet 1:** Changed Note 7 to reference Specification 635; Added Note 8, Wind Speed by County.
## STANDARD PLANS
### FY 2018-19 REVISIONS LOG

<table>
<thead>
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<th>Design Standards Index</th>
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<tr>
<td>17502</td>
<td>715-010</td>
<td><strong>Sheet 1</strong>: Added Note 7, Wind Speed by County.</td>
</tr>
<tr>
<td>21240</td>
<td>715-240</td>
<td>Changed Title: Inspection Lighting for Box Girders.</td>
</tr>
</tbody>
</table>
NOTES

1. All material in the shaded area is excess base to be removed.
2. The cost for removal of excess base material shall be included in the contract unit price for base.
3. Payment for base shall be calculated using normal width.

REMOVAL OF EXCESS BASE MATERIAL

1. When the median has curb or curb and gutter, stabilize 4" back of curb.
2. When the median has shoulder with no curb or curb and gutter, stabilize to normal shoulder width.
3. See the details above for stabilizing requirements at crossroads.
4. Stabilize entire area under all paved traffic islands.
5. Stabilize full width under all traffic separators.
6. Select material as defined on Index 120-001. For minor collectors and local facilities the depth of select material thickness may be reduced from 24" to 18".
8-LANE PAVEMENT WITH ONE LANE SLOPED TO MEDIAN

SECTION A-A
NORMAL CROWNED SECTION

SECTION B-B
SUPERELEVATION SECTION LT. & RT.

SECTION C-C
SUPERELEVATION SECTION LT.
PLANE INCLINED SECTION RT.

SECTION D-D
PLANE INCLINED SECTION LT.
SUPERELEVATION TRANSITION RT.

SECTION E-E
SUPERELEVATION TRANSITION LT.
FULL SUPERELEVATION RT.

SECTION F-F
FULL SUPERELEVATION LT. & RT.

SUPERELEVATION Transition L (Varies 100' Min.)

Profile Grade

SUPERELEVATION - HIGH SPEED ROADWAYS

SPECIAL SHOULDER BREAK OVER DETAILS

SHOULDER SLOPES ON SUPERELEVATION SECTIONS

# FOR SHOULDERs WITH PAVED WIDTHS
5 FEET OR LESS SEE SPECIAL SHOULDER BREAK OVER DETAILS
**SUPERELEVATION RATES (e) FOR URBAN HIGHWAYS AND HIGH SPEED URBAN STREETS**

\[ e_{\text{max}} = 0.05 \]

### CHARTED VALUES

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<thead>
<tr>
<th>Degree Of Curve (D)</th>
<th>Radius (R) (Ft.)</th>
<th>Design Speed (mph)</th>
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<td>2° 00'</td>
<td>2,865</td>
<td>NC</td>
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<td>2° 15'</td>
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<td>1,910</td>
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<td>3° 15'</td>
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<td>RC</td>
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<td>3° 30'</td>
<td>1,528</td>
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<tr>
<td>4° 00'</td>
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<tr>
<td>6° 45'</td>
<td>849</td>
<td>RC</td>
</tr>
</tbody>
</table>

### GENERAL NOTES

1. Maximum rate of superelevation for urban highways and high speed urban streets shall be 0.05.

2. Superelevation shall be obtained by rotating the plane successively about the break points of the section until the plane has attained a slope equal to that required by the chart. Should the rotation traverse the entire section and further superelevation be required, the remaining rotation of the superelevation shall be that of the inside edge of the side travel lane. Crown is to be removed in the auxiliary lane to the side of the curve only when the adjoining travel lanes require positive superelevation.

3. When positive superelevation is required, the slope of the gutter on the high side shall be a continuation of the slope of the superelevated pavement.

4. In construction, short vertical curves shall be placed at all angular profile breaks within the limits of the superelevation transition.

5. The variable superelevation transition length \( L \) shall have a minimum value of 50 feet for design speeds under 40 MPH and 75 feet for design speeds of 40 MPH or greater.

6. Roadway sections having lane arrangements different from those shown, but composed of a series of planes, shall be superelevated in a similar manner.

7. For superelevation of lower speed urban streets, see the FDOT Manual of Uniform Minimum Standards for Design, Construction And Maintenance For Streets And Highways. For superelevation of curves on rural highways, urban freeways and high speed urban highways, see Index 000-510.
**DESCRIPTION:**

**REVISION LAST of STANDARD PLANS FY 2018-19 SHEET INDEX 000-511**

11/01/17

**SUPERELEVATION - LOW SPEED HIGHWAYS**

**PROFILE**

**TWO LANES EACH DIRECTION**

**TWO LANES EACH DIRECTION WITH MEDIAN AND AUXILIARY LANE**

**EXAMPLE SUPERELEVATION SECTIONS AND PROFILES FOR URBAN HIGHWAYS AND HIGH SPEED URBAN STREETS**

*Note:*

The sections and profiles shown are examples of superelevation transitions. Similar schemes should be used for roadways having other sections.
SUMMARY OF GEOMETRIC REQUIREMENTS FOR DRIVEWAY TURNOUTS

**GENERAL NOTES**

1. For definitions and descriptions of access connection categories and access classifications of highway segments, and for other detailed information on access to the State Highway System, refer to FDOT Rule Chapter 14-96, "State Highway Connection Permits Administrative Process" and Rule Chapter 14-97, "State Highway System Access Management Classification System and Standards."

2. For this index the term 'turnout' applies to that portion of driveways or side roads adjoining the outer roadway. For this index the term 'connection' encompasses a driveway or side road and their appurtenant islands, separators, transition layers, auxiliary lanes, travelway flares, drainage pipes and structures, crossovers, sidewalks, curb cut ramps, signage, pavement marking, required signalization, maintenance of traffic or other means of access to or from controlled access facilities. The turnout requirements set forth in this index do not provide complete intersection design, construction or maintenance requirements.

3. The location, positioning, orientation, spacing and number of connections and median openings shall be in conformance with FDOT Rule Chapter 14-97.

4. On Department construction projects all driveways not shown on the plans shall be reconstructed at their existing location in accordance with these standards, or, in conformance to permits issued during the construction project.

5. Driveways shall have sufficient length and size for all vehicular queuing, stacking, maneuvering, standing and parking to be carried out completely beyond the right of way line. Except for vehicles stopping to enter the highway, the turnout areas and drives within the right of way shall be used only for moving vehicles entering or leaving the highway.

6. Connections with expected daily traffic over 4000 vpd shall be constructed an intersecting side roads. The design requirement of this index and that of the local government shall be used to select appropriate connection widths, radial and intersection design, subject to the approval of the Department. For connections with expected daily traffic less than 4000 vpd, the Department will determine if a drop curb or radial returns are required in accordance with existing or planned connections. Where radius returns apply, the design requirements of this index and that of the local government shall be used to select appropriate connection widths, radial and intersection design, subject to the approval of the Department. For connections that are intended to daily accommodate either multi-unit vehicles or single unit vehicles exceeding 30' in length, returns with 50' radii shall be used, unless otherwise called for in the plans or otherwise stipulated by permit. Where large numbers of multi-unit vehicles will use the connection, the connection width and radial shall be increased and auxiliary lanes, lanes, lane flares, separators and/or islands constructed, as determined by the Department to be necessary for safe turning movements.

7. Any connection requiring or having a specified median opening with left turn storage and served directly by that opening shall have radial returns.

8. Where a connection is intended to align with a connection across the highway, the through lanes shall align directly with the corresponding through lanes.

9. For new connections and for connections on all new construction and reconstruction projects, pavement materials and thicknesses shall meet the requirements applicable to either that detailed for "Curbed Roadway-Flared Turnouts", or that described in Table 515-1, for connections with radial returns and/or auxiliary lanes.

10. The responsibility for the cost of construction or alteration to an access connection shall be in accordance with FDOT Rule Chapter 14-96.

**DEsign Notes**

1. Prior to the adoption of FDOT Rules Chapter 14-96 and 14-97, connections to the State Highway System were defined and permitted by Classes. Connections have been redefined by Categories under Rule 14-96, and the term "Class" has been applied to highway segments of the State Highway System as defined under Rule 14-97.

**Curbed Roadways**

**Flush Shoulder Roadways**

**Sketch Illustrating Definitions**

For Additional Information Refer To FDOT Rules Chapters 14-96 And 14-97.

For Corner Clearance (C) Requirements see General Note 3.

**Not Intended For Full Intersection Design**

**Last Revision 01/01/17**

**Turnouts And Driveways**

**Index 000-515**

**Sheet 1 of 7**
Turnouts and Driveways

**Footnotes:**

- All 1/2" joints shall be constructed with preformed joint filler.
- 1/4" open joints placed at equal (20' max) intervals for driveways over 20' wide. Joints in curb and gutter to match joints in driveways.
- When connecting to side road curb and gutter sections, the no drop curb limits should extend back to the side road radius point. With or without curb and gutter, no driveway should encroach on the corner radius.
- Driveways (6" concrete) shall be of a uniform width (W) to the right of way line.
- Delta numeric identification of a flared driveway type specifically called for in the plans, see sheets 3 and 4.

**Design Notes for Curbed Roadway - Flared Turnouts**

1. Driveways indicated as 'Adverse Applications' are those with slopes that can cause overhang drag for representative standard passenger vehicles under fully loaded conditions; or, those with slopes that can cause drivers who are leaving the roadway to slow or pause to the extent that traffic demand volumes will be impeded.
2. Driveways indicated as 'Marginal Applications' are those with slopes that can readily accommodate representative standard passenger vehicles and those that can accommodate representative standard trucks, vans, buses, and recreational vehicles operating under normal crown and super-elevation conditions.
3. The standard flared driveways on this index may not accommodate vehicles with low beds, low undercarriage or low appendage features. Where such vehicles are design vehicles, driveways shall have site specific flare designs or Category III designs.
4. When specific flare type driveways shall be constructed, the type shall be designated in the plans using the assigned alpha-numeric designation.

**Special Notes for Curbed Roadways - Flared Turnouts**

1. Drop curb, concrete sidewalks (6" thick) and driveways (6" thick) shall meet Specification Sections 520 and 522. The driveway foundation shall meet the requirements of Subarticle 522-A.
2. For details of drop curb and sidewalk curb ramps refer to Indexes 520-001 and 522-002 respectively.
3. Where turns are constructed within existing curb and gutter, the existing curb and gutter shall be removed either to the nearest joint beyond the flare point or to the extent that no remaining section is less than 9' long, and drop curb constructed in accordance with Notes 1 and 2.
4. For turnouts with radial returns see the requirements under the "Summary Of Geometric Requirements For Turnouts", the "General Notes", the details of "Flush Shoulder Roadway-Turnout Construction" and the detail of "Limits Of Clearing & Grubbing, Stabilization And Base At Intersections".
5. Maintenance of pavement shall extend out to the right of way or 2' beyond the back of sidewalk, whichever distance is less.
6. The maintenance and operation of highway lighting, traffic signals, associated equipment, and other necessary devices shall be the responsibility of a public agency.
7. All pavement markings on the State highways, including acceleration and deceleration lane markings, and signing installed for the operation of the State highway shall be maintained by the Department.
8. All signing and marking installed for the operation of the connection (such as stop bars and stop signs for the connection) shall be the responsibility of the permittee.
9. All sidewalk surfaces crossing driveways with a cross slope shown in this Index shall be 0.02 or shall be 0.02 Maximum.

**Curbed Roadway - Flared Turnouts**

- Driveway To Be Constructed As Called For In The Plans Or As Directed By The Engineer
- Driveway To Be Constructed As Called For In The Plans Or As Directed By The Engineer
- Utility Strip (10' Or Greater)
- Joint Pattern When Concrete Drive Constructed Inset
- Joint Pattern When Concrete Drive Constructed Inset
- Special Notes For Curbed Roadway - Flared Turnouts
- Special Notes For Curbed Roadway - Flared Turnouts
- Standard Plans
- Standard Plans
- Curbed Roadway - Flared Turnouts
- Curbed Roadway - Flared Turnouts
- FY 2018-19 Standard Plans
- FY 2018-19 Standard Plans
APPLICATIONS

GENERAL*

MARGINAL* APPLICATIONS ON LOW SIDE OF FULLY SUPERELEVATED ROADWAY (REFER TO MODIFICATIONS ON SHEET 4)

ADVERSE* APPLICATIONS (REFER TO MODIFICATIONS ON SHEET 4)

SIDEWALK ADJACENT TO CURB

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

DRIVEWAY SECTIONS ON CURBED FACILITIES WITH SIDEWALKS
MODIFICATIONS OF 'ADVERSE' AND 'MARGINAL' APPLICATIONS

SIDEWALK ADJACENT TO CURB
SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

MODIFICATIONS TO ADVERSE AND MARGINAL SECTIONS

* See 'DESIGN NOTES FOR CURVED ROADWAY - FLARED TURNOUTS'
**DESCRIPTION:**

**REVISED:**

**LAST SHEET:**

**INDEX:**

**TURNOUTS AND DRIVEWAYS**

**INTERSECTIONS NOTES:**

- **Return Radius Point or Transition Point.**

**DRIVE ENTRANCES NOTES:**

- Drainage pipe size and length shall be that shown on the plans, or as stipulated by permit, or, as determined by the Engineer during construction. The size shall be at least that established by the FDOT District, but not less than 15" diameter or equivalent. For minimum cover over drainage pipe see Section 125. Pipe arch or elliptical pipe may be required to obtain necessary cover. For minimal cover applications a modified pavement apron is permitted. See "PERMISSIBLE PAVEMENT MODIFICATION" Index 430-022. For spacing between adjacent pipe end treatments see Index 430-022.

- Stable material may be required for graded turnouts to private property as directed by the Engineer in accordance with Section 102-8 of the Standard Specifications.

- The turnout pavement requirement at graded connections may be waived for connections serving one or two homes or field entrances with less than 20 trips per day, or 5 trips per hour as approved by permit or by the Engineer, or when not itemized in the plans.

- The turnout pavement shall be constructed for all paved connecting facilities. The connection point will be determined by the Engineer.

- Paved turnouts shall be constructed for all business, commercial, industrial or high-volume residential graded connecting facilities. The connection point shall be 30' from edge of travel way or at R/W line, whichever is less.

- Paved turnouts shall be constructed for all connecting facilities over 4000 vehicles per day. The connection point shall be at the R/W line.

- Pavements shall be for return radius lengths and supplemental information.

- See "Summary Of Geometric Requirements For Turnouts" chart for return radius lengths and supplemental information.

- **Return Radius Point or Plane Point.**
**Material Types and Thicknesses in Driving Areas for All Connections**

<table>
<thead>
<tr>
<th>Course</th>
<th>Materials</th>
<th>Thickness (in.)</th>
<th>Connections</th>
<th>Roadway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td>Asphaltic Concrete</td>
<td>1&quot;</td>
<td>176&quot;</td>
<td>0.8 &amp; 1&quot;</td>
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<tr>
<td>Bases</td>
<td>Optional Base (see Spec. Section 285)</td>
<td>0.8 &amp; 1&quot;</td>
<td>0.8 &amp; 1.5&quot;</td>
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1. Minimum thickness.
2. All materials shall be approved by the Department prior to being placed.
3. Connection structure other than traffic lanes. See Notes 1 and 2 below.
4. Travel way flares (bypass lanes), auxiliary lanes serving more than a single connection, and all median crossovers including their auxiliary lanes and/or transition tapers. See Notes 1 and 2 below.

**Notes**

1. The pavement should be structurally adequate to meet the expected traffic loads and should not be less than that shown above, except as approved by the Department for graded connections. Other Department-approved equivalent pavements may be used at the discretion of the Engineer.

2. Auxiliary lanes and their transition tapers shall be the same structure as the abutting travel way pavement thickness or any of the roadway structures tabulated above, whichever is thicker.

3. If an asphalt base course is used for a turnout, its thickness may be increased to match the edge of travel way pavement thickness in lieu of a separate structural course. 6" of Portland cement concrete will be acceptable in lieu of the asphalt base and structural courses. See Notes 4 and 5 below.

4. A structural course is required for flexible pavements when they are used for auxiliary lanes serving more than a single connection.

5. Connections paved with Portland cement concrete shall be Class NS concrete at least 6" thick. The Department may require greater thickness when called for in the plans or stipulated by permit. Materials and construction shall conform with FDOT Standard Specifications Sections 347, 350 and 522.

6. The Department may require other pavement criteria where local conditions warrant.

**Pavement Structure for Turnouts and Auxiliary Lanes**

**Table 515-1**

---

**Notes**

1. Auxiliary lane pavements and crossover pavements shall be maintained by the Department.

2. Department maintenance of turnout pavement extends 9' from edge of travel way or to the edge of paved shoulder, whichever is greater. The remainder of any turnout paved area on the right of way shall be maintained by the owner or his authorized agent. As a function of routine remarking shoulders, the Department may grade and shape existing material on nonpaved areas beyond the maintained pavement.

3. Control and maintenance of drainage facilities within the right of way shall be solely the responsibility of a public agency.

4. The maintenance and operation of highway lighting, traffic signals, associated equipment, and other necessary devices shall be the responsibility of a public agency.

5. All pavement markings on the State highways, including acceleration and deceleration lane markings, and signing installed for the operation of the State highway shall be maintained by the Department.

6. All signing and marking installed for the operation of the connection (such as stop bars and stop signs for the connection) shall be the responsibility of the permittee.

**Limits of Construction and Maintenance for Flush Shoulder Roadway Connections**
**FLUSH SHOULDER ROADWAY - TURNOUT PROFILES**

**Definitions**

- **G** - Grade (%)
- **L** - Length (ft)
- **Commercial** = 10%
- **Residential** = 28%
- **Option 1**
- **Option 2**
- **Existing Or Proposed Drive**
- **Maximum Grades**
  - **Commercial** = 10%
  - **Residential** = 28%
- **Algebraic Difference In Grades (%)**
- **STORMWATER RUNOFF AND PROFILE OPTION NOTES**
- **ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**
- **G** slopes

**CURBED ROADWAY - TURNOUT PROFILES**

1. When restoring or reconstructing existing commercial turnout connections on new construction and reconstruction projects, the maximum 10% commercial grade may be exceeded provided this does not create adverse roadway operational or safety impacts. This shall be approved by the District Design Engineer and supported by documented site specific findings.

2. The Option 1 profile is intended for locations where roadway, turnout taper and auxiliary lane stormwater runoff volumes are relatively large. The Option 2 profile is intended for locations where runoff volumes are relatively small and/or where there is no roadside ditch. The plans or the Engineer may specify a particular type of curvature.

**RECOMMENDED TURNOUT PROFILE TRANSITION LENGTHS (L) (FT.)**

1. Turnouts shall not cause water to flow on or across the roadway pavement, nor cause water ponding or erosion within the State right of way. On all Flush Shoulder Roadway turnouts, the transition (L) nearest the roadway shall be sloped or crowned to direct stormwater runoff to the roadside ditch. Inlets, flumes or other appropriate runoff control devices shall be constructed when runoff volumes are sufficient to cause erosion of the shoulder. If high runoff control device shall be constructed as necessary to properly direct and control the stormwater runoff on Curved Roadway turnouts.

2. The Option 1 profile is intended for locations where roadway, turnout taper and auxiliary lane stormwater runoff volumes are relatively large. The Option 2 profile is intended for locations where runoff volumes are relatively small and/or where there is no roadside ditch.

**ROADWAY SUPERELEVATION SECTIONS (G)**

**TURNOUT PROFILES**

**FLUSH SHOULDER ROADWAY - TURNOUT PROFILES**

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes

**STORMWATER RUNOFF AND PROFILE OPTION NOTES**

**ROADWAY PAVEMENT SLOPES AND SLOPES OF ABUTTING ROADWAY SURFACES (G)**

**G** slopes
General Notes:

1. Turnouts are to be constructed or resurfaced for low volume (single family, duplex, farm, etc.) residential connections as directed by the Engineer.

2. Turnout construction is not required for low volume residential connections where roadway shoulders are paved.

3. Match existing paved shoulder widths ≥ 4'. For all other shoulder conditions, construct at 5' wide.

4. Connections beyond the shoulder width are to be constructed as directed by the Engineer.

5. The contract unit price for Turnout Construction includes the cost for excavation and base.

6. Payment for structural course is to be included in the roadway resurfacing pay item.

7. Payment for feathering friction course is to be included in the unit price for Asphaltic Concrete Friction Course placed on the roadway. Feathered areas will not be included in measured quantities. Feathering is not required for FC-5 friction course.
1. Taper-Type exit and entrance terminals as detailed shall not be used on ramps for which a speed of 50 MPH or greater cannot be maintained. For such ramps, parallel deceleration and acceleration lanes shall be used in place of tapers with lengths set according to AASHTO.

2. Shoulder Pavement:
   A. Concrete Pavement Projects: Where shoulder pavement adjacent to shoulder gutter is less than 6' wide, it shall be identical to the adjacent roadway pavement beginning with the transverse joint nearest the point of 6' width.
   B. Flexible Pavement Projects: Where shoulder pavement used in conjunction with shoulder gutter is less than 6' uniform width, it shall be identical to the adjacent roadway pavement.

3. For concrete pavement joint details and layouts at entrance and exit ramp terminals, see Index 350-001.

GENERAL NOTES:

LEGEND:

Shoulder Pavement

SINGLE LANE RAMPS - EXIT TERMINALS

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RAMP TERMINALS

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DESCRIPTION:

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LEGEND:

- Shoulder Pavement

THREE THRU LANES - APPROACH AUXILIARY LANE
(Shown Without Shoulder Gutter)

FLEXIBLE PAVEMENT THICKNESS TRANSITION

DETAIL "A"

SECTION A-A

SECTION B-B

SECTION C-C

TWO LANE RAMPS - EXIT TERMINALS
**DESCRIPTION:**

**RAMP TERMINALS**

**INDEX**

**SHEET**

**ENTRANCE TERMINALS - FRICTION COURSE LOCATION (FOR FLEXIBLE PAVEMENT)**

**LEGEND:**
- Exclude Friction Course
- Friction Course Optional

The diagram illustrates various types of entrance terminals for flexible pavement, including taper and parallel types, with and without shoulder gutters. The friction course location is indicated with specific annotations and symbols.
GENERAL NOTES:

1. Temporary barrier systems may be any of the following:
   A. Type K Temporary Concrete Barrier System (Index 102-110) installed as either Free-Standing or Anchored
   B. Proprietary Temporary Barrier Systems on the Approved Product List (APL)
      a. Concrete Barrier (Free-Standing or Anchored)
      b. Steel Barrier (Anchored)
      c. Water Filled Barrier (Free-Standing)

2. Where existing flexible pavement is not present, construct a minimum 2" thick temporary Asphalt Pad using Miscellaneous Asphalt Pavement in accordance with Specification 339 with the exception that the use of a pre-emergent herbicide is not required.

3. For Barrier Delineators, see Specification 102. Mount on top of temporary barriers. Color must match adjacent longitudinal pavement marking.

4. Ensure the setback distance is clear of any grass, construction debris, stockpiled materials, equipment, and objects.

5. Transitions are required between Type K Barrier and free-standing, anchored, back-filled or other types of temporary barrier. See Index 102-110 for transitions between Type K Barrier and permanent bridge or traffic railing. Refer to the APL for additional information.

6. Anchoring (Bolting) of temporary barrier or crash cushions is not permitted on bridge superstructures that contain post-tensioned tendons within the concrete deck (top flange of concrete box girders) or on bridge superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slabs units.

7. Transitions are required between Type K Barrier and free-standing, anchored, back-filled or other types of temporary barrier. See Index 102-110 for transitions between Type K Barrier and permanent bridge or traffic railing. Refer to the APL for additional information.

8. Anchoring (Bolting) of temporary barrier or crash cushions is not permitted on bridge superstructures that contain post-tensioned tendons within the concrete deck (top flange of concrete box girders) or on bridge superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slabs units.

9. Anchor abutting segments of temporary barrier terminated with a Crash Cushion as shown in Index 102-110 or the APL.

10. The requirements of this Index do not apply to Temporary Low Profile Barrier, see Index 102-120.

11. Setback requirements below cover most Temporary Barrier options. Provide additional setback distance for APL products that require additional setback (deflection) space.

---

### INSTALLATION DATA

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>LATERAL OFFSET</th>
<th>SETBACK DISTANCE</th>
<th>PAVEMENT/ ASPHALT WIDTH</th>
</tr>
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<tbody>
<tr>
<td>Anchored</td>
<td>2' Min.</td>
<td>2' Min.*</td>
<td>1' Min.</td>
</tr>
<tr>
<td>Free-standing</td>
<td>2' Min.</td>
<td>4' Min.</td>
<td>4' Min.</td>
</tr>
</tbody>
</table>

* For Bridge Decks see Index 102-110 or APL
APPROACH SHOULDER BARRIER TRANSITION ON UNDIVIDED FACILITIES

APPROACH SHOULDER BARRIER TRANSITION ON DIVIDED FACILITIES

MEDIAN BARRIER TRANSITION
DEPARTURE SHOULDER BARRIER TRANSITION ON UNDIVIDED FACILITIES

DEPARTURE (TRAILING) SHOULDER BARRIER TRANSITION ON DIVIDED FACILITIES
GENERAL NOTES:
1. Meet the requirements of Index 102-100.
2. For fabrication details see Sheets 15 thru 17.
3. HANDLING: Do not lift or move the Barrier Units by using Bars 6D that extend from the ends of the units. Approximate weight of one unit equals 2.7 tons.
4. CONNECTION PIN ASSEMBLY: Use steel for Connection Pin and Top Plate assemblies in accordance with ASTM A36 or ASTM A709 Grade 36. Nondestructive testing of welds is not required. At the Contractor's option, a 1/8" diameter hole may be provided at the bottom of the Connection Pin, as shown, for the installation of a vandal resistance bolt.
5. CONNECTION PIN INSTALLATION: Initially set Barrier Units by using a 3/8" wooden block between ends of adjacent units. Install Connection Pin between adjacent Barrier Units as shown, then pull newly placed Barrier Unit away from adjacent Barrier Unit to remove slack between Connection Pin and Bars 6D (except as shown on Sheet 2). Do not use Barrier Units unconnected.
6. USE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.
7. REMOVAL OF BOLTS, STAKES AND KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification 930 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification 926. If a flexible pavement is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

NOTES FOR THRIE-BEAM GUARDRAIL SPLICE INSTALLATIONS:
1. THRIE-BEAM GUARDRAIL: Provide Thrie-Beam Guardrail for splices meeting the requirements of specification 967 and as follows: Two panels per splice (one panel per side of Class B (10 Gauge), or four panels per splice (two nested panels per side) of Class A (12 Gauge). Use a 12-6" guardrail panel. Provide and install all other associated metallic guardrail components (Terminal Connectors, Shoulder Bolts, Hex Bolts and Nuts, Filler Plates, etc.) in accordance with Index 536-001. Install five Guardrail Anchor Bolts at each end of each splice in any of the standard seven anchor bolt holes in the Thrie-Beam Terminal Connector. If reinforcing steel is encountered when drilling holes for Guardrail Anchor Bolts in Type K Barrier Units, shift Thrie-Beam Terminal Connector so as to clear reinforcing steel within the given tolerances or select a different bolt hole to use. Do not drill or cut through reinforcing steel within Type K Barrier Units. Drilling or cutting through reinforcing steel within permanent concrete traffic railings is permitted.
2. GUARDRAIL OFFSET BLOCKS: Provide and install timber Offset Blocks meeting the requirements of Specification 967. Field trim Offset Blocks as required for proper fit. Utilize Offset Blocks as shown and required in order to prevent bending or kinking of Thrie-Beam Guardrail panels.
3. CONCRETE FOR FILLING TAPERED TRAFFIC RAILING TOES: Provide concrete for filling tapered toes of Traffic Railings as shown meeting the material requirements of Specification 346, any Class, or a commercially available prebagged concrete mix (3000 psi minimum compressive strength). Sampling, testing, evaluation and certification of the concrete in accordance with Specification 346 is not required. Saturate with water the surfaces upon and against which the concrete fill will be placed prior to placing concrete. Place and finish concrete fill using forms or by hand methods to the general configurations shown so as to provide a smooth shape transition between the Type K Barrier and the adjacent traffic railing. A low slump is desirable if placing and finishing concrete by hand methods. Cure the concrete fill by application of a curing compound, or by covering with a wet tarp or burlap for a minimum of 24 hours. Completely remove the concrete fill upon relocation or removal of the Type K Temporary Concrete Barrier.
4. CONNECTION PIN ASSEMBLY: Use steel for Connection Pin and Top Plate assemblies in accordance with ASTM A36 or ASTM A709 Grade 36. Nondestructive testing of welds is not required. At the Contractor's option, a 1/8" diameter hole may be provided at the bottom of the Connection Pin, as shown, for the installation of a vandal resistance bolt.
5. CONNECTION PIN INSTALLATION: Initially set Barrier Units by using a 3/8" wooden block between ends of adjacent units. Install Connection Pin between adjacent Barrier Units as shown, then pull newly placed Barrier Unit away from adjacent Barrier Unit to remove slack between Connection Pin and Bars 6D (except as shown on Sheet 2). Do not use Barrier Units unconnected.
6. USE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.
7. REMOVAL OF BOLTS, STAKES AND KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification 930 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification 926. If a flexible pavement is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.
NOTES FOR BOLTED INSTALLATIONS:
Bridge deck shown, approach slab or rigid pavement similar; installation adjacent to drop-off shown, median transition installation similar.

LIMITATION OF USE: This installation technique can only be used on rigid pavement and concrete bridge decks as shown. Anchor Bolts must not be installed on both sides of the Barrier Units. Do not bolt down Barrier Units across bridge finger or modular expansion joints.

ANCHOR BOLTS, NUTS AND WASHERS: When using Adhesive-Bonded Anchor Bolts, use fully threaded rods in accordance with ASTM F 1554 Grade 36. Install Anchor Bolts for through bolting in accordance with ASTM A 397 or ASTM F 1554 Grade 36. Install nuts in accordance with ASTM A 563 or ASTM A 194. Install Flat Washers in accordance with ASTM F 436 and Plate Washers in accordance with ASTM A 36 or ASTM A 194 Grade 36.

Install three (3) Anchor Bolts per Barrier Unit on the traffic side of the Barrier Units as shown, except for Transition Installations. For the number and positions of Anchor Bolts required in Transition Installations see Sheets 8 and 9 and Index 102-100. Drilling through deck reinforcing steel to install Anchor Bolts is permitted. Unless otherwise shown in the Plans, at the Contractor's option Barrier Units may be installed by through bolting (where geometrically possible) or by the use of Adhesive-Bonded Anchor Bolts. Do not drill into or otherwise damage the top of supporting beams or girders, bridge deck expansion joints or drains. Install Anchor Bolts and Nuts so that the maximum extension beyond the face of the Barrier Units is 3/16. Snug tighten the nuts on the Anchor Bolts. For through/bolted installations, snug tighten the double Nuts on the underside of the deck against each other to minimize the potential for loosening.

Omit one (1) Anchor Bolt within a single Barrier Unit if a conflict exists between the Anchor Bolt location and a bridge deck expansion joint or drain. The adjacent Barrier Units must each be installed with the standard three (3) Anchor Bolts. Omit one (1) Anchor Bolt within a single Barrier Unit as shown in the Treatment at Bridge Deck Expansion Joint Schematic if the Barrier Unit straddles a bridge deck expansion joint. The adjacent Barrier Units must each be installed with the standard three (3) Anchor Bolts.

ADHESIVE-BONDING MATERIAL SYSTEMS: When using Adhesive Bonding Material Systems for Anchor Bolts, use Type HSHV in accordance with Specification 937 and installed them in accordance with Specification 416. Prior to installation of the Barrier Units in the Plan locations, install a demonstration Barrier Unit using the proposed production installation method, at a location approved by the Engineer. In lieu of the production test requirements of Specification 416, install six (6) Adhesive-Bonded Anchor Bolts in the demonstration Barrier Unit and test each Anchor Bolt with a 29,800 pound tensile proof load. Install and test additional demonstration Barrier Units when requested by the Engineer. Remove the demonstration Barrier Unit prior to testing the Anchor Bolts. Remove the test Anchor Bolts after testing as directed by the Engineer.

TREATMENT AT BRIDGE DECK EXPANSION JOINT SCHEMATIC

ANCHORED INSTALLATIONS - BOLTED

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TYPICAL SECTION

ANCHORED INSTALLATIONS - STAKED

FREE-STANDING INSTALLATION

NOTES FOR STAKED INSTALLATIONS:
LIMITATION OF USE: This installation technique can only be used on flexible pavement or an Asphalt Pad as shown. Stakes must not be installed on both sides of the Barrier units.

STAKES: Provide steel for Stake assemblies in accordance with ASTM A 36 or ASTM A 309 Grade 36. Weld in accordance with the American Welding Society Structural Welding Code (Steel) AWS/AWS D1.1 (current edition). Welding metal are E60XX or E70XX. Nondestructive testing of welds is not required.

Install three (3) Stakes on the traffic side of the Barrier units as shown, except for Transition Installations. For the number and positions of stakes required in Transition Installations see Sheets 4, 5 and 6 and Index 102-100. Install Stakes so that the Stop Plate is snug against the bottom of the Anchor Blockout.

BURIED UTILITIES: Prior to installation of Stakes verify locations of all adjacent buried utilities, drainage structures, pipes, etc. if conflicts between Stake locations and buried elements exist, a maximum of two (2) Stakes within a single Barrier Unit may be omitted if the adjacent Barrier units are installed with the standard three (3) Stakes.

NOTES FOR FREE-STANDING INSTALLATION:

1. For Bridge Decks only, use Keeper Pins that are \( \frac{1}{2} \)" diameter, smooth steel bar in accordance with ASTM A36 or ASTM A309 Grade 36. As directed by the Engineer, in order to limit vibration induced translation of the Barrier Units, install one (1) Keeper Pin per Barrier Unit as shown.

2. If traffic is on both sides of the Barrier (i.e. Median Installations), alternate Keeper Pin locations from side to side of Barrier Units along the length of the installation. If traffic is on only one side of the barrier install keeper pins on the traffic side as shown.

3. Do not drill into or otherwise damage bridge deck expansion joints or drains.

TYPICAL MEDIAN SECTION

TYPICAL ROADWAY SECTION

FREE-STANDING INSTALLATION

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TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

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NOTES FOR SOIL BACK-FILLED ROADWAY INSTALLATIONS:

SOIL BACK-FILL MATERIAL: Provide Back-Fill Material consisting of any available clean soil. Compact Back-Fill Material until the soil mass is firm and unyielding. Provide erosion control as specified in the Plans. If none is specified in the Plans, provide erosion control as required to maintain the integrity of the Back Fill embankment.

GEOTEXTILE FABRIC: Provide Type D-5 Geotextile Fabric in accordance with Specification 985 to contain Back Fill Material behind Barrier Units. Geotextile Fabric may be continuous over the length and height of the installation or may be individual pieces as required to cover the Lift / Drain Slots and open vertical joints between Barrier Units.
DESCRIPTION:

TRAILING END TRANSITION FROM ANCHORED TO FREE-STANDING TYPE K TEMPORARY CONCRETE BARRIERS

LEGEND:

* NOTE:
Where Barrier is located within Clear Zone of opposing traffic, Approach Transition is required.

Dot Indicates number and position of Bolts or Stakes
TRANSITION FROM FREE-STANDING TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE MEDIAN TRAFFIC RAILING OR ROADWAY MEDIAN CONCRETE BARRIER WALL

TRANSITION FROM FREE-STANDING TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

TRANSITION FROM ANCHORED TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

NOTE:
Where barrier is located within clear zone of opposing traffic, approach transition is required.

LEGEND:
- Dot indicates number and position of Bolts or Stakes

DESCRIPTION:
TRANSITION FROM ANCHORED TYPE K TEMPORARY CONCRETE BARRIERS TO BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

FREE-STANDING BARRIER (13 UNITS MIN.)
TRANSITION (4 UNITS)
DROP-OFF OR HAZARD
TYPE K BARRIER (TYP.)
NEW JERSEY SHAPE OR ROADWAY CONCRETE MEDIAN
BRIDGE MEDIAN TRAFFIC RAILING (32" F SHAPE OR NEW JERSEY SHAPE) OR ROADWAY CONCRETE MEDIAN
BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

FREE-STANDING BARRIER (13 UNITS MIN.)
TRANSITION (4 UNITS)
DROP-OFF OR HAZARD
TYPE K BARRIER (TYP.)
NEW JERSEY SHAPE OR ROADWAY CONCRETE MEDIAN
BRIDGE MEDIAN TRAFFIC RAILING (32" F SHAPE OR NEW JERSEY SHAPE) OR ROADWAY CONCRETE MEDIAN
BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

FREE-STANDING BARRIER (13 UNITS MIN.)
TRANSITION (4 UNITS)
DROP-OFF OR HAZARD
TYPE K BARRIER (TYP.)
NEW JERSEY SHAPE OR ROADWAY CONCRETE MEDIAN
BRIDGE MEDIAN TRAFFIC RAILING (32" F SHAPE OR NEW JERSEY SHAPE) OR ROADWAY CONCRETE MEDIAN
BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL

FREE-STANDING BARRIER (13 UNITS MIN.)
TRANSITION (4 UNITS)
DROP-OFF OR HAZARD
TYPE K BARRIER (TYP.)
NEW JERSEY SHAPE OR ROADWAY CONCRETE MEDIAN
BRIDGE MEDIAN TRAFFIC RAILING (32" F SHAPE OR NEW JERSEY SHAPE) OR ROADWAY CONCRETE MEDIAN
BRIDGE TRAFFIC RAILING OR ROADWAY CONCRETE BARRIER WALL
PARTIAL PLAN VIEW AT MEDIAN TRAFFIC RAILING

PARTIAL PLAN VIEW AT SHOULDER TRAFFIC RAILING

PARTIAL ELEVATION VIEW - FLORIDA CORRAL TRAFFIC RAILING

PARTIAL ELEVATION VIEW - VERTICAL SHAPE TRAFFIC RAILINGS

FOR F AND NEW JERSEY SHAPE TRAFFIC RAILINGS AND 8' & 14' TRAFFIC RAILING / NOISE WALL (CONCRETE BARRIER WALL SIMILAR)

FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

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TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

Cross References:
See Sheet 10 for Section A-A, Section B-B and Section C-C.
**TRAILING END SPLICE DETAIL**

**FOR 32" F AND NEW JERSEY SHAPE TRAFFIC RAILINGS WITH RAILING TRANSITION AND END POST**

**PARTIAL ELEVATION VIEW**

- Free-standing Type K Barrier shown, Anchored Barrier Similar, See Plans For Specific Requirements
- End Post
- Railing Transition
- Traffic Railing
- Approach Slab
- Guardrail Splice
- Offset Block bolted to Guardrail
- Begin or End Approach Slab (approximate location)
- Fill tapered toe if present (shown hatched) with concrete, see Note on Sheet 1
- Traffic Railing (shown, Flat Slab Bridge similar)

**PARTIAL ELEVATION VIEW**

- Part of Plan View
- See Thrie-Beam Guardrail Positioning Detail, Sheet 10 and Notes for Thrie-Beam Guardrail Splice Installations. Sheet 1

**APPEND TRANSITION SPLICE DETAIL**

**FOR 32" F AND NEW JERSEY SHAPE TRAFFIC RAILINGS WITH RAILING TRANSITION AND END POST**

**PARTIAL ELEVATION VIEW**

- Anchor Bolts or Stakes; See Partial Plan View for locations
- Approach Slab shown, Paved Surface similar
- Cross References: See Sheet 10 for Section B-B, Section C-C and Section E-E.

**PARTIAL PLAN VIEW**

- See Thrie-Beam Guardrail Positioning Detail, Sheet 10 and Notes for Thrie-Beam Guardrail Splice Installations. Sheet 1
- Traffic Railing
- Railing Transition & End Post (Beam or Girder Bridge shown, Flat Slab Bridge similar)
- Offset Block bolted to Guardrail
- Align Top of Type K Barrier Unit with Traffic Railing at its end
- Begin or End Bridge

**PARTIAL PLAN VIEW**

- Begin or End Approach Slab (approximate location)
**SECTION A-A**

32" F Shape Median Traffic Railing (shown), Median Concrete Barrier Wall (similar)

**SECTION A-A**

32" F Shape Traffic Railing (shown), 42" Traffic Railing and 8' & 14' Traffic Railing / Noise Walls (similar)

**SECTION A-A**

32" New Jersey Shape Concrete Barrier Wall (shown), 32" New Jersey Shape Traffic Railing & other Narrow Traffic Railings (similar)

**SECTION A-A**

32" & 42" Vertical Shape Traffic Railing (shown), Florida Corral Traffic Railing (similar)

**SECTION B-B**

Adjacent to Shoulder Traffic Railings

**SECTION C-C**

Adjacent to 32" F or New Jersey Shape Median Traffic Railing or Median Concrete Barrier Wall

**SECTION C-C**

32" F or New Jersey Shape Traffic Railing, Railing Transition & End Post

**SECTION E-E**

32" New Jersey Shape Traffic Railing (shown), 32" F Shape Traffic Railing (similar)
**DESCRIPTION:**

**TYPE K-PROPRIETARY TEMPORARY CONCRETE BARRIER SYSTEM**

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**APPROACH TRANSITION FROM FREE-STANDING PROPRIETARY TEMPORARY BARRIERS TO ANCHORED TYPE K TEMPORARY CONCRETE BARRIERS**

**APPROACH AND TRAILING END TRANSITIONS FROM FREE-STANDING TYPE K TEMPORARY CONCRETE BARRIERS TO FREE-STANDING PROPRIETARY TEMPORARY BARRIERS**

**TRAILING END TRANSITION FROM ANCHORED TYPE K TEMPORARY CONCRETE BARRIERS TO FREE-STANDING PROPRIETARY TEMPORARY BARRIERS**

**LEGEND:**

- Dot indicates number and position of Bolts or Nails

**NOTE:**

Where Barrier is located within Clear Zone of opposing traffic, Approach Transition is required.
**DESCRIPTION:**

**NOTE:**
Where Barrier is located within Clear Zone of opposing traffic, Approach Transition is required.

**LEGEND:**

- Dot indicates number and position of Bolts or Stakes

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**MEDIAN APPROACH AND TRAILING END TRANSITIONS FROM FREE-STANDING TYPE K TEMPORARY CONCRETE BARRIERS TO FREE-STANDING PROPRIETARY TEMPORARY BARRIERS**

**APPRAOCH TRANSITION FROM FREE-STANDING PROPRIETARY TEMPORARY BARRIERS TO BACK-FILLED TYPE K TEMPORARY CONCRETE BARRIERS**

**TRAILING END TRANSITION FROM BACK-FILLED TYPE K TEMPORARY CONCRETE BARRIERS TO FREE-STANDING PROPRIETARY TEMPORARY BARRIERS**

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**TYPE K-PROPRIETARY TEMPORARY CONCRETE BARRIER TRANSITIONS**
NOTE:
When subjected to reverse direction hits, construct Transition Panels from Temporary Barrier to Crash Cushions; for additional details refer to the applicable crash cushion drawings on the API.

LEGEND:
 Dot indicates number and position of Bolts or Stakes

UNIDIRECTIONAL - SEPARATED TRAFFIC

BIDIRECTIONAL - SEPARATED TRAFFIC

TWO-WAY TRAFFIC WITH CRASH CUSHION LOCATED OUTSIDE OPPOSING LANE CLEAR ZONE OR ONE-WAY TRAFFIC

TWO-WAY TRAFFIC WITH CRASH CUSHION LOCATED WITHIN OPPOSING LANE CLEAR ZONE

SHIELDING ENDS WITH REDIRECTIVE CRASH CUSHIONS (REDIRECTIVE OPTION)
FABRICATION NOTES:
In order to maintain crashworthiness of the Barrier System, do not substitute different grades, sizes, shapes or types of reinforcing steel for those shown for constructing Type K Barrier Units. Also, do not substitute different type, size, length or material grade anchor bolts, nuts, washers, adhesives, connector pins, stakes, keeper pins, or guardrail components for installing Type K Barrier Units.

FABRICATION PREQUALIFICATIONS:
A. The Concrete Plant that meets the requirements:
   a. Specifications 450 for prestressed concrete
   b. Specification 105 for precast.

CONCRETE:
A. Construct Barrier units with Class IV concrete in accordance with Specification 346.
B. Specification 346-10.2 through 346-10.4 are not applicable.
C. Barrier Units represented by concrete acceptance strength tests which fall below 3000 psi will be rejected.

REINFORCING STEEL:
A. Use only steel reinforcing that meet ASTM A 615, Grade 60, with the exception of Bars 6D1, 6D2 and 6D3.
B. Bars 6D1, 6D2 and 6D3 use steel reinforcing that meets ASTM A 706, with the exception that a 2½” diameter pin must be used for the 180 degree bend test.
C. After steel reinforcing fabrication, hot dip galvanized in accordance with Specification 962 or coated with a cold galvanizing compound in accordance with Specification 346, all or part of Bars 6D1, 6D2 and 6D3 may be galvanized or coated.
D. At the Fabricator’s option, the entire length of Bars 6D may be galvanized or coated.
E. The minimum limit of galvanizing or coating is shown in the Bending Diagrams.
F. Install Bars 6D within ½ of the plan dimensions.
G. Correct placement of Bars 6D is critical for proper fit up and performance of individual Barrier Units.
H. At the option of the Fabricator, Deformed Welded Wire Fabric in accordance with Specification Section 931 and the details shown on Sheet 15 may be utilized in lieu of Bars 4A and 5B.
I. All dimensions in the Bending Diagrams are out to out.
J. Install all reinforcing steel with a 2” minimum cover, except as noted.

LIFTING SLEEVE ASSEMBLY:
A. Inclusion of the Lifting Sleeve Assemblies is optional.
B. Use steel in accordance with ASTM A 53 for the Pipe Sleeve.
C. Hot-dip galvanize the Lifting Sleeve Assemblies after their fabrication in accordance with the Specifications.

SURFACE FINISH:
A. Construct Barrier Units in accordance with Specification Sections 521 and 525.
B. Finish the top and sides of the Barrier Units with a General Surface Finish.
C. Finish the bottom of the Barrier Units to a dense uniform surface by floating in lieu of the General Surface Finish.
D. Use stationary metal forms or stationary timber forms with a form liner.

MARKING:
A. Permanently mark the top left end of each Barrier Unit by the use of an embedded and anchored metallic plate with letters and figures a minimum of 0.5” tall.
B. Ink stamps are not allowed.
C. Permanently mark with the following information:
   - Type K1
   - Fabricator’s name or symbol
   - Date of manufacture (day, month and year)
DESCRIPTION:

A Revision of Standard Plans FY 2018-19

Sheet Index 11/01/17

Type K Temporary Concrete Barrier System

CONCRETE BARRIER QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY</td>
<td>1.29</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>218</td>
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</table>

The above quantities are for one Barrier Unit.

Cross References:
For Section A-A, Section B-B and Section C-C see Sheet 16.

ANCHOR BLOCKOUT DETAIL

SECTION D-D
(Reinforcement not shown for clarity)

* Measured from end of Barrier Unit to outside edge of Bars 6D.

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

INDEX

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16 of 17
**No. 4 Drain Bar over Drain Slots (Conventional Steel)**

- **Configuration One**
  - D 17.2 (Typ.)
  - No. 4 Drain Bar over drain slots (Conventional Steel), placed with D 19.7

- **Configuration Two**
  - D 17.2 (Typ.)
  - No. 4 Typical Bar (Conventional Steel), placed with D 19.7

**Notes:**
- Place 2 - No. 5 Bars (12'-3" long) in bottom of Welded Wire Reinforcement cage as shown.
- Match D17.2 spacing to Bars 4A in the Elevation View, Sheet 15.
- Field trim D17.2 to clear drain slot by 2".

**Reinforcement Cage as shown.**

**Place 2 ~ No. 5 Bars (12'-3" long) tied to D 19.7 inside of bottom Welded Wire Reinforcement cage as shown.**

**Match D19.7 spacing to Bars 4A in the Elevation View, Sheet 15.**

**Field trim D19.7 to clear drain slot by 2".**

**Reinforcement cage as shown.**

**Place 2 ~ No. 5 Bars (12'-3" long) tied to D 19.7 inside of bottom Welded Wire Reinforcement cage as shown.**
GENERAL NOTES

1. Pursuant to 35 United States Code, Chapter 18, also known as the Bayh Dole Act of 1980, the non mountable curb was developed through federal funding. The ‘Portable Temporary Low Profile Barrier For Roadside Safety’ is a licensed design by the University Of Florida. Any infringement on the rights of the designer shall be the sole responsibility of the user.

2. This Index is provided by the Florida Department Of Transportation solely for use by the Department and its assignees. The purpose for this Index is to indicate the approval of use of the barrier on the State Highway System; to provide sufficient pictorials for identifying the barrier unit; and, to provide general installation geometry for the barrier.

3. This legally mandated relationship is unique to federally funded university patents that Department contractors use on Contracts. Pursuant to federal law, the University may pursue royalties for a valid patent. Only three barrier units cast by producers licensed by the University Of Florida will be allowed for installation on the State Highway System in Florida. Barrier wall units shall conform to Section 521 of the Standard Specification and shall be produced in Department-approved plants with quality control plans for precasting concrete barrier walls. Each barrier wall unit shall be permanently marked with an identification that is traceable to the manufacturer, the producing precast concrete plant and the date of production. This permanent identification mark will serve as certification that the unit has been manufactured in accordance with University of Florida drawings and specifications, and the approved quality control program.

4. The low profile barrier is to be installed only with hardware and accessories furnished by the licensed barrier producer. Units shall be used for no purpose other than as interconnected segments in a run of barrier. Low profile barrier wall units shall maintain firm contact with adjoining units. Nuts on tensioning rods shall be installed snug tight.

5. The low profile barrier is applicable for work zone speeds of 45 mph or less.

6. If the plans specify Low Profile Barrier then substitution with other barrier types is not permitted.

7. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 50 centers on tangents and 25 centers on radii. The markers shall be fixed to the top of the barrier by an adhesive or other method approved by the engineer. Approach end units shall be marked with a Type I object marker. The cost of the tubular markers and Type I object marker shall be included in the cost of the low profile barrier.

8. Information regarding licensing, shop drawings, specifications, quality control and certification of compliance can be obtained from the University Of Florida: Office of Technology Licensing, P.O. Box 115500, Gainesville, Florida, 32611-5500. Telephone: 352-392-8660, Fax: 352-392-6600. Reference UF#11052.

9. The Portable Temporary Low Profile Barrier For Roadside Safety shall be paid for under the contract unit price for Barrier Wall (Temporary) Low Profile Concrete, LF, and will be full compensation for furnishing, installing, maintaining and removing barrier wall.

10. Deflection space shall be kept clear of any grass, construction debris, stockpiled materials, equipment, and objects.
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

CONVEX CURVATURE

CONCAVE CURVATURE

MAXIMUM CURVATURE ● MINIMUM RADIUS

Inset A

See Inset A

Traffic Side

Inset B

See Inset B

Traffic Side

See Inset B
* Trailing End Flares Are Not Required When Barrier Located Outside The Clear Zone Of Opposing Traffic

Type I Object Marker To Be Installed When Trailing End Flare Falls Within The Clear Zone Of Opposing Traffic

**BARRIER OPENINGS AT DRIVEWAYS**

**LEGEND**

- Type I Object Marker

**PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY**
Flare Falls Within The Clear Zone Of Opposing Traffic

Type I Object Marker To Be Installed When Trailing End Located Outside The Clear Zone Of Opposing Traffic

* Trailing End Flares Are Not Required When Barrier Located Outside The Clear Zone Of Opposing Traffic

Type I Object Marker To Be Installed When Trailing End Flare Falls Within The Clear Zone Of Opposing Traffic

LEGEND
| Type I Object Marker

BARRIER OPENINGS AT DRIVEWAYS

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
## General Notes:

1. All projects and works on highways, roads and streets shall have a traffic control plan. All work shall be executed under the established plan and Department-approved procedures. This Index contains information specific to the Federal and State guidelines and standards for the preparation of traffic control plans and for the execution of traffic control in work zones, for construction and maintenance operations and utility work on highways, roads and streets on the State Highway System. Certain requirements in this Index are based on the high volume nature of State Highways. For highways, roads and streets off the State Highway System, the local agency (City/County) having jurisdiction may adopt requirements based on the minimum requirements provided in the MUTCD.

2. Indexes 102-601 through 102-670 are Department-specific typical applications of commonly encountered situations. Adjust device location or number thereof as recommended by the Worksite Traffic Supervisor and approved by the Engineer. Devices include, but are not limited to, flaggers, portable temporary signals, signs, pavement markings, and channelizing devices. Comply with MUTCD or applicable Department criteria for any changes and document the reason for the change.

3. Except for emergencies, any road closure on State Highway System shall comply with Section 333.15, F.S.

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<td>Pavement Markings</td>
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DEFINITIONS

Regulatory Speed (In Work Zones)
The maximum permitted travel speed posted for the work zone is indicated on the regulatory speed limit sign. The work zone speed must be posted or noted in the plans. This speed should be used as the minimum design speed to determine length limits, departure rates, flare rates, lengths of need, clear zone widths, taper lengths, crash cushion requirements, marker spacings, superelevation, and other similar features.

Advisory Speed
The maximum recommended travel speed through a curve or a hazardous area.

Travel Way
The portion of the roadway for the movement of vehicles. For traffic control through work zones, travel way may include the temporary use of shoulders and any other permanent or temporary surface intended for use as a lane for the movement of vehicular traffic.

a. Travel Lane: The designated widths of roadway pavement marked to carry traffic and to separate it from opposing traffic or occupying other traffic lanes.
b. Auxiliary Lane: The designated widths of roadway pavement marked to separate speed change, turning, passing and climbing maneuvers from through traffic.

detour, Lane Shift, and Diversion
A detour is the redirection of traffic onto another roadway to bypass the temporary traffic control zone. A lane shift is the redirection of a traffic lane to a different section of the permanent pavement. A diversion is the redirection of traffic onto a temporary roadway, usually adjacent to the permanent roadway and within the limits of the right of way.

Aboveground Hazard
An aboveground hazard is any object, material or equipment other than traffic control devices that encroaches upon the travel way or is located within the clear zone which does not meet the Department's safety criteria, i.e., anything that is greater than 4' in height and is firm and unyielding or doesn't meet breakaway requirements.

TEMPORARY TRAFFIC CONTROL DEVICES
All temporary traffic control devices shall be ODOT's Approved Products List (APL). Ensure the appropriate APL number is permanently marked on the device in a readily visible location.

All temporary traffic control devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate shall be removed or covered.

Arrow Boards, Portable Changeable Message Signs, Radar Speed Displays, Trailer, Portable Regulatory Signs, and any other trailer mounted device shall be delineated with a channelizing device placed at each corner when in use and shall be moved outside the travel way and clear zone or be shielded by a barrier or crash cushion when not in use.

PEDESTRIAN AND BICYCLIST
When an existing pedestrian way or bicycle way is located within a traffic control work zone, accommodation must be maintained and provision for the disabled must be provided.

Only approved pedestrian longitudinal channelizing devices may be used to delineate a temporary traffic control zone pedestrian walkway.

Advanced notification of sidewalk closures and marked detours shall be provided by appropriate signs.

OVERHEAD WORK

Work is only allowed over a traffic lane when one of the following conditions is met:

OPTION 1 (OVERHEAD WORK USING A MODIFIED LANE CLOSURE)

a. Work operation is located on a utility pole, light pole, signal pole, or their appurtenances.
b. Work operations are 60 minutes or less.
c. Speed limit is 45 mph or less.
d. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.
e. Aerial lift equipment is placed directly below the work area to close the lane.
f. Traffic control devices are placed in advance of the vehicle/equipment closing the lane using a minimum 100 foot taper.
g. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.

OPTION 2 (OVERHEAD WORK ABOVE AN OPEN TRAFFIC LANE)

Work above allow a open traffic lane is allowed if all of the following conditions are met:

a. Work operation is located on a utility pole, light pole, signal pole, or their appurtenances.
b. Work operations are 60 minutes or less.
c. Speed limit is 45 mph or less.
d. No encroachment by any part of the work activities and equipment within an area bounded by 2 feet outside the edge of travel way and 18 feet high.
e. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.
f. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.
g. Adequate precautions are taken to prevent parts, tools, equipment and other objects from falling into open lanes of traffic.
h. Other Governmental Agencies, Rail facilities, or Codes may require a greater clearance.

OPTION 3 (OVERHEAD WORK ADJACENT TO AN OPEN TRAFFIC LANE)

Overhead work adjacent to an open traffic lane is allowed if all of the following conditions are met:

a. Work operation is located on a utility pole, light pole, signal pole, or their appurtenances.
b. Work operations are 60 minutes or less.
c. Speed limit is 45 mph or less.
d. No encroachment by any part of the work activities and equipment within 2 feet from the edge of travel way up to 18 height.
e. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.
f. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.
g. Adequate precautions are taken to prevent parts, tools, equipment and other objects from falling into open lanes of traffic.
h. Other Governmental Agencies, Rail facilities, or Codes may require a greater clearance.

OPTION 4 (OVERHEAD WORK MAINTAINING TRAFFIC WITH NO ENCROACHMENT BELOW THE OVERHEAD WORK AREA)

Traffic shall be detoured, shifted, diverted and/or paced as to not encroach in the area zone below the work area. Overhead work operations shall be in accordance with the appropriate index drawing or detailed in the plans. This option applies to, but not limited to, the following construction activities:

a. Beam, girder, segments, and bent/pier cap placement.
b. Form and falsework placement and removal.
c. Concrete placement.
d. Retaining construction located at edge of deck.
e. Structure demolition.

OPTION 5 (CONDUCTOR/CABLE PULLING ABOVE AN OPEN TRAFFICE LANE)

Overhead cable and/or de-energized conductor installations initial pull to proper tension shall be done in accordance with the appropriate index or temporary traffic control plan.

Continuous pulling operations of secured cable and/or conductors are allowed over open lane(s) of traffic with no encroachment by any part of the work activities, materials or equipment within the minimal vertical clearance above the travel way. The utility shall take precautions to ensure that pull ropes and conductors/cables at all time fall below the minimum vertical clearance.

On Limited Access facilities, a site specific temporary traffic control plan is required. The temporary traffic control plan shall include:

a. The temporary traffic control set up for the initial pulling of the pull rope across the roadway.
b. During pulling operations, advance warning consisting of no less than a Changeable Message Sign upstream of the work area with alternating messages: 'Overhead Work Ahead' and 'Be Prepared to Stop' followed by a traffic control officer and police vehicle with blue lights flashing during the pulling operation.

RAILROADS

Railroad crossings affected by a construction project should be evaluated for traffic control to reduce queuing on the tracks. The evaluation should include as a minimum: traffic volumes, distance from the tracks to the intersections, lane closure or taper locations, signal timing, etc.

SIGHT DISTANCE

Tapers: Transition tapers should be obvious to drivers. If restricted sight distance is a problem (e.g., a sharp vertical or horizontal curve), the taper should begin well in advance of the view obstruction. The beginning of tapers should not be hidden behind curves.

Intersections: Traffic control devices at intersections must provide sight distances for the road user to perceive potential conflicts and to traverse the intersection safely. Construction equipment and materials shall not restrict intersection sight distance.

ABOVEGROUND HAZARD

Aboveground hazards (see definitions) are to be considered work areas during working hours and treated with appropriate work zone traffic control procedures. During nonworking hours, all objects, materials and equipment that constitute an aboveground hazard must be stored/placed outside the travel way and clear zone or be shielded by a barrier or crash cushion.

For aboveground hazards within a work zone the clear zone required should be based on the regulatory speed posted during construction.
CLEAR ZONE WIDTHS FOR WORK ZONES

The term ‘clear zone’ describes the unobstructed relatively flat area, impacted by construction, extending outward from the edge of the traffic lane. The table below gives clear zone widths in work zones for medians and roadside conditions other than for roadside canals; where roadside canals are present, clear zone widths are to conform with the distances to canals as described in the FDM 215.2.

### CLEAR ZONE WIDTHS FOR WORK ZONES

<table>
<thead>
<tr>
<th>WORK ZONE SPEED (MPH)</th>
<th>TRAVEL LANES &amp; MULTILANE RAMPS (feet)</th>
<th>AUXILIARY LANES &amp; SINGLE LANE RAMPS (feet)</th>
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<tbody>
<tr>
<td>60-70</td>
<td>30</td>
<td>10</td>
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<tr>
<td>55</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>45-50</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>ALL SPEEDS</td>
<td>4' BEHIND FACE OF CURB</td>
<td>4' BEHIND FACE OF CURB</td>
</tr>
</tbody>
</table>

### SUPERELEVATION

Horizontal curves constructed in conjunction with work zone traffic control should have the required superelevation applied to the design radius. Under conditions where normal crown controls curvature, the minimum radii that can be applied are listed in the table below.

<table>
<thead>
<tr>
<th>MINIMUM RADIUS FOR NORMAL CROWN</th>
<th>WORK ZONE POSTED SPEED</th>
<th>MINIMUM RADIUS</th>
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<tbody>
<tr>
<td></td>
<td>MPH</td>
<td>Feet</td>
</tr>
<tr>
<td>70</td>
<td>65</td>
<td>11.80</td>
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<td>65</td>
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<td>35</td>
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<td>24.00</td>
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### OVERWEIGHT/OVERSIZE VEHICLES

Restrictions to Lane Widths, Heights or Load Capacity can greatly impact the movement of over-dimensional loads. The Contractor shall notify the Engineer who in turn shall notify the State Permits Office, phone no. (850) 410-5777, at least seven calendar days in advance of implementing a maintenance of traffic plan which will impact the flow of overweight/oversized vehicles. Information provided shall include location, type of restriction (height, width and weight) and restriction time frames. When the roadway is restored to normal service the State Permits Office shall be notified immediately.

### LANE WIDTHS

Lane widths of through roadways should be maintained through work zone travel lanes wherever practical. The minimum widths for work zone travel lanes shall be as follows: 11' for Interstate with at least one 12' lane provided in each direction, unless formally excepted by the Federal Highway Administration; 11' for freeways, and 10' for all other facilities.

### HIGH-VISIBILITY SAFETY APPAREL

All high-visibility safety apparel shall meet the requirements of the International Safety Equipment Association (ISEA) and the American National Standards Institute (ANSI) for ‘High-Visibility Safety Apparel’, and labeled an ANSI/ISEA 107-2004 or newer. The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined by the standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 feet. Class 3 apparel may be substituted for Class 2 apparel. Replace apparel that is not visible at 1,000 feet.

### WORKERS

All workers within the right-of-way shall wear ANSI/ISEA Class 2 apparel. Workers operating machinery or equipment in which loose clothing could become entangled during operation shall wear fitted high-visibility safety apparel. Workers inside the bucket of a bucket truck are not required to wear high-visibility safety apparel.

### UTILITIES

When other industry apparel safety standards require utility workers to wear apparel that is inconsistent with FDOT requirements such as NFPA, OSHA, ANSI, etc., the other standards for apparel may prevail.

### FLASHERS

For daytime activities, Flashers shall wear ANSI/ISEA Class 2 apparel. For nighttime activities, Flashers shall wear ANSI/ISEA Class 3 apparel.

### REGULATORY SPEEDS IN WORK ZONES

Traffic Control Plans (TCPs) for all projects must include specific regulatory speeds for each phase of work. This can either be the posted speed or a reduced speed. The speed shall be noted in the TCPs; this includes indicating the existing speed if no reduction is to be made. Regulatory speeds are to be uniformly established through each phase.

In general, the regulatory speed should be established to route vehicles safely through the work zone as close as to normal highway speed as possible. The regulatory speed should not be reduced more than 10 mph below the posted speed and never below the minimum statutory speed for the class of facility. When a speed reduction greater than 10 mph is imposed, the reduction is to be done in 10 mph per 500 increments.

Temporary regulatory speed signs shall be removed as soon as the conditions requiring the reduced speed no longer exist. Once the work zone regulatory speeds are removed, the regulatory speed existing prior to construction will automatically go back into effect unless new speed limit signing is provided for in the plans.

On projects with interspersed work activities, speed reductions should be located in proximity to those activities which merit a reduced speed, and not "blanketed" for the entire project. At the departure of such activities, the normal highway speed should be posted to give the motorist notice that normal speed can be resumed.

### REGULATORY SPEEDS IN WORK ZONES

If the existing regulatory speed is to be used, consideration should be given to supplementing the existing signs when the construction work zone is between existing regulatory speed signs. For projects where the reduced speed conditions exist for greater than 1 mile in rural areas (non-interstate) and on rural or urban interstate, additional regulatory speed signs are to be placed at no more than 1 mile intervals. Engineering judgement should be used in placement of the additional signs. Locating these signs beyond ramp entrances and beyond major intersections are examples of proper placement. For urban situations (non-interstate), additional speed signs are to be placed at a maximum of 1000 feet apart.

When field conditions warrant speed reductions different from those shown in the TCP, the contractor may submit to the project engineer for approval by the Department, a signed and sealed study to justify the need for further reducing the posted speed or, the engineer may request the District Traffic Operations Engineer (DTOE) to investigate the need. It will not be necessary for the DTOE to issue regulations for regulatory speeds in work zones due to the revised provisions of F.S. 316.07451(2) (b). Accurate Speed plates will be used at the option of the field engineer for temporary use while processing a request to change the regulatory speed specified in the plans when deemed necessary. Advisory speed plates cannot be used alone but must be placed below the construction warning sign for which the advisory speed is required.

For additional information, refer to the Plans Preparation Manual, Volume I, Chapter 10.

### LENGTH OF LANE CLOSURES

Lane closures must not exceed the following total lengths (includes taper, buffer and work space) in any given direction on the interstate or on state highways with a posted speed of 55 MPH or greater:

1. 3 miles for ground-in rumble strip operations on two-lane, two-way roadways.
2. 2 miles for all other operations.
SURVEY WORK ZONES

The SURVEY CREW AHEAD symbol or legend sign shall be the principal Advance Warning Sign used for Traffic Control Through Survey Work Zones and may replace the ROAD WORK AHEAD sign on the side street entering the work zone.

SIGN COVERING AND INTERMITTENT WORK STOPPAGE SIGNING

Existing or temporary traffic control signs that are no longer applicable or are inconsistent with intended travel paths shall be removed or fully covered.

SIGNBLANKS or other available coverings must completely cover the existing sign. Rigid sign coverings shall be the same size as the sign it is covering, and bolted in a manner to prevent movement.

SIGNING FOR DETOURS, LANE ShiftS AND DIVERSIONS

Detours should be signed clearly over their entire length so that motorists can easily determine how to return to the original roadway. The reverse curve (R1-4) warning sign should be used for the advanced warning for a lane shift. A diversion should be signed as a lane shift.

EXTENDED DISTANCE ADVANCE WARNING SIGN

Advance Warning Signs shall be used at extended distance of one-half mile or more where limited sight distance or the nature of the obstruction may require a motorist to bring their vehicle to a stop. Extended distance Advance Warning Signs may be required on any type roadway, but particularly may be required on isolated divided highways where vehicle speed is generally in the higher range (45 MPH or more).

UTILITY WORK AHEAD SIGN

The UTILITY WORK AHEAD (W1-17) sign may be used as an alternate to the ROAD WORK AHEAD or the ROAD WORK XX FY (W1-01) sign for utility operations adjacent to a highway.

LENGTH OF ROAD WORK SIGN

The length of road work sign (G20-1) shall cover the length of the road work. MILES is required for all projects of more than 2 miles in length. The number of miles entered should be rounded up to the nearest mile. The sign shall be located at beginning construction points.

SPEDING FINES DOUBLED WHEN WORKERS PRESENT SIGN

The SPEEDING FINES DOUBLED WHEN WORKERS PRESENT sign should be installed on all projects, but may be omitted if the work operation is less than 1 day. The placement should be 500 feet beyond the road work sign to midway to the next sign whichever is less.

GROOVED PAVEMENT AHEAD SIGN

The GROOVED PAVEMENT AHEAD sign is required 500 feet in advance of a milled or ground surface open to traffic. The W1-15P placard shall be used in conjunction with the GROOVED PAVEMENT AHEAD sign.

END ROAD WORK SIGN

The END ROAD WORK sign (G20-2) should be installed on all projects, but may be omitted when the road operation is less than 1 day. The sign should be placed approximately 300 feet beyond the end of a construction or maintenance project unless other distance is called for in the plans. When other Construction or Maintenance Operations occur within 1 mile this sign should be omitted and signs coordinated in accordance with Index 102-600. ADJOINING AND/OR OVERLAPPING WORK ZONE SIGNING.

PROJECT INFORMATION SIGN

The Project information sign shall be installed when called for in the plans.
**TEMPORARY SIGN SUPPORT NOTES:**

1. All signs shall be post mounted when work operations exceed one day except for:
   - Road closure signs mounted in accordance with the vendor drawing for the Type III Barricade shown on the APL.
   - Pedestrian advanced warning or pedestrian regulatory signs mounted on signs in support of the vendor drawing shown on the APL.
   - Median barrier mounted signs per Index 700-013.
2. Unless shielded with barrier or outside of the Clear Zone, signs mounted on temporary supports or barricades, and barricade/sign combination must be crashworthy in accordance with NCWMP 500 requirements and included on the Approved Products List (APL).
3. Use only approved systems listed on the Department’s Approved Products List (APL).
4. Manufacturers seeking approval of U-Channel and steel square tube sign support assemblies (for inclusion on the Approved Products List (APL)), must submit a full set of engineering drawings showing the product meets all the requirements of this Index.
5. Provide 3 lb/ft Steel U-Channel Posts with a minimum section modulus of 0.43 in³ for 60 ksi steel, a minimum section modulus of 0.37 in³ for 70 ksi steel, or a minimum section modulus of 0.34 in³ for 80 ksi steel.
6. Provide 4 lb/ft Steel U-Channel Posts with a minimum section modulus of 0.56 in³ for 60 ksi steel, or a minimum section modulus of 0.47 in³ for 70 ksi or 80 ksi steel.
7. U-channel posts shall conform with ASTM A 499, Grade 60, or ASTM A 596, Grade 100 (with a minimum yield strength of 60 ksi). Square tube posts shall conform with ASTM A 653, Grade 50, or ASTM A 1011, Grade 50.
8. Sign attachment bolts, washers, nuts, and spacers shall conform with ASTM A 307 or A 36.
9. For diamond warning signs with supplementary plaque (up to 5 ft² in area), use 4 lb/ft posts for up to 10 ft (Clear Height measured to the bottom of diamond warning sign).
10. Install 4 lb/ft Steel U-Channel Posts with approved breakaway splice in accordance with the manufacturer’s detail shown on the APL.
11. Install 4 lb/ft Steel U-Channel Posts with approved breakaway splice in accordance with the manufacturer’s detail shown on the APL.
12. Install all posts plumb.
13. The contractor may install 3 lb/ft Steel U-Channel Posts with approved breakaway splice in accordance with the manufacturer’s detail shown on the APL.

**POST AND FOUNDATION TABLE FOR WORK ZONE SIGNS**

<table>
<thead>
<tr>
<th>SHAPES</th>
<th>SIGN SIZE</th>
<th>NUMBER OF STEEL U-CHANNEL POSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
<td>18&quot; x 18&quot;</td>
<td>1</td>
</tr>
<tr>
<td>Rectangle (W x H)</td>
<td>36&quot; x 36&quot;</td>
<td>1</td>
</tr>
<tr>
<td>Square</td>
<td>36&quot; x 36&quot;</td>
<td>1</td>
</tr>
<tr>
<td>Circle</td>
<td>36&quot;</td>
<td>2</td>
</tr>
</tbody>
</table>

Notes for Table:
1. Use 3 lb/ft posts for Clear Height up to 12" and 4 lb/ft posts for Clear Height up to 15".
2. Minimum foundation depth is 4.0' for 3 lb/ft posts and 4.5' for 4 lb/ft posts.
3. For both 3 lb/ft and 4 lb/ft base or sign posts installed in rock, a minimum cumulative depth of 2' of rock layer is required.
4. The soil plate as shown on the APL vendor drawing is not required for base posts or sign posts installed in existing rock (as defined in Note 3), asphalt roadbed, shoulder pavement or soil under sidewalk.

**WORK ZONE SIGN SUPPORTS**

**GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONES**
MANHOLES/CROSSWALKS/JOINTS

Manholes extending 1" or more above the travel lane and crosswalks having an uneven surface greater than 1/2" shall have a temporary asphalt apron constructed as shown in the diagram below.

All transverse joints that have a difference in elevation of 1" or more shall have a temporary asphalt apron constructed as shown in the diagram below.

The aprons are to be removed prior to constructing the next lift of asphalt. The cost of the temporary asphalt shall be included in the contract unit price for Maintenance of Traffic, LS.

REMOVING PAVEMENT MARKINGS

Existing pavement markings that conflict with temporary work zone delineation shall be removed by any method approved by the Engineer, where operations exceed one daylight period. Remove conflicting pavement marking using a method that will not damage the surface texture of the pavement, unless the pavement will be restored prior to traffic use. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as substitute for removal or obliteration. Full pavement width overlays of either a structural or friction course (non-final surface) are an acceptable alternate means to achieve removal.

SIGNS

Existing traffic signal operations that require modification in order to carry out work zone traffic control shall be included in the TCP and be approved by the District Traffic Operations Engineer.

Maintain all existing actuated or traffic responsive mode signal operations for main and side street movements for the duration of the Contract and require restoration of any loss of detection within 12 hours. The contractor shall select only detection technology listed on the Department’s Approved Products List (APL) and approved by the Engineer to restore detection capabilities.

ADVANCE WARNING ARROW BOARDS

An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multilane roadways.

For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode.

A single arrow board shall not be used to merge traffic laterally more than one lane. When arrow boards are used to close multiple lanes, a single board shall be used at the merging taper for each closed lane.

When Advance Warning Arrow Boards are used at night, the intensity of the flashers shall be reduced during darkness when lower intensities are desirable.

PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)

The PCMS can be used to:
1. Supplement standard signing in construction or maintenance work zones.
2. Reinforce static advance warning messages.
3. Provide motorists with updated guidance information.

PCMS should be placed approx. 500 to 800 feet in advance of the work zone conflicts or 0.5 to 2 miles in advance of complex traffic control schemes which require new and/or unusual traffic maneuvers.

If PCMS are to be used at night, the intensity of the flashers shall be reduced during darkness when lower intensities are desirable.

For additional information refer to the FDOT Plans Preparation Manual, Volume I, Chapter 10.

TRUCK/TRAILER-MOUNTED ATTENUATORS

Truck/trailer-mounted attenuators (TMA) can be used for moving operations and short-term stationary operations. For moving operations, see Indexes 102-607 and 102-619. For short-term, stationary operations, see Part VI of the MUTCD.

CHANNELIZING DEVICES

Channelizing devices for work zone traffic control shall be as prescribed in Part VI of the MUTCD, subject to supplemental revisions provided in the contract documents and the 102 Series of Indexes. Lighting Devices must not be used to supplement channelization.

CHANNELIZING DEVICE CONSISTENCY

Barricades, vertical panels, cones, tubular markers and drums shall not be intermixed within either the lateral transition or within the tangent alignment.
DROP-OFF CONDITION NOTES

1. These conditions and treatments can be applied only in work areas that fall within a properly signed work zone.

2. When drop-offs occur within the clear zone due to construction or maintenance activities, protection devices are required (See Table 1). A drop-off is defined as a drop in elevation, parallel to the adjacent travel lanes, greater than 3" with slope (A:B) steeper than 1:4. In superelevated sections, the algebraic difference in slopes should not exceed 0.25 (See Drop-off Condition Detail).

3. Drop-offs may be mitigated by placement of slopes with optional base material per Specifications Section 285. Slopes shallower than 1:4 may be required to avoid algebraic difference in slopes greater than 0.25. Include the cost for the placement and removal of the material in Maintenance of Traffic, LSD. Use of this treatment in lieu of a temporary barrier is not eligible for CSP consideration. Conduct daily inspections for deficiencies related to erosion, excessive slopes, rutting or other adverse conditions. Repair any deficiencies immediately.

4. For Setback Distance, refer to the Index or Approved Products List (APL) drawing of the selected barrier.

5. For Conditions 1 and 3 provided in Table 1, any drop-off condition that is created and restored within the same work period will not be subject to the use of temporary barriers; however, channelizing devices will be required.

6. When permanent curb heights are ≥ 6", no channelizing device will be required. For curb heights < 6", see Table 2.

TRAVEL LANE TREATMENT FOR MILLING OR RESURFACING NOTES

1. This treatment applies to resurfacing or milling operations between adjacent travel lanes.

2. Whenever there is a difference in elevation between adjacent travel lanes, the W8-11 sign with "UNEVEN LANES" is required at intervals of 0.5 mile maximum.

3. If D is 1-½" or less, no treatment is required.

4. Treatment allowed only when D is 3" or less.

5. If the slope is steeper than 1:4 (not to be steeper than 1:1), the R4-1 and W8-11 signs shall be used as a supplement to the W8-11; this condition should never exceed 3 miles in length.

PEDESTRIAN WAY DROP-OFF CONDITION NOTES

1. A pedestrian way drop-off is defined as:
   a. a drop in elevation greater than 10" that is closer than 2' from the edge of the pedestrian way
   b. a slope steeper than 1:2 that begins closer than 2' from the edge of the pedestrian way when the total drop-off is greater than 60"

2. Protect any drop-off adjacent to a pedestrian way with pedestrian longitudinal channelizing devices, temporary barrier wall, or approved handrail.


## CHANNELIZING DEVICES

### FIXED (SURFACE MOUNTED)

#### BUSINESSES ENTRANCE SIGNS AND CHANNELIZING DEVICES AT BUSINESS ENTRANCE

1. For single business entrances, place one 24" x 36" business sign for each driveway entrance affected. Signs shall show specific business names. Logos may be provided by business owners. Standard BUSINESS ENTRANCE sign in Index 700-102 may be used when approved by the Engineer.

2. When several businesses share a common driveway entrance, place one 24" x 36" standard BUSINESS ENTRANCE sign in accordance with Index 700-102 at the common driveway entrance.

3. Channelizing devices shall be placed at a reduced spacing on each side of the driveway entrance, but shall not restrict sight distance for the driveway users.

4. Business entrance signs are intended to guide motorists to business entrances moved/modified or disturbed during construction projects. Business entrance signs are not required where there is minimal disruption to business driveways which is often the case with resurfacing type projects.

### TEMPORARY LANE SEPARATOR

- Temporary lane separators shall be supplemented with any of the following approved fixed (surface mounted) channelizing devices: tubular markers, vertical panels, or opposing traffic lane divider panels. Opposing traffic lane divider panels (WB-4) shall only be used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation. Tubular Markers, Vertical Panels and Opposing Traffic Lane Divider panels shall not be intermixed within the limits where the temporary lane separator is used. The connection between the channelizing device and the temporary lane separator curb shall hold the channelizing device in a vertical position.

- Reflective materials shall have a smooth sealed outer surface which will display the same approximate color day and night. Furnish channelizing devices having retroreflective sheeting meeting the requirements of Section 990.

- 12" openings for drainage shall be constructed in the asphalt and portable temporary lane separator at a maximum spacing of 25' in areas with grades of 1% or less or 50' in areas with grades over 1% as directed by the Engineer.

- Tapered ends shall be used at the beginning and end of each run of the temporary lane separator to form a gradual increase in height from the pavement level to the top of the temporary lane separator.

- The Contractor has the option of using portable temporary lane separators containing fixed channelizing devices in lieu of the temporary asphalt separator and channelizing devices detailed on this sheet. The portable temporary lane separator shall come in portable sections that can be connected to maintain continuous alignment between the separate curb sections. Each temporary lane separator section shall be 36 inches to 48 inches in total length. Portable temporary lane separators shall duplicate the color of the pavement marking. Portable temporary lane separators shall be one of those listed on the Approved Products list.

- Any damage to existing pavement caused by the removal of temporary lane separator shall be satisfactorily repaired and the cost of such repairs are to be included in the cost of Maintenance of Traffic, LS.
**CHANNELIZING DEVICE NOTES:**

1. The details shown on this sheet are for the following purposes:
   a. For ease of identification and
   b. To provide information that supplements or supersedes that provided by the MUTCD.

2. The Type III Barricade shall have a unit length of 6'-0" only. When barricades of greater lengths are required those lengths shall be in multiples of the 6'-0" unit.

3. No sign panel should be mounted on any channelizing device unless the channelizing device/sign combination was found to be crashworthy and the sign panel is mounted in accordance with the vendor drawing for the channelizing device shown on the Approved Products List (APL).

4. Ballast shall not be placed on top rails or any striped rails or higher than 1/3 above the driving surface.

5. The direction indicator barricade may be used in tapers and transitions where specific directional guidance to drivers is necessary. If used, direction indicator barricades shall be used in series to direct the driver through the transition and into the intended travel lane.

6. The splicing of sheeting is not permitted on either channelizing devices or MOT signs.

7. For rails less than 3'-0" long, 4" stripes shall be used.

8. Cones shall:
   a. Be used only in active work zones where workers are present.
   b. Not exceed 2 miles in length of use at any one time.
   c. Be reflectorized as per the MUTCD with Department-approved reflective collars when used at night.

9. Vehicular longitudinal channelizing devices shall not exceed 36" in height. For vehicular longitudinal channelizing devices (LCDs) less than 32" in height, the LCD shall be supplemented with approved fixed (surface mounted) channelizing devices (tubular markers, vertical panels, etc.) along the run of the LCD, at the ends, at 20' centers on tangents, and 25' centers on radii. The cost of the fixed supplemented channelizing devices shall be included in the cost of the LCD. LCDs less than 32" in height shall not be used for speeds greater than 45 mph.

10. For pedestrian longitudinal channelizing devices, the device shall have a minimum of 8" continuous detectable edging above the walking surface. A gap not exceeding a height of 2" is allowed to facilitate drainage. The top surface of the device shall be a minimum height of 32" and have a 1/8" or less difference in any plane at all connection points between the devices to facilitate hand trailing. The bottom and the top surface of the device shall be in the same vertical plane. If pedestrian drop-off protection is required, the device shall have a footprint or offset of at least 2', otherwise the device must be at least 42" in height above the walkway and be anchored or ballasted to withstand a 200 lb lateral point load at the top of the device.

11. For Barrier Delineators, see Specification 102. Place on top of unit so that retroreflective sheeting faces vehicular traffic. Color must match adjacent longitudinal pavement marking.

---

**TEMPORARY BARRIER NOTES:**

3. Where a barrier is specified, any of the types below may be used in accordance with the applicable notes:

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-100</td>
<td>Temporary Barriers</td>
<td>Per Note #11</td>
</tr>
<tr>
<td>102-120</td>
<td>Low Profile Barrier</td>
<td></td>
</tr>
<tr>
<td>536-001</td>
<td>Guardrail</td>
<td></td>
</tr>
</tbody>
</table>

2. Trailer Mounted Barriers may be used to provide positive protection for workers within the work area. APL drawings may be used as a guide to develop project specific Temporary Traffic Control Plans that are signed and sealed by the Contractor's Engineer.
USE OF RPMS TO SUPPLEMENT PAINT OR REMOVABLE TAPE IN WORK ZONES

1. RPMS shall be installed as a supplement to:
   a. All lane lines.
   b. Edge lines in transition & approach areas.
   c. Edge lines of gore areas.
2. Placement of RPMS should be as shown in Index 706-001 with the following exceptions:
   RPMS shall be placed at 5 feet center to center in approach and transition areas.

NOTES FOR RAISED PAVEMENT MARKERS:

1. The color of the raised pavement marker under both day and night conditions shall conform to the color of the marking for which they serve as a positioning guide, or for which they supplement.
2. RPMS used to supplement lane lines are to be paid for as Raised Pavement Marker (Temporary). EA. RPMS used as a temporary substitute for paint or removable tape due to equipment malfunction are to be placed at the Contractor's expense.
GENERAL NOTES

1. If the work operation (excluding establishing and terminating the work area) requires that two or more work vehicles cross the offset zone in any one hour, traffic control will be in conformance with Index 102-602.

2. No special signing is required.

3. When a side road intersects the highway within the work area, additional TTC devices shall be placed in accordance with other applicable TCZ indexes.

4. When construction activities encroach on a sidewalk refer to Index 102-660.

5. For general TCZ requirements and additional information, refer to Index 102-600.

SYMBOLS

- Work Area
- Lane Identification + Direction of Traffic

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS AND THEIR ACTIVITIES ARE BEHIND AN EXISTING BARRIER, MORE THAN 2 BEHIND THE CURB, OR 15' OR MORE FROM THE EDGE OF TRAVEL WAY.
**SYMBOLS**

- **Work Area**
- **Channelizing Device** (See Index 102-600)
- **Work Zone Sign**
- **Lane Identification = Direction of Traffic**

**GENERAL NOTES**

1. When four or more work vehicles enter the through traffic lanes in a one hour period or less (excluding establishing and terminating the work area), the advanced FLASHER sign shall be substituted for the WORKERS sign. For location of flaggers and FLASHER signs, see Index 102-603.

2. SHOULDER WORK sign may be used as an alternate to the WORKER symbol sign only on the side where the shoulder work is being performed.

3. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC Indexes.

4. For general TTC requirements and additional information, refer to Index 102-600.

**DURATION NOTES**

1. Signs and channelizing devices may be omitted if all of the following conditions are met:
   a. Work operations are 60 minutes or less.
   b. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH THE AREA CLOSER THAN 15' BUT NOT CLOSER THAN 2' TO THE EDGE OF TRAVEL WAY.

---

**Table I**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>250</td>
<td>200</td>
</tr>
<tr>
<td>45 mph</td>
<td>350</td>
<td>300</td>
</tr>
<tr>
<td>50 mph or greater</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

*Midway between signs.

**Table II**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>30</td>
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<tr>
<td>70</td>
<td>187</td>
<td>233</td>
</tr>
</tbody>
</table>

$L_{WS} = \frac{S - 60}{2}$

$WS = L_{WS}$

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**REV 0**

10/23/2017

A M

**REVISION**

**DESCRIPTION**

**STANDARD PLANS**

TWO-LANE, TWO-WAY, WORK ON SHOULDER

**INDEX**

102-602

**SHEET**

1 of 1
GENERAL NOTES:

1. Special Conditions may be required in accordance with these notes and the following sheets.

2. Temporary Raised Rumble Strips:
   a. The two channelizing devices directly in front of the work area may be
      placed transversely across the lane at locations where the speed is greater than 25 mph.
   b. A minimum of 200 ft of raised rumble strips is required at all posted speeds.
   c. Rumble strips are placed transversely across the lane at locations where the speed is greater than 25 mph.

3. Additional one-way control may be provided by the following means:
   a. Flag-carrying vehicle;
   b. Official vehicle;
   c. Pilot vehicles;
   d. Traffic signals.

4. When a side road intersects the highway within the TTC zone, place additional TTC devices in accordance with other applicable TTC Indexes.

5. The two channelizing devices directly in front of the work area may be omitted provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.

6. When Buffer Space cannot be attained due to geometric constraints, use the greatest attainable length, not less than 200 ft, for posted speeds greater than 25 mph.

7. ROAD WORK AHEAD and the BE PREPARED TO STOP signs may be omitted if all of the following conditions are met:
   a. Existing Posted Speed is 55 mph or greater;
   b. Speed limit is 45 mph or less.
   c. Volume and complexity of the roadway has been considered.
   d. There are no sight obstructions to vehicles approaching the work area for a distance equal to the Buffer Space shown in Table 1.
   e. Traffic signals are in place.
   f. Volume and complexity of the roadway has been considered.
   g. AFADs are not in use.
   h. Volume and complexity of the roadway has been considered.
   i. Automatic Flagger Assistance Devices (AFADs) may be used in accordance with Specifications Section 102, 990 and the APL vendor drawings.

8. See Index 102-600 for general TCZ requirements and additional information.

9. Automated Flagger Assistance Devices (AFADs) may be used in accordance with Specifications Section 102, 990 and the APL vendor drawings.

10. See Table 102-600 for general TCZ requirements and additional information.

CONCLUSIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH THE AREA BETWEEN THE CENTERLINE AND A LINE 2' OUTSIDE THE EDGE OF TRAVEL WAY.

SYMBOLS:

- **Work Area**
- **Channelizing Device (See Index 102-600)**
- **Flagger**
- **Lane Identification + Direction of Traffic**

---

**INDEX 102-603**

**STANDARD PLANS**

**TWO-LANE, TWO-WAY, WORK WITHIN THE TRAVEL WAY**

**DESCRIPTION:**

FY 2018-19

**REVISED:**

01/01/17

06/27/18

**LAST REVISED:**

01/01/17

**PAGE:**

1 of 3
**SYMBOLS:**
- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Flagger
- Lane Identification = Direction of Traffic

---

**DESCRIPTION:**

- **RUMBLE STRIP SET**
  - **OPTION - 1**
  - **REMOVABLE POLYMER STRIPING TAPE**

- **RUMBLE STRIP SET**
  - **OPTION - 2**
  - **MOLDED ENGINEERED POLYMER SET**

---

**TEMPORARY RAISED RUMBLE STRIPS**

(When Required See GENERAL NOTE #2)

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* May Be omitted if ROAD WORK AHEAD sign is installed upstream within the project limits.

---

**SYMBOLS:**
- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Flagger
- Lane Identification = Direction of Traffic
TEMPORARY RAILROAD CROSSING BUFFER SPACE EXTENSION

TEMPORARY LANE SHIFT TO SHOULDER WHEN WORK AREA ENCROACHES ON THE CENTERLINE

SPECIAL CONDITIONS

Cross Reference:
1. See General Note #1, Sheet 1 for more information.
**SYMBOLS**

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Flagger
- Stop Bar
- Lane Identification + Direction of Traffic

**GENERAL NOTES**

1. The FLAGGER legend sign may be substituted for the symbol sign.  
2. When vehicles in a parking zone block the line of sight to TCZ signs, the signs shall be post mounted and located in accordance with Index 700-101. 
3. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-660. 
4. Flaggers shall be located where they can control more than one direction of traffic. 
   - Flaggers shall be in sight of each other or in direct communication at all times. 
5. Maximum spacing between channelizing devices shall be not greater than 20'. 
6. Temporary signal phasing modifications are to be approved by the District Traffic Operations Engineer prior to the beginning of work. 
7. For general TCZ requirements and additional information, refer to Index 102-600. 
8. For unsignalized intersections, use Temporary Raised Rumble Strips in accordance with Index 102-603. Placement of Rumble Strips and additional signs should begin at FLAGGER sign location.

**DURATION NOTES**

1. ROAD WORK AHEAD AND END ROAD WORK sign may be omitted if all of the following conditions are met: 
   - Work operations are 60 minutes or less. 
   - Speed is 65 mph or less. 
   - No sight obstructions to vehicles approaching the work area for a distance equal to A plus B. 
   - Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating. 
   - Volume and complexity of the roadway has been considered.

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
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<td>200</td>
</tr>
<tr>
<td>45 mph</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF A PORTION OF ONE OR MORE TRAFFIC LANES IN AN INTERSECTION.
**SYMBOLS**

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Flagger
- Lane Identification + Direction of Traffic

**GENERAL NOTES**

1. Work operations shall be confined to one travel lane, leaving the opposing travel lane open to traffic.
2. When vehicles in a parking zone block the line of sight to TCZ signs or when TCZ signs encroach on a normal pedestrian walkway, the signs shall be post mounted and located in accordance with Index 700-101.
3. If work area is confined to an outside auxiliary lane, the work area shall be barricaded and the FLAGGER signs replaced by ROAD WORK AHEAD signs. Flaggers are not required.
4. Flaggers shall be in sight of each other or in direct communication at all times.
5. The FLAGGER legend sign may be substituted for the symbol sign.
6. The maximum spacing between devices shall be no greater than 25'.
7. For general TCZ requirements and additional information, refer to Index 102-600.
8. The two channelizing devices directly in front and directly at the end of the work area may be omitted provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.
9. Use Temporary Raised Rumble Strips in accordance with Index 102-603. Placement of Rumble Strips and additional signs should begin at FLAGGER sign location.

**DURATION NOTES**

1. ROAD WORK AHEAD sign may be omitted if all of the following conditions are met:
   a. Work operations are 60 minutes or less.
   b. Speed is 45 mph or less.
   c. No sight obstructions to vehicles approaching the work area for a distance of 600 feet.
   d. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.
   e. Volume and complexity of the roadway has been considered.
GENERAL NOTES

1. Use either portable signals or span wire signals and include two signal faces for each approach.

2. Obtain approval from the District Traffic Operations Engineer for the installation and timing of the signals prior to the signals being placed in operation. Adjust timing based on changing field conditions as approved by the Worksite Traffic Supervisor. Obtain approval from the District Traffic Operations Engineer for any timing changes that are either reoccurring or last longer than 24 hours.

3. For the maximum distance between portable distance between portable traffic signals do not exceed the distance at which the signals can safely communicate. When the distance between signals is 0.25 miles to 0.50 miles, use a countdown timer on both signals. When the distance between signals is greater than 0.50 miles, use a combination of a pilot vehicle and manually controlled temporary traffic signals.

4. The SIGNAL AHEAD legend sign may be substituted for the symbol sign.

5. Use Type III Barricades to block haul road access when the haul road is not in operation and a flagger/signal operator is not on duty, except when the haul road is an existing properly marked road.

6. Monitor temporary traffic signals by having one or more workers present during operation. In the event of a temporary traffic signal failure, maintain traffic with flaggers.

7. Use Temporary Raised Rumble Strips in accordance with Index 102-603.

SYMBOLS

- Work Area
- Temporary Traffic Signal
- Channelizing Device (See Index 102-600)
- Type III Barricade
- Stop Bar
- Flagger
- Lane Identification + Direction of Traffic

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES WILL ENCROACH ON ONE LANE OR MOMENTARILY ENCROACH ON BOTH LANES OF A TWO-LANE TWO-WAY ROADWAY AND TRAFFIC SIGNALS ARE NEEDED.
MOMENTARY ROADWAY CLOSURE • HAUL ROUTE CROSSING
**DESCRIPTION:**

**REVISION** 102-607

**STANDARD PLANS**

**INDEX**

**F Y 2018-19**

**TWO-LANE, TWO-WAY MOBILE OPERATION, WORK ON SHOULDER AND WORK WITHIN THE TRAVEL WAY**

**ON SHOULDER AND WORK WITHIN THE TRAVEL WAY**

**GENERAL NOTES**

1. Where work activities within 2 of the edge of travel way are incidental (i.e., Mowing, Litter Removal), the Engineer may delete requirements for signs and the advance warning vehicle provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.

2. If an arrow board is used, the caution mode shall be used.

3. Shadow and Advance Warning Vehicle shall display rotating/strobe lights.

4. For general TCZ requirements and additional information, refer to Index 102-600.

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES REQUIRE AN INTERMITTENT OR CONTINUOUS MOVING OPERATION.

OPTION 1: Advanced Warning Vehicle is optional and to be operated on the shoulder when feasible. An approved Truck Mounted Attenuator is required on the Shoulder Warning Vehicle, but not required on the Advance Warning Vehicle. The Advance Warning Arrow Board and Warning Sign is required on the Shadow Vehicle. The Advance Warning Arrow Board and Warning Sign is required on the Shadow Vehicle.

OPTION 2: Advanced Warning Vehicle is required and must be operated in the lane behind the Shadow Vehicle. An approved Truck Mounted Attenuator will be required on the Advanced Warning Vehicle, but not required on the Shadow Vehicle. The Advance Warning Arrow Board and Warning Sign is required on the Advanced Warning Vehicle, but not required on the Shadow Vehicle.

**SYMBOLS**

- Work Area
- Work Zone Sign
- Lane Identification + Direction of Traffic
- Work Vehicle With Rotating/Strobe Lights
- Shadow (S) or Advance Warning (AW) Vehicle with Advance Warning Arrow Board and Sign Message
- Truck/Trailer Mounted Attenuator (TMA)
- Advanced Warning Arrow Board

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES REQUIRE AN INTERMITTENT OR CONTINUOUS MOVING OPERATION.
GENERAL NOTES

1. If the work operation (excluding establishing and terminating the work area), requires that two or more work vehicles cross the offset zone in any one hour, traffic control will be in accordance with Index 102-612.

2. No special signing is required.

3. This index also applies when work is being performed on a multilane undivided highway.

4. This index also applies to work performed in the median behind an existing barrier or more than 15' from the edge of travel way, both roadways. Work performed in the median behind curb and gutter shall be in accordance with Index 102-612.

5. When a side road intersects the highway within the work area, additional traffic control devices shall be placed in accordance with other applicable TCZ Indexes.

6. When construction activities encroach on a sidewalk, refer to Index 102-660.

7. For general TCZ requirements and additional information, refer to Index 102-600.

SYMBOLS
- Work Area
- Lane Identification + Direction of Traffic

CONDITIONS
WHERE ANY VEHICLE, EQUIPMENT, WORKERS AND THEIR ACTIVITIES ARE BEHIND AN EXISTING BARIER, MORE THAN 2' BEHIND THE CURB, OR 15' OR MORE FROM THE EDGE OF TRAVEL WAY.
GENERAL NOTES

1. When a high volume of work vehicles are entering and leaving the Work Area at speeds slower than 10 mph below the posted speed, place an MOT-5-06 sign in the ROAD WORK AHEAD sign location and shift the ROAD WORK AHEAD sign upstream 500 ft.

2. This TCZ plan also applies to work performed in the median more than 2' but less than 15' from the edge of travelway.

3. When work is being performed on a multiline undivided roadway the signs normally mounted in the median (as shown) shall be omitted.

4. WORKERS signs to be removed or fully covered when no work is being performed.

5. SHOULDER WORK sign may be used as an alternate to the WORKER symbol sign.

6. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCZ Indexes.

7. For general TCZ requirements and additional information, refer to Index 102-600.

DURATION NOTES

1. Signs and channelizing devices may be omitted if all of the following conditions are met:
   a. Work operations are 60 minutes or less.
   b. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENTRUST THE AREA CLOSER THAN 15' BUT NOT CLOSER THAN 2' TO THE EDGE OF TRAVEL WAY.

SYMBOLS

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Lane Identification + Direction of Traffic
- Median

DISTANCE BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Spacing (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>200 200</td>
</tr>
<tr>
<td>45 mph</td>
<td>250 250</td>
</tr>
<tr>
<td>50 mph or greater</td>
<td>300 300</td>
</tr>
</tbody>
</table>

*250' beyond the ROAD WORK AHEAD sign or midway between signs whichever is less.

Table II

<table>
<thead>
<tr>
<th>L/ft.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>30</td>
<td>35</td>
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<tr>
<td>35</td>
<td>42</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
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<td>45</td>
<td>60</td>
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<tr>
<td>50</td>
<td>70</td>
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<tr>
<td>55</td>
<td>80</td>
</tr>
<tr>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>65</td>
<td>100</td>
</tr>
<tr>
<td>70</td>
<td>110</td>
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<td>75</td>
<td>120</td>
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<td>80</td>
<td>130</td>
</tr>
<tr>
<td>85</td>
<td>140</td>
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<tr>
<td>90</td>
<td>150</td>
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<tr>
<td>95</td>
<td>160</td>
</tr>
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<td>100</td>
<td>170</td>
</tr>
<tr>
<td>105</td>
<td>180</td>
</tr>
<tr>
<td>110</td>
<td>190</td>
</tr>
<tr>
<td>115</td>
<td>200</td>
</tr>
</tbody>
</table>

Table I

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Cones or Tubular Markers</th>
<th>Type I or Type II Barricades or Vertical Panels or Drums</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30 to 45</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>45 to 70</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>70 to 85</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>85 to 100</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

TAPER LENGTH

Taper Length = \( \frac{L}{3} \) See Table II

\( \frac{L}{3} \) = minimum shoulder width.

\( L = WS \)

\( W = \text{Width of total shoulder in feet} \)

\( S = \text{Posted speed limit (mph)} \)

\( L = WS^2 \)

Posted speed limit (mph)

S = Width of total shoulder in feet (combined paved and unpaved width)

L = Length of shoulder taper in feet

Last Revision 01/01/17

FY 2018-19

STANDARD PLANS

MULTILANE, WORK ON SHOULDER

INDEX 102-612

SHEET 1 of 1

REV 3

10/23/17

DESCRIPTION:

REV 3

10/23/17

FY 2018-19

STANDARD PLANS

MULTILANE, WORK ON SHOULDER

INDEX 102-612

SHEET 1 of 1

REV 3

10/23/17

DESCRIPTION:
**GENERAL NOTES**

1. Work operations shall be confined to one traffic lane, leaving the adjacent lane open to traffic.

2. On undivided highways the median signs as shown are to be omitted.

3. When work is performed in the median lane on divided highways, the channelizing device plan is inverted and left lane closed and lane ends signs substituted for the right lane closed and lane end signs.

4. Signs and traffic control devices are to be modified in accordance with **INTERMITTENT WORK STOPPAGE DETAILS** sheet 2 of 2 when no work is being performed and the highway is open to traffic.

5. The two channelizing devices directly in front of the work area may be omitted provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.

6. When paved shoulders having a width of 2 ft. or more are closed, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the travel way. See Index 102-612 for shoulder taper formulas.

7. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCZ Indexes.

8. This TCZ plan does not apply when work is being performed in the middle lane(s) of a six or more lane highway. See Index 102-614.

9. For general TCZ requirements and additional information, refer to Index 102-600.

**DURATION NOTES**

1. Temporary white edgeline may be omitted for work operations less than 3 consecutive calendar days.

2. For work operations up to approximately 15 minutes, signs, channelizing devices, arrow board, and buffer space may be omitted if all of the following conditions are met:
   a. Speed limit is 45 mph or less.
   b. No sight obstructions to vehicles approaching the work area for a distance equal to the buffer space and the taper length combined.
   c. Volume and complexity of the roadway has been considered.
   d. The closed lane is occupied by a class 5 or larger, medium duty truck(s) with minimum gross weight vehicle rating (GVWR) of 16,000 lb with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

3. For work operations up to 60 minutes, arrow board and buffer space may be omitted if conditions a, b, and c in DURATION NOTE 2 are met, and vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE LANE ADJACENT TO EITHER SHOULDERS AND THE AMBER LANE OUTSIDE THE EDGE OF TRAVEL WAY.
Arrow Board Operation Discontinued And Arrow Board Shall Be Removed Or Relocated Outside The Clear Zone Or Be Shielded By A Barrier Or Crash Cushion

Temporary Pavement Markings
Placed Through Work Area And Devices Relocated Laterally 2' To 4' Outside Edge Of Travel Way

EVEN PAVEMENT

UNEVEN PAVEMENT

INTERMITTENT WORK STOPPAGE - LANE REOPENED TO TRAFFIC

WORK AREA

AREA TEMPORARILY REOPENED TO TRAFFIC

L and Buffer Space

500'
CONDITIONS

1. The RIGHT LANE CLOSED and lane reduction signs are to be removed or fully covered when no work is being performed and the center lane is opened to traffic.

2. For work performed in the median or outside lane, refer to Index 102-613.

3. When the lane closure exceeds a continuous 24 hour period, all existing pavement markings within the realignment which conflict with the revised traffic pattern are to be removed and removable pavement marking used for marking new edge lines and centerline.

GENERAL NOTES

1. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC Indexes.

2. For general TTC requirements and additional information, refer to Index 102-600.

DURATION NOTES

1. Temporary pavement markings may be omitted for work operations less than 3 days.

CONDITION NOTES

1. The RIGHT LANE CLOSED and lane reduction signs are to be removed or fully covered when no work is being performed and the center lane is opened to traffic.

2. For work performed in the median or outside lane, refer to Index 102-613.

3. When the lane closure exceeds a continuous 24 hour period, all existing pavement markings within the realignment which conflict with the revised traffic pattern are to be removed and removable pavement marking used for marking new edge lines and centerline.

GENERAL NOTES

1. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC Indexes.

2. For general TTC requirements and additional information, refer to Index 102-600.

DURATION NOTES

1. Temporary pavement markings may be omitted for work operations less than 3 days.

SYMBOLS

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCroach ON ANY PORTION OF A CENTER LANE OF A MULTILANE HIGHWAY, AND TWO DRIVING LANEs ARE MAINTAINED ON THE TRAVEL WAY.
CONDITION NOTES

1. See General Notes, Sheet 1.

2. Length of time that traffic is using shoulder should be minimized. For example, remove lane closure and lane shift at night (unless performing night work) if practical.

3. The RIGHT LANE CLOSED, lane reduction and reverse curve signs are to be removed or fully covered when no work is being performed and the travel way is open to traffic.

4. When the lane closure exceeds a continuous 24 hour period, all existing pavement markings within the realignment which conflict with the revised traffic pattern are to be removed and removable pavement markings used for marking new edge lines and centerlines.

5. For general TCZ requirements and additional information, refer to Index 102-600.

SYMBOLS

- Work Area
- Channelizing Device (See Index 102-600)
- Advance Warning Arrow Board
- Work Zone Sign

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON ANY PORTION OF A CENTER LANE OF A MULTILANE HIGHWAY, AND TWO DRIVING LANES ARE MAINTAINED, AND, THE OUTSIDE SHOULDER PAVEMENT IS TEMPORARILY USED AS A TRAVEL LANE.
1. The WORKERS legend sign may be substituted for the symbol sign.

2. When vehicles in a parking zone block the line of sight to TCZ signs, the signs shall be post mounted and located in accordance with Index 700-101.

3. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-660.

4. Dual signs are required for divided roadways.

5. Maximum spacing between barricades, vertical panels, cones, tubular markers and drums shall not be greater than 25.

6. Temporary signal phasing modifications are to be approved by the District Traffic Operations Engineer prior to the beginning of work.

7. For general TCZ requirements and additional information, refer to Index 102-600.

**DURATION NOTES**

1. Signs and arrow board may be omitted if all of the following conditions are met:
   a. Work operations are 60 minutes or less.
   b. Speed is 45 mph or less.
   c. No sight obstructions to vehicles approaching the work area.
   d. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.
   e. Volume and complexity of the roadway has been considered.
GENERAL NOTES

1. Work operations shall be confined to either one lane, or lane combinations as follows:
   a. Outside travel lane;
   b. Inside auxiliary lane;
   c. Inside travel lane and adjoining auxiliary lane;
   d. Inside travel lane;
   e. Inside auxiliary lane;
   f. Inside travel lane and adjoining auxiliary lane.

2. If the work area is confined to an auxiliary lane the work area shall be barricaded and the RIGHT (LEFT) LANE CLOSED AHEAD signs replaced by ROAD WORK AHEAD signs, and the merge symbol signs eliminated.

3. When vehicles in a parking zone block the line of sight to TCZ signs, the signs shall be post mounted and located in accordance with Index 700-101.

4. Signs are required on the median side for divided highways.

5. The two channelizing devices directly in front and directly at the end of the work area may be omitted provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.

6. For general TCZ requirements and additional information, refer to Index 102-600.

DURATION NOTES

1. For work operations up to approximately 15 minutes, signs, channelizing devices, and arrow board may be omitted if all of the following conditions are met:
   a. Speed limit is 45 mph or less.
   b. No sight obstructions to vehicles approaching the work area for a distance equal to twice the taper length.
   c. Volume and complexity of the roadway has been considered.
   d. The closed lane is occupied by a class 2 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GWVR) of 16,001 lb, or with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

2. For work operations up to 60 minutes, the arrow board may be omitted if conditions a, b, and c in DURATION NOTE 1 are met, and vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

SYMBOLS

- Work Area
- Work Zone Sign
- Advance Warning Arrow Board
- Type III Barricade
- Channelizing Device (See Index 102-600)
- Lane Identification & Direction of Traffic
1. Right lane must turn right

2. For intersection approaches reduced to a single lane, left turning movements may be prohibited to maintain capacity for through vehicular traffic.
SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

LEFT LANE CLOSED ON FAR SIDE OF MINOR SIDESTREET - RESTRICTED TURNING MOVEMENTS

Table I
Device Spacing

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Type I or Type II Barricades or Vertical Panels or Drums</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Taper</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30 to 45</td>
<td>25</td>
</tr>
</tbody>
</table>

Table II
Taper Length - Merge (12' Lateral Transition)

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L (ft)</th>
<th>Notes (Merge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>125</td>
<td>L = 45' / 65'</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td>L = 45' / 65'</td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td>L = 45' / 65'</td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td>L = 45' / 65'</td>
</tr>
<tr>
<td>45</td>
<td>390</td>
<td>L = 45' / 65'</td>
</tr>
</tbody>
</table>

For lateral transitions other than 12', use formula for L shown in the notes column. Where:
L = length of taper in feet
W = Width of lateral transition in feet
S = Posted speed limit (mph)

1. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left turning movements, then the left lane may be reopened as a turn bay for left turns only as shown in this detail.

MULTILANE, WORK NEAR INTERSECTION MEDIAN OR OUTSIDE LANE

DISTANCE BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 or less</td>
</tr>
<tr>
<td>45</td>
</tr>
</tbody>
</table>

50' beyond the ROAD WORK AHEAD sign or midway between signs whichever is less.

1/01/17

MULTILANE, WORK NEAR INTERSECTION MEDIAN OR OUTSIDE LANE

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INDEX

REV 01/01/17

DESCRIPTION:

FY 2018-19

STANDARD PLANS

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MULTILANE, WORK NEAR INTERSECTION MEDIAN OR OUTSIDE LANE

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INDEX

REV 01/01/17

DESCRIPTION:

FY 2018-19

STANDARD PLANS

MULTILANE, WORK NEAR INTERSECTION MEDIAN OR OUTSIDE LANE

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DESCRIPTION:

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MULTILANE, WORK NEAR INTERSECTION MEDIAN OR OUTSIDE LANE

102-616

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INDEX

REV 01/01/17

DESCRIPTION:

FY 2018-19

STANDARD PLANS
**GENERAL NOTES**

1. Work operations shall be confined to one center travel lane, leaving the adjacent travel lanes open to traffic.

2. The merging taper shall direct vehicular traffic into either the right or left lane, but not both.

3. When vehicles in a parking zone block the line of sight to TCZ signs, the signs shall be post-mounted and located in accordance with index 100-101.

4. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-660.

5. For general TCZ requirements and additional information, refer to Index 102-600.

**DURATION NOTES**

1. Signs and buffer space may be omitted if all of the following conditions are met:
   a. Work operations are 60 minutes or less.
   b. Speed limit is 45 mph or less.
   c. No sight obstructions to vehicles approaching the work area for a distance equal to the buffer space and the taper length combined.
   d. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.
   e. Volume and complexity of the roadway has been considered.

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF THE CENTER LANE NEAR AN INTERSECTION.

**SYMBOLS**

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Spacing (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 or less</td>
<td>200</td>
</tr>
<tr>
<td>45 or more</td>
<td>300</td>
</tr>
</tbody>
</table>

**Table I**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Max. Distance Between Devices (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Taper: 25, Taper: 50</td>
</tr>
<tr>
<td>35</td>
<td>Taper: 75, Tangent: 50</td>
</tr>
<tr>
<td>40</td>
<td>Taper: 100, Tangent: 50</td>
</tr>
</tbody>
</table>

**Table II**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Buffer Space (ft.)</th>
<th>Taper Length (L)</th>
<th>Notes (Merges)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>135</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>200</td>
<td>180</td>
<td>150</td>
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<tr>
<td>35</td>
<td>230</td>
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<tr>
<td>40</td>
<td>305</td>
<td>320</td>
<td>360</td>
</tr>
<tr>
<td>45</td>
<td>360</td>
<td>540</td>
<td>580</td>
</tr>
</tbody>
</table>

When Buffer Space cannot be attained due to geometric constraints, the greatest attainable length shall be used, but not less than 200 ft.

For lateral transitions other than 12', use formula for L shown in the notes column. Where:

- **L** = Length of taper in feet
- **W** = Width of lateral transition in feet
- **S** = Posted speed limit (mph)
**GENERAL NOTES**

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-660.

2. Signs are required on the median side for divided highways.

3. The two channelizing devices directly in front and directly at the end of the work area may be omitted provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.

4. Within the lateral transitions, the maximum spacing between cones and tubular markers shall be 25'.

Spacing for devices parallel to the travel lanes shall be 25' centers for cones or tubular markers and 50' centers for Type I or Type II barricades or vertical panels or drums for 250', thereafter, cones or tubular markers at 50' centers and Type I or Type II barricades or vertical panels or drums at 100' centers.

5. For general TCZ requirements and additional information, refer to Index 102-660.

**SYMBOLS**

- **Road Work Ahead**
- **Channelizing Device (See Index 102-600)**
- **Advance Warning Arrow Board**
- **Stop Bar**
- **Lane Identification + Direction of Traffic**

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS, OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF EITHER THE OUTSIDE AND CENTER TRAVEL Lanes, OR THE MEDIAN AND CENTER TRAVEL LANES, WITH OR WITHOUT CLOSURE OF ADJOINING AUXILIARY LANES, FOR WORK AREA LESS THAN 200' FROM INTERSECTION, FOR A PERIOD OF MORE THAN 60 MINUTES.

WHERE ANY VEHICLE, EQUIPMENT, WORKERS, OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF EITHER THE OUTSIDE AND CENTER TRAVEL Lanes, OR THE MEDIAN AND CENTER TRAVEL LANES, WITH OR WITHOUT CLOSURE OF ADJOINING AUXILIARY LANES, FOR WORK AREA 200' OR MORE FROM INTERSECTION, FOR A PERIOD OF MORE THAN 60 MINUTES.

### Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L (ft)</th>
<th>Notes (Merges)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>125</td>
<td>L = ( S^2 )</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td>L = ( S^2 )</td>
</tr>
<tr>
<td>45</td>
<td>340</td>
<td></td>
</tr>
</tbody>
</table>

For lateral transitions other than 12', use formula for L shown in the notes column. Where:

- **L** = Length of taper in feet
- **W** = Width of lateral transition in feet
- **S** = Posted speed limit (mph)
GENERAL NOTES

1. These illustrations are representative of general conditions.
2. The figures illustrate closing the right shoulder or right lanes for various lane configurations. When work is required on left side of roadways, the inverted plan is to be applied. The intent of this index is to allow passing on only one side of the work convoy.
3. Arrow boards shall not be obscured by equipment, supplies, signs, or the enclosure.
4. Vehicle-mounted signs shall be mounted with the bottom of the sign at a minimum height of 48 inches above the pavement. Vehicle-mounted changeable message signs may be used in lieu of truck mounted static signs. Changeable message signs shall flash alternately to read “Left or Right Lane” on “Two Left or Two Right Lanes”, “Closed Ahead”, and the arrow symbol. Arrow boards shall not be used with truck mounted changeable message signs. Sign legends shall be covered or turned from view when work is not in progress.
5. On Freeway facilities (interstates, toll roads, and expressways), a traffic control officer is required for all nighttime non-emergency operations for work within the travel lane.
6. If the work vehicle speed exceeds the minimum legal speed limit on limited access facilities and one-half the posted speed limit on other facilities, the Engineer may delete requirements for a shadow vehicle and attenuator. The work vehicle will be required to have an arrow board and sign message.
7. Where work activities within 2' of the edge of travel way are incidental (i.e. Mowing, Litter Removal), the Engineer may delete requirements for signs and the advance warning vehicle provided vehicles in the work area have high-intensity rotating, flashing, oscillating, or strobe lights operating.
8. Work, Shadow, and Advance Warning Vehicles shall have high-intensity rotating, flashing, oscillating, or strobe lights operating.
9. Functional two-way communication is required between all vehicles in the mobile operation convoy.
10. For general TCZ requirements and additional information, refer to Index 102-600.
DESCRIPTION:

REVISED

STANDARD PLANS
FY 2018-19

MULTILANE, MOBILE OPERATIONS WORK ON SHOULDER, WORK WITHIN TRAVEL WAY

WORK WITHIN TRAVEL WAY, CENTER LANE OR OUTSIDE CENTERLINE

Where adequate shoulder width is not available, the advance warning vehicle may drive in the lane.

WORK WITHIN TRAVEL LANE

SYMBOLES

W Work Vehicle
S Shadow (S) Vehicle with Arrow Board
AW Advance Warning (AW) Vehicle with Arrow Board and Sign Message or Changeable Message Sign
TMA Truck/Trailer Mounted Attenuator (TMA)

Lane Identification And Direction Of Traffic

Arrow Board

500'-500' Urban
500'-1500' Rural
500'-800' Rural

500'-500' Urban
500'-1500' Rural
500'-800' Rural

500'-1500' Rural
500'-800' Rural

500'-1500' Rural
500'-800' Rural
GENERAL NOTES

1. TWO-WAY TRAFFIC signs shall be repeated every ½ mile in each direction, throughout the tangent distance (T).

2. \[ t (\text{min}) = \frac{W}{S} \times 60 \]
   for speeds \( S \leq 45 \text{ mph} \)
   \[ t (\text{min}) = \frac{W}{S} \]
   for speeds \( S > 45 \text{ mph} \)

   Where:
   \( W = \) Width of lateral transition in feet.
   \( S = \) Posted speed limit (mph)

3. Where the tangent distance (T) exceeds 250', spacing between Type I or II barricades or vertical panels or drums may be increased to 100' within the limits of the tangent, or post mounted delineators at 50' centers may be substituted for barricades, vertical panels or drums.

4. All existing pavement markings within the realignment which conflict with the revised traffic pattern are to be removed and removable pavement markings used for making new edge lines.

5. When side roads, cross roads or interchanges intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC Indexes.

6. For general TTC requirements and additional information, refer to Index 102-600.

SYMBOLS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Area</td>
<td><img src="symbol.png" alt="Work Area" /></td>
</tr>
<tr>
<td>Channelizing Device (See Index 102-600)</td>
<td></td>
</tr>
<tr>
<td>Work Zone Sign</td>
<td><img src="symbol.png" alt="Work Zone Sign" /></td>
</tr>
<tr>
<td>Advance Warning Arrow Board</td>
<td><img src="symbol.png" alt="Advance Warning Arrow Board" /></td>
</tr>
<tr>
<td>Lane Identification &amp; Direction of Traffic</td>
<td><img src="symbol.png" alt="Lane Identification &amp; Direction of Traffic" /></td>
</tr>
</tbody>
</table>

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES REQUIRE THE CLOSURE OF ONE ROADWAY AND THE OPPOSING ROADWAY IS CONVERTED TO TEMPORARY TWO-WAY TRAVEL, A WAY OF CROSSOVERS IS REQUIRED.
GENERAL NOTES

1. TWO-WAY TRAFFIC signs shall be repeated every 1/4 mile in each direction, through the tangent distance (T).

2. When paved shoulders having a width of 8 ft. or more are closed, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the travel way. See Index 102-612 for shoulder taper formulas.

3. Where the tangent distance (T) exceeds 250', spacing between cones or tubular markers may be increased to 50' or spacing between Type I or Type II barricades or vertical panels or drums may be increased to 100' within the limits of the tangent.

4. This index does not apply when work is being performed in the middle lane(s) of a six or more lane highway. Special maintenance of traffic details will be required.

5. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC Indexes.

6. For general TTC requirements and additional information, refer to Index 102-600.

SYMBOLS

- Work Area
- Channelizing Device (See Index 102-600)
- Type III Barricade
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic

Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L (ft.)</th>
<th>Notes (Merge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>125</td>
<td>L = WS²/80</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
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</tr>
<tr>
<td>70</td>
<td>840</td>
<td></td>
</tr>
</tbody>
</table>

For lateral transitions other than 12' use formula for L shown in the notes column. Where:

\[ L = \text{Length of taper in feet} \]
\[ W = \text{Width of lateral transition in feet} \]
\[ S = \text{Paved speed limit (mph)} \]

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES REQUIRE THE CLOSURE OF THE LANES IN ONE DIRECTION AND A DIVERSION IS PROVIDED BY UTILIZING ONE LANE OF THE OPPOSING TRAFFIC LANES.
ROAD WORK END
ROAD AHEAD WORK
ROAD AHEAD WORK
ROAD AHEAD WORK

DESCRIPTION:
REVISED of STANDARD PLANS FY 2018-19 SHEET 07/01/15

CONDITIONS:
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF TRAFFIC LANES IN ONE DIRECTION AND THE USE OF ONE OPPOSING TRAFFIC LANE TO MAINTAIN TWO-WAY TRAFFIC, FOR WORK AREA LESS THAN 200' FROM INTERSECTION, FOR A PERIOD OF MORE THAN 60 MINUTES.

SYMBOLS
- Work Area
- Channelizing Device (See Index 102-600)
- Type III Barricade
- Work Zone Sign
- Advance Warning Arrow Board
- Stop Bar
- Lane Identification + Direction of Traffic

GENERAL NOTES
1. When vehicles in a parking zone block the line of sight to TCZ signs or when TCZ signs encroach on a normal pedestrian walkway, the signs shall be post mounted and located in accordance with Index 700-101.
2. Dual signs are required for divided roadways.
3. Channelizing devices are to be spaced with Type I or Type II barricades or vertical panels or drums at 30' centers in tapers, 50' centers in tangent sections and 15' centers where reduced device spacing runs are identified in the drawing.
4. For general TCZ requirements and additional information, refer to Index 102-600.

DURATION NOTE
Renewable reflectorized pavement markings shall be used when closure time exceeds one daylight period.

CONDITIONS:
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF TRAFFIC LANES IN ONE DIRECTION AND THE USE OF ONE OPPOSING TRAFFIC LANE TO MAINTAIN TWO-WAY TRAFFIC, FOR WORK AREA 200' OR MORE FROM INTERSECTION, FOR A PERIOD OF MORE THAN 60 MINUTES.

* When Other Construction Or Maintenance Operations Occur Within 1 Mile, Sign To Be Omitted And Signing To Be Coordinated In Accordance With Index 102-600.
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES AHEAD
CLOSED RIGHT LANE


REV ISIO N DESCRIPTION:

11/01/17 DOUBLE LANE CLOSURE

MULTILANE, WORK WITHIN THE TRAVEL WAY
DOUBLE LANE CLOSURE

DISTANCE BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed (mph)</th>
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<th>B</th>
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<tr>
<td>50</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
</tr>
</tbody>
</table>

* The ROAD WORK 1 MILE sign may be used as an alternate to the ROAD WORK AHEAD sign. A sign may be used as an alternate to the RIGHT LANE CLOSED AHEAD sign.

** See Table II for details.

*** 500' beyond the ROAD WORK AHEAD sign or midway between signs whichever is less.

Buffer Space and Taper Length

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Buffer Space</th>
<th>Taper Length</th>
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<tbody>
<tr>
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<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. Work operations shall be confined to the outside traffic lanes, leaving the adjacent lanes open to traffic.
2. On undivided highways the median signs as shown are to be omitted.
3. When work is performed in the median lane on divided highways, the channelizing device plan is inverted and left lanes closed and lane ends signs substituted for the right lanes closed and lane end signs.
4. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCC Indexes.
5. For general TTC requirements and additional information, refer to Index 102-600.
6. When paved shoulders having a width of 8 ft. or more are closed, channelizing devices shall be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the travel way. See Index 102-612 for shoulder taper formulas.

DURATION

Temporary white edgeline may be omitted for work operations less than three (3) days.

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE TWO LANES ADJACENT TO EITHER SHOULDER.
### GENERAL NOTES

1. This Index does not apply to limited access facilities.

2. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with applicable T&Z Indexes.

3. Traffic volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.

4. The buffer space may be omitted if there are no sight obstructions to vehicles approaching the Flagger/Officer for distance equal to the buffer space.

5. A Flagger may be substituted for a Traffic Control Officer and the BE PREPARED TO STOP sign may be omitted, when the following conditions are met:
   a. Speed limit is 45 mph or less.
   b. No sight obstructions to vehicles approaching the Flagger/Officer for a distance equal to the buffer space.
   c. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

6. On undivided highways the median sign as shown are to be omitted.

7. For general T&Z requirements and additional information refer to Index 102-600.

### CONDITIONS

**PLANNED CLOSURE NOT EXCEEDING 5 MINUTES.**

#### SYMBOLS
- **Work Area**
- **Work Zone Sign**
- **Flagger**
- **Traffic Control Officer**
- **Lane Identification + Direction of Traffic**

#### BUFFER SPACE

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Dist. (ft.)</th>
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<tbody>
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<tr>
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<td>645</td>
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#### DISTANCE BETWEEN SIGNS

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<td>45</td>
<td>350 350 350</td>
</tr>
<tr>
<td>50 or greater</td>
<td>500 500 500</td>
</tr>
</tbody>
</table>

#### ROAD WORK AHEAD

- **BE PREPARED TO STOP**
- **ROAD WORK AHEAD**

#### TWO-LANE, TWO-WAY

- **Buffer Space**
- **Work Area**

#### MULTILANE

- **Buffer Space**
- **Work Area**

---

**REV**

**DESCRIPTION:**

**REVISION**

**LAST**

**REV**

**INDEX**

**STANDARD PLANS**

**TEMPORARY ROAD CLOSURE 5 MINUTES OR LESS**

**SYMBOLS**

**BUFFER SPACE**

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<th>Speed (mph)</th>
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</thead>
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<table>
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<th>Speed</th>
<th>spacing (ft.)</th>
</tr>
</thead>
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<tr>
<td>45</td>
<td>350 350 350</td>
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<tr>
<td>50</td>
<td>500 500 500</td>
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**SYMBOLS**

<table>
<thead>
<tr>
<th>work zone</th>
<th>work area</th>
<th>flagger</th>
<th>traffic control officer</th>
<th>lane identification + direction of traffic</th>
</tr>
</thead>
<tbody>
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**BUFFERS SPACE**

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<tr>
<th>speed (mph)</th>
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**DISTANCE BETWEEN SIGNS**

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<td>45</td>
<td>350 350 350</td>
</tr>
<tr>
<td>50 or greater</td>
<td>500 500 500</td>
</tr>
</tbody>
</table>

**SYMBOLS**

- **Work Area**
- **Work Zone Sign**
- **Flagger**
- **Traffic Control Officer**
- **Lane Identification + Direction of Traffic**
GENERAL NOTES

1. Work operations shall be confined to two-way left turn lane, leaving the adjacent lanes open to traffic.

2. Advance Warning Vehicle will have an Advanced Warning Arrow Board in the Warning Mode.

3. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCZ Indexes.

4. For general TCZ requirements and additional information, refer to Index 102-600.

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ARE BEING CONDUCTED IN THE TWO WAY LEFT TURN LANE.
Traffic transition area upstream from crossover

The advance warning arrow boards are located within the limits of the crossover. The advance warning arrow boards are required. Under no circumstances will the traffic transition be located within the limits of the crossover.

General Notes

1. This Index does not apply to limited access facilities.

2. When crossovers do not exist, the contractor will construct temporary crossovers in accordance with Index 102-631.

3. 1. = length of taper in feet:
   - $W_S$ for speeds ≤ 45 mph
   - $W_S$ for speeds ≤ 40 mph

   $W$ = Width of lateral transition in feet.

   $S$ = Posted speed limit (mph).

4. Within the lateral transitions, the maximum spacing between cones and tubular markers shall be 25'. Maximum spacing between Type I or Type II barricades or vertical panels or drums shall be based on the speed limit as follows: 15' up to 25 MPH; 30' for 30-40 MPH; 50' for 45 MPH or greater.

   Spacing for devices parallel to the travel lanes shall be 25' for cones or tubular markers and 30' for Type I or Type II barricades or vertical panels or drums.

   When crossovers do not exist, the contractor will construct temporary crossovers in accordance with Index 102-631.

   When crossovers do not exist, the contractor will construct temporary crossovers in accordance with Index 102-631.

5. For Case I, Condition A, when the median width is too narrow for trucks to make turns into Lane No. 2, Sign Nos. 1, 2, 3 and the Flagger Actuated Advance Warning Arrow Board shall be moved ahead to a crossover in advance of the paving lane taper. Project advance warning signs (not shown) shall be located in advance of the relocated Sign No. 3.

6. For Case II, Conditions A & B, the advance warning arrow boards are required. Under no circumstances will the traffic transition be located within the limits of the crossover.

Symbols

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Advance Warning Arrow Board - Type C (48" x 96")
- Advance Warning Arrow Board - Type C (48" x 96")
- (F) Trailer Mounted And Actuated By Flagger Upon Approach Of The Work Vehicle
- Approach Of The Work Vehicle
- Lane Number
- Lane Identification + Direction of Traffic

Case 1

Condition A

When the paving train is in Lane 2, the U-turning vehicle shall cautiously turn into Lane 2 and proceed in Lane 2 to the front of the train. The advance warning arrow boards are required. Under no circumstances will the traffic transition be located within the limits of the crossover.

Condition B

The advance warning arrow boards are required. Under no circumstances will the traffic transition be located within the limits of the crossover.

Condition A & B

The advance warning arrow boards are required. Under no circumstances will the traffic transition be located within the limits of the crossover.
When this sign conflicts with ROAD WORK ½ MILE, the ROAD WORK ½ MILE sign shall be temporarily removed.

CONDITION A

WHEN THE PAVING TRAIN IS IN LANE « THE U-TURNING VEHICLE SHALL CAUTIOUSLY TURN INTO LANE « AND PROCEED IN LANE « TO THE FRONT OF THE TRAIN.

CONDITION B

WHEN THE PAVING TRAIN IS IN LANE « THE U-TURNING VEHICLE SHALL TURN INTO LANE « CAUTIOUSLY MERGE INTO LANE « AND PROCEED TO THE FRONT OF THE PAVING TRAIN.

CONDITION A & B

THE ADVANCE WARNING ARROW BOARD IS REQUIRED. UNDER NO CIRCUMSTANCES WILL THE TRAFFIC TRANSITION BE LOCATED WITHIN THE LIMITS OF THE CROSSOVER.

CONDITION A

TRAFFIC TRANSITION AREA DOWNSTREAM FROM CROSSOVER

CASE II

Note: See Sheet 1 for General Notes.
GENERAL NOTES

1. Temporary median crossovers shall be within the project limits and shall not be used for transporting materials to or from any other project. The acceleration-deceleration surfaces shall be paved. RAP material is acceptable for crossing surfacing.

2. Temporary median crossovers shall be located only in areas having adequate sight distance. On limited access facilities temporary median crossovers shall not be located within 1.5 miles of interchanges nor within 2000 ft. of acceleration-deceleration lanes at rest areas, other access openings or other highway service areas.

3. For paving train operations at permanent crossovers, see Index 102-630.

4. All traffic control devices are to be removed when crossover will not be in use for one hour or longer.

5. Trailer mounted advance warning panels may be used in lieu of advance warning vehicle.

6. When a crossover is no longer needed, all temporary construction shall be immediately removed and the area restored to its original condition.

7. Cost of construction, maintenance, removal and restoration work related to temporary crossovers shall be included in the contract unit price for Maintenance of Traffic, LS.

8. Temporary crossovers on limited access right of way and use of this Index are prohibited unless specifically permitted in the Contract Plans or Special Provisions. When permitted in the Contract Plans or Special Provisions and prior to construction of any temporary crossover, the Contractor must submit, in writing, a request identifying specific locations for approval by the Engineer.

9. Pipe and mitered end sections are not required when crossover is located at the high point of a crest vertical curve.
REVISED DESCRIPTION:

LAST REVISION 01/01/17

SYMBOLS

Temporary Pavement

Work Zone Sign

Channelizing Device (See Index 102-600)

Advance Warning Vehicle

Lane Identification + Direction of Traffic

LENGTH OF ACCESS LANES (Ft.)

<table>
<thead>
<tr>
<th>Grade</th>
<th>D_1</th>
<th>D_2</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<tr>
<td>3 to 4% Downgrade</td>
<td>710</td>
<td>925</td>
</tr>
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</table>

NOTE

1. A lane closure analysis will be required to determine the times of day that this crossover can be in operation.

Maximum Spacing Between Cones And Tubular Markers Shall Be 25'

I. (Min.) = WS

S = Existing Posted Speed (MPH)

TEMPORARY Crossover FOR MEDIAN WIDTHS FROM 50' TO < 75'

EXIST. SHD. PAV.

MERGE

RIGHT LANE ENDS

STAY IN YOUR LANE

MERGE

RIGHT LANE ENDS

TEMPORARY CROSSOVER FOR MEDIAN WIDTHS FROM 50' TO < 75'
**SYMBOLS**

- Channelizing Device (See Index 102-600)
- Type III  Barricade
- Work Zone Sign
- Lane Identification + Direction of Traffic

**LEGEND**

- Phase I Construction
- Phase II Construction
- Phase III Construction

---

**PHASE III**

1. Remove temporary marking from the existing pavement and temporary shoulder pavement. Mark pavement, install warning devices and resign as shown. Traffic to be controlled in accordance with Index 102-607. For lane width requirements see index 102-600.

2. Route through traffic to newly constructed roadway.

3. Resurface or reconstruct existing pavement including required shoulder pavement and friction course.

---

**GENERAL NOTES**

1. Existing signs and pavement markings that conflict with construction signing and marking shall be obliterated or removed.

2. Lane widths for maintenance of two-way traffic should desirably be equal to lane widths of the existing facility, but lanes shall be not less than 10 ft in width. When one-lane one-way operations are necessary, a minimum width of 12' shall be maintained and traffic controlled in accordance with Indexes 102-603 and 102-607. Minimum width for the temporary shoulders is 6'.

3. Within the lateral transitions, the maximum spacing between Type I or Type II barricades or vertical panels or drums shall be based on the speed limit as follows: 15' up to 25 MPH; 30'-40 MPH; 50' for 45 MPH or greater.

The maximum spacing between warning devices used for delineation between the travel way and construction area is 50' for Type I or Type II barricades or vertical panels or drums.

4. Warning devices shall be in conformity with ‘Dropoffs In Work Zones’ Index 102-600.

5. For speed sign applications, see ‘Regulatory Speed In Work Zones’ Index 102-600.

6. For reflectorized raised pavement markers, see ‘Pavement Markers’ Index 102-600 and Index 706-001.

7. Additional barricades, signing, or other traffic controls shall be provided for limited work areas in accordance with other applicable TCZ Indexes.

8. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCZ Indexes.

9. Provisions approved by the Engineer shall be made for the removal of storm water from the roadway(s) during construction.

10. For general TCZ requirements and additional information, refer to Index 102-600.

---

**PHASE IV**

1. Reroute through traffic as shown in Phase II. Signing to be as shown in Phase II.

2. Construct friction course over pavement constructed in Phases I and II.

---

* Required For Projects > 2 Miles

** Required Only When Construction Zone Speed Reduced Below Existing Posted Speed Prior To Construction

*** When Other Construction Or Maintenance Operations Occur Within 1 Mile, Signs To Be Omitted And Signing To Be Coordinated In Accordance With Index 102-600.
PHASE I

1. Maintain two-lane two-way traffic along existing facility. Install construction signing.

2. Remark existing pavement to facilitate temporary pavement construction. For lane width requirements see Index 102-600.

3. Construct temporary pavement of sufficient width to accommodate two-lane two-way traffic on the temporary pavement and a portion of the existing pavement during Phase I roadway construction. When two-lane two-way traffic can not be maintained during temporary pavement construction one-lane operations shall be maintained in accordance with Index 102-605. Channelizing devices shall be in conformance with 'Drop-Offs in Work Zones' of Index 102-600.

4. Mark the pavement in accordance with the Phase I diagram. Reroute through traffic to the temporary pavement and a portion of the existing pavement. For lane width requirements see Index 102-600.

5. Construct two lanes of the proposed roadway, excluding the friction course. Side street traffic to be maintained. Through and cross traffic to be controlled in accordance with Indexes 102-604, 102-605 and 102-615. Barricading shall be in conformance with 'Drop-Offs in Work Zones', Index 102-600. When work extends through an intersection temporarily reroute the cross traffic to other cross streets. When rerouting is not possible, provide one-lane access (minimum) for two-lane two-way cross streets and one-lane access (minimum) each direction for four-lane two-way cross streets, in accordance with Indexes 102-604, 102-605 and 102-615.

LEGEND

See Sheet 3 for General Notes.

CONVERTING TWO LANES TO FOUR LANES
DIVIDED, URBAN

INDEX
102-641

SHEET
1 of 3
ROAD WORK END NEXT X MILES

ROAD AHEAD WORK

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

ROAD AHEAD WORK

ROAD AHEAD WORK

10/23/2017 10:22:46 AM

R E V I S I O N

DESCRIPTION:

REVISED 11/01/17

DIVIDED, URBAN

Projects >2 Miles

Required For

Lane Reopened To Traffic. Erect STOP Sign
And Reinstall When Through Lane
Reopened To Traffic.

When Other Construction Or
Maintenance Operations Occur
Within 1 Mile, Signs To Be
Omitted And Signs To Be
Coordinated In Accordance
With Index 102-600

With Index 102-600

When Through Lane
Reopened To Traffic.

STOP Sign And Reinstall
Marking. Remove Existing
Install Removable Stop Bar
Erect STOP Sign And
Remove Workers
Do Not Enter

STOP

STOP

Double Yellow Reflectorized Pavement Markings

White Reflectorized Pavement Markings

Temporary Guide Lines

PHASE II

1. Sign and mark Phase I pavement in accordance with the Phase II diagram. For lane width requirements see Index 102-600.

2. Reroute through traffic to Phase I pavement.

3. Complete all Phase II construction, including the friction course. Side street traffic to be maintained. Through and cross traffic to be controlled in accordance with Indexes 102-604, 102-605 and 102-613. Channelizing devices shall be in conformance with "Drop-Offs in Work Zones" of Index 102-600. When work extends through an intersection, temporarily reroute cross traffic to other cross streets. When rerouting is not possible, provide one-lane access (minimum) for two-lane two-way cross streets and one-lane access (minimum) each direction for four-lane two-way cross streets, in accordance with Indexes 102-604, 102-605 and 102-613.

LEGEND

See Sheet 3 for General Notes.

CONVERTING TWO LANES TO FOUR LANES

DIVIDED, URBAN
CONVERTING TWO LANE TO FOUR LANE
DIVIDED, URBAN

SYMBOLS
- Channelizing Device (See Index 102-600)
- Type III Barricade
- Work Zone Sign
- Stop Bar
- Lane Identification + Direction of Traffic

LEGEND
- Phase I Construction
- Phase II Construction
- Phase III Construction

GENERAL NOTES
1. All signing, pavement marking, and barricades necessary for maintenance of traffic shall conform to Index 102-600.
2. Lane widths for maintenance of two-way traffic should desirably be equal to lane widths of the existing facility, but lanes shall not be less than 10' in width. When one-lane one-way operations are necessary, a minimum width of 12' should be maintained and traffic controlled in accordance with Index 102-604, 102-605 or 102-615.
3. At signalized intersections, signals shall be directed or relocated as required to the center of relocated lanes.
4. For reflectorized raised pavement marker application, see Indexes 102-600 and 706-001.
5. Additional barricades, signing, lighting or other traffic controls for limited work areas shall be provided in accordance with other applicable TCZ Indexes as conditions warrant in each phase.
6. Provisions approved by the Engineer shall be made for the removal of storm water from the roadway(s) during construction.
7. For general TCZ requirements and additional information, refer to Index 102-600.

PHASE III

1. Sign and mark Phase III pavement in accordance with the Phase III diagram.
2. Reroute through traffic to Phase II pavement.
3. Construct friction course over Phase I pavement. Side street traffic to be maintained. Through and cross traffic to be controlled in accordance with Index 102-604, 102-605 or 102-615. When work extends through an intersection, temporarily reroute cross traffic to other cross streets. When rerouting is not possible, provide one-lane access (minimum) for two-lane two-way cross streets.
4. Reroute through traffic to Phase II pavement.
5. Sign and mark Phase II pavement in accordance with the Phase III diagram.
6. For reflectorized raised pavement marker application, see Indexes 102-600 and 706-001.
7. Additional barricades, signing, lighting or other traffic controls for limited work areas shall be provided in accordance with other applicable TCZ Indexes as conditions warrant in each phase.
8. Provisions approved by the Engineer shall be made for the removal of storm water from the roadway(s) during construction.
9. For general TCZ requirements and additional information, refer to Index 102-600.
**BARRIER AND TRANSITION LOCATED ON PAVED OR UNPAVED SHOULDERS**

**PLAN SHOWN FOR RIGHT LANE - INVERTED PLAN FOR LEFT LANE**

- **Temporary Barrier**
- **Crash Cushion**
- **Type I or Type II Barricades or Vertical Panels or Drums**
- **Shoulder Line**
- **Edge Line**
- **Shoulder Line**

**TWO OR MORE LANES ONE WAY**

**LANE DROP • PLAN SHOWN FOR RIGHT LANE MERGE LEFT - INVERTED PLAN FOR LEFT LANE MERGE RIGHT**

- **Reflectorized Pavement Marking**
- **Solid Line Only (Transition Zone)**
- **类型 I 或 Type II Barricades or Vertical Panels or Drums**
- **Edge Line**
- **Shoulder Line**

**GENERAL NOTES**

\[1. \text{ For signing information see the Plans, Specifications, MUTCD and other TCZ Indexes.}\]

\[2. \text{ Where } W=\text{width of lateral transition in feet, } S=\text{posted speed limit.}\]
1. Maintain two-lane two-way traffic over existing facility.

2. Construct temporary structure, approaches, guardrail and install crash cushions if center truss is constructed.

3. The signing shown in the Phase I diagram is required whenever equipment workers or their activities are within 15’ of the existing pavement edge.

PHASE II

1. Reroute traffic to diversion and maintain two-way traffic on diversion. Install Type III barricades.

3. Construct proposed structure and reconstruct or resurface existing approaches.

PHASE III and General Notes (See Sheet 2)
PHASE III

1. Reroute traffic to final alignment and maintain two-way traffic.
2. Remove all temporary construction items.

GENERAL NOTES

1. All signage, pavement marking, and barricades necessary for maintenance of traffic shall conform to Index 102-600.

2. For speed sign applications, see Index 120-600.

3. For lane width requirements see Index 102-600. When one-way one-lane operations are necessary, a minimum width of 12' shall be maintained and traffic controlled in accordance with Index 102-603, 102-606 or 102-607. Minimum width for the diversion shoulders is 6'.

4. Method of attaching temporary guardrail to the diversion structure to be approved by the Engineer. Cost of temporary guardrail systems, including end anchorage assemblies, transitions and attachment to temporary structures, are to be included in the contract unit price for Guardrail (Temporary) LF.

5. Provisions approved by the Engineer shall be made for the removal of storm water from the roadway(s) during construction.

6. Only temporary crash cushions approved by the Department shall be used unless specified devices called for in the plans.

7. Where the temporary structure is not required, the diversion may be constructed in accordance with Index 102-608, unless otherwise stipulated in the plans.

8. For reflective raised pavement marker application, see Indexes 102-600 and 706-001.

9. For general TCZ requirements and additional information, refer to Index 102-600.
GENERAL NOTES

1. S = Posted speed limit (mph)
2. Within the lateral transitions, the maximum spacing between Type I or Type II barricades or vertical panels or drums shall be based on the speed limit as follows: 15' up to 25 MPH; 30' for 30-40 MPH; 50' for 45 MPH or greater. Barricades, vertical panels, and drums shall be placed in accordance with other applicable TCZ indexes.
3. For speed sign applications, see Regulatory Speed in Work Zones’ Index 102-600.
4. All existing pavement markings within the realignment which conflict with the revised traffic pattern are to be removed and new pavement markings used for marking edge lines and lane lines.
5. When side roads, cross roads or interchanges within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCZ indexes.
6. For general TCZ requirements and additional information, refer to Index 102-600

SYMBOLS
- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Lane Identification + Direction of Traffic

CONDITIONS
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES REQUIRE THE CLOSURE OF ONE ROADWAY AND THE OPPOSING ROADWAY IS CONVERTED TO TEMPORARY TWO-WAY TRAFFIC BY WAY OF CROSSOVERS.

* Required For Projects > 2 miles
** Required Only When Construction Zone Speed Reduced Below Existing Posted Speed Prior To Construction
*** When Other Construction Or Maintenance Operations Occur Within 1 Mile, Signs To Be Omitted And Signing To Be Coordinated In Accordance With Index 102-600.
When Other Construction Or Maintenance Operations Occur Within 1 Mile, Signs To Be Omitted And Signing To Be Coordinated In Accordance With Index 102-600.

NOTE: Diversions with speeds of 50 mph or greater are considered high speed facilities; curvature and superelevation criteria for open highway conditions apply.

Minimum Radii For Normal Cross Slopes

<table>
<thead>
<tr>
<th>Construction Zone Speed</th>
<th>Minimum Radius (ft)</th>
<th>Curves 1 &amp; 4</th>
<th>Curves 2 &amp; 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>60°</td>
<td>60'</td>
<td>22,918 (6° 15')</td>
<td>5,584 (1° 15')</td>
</tr>
<tr>
<td>55°</td>
<td>60'</td>
<td>22,918 (6° 15')</td>
<td>5,584 (1° 15')</td>
</tr>
<tr>
<td>50°</td>
<td>60'</td>
<td>11,450 (6° 30')</td>
<td>2,392 (1° 30')</td>
</tr>
<tr>
<td>45°</td>
<td>60'</td>
<td>1,080 (1° 15')</td>
<td>700 (1° 15')</td>
</tr>
<tr>
<td>60°</td>
<td>30'</td>
<td>820 (1° 45')</td>
<td>550 (1° 25')</td>
</tr>
<tr>
<td>55°</td>
<td>30'</td>
<td>420 (2° 15')</td>
<td>430 (1° 30')</td>
</tr>
</tbody>
</table>

Typical For 64' Or 88' Median (64' Shown)

Section AA

CURVILINEAR ALIGNMENT CROSSOVER

When Other Construction Or Maintenance Operations Occur Within 1 Mile, Signs To Be Omitted And Signing To Be Coordinated In Accordance With Index 102-600.

NOTE: Diversions with speeds of 50 mph or greater are considered high speed facilities; curvature and superelevation criteria for open highway conditions apply.
TRAFFIC PACING GUIDE

Traffic pacing is a traffic control technique to slow but not stop traffic to facilitate short duration work operations without an elaborate and difficult detour or diversion. Traffic Control Officers pace or slow the traffic to a speed that provides approximately 20-30 minutes to perform the overhead construction. The Department has frequently used this technique for setting bridge beams, overhead sign structures and replacing overhead sign panels.

The traffic pacing begins with approval of the exact date of the activity that shall be made two weeks in advance. The District Public Information Office, the District Traffic Operations Engineer, Local Emergency Management Agencies and Project Personnel shall be notified of the location, date and time. Advance notification to the public shall begin at least one week in advance by using Changeable Message Signs.

The day of the traffic pacing operation, the Changeable Message Sign messages shall be revised to indicate the activity will occur that night or day. The traffic pacing operation begins with a Traffic Control Officer Supervisor at the work site initiating the pacing operation in accordance with pacing details shown on sheet 2. The intent is to keep traffic moving unless there is an emergency.

The intent is to keep traffic moving unless there is an emergency. The traffic pacing operation begins with a Traffic Control Officer Supervisor at the work site initiating the pacing operation in accordance with pacing details shown on sheet 2. The intent is to keep traffic moving unless there is an emergency.

CHANGEABLE MESSAGE SIGNS
(Typical Placement and Messages)

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channelizing Device (See Index 102-600)</td>
<td></td>
</tr>
<tr>
<td>Marked Police Vehicle with Flashing Blue Lights</td>
<td></td>
</tr>
<tr>
<td>PCMS, Portable Changeable Message Sign</td>
<td></td>
</tr>
<tr>
<td>To be placed the day of pacing operation</td>
<td></td>
</tr>
<tr>
<td>Lane Identification and Direction of Traffic</td>
<td></td>
</tr>
</tbody>
</table>

CHANGEABLE MESSAGE SIGN MESSAGE
(MAINLINE AND RAMPS)

<table>
<thead>
<tr>
<th>One Week Prior To Pacing Operation</th>
<th>Expect Delays On</th>
<th>NHM DD-DD X AM - X AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>DURING DAY OF PACING OPERATION</td>
<td>ROAD WORK TONIGHT</td>
<td>EXPECT PERIODIC DELAYS</td>
</tr>
<tr>
<td>DURING PACING OPERATION</td>
<td>SLOW TRAFFIC AHEAD</td>
<td>BE PREPARED TO STOP</td>
</tr>
</tbody>
</table>

TRAFFIC PACING GENERAL NOTES

1. Install ROAD CLOSED (W20-3) signs approximately 1000' prior to the work area. These signs shall remain covered until the pacing operation begins and covers when the pacing operation has ended.

2. Prior to requesting that the traffic control officer supervisor initiate the pacing operation, the contractor shall ensure that the necessary equipment is properly positioned (off the roadway) for the construction activity requiring the traffic pacing operation.

3. Truck mounted attenuator(s) with changeable message sign(s) are required to protect workers and equipment positioned in a travel lane(s) at the work area during the pacing operation from an errant vehicle. If no workers and/or equipment are positioned in a travel lane(s) at the work area, truck mounted attenuator(s) are not required.

4. A traffic control officer supervisor shall be stationed at the work area continuously throughout the pacing operation to ensure radio communications between the contractor and/or the project administrator, and all the police vehicles involved in the pacing operation.

5. When more than one pacing operation is required in one work period the contractor shall allow sufficient time between pacing operations to permit traffic to return to normal speeds and flow. Additional time may be required between pacing operations to allow traffic to resume normal speeds and flow upstream of the work area as determined by the project administrator or traffic control officer supervisor.

TRAFFIC CONTROL PLANS OR TECHNICAL SPECIFICATION

1. The specific activities and locations, along with allowable times of day and days of the week, when pacing will be allowed should be clearly detailed in the traffic control plans or technical specification. If there are specific holiday or special event dates that, due to anticipated traffic congestion, pacing operations should not be allowed these dates should also be spelled out in plans or specifications. When detailing the specific activities and locations of pacing activities, identify the minimum number of traffic control officers needed for each function and location of the pacing operation. If there are certain work activities that need to be completed prior to the contractor starting the work anticipated during the pacing operation, the activities should be clearly detailed in the plans or technical specification.

2. When developing a pacing plan, failsafe "stop points" should be identified for those work operations in which a construction problem could create a condition that could not be immediately cleared. A failsafe stop point is the last safe egress from the highway facility prior to traffic coming upon the work that is being completed during the operation. In the unlikely event that the work is not completed during the time estimated for the pacing, the plan or specification should direct the pacing to not proceed past the failsafe stop point until the highway is cleared. In the event of major construction problem that cannot be immediately cleared, traffic can then be diverted off the facility.

3. The traffic control plans or technical specification should require the contractor to submit a pacing plan in advance of the operation. The pacing plan should outline the contractors expected equipment and personnel, outline the operation, and include a contingency plan should any of the contractors critical equipment break down. If the project includes a damage recovery clause, the traffic control plan or technical specification should clearly state the damage recovery applies to the pacing operation as well.

4. Changeable message signs shall be displayed one week prior to work using messages described in the traffic pacing plan. The number and location of changeable message signs shall be called out in the traffic control plans.
Mainline Pacing Details

Stage One
1. Four police vehicles located upstream of the work area at the beginning location of the traffic pacing operation with flashing blue lights off.

Stage Two
1. Once the police vehicles are in place and the traffic control officer supervisor at the work area notifies all officers to begin the traffic pacing operation, the lead police vehicle shall match the speed of regular traffic (20 mph is preferred, 10 mph minimum) for the duration of the traffic pacing operation.
2. The lead police vehicle (flashing blue lights off) shall match the speed of the last vehicles ahead of the pacing vehicles and continue following traffic until a point approximately 500' in advance of the work area. The lead police vehicle shall then come to a complete stop on the right shoulder and turn on its flashing blue lights. If required, crash truck(s) with rear mounted impact attenuator(s) and changeable message sign(s) shall move into the travel lanes approximately 200 ft. upstream of the work area with the impact attenuators down and operating once traffic has cleared the work area.

Stage Three
1. The two pace setting police vehicles shall begin to slow to the pacing speed (20 mph is preferred, 10 mph minimum), for the duration of the traffic pacing operation.
2. The lead police vehicle (flashing blue lights off) shall match the speed of the last vehicles ahead of the pacing vehicles and continue following traffic until a point approximately 500' in advance of the work area. The lead police vehicle shall then come to a complete stop on the right shoulder and turn on its flashing blue lights. If required, crash truck(s) with rear mounted impact attenuator(s) and changeable message sign(s) shall move into the travel lanes approximately 200 ft. upstream of the work area with the impact attenuators down and operating once traffic has cleared the work area.

Stage Four
1. When the pace setting police vehicles are within approximately two miles of the work area they shall notify the onsite traffic control officer supervisor who will immediately inform the contractors on site supervisor of their location. Once the contractors on site supervisor has been notified of the pacing vehicles location, the contractor shall begin to clear the travel lanes of all equipment and debris in order to reopen all travel lanes.
2. In case of emergency the pace setting police vehicles shall come to a complete stop once they reach the lead police vehicle. If no emergency is encountered, the crash truck(s) shall be moved from the travel lanes and the two pace setting police vehicles shall clear the work area and immediately move to the right shoulder or an area designated by the traffic control officer supervisor and turn off the flashing blue lights. Once the two pace setting police vehicles pass the work area, the traffic control officer supervisor shall instruct the lead and last police vehicles to turn off their flashing blue lights.

Ramp Pacing Details

One Lane Ramp
1. Once notified by the on site traffic control officer supervisor to begin the traffic pacing operation each police vehicle at the indicated ramp shall turn their flashing blue lights on and position the vehicle across the ramp lane(s) to close ramp access.

Two Lane Ramp
1. Once the pacing operation passes the closed on ramp the police vehicle on the ramp shall turn off the flashing blue lights and move from the ramp lane(s) to allow traffic to enter the mainline pacing operation.

Ramp Closure Details
1. Once notified by the on site traffic control officer supervisor to begin the traffic pacing operation each police vehicle at the indicated ramp shall turn their flashing blue lights on and position the vehicle across the ramp lane(s) to close ramp access.
2. Once the pacing operation passes the closed on ramp the police vehicle on the ramp shall turn off the flashing blue lights and move from the ramp lane(s) to allow traffic to enter the mainline pacing operation.

General Notes
1. Each Traffic Control Officer shall have a marked vehicle with flashing blue lights, for the pacing operation. The location and number of officers at each location will be as follows:

<table>
<thead>
<tr>
<th>No. Of Traffic Control Officers With Vehicles</th>
<th>Function</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supervisor</td>
<td>Work Area</td>
</tr>
<tr>
<td>1 Lead Vehicle</td>
<td>Varies</td>
<td>Mobile operation</td>
</tr>
<tr>
<td>1 for each travel lane</td>
<td>Pacing Operation</td>
<td>Mobile operation beginning x miles upstream and terminating at the work area</td>
</tr>
<tr>
<td>1 stationed at the beginning of pacing operation</td>
<td>Advanced Warning to Motorist</td>
<td>Stationed at the beginning of pacing operation</td>
</tr>
<tr>
<td>1 for each entrance ramp Roadblock</td>
<td></td>
<td>One each of the entrance ramps upstream of the work area</td>
</tr>
</tbody>
</table>
**DESIGN CONSIDERATIONS:**

The design shall evaluate the actual distance required for the pacing operation based on site specific features such as: roadway geometrics, pacing speeds, regulatory speeds, interchange spacing, work duration, availability of traffic control officers, traffic volumes and maximum queue length.

The starting point of a traffic pacing operation must consider the following factors: the speed of the pacing vehicles, the location of entrance ramps, horizontal and vertical alignment of the facility.

In some instances, it may be necessary to close a lane at the work site to position a crane(s) and the materials to be lifted.

All material to be installed shall be on-site before the traffic pacing operation begins.

It may be necessary to install temporary barrier walls to protect pre-positioned and assembled materials in the right of way.

The minimum speed allowed for a pacing operation is 10 mph with 20 mph the preferred speed.

The maximum allowed work duration is 1 hour (30 min).

The maximum practical pacing operation length is 10 miles.

---

**TRAFFIC PACING DISTANCES (L) miles**

\[ S_p = 20; \quad \text{pcphpl} = 1,750 \]

<table>
<thead>
<tr>
<th>( S_p ) (mph)</th>
<th>( t_w ) (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>7.3 4.7 7.0 9.3</td>
</tr>
<tr>
<td>65</td>
<td>2.4 4.8 7.2 9.6</td>
</tr>
<tr>
<td>60</td>
<td>2.5 5.0 7.5 10.0</td>
</tr>
<tr>
<td>55</td>
<td>2.6 5.2 7.9</td>
</tr>
<tr>
<td>50</td>
<td>2.8 5.6 8.3</td>
</tr>
</tbody>
</table>

* Site Specific design required.

**NOTES FOR TABLE:**

\( t_w \) is the total time allowed for work activity in minutes. This time starts just after the last vehicle traveling at the pre-pacing regulatory speed clears the work area and ends just as the pacing operation reaches the work area. \( t_w \) must include the time required to clear the roadway of equipment, materials, and personnel.

Demand volume may not exceed 1,750 pcphpl (passenger cars per hour per lane) without a specific design. Traffic counts can be obtained from the Office of Planning, or you may need to collect traffic counts. Hourly directional traffic volumes must be converted to pcphpl using the following:

\[ \text{pcphpl} = \left( \frac{\text{Hourly Directional Volume}}{2 \text{ Lanes reach direction}} \right) \times \text{Heavy Vehicle Factor} \]

For additional guidance for site specific designs refer to the Plans Preparation Manual, Volume 1 Chapter 10.
1. When encroaching work requires a sidewalk closure for 60 minutes or greater, provide an alternate pedestrian route.
2. For spacing of vehicular Channelizing Devices, see applicable vehicular temporary traffic control Indexes.
3. Cover or deactivate pedestrian traffic signal displays controlling closed crosswalks.
4. For post mounted signs located near or adjacent to a sidewalk, maintain a minimum 2' clearance from the bottom of the sign panel to the surface of the sidewalk.
5. Provide a 5' wide temporary walkway, except where space restrictions warrant a minimum width of 4'. Provide a 5' x 5' passing space for temporary walkways less than 5' in width at intervals not to exceed 100'.
6. Provide a cross-slope with a maximum value of 0.02 for all temporary walkways.
7. Maintain temporary walkway surfaces and ramps that are stable, firm, slip-resistant, and free of any obstructions or hazards such as holes, debris, mud, construction equipment, and stored material.
8. Remove temporary walkways immediately after reopening of the sidewalk, unless otherwise noted in the plans.
9. Meet the requirements of Index 322-002 for temporary curb ramps.
10. Place pedestrian longitudinal channelizing device(s) across the full width of the closed sidewalk. For temporary walkways, similar to the Sidewalk Diversion, place LCDs to delineate both sides of the temporary walkway.
11. For sidewalk diversions, ensure that there is sufficient R/W for placement of temporary sidewalk and pedestrian longitudinal channelizing devices.

GENERAL NOTES:

SYMBOLS

- [ ] Work Area
- [ ] Channelizing Device
- [ ] Work Zone Sign
- [ ] Required Locations For Either Temporary or Permanent Curb Ramps.
- [ ] Lane Identification + Direction of Traffic
- [ ] Pedestrian Longitudinal Channelizing Device (LCD) with Mounted Work Zone Sign or separate Work Zone Sign
- [ ] Pedestrian Longitudinal Channelizing Device (LCD)
- [ ] Temporary Sidewalk

CROSSWALK CLOSURE AND PEDESTRIAN DETOUR

ROAD WORK AHEAD

SIDEWALK CLOSING

CROSS HERE AHEAD

SIDEWALK DIVERSION

SIDEWALK DETOUR
1. Access openings across limited access right of way and use of this Index are prohibited unless specifically permitted in the Contract Plans or Special Provisions. When permitted in the Contract Plans or Special Provisions and prior to construction of any opening, the Contractor must submit, in writing, a request identifying specific locations for approval by the Engineer.

2. No more than two (2) access openings will be allowed on each project.

3. Access openings shall be located only in areas having adequate sight distance and shall not be located within 1.5 miles of interchanges nor within 2000 ft. of acceleration-deceleration lanes at rest areas, other access openings or other highway service areas.

4. Access openings shall not be constructed directly opposite temporary median crossovers nor within 2000 ft. of temporary median crossovers.

5. Access openings shall be within the project limits and shall not be used for transporting materials to or from any other project. The acceleration-deceleration surfaces shall be paved. RAP material is acceptable for driveway surfacing.

6. Any Motorist Aid Call Boxes affected by the temporary access openings shall be relocated outside the limits of access lanes and remain in use during construction. Upon removal of access lanes, call boxes shall be returned to their previous location. Temporary relocation and restoration of call boxes shall be at the contractor's expense.

7. Access openings in the limited access fence shall have gates which are to be locked during nonwork hours or periods when the access is not in active use.

8. The contractor shall take all precautions necessary to insure against entrance by livestock or unauthorized persons or vehicles.

9. The contractor shall not vary from the plan detail without approval of the Engineer.

10. Gates shall be removed and access opening locations shall be restored to preconstruction condition immediately upon completion of activities utilizing the materials being transported through the openings whether or not the project is completed.

11. Failure to comply with any provision of the access opening plan shall be cause for terminating use of all openings. Upon notification by the Engineer, the contractor shall cease hauling and begin restoration of affected areas. Under this condition expense of removal, restoration and of additional hauling distances shall be borne by the contractor.

12. No guardrail or barrier wall will be removed for access openings.

13. Construction and removal of the access and restoring the area to preconstruction condition shall be included in the cost of Maintenance of Traffic, 15.
**SYMBOLS**

- **Work Area**
- **Channelizing Device** (See Index 102-600)
- **Work Zone Sign**
- **Advance Warning Arrow Board**
- **Lane Identification + Direction of Traffic**
- **Advance Warning Vehicle Equipped with**
- **Truck/Trailer Mounted Attenuator**
- **Portable Changeable (Variable) Message Sign**

**PCMS DISPLAY A**

MESSAGE 1: SUNPASS CASH
MESSAGE 2: CLOSED LANE(S)

**PCMS DISPLAY B**

MESSAGE 1: SUNPASS CASH
MESSAGE 2: CLOSED LANE(S)

**PCMS DISPLAY C**

MESSAGE 1: SUNPASS LANE(S)
MESSAGE 2: KEEP LEFT/RIGHT

**GENERAL NOTES**

1. This Plan is to be used at Mainline Plazas Only.
2. This Plan is for Lane Closures that exceed three hours.
3. Plaza canopies which have existing DMS signs on the canopies shall display the message "LANE CLOSED" for the duration of this closure.
4. A truck/trailer mounted attenuator is required.
5. Lane use control lights, signs, or signals over toll lanes shall be switched to the appropriate symbol, message, or correct color prior to the start of any lane closure. They should also be switched at project completion.
6. At least 48 hours prior to any closure, other than emergencies, the plaza manager shall be notified for security and staffing.

**Dedicated Lane(s) In Center**

**Dedicated Lane(s) On Inside (Single Left Lane Closure)**

**Table 1 - Taper Length (L)**

<table>
<thead>
<tr>
<th>Dedicated Lane Location</th>
<th>Number of Dedicated Lanes Closed</th>
<th>Number of Dedicated Lanes</th>
<th>Taper Length (Feet)</th>
<th>PCMS Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center</td>
<td>1</td>
<td>1</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>300</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>350</td>
<td>A, B</td>
</tr>
<tr>
<td>Inside***</td>
<td>1</td>
<td>1</td>
<td>350</td>
<td>A, C</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>350</td>
<td>C</td>
</tr>
</tbody>
</table>

*** See Index 102-667 Sheet 2 for Right or Center Inside Dedicated Lane Closed, or Two or More Inside Dedicated Lanes Closed Configurations.
**CENTER OR RIGHT DEDICATED LANE CLOSED**

* If there is no room in the median for the PCMS, then locate it on the outside of the roadway only.

** Install temporary Speeding Fines Doubled sign only if there is not an existing permanent “Speeding Fines Doubled Through Toll Plaza” sign or an existing “Speeding Fines Doubled When Worker’s Present” sign in place.

---

**GENERAL NOTES**

1. This Plan is to be used at Mainline Plazas Only.

2. This Plan is for Lane Closures that exceed three hours.

3. Plaza canopies which have existing DMS signs on the canopies shall display the message “LANE CLOSED” for the duration of this closure.

4. A truck/trailer mounted attenuator is required.

5. See Sheet 1 for Two or More Inside Dedicated Lanes Single Left Lane Closed Configuration.

6. Lane use control lights, signs, or signals over toll lanes shall be switched at project completion.

7. At least 48 hours prior to any closure, other than emergencies, the plaza manager shall be notified for security and staffing.
**If there is no room in the median for the PCMS, then locate it on the outside of the roadway only.**

If there is no room in the median for the PCMS, then locate it on the outside of the roadway only.

### SYMBOLS
- Work Area
- Channelizing Device (See Index 102-400)
- Work Zone Sign
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic
- Advance Warning Vehicle Equipped with
  - Advance Warning Arrow Board and
  - Truck/Trailer Mounted Attenuator
- Portable Changeable (Variable) Message Sign
- Type III Barricades and "RAMP CLOSED" sign

### GENERAL NOTES
1. This Plan is to be used at Mainline Plazas Only.
2. This Plan is for lane closures of any time length.
3. Plaza canopies which have existing DMS signs on the canopies shall display the message "LANE CLOSED" for the duration of this closure.
4. For planned lane closure, a portable changeable message sign shall be placed and shall display the message shown at a minimum of one week prior to closure. If planned lane closure is less than one week, place portable changeable message sign immediately using "prior to closure" messages.
5. A truck/trailer mounted attenuator is required.
6. Lane closure configurations applicable to 2 or 3 lane open road tolling plazas.
7. At least 48 hours prior to any closure, other than emergencies, the plaza manager shall be notified for security and staffing.

### OUTSIDE OPEN ROAD TOLLING LANES

- Toll Plaza Traffic Control Standards
- FY 2018-19
- Standard Plans
- Index 102-667
- Sheet 3 of 6
1. This Plan is to be used at Mainline Plazas only.
2. This Plan is for lane closures of any time length.
3. Plaza canopies which have existing DMS signs on the canopies shall display the message "LANE CLOSED" for the duration of this closure.
4. For planned lane closure, a portable changeable message sign shall be placed and shall display the message if shown at a minimum of one week prior to closure. If planned lane closure is less than one week, a portable changeable message sign immediately using 'prior to closure' messages.
5. A truck/trailer mounted attenuator is required.
6. Lane closure configurations applicable to 2 or 3 lane open road tolling plazas.
7. At least 48 hours prior to any closure, other than emergencies, the plazam manager shall be notified for security and staffing.

** PCMS Displays:**

**PCMS Display Prior to Closure**
- Message 1: ONE SUNPASS ONLY
- Message 2: LANE OPEN "DATE/EST"

**PCMS Display During Closure**
- Message 1: SUNPASS ONLY
- Message 2: USE LANE CAUTION

Symbols:
- Work Area
- Work Zone Sign
- Lane Identification + Direction of Traffic
- Portable Changeable (Variable) Message Sign

Notes:
- If there is no room in the median for the PCMS sign, then locate it on the outside of the roadway only.
- Install temporary 'Speeding Fines Doubled' sign only if there is not an existing permanent 'Speeding Fines Doubled Through Toll Plaza' sign or an existing "Speeding Fines Doubled When Workers Present" sign in place.

**Inside Open Road Tolling Lanes**

**FY 2018-19 Standard Plans**

**Toll Plaza Traffic Control Standards**

**Index 102-667**

**Sheet 4 of 6**
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

AHEAD WORK PLAZA

CLOSED LEFT LANE AHEAD

PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

AHEAD WORK PLAZA

CLOSED CENTER LANE AHEAD

10/23/2017 10:22:56 AM

REVISION DESCRIPTION:

LAST REVISION 01/01/17

DESCRIPTION:

FY 2018-19

STANDARD PLANS

TOLL PLAZA TRAFFIC CONTROL STANDARDS

INDEX 102-667 SHEET 5 of 6

SYMBOLS

Work Area

Channelizing Device (See Index 102-600)

Work Zone Sign

Lane Identification + Direction of Traffic

Advance Warning Vehicle Equipped with Advance Warning Arrow Board and Truck/Trailer Mounted Attenuator

EXHIBIT A

DEDICATED, CASH, OR MIXED-USE LANES IN CENTER - ONE LANE CLOSED

(This same plan can be used for any non-dedicated lane even if they are not in the center of the plaza)

** Install temporary Speeding Fines Doubled sign only if there is not an existing permanent "Speeding Fines Doubled Through Toll Plaza" sign or an existing "Speeding Fines Doubled When Workers Present" sign in place.

EXHIBIT B

DEDICATED LANE INSIDE OR OUTSIDE - ONE LANE CLOSED

(Outside Lane Closure is a Mirror Image of this Exhibit)

GENERAL NOTES

1. This Plan is for lane closures that exceed three hours.

2. If the closed lane is a dedicated lane, Exhibit A shall be used at Ramp Plazas only. If the closed lane is a cash or mixed-use lane, Exhibit A may be used at Ramp or Mainline Plazas.

3. A truck/trailer mounted attenuator is required.

4. Exhibit B shall be used at Ramp Plazas only.

5. Lane use control lights, signs, or signals over toll lanes shall be switched to the appropriate symbol, message, or correct color prior to the start of any lane closure. They should also be switched at project completion.

6. At least 48 hours prior to any closure, other than emergencies, the plaza manager shall be notified for security and staffing.

MAINLINE PLAZAS & RAMP PLAZAS
**GENERAL NOTES**

1. This Plan is for lane closures that are three hours or less.
2. This Plan is to be used at Ramp or Mainline Plazas.
3. This plan can be used for any lane, with appropriate modifications, even if it is not in the center of the Plaza.
4. Lane use control lights, signs, or signals over toll lanes shall be switched to the appropriate symbol, message, or correct color prior to the start of any lane closure. They should also be switched at project completion.
5. At least 48 hours prior to any closure, other than emergencies, the plaza manager shall be notified for security and staffing.
6. A Truck/Trailer Mounted Attenuator is required for all aerial work operations (lift truck). For non-aerial operations, the Truck Mounted Attenuator or additional devices may be required by the Engineer based on the work being performed.

**SHORT-TERM CLOSURES**

SYMBOLS

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Lane Identification + Direction of Traffic
- Advance Warning Vehicle Equipped with Advance Warning Arrow Board and Truck/Trailer Mounted Attenuator

WORK DONE WITHIN TRAVEL LANE - ONE LANE CLOSED

WORK NOT DONE WITHIN TRAVEL LANE - ONE LANE CLOSED
GENERAL NOTES:

1. Use the MAS for lane closures of 5 day or more on multilane divided facilities with a posted speed of 55 MPH or greater when workers are present and not protected by a barrier.

2. For posted speeds of 65 MPH or greater, reduce Work Zone Speeds by 10 MPH. For posted speeds of 60 MPH, use a Work Zone Speed of 55 MPH.

3. Right lane closure shown, left lane closure similar using left lane signing.

4. Use shoulder taper in accordance with Index 102-612 for shoulder widths 8 feet or greater.

5. See Index 102-600 for general TCZ requirements and additional information.

SYMBOLS

- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic

(1) PCMS= Portable Changeable(Variable) Message Sign
(2) PRS= Portable Regulatory Sign - Speed Limit When Flashing
(2) RSDU= Radar Speed Display Unit
NOTES:
1. Crown Dripline Protection Zone: Extends in all directions from trunk of tree to a distance equal to one foot per inch of trunk diameter at breast height.
2. Staging, storage, dumping, washing and operation of equipment is not permitted within the limits of the tree protection barrier, including during barrier installation.
3. Install all tree protection prior to commencement of construction and remove when directed by the engineer. Maintain protection at all times.
4. For closely spaced groups of trees, place the tree protection barrier around the entire group.
5. Inspect trunk protection and tree quarterly to prevent girdling. Adjust bands to allow tree growth as needed.
6. See plans for any additional requirements or modifications within the tree protection area.
7. Place weather resistant sign every 50' along the barrier, with 6" minimum text height and provide text in English and Spanish. Sign should read “Keep Out Tree Protection Area”.
8. Alternate tree protection systems approved by the Engineer may be used in lieu of the tree protection barrier detailed on this index.

DESCRIPTION:
1. Crown Dripline Protection Zone: Extends in all directions from trunk of tree to a distance equal to one foot per inch of trunk diameter at breast height.
2. Staging, storage, dumping, washing and operation of equipment is not permitted within the limits of the tree protection barrier, including during barrier installation.
3. Install all tree protection prior to commencement of construction and remove when directed by the engineer. Maintain protection at all times.
4. For closely spaced groups of trees, place the tree protection barrier around the entire group.
5. Inspect trunk protection and tree quarterly to prevent girdling. Adjust bands to allow tree growth as needed.
6. See plans for any additional requirements or modifications within the tree protection area.
7. Place weather resistant sign every 50' along the barrier, with 6" minimum text height and provide text in English and Spanish. Sign should read “Keep Out Tree Protection Area”.
8. Alternate tree protection systems approved by the Engineer may be used in lieu of the tree protection barrier detailed on this index.

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4. For closely spaced groups of trees, place the tree protection barrier around the entire group.
5. Inspect trunk protection and tree quarterly to prevent girdling. Adjust bands to allow tree growth as needed.
6. See plans for any additional requirements or modifications within the tree protection area.
7. Place weather resistant sign every 50' along the barrier, with 6" minimum text height and provide text in English and Spanish. Sign should read “Keep Out Tree Protection Area”.
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3. Install all tree protection prior to commencement of construction and remove when directed by the engineer. Maintain protection at all times.
4. For closely spaced groups of trees, place the tree protection barrier around the entire group.
5. Inspect trunk protection and tree quarterly to prevent girdling. Adjust bands to allow tree growth as needed.
6. See plans for any additional requirements or modifications within the tree protection area.
7. Place weather resistant sign every 50' along the barrier, with 6" minimum text height and provide text in English and Spanish. Sign should read “Keep Out Tree Protection Area”.
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2. Staging, storage, dumping, washing and operation of equipment is not permitted within the limits of the tree protection barrier, including during barrier installation.
3. Install all tree protection prior to commencement of construction and remove when directed by the engineer. Maintain protection at all times.
4. For closely spaced groups of trees, place the tree protection barrier around the entire group.
5. Inspect trunk protection and tree quarterly to prevent girdling. Adjust bands to allow tree growth as needed.
6. See plans for any additional requirements or modifications within the tree protection area.
7. Place weather resistant sign every 50' along the barrier, with 6" minimum text height and provide text in English and Spanish. Sign should read “Keep Out Tree Protection Area”.
8. Alternate tree protection systems approved by the Engineer may be used in lieu of the tree protection barrier detailed on this index.
Mailbox production standards, lists of approved manufacturers and suppliers of mailboxes, design approval and guidance may be obtained by writing to the Rural Delivery Division, Delivery Service Department, Operations Group, USPS Headquarters, Washington, DC 20260.

Mailboxes shall be set with the bottom of the box between 42" and 48" above the ground. Mailboxes on curbed highways, roads, and streets shall be set with the face of the box between 6" and 12" behind the face of curb. If the sidewalk abuts the curb or if an unusual condition exists which makes it difficult or impractical to set the box between 6" and 12" behind the face of curb, the Contractor, with concurrence of the local postal authority, may be permitted to install the mailbox at the back edge of the sidewalk, where they can be served by the carrier from the sidewalk.

Mailboxes will not be permitted on Interstate highways, freeways, or other highways where prohibited by law or regulation.

Mailboxes shall be light sheet metal or plastic construction, in traditional style. Lightweight newspaper receptacles may be mounted below the mailbox on the support structure and mailbox arrangements have been shown to be safe by crash testing in accordance with NCHRP Report 350.

Mailboxes shall be located on the right-hand side of the roadway in the direction of the delivery route, except on one-way roads and streets where they may be placed on the left-hand side. Mailboxes on rural highways shall be set with the roadside face of the box offset from the edge of the traveled way a minimum distance of the greater of the following:

a. Shoulder width plus 8" to 12".

b. 10' for ADT over 10,000 vpd.
   - # for ADT 100 to 10,000 vpd
   - 6' for ADT under 100 vpd
   - 2'-6" for low speed and ADT under 100 vpd

When a mailbox is installed within the limits of a guardrail it should be placed behind the guardrail whenever practical.

Mailboxes on curbed highways, roads, and streets shall be set with the face of the box between 6" and 12" behind the face of curb. If the sidewalk abuts the curb or if an unusual condition exists which makes it difficult or impractical to install or serve boxes at the curb, the Contractor, with concurrence of the local postal authority, may be permitted to install all mailboxes at the back edge of the sidewalk, where they can be served by the carrier from the sidewalk.

5. Mailboxes shall be located on the right-hand side of the roadway in the direction of the delivery route, except on one-way roads and streets where they may be placed on the left-hand side.

6. Mailboxes shall be set with the bottom of the box between 42" and 48" above the ground. Mailboxes on curbed highways, roads, and streets shall be set with the face of the box between 6" and 12" behind the face of curb.

7. No more than two mailboxes may be mounted on a support structure unless the support structure and mailbox arrangements have been shown to be safe by crash testing in accordance with NCHRP Report 350.

8. Lightweight newspaper receptacles may be mounted below the mailbox on the side of the support post in conformance with the USPS Domestic Mail Manual. The mail patron shall be responsible for newspaper receptacle installation and maintenance.

9. Wood and steel support posts for both single and double mailbox mountings shall be embedded no more than 2' into the ground. Concrete, block, brick, stone or other rigid foundation structure or entasement, either above or below the shoulder groundline, will not be permitted for mailboxes on rural highways. On urban roads and streets where mailbox support posts are set within rigid pavement back of curb, the support posts shall be separated from the pavement by a minimum of 7" of expansion material.

Support posts shall not be fitted nor installed with surface mount base plates.

10. At driveway entrances mailboxes shall be placed on the far side of the driveway in the direction of the delivery route.

At intersecting roads mailboxes shall be located 100' or more from the centerline of the intersecting road on the far side in the direction of the delivery route, with the distance increased to 200' when the route volume exceeds 400 vehicles per day.

11. Wood support posts shall be in conformance with the material and dimensional requirements of Section 952 and the treatment requirements of Section 955 of the Standard Specifications. Steel support posts shall have an external finish equal to or better than two coats of water-resistant, air dried or baked, paint or enamel. Surface(s) shall be cleaned of all loose scale prior to finishing. The Postal Service prefers that posts be painted white, but other colors may be used when approved by the Engineer. When galvanized posts are used painting is not required.

12. Mailboxes shall be placed under the contract unit price for Mailboxes. Each. Payment shall be full compensation for boxes, posts and accessory items required.

The above compensation shall include any work and cost incurred by the contractor for removal and disposal of existing mailboxes.

The above compensation shall include any work and cost incurred by the contractor for removal and disposal of existing mailboxes.

There shall be no payment participation for NDCBUs furnishing, assembly, installation, resetting or relocation.
Platform
1 Nut, 1 Spacer (12 Req'd)
2 Washers, 1 Lockwasher, " Hex Bolt 4
3
5
16
SHALLOW 2 x 10/
1.5" Slotted Rd. Hd. Bolt
2 Washers, 1 Lockwasher, 1 Nut (4 Req'd)
10-200
2
3
2 lb. Per Foot Flanged Channel See General Notes For Finish Requirements
For Finish Requirements See General Notes
Flanged Channel 2 Lb. Per Foot

Bracket
1 Nut (3 Req'd)
2 Washers, 1 Lockwasher, " Hex Bolt, 4
1
3
16
5
Bracket
1 Nut (4 Req'd)
2 Washers, 1 Lockwasher, " Hex Bolt,
4
3
16
5
For Finish Requirements See General Notes
Flanged Channel 2 Lb. Per Foot
Bracket
1 Nut (3 Req'd)
2 Washers, 1 Lockwasher, " Hex Bolt,
4
3
16
5
Platform
1 Lockwasher, 1 Nut (10 Req'd)
(Stove Bolt) 2 Washers, " Slotted Rd. Hd. Bolt
#8-32 x 1-1/4" Dia.
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Note: See General Notes for finish requirements.
GENERAL NOTES
1. Roadway dimensions are representative. Subgrade dimensions and control lines are standard. The details shown on this Index do not supersede the details shown in the plans or on Index 120-002 or 000-506.

2. Plastic (P) soils may be placed above the existing water level (at the time of construction) to within 4 feet of the proposed base. It should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for short distances.

3. High Plastic (H) soils excavated within the project limits may be used in embankment construction as indicated on this Index. High Plastic soils are not to be used for embankment construction when obtained from outside the project limits.

4. Select (S) soils having an average organic content of more than two and one-half (2.5) percent, or having an individual test value which exceeds four (4) percent, shall not be used in the subgrade portion of the roadbed. Select (S), Plastic (P), or High Plastic (H) soils having an average organic content of more than five (5) percent, or an organic content individual test result which exceeds seven (7) percent, shall not be used in the portion of embankment inside the control line, unless written authorization is provided by the District Geotechnical Engineer, these soils may be used for embankment construction outside the control line, unless restricted by the plans or otherwise specified in the plans, provided they can be compacted sufficiently to sustain a drivable surface for operational vehicles as approved by the Engineer. Average organic content shall be determined from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Tests shall be performed in accordance with AASHTO T 267 on the portion of a sample passing the No. 4 sieve.

5. Highly organic soils, composed primarily of partially decayed organic matter, often dark brown or black in color with an odor of decay, and sometimes fibrous, shall be designated as muck. Further, any stratum or stockpile of soil which contains percent of highly organic material may be designated as Muck (M). Highly organic soils shall not be used in the subgrade portion of the roadbed with the exception of muck used as a supplement to construct a finish soil layer as described in Section 162 of the FDOT Standard Specifications.

DESIGN NOTES
1. The designer shall take into consideration the expectancy of roadway widening to the outside, and where widening is anticipated, specify in the plans the location of the future widening control line for utilization of High Plastic (H) soils and/or soils classified as organic material in the embankment.

2. The designer shall take into consideration the position of the drainage swales in the portion of the embankment where Plastic (P) soils, High Plastic (H) soils, or soils classified as organic material would be allowed. The designer shall limit the use of Plastic (P) soils, High Plastic (H) soils, and/or soils classified as organic material to locations that will not inhibit the infiltration of stormwater from the swales.

SYMBOL CLASSIFICATION (AASHTO M 145)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Select A-1, A-3, A-2-4 **</td>
</tr>
<tr>
<td>N</td>
<td>High Plastic A-2-7, A-2-7, A-5 Or A-7 (ALL WITH LL &gt; 50)</td>
</tr>
<tr>
<td>M</td>
<td>Muck A-8</td>
</tr>
</tbody>
</table>

Classification listed left to right in order of preference.

** Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadbed approved by the District Materials Engineer. A-2-4 material placed below the existing water level must be nonplastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

* For cut sections this dimension may be reduced to 24". See Index 120-002. For minor collectors and local facilities this dimension may be reduced to 18".

FLEXIBLE PAVEMENT
DIVIDED ROADWAYS

UNDIVIDED ROADWAY

SYMBOL | SOIL CLASSIFICATION (AASHTO M 145)
--- | ---
S | Select A-1, A-2, A-2-4**
H | High Plastic A-2-5, A-2-7, A-5 or A-7 (ALL WITH LL > 50)
M | Muck A-8

Classification listed left to right in order of preference.

*See General Notes Nos. 4 & 5 for utilization of soils classified as organic material or muck.

**Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact.
They should be used in the embankment above the water level existing at time of construction. They may be used in
the subgrade portion of the roadway when approved by the District Materials Engineer. A-2-4 material placed below
the existing water level must be nonplastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

*For cut sections this dimension may be reduced to 24"; see Index 120-002. For minor collectors and local facilities
this dimension may be reduced to 18".

RIGID PAVEMENT - TREATED PERMEABLE BASE OPTION
DIVIDED ROADWAYS

DESIGN NOTE
1. Concrete pavement is to be placed over Optional Base Group 3 Type B-12.5 only Asphalt Base as identified in the plans. This will be placed on a working platform using 12" of Type B Stabilization.

UNDIVIDED ROADWAY

SYMBOL  SOIL   CLASSIFICATION (AASHTO M 145)

S  Select  A-1, A-2, A-2-4 **
H  High Plastic  A-2-5, A-2-7, A-5 or A-7 (ALL WITH LL > 50)
M  Muck  A-8

Classification listed left to right in order of preference.

See General Notes Nos. 4 & 5 for utilization of soils classified as organic material or muck.

** Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadbed when approved by the District Materials Engineer. A-2-4 material placed below the existing water level must be nonplastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

* For cut sections this dimension may be reduced to 24". For minor collectors and local facilities this dimension may be reduced to 18".

RIGID PAVEMENT - ASPHALT BASE OPTION
**SYMBOL**  **SOIL CLASSIFICATION (AASHTO M 145)**

- **S** Select  
  - A-1, A-3, A-2-4 **
  
- **S+** Special Select  
  - A-3 *** With Minimum Average Lab Permeability of $5 \times 10^{-5}$ cm/sec (0.14 ft./day) as per AASHTO T 215

- **P** Plastic  

- **H** High Plastic  
  - A-2-5, A-2-7, A-5 Or A-7 (ALL WITH LL>50)

- **M** Muck  
  - A-8

Classification listed left to right in order of preference.

- See General Notes Nos. 4 & 5 for utilization of soils classified as organic material or muck.

---

*** When allowed by the plans, some types of A-2-4 material may be approved in writing by the District Materials Engineer. This material must meet the minimum lab permeability requirement, be nonplastic, and not exceed 12% passing the No. 200 U.S. Standard sieve.

** Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. A-2-4 material placed below the existing water level must be nonplastic and contain less than 12% passing the No. 200 U.S. Standard sieve.

- **3' of #57 or #89 Coarse Aggregate Mixed Into Top 6'**

---

** Note:** SPECIAL SELECT SOIL OPTION may be used only when allowed in writing by the District Materials Engineer and shown in the plans.
Whether or not shoulder gutter is used, control line set by normal shoulder point. Limit for minimum removal of organic material. *Remove overlying material and organic material within the limits shown and backfill in accordance with Index 120-001, unless approved otherwise by the District Geotechnical Engineer. The limits include full median width when applied to divided facilities with median widths up to 64'; when median width is greater than 64' and for bifurcated roadways, the organic material removal limits will be set by a 1:2 control line complimentary to the outer roadway that will accommodate one future median lane on each roadway unless specified otherwise by the plans.

**GENERAL NOTES:**

1. All details shown on this Index for removal of organic and plastic materials apply unless otherwise shown on the plans.
2. Utilize excavated materials in accordance with Index 120-001.
3. Where organic or plastic material is undercut, backfill with suitable material in accordance with Index 120-001, unless otherwise shown on the plans.
4. The term "Plastic Material" used in this Index in conjunction with removal of plastic soil is as defined under soil classifications for Plastic (P) and High Plastic (H) on Index 120-001.
5. See Index 000-506 for miscellaneous earthwork details.
6. The term "Organic Material" as used on this Index is defined as any soil which has an average organic content greater than five (5.0) percent, or an individual organic content test result which exceeds seven (7.0) percent. Remove organic material as shown on this Index and the plans unless directed otherwise by the District Geotechnical Engineer. Determine the average organic content from the test results from a minimum of three randomly selected samples from each stratum. Perform tests in accordance with AASHTO T267 on the portion of a sample passing the No. 4 sieve.
7. In areas of curbed roadway, where underdrain is to be constructed beneath the proposed pavement, the grade of the underdrain filter material will not extend above the bottom of the stabilized section of the subgrade. Gradation of the filter material must conform to Standard Specifications. The minimum grade of underdrain pipe is 0.02.

**GENERAL NOTES AND REMOVAL OF ORGANIC MATERIAL**
DIVIDED FREeways, ARTERIAlS, MAJOR COLLECTORS HAVING FLUSH MEDIANs, ON UNDivIDed ARTERIAlS AND MAJOR COLLECTORS

INTERSTATE FACILITIES, FREEWAYS, DIVIDed ARTERIAls AND MAJOR COLLECTORS HAVING DEPRESSED MEDIANs

NOTES:
1. See Sheet 1 for the GENERAL NOTES.
2. When the typical cut details are applied to minor collectors and local facilities, the underdren may be reduced from 24" to 18".
3. Where frequency of median breaks indicates that it is impractical to leave plastic material in the median, the designer may elect to indicate total removal of this material. If during construction it becomes apparent, due to normal required construction procedures, that it is impractical to leave the plastic material in the median, total removal of this material shall be approved by the Engineer.
4. Refer to roadway cross sections to determine whether minimum or preferable removal is used.
5. Where the Preferable Removal method is shown in the plans and it is impossible to place the underdrain at the Outer Cut Limit due to conflict with storm drain trunk lines, remove to Inner Cut Limit and place underdrain at location shown for Minimum Removal. (See Special Removal Detail)
6. Cross slopes of 0.02 shown above are minimums. Follow the cross slope of the pavement to the extent possible.
NOTES:

PAVEMENT REMOVAL AND REPLACEMENT

1. Pavement shall be mechanically sawed.

2. The replacement asphalt shall match the existing structural and friction courses for type and thickness in accordance with current FDOT asphalt mix specifications.

3. The new base materials shall be either of the same type and composition as the materials removed or of equal or greater structural adequacy.

BACKFILL OPTION

1. COMPACTED AND STABILIZED FILL
   A. Place backfill material in accordance with Specifications 125.
   B. In Stage #1, construct compacted fill below the haunches of the pipe, using mechanical tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding.
   C. In Stage #2, construct compacted fill along the sides of the pipe and up to the bottom of the base, with the upper 12" receiving Type B Stabilization. In lieu of Type B Stabilization, the Contractor may construct using optional Base Group 3.

2. FLOWABLE FILL
   A. If compaction can not be achieved through normal mechanical methods then flowable fill may be used.
   B. Flowable fill is to be placed in accordance with Section 121 of the Specifications, as approved by the Engineer.
   C. Do not allow the utility being installed to float. If a method is provided to prevent flotation from occurring, Stages #1 and #2 can be combined, if approved by the Engineer.
   D. In Stage #2, place flowable fill midway up on both sides of the utility. Allow to harden before placing Stage #2.
   E. In Stage #2, place flowable fill to the bottom of the existing base course.

FLEXIBLE PAVEMENT CUT

1. HIGH early strength cement concrete (3000 psi) meeting the requirements of Standard Specification 346 shall be used for rigid pavement replacement.

2. Pavement shall be mechanically sawed and restored to conform with existing pavement joints within 12 hours. (See Index 350-001)

BACKFILL OPTION

1. GRANULAR BACKFILL
   A. Any edgewise system that is removed shall be replaced with the same type materials. Any edgewise system that is damaged shall be replaced with methods approved by the Engineer.
   B. Fill material shall be placed in accordance with the Standard Specifications. Fill material shall be special soil in accordance with Index 350-001.
   C. In Stage #1, construct compacted fill below the haunches of the pipe, using mechanical tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding.
   D. In Stage #2, compact fill along the sides of the pipe and up to the bottom of replacement pavement.

2. FLOWABLE FILL
   A. In Stage #1, place flowable fill midway up on both sides of the utility. Allow to harden before placing Stage #2.
   B. In Stage #2, place flowable fill to the bottom of the existing base course.

RIGID PAVEMENT CUT

1. High early strength cement concrete (3000 psi) meeting the requirements of Standard Specification 346 shall be used for rigid pavement replacement.

2. Pavement shall be mechanically sawed and restored to conform with existing pavement joints within 12 hours. (See Index 350-001)

3. The new base materials shall be either of the same type and composition as the materials removed or of equal or greater structural adequacy.

GENERAL NOTES

1. The details provided in this Index apply to cases in which jack and bore or directional boring methods are not required by the Engineer.

2. Flowable fill shall not be placed directly over loose, or high plastic, or muck material (see Index 120-001) which will cause settlement due to fill weight. Where highly compressible material exists, the amount, shape and depth of flowable fill must be engineered to prevent pavement settlement.

3. These details do not apply to utility cuts longitudinal to the centerline of the roadway which may require the additional use of geotextiles, special bedding and backfill, or other special requirements.

4. Method of construction must be approved by the Engineer.

5. Some pipe may require special granular backfill up to 6" above top of pipe. Geotextiles may be required to encapsulate the special granular material.

TRENCH CUTS AND RESTORATIONS ACROSS ROADWAYS
NOTES

1. Cut-Lines must be straight and cleanly sawed.
2. See Sheet 1 for replacement pavement.
3. Adjust manholes prior to placing friction course when pavement resurfacing is occurring in the area adjacent to the manhole.
4. Align longitudinal cut-lines with pavement joint or center of traffic lane to avoid wheel path.
5. For rigid pavement, align Transverse Cut-lines with nearest existing joint.
**REVISION DESCRIPTION:**

**REVISION:**

**LAST OF STANDARD PLANS FY 2018-19**

**SHEET INDEX**

**SETTLEMENT PLATE 01/01/00**

**6" x 8" Treated Timbers**

**2" x 6" Treated Timber**

**1/2" Dia. Bolt, Nut & Washer (Bolt thread end up)**

**PLANT**

**TIMBER PLATE**

**STEM AND PLATE OPTIONS**

**STEEL PLATE**

**STEEL PLATE**

**STEEL PLATE**

**STEM TO BE PLUMB**

**Top Of Lift Or Top Of Full Surcharge**

**Surcharge (Compacted Fill)**

**Fill Within 2' Of Stem Shall Be Compacted By Hand To Required Density**

**Plates To Be Secured (Level) After Clearing And Grubbing & Demucking Operations And Prior To Placing First Fill Lift**

**NOTES:**

1. Elevation of the top of each length of marker pipe shall be determined as soon as it is installed and also immediately before the next length of marker pipe is added.

2. Settlement plate locations shall be flagged and protected from construction vehicles and equipment. If settlement plates are disturbed, they shall be replaced in kind.

3. Oakum used to construct seal should not have a mesh covering (plastic or other synthetic material).

4. The settlement plates shall be paid for under the contract unit price for Settlement Plate Assembly, AS.

**INSTALLATION**

**Threaded or Socket Type Cap.**

**Stamp or label with Installation Date, Location and Identification Number.**

**Threaded type Caps to be hand tightened.**

**2 1/2" Steel or PVC Schedule 40 Pipe (Casing).**

**Casing to be installed in 5' sections, as required.**

**Threaded or Socket Type Fittings (PVC Socket Type shown).**

**PVC casing sections not permitted below steel sections.**

**Coupling (As Required).**

**Cement when Socket Type Coupling used.**

**Iron Coupling (As Required).**

**1" Iron Pipe (Marker).**

**Lower pipe section to be 4'-6" in length.**

**Added pipe sections to be 5'-0" in length.**

**Stem To Be Plumb**

**Top Of Lift Or Top Of Full Surcharge**

**Surcharge (Compacted Fill)**

**Plate To Be Secured (Level) After Clearing And Grubbing & Demucking Operations And Prior To Placing First Fill Lift**

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**1" Iron Pipe (Marker).**

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3. Oakum used to construct seal should not have a mesh covering (plastic or other synthetic material).

4. The settlement plates shall be paid for under the contract unit price for Settlement Plate Assembly, AS.
NOTES:
1. For joint seal dimensions see Sheet 2.
2. For slabs poured simultaneously, tie bars may be inserted in the plastic concrete by means approved by the Engineer.
3. For Longitudinal Joints:
   A. Tie bars are deformed #4 or #5 reinforcing bars meeting the requirements of Specifications, Section 931.
   B. Provide a standard load transfer tied joint with #4 bars 28" in length at 48" spacing or #5 bars 38" in length at 38" spacing.
4. Transverse joints are to be spaced at a maximum of 15'. Dowels are required at all transverse joints unless otherwise noted in the plans.
5. Expansion joints to be placed on approaches to bridges, at street intersections and other locations indicated in the plans.
6. Punch clean holes in preformed joint filler greater than bar diameter.
7. Coat and lubricate plain steel dowel bars in accordance with Specifications, Section 931.
8. Sheet metal bottom strips in accordance with Specifications, Section 350.

1. For joint seal dimensions see Sheet 2.
2. For slabs poured simultaneously, tie bars may be inserted in the plastic concrete by means approved by the Engineer.
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6. Punch clean holes in preformed joint filler greater than bar diameter.
7. Coat and lubricate plain steel dowel bars in accordance with Specifications, Section 931.
8. Sheet metal bottom strips in accordance with Specifications, Section 350.
CONCRETE-CONCRETE JOINTS

FOR NEW PROJECTS

PREFORMED ELASTOMERIC COMPRESSION SEAL

FOR NEW AND REHABILITATION PROJECTS

BACKER ROD BOND BREAKER

NOTE: Dimension w will be shown in the plans or established by the Engineer based on field conditions. Dimension d will be constructed so that the shape factor w/t has a maximum value of 2.0 and a minimum value of 1.0.

CONCRETE-ASPHALT SHOULDER JOINTS

JOINT SEAL DIMENSIONS

UNLESS SPECIFIED OTHERWISE IN THE PLANS

TAPE BOND BREAKER

BACKER ROD BOND BREAKER

CONCRETE PAVEMENT JOINTS

INDEX 350-001

SHEET 2 of 4

FY 2018-19

STANDARD PLANS
**ALTERNATE KEYWAY AND HOOK BOLT**

**STEEL HOOK BOLT ASSEMBLY**

**CONTRACTION ASSEMBLY**

**EXPANSION ASSEMBLY**

**NOTES**

1. Longitudinal joints will not be required for single lane pavement 14' or less in width. For entrance and exit ramp joint details, see Sheet 4.

2. Arrangement of longitudinal joints are to be as directed by the Engineer.

3. All manholes, meter boxes and other projections into the pavement shall be boxed-in with 1/2" preformed expansion joint material.

*Note: Proprietary contraction and expansion assemblies may be used. Products shall be introduced to the State Construction Office in accordance with section (C) of the Product Evaluation Procedure.*
**DESCRIPTION:**

**REVISION**

**LAST REVIEW**

**STANDARD PLANS**

**CONCRETE PAVEMENT JOINTS**

**INDEX**

**SHEET**

---

2-THRU LANES WITH SINGLE LANE ENTRANCE RAMP

- Longitudinal Joint
- Contraction Joint (Typ.)

ENTRANCE TAPER WITH AUXILIARY LANE

- Longitudinal Joint
- Contraction Joint (Typ.)

ENTRANCE RAMP WITH ADDED LANE

- Longitudinal Joint
- Contraction Joint (Typ.)

2-THRU LANES WITH SINGLE LANE EXIT RAMP

- Longitudinal Joint
- Contraction Joint (Typ.)

EXIT TAPER WITH AUXILIARY LANE

- Longitudinal Joint
- Contraction Joint (Typ.)

3-THRU LANES WITH AUXILIARY LANE AND 2-LANE EXIT RAMP

- Longitudinal Joint
- Contraction Joint (Typ.)

**JOINT LAYOUT AT ENTRANCE AND EXIT RAMP TERMINALS**

* 13' with tied Concrete Shoulders or 14' with Asphalt Shoulders.

---

*Note: On single lane ramps, longitudinal joint to be constructed along centerline of ramp.*

---

* *13' with tied Concrete Shoulders or 14' with Asphalt Shoulders.*
1. For Repair and Replacement Criteria see Sheet 2.

2. Full depth repairs consist of removing and replacing at least a portion of the existing slab to the bottom of the concrete.

3. Repair boundaries shall be sawed full-depth with diamond saw blades. On hot days, it may not be possible to make this cut without first making a wide pressure relief cut within the repair boundaries. A carbide-tipped wheel saw may be used for this purpose, but the wheel saw must not intrude on the adjacent lane, unless the lane is slated for repair. The wheel saw cuts produce a ragged edge that promotes excessive spalling along joints. Hence, if wheel saw cuts are made, diamond saw cuts must be made 18 in. outside the wheel saw cuts. To prevent damage to the base, the wheel saw must not be allowed to penetrate more than 0.5 in. into the base.

4. No additional base or subgrade material shall be added and all loose base or subgrade material shall be removed prior to placement of the new concrete slab. The concrete slab shall be placed to the full depth of the material removed. No additional compensation will be allowed for additional concrete required to bring proposed concrete slab up to finished grade.

5. Removal of the damaged concrete pavement shall be by lifting. Any good concrete pavement which is damaged during removal of damaged areas shall be removed and replaced by the contractor at his expense.

6. If the roadway contract includes grinding, then the slab replacement shall be performed first.

7. During slab replacement operations, fill any saw cut overrun into adjacent slabs with epoxy.

8. Install tie bars at longitudinal joints when two full adjacent or multiple replaced slabs.
<table>
<thead>
<tr>
<th>DISTRESS PATTERN</th>
<th>SEVERITY/DESCRIPTION</th>
<th>REPAIR METHOD</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRACKING</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitudinal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>&lt; 1/8&quot; no faulting, spalling &lt; 1/2&quot; wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>1/8&quot; - 1/2&quot; width, spalling = 3&quot; wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Severe</td>
<td>width &gt; 1/2&quot;, spalling &gt; 3&quot; faulting &gt; 1/2&quot;</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td>Transverse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>&lt; 1/8&quot; no faulting, spalling &lt; 1/2&quot; wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>1/8&quot; - 1/2&quot; width, spalling &lt; 1/2&quot; wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Severe</td>
<td>width &gt; 1/2&quot;, spalling &gt; 3&quot; faulting &gt; 1/2&quot;</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td><strong>Corner Breaks</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>A corner of the slab is separated by a crack that intersects the adjacent longitudinal and transverse joint, describing an approximate 45° angle with the direction of traffic.</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>Intersecting Random Cracks</strong> (Shattered Slab)</td>
<td>Cracking patterns that divide the slab into three or more segments.</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>JOINT DEFICIENCIES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spall Nonwheel Path</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>spall width &lt; 1/16&quot;, &lt; 1/2&quot; slab depth, &lt; 1/2&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>1/16&quot; - &lt; 1/2&quot; width, &lt; 1/2&quot; slab depth, &lt; 1/2&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Severe</td>
<td>spall width &gt; 1/16&quot; or length &gt; 1/2&quot;</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Spall Wheel Path</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>spall width &lt; 1/16&quot;, &lt; 1/2&quot; slab depth, &lt; 1/2&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>1/16&quot; - &lt; 1/2&quot; width, &lt; 1/2&quot; slab depth, &lt; 1/2&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Severe</td>
<td>spall width &gt; 1/16&quot; or length &gt; 1/2&quot;</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>SURFACE DETERIORATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pop Outs Nonwheel Path</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Light</td>
<td>Not deemed to be a traffic hazard</td>
<td>Keep under observation</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Pop Outs Wheel Path</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>Deemed to be a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td><strong>MISCELLANEOUS DISTRESS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faulting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>Faulting &lt; 4/32&quot;</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Moderate</td>
<td>4 &lt; Faulting &lt; 16/32&quot;</td>
<td>Grind</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Faulting &gt; 16/32&quot;</td>
<td>Grind</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Lane To Shoulder Drop Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>0 - depth &lt; 1&quot;</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Moderate</td>
<td>1&quot; - drop-off &lt; 3&quot;</td>
<td>Build Up</td>
<td>N/A</td>
</tr>
<tr>
<td>Severe</td>
<td>drop-off &gt; 3&quot;</td>
<td>Build Up</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Bleeding Or Pumping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seeping or ejection of water through joints or cracks.</td>
<td>Install appropriate drainage, edge drain, permeable subbase, reseal joints, etc.</td>
<td>N/A</td>
</tr>
<tr>
<td>Blowups</td>
<td>Upward movement at transverse joints or cracks often accompanied by shattering of the concrete.</td>
<td>Full Depth</td>
<td>Figure 10.3 and 10.4</td>
</tr>
</tbody>
</table>
1. Expansion Joints Shall Be Constructed Parallel To The Existing Transverse Pavement Joints On Rehabilitation Projects, And Parallel To The Standard Transverse Pavement Joints Shown In The Plans For New Construction.

**SECTION AA**

**EXPANSION JOINT**

*Note: Immediately prior to placing the seal, the joint shall be thoroughly cleaned of all foreign material. Immediately after the seal is placed, sheet metal strip shall be bent up against the pavement edge.*

The sheet metal strip shall be a minimum 16 gauge steel, 12" wide and shall be galvanized in accordance with ASTM A-526, Coating Designation G90.

**REINFORCING STEEL**

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</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>5'</td>
<td>10</td>
<td>W Minus 6&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>5'</td>
<td>10</td>
<td>W Minus 6&quot;</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**OPTIONAL SEALS**

- Tool To 1/8" Radius Or Grind 1/4" Chamfer
- Polychloroprene Compression Seal Installed As Per Manufacturer's Specifications.

**JOINT DIMENSIONS**

**COMPRESSION SEAL DETAIL**

**GENERAL NOTES**

1. The centerline of roadway and the centerline of bridge do not necessarily coincide. Prior to the placement of the expansion joint, the centerline of the roadway pavement shall be determined.

2. For information on other types of concrete pavement joints see Index 350-001.

3. Pay quantity for expansion joint is the length of joint to be constructed across the roadway and shoulder pavements, measured at right angles to the centerline of the roadway. Payment for expansion joint shall be full compensation for joint construction, including reinforced concrete slab, sheet metal strip and compression seal, but, not including roadway pavement reconstruction associated with joint replacement or reconstruction. Expansion joint to be paid for under the contract unit price for Bridge Approach Expansion Joint, LF.

**DESIGN NOTES**

1. For rehabilitation projects, the designer must indicate in the plans the number of slabs to be removed, the number of subslabs to be constructed/reconstructed, and the location of expansion joints.

2. Pay quantity of expansion joint to be calculated across pavement at right angles to the centerline of the roadway pavement. Shoulder pavement joint included.
NOTES

TRAFFIC RAILINGS OR PARAPETS:
If there is a Traffic Railing or Parapet on the wall, align Wall Joints with V-Grooves, and Wall Expansion Joints with Barrier Open Joints.

FOUNDATION: Prepare the soil below the footing in accordance with the requirements for spread footings in Specification Section 455.

REINFORCING STEEL BENDING DIAGRAMS

Total Length

1'-0" Lap Splice (Typ.)

BARS GI

BARS J & K

NOTE: All bar dimensions are out-to-out

* Shear Key is required only when specified in the Plans.
Wall joint spacing 25 ft. maximum and 5' minimum. At minimum, every fourth wall joint to be an expansion joint. See Plans for actual wall joint spacing and expansion joint location.

**Wall Joint Spacing**

\[
\frac{3}{4} \times \text{V-Groove across top and down front face of wall at joint (Typ.)}
\]

Extend V-Groove down back of wall to 6' min. below ground. (see V-Groove Detail)

\[
\text{Stem Offset (in.)} = \frac{H (\text{Ft})}{16}
\]

Stem as constructed

Survey Plan for drainage requirement

Top of Footing

45° (Typ.)

\[
\text{V-Groove detail}
\]

\[
\text{Stem Offset Values}
\]

Front Face of Wall

Stem Offset

Slope backfill layers transversely and longitudinally as necessary to drain and prevent ponding during backfilling.

Limits of Excavation

Drain shall be continuous 1.5' x 1.5' clean, broken stone or gravel, graded and placed to allow free drainage. Place Type D-3 (see Specification Section 985 geotextile fabric, 1'-0" wide and full height of fill, to the back of the wall with an adhesive approved by the Engineer.

Traffic Railing (Index 521-610, 36' Single-Slope shown, see Plans for Traffic Railing type)

3'-0 PVC Drain Pipe at 10 ft. max. spacing (Typ.)

At Contractor's option, Surface Treatments may terminate 3'-0 below ground line

See 'Detail A'

Final Groundline

Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with 1/8" openings

Traffic Railing/Junction Slab Detail

(36' Single-Slope shown, other Traffic Railings similar)

3" Ø PVC Drain Pipe. Slope down 1'/2 from back to front of wall and extend 1'/2 beyond both front face and back face of wall.

See Roadway Plans for drainage requirement

Top of Footing

Top of Coping

Top of CIP Wall

Height of Wall

Junction Slab

TRAFFIC RAILING/JUNCTION SLAB DETAIL

(36' Single-Slope shown, other Traffic Railings similar)

Top of Wall

Traffic Railing (Index 521-610, 36' Single-Slope shown, see Plans for Traffic Railing type)

Junction Slab

(36' Single-Slope shown, other Traffic Railings similar)

\[
\text{SECTION A-A EXPANSION JOINT DETAIL}
\]

At Contractor's option, Surface Treatments may terminate 6' below ground line

* Key to stop at top of footing and 6' from top of wall. Joint across footing and top of wall to be a straight line.

** Stay-In-Place Plastic Preformed Bond Beakers are permitted to form joints.
KEYWAY & WALL JOINT DETAIL
(TOP VIEW)

TYPICAL SECTION
C-I-P CONCRETE GRAVITY WALL

ESTIMATED QUANTITIES FOR C-I-P WALL

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<thead>
<tr>
<th>HEIGHT (FT.)</th>
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<tr>
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<td>CLASS NS CONCRETE (CY)</td>
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<tr>
<td>1</td>
<td>0.08 0.11 (0.20*)</td>
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<tr>
<td>2</td>
<td>0.14 0.20 (0.32*)</td>
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<tr>
<td>3</td>
<td>0.22 0.32 (0.47*)</td>
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<tr>
<td>4</td>
<td>0.32 (0.49*)</td>
</tr>
<tr>
<td>5</td>
<td>0.43 (0.55*)</td>
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ESTIMATED QUANTITIES NOTES:
For Scheme 3 Junction Slab and Traffic Railing see the referenced index for estimated quantities.
* Quantity for 2'-0" Toe Depth.
** Quantity for Scheme 3 assumes 1'-3" thick coping above Gravity Wall.

GENERAL NOTES
1. C-I-P Gravity Walls constructed as extensions of reinforced concrete retaining walls, except walls of proprietary designs, shall have the same face texture and finish as the reinforced concrete retaining wall.
2. Concrete for Gravity Wall shall be Class NS per Section 347. Concrete for Scheme 3 Junction Slab and Traffic Railing shall be Class II per Section 348, unless otherwise specified in the plans.
3. Reinforcing steel shall meet the requirements of Specification Section 931 (Grade 40 or 60). Smooth or Deformed Welded Wire Reinforcement (WWR) may be substituted on an equal area basis. Do not increase bar/wire spacing for Grade 60 reinforcing steel or WWR.
4. When required, for adjacent guidewall, see Index 515-075 or 315-080 as appropriate. For adjacent Type B fence see Index 350-002.
5. Joint Seal: Organic Felt bond breaker in accordance with Specification Section 400 or Type D-5 geotextile fabric in accordance with Specification Section 985. Map all contact surfaces of concrete and Organic Felt or geotextile fabric with cut-back asphalt. Step Organic Felt or geotextile fabric 6" below top of wall.
6. Provide a continuous 1" clean gravel or crushed rock drain for wall heights > 3 ft. and higher. Wrap drainage layer as shown, with Type D-3 geotextile fabric in accordance with Specification Section 985. Provide Type B galvanized mesh with 2" openings, at the inside end of the PVC Drain Pipe. Provide 2" PVC Drain Pipe (Sch. 40) at 10 ft. max. spacing (when Drainage Layer is required). Locate or grid-out edge of Drain Pipe a minimum of 2'-0" from wall joints.
7. Cost of reinforcing steel, face texture, finish, joint seal, drain pipes, drainage layer, galvanized mesh and geotextile fabric to be included in the Contract Unit Price for Concrete Class NS, Gravity Wall. Cost of concrete for Junction Slab in Scheme 3, to be included in Contract Unit Price for Concrete Traffic Railing Barrier with Junction Slab. Adjacent railings or fences to be paid for separately.

BILL OF REINFORCING STEEL

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<th>LENGTH</th>
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<td>4</td>
<td>4</td>
<td>As Req.</td>
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BAR BENDING DIAGRAM

BAR A

BAR B

NOTES:
1. All bar dimensions are cut to out.
2. Lap splices for Bars A must be a minimum of 1'-0".
**CONCRETE STEPS**

**STAIR TREAD AND RISER DETAILS**

- The greatest riser height within the flight of steps shall not exceed the smallest by more than 3/8".

- The greatest tread depth within the flight of steps shall not exceed the smallest by more than 3/8".

**Max Landing Slope = 2%**

**Max Landing Cross-Slope = 2%**

**NOTE:** Provide a maximum of 12 risers between landings.

**ALIGN RAILINGS**

- Pedestrian Railing: See Indexes 515-052, 515-062, 515-070, 515-080 or Project Specific Design.

- Tread Finish: Broom finish parallel to steps unless otherwise shown in Plans.

**CONCRETE**

- Class NS, Specification 347

**CONSTRUCTION**

- Construct steps in accordance with Section 522 of the FDOT Standard Specifications.

- Do not use this Index for suspended (structural) steps or stairways.

**NOTES:**

1. Cost of concrete steps, landings and cheekwalls shall be paid for under the contract unit price for Class NS Concrete (Concrete Steps). Cost of reinforcing steel shall be paid for under the contract unit price for Reinforcing Steel (Miscellaneous), LB.

2. The greatest tread depth within the flight of steps shall not exceed the smallest by more than 3/8".

3. The greatest riser height within the flight of steps shall not exceed the smallest by more than 3/8".


5. Construct steps in accordance with Section 522 of the FDOT Standard Specifications.

6. Do not use this Index for suspended (structural) steps or stairways.
### DESCRIPTION:

**REVISION**

**LAST:** 01/01/17  
**REV.:** 01/01/17  

**STANDARD PLANS**

**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**INDEX:** 425-001  
**SHEET:** 1 of 5  

---

**TOP VIEW**

**WALL SECTION**

- **For Manholes**
  - **TYPE I**
  - **TYPE II**
  - **TYPE III**

- **For Curb Inlets Types 1, 2, 3, & 4**
  - **TYPE II**

- **For Curb Inlets Types 7 & 8**

**SECTION**

- **For Manholes**
  - **TYPE I**

- **For Curb Inlets**
  - **Types 1, 2, 3, & 4**
  - **Types 7 & 8**

**WEIGHT OF CASTINGS (lb)**

<table>
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<th>Frame Type</th>
<th>2&quot; OPENING Frame</th>
<th>2&quot; OPENING Cover (Std)</th>
<th>2&quot; OPENING 2-Piece Cover Inside</th>
<th>2&quot; OPENING 2-Piece Cover Outside</th>
<th>2&quot; OPENING 2-Piece Cover Total</th>
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<td>200</td>
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<tr>
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<td>190</td>
<td>255</td>
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<td>180</td>
<td>190</td>
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</table>

* Includes Type I Adjustable

**NOTES (FRAMES, AND COVER)**

1. The standard cover is to be used for all frames Types I, II, III, and the 2-piece cover, and is the replacement cover for all previous frames with 12" deep seats (traffic type). The 185 lb. cover (nontraffic type), 1984 Roadway and Traffic Design Standards, Index 201, is the replacement cover for existing frames with 10" deep seats. Installation of frame with 10" deep seats is not permitted.

2. Use the 2'-0" cover, unless the 2-piece cover is called for in the plans, except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

**DESIGNER NOTE:**

- Consider using the 2-piece cover where depths exceed 3' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover on the drainage structure sheets in the plans.

---

**TOP VIEW**

**SECTION**

- **For Use With Types I, II, And III Frames With 3" Opening**
  - **2-Piece Cover**

---

**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**INDEX:** 425-001  
**SHEET:** 1 of 5  

---

**TOP VIEW**

**SECTION**

- **For Manholes**
  - **TYPE I ADJUSTABLE**

**WEIGHT OF CASTINGS (lb)**

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<tr>
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* Includes Type I Adjustable

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2. Use the 2'-0" cover, unless the 2-piece cover is called for in the plans, except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

**DESIGNER NOTE:**

- Consider using the 2-piece cover where depths exceed 3' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover on the drainage structure sheets in the plans.

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**TOP VIEW**

**SECTION**

- **For Manholes**
  - **TYPE I ADJUSTABLE**

**WEIGHT OF CASTINGS (lb)**

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2. Use the 2'-0" cover, unless the 2-piece cover is called for in the plans, except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

**DESIGNER NOTE:**

- Consider using the 2-piece cover where depths exceed 3' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover on the drainage structure sheets in the plans.
SECTION

NOTE: See Slab Designs Index 425-010.

Type 7

MANHOLE TOPS

NOTES (TOPS)

1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C478 may be used for precast units; see General Note No. 3.

2. Manhole top Type 7 slabs may be of cast-in-place or precast construction. The optional key is for precast tops and in lieu of dowels. Frame and slab openings are to be omitted when top is used over a junction box.

3. Manhole top Type 8 may be of cast-in-place or precast concrete construction or brick construction. For concrete construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric cone may be used.

4. Manhole tops shall be secured to structures by optional construction joints as shown on Sheet 3.

5. Frames can be adjusted a maximum 12" height with brick or precast concrete and steel reinforcement shall be the same as the supporting wall unit. The optional key is for precast tops and in lieu of dowels. Frame and slab openings are to be omitted when top is used over a junction box.

6. Substitution of manhole top Type 8 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.

7. Substitution of manhole top Type 7 for Type 8 is allowed if the minimum thickness (h) above pipe opening cannot be maintained with manhole top Type 8.

DESIGN NOTES

1. Manhole top Type 8 should be specified in the plans when depths shown above can be maintained.

Brick Adjustment or Grade Ring Permitted

Min. 0" - Max. 12"
Separate Riser Segments with Construction Joints Other Than Dowel Option

Segments for Slab to Wall Dowel Construction Joints or Monolithically Cast Segments

Note: h may be less than 6" when approved by the Engineer, but not for inlet segments at finish grade elevation.

Comparative Side Views

Minimum Dimensions for Box and Riser Segments

Rebar Straight End Embedment for Top and Bottom Slabs

Optional Construction Joints

WALL JOINTS

Top Slabs to Walls

Bottom Slabs to Walls

1. One or more types of joints may be used in a single structure, except brick wall structure. Brick wall construction is permitted in circular units only.

2. All grouted joints are to have a maximum thickness of 1".

3. Keyways are to be a minimum of 1/2" deep.

4. Joint dowels are to be #4 bars, 12" long with a minimum of 6 bars per joint approximately evenly spaced for circular structures or at maximum 12" spacing for rectangular structures. Bars may be either Adhesive Bonded Dowels in accordance with Specification Section 416, or placed approximately 6" into fresh concrete leaving the remainder to extend into the secondary cast. Welded wire reinforcement may be substituted for the dowel bar in accordance with the equivalent steel area table on Sheet 4.

5. Minimum cover on dowel reinforcing bars is 2" to outside face of structure.

6. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 934 of the Specifications.

7. Insert products approved by the Engineer may be used in lieu of dowel embedment.

COMPARATIVE SIDE VIEWS

MINIMUM DIMENSIONS FOR BOX AND RISER SEGMENTS

REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS

OPTIONAL CONSTRUCTION JOINTS
### GENERAL NOTES
1. For square or rectangular precast drainage structures, use either deformed or smooth WWR meeting the requirements of Specification Section 931. WWR shall be continuous around the box and lap in accordance with Option 1 or 3 as shown in the Wall Reinforcing Splice Details.
2. Horizontal steel in the walls of rectangular structures shall be lap spliced in accordance with Option 1 or 2 as shown in the Wall Reinforcing Splice Details.
3. Welding of splices and laps is permitted. The requirements and restrictions placed on welding in AASHO M259 shall apply.
4. Rebar straight end embedment of peripheral reinforcement may be used in lieu of ACI standard hooks for top and bottom slabs when hooks are specifically called for in the plans or standard drawings.
5. Concrete as specified in ASTM C479 (4000 psi) may be used in lieu of ACI standard hooks for top and bottom slabs.
6. Prestress opening for pipe shall be the pipe 60 plus 6" (2" tolerance). Mortar used to seal the pipe into the opening shall be of such a mix that shrinkage will not cause leakage into or out of the structure. Dry-pack mortar may be used in lieu of brick and mortar construction to seal openings less than 20" wide.
7. For pay item purposes, the height used to determine if a drainage structure is greater than 10 feet shall be computed using:
   - A: The elevation of the top of the manhole lid.
   - B: The grate elevation or the theoretical gutter grade elevation of an inlet, or
   - C: The outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

### EXAMPLE TABLE OF EQUIVALENT STEEL AREA

<table>
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<tr>
<th>SCHEDULE</th>
<th>GRADE 60 REINFORCING BAR</th>
<th>EQUIVALENT GRADE 40 REINFORCING BAR</th>
<th>EQUIVALENT 65ksi SMOOTH WELDED WIRE REINFORCEMENT</th>
<th>EQUIVALENT 70ksi DEFORMED WELDED WIRE REINFORCEMENT</th>
<th>MIN. STEEL AREA (in²/ft)</th>
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<td>#5 @ 65' Ctrs.</td>
<td></td>
<td></td>
<td>5&quot;-P 43.3x06.8</td>
<td></td>
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<td>#6 @ 65' Ctrs.</td>
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<td>6&quot;-P 35.1x07.3</td>
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</tr>
<tr>
<td>F</td>
<td>#5 @ 35' Ctrs.</td>
<td>1.06</td>
<td>1.59</td>
<td>#5 @ 35' W60x60</td>
<td>0.9785</td>
</tr>
<tr>
<td></td>
<td>#6 @ 35' Ctrs.</td>
<td></td>
<td></td>
<td>#6 @ 60' W48x48</td>
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</tr>
<tr>
<td></td>
<td>#7 @ 35' Ctrs.</td>
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<td>5&quot;-P 35.1x07.3</td>
<td></td>
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<td>Special 2</td>
<td>1.24</td>
<td>1.86</td>
<td>#5 @ 35' W60x60</td>
<td>1.1446</td>
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<tr>
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<td>#6 @ 35' Ctrs.</td>
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<td>#6 @ 60' W48x48</td>
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</tr>
<tr>
<td></td>
<td>#7 @ 35' Ctrs.</td>
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<td></td>
<td>5&quot;-P 35.1x07.3</td>
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<tr>
<td></td>
<td>#8 @ 35' Ctrs.</td>
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<td></td>
<td>6&quot;-P 28.3x08.2</td>
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<td>G</td>
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<td>#6 @ 35' Ctrs.</td>
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<td>#6 @ 60' W48x48</td>
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<tr>
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<td>#7 @ 35' Ctrs.</td>
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<td></td>
<td>6&quot;-P 28.3x08.2</td>
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</tr>
</tbody>
</table>

### NOTES FOR PRECAST OPTIONS AND EQUIVALENT REINFORCEMENT SUBSTITUTION
1. Details for optional precast inlet construction up to depths of 15' are shown on the inlet indexes.
2. When precast units are used in conjunction with All "B" Structure Bottoms, Index 425-010, the inter dimensional measurements of All "B" Bottom can be adjusted to reflect these inlet interior dimensions.
3. Concrete which meets the requirements of ASTM C479 or Class IV must be used for precast structures constructed with 6" wall or slab thickness.
4. Reinforcement can be either deformed bar reinforcement or welded wire reinforcement. Bar reinforcement other than 60 ksi may be used, however only two grades are recognized: Grade 40 and Grade 60. Smooth welded wire reinforcement will be recognized as having a design strength of 65 ksi and deformed wire reinforcement will be recognized as having a design strength of 70 ksi. The area of reinforcement required may be adjusted in accordance with the Equivalent Steel Area Table provided. For bars and spacings not given, the steel area required can be determined by the following equations:
   - Max. Grade 40 Bar Spacing = Grade 60 Bar Spacing
   - Max. Smooth Welded Wire Reinforcement Steel Area = 0.65 x 60 ksi
   - Max. Deformed Welded Wire Reinforcement Steel Area = 0.60 x 60 ksi

When a reduced area of reinforcement is provided, any maximum bar spacing shown may also be reduced as determined by the following equations, unless otherwise shown:
   - Max. Grade 40 Bar Spacing = Grade 60 Bar Spacing x 0.86
   - Max. Deformed Welded Wire Reinforcement Spacing = Grade 60 Bar Spacing x 0.74

When an increased area of reinforcement is provided, then the maximum bar spacing may be increased by the squared ratio of increased steel area, but not to exceed 12":
   - Max. Bar Spacing Provided = Max. Bar Spacing Required x \( \sqrt{\frac{A_{\text{Steel Area Provided}}}{A_{\text{Steel Area Required}}}} \)

In no case will reinforcement with wires smaller than W3.1 or D4.0, or spacings greater than 20" be permitted. Bar reinforcement shall show the minimum yield designation grade mark or either the number 60 or one (1) grade mark line to be acceptable at the higher value.

Maximum bar spacing shall not be greater than two (2) times the slab thickness with a maximum spacing of 12" or three (3) times the wall thickness, with a maximum spacing of 18" for vertical bars and 12" for horizontal bars. Wires smaller than W3.1 or D4.0 are permitted in the walls of ASTM C478 round structure bottoms and round risers.

5. Fiber-reinforced concrete may be substituted for conventional steel reinforcement in accordance with the Structures Design Guidelines. Shop drawings corresponding to an approved fiber-reinforced concrete mix design must be submitted for approval to the States Drainage Engineer.
DESIGNER NOTE: Use only when round structures are not practical, engineer of record approval required.

PICTORIAL VIEW

NOTE:
1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.
2. $h_2$ may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.
3. For inlet segments at finish grade elevation substitute a #8 Bar for the top corner bar when 1'-0" ≤ $h_2$ < 2'-0".

RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER

SECTION AA

DETAILS FOR SKEWED PIPES IN RECTANGULAR STRUCTURES
**TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE A)**

**TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE B)**

**ROUND RISER OPENING**

**SQUARE OPENING WITH CORNER FILLETS**

**SECTION A-A**

**SECTION B-B**

**NOTE:**

- Not Applicable For Type A, B, C, D & E Ditch

**DESCRIPTION:**

- Type A Or B Riser
- Structure Bottom

**NOTE:**

- When the inside diameter of a round structure is not more than 1"-6" larger than the opening in the riser or top slab, the top of the structure or riser shall be constructed according to the "Special Top Slab" details on this sheet.

**NOTE:**

- Provide one extra #4 bar reinforcement each side of each opening and two extra #4 bars at 3" min. spacing above each opening.
### ROUND STRUCTURE BOTTOMS (ALTERNATE A) & ROUND RISERS - TABLE 1

Wall Thickness (H) & (L) and Vertical & Horizontal Areas of Reinforcement (A)

<table>
<thead>
<tr>
<th>Type</th>
<th>Structure/ Riser Diameter (ft)</th>
<th>Cast-in-Place Items</th>
<th>Precast Items</th>
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<tr>
<td></td>
<td>Class II Concrete</td>
<td>ASTM C47B</td>
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<td>Class II Concrete</td>
<td>ASTM C47B</td>
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<tr>
<td></td>
<td>(in.)</td>
<td>(in.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A, **</td>
<td>A, **</td>
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</tr>
<tr>
<td></td>
<td>(in.²)</td>
<td>(in.²)</td>
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</tr>
<tr>
<td></td>
<td>A, ***</td>
<td>A, ***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(in.²)</td>
<td>(in.²)</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>3'-6&quot;</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>6'-0&quot;</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>P</td>
<td>9'-0&quot;</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>6'-0&quot;</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>9'-0&quot;</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>12'-0&quot;</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

**TABLE 1 NOTES:**

**#** = Modified minimum wall thickness.

**#*#** = Modified minimum wall thickness.

A, ** = 0.40 sq. in. for riser section height equal or less than 2'-0" (3 hoop min.)

A, *** = 0.60 sq. in. for riser section height more than 2'-0" up to 4'-0" (3 hoop min.)

Areas of reinforcing for precast items are based on Grade 60 reinforcing.

No reduction in the area of reinforcement is allowed for welded wire fabric in Table 1.

Area of vertical reinforcing may be reduced in accordance with ASTM C478.

### SQUARE & RECTANGULAR STRUCTURES (ALTERNATE B) - TABLE 2

<table>
<thead>
<tr>
<th>Type</th>
<th>Wall Length (ft)</th>
<th>Max. Depth (ft)</th>
<th>Wall Thickness (ft)</th>
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<td>CIP (in.)</td>
<td>Precast (in.)</td>
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<td>P</td>
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<td>6</td>
</tr>
<tr>
<td>J</td>
<td>6'-0&quot;</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>9'-0&quot;</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>J</td>
<td>9'-0&quot; to 12'-0&quot;</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>12'-0&quot;</td>
<td>26</td>
<td>8</td>
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<tr>
<td>J</td>
<td>15'-0&quot;</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>J</td>
<td>18'-0&quot;</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>J</td>
<td>20'-0&quot;</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>J</td>
<td>20'-0&quot;</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

**TABLE 2 NOTES:**

See Table 8 for Reinforcing Schedule.

### GENERAL NOTES

1. Standard structure bottoms 4'-0" diameter and smaller (Alt. A) and 3'-6" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type J. Risers are permitted for all structures. Round risers are designated Type B.

2. Walls of circular structures (Alt. A) in place may be of brick or reinforced concrete. Precast and rectangular structures (Alt. B) shall be constructed of reinforced concrete only.

3. Wall thickness and reinforcement are for either cast-in-place or precast concrete units except that precast circular units may be furnished with walls in accordance with ASTM C478 (see modified wall thicknesses in Table 1).

4. Top and bottom slab thickness and reinforcement are for precast and cast-in-place construction. All concrete shall be of Class II, except use Class III concrete when shown in the plans, for special applications of structures located in extremely aggressive environments. Concrete as specified in ASTM C478 (4000 psi) may be used in lieu of Class II concrete for precast items manufactured in accordance with Specifications Section 499.

5. All reinforcement shown is Grade 60 steel, deformed bar. Equivalent area Grade 40 steel or equivalent area smooth or deformed welded wire reinforcement in accordance with Specification Section 931 may be substituted according to Index 425-001, unless otherwise noted.

6. Alt. A or Alt. B structure bottoms may be used in conjunction with curb inlet tops Types 1, 2, 3, 4, 5, 6, 9, and 10, and any manifold or junction box unless otherwise shown in the plans or other standard drawings. Alt. B structure bottoms may be used in conjunction with curb inlet Types 7 & 8, or any ditch bottom inlet unless otherwise shown in the plans or other standard drawings.

7. Rectangular structures may be rotated as directed by the Engineer in order to facilitate connections between the structure walls and storm sewer pipes.

8. Except when ACI hooks are specifically required, reinforcement in top and bottom slab shall be straight embedding.

9. All reinforcement must have 2" minimum cover except for 7'-6" diameter precast circular units manufactured under ASTM C478, keyed construction otherwise shown. Additional bars used to restrain hole formers for precast structures with grated pipe connections may be left flush with the hole surface. Cut or bent reinforcement at pipe openings to maintain cover. Exposed ends of reinforcing at precast pipe openings and grouted joints must be removed to 1" below the concrete surface and sealed with a Type F epoxy in accordance with Specification Section 926. Horizontal steel in rectangular structures shall be lapped a minimum of 30 bar diameters or by standard hooks at corners.

10. The corner fillets shown are necessary for rectangular structures used with circular risers and inlet throats and when used on skew with rectangular risers, inlets and inlet throats. Fillets will be required in the top slab of the Alt. A structure bottoms when used with the Alt. B risers. Each fillet shall be reinforced with two #5 bars.

11. Inlet walls, throats, risers or manifold tops shall be secured to structures as shown on Index 425-001 (Optional Construction Joints).

12. Structures with depths over 14' below the mean high water table are to be checked for flotation by the designer of the drainage project.

13. Units larger than specified standards may be substituted at the contractor's option when these units will not cause or increase the severity of utility conflicts. Such larger units shall be furnished at no additional cost to the Department. Larger Alt. A units cannot replace Alt. B units without approval of the Engineer. This note applies to this Index only.

14. For manifold and junction box tops, for frames and covers, and, for supplementary details and notes see Index 425-001.

15. Type J structure bottoms must have a minimum 6'-0" wall height when possible, for maintenance access.
**TABLE 3 - MINIMUM STRUCTURE SIZES FOR SINGLE PIPE CONNECTION PER SIDE**

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>RECTANGULAR</th>
<th>ROUND</th>
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<tr>
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<td>Single Pipe</td>
<td>Note</td>
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<tr>
<td>18&quot;</td>
<td>2'-0&quot;</td>
<td>2</td>
</tr>
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<td>24&quot;</td>
<td>3'-0&quot;</td>
<td>3</td>
</tr>
<tr>
<td>30&quot;</td>
<td>4'-0&quot;</td>
<td>4</td>
</tr>
<tr>
<td>36&quot;</td>
<td>5'-0&quot;</td>
<td>5</td>
</tr>
<tr>
<td>48&quot;</td>
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<td>6</td>
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<tr>
<td>60&quot;</td>
<td>7'-0&quot;</td>
<td>7</td>
</tr>
<tr>
<td>72&quot;</td>
<td>8'-0&quot;</td>
<td>8</td>
</tr>
<tr>
<td>84&quot;</td>
<td>9'-0&quot;</td>
<td>9</td>
</tr>
</tbody>
</table>

**TABLE 3 NOTES:**
1. For Round Structures sizes with variable angles between sides and variable pipe sizes, refer to the FDOT Storm Drain Handbook.
2. For 3'-6" Precast Square Structure Bottoms, 30" Pipes with similar invert elevations are not permitted in adjacent walls. Use 4'-0" Side Dimensions when 30" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
3. For 4'-0" Precast Square Structure Bottoms, 36" Pipes with similar invert elevations are not permitted in adjacent walls. Use 5'-0" Side Dimensions when 36" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
4. For 7'-0" Precast Square Structure Bottoms, 66" Pipes with similar invert elevations are not permitted in adjacent walls. Use 8'-0" Side Dimensions when 66" pipe openings are required on adjacent walls and the difference in flow lines is less than 6'-0".

**TABLE 4 - MINIMUM SIZES FOR MULTIPLE PARALLEL PIPE CONNECTIONS FOR RECTANGULAR STRUCTURE BOTTOMS**

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>PIPE SPACING</th>
<th>MINIMUM WALL LENGTH (L) FOR NUMBER OF PARALLEL PIPES</th>
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<tr>
<td></td>
<td></td>
<td>Single Pipe</td>
</tr>
<tr>
<td>18&quot;</td>
<td>2'-10&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>3'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>4'-0&quot;</td>
<td>10'-0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>5'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>6'-0&quot;</td>
<td>14'-0&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>7'-0&quot;</td>
<td>16'-0&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
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<td>18'-0&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>9'-0&quot;</td>
<td>20'-0&quot;</td>
</tr>
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</table>

**TABLE 4 NOTES:**
1. Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.
2. Wall lengths exceeding 20'-0" require special designs.

**TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS**

**TABLE 5 NOTES:**
These values are based on 2" clearance for precast structures. Larger skews are possible for Cast-In-Place Structures or elliptical pipe openings when approved by the Engineer.

**STANDARD PLANS**

**FY 2018-19**

**INDEX 425-010**

**3 of 5**
## Slab and Wall Design Table Notes

1. **Size** is the inside dimensions of a structure.

2. Slab reinforcement is appropriate for top, intermediate, and bottom slabs.

3. Bottom Slabs for precast 3'-6" x 3'-6" rectangular structures at 15' depth or less, may be 6" thick.

4. Slab depth is measured from finished grade to top of slab.

5. Wall depth is measured to the top of the bottom slab for boxes and to the top of the intermediate slab for risers.

6. Wall height is the distance between top of lower slab to bottom of upper slab. Maximum wall height is 12' for wall lengths exceeding 5', or 10' for wall lengths exceeding 12'.

7. Wall lengths exceeding 6'-0" require two layers of reinforcing (See Table 6) with 2" cover of the horizontal bars to the inside and outside faces for each layer.

8. Wall lengths exceeding the dimensions or depths shown in Table 8, or 12'-0" diameter, may require a special design.

9. Wall thickness and reinforcing for rectangular structures is based on the longer wall length.

10. Reinforcing schedules with larger areas of steel may be substituted for schedules with smaller bar or wire spacing, except that Schedule B10 may not be substituted for Schedule 66. See Index 425-001 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.
### WALL DESIGNS - RECTANGULAR STRUCTURES (TABLE B)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>WALL SCHEDULE</th>
<th>WALL DEPTH</th>
<th>WALL SCHEDULE</th>
<th>WALL DEPTH</th>
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<tr>
<td>a1.17 - 40</td>
<td>A12</td>
<td>B10</td>
<td>C5</td>
<td>E5</td>
</tr>
<tr>
<td>10&quot; &lt; 10&quot;</td>
<td>Outside</td>
<td>Inside</td>
<td>Inside</td>
<td>Outside</td>
</tr>
<tr>
<td>10&quot;</td>
<td>D7</td>
<td>D7</td>
<td>D7</td>
<td>F5</td>
</tr>
<tr>
<td>10&quot; - 40&quot;</td>
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**SCHEDULE**

#### Vertical Reinforcing

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<td>10&quot; - 40&quot;</td>
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#### Horizontal Reinforcing

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<tbody>
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### WALL THICKNESS

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**SCHEDULE**

#### Vertical Reinforcing

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### WALL THICKNESS

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**SCHEDULE**

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</tbody>
</table>

### WALL THICKNESS

<table>
<thead>
<tr>
<th>SIZE: 3'-6&quot; &amp; RISERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a1.17 - 40&quot;</td>
</tr>
<tr>
<td>10&quot; &lt; 10&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
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<td>10&quot; - 40&quot;</td>
</tr>
<tr>
<td>10&quot; - 40&quot;</td>
</tr>
<tr>
<td>10&quot; - 40&quot;</td>
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</table>

### REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>GRADE</th>
<th>60 AREA</th>
<th>MAXIMUM SPCING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 BARS</td>
<td>65 KSI &amp; 70 KSI</td>
</tr>
<tr>
<td></td>
<td>(in.)</td>
<td>(in.)</td>
</tr>
<tr>
<td>a12</td>
<td>0.20</td>
<td>12</td>
</tr>
<tr>
<td>a6</td>
<td>0.20</td>
<td>6</td>
</tr>
<tr>
<td>B10</td>
<td>0.24</td>
<td>16</td>
</tr>
<tr>
<td>B5.5</td>
<td>0.28</td>
<td>6</td>
</tr>
<tr>
<td>C6.5</td>
<td>0.32</td>
<td>6</td>
</tr>
<tr>
<td>C3.5</td>
<td>0.37</td>
<td>3</td>
</tr>
<tr>
<td>D7</td>
<td>0.53</td>
<td>7</td>
</tr>
<tr>
<td>D4.5</td>
<td>0.53</td>
<td>4</td>
</tr>
<tr>
<td>E3</td>
<td>0.73</td>
<td>3</td>
</tr>
<tr>
<td>F5</td>
<td>1.06</td>
<td>4</td>
</tr>
<tr>
<td>F3.5</td>
<td>1.06</td>
<td>3</td>
</tr>
<tr>
<td>G5</td>
<td>1.45</td>
<td>3</td>
</tr>
<tr>
<td>H6</td>
<td>1.75</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note: Equivalent Area Welded Wire Reinforcing may be substituted, if required.*

---

### WALL REINFORCING SPICE DETAILS (ALTERNATE B)

- **Option 1:** Lap Splice: At Quarter Point (6 Bar Diameter Or Vertical Wire Spacing + 2" For WWR)
- **Option 2:** Lap Splice: With Standard 90° Hooks At Corners (8" For #4's, 10" For #5's, 12" For #6's)
- **Option 3:** Lap Splice: Corner Spliced Bar (30 Bar Diameter, But Not Less Than Two Vertical Wire Spacing + 2" For WWR)
DESCRIPTION:

GENERAL NOTES

1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or gutter.

2. For inlets constructed on a curve, refer to the plans to determine the radius, and modify the inlet details accordingly. Bend steel when necessary.

3. All reinforcing steel to be Grade 60 bars with 1½' minimum cover unless otherwise shown, see Sheet 4 for equivalent a welded wire reinforcement details.

4. Inlet tops shall be either cast-in-place or precast concrete. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer.

5. Concrete meeting the requirements of ASTM C476 (4,000 psi) may be used in lieu of Class II concrete for precast units, manufactured in plants which meet the requirements of Section 449 of the Specifications.

6. Corner fillets are required at inlet opening for precast units or C-I-P units used in conjunction with circular inlet bottoms or skewed rectangular inlet boxes. Finish top of fillets flush with drain throat bottom and match slope.

7. For inlet bottoms see Index 425-010. Inlet tops are to be used with Type P bottoms, or Type J bottoms with 3'-6" square (Type B), 3'-6" or 4' round (Type A) risers or top slab openings.

8. These inlet tops are designed for use with standard curb and gutter Type E and Type F. Locate inlet outside of pedestrian crosswalks. For Type E curb, transition the shape of the curb over the gutter transition length to match the face of the inlet (Type F).


10. All steel used for frame and grate shall meet the requirements of ASTM A36/A36M.

11. Either cast iron grates or steel grates may be used.

12. When Alternate "G" grate is specified in the plans either the cast iron grate and galvanized steel frame or the galvanized steel grate and frame must be used. Grates are to be grouted in accordance with the grouting detail shown on Sheet 5, in lieu of tack welding.

13. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type _), Each.
SECTION DD
(End View Of Inlet)

Pipe shall not be constructed within these limits.

8" min. Or If Top Slat Present, Top Slat Thickness Plus 3'

Top of Pipe

Cross References:
For General Notes See Sheet 1.
For Location Of Sections DD Thru HH See Sheet 1.

SECTION EE

Field Cut Bars To Maintain 1 1/2" Cover

Bars 4A @ 3" Sp.
Bars 4C @ 3" Sp.

Bars 4F @ 12" Sp.
Bars 4H In Corners

SECTION FF

Slope To Match Adjacent Curb With 2" Top Radius
And 3/8" Bottom Chamfer Or 1 1/2" Radius

Bars 4A @ 5" Sp.
Bars 4C @ 5" Sp.

Bars 4G @ 8" Sp.

Bars 4J

SECTION GG

12" Corner Fillet
(See Note 6, Sheet 1)

Inlet Bottom Or Riser
(Type Varies, See Note 7, Sheet 1)

SECTION HH
(Type 5 Inlet Only)

CROSS REFERENCES:
For General Notes See Sheet 1.
CURB INLET TOPS TYPES 5 AND 6

TYPE 5 INLET

<table>
<thead>
<tr>
<th>PIECE NO.</th>
<th>LENGTH</th>
<th>TYPE 6 INLET</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Precast)</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>B (C-F-P)</td>
<td>4</td>
<td>38</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>10'-3&quot;</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>61</td>
</tr>
<tr>
<td>E</td>
<td>16</td>
<td>3'-3&quot;</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>3-0&quot;</td>
</tr>
<tr>
<td>G</td>
<td>4</td>
<td>4-0&quot;</td>
</tr>
<tr>
<td>H</td>
<td>4</td>
<td>4-0&quot;</td>
</tr>
<tr>
<td>I</td>
<td>2</td>
<td>2'-3&quot;</td>
</tr>
<tr>
<td>J</td>
<td>4</td>
<td>4-0&quot;</td>
</tr>
<tr>
<td>K (Fillet)</td>
<td>4</td>
<td>2-0&quot;</td>
</tr>
<tr>
<td>L (Precast)</td>
<td>4</td>
<td>1-3&quot;</td>
</tr>
<tr>
<td>M</td>
<td>4</td>
<td>3'-2&quot;</td>
</tr>
</tbody>
</table>

WELDED WIRE REINFORCEMENT

PIECE NO. 1

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE NO. 1

PIECE NO. 2

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE NO. 2

PIECE NO. 3

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE NO. 3

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>TYPE 5 INLET</th>
<th>TYPE 6 INLET</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>38</td>
<td>3'-1&quot;</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>38</td>
<td>2'-15&quot;</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>10'-3&quot;</td>
<td>6</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>61</td>
<td>11&quot; to 1'-11&quot;</td>
</tr>
<tr>
<td>E</td>
<td>16</td>
<td>3'-3&quot;</td>
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<td>G</td>
<td>4</td>
<td>4-0&quot;</td>
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<td>H</td>
<td>4</td>
<td>4-0&quot;</td>
<td>4</td>
</tr>
<tr>
<td>I</td>
<td>2</td>
<td>2'-3&quot;</td>
<td>2</td>
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<tr>
<td>J</td>
<td>4</td>
<td>4-0&quot;</td>
<td>4</td>
</tr>
<tr>
<td>K (Fillet)</td>
<td>4</td>
<td>2-0&quot;</td>
<td>0</td>
</tr>
<tr>
<td>L (Precast)</td>
<td>4</td>
<td>1-3&quot;</td>
<td>9</td>
</tr>
<tr>
<td>M</td>
<td>4</td>
<td>3'-2&quot;</td>
<td>7</td>
</tr>
</tbody>
</table>

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. Bars 4A and 4E may be combined into a single bar.
3. Welded wire reinforcement consists of smooth or deformed wire meeting the requirements of Specification Section 931.

WELDED WIRE REINFORCEMENT PIECE No. 1

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE No. 1

WELDED WIRE REINFORCEMENT PIECE No. 2

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE No. 2

WELDED WIRE REINFORCEMENT PIECE No. 3

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE No. 3

TYPICAL SECTION SHOWING WELDED WIRE REINFORCEMENT

CONVENTIONAL REINFORCING STEEL DETAILS FOR WELDED WIRE REINFORCEMENT (WWR)
CAST IRON GRATE

STANDARD PLANS

CURB INLET TOPS TYPES 5 AND 6

REV 03.01.17

10/23/17 10:27:03 AM

REVISION

DESCRIPTION:

REVISION

LAST

STANDARD PLANS

FY 2018-19

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CURB INLET TOPS TYPES 5 AND 6

11/01/17

425-021

5 of 5

SHEET

See Sheet 1.

For Location Of Section GG and QQ

CROSS REFERENCES:

See Sheet 1.

ENGR FDOT

REV

03.01.17

REV

10/23/17 10:27:03 AM

REV

425-021

5 of 5

SHEET

See Sheet 1.

For Location Of Section GG and QQ

CROSS REFERENCES:

See Sheet 1.
GENERAL NOTES

1. This inlet is used in Traffic Separators Types I and II; or, in separators constructed with Curbs Types A, B, and E and sidewalk paving which cannot accommodate Inlets Types 3, 4, 5, or 6. Use of this inlet on through traffic side of the separator is not permitted in medians with Curbs Types A and B. Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1½".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, Inlets with Alt. B bottoms, Index 425-010 are recommended.

4. For supplementary details see Index 425-001.

5. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 7), Each.
GENERAL NOTES

1. This inlet is to be used only in Traffic Separators Types IV and V, or in separators constructed with Curbs Types D and F and sidewalk paving, which cannot accommodate Inlets Types 1, 2, 3, 4, 5, or 6. Use of this inlet on the through traffic side of the separator should be avoided in medians constructed with Curbs Type D (Curb inlets Types 9 or 10 are recommended). Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2 in. min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1 in.

3. Recommended maximum pipe sizes are 24 in. longitudinal and 30 in. transverse. For larger pipe, inlets with All. B bottoms, Index 425-010 are recommended.

4. For supplemental details and notes see Index 425-001.

5. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 8), Each.

For Callouts, Options See Optional Construction Joints, Index 425-001.
GENERAL NOTES
1. This inlet is primarily intended for locations with light to moderate flows where right of way does not permit the use of throated Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward Predominant flow.

3. For structure bottoms see Index 425-010. For supplemental details see Index 425-001.

4. All steel in slab tops shall have 1/2" minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom wall or riser wall.

6. When used on a structure with dimensions larger than those detailed above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 24"x36". The "Special Top Slab" on Index 425-010 is not permitted.

7. Frame may be adjusted with one to six courses of brick.

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible, right or left.

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CURB INLET TOP TYPE 9
FY 2018-19
STANDARD PLANS
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TOP SLABS
(SEE NOTE 6 BELOW)
This inlet is primarily intended for locations with light flows where right of way does not permit the use of throated Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward predominant flow.

3. For structure bottoms see Index 425-010. For supplemental details see Index 425-001.

4. All steel in slab tops shall have 1½” minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom or riser walls.

6. When used on a structure with dimensions larger than those detail above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 22”x24”. The “Special Top Slab” on Index 425-010 is not permitted.

7. Frame may be adjusted with one to six courses of brick.

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible.
TABLE 1: HORIZONTAL WALL REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>AREA (in²/ft.)</th>
<th>BARS</th>
<th>SPACING</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-6</td>
<td>0.9</td>
<td>1</td>
<td>0.8</td>
<td>1.5</td>
</tr>
<tr>
<td>0'-8</td>
<td>0.9</td>
<td>1</td>
<td>0.8</td>
<td>1.5</td>
</tr>
<tr>
<td>0'-10</td>
<td>0.9</td>
<td>1</td>
<td>0.8</td>
<td>1.5</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

1. Where called for in the Plans, use this inlet in conjunction with Median Barrier per Index 521-003.

2. For grade details, see Index 425-040. The parallel bar grate shall be used unless the retrofit grate is called for in the plans. The retrofit grate shall be specified where bicycle traffic is anticipated. Used in areas of occasional pedestrian traffic. Not suitable for use in pedestrian traffic or bicycle way.

3. All exposed edges and corners shall be 1/2 chamfer or tooled to 1/2 radius.

4. For standard Median Barrier dimensions and requirements, see Index 521-001.

5. Inlet wall reinforcing is Grade 60 #4 bars. The horizontal wall reinforcing must be positioned 3' from the inside face unless otherwise shown. Per Index 425-001, the equivalent area of welded wire fabric is permitted.

6. Barrier reinforcing is Grade 60 #4 bars or #5 bars as required to match the stirrups and longitudinal steel of the adjacent Concrete Barrier per Index 521-001. Barrier reinforcing steel cover may be either 2' or 3' as needed to match the adjacent barrier reinforcing cover, unless otherwise shown. Match the stirrup spacing of the adjacent barrier run (longitudinal steel bars over the full length of the Concrete Barrier Transition and run continuously with the longitudinal steel of the adjacent barriers; use lap splices as required).

7. For supplemental details see Index 425-003.

8. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

9. Inlets to be paid for under the contract unit price for Inlets (Median Barrier Type_). EA. Concrete Barrier to be paid for under the contract unit price for Concrete Barrier, LF.

10. Bond Breaker: One layer of ASTM 06380 Class S, Type I1 organic felt between inlet and barrier, including footings.
GENERAL NOTES:
1. When called for in the Plans, use this inlet in conjunction with Shoulder Barrier per Index 521-001 or a Wall Coping with Shoulder and Junction Slab per Index 521-610. Use of the inlet adjacent to other Concrete Barrier or Traffic Railing types requires approval of the Drainage Engineer. The inlet is suitable for bicycle and occasional pedestrian traffic, with roller bar installation (see INSET B), but should not be placed in a designated pedestrian travel way.

2. Inlets located in embankments constructed with earth anchored retaining wall shall be designed with minimum depths to reduce adverse impact on the anchorage system. Runs of pipe parallel to and near anchored wall shall avoid wherever practical. Special coordination must be exercised during the design and construction of storm water systems within anchored wall systems.

3. Inlet bottoms and/or tops may be either precast or cast-in-place. Whether cast as a single unit or as multiple segments, and whether precast or cast-in-place, the upper 2'-3" of the inlet shall be reinforced in accordance with sections CC, DD and EE.

4. All exposed edges and corners shall be 1/2" chamfer or tooled to 1/4 radius.

5. When Alternate G grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication. Field installation of the filter bar called for in Inset B will not be permitted, thereby requiring tolerance adjustment during fabrication and/or casting, or, matching grate to structure prior to galvanizing.

6. All reinforcing is Grade 60 bars. See Index 425-001 for equivalent area of welded wire fabric.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

8. For supplemental details see Indexes 425-001 and 425-010.

9. Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

WALL DEPTH SCHEDULE
<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
<th>BASE</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-5</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
<td>5'</td>
</tr>
<tr>
<td>5'-10</td>
<td>A6</td>
<td>0.20</td>
<td>4&quot;</td>
<td>3'</td>
</tr>
<tr>
<td>10'-15</td>
<td>A4</td>
<td>0.20</td>
<td>4&quot;</td>
<td>3'</td>
</tr>
<tr>
<td>15'-20</td>
<td>B5.5</td>
<td>0.24</td>
<td>5½&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

SECTION A-A (WITHOUT GRATE)
(Pipe Opening Shown)

SECTION B-B
(Pipe Opening Not Shown)

TOP VIEW (WITHOUT GRATE)

See Inset B
(See Index 425-003)

Eyebolt & Chain
(See Table 1)

#4 Bars @ 12" Ctrs.

#4 Bars @ 10" Ctrs.

A l t.  B  S t r u c t u r e  B o t to m
B a r r ie r  W a l l  I n le t

Note: Alt. B Structure Bottom Only. See Index 425-010

#4 Bars @ 12" Ctrs.

Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.
DESCRIPTION:

REVISION LAST

11/01/17

STANDARD PLANS

FY 2018-19

SHOULDER BARRIER INLET

INDEX

425-031

1. All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A325 or F1554 (Grade 36) galvanized fully threaded rod, adhesive bonded anchors installed in accordance with Specification Section 436. Bolts or rods shall be 6" long (4" min. embedment) with one heavy hex head nut (ASTM 194 or A563) and one flat washer (ASTM F436) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

NOTES

GENERAL NOTE 1)

(See Sheet 1, General Note 1)
GENERAL NOTES:

1. Where called for in the Plans, use this inlet in conjunction with Curb and Gutter Barrier per Index 521-001. Construct Barrier segments shown herein in accordance with requirements of Index 521-001, including connections to adjacent barrier segments using the Doweled Joint.

2. Reinforcing shown is grade 60 steel bars. For the equivalent area of welded wire reinforcement for the inlet, see Index 425-001. Reinforcing shall have 2" minimum cover unless otherwise shown. Trim or bend bars to provide 1½" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier.

3. All barrier, as Class II or IV concrete per Index 521-001.

4. Apply a 32° chamfer or 3½ radius to all exposed concrete edges.

5. For pipe connections to inlet structure bottoms, the recommended maximum pipe sizes are 18" longitudinal and 30" transverse. For larger pipes, use Alternate B bottoms, Index 425-010.

6. Grates may be fabricated with galvanized after fabrication, in accordance with Specification 962-9.

7. Where Alternate A grate is specified in the Plans, the grate is to be hot-dip galvanized after fabrication. The top end elevation of the lowest grate flow line is 1½" below the sump floor elevation.

8. For Pay Item purposes, the depth of the barrier inlet shall be computed using the center of box grate elevation, minus the flow line elevation of the lowest grate flow line or the top of the sump floor elevation.

9. All dimensions are for both precast and cast-in-place (C-I-P) inlets unless otherwise indicated.

10. Pipe sizes are 18" longitudinal and 30" transverse. For larger pipes, use Alternate B bottoms, Index 425-010.

11. All bars and bearing bars as detailed on Sheet 2 & 3.

12. Concrete Barrier to be paid for under the contract unit price for Inlet, Barrier Rigid, Curb and Gutter, Each.
SECTION D-D
INLET STRUCTURE
(18" Dia. Pipe Opening Shown)

1. For Bar Bending Diagrams of Bars 5V2 & 5U4, See Index 521-001. Bars 5V2M, 5U4M, & 5S may be field cut from Bars 5V2 & 5U4.

2. Install PVC drainage pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3 – 3½" PVC Drainage Pipes spaced @ 8", (Where Applicable) See TABLE 1.

3. Install PVC drainage pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3 – 3½" PVC Drainage Pipes spaced @ 8", (Where Applicable) See TABLE 1.

TABLE 1: HORIZONTAL WALL REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>AREA</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>5-9</td>
<td>0.20</td>
</tr>
<tr>
<td>4-9</td>
<td>3-6</td>
<td>0.20</td>
</tr>
<tr>
<td>6-10</td>
<td>5-7</td>
<td>0.24</td>
</tr>
<tr>
<td>10-15</td>
<td>C-5</td>
<td>0.37</td>
</tr>
</tbody>
</table>

1. Install Drainage Pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3 – 3½" PVC Drainage Pipes spaced @ 8", (Where Applicable) See TABLE 1.
BAR STUB
SECTION II
SECTION HH
CROSS BAR OPTIONS
SECTION FF
SECTION GG
OPTIONAL STEEL GRATES
WELDED
ELECTROFORGED
CROSS BAR GRATE
PLAN VIEW
PLAN VIEW
RETICULINE GRATE
CROSS BAR OPTIONS
PLAN VIEW
OPTIONAL STEEL GRATES
WELDED
ELECTROFORGED
CROSS BAR GRATE
PLAN VIEW
RETICULINE GRATE
PICTORIAL VIEW OF INLET TOP
TOP VIEW OF INLET TOP WITHOUT GRATE
PRECAST INLET TOP REINFORCING DETAILS

NOTE:
1. For additional information on Bar 4B, see Bar Bending Diagrams (Sheet 2).
2. C-I-P Inlet Top Reinforcing Similar

CURB AND GUTTER BARRIER INLET

PICTORIAL VIEW OF INLET TOP

PRECAST INLET TOP REINFORCING DETAILS

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Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter

CONCRETE APRON AT TERMINAL INLETS

PICTORIAL VIEW

SECTION BB
(Enlarged)

SECTION AA
(Enlarged)

5'-0" Concrete Apron

Shoulder Gutter Transition

Shoulder Pavement

A

B

Top View

A

B

GUTTER INLET TYPE S

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2 of 3
ALT. A STRUCTURE BOTTOM FOR INLET TYPE S

SECTION AA

- Centered Inlet
- Structure Bottom

SECTION BB

- #4 Bar Each Corner (2'-0" Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement See Tables

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot; To 8'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>3'-3&quot; x 3'-10&quot;</td>
<td></td>
</tr>
</tbody>
</table>

- Round Structure Bottom
- See Index 425-020 For Structure Bottom Details and Hole Reinforcement.

- #5 Hoop Bar
- #4 Bars Each Corner

- 2 Way Reinforcement See Tables

TOP SLAB REINFORCING DIAGRAM

- Centered Opening - See Table For Dimensions

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>OR 65 KSI &amp; 70 KSI</th>
<th>(W/M KSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
<td>In/ft</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0.73</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1.35</td>
<td></td>
</tr>
</tbody>
</table>

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot;</td>
<td>9%</td>
<td>C</td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td>9%</td>
<td>D</td>
</tr>
<tr>
<td>3'-3&quot;</td>
<td>9%</td>
<td>E</td>
</tr>
<tr>
<td>3'-6&quot;</td>
<td>9%</td>
<td>F</td>
</tr>
</tbody>
</table>

- 2'-11" x 4'-0"

- 5'-0" Min. To 8'-0" Max

- (Unless Otherwise Shown In The Plans)

- 9\% For 5'-0"/6'-0" Structure Bottoms
- 11\% For 8'-0" Structure Bottoms

- 2" Cl.

- 2 Way Reinforcement See Tables

- #8 Bars @ 5" Spacing

(INLET WITH STRUCTURE BOTTOM)

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-11&quot; or 3'-3&quot;</td>
<td>2'</td>
</tr>
<tr>
<td>3'-10&quot; or 3'-7&quot;</td>
<td>2'</td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail above and Index 425-010.

**GENERAL NOTES**

1. This inlet is suitable for multiple uses, washouts, ditches, or other areas subject to heavy wheel loads, minimum debris. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. This inlet is not for use in a bicycle way.

2. When alternate "C" grate is specified in plans, the grate is to be hot dip galvanized after fabrication.

3. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe to clear pipe 1/2".

4. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/4" radius.

5. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

6. For supplementary details see Index 425-001.

7. Inlet to be paid for under the contract unit price for Inlets (Gutter Type V), EA

**HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft²)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5'</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; and 8&quot;</td>
</tr>
<tr>
<td>5' - 9'</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot; and 3&quot;</td>
</tr>
<tr>
<td>9' - 12'</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot; and 3&quot;</td>
</tr>
<tr>
<td>9' - 15'</td>
<td>B5.5</td>
<td>0.24</td>
<td>510&quot; and 5&quot;</td>
</tr>
</tbody>
</table>
ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot; To 8'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>2'-3&quot; x 3'-10&quot;</td>
<td></td>
</tr>
</tbody>
</table>

SECTION AA

SECTION BB

GUTTER INLET TYPE V

TOP SLAB REINFORCING DIAGRAM

#5 Hoop Bar (Peripheral Reinforcement)

#4 Bar Each Corner (2'-9" Min. Length)

2 Way Reinforcement See Tables

#8 Bars @ 5" Spacing

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot; To 8'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>2'-3&quot; x 3'-10&quot;</td>
<td></td>
</tr>
</tbody>
</table>

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 46 (BAR) OR 49 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 0.5'-3'-9&quot;</td>
<td>90°'</td>
</tr>
<tr>
<td>3'-10&quot;</td>
<td>90°'</td>
</tr>
<tr>
<td>0.5'-3'-9&quot;</td>
<td>90°'</td>
</tr>
<tr>
<td>3'-10&quot;</td>
<td>90°'</td>
</tr>
</tbody>
</table>

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
</tr>
</thead>
</table>

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 46 (BAR) OR 49 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 0.5'-3'-9&quot;</td>
<td>90°'</td>
</tr>
<tr>
<td>3'-10&quot;</td>
<td>90°'</td>
</tr>
<tr>
<td>0.5'-3'-9&quot;</td>
<td>90°'</td>
</tr>
<tr>
<td>3'-10&quot;</td>
<td>90°'</td>
</tr>
</tbody>
</table>

GUTTER INLET TYPE V

STANDARD PLANS

REV 01/23/17

REV 01/01/17

REV 01/01/17

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2 of 2
Ditch Bottom Inlet Type A

**Recommended Maximum Pipe Sizes**

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td>24&quot;</td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail right and Index 425-010.

---

**General Notes**

1. This inlet is designed for ditches, medians, or other areas subject to heavy wheel loads on limited access facilities where debris may be a problem. This inlet is not for use in areas subject to pedestrian and/or bicycle traffic.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Cut or bend bars out of way of pipe to clear pipe by 1/2". See Index 425-001 for equivalent area of welded wire fabric.

3. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/8" radius.

4. When alternate "G" grate is specified in plans, the grate is to be hot-dip galvanized after fabrication.

5. Cost of ditch paving to be included in the cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.

6. For supplemental details see Index 425-001.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

8. Inlet to be paid for under the contract unit price for Inlet Cost Type A, EA.

---

**Horizontal Wall Reinforcing Schedule (Table 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
<th>BARS</th>
<th>W/HF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>A12</td>
<td>0.20</td>
<td>12</td>
<td>8&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>10 - 15</td>
<td>A6</td>
<td>0.20</td>
<td>12</td>
<td>8&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

---

**Special Notes**

- All B Structure Bottom Only. See Index 425-010 for Structure Bottom Details and Hole Reinforcement.

---

**Notes:**

- All reinforcing is from Table 1.
- All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
- Inlet to be paid for under the contract unit price for Inlet Cost Type A, EA.

---

**Recommendations:**

- Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail right and Index 425-010.

---

**Scheduling:**

- All reinforcing is from Table 1.
- All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
- Inlet to be paid for under the contract unit price for Inlet Cost Type A, EA.
ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

**TOP SLAB REINFORCING DIAGRAM**

- **Centered Opening - See Table For Dimensions**
- **#5 Hoop Bar (Peripheral Reinforcement)**
- **2 Way Reinforcement See Tables**

**TOP SLAB REINFORCING SCHEDULE**

<table>
<thead>
<tr>
<th>SIZE: 4'-0&quot;</th>
<th>65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.33</td>
</tr>
<tr>
<td>D</td>
<td>0.73</td>
</tr>
<tr>
<td>E</td>
<td>1.06</td>
</tr>
<tr>
<td>F</td>
<td>1.45</td>
</tr>
</tbody>
</table>

**TOP SLAB OPENINGS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; To 8'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
<td></td>
</tr>
<tr>
<td>8'-0&quot; Min. To 8'-0&quot; Max</td>
<td>3'-1&quot; Or 2'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

- **Centered Inlet Structure Bottom (2'-0" Min. Length)**
- **#4 Bar Each Corner**
- **#5 Hoop Bar**
- **Each Corner**
- **Round Structure Bottom**
- **See Index 425-010 For Structure Bottom Details and Hole Reinforcement.**
- **90° For 4'-0"/5'-0"/6'-0" Structure Bottoms**
- **110° For 8'-0" Structure Bottoms**
- **2 Way Reinforcement**
- **See Tables**

**SECTION AA**

**SECTION BB**

**DITCH BOTTOM INLET TYPE A**

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SHEET 2 of 2
CONCRETE INLET PAVEMENT AND SODDING

PLAN

SECTION EE
DITCH BLOCK

ESTIMATED QUANTITIES
For Informational Purposes Only

<table>
<thead>
<tr>
<th>SLOT TYPE</th>
<th>PAVEMENT</th>
<th>SOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Slot</td>
<td>6.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Double Slot</td>
<td>8.1</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Traversable inlet top (Single Slot Shown)

CONCRETE INLET PAVEMENT

PLAN

SECTION AA
HORIZONTAL WALL REINFORCING

SCHEDULE (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>A11</td>
<td>0.20</td>
<td>12</td>
</tr>
<tr>
<td>3 - 9</td>
<td>A6</td>
<td>0.20</td>
<td>6</td>
</tr>
<tr>
<td>9 - 13</td>
<td>0.5</td>
<td>0.24</td>
<td>5'</td>
</tr>
<tr>
<td>12 - 18</td>
<td>Special</td>
<td>0.267</td>
<td>5'</td>
</tr>
</tbody>
</table>

Recommended Maximum Pipe Sizes

PLAN

SECTION CC
STEEL GRADE

HORIZ. WALL REINFORCING (See Table 1)

SECTION BB

DITCH BOTTOM INLET TYPE B

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Sheet 1 of 3
GENERAL NOTES

1. The general purpose of the inlet top designs are:
   a. For ditches, medians or other areas subject to heavy wheel loads. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. Inlet not suitable for bicycle traffic.
   b. Provide full grate and horizontal slot designs for new construction.
   c. Provide full grate and horizontal slot designs for replacing the vertical slot tops on existing Inlets Type B and Type X that are in locations subject to occasional pedestrian traffic.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for min. 1½' clearance around pipe.

3. All exposed edges and corners shall be ½" chamfer or ½" radius.

4. When Alternate G graters are specified in the plans, the graters are to be hot-dip galvanized after fabrication.

5. Cost for constructing traversable tops on new inlet boxes shall be included in the contract unit price for Inlets (DT BOT) (Type B), EA., and shall include the cost for surrounding concrete inlet pavement. Existing Inlets Type B and Inlets Type X that are converted to traversable inlet tops shall be paid for under the contract unit price for Inlets (DT BOT) (Type B) (Partial), EA. Unit price and payment shall be full compensation for inlet conversion and shall include the removal of any existing concrete inlet pavement; the removal and stockpiling or disposal of sufficient material from the existing inlet box to facilitate construction of the required inlet top; construction of the required inlet conversion; backfill construction; construction of concrete inlet pavement; reusing, supplementing, transferring or replacing graters as required by plans or as directed by the Engineer; any required earthwork for ditch restoration within 30' of the inlet; and, restoration of disturbed turf.

6. Ditch pavement shall be paid for, separate from the inlet and concrete inlet pavement, by pavement types and units as called for in the plans.

7. Sod will be paid for under the contract unit price for Performance Turf, SY.

8. For supplementary details see Index 425-001.

9. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

DESIGN NOTES

1. The type of top (single or double slots) depends on the approach ditch configuration and the hydraulic requirements of the site. The designer will stipulate in the plans the type of top to be constructed at each individual inlet location.

2. On existing inlets, conversion graters shall be constructed at the original grate elevations unless other elevations are called for in the plans. When plans call for the inlet top to be constructed to support storm water detention, details for ditch modifications and underdrains shall be shown in the plans.

MAINTENANCE NOTES

1. Traversable inlet tops that are constructed by maintenance contract or by maintenance forces may reuse the existing graters that are determined by the Maintenance Engineer to be functionally sound, and their reuse is so directed by the Maintenance Engineer. Existing graters approved for reuse and new graters may be mixed, matched or replaced as directed by the Maintenance Engineer.

TRAVERSABLE TOPS FOR INLETS TYPE B AND FOR CONVERSIONS OF EXISTING INLETS TYPE B AND TYPE X
DEFINITIONS:

- **TOP SLAB OPENINGS**
- **TOP SLAB REINFORCING DIAGRAM**
- **SECTION AA**
- **SECTION BB**
- **ALT. A STRUCTURE BOTTOM FOR INLET TYPE B**

**TOP SLAB REINFORCING SCHEDULE**

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 40 (BAR) ON 65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.33</td>
</tr>
<tr>
<td>D</td>
<td>0.53</td>
</tr>
<tr>
<td>E</td>
<td>0.73</td>
</tr>
<tr>
<td>F</td>
<td>1.06</td>
</tr>
<tr>
<td>G</td>
<td>1.45</td>
</tr>
</tbody>
</table>

**TOP SLAB WITH CENTERED OPENING**

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 - 8</td>
<td>9%</td>
<td>B</td>
</tr>
<tr>
<td>8 - 18</td>
<td>9%</td>
<td>C</td>
</tr>
<tr>
<td>18 - 32</td>
<td>9%</td>
<td>D</td>
</tr>
<tr>
<td>32 - 37</td>
<td>9%</td>
<td>E</td>
</tr>
<tr>
<td>37+</td>
<td>9%</td>
<td>G</td>
</tr>
</tbody>
</table>

**ALT. A STRUCTURE BOTTOM FOR INLET TYPE B**

**DITCH BOTTOM INLET TYPE B**

**INDEX**

- 425-051

**Sheet 425-051**

**Sheet 3 of 3**

**Description:**

- **LAST REVISION**: 11/01/17
- **FY 2018-19 STANDARD PLANS**
- **DITCH BOTTOM INLET TYPE B**

**Centered Opening:**

- See Index 425-010 For Structure Round Structure Bottom
- See Tables 2 Way Reinforcement
- See Tables 2 Way Reinforcement
- Peripheral Reinforcement
- #5 Hoop Bar (Peripheral Reinforcement)
- #4 Bars Each Corner (2'-0" Min. Length)
- #5 Hoop Bar

**Top slab with centered opening:**

- Top slab with centered opening
- Round structure bottom
- See Index 425-010 for structure bottom details and hole reinforcement.

**Top slab reinforcing diagram:**

- Centered inlet
- Structure bottom
- Top slab reinforcing diagram
- Top slab openings
- Top slab openings
- Centered opening
- Top slab with centered opening

**Dimensions:**

- Diameter
- Opening size

**Schedule:**

- Diameter: 6'-0" to 8'-0"
- Opening size: 3'-8" x 4'-2" to 3'-10" x 4'-2"
- Slab depth: 0.5' to 9'
- Slab thickness: 0.20 to 1.45

- Slab size: 6'-0" to 8'-0"
- Slab size: 3'-8" to 4'-2"
DITCH BOTTOM INLET TYPES C, D, E AND H

**TYPE C**
- Recommended Maximum Pipe Size:
  - 2'-0" Wall - 18" Pipe
  - 3'-1" Wall - 24" Pipe (18" where an 18" pipe enters a 2'-0" wall)

**TYPE D**
- Recommended Maximum Pipe Size:
  - 3'-1" Wall - 24" Pipe
  - 4'-1" Wall - 30" Pipe

**TYPE E**
- Recommended Maximum Pipe Size:
  - 3'-0" Wall - 24" Pipe
  - 4'-6" Wall - 36" Pipe
**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 4)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-5'</td>
<td>85.5</td>
<td>0.24</td>
<td>5/16 3/8</td>
</tr>
<tr>
<td>0'-7'</td>
<td>68.5</td>
<td>0.37</td>
<td>6/32 1/4</td>
</tr>
<tr>
<td>0'-10'</td>
<td>48.5</td>
<td>0.53</td>
<td>10/32 5/16</td>
</tr>
</tbody>
</table>

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 5)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-5'</td>
<td>C3.5</td>
<td>0.37</td>
<td>3/8 3/8</td>
</tr>
<tr>
<td>0'-10'</td>
<td>D4.5</td>
<td>0.53</td>
<td>5/16 5/16</td>
</tr>
</tbody>
</table>

**TYPE H (2 & 3-GRATE INLET)**

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 6'-7" Wall - 1-80" Pipe
- Or 2-24" Pipe (5'-3-5')

**TYPE H (4-GRATE INLET)**

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 6'-9" Wall - 1-80" Pipe
- Or 2-30" Pipe (5'-6-3')

**GENERAL NOTES**

See Sheet 3 of 7.
1. These inlets are suitable for bicycle traffic and are to be used in ditches, medians, and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to any heavy wheel loads. These inlets may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. Inlets subject to minimal debris should be constructed without slots. Subjected to the selection described above, when Alternate Type H is specified in the plans, either the steel grate, hot dip galvanized after fabrication, or the cast iron grate may be used, unless the plans stipulate the particular type.

3. Steel grates are to be used on all inlets where bicycle traffic is anticipated. Steel grates are to be used on inlets with traversable slots. Either cast iron or steel grates may be used on inlets without slots where bicycle traffic is not anticipated. Either cast iron or steel grates may be used on all inlets with non-traversable slots. Subject to the selection described above, when Alternate Type H is specified in the plans, either the steel grate, hot dip galvanized after fabrication, or the cast iron grate may be used, unless the plans stipulate the particular type.

4. Recommended maximum pipe sizes shown are for concrete pipe. Size for other types of pipe must be checked for fit.

5. All exposed edges and corners shall be 1/16" chamfer or tooled to 1/8" radius.

6. Concrete inlet pavement to be used on inlets without slots and inlets with non-traversable slots only when called for in the plans; but required on all traversable slot inlets. Cost to be included in contract unit price for inlets. Quantities shown are for information only.

7. Traversable slots constructed in existing inlets shall be paid for as inlets partial. For conversion work and method of payment see "TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLET".

8. Sodding to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, SS.

9. For supplementary details see Index 425-001.

10. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.
SLOTS NOT PERMITTED ON SIDES WITH GRATE SEATS

NOTE: See General Notes Nos. 6 and 7, Sheet 3 of 7.

SODDING AND PAVEMENT FOR INLETS WITHOUT SLOTS AND INLETS WITH NON-TRAVERSABLE SLOTS

NOTE: For plan view and additional details see Sheet 4 of 7.

For payment see General Notes Nos. 6 and 7, Sheet 3 of 7.

PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Pavement</th>
<th>Sod</th>
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<tbody>
<tr>
<td></td>
<td>Single Slot</td>
<td>Double Slot</td>
</tr>
<tr>
<td>C</td>
<td>4.07</td>
<td>0.83</td>
</tr>
<tr>
<td>D</td>
<td>5.99</td>
<td>0.91</td>
</tr>
<tr>
<td>E</td>
<td>5.85</td>
<td>0.90</td>
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NOTE: For payment see General Notes Nos. 6 and 7, Sheet 3 of 7.

TRAVERSABLE SLOTS FOR EXISTING INLETS

NOTE: For plan view and additional details see Sheet 4 of 7.

For payment see General Notes Nos. 6 and 7, Sheet 3 of 7.

DITCH BOTTOM INLET TYPES C, D, E AND H

INDEX

425-052

5 of 7

REVISED

10/01/17

DESCRIPTION:

FY 2018-19

STANDARD PLANS
**DESIGN NOTES FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS**

1. The general purpose of these conversions is to remove the hazard of the protruding inlet top, while not creating a hazard by depressing the top too deeply.

2. The corrective procedure depends on the approach ditch grade and hydraulic requirements of the site. The selection of the appropriate case depends on the relationship between inlet top and ditch elevation, and on the vertical clearance between the top of the uppermost pipe(s) and the grate. The purpose for the Case 3 conversion is to add the traversable slot to an existing inlet where top removal, change in grate elevation and ditch transitions are not required. Case 2 will normally be applicable to ditches with steeper grades adjoining the inlet. Case 3 will normally be applicable to ditches with gentle grades adjoining the inlet where build-up of the existing ditch is acceptable.

3. The designer shall stipulate in the plans which case is to be constructed at each individual inlet location.

Where the existing inlet top is above the existing ditch (Case 2) but borrow material will be required to adjust the ditch (Case 3), and vertical clearance or other conditions do not prevent removal of the inlet top, the designer should call for Case 3. The designer shall determine if ditch reconstruction is required more than 35 feet beyond any traversable slot side and shall include separate pay items in the plans to cover the cost for that portion of required ditch reconstruction exceeding the 35 foot limit. The designer shall also determine whether ditch pavement is required for ditch restoration within the 35 foot limit and include that pavement under a pay item separate from the inlets partial.

When the detention ditch concept is to be used with Case 3, the designer shall stipulate Case 3 (Detention) in the plans.

The designer shall determine whether light soil or other conditions at each individual Inlet indicates the need for underdrain in Case 3 conversions and shall call for Underdrain, Type 1 in the plans.

**METHOD OF PAYMENT FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS**

1. Existing inlets converted to traversable slot tops under Cases 1, 2 and 3 shall be paid for as inlets partial, each. Case shall not be included in the pay item description.

2. All ditch reconstruction work within 35 feet of each traversable slot conversion, whether required by these details or as a direct result of the conversion, shall be included as a part of the partial cost. Reconstruction work shall include excavation and removal of surplus materials or borrow materials in place, grading, compaction, shaping and restoration of disturbed turf. Sodding, ditch pavement and underdrain are not included as part of the inlet partial cost and are to be paid for separately.

3. Concrete inlet pavement and sodding shall be in accordance with the sections on this detail and with the Plan on Sheet 4 and Sections AA, BB and CC (as Case 1) and tabular quantities on Sheet 5.

4. Unit price and payment shall constitute full compensation for inlet conversion (including concrete inlet paving and replacement grate(s), ditch reconstruction, restoration of disturbed turf, and shall be paid for under the contract price for inlets (DT Bid) (Type __) (Partial), each.

Sodding shall be paid for under the contract unit price for Performance Turf, SY. Ditch pavement shall be paid separately from the inlet by pavement type(s) and ordered as called for in the plans.

**SINGLE SLOT SHOWN (DOUBLE SLOTS SYMMETRICAL ABOUT CENTERLINE)**

**SECTION CC (CASE 2)**

**SECTION CC (CASE 3)**

**TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS**
ALT. B STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

TOP SLAB REINFORCEMENT SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 70 BAR (WIRE FABRIC)</th>
<th>#5 HOOP BAR</th>
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<tr>
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<tr>
<td>B</td>
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<td>2.00</td>
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<tr>
<td>C</td>
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<tr>
<td>D</td>
<td>1.06</td>
<td>2.00</td>
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<tr>
<td>E</td>
<td>1.85</td>
<td>2.00</td>
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TOP SLAB OPENINGS

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<th>DIAMETER</th>
<th>OPENING SIZE</th>
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<tr>
<td>&lt;4'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>&gt;4'-0&quot;</td>
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</tr>
<tr>
<td>&gt;5'-0&quot;</td>
<td>3'-0&quot;</td>
</tr>
<tr>
<td>&gt;6'-0&quot;</td>
<td>3'-0&quot;</td>
</tr>
</tbody>
</table>

SECTION AA

SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D AND E
**GENERAL NOTES**

1. These inlets are designed for use in ditches, medians, pavement areas, or other areas subject to heavy wheel loads, minimal debris, and bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. When inlet is placed in areas subject to bicycle traffic, install filler bar when clearance or gap is greater than 1/8' as shown in Index 425-031.

2. When Alternate G grate is specified in plans, the grate is to be hot dip galvanized after fabrication.

3. These inlets may be used with Alternate B structure bottoms, Index 425-030. The inlet and bottom combinations are to be paid for under the contract unit price for inlets (DT Bot) (Type F (or G)) (J Bot, Depth), Ea.

4. All exposed edges and corners shall be 1/8' chamfer or tooled to 1/4' radius.

5. For supplemental details, see Index 425-001.

6. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

**RECOMMENDED MAXIMUM PIPE SIZES**

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<thead>
<tr>
<th>PIPE SIZE</th>
<th>INLET INSIDE WIDTH</th>
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<td>2'-0&quot; (Type F)</td>
<td>A12</td>
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<td>4'-0&quot; (Type F)</td>
<td>6</td>
</tr>
<tr>
<td>4'-10&quot; / 5'-0&quot; (Type G)</td>
<td>48&quot;</td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe sizes see Note 3.
### Horizontal Wall Reinforcing Schedule (Table 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
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<tr>
<td>0'-4'</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
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<tr>
<td>4'-9'</td>
<td>A8</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>9'-12'</td>
<td>A4</td>
<td>0.20</td>
<td>8&quot;</td>
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<tr>
<td>9'-15'</td>
<td>0.24</td>
<td>30°</td>
<td></td>
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</tbody>
</table>

### Recommended Maximum Pipe Sizes

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-11&quot; or 3'-3&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>3'-10&quot; or 4'-0&quot;</td>
<td>30°</td>
</tr>
</tbody>
</table>

### General Notes

1. This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. All reinforcing Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1/4".

3. All exposed edges and corners shall be 1/4" chamfered or tooled to 1/4" radius.

4. When alternate C grate is specified in plans the grate is to be hot dip galvanized after fabrication.

5. For supplemental details, see Index 425-001.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

7. Cost of ditch paving to be included in cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.
Ditch Bottom Inlet Type J

**SECTION CC**

- Ditch Bottom
- Toe Wall Required (Paved or Unpaved Ditches)
- Side Slope

**SECTION DD**

- Ditch Block (low side of Inlet on Continuous Ditches)
- Side Slope

**PAVEMENT & SODDING**

- 4'-3" Out To Out
- 1'-5" Each End
- Weld Main Bars To L (See Detail Below)

**STEEL GRATING**

- Main Bars 5" x 1/2" (Notched for Cross Bars)
- Cross Bars 1-3/4" x 1/2" (Continuously Welded At Main Bar Notches) Main Bars and Cross Bars Flush on Top.

Note: Two Required Per Inlet
GENERAL NOTES

1. This inlet is to be used at locations having high flow rates, usually where an overhead could not be utilized without hazardous intake.

2. Inlet length (L) shall be set by the designer for the greater of either culvert requirement or inlet pool not to exceed 12' depth. Structures over 6 feet in depth are to be checked for flotation by the designer of project drainage.

3. This inlet is not intended for use with Index 425-010 structure bottoms.

4. All exposed edges and corners shall be 1/4" chamfered or tooled to 1/4" radius.

5. Inlet and anti-vortex wall to be Class II Concrete.

6. All reinforcing is Grade 60 with 7" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric (WWF). Bars to be cut or bent for 1/2" clearance around pipe opening. Bend top and corner bars to clear anchor holes.

7. Channel section C 3x6 at 14" max. bar spacing may be used as an alternate for the C 4x5.4 channel at 15" bar spacing.

8. Channels and bars for grate shall be ASTM A242/A242M, A572/A572M or ASTM A588/A588M, Grade 50 steel, and galvanized in accordance with Specification Section 975.

9. Fence enclosure shall be Fence Type B (Index 550-002). All posts to be set in concrete. A minimum of 10 posts required. Corner and approach side posts to be 3" nominal diameter.

10. Cost of ditch paving, anti-vortex wall, grate, reinforcing steel and fence enclosure to be included in the cost of inlet. Inlet to be paid for under the contract unit price for Inlets (DT Bot) (Type K).

11. Anchor Bolts shall be ASTM F1554 Grade 36 fully threaded headless bolts, installed in accordance with Specification Sections 416 and 937. Nuts shall be ASTM A563 or A194 and washers shall be ASTM F436 or alternate for the C 4x5.4 channel at 15" bar spacing.

This inlet is not intended for use with Index 425-010 structure bottoms.
Notes:
1. Maximum pipe size shall be 24" diameter.
2. Grading back of sidewalk varies and shall be done as directed by the Engineer.
3. Concrete quantities shown are for maximum wall heights, and shall be basis for estimate and payment.
4. Riprap quantities shown are for estimate purposes only. Cost of riprap to be included in cost of the endwall.
5. Endwalls to be paid for under the contract unit price for Concrete Class I (Endwalls), CY. Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.

### SPECIAL CONCRETE ENDWALL

<table>
<thead>
<tr>
<th>Pipe Size (in)</th>
<th>Concrete Class I (CY)</th>
<th>Sand-Cement Riprap (CY)</th>
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</tr>
<tr>
<td>18</td>
<td>2.5</td>
<td>1.3</td>
</tr>
<tr>
<td>24</td>
<td>3.3</td>
<td>1.8</td>
</tr>
</tbody>
</table>

See Plans For Handrail Requirements

And Ditch Bottom (Symmetrical About Υ)
YARD DRAIN ITEM INCLUDES:
1. 15" x 15" x 12" Concrete or PVC Tee 4' long.
2. Grate diameter = 14-½"  
   Thickness = 2-½"  
   Flow area = 45 sq in min.  
   Light Duty Cast Iron, see Specification Section 962.
3. 12" pipe as necessary.
4. 0.04 Cubic yards concrete for slab.

Notes:
1. Yard drains to be located outside the R/W. Drainage area should not exceed 750 SF (grate flow 0.1 CF/s).
2. Yard drains may be constructed at the option of the property owner as shown on the plans.
3. Cost of plugs and collars to be included in the cost for 15" pipe. For collar and plug details see Index 430-001.
4. Yard drains to be paid for under the contract unit price for Yard Drains, EA.

SHALLOW DITCHES

Notes:
1. To be constructed at locations as directed by the Engineer.
2. Either cast iron pipe or PVC rigid conduit, U.L. listed for direct sunlight exposure, Schedule 40, may be used.
3. Pipe and Mitered End to be paid for under the contract unit price for either Cast Iron Soil Pipe (Standard) (4′).
4. 12′ or PVC Pipe For Back Of Sidewalk Drainage (4′), 12′.
DESIGN NOTES

1. These inlets are designed for use with Type F curb and gutter only. Locate inlet outside of curb ramp area.

The Single Barrel Flume is intended for locations with light to moderate flows. Multiple Barrel Flumes must be selected to meet design heavy flows.

2. Designer must specify Flume Type, "D" dimension, number of barrels and guiderail requirements in plans.

3. Designer must specify where energy dissipating bricks are required.

GENERAL NOTES

1. The finished grade and slope of the inlet top are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.

2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.

3. All steel shall have 2" minimum cover unless otherwise shown. Inlets can be either cast-in-place or precast concrete. Chamfer all exposed edges 45°.

4. All reinforcement is ASTM A615/A615M Grade 60 steel, either smooth or deformed. Equivalent area grade 40 steel or 65 ksi welded wire fabric may be substituted.

5. Inlets to be paid for under the contract unit price for Inlets (Closed Flume) EA.

FLUME W/SIDEWALK INLET (CLOSED FLUME) TYPE I

SINGLE BARREL FLUME DEPICTED
FLUME W/O SIDEWALK INLET (CLOSED FLUME) TYPE II
SINGLE BARREL FLUME DEPICTED
GENERAL NOTES

1. This skimmer is intended for use on Type C, D, or E Ditch Bottom Inlets that are used as outlet control structures of stormwater management facilities.

2. The side panels are dimensionally symmetric, therefore they may be used on either side of the structure.

3. Two (2) skimmers may be constructed on one structure provided they are on opposite ends.

4. The width of the front panel (dimension W) shall be the same as the outside dimension across the front of the structure.

5. The front panel, side panels, and flat bars are to be hot dip galvanized after fabrication.

6. The location of the reinforcing steel in these structures must conform to the applicable standards to avoid conflict with the expansion anchors used to attach the skimmer.

7. Grates to be used on the inlets unless otherwise specified in the plans.

8. A skimmer consists of two (2) side panels, one front panel, two (2) flat bars, and accessory hardware. The cost of skimmers is to be included in the cost of the inlet.

DESIGN NOTES

1. The designer must specify, in the plans, the skimmer height (dimension H) and the sides where the weir slots and skimmers are located. The skimmer height must be one of the dimensions shown in the table on Sheet 2. The skimmer should not be used on structure sides with outside dimensions greater than 6'-4".

2. To minimize hydraulic losses across the skimmer, the flow area under the skimmer should be three times larger than the flow area of the weir slot. The distance between the pond bottom at the structure and the skimmer shall be not less than 1 foot.

3. The configuration of skimmers may be subject to regulatory requirements. The designer should coordinate the outlet control structure details with the permitting agencies.

4. Where this skimmer is used, the designer should reference this index with the outlet control structure details. Where a different skimmer design is needed, the designer should provide skimmer details in the plans.

5. The designer shall evaluate if a grate is needed for safety reasons. Where a grate is needed for safety reasons and is not desirable for hydraulic or other reasons, the designer may omit the grate by stating so in the outlet control structure details.

6. The designer must show the configuration of the weir slots in the outlet control structure detail.
**DESCRIPTION:**

**SKIMMER FOR OUTLET CONTROL STRUCTURES**

**DIMENSIONS**

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<tr>
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<th>E</th>
<th>L</th>
<th>S</th>
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</table>

**SIDE PANEL**

**SIDE VIEW**

**END VIEW (FRONT)**

**TOP VIEW**

**END VIEW**

**FRONT PANEL**

**FRONT VIEW**
NOTES:
1. These details are for construction field expedients to resolve utility conflicts that cannot be remedied by relocation. For conflicts determined during design, use the construction shop drawings for structure details.
2. Concrete used in conflict structures shall be as specified in ASTM C467. 4000 psi may be used in lieu of Class I concrete.
3. Maximum opening for pipe shall be the pipe OD plus 6". Mortar used to seal the pipe into the opening will be of such mix that shrinkage will not cause leakage into or out of the structure.
4. If the conflict structure is round or there are multiple inlet or outlet pipes, then the wall section should be reviewed for strength.
5. If during construction or the plans design process it is determined that a potable water supply line must pass through a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C. and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator For Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organizational" on the menu to the right.

DESIGNER’S NOTES:
"Sumped" conflict manholes shall not be used unless the system is hydraulically designed to account for the headloss generated if the sump is completely blocked.

6. If during construction or the plans design process it is determined that a potable water supply line must pass though a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C. and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator For Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organizational" on the menu to the right.

UTILITY CONFLICT CONDITION I
(Nonpressure Or Nonfluid Carrier Installations)

UTILITY CONFLICT CONDITION II
(Pressure Or Fluid Carrier Installations)
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

LONGITUDINAL SECTION

SECTION AA

SECTION BB
CONCRETE GUTTER AND DRAINS AT RETAINING WALLS

Note: PVC pipe, Schedule 40, to be paid for under the contract unit price for Polyvinyl Chloride Pipe Culvert (4"), LF.

METHOD FOR SETTING LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

1. L=10xH (No Maximum)
2. L=10xDitch Offset (Maximum L=100')

Use Larger Value Of Either:

1:10 Slope Not To Be Steeper Than 1:10

NOTE: Filling or excavation of variable slopes to be done during normal grading operations.

Note: Guards to be constructed only at locations specifically called for in plans.
**MISCELLANEOUS DRAINAGE DETAILS**

**PLAN OF TOP**

**SECTION**

**INLETS, MANHOLES OR JUNCTION BOXES ON INTEGRAL PRECAST CONCRETE RISER FOR CONCRETE PIPE**

**METHOD FOR DETERMINING THE LENGTH OF SPECIAL PIPE REQUIRED UNDER RAILROADS**

**RAILROAD COMPANY**

<table>
<thead>
<tr>
<th>CLEARANCE BELOW BOTTOM OF RAIL (Ft/Et)<strong>(1)</strong></th>
<th>STRENGTH</th>
<th>ASTM (C76) CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama &amp; Gulf Coast Railway (Rail America)</td>
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(1) - Distance standard for yard and industrial tracks.

(2) - Clearance is for casing pipe. All subgrade carrier pipelines and wirelines will be installed within a casing pipe which will extend from Right-of-Way line to Right-of-Way line.
### GENERAL NOTES

1. This endwall is to be used only in the clear zone for the drainage of medians and other areas having low design velocities and negligible debris.

2. Reinforcing steel: All bars are size #4. Spacings shown are center to center. Laps to be 1'-5" minimum. Cover is 2" except as noted. Square welded wire fabric (two cages max.) having an equivalent cross sectional area (0.20 sq. in.) may be substituted for bar reinforcement.

3. Grates shall be ASTM A242/A242M, A572/A572M or ASTM A588/A588M, Grade 50 steel. When "Alt. G" grates are specified in the plans, grates shall be galvanized in accordance with Section 975 and 425.3.2 of the Standard Specifications.

4. Endwall to be paid for under the contract unit price for U-Endwall, Each. Payment shall include cost of concrete, reinforcing steel, grate, and accessories. Quantities shown are for estimating purposes only.

5. Sod slopes 5' each side and above endwall. Sodding to be paid for under contract unit price for Performance Turf, SY.

6. Precasting of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index 425-001 for opening and grouting details.

7. Concrete shall be Class I except ASTM C498 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

### TABLE OF DIMENSIONS AND QUANTITIES

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<tr>
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<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<th>Section BB</th>
<th>End View</th>
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### U-TYPE CONCRETE ENDWALLS WITH GRATES 15' TO 30' PIPE

#### DESCRIPTION:

- Bars to be evenly spaced across dimension 'D'.
- All bars 1/2" x 2".
- Place on Topside for Bottom Grate Unit Only.

#### INDEX

- FY 2018-19
- STANDARD PLANS
- 440-010

#### SHEET

- 1 of 1
Quantities shown are for estimating purposes only.

When called for in the plans, steel grating, baffles and accessories.

Each. Payment shall include cost of concrete, reinforcing steel, and
Endwall to be paid for under the contract unit price for U-Endwall,

9.

under the contract unit price for Performance Turf, SY.

Sodding shall be in accordance with Index 524-001, and paid for

8.

requirements of Section 449 of the Specifications.

be substituted for precast items manufactured in plants meeting the

Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may

7.

or A588/A588M Grade 50 steel. When designated Alternate G in the

plans galvanize in accordance with Section 975 and 425-3.2 of the

Standard Specifications.

4.

All angles, channels and bars shall be ASTM A242/A242M, A572/A572M

3.

All reinforcing No. 4 bars with 2" clearance except as noted.

2.

Baffles to be constructed only when called for in plans.

1.

Channel section C 3x6 may be substituted for C 4x5.4 channel.

5.

Precasting of this endwall will be permitted. Precast units shall

6.

conform to the dimensions shown or in accordance with approved shop
drawings. Request for shop drawing approval shall be directed to the
State Drainage Engineer. Use Index 425-001 for opening and grouting
details.

PRECAST CONCRETE ENDWALL

W/BAFFLES

ENDWALLS FOR 1:2 SLOPES

WITH BAFFLES

ENDWALLS FOR 1:2 SLOPES

WITHOUT BAFFLES

GENERAL NOTES

1. Baffles to be constructed only when called for in plans.

2. When steel grating is required on endwall see Sheet 3 of 3 for
details.

3. All reinforcing No. 4 bars with 2" clearance except as noted.

4. All angles, channels and bars shall be ASTM A242/A242M, A572/A572M

5. Channel section C 3x6 may be substituted for C 4x5.4 channel.

6. Precasting of this endwall will be permitted. Precast units shall

7. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may

be substituted for precast items manufactured in plants meeting the
requirements of Section 498 of the Specifications.

8. Sodding shall be in accordance with Index 524-001, and paid for
under the contract unit price for Performance Turf, SY.

9. Endwall to be paid for under the contract unit price for U-Endwall.
Each. Payment shall include cost of concrete, reinforcing steel, and
when called for in the plans, steel grating, baffles and accessories.
Quantities shown are for estimating purposes only.
DESCRIPTION:
REV\NSION

LAST

REVISION

OF

STANDARD PLANS

FY 2018-19

U-TYPE CONCRETE ENDWALLS BAFFLES

& GRATE OPTIONAL 15" TO 30" PIPE

INDEX

430-011

2 of 3

ENDWALLS WITH AND WITHOUT BAFFLES FOR 1:3, 1:4 AND 1:6 SLOPES

DIMENSIONAL DETAILS

DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL

DIMENSIONS AND QUANTITIES FOR BAFFLES

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STEEL GRATING USE CRITERIA

1. Provide positive debris control at all upgradient openings. Do not install grates unless one of the following conditions exist:

   A. Pipe culvert endwalls are located within the designated clear zone.

   B. Drainage area to culvert consists of median or infield areas or areas where debris and/or drift is negligible.

   C. Runoff to culvert is by sheet flow or in such ill defined channels that debris transport is a major problem.

   D. Runoff to culvert is minor except on an infrequent basis (10 to 15 year frequency); for example a drainage basin in flat sandy terrain with normally low ground water table.

   E. Areas where culvert blockage with resultant backwater would not seriously affect roadway embankment, traffic operation or upland property.

2. Steel grating to be used only where called for in plans.

STEEL GRATE

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CHANNEL TO ANGLE WELD

SECTION BB

BAR TO BAR WELD

END VIEW

STEEL GRATING MOUNTING DETAIL

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<td>430-011</td>
<td>3 of 3</td>
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U-TYPE CONCRETE ENDWALLS BAFFLES & GRATE OPTIONAL 15° TO 30° PIPE

STANDARD PLANS

FY 2018-19

DESCRIPTION:

LAST REVISED: 03/01/17

FDOT

3.5 x 5.4 CHANNEL TO ANGLE WELD

SECTION AA

END VIEW
In Plans When Called For Fence Type B (Typical):
Fence Type B, LF. See Index 550-002 for details of Type B fencing.

Fencing, when called for in the plans, to be paid for under the contract unit price for Fencing, Type B, LF. See Index 550-002 for details of Type B fencing.

Pipe Size | Diam (in) | Area (SF) | Q (Max) (cfs) | Dimensions | Feet | Inches | Inches | Concrete Class A (CY) | Reinforcing Steel (lb) | Sand-Cement Riprap (CY) |
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GENERAL NOTES

1. Flared end sections shall conform to the requirements of ASTM C678, except where dimensions and reinforcement are as prescribed in the table above. Circumferential reinforcement may consist of either one cage or two cages of steel. Fiber-reinforced concrete may be substituted for conventional reinforcement in accordance with Structures Design Guidelines, Section 3.17. Compressive strength of concrete shall be 4000 psi. Shop drawings for flared and rebar steel having fiber reinforcing or dimensions other than above must be submitted for approval to the State Drainage Engineer.

2. Connections between the flared end section and the pipe culvert may be any of the following types unless otherwise shown on the plans.
   a. Joints meeting the requirements of Section 449 of the Standard Specifications (O-Ring Gasket). Flared end section joint dimensions and tolerances shall be identical or compatible to those used in the pipe culvert joint. When pipe culvert and flared end section manufacturers are different, the compatibility of joint designs shall be certified to by the manufacturer of the flared end sections.
   b. Joints sealed with preformed plastic gaskets. The gaskets shall meet the requirements of Section 942.2 of the Standard Specifications and the minimum sizes for gaskets shall be as that specified for equivalent sizes of elliptical pipe.
   c. Reinforced concrete jackets, as detailed on this drawing. Cost of the reinforced concrete jacket to be included in the contract unit price for the flared end section. When non-coated corrugated metal pipe is called for in the plans, the pipe shall be bituminous coated in the jacketed area as specified on Index 430-001. Bituminous coating to be included in the contract unit price for the pipe culvert. Concrete jacket shall be as specified on Index 430-001. Cost of concrete and reinforcement shall be included in the contract unit price for the pipe culvert.

3. Toe walls shall be constructed where shown on the plans or at locations designated by the Engineer. Toe walls are to be cast-in-place with Class I Concrete and paid for under the contract unit price for Flared End Section (Concrete), EA. Reinforcing steel shall also be included in the cost of the Flared End Section (Concrete), EA.

4. On skewed pipe culverts the flared end sections shall be placed in line with the pipe culvert. Side slopes shall be warped as required to fit the flared end sections.

5. Flared End Section to be paid for under the contract unit price for Flared End Section (Concrete), EA. Sodding shall be in accordance with Index 324-001, and paid for under the contract unit price for Performance turf, SY.
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**NOTE:** See Sheet 6 For Details And Notes.

**X:** Reinforced With WWF 6x6-WI.4xWI.4

**SECTION:**

**CROSS DRAIN MITERED END SECTION**

**SINGLE AND MULTIPLE CORRUGATED METAL PIPE-ARCH**
**DIMENSIONS & QUANTITIES**

**SECTION:** CROSS DRAIN MITERED END SECTION

**NOTE:** See Sheet 6 For Details And Notes.

**VALUES SHOWN FOR ESTIMATING PIPE QUANTITIES AND ARE FOR INFORMATION ONLY.**
GENERAL NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of cross drain pipe; corrugated steel pipe mitered end sections may be used with any type of cross drain pipe except aluminum pipe; and corrugated aluminum mitered end sections may be used with any type of cross drain pipe except steel pipe. When bituminous coated metal pipe is specified for cross drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the cross drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete mitered end sections, concrete jacket constructed in accordance with index 430-001.

3. Class K8 concrete cast-in-place reinforced slabs are required for all sizes of cross drain pipes. Unless 3" thickness called for in plans, construct slabs at 5½" thick.

4. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.

5. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.

6. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

7. When existing multiple cross drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

8. When placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

9. Bolt diameters shall be 4 x Bolt Dia.

10. All bars, bolts, nuts and washers are to be galvanized steel.

SPECIAL DETAILS AND NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of cross drain pipe; corrugated steel pipe mitered end sections may be used with any type of cross drain pipe except aluminum pipe; and corrugated aluminum mitered end sections may be used with any type of cross drain pipe except steel pipe. When bituminous coated metal pipe is specified for cross drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the cross drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete mitered end sections, concrete jacket constructed in accordance with index 430-001.

3. Class K8 concrete cast-in-place reinforced slabs are required for all sizes of cross drain pipes. Unless 3" thickness called for in plans, construct slabs at 5½" thick.

4. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.

5. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.

6. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

7. When existing multiple cross drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

8. When placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

9. Bolt diameters shall be 4 x Bolt Dia.

10. All bars, bolts, nuts and washers are to be galvanized steel.
**DIMENSIONS & QUANTITIES**

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**Note:** See Sheets 6 and 7 for details and general notes.

**SIDE DRAIN MITERED END SECTION**

- **Construction Joints Permitted**
- **Concrete Slab, 3" Thick, Reinforced With WWF 6x6-W1.4x1.4**
- **Slope:** 1/4 For Pipes 18' And Smaller / 1/2 For Pipes 24' And Larger.

**TO TOP VIEW SINGLE PIPE**

- **Top View Single Pipe**
- **Concrete Pipe**
- **Connector**
- **Fastener**
- **Saddle**
- **Construction Joints Permitted**
- **No Pipe Joint Permitted Unless Approved By The Engineer**
- **Pipe To Be Included Under Unit Price For Mitered End Section**

**TO TOP VIEW MULTIPLE PIPE**

- **Top View Multiple Pipe**
- **Concrete Pipe**
- **Connector**
- **Fastener**
- **Saddle**
- **Construction Joints Permitted**
- **No Pipe Joint Permitted Unless Approved By The Engineer**
- **Pipe To Be Included Under Unit Price For Mitered End Section**

**INDEX**

- **430-022**
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REMARKS

These sizes are restricted to inlet and outlet treatment for water management systems or similar applications.

Values shown for estimating pipe quantities and are for information only.

NOTES: See Sheets 6 and 7 for details and general notes.

SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE

SIDE DRAIN MITERED END SECTION

SECTION

FY 2018-19 STANDARD PLANS

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REVISION

DESCRIPTION:

SIDE DRAIN MITERED END SECTION
### SINGLE AND MULTIPLE ELLIPTICAL CONCRETE PIPE

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<td>20.64</td>
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</table>

**SODDING (SY)**

- Beveled Or Round Corners
- Slope: See ditch transition and pavement modification details, Sheet 1 or 2
- Width 6" Permitted Above ¥
- No Pipe Joint Permitted Unless Approved By The Engineer

**INDEX**

- Values shown for estimating pipe quantities and are for information only.

**NOTE:** See Sheets 6 and 7 for details and general notes.

### SECTION

- Pipe Culvert
- Construction Joint Permitted
- No Pipe Joint Permitted Unless Approved By The Engineer

**SIDE DRAIN MITERED END SECTION**

- Pipe Culvert
- Construction Joint Permitted
- Ditch Grade

**TAP 2018-19 STANDARD PLANS**

- Pipe Culvert
- Construction Joint Permitted
- Ditch Grade

* Slope: To Major Axis For Pipes 24"x38" And Smaller. 1/2 For Pipes 29"x45" And Larger.
**DESCRIPTION:**

**REVISION LAST of STANDARD PLANS FY 2018-19 SHEET INDEX 11/01/17**

**SIDE DRAIN MITERED END SECTION 430-022 5 of 7**

**FOR ALL SIZES OF SINGLE AND MULTIPLE DRAIN PIPE FASTENER UNIT**

**DETAILS FOR CONCRETE & CORRUGATED METAL PIPE**

- **CONCRETE PIPE (ROUND)**
- **ELLIPTICAL CONCRETE PIPE**
- **CONCRETE PIPE (ROUND)**
- **CORRUGATED METAL PIPE (ARCH)**
- **CORRUGATED METAL PIPE (ARCH)**

**Grate Size (Std. & X-Stg.) Bolt Length**

- **15"**
- **18"**
- **24"**
- **30"**
- **36"**
- **42"**
- **48"**
- **54"**
- **60"**

**Note:** 3/4" x 3" bolts are standard for all grate fasteners, except when the contractor elects to use the slotted upper holes for the intermediate fasteners on multiple drain pipes, which will require the following bolt lengths:

**Side Drain Mitered End Section**

- **Details for Concrete & Corrugated Metal Pipe**

**For All Sizes of Single and Multiple Drain Pipe Fastener Unit**

**Details for Concrete & Corrugated Metal Pipe**

- **Concrete Slab**
- **Welding**
- **Galvanizing**
- **Tack Welds**

**Wire Mesh #3 Steel Bars**

**Top View**

- **Galvanized Bolt Hex Head Bolt Shown:**
  - Either Hex Head or Square Head Bolt May Be Used. Only Hex Nut To Be Used.

**End View**

- **3" Steel Bars**

**Side View**

- **#3 Steel Bars**

**Bottom View**

- **6" Galvanized Bolt & Washer, Install With Chamered Face Down**

**Note:**

Galvanizing over welded surface not required.
FOR SINGLE & MULTIPLE DRAIN PIPE

ANCHOR DETAIL

16" x 6" Bolt
May Be Substituted

Notes:
- Anchors required for CMP only.
- Anchor, washer and nuts to be galvanized steel.
- Bend anchor where required to center in concrete slab.
- Damaged surfaces to be repaired after bending.
- Anchors are to be spaced a distance equal to four (4) corrugations.
- Place the anchors in the outside crest of corrugation.
- Flat washer to be placed on inside wall of pipe.
- Nails in the mitered end pipe are to be drilled or punched; burning not permitted.

ANCHOR DETAIL

SIDE VIEW

END VIEW

TOP VIEW

FOR SINGLE & MULTIPLE DRAIN PIPE

GRATE DETAIL

See General Notes, Sheet 7.

CONCRETE PIPE CONNECTOR DETAIL

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

All bars, bolts, nuts and washers are to be galvanized steel.

- Bolt diameters shall be 1/2" for 15" to 36" pipe and 5/8" for 42" to 60" pipe.
- Two connectors required per joint, located 60° right and left of bottom center of pipe.
- Bolt holes in pipe shell are to be drilled.
GENERAL NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of side drain pipe; corrugated steel pipe mitered end sections may be used with any type of side drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of side drain pipe except steel pipe. When bituminous coated metal pipe is specified for side drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the side drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designed to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete mitered end sections, concrete jacket constructed in accordance with Index 430-001.

3. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.

4. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.

5. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

6. When existing multiple side drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

7. Class B5 concrete cast-in-place reinforced slabs are required for all sizes of side drain pipes.

8. Install grates on all round pipes 30" or greater, pipe-arches 35"x24" or greater, and elliptical pipe 19"x30" or greater, unless excluded in the Plans. Install grates on smaller size pipes only when called for in the Plans. Omit the lower grate on the downstream end of mitered end sections along divided highways.

9. Use Schedule 80 pipe for the lower grate on all traffic approach ends and Schedule 40 pipe for all remaining grates. Fabricate the grates from ASTM A53, Grade B, black steel pipe and hot dip galvanize after fabrication in accordance with ASTM A123 for all corrosive environments.

DESIGN NOTES

1. Do not use grates until the debris transport potential has been evaluated by the drainage engineer and appropriate adjustments made. Ditch grades in excess of 3% or pipe with less than 1.5' of cover and grades in excess of 1% will require such an evaluation (General Note 10).

2. The design engineer must determine and designate in the plans which alternate types of mitered end sections will not be permitted. Restrict use based on corrosive or structural requirements.

3. Contact the District Drainage Engineer for possible alternate treatment of side drain mitered end sections where a minimum spacing of 3' will not result between the low points of the mitered end sections.

4. Provide ditch transitions on all grades in excess of 3%.
GENERAL NOTES
1. Endwall dimensions, locations and positions are for round and elliptical concrete pipe and for round and pipe-arch corrugated metal pipe. Round concrete pipe shown.
2. Front slope and ditch transitions shall be in accordance with Index 430-001.
3. Endwalls may be cast in place or precast concrete. Reinforcing steel shall be Grades 40 or 60. Additional reinforcement necessary for handling precast units shall be determined by the Contractor or the supplier. Cost of reinforcement shall be included in the contract unit price for Concrete. (Endwalls).
4. All exposed corners and edges of concrete are to be chamfered 1/2.
5. Concrete shall be Class I, except ASTM C476 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
6. On outfall ditches with side slopes flatter than 1:1, provide 20° transitions from the endwall to the flatter side slopes, right of way permitting.
7. For sodding around endwalls see Index 524-001.
8. Payment for concrete quantities for endwalls skewed to the pipe shall be made on the following basis:
   - Endwall skew to pipe: Use Tabled Value
     - 0° to 5°: Use Tabulated Value
     - 5° to 10°: 10°
     - 10° to 15°: 15°
     - 15° to 30°: 30°
     - 30° or over: 45°
9. Pipe length plan quantities shall be based on the pipe end locations shown in the standard location control end view, or lengths based on special endwall locations called for in the plans.
10. Payment for pipe in pipe culverts shall be based on plan quantities, adjusted for endwall locations subsequently established by the Engineer.
11. Endwalls to be paid for under the contract unit price for Class I Concrete (Endwalls), CY.

STANDARD LOCATION CONTROL

ENDWALL DIMENSIONS (EXCLUSIVE OF MULTIPLE PIPE SPACING)

ENDWALL POSITIONS FOR SINGLE AND MULTIPLE PIPE

PIECE AND SPACING FOR MULTIPLE PIPE

LEGEND
- Pipe skew
- Center To Center Pipe Spacing
- X Centerline To Centerline Dimension At Face Of Headwall

TOP VIEW

END VIEW

END VIEW (ENLARGED)
# ROUND CONCRETE AND CORRUGATED METAL PIPE

**Class I Concrete (CY)**

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<tr>
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<th>Number And Type Of Pipe And Skew Angle Of Pipe</th>
<th>Dimensions</th>
<th>Area</th>
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**Corrugated Metal Pipe Arch**

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**Note:** Use the guidelines of General Note B for selecting tabular quantities.

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**CONCRETE ENDWALLS SIMPLE AND MULTIPLE PIPE**

**STRAIGHT CONCRETE ENDWALLS**

---

**DATA AND ESTIMATED QUANTITIES FOR ONE ENDWALL**

---

**DESCRIPTION:** FY 2018-19 STANDARD PLANS

**INDEX:** 430-030

**PAGE:** 2 of 2
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered \( \frac{1}{2} \) unless otherwise shown.

6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), Cu-T, and Reinforcing Steel (Roadway), Lb.

### BILL OF REINFORCING STEEL

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</tr>
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<td>C</td>
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### ESTIMATED QUANTITIES

#### ITEM

**Class II Concrete**

- CU-YD: 11.3
- LB: 11.4

**Reinforcing Steel**

- CU-YD: 695
- LB: 695

### GENERAL NOTES

- Straight concrete endwalls are intended for use outside the clear zone.
- Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.
- Reinforcing steel shall be either Grade 40 or 60.
- Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
- Chamfer: All exposed edges and corners to be chamfered \( \frac{1}{2} \) unless otherwise shown.
- That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.
- Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.
- Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CU-YD and Reinforcing Steel (Roadway), LB.
SECTION BB

SECTION AA

PLAN

HALF ELEVATION

THRU ENDWALL

TYPICAL SECTION

NOTE: See Sheet 1 of 2 For General Notes.

BILL OF REINFORCING STEEL

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BENDING DIAGRAM

NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

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<th>UNIT</th>
<th>RCP</th>
<th>CMP</th>
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<tr>
<td>Footing &amp; Wall</td>
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<tr>
<td>Reinforcing Steel</td>
<td>Lb.</td>
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NOTE: See Sheet 1 of 2 For General Notes.
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II except ASTM C496 (6000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered ¼" unless otherwise shown.

6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.
**SECTION BB**

- Plan (Showing Bars in Footing)

**SECTION AA**

- Half Elevation
  - (Showing Bars in Back Face of Wall)

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD</th>
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<tr>
<td>D</td>
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**ESTIMATED QUANTITIES**

- Class II Concrete
- Cu. Yd.: 1,406
- Lb.: 16.2

**NOTE:** Cut and Field Bend Bars B as shown.

**TYPICAL SECTION THRU ENDWALL**

- Optional Entrance for Concrete Pipe

---

**DESCRIPTION:**

- 2018-19 Standard Plans
- Single and Double 66° Pipe

**INDEX:** 430-032

**SHEET:** 2 of 2
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered 45° unless otherwise shown.

6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness coated applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

GENERAL NOTES:

1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered 45° unless otherwise shown.

6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness coated applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.
GENERAL NOTES

1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 489 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered 45° unless otherwise shown.

6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

NOTE: All bar dimensions are out to out

10'-2" 5'-8"
2'-2" 2'-2"
20'-0"
40'-0"
20'-0"
1. Winged concrete endwalls are intended for use outside the clear zone.

2. Chamfer all exposed edges 90°.

3. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

4. Endwall to be paid for under the contract unit price for Class I Concrete.

5. Sodding to be in accordance with Index 524-001, and paid for under the contract unit price for Performance Turf, SY.

GENERAL NOTES

1. Winged concrete endwalls are intended for use outside the clear zone.

2. Chamfer all exposed edges 90°.

3. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

4. Endwall to be paid for under the contract unit price for Class I Concrete.

5. Sodding to be in accordance with Index 524-001, and paid for under the contract unit price for Performance Turf, SY.
SAFETY MODIFICATIONS FOR ENDWALLS

1. For use criteria see "Steel Grating Use Criteria" Index 430-011.
2. Grates shall be ASTM A242, A572 or A588, Grade 50 steel, and galvanized in accordance with Section 975 and 425-3.2 of the Standard Specifications.
3. Channel section C3 x 6.0 may be substituted for the C4 x 5.4 channel.
4. All steel reinforcing bars are #4 with 2" cover except as noted. Spacings shown are center to center. Lags to be 1'-5" minimum. Welded wire fabric (two cages max.) with an equivalent cross section area (0.20 sq. in.) may be substituted for bar reinforcement.
5. Drills 1/8" holes 8" deep with a rotary drill in existing endwall for dowel bars. Holes shall be thoroughly cleaned prior to installing Adhesive-Bonded Dowels.
6. Endwall to be paid for under the contract unit price for Class I Concrete (Endwalls), CY and Reinforcing Steel (Roadway), Lb. Cost of Adhesive-Bonded Dowels to be included in the contract unit price for reinforcing steel. Cost of grates to be paid for under the contract unit price for Endwall Grate, Lb. plan quantity. Cost of galvanized bolts and nuts to be included in the contract unit price for the grate.
7. Sod slopes 5' each side and above endwall. Sodding to be paid for under the contract unit price for Performance Turf, SY.

**DIMENSIONS AND QUANTITIES PER GRADE**

<table>
<thead>
<tr>
<th>Slope</th>
<th>Pipe</th>
<th>Channels @ 5.4 Lbs./LF</th>
<th>Bars @ 3.4 Lbs./LF (2 ea.)</th>
<th>Angles @ 3.2 Lbs./LF</th>
<th>(2)Total Weight Lbs.</th>
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**DIMENSIONS AND QUANTITIES PER U-ENDWALL**

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**GENERAL NOTES**

- SAFETY MODIFICATIONS FOR ENDWALLS

[Diagram of SAFETY MODIFICATIONS FOR ENDWALLS]

- Dimensions and quantities per grate

- Dimensions and quantities per U-endwall

- General notes

**INDEX**

- 430-090

- SHEET

- 1 of 1
PREFORMED POLYETHYLENE ALTERNATE  
SEE SHEET 2 FOR TYPICAL LOCATIONS

TYPE I (NON-REMOVABLE GRATE)

GENERAL NOTES

1. Trench drain is intended for use in gutters and driveways as shown on the typical locations on Sheet 2. Type I is intended for use in Type E, F, and drop curbing, and adjacent to traffic separators and standard barrier walls. The width of the channel grate for Type I Trench Drain shall be 15" throughout varying the depth of the channel neck. Type II may also be used in those locations if an independent laboratory certifies that the grating used has an open area equal to at least 0.27 square feet per linear foot. Type II is primarily intended for use in valley gutter across driveway openings and drop curbing. Type I may also be used in those locations. The width of the channel grate for Type I Trench Drain shall be the same as the width of the channel. The linear slope or gradient for Type II may be manufactured by varying the depth of the channel. Trench Drain shall not be placed in pedestrian paths unless ADA compliant grates are used.

2. Unless shown in the plans, outlet pipes and preformed channel inverts shall be sloped 0.6% or steeper toward the outlet regardless of the surface slope.

3. Trench drain may be stubbed directly into drain structures, or outlet pipes may be used to connect trench drain to drainage structures.

4. A cleanout port compatible with the manufactured system shall be provided for Type I. A cleanout port shall be at the upstream end and at intervals not to exceed 50 feet. The cleanout port shall provide an opening 6" to 10" wide (transverse to the trench length) and 18" to 24" long. Where cleanouts are placed adjacent to raised curb or separator, the curb or separator shall be formed around the cleanout. The cleanout shall have a removable load resistant cover or grate.

5. Trench excavation must allow for a minimum of 6" of concrete to be placed under and alongside the trench drain channel system. Concrete backfill shall meet the requirements of Section 347 of the Standard Specifications. At the end of all units (Type I or II), the concrete backfill shall extend 6" minimum past the end of the drain opening.

6. Transverse bars for Type I Trench Drain shall be spaced 4" to 6" on center.

7. Whenever the work disturbs existing conditions or work already completed, restore the same to its original condition in every detail. All such repair and replacement shall meet the approval of the Engineer.

Design Notes

1. Where placed adjacent to reinforced concrete barrier, the designer shall detail the plans the position of the drain relative to the barrier to avoid conflicts with the foundation. (See Index 521-001)

2. The designer shall identify the following in the plans:

(a) The type of drain at each location.

(b) The begin and end locations of the Trench Drain.

(c) The location of the outlet pipe if the Trench Drain is not stubbed directly into a drainage structure.

(d) The design flow (Q) for the Trench Drain must be shown on the plans.

3. Capture efficiency for Type I Trench Drain may be computed using the equations for slotted drain in FHWA's HEC 12 & 22. Grate Type I and Type II must have at least 30% open area.

4. Round pipe alternate is available in 12, 18, 24 and 36 inch.

5. Type II Preformed Channel with integral anchoring lugs are applicable.
TRENCH DRAIN

DESCRIPTION:

REVISION LAST STANDARD PLANS FY 2018-19 SHEET INDEX

12/06/17

WITHIN TYPE E CURB

WITHIN TYPE F CURB

WITHIN DROP CURB

ADJACENT TO TRAFFIC SEPARATOR

WITHIN VALLEY GUTTER

TYPICAL LOCATIONS FOR TYPE I

ROUND PIPE ALTERNATE SHOWN, BUT PREFORMED POLYETHYLENE ALTERNATE ACCEPTABLE

TYPICAL LOCATIONS FOR TYPE II

* As Necessary To Provide 6' Of Concrete On This Side Of Drain

WITHIN DROP CURB

TYPICAL LOCATIONS FOR TYPE II
1. The underdrain pipe shall be either 4" smooth or 5" corrugated tubing unless otherwise shown in the plans. The size to be furnished will be based on the nominal internal diameter of a pipe with a smooth interior wall. Except when prohibited by the plans, the special provisions or this standard, pipe with a corrugated interior wall may be provided based on the following size equivalencies:

- 4" smooth interior equivalent to 5" corrugated interior
- 5" smooth interior equivalent to 6" corrugated interior
- 6" smooth interior equivalent to 8" corrugated interior
- 8" smooth interior equivalent to 10" corrugated interior

2. Filter fabric shall be Type D-3 (See Specifications Section 985). The internal filter fabric of Type V underdrain shall have a permittivity of 0.7 /sec. and an AOS of #40 sieve.

3. Coarse aggregate shall be gravel or stone meeting the requirements of Sections 901-2 or 901-3. The gradation shall meet Section 901-4, Grades 4, 467, 5, 56 or 57 stone unless otherwise shown restricted in the plans.

4. Underdrain Type I, II, III and V shall be in accordance with Section 440.

5. Filter fabric shall be Type D-3 (See Specifications Section 985). The internal filter fabric of Type V underdrain shall have a permittivity of 0.7 /sec. and an AOS of #40 sieve.

6. When Type I is used, a filter fabric sock meeting Section 948 is required.

7. The designer should detail in the plans, the location of: (a) Type V underdrain, (b) nonstandard locations of Type I, II, and III underdrain, (c) underdrain inspection boxes, (d) cleanouts for Type V underdrain, and (e) underdrain outlet pipes.

8. The designer should specify the flow line elevations at the beginning, bends, junctions and ends of underdrain pipes and outlet pipes.

9. Underdrain outlet pipes shall be nonperforated and all bends shall be made using 90 deg. bends shall be constructed with at least 1' of straight pipe. Outlet pipes stubbed into inlets or other drainage structures shall be not less than 6" above the structure flow line. Outlet pipes discharging to grassed areas shall have concrete aprons, hardware cloth, and bordering sod as shown in Index 466-001 for Edgedrain outlets.

10. Pay Item shall be based on the size of the smooth interior products. The contract unit price for Underdrain, LF, shall include the cost of pipe, fittings, aggregate, egg, filter fabric, underdrain cleanouts, and concrete aprons.

The contract unit price for Underdrain Outlet Pipe, LF, shall be full compensation for trench excavation, pipe and fittings, concrete aprons, hardware cloth, and bordering sod as shown in Index 120-002 for the standard location of Type I, II, and III underdrain. The location of Type V underdrain and nonstandard locations of Type I, II, and III underdrain will be as detailed in the plans.

11. All filter fabric joints shall overlap a minimum of 1'. The internal filter fabric of Type V underdrain shall overlap into the coarse aggregate or the fine aggregate a minimum of 1'.

12. The designer should detail in the plans, the location of: (a) Type V underdrain, (b) nonstandard locations of Type I, II, and III underdrain, (c) underdrain inspection boxes, (d) cleanouts for Type V underdrain, and (e) underdrain outlet pipes.

13. The designer should specify the flow line elevations at the beginning, bends, junctions and ends of underdrain pipes and outlet pipes.
ADT increases chance of the repeated vehicle loadings. Box detailed on this sheet, and is recommended when high

All covers shall be furnished with pick holes. Fitted lifts or handles are not permitted.

Underdrain Inspection Box. Concrete apron to be included in the contract unit price for Underdrain Inspection Box.

Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications. Box shall be reinforced with No. 3 bars (Grade 60) on 8" centers both ways, sides and bottom.

1. Light duty cast iron cover and frame, see Specifications Section 962.

2. Manhole Type P Alternate A, Index 425-010, with Type I Frame and Cover, Index 425-001, may be used in lieu of the box detailed on this sheet, and is recommended when high ADT increases chance of the repeated vehicle loadings.
GENERAL NOTES

1. Pipe shall be any of the optional types permitted in Section 443 of the Specifications unless otherwise restricted in the plans. Dissimilar types of pipe will not be permitted in a continuous run of pipe.

2. Concrete pipe shall be placed with the slots positioned on sides.

3. Alignment joints are standard (gaskets not required). Recorrugation of metal pipe ends not required.

4. The contractor may submit other methods of providing slots having equal or greater area of opening, for approval by the Engineer.

5. Filter fabric shall be Type D-3 meeting the requirements of Section 985. All filter fabric joints shall lap a minimum of one (1) foot.

6. The standard cross section shall be constructed unless other section(s) described or detailed in the plans.

7. For supplemental details see Index 430-001.

8. The contractor shall take the necessary precautions to prevent contamination of the trench with sand, silt and foreign materials.

9. French drains shall be paid for under the contract unit price for French Drains, LF. The unit price shall include the cost of pipe, pipe plugs, pipe fittings, coarse aggregate and filter fabric in place, and the cost for trench excavation, backfill and compaction. The unit price shall also include the cost for disposal of surplus excavated materials and cost for restoration of pavement removed or damaged by French drain construction, but shall not include payments for items paid for elsewhere.

DESIGN NOTES

1. Pipe invert should be at or above the water table whenever possible.

2. French drains with minor dimensional changes or otherwise different from the standard cross-section shall be either described or detailed in the plans. French drains with significantly different cross-sections shall be detailed in the plans.

FRENCH DRAIN SYSTEM
**SLOTTED PIPE OPTIONS**

**OPTION A** - ROUND PIPE

**OPTION B** - ROUND OR ELLIPTICAL PIPE

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**ROUND PIPE**

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<th>Pipe Size</th>
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<th>Slot Cut Opening Max.</th>
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**ELLIPtical PIPE**

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<th>Pipe Size</th>
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**SLOTTED PIPE OPTIONS**

**SIDE VIEW**

**SECTION AA**

**SECTION BB**

**PICTORIAL VIEW**

**ROUND PIPE SHOWN**

---
1. The Frenchdrain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin. Use this skimmer in Frenchdrain Catchbasins and in other locations where there is a need to prevent oil, debris or other floating contaminants from exiting Catchbasins through outlet pipes.

2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket neatly to extend ½ inch beyond the joint on all sides.

3. Skimmer baffles, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrile butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.

4. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.

5. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.

6. All costs for furnishing and installing a Frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.

7. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.

**GENERAL NOTES**

**TYPE I SKIMMER**

**GENERAL NOTES**

1. The Frenchdrain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin. Use this skimmer in Frenchdrain Catchbasins and in other locations where there is a need to prevent oil, debris or other floating contaminants from exiting Catchbasins through outlet pipes.

2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket neatly to extend ½ inch beyond the joint on all sides.

3. Skimmer baffles, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrile butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.

4. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.

5. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.

6. All costs for furnishing and installing a Frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.

7. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.

**DESIGN NOTES**

1. The contractor may submit an alternative design prefabricated Frenchdrain Skimmer for approval by the Engineer.

2. Show, in the plans, the location of the basin and indicate the interior side(s) of the basin on which a skimmer will be installed.

3. Type I Skimmer dimensions shall be based on the outlet pipe diameter as shown in the dimension table.

4. Type II Skimmers are to be used only with outlet pipe diameters of 13', 18", and 24".

**TYPE II SKIMMER**
SPECIAL MANHOLE STRUCTURE
DETAIL WITH OUTFALL

DESIGN NOTES:
1. Depth of Casing Varies, 60 min.
2. Depth of Open Hole, 10'-20'.
3. Actual Size of The Inflow And Outflow Chambers Will Be Determined By The Size Of The Pipes (Refer To Table 3 Of Index 425-010). The Width Of The Box Shall Be Constant Based On The Largest Pipe. The Length Is To Be Adjusted Based On Size and Orientation Of The Pipes.
ALIGNMENT OF OUTLET PIPE

NOTE: For Section AA see following Sheets.

SUBDRAINAGE PIPE

Hole Pattern In Accordance With The Standard Specifications

Hole Pattern Duplicated On Top Side Of Pipe

Trough Slope Shall Match Outlet Pipe Slope

4" Dia. Outlet Pipe (Nonperforated) Length Varies

NOTE: For Section AA see following Sheets.

Subdrainage Pipe

45° Elbow Or 90° Bend

4" Elowedrain (4" Cross For Outlet Pipe)

Base of Ditch Subdrainage Pipe shall be capped.

6" Thick (0.19 CY-1:4 Slope) 6" Thick (0.10 CY-1:6 Slope)

Class NS Concrete (6" Thick) 2' sod

8" Galvanized Hardware Cloth

Bevel - Trough For Outlet Pipe

1:6 Slope 1:4 Slope

Outlet Pipe (s) (Single Or Double Pipe) Double Pipe At 1' Centers. Single Pipe Shown

Outlet Pipe For Counter Drain (See 1:4 Detail Above)

Elbow Or Bend As Required (See Note No. 7)

4" Dia. Minimum Outlet Pipe (Nonperforated) Length Varies

Varies (To Exist. Shdr. Pavt.)

Varies (1' Min.) (See 1:4 Detail Above)

Trough For Outlet Pipe

Outlet Pipe (s) (Single Or Double Pipe) Double Pipe At 1' Centers. Single Pipe Shown

Outlet Pipe For Counter Drain (See 1:4 Detail Above)

Elbow Or Bend As Required (See Note No. 7)

4" Dia. Minimum Outlet Pipe (Nonperforated) Length Varies

Varies (To Exist. Shdr. Pavt.)

Varies (1' Min.) (See 1:4 Detail Above)

Trough For Outlet Pipe

OUTLET PIPE APRON

1.8" Bend shall be used to connect the outlet pipe to the concrete pavement subdrain pipe. The elbows or bends shall be of the same material as the outlet pipe but compatible with the pipe.

When directed by the Engineer, outlet pipes shall be stubbed into existing inlets or into existing ditch pavements at an elevation 6" above the inlet flowline or ditch bottom. Concrete apron and bordering sod are not required for stubbed outlets but replacement sodding will be required at trenches for pipes stubbed into paved ditches.

In sag vertical curves separate outlet pipes for concrete pavement subdrains from opposite directions shall use a single apron unless otherwise shown in the plans or otherwise directed by the Engineer.

Backfill around outlet pipes shall be of cohesive soils, draincrete will not be permitted.

Existing paved shoulder that is removed for the construction of concrete pavement subdrainage shall extend 50' beyond and begin 50' before the flat point (100' overlap). Concrete pavement subdrainage shall be placed on the low side of ramps of crossroad terminals.

Concrete pavement subdrainage shall be constructed adjacent to the low edge of the roadway pavement and under travel lanes, auxiliary pavement and shoulders, as called for in the plans. When the low edge shifts between outside and inside edges of pavement the concrete pavement subdrainage shall extend 50' beyond and begin 50' before the flat point (100' overlap).

Concrete pavement subdrainage shall be constructed on a grade parallel with the edge of pavement profile, except on profiles flatter than one-tenth percent (0.10%). The concrete pavement subdrainage shall be constructed on a grade of one-tenth percent (0.10%).

Outlet pipes shall be constructed at a maximum of 500' intervals. Elbows or 90° bends shall be used to connect the outlet pipe to the concrete pavement subdrain pipe. The elbows or bends shall be of the same material as the outlet pipe but compatible with the pipe.

The upper end of each separate run of the concrete pavement subdrainage pipe shall be capped.

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When directed by the Engineer, outlet pipes shall be stubbed into existing inlets or into existing ditch pavements at an elevation 6" above the inlet flowline or ditch bottom. Concrete apron and bordering sod are not required for stubbed outlets, but replacement sodding will be required at trenches for pipes stubbed into paved ditches.

In sag vertical curves separate outlet pipes for concrete pavement subdrains from opposite directions shall use a single apron unless otherwise shown in the plans or otherwise directed by the Engineer.

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**Notes for Draincrete**

**New Construction**

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. The contractor shall confine the construction of draincrete edgedrain to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

**Method of Payment**

1. The contract unit price for Edgedrain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess materials, filter fabric, draincrete edgedrain pipe and fittings, and draincrete.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

**For Rehabilitation**

1. The contract unit price for Edgedrain (Draincrete) LF shall be full compensation for removal of existing shoulder pavement, trench excavation, disposal of excess materials, filter fabric, draincrete edgedrain pipe and fittings, and draincrete, necessary for edgedrain construction.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

Shoulder joint seal shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.

Shoulder joint seal shall be paid for under the contract unit price for Pavement Joint, LF.
NOTES FOR DRAINCRETE

CONCRETE TRAVEL LANES,
SHOULders, AND AUXILIARY PAVEMENT

NOTES FOR DRAINCRETE

PAVEMENT SUBDRAINAGE

1. The edgerain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. The contractor shall confine the construction of draincrete edgerains to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

NEW CONSTRUCTION:

1. The contract unit price for Edgerain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess material, filter fabric, draincrete edgerain pipe and fittings and draincrete.

2. Type B-12.5 shall be paid for under the contract unit price for Optional Base.

3. Shoulder pavement shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.
Concrete Pavement Subdrainage

CONCRETE TRAVEL LANE, SHOULDERS, AND AUXILIARY PAVEMENT

ASPHALT SHOULDERS

TREATED PERMEABLE BASE SUBDRAINAGE

EXCERPTS FROM THE TEXT:

**Concrete Pavement Subdrainage**

**General Notes for Treated Permeable Base Edgedrain**

**New Construction**

1. The contractor shall confine the construction of edgedrain to an area in which the entire operation can be carried out in (5) work days, unless another construction period is called for in the plans.

**Method of Payment**

**New Construction**

1. Payment shall be full compensation for trench excavation, disposal of excess materials, filter fabric, pipe and fittings, necessary for concrete pavement subdrainage construction. Payment shall be included in the cost for Asphalt Treated Permeable Base, CF or Cement Treated Permeable Base, CT.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

2. Shoulder pavement and separation layer shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.
**DESCRIPTION:**
This Design Standard includes details for five types of piles with two thicknesses. Types “B1”, “B2”, “C1” and “C2” piles (corner piles) are of reinforced concrete construction, and Type “A” is of prestressed concrete construction. The piles shall be manufactured, cured and installed in accordance with the requirements of the contract documents.

**MATERIALS:** (for materials not listed refer to the Specifications)
- **CONCRETE**
  - Class: V (Special) for slightly and moderately aggressive environments
  - V (Special) with silica fume, metakaolin or ultrafine fly ash for extremely aggressive environments
  - Unit weight: 150 pcf
  - Modulus of Elasticity: Based on the use of Florida limestone concrete

- **REINFORCING STEEL**
  - ASTM A615 Grade 60

- **PRESTRESSING STEEL**
  - ASTM A416 Grade 270 (Low-Relaxation Strand)

**DESIGN PARAMETERS:**
- **Type “A”**
  - Concrete Compressive Strength at release of prestressing: 4000 psi minimum
  - Uniform compression after prestressing losses: 1000 psi minimum
  - Pick-up, Storage and Transportation: 0.0 psi tension with 1.5 times pile self weight

- **Types “B1”, “B2”, “C1” & “C2”**
  - Minimum compressive strength f’ci ≥ 4000 psi required.

**ENVIRONMENT:**
The pile designs are applicable to all Environments.

**PLASTIC FILTER FABRIC:**
The plastic filter fabric shall extend to the bottom of the “X” dimension.

**PILE PICK-UP AND HANDLING:**
- **Type “A”**
  - Pick-up of pile may be either a single point pick-up or a two point pick-up as shown below.
  - Two point pick-up for lifting out of forms & two point support for storage & transportation.
  - Single point pick-up for installation only.

- **Types “B1”, “B2”, “C1” & “C2”**
  - Two point pick-up for lifting out of forms & two point support for storage & transportation.
  - Minimum compressive strength f’ci ≥ 4000 psi required.

**PILE FIT-UP:**
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to $\frac{1}{4}$" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5$\frac{1}{4}$". No changes shall be made to the tongues or grooves.

---

**DETAIL “A”**
(Cap and Anchoring System Not Shown)  
(Section Taken Above Dimension X)

**NOTES AND DETAILS**
- **PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS**
1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are #5 and Bars S are #4.
4. At the Contractor’s option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
5. The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 933 in lieu of Bars A and Bars S if the wire size and spacing provide the same area of reinforcing steel per foot as the Bars shown.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

### TYPICAL PILE

**Sheet Pile Dimensions**

<table>
<thead>
<tr>
<th>Section</th>
<th>A-A</th>
<th>B-B</th>
<th>C-C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wall Thickness (in.)</strong></td>
<td><strong>Maximum L (in.)</strong></td>
<td><strong>Strand Dia.</strong></td>
<td><strong>Maximum</strong></td>
</tr>
<tr>
<td>1'-0*</td>
<td>10&quot;</td>
<td>0.5</td>
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<tr>
<td>1'-0*</td>
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<td>0.6</td>
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* Unit Prestress after losses.

### DIMENSION A

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<tr>
<td>S2</td>
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<td>S3</td>
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<td>S4</td>
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### DIMENSION B

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<td>1'-4&quot;</td>
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<tr>
<td>2-PIECE</td>
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**Bar Bending Diagrams**

**NOTES:**

1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are #5 and Bars S are #4.
4. At the Contractor’s option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
5. The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 933 in lieu of Bars A and Bars S if the wire size and spacing provide the same area of reinforcing steel per foot as the Bars shown.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.
**STIRRUP DIMENSIONS (T = 10")**

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**STIRRUP DIMENSIONS (T = 12")**

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**NOTES:**

1. This drawing includes details for precast concrete corner piles for 10' and 12' thick sheet pile systems. The details apply equally to both thicknesses.
2. The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out to out.
4. Bars A are #8 and Bars B are #4.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60° only.
6. At the Contractor’s option Bars S may be fabricated as a 2 piece bar with a minimum lap length of 1'-4", as shown in Bar Bending Diagrams.
7. If a Type “B1” or “B2” pile is used as a Starter Pile show tongue on both sides of pile from Dim X down. Show dimensions for bars S2, S3 & S4 in shop drawings.
8. If tongue must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.

**DETAIL “D”**

**TYPE “B1” PILE SHOWN, TYPE “B2” PILE OPPOSITE HAND**

**ELEVATION**

**PRECAST CONCRETE SHEET PILE WALL**

**CONVENTIONAL**

**INDEX**

**455-400**

**PREPARED BY:**

**FOOT**

**STANDARD PLANS**

**FY 2018-19**

**DESCRIPTION:**

**LAST REVISION:**

**B-1/01/16**

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**SHEET 3 of 4**
1. All bar dimensions are out-to-out.
2. Bars A are #8 and Bars S are #4.
3. This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
4. If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
5. If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.
DESCRIPTION:
This Index includes details for six types of piles with two thicknesses. Type "A" is prestressed concrete construction with CFRP or HSSS strands. Types "B1", "B2", "C1" and "C2" piles (corner piles) are reinforced concrete construction. Manufacture, cure and install Sheet Piles in accordance with the requirements of the contract documents.

MATERIALS: (for materials not listed refer to the Specifications)
CONCRETE
Class: V (Special)
Unit weight: 145 pcf
Modulus of Elasticity: Based on the use of Florida limestone aggregate concrete

REINFORCING BARS
Glass Fiber Reinforced Polymer (GFRP) bars meeting the requirements of Specification Section 932.

PRESTRESSING STRAND
Stainless Steel: Prestressing steel shall be seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
Carbon FRP: Prestressing strand shall be CFRP strand, meeting the requirements of Specification Section 933.

DESIGN PARAMETERS:
Type "A"
Concrete Compressive Strength at release of prestressing: 4000 psi minimum
Uniform compression after prestressing losses: 700 psi minimum
Pick-up, Storage and Transportation: 450 psi tension with 1.5 times pile self weight for single-point pick-up at f'c ≥ 6000 psi

Types "B1", "B2", "C1" & "C2"
Pick-up, Storage and Transportation: Minimum compressive strength f'ci ≥ 4000 psi required for two-point pick-up; f'c ≥ 6000 psi for single-point pick-up.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:
Two-point pick-up for lifting out of forms & two-point support for storage & transportation. 
Single-point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to ½" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5½". No changes shall be made to the tongues or grooves.

NOTE: Detail "A" shows a Part-Plan View of a assumed bulkhead. See Bulkhead plans for actual Plan View.

CROSS REFERENCES:
For Dimensions L and X see Sheet Pile Wall Data Table in Structures Plans.
STIRRUP DIMENSIONS (T = 10")

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>T1</th>
<th>T2</th>
<th>7&quot;</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

STIRRUP DIMENSIONS (T = 12")

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>T1</th>
<th>T2</th>
<th>7&quot;</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>1½</td>
<td>½</td>
<td>1½</td>
<td>½</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

BAR BENDING DIAGRAMS

BAR A1 or A4

BAR A2

Varies

SHEET PILE DIMENSIONS

<table>
<thead>
<tr>
<th>T (in.)</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>3½</td>
<td>4½</td>
</tr>
<tr>
<td>45°</td>
<td>3½</td>
<td>4½</td>
</tr>
<tr>
<td>60°</td>
<td>3½</td>
<td>4½</td>
</tr>
</tbody>
</table>

DETAIL "D"

(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)

NOTES:
1. This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
2. The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-out.
4. Bars A are GFRP #8 and Bars S are GFRP #4.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60° only.
6. Bars S are fabricated as a 2 piece stirrup with a minimum lap length of 8", as shown in Bar Bending Diagrams, or a single closed bar (hoop) when approved by the Engineer.
7. If Type "B1" or "B2" pile is used as a Starter Pile show tongue on both sides of pile as shown in Bar Bending Diagrams, or a single closed bar (hoop) when approved by the Engineer.
8. If tongue must be on opposite side from that shown all dimensions and Bars A, S, and S4 will be the same but opposite hand.
9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.

TYPE "B1" AND "B2" - VARIABLE ANGLE CORNER PILE
**This Bar A4 shall be 1'-2" shorter than other A4 bars for T = 12".

"** This Bar A4 (not shown in elevation) is included only if T = 12".

*This A4 bar ends here if T=12".

1. All Bar dimensions are out-to-out.

2. Bars A are GFRP #8 and Bars S are GFRP #4.

3. This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.

4. If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.

5. At the Contractor's option Bars S may be fabricated as a 2 piece or 3 piece bar with a minimum lap length of 8", as shown in Bar Bending Diagrams, or as a single closed bar (hoop) when approved by the Engineer.

6. If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.

7. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

** Type "C1" and "C2" - Right Angle Corner Pile

** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

"** This Bar A4 (not shown in elevation) is included only if T = 12".

This A4 bar ends here if T=12".

---

** This Bar A4 shall be 1'-2" shorter than other A4 bars for T = 12".

** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

---

For 10" Pile

For 12" Pile

** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

---

** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

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** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

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** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

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** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".

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** Bar A4

** This Bar A4 (not shown in elevation) is included only if T = 12".
NOTES:

1. A bypass switch shall be installed to override each timing interval in case of a malfunction.

2. "STOP HERE ON RED" is omitted in Type I operation and "TRAFFIC SIGNALS" are omitted in Type II operation.

3. The time between beginning of flashing yellow on "Drawbridge Ahead" sign and the clearance of traffic signal to red, or beginning of flashing red should not be less than the travel time of a passenger car, from the sign location to the stop line, traveling at the 85 percentile approach speed.

4. Beginning of operation of drawbridge gates shall not be less than 15 seconds after steady red or 20 seconds after flashing red (actual time may be determined by the bridge tender).

5. Time of gate lowering and raising is dependent upon gate type.

6. Time of bridge opening is determined by the bridge tender.

7. Each gate shall be operated by a separate switch.

8. On each approach (Type II), all four red signals shall be on the same two circuit flashers, with the two top signals on one circuit, and the two bottom signals on the alternately flashing circuit.

9. A drawbridge Ahead sign is required for both types of signal operation. However, a flashing beacon shall be added to the sign when physical conditions prevent a driver traveling at the 85% approach speed from having continuous view of at least one signal indication for approximately 15 seconds.

10. Requirements on gate installation are contained in Section 4I of the "Manual on Uniform Traffic Control Devices".

11. In accordance with Traffic Engineering Manual (Topic Number 750-000-005) Section 2, "SLIPPERY WHEN WET SIGNS shall be placed in advance of all MOVABLE and NONMOVABLE STEEL DECK BRIDGES."

* Field conditions may require adjustment of this standard distance.

TRAFFIC CONTROL DEVICES FOR MOVABLE SPAN BRIDGE SIGNALS

INDEX
FA 2018-19 STANDARD PLANS

FY 2018-19

DESCRIPTION:

<table>
<thead>
<tr>
<th>S E E M E T A L N O .8</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8-5 SLIPPERY WHEN WET SIGN</td>
</tr>
<tr>
<td>See Note 11</td>
</tr>
</tbody>
</table>
BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND
TO BE USED WITH TYPE 1 OPERATION, AS SHOWN ON PREVIOUS SHEET
MONOTUBE SUPPORT MOUNTING

NOTES:
1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only when gate arm is in the lower position or in the process of being lowered. The number of lights shall vary accordingly to length of the gate arm.
2. Alternating 16” pattern of fully reflectorized red and white stripes.
NOTES:
1. The location of flashing warning devices and stop lines shall be
   established based on future (or present) installation of gate with
   appropriate track clearances.
2. Where plans call for railroad traffic control devices to be
   installed in curbed medians, the minimum median width shall be
   12'-6".
3. Location of railroad traffic control device is based on the
   distance available between face of curb & sidewalk. 0 to 6' -
   Locate device inside sidewalk. 6' to 9' - Locate device between
   face of curb and sidewalk.
4. Stop line to be perpendicular to edge of roadway, approx. 15'
   from nearest rail; or 8' from and parallel to gate when present.
5. When a cantilevered-arm flashing warning device is used, the
   minimum vertical clearance shall be 12'-6" from above the Crown
   of Roadway to the Lowest Point of the Overhead Signal Unit.

TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY
RAILROAD CROSSING AT
TWO (2)-LANE ROADWAY

Stop Bar Perpendicular to Edge Of Travel Way Or B From & Parallel To Gate When Present

24" White
Future Gate Location

RAILROAD CROSSING AT
MULTILANE ROADWAY

Stop Bar Perpendicular to Edge Of Travel Way Or B From & Parallel To Gate When Present

24" White
See Note 5

RAILROAD PROTECTION Device Is Not To Be Located Within 1' Of The RR Center Line.

24" White

24" White

NOTES:
1. When computing pavement message, quantities do not include traverse lines.
2. Placement of sign W10-1 is in a residential or business district, where low speeds are prevalent, the W10-1 sign may be placed a minimum distance of 100' from the crossing. Where street intersections occur between the RR pavement message and the tracks an additional W10-1 sign and additional pavement message should be used.
3. A portion of the pavement markings symbol should be directly opposite the W10-1 sign.
4. Recommended location for FTP-61-06 or FTP-62-06 signs, 100' urban and 300' rural. See Index 700-102 for sign details.
5. Gate Length Requirements:
   For Two-way undivided sections: The gate should extend to within 1' of the center line. On multiple approaches the maximum gate length may not reach to within 1' of the center line. For those cases, the distance from the gate to the center line shall be a maximum of 4'.
   For one-way or divided sections: The gate shall be of sufficient length such that the distance from the gate tip to inside edge of pavement is a maximum of 4'.

SPEED (mph)  "A" (ft)  
60  400
55  325
50  250
45  175
40  125
35  100
URBAN  85 M.P.H.
MEDIAN SIGNAL GATES FOR
MULTILANE UNDIVIDED URBAN SECTIONS
(THREE OR MORE DRIVING LANES IN ONE DIRECTION, 45 MPH OR LESS)

NOTE:

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>Dimension &quot;A&quot;</th>
<th>Dimension &quot;B&quot;</th>
<th>Dimension &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Ft.</td>
<td>6&quot;</td>
<td>36&quot;</td>
<td>5</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5</td>
</tr>
<tr>
<td>16-17 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>30&quot;</td>
<td>45&quot;</td>
<td>5</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>30&quot;</td>
<td>45&quot;</td>
<td>5</td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>36&quot;</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>29-31 Ft.</td>
<td>36&quot;</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>32-34 Ft.</td>
<td>36&quot;</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>36&quot;</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>
LOCATION OF THE ADVANCE WARNING SIGN

<table>
<thead>
<tr>
<th>SPEED (mph)</th>
<th>DISTANCE (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>50</td>
</tr>
<tr>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>40</td>
<td>125</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
</tr>
<tr>
<td>55</td>
<td>325</td>
</tr>
</tbody>
</table>

NOTE:
1. "STOP AHEAD" is standard and preferred sign message. Another message may be approved when appropriate for specific situations.
2. Pull Boxes 200’ Nominal Spacing
3. RR Control Cabinet To Contain Normally Closed Relay. (Furnished By RR)
4. Pull Box
5. Advance Warning Sign Location May Be Adjusted To Fit Field Condition
6. The Distance Is Measured Along Right Edge Of Pavement From RR Stop Bar To Sign Advance Warning Sign.

TYPICAL PLAN

FUNCTIONAL BLOCK DIAGRAM
### TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post &quot;A&quot;</td>
<td>HSS 2½ x 1½ x ½</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS 2½ x 1½ x ½</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>2¾ NPS (Sch. 10)</td>
<td>2.785&quot;</td>
<td>0.12&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 3.000 x 0.120</td>
<td>3.000&quot;</td>
<td>0.12&quot;</td>
</tr>
<tr>
<td>Top Rail Support Bar</td>
<td>¾&quot; Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Handrails</td>
<td>3½ x 1½ x ½</td>
<td>1.900&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>HSS</td>
<td>3 x 1½ x ½</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>HSS 2 x 2 x ½</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeves</td>
<td>HSS 1.500 x 0.125</td>
<td>1.500&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>HSS 1.500 x 0.125</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>¾&quot; Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

### NOTES

Notes:
1. Shop Drawings are required; see Specification Section 515.
2. For bridge mounted railings work this Index with Index 515-051 Bridge Bicycle/Pedestrian Railing.
3. Materials:
   a. Pipe Rails and Pickets: ASTM A500 Grade B, C or D, or ASTM A36 Grade B for standard weight pipe (Schedule 40) and ASTM A36 for bars.
   b. Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A501.
   c. Steel Plate: ASTM A36 or ASTM A709 Grade 36.
   d. U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
   e. Stainless steel (SS) screws: Type 316 or 18-8 Alloy.
   f. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
      i. Hex Head Bolts: ASTM A307 or ASTM F1554
         1. ¾" diameter single bolt option, Grade 36
         2. ¾" four bolt option, Grade 55
   g. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55.
   h. Flat Washers: ASTM F436
   i. Bearing Plates: ASTM A36 or ASTM A706 Grade 36.
   j. Shims: ASTM B169 Alloy 6061.
4. Fabricate pickets and vertical panel elements parallel to the posts; except Type 2, 3 and 5 panel infills may be fabricated parallel to the longitudinal grade. Maintain a maximum clear opening of 5½" for standard installations and 3½" when a 4" sphere requirement is indicated in the Data Tables.
5. Maximum spacing between expansion joints is 40'-0". Locate an Expansion Joint between the posts on either side of the Deck Expansion Joint.
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K".
8. Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
9. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
   a. Grades Steeper than 5%.
   b. Three or more steps.
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.
Handrail required for ramps (Handrail continuous at landings between runs. Handrail = 1½ NPS Sch. 40). For slopes greater than 5%:
Max. ramp slope = 8.33% Max. ramp cross-slope = 2.0% LANDING REQUIREMENTS
Max. landing slope = 2% Max. landing cross slope = 2%

RAILINGS ON GRADES STEEPER THAN 5% (Type 1 - Picket Railing Shown, Other Types Similar)

ELEVATION (Showing Inside Face of Railing with Type "A" Posts)

NOTES:
* Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.
** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

See Plans for continuation or termination limits of railing.

RAMP REQUIREMENTS

EXPANDED ELEVATION AT CORNERS
DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS

See "Typical Railing Details" for post, rail & picket or infill panel details

For slopes greater than 5%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%
SECTION A-A

Typ. Picket ~ 6" O.C. (Max.)

Typ. Picket Spacing ~ 2 5/8" ~ SHR

SECTION A-A

DETAIL "1A"

(Top of Picket Connection)

DETAIL "1B"

(Bottom of Picket Connection)

PICKET NOTES:
* Picket Spacing of 6" centers is based on a 5/8" Ø Bar for standard applications.
When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).

TYPE 1 - PICKET INFILL PANEL

Ties @ 1'-0" center (Post and End Rail)

Ties @ 2'-0" center (Intermediate & Bottom Rail)

NOTE:

1. See Plans for Infill Panel option required.

SECTION A-A

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPONENT</strong></td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter)</td>
</tr>
<tr>
<td>Tie Wires</td>
</tr>
<tr>
<td>Tension Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
</tr>
</tbody>
</table>

CHAIN-LINK PANEL NOTE:
Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
TYPE 3 - SUNSHINE INFILL PANEL

*Arc, Rays and Sun Segment may be formed in a single panel from 3/8 steel plate pattern cut with laser or plasma CNC, welded to a 1 x 1 x 3/8 Angle Border or the 3/4 x 3/8 Channel Border shown.

NOTES:
1. See Plans for Infill Panel Option required.

SECTION A-A

SECTION C-C

DETAIL "3A"
INTERMEDIATE RAIL/RAY CONNECTION

DETAIL "3B"
BOTTOM RAIL/RAY CONNECTION

DETAIL "3C"
RAY/ARC CONNECTION

DETAIL "3D"
RAY/ARC CONNECTION (Continuous Top Rail)

DETAIL "3E"
PANEL END CONNECTION AT POST WITH EXPANSION JOINT

SECTION A-A

SECTION C-C

SECTION B-B
PANEL END CAP

NOTES:
1. See Plans for Infill Panel Option required.
NOTES:

1. See Plans for Infill Panel Type required.
**TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)**

- Edge Shim (8" long x 3/4" wide x thickness as reqd.)
- Bed of Adhesive Bonding Material

**TYPICAL SECTION ON RETAINING WALL (Case II)**

- 1'-0" (Min.) wide bed of Adhesive Bonding Material
- Full size Shim Plates when required for height adjustment
- Edge Shim (8" long x 3/4" wide x thickness as reqd.)

**TYPICAL SECTION ON STEPS & STAIRS (Case III)**

- Washers or Leveling Channel
- Minimum 2 ~ #4 Bars in Top of Structure for Case IIa, III & IV
- Minimum #4 Bars @ 1'-0" (Max. spacing for Case IIa)

**TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)**

- * Embedment length "C" may be reduced to 9" for the 42" height railings for Case IIb, when the post spacing does not exceed 5'-0".

**ANCHOR BOLT TABLE**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>I</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>1'-2&quot;</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>IIb</td>
<td>Gravity Wall Index 400-011</td>
<td>6&quot;</td>
<td>3 1/2&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Checkwall</td>
<td>4&quot;</td>
<td>4 1/2&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

* When required; measured from top of sidewalk.

**DESCRIPTION:**

FY 2018-19 STANDARD PLANS

PEDESTRIAN/BICYCLE RAILING (STEEL)

INDEX 515-052

SHEET 8 of 8
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>ALLOY</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1½ x 2.50 x 0.125</td>
<td>1.50 x 2.50/2.00</td>
<td>0.250</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion See Details</td>
<td>2½ x 7&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6</td>
<td>2½ NPS (Sch. 10)</td>
<td>2.875&quot; x 0.125</td>
<td></td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2½ NPS (Sch. 10)</td>
<td>2.875&quot; x 0.125</td>
<td></td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</td>
<td>2.500&quot; x 0.125</td>
<td></td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>Extrusion 2½ x 2.50 x 0.125</td>
<td>2.500&quot; x 2.00</td>
<td></td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1½ NPS (Sch. 40)</td>
<td>1.975&quot; x 0.125</td>
<td></td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>1½ Ø Round Bar</td>
<td>0.750&quot; N/A</td>
<td></td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6061-T6</td>
<td>2½ Ø Round Bar</td>
<td>0.750&quot; N/A</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. Shop Drawings are required, see Specification Section 515.
2. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
3. Perforated panels (Type S) Alloy 3003-H14
4. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
5. Aluminum screws: Alloy 2024-T4 or 7075-T6
7. See Screw Slot Details Section 1.3

3" ROUND TOP CAP RAIL
ALTERNATE TOP RAIL SECTION
TOP CAP RAIL INNER SPICE SLEEVE
ALTERNATIVE BOTTOM & INTERMEDIATE RAIL SECTION FOR TYPE 3, 4 & 5 RAILINGS
POST TYPE "C" SCREW SLOT SECTION
SCREW SLOT DETAIL
OPTIONAL TOP PLATE EXTRUSION SECTION (POST TYPE "C")
Handrail required for ramps (Handrail continuous at landings between runs)

**Typical Railing Details & Railings on Grades 0% to 5%**

(Type 1 - Picket Railing Shown, Other Types Similar)

### Notes:

* Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.

** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

### Expanded Elevation at Corners

**Detail for Non-Continuous Railing at Corners**

Note: Non-continuous corners are permitted when handrails are not required.

### Railing Requirements

### Landing Requirements

Max. landing slope = 2%
Max. landing cross-slope = 2%

### Ramp Requirements

For slopes greater than 3.33%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%

### Typical Railing Details

ELEVATION

(Showing Outside Face of Railing with Type "A" Posts)

EXPANDED ELEVATION AT CORNERS

See Plans for continuation or termination limits of railing.

RAILINGS ON GRADES STEEPER THAN 5%

(= Type "B" or "C" Post

See "Typical Railing Details" for post, rail & picket or infill panel details

Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1½ NPS Sch. 40

Horizontal handrail extension at landing

Note: Non-continuous corners are permitted when handrails are not required.

For slopes greater than 3.33%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%

### Railing Requirements

### Landing Requirements

Max. landing slope = 2%
Max. landing cross-slope = 2%

### Ramp Requirements

For slopes greater than 3.33%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%

### Typical Railing Details

ELEVATION

(Showing Inside Face of Railing with Type "A" Posts)
BASE PLATE DETAILS FOR TYPE "C" POST

(Screws Not Shown for Clarity)

Countersunk holes for 5/8" Ø x 1½" Self-Tapping Screws (Typ.)

COUNTERSUNK HOLES FOR 5/8" Ø x 1½" SELF-TAPPING SCREWS (TYP.)

Top Rail

Post Type "C" (Typ.)

(b) Countersunk holes for Self-Tapping Screws (Min. 3/16" deep, 3/8" Max.)

Optional Intermittent weld in-lieu of Self-Tapping screws between posts.

Notes:
† See Sheet 4 for Notes.
†† See Sheet 4 for Notes.
††† Length varies for beveled posts on grades. Holes must be drilled plumb to align with screw slot.
SECTION A-A

SEE DETAIL "1B"

SEE DETAIL "1A"

PICKET NOTES:

* Picket Spacing of 6\(\text{"}\) centers is based on a \(\frac{3}{8}\) Ø Bar for standard applications. When shown in the Contract Plans a 4\(\text{"}\) picket spacing may be required. See Note 4 (Sheet 1).

TYPE 1 - PICKET INFILL PANEL

Equal Clear Openings at Posts
\(\frac{3}{8}\) min. ~ \(\frac{5}{8}\) max. (Typ.)

SECTION A-A

NOTES:

1. See Plans for Infill Panel option required.

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F668</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>5/32&quot; (min. thickness) x 5/32&quot; (min. width) x 2'-7&quot; (min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc-Coated Steel</td>
</tr>
</tbody>
</table>

CHAIN-LINK PANEL NOTE:

Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

10/25/17 4:21:50 PM
11/01/16
515-062
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 1/8" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the 3x8½x5½ Channel Border shown.

NOTES:
1. See Plans for Infill Panel Option required.
**DESCRIPTION:**

**TYPE 5 - PERFORATED INFILL PANEL**

- **SECTION A-A**
  - Panel Mullion
  - Panel Width: 3'-0" Max.
  - Panel Height: 2'-0" Max.
  - Perforated Panel (0.04" Min.)

- **SECTION C-C**
  - Panel/Spline Connection
  - Inside Face of Rail
  - Channel 3/8"x3/8"x3/16" (Typ.)
  - Perforated Panel (0.04" Min.)
  - B"xB" Filler Strip

- **DETAIL "5A"**
  - Panel/Rail Connection
  - (Top Shown, Bottom Similar)
  - #10 x 1/2" Pan Head Screws @ 2'-0" sp.
  - Perforated Panel (0.04" Min.)
  - Channel 3/8"x3/8"x3/16" (Typ.)

- **DETAIL "5B"**
  - Panel End Connection
  - (Expansion Joint Shown, Sides Similar)
  - #10 x 1/2" Pan Head Screws @ 1'-0" sp.
  - Perforated Panel (0.04" Min.)

**REPEATING PATTERN DETAIL FOR PERFORATED PANEL**

**DETAIL "5A"**

- Seal welding mitered corners is permitted

**DETAIL "5B"**

- Seal welding mitered corners is permitted

**10 /25 /2017**

- REV 515-062
NOTES:
1. Shop Drawings are required.
2. Work with Specification Section 515.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T3 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM B209, Alloy 6061-T6
   C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6
   D. End Rails 90° bends and corner bends with a maximum 4 foot spacing; Alloy 6061-T6 is permitted.

### RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2” NPS (Sch. 40)</td>
<td>2.375”</td>
<td>0.154”</td>
</tr>
<tr>
<td>Rails</td>
<td>2” NPS (Sch. 40)</td>
<td>2.375”</td>
<td>0.154”</td>
</tr>
<tr>
<td>Rails Joint/Splice Sleeves</td>
<td>1” NPS (Sch. 40)</td>
<td>1.900”</td>
<td>0.145”</td>
</tr>
<tr>
<td>Handrails Joint/Splice Sleeves</td>
<td>1” NPS (Sch. 40)</td>
<td>1.900”</td>
<td>0.145”</td>
</tr>
<tr>
<td>Handrails</td>
<td>1” Round Bar</td>
<td>1.000”</td>
<td>N/A</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1” Round Bar</td>
<td>1.000”</td>
<td>N/A</td>
</tr>
</tbody>
</table>

E. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A 327 Type 1 or ASTM F1554 Grade 36
   b. Adhesive Anchors: ASTM F1554 Grade 36 Fully Threaded Rods
   c. Hex Nuts: ASTM A563
   d. Flat Washers: ASTM F436
   e. Aluminum Shims: ASTM B209, Alloy 6061

4. Fabrication:
   A. Place expansion joints at a maximum of 30'-0” spacing.
   B. Field splices are similar in the expansion joint detail and may be approved by the Engineer to facilitate handling, but top rail must be continuous across a minimum of two posts.
   C. Continuity field splice (Detail "E") only used to make the railing continuous for unforeseen field adjustments.
   D. Corners and changes in tangential longitudinal alignment may be made continuous with a 9” bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For changes in tangential longitudinal alignment greater than 45° position posts a maximum of 2'-0” each side of the corner, not at the corner apex.
   F. For changes in tangential longitudinal alignment greater than 45° position rails at a maximum of 2'-0” each side of the corner, not at the corner apex.
   G. Handrails are required and must be continuous at landings for:
      A. Grades Steeper than 5%.
      B. Three or more steps.
   H. Cutting of reinforcing steel is permitted for post installed anchor bolts.
PIPE GUARD RAIL (ALUMINUM)

ELEVATION

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

RAMP REQUIREMENTS

LANDING REQUIREMENTS

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

NOTES:
NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity
Rail are not considered to be expansion joints.

Example:
1\'-6" (Typ.)

Minimum from free end of concrete and expansion joints (Typ.)

Ground Line

Top of Sidewalk or Bikeway

1\'-6" Max. (Typ.)

6\'-0" (Max.) - Equal Panels

Post Spacing (Typ.)

2\'-6"

3\'-6"

Min. post spacing (Typ.)

6\'-0" Min.

Bottom Landing

5\'-0" Min.

Intermediate Landing

5\'-0" Max.

Ramp

30\'-0" Max. for Slopes ≤ 6.25%

40\'-0" Max. for Slopes > 6.25%

Ramp

5\'-10"

Grade

Top Landing

See Plans for continuation or termination limits of railing

See Plans for continuation or termination limits of railing

Handrail (Typ.)

Handrail (Typ.)

See Detail "C" Sheet 4

See Detail "C" Sheet 4

See "Typical Railing Details" for post & rail details

See "Typical Railing Details" for post & rail details

Continuous Field Splice (as required) see Detail "E" Sheet 4 (Typ.)

1\'-6" Max. (Typ.)

Varies (4" Min., 5\'-0" Max.) (Typ.)

Rail Expansion Joints (Typ.) see Detail "D" Sheet 4

Rail expansion joints to be located in panels above structure expansion joints * (30\'-0" maximum spacing).

For Details "C", "D" and "E", see Sheet 4.

CROSS REFERENCE:

For Details "C", "D" and "E", see Sheet 4.

ELEVATION

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

RAMP REQUIREMENTS

LANDING REQUIREMENTS

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

NOTES:
NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity
Rail are not considered to be expansion joints.

Example:
1\'-6" (Typ.)

Minimum from free end of concrete and expansion joints (Typ.)

Ground Line

Top of Sidewalk or Bikeway

1\'-6" Max. (Typ.)

6\'-0" (Max.) - Equal Panels

Post Spacing (Typ.)

2\'-6"

3\'-6"

Min. post spacing (Typ.)

6\'-0" Min.

Bottom Landing

5\'-0" Min.

Intermediate Landing

5\'-0" Max.

Ramp

30\'-0" Max. for Slopes ≤ 6.25%

40\'-0" Max. for Slopes > 6.25%

Ramp

5\'-10"

Grade

Top Landing

See Plans for continuation or termination limits of railing

See Plans for continuation or termination limits of railing

Handrail (Typ.)

Handrail (Typ.)

See Detail "C" Sheet 4

See Detail "C" Sheet 4

See "Typical Railing Details" for post & rail details

See "Typical Railing Details" for post & rail details

Continuous Field Splice (as required) see Detail "E" Sheet 4 (Typ.)

1\'-6" Max. (Typ.)

Varies (4" Min., 5\'-0" Max.) (Typ.)

Rail Expansion Joints (Typ.) see Detail "D" Sheet 4

Rail expansion joints to be located in panels above structure expansion joints * (30\'-0" maximum spacing).

For Details "C", "D" and "E", see Sheet 4.

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

NOTES:
NPS = Nominal Pipe Size

STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity
Rail are not considered to be expansion joints.

Example:
1\'-6" (Typ.)

Minimum from free end of concrete and expansion joints (Typ.)

Ground Line

Top of Sidewalk or Bikeway

1\'-6" Max. (Typ.)

6\'-0" (Max.) - Equal Panels

Post Spacing (Typ.)

2\'-6"

3\'-6"

Min. post spacing (Typ.)

6\'-0" Min.

Bottom Landing

5\'-0" Min.

Intermediate Landing

5\'-0" Max.

Ramp

30\'-0" Max. for Slopes ≤ 6.25%

40\'-0" Max. for Slopes > 6.25%

Ramp

5\'-10"

Grade

Top Landing

See Plans for continuation or termination limits of railing

See Plans for continuation or termination limits of railing

Handrail (Typ.)

Handrail (Typ.)

See Detail "C" Sheet 4

See Detail "C" Sheet 4

See "Typical Railing Details" for post & rail details

See "Typical Railing Details" for post & rail details

Continuous Field Splice (as required) see Detail "E" Sheet 4 (Typ.)

1\'-6" Max. (Typ.)

Varies (4" Min., 5\'-0" Max.) (Typ.)

Rail Expansion Joints (Typ.) see Detail "D" Sheet 4

Rail expansion joints to be located in panels above structure expansion joints * (30\'-0" maximum spacing).

For Details "C", "D" and "E", see Sheet 4.

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.
GUIDERAIL ON STEPS & STAIRS

PIPE GUIDERAIL (ALUMINUM)

DESCRIPTION:
FY 2018-19
STANDARD PLANS

INDEX
515-070

SHEET
3 of 5
SECTION B-B
(Handrail Connection)

SECTION C-C
BASE PLATE DETAIL
(2-Bolt Anchorage)

SECTION C-C
BASE PLATE DETAIL
(4-Bolt Anchorage)

SHIM PLATE DETAIL
(2-Bolt Anchorage)

SHIM PLATE DETAIL
(4-Bolt Anchorage)

PLATE WASHER DETAIL

ALTERNATE BASE PLATE DETAIL
(Recommended for Steep Slopes)

DETAIL "C" - RAIL CONNECTIONS
(Handrail and 4-Bolt Anchorage Not Shown)

DETAIL "D" - EXPANSION JOINT
(FIELD SPICE SLIP JOINT SIMILAR)

DETAIL "E" - CONTINUITY
FIELD SPICE

CROSS REFERENCE:
For locations of Details "C", "D" and "E", see Sheet 2.
NOTES:
1. Shop Drawings are required, refer to Specification Section 515.

2. Materials:
   A. Pan Head Set Screws: Stainless Steel (SS) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM A36 or ASTM A706 Grade 36.
   C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A501 for Structural Tube.

   Handrail Support Bars: ASTM A36

   Handrail Support Bar: 1 3/8 Round Bar

   1. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.

   2. Materials:
      a. Hex Head Bolts: ASTM A307 Grade 1 or ASTM A354 Grade 36
      b. Adhesive Anchors: ASTM F1554 Grade 36 fully threaded rods
      c. Hex Nuts: ASTM A563
      d. Flat Washers: ASTM F436
      e. Aluminum Shims: ASTM B209, Alloy 6061

   3. Fabrication:
      A. Place expansion joints at a maximum of 30'-0" spacing.
      B. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling; but top rail must be continuous across a minimum of two posts.
      C. Continuity field splice (Detail "P") only use to make the railing continuous for unforeseen field adjustments.
      D. Corners and changes in tangential longitudinal alignment may be made continuous with a 9" bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
      E. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
      F. For changes in tangential longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.

   4. Handrails are required and must be continuous at landings for:
      A. Grades Steeper than 3%.
      B. Three or more steps.

   5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.

RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.134&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.134&quot;</td>
</tr>
<tr>
<td>Railing Joint/Splice Sleeves</td>
<td>1 1/2&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1 1/2&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1 1/2&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1 3/8 Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>
PIPE GUIDERAIL (STEEL)

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

See Plans for continuation or termination limits of railing.

ELEVATION

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

RAMP REQUIREMENTS

LANDING REQUIREMENTS

NOTES:
NPS = Nominal Pipe Size
* Keyed construction joints in Index 400-011 Gravity Structures Expansion Joints

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

STRUCTURES EXPANSION JOINTS NOTE:
Walls are not considered to be expansion joints.

Top of Sidewalk or Bikeway

Ground Line

Minimum from free end of concrete and expansion joints (Typ.)

Continuity Field Splice
(see required) see Detail "E" Sheet 4 (Typ.)

Rail Expansion joint (Typ.)
See Detail "D" Sheet 4

Rail Expansion joints to be located in panels above structure expansion joints *(30'-0" maximum spacing).

For Details "C", "D" and "E", see Sheet 4.
**Railing Continuation Beyond Steps**
(Bottom shown, Top similar)

Steel handrail required for three or more steps (handrail and cheekwalls continuous at landings).

Handrail Continuation
See Detail "A" (Typ.)

Handrail Termination
See Detail "A" (Typ.)

Elevation
(At-Grade Steps)

Length of Landing 5' Min.
Top Landing

Length of Landing 5' Min.
Bottom Landing

**Guiderail on Steps & Stairs**
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

TYPICAL SECTION ON STEPS & STAIRS

OPTIONAL SIDEWALK ANCHORAGE DETAIL
(Used in lieu of Beveled Shim Plates)

SIDEWALK ANCHORAGE DETAIL
OPTION 2 & 3

NOTES:
**2 - 3/8" Ø x 6" or 4 - 5/8" Ø x 6" Steel Anchors:
Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted (**2): Expansion Anchors Not Permitted.

*** The minimum embedment for adhesive anchors is 6" for 2-Bolt Anchorage or 4" for 4-Bolt Anchorage.
Future Curb And Gutter Construction

Valley Gutter

Curb And Gutter

SECTION AA

SECTION BB

SECTION CC

VALLEY GUTTER

* When used on high side of roadways, the cross slope of the gutter shall match the cross slope of the adjacent pavement. The thickness of the lip shall be 6", unless otherwise shown on plans.

Note: To be paid for as parent curb.

For use adjacent to concrete or flexible pavement, concrete seal and joint filler are required between curb & gutter and concrete pavement only, see Sheet 2.

Note: For use adjacent to concrete or flexible pavement, concrete shown. Expansion joint, preformed joint filler and joint seal are required between curbs and concrete pavement only, see Sheet 2.

TRAFFIC BEARING SECTION FOR USE IN ROUNDABOUT CENTRAL ISLAND CONSTRUCTION

TYPE RA

CONCRETE CURB AND GUTTER
Sawcuts should be avoided within valley gutter and within curb and gutter endings.

CONTRACTION JOINT IN CURB AND GUTTER

CONTRACTION JOINT IN CURB

CONCRETE BUMPER GUARD

ASPHALTIC CONCRETE CURB

GENERAL NOTES

1. For curb, gutter and curb & gutter provide 1/8" - 1/2" contraction joints at 10' centers (max.). Contraction joints adjacent to concrete pavement on tangents and flat curves are to match the pavement joints, with intermediate joints not to exceed 10' centers. Curb, gutter and curb & gutter expansion joints shall be located in accordance with Section 520 of the Standard Specifications.

2. Ends of Curbs Types B and D shall transition from full to zero heights in 3'.

EXPANSION JOINT BETWEEN GUTTER AND CONCRETE PAVEMENT

Applies to both high and low sides of pavement, low side shown.

Applies to both high and low sides of pavement, low side shown.

Applies to shoulder gutter only where adjoining traffic lanes.
CONCRETE SHOULDER GUTTER SPILLWAY

DETAILED OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER
(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPRACTICAL)

1. Spillway to be paid for as Shoulder Gutter, L.F.

2. If spillway empties into an unpaved ditch, the detail should be modified as necessary.
General Notes

1. These details are to apply to projects which provide for the conversion of 2-lane sections to 4-lane divided highway sections and for superelevated sections of new 4-lane divided highways. Layout above is illustration only. Cost of Flumes to be included in the contract price for curb or curb and gutter. Sod to be paid for under the contract unit price for Performance Turf, SF.

2. Flumes to be located in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.
DESCRIPTION:

ROADWAY INSTALLATIONS - RIGID PAVEMENT

TYPE II - CONCRETE TRAFFIC SEPARATOR

LONGITUDINAL SECTION (NOSE)

TRANSVERSE SECTION

Pitch:

\[ \frac{1}{8} \text{" for 8" separator} \\
\frac{1}{8} \text{" for 6" separator} \\
\frac{1}{8} \text{" for 4" separator} \]

\[ 2'-0", 3'-0" \text{ or } 4'-3" R \]

\[ 1'\frac{1}{2}" \text{ R (Typ.)} \]

\[ \frac{1}{8}" \text{ Expansion Joint (Preformed Filler \& Joint Sealant)} \]

\[ \text{Concrete Pavement} \]

TYPE V - CONCRETE TRAFFIC SEPARATOR

LONGITUDINAL SECTION (NOSE)

TRANSVERSE SECTION

Pitch:

\[ \frac{1}{8} \text{" for 8" separator} \\
\frac{1}{8} \text{" for 6" separator} \\
\frac{1}{8} \text{" for 4" separator} \]

\[ 4'-0", 6'-0" \text{ or } 8'-6" \]

\[ 1'\frac{1}{2}" \text{ R (Typ.)} \]

\[ \frac{1}{8}" \text{ Expansion Joint (Preformed Filler \& Joint Sealant)} \]

\[ \text{Concrete Pavement} \]
Approach Slab
Bridge Deck Or Construction Joint

Bars 4E (Typ.)
Bars 4B (Typ.)
Bars 4A (See Note 4)

Approach Slab
Bridge Deck Or Construction Joint

Bars 4C (Typ.)
Bars 4A (See Note 7)

Approach Slab
Bridge Deck Or Construction Joint

Notes:
1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-Grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

7. Field bend and cut rebars as required to maintain cover.

See Reinforcing Steel Option I or II For Bar Spacing

Traffic Separator (Typ.)

Detail At Poured Joint With Backer Rod Expansion Joint

(Skewed Bridge Deck and Approach Slab With Traffic Separator)

(Bridge Deck Shown, Approach Slab Similar)

REINFORCING STEEL

Longitudinal Section (Nose)

Option I

Option II

Traffic Separator (Typ.)

Detail At Expansion Joints

(Bridge Deck Shown, Approach Slab Similar)

Longitudinal Section (Nose)

Traffic Separator (Typ.)

Detail At Expansion Joints

(Bridge Deck Shown, Approach Slab Similar)
NOTES:

1. Treatment of separators on straight bridges shown. For additional notes and treatment of separators on skewed bridges, see Sheet 2.

2. Option II is not permitted on bridge decks with prestressing steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

4. At the Contractor’s option, a one piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.
REINFORCING STEEL NOTES:
1. All dimensions are out to out.

2. The 8" vertical dimension shown for Bars 4B and 4D are based on a slab 8½" thick or greater without a wearing surface. If slab thickness is less than 8½", decrease this dimension by an amount equal to the difference in thickness. If a wearing surface is to be provided, increase this dimension by an amount equal to the wearing surface thickness.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

DRAINAGE JOINT DETAIL
(For 5" Opening Or Less)

REINFORCING STEEL:

CONCRETE:

Material System

Adhesive Bonding

Dowel Notes:
1. Shift Dowel Holes to clear if existing reinforcement is encountered.
2. Provide and install an adhesive bonding material system in accordance with Sections 416 and 937 of the Specifications.
3. The dowel hole diameter is to meet adhesive bonding material system manufacturer's requirements.

Conventional Reinforcing Steel Bending Diagrams

Bridge Installations - Type "E" and "F" Curb

Estimated Traffic Separator Quantities:

Concrete:

Constant Width of Separator:

<table>
<thead>
<tr>
<th>Width</th>
<th>Type IC</th>
<th>Type IE</th>
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<tbody>
<tr>
<td>4'-0&quot; Width</td>
<td>0.056 CY per Ft.</td>
<td>0.072 CY per Ft.</td>
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<tr>
<td>6'-0&quot; Width</td>
<td>0.089 CY per Ft.</td>
<td>0.112 CY per Ft.</td>
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<tr>
<td>8'-0&quot; Width</td>
<td>0.132 CY per Ft.</td>
<td>0.164 CY per Ft.</td>
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Nose:

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<tbody>
<tr>
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<td>0.080 CY</td>
<td>0.109 CY</td>
</tr>
<tr>
<td>6'-0&quot; Width</td>
<td>0.193 CY</td>
<td>0.257 CY</td>
</tr>
<tr>
<td>8'-0&quot; Width</td>
<td>0.403 CY</td>
<td>0.538 CY</td>
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</tbody>
</table>

Reinforcing Steel:

(All quantities are based on an 8½" slab.)

Option I:

4'-0" Width | 6.37 Lbs. per Ft. |
6'-0" Width | 8.60 Lbs. per Ft. |
8'-0" Width | 11.95 Lbs. per Ft. |

Option II:

4'-0" Width | 4.77 Lbs. per Ft. |
6'-0" Width | 7.00 Lbs. per Ft. |
8'-0" Width | 9.45 Lbs. per Ft. |
DESCRIPTION:

Reinforcing Bar Bending Diagrams

Curb and Gutter Barrier - Sloped End Treatment

Curb and Gutter Barrier - Reinforcing Details

Curb and Gutter Barrier - 56" Height Section for Barrier-Mounted Sign Support Shielding - Symmetrical

Curb and Gutter Barrier - 56" Height Section for Barrier-Mounted Sign Support Shielding - Asymmetrical

Curb and Gutter Barrier - 38" Height Split Section for Stand-Alone Sign Support Shielding

Curb and Gutter Barrier - 44" Height Split Section for Pier Shielding

Curb and Gutter Barrier - 44" Height Split Section for Pier Shielding - Details

Curb and Gutter Barrier - Connection to F-Shape

Shoulder Barrier - Reinforcing Details

Shoulder Barrier - 44" Height Rear-Flush Section for Reduced Setback Pier Shielding (Low-Speed)

Shoulder Barrier - Section Options

Shoulder Barrier - 44" Height Rear-Flush Section for Reduced Setback Pier Shielding

Shoulder Barrier - 38" Height Rear-Flush Section for Stand-Alone Sign Support Shielding

Shoulder Barrier - Connection to F-Shape

Shoulder Barrier - 56" Height Section for Pier Shielding

Shoulder Barrier - Sloped End Treatment

Shoulder Barrier - Connection to F-Shape

Shoulder Barrier - 44" Height Rear-Flush Section for Reduced Setback Pier Shielding

Shoulder Barrier - 44" Height Rear-Flush Section for Pier Shielding

Shoulder Barrier - 38" Height Rear-Flush Section for Pier Shielding - Details

Shoulder Barrier - Median Barrier - Connection to F-Shape

Median Barrier - 44" Height Rear-Flush Section for Pier Shielding

Median Barrier - 44" Height Rear-Flush Section for Pier Shielding - Details

Median Barrier - 56" Height Section for Pier Shielding

Median Barrier - 44" Height Split Section for Pier Shielding

Median Barrier - 38" Height Split Section for Stand-Alone Sign Support Shielding

Median Barrier - Reinforcing Details

Median Barrier - Sloped End Treatment

Median Barrier - Section Options

Median Barrier - Grade Separated

Median Barrier - Median Barrier - Connection to F-Shape

Median Barrier - 44" Height Split Section for Pier Shielding - Details

Median Barrier - 44" Height Split Section for Pier Shielding

Median Barrier - 38" Height Split Section for Stand-Alone Sign Support Shielding

Median Barrier - Median Barrier - 44" Height Split Section for Pier Shielding

Median Barrier - 56" Height Section for Pier Shielding

Median Barrier - Median Barrier - 38" Height Split Section for Stand-Alone Sign Support Shielding

Median Barrier - Median Barrier - 56" Height Section for Pier Shielding

Median Barrier - Median Barrier - 56" Height Section for Pier Shielding

Median Barrier - Median Barrier - 56" Height Section for Pier Shielding

Median Barrier - Median Barrier - 38" Height Split Section for Stand-Alone Sign Support Shielding

Median Barrier - Median Barrier - 56" Height Section for Pier Shielding

Median Barrier - Median Barrier - 38" Height Split Section for Stand-Alone Sign Support Shielding

MEDIAN BARRIER

Index Contents; General Notes

GENERAL NOTES:

1. CONCRETE: Use Class II concrete for all barriers constructed in slightly aggressive environments, and use Class IV Concrete for all barriers constructed in moderately or extremely aggressive environments. On all exposed surfaces, apply a Class 3 surface finish in accordance with Specification 400.

2. STEEL BAR REINFORCEMENT: Where required to maintain continuity, provide lap splices of at least 18 inches for No. 4 bars and 20 inches for No. 5 bars, unless otherwise shown herein (including shorter splices as provided by the default bar bending diagrams).

3. OPTIONAL WELDED WIRE REINFORCEMENT: With the approval of the Engineer, steel welded wire reinforcement in accordance with Specification 415 may be substituted for the steel bars shown herein. Place the welded wire in the same locations specified for the steel bars, and maintain the equivalent strength, cover, maximum spacing, and continuity requirements.

4. TOP FACE LONGITUDINAL REINFORCEMENT: Unless otherwise specified, the longitudinal reinforcement shown closest to the top face of the barrier has a maximum cover of 4½", measured from the top face of the barrier.

5. MINIMUM BARRIER LENGTH: Unless otherwise shown in the Plans, the minimum Concrete Barrier length is 40 feet.

6. CONSTRUCTION JOINTS: Install Construction Joints only as needed for discontinuous concrete casting or cold joints. Maintain continuity of steel reinforcement across Construction Joints. Construction Joints are classified herein as Transverse Joints or Longitudinal Joints.

Transverse Joints are permitted at 20-foot or greater intervals along the barrier. For Tail Grade-Separated Sections, see Sheet 5 for additional Transverse Joint requirements.

Longitudinal Joints are only permitted where indicated in the following details and notes, with a vertical position tolerance of ± 1 ½" from the locations shown.

7. DOWELED JOINTS: As shown in the Dowel Details on Sheets 2 & 12, install ¾" Doweled Joints for Concrete Barrier connections to Pier Protection Barrier and Traffic Railings. Doweled Joints are also required for expansion mitigation in Median Barrier as defined per Sheets 2 & 5. Doweled Joints are not permitted within Grade-Separated Median Barrier.

8. CRACK CONTROL V-GROOVES: At 20-foot intervals, place ½" depth V-grooves that run vertically and/or transversely in the front, top, and back faces of barriers. The V-grooves can be either molded or scored while the concrete is still plastic.

9. SUBGRADE: Compact the top layer of subgrade with Type B Stabilization, LBR 40 (12 in.).

10. FOOTING BOTTOM CONCRETE COVER: At the bottom of each footing, where shown herein, minimum 2 inches of additional concrete cover is permitted beyond what is shown herein to accommodate soil grade irregularities.

11. FINISH GRADE ELEVATION: At the barrier face location, the finish grade pavement has a vertical position tolerance of ± 1½" from the locations shown herein, relative to the barrier elevation. Maintain visually smooth and even pavement at the barrier face, per the approval of the Engineer.

12. DRAINAGE INLETS: Where called for in the Plans, install corresponding inlets per Indexes 425-030 or 425-032.


15. LIGHT POLE MOUNTING: Where called for in the Plans, install aluminum light poles per Index 715-002.

16. BARRIER Delineators: Install Barrier Delineators in accordance with Specification 705. For median barriers, mount the delineator on the top of the barrier, at the centerline of the barrier, with reflective sheeting facing traffic on both approaches. For shoulder barriers and split sections, mount the delineators on the top of the barrier, with the roadway side of the delineator located 2" from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.
NOTES:

1. BARRIER RUN SEGMENT: Within the Barrier Run Segment, either the 38" Height Median Barrier or the differing Median Barrier sections shown throughout the Index may be placed as required per the Plans.

2. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 3.

3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Space Doweled Joints at 100-foot maximum intervals. Place steel reinforcing with a longitudinal 3" cover adjacent to the joint faces(s) in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

4. OPTIONAL LONGITUDINAL JOINT: When a longitudinal joint is placed above the footing, use the Optional 1/2" x 3/4" (Min.) Shear Key shown. As a substitute for the Shear Key, the concrete footing's top surface may be raked to provide additional shear friction. Rake the fresh concrete surface so that about half of the surface area consists of approximately 45° depth longitudinal grooves, distributed evenly and approved by the Engineer.

5. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1/2" Dowelled Joint.

6. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 538-001 in conjunction with the 16'-0" End Segment for Guardrail shown herein.

7. CRASH CUSHION CONNECTIONS: Connect Crash Cushions per Index 544-001 in conjunction with the 3'-0" End Transition for Guardrail shown herein.

8. FREE ENDS: When the barrier end does not terminate with a Traffic Railing Connection, Guardrail Connection, Crash Cushion Connection, or Sloped End Treatment as called for in the Plans, terminate in accordance with the Free End Reinforcing detail on Sheet 3.
**NOTES:**

1. **GENERAL:** Work with the Plan and Elevation Views on Sheet 2.

2. **BAR BENDING DIAGRAMS:** For additional information on Bars 4V1 and 4U1, see the details on Sheet 2.

3. **PLAN VIEWS:** Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal steel locations, see the section views.

---

**PLAN VIEW - 38" HEIGHT MEDIAN BARRIER FREE END REINFORCING (See Note 3)**

**PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION (See Note 3)**

**SECTION A-A 38" HEIGHT MEDIAN BARRIER**

Concrete Mix = C-60/75

Steel Qty. = 11.8 LB/FT

Concrete Qty. = 0.20 CY/FT

**VIEW B-B**

**REDUCED SECTION OF END TRANSITION FOR GUARDRAIL**

(End of Barrier)
39' Height Median Barrier

(See Sheet 2)

Sloped End Treatment (Linear Transition)

25'-0"

ELEVATION - SLOPED END TREATMENT

PLAN - SLOPED END TREATMENT

(Only Top & Bottom Longitudinal Bars Shown for Clarity,
See Section Views for All Longitudinal Steel Locations)

SECTION C-C
BEGIN TRANSITION
REINFORCING
(Height Varies Linearly per Elevation View)

SECTION D-D
INTERMEDIATE TRANSITION
REINFORCING
(Height Varies Linearly per Elevation View)

VIEW E-E
END TRANSITION

NOTES:
1. GENERAL: Install Sloped End Treatment only where called for in the plans.
2. JOINTS: Construction or Doweled Joints are not permitted within the Sloped End Treatment segment.

MEDIAN BARRIER -
SLOPED END TREATMENT

39" Height Median Barrier

(See Sheet 2)

Sloped End Treatment (Linear Transition)

25'-0"

ELEVATION - SLOPED END TREATMENT

PLAN - SLOPED END TREATMENT

(Only Top & Bottom Longitudinal Bars Shown for Clarity,
See Section Views for All Longitudinal Steel Locations)

SECTION C-C
BEGIN TRANSITION
REINFORCING
(Height Varies Linearly per Elevation View)

SECTION D-D
INTERMEDIATE TRANSITION
REINFORCING
(Height Varies Linearly per Elevation View)

VIEW E-E
END TRANSITION

NOTES:
1. GENERAL: Install Sloped End Treatment only where called for in the plans.
2. JOINTS: Construction or Doweled Joints are not permitted within the Sloped End Treatment segment.

MEDIAN BARRIER -
SLOPED END TREATMENT
NOTES:

1. GENERAL: Install the Grade-Separated sections where shown in the Plans and as required to accommodate vertical offsets in pavement of Height Y. Dowelled joints are not permitted within Grade-Separated sections.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect Short Grade-Separated sections and Tall Grade-Separated sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent section's longitudinal steel. Connect Short Grade-Separated sections and 38" Height Median Barrier sections of Sheet 1 using a 5" Dowelled Joint.

3. SHORT GRADE-SEPARATED SECTIONS: Bars 4C1 and the two uppermost longitudinal bars may be omitted for segements where Y ≤ 2'.

4. TALL GRADE-SEPARATED SECTIONS. For the vertical and transverse steel reinforcement shown in the Tall Grade-Separated sections, bar bending diagrams are not provided due to varying section dimensions and Longitudinal Joint locations. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

Longitudinal joints are permitted between the vertical limits shown, and must remain level and at a consistent height per each continuous casting of concrete. Longitudinal joints may change elevations at Transverse Joint locations. Field bending of bars is permitted at Longitudinal Joint locations.

Transverse Joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:

i. The barrier length on both sides is at least 40 feet, where each segment has continuous steel reinforcement.

ii. The barrier's vertical steel spacing is reduced to 4" O.C. for a total of 12 spaces on both sides of the joint.

Grade separation heights of Y < 2' are permitted on a limited basis using the Tall Grade-Separated section, this is to accommodate cases where maintaining the spread footing through lower height segments is more practical than changing to the Short Grade-Separated section.
NOTES:

1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38' Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 60' maximum cover from the top of the barrier.

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

MEDIAN BARRIER - 56' HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - SYMMETRICAL
NOTES:

1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 40" maximum cover from the top of the barrier.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, our bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - ASYMMETRICAL

FAA 2018-19
STANDARD PLANS

CONCRETE BARRIER

01/17

INDEX

521-001

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1. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the actual shape dimensions and requirements. The overall length and width of the split barrier system is governed by the project-specific overhead sign support dimensions, as defined in the Plans.

2. MULTIPLE SIGN SUPPORTS: The parallel segment may be lengthened to accommodate multiple sign supports, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last sign support bases, respectively.

3. STIRRUP BARS: For the vertical and transverse reinforcement requirements shown in Sections A-A and B-B, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

4. PLAN VIEW: Only outermost longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

NOTES:

MEDIAN BARRIER - 38" HEIGHT SPLIT SECTION FOR STAND-ALONE SIGN SUPPORT SHIELDING
**DESCRIPTION:**

**REVISED STANDARD PLANS FY 2018-19 SHEET INDEX 3" 3" 20**

**ELEVATION**

**PLAN**
(See Section Views on Sheet 10 for All Longitudinal Steel Locations)

**NOTES:**

1. **SECTION VIEWS:** See Sheet 10 for Section Views A-A through D-D and corresponding reinforcing steel details.

2. **PIER:** The round pier shown is an example only, and project-specific pier shapes may vary. For actual dimensions and requirements, see the Plans. The overall length and width of the split barrier system is governed by the project-specific pier dimensions, as defined in the Plans.

3. **MULTIPLE PIERS:** The parallel segment may be lengthened to accommodate multiple consecutive piers, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last piers, respectively.

**MEDIAN BARRIER - 44 INCH HEIGHT SPLIT SECTION FOR PIER SHIELDING**
NOTES:

1. GENERAL: Work with the Plan and Elevation views on Sheet 9.

2. LONGITUDINAL REINFORCING CONTINUITY: Maintain all longitudinal steel reinforcing shown in Section C-C continuously into Section D-D (spliced where required). The additional longitudinal reinforcing shown in Section D-D does not require continuity into Section C-C, and it starts 3" from the construction joint or edge of concrete per the details on Sheet 9.

3. STIRRUP BARS: For the vertical and transverse reinforcement requirement shown, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

MEDIAN BARRIER - 44 INCH HEIGHT
SPLIT SECTION PIER SHIELDING - DETAILS

CONCRETE BARRIER

INDEX

sheets
SECTION A-A  
BEGIN TRANSITION - OPTION 'A'  
MATCH SINGLE-SLOPE  
38" HEIGHT MEDIAN BARRIER

SECTION A-A  
BEGIN TRANSITION - OPTION 'B'  
MATCH SINGLE-SLOPE  
36" HEIGHT TRAFFIC RAILING  
(Bridge Applications)

SECTION B-B  
INTERMEDIATE SECTION  
OF LINEAR TRANSITION

SECTION C-C  
END TRANSITION  
MATCH 32" HEIGHT  
F-SHAPE SECTION

NOTES:
1. GENERAL: Construct the Connection Segment as required per the Plans to connect existing F-Shape sections to Single-Slope Median Barriers or Traffic Railing sections. Construct Option 'A' or 'B' as required to match the heights of the connecting sections.
2. DOWELED JOINT: Install Dowel Bars per the Dowel Details on Sheet 2.
3. TRAFFIC RAILING CONNECTION: For the Option 'B' connection, use a Doweled Joint per Sheet 2 and the additional Free End Reinforcing with reduced bar spacing per Sheet 3.
4. STIRRUP BARS: For the vertical and transverse reinforcement requirements shown, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

MEDIAN BARRIER - CONNECTION TO F-SHAPE
SECTION A-A
38" HEIGHT SHOULDER BARRIER

Concrete Qty. = 0.32 CY/FT
Steel Qty. = 50.9 LB/FT

NOTES:
1. GENERAL: Work with the Plan and Elevation Views on Sheet 12. The Section Option footings shown on Sheet 14 may be substituted where called for in the Plans.

2. FREE END REINFORCING: Where shown in the Plans, terminate the 38" height Barrier section with a transverse vertical end face. Reduce the spacing of Bars 5V2 and 5U3 to 6" for 5 Spaces, placed with 3" cover from the barrier's end face.

3. BAR BENDING DIAGRAMS: For additional details for bars 5V2 and 5U3, see the Bar Bending Diagrams on Sheet 22.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION
(Longitudinal Steel Not Shown for Clarity)

SHOULDER BARRIER - REINFORCING DETAILS

CONCRETE BARRIER

FY 2018-19
STANDARD PLANS

INDEX 521-001
SHEET 13 of 22
DESCRIPTION:
REVISED
of
STANDARD PLANS
FY 2018-19

SHEET
INDEX

3'-2"
2'-0"
Min.
2" Cover (Typ.)
Top & Sides)
(Stem & Barrier
2" Cover (Typ.)
2'-3"
2'-0"
Min.
Top & Sides)
(Stem & Barrier
2" Cover
3'-2"
1'-0"
3" Cover (Typ.)
Top, & Sides)
(Footing Bottom,
3" Cover & Bottom)
(Footing Top

REVISION
LAST
11/01/17

FRONT-FLUSH SECTION
(Where Required For Barrier Inlet Locations)
Concrete Qty. = 0.29 CY/FT
Steel Qty. = 46.6 LB/FT

Retaining Section
Concrete Qty. = 0.36 CY/FT
Steel Qty. = 33.3 LB/FT

TRENCH FOOTING SECTION
Concrete Qty. = 0.35 CY/FT
Steel Qty. = 46.2 LB/FT

NOTES:
1. GENERAL: Install the differing Section Options as required per the Plans.
2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect differing Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections. Alternatively, a Dowelled Joint may be used as shown on Sheet 12.
3. FLUSH RETAINING SECTION COMBINATION: Where Barrier Joints are required in retaining segments, install the Flush Section, except replace the 1'-0" General Heel with the 2'-0" Extended Heel as shown in the Retaining Section. Use longer lateral reinforcing bars of 2'-10" length to maintain the cover shown.

SHOULDER BARRIER - SECTION OPTIONS
NOTE:

1. GENERAL: See the applicable Notes on Sheet 17.
44" HEIGHT REAR-FLUSH SECTION
ABOVE-GROUND HAZARD EMBEDDED IN FOOTING

SECTION C-C

NOTE:
1. PIERS: The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details shown herein are only for use when piers do not require protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.

SHOULDER BARRIER - 44" HEIGHT REAR-FLUSH SECTION
FOR REDUCED SETBACK PIER SHIELDING

FY 2018-19
STANDARD PLANS
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CONCRETE BARRIER
DRAINAGE SLOT NOTES:

1. GENERAL: Place 2'-0" x 18" Drainage Slots at locations and/or spacing called for in the Plans.

2. STEEL REINFORCEMENT CONFLICT: When the Drainage Slot encounters a conflict with reinforcing steel, shift or cut the reinforcing steel to provide 2'-6½'' / 1½'' of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 8" bar spacing. If shifting the vertical bars, move the bars from the standard 8" spacing location to the closest end of the drainage slot and distribute additional vertical reinforcement evenly on each side of the Drainage Slot.

3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install ½" Doweled Joints as defined on Sheet 12.

4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the ½" Doweled Joint per Sheet 12.

5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3'-0" End Transition for Guardrail as shown herein.

6. FREE ENDS: When the barrier end does not terminate with a Traffic Railing connection or Guardrail connection as called for in the Plans, terminate the barrier in accordance with the Reinforcing Steel Note on Sheet 20.

Curb and Gutter Barrier Notes:

1. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 20.

2. EXPANSION JOINTS: Place ½" with transverse expansion joints through the barrier and footing spaced at 100-foot maximum intervals. On both sides of each joint, use the free end reinforcing bar spacing per Sheet 20.

3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install ½" Doweled Joints as defined on Sheet 12.

4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the ½" Doweled Joint per Sheet 12.

5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3'-0" End Transition for Guardrail as shown herein.

6. FREE ENDS: When the barrier end does not terminate with a Traffic Railing connection or Guardrail connection as called for in the Plans, terminate the barrier in accordance with the Reinforcing Steel Note on Sheet 20.
NOTES:
1. GENERAL: Work with the Plan and Elevation Views on Sheet 19.
2. FREE END REINFORCING: Where shown in the Plans, terminate the 38" Curb & Gutter Barrier section with a transverse vertical end face. Reduce the spacing of Bars 5/8" and 5/4" to 6" for 5 Spaces, placed with 3" cover from the barrier's end face.
3. BAR BENDING DIAGRAMS: For additional details for bars 5/8" and 5/4", see the Bar Bending Diagrams on Sheet 22.
1. GENERAL: Install a Sloped End Treatment only where called for in the Plans, using either a 10'-0" length or 25'-0" length treatment as specified in the Plans. The 10'-0" length option is shown herein, while the 25'-0" length option requires additional trimmed Bars 5V2 & 5U4 at the same 9" longitudinal spacing.

2. BAR BENDING DIAGRAMS: For additional details on Bars 5V2 & 5U4, see the Bar Bending Diagrams on Sheet 22.

NOTES:

CURB AND GUTTER BARRIER - SLOPED END TREATMENT

PLAN - CURB AND GUTTER BARRIER SHOWING SLOPED END TREATMENT
(Approach and Trailing End Similar by Opposite Hand; See Sections for All Longitudinal Steel Locations)

ELEVATION - CURB AND GUTTER BARRIER SHOWING SLOPED END TREATMENT
(Approach and Trailing End Similar by Opposite Hand)

SECTION D-D
BEGIN TRANSITION

SECTION E-E
INTERMEDIATE TRANSITION
(Height Varies Linearly Per Elevation View)

SECTION F-F
END TRANSITION
(Align with Type-F Curb)
**NOTES:**

1. Work with the Standard Bar Bending Details per Index 415-001.
2. All bar dimensions in the bending diagrams are out to out.
GENERAL NOTES:

1. CONCRETE: Use Class III or IV concrete unless otherwise called for in the Plans.

2. CONSTRUCTION JOINTS: Maintain continuity of reinforcement steel across Construction joints; reinforcement lap splices are permitted immediately adjacent to joints. Construct all Pier Protection Barrier continuously, with no expansion or contraction joints. Construction joints are classified herein as Transverse joints or Longitudinal joints.

   Transverse joints are permitted at 40 foot or greater intervals along the barrier. Longitudinal joints may only be installed where indicated in the following details and notes, with a location tolerance of ± 1' from the locations shown.

3. SUBGRADE: Compact the top layer of subgrade with Type B Stabilization, LBR 40 (12 in.).

4. DRAINAGE INLETS: See Index 425-001 for Shoulder Barrier Inlets, and isolate these structures from Pier Protection Barriers and Footings with 1" Preformed Joint Filler.

5. BARRIER END MARKERS: For all free ends of barriers that are not connected to guardrail or concrete barrier, install a Type 3 Object Marker on the end face per Specification 705.

6. BARRIER DELINEATORS: Install Barrier Delineators in accordance with Specification Section 705. Mount the delineators on the top face of the barrier, with the roadway side of the delineator located 2" from the front face of the barrier and the reflective sheathing facing traffic of the nearest approach.

7. CRACK CONTROL: Provide 1/2" depth crack control V-Grooves at 15' to 30' spacing. Locate V-Grooves above any joint or discontinuity in the barrier facing. Align V-Grooves perpendicular to the longitudinal axis of the Pier Protection Barrier and make continuous across the top surface and both side faces. For slip formed barriers, score 1/2" V-Grooves while the concrete is still plastic; otherwise pre-form the joints when stationary forms are utilized.
NOTES:

1. GENERAL: The views shown herein are schematic only, showing example layouts for Pier Protection Barrier (PPB) footings and Crash Wall placement in relation to adjacent miscellaneous structures (including bridge piers, footings, drainage structures, etc.). The actual PPB footing placement depends on the project-specific configuration of adjacent structures and obstacles. For project-specific locations of PPB and adjacent features, see the Plans.

2. MINIMUM FOOTING LENGTH: The minimum length of a single footing option (i.e. Symmetrical Footing, Rear-Flush Footing, Front-Flush Footing), is 8'-0", measured longitudinally. See Sheet 6 for the footing option details.

3. FOOTING OVERLAP: When a Front-Flush Footing section connects to a Rear-Flush Footing section, a 4'-0" footing overlap is required as shown. In footing overlap segments, place all lateral steel reinforcement continuously for the entire width of the combined footing while maintaining the cover requirements per Sheet 6.

4. CONNECTING GUARDRAIL OR CONCRETE BARRIER: Connect the PPB to either Guardrail or Concrete Barrier as specified in the Plans. For additional Guardrail Details, see Sheet 3 and Index 536-001. For additional Concrete Barrier Details, see Sheet 3 and Index 521-001.
ELEVATION
(56" PPB Shown, 44" PPB Similar
with T-0" Riser and Related
Reinforcing Removed)

PLAN
(Details Not Shown Below Gutter Line,
See Sheet 6 for Footing and Stem Details)
(Only Top & Bottom Longitudinal Steel Shown,
See Section Views for All Steel Locations)

NOTES:
1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans.
   See Sheets 2 & 3 for additional plan and elevation details.
2. FOOTING OPTIONS: See Sheet 6 for supporting stem and footing details.
BARRIER DETAILS - CONNECTION TO GUARDRAIL

NOTES:

1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Sheets 2 & 3 for additional plan and elevation details.

2. FOOTING OPTIONS: See Sheet 6 for the supporting stem and footing details.

PIER PROTECTION BARRIER

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1. GENERAL: Only where called for in the Plans, install the Crash Wall as a supplement for PPB. If applicable, see the Plans for the corresponding Station and Offset required. For additional layout details, see Sheets 2 & 3.

2. CRASH WALL HEIGHT: Install the Crash Wall at a height which matches the adjacent PPB (either 44" or 56") and extend by 3" laterally beyond the face of the wall to provide support.

3. SCHEMATIC VIEWS: Only partial reinforcing is shown in the Schematic Views to establish a trend while keeping clarity. For all reinforcing steel locations and spacing requirements, see Section H-H.

4. GUARDRAIL CONNECTION: To facilitate guardrail connections, shift the Crash Wall 3 feet from the end of the PPB as shown on Sheets 2 & 3.

5. OPTIONAL SLIP FORMING SUPPORT: The 1'-0" depth spread footing may be extended by 3" laterally beyond the face of the wall to provide support for a subsequent slip forming operation above. Do not adjust the steel reinforcement location for the additional concrete.

NOTES:

CRASH WALL DETAILS

Concrete Qty. = 0.82 CY/FT (44" Crash Wall) or 0.93 CY/FT (56" Crash Wall)
Steel Qty. = 71.8 LB/FT (44" Crash Wall) or 76.0 LB/FT (56" Crash Wall)
**BILL OF REINFORCING STEEL**

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<th>LENGTH</th>
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<td>5</td>
<td>13'-9&quot;</td>
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<tr>
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<td>5</td>
<td>Varies (Straight)</td>
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<td>5</td>
<td>6'-0&quot; / 7-9&quot;</td>
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<td>5</td>
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<tr>
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<td>8</td>
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</tr>
<tr>
<td>S2, S3</td>
<td>5</td>
<td>Varies (Straight)</td>
</tr>
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</table>

**NOTES:**

1. Work with the Standard Bar Bending Details per Index 415-001.
2. All bar dimensions in the bending diagrams are out to out.

**BAR BENDING DIAGRAMS**
DESCRIPTION:

3" 2" Clear
Visual Barrier Payment, LF
End Measurement For Opaque
Concrete
Cut & Field Bend Rein. Steel

ESTIMATED QUANTITIES, LF
Concrete 0.042 CY
Reinforcing Steel 3.27 Lbs.*
+3.38 Lbs. With 2'-2" Dowels

GENERAL NOTES

1. The opaque visual barrier is intended to function as a visual screen, and is not intended to resist vehicle impact loads nor to restrain, contain or restrict vehicles or cargo. The barrier is designed to withstand zone wind loading and strikes by light debris; and, designed to yield to exceptional strikes by vehicles or cargo, and to contain ruptured segments of the screen when yielding to such strikes.

2. When the opaque visual barrier is constructed on an existing barrier wall, dowels shall be 7'-8" in length, embedded 6' into the barrier wall and set with an approved non-shrink grout. Embodiment holes shall be 3/8" diameter, drilled to a depth 1 1/2" below the tip of the dowel unless greater depth is required to accept manufactured grout capsules.

When the opaque visual barrier is constructed in conjunction with project concrete barrier walls, dowels may be set as described above, in either the drilled or preformed holes; or, placed when the barrier wall is cast. For dowels that are placed when the wall is cast, the dowel shall be 2'-2" in length and embedded to a depth of 12'.

When longitudinal reinforcing bars are encountered in the stem of existing barrier, shift the dowels to clear, maintaining the 11/2" Cover Minimum to the face of the Opaque Visual Barrier.

3. For both double and single faced concrete barrier walls the opaque visual barrier is to be located in the center of the top of the wall.

For single faced barrier walls that are constructed around other vertical structures, the opaque visual barrier shall follow the alignment of only one of the walls and be centered along that wall.

For dual median barrier walls that follow differential profiles, the opaque visual barrier shall be constructed atop the wall with the higher elevation, unless conditions dictate otherwise. Lateral transitions or end overlaps for opaque visual barriers that alternate between dual walls shall be detailed in the plans.

For median barrier walls that are divided when connecting to separated bridges, the opaque visual barrier shall be constructed atop the approach side barrier wall, unless differential profiles dictate locating the opaque visual barrier on the departure side barrier wall.

Opaque visual barriers to be located on capped fills between barrier walls shall be detailed in the plans.

4. In lieu of the reinforcement shown, the Contractor may substitute welded wire fabric equal to or better than that shown, when approved by the Engineer. Details shall be submitted with requests for substitution.

5. The Contractor may construct contiguous precast concrete panels in lieu of the cast-in-place opaque screen when approved by the Engineer. Panel design and method for anchorage to the barrier wall shall be detailed by shop drawings when requesting the Engineer's approval.

The Contractor may construct the opaque screen monolithically with the barrier wall; however, the screen design shall not be modified so as to cause the wall to be dynamically active from strikes on the screen; see design considerations in Note No. 1 above.

6. Exposed concrete surfaces shall have a Class 3 surface finish in accordance with Section 521 of the Standard Specification, unless another finish is called for in the plans.

7. Payment for opaque visual barrier shall be full compensation for concrete, reinforcement, dowels, casting, placement, drilling, grouting, tooling, finishing and incidental thereto, and shall be paid for under the contract unit price for Opaque Visual Barrier (Concrete) (2'-3" Height), LF.
PLAN
(Restraining Steel not shown for clarity)

ELEVATION OF INSIDE FACE OF RAILING/NOISE WALL (T-SHAPED FOOTING SHOWN, OTHER FOUNDATIONS SIMILAR) (Restraining Steel not shown for clarity)

* Construct 3/4" Open Joints plumb at Construction Joints in Junction Slabs or Footings.

CROSS REFERENCE:
For Detail "F" see Sheet 2.
For Section A-A see Sheet 4.
For Section C-C and Detail "A" see Sheet 5.
For Wall mounted Railing/Noise Wall Details see Index 521-512.
For Footing mounted Railing/Noise Wall Details see Index 521-513 (T-Shaped), 521-514 (L-Shaped) or 521-515 (Trench).

For Footing mounted Railing/Noise Wall Details see Index 521-513 (T-Shaped), 521-514 (L-Shaped) or 521-515 (Trench).

40'-0" End Taper

10'-0" Maximum

1/2" V-Groove in both faces and top of Railing/Noise Wall (Equally spaced between open joints)

3'-0" Max.

Varies

Single-Slope Traffic Railing/Barrier Continuing

Noise Wall End Taper (see Sheet 3) required when Noise Wall is terminated within the clear zone of the Roadway. See Plans for location of End Taper.

3'-0" Max.

T-Shaped Spread Footing Shown, L-Shaped Spread Footing, Trench Footing and Junction Slab similar

See Detail "A" for Railing End Transition when Guardrail called for in Roadway Plans

Coping (Typ.)

Gutter Line

Guardrail (when called for in Roadway Plans)

Railing End Transition required at Guardrail Connection

Railing/Barrier shown continuing on Roadway

Begin or End Noise Wall

1/2" V-Groove in both faces and top of Railing/Noise Wall (Equally spaced between open joints)
NOTES:
Work this Index with Indexes 521-512 through 521-515.

CONSTRUCTION REQUIREMENTS: The Traffic Railing/Noise Wall and joints shall be constructed plumb, they shall not be constructed perpendicular to the roadway surface.
CONCRETE: Class II for slightly aggressive environments and Class IV for moderately or extremely aggressive environments.

BARRIER DELINERATORS: Install Barrier Delimiter 2'-4" above the riding surface in accordance with Specification Section 705. Match the Barrier Delimiter color (White or Yellow) to the near edgeline.

OPEN JOINTS: Provide ½" Open Joints spaced between 30 feet minimum or 90 feet maximum.
Align Open Joints with construction joints in the Junction Slab or footing.
Provide additional reinforcing (see Sheet 3) at each open joint.

ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES

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<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
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<td>Reinforcing Steel (Typical)</td>
<td>LB/F</td>
<td>67.36</td>
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<tr>
<td>Additional Rein. @ Open Joint</td>
<td>LB</td>
<td>262.58</td>
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(The above quantities are based on the Traffic Railing/Noise wall typical section, (excluding junction slab or footing)

REINFORCING STEEL BENDING DIAGRAMS

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel in 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 5R 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 93.

END STIRRUP BAR 5V
To Be Field Cut
(Railing End Transition)

CROSS REFERENCE:
See Index 521-512 for Junction Slab Details and Indexes 521-513 thru 521-515 for additional footing details.
4" (Space may be increased to 6" to lap Bars 5R on opposite side of remaining Bars 5V, as required)

---

**ELEVATION OF RAILING/NOISE WALL REINFORCING STEEL AT OPEN JOINT**
(Bars 5S1 in Railing not shown for clarity)
(Footing or Junction Slab Details not shown)

---

**ELEVATION OF RAILING/NOISE WALL END TAPER (ADJACENT TO TRAFFIC RAILING/BARRIER SHOWN, GUARDRAIL ATTACHMENT SIMILAR SEE DETAIL "A", SHEET 5)**
(Bars 5S1 in Railing not shown for clarity)
(Footing or Junction Slab Details not shown)

**NOTES:**
* Field Cut Bars 5R & 5S1 to maintain clearance.
** Terminate 5/8" 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.
Work Traffic/Noise Wall reinforcing with Index 521-512 (Junction Slab) or Index 521-513 through 521-515 (T, L or Trench Footings)
SECTION A-A
TYPICAL SECTION THRU TRAFFIC RAILING/NOISE WALL AT OPEN JOINT
(Section Thru T-Footing Shown, Section Thru Junction Slab, L or Trench Footings similar)

NOTES:
1. Bars 5V shown are for T-Shape footings.
2. For Junction Slab, L-Shape and Trench footings are similar.
3. Const. Joint Required
4. Thickened section required for Textured Form Liner, when called for in the Plans (See Plans for details)

VIEW B-B
END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT
(T-Footing shown, Junction Slab, L or Trench Footings similar)

CROSS REFERENCE:
For locations of Section A-A see Sheet 1.
For location of View B-B see Sheet 5.
For Detail "A", see Sheet 3

NOTES:
1. Bars 5V shown are for T-Shape footings.
2. For Junction Slab, L-Shape and Trench footings are similar.

Gutterline
Bars 5S2 (cut and lap as shown, (See Detail "A" for bar spacings)

Spacing Bars 5S1 & 5S2
Bars 5S1 & 5S2
Bars 5S1
Bars 5S2
Bars 5V
V-Groove

2" Cover
Bars 5S1 (Typ.)
9 - Bars 5S2 at each side of open joints, shown as ( )
(Typ.)
2" Cover

Varies (Typ.)

Textured Form Liner when called for in the Plans (See Plans for details)

Const. Joint Required

Bars 5S1 (Typ.)

Thickened section required for Textured Form Liner when called for in the Plans (See Plans for details)

Const. Joint Required

T-Footing (See Note 2)
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 SR with Bars 5V as shown. Clearance of Bars SR & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if bolt 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 Single-Slope Traffic Railing/Barrier continues beyond the End Taper. See the Plan Sheets.
4. Field cut Bars SR1 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars SR2 front leg (more plumb) to maintain cover and tie to S1 Bars. (See Sheet 4 Notes 1 and 2)
**CONCRETE BARRIER/NOISE WALL NOTES**

1. This railing has been structurally evaluated to be equivalent or greater in strength to a safety shape/Noise Wall combination railing which has been crash tested to NCHRP Report 350 TL-4 Criteria.

2. **CONSTRUCTION REQUIREMENTS:** Construct the Concrete Barrier/Noise Wall and joints plumb; do not construct the Concrete Barrier/Noise Wall perpendicular to the roadway surface.

3. **CONCRETE:** Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.

4. Construct 3/8" Open Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. 3/8" Open Joint locations are to coincide with 3/8" Expansion Joints in footings.

5. Construct 1/8" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 3/8" Open Joints and/or Begin or End Concrete Barrier/Noise Wall. V-Groove locations are to coincide with V-groove locations in footings.

6. 14'-0" Noise Wall End Taper is required when adjacent to a 8'-0" Concrete Barrier/Noise Wall and may be used when an 8'-0" Concrete Barrier/Noise Wall End Taper is provided (see Index 521-510 for details). See Roadway Plans for Concrete Barrier/Noise Wall End Treatment.

7. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0") and one or more of the following:
   a. Index 521-513 - Concrete Barrier/Noise Wall T-Shaped Spread Footing,
   b. Index 521-514 - Concrete Barrier/Noise Wall L-Shaped Spread Footing or
   c. Index 521-515 - Concrete Barrier/Noise Wall Trench Footing.

8. 8'-0" Concrete Barrier/Noise Wall continuing or End Taper on Approach Slab or Roadway (shown)

9. 8'-0" Concrete Barrier/Noise Wall continuing or End Taper on Approach Slab or Roadway (shown)

**PLAN (Reinforcing Steel not shown for clarity)**

(T-Shaped Spread Footing Shown, L-Shaped Spread Footing and Trench Footing Similar)

**ELEVATION OF INSIDE FACE OF CONCRETE BARRIER/NOISE WALL**

(Reinforcing Steel not shown for clarity)

(T-Shaped Spread Footing Shown, L-Shaped Spread Footing and Trench Footing Similar)
NOTES:
1. Field cut Bars SR & S51 in Noise Wall End Taper as required to maintain minimum cover.
2. See Index S52-513, S52-514 and S52-515 for footing reinforcement.
3. 3/4" Open Joint may be omitted when 8'-0" Railing/Noise Wall End Taper is adjacent to a 14'-0" Concrete Barrier/Noise Wall End Taper as shown on Sheet 1. See Index S52-510 for reinforcement details and spacing. Bars S52 are not required when 3/4" Open Joint is omitted.
4. Bar spacing shown is along the Gutter Line.
**SECTION A-A**

**TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL**

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tr>
<td>R2</td>
<td>5</td>
<td>13'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>S52</td>
<td></td>
<td>5'-3&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 will have a 2" minimum cover.
3. Bars S1 may be continuous or spliced at construction joints. Lap splices for Bars S1 and S52 will be a minimum of 2'-2".
4. 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 CONCRETE BARRIER/NOISE WALL QUANTITIES**

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<tr>
<th>ITEM</th>
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<tr>
<td>Concrete (Concrete Barrier)</td>
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<tr>
<td>Concrete (Noise Wall, excluding any thickening)</td>
<td>CF/FT</td>
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<tr>
<td>Reinforcing Steel (Railing/Noise Wall) (Bars R1, R2, S1 &amp; S2)</td>
<td>LB/FT</td>
<td>105.95</td>
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<tr>
<td>Additional Rein. @ Open Joint (Railing/Noise Wall)</td>
<td>LB/FT</td>
<td>488.12</td>
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</table>

**NOTES:**

1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 1/2 Open Joints, plug the lower 1/2 portion of the open joint by filling it with mortar in accordance with Specification Section 400.
**Plan**

**Junction Slab Adjacent to Skewed Approach Slab and with Barrier Wall Inlet**

**Notes**

1. Construction Requirements: Construct the expansion joints and face of coping plumb.
2. Concrete: Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.
3. Dowels: Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D6967. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
4. Expansion Joints: Construct 1" Expansion Joints plumb, and either perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant and between 9" to 45" from horizontal.
6. Provide Organic Felt bond breaker on top and Expanded Polystyrene (1/2" thick) on sides.
7. V-Grooves: Construct 1/2 V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Junction Slab. V-Groove locations are to coincide with V-Groove locations in the Railing/Noise Wall. See Section B-B for details.
8. Fill Requirements: Shoulder or Roadway Pavement or Fill is required on top of the Junction Slab for its entire length on the traffic side of the Railing/Noise Wall. See Section B-B for details.
9. Actual location & width vary depending on type of Retaining Wall used. Filled cut Bars 5A and 5B2 as required to maintain minimum cover for skewed Approach Slab.
10. Spacing shown is along the Gutter Line.
13. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0').

**CROSS REFERENCE:**
For Section B-B and Detail 'A', see Sheet 2.

**Index:**

- 1. Construction Requirements: Construct the expansion joints and face of coping plumb.
- 2. Concrete: Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.
- 3. Dowels: Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D6967. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
- 4. Expansion Joints: Construct 1" Expansion Joints plumb, and either perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
- 5. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant and between 9" to 45" from horizontal.
- 6. Provide Organic Felt bond breaker on top and Expanded Polystyrene (1/2" thick) on sides.
- 7. V-Grooves: Construct 1/2 V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Junction Slab. V-Groove locations are to coincide with V-Groove locations in the Railing/Noise Wall. See Section B-B for details.
- 8. Fill Requirements: Shoulder or Roadway Pavement or Fill is required on top of the Junction Slab for its entire length on the traffic side of the Railing/Noise Wall. See Section B-B for details.
- 9. Actual location & width vary depending on type of Retaining Wall used. Filled cut Bars 5A and 5B2 as required to maintain minimum cover for skewed Approach Slab.
- 10. Spacing shown is along the Gutter Line.
- 13. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0').
CROSS REFERENCE:
For Section B-B and Detail "A", see Sheet No. 2.

1'-0" 1'-0"

Joint Filler

Back of Spread Footing

Approved metal or fiber cap

Top of Spread Footing

1" Ø Dowel Load Transfer Devices (See Section B-B for details)

Preformed Expansion Joint

2" Cover

Top & Sides

Bars 5B (Typ.)

Bottom of Spread Footing

1" Preformed Expansion Joint Filler (Typ. all Sides)

2" Cover

Typ. all Sides

Bars 5A (Typ.)

Cross Reference
For Section B-B and Detail "A", see Sheet No. 2.

PLAN

SPREAD FOOTING ADJACENT TO SKEWED APPROACH SLAB AND WITH BARRIER WALL INLET

14'-0" or 8'-0" Concrete Barrier/Noise Wall

10/30/2017 1:49:24 PM

REVISION

INDEX

CONCRETE BARRIER/NOISE WALL

T-SHAPED SPREAD FOOTING

11/01/17 1 2

521-513

1 of 2

11 ~ Bars 5A @ 6" Spacing

Field Cut Bars 5B as required to maintain minimum cover for skewed approach slab

Field Bend Bars 5A as required to maintain minimum cover

2" Cover

¼" Preformed Expansion Joint Filler

8" Joint Filler (See Note 6)

1/2" V-Groove (See Note 6 and Detail "A")

Expansion Joint (See Detail this sheet)

1" Ø Dowel Load Transfer Devices

Bottom of Spread Footing (Level Transversely)

3/8" Open Joint

3/8" Expansion Joint (Field cut to Clear Inlet)

1" Preformed Expansion Joint Filler (Typ. all Sides)

2" Cover (Top & Sides)

Barrier Wall Inlet

Grate

(See Index 425-031 or 521-510 for details)

Bars 5B (Field Cut as required to clear Barrier Wall Inlet) (Typ.)

Top of Spread Footing

Barrier Wall Inlet and Grade (See Index 425-031 for details)

Gutter Line

Bars 5V2 (See Note 9)

B

A

1/2" Preformed Expansion Joint Filler

2" Cover (Top & Sides)

1/2" Spacing

1" Spacing

A

B

EXPANSION JOINT DETAIL

(Spread Footing expansion joints are required at 1/8" open joints in Concrete Barrier/Noise Wall)

NOTES

1. CONSTRUCTION REQUIREMENTS: Construct the Spread Footing level transversely and expansion joints plumb. Do not construct the spread footing perpendicular to the roadway surface.

2. CONCRETE: Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.

3. DOWELS: Dowel Load Transfer Devices will be ASTM A 36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.

4. Construct 1/2" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

6. Construct ¼" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Railing/Noise Wall.

7. FILL REQUIREMENTS: Shoulder or Roadway Pavement or Fill is required on top (1'-0" minimum depth) for the entire length of the spread footing on both sides of the Railing/Noise Wall. See Section B-B for details.

8. See Index 521-510 for Bars 5V2.

9. Place B ~ Bars (6 = 5B1 & 2 = 5S1) inside Stirrup Bars 5V2 as shown. (2 = 5S1 Bars included in 521-510 or 521-511 quantities)

10. Spacing shown is along the Gutter Line.

11. Work this Index with one or both of the following:
   a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0")
   b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0"

SECTION A-A

SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)
CROSS REFERENCE:
For location of Section B-B, see Sheet 1.

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</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 will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. 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.

**SECTION B-B**

**TYPICAL SECTION THRU SPREAD FOOTING**

(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

**NOTES:**
1. Match Cross Slope of Travel Lane or Shoulder.
2. See Sheet 1, Notes 8 & 9.

**SHORT-view: See Index 521-510, Detail "A" for details.**

**DETAIL "A"**

(Showing Locations of \( \frac{1}{2} \) V-Grooves and \( \frac{3}{8} \) Preformed Expansion Joint Filler)

**ESTIMATED T-SHAPED SPREAD FOOTING QUANTITIES**

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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Reinf Steel (Typical)</td>
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<tr>
<td>Add'l Rein @ Exp Jnt</td>
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Note: The reinforcing steel quantity includes the difference between Index 521-510 or 521-511 and Bars 5V shown. Bars 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE:
For location of Section B-B, see Sheet 1.
CROSS REFERENCE:
For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.

Bars 5U2 @ 6" sp. (Tie to Bars 5U1) (Typ.)

Gutter Line

Bars 5U3
1" Preformed Expansion Joint Filler (Typ. all Sides)

Bars 5S4 (Tie to Bars 5U1)
2" Cover Typ. all Sides

Bars 5V (Typ.) 6" Spacing (See Note 8)
V-Groove Spacing ~ 30'-0" Max. (See Note 6)

Expansion Joint (See Detail on Sheet 3)

1/2 V-Groove (See Note 6 and Detail "A")

Bars 5B (Field Cut as required to clear Barrier Wall Inlet) (Typ.)

Bars SU2 @ 6" sp. (Tie to Bars SU1) (Typ.)

Stem Wall

Barrier Wall Inlet (Grate not shown for clarity) (See Index 425-031 for details)

Bars 5B (Field Cut as required to clear Barrier Wall Inlet) (Typ.)

Field Cut Bars 5U1 & 5B as required to maintain minimum cover for skewed approach slab (Typ.)

PLAN - OPTION B
SPREAD FOOTING ADJACENT TO SKEWED APPROACH SLAB AND WITH BARRIER WALL INLET
(Option A Similar) (Bars SI Not Shown)

NOTES
1. CONSTRUCTION REQUIREMENTS: Construct the Spread Footing level transversely and expansion joints plumb; do not construct the spread footing perpendicular to the roadway surface.
2. CONCRETE: Use Class II concrete for slightly aggressive environments. Use Class IV concrete for moderately or extremely aggressive environments. Concrete will be in accordance with Specification Section 346.
3. DOWELS: Dowel Load Transfer Devices will be ASTM A36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
4. Construct 1" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
6. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier/Noise Wall.
7. FILL REQUIREMENTS: Shoulder or Pavement Fill is required on the traffic side of the spread footing for Option A. Fill is required for a distance of 4'-0" on the backside of the spread footing for Option A. Fill is required for a distance of 4'-0" on the backside of the spread footing and the full length of the spread footing (3'-0" minimum depth) on the traffic side of the spread footing for Option B. See Typical Sections on Sheets 2 and 3 for details.
8. Spacing shown is along the Gutter Line.
9. Work this Index with one or both of the following:
   a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0").
   b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0").

CROSS REFERENCE:
For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.
NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 - Bars (8 - Bars 5B and 2 - Bars 5S1) inside
   Bars 5U1 as shown; (2 - 5S1 Bars are included in 521-510
   or 521-511 quantities).
3. For Reinforcing Steel spacing, see Typical Section Thru
   Spread Footing - Option A This Sheet.
4. Provide 3" lip when optional construction joint is used.

TYPICAL SECTION THRU SPREAD FOOTING - OPTION A
(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

TYPICAL SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET - OPTION A
(Reinforcing Steel not shown for clarity (See Note 3))
TYPICAL SECTION THRU SPREAD FOOTING - OPTION B
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 - Bars 8 (Bars 5B and 2 - Bars 5S1) inside Bars 5U1 as shown.
3. Provide 3" lip when optional construction joint is used.

EXPANSION JOINT DETAIL
(Spread Footing expansion joints are required at 1/8" open joints in Concrete Barrier/Noise Wall)

DETAIL "A"
(Option A Shown, Option B Similar)
(Showing Locations of 1/8" V-Grooves and 1 1/2" Preformed Expansion Joint Filler)
SECTIONS

TYPICAL SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET - OPTION B
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:
1. Place 8 - Bars 5B and 2 Bars S1 inside Bars 5U1 as shown.
2. For reinforcing Steel spacing, see Typical Section Thru Spread Footing - Option B on Sheet 3.
3. Provide 3" lip when optional construction joint is used.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<th>MARK</th>
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<td>F</td>
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<td>S3</td>
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<td>17'-10&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>5</td>
<td>12'-10&quot;</td>
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REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. Lap splices Bars 5T and 5V with 5U1 will 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 L-SHAPED SPREAD FOOTING QUANTITIES

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<th>ITEM</th>
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<td>Concrete (footing)</td>
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<tr>
<td>Reinforcing Steel (Typical)*</td>
<td>LB/FT</td>
<td>68.84</td>
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<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>48.06</td>
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* Bars 5V and S51 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE:
For location of Section A-A, see Sheet 1.
C-I-P COPING - PARTIAL ELEVATION VIEW

PRECAST AND C-I-P COPING NOTES:
1. Provide Class II concrete for slightly aggressive environments
   or Class IV for moderately or extremely aggressive environments.
2. Dowel Bars 4D extend 11" above the top of retaining wall panel. Field cut as necessary to maintain 2" minimum cover. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
3. Payment for Dowel Bars 4D, Buildup Concrete and Coping will be made under Retaining Wall System (Permanent).

PRECAST COPING - PARTIAL ELEVATION VIEW

SECTION A-A

C-I-P COPING

SECTION B-B

PRECAST COPING
REINFORCING STEEL BENDING DIAGRAMS - PRECAST AND C-I-P COPINGS

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. 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.

** For Slightly Aggressive Environments
M = Moderately Aggressive
E = Extremely Aggressive

Bars 4A (Horizontal) (Field cut as required to maintain 2" minimum cover for Extremely Aggressive Environments)

C-I-P COPING ENCLOSURE DETAIL

C-I-P coping used with precast coping

Note: When precast coping units do not fit the entire length of the retaining wall, use this similar C-I-P coping for short portions between precast coping units. This C-I-P coping may also be used for vertical copings.
1" Ø Dowel Load Transfer Devices (See Typical Sections for details)

**Open Joint in Traffic Railing**

SHEET 4 : 10 : 10 P M

**Open Joint in Precast**

3

10 /25 /2017

Optional 11/01/17 for details)

Devices (See Typical Sections

1" Ø Dowel Load Transfer

REVISION

Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

11. The following Indexes contain details of the intersection of the retaining wall at approach slabs:

- Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
- Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

CROSS REFERENCE: For Detail "A", see Sheet 2

PARTIAL ELEVATION VIEW

(Precast Coping and Junction Slab Reinforcing not shown for Clarity) (Precast Coping Shown, C-I-P Coping Similar) (Traffic Railing not Shown for Clarity)

* C-I-P End Section must be ≥ 12'-0".

PARTIAL PLAN VIEW FOR 36" SINGLE-SLOPE TRAFFIC RAILING

(Skewed Approach Slab Shown, Perpendicular Approach Slab Similar) (Precast Coping Shown, C-I-P Coping Similar) (Traffic Railing not Shown for Clarity)
PLAN - RAILING END TRANSITION (Showing Bars V and S)

Bars V (Typ.)

Bars S (Top) (Field Bent)

Approach Slab

PRECAST COPING

DETAIL "A"

(Showing Locations of 1/2" V-Grooves and 1/4" Preformed Expansion Joint Filler)

C-I-P COPING

DETAIL "A"

(Showing Locations of 1/2" V-Grooves and 1/4" Preformed Expansion Joint Filler)

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Joint Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. For Rigid Pavement (Concrete), Joint Slab may be thickened to match finished grade. Vary the Joint Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. Minimum length of Junction Slab between expansion joints (s 30'-0").
5. At the Contractor's option, mechanical couplers may be used to splice reinforcing. Complete details, including reinforcement lengths are required in the Shop Drawings. Provide mechanical couplers in accordance with Specification Section 415. Mechanical couplers shall develop 125% of the bar yield strength.
6. Contractor to maintain stability of precast coping/traffic railing prior to junction slab completion. In the Shop Drawings, show reinforcement for optional extension required for stability, shipping and handling. Maintain 2" minimum concrete cover.
7. When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polystyrene to provide a maximum 2½" air gap.
8. Angle varies ~ 0° min., 25° max.
REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
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<th>MARK</th>
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<th>C-I-P COPING FOR SINGLE SLOPE</th>
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<td></td>
<td>3'-6&quot; (36&quot;) 6'-0&quot; (42&quot;)</td>
<td>3'-6&quot; (36&quot;) 6'-0&quot; (42&quot;)</td>
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<td>3'-3&quot; (36&quot;) 6'-0&quot; (42&quot;)</td>
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<tr>
<td>B1</td>
<td>5</td>
<td>1'-6&quot; (36&quot;) 3'-7&quot; (42&quot;)</td>
<td>1'-6&quot; (36&quot;) 3'-7&quot; (42&quot;)</td>
</tr>
<tr>
<td>B2</td>
<td>5</td>
<td>AS REQD. AS REQD. AS REQD.</td>
<td>AS REQD. AS REQD. AS REQD.</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>4'-10&quot; 4'-10&quot; N/A N/A</td>
<td>4'-10&quot; 4'-10&quot; N/A N/A</td>
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<tr>
<td>F</td>
<td>5</td>
<td>4'-10&quot; 4'-10&quot; 4'-10&quot; 4'-10&quot;</td>
<td>4'-10&quot; 4'-10&quot; 4'-10&quot; 4'-10&quot;</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>4'-5&quot; 4'-5&quot; 4'-5&quot; 4'-5&quot;</td>
<td>4'-5&quot; 4'-5&quot; 4'-5&quot; 4'-5&quot;</td>
</tr>
<tr>
<td>P</td>
<td>4</td>
<td>5'-11&quot; N/A 5'-11&quot; N/A</td>
<td>5'-11&quot; N/A 5'-11&quot; N/A</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>N/A 7'-0&quot; N/A 7'-0&quot;</td>
<td>N/A 7'-0&quot; N/A 7'-0&quot;</td>
</tr>
<tr>
<td>S</td>
<td>5</td>
<td>N/A 9'-6&quot; N/A 9'-6&quot;</td>
<td>N/A 9'-6&quot; N/A 9'-6&quot;</td>
</tr>
<tr>
<td>V1</td>
<td>4</td>
<td>5'-9&quot; N/A 5'-9&quot; N/A</td>
<td>5'-9&quot; N/A 5'-9&quot; N/A</td>
</tr>
<tr>
<td>V1</td>
<td>5</td>
<td>N/A 6'-4&quot; N/A 6'-4&quot;</td>
<td>N/A 6'-4&quot; N/A 6'-4&quot;</td>
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<tr>
<td></td>
<td>1&quot; Ø Dowel</td>
<td>Smooth Bar</td>
<td>2'-0&quot; 2'-0&quot; 2'-0&quot; 2'-0&quot;</td>
</tr>
</tbody>
</table>

See Table

BARS 5B1, 5B2, 5C, 5F, 5S & 5F

STIRRUP BAR 4P (36") 5P (42")

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are cut to cut.
2. All reinforcing steel at expansion and open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B & 5E will be a minimum of 2'-2".
4. For Precast Copings only, lap splice Bars 5A with Bars 5C. Lap splices will be a minimum of 2'-2".
5. The Contractor may use either full length Bars 5A or lap splice with Bars SC at Bars 5A for C-I-P Copings.
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 2'-2".
7. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 2'-2".
8. When approved by the Engineer, the Contractor may use deformed welded wire reinforcement (WWR) meeting the requirements of Specification Section 93).
9. Contractor may use a single #5 stirrup in lieu of two bars for 4P and 4V1.

TYPICAL SECTION THRU C-I-P TRAFFIC RAILING WITH C-I-P JUNCTION SLAB AND C-I-P COPING
(PRECAST COPING SIMILAR WITH C-I-P BUILDUP)

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary the Junction Slab slope based on the roadway cross slope to maintain a minimum 1'-6" thickness at the inside edge of the slab.
3. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finish grade.
4. Minimum length of Junction Slab between expansion joints is 30'-0" for 30" Single-Slope, or 60'-0" for 42" Single-Slope.
5. Contractor to maintain stability of precast coping prior to junction slab completion. In the Shop Drawings, show reinforcement for optional extension required for stability, shipping and handling. Maintain 2" minimum concrete cover.
6. If slip forming is used, submit shop drawings for approval showing 2½" side cover with the Typical Section dimensions adjusted.

ESTIMATED QUANTITIES FOR C-I-P

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY (36&quot;)</th>
<th>QUANTITY (42&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.376</td>
<td>0.420</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical) (Yields Bars SC &amp; 5F)</td>
<td>LB/LF</td>
<td>62.45</td>
<td>82.27</td>
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<tr>
<td>Additional Rein @ Expansion Joint (Steel Dowels)</td>
<td>LB</td>
<td>21.36</td>
<td>21.36</td>
</tr>
</tbody>
</table>

(The above concrete quantities are based on a max. super-elevation of 6.25%)
**RAISED SIDEWALK NOTES:**

1. When a 42" Vertical Shape Traffic Railing is used with a precast coping, increase Bars 4C to Bars 5C or provide Bars 4C @ 4" spacing within 6'-0" of Expansion Joints.
2. Construct the expansion joints, V-Grooves and face of coping plumb.
3. Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A 36 smooth round bar, or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Construct 2" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 30'-0" maximum intervals as shown.
6. Dowel or fiber caps are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue slope on Shear Key must be constant and between 3" to 45" from horizontal.
7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
8. Construct 2" V-Grooves in raised sidewalk and C-I-P coping at 30'-0" maximum intervals as shown. Space V-Grooves equally between 2" Expansion Joints and/or Begin or End Raised Sidewalk. V-Groove locations are to coincide with V-Groove locations in the Traffic Railing.
9. Spacing shown is along the Outer Line.
10. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. Finish Sidewalks in accordance with Specification Section 522.
12. When 32" Vertical Shape is required, see Indexes 51-821 and 51-822 for Bullet Railings.
13. The following Indexes contain details of the intersection of the retaining wall at approach slabs:
   - Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
   - Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

**EXPANSION JOINT DETAIL**

(Raised Sidewalk expansion joints are to coincide with 2" open joints in Traffic Railing)

**STANDARD PLANS**

**VERTICAL SHAPE TRAFFIC RAILINGS**

**PARTIAL PLAN VIEW FOR VERTICAL SHAPE TRAFFIC RAILING**

(Precast Coping Shown, C-I-P Coping Similar) (Traffic Railing not Shown for Clarity)

**CROSS REFERENCE:** For Detail "N", see Sheet 2.
Estimated Quantities for Precast Coping

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Precast Coping)</td>
<td>CY/LF</td>
<td>0.095</td>
</tr>
<tr>
<td>Concrete (C-I-P Raised Sidewalk)</td>
<td>CY/LF</td>
<td>0.232</td>
</tr>
<tr>
<td>Reinforcing Steel (Precast Coping) excluding Bars ST, SA and S5 (Typ.)</td>
<td>LB/LF</td>
<td>23.90</td>
</tr>
<tr>
<td>Reinforcing Steel (C-I-P Raised Sidewalk) (Typ.)</td>
<td>LB/LF</td>
<td>13.50</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joints (Steel Dowels)</td>
<td>LB</td>
<td>32.04</td>
</tr>
</tbody>
</table>

The above concrete quantities are based on a Type D Concrete Curb (See Note 2).

NOTES:
1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height; see Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
3. Trim end of Bars ST and S5 to clear construction joint for 42" Vertical Shape Traffic Railing.
4. At the Contractor’s option, mechanical couplers may be used to splice reinforcing. Complete details, including reinforcement lengths are required in the Shop Drawings. Mechanical couplers shall develop 125% of the bar yield strength.
5. Contractor to maintain stability of precast coping prior to junction slab completion.
6. When the air gap between the precast coping extension and retaining wall exceeds 2\(\text{in.}\), fill gap with full depth Expanded Polystyrene to provide a maximum 2\(\text{in.}\) air gap.
Concrete Reinforcing Steel (Typical) excluding Bars 5T, 5X and 5S (Typ.):

- 35.38 CY/LF
- 32.04 LB/LF

Estimated Quantities for C-I-P Coping:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.326</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical) excluding Bars ST, 5S and 5S (Typ.)</td>
<td>LB/LF</td>
<td>35.38</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joints (Steel Dowels)</td>
<td>LB</td>
<td>32.04</td>
</tr>
</tbody>
</table>

TYPICAL SECTION THRU C-I-P COPING AND RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS

(42" Vertical Face Shown, 32" Vertical Face Similar)

**NOTES:**
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-8" dimension is based on a 32" Vertical Shape Traffic Railing with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
2. If slip forming is used, submit shop drawings for approval showing 3" side cover with the Typical Section dimensions adjusted.
3. Begin placing Railing Bars ST and 5X at the railing end and proceed toward Retaining Wall to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars ST and 5X shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars ST and 5X as required to maintain cover in Railing End Transition.

**END VIEW OF TRAFFIC RAILING END TRANSITION**

**ELEVATION RAILING END TRANSITION**

(Guardrail Not Shown For Clarity)

**BUILD UP FOR STEPPED MSE WALL PANELS AND C-I-P COPING**

**42" VERTICAL SHAPE TRAFFIC RAILINGS**
Concrete Reinforcing Steel

To Be Field Cut (7 of each required per Railing End Transition)

V a r i e s (F i e l d c u t to)

Field Cut & Discard

1'-2"

Field Cut & Discard

ØA

Bar 5A

Bar 5L

BAR 5A

BAR 5L

1" Ø Dowel Smooth Bar

32" 42"

T 5 7'-4" 9'-3"

X 5 5'-1" 6'-0"

STIRRUP BAR 5T

STIRRUP BAR 5X

END TRANSITION STIRRUP BARS 5T FOR 42"

To Be Field Cut (7 of each required per Railing End Transition)

END TRANSITION STIRRUP BARS 5X FOR 42"

To Be Field Cut (7 of each required per Railing End Transition)

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at expansion joints will have a 2" minimum cover.
3. Lap splices for Bars 5B and 5S will be a minimum of 2'-2".
4. Lap splice Bars 5A with Bars 4C. Lap splices will be a minimum of 2'-2".
5. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-8".
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 5'-8", and reinforcing size must be increased to #5 bars (Bars 5C).
7. The Contractor may use deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

* See Sheet 3 Note 3.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>PRECAST COPING/RAILING</th>
<th>C-I-P COPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 5</td>
<td>5'11&quot;</td>
<td>9'-1&quot;</td>
<td></td>
</tr>
<tr>
<td>B1 5</td>
<td>9'-6&quot;/11'-6&quot;</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>B2 5</td>
<td>5'-9&quot;/11'-6&quot;</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>C 5</td>
<td>5'-5&quot;</td>
<td>N/A</td>
<td></td>
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<tr>
<td>F 5</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>L 5</td>
<td>4'-5&quot;</td>
<td>4'-5&quot;</td>
<td></td>
</tr>
<tr>
<td>T 5</td>
<td>7'-4&quot;</td>
<td>9'-3&quot;</td>
<td></td>
</tr>
<tr>
<td>X 5</td>
<td>5'-1&quot;</td>
<td>6'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

1" Ø Dowel Smooth Bar

32" 42"

T 5 7'-4" 9'-3"

X 5 5'-1" 6'-0"

STIRRUP BAR 5T

STIRRUP BAR 5X

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at expansion joints will have a 2" minimum cover.
3. Lap splices for Bars 5B and 5S will be a minimum of 2'-2".
4. Lap splice Bars 5A with Bars 4C. Lap splices will be a minimum of 2'-2".
5. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-8".
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 5'-8", and reinforcing size must be increased to #5 bars (Bars 5C).
7. The Contractor may use deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

* See Sheet 3 Note 3.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Concrete</td>
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<td>0.095 0.14</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>23.38 28.33</td>
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</table>

VERTICAL SHAPE TRAFFIC RAILINGS
PRECAST COPING/ PARAPET AND SIDEWALK NOTES:

1. Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
2. Construct ⅛" Expansion Joints in sidewalk and C-I-P coping plumb and either perpendicular or radial to the Gutter Line. Provide Expansion Joints at 90'-0" maximum intervals as shown.
3. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
4. Construct ⅛" V-Grooves in sidewalk and C-I-P coping. Space V-Grooves at 30'-0" maximum intervals equally spaced between ⅛" Expansion Joints and/or Begin or End Sidewalk. For C-I-P Coping only, V-Groove locations are to coincide with V-Groove locations in the Concrete Parapet.
5. Spacing shown is along the Gutter Line.
6. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 11" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the buildup concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
7. Work this Index with Index 521-001 - Concrete Barrier Wall
8. Work this Index with Index 521-820 - Pedestrian/Bicycle Railing, or Index 521-825 - 42" Concrete Pedestrian/Bicycle Railing.
9. Finish Sidewalks in accordance with Specifications Section 522.
10. The following Indexes contain details of the intersection of the retaining wall at approach slabs:
    Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
    Index 400-091 - Approach Slabs (Rigid Pavement Approaches)

PARTIAL PLAN VIEW
(Skewed Approach Slab Shown, Perpendicular Approach Slab Similar)
(Precast Coping Shown, C-I-P Coping Similar) (Concrete Parapet not Shown for Clarity)

PARTIAL ELEVATION VIEW
(Precast Coping and Sidewalk Reinforcing not Shown for Clarity) (Precast Coping Shown, C-I-P Coping Similar)
**TYPICAL SECTION THRU PRECAST COPING/PARAPET WITH C-I-P SIDEWALK AND RETAINING WALL (MSE Wall Shown, other Wall Types Similar)**

- **Concrete Barrier Wall:**
  - Spread Footing (See Index 521-003 for details)
  - It is the Contractor's responsibility to ensure Soil Reinforcement is placed a minimum of 2" below the Stabilized Subbase.

- **C-I-P Concrete Parapet (42" Shown, 27" Similar):**
  - Top of C-I-P Coping/Sidewalk (Const. Joint Required)
  - Bars 4S1 & 4S2
  - Spacing Bars 4S
  - Bars 452
  - 25° Cover (Typ.)
  - 1'-9" Min. Clearance

- **Coping Line:**
  - Top of Coping
  - Bars 452
  - 25° Cover (Typ.)
  - 1'-9" Min. Clearance

- **PRECAST COPING/PARAPET AND SIDEWALK:**
  - Bars 5L @ 1'-0" sp.
  - Bars 5L @ 1'-0" sp. (Sides)
  - Bars 5S @ 1'-0" sp.
  - Bars 5B2 @ 1'-0" sp. (Max. Typ.)
  - Stabilized Subbase
  - It is the Contractor's responsibility to ensure Soil Reinforcement is placed a minimum of 2" below the Stabilized Subbase.

- **REINFORCING STEEL BENDING DIAGRAMS - COPING/PARAPET AND SIDEWALK:**

- **BILL OF REINFORCING STEEL:**

**PRECAST COPING/PARAPET AND SIDEWALK NOTES:**
1. Actual width varies depending on type of Retaining Wall used.
2. Place or cast Concrete Parapet vertical.
3. Gradually deflect/displace Soil Reinforcement downward as required. Soil Reinforcement is shown deflected downward for illustrative purposes only and is not to scale. See Wall Company Drawings for details.
4. Complete details and dimensions of Concrete Pedestrian/Bicycle Railing are required in the Shop Drawings.
5. Match cross slope of connecting sidewalk or as shown in the Wall Control Drawings.
6. If slip forming is used, submit shop drawings for approval showing 2½" side cover with adjusted Typical Section dimensions.
LIGHT POLE PEDESTAL NOTES:

1. ANCHOR BOLTS:
   Anchor Bolt design is based on the standard Roadway Aluminum Light Pole configurations shown on Index 715-040 with top of pedestal 75' or less above ground or MLW. Anchor Bolt Diameter: See Table 1

2. MATERIALS:
   Anchor Bolts: ASTM F1554 Grade 55.
   Nuts: ASTM A563 Grade A, Heavy-Hex.
   Washers: ASTM F436 Type 1.
   Anchor Plate: ASTM A570 (Grade 36) or ASTM A36.
   Coating: Galvanized all Nuts, Bolts Washers, and plates in accordance with ASTM F2329.

3. The Contractor is responsible for ensuring the anchor bolt design is compatible with the light pole base plate. Modifications to the anchor bolt design shown must be signed and sealed by the Contractor's Specialty Engineer and submitted to the Engineer for approval prior to construction.

4. Install Anchor Bolts plumb.

5. For conduit, EJB and expansion/deflection fitting details, see Utility Conduit Detail Drawings.

6. The cost of anchor bolts, nuts, washers and anchor plates will be included in the Bid Price for Light Poles. Include the cost of all labor, concrete and reinforcing steel required for construction of the pedestals, and miscellaneous hardware required for the completion of the electrical system in the Bid Price for either the Traffic Railing or Concrete Parapet that the pedestal is behind.

7. Field Cut Bars 4M2 as required to maintain clearance.

8. Slip Forming Method of construction requires the Engineer's approval within the limits shown.

9. Reinforcing shown for light pole pedestals is in addition to typical reinforcing for Junction Slabs and Raised Sidewalks.

10. Work this Index with the following as appropriate:
    Index 521-512
    Index 521-610
    Index 521-620
    Index 521-630

11. Pedestal may be precast in one section with Coping. Minimum Precast Coping section length is 10 ft. or 12 ft for combination Precast Traffic Railing and Coping section.

12. For Estimated Quantities, see Sheet 6.

13. Unless otherwise noted, Traffic Railing (36° Single-Slope) is shown in all Views and Sections. The Pedestal details for other traffic railings or pedestrian/bicycle railings are similar.

TABLE 1 DESIGN LIMITATION FOR ANCHOR BOLTS (1" Dia.)

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Arm Length (FT)</th>
<th>Base of Pole Height*</th>
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</thead>
<tbody>
<tr>
<td>120</td>
<td>40</td>
<td>75 75 75</td>
</tr>
<tr>
<td>140</td>
<td>40, 50</td>
<td>75 75 75</td>
</tr>
<tr>
<td>160 8 &amp; 10</td>
<td>50</td>
<td>75 75 45**</td>
</tr>
<tr>
<td>160 12 &amp; 15</td>
<td>75</td>
<td>75 75 25**</td>
</tr>
</tbody>
</table>

* Above Natural Ground
** (use 1½ Ø Anchor bolts for wall heights greater than the height shown and less than 75'.

PLAN VIEW
(Junction Slab reinforcing not shown for clarity)
(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)
TYPICAL SECTION AT LIGHT POLE PEDESTAL
(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar) (36" Single-Slope Traffic Railing shown, other railings similar)

NOTES:
1. Provide Concrete Class to match adjacent coping.
2. For junction slabs, increase the 1'-0" depth dimension to 1'-9".
3. For Parapet with sidewalk see Index 521-630, but increase 6" sidewalk depth to 1'-6".
   For raised sidewalk see Index 521-620.
4. The minimum length of the Junction Slabs, raised sidewalks and sidewalks is 30'-0", measured along the Gutter Line.
5. Bars 4J are only required when pedestals are behind a Traffic Railing or Traffic Railing/Noise Wall.
6. Top of junction slab may be thickened to match finished grade of concrete pavement or shoulder, or top of sidewalk or raised sidewalk (See Notes 3 & 4).
7. Actual width varies depending on type of retaining wall used.
8. See Index 521-610 for Bars 4V1, 5V1 and 5B, or Index 521-512 for Bars 5V and 5B1.
9. Work with Index 521-610 (Traffic Railing/Noise Wall), Index 521-610 (Single-Slope), Index 521-620 (Vertical Shape), and Index 521-630 (Concrete Parapet).
**DETAIL "A"**

- Optional Notch for Index 521-610 (Typ.)
- Top of recess & Bottom of Junction Slab
- Bars 4G1, 4G2, 4G3, 4G4 & 4G5
- Bars 5B3 & 5J
- Bars 4H1
- Bottom of MSE Wall Coping
- Varies (Transition to 1'-9" Thick Junction Slab) Junction Slab
- Bottom of Pedestal
- Minimum Limits of C-I-P Coping

**NOTES:**
1. Field Cut Bars 4M2 as required to maintain minimum cover.
2. Maximum clearance between leveling nut and top of pedestal will not exceed anchor bolt diameter.

**ESTIMATED QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Pedestal)</td>
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<td>0.926</td>
</tr>
<tr>
<td>Concrete (Thickened Junction Slab)</td>
<td>CY</td>
<td>1.222</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>334.09</td>
</tr>
</tbody>
</table>

(The quantities above are for one C-I-P Light Pole Pedestal. The concrete quantity for the thickened junction slab is based on a 5'-0" length, 9" increase in thickness and a 5" wide retaining wall panel. Adjust thickened concrete quantity as required.)
GENERAL NOTES:
1. Construct sidewalks in accordance with Specification 522. Use 6" concrete for sidewalks and curb ramps located within curb returns (see plan view). Install all other concrete with thickness as shown, unless otherwise detailed in the Plans.
2. Include detectable warnings on sidewalk curb ramps in accordance with Index 522-002.
3. For TURNOUTS see Index 000-515.
4. Bond breaker material can be any impermeable coated or sheet membrane or preformed material having a thickness of not less than 6 mils not more than 0.05".
5. Construct sidewalks with Edge Beam through the limits of any surface mounted Pedestrian/Bicycle railing or pipe guiderail shown in the plans. (See RAILING DETAIL)
6. When roadways or driveways are newly constructed, reconstructed or altered, construct the cross slopes for crosswalks and discontinuous sidewalks as follows:
   A. Max. 0.02 cross slope for roadways or driveway controlled by "STOP" Sign or "YIELD" sign.
   B. Max. 0.05 cross slope for roadways or driveways controlled by traffic signal.

OPEN JOINTS

SAWED JOINTS

LONGITUDINAL SECTION

LEGEND:
A- 1/4" Expansion Joint (Preformed Joint Filler)
B- 1/4" Dummy Joint, Tooled
C- 1/4" Formed Open Joint
D- 1/8" Saw Cut Joints, 1/8" Deep (within 96 hours) Max. 5' Centers
E- 1/8" Saw Cut Joints, 1/8" Deep (within 12 hours) Max. 30 Centers Joint(s) Required When Length Exceeds 120'
F- 1/4" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.
G- Cold Joint With Bond Breaker, Tooled

SIDEWALK JOINTS

PLAN

SIDEWALK WITH UTILITY STRIP

PLAN

SIDEWALK WITHOUT UTILITY STRIP

SECTION A-A

SECTION B-B

RAILING DETAIL
**LEGEND:**

A- 1/8" Expansion Joints (Preformed Joint Filler)
B- 1/8" Dummy Joints, Tooled
C- 1/8" Formed Open Joints
D- 3/16" Saw Cut Joints, 1/8" Deep (within 96 hours) Max. 5' Centers
E- 1 1/16" Saw Cut Joints, 1/8" Deep (within 12 hours) Max. 30' Centers
F- 1/8" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.

**LONGITUDINAL SECTION**

**SIDEWALK JOINTS**

**CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS**
GENERAL NOTES

1. Cross slopes and grades:
   A. Sidewalk, ramp, and landing slopes (i.e. 0.02, 0.05, and 1:12) shown in this Index are maximums. With approval of the Engineer, decrease the minimum feasible slope where the requirements cannot be met.
   B. Landings must have cross-slopes less than or equal to 0.02 in any direction.
   C. Install ramp slopes along a single linear plane (i.e. no warps or varying slope). Ramp slopes are not required to exceed 15 feet in length.
   D. Joints permitted at the location of Slope Breaks. Otherwise locate joints in accordance with Index 522-001. No joints are permitted within the ramp portion of the Curb Ramp.

2. Grade breaks:
   Grade breaks at the top and bottom of ramps must be parallel to each other and perpendicular to the direction of the ramp slope.

3. Curb, Curb and Gutter and/or Sidewalk:
   A. Refer to Index 522-001 for concrete thickness and sidewalk details.
   B. Remove any existing curb or curb and gutter to the nearest joint beyond the curb transition or to the extent that no remaining section of curb or curb and gutter is less than 5 feet long. Remove any existing sidewalk to the nearest joint beyond the transition slope or to the extent that no remaining section of sidewalk is less than 5 feet long.

4. Curb Ramp Alpha-Identification:
   A. Sidewalk curb ramp alpha-identifications (e.g. CR-A) are provided for reference purposes in the Plans.
   B. Alpha-identifications CR-I and CR-J are intentionally omitted.

5. Detectable Warning:
   A. Install detectable warnings in accordance with Specification 527.
   B. Place detectable warnings across the full width of the ramp or landing, to a minimum depth of 2 feet measured perpendicular to the curb line and no greater than 5 feet from the back of the curb or edge of pavement.
   C. If detectable warnings are shown in the Plans on slopes greater than 5%, align the truncated domes with the centerline of the ramp; otherwise, the truncated domes are not required to be aligned.

6. Detectable Warnings – Acceptance Criteria:
   A. Color and texture shall be complete and uniform.
   B. 90% of individual truncated domes shall be in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.
   C. There shall be no more than 4 non-compliant domes in any one square foot.
   D. Non-compliant domes shall not be adjacent to other non-compliant domes.
   E. Surfaces shall not deviate more than 0.10" from a true plane.
SECTION A-A

SIDEWALK CURB RAMPS CR-A AND CR-B

DESCRIPTION:

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REV 01/01/17

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

FY 2018-19 STANDARD PLANS

SIDEWALK CURB RAMPS CR-A AND CR-B

DESCRIPTION:

REVISIONS:

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REV 01/01/17

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

FY 2018-19 STANDARD PLANS
DESCRIPTION:

SECTION B-B

Sidewalk Curb
(Where Necessary)

See SIDEWALK CURB OPTIONS details.

* Note: For Additional Information On Sidewalk Curb Construction, See SIDEWALK CURB OPTIONS details.

SECTION C-C

SIDEWALK CURB OPTIONS

CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS

MONOLITHIC CAST CURB

SEPARATELY CAST CURB

Note: Remove Elevated Pavement By Spading And Rolling, Smooth Milling or Grinding.
DESCRIPTION:

OPTION A

OPTION B

SIDEWALK CURB RAMPS CR-D, CR-E, CR-F & CR-G

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS
NOTE:
Crosswalk Width and Configuration Vary; Must Conform to Index 711-001.
15' Radius Curve Shown for CR-L.

*R Note: For Additional Information On Sidewalk Curb Construction, See SIDEWALK CURB OPTIONS details.

DESCRIPTION:

REVISION

REVISION

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SIDEWALK CURB RAMPS CR-H, CR-K & CR-L

PLAN VIEW

ISOMETRIC VIEW

PLAN VIEW

ISOMETRIC VIEW

OPTION A

OPTION B

NOTE:

SECTION D-D

SECTION E-E

10'-0" (Type F Curb Shown)

9" For Type E Curb
(Type F Curb Shown)

8" For Type F Curb

Pavement Relief (If Needed) (See Section C-C)

If Needed

Gutter Line

Rdwy. Pavt. 0.02

Rdwy. Pavt. 0.02

0.02 (Max.)

Rdwy. Pavt.

Landing

Landing

Landing

Sidewalk Curv* (Where Necessary)

Sidewalk Curv* (Where Necessary)

Sidewalk Curv* (Where Necessary)

Utility Strip (Grass Or Pavt.)

Utility Strip (Grass Or Pavt.)

Utility Strip (Grass Or Pavt.)

Sidewalk

Sidewalk

Sidewalk

2'-0" Detectable Warnings

2'-0" Detectable Warnings

2'-0" Detectable Warnings

Sidewalk Curb

Sidewalk Curb

Sidewalk Curb

2'-0" (Min.)

2'-0" (Min.)

2'-0" (Min.)

7'-0" (Std.)

4'-0" (Min.)

4'-0" (Min.)

4'-0" (Min.)

3'-0" (Min.)

2'-0" (Max.)

2'-0" (Max.)

2'-0" (Max.)
LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS

(See CR-F, CR-G & CR-K Respectively For Detectable Warning Details/Options)

OPTION A

OPTION B

DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS

CURB RAMPS WITHOUT SIDEWALKS AND FLUSH SHOULDER SIDEWALKS
NOTES:

1. Cross Slope of the median crossing not to exceed 0.02.

2. Running Slopes:
   
   A. Slopes ≤ 0.05: For roadway cross sections were the Edge of Pavement elevation is the same for both directions of traffic, the median crossing running slopes (0.02 Typ.) should meet at the centerline of the median. For roadway cross sections with variable Edge of Pavement elevations, or to accommodate other construction in the median, the slopes may intersect off the centerline of the median.

   B. Slopes > 0.05: Provide a median refuge area (landing, 0.02 slope) for crossings with running slopes > 0.05. The refuge area must extend the full width of the crossing and have a minimum length of 5 feet.

3. On existing facilities, remove and reconstruct curb transition for raised sidewalk with ramp.

SECTION F-F
NOTES:
1. Where crosswalk markings are used, ramps must fall within the crosswalk limits. A clear space of 48" minimum is required at the bottom of the ramp within a marked crosswalk. If crosswalk markings are not present, a clear space of 48" minimum is required at the bottom of the ramp outside of active travel lanes.
2. Crosswalk widths and configurations vary; must conform to Index 711-003.
3. Flangeway Gap may be up to 3" for Freight-only Railways.

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DESCRIPTION: 11/01/17
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DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS
RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS
SOD PLACEMENT AT PIPE/CULVERT END TREATMENTS

TABLE 2: SOD QUANTITIES (SY)

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>INDEX 430-030</th>
<th>INDEX 430-031</th>
<th>INDEX 430-040</th>
<th>INDEX 430-020</th>
<th>ALL SLOPES</th>
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<td>68</td>
<td>69</td>
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<td>71</td>
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</tbody>
</table>

Note: Either option may be used unless otherwise called for in the plans.

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE

SODDING QUANTITIES FOR EACH ENDWALL TO BE DETERMINED BY THE DESIGNER FROM THIS DETAIL.

INDEX 430-030
STRAIGHT ENDWALL
INDEX 430-030
U-TYPE ENDWALL
INDEX 430-011
INDEX 430-020
INDEX 430-040

U-TYPE ENDWALLS
INDEX 430-040
FLARED END SECTION
INDEX 430-020

Note: Sodding quantities for each endwall to be determined by the designer from this detail.
1. Provide Plain or Fiber Reinforced Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.

A. For Collar Bearing Points provide:
   1. 4" x 4" x ½" Fiber Reinforced Pads;
   2. Plain Pads may be substituted for Fiber Reinforced Pads when sufficient bearing area is available on the concrete collar for the following:
      a. 10' Post Spacing; 4" x 4" x ½"
      b. 20' Post Spacing and Wall Height < 17 feet: 4" x 4" x ½"
      c. 20' Post Spacing and Wall Height ≥ 17 feet; 4" x 5" x ½"

B. At panel bearing points between stacked panels, use Plain or Fiber Reinforced Bearing Pads.

1. Work this Index with the Noise Wall Data Tables, and Wall Control Drawings in the Plans.
   A. Prestressed concrete posts with equivalent strength resistance may be substituted for conventionally reinforced precast posts shown in this index when approved as part of a Producer's Quality Control Plan.
   B. Producer shop drawings for prestressed concrete post designs must be approved by the State Structures Design Office prior to inclusion in the Quality Control Plan.

2. Construct Noise Walls in accordance with the requirements of Specification Section 534, and Augers Cast Piles in accordance with Specification Section 455.

3. Field verify the location of all overhead and underground services shown in the Wall Control Drawings.

4. Wall Height is the nominal height of the walls above finished grade. The Wall Embedment Depth for design is 1'-0". The actual embedment depth may vary plus or minus 6" along the length of the wall.

5. Post Spacing in this Index are nominal, and are measured from centerline to centerline of the auger cast piles. Actual post spacing may vary as shown in the Wall Control Drawings.

6. Panels:
   A. The sum of the individual stacked panel heights is the Wall Height plus 1'-0" (embedment depth).
   B. Where special graphics are required, locate the horizontal panel joints outside of the graphics. Where possible, hold horizontal panel joints at a constant elevation.
   C. Side installed Panels are only permitted when reduced overhead clearance between posts prohibits installing panels from the top.
      1. For Flush Face panels, install panel into posts from the roadway (front face) of the wall. Recessed panels may be installed from the back face of the wall.
      2. After panels are installed and centered between posts, grout between both panel ends and the adjoining posts (see Sheets 4 and 5 for details).
   D. Individual panel heights should be between 6'-0" and 12'-0" tall. The minimum panel height is 4'-0" and may be used where overhead clearance is limited, or where graphic panels are required on shorter walls.

7. Concrete And Grout:
   A. Concrete Class and Compressive Strength for:
      1. Precast Panels, Posts, and Post Caps: Class IV
      2. Cast-In-Place Collars: Class IV
   B. Minimum Compressive Strength for form removal and handling of posts and panels:
      1. 2,500 psi for horizontally cast post and panels
      2. 2,000 psi for vertically cast panels or when tilt-up tables are used for horizontally cast panels.
   C. Grout for Auger Cast Piles:
      1. Maximum Working Compressive Strength = 2,000 psi
      2. Minimum 28 day strength = 5,000 psi

8. Reinforcing Steel:
   A. In addition to the requirements of Specification Section 415, tie post and pile stirrups at the following locations as a minimum:
      1. Post Stirrups Tie at all four corner bars and at every third interior bar intersection.
      2. Pile Stirrups Tie to the main vertical reinforcing at alternate intersections for circular configurations and at the four corners and at every third interior bar intersection for rectangular configurations.
   B. Provide 2" concrete cover unless noted otherwise.

9. Casting Tolerances for precast panels and posts:
   A. Overall Height and Width: +/- 1/32
   B. Thickness: +/- 1/32
   C. Plane of side mold: +/- 1/16
   D. Openings: +/- 1/32
   E. Out of Square: 1/8" per 6 ft., but not more than 3/8" total along any side
   F. Warping: 1/16" per foot distance to nearest corner
   G. Bowing: 1/240 panel dimension
   H. Surface Smoothness for Type "A" Smooth Surface Texture Option: +/- 1/16
Type "A" SMOOTH

Type "B" ASHLAR STONE

Type "C" RUNNING BOND BLOCK

Type "D" FRACTURED GRANITE

Type "E" WIRE-CUT BRICK

Type "F" PEAS GRAVEL

Type "G" VERTICAL FRACUTED FIN

Type "H" TRAPEZOID VERTICAL FINS W/ FRACTURED FACE (COLORADO DRAG AGGREGATE)

Type "I" CUT CORAL BLOCK (RUNNING BOND)

NOTES:
1. Surfaces shall be formed, rolled, or pressed using form liners in accordance with the Plans and Specifications for Class 2 Surface Finish.
2. See Noise Wall Data Tables for project aesthetic requirements.
**DESCRIPTION:**

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**NOISE WALLS - (PRECAST)**

**GRAPHICS & TEXTURE DETAILS**

---

**HALF ELEVATION**

(Front Face Post and Panel Texture Type "H" shown)

(Graphic Type SE-2 shown)

(Two stacked panels shown, three stacked panels similar)

---

**NOTES:**

1. Submit specific form liner samples for approval by the Engineer.

2. Textures and graphics shown are for demonstration purposes only. See Noise Wall Data Tables in the plans for project specific texture and graphic requirements.
NOTE: At the Contractor's option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

* Vertical Steel – #4 Bars @ 10" (As=0.24 in.²/ft.) (Typ.)

Horizontal Steel – #4 Bars @ 8" (As=0.30 in.²/ft.) (Typ.)

** Vertical Steel – #4 Bars @ 10" (As=0.24 in.²/ft.) (Typ.)

PLAIN TEXT:

TYPICAL PANEL ELEVATION

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using tilt-tables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in.²/ft.).

STANDARD PICK UP POINTS FOR PANELS
(Panel shall be rotated about long axis only)

Pick up points

Notes:
1. See Sheet 3 for allowable methods of applying textures.
2. See plans for panel type and aesthetic requirements.
3. For equal post spacing, side-installed panel length will be shorter than top-installed Panel length.

** Panel Height (H)

Pick up points

** Panel Height (H)

Panel Height (H)

Panel Height (H)

Panel Height (H)

Panel Height (H)

Pick up points

Notes:
1. See Sheet 3 for allowable methods of applying textures.
2. See plans for panel type and aesthetic requirements.
3. For equal post spacing, side-installed panel length will be shorter than top-installed Panel length.
NOTE: The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2\(\Delta\)) between panels exceeds 7\(\degree\).

NOTE: The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2\(\Delta\)) between panels exceeds 20\(\degree\).
DRAINAGE HOLES TYPES A, B, C & D  
(Front Face of Wall Shown)  
(Two Holes Shown, One Hole Similar)

1. Grating shall be ASTM A36 steel welded in accordance with the current edition of ANSI/AWS D1.1 Steel Welding Code. Hot-dip galvanize grate after fabrication in accordance with Specification Section 962.

2. Expansion Anchors: Use 1/2" Ø x 2" min. corrosion resistant (zinc/aluminum alloy or stainless steel) expansion anchors to connect grates to panels.

3. Blockout textured concrete surface for a strip 2" wide around drainage hole to enable secure attachment of the drainage grate.

DRAINAGE HOLES DETAILS

BAR BENDING DETAILS (#3 Bars)
**STANDARD POST REINFORCEMENT**

(Standard Post Shown, 45° Corner Posts Similar)

---

**LOW CLEARANCE OPTION**

* Extend Post 3" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

---

**NOTES:**

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
DESCRIPTION:

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NOISE WALLS - (PRECAST)

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POST PLACEMENT & PILE REINFORCING STEEL DETAILS

POST PLACEMENT & PILE REINFORCING STEEL DETAILS

NOTE:

1. For Pile Length Tables, see Sheets 15 and 16.
45° POST NOTES:
1. Reference Sheets 8 & 9 for location of Sections.
   Space Bars P7 as shown for Bars P1.
   Space Bars P8 as shown for Bars P2.
2. Match texture thickness with appropriate Panel face.
3. For Post Reinforcing, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.

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NOISE WALLS - (PRECAST)

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NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel finish top of Collar to allow placement of Bearing Pads.
* Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".
NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel Finish top of auger cast pile to allow placement of Bearing Pads.
   * Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

* Top of Wall

90° Corner Low Clearance Post

Finished Grade

Exposed Precast Post Reinforcement (Typ.)

36" Ø Auger Cast Pile

10 - #9 Bars (Typ.), See Section W-W

Bottom of Augered Hole per Plan

ELEVATION

SECTION W-W

SECTION V-V
### Table 1A - Table of Post Reinfacing Steel

<table>
<thead>
<tr>
<th>Post Length Without Caps</th>
<th>#4</th>
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<td>11'-8&quot;</td>
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<td>12'-1&quot;</td>
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<td>13'-2&quot;</td>
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<td>14'-4&quot;</td>
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<td>22'-0&quot;</td>
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</table>

**Wind Speed:** 130 MPH

*See Sheet 1, Note 4.*

### Table 1B - Pile Lengths (Foot) - Wind Speed = 330 MPH

<table>
<thead>
<tr>
<th>Soil</th>
<th>Wind Speed</th>
<th>Pile Length</th>
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<tbody>
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<td>Soil 1</td>
<td>330 MPH</td>
<td>10'-8&quot;</td>
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<td>Soil 2</td>
<td>330 MPH</td>
<td>11'-8&quot;</td>
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<tr>
<td>Soil 3</td>
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<td>12'-8&quot;</td>
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<td>Soil 4</td>
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<td>Soil 5</td>
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<td>Soil 11</td>
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<td>20'-8&quot;</td>
</tr>
<tr>
<td>Soil 12</td>
<td>330 MPH</td>
<td>21'-8&quot;</td>
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**Wind Speed:** 330 MPH

*See Table Below.*

### Diagrams

- **Diagram A:** Pile Post & Wall
- **Diagram B:** Corner Posts
- **Diagram C:** Cast-in-Place Collar (5 Bars)
- **Diagram D:** Foundation

**Note:** All bar directions in bending diagrams are counterclockwise. All bars not shown in the bending diagrams are clockwise.

**Bar Bending Details:**

- **Bar P1:** Bar length = 3'-0"
- **Bar P2:** Bar length = 4'-0"
- **Bar P3:** Bar length = 5'-0"
- **Bar P4:** Bar length = 6'-0"
- **Bar P5:** Bar length = 7'-0"
- **Bar P6:** Bar length = 8'-0"

**Bar Bending Details for Pile:**

- **Bar P7:** Bar length = 9'-0"

**Soil 2** = Medium Dense Granular Soil, N = 10 to 40.

**Soil 1** = Low Drained Soil, S = 1 to 4.

**Soil 3** = Medium Drained Soil, S = 4 to 8.

**Soil 4** = High Drained Soil, S = 8 to 16.

**Soil 5** = Very High Drained Soil, S = 16 to 32.

**Soil 6** = Very High Drained Soil, S = 32 to 64.

**Soil 7** = Very High Drained Soil, S = 64 to 128.

**Soil 8** = Very High Drained Soil, S = 128 to 256.

**Soil 9** = Very High Drained Soil, S = 256 to 512.

**Soil 10** = Very High Drained Soil, S = 512 to 1024.

**Soil 11** = Very High Drained Soil, S = 1024 to 2048.

**Soil 12** = Very High Drained Soil, S = 2048 to 4096.
### Table 2A - Table of Post Reinforcing Steel

<table>
<thead>
<tr>
<th>Nominal Wall Height (Feet)</th>
<th>Post Lengths</th>
<th>Wind Speed = 150 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10'-0&quot; Post Spacing</td>
<td>20'-0&quot; Post Spacing</td>
</tr>
<tr>
<td></td>
<td>BARS A</td>
<td>BARS B</td>
</tr>
<tr>
<td>12</td>
<td>#12</td>
<td>#12</td>
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<tr>
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<tr>
<td>22</td>
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</table>

### Table 2B - Pile Lengths (Feet) - Wind Speed = 150 MPH

<table>
<thead>
<tr>
<th>Nominal Wall Height (Feet)</th>
<th>H-Posts</th>
<th>Corner Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SOIL 1</td>
<td>SOIL 2</td>
</tr>
<tr>
<td>30'</td>
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<td>30'</td>
</tr>
<tr>
<td>36'</td>
<td>0</td>
<td>36'</td>
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</tbody>
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### Table 3A - Table of Post Reinforcing Steel

<table>
<thead>
<tr>
<th>Nominal Wall Height (Feet)</th>
<th>Post Lengths</th>
<th>Wind Speed = 170 MPH</th>
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<td>20'-0&quot; Post Spacing</td>
</tr>
<tr>
<td></td>
<td>BARS A</td>
<td>BARS B</td>
</tr>
<tr>
<td>12</td>
<td>#12</td>
<td>#12</td>
</tr>
<tr>
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<td>#21</td>
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<tr>
<td>22</td>
<td>#22</td>
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</table>

### Table 3B - Pile Lengths (Feet) - Wind Speed = 170 MPH

<table>
<thead>
<tr>
<th>Nominal Wall Height (Feet)</th>
<th>H-Posts</th>
<th>Corner Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SOIL 1</td>
<td>SOIL 2</td>
</tr>
<tr>
<td>30'</td>
<td>0</td>
<td>30'</td>
</tr>
<tr>
<td>36'</td>
<td>0</td>
<td>36'</td>
</tr>
</tbody>
</table>

### Table Note:
1. Bars D and Bars E are for 49' Corner Posts only.
2. See Contract Plans for project wind speed.
   Soil 2 = Medium Dense Granular Soil, N = 10 to 40.

---

**Table 2A**

- **Post Reinforcing Steel**
- **Wind Speed = 150 MPH**

**Table 2B**

- **Pile Lengths (Feet)**
- **Wind Speed = 150 MPH**

**Table 3A**

- **Post Reinforcing Steel**
- **Wind Speed = 170 MPH**

**Table 3B**

- **Pile Lengths (Feet)**
- **Wind Speed = 170 MPH**
GENERAL NOTES:
1. Construct Perimeter Walls in accordance with Specification Section 534.
2. Choice of either Precast Option or Masonry Option is at the discretion of the Contractor. Contractor must also select the desired foundation type. Modifications to this Index is restricted to those required for geometric needs only.
3. Post spacing is measured from centerline to centerline of foundation element. For this Index, posts and foundation elements have been designed for 20’ ft. spacings. Use post spacing less than 20 ft only at changes in horizontal alignment, wall terminations or to accommodate turn radii.
4. See "Perimeter Wall Data Tables" in the plans for project requirements.
5. Field verify the locations of all overhead and underground utilities shown in the Wall Control Drawings.

PRECAST OPTION NOTES:
6. WALL NOTES:
   A. Walls may consist of either a single height panel or two stacked panels. Minimum panel height is 6’-0”.
   B. Only when reduced headroom clearance between posts prohibits installation of panels from the top, side-installed panels are allowed. After panel is centered between posts, grout between panel ends and posts.

7. CONCRETE AND GROUT:
   A. Cast-in-Place and Precast Concrete: Class IV
   B. Grout for Auger Cast Piling: Minimum 28 Day Strength = 5000 psi
   C. Minimum Compressive Strength for Form Removal and Handling of Posts, Panels and Precast Spread Footings:
      i. 2,500 psi for horizontally cast post, panels and precast spread footings.
      ii. 2,000 psi for vertically cast panels or when lift-up form tables are used for horizontally cast panels.

8. REINFORCING STEEL:
   A. Concrete Cover: 1/2” unless otherwise noted.
   B. In addition to the requirements of Specification Section 415, tie post and pile stirrups at the following locations as a minimum:
      i. Post Stirrups – Tie at all four corner bars and at every third interior bar intersection.
      ii. Pile Stirrups – Tie to the main vertical reinforcing at alternate intersections.

9. BEARING PADS:
   A. Bearing Pads for Collar or Pedestal Bearing Points and between stacked panels may be either Plain or Fiber Reinforced Neoprene Pads, in accordance with Specification Section 932 for ancillary structures.

10. CASTING TOLERANCES:
    A. Overall Height & Width: +/- 1/2”
    B. Thickness: +/- 3/8”
    C. Plane of side mold: +/- 1/8”
    D. Openings: +/- 1/32”
    E. Out of Square: 1/16” per 6 ft., but not more than 1/8” total along any side
    F. Warping: 1/8” per foot distance to nearest corner
    G. Bowing: 1/240 panel dimension

11. PILING:
    A. Construct Auger Cast Piling in accordance with the Plans and Specification Section 455.
    B. Grout for Auger Cast Piling: Minimum 28 Day Strength = 5000 psi
    C. Minimum Compressive Strength for Form Removal and Handling of Posts, Panels and Precast Spread Footings:
       i. 2,500 psi for horizontally cast post, panels and precast spread footings.
       ii. 2,000 psi for vertically cast panels or when lift-up form tables are used for horizontally cast panels.

MASONRY OPTION NOTES (CONT.):
12. WALL NOTES:
    A. Inspect construction in accordance with the International Building Code (IBC) Section 17.
    B. Construct masonry walls with 8x8x16 block using a running bond pattern and concave notched joints.
    C. Make all elevation changes (steps) in footing and top of wall using full height blocks.
    D. Fully Grout all cells with horizontal or vertical reinforcing bars.
    E. Use reinforcing bar positioners to maintain vertical and horizontal bar placement.
    F. Fully grout first three courses of the wall.
    G. Joint Reinforcement: Use W 1.7 (9mm) galvanized ladder reinforcing spaced at 16” vertically. Provide special accessories for corners, intersections, etc. Joint reinforcing shall be continuous except it shall not pass through vertical masonry control joints. Lap joint reinforcing a minimum of 6”.
    H. Construct expansion joints in the foundation at 90 foot maximum intervals, and directly below a wall control joint.
    I. Dowel Load Transfer Devices will be ASTM A 36 smooth round bars hot-dip galvanized in accordance with Specification Section 682. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
    J. Fully Grout all cells with horizontal or vertical reinforcing bars.
    K. Protect walls during construction from soil, grout or mortar stains. Clean wall as work progresses by dry brushing to remove mortar fins and smears before grouting joints.
    L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA (IBC) Section 17.

MASONRY OPTION NOTES:
12. WALL NOTES:
    A. Inspect construction in accordance with the International Building Code (IBC) Section 17.
    B. Construct masonry walls with 8x8x16 block using a running bond pattern and concave notched joints.
    C. Make all elevation changes (steps) in footing and top of wall using full height blocks.
    D. Fully Grout all cells with horizontal or vertical reinforcing bars.
    E. Use reinforcing bar positioners to maintain vertical and horizontal bar placement.
    F. Fully grout first three courses of the wall.
    G. Joint Reinforcement: Use W 1.7 (9mm) galvanized ladder reinforcing spaced at 16” vertically. Provide special accessories for corners, intersections, etc. Joint reinforcing shall be continuous except it shall not pass through vertical masonry control joints. Lap joint reinforcing a minimum of 6”.
    H. Construct expansion joints in the foundation at 90 foot maximum intervals, and directly below a wall control joint.
    I. Dowel Load Transfer Devices will be ASTM A 36 smooth round bars hot-dip galvanized in accordance with Specification Section 682. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
    J. Fully Grout all cells with horizontal or vertical reinforcing bars.
    K. Protect walls during construction from soil, grout or mortar stains. Clean wall as work progresses by dry brushing to remove mortar fins and smears before grouting joints.
    L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA (IBC) Section 17.

MASONRY OPTION NOTES (CONT.):
12. WALL NOTES:
    A. Inspect construction in accordance with the International Building Code (IBC) Section 17.
    B. Construct masonry walls with 8x8x16 block using a running bond pattern and concave notched joints.
    C. Make all elevation changes (steps) in footing and top of wall using full height blocks.
    D. Fully Grout all cells with horizontal or vertical reinforcing bars.
    E. Use reinforcing bar positioners to maintain vertical and horizontal bar placement.
    F. Fully grout first three courses of the wall.
    G. Joint Reinforcement: Use W 1.7 (9mm) galvanized ladder reinforcing spaced at 16” vertically. Provide special accessories for corners, intersections, etc. Joint reinforcing shall be continuous except it shall not pass through vertical masonry control joints. Lap joint reinforcing a minimum of 6”.
    H. Construct expansion joints in the foundation at 90 foot maximum intervals, and directly below a wall control joint.
    I. Dowel Load Transfer Devices will be ASTM A 36 smooth round bars hot-dip galvanized in accordance with Specification Section 682. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
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    K. Protect walls during construction from soil, grout or mortar stains. Clean wall as work progresses by dry brushing to remove mortar fins and smears before grouting joints.
    L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA (IBC) Section 17.
**TYPE "A" CAP DETAILS**

**TYPE "B" CAP DETAILS**

**TYPE "C" CAP DETAILS**
**NOTES:**

1. Drainage holes may be formed with 4" NPS PVC pipe that may remain in place.
2. See Wall Control drawings for number, Type and location/spacing of drainage holes.
**PRECAST OPTION - TYPICAL PANEL DETAILS**

**TYPICAL PANEL ELEVATION**

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using lift-cables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in.²/ft.)

**STANDARD PICK UP POINTS FOR PANELS**

(Panels shall be rotated about long axis only)

**SECTION F-F**

**SECTION G-G**

**DETAIL "B" - TOP-INSTALLED**

(Typ. Both Ends)

**DETAIL "B" - SIDE-INSTALLED**

(Typ. Both Ends)
TYPICAL POST SECTION
(H Section)

SECTION H-H
(H Section - Above Collar)

Roadway face of wall
Front Face Post Texture (Formed)

1'-4"

Post & Wall (Typ.)

Bars P1 (Typ.)

Bars P2 (Typ.)

Bars A

3\(^{\frac{1}{2}}\) Chamfer (Typ.)

Low Clearance Option

PreCast Collar

SECTION I-I

Precast Collar

SECTION J-J

Bars P1 (Pairs)

Bars P2

Bars A

3\(^{\frac{1}{2}}\) Chamfer (Typ.)

Table 1

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Pile Length</th>
<th>Bars A</th>
<th>Bars P1 thru P6</th>
<th>Bars S1</th>
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</thead>
<tbody>
<tr>
<td>130</td>
<td>12'-0&quot;</td>
<td>#3</td>
<td>#3</td>
<td>#4</td>
</tr>
<tr>
<td>150</td>
<td>13'-6&quot;</td>
<td>#5</td>
<td>#3</td>
<td>#4</td>
</tr>
<tr>
<td>170</td>
<td>15'-0&quot;</td>
<td>#6</td>
<td>#3</td>
<td>#4</td>
</tr>
</tbody>
</table>

Bar Bendings Details

Bar P1

Bar Length = 2'-3\(\frac{1}{2}\)'

Bar P2

Bar Length = 9'-0"

Notes:
1. See Shop Drawing for Post Lengths.

All bar dimensions in bending diagrams are out-to-out.
All bars not shown in the bending diagrams are straight.
**Table 2**

<table>
<thead>
<tr>
<th>Wind Speed Category</th>
<th>Masonry Walls (8x8x16)</th>
<th>Foundations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bars</td>
<td>T-Footing Width</td>
</tr>
<tr>
<td></td>
<td>V1</td>
<td>(W)</td>
</tr>
<tr>
<td>120</td>
<td>#5</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>170</td>
<td>#5</td>
<td>1'-8&quot;</td>
</tr>
</tbody>
</table>

Notes:
1. End vertical reinforcing bars 1½' from top of bond beam blocks and horizontal bars 1½' from edge of control joints.
2. Do not continue horizontal #4 bond beam reinforcing through control joint.
3. Use stainless steel joint stabilizing anchors spaced at 16" vertically at all control joints. Install per manufacturer's instructions.
4. Seal control joints with backer rod and Type "A" silicone sealant (top and both sides).
5. See Sheet 10 for Bar placement details.
6. For Pilaster Cap Details, see Sheet 2.
REINFORCING AT PILASTER WITH EXPANSION JOINT
(Step Shown, without Step Similar)
(T-Footing Shown, Trench Footing Similar)

SECTION K-K
TYPICAL WALL SECTION
WITH T-FOOTING

SECTION L-L
PILASTER SECTION
WITH T-FOOTING

SECTION K-K
TYPICAL WALL SECTION
WITH TRENCH FOOTING

SECTION L-L
TYPICAL PILASTER SECTION
WITH TRENCH FOOTING

Notes:
1. For location of Sections K-K and L-L see Sheet 9.
2. Provide and install 1” Ø Dowel Load Transfer Devices at 90’ Max. as shown. See Sections L-L for placement details.
3. For reinforcing sizes and spacings, see Table 2, Sheet 9.
4. Pairs F1, V1 are required in the wall cells on both sides of pilasters, plus a pair in each pilaster cell. Space wall reinforcing per Table 2, Sheet 9.
GENERAL NOTES:

1. INSTALLATION: Construct guardrail in accordance with Specification Section 536.

This Index, along with the plans and the manufacturers’ drawings on the Approved Products List (APL), is sufficiently detailed for installation of General Guardrail, Low-Speed Guardrail, End Treatment assemblies, and their connecting options shown herein. This precludes requirements for shop drawing submittals unless otherwise specified in the plans.

2. COMPATIBILITY: The General Guardrail in this Index is based on the Midwest Guardrail System (MGS) design, with an approximate height of 31” at the top of the Panel (2’-1” mounting height at vertical line of Panel) and a midspan panel splice as shown on Sheet 2. The Guardrail components included on the APL, which are compatible with this Index, may also be identified as 33” or 565 Guardrail.


4. BUTTON-HEAD BOLTS: Install Button-Head Bolts where indicated using bolts, nuts, and washers as shown on Sheet 22. Place washers under nuts; washers are optional against steel flanges. Do not place washers between bolt heads and panels, except where otherwise shown in this Index.

5. HEX-HEAD BOLTS: Install Hex-Head Bolts where indicated using bolts, nuts, and washers in accordance with material properties of Specification Section 967. Place washers under nuts; washers are optional against steel flanges.

6. MISCELLANEOUS ASPHALT PAVEMENT: Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ± 1/2” depth and in accordance with Specification Section 339.

7. ADJACENT SIDEWALKS & SHARED USE PATHS: When guardrail posts are placed within 4’-0” of a sidewalk or shared use path, use timber posts, or use steel posts only if treated with Pipe Rail as shown on Sheet 20.

When timber posts are used, one of the following safety treatment is required for the bolts protruding from the back face of the posts:

- a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification Section 562.
- b. Use post bolts 15” in length and countersink the washer and nut between 1” and 1 1/2” deep into the back face of the post.
- c. Use 19” post bolts with sleeve nuts and washers.

When End Transition posts are within 4’-0” of a sidewalk or shared use path, steel posts are not permitted within the End Transition segment. Terminate the Pipe Rail outside of End Transition segments, as noted per Sheet 20.

8. NESTED W-BEAM: Where called for in the plans, install two W-Beam Panels mounted flush per location, securing all panels with Button-Head Bolts threaded through aligned slots and holes. Button-Head Bolts are permitted for panel splice locations.

9. CONNECTION TO RIGID BARRIER: The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railing and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.

For connecting guardrail to existing bridge Traffic Railings, see the layouts and details of Indexes 536-002, 521-404, and 421-405.

10. CONNECTION TO EXISTING GUARDRAIL: Where a transition to existing guardrail at 27” height is required, linearly transition the guardrail height over a distance ranging from 25’-0” to 31’-2”. Provide an immediate transition to the required midspan splice using the available panel options on Sheet 6 (9’-4” or 15’-7” panel).

11. PLANS CALLOUTS: Begin/End Station labels are shown throughout this Index as they correspond to the station and offset callouts specified in the plans.

In the plans, Begin/End Guardrail Station refers to the General TL-3 Guardrail Pay Item, and it may be abbreviated as Begin/End GR Station. Where the Low-Speed TL-2 Guardrail Pay Item is specifically required, the callout in the plans will then specify Begin/End TL-2 GR Station.

12. QUANTITY MEASUREMENT: Measure guardrail and corresponding components as defined in Specification Section 536. The Guardrail length is measured along the centerline of installed Panels, between the points labeled Begin/End Guardrail Station shown on the following Index Sheets and defined in the plans (typically measured from the edge of the panel’s post bolt slotted at the approach/trailing ends).
GENERAL GUARDRAIL

INSTALLED ELEVATION

GENERAL GUARDRAIL

INSTALLED PLAN

NOTES:
1. GENERAL: Install the General Guardrail configuration where indicated in the plans. This may include tapered segments if called for in the plans.

2. MIDSPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated. Use 12' - 6" or longer W-Beam Panels. A single 6' - 3" Panel may be used at the end of the run to meet the nominal Begin/End Guardrail Sta requirements.

3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the following Index Sheets, APL Drawings, or the plans. Transitions, or other segment types are defined in the plans. This may include tapered segments if called for in the plans. For defined segment modifications where indicated in the plans and using the Guardrail Types, Sections, and/or hardware as shown in this Index (e.g. Double Faced W-Beam, Modified Thrie-Beam, Deep Posts at Slope Breaks, Pipe Rail, Rub Rail, or Reduced Post Spacing for Hazards).


5. POST & OFFSET BLOCK DETAILS: See Sheet 5.

6. GUARDRAIL SECTIONS: For Sections showing typical mounting heights, grading, and lateral offsets in relation to adjacent roadway features, see Sheet 6.

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalks, or shallow depth conditions are encountered, see Sheet 6 for additional post mounting options.

8. DEFINED SEGMENTS: The General Guardrail shown provides the base configuration, including Post Spacing and splice locations, for defined segment modifications where indicated in the plans and using the Guardrail Types, Sections, and/or hardware as shown in this Index (e.g. Double Faced W-Beam, Modified Thrie-Beam, Deep Posts at Slope Breaks, Pipe Rail, Rub Rail, or Reduced Post Spacing for Hazards).

GENERAL, TL-3 GUARDRAIL DETAILS

INDEX
536-001

SHEET
2 of 22

DESCRIPTION:
FY 2018-19
STANDARD PLANS

536-001
LOW-SPEED GUARDRAIL DETAILS

INSTALLED PLAN

LOW-SPEED GUARDRAIL
INSTALLED ELEVATION

NOTES:
1. GENERAL: Install the Low-Speed Guardrail configuration where indicated in the plans. Low-Speed Guardrail may include tapered segments if called for in the plans.

Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 9'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" post spacing to meet the nominal Begin/End Guardrail Sta. required.

Where a differing guardrail configuration is required for constructability beyond the options shown in this Index or the Plans, obtain approval from the Engineer prior to installation.

2. MIDSPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

Lap the Panels with the Splice Ridge oriented downstream of the final Direction of Traffic in the nearest traffic lane. For reverse lane conditions, orient the Splice Ridge downstream of the lane direction with the highest traffic volume. Orienting Lap Splices for Temporary Traffic Control phasing is not required.

3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the following Index Sheets, APL Drawings, or the plans.


5. POST & OFFSET BLOCK DETAILS: See Sheet 5.

6. GUARDRAIL SECTIONS: For Sections showing typical mounting heights, grading, and lateral offsets in relation to adjacent roadway features, see Sheet 6.

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalk, or shallow depth conditions are encountered, see Sheet 21 for additional post mounting options.

8. RESTRICTIONS: Low-Speed Guardrail segments are not permitted for use with items including, but not limited to, Double Faced W-Beam, Modified Thrie-Beam, Deep Posts at Slope Breaks, Pipe Rail, and/or Rub Rail.

LOW-SPEED, TL-2 GUARDRAIL DETAILS

INDEX
536-001

SHEET
3 of 22
W-Beam Panel Elevation

THREE-BEAM PANEL ELEVATION

Varies (6'-3", 9'-0", 12'-6", 15'-7", or 25'-0")

THREE-BEAM PANEL SECTION

W-Beam Panel Section

PANEL SUMMARY TABLE:

<table>
<thead>
<tr>
<th>Panel Type</th>
<th>Number of Spaces</th>
<th>&quot;N&quot;</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'-3&quot; W-Beam</td>
<td>2</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6'-4&quot; W-Beam</td>
<td>3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>12'-6&quot; W-Beam</td>
<td>4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>15'-7&quot; W-Beam</td>
<td>5</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>25'-0&quot; W-Beam</td>
<td>6</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3'-1&quot; Thrie-Beam</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6'-3&quot; Thrie-Beam</td>
<td>2</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>12'-6&quot; Thrie-Beam</td>
<td>3</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>25'-0&quot; Thrie-Beam</td>
<td>4</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Thrie-Beam Trans.</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:

1. MATERIALS:
The corrugated steel panels in accordance with Specification Section 967 and made from either Class A, 12 gauge steel or Class B, 10 gauge steel as specified in the Panel Summary Table above.

2. CABLE ANCHOR PLATE BOLT HOLES:
Include 8" Ø Cable Anchor Plate Bolt Holes only where required for installation of the Cable Anchor Plate shown on Sheet 9, 10, & 11.

"Ø" x 3/4" slots may substitute for the 8" Ø 3/4" holes shown.
1. STANDARD POSTS: Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the Length, 'L', shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only when specified in the Plans, use the Deep Post 'L' for Slope Break Conditions as shown on Steel 6.

2. OFFSET BLOCKS: For each Panel type, install the corresponding Offset Block type as shown. For General, 1'-6" Thrie-Beam Block (See Sheet 13).

3. BOLT HOLES: Bolt Hole and bend the nail so its head contacts the flange. Type 16d nails with ASTM A153 hot-dip galvanization. For Steel posts, drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange.

4. DOUBLE FACED GUARDRAIL: Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolts threaded portion is not permitted to extend beyond 1/4" from the face of the tightened nut. Trim the threaded portion as needed and galvanize in accordance with Specification Section 562.

5. MODIFIED THRIE-BEAM NESTED BACK-UP PLATE: At each post connection, install a Nested Back-up Plate between the Thrie-Beam Panel and the post. The Nested Back-up Plate has a cross-section and material matching the Thrie-Beam Panel Section.

6. BLOCK STOP-RAIL: Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3/8" Type 16d nails with ASTM A153 hot-dip galvanization. For Steel posts, drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange.

7. MATERIALS: Use timber and steel posts and offset blocks in accordance with Specification Section 967. Composite offset blocks may be substituted as approved on the APL. Use a single offset block type consistently per each run of guardrail. Steel offset blocks are only permitted for Modified Thrie-Beam.

POST AND OFFSET BLOCK DETAILS
GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS

GUARDRAIL SECTIONS - TYPICAL

GUARDRAIL SECTIONS - CURB & GUTTER

GUARDRAIL SECTIONS - SHOULDERS

GUARDRAIL HEIGHT SUMMARY TABLE:

<table>
<thead>
<tr>
<th>Type</th>
<th>Min. Depth 'D'</th>
<th>Mounting Height 'H'</th>
<th>Post Length 'L'</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-Beam Single</td>
<td>3'-10&quot;</td>
<td>2'-10&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>W-Beam Double</td>
<td>3'-10&quot;</td>
<td>2'-10&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Thrie-Beam Single</td>
<td>3'-10&quot;</td>
<td>1'-9&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Thrie-Beam Double</td>
<td>3'-11&quot;</td>
<td>2'-6&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Modified Thrie-Beam</td>
<td>4'-10&quot;</td>
<td>See Above</td>
<td>7'-6&quot;</td>
</tr>
<tr>
<td>Timber Deep Post</td>
<td>6'-4&quot;</td>
<td>See Above</td>
<td>9'-0&quot;</td>
</tr>
</tbody>
</table>

NOTES:

1. GUARDRAIL SECTIONS: Construct Sections as indicated in the plans. The details shown herein depict W-Beam guardrail, but are applicable to the other defined Guardrail Types placed at the corresponding height. 'H' Use components per Sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined. The 1:10 Max. cross slope shown is the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed per the plans.

2. TYPICAL GRADING & PAVEMENT DETAIL: (Type F Curb Shown) Place the Slope Break a Minimum of 2' behind the post. For Deep Posts, the slope break may be placed at the Edge of Post with the 2" Miscellaneous Asphalt Pavement omitted.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post spacing is 6'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts for Face of Guardrail, as shown in the plans.

5. ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

GUARDRAIL SECTIONS - SHOULDER GUTTER

GUARDRAIL SECTIONS - FULLY PAVED SHOULDER

GUARDRAIL SECTIONS - SHOULDER GUTTER

GUARDRAIL SECTIONS - DOUBLE FACED GUARDRAIL (Shown in Median)
NOTES:
1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) placed at the Beginning of Guardrail Station indicated in the plans.

The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed in the APL. The predefined Length of End Treatment, 'LE', includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across all the differing Approach Terminal types. Forward-anchoring style Approach Terminals may vary from the planned lengths shown by up to 3'-0".

Construct Approach Terminals as shown in the APL and in accordance with the manufacturer's unique drawing details, procedures, and specifications.

Install posts in accordance with the manufacturer's drawings. The Special Posts on Sheet 21, including Special Steel Posts, Encased Posts, and Tubing/Steel Posts, are not permitted within the Approach Terminal segment unless otherwise called for in the plans.

Align panel lap splices in accordance with the manufacturer's drawings, regardless of the direction of traffic.

2. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments.

Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

3. APPROACH TERMINAL TEST LEVEL: Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans.

TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may substitute for TL-3 installations.

4. IMPACT HEAD END DELIMITER: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification Section 536.

5. 2" MISCELLANEOUS ASPHALT PAVEMENT: The Plan Views shown herein depict the Unpaved Shoulder condition. For Fully Paved Shoulder and Shoulder Gutter conditions, extend the 2" Misc. Asphalt Pavement as shown in the corresponding Section at Post (1) details below.

NOTES:

1. COMPONENT DETAILS: For additional Type II component details, See Sheet 10, For Rectangular Button Head Bolt details, See Sheet 22.

2. END UNITS: Use materials for end units as defined in Specifications Section 967. End Units are referred to as "End or Buffer Sections" in AASHTO M180.

3. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the Tube and Soil Plate.
   b. Drive the Tube and Soil Plate as a single unit using a dummy Timber post to prevent damage to the Breakaway Post.

4. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

5. SIDEWALK REQUIREMENTS: When sidewalks are located adjacent to this End Treatment, install a Rounded End Unit (Flared End Unit not permitted for this case).

When sidewalks or shared use paths are within 4'-0" from the backs of posts, use the Timber Post option shown (including the first post in the General Guardrail segments). Install the Pipe Rail for adjacent Steel Posts II, as shown on Sheet 20.

6. END DELINEATOR: Mount retroreflective sheeting to the approach Face of the End Unit in accordance with Specifications Sections 3.6 and 3.67.
1. INSTALLATION: Use components as shown on Sheets 9 & 11.

2. MATERIALS: Use steel Plates and Cable Assemblies in accordance with Specification Section 967. Use Short Timber Breakaway Posts and Steel Tube Foundations in accordance with Specification Section 536.

3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 3½" Type B nails with ASTM A153 hot-dip galvanization.

4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount to the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 4. These panel holes are only permitted for this Cable Anchor Plate application.
1. INSTALLATION: Use with CRT Systems as required on Sheet 12.

2. COMPONENT DETAILS: For additional component details, see Sheet 10 & 12. For the Rectangular Washer detail, see Sheet 22.

3. MATERIALS: Use steel End Shoes, Plates, Tubes, and pipes in accordance with Specifications Section 567.

4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a W-Beam Panel only and the Swage Fitting and Cable Stud omitted from one end. Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the H-Jam Nut System as defined on Sheet 10.

5. SPECIAL END SHOE MOUNT: Punch a 3/4" hole in the W-Beam Panel as needed to secure the Special End Shoe with the 3/4" x 1 1/2" Hex-Head Bolt. Galvanize hole per Specification Section 562.

6. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the tube and soil plate.
   b. Drive the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the roadway post.

7. END DELINERATION: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specification Sections 536 and 967.

NOTES:
NOTES:

1. INSTALLATION: Construct the specified radius layout and Connecting Detail option as shown in the plans.
2. MIN. CLEAR AREA: Keep the area behind the CRT free of fixed objects and shoefoot hazards within the Min. Clear Area Limits shown. Maintain a slope not steeper than 1:10 for a minimum 2' behind the posts, and maintain a slope not steeper than 1:2 beyond 2'.
3. APPROACH GRADING: Maintain grading on the roadway side of the guardrail face at a maximum slope of 1:10.
4. MATERIALS: For CRT Posts, use Timber Post material in accordance with Specification Section 967. Use steel panels and hardware in accordance with Specification Section 967.
5. BOLT OMISSION: For the 8 Foot Radius CRT System only, do not place a panel-to-post mount bolt at the center CRT Post (omit the #18 Button-Head Bolt only at the location shown).
6. SHOP-BENT PANELS: Install Shop-Bent panel(s) where indicated using 12'-0" or 25'-0" W-Beam Panels. Splice at post locations within the CRT radius using the General configuration of 5/8" Button-Head Bolts (8 reqd. per splice).
7. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

CONNECTING DETAIL

CONTINUING OPTION END TREATMENT OPTION

CRT SYSTEM SUMMARY TABLE:

<table>
<thead>
<tr>
<th>RETURN RADIUS (FT.)</th>
<th>LENGTH OF SHOP-BENT PANELS (FT.)</th>
<th>QUANTITY OF CRT POSTS</th>
<th>AREA CLEAR OF HAZARDS &quot;L x W&quot; (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>12.5</td>
<td>5</td>
<td>25 x 15</td>
</tr>
<tr>
<td>16</td>
<td>25.0</td>
<td>6</td>
<td>30 x 15</td>
</tr>
<tr>
<td>24</td>
<td>37.5</td>
<td>8</td>
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</tr>
<tr>
<td>32</td>
<td>50.0</td>
<td>10</td>
<td>50 x 20</td>
</tr>
</tbody>
</table>

CRT POST ELEVATION (6"x8" Nom. Timber)

CRT INSTALLED SECTION

LAYOUT FOR CONTROLLED RELEASE TERMINAL (CRT) SYSTEMS - SIDE ROADS AND DRIVEWAYS
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans. The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

For existing bridge connection options, see Indexes 536-000, 531-404, and 531-406.

2. SECTION VIEWS & DETAILS: For cross sections and details including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 15.

3. END TRANSITION OF CURB OPTION: The Plan and Elevation views depict a Curb Transition to Shoulder Gutter from Section D-D to E-E. The transition may require a different shape depending on the End Transition option indicated in the plans (Either a Shoulder Gutter Option, Raised Curb Option, or Flat No Curb Option). See Sheet 15 for curb shape details.

4. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 531-420 thru 531-426, for details.

5. OFFSET: The required offset difference between the Face of Guardrail and Rigid Barrier Shoulder Line is considered negligible and may not be shown in the guardrail offset callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.

6. LOW-SPEED GUARDRAIL: Low-Speed Guardrail typically includes Panels and Post Spacing as shown on Sheet 3, including parallel and tapered segments. Approach Terminals, General Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the Low-Speed Guardrail shown herein if indicated in the plans.
DESCRIPTION:
BEGIN ALIGNMENT CURB
(Mate to Rigid Barrier)

SECTION B-B
BEGIN ALIGNMENT CURB
(Intermediate)

SECTION C-C
ALIGNMENT CURB
(END Transition)

SECTION D-D
BEGIN TRANSITION
(Flat Alignment Curb)

SECTION E-E
END TRANSITION
SHOULDER GUTTER OPTION

SECTION E-E
END TRANSITION
RAISED CURB OPTION

SECTION E-E
END TRANSITION
FLAT NO CURB OPTION

CURB TRANSITION ISOMETRIC VIEWS

NOTES:
2. END TRANSITION OF CURB OPTION: Install one of the three End Transition types shown per Section E-E as indicated by the plans.
3. GRADING BEHIND POSTS: Place Slope Break a Min. 2'-0" behind the post, per Sheet 6.
4. MATERIALS & CONSTRUCTION: Construct the concrete Aligning Curb and Curb transitions in accordance with Specification Section 520. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specifications Section 967.

APPRAOCH TRANSITION CONNECTION - DETAILS

GUARDRAIL
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. Ensure all the required offsets are indicated in the plans.

2. THRIE-BEAM TERMINAL CONNECTOR: See Sheet 18 for details. The installed bolt's threaded portion is not permitted to extend beyond 3/4" from the face of the nut. Trim the threaded portion as needed and galvanize in accordance with Specification Section SP62.

3. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including Parallel and Lapped segments. End Treatments or Reduced Post Spacing Guardrail segments may be substituted and shall match any Guardrail shown herein if indicated in the plans.

4. TRIMMED STD. OFFSET BLOCKS:
   - TIMBER POST ALIGNMENT WIDTH
   - STEEL POST ALIGNMENT WIDTH

APPROACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL
1. INSTALLATION: The Plan Views shown are schematic only, showing example geometry for connecting guardrail segments including taper locations and Double Faced Guardrail requirements as applicable. Work this Sheet with the plans, where stationing and offsets for Begin/End Guardrail, Begin/End Rigid Barrier, and Begin/End Taper are specified. For existing bridge layouts, see Index 536-002, 521-404, and 521-405.

2. GENERAL (OR LOW-SPEED) GUARDRAIL SEGMENT: Construct this segment if shown in the plans. For the shortest length case of a direct connection between the Begin/End Taper Stations and offsets as specified in the plans.

3. LENGTH OF APPROACH TRANSITION 'LA': Install the Approach Transition as shown on Sheet 13 or 14 for either Option, meet the 1:10 adjacent grading requirements for Approach Terminals as shown on Sheet 8.

4. LENGTH OF END TREATMENT 'LE': Install the Approach Terminal End Treatment as shown per Sheet 7 or 8, where called for in the plans. Use the corresponding APL drawings for construction details.

5. Crossover Guardrail: (for Type B Approach): Install the Crossover Segment tapering linearly from the Begin Taper Sta. and offset to the End Taper Sta. and offset as specified in the plans.

6. LENGTH OF DOUBLE FACED GUARDRAIL PANELS, 'LD' (FOR TYPE B APPROACH): Terminate the Double Faced Guardrail panels as shown (based upon the 30° line measured from the hazard on the opposite side of the median). Extend the panel segment longer than the dimension 'LD' as needed for the Panel's end Bolt Slot to align with a post Bolt hole.

7. END TREATMENT OPTIONS (FOR TYPE B & C APPROACH): For Double Faced applications, use either a Double Faced Approach Terminal Assembly per Sheet 8 or a Crash Cushion per Index 544-001. For either option, meet the 1:10 adjacent grading requirements for Approach Terminals.

8. SLOPE GUARD: Where indicated in the plans, install a Guardrail segment between bridge approaches and offset from the bridge abutment's Slope Break as shown. Install posts at the end bolt slots of the panel system. Use post spacing of either 3'-1" or 6'-3", as needed to correctly fit system between barriers. The system may also be lengthened to fit by installing two Rounded End Units as defined on Sheet 9.

NOTES:

- CROSSOVER GUARDRAIL FOR MEDIAN SHOULDERS ONLY: For Double Faced Guardrail the crossover segment(s) may be added to the panel system. Use post spacing of either 3'-1" or 6'-3", as needed to correctly fit system between barriers. The system may also be lengthened to fit by installing two Rounded End Units as defined on Sheet 9.

- FACE OF GUARDRAIL & MEDIAN Shoulder Line:

- GROUND PLANE:

- HORIZONTAL CURVES:

- VERTICAL CURVES:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:

- TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW:

- TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW:

- MEDIAN OR OUTSIDE SHOULDERS:

- DUAL BRIDGE APPROACH CONFIGURATION:
NOTES:

1. See the applicable Notes on Sheet 17.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.
3. THREE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.
4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-423, for details.

TYPE C APPROACH TO RIGID BARRIER - DOUBLE FACED GUARDRAIL

PLAN VIEW - MEDIAN SHOULDERS ONLY
(Mirror Horiz. and Vert. for Opposite Direction and/or Side of Road)

NOTES:

1. See the applicable Notes on Sheet 17.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.
3. THREE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.
4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-423, for details.

TYPE D TRAILING CONNECTION FROM RIGID BARRIER

PLAN VIEW - MEDIAN OR OUTSIDE SHOULDER
(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)

NOTES:

1. See the applicable Notes on Sheet 17.
2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage - Type II as shown on Sheet 9, where called for in the plans.
3. THREE-BEAM TERMINAL CONNECTOR: Install connector and bolts as shown on Sheet 15.
4. RIGID BARRIER SINGLE SLOPE END FACE: See Concrete Barrier Wall, Index 521-001, and Traffic Railing, Indexes 521-422 and 521-423, for details.

LAYOUT TO RIGID BARRIER - APPROACH ENDS WITH DOUBLE FACED GUARDRAIL

TRAILING END TRANSITION CONNECTION TO RIGID BARRIER - INSTALLED ELEVATION

LAYOUT TO RIGID BARRIER - TRAILING ENDS
1. GENERAL: Install Rub Rail where called for in the plans. Position as shown on Sheet 6 unless otherwise shown in the plans. Install the backs of Rub Rail panels flush against Standard Posts. Either of the Channel Section or Bent-Plate Panel Rub Rail options may be used (consistent type per project). Where Double Sided Rub Rail is called for, thread the Button-Head Bolt through the Post Bolt Hole(s) and the panels on either side, and tighten the nut against the face of the panel farthest from adjacent traffic lanes. Trim the bolt’s threaded portion in accordance with Note 4 on Sheet 5.

2. MOUNTING HEIGHT: Mount to the Standard Post’s Rub Rail Bolt Hole as defined on Sheet 5.

3. MATERIALS: Use steel components in accordance with Specification Section 967.

4. END RUB RAIL: For Single Sided Rub Rail, terminate the run of Rub Rail by bending the panel behind the post and securing in place (as shown). For Double Sided Rub Rail, terminate the runs of Rub Rail on their respective front face of the post and secure with the typical Button-Head bolt.

NOTES:
GENERAL PIPE RAIL SECTION

PIECE RAIL INSTALLED ELEVATION (End Segment Shown)

PIECE RAIL INSTALLED PLAN END AT TIMBER POST OPTION

PIECE RAIL INSTALLED PLAN END AT STEEL POST OPTION

MOUNT BRACKET DETAIL ELEVATION SECTION END FIXTURE DETAIL

PEDESTRIAN SAFETY TREATMENT - PIPE RAIL

NOTES:
1. GENERAL: Install General Pipe Rail where indicated in the plans or when existing sidewalks or shared use paths are located less than 4'-0" from the back of Steel Posts as shown on Sheet 6.
2. PIPE RAIL END SEGMENTS: Place End Segments on both ends of General Pipe Rail runs, with End Fixtures mounted to Terminal Posts located outside of Approach Terminal Assembly (LT), Trailing Anchorage Assembly (TA), Approach Transition (A), and Approach Transition (TA) segments.
3. MATERIALS: Use steel brackets, fixtures, and pipes in accordance with Specification 967.
4. RAIL SPLICES: Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.
NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) located atop curbs, streets, pipe feetings, or similar structures, a Special Steel Post may be substituted for a Standard Post. Install where shown in the plans and/or as-needed, in accordance with Specification Section 536.

2. EDGE CONFLICT: When a required post location causes an Edge Conflict with the structure, where the Steel Base Plate is not located entirely on the structure at least 3" from the Edge of Concrete, the longitudinal post location may be altered by up to 1'-6" (Quarter Span) from the original required spacing location to prevent the Edge Conflict. With the post location adjusted, use a Std. Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate mounted entirely on the structure (Option 2). Maintain the original required spacing locations upstream and downstream of the structure.

3. BASE PLATE MOUNT: Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification Section 536. Use 3/8" Hex-Head Bolts for structures less than 9" deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 3/8" x 2½" Post Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slots requirements of Specification Section 536.

5. MATERIALS: Use steel base plates in accordance with Specification Section 536.

SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT

NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) conflicting with underground utilities or other underground obstructions, an Encased Post may be used. Install where shown in the plans and/or as-needed, in accordance with Specification Section 536.

2. REDUCED-LENGTH STANDARD POST: Use a Standard Post with reduced length such that the Panel Height 'H' is maintained while the post bottom terminates 3" from the top of the Concrete Foundation. Typically, the post length 'L' is 4'-6" for W-Beam Guardrail.

3. FOUNDATION: Use non-reinforced Class NS Concrete material in accordance with Specification Section 347. After casting the concrete, ensure the surrounding soil material is completely backfilled and tamped to provide full passive resistance.

4. LIMIT: Encased Posts are not permitted for consecutive posts unless otherwise shown in the plans.

ENCASED POST FOR SHALLOW MOUNT

FRANGIBLE LEAVE-OUT FOR CONCRETE SURFACE MOUNT

NOTES:
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) placed within a concrete surface (typically a sidewalk), use a Frangible Leave-Out around the post base as shown. Install where shown in the plans and/or as-needed, in accordance with Specification Section 536.

2. MATERIALS: Use Non-Excavatable Flowable Fill in accordance with Specification Section 121, not to exceed 150 psi.

3. For the required 1" x 1" x 4"-6" Leave-Out, smoothly cut the existing concrete surface or form-up the square shape when an application has now surrounding concrete. Ensure Flowable Fill surface is smooth and even with the adjacent concrete surface.

4. LIMIT: Encased Posts are not permitted for consecutive posts unless otherwise shown in the plans.
NOTES:

1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications Section 536 and 705, and with the manufacturer's design as approved on the APL.

2. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications Section 993.

3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edge line.

4. MOUNT LOCATIONS: Mount Barrier Delineators at posts as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:

   - S1 = 25' x 1 Space
   - S2 = 50' x 1 Space
   - S3 = 75' x 1 Space
   - S4 = 100' x 1 Space for the Remaining Run

   Additionally, place a Barrier Delineator on Post (2) of the Trail Anchorage or on the post nearest the Rigid Barrier.

5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

6. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8"x5/16" Post Bolt Slots in the panels only where required for mounting and in accordance with Specifications Section 536.

7. INSTALLATION (General)

   - FULL LENGTH
   - SHEET PROFILE
   - TRANSITION

8. STEEL POSTS

   - TIMBER POSTS

9. MOUNT LOCATION - ISOMETRIC VIEWS

10. MOUNT LOCATION - PLAN VIEW

11. BARRIER DELINEATORS

12. Notes:

   1. INSTALLATION: Work these details with the plans, where spacing for Begin/End Half Spacing and Begin/End Quarter Spacing are indicated if required.

   2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing 3'-1". Begin/End Half Spacing 6'-3" and 3'-1" Splice lengths (9'-45" or 10'-75") or add an additional Transition spaced post where required.

   3. LOW-SPEED GUARDRAIL: For Reduced Post Spacing with Low-Speed Guardrail (12' 6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 3'-1" spaces.

   4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8"x5/16" Post Bolt Slots in the panels only where required for mounting and in accordance with Specifications Section 536.

   5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

   6. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications Section 536 and 705, and with the manufacturer's design as approved on the APL.

   7. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications Section 993.

   8. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edge line.

   9. MOUNT LOCATIONS: Mount Barrier Delineators at posts as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:

   - S1 = 25' x 1 Space
   - S2 = 50' x 1 Space
   - S3 = 75' x 1 Space
   - S4 = 100' x 1 Space for the Remaining Run

   Additionally, place a Barrier Delineator on Post (2) of the Trail Anchorage or on the post nearest the Rigid Barrier.

   10. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

   11. STEEL POSTS

   - TIMBER POSTS

   12. MOUNT LOCATION - ISOMETRIC VIEWS

   13. MOUNT LOCATION - PLAN VIEW

   14. BARRIER DELINEATORS

   15. Notes:

   1. INSTALLATION: Work these details with the plans, where spacing for Begin/End Half Spacing and Begin/End Quarter Spacing are indicated if required.

   2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing 3'-1". Begin/End Half Spacing 6'-3" and 3'-1" Splice lengths (9'-45" or 10'-75") or add an additional Transition spaced post where required.

   3. LOW-SPEED GUARDRAIL: For Reduced Post Spacing with Low-Speed Guardrail (12' 6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 3'-1" spaces.

   4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8"x5/16" Post Bolt Slots in the panels only where required for mounting and in accordance with Specifications Section 536.

   5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

   6. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications Section 536 and 705, and with the manufacturer's design as approved on the APL.

   7. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications Section 993.

   8. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edge line.

   9. MOUNT LOCATIONS: Mount Barrier Delineators at posts as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:

   - S1 = 25' x 1 Space
   - S2 = 50' x 1 Space
   - S3 = 75' x 1 Space
   - S4 = 100' x 1 Space for the Remaining Run

   Additionally, place a Barrier Delineator on Post (2) of the Trail Anchorage or on the post nearest the Rigid Barrier.

   10. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

   11. STEEL POSTS

   - TIMBER POSTS

   12. MOUNT LOCATION - ISOMETRIC VIEWS

   13. MOUNT LOCATION - PLAN VIEW

   14. BARRIER DELINEATORS

   15. Notes:

   1. INSTALLATION: Work these details with the plans, where spacing for Begin/End Half Spacing and Begin/End Quarter Spacing are indicated if required.

   2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing 3'-1". Begin/End Half Spacing 6'-3" and 3'-1" Splice lengths (9'-45" or 10'-75") or add an additional Transition spaced post where required.

   3. LOW-SPEED GUARDRAIL: For Reduced Post Spacing with Low-Speed Guardrail (12' 6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 3'-1" spaces.

   4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8"x5/16" Post Bolt Slots in the panels only where required for mounting and in accordance with Specifications Section 536.
1. This index provides guardrail transition and connection details for approach end guardrail on existing bridges, and anchorage details for trailing end traffic railing retrofits and safety shapes on existing bridges. Sheets 1 through 26 apply to bridges with retrofitted traffic railings. (Sheet 26 shows the trailing end guardrail connections). Sheet 27 applies to bridges with safety shaped traffic railing. Construct the guardrail transitions and connections where shown in the plans.

2. For trailing end guardrail connections for existing bridges with either Vertical Face Retros or Safety Shape Traffic Railing, see the Trailing End Transition Connection to Rigid Barrier detail shown in Index 536-001. Likewise, for miscellaneous guardrail construction details that are not provided in this index, refer to Index 536-001.

NOTES FOR GUARDRAIL TRANSITIONS CONNECTING TO TRAFFIC RAILING RETROFITS ON EXISTING BRIDGES

1. The transition detail shown on this sheet shows (a) the standard post spacings within the typical thrie-beam approach transitions connecting to existing bridges with retrofitted traffic railings, and (b) depict the typical alignments of the approach transitions.

2. The curb and gutter flare shown on this sheet is typical of flares that are to be constructed when approach slab curbs extend to the beginning of the slab, and where other treatment to curb bunt ends are not in place.

3. The special steel post for roadway thrie-beam transitions detailed on this sheet is specific to all transition applications on this index that require one or more steel posts.

4. The special steel post and base plate assembly shall be fabricated in accordance with Specification 967.

5. Anchor studs shall be fully threaded rods in accordance with ASTM F1554 Grade 36 or ASTM A193 Grade B7. All nuts shall be heavy hex in accordance with ASTM A563 or ASTM A19.

6. Anchor studs and nuts shall be hot-dip zinc coated in accordance with the Specifications. After the nuts have been snug tightened, the anchor stud threads shall be single punch distorted immediately above the top nuts to prevent loosening of the nuts. Distorted threads shall be coated with a galvanizing compound in accordance with the Specifications.

7. Adhesive bonding material systems for anchors shall comply with Specification 937 and be installed in accordance with Specification 416.4. Nested beam extensions and points for terminal connector attachments will vary for traffic railing barrier vertical face retrofits. The plan views for the vertical face retrofit barriers show the primary configurations for each particular scheme. The associated pictorial views show the variations.

8. For trailing end guardrail connections for existing bridges with either Vertical Face Retros or Safety Shape Traffic Railing, see the Trailing End Transition Connection to Rigid Barrier detail shown in Index 536-001. Likewise, for miscellaneous guardrail construction details that are not provided in this index, refer to Index 536-001.

For installing thrie-beam terminal connector to traffic railing vertical face retrofits, see notations on Sheets 15 through 18 and the flag notation on Sheet 26.

6. Payment for connections to traffic railing vertical face retrofits are to be made under the contract unit price for Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate and bolts, nuts and washers.

GUARDRAIL TRANSITION ALIGNMENTS FOR BRIDGE THRIE-BEAM AND VERTICAL FACE TRAFFIC RAILING RETROFIT

LONGITUDINAL LOCATION OF TRANSITION BLOCKS AND CURB END FLARES WILL VARY WITH SCHEME TYPE

PARTIAL PLAN VIEWS

GUARDRAIL TRANSITIONS AND CONNEXIONS FOR EXISTING BRIDGES

INDEX 536-002

SHEET 1 of 27
UNDIVIDED ROADWAY - DETAIL H

GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

DIVIDED ROADWAY - DETAIL I

UNDIVIDED ROADWAY - DETAIL S

GUARDRAIL APPLICATIONS FOR BRIDGES WITH LESS THAN FULL WIDTH SHOULDERS AND CONCRETE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH
GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

Approach Guardrail Treatments for Bridges with Concrete Traffic Railing

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN WIDE MEDIANS WITH FLUSH SHOULDERS

WHEN END TERMINAL IS OUTSIDE OF OPPOSING ROADWAY CLEAR ZONE

Approach Guardrail Lengths See Table Below

Approach Guardrail Lengths See Table Below

When End Terminal Cannot Be Located Outside of Opposing Roadway Clear Zone

Approach Guardrail Treatments for Bridges with Concrete Traffic Railing

Extending Less Than Full Approach Slab Length in Wide Medians with Flush Shoulders

Notes:

- For approach end anchorage assemblies see sheets elsewhere in this Index and the plans.

Guards may need to be adjusted for connection location on wing post or bridge traffic railing barrier. Auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present.

Guardrail transitions shown on this table are typical for roadways with standard wash shoulders and a relocated connection to the existing wing post. Length requirements shall be determined on a site specific basis for both standard width and narrow bridge shoulders and for end anchorage or end shielding use.

The lengths shown on this table are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for tilted end anchorage assemblies to shield normal transverse underslope and bridge end hazards. L}

Guardrail Lengths

Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for tilted end anchorage assemblies to shield normal transverse underslope and bridge end hazards.

Approach Slab

For Guardrail Lengths See Table Below

Approach Slab

Guards may need to be adjusted for connection location on wing post or bridge traffic railing barrier. Auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present.

Exten

Approach Guardrail Lengths See Table Below

Approach Guardrail Lengths See Table Below

When End Terminal Is Outside of Opposing Roadway Clear Zone

Approach Guardrail Treatments for Bridges with Concrete Traffic Railing

Extending Less Than Full Approach Slab Length in Wide Medians with Flush Shoulders

Notes:

- For approach end anchorage assemblies see sheets elsewhere in this Index and the plans.

Guards may need to be adjusted for connection location on wing post or bridge traffic railing barrier. Auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present.

Guardrail transitions shown on this table are typical for roadways with standard wash shoulders and a relocated connection to the existing wing post. Length requirements shall be determined on a site specific basis for both standard width and narrow bridge shoulders and for end anchorage or end shielding use.

The lengths shown on this table are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for tilted end anchorage assemblies to shield normal transverse underslope and bridge end hazards. L}
Approach Guardrail Treatments for Bridges with Concrete Traffic Railing

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN NARROW MEDIANs WITH FLUSH SHOULders

Guardrail Lengths

<table>
<thead>
<tr>
<th>MEDIAN WIDTH (ft.)</th>
<th>6' BRIDGE SHOULders</th>
<th>10' BRIDGE SHOULders</th>
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<tr>
<td></td>
<td>110 TAPER RATE</td>
<td>115 TAPER RATE</td>
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<tr>
<td>10</td>
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<td>24</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorages or end shielding requirements shall be determined on a site specific basis. When crash cushions are required on approach roadway shoulders, their sizes may be determined by the residual speeds (S') along the runouts from the approach roadway; however, when calculated speeds (S') are less than 30 mph crash cushions shall be no less in size than for 30 mph; see speed diagram left. The number of panels may be reduced when installing a crash cushion more than 2.5' in width, see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

Sizing Crash Cushions Located on Opposing Roadway Shoulders

\[ S' = \left( \frac{200,000}{1000 D^2} \right) \]

Point of Impact Speed (S') For Determining Crash Cushion Size:

\[ S' = \left( \frac{200,000}{1000 D^2} \right) \text{ Design Speed} \]
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-472 & 460-475 - SCHEMES 3 & 4

SEE INDEXES 460-472 & 460-475 - SCHEMES 5 & 6

SEE INDEXES 460-472 & 460-475 - SCHEMES 3 & 4

SEE INDEXES 460-472 & 460-475 - SCHEMES 5 & 6
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-473 & 460-476 - SCHEME 1

SEE INDEXES 460-473 & 460-476 - SCHEME 2

SEE INDEXES 460-473 & 460-476 - SCHEMES 3 & 4
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-473 & 460-476 - SCHEMES 5 & 6
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEEN IN INDEX 460-474 - SCHEMES 1, 2, 3
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
21" x 12" x 1/2" Thrie-Beam Terminal Connector Plate (Back-Up Plate). And 1 1/8" x 12" Long HS Hex Bolts And Nuts (5 Req'd.) With 21G 06 Plain Round Washers Under Heads And Nuts

SEE INDEX 460-481 - SCHEME 1

SEE INDEX 521-481 - SCHEME 2

SEE INDEX 521-481 - SCHEME 3

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

INDEX SHEET
536-002 15 of 27

FY 2018-19 STANDARD PLANS

DESCRIPTION:

REVISED 01/01/17

LAST
REVISION
10/23/2017

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PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 21" x 12" x 16" Thire-Beam Terminal Connector Plate (Back-Up Plate), And 5/8" x 12" Long
  1/4" Hex Bolts And Nuts (5 Req'd.) With 21/2" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 21" x 12" x 1/8" Thrie-Beam Terminal Connector Plate (Back-Up Plate), and 3/8" x 12" Long
HS Hex Bolts And Nuts (3 Req'd.) With 2½" OD Plain Round Washers Under Heads And Nuts

SEE INDEX 521-405 OR 521-482 - SCHEME 1

SEE INDEX 521-405 OR 521-482 - SCHEME 4

SEE INDEX 521-405 OR 521-482 - SCHEME 5

SEE INDEX 521-405 OR 521-482 - SCHEME 5
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
* 21" x 12" x 1/2" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 5/8 HS Hex Bolts And Nuts (12" Long For Scheme 1 And Length To Fit For Schemes 2 And 3/15 Req.) With 21/2" OD Plain Round Washers Under Heads And Nuts
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use 7/8" HS Hex Bolts And Nuts With 29/32" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts at First Standard (3'-1"") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use 1/4" HS Hex Bolts And Nuts
With 2 1/2" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

* Post Bolts At First Standard (7'-1") Post Hole Location On Bridge (1'-6" Min. From End Of Bridge) Use 7/8" HS Hex Bolts And Nuts With 21/2" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND
CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS

AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts At First Standard (7'-15") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use Ø3/8 HS Hex Bolts And Nuts
With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

**SEE INDEX 521-483 - SCHEME 3**

* Post Bolts At First Standard (3-1/2") Post Hole Location On Bridge
  17" Min. From End Of Bridge. Use 1/2" HS Hex Bolts And Nuts
  With 2" OD Plain Round Washers Under Heads And Nuts.

**SEE INDEX 521-483 - SCHEME 3**
GUARDRAIL TRAILING END ANCHORAGE IN ABSENCE OF OTHER HAZARDS

GUARDRAIL TRAILING END ANCHORAGE WHEN OTHER HAZARDS PRESENT

TRAILING END GUARDRAIL AND ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)
GUARDRAIL TRANSITIONS TO EXISTING FLAT SLAB BRIDGES

**SCHEME I**

*Use Of Scheme I Shall Be Determined In Accordance With The Instructions For Standard Plans (IDS-402)*

GUARDRAIL TRANSITION TO EXISTING WING POST

*Splice Locations: Thrie-Beam - 12 Guardrail Splice Bolts And Recessed Nuts
W-Beam - 8 Guardrail Splice Bolts And Recessed Nuts

**SCHEME II**

*Use Of Schemes II: And III Shall Be Determined In Accordance With The Instruction For Standard Plans (IDS-402)*

GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

**PLAN**

- **NOTES FOR GUARDRAIL TRANSITIONS TO SAFETY SHAPE TRAFFIC RAILINGS ON EXISTING BRIDGES**
  1. When the guardrail attachment overlays the bridge number, bridge name or date on the traffic railing, provide an aluminum sign panel with the obscured information. Attach the sign panel to the face of the traffic railing adjacent to the Three-Beam Terminal Connector with #8 x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/4" thick and meet the requirements of Specification Section 700 with a white background and 3" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail. Bridge Anchorage Assembly.
  2. When retrofitting thrie-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.

**APPENDIX POSTS AND SPECIAL OFFSET BLOCKS**

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 16d galvanized nails, see "16d NAIL FOR PREVENTION OF OFFSET BLOCK," Index 536-001. The nested rails shall not be bolted to the blocks and posts at posts (a), (c) and (e). The details shown are for approach slabs with internal edge side extending beyond parapet type traffic railing serifs.
GENERAL NOTES

1. This Index is applicable for permanent crash cushion installations that shield the ends of Concrete Barrier or Guardrail, only.

2. Design Length is based on a given design speed and the shortest Crush Cushion available on the Approved Products List (APL) when a Length Restriction is not applicable (N/A), then the Contractor has the option to select valid Crush Cushions from the APL which have design lengths greater than or equal to the Design Length identified in the plans. When a Length Restriction is applicable, then the Contractor has the option to select valid Crush Cushions from the APL which have design lengths greater than or equal to the Design Length identified in the plans and that are less than or equal to the Length Restriction identified in the plans.

3. For High Speed Facilities with a Design Speed greater than 60 mph, use a TL-3 Crush Cushion.

4. Assemble and install Crush Cushions according to the limitations noted on the Approved Products List (APL) webpage, the manufacturer’s specifications, and the applicable Crush Cushion drawings posted on the APL.

5. When subjected to reverse direction hits, construct Transition Panels from Concrete Barrier to Crush Cushions; for additional details refer to the applicable Crush Cushion drawings on the APL.

6. Galvanize metallic components are to meet the requirements in the Specification, Section 967.

7. For Guardrail Applications, construct the Manufacturer’s Transition between the Permanent Crush Cushion and the Standard Guardrail Transition; refer to all Standard Guardrail Transition details of this Index.

8. For additional information on the End Measurement for Guardrail Payment, refer to the Standard Specifications for Road and Bridge Construction, Section 536.

9. Provide delineation in accordance with Specification, Section 544.

10. The EOR shall provide the station of the Length of Need (LON) location in the plans. Provide delineation in accordance with Specification, Section 544.

PERMANENT CRASH CUSHION APPLICATIONS

Concrete Barrier Applications

<table>
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<th>Design Length (ft)</th>
<th>Design Speed (mph)</th>
<th>Crash Test Level</th>
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</thead>
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</tr>
<tr>
<td>15.00</td>
<td>60</td>
<td>TL-3</td>
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</table>

Guardrail Applications

<table>
<thead>
<tr>
<th>Design Length (ft)</th>
<th>Design Speed (mph)</th>
<th>Crash Test Level</th>
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</thead>
<tbody>
<tr>
<td>8.75</td>
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<td>TL-3</td>
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RAISED RUMBLE STRIPS AT INTERSECTIONS

Inset A

Note: Rumble strips may be required for one or more legs of the intersection (one leg shown for spacing information). Rumble strips shall be constructed only on the legs identified in the plans.

Thermoplastic rumble strip sets shall be white.

** May be decreased in urban areas with low operating speeds.

Plan

Section AA for Thermoplastic and Asphalt Rumble Strip Sets

Note: Raised rumble strips are to be constructed in accordance with Section 546 of the Specifications.
GENERAL NOTES

1. For Limited Access roadways, when friction course extends more than 8” beyond the edge of the traveled way, blade off the extended friction course to the 8” line prior to rumble strip grinding.

2. Use the continuous array on both inside and outside shoulders in advance of bridge ends for a distance of 1,000 feet or back to the gore recovery area for mainline interchange bridges. Use the skip array for all other locations.

3. Exclude rumble strips at the following locations:
   A. At mainline tolling areas, terminate rumble strips at the end of the mainline normal section.
   B. At All Electronic Tolling (AET) facilities, terminate rumble strips within 50 feet of the centerline of the overhead gantry.
   C. On outside shoulders of entrance ramp terminals, terminate rumble strips at the point of the physical gore and resume at the end of the acceleration lane taper.
   D. On outside shoulders of exit ramp terminals, terminate rumble strips at the start of the deceleration lane taper and resume at the point of the physical gore.
   E. On approaches to bridges, terminate rumble strips at the approach slab joint.
   F. On either side of median crossover openings, terminate rumble strips within 400 feet.
   
GROUND-IN RUMBLE STRIPS FOR LIMITED ACCESS ROADWAYS
Concrete Facing Panels

SOIL PARAMETERS:
1. See Wall Control Drawings for soil characteristics of foundation material to be used in the design of the wall system.
2. The Contractor will provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site.

MATERIALS:
1. See Specification Section 548 for material requirements.

CONSTRUCTION:
1. Walls will be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. If required, locate manholes and drop inlets as shown on wall elevations.
4. Refer to Wall Control Drawings of individual walls for minimum reinforcement strip/mesh length, factored bearing resistance, minimum wall embedment and anticipated long term and differential settlements.
5. The Contractor is responsible for controlling water during storm events as needed during construction.
6. It is the Contractor's responsibility to determine the location of any guardrail posts behind retaining wall panels. Prior to placement of the top layer of soil reinforcement, individual reinforcing strips/mesh may be skewed (15° maximum) to avoid the post locations if authorized by the Engineer. No cutting of soil reinforcement is allowed unless shown on Shop Drawings and approved by the Engineer. Any damage done to the soil reinforcement due to installation of the guardrail will be repaired by the Contractor at the Contractor's expense. Repair method will be approved by the Engineer.
7. If existing or future structures, piles, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor will notify the Engineer to determine what course of action shall be taken.
8. The Contractor is responsible for gradually displacing upper layers of soil reinforcement downward (15° maximum from horizontal) to avoid cutting the soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.
9. For concrete facing panel surface treatment, see Wall Control Drawings. Extend surface treatment a minimum of 6" below final ground line.
10. Drive piles located within the soil volume prior to construction of the retaining wall, unless a method to protect the structure, acceptable to both the Engineer and Wall Company, is proposed and approved in writing. The portion of piles or drilled shaft extensions within the soil volume will be wrapped with polyethylene sheathing in accordance with Specification Section 459.
11. A structural extension of the connection of the retaining wall panel to soil reinforcement will be used whenever necessary to avoid cutting or excessive skewing (greater than 15°) of the soil reinforcement around obstructions (i.e., piles, pipes, manholes, drop inlets, etc.).
12. Steps in leveling pads will occur at MSE Wall panel interfaces. Panels will not cantilever more than 2" past the end of the upper tier leveling pad.
13. The top of the leveling pad or footing will be 2'-0" minimum below final ground line.
14. Top of leveling pad elevations shown in the Wall Control Drawings are maximum elevations. The constructed leveling pad elevations may be deeper based on the panel layout shown in the shop drawings.
15. The height of panels in the bottom course of MSE Walls must not be less than half the height of a standard panel.
16. Work this Index with Index 521-600 thru 521-650.

SHOP DRAWING REQUIREMENTS:
See Specification Section 548 for shop drawing requirements.
**DESIGN CRITERIA:**
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and DOT Structures Design Guidelines Section 3.13.2.
2. It is the responsibility of the Engineer to determine that the factored bearing pressure shown for the wall does not exceed the factored bearing resistance of the foundation for that specific wall location.
3. The Wall Company is responsible for internal stability of the wall. External stability design, including foundation and slope stability, is the responsibility of the Engineer.
4. If present, consider in design and analysis and locate manholes and drop inlets as shown on wall elevations.

**SOIL PARAMETERS:**
1. See wall control drawings for soil characteristics of foundation material to be used in the design of the wall system. The Contractor must provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site. Provide the values of unit weight, cohesion and internal friction angle in the Shop Drawings.

**MATERIALS:**
1. Provide soil reinforcement in accordance with Specification Section 548.
2. For additional material notes, see Wall Company General Notes.

**CONSTRUCTION:**
1. Walls must be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length. Factored bearing resistance, minimum wall embedment and anticipated long term and differential settlements.
4. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor must notify the Engineer to determine what course of action should be taken.
5. The Contractor is responsible for gradually deflecting upper layer(s) of soil reinforcement downward (15° maximum from horizontal) to avoid cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.

**DESIGN CRITERIA:**
1. See wall control drawings for soil characteristics of foundation material to be used in the design of the wall system. The Contractor must provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site. Provide the values of unit weight, cohesion and internal friction angle in the Shop Drawings.

**MATERIALS:**
1. Provide soil reinforcement in accordance with Specification Section 548.
2. For additional material notes, see Wall Company General Notes.

**CONSTRUCTION:**
1. Walls must be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length. Factored bearing resistance, minimum wall embedment and anticipated long term and differential settlements.
4. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor must notify the Engineer to determine what course of action should be taken.
5. The Contractor is responsible for gradually deflecting upper layer(s) of soil reinforcement downward (15° maximum from horizontal) to avoid cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.

**GENERAL NOTES AND DETAILS**
1. This fence to be provided generally in rural areas. For supplemental information see Specifications 550.

2. Fabrik shall be woven wire, either galvanized steel, meeting the requirements of ASTM A120, No. 4 Grade B, Design No. 1047-6-9, with Class 3 zinc coating; No. 12 1/2 Grade 173, Design No. 1047-8-12 1/2, with a 16 1/2 gage top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A584, No. 9 Farm, Design No. 1047-6-9, with a minimum coating weight of 0.40 oz./ft.². For additional information see payment note below.

3. Fence shall be installed with wire to private property except on horizontal curves greater than 3° the fence shall be installed so as to pull against all posts.

4. Posts may be either timber, steel, recycled plastic or concrete. Unless specific post material is called for in the plans, the Contractor may elect to use either a single material or a combination of timber, steel, recycled plastic or concrete materials, but must comply with the electrical grounding requirements in Section 550. Line posts of one material may be used with corner, pull and end post assemblies or different materials. Line posts of only one optional material will be permitted between corner and end post assemblies, within individual corner and end post assemblies only one optional material will be permitted.

5. Pull post assemblies shall meet the material requirements of Specification 956. Timber line posts are to be a minimum 4 diameter. Timber corner, pull, end and approach posts are to be a minimum 6 diameter. Timber frames are to be minimum 4 diameter. (A) Stakes for line posts to be 1½ minimum length, for approach, corner and pull posts 1½ minimum length. At approach, corner and pull posts, staple every line wire. At line posts, staple every line wire in top half and alternate line wires on bottom half. Staples shall be driven diagonally across the line wire with the parts on separate slats.

6. Connections between timber topper and braces to be provided by dowels as shown in fastener details.

7. Wire to be wrapped and tied, as shown in the splice details, at the following locations: (a) At end posts, (b) Corner post, including the assemblies at vertical breaks of 15° or more and (c) Pull posts where the wire is not spliced and pulled through the assembly, see General Note 18.

8. Steel posts and braces shall be standard steel posts, galvanized or the rate of 2 oz./ft.², together with necessary hardware and wire clamps and meeting the following requirements: (A) Line posts: 8' long; 1.13 lbs./ft.; roll formed studding, anchor plate attached, ASTM A702 (18 in²).

9. Approach posts: 25'/24½'W², 8' long; fabricated for attaching brace; with necessary hardware, clamps, etc.

10. Pull, end and corner posts: 25'/24½'W², 8' long; fabricated for attaching brace; with necessary hardware, clamps, etc.

11. Brace: 2½' X 4½' angles with necessary hardware and fabricated for attaching to post.

12. The pull, corner, approach and end posts are to be set in concrete as per detail. (Also see General Note 15.)

13. The pull, corner, approach and end posts are to be set in concrete as per detail. (Also see General Note 15.)

14. Plastic posts can be set by either digging and tamp backfill or by driving into full depth preformed holes 1½' to 1½' greater than cross section of post. Staples for fabric and barbed wire connection to plastic line posts shall be the same size, count and location as that for timber posts.

15. The Contractor, at his option, may use any suitable precast or prestressed concrete posts; however, approval by the Engineer of posts not shown on this index, will be required prior to construction of the fence. Individual corner and end post assemblies shall be Class 1 concrete. Prestressed post shall be Class I concrete. Lengths of concrete post to be as indicated for timber posts.

16. Prestressed post shall be Class I concrete. Lengths of concrete post to be as indicated for timber posts.

17. Aluminum Barbed Wire shall be fabricated of two strands of 0.110-inch wire with 0.08-inch diameter four-point barbs spaced at approximately 3½° and at a maximum spacing of 6". The wire for the strands and for the bars shall be ASTM 1141-Aloy 302-10BA or equal.

18. The woven wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.

19. Posts to be set by driving or digging. If by digging, the posts shall be set at the center of the hole and the soil tamped securely on all sides.

20. Long posts than those indicated above may be required by the plans or for deeper installations.

21. Concrete bases for angular steel posts (pull, corner, end and approach) shall be Class NS as specified in Section 550. Materials for Class NS concrete may be proportioned by volume and/ or weight.

22. Pull post assemblies shall be installed at approximately 330' centers except that this maximum interval may be reduced by the Engineer on criteria where the radius is less than 3'.

23. Corner post assemblies to be installed at all horizontal and vertical breaks in fence of 15° or more.

24. A maximum length of 1320' of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

25. Unless otherwise called for in the plans gates shall be commercially available metal swing gates assembled and installed in accordance with the manufacturer's specifications as approved by the Engineer. Chain link swing gates in accordance with Index 550-002 may be substituted for metal swing gates as approved by the Engineer. Gate size is full opening width whether single leaf or double leaves. Payment for gates shall include the gate, single or double, all necessary hardware for installation and any additional length and/or for posts all the necessary fittings and hardware. Gates shall be paid for under the contract unit price for Fencing Gates, EA.

26. For construction purposes, assemblies are defined as follows: End post assemblies shall consist of: one end post, one approach post, two braces, four diagonal tension wires and all necessary fittings and hardware.

27. Pull post assemblies shall consist of: one pull post, two braces, four diagonal tension wires and necessary fittings and hardware.

28. Corner post assemblies shall consist of: one corner post, two approach posts, four braces, eight diagonal tension wires and all necessary fittings and hardware.
DESCRIPTION:

REVISED STANDARD PLANS FY 2018-19

SHEET INDEX 11/01/17

FENCE TYPE A

14' Maximum Spacing For Line Posts

Illustrates Angle In Fence Alignment

Two No. 9 Gauge Wires
Twisted To Singing
Tightness, Steel Wire,
Soft Temper, Galvanized
At The Rate Of 0.8
oz./ft.²; ASTM A641
(Typical)

One Strand Barbed Wire

Two No. 9 Gauge Wires
Twisted To Singing
Tightness, Steel Wire,
Soft Temper, Galvanized
At The Rate Of 0.8
oz./ft.²; ASTM A641
(Typical)

Note: Timber Post Illustrated.

See General Note No. 2.

PRIVATE PROPERTY

This index details fencing that is constructed with farm
fabric 46\" (47" nominal) in height and with specific
ground clearance and specific barbed wire spacings. For
fencing of different height or installation details, the fence
shall be fully detailed in the Contract Plans.

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

CONCRETE BASE FOR
ANGULAR STEEL POST

FENCE POSITION AT LOCATIONS
WITHOUT FRONTAGE ROADS

(Typically, with no frontage road)

APPROACH POST

LINE POST

APPROACH POST

LINE POST

LINE POST

LINE POST

LINE POST

LINE POST

LINE POST

LINE POST

POST

PRIVATE PROPERTY

Wire Fabric

6' As Indicated
In Plans

Design Note

(Corner, End And
Approach Posts)

(select different height or installation details, the fence
shall be fully detailed in the Contract Plans.

12"
1. This fence to be used generally in urban areas.

2. For supplemental information refer to Section 550 of FDOT Standard Specifications.

3. Chain link fabric, post, truss rods, tension wires, tie wires, stretcher bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHO and AASHTO signify current reference.

4. Fence Component Options:
   A. Line post options:
      (1) Galvanized steel pipe, Schedule 40- 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 2 (Grade A or B); ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe; ASTM A53 steel, X 2 Tables Schedule 40, 1½" nominal dia., 1.860" OD, coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe- 2" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
      (4) Steel H-Beam- 1½" x 1½": Zinc Galv. 1.8 oz./ft²: AASHTO M111 and Detail.
      (5) Aluminum alloy H-Beam- 1½" x 1½": Detail.
      (6) Steel C- 1½" x ½" galv. 1.8 oz/ft² zinc: AASHTO M111; OR, 0.9 oz./ft² zinc-5% aluminum-mischmetal: ASTM F1043 and Detail.
      (7) Resistance welded steel pipe No. 9 gage coated at the rate of 0.040 oz./ft². ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
   B. Corner, end, and pull post options:
      (1) Galvanized steel pipe, Schedule 40- 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 2 (Grade A or B); ASTM F1083, and AASHTO M111.
      (2) Galvanized steel pipe, Schedule 40- 2" nominal dia., 2.375" OD; coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Galvanized steel pipe, Schedule 40- 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 2 (Grade A or B); ASTM F1083, and AASHTO M111.
   C. Rail options:
      (1) Galvanized steel pipe, Schedule 40- 1½" nominal dia. zinc galvanized at the rate of 1.8 oz./ft²: ASTM A53 Table 2, ASTM F1083, and AASHTO M111.
      (2) Aluminum coated steel pipe; ASTM A53 steel, X 2 Tables Schedule 40, 1½" nominal dia., 1.860" OD, coated at the rate 0.40 oz./ft²: AASHTO M111.
      (3) Aluminum alloy pipe- 1½" nominal dia.: ASTM B241 or B221, Alloy 6063, T6.
      (4) Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials: ASTM F185 Group 1.
      (5) Resistance welded steel pipe, 40,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials: ASTM F185 Group 2.
      (6) Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials: ASTM F185 Group 3.
      (7) Resistance welded steel pipe, 60,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials: ASTM F185 Group 4.
      (8) Resistance welded steel pipe, 70,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials: ASTM F185 Group 5.
      (9) Resistance welded steel pipe, 80,000 psi min. yield strength ASTM A569/A569M, A653/A653M or undepleted stock of discontinued A446/A446M base materials: ASTM F185 Group 6.
   D. Chain link fabric options 12 mesh with twisted and barbed selvage top and bottom for all options except as described in Note No. 10.
      (1) AASHTO M181 Type I- Extruded Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.8 oz./ft². (M181 Class D 2.0 oz./ft². Modified to 1.8 oz./ft².).
      (2) AASHTO M181 Type III- Aluminum alloy wire with a diameter of 0.1443" or larger conforming to the requirements of ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
      (3) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter) coated at the rate of 0.40 oz./ft².
      (4) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter) coated at the rate of 0.40 oz./ft².
      (5) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter) coated at the rate of 0.40 oz./ft².
      (6) AASHTO M181 Type IV- Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated wire diameter) coated at the rate of 0.40 oz./ft².
   E. Tension wire options:
      (1) Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (2) Steel wire No. 8 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (3) Steel wire No. 9 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (4) Steel wire No. 10 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (5) Steel wire No. 11 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (6) Steel wire No. 12 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (7) Steel wire No. 13 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (8) Steel wire No. 14 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (9) Steel wire No. 15 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (10) Steel wire No. 16 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (11) Steel wire No. 17 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (12) Steel wire No. 18 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
      (13) Steel wire No. 19 gage zinc galvanized at the rate of 1.2 oz./ft²: AASHTO M111.
GENERAL NOTES CONTINUED

5. Unless a specific material is called for in the plans the Contractor may elect to use either a single type of material or a combination of material types from the component options listed in note 4. Combinations of optional materials are restricted as follows:
(a) Only one fabric optional material will be permitted between corner and/or end post assemblies.
(b) Only one line post optional material will be permitted between corner and/or end post assemblies.
(c) Pull post assemblies shall be optional materials identical to the linepost optional material or the corner and end post assembly optional material; but, pull post assemblies shall be the same optional material between any set of corner and/or end post assemblies.

6. Concrete for bases shall be Class NS concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-197. Materials for Class NS concrete may be proportioned by volume and/or by weight.

7. Line post shall be 8'-0" long (Standard). Line post are to be set in concrete as described above or by the following method:
(a) In accordance with special details and/or as specifically described in the contract plans and specifications.
(b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer.
(c) Line post installed in accordance with Section 5.8 shall be 9'-6" long.

8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that this maximum interval may be reduced by the Engineer on curves where the curve is greater than 3°.

9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical breaks over 15° as determined by the Engineer.

10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall be used unless the plans specifically identify locations for twisted selvage fabrics.

11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates meeting the material requirements described and as approved by the Engineer. Payment shall include the gates, single or double, all necessary hardware for installation and any additional length and/or size for posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.

12. For construction purposes corner post assemblies shall consist of one corner post, two braces, two truss rods, and all necessary fittings and hardware as detailed. End post assemblies shall consist of one end post, one brace, one truss rod and all necessary fittings and hardware as detailed.

13. In areas where there are physical constraints outside the right-of-way which restricts the fence construction, the fabric may be installed on the inside of the posts.

### TYPE IV VINYL COATED FABRIC

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**DESIGN NOTE**

This index details fencing that is constructed with chain link fabric 6' (nominal) in height and with specific ground clearance. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
REVISION DESCRIPTION:

REVISION OF STANDARD PLANS FY 2018-19 SHEET

11/01/17

FENCE TYPE B

SHEET 3 of 3

INDEX 550-002

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

NOTES

Attachments to be used only when called for in plans.
Attachments to extend in direction of restraint. Unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from lateral ditches, outfalls, retention basins within highway right of way.
(d) Outward from lateral ditches, buffer, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

BARB WIRE ATTACHMENT

BASE PLATE AND ANCHOR NOTES:
1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.
2. Post to be plumbed by grout shim under base plate.
3. Anchors (Galvanized Steel):
   - 12" Cast In Place, 100% Embedment
   - Headed Bolts, U-Bolts or Cluster Plates, 8" Dia. Bolts or Cluster Plates: 8" Headed Anchors, 8" Headed Anchors, 6" Headed, Embedment:
   - Expansion Anchors with Adhesive Material System in accordance with Specifications Sections 416 and 937.

OS; NOTE:

1/" x 3/" H-BEAM LINE POST

TOP VIEW

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

NOTES

Attachments to be used only when called for in plans.
Attachments to extend in direction of restraint: unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from lateral ditches, outfalls, retention basins within highway right of way.
(d) Outward from lateral ditches, buffer, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

BARB WIRE ATTACHMENT

BASE PLATE AND ANCHOR NOTES:
1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.
2. Post to be plumbed by grout shim under base plate.
3. Anchors (Galvanized Steel):
   - 12" Cast In Place, 100% Embedment
   - Headed Bolts, U-Bolts or Cluster Plates, 8" Dia. Bolts or Cluster Plates: 8" Headed Anchors, 8" Headed Anchors, 6" Headed, Embedment:
   - Expansion Anchors with Adhesive Material System in accordance with Specifications Sections 416 and 937.

OS; NOTE:

1/" x 3/" H-BEAM LINE POST

TOP VIEW

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

NOTES

Attachments to be used only when called for in plans.
Attachments to extend in direction of restraint: unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from lateral ditches, outfalls, retention basins within highway right of way.
(d) Outward from lateral ditches, buffer, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

BARB WIRE ATTACHMENT

BASE PLATE AND ANCHOR NOTES:
1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.
2. Post to be plumbed by grout shim under base plate.
3. Anchors (Galvanized Steel):
   - 12" Cast In Place, 100% Embedment
   - Headed Bolts, U-Bolts or Cluster Plates, 8" Dia. Bolts or Cluster Plates: 8" Headed Anchors, 8" Headed Anchors, 6" Headed, Embedment:
   - Expansion Anchors with Adhesive Material System in accordance with Specifications Sections 416 and 937.

OS; NOTE:

1/" x 3/" H-BEAM LINE POST

TOP VIEW

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

NOTES

Attachments to be used only when called for in plans.
Attachments to extend in direction of restraint: unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from lateral ditches, outfalls, retention basins within highway right of way.
(d) Outward from lateral ditches, buffer, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

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(d) Outward from lateral ditches, buffer, retention basins, canals, borrow areas and similar support facilities.
(e) Outward on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.
**GENERAL NOTES**

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

Gate components shall meet or exceed the protective coatings specified on Index 550-002.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36, or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002.  That are tolerant of welding (low burn back), and a protective coating applied to the weld and damaged pipe surfaces that is equivalent to the protective coating of the fabricated pipe stock.

3. All fabric shall be knuckled top and bottom selvages.

4. Concrete for bases shall be other Class R5 concrete as specified in Section 347 of the Standard Specifications or a packaged, dry material meeting the requirements of a concrete under ASTM C-398.  Materials for Class R5 concrete may be proportioned by volume and/or by weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

---

**CANTILEVER SLIDE GATE TYPE B FENCE**

**INDEX**

550-003

**SHEET**

1 of 1
**FENCING TERMINALS AT BRIDGE ENDS**

- **Proposed Fence**
  - LA R/W Line
  - 6"

**PLAN**

- *Approach Slab*
- *Shoulder Line*
- *Tee Of Slope*
- *Natural Ground*
- *Proposed Fence*

**ELEVATION**

- For Heights Of Headwalls 4’ Or Less.
- Fence Locations At Cross Drains With Excavated Outfall Ditches Or As Shown In Plans.
- Fence To Be Located Approx. In Line With End Bends. Set Post At Edge Of Slope Pavement.
- Top Of Fence Approx. Equals Top Of Headwall. Construct Flush Against Footing.
- Embedment 2” Min. (3 Req’d.)
- Anchor Eyebolt Or Studs And Eyenuts.
- 3 Strands Barbed Wire

**FENCING TERMINALS AT BOX CULVERTS**

- For Heights Of Headwall Greater Than 4’

**PLAN**

- *Approach Slab*
- *Shoulder Line*
- *Tee Of Slope*
- *Natural Ground*
- *Proposed Fence*

**ELEVATION**

- Fencing Detail At Culvert
  - (For Heights Of Headwalls 4’ Or Less.)
  - Note: When height of headwall is 4’ or less (drainage pipe 36” or less) the fence shall not be tied to the headwall, but shall span the lateral ditch.
NOTES:

LA R/W along the crossroad will extend a minimum of 300' beyond the end of the acceleration or deceleration ramp. The end of the LA R/W line establishing the end of both sides of the roadway in the absence of a ramp the radius point of the ramp return will be used with the above criteria.

For interchange quadrants having no ramp the LA R/W will extend along the crossroad to a point opposite the limit of LA R/W established by the ramp taper or radius point as noted above.

FENCING TERMINALS AT URBAN INTERCHANGES

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT RURAL INTERCHANGES

FENCING TERMINALS AT RETAINING WALLS

NOTE: LA R/W along the crossroad will extend a minimum
300' beyond the end of the acceleration or deceleration
ramp. The end of the LA R/W line establishing the end for
both sides of the roadway, in the absence of a ramp the
radius point of the ramp return will be used with the above
criteria.

For interchange quadrants having no ramp the LA R/W
will extend along the crossroad to a point opposite the
limit of LA R/W established by the ramp taper or
radius point as noted above.

FENCING TERMINALS AT URBAN INTERCHANGES

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT RURAL INTERCHANGES

APPLIES TO RETAINING WALLS

6' Where Footing Permits

Varies

Note A: The indicated distance shall be sufficient to provide satisfactory
sight distance for the traffic from the ramp.

Note B: The indicated distance shall be identical to the above noted
dimension, if practical.

FENCING TERMINALS AT URBAN INTERCHANGES

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT RURAL INTERCHANGES

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FENCING TERMINALS AT RURAL INTERCHANGES

APPLIES TO RETAINING WALLS

6' Where Footing Permits

Varies

Note A: The indicated distance shall be sufficient to provide satisfactory
sight distance for the traffic from the ramp.

Note B: The indicated distance shall be identical to the above noted
dimension, if practical.
GENERAL NOTES

1. All turf establishment shall be performed meeting the requirements of Section 570 of the Standard Specifications.

2. Activities such as clearing, grading, and excavating that will disturb one or more acres of land require coverage under the Generic Permit for Stormwater Discharge from Large and Small Construction Activities from the Florida Department of Environmental Protection, and implementation of appropriate pollution prevention measures to minimize erosion and sedimentation and properly manage stormwater.

3. Confirm compatibility of wildflower with Seeding Zones.

SEEDING ZONES

WILDFLOWER SEEDING RATES

<table>
<thead>
<tr>
<th>Common Name (Botanical Name)</th>
<th>#1 Group</th>
<th>#2 Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-Eyed Susan (Rudbeckia hirta)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Lance Leaf Tickseed (Coreopsis lanceolata)</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Goldemanco Tickseed (Coreopsis baalis)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Soft Hair Coneflower (Rudbeckia mollis)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Annual Phlox (Phlox drummondi)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Moss Verbena (Verbena cunjevaca)</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Wildflower seeding rates are for restoring impacted wildflower areas.
Shoulder Point

**DESCRIPTION:**

**REVISED STANDARD PLANS FY 2018-19**

**INDEX 11/01/17**

**PERMANENT EROSION CONTROL**

**TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING**

**SHOULDER AND SLOPE TREATMENT FOR SUPERELEVATED ROADWAYS**

**CRITERIA FOR PAVING SHOULDER ON DIVIDED AND UNDIVIDED FACILITIES**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Degree Of Curve</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>7° Or Greater</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>5° Or Greater</td>
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<tr>
<td>50</td>
<td>4° Or Greater</td>
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<td>60</td>
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<td>70</td>
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<td>80</td>
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<td>120</td>
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<td>220</td>
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<td>240</td>
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<td>260</td>
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<td>280</td>
<td>10° Or Greater</td>
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</tr>
<tr>
<td>300</td>
<td>5° Or Greater</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES**

1. These treatments are applicable to new construction, reconstruction and RRR projects. Project requirements for shoulder pavement and sodding that exceed the limits of this standard two precedents.

2. For sodding adjacent to ditches and at headwalls, see Index 524-001.

3. All front slopes steeper than 1:3 are to be sodded.
TREATMENT I

1. Treatment I:
   A. If trenching under sod is necessary to achieve the required Drop-Off, excavated turf and topsoil are to be used for filling voids and low areas at the edge of pavement or for flushing along the edge of sod. Excess material to be uniformly distributed over the shoulder.
   B. Payment for sod, excavation of turf and topsoil and for back fill of this material under Treatment I is to be included in the contract unit price for Performance Turf, SY.

2. Treatment II:
   A. All borrow shall meet requirements for a "Select" material in accordance with Index 120-001 and Section 120 of the Standard Specifications.
   B. Borrow may be used in lieu of excavated turf and topsoil when economically feasible, however the upper 6" shall meet the requirements of Section 162 "Prepared Soil Layer". There will be no additional payment for substituting borrow for excavated turf and topsoil.
   C. When excavated turf and topsoil do not meet the requirements of Section 162 "Prepared Soil Layer", provide additive materials as necessary in the upper 6" to meet the requirements of Section 162. There will be no additional payment for additives.
   D. Payment for Treatment II will be under Prepared Soil Layer. Sod and other materials for turf establishment shall be paid for as Performance Turf, SY.

3. Special attention is to be directed at achieving the required Drop-Off at the edge of pavement, within the dimension range shown.

4. Activities such as clearing, grading, and excavating that will disturb one or more acres of land require coverage under the General Permit for Stormwater Discharge from Large and Small Construction Activities from the Florida Department of Environmental Protection, and implementation of appropriate pollution prevention measures to minimize erosion and sedimentation and properly manage stormwater.

5. Turf Establishment:
   A. Wildflowers destroyed by shoulder sodding and turf operations are to be reestablished under the seeding rates prescribed for permanent wildflower #2 Group shown by table on Index 570-000.
   B. All turf establishment shall be performed meeting the requirements of Section 570 of the Standard Specifications.

GENERAL NOTES

SHOULDER SODDING AND TURF ON EXISTING FACILITIES

TREATMENT II

SHOULDER OPTION 1

SHOULDER OPTION 2

CRITERIA FOR USING TREATMENT I

CRITERIA FOR USING TREATMENT II

A SIMILAR TREATMENT MAY BE USED FOR PROJECTS THAT REQUIRE SHOULDER WIDENING. DETAILS ARE TO BE SHOWN IN THE PLANS.
UNDER 4" CALIPER TREE PLANTING

GENERAL NOTES:

1. All dimensions 6" and less are exaggerated for illustrative purposes only.

2. Plant containers shall be removed prior to planting. If plants are not container grown, remove a minimum of the top 1/3 of burlap, fabric, or wire mesh. Never lift or handle the tree by the trunk.

3. The uppermost root on all trees shall be covered by less than 1" of soil. Use hand tools to carefully remove all excess soil. The top of root ball shall be set 1"-2" above finish grade after settling and set plumb to the horizon. If planting pit is too deep, remove the tree and firmly pack additional soil in the bottom of the planting pit to raise the rootball. After positioning the tree in the planting pit, slice through rootballs with 3 or 4 vertical slices (top to bottom) equally distributed around the tree.

4. Backfill shall be loosened existing soil. Remove rocks, sticks, or other deleterious material greater than 1" in any direction prior to backfilling. Water and tamp to remove air pockets. If existing soils contain excessive sand, clay, or other material not conducive to proper plant growth, consult Engineer prior to planting.

5. Soil rings shall be constructed of existing soil at the outer edge of the planting pit, with a height of 3" and gently sloping sides. Do not pile soil on top of rootball.

6. Mulch shall be a 3" deep layer placed 2" off the edge of the trunk flare, around the base of shrub, or solidly around groundcover. Never pile mulch against the tree trunk.

7. Straps shall be minimum 1" wide nylon or polypropylene. Check straps monthly and adjust as required to eliminate girdling of tree. All wood stakes or anchors shall be located beyond the edge of soil ring in undisturbed soil and located below finished grade, unless otherwise specified.

8. Sabal Palms may be hurricane cut. All other palms must have fronds tied with biodegradable twine. Palm trunks shall have no burn marks, scars, or sanding.

9. All dimensions provided for wood materials are nominal.

10. When a permanent, subsurface, or drop irrigation system is provided, a soil ring is not required. Mulch to edge of planting pit.

11. Alternate tree bracing and guying systems specified or approved by the Engineer may be used in lieu of the tree bracing and guying methods detailed on the Index.

12. Remove above ground guying systems at the end of the establishment period.
CONDUIT INSTALLATION DETAILS

FIGURE A

Note:
1. Sidewalk patches to match existing joints.
2. Entire sidewalk slab must be replaced when specified in the plans.
3. Backfill and tamp with material from trench except at driveways. At driveways, backfill a length of trench within the driveway entirely with flowable fill.

FIGURE B

Note:
1. Trench not to be open more than 360° at a time when construction area is subject to vehicular or pedestrian traffic.
2. Asphalt to be sawcut to leave neat lines at the pavement cut.
3. See note 3 Figure C.

FIGURE C

Note:
1. Rigid conduit must be used when jacking under existing pavement at 36” minimum depth.
2. Asphalt to be sawcut at the edges of the trench.
3. The removal and replacement of the additional pavement width (18") will not be required when the trench can be constructed without disturbing the asphalt surface on either side.

FIGURE D

FOR USE IN AREAS NOT EXPOSED TO VEHICULAR TRAFFIC

FIGURE E

FOR USE IN INSTALLING CONDUIT UNDER A NEW ROADWAY PRIOR TO INSTALLATION OF BASE AND PAVEMENT

FIGURE F

FOR USE IN INSTALLING CONDUIT UNDER EXISTING ASPHALT PAVEMENT NOT ADJACENT TO GUTTER WHEN JACKING OR DIRECT BORING IS NOT FEASIBLE.
GENERAL NOTES:

1. The contractor, with approval from the Engineer, may adjust the final burial depth of the conduit(s) in order to transverse nonmoveable object conflicts.

2. Backfill with excavated material and compact the soil until firm and unyielding. Remove rock and debris from backfill material.

3. Where conduits are to be installed over existing underground structures (e.g., drain pipes or utility lines) which are less than 30" deep, the contractor shall encase the conduit in 2500 PSI Class I Concrete for the entire length of conduit that is installed at a depth of less than 30".

4. If the amount of cover over the encasement is less than 6", the contractor shall install the conduit to pass below the underground structures (e.g., drain pipes).
NOTES:
1. Use only span wire mounting assemblies listed on the APL. For specific details and requirements, see the vendor drawings on the APL.
2. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.
3. Lashing wire should normally be used for distances of 12' or greater.
4. Use only stainless steel hardware on all signal attachments.
5. Hole for eyebolt will require field reaming for 1" & 1¼" eyebolts.
6. Meet all grounding requirements of Specification 620.
7. The load face of pole is to be perpendicular to the resultant load.
8. Field Drill 2-½" drain holes in the bottom of the installed signals.
9. Method of framing corner Strain Poles angles 10° to 120°.
10. "Drilled Shaft (See Index 649-10)"
11. "Class NS Concrete Foundation"
12. "Finished Grade"
13. "PVC Conduit For Ground Wire"
14. "Grounding Electrode (Copperclad)"

Index 649-010: Drilled Shaft (See)
Index 649-010: Class NS Concrete Foundation
Index 649-010: Finished Grade
Index 649-010: PVC Conduit For Ground Wire
Index 649-010: Grounding Electrode (Copperclad)

11/01/17
634-001
FY 2018-19
STANDARD PLANS
SIGNAL CABLE AND SPAN WIRE
INSTALLATION DETAILS

REV
000
ELEVATION
STEEL STRAIN POLE
PRESTRESSED CONCRETE STRAIN POLE

1. Use only span wire mounting assemblies listed on the APL. For specific details and requirements, see the vendor drawings on the APL.
2. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.
3. Lashing wire should normally be used for distances of 12' or greater.
4. Use only stainless steel hardware on all signal attachments.
5. Hole for eyebolt will require field reaming for 1" & 1¼" eyebolts.
6. Meet all grounding requirements of Specification 620.
7. The load face of pole is to be perpendicular to the resultant load.
8. Field Drill 2-½" drain holes in the bottom of the installed signals.
9. Method of framing corner Strain Poles angles 10° to 120°.
DESCRIPTION:

AERIAL INTERCONNECT

1. The messenger wire of the interconnect cables shall be grounded to the copper ground wire of the pole or to the external wire extending down the pole.

2. When utilizing the external ground wire to the pole, a piece of 1/2" conduit shall extend up the pole externally to a point 8' above finish grade to protect the messenger wire connecting the messenger wire to the ground rod.

3. Locking cable ties or lashing wire when used shall be placed no further than 12" apart except at the point where one (1) shall be placed at the point where the cables separate from the messenger wire and another placed 4" (max) from that tie. When using Figure "8" interconnect cable only the locking cable ties shall be used.

4. If accessible the internal ground wire of the support pole may be used to ground the messenger wire.

5. Lashing wire should normally be used for distances of 12" or greater.

6. Meet all grounding requirements of Section 820 of the Standard Specifications.
NOTES:

1. Boxes shall not be installed in roadways or driveways.
2. Boxes shall be on the Approved Product List (APL).
3. Boxes shall be installed flush with the finished grade surface.
4. Fiber optic splice boxes shall be provided with cable hanger racks designed to support cables and splice enclosures.
   Cost of racks to be included in cost of splice box.
5. Fiber optic boxes shall contain only Fiber Optic Cable, Conduit, and Locate Wire.
6. Conduit center line shall be aligned to top edge of box to facilitate cable pulling.
7. All boxes shall have 1'-0" wide (Min.) concrete apron. Concrete for concrete aprons shall be Class NS with a minimum strength at 28 Days of f’c=2.5 Ksi. Aprons shall be sloped away from box. Cost of apron to be included in the cost of each box.
8. Prevent the ingress of Water, Dirt, Sand, and other foreign materials into the conduit prior to, during and after construction using a foam-sealing material, rubber plug, or other device designed for this application.
9. Where multiple pull boxes are placed side by side, maintain at least 8" between the pull boxes.
GENERAL NOTES:
1. It shall be the contractors responsibility to provide a complete service assembly as per the plans and service specifications.
2. The service installation shall meet the requirements of the national electric code and applicable local codes.
3. Shop drawings are not required for service equipment, unless noted in the plans.
4. A Pull Box is required at each service point, see Index 635-001.
PHOTO ELECTRIC CONTROLLER DETAIL

High Mast Lighting Systems.


6. Concrete Riser Pole.

7. Weatherhead.

8. Electrical Panel. Number and Rating of Branch Circuit Breakers shall be as indicated on Distribution Point Description on Lighting Plan Sheets.


10. #6 Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.

12. Fusible Control Power Transformer 0.5 KVA, Single Phase, 480V Primary, 120V Secondary (Part of Lighting Contactor, Shown Outside for Clarity).

13. Lightning Arrester Mounted on Outside of Enclosure.


15. 2 Pole Electrical Lighting Contactor.

16. Photo Electric Switch-120V Rated.

17. Hand-off Automatic Selector Switch (Part of Lighting Contactor, Shown Outside for Clarity).

18. Concrete Pad.


20. Mount on Riser Pole.

21. Ground BUS.

22. NEMA 4X SST Ground Mounted Storage Cabinet with Two Shelves. Only Required for High Mast Lighting Systems.

Keyed Notes:
2. Service Feeder in Rigid Galvanized Steel Conduit.
3. Meter Socket by Contractor.
4. Service Main Disconnect.
6. Concrete Riser Pole.
7. Weatherhead.
8. Electrical Panel. Number and Rating of Branch Circuit Breakers shall be as indicated on Distribution Point Description on Lighting Plan Sheets.
10. #6 Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.
11. #6 Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.
12. Fusible Control Power Transformer 0.5 KVA, Single Phase, 480V Primary, 120V Secondary (Part of Lighting Contactor, Shown Outside for Clarity).
13. Lightning Arrester Mounted on Outside of Enclosure.
15. 2 Pole Electrical Lighting Contactor.
16. Photo Electric Switch-120V Rated.
17. Hand-off Automatic Selector Switch (Part of Lighting Contactor, Shown Outside for Clarity).
18. Concrete Pad.
20. Mount on Riser Pole.
21. Ground BUS.
22. NEMA 4X SST Ground Mounted Storage Cabinet with Two Shelves. Only Required for High Mast Lighting Systems.

Cut a 2" hole in the side of the Lighting Control Panel enclosure for the operation and mounting of the Photo Electric controller. Use Araldite and a clear silicone sealant to cover hole. Install Photo Electric Controller.

To Electrical Service Drop

Ground

Circuit 1
Circuit 1
Circuit 2
Circuit 2
Circuit 3
Circuit 3
Circuit 4
Circuit 4
Circuit 5
Circuit 5
Circuit 6
Circuit 6

CLEANSING PROTECTIVE CEMENT

CUT

Photo Electric Controller

Side or Back of Enclosure

Ground Bus

Neutral Bar

TYPICAL DISTRIBUTION POINT SCHEMATIC DETAIL

RISER DIAGRAM - TYPICAL DISTRIBUTION POINT
AERIAL FEED
(NO METER USED)
FIGURE A

Service Entrance Conduit

Lightning Arrester See Note 1.

Service Disconnect

Ground Bushing

Molded Bushing

Conduit Strap

#6 AWG insulated copper ground wire in 3/4" rigid galvanized steel conduit. (Typical)

Conduit

AERIAL FEED
(METER USED)
FIGURE B

Service Entrance Conduit

Lightning Arrester See Note 1.

Service Disconnect

Ground Bushing

Molded Bushing

Conduit Strap

#6 AWG insulated copper ground wire in 3/4" rigid galvanized steel conduit. (Typical)

Conduit

UNDERGROUND FEED
(NO METER USED)
FIGURE C

Service Entrance Conduit

Lightning Arrester See Note 1.

Service Disconnect

Ground Bushing

Molded Bushing

Conduit Strap

#6 AWG insulated copper ground wire in 3/4" rigid galvanized steel conduit. (Typical)

Conduit

TYPE "B" UNDERGROUND FEED
(METER USED)
FIGURE D

Service Entrance Conduit

Lightning Arrester See Note 1.

Service Disconnect

Ground Bushing

Molded Bushing

Conduit Strap

#6 AWG insulated copper ground wire in 3/4" rigid galvanized steel conduit. (Typical)

Conduit

NOTES:
1. The lightning arrester can be located on the side or bottom of the service disconnect enclosure at the Contractor's option.
2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.
3. Supplemental Grounding shall be provided to bond all elements together to form a Grounding Network in accordance with Section 620. The bond wire shall be run in conduit with the Electrical Service Wire or Signal Cable.
4. Meet all grounding requirements of Section 620 of the Standard Specifications.
5. The Service Disconnect shall be lockable by padlock and four keys provided to the maintaining agency. The door shall have a minimum of three hinges and be lockable. No screws to be used to attach door.
6. The Service Disconnect shall be Nema 3R or better.

UNDERGROUND CABINET MOUNTED (METER USED)
FIGURE E

Service Disconnect

Lightning Arrester See Note 2.

Molded Bushing (Nonmetallic)

Conduit

Service Entrance Conduit

Lightning Arrester See Note 1.

Service Disconnect

Ground Bushing

Molded Bushing

Conduit Strap

#6 AWG insulated copper ground wire in 3/4" rigid galvanized steel conduit. (Typical)

Conduit

Grade

Grounding Electrode

Grade

From Service

Grade

Grounding Electrode

Grade

From Service

From Service

Grade

Grounding Electrode

Grade

From Service

From Service

Grade

Grounding Electrode

Grade

From Service

From Service

Grade

Grounding Electrode

Grade

From Service
GENERAL NOTES:

1. Work these Index drawings with the Strain Pole Schedule in the Plans.
2. Shop Drawings: This Index is considered fully detailed and no shop drawings are necessary.
3. Submit shop drawings for minor modifications not detailed in the plans.
4. Fabrication:
   a. Pole Taper for pole width, strands, reinforcing and void: 0.081 in/ft per face.
   b. Prestress Strand & Spiral Reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
   c. Concrete Cover: 1" minimum
   d. Spiral Reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
   e. Prestress Strands & Spiral Reinforcing: Specification Section 641
   f. Prestress Strands & Spiral Reinforcing: Specification Section 641
   g. Hand and coupler cover plates: Non-corrosive material
   h. Screws: Round headed, chrome plated
   i. Splices: Round headed, chrome plated
   j. Prestress Strands & Spiral Reinforcing: Class V Special or Class VI
5. Support locations are for strand release, storage, lifting and transport. Keep BF oriented downward until final erection.
6. Pick-up and support locations shown may vary within a tolerance of ±3".
7. Two point attachment: provide an eye bolt hole for the messenger wire.
8. Tether Wire: When required, field-drill the eyebolt hole prior to installation.
SERVICE POLE P-IIA (12 Ft.) & P-IIB (36 Ft.) ELEVATION
(Strands Not Shown)

PEDESTAL POLE P-IIC (12 Ft.) ELEVATION
(Strands Not Shown)

NOTES:
Strands shown are continuous from Tip End to Butt End.
Elevation view scales are exaggerated vertically for clarity.
For final erection, tilt pole upright with single point attachment located a
distance of 4 Ft. (for P-IIA & P-IIC) or 10 Ft. (for P-IIB) from the Tip End.
* Dimension may vary from 2¼" to 3½" to accommodate smaller radius of
optional stepped (PVC) void. The void diameter shall not be less than 2".

SERVICE AND PEDESTAL POLE TYPE P-II

CONCRETE POLES

INDEX
641-010
SHEET 2 of 8
DESCRIPTION:

REVISION LAST of STANDARD PLANS FY 2018-19

SHEET INDEX

11/01/17

CONCRETE POLES

641-010

POLE TYPE P-III

POLE ELEVATION
(Strands and Reinforcing Not Shown)

POLE ELEVATION
(Strands, Holes, and Fixtures Not Shown)

SPIRAL REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

NOTES:

- Prestressed Strand:
  0.5 in. ~ 31 kips Before Transfer (4 strands total)

- Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optimal stepped (PVC) void.

- For final erection, tilt pole upright with single point attachment located a distance 33.3% L from Tip End.

- Ground Wire:
  24" No. 6 Bare Copper

- Identification Markings:
  8x8" Hand Hole with Cover

STRAND LEGEND

- Prestressed Strand:
  0.5 in. ~ 31 kips Before Transfer (4 strands total)

- Final Grade Location
  2'-0"

- Pole Height Dim. H

- Pole Length Dim. L

- Depth Dim. D

- Ø5 Gauge Spiral

- Ø5 Gauge Spiral Reinforcing

- Strands shown are continuous from Tip End to Butt End.

- Elevation view scale is exaggerated vertically for clarity.

- Support Locations (Horizontal Poles)

- Drainage at Butt End

- Pole Height Dim. H

- Pole Length Dim. L

- Depth Dim. D

- Ø5 Gauge Spiral Reinforcing

- Ø5 Gauge Spiral

- Ø5 Gauge Spiral Reinforcing

- Ø5 Gauge Spiral

- Ø5 Gauge Spiral

- Ø5 Gauge Spiral

- Ø5 Gauge Spiral Reinforcing

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**SPRAL REINFORCING ELEVATION**
(Strands, Holes, and Fixtures Not Shown)

**POLE ELEVATION**
(Strands and Reinforcing Not Shown)

**STRAND LEGEND**
- Prestressed Strand
0.5 in. ~ 31 kips Before Transfer (6 strands total)
- Dormant Strand
0.5 in. (5 strands total)
One 24" Splice Allowed Per Strand

**NOTES:**
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 20% L from the Tip End.
- Dimension may vary from 3" to 4¼" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2½".

**CONCRETE POLES**

**INDEX**
641-010

**SHEET**
4 of 8
Spiral Reinforcing Elevation

(Strands, Holes, and Fixtures Not Shown)

Pole Elevation

(Strands and Reinforcing Not Shown)

Notes:

Strands shown are continuous from Tip End to Butt End.
Elevation view scale is exaggerated vertically for clarity.

For final erection, tilt pole upright with single point attachment located a distance 12.5% L from the Tip End.

- Dimension may vary from 3½” to 4½” to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 4”.

Concrete Poles

FY 2018-19

Standard Plans

Revision

Description:

Revision

Index

Sheet

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SPRAL REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

POLE ELEVATION
(Strands and Reinforcing Not Shown)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 10% L from Tip End.
- Dimension may vary from 3” to 4½” to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½”.

STRAIN POLE TYPE P-VI

CONCRETE POLES
**DESCRIPTION:**

**REVISION**

**LAST OF STANDARD PLANS**

**11/01/17**

**CONCRETE POLES**

**INDEX**

**641-010**

**8 of 8**

**SPIRAL REINFORCING ELEVATION**

*(Strands, Holes, and Fixtures Not Shown)*

---

**POLE ELEVATION**

*(Strands and Reinforcing Not Shown)*

---

**NOTES:**

Strands shown are continuous from Tip End to Butt End.

Elevation view scale is exaggerated vertically for clarity.

For final erection, tilt pole upright with single point attachment located a distance 10% L from the Tip End.

* Dimension may vary from 3½” to 5” to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½”.

---

**STRAND LEGEND**

- **Prestressed Strand**
  0.5 in. ~ 31 kips Before
  Transfer (12 strands total)
- **Dormant Strand**
  0.5 in. (6 strands total)
  One 24” Splice Allowed Per Strand

---

**POLE TYPE**

P-VIII
GENERAL NOTES:
1. Work this Index with Specifications 641.
2. This Index is considered fully detailed and no shop drawings are necessary. Submit Shop Drawings for minor modifications not detailed in the Plans.
3. Install pole plumb.
4. Provide either round or 12-sided Poles.
5. See Index 635-001 for additional details for Pull Boxes.

6. Materials:
A. Pole: Use Class VI concrete with 6 ksi minimum strength at transfer.
B. Prestressing Strand: ASTM A416, Grade 270 low relaxation.
C. Reinforcing Steel: ASTM A615, Grade 60.
D. Spiral Reinforcing: ASTM A516 Cold-Finish.
E. Bolts: ASTM F1554, Grade 55.
F. Washers: ASTM F2329.
G. Steel plates and pole cap: ASTM A36 or ASTM A709, Grade 50.
H. Galvanization bolts, nuts and washers: ASTM F2239.
I. All other steel: ASTM A123.

7. Pole Fabrication:
A. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
B. For spiral reinforcing, one turn is required for spiral splices and two turns are required at the top and bottom of poles.
C. For reinforcing steel, lap splice to consist of a 3'-0" lap length at each splice. No more than two opposing rebars to be spliced at the same cross-section. Stagger lap splices as needed.
D. Provide a 1'-0" minimum cover.
E. Provide handleless and coupler cover plates made of non-corrosive materials. Attach cover plates to poles using lead anchors or threaded inserts embedded in the poles in conjunction with round-headed chrome-plated screws.
F. Provide identification markings on the poles where indicated on the following sheets. Include the following information using inset numerals with 1" height or as approved in the Producers' Quality Control Program.
G. Provide Identification Markings on the poles where indicated on the following sheets. Include the following information using inset numerals with 1" height or as approved in the Producers' Quality Control Program.

8. Cabinet Installation:
A. Splice fiber optic cables in cabinet to preterminator patch panel.
B. Furnish and install TVSS protection on all cabling in cabinet.
C. Furnish and install secondary TVSS protection on outlets for equipment in cabinet.
D. Ensure that all electrical equipment power is protected and conditioned with TVSS devices.
E. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
F. Install the pole-mounted cabinet with the hinges next to the pole.
G. Ensure that electronic equipment power is protected and conditioned with TVSS devices.

9. Lowering Device Installation:
A. Place the lowering cable that moves within the pole in an interior conduit to prevent it from tangling or interfering with any electrical wire that is in the pole. Ensure that any electrical cable within the pole is routed securely and free from slack.
B. Mount lowering arm perpendicular to the roadway or as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
C. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking plates, etc.) with lowering device manufacturer.

CONCRETE CCTV POLE
NOTES:
1. Diameter of 12-sided poles are measured flat to flat.
2. Total Taper applies to pole, strands and reinforcing.
3. For 12-Sided Pole and Round Roles Option 2, stress prestressed strand to 70% of Ultimate before transfer. For Round Pole Option 3, stress prestressed strand to 60% of Ultimate before transfer.
4. Pole Design Tables, Burial Depth is based on level ground (Flatter than 1:5). For poles within slopes 1:5 and greater, increase the burial depth in accordance with the Addition Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

### ADDITIONAL BURIAL DEPTH DUE TO GROUND SLOPE

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### 12-SIDED POLE DESIGN TABLE

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### ROUND POLE DESIGN TABLE

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**Pole Identification Markings:**
- Handhole Box
- Ground Lug
- Conduit Entry Hole

**Notes:**
- those shown in the table, use the higher value.
- For values in-between those shown in the table, use the higher value.

**Due To Ground Slope:**
- For poles within slopes 1:5 and greater, increase the burial depth in accordance with the Addition Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

- Diameter of 12-sided poles are measured flat to flat.
- Total Taper applies to pole, strands and reinforcing.
- Stress prestressed strand to 70% of Ultimate before transfer. For Round Pole Option 3, stress prestressed strand to 60% of Ultimate before transfer.

**Additional Burial Depth Due To Ground Slope:**
- 1:5: 2 feet
- 1:4: 3 feet
- 1:3: 4 feet
- 1:2: 5 feet

**Handhole With Cover at RP:**
- Form the Lowering Arm and Away Form Approaching Traffic

**2-2 Couplings With Caps:**
- At 90° To Handhole Box
- Conduit Entry Hole

**Conduit Entry Hole:**
- With Lowering Device

**WITH LOWERING DEVICE:**
- ELEVATION

**WITH FIXED MOUNTING BRACKET:**
- PLAN VIEW
ASSEMBLY

NOTES:
1. Install all handhole and opening covers prior to shipping.
2. Install ¾" x 5" long stud with hex nut in insert before shipment.
3. As an alternate, embed 4½" Ø x 18" stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate w/ 4½" x 1½" stainless steel bolts.
4. Handhole frame may be Cast Aluminum 356.2.

TENON CAP

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<th>Equally Spaced</th>
<th>¾&quot; Ø Holes (Typ.)</th>
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</tbody>
</table>

ELEVATION

LOWERING DEVICE TENON

| 7½" Ø Plate |
| 6½" Ø Hole (Typ.) |
| 2½" Ø Hole |

PLAN VIEW

POLE TOP DETAIL

| Concrete Pole |
| 4½" Ø Hole |
| 5½" Ø Nut With Flat Washer (Typ.) |
| 3½" Ø Hex Head Screws |

CAP PLATE DETAIL

| Concrete Pole |
| 4½" Ø Hole |
| 5½" Ø Nut With Flat Washer (Typ.) |

ELEVATION

HANDHOLE COVER

2" Couplings With Cap

| Concrete Pole |
| 4½" Ø Hole For Handhole Cover |
| 3½" Ø Hole |

ASSEMBLY

| Handhole frame may be Cast Aluminum 356.2. |

PARK STAND DETAIL

| Concrete Pole |
| 4½" Ø Hole |
| 5½" Ø Nut (Typ.) |
| 3½" Ø Hole |
| 2½" Ø Plate |
| 6½" Ø Hole (Typ.) |

ELEVATION

HANDHOLE DETAIL

| Handhole Cover |
| Ø Holes For Handhole Cover |
| 2½" Ø Plate |
| 4½" Ø Screw |

NOTES:

1. Handhole frame may be Cast Aluminum 356.2.
2. Install all handhole and opening covers prior to shipping.
3. As an alternate, embed 4½" Ø x 18" stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate w/ 4½" x 1½" stainless steel bolts.
4. Handhole frame may be Cast Aluminum 356.2.

FOOT

1/1/17

INDEX
641-020

SHEET
4 of 5
NOTES:

1. Work with Index 634-001 for grounding and span wire details. See the Plans for clamp spacing, cable sizes and forces, signals and sign mounting locations and details.

2. Shop Drawings:
   This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

3. Materials:
   A. Strain Pole and Backing Rings:
      a. Less than 30 ksi: ASTM A1011 Grade 50, 55, 60 or 65
      b. Greater than or equal to 30 ksi: ASTM A572 Grade 50, 55, 60 or 65
      c. ASTM A500 Grade A (50 ksi yield) or Grade B (60 ksi yield)
   B. Steel Plates: ASTM A36
   C. Steel Wedge: E70XX
   D. Nuts, Bolts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade A Heavy-Hex (per anchor bolt)
      c. Plate Washers: ASTM A490 Type 1, one under turned element
      d. Hex Nuts: ASTM A564 Type 2
      e. Round Nuts: ASTM A564 Type 1
   E. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade A Heavy-Hex (per anchor bolt)
      c. Plate Washers: ASTM A490 Type 1, one under turned element
   F. Hot Dip Galv. after fabrication.
   G. Perform all welding in accordance with Specification Section 460-6.4.
   H. Reinforcing Steel: Specification Section 415

4. Fabrication:
   A. Pole Taper: Change diameter at a rate of 0.14 inches per foot, round or 12-sided (Min.)
   B. Upright splices are not permitted. Transverse welds are only permitted at the base.
   C. Provide bolt hole diameters as follows:
      a. Bolts (except Anchor Bolts): Bolt diameter plus 0.1, minimum.
      b. Anchor Bolts: Bolt diameter plus 0.2, minimum.
   D. Locate handhole 180° from 2" wire entrance pipe.
   E. Identification Tag: Submit details for approval.
      a. 1" x 4" (Max.) aluminum identification tag.
      b. Locate on the inside of the pole and visible from the handhole.
      c. Secure to pole with 3/8" diameter stainless steel rivets or screws.
      d. Include the following information on the ID Tag:
         1. Financial Project ID
         2. Pole Type
         3. Pole Height
         4. Manufacturer’s Name
         5. Ty of Steel
         6. Base Wall Thickness
   F. Provide a "J" or "C" hook at the top of the pole for signal wiring support (See Sheet 3).
   G. Steel Plates: ASTM A36
   H. Hot Dip Galv. after fabrication.

5. Coatings:
   A. Anchor Bolts: ASTM F1554 Grade 55
   B. Steel Plates: ASTM A36
   C. Weld Metal: E70XX
   D. Steel Wedge: E70XX
   E. Paint: 2 coat primer, 1 coat color.

6. Post-Construction:
   A. Bollard: 3" Diameter 60 ksi
   B. Before bollard installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification Section 460-6.4.

7. Construction:
   A. Foundation: Specification Section 455, except that payment is included in the cost of the strain pole.
   B. After installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification Section 460-6.4.

8. Piping:
   A. Pipe: Schedule 40, ammonia.
   B. Fittings: Schedule 40, weld.
   C. Valves: Gate valves, welded.
   D. Joint Filler:
      a. Use 0.5" Segmental Expansion Joint Filler.
      b. Be sure to check with the Contractor for expansion joint filler requirements.

9. splice:
   A. Splice: 2 x 4 (Min.) aluminum identification tag.
   B. Locate on the inside of the pole and visible from the handhole.
   C. Secure to pole with 3/8" diameter stainless steel rivets or screws.
   D. Include the following information on the ID Tag:
      1. Financial Project ID
      2. Pole Type
      3. Pole Height
      4. Manufacturer’s Name
      5. Ty of Steel
      6. Base Wall Thickness
   E. Provide a "J" or "C" hook at the top of the pole for signal wiring support (See Sheet 3).
   F. Perform all welding in accordance with Specification Section 460-6.4.
   G. Hot Dip Galv. after fabrication.
**DESCRIPTION:**

1. Clamps have been sized for Design Table Loads shown in the Clamp Thickness Table, and a Maximum Pole Diameter at the clamp location of 2'-1". Use one clamp per cable.

2. Install a properly sized Weather Head, fastened securely to the standard pipe for each pole location. At locations other than the wire entrance, the Weather Head Face is to be left closed to outside atmosphere. Wire entrance installed per Index 634-001.

3. Any combination of Option 'a' or 'b' may be used provided both lifting and wiring is accommodated.

**NOTES:**

**CLAMP THICKNESS TABLE**

<table>
<thead>
<tr>
<th>Cable Diameter (in.)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>17.5</td>
<td>3/16</td>
</tr>
<tr>
<td>1/2</td>
<td>21.5</td>
<td>5/32</td>
</tr>
</tbody>
</table>

**CUT-AWAY**

- Option 'a': 1/4" thick clevis, hole and matching nut. 'C' hook for lifting and wiring. 1/8" commercial grade hot rolled bar welded to inside of pole.

- Option 'b': Stainless steel screws (3 Typ.), 1/4" thick clevis, hole and matching nut. 'C' hook for lifting and wiring. 1/8" commercial grade hot rolled bar welded to inside of pole.

**ATTACHMENT DETAILS**

- Cast aluminum pole cap plate.
- Steel strain pole.

**PLAN**

- 1/4" thick clevis, ASTM A709 Grade 50.

**SECTION C-C**

- 11 Gage Handhole Cover.

**ELEVATION**

- Partial Penetration Weld (Typ.)
- 1/2" Bolt with Double Nuts and Washers (Typ.)
- 1/2" Bolt with Double Nuts and Washers (Typ.)

**HANDHOLE**

- Tack Weld Cover Clip (Typ.)
- Handhole Frame.
- 1/4" Stainless Steel Hex Head Screw (Typ.)

**WIRE ENTRANCE DETAIL**

- Wire entrance detail.
- Full penetration weld.

**POLE TOP**

- 1/8" thick. 1/4" hole for lifting. 1/8" commercial grade hot rolled bar welded to inside of pole.

- 1/8" inside of pole bar welded to grade hot rolled bar. 1/8" thick minimum. Bolt size Min.

**ATTACHMENT DETAILS**

- Cast aluminum pole cap plate.
- Stainless steel screws (3 Typ.).

**REVISED:** 10/23/2017

**INDEX:** 649-010

**SHEET:** 3 of 3
GENERAL NOTES:
1. Work this Index with Specification 649.
2. This Index is considered fully detailed and no shop drawings are necessary. Submit Shop Drawings for minor modifications not detailed in the Plans.
3. Materials:
   A. Pole: ASTM A1011 Grade 50, 55, 60 or 65 (less than 1/4") or ASTM A372 Grade 50, 60 or 65 (greater than or equal to 1/4") or ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield).
   B. Steel Plates and Pole Cap: ASTM A36 or ASTM A709 Grade 50.
   C. Weld Metal: E70XX.
   D. Rock: ASTM A656-
   E. Anchor Bolts: ASTM F1554 Grade 55 with ASTM A693 Grade A heavy-hex nuts and plate washers. ASTM F3329 galvanization.
   F. Handhole Frame: ASTM A379 Grade 36 or ASTM A36.
   G. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65.
   H. Stainless Steel Screws: AISI Type 316.
4. Pole Fabrication:
   A. Provide either a round or 16 sided pole with a constant taper of 0.14 inches per foot.
   B. Pole shaft may be either One or Two sections (with telescopic field splice).
   C. Up to two longitudinal seam welds are permitted.
   D. Use only circumferential welds at base.
   E. Use a complete penetration weld for longitudinal seam welds within 6" of circumferential welds.
   G. Provide a 2" x 4" (Max.) aluminum identification tag on the pole. Secured tag to pole with stainless steel screws. Locate the tag inside pole and visible from handhole. Include the following information:
      Financial Project ID,
      Pole Height,
      Manufacturers Name,
      Yield Strength (ry of Steel),
      Pole Base Wall Thickness.
5. Pole Installation:
   A. Do not install additional wire access holes (not shown in this Index) with a diameter that exceeds 1/4" in diameter.
   B. Install Anchor Bolts in accordance with Specification 649-5.
   C. Cable Supports: Electrical Cable Guides and Eyebolts.
      a. Locate top and bottom cable guides within the pole aligned with each other.
      b. Position one cable guide 2" below the handhole.
      c. Position other cable guide 1" directly below the top of the tenon.
      d. Position Pars Shines 2” below the top of the handhole.
6. Cabinet Installation:
   A. Splice fiber optic cables in cabinet to preterminer patch panel.
   B. Furnish and install TVSS protection on all cabling in cabinet.
   C. Furnish and install TVSS protection on outlets for equipment in cabinet.
   D. Ensure that all electrical equipment power is protected and conditioned with TVSS devices.
   E. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   F. Install the pole mounted cabinet with the hinges next to the pole.
   G. Sizes and types of conduits and innerducts for network communications between the pullbox and cabinet are stated in the Contract Documents.
7. Lowering Device Installation:
   A. Plan the lowering cable that moves within the pole in an interior conduit to prevent it from tangling or interfering with any electrical wire that is in the pole. Ensure that any electrical wire within the pole is routed securely and free from slack.
   B. Mount lowering device perpendicular to the roadway as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
   C. Coordinate all lowering device hardware requirements (including Tenon, Tenon Mounting plates, parking stands, etc.) with lowering device manufacturer.
**SHAFT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter</th>
<th>Shaft Length</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>6'-0&quot;</td>
<td>11'-0&quot;</td>
<td>11 [11]</td>
</tr>
<tr>
<td>60</td>
<td>6'-0&quot;</td>
<td>13'-0&quot;</td>
<td>16 [16]</td>
</tr>
<tr>
<td>70</td>
<td>5'-0&quot;</td>
<td>14'-0&quot;</td>
<td>18 [18]</td>
</tr>
</tbody>
</table>

**ADDITIONAL BURIAL DEPTH DUE TO GROUND SLOPE**

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>1:4</td>
<td>7&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>9&quot;</td>
<td>9&quot;</td>
</tr>
</tbody>
</table>

**FOUNDATION NOTES:**

1. Shaft Length is based on 1'-0" height above the finished grade.
2. Shaft Design Table values are based on level ground (Flatter than 1:5). For foundation within slopes 1:5 and greater, increase the foundation depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

**BASE PLATE AND ANCHOR BOLT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Diameter (in.)</th>
<th>Base Plate Thickness (in.)</th>
<th>Anchor Bolt Diameter (in.)</th>
<th>Anchor Bolt Embedment (in.)</th>
<th>Minimum Anchor Bolt Projection (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>23</td>
<td>1.25</td>
<td>3/4</td>
<td>3/4</td>
<td>3/4</td>
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<tr>
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<td>1.50</td>
<td>3/4</td>
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<tr>
<td>70</td>
<td>30</td>
<td>1.25</td>
<td>3/4</td>
<td>3/4</td>
<td>3/4</td>
</tr>
</tbody>
</table>

**POLE DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Section 1 (Top)</th>
<th>Section 2 (Bottom)</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>5'-0&quot;</td>
<td>30'-0&quot;</td>
<td>35'-0&quot;</td>
</tr>
<tr>
<td>60</td>
<td>6'-0&quot;</td>
<td>35'-0&quot;</td>
<td>40'-0&quot;</td>
</tr>
<tr>
<td>70</td>
<td>7'-0&quot;</td>
<td>40'-0&quot;</td>
<td>45'-0&quot;</td>
</tr>
</tbody>
</table>

**ELEVATION**

- **Air Terminal** (See Sheet 6)
- **Camera Lowering Device**
- **Dome Type CCTV Camera**
- **Fixed Mounting Bracket**
- **Nipple Grommet**
- **Pole And Foundation Details Same As "With Lowering Device"**
- **Steel Pole**
- **Concrete"**

**ASSEMBLY**

- **Shaft Design Table values are based on level ground (Flatter than 1:5). For foundation within slopes 1:5 and greater, increase the foundation depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.**

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<td>3/4</td>
<td>3/4</td>
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</tr>
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</tr>
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<td>70</td>
<td>7'-0&quot;</td>
<td>40'-0&quot;</td>
<td>45'-0&quot;</td>
</tr>
</tbody>
</table>

**ELEVATION**

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- **Camera Lowering Device**
- **Dome Type CCTV Camera**
- **Fixed Mounting Bracket**
- **Nipple Grommet**
- **Pole And Foundation Details Same As "With Lowering Device"**
- **Steel Pole**
- **Concrete”**

**ASSEMBLY**

- **Shaft Design Table values are based on level ground (Flatter than 1:5). For foundation within slopes 1:5 and greater, increase the foundation depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.**

**BASE PLATE AND ANCHOR BOLT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
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<th>Base Plate Thickness (in.)</th>
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<th>Anchor Bolt Embedment (in.)</th>
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</tr>
</thead>
<tbody>
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<td>1.25</td>
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<td>3/4</td>
<td>3/4</td>
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<tr>
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<td>30</td>
<td>1.25</td>
<td>3/4</td>
<td>3/4</td>
<td>3/4</td>
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</tbody>
</table>

**POLE DESIGN TABLE**

<table>
<thead>
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<th>Pole Overall Height (ft)</th>
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<th>Section 2 (Bottom)</th>
<th>Joint</th>
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</thead>
<tbody>
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<td>35'-0&quot;</td>
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<tr>
<td>60</td>
<td>6'-0&quot;</td>
<td>35'-0&quot;</td>
<td>40'-0&quot;</td>
</tr>
<tr>
<td>70</td>
<td>7'-0&quot;</td>
<td>40'-0&quot;</td>
<td>45'-0&quot;</td>
</tr>
</tbody>
</table>
DESCRIPTION:

NOTE:

To secure the cover plate, install a steel chain from the cover to the pole or by mounting the cover with hinges and install a pad lock tab.
### ARM AND BASE PLATE

<table>
<thead>
<tr>
<th>Arm ID</th>
<th>Total Arm Length (ft)</th>
<th>Arm Length (ft)</th>
<th>Arm Extension</th>
<th>Base Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A50/5</td>
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<td>11</td>
<td>0.250</td>
<td>22</td>
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<tr>
<td>A60/5</td>
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<td>13</td>
<td>0.250</td>
<td>22</td>
</tr>
<tr>
<td>A70/5</td>
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<td>12</td>
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<td>22</td>
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<tr>
<td>A80/5</td>
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</tr>
<tr>
<td>A90/5</td>
<td>70</td>
<td>12</td>
<td>0.250</td>
<td>22</td>
</tr>
<tr>
<td>A10/5</td>
<td>80</td>
<td>12</td>
<td>0.250</td>
<td>22</td>
</tr>
<tr>
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</tr>
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<td>A20/5</td>
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<td>11</td>
<td>0.250</td>
<td>22</td>
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</table>

### POLE, BASE PLATE AND ARM CONNECTION

<table>
<thead>
<tr>
<th>Pole ID</th>
<th>Upright</th>
<th>Arm-Upright Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1/S</td>
<td>16</td>
<td>0.375</td>
</tr>
<tr>
<td>P1/D</td>
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<td>0.375</td>
</tr>
<tr>
<td>P2/S</td>
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<td>0.375</td>
</tr>
<tr>
<td>P2/D</td>
<td>18</td>
<td>0.375</td>
</tr>
<tr>
<td>P3/S</td>
<td>20</td>
<td>0.375</td>
</tr>
<tr>
<td>P3/D</td>
<td>20</td>
<td>0.375</td>
</tr>
<tr>
<td>P4/S</td>
<td>22</td>
<td>0.375</td>
</tr>
<tr>
<td>P4/D</td>
<td>22</td>
<td>0.375</td>
</tr>
<tr>
<td>P5/S</td>
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<td>0.375</td>
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<tr>
<td>P5/D</td>
<td>24</td>
<td>0.375</td>
</tr>
<tr>
<td>P6/S</td>
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<tr>
<td>P6/D</td>
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### DRILLED SHAFT

<table>
<thead>
<tr>
<th>Drilled Shaft ID</th>
<th>DA (ft)</th>
<th>BR (ft)</th>
<th>RA</th>
<th>RB</th>
<th>RC</th>
<th>AD (in)</th>
<th>RE</th>
<th>RF (in)</th>
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<tbody>
<tr>
<td>DS/12/4.0</td>
<td>12</td>
<td>4.0</td>
<td>11</td>
<td>14</td>
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<td>8</td>
<td>12</td>
</tr>
<tr>
<td>DS/12/4.5</td>
<td>12</td>
<td>4.5</td>
<td>11</td>
<td>16</td>
<td>8</td>
<td>16</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>DS/14/5.0</td>
<td>14</td>
<td>5.0</td>
<td>11</td>
<td>18</td>
<td>10</td>
<td>18</td>
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<td>8</td>
</tr>
<tr>
<td>DS/16/4.5</td>
<td>16</td>
<td>4.5</td>
<td>11</td>
<td>16</td>
<td>10</td>
<td>16</td>
<td>10</td>
<td>8</td>
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<tr>
<td>DS/16/5.0</td>
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<td>5.0</td>
<td>11</td>
<td>18</td>
<td>10</td>
<td>18</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>DS/20/5.0</td>
<td>20</td>
<td>5.0</td>
<td>11</td>
<td>18</td>
<td>10</td>
<td>18</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

### LUMINAIRE AND CONNECTION

<table>
<thead>
<tr>
<th>LA (ft)</th>
<th>LB (ft)</th>
<th>LC (ft)</th>
<th>LD (ft)</th>
<th>LE (ft)</th>
<th>LF (ft)</th>
<th>LG (ft)</th>
<th>LM (ft)</th>
<th>LJ (ft)</th>
<th>LK (ft)</th>
<th>LL (Deg)</th>
<th>US (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>10</td>
<td>3</td>
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<td>0.5</td>
<td>0.5</td>
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<td>0.25</td>
<td>0.25</td>
<td>0</td>
<td>37.5</td>
<td>37.5</td>
</tr>
</tbody>
</table>

**NOTE:**

1. Work this Index with Index 649-031.
GENERAL NOTES

1. Shop Drawings. This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

2. Prior to Fabrication, verify the installed foundation elevation will result in the required signal elevation and adjust the Pole height as needed.

3. Details for Signal and Sign locations, Signal Head attachment, Sign attachment, Pedestrian Head attachment, and Foundation Conduction are not shown for simplicity.

4. Materials:
   - A. Poles, Mast Arms and Backing Rings:
     - a. Less than $\frac{1}{8}$" ASTM A1011 Grade 50, 55, 60 or 65
     - b. Greater than or equal to $\frac{1}{8}$" ASTM A709 Grade 50, 55, 60 or 65
   - B. Steel Plates: ASTM A28
   - C. Weld Metal: E70XX
   - D. Bolts, Nuts and Washers:
     - a. High Strength Bolts: ASTM F3125, Grade A325, Type 1
     - b. Nuts: ASTM A325 OH Heavy-Hex
     - c. Washers: ASTM A446 Type 1, one under turned element
   - E. Anchor Bolts, Nuts and Washers:
     - a. Anchor Bolts: ASTM A1554 Grade 55
     - b. Nuts: ASTM A325 Grade A Heavy-Hex (5 per anchor bolt)
   - F. Plate Washers: ASTM A563 (2 per bolt)
   - G. Threaded Bars/Studs: ASTM A36 or ASTM A307

5. Fabrication:
   - A. Pole and Mast Arm Taper: Change diameter at a rate of 0.14 inches per foot.
   - B. Upright splices are not allowed. Transverse welds are only permitted at the base.
   - C. First and Second arm camber angle = 2°
   - D. Provide bolt hole diameters as follows:
     - a. Bolts (except Anchor Bolts): Bolt diameter plus $\frac{1}{16}$" (Max.)
     - b. Anchor Bolts: Bolt diameter plus $\frac{1}{8}$" (Max.)
     - c. Plate Washers: ASTM A563 Grade A (2 per bolt)

6. Coatings:
   - A. Poles, Mast Arms and Backing Rings:
     - a. Less than $\frac{1}{8}$" ASTM A1011 Grade 50, 55, 60 or 65
     - b. Greater than or equal to $\frac{1}{8}$" ASTM A709 Grade 50, 55, 60 or 65
   - B. All nuts, bolts, washers and threaded bars/studs:
     - a. Nuts: ASTM F2329
     - b. Washers: ASTM A446 Type 1, one under turned element
     - c. Threaded bars/studs: ASTM A36 or ASTM A307

7. Construction:
   - A. Foundation: Specification 455 Drilled Shaft, except that payment is included in the cost of the Mast Arm.
   - B. Mast Arm:
     - a. Face handhole perpendicular from arm on single arm poles, perpendicular from first arm of double arm poles facing away from traffic or see special instructions on the Mast Arm Tabulation Sheet.
     - b. Seam weld on bottom side of arm. Seam weld under Arm 1 side of pole.
   - C. Free-Swinging, Internally Illuminated Street Sign. (See Index 700-050)
   - D. Provide 1" x 2" Weep Hole on outside of pole.

8. Table of Contents:
   - SHEET NO.: 649-031
   - SUBJECT: MAST ARM ASSEMBLY
   - INDEX: 1 of 6

ELEVATION AND NOTES
NOTES:

1. The Structural Grout Pad diameter may be reduced where the footprint of the Grout Pad does not provide adequate clearance for the sidewalk and/or accessibility considerations.

2. See Index 649-030 and the plans for actual quantity of bolts in the Base Plate Connection.

3. The bottom hex nut of the Double Nuts shown in Section 4-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

Section A-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

2. See Index 649-030 and the plans for actual quantity of bolts in the Base Plate Connection.

3. The bottom hex nut of the Double Nuts shown in Section A-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

1. The Structural Grout Pad diameter may be reduced where the footprint of the Grout Pad does not provide adequate clearance for the sidewalk and/or accessibility considerations.

2. See Index 649-030 and the plans for actual quantity of bolts in the Base Plate Connection.

3. The bottom hex nut of the Double Nuts shown in Section A-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.
**NOTE:**

1. Install the Slip joint splice with a tight fit and no change in the Mast taper due to the splice.

2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.

3. Match mark the Arm and Connection Plates to ensure proper assembly and the seam weld is in the proper location (seam located at the bottom side of the Arm).
**DESCRIPTION:**

**MAST ARM ASSEMBLY**

1. **Double Arm Connections & Splice Details**

   **SECTION E-E**
   - **DOUBLE ARM CONNECTION**
     - Center of First Mast Arm Extension
     - Center of Second Mast Arm Extension
     - 2" Min. (Typ.)
     - 2" Min. (See Note #5)
     - 'SF' Diameter
     - Connection Bolt
     - See DETAIL 'F'

   **SECTION F-F**
   - **SIDE VIEW OF ARM SPLICE**
     - Splice - 2"Ø (Nominal)
     - 'SF' Diameter
     - Connection Bolt
     - See DETAIL 'E'

   **SECTION G-G**
   - **FULL PENETRATION WELD**
     - Center of Second Mast Arm Extension
     - 2" Min. (Typ.)
     - 'SF' Diameter
     - Connection Bolt
     - See DETAIL 'F'

   **NOTE:**
   1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
   2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
   3. Match mark the Arm and Connection Plates to ensure proper assembly and the seam weld is in the proper location (seam located at the bottom side of the Arm).
   4. 'UF' measured counter clockwise from First Mast Arm Extension.
   5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

**FACTORs:**

- Minimum Internal Bend Radius = 5x Wall Thickness (1" Min.)
- Seam Weld (Typ.)
- Full Penetration Weld (Typ.)
- 4"Ø Wiring Hole
- Connection Plates (Typ.)

**DETAILS:**

- **DETAIL 'D'**
  - Pole Connection Plate
  - 'SF' Diameter
  - Connection Bolt
- **DETAIL 'E'**
  - Side Connection Plate
  - Edge of Top Plate
  - 'SF' Diameter
  - Connection Bolt
  - Full Penetration Weld (Typ.)
- **DETAIL 'F'**
  - Center of Pole
  - 4"Ø Wiring Hole
  - 2" Min. (Typ.)
  - 'SF' Diameter
  - Connection Bolt
  - See DETAIL 'F'

**LAST REVISION:**
11/01/17

**STANDARD PLANS**
FY 2018-19

**INDEX**
649-031

**MAST ARM ASSEMBLIES**

10/23/17

**REV.**
NOTES:
1. Luminaire type and luminaire length may be found in the Lighting Plans.
2. Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.
3. The fabricator may substitute a 1/2" thick bent plate with the same flange width, height, and length as the MC 10x33.6 Channel section.
4. 'L' measure counter clockwise from First Mast Arm.

DESCRIPTION:
1. Luminaire type and luminaire length may be found in the Lighting Plans.
2. Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.
3. The fabricator may substitute a 1/2" thick bent plate with the same flange width, height, and length as the MC 10x33.6 Channel section.
4. 'L' measure counter clockwise from First Mast Arm.
NOTES:

1. Handhole covers may be omitted when Terminal Compartment is provided.
2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required for locations.
3. Terminal Compartment Frame Height 2'-0" minimum to 2'-4" maximum. Align bottom of Terminal Compartment a minimum of 1" below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.

1. Handhole covers may be omitted when Terminal Compartment is provided.
2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required for locations.
3. Terminal Compartment Frame Height 2'-0" minimum to 2'-4" maximum. Align bottom of Terminal Compartment a minimum of 1" below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.

1. Handhole covers may be omitted when Terminal Compartment is provided.
2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required for locations.
3. Terminal Compartment Frame Height 2'-0" minimum to 2'-4" maximum. Align bottom of Terminal Compartment a minimum of 1" below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.
NOTES:

1. As an option, pedestrian signals may be installed on concrete poles and pedestals using lead anchors (two bolts same size per hub) in lieu of the stainless steel bands.

2. For Prestressed Concrete Poles see Index 641-010.

3. Meet grounding requirements of Specifications 620.

4. For Steel Strain Poles see Index 649-010.

5. For Prestressed Concrete Poles see Index 641-010.

6. For Steel Strain Poles see Index 649-010.

7. For Prestressed Concrete Poles see Index 641-010.

8. Install 4 - ½" x 18" Anchor Bolts With Double Nuts. (ASTM F1554 Grade 55)

9. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.
SPAN WIRE MOUNTED SIGN DETAILS

TYPICAL INSTALLATIONS FOR SIGN PANEL(S) MOUNTED ON SPAN WIRE

SIGN MOUNTING DETAIL

TYPICAL SPAN WIRE INSTALLATION

NOTES:
1. Bottom edge of signs shall be approximately at the same elevation.
2. Type B & C attachments with one hanger shall have wind beams for signs wider than 3' 6". The beams shall extend to within 6" of the sign edge.
3. Type B & C attachments for signs 6' and wider shall have 2 hangers. Signs 7' and wider shall have wind beams that extend to within 6" of the sign edge.
4. Type D attachments shall be for signs 9' 6" wide or less.
5. Sign panels shall meet the requirements of Index 700-020.
6. Refer to section 634 of the Standard Specifications For Road and Bridge Construction.
7. All bolts, nuts, and washers shall be passivated stainless steel, AISI 300 series, commercial grade, type 316.

SURPLUS WIRE MOUNTED SIGN DETAILS

TYPICAL SPAN WIRE INSTALLATION

DETAIL OF OPPOSING SIGNS SPAN WIRE MOUNTED

TWO POINT ATTACHMENT

DESCRIPTION:
REVISED

LAST REVISION
10/23/17

10:34:06 AM

REVISION

11/01/17

659-010

1 of 1
GENERAL NOTES:

1. Lowering device to be shipped ready for pole attachment to include 100 ft. of composite power and signal cable prewired to lowering device at the factory.

2. The lowering device manufacturer shall supply both a portable lowering tool with a manual hand crank and a half-inch chuck variable-speed reversible industrial-duty electric drill that matches the winch’s manufacturer-recommended revolutions per minute. One lowering tool per every 10 lowering devices is required.

3. The lowering device manufacturer shall provide an on-site installation inspection and operator instruction and certification. This ensures the product is assembled correctly and that all necessary persons are trained in the proper, safe operation of the system. Before erecting the first pole the contractor must contact the lowering device supplier and schedule a manufacturer’s representative to be on-site.


5. Camera to be mounted to camera junction box and stabilizing weight via 1½” Standard NPT Pipe Thread.

6. Use air terminal extension when the pole top junction box is wider than top of pole.

7. The stainless steel device lowering cable shall be installed inside the pole within a 1½” diameter PVC conduit.

8. All communication and power cables must be neatly bundled and secured.


10. See Index 641-020 for concrete pole details and Index 649-020 for steel pole details.

See Index 641-020 for concrete pole details and Index 649-020 for steel pole details.

Use a Camera Lowering Device listed on the Approved Product List (APL).

All communication and power cables must be neatly bundled and secured.

Use air terminal extension when the pole top junction box is wider than top of pole.

The stainless steel device lowering cable shall be installed inside the pole within a 1½” diameter PVC conduit.

See Index 641-020 for concrete pole details and Index 649-020 for steel pole details.
CAMERA MOUNTING WITH FIXED BRACKET

GENERAL NOTES:

1. Verify the pole type, the dimensions of the pole at the pole of installation of the camera mount, and angle with respect to the roadway before manufacturing camera mount assembly.

2. Design camera mounting arm and connection to the pole according to FDOT Structures Manual (current edition).

3. No field welding shall be permitted.

4. Mounting bracket arm shall be level after installation.

5. The contractor shall submit shop drawings for the proposed fixed mounting arm, signed and sealed by a Professional Engineer registered in the State of Florida, to the Engineer for review and approval.


7. Galvanized pipe connections and conduit every joints shall be sealed in accordance with Section 630 of the Standard Specifications.

Varies (2' Max.)

Dome Type Camera Assembly (TYF)

Variation (30" Max.) Dia.

Pole Plate With Stainless Steel Band
(Or Method Approved By Engineer)

Camera Connector Harness
Supplied To Match Camera

Strain Relief Fitting

Fixed Mounting Bracket Must Be
Designed To Match Mounting
Provisions For CCTV Camera

Cable In Place 2" Galvanized Nipple
For Concrete Poles, Hole With
Nipple Grommet For Steel Poles.

Bond #4 AWG Tin-Plated Bare Solid Copper Ground Wire To
Camera Support Base By An Aluminum To Copper #2-#14 AWG
Lug. Attached To Camera Base With A Stainless Steel Screw.
Remove Paint Or Protective Coating Where Attaching Lug.

Bracket Design May Vary
By CCTV Manufacturer

Fixed Mounting Bracket Was To Be
Designed To Match Mounting
Provisions For CCTV Camera

Cable In Place 2" Galvanized Nipple
For Concrete Poles, Hole With
Nipple Grommet For Steel Poles.

The Contractor Shall Coordinate
Brackets And Flange Connection
With CCTV Camera Manufacturer For
Mounting The CCTV Camera Housing

GENERAL NOTES:

1. Verify the pole type, the dimensions of the pole at the pole of installation of the camera mount, and angle with respect to the roadway before manufacturing camera mount assembly.

2. Design camera mounting arm and connection to the pole according to FDOT Structures Manual (current edition).

3. No field welding shall be permitted.

4. Mounting bracket arm shall be level after installation.

5. The contractor shall submit shop drawings for the proposed fixed mounting arm, signed and sealed by a Professional Engineer registered in the State of Florida, to the Engineer for review and approval.


7. Galvanized pipe connections and conduit every joints shall be sealed in accordance with Section 630 of the Standard Specifications.
TWISTED PAIR AND LOOP LEAD-IN INSTALLATION WITH CURB & GUTTER

**ALTERNATIVE 1**
Drill a Hole Through the Curb. At the Point Which the Required Saw-Cut Depth is Obtained, Just Prior to Cutting the Top Inside Edge of the Curb. Slide a Section of Flexible Conduit at Least 6" Into the Hole from the Back Side of the Curb But Not Within 2" of the Top of the Hole. The Conduit Shall Be Serve Within the Drilled Hole. Fill the Top of the Hole with Loop Sealant to the Level of the Roadway Surface. A Nonmetallic Material Should Be Used to Prevent Excessive Loop Sealant From Entering the Flexible Conduit.

**ALTERNATIVE 2**
Drill a Hole 1/2" to 1" Larger in Diameter Than the Rigid Conduit to Be Used Through the Roadway Asphalt (or Concrete) Surface and Base at an Appropriate Angle to Intercept the Trench Or Pull Box Hole. Place a Predetermined Length of Rigid Conduit in the Hole and Drive the Conduit into the Trench Or Hole. Install a Molded Bushing (Nonmetallic) on the Roadway End Of the Rigid, Conduit. The Top Of The Rigid Conduit Shall Be Approximately 2" Below the Roadway Surface. Fill the Hole With Loop Sealant to the Level of the Roadway Surface. A Nonmetallic Material Should Be Used to Prevent Excessive Loop Sealant From Entering the Rigid Conduit.

**GENERAL NOTES**

1. If the loop lead-in is 75' or less from the edge of the loop detector to controller cabinet, continue the twisted pair to the cabinet. If the loop lead-in is greater than 75' continue the twisted pair to the specified pullbox, splice to shielded lead-in wire and continue to the controller cabinet.

2. The width of all saw cuts shall be sufficient to allow unforced placement of loop wires or lead-in cables into the saw cut. The depth of all saw cuts, except across expansion joints, shall be 3" standard with a maximum of 4".

3. On resurfacing or new roadway construction projects, the loop wires and lead-in cable will be installed in the asphalt structural course prior to the placement of the final asphalt wearing course. The loop wires and lead-in cables shall be placed in a saw cut in the structural course. The depth of the cables below the top of the final surface shall comply with note 2.

4. A nonmetallic hold down material shall be used to secure loop wires and lead-in cables to the bottom of saw cuts. Hold down material shall be placed at approximately 12" intervals around loops and 24" intervals on lead-ins.

5. The maximum distance between the twisted pairs of loop lead-in wire is 6' from the loop to 12' from the pavement edge or curb.

6. Splices Connections in pull boxes with UL listed, watertight, insulated enclosures. Place one enclosure over the end of each conductor and place a third enclosure over the exposed end of the shielded cable.

7. As an alternate, a larger diameter enclosure that will accommodate both the loops of the conductors and the exposed end of the shielded cable may be used.

8. The maximum area of asphalt to be disturbed shall be 6'x6'. This area shall be restored as directed by the Engineer.

**NOTE:**

Other alternatives may be approved by the State Traffic Operations Engineer.
Loop conductors must follow saw-cut to bottom forming slack section at joint.

Notes:
1. The "number of turns" indicated at the specified point on the loop refers to the number of passes of loop wires which are placed in the saw-cut forming the complete loop.
2. Loop types or details not drawn to scale.
3. Loop Types are centered in a single lane except Type E which is centered on two lanes.
4. The number of individual loops in the Type G loop may vary up to a maximum of four (4).
5. Lead-in may be connected to either end of loop.
6. The leading edge of loop Types A,C,D,& F may extend past the stop line a maximum of 10'. The length of these loops may be extended to a maximum of 60'. Each intersection should be individually designed and if the modifications noted above is required it must be noted or detailed in the plans.
7. Loop lead-in wires should not be installed in the same pull box with signal power cable.
NOTES:
1. Mount Signs above the detectors. See Index 700-102 or MUTCD for sign details.
2. Position the pedestrian pushbutton to clearly indicate which crosswalk signal is actuated by each pushbutton.
3. Mount pushbuttons and Signs in accordance with Specification 665.
4. Install all grounding per Specification 620.
5. Pushbutton mounting height shown above is taken at the center of the actuation switch.
Vehicle movements & signal head number assignments are not directionally oriented but shall maintain their relative orientation about the intersection (I.E., movements 7 and 4 are always to the right of movements 1 and 6 etc.).

LEGEND

1 Vehicle Movement Number
2 Pedestrian Movement Number
3 Timing Function Number
4 Phase Number
5 Green Arrow (Left or Right)
6 Red Arrow
7 Yellow Arrow

SIGNAL CLEARANCE TABLE
(Blank Indicates No Clearance Required)
Notes:
1. The number, size and orientation of conduit sweep will vary according to site condition or locations. Two spare 2" PVC conduits shall be provided in all bases. The spares shall exit in the direction of the center rear of the cabinet base, into a pullbox and capped with a weatherproof fitting. If obstructions prevent the spare conduit from exiting to the rear, or the rear of the cabinet is located on the R/W line, a side exit of the spare conduits will have to be approved by the project engineer. All spare conduit sweeps shall be capped with a weatherproof fitting.
2. Meet all grounding requirements of the Standard Specifications 620.
3. New Controller Cabinet installation shall meet the requirements of the Standard Specifications 676.

Cabinet Installation Details

METAL POLE
CONCRETE POLE
WOOD POLE
POLE MOUNTED CABINET
INTERCONNECT JUNCTION BOX
BASE MOUNTED

Notes:

1. Existing controller cabinets to be retrofitted shall meet the requirements of the Standard Specifications 678.
2. The signalized intersection controller cabinet retrofit installation procedures are located at:
   For Generator Power for Signalized Intersection

3. New Controller Cabinet installation shall meet the requirements of the Standard Specifications 676.

NEW CONTROLLER CABINET
EXISTING CONTROLLER CABINET
PEDESTAL MOUNTED
**DESCRIPTION:**

Traffic monitoring site cabinet includes:

- One adjustable shelf; (equipped as shown)
- One basic backplane assembly; (equipped as shown)
- One J1 receptacle with mounting bracket;
- One J1 equipment cable 5 ft. long (Reference Sheet No. 4);
- All associated wiring and wiring harnesses.

Basic backplane assembly consists of:

- Two inductive loop terminal strips;
- One piece sensor terminal strip;
- One battery terminal strip;
- One solar panel terminal strip.

The contractor is responsible for contacting the TMS Manager at the Transportation Statics Office for lane number information and verification.

- Speed/Classification unit and Modem furnished separately.

- Cable ends must be fabricated to fit the vehicle speed/classification unit (Reference Sheet No. 4).

**NOTES:**

1. Traffic monitoring site cabinet includes:
   - One adjustable shelf; (equipped as shown)
   - One basic backplane assembly; (equipped as shown)
   - One J1 receptacle with mounting bracket;
   - One J1 equipment cable 5 ft. long (Reference Sheet No. 4);
   - All associated wiring and wiring harnesses.

2. Basic backplane assembly consists of:
   - Two inductive loop terminal strips;
   - One piece sensor terminal strip;
   - One battery terminal strip;
   - One solar panel terminal strip.

3. The contractor is responsible for contacting the TMS Manager at the Transportation Statics Office for lane number information and verification.

4. Speed/Classification unit and Modem furnished separately.

5. Cable ends must be fabricated to fit the vehicle speed/classification unit (Reference Sheet No. 4).

**NOTE:**

Fabricate bracket out of 1/8" - 1/4" inch thick aluminum. Dimensions may vary depending on the manufacturer of the J1 receptacle being furnished. The cabinet manufacturer will construct the mounting bracket to fit the receptacle.
**DESCRIPTION:**

**OPTION A**

1. **Traffic monitoring site cabinet includes:**
   - A. One adjustable shelf (equipped as shown)
   - B. Two backplane assemblies (equipped as shown)
   - C. Two J1 receptacles with mounting brackets
   - D. One J1 equipment cable 5 ft. long (reference Sheet No. 4)
   - E. All associated wiring and wiring harnesses

2. **Basic backplane assembly consists of:**
   - A. Two inductive loop terminal strips
   - B. One piezo sensor terminal strip
   - C. One battery terminal strip
   - D. One solar panel terminal strip

**OPTION B**

- **Equipment Cable Assembly**

- **NOTES:**
  1. Traffic monitoring site cabinet includes:
     - A. One adjustable shelf (equipped as shown)
     - B. Two backplane assemblies (equipped as shown)
     - C. Two J1 receptacles with mounting brackets
     - D. One J1 equipment cable 5 ft. long (reference Sheet No. 4)
     - E. All associated wiring and wiring harnesses
  2. Basic backplane assembly consists of:
     - A. Two inductive loop terminal strips
     - B. One piezo sensor terminal strip
     - C. One battery terminal strip
     - D. One solar panel terminal strip

3. The contractor is responsible for contacting the TMS Manager in the Transportation Statics Office for lane number information and verification.

4. Speed/Classification Unit and Modem furnished separately.

5. Cable ends must be fabricated to fit the vehicle speed/classification unit (reference Sheet No. 4 for pinout charts, receptacle and plug details).

**CABINET LAYOUT DETAILS (Five to Eight Lanes)**
NOTES:
1. Reference Sheet No. 1 or 2, Note #2 for items to be included with backplane.
2. All terminal strip contacts are on 1/2" centers (Clinch 142 Series or equal)
   Use insulated fork wire terminations.
3. The contractor is responsible for contacting the TMS Manager in the Transportation
   Statics Office for lane number information and verification.

SERGE SUPRESSOR (Typ.)

To J1 Receptacle
DESCRIPTION:

NOTES:

1. The contractor is responsible for contacting the EMS Manager in the Transportation Statics Office for lane number information and verification.
2. The equipment cable can accommodate up to four lanes of inductive loop and piezo sensor inputs (Reference Sheet No. 1 for cabinet layout).
3. For more than four lanes and up to eight lanes of inputs, the following options are available:
   A. Second Vehicle Speed/Class. Unit and separate equipment cable connecting to a second J1 receptacle; or
   B. Single Vehicle Speed/Class. Unit capable of up to eight lanes of inputs and a single equipment cable with split ends to fit two J1 receptacles. (Reference Sheet 2 details)
4. Numbers in parenthesis in the pinout chart identify lane numbers when a second backplane for lanes 5 through 8 is required.
5. Cable ends must be fabricated to fit the vehicle Speed/Classification Unit.

J1 RECEPTACLE PINOUT

26 Recessed Male Pins

A  Loop 1a (5a) yellow
B  Loop 1a (5a) purple
C  Loop 1b (5b) gray
D  Loop 1b (5b) pink
E  Loop 2a (6a) brown
F  Loop 2a (6a) blue
G  Loop 2b (6b) orange
H  Loop 2b (6b) tan
I  Loop 3a (7a) white
J  Loop 3a (7a) green
K  Loop 3b (7b) red
L  Loop 3b (7b) black
M  Loop 4a (8a) red/black
N  Loop 4a (8a) w/yellow
O  Loop 4a (8a) w/purple
P  Loop 4b (8b) w/gray
Q  Loop 4b (8b) w/brown
R  Piezo 1 (5) (+) w/blue
S  Piezo 1 (5) sh w/orange
T  Piezo 2 (6) (+) w/green
U  Piezo 2 (6) sh w/red
V  Piezo 3 (7) (+) w/black
W  Piezo 3 (7) sh w/red/blk
X  Piezo 4 (8) (+) w/red/green
Y  Piezo 4 (8) sh w/red/yellow
Z  Gnd red/black

J1 EQUIPMENT CABLE PLUG

26 Female Pin Slots

A  Loop 1a (5a)
B  Loop 1a (5a)
C  Loop 1b (5b)
D  Loop 1b (5b)
E  Loop 2a (6a)
F  Loop 2a (6a)
G  Loop 2b (6b)
H  Loop 2b (6b)
I  Loop 3a (7a)
J  Loop 3a (7a)
K  Loop 3b (7b)
L  Loop 3b (7b)
M  Loop 4a (8a)
N  Loop 4a (8a)
O  Loop 4b (8b)
P  Loop 4b (8b)
Q  Gnd
R  Piezo 1 (5) (+)
S  Piezo 1 (5) sh
T  Piezo 2 (6) (+)
U  Piezo 2 (6) sh
V  Piezo 3 (7) (+)
W  Piezo 3 (7) sh
X  Piezo 4 (8) (+)
Y  Piezo 4 (8) sh
Z  Gnd
TYPICAL FOR UP TO 4 LANES OF SENSOR LEADS PULLED TO ONE SIDE OF THE ROADWAY

ROADWAYS WITH PAVED SHOULDERS

1. Install axle sensors and loops associated with axle sensors after placement of the friction course.

2. Cut a 3' deep slot for the Inductive loops. Loop slots shall be cut wide enough to allow unforced placement of the wire into the bottom of the slot. Each turn of a #14 AWG place the IPSA 51-3 copper wire in the slot. Place short pieces of backer rod (2 to 3" in length) every 24" to 36" to hold the loop wire in the bottom of the slot.

3. Twist loop leads at the rate of 8 to 16 twists per foot. Leads that are within 15' of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances over 15', #14 IPSA 50-2 shielded loop-in cable must be spliced to the loop wire twisted pair at the first pull box to which the loop wire is pulled.

4. Marking will consist of two rounds of contrasting colored tape, one color for the lane number and the second color for the lead loop location in the lane. The first band closest to the cabinet will represent the lane number, one round of tape and a second round of a contrasting colored tape for the lead loop in the lane. The trailing loop would not have a second contrasting colored band of tape.

5. See Index 635-001 for pull box and apron details.

6. All splices will be performed using splice kits designed for direct burial. Splice kits will include screw on wire connectors and a housing with sufficient sealant to fully encapsulate the spliced connections. Taped splices are not permitted.

7. Use a chalk line or string and paint to layout the position of the sensor and lead-in cable slots. Ensure saw cuts do not deviate more than 0.5 inches from the chalk line. Use a single blade or ganged blade saw wide enough to cut the sensor slot at full depth in a single pass. Cutting two slots and chipping out roadway material between them is not allowed.

8. All sensor slots and any cuts in the roadway will be thoroughly blown out to ensure there is no dust or debris prior to installation of sensors or leads.

9. Install Exit Windows at least 2' apart.
1. The unit must be capable of detecting up to eight lanes of traffic (in either or both directions) when mounted perpendicular to the roadway.

2. Coverage area of the unit is affected by the roadway geometry: distance from the travel lanes, median type and width, barrier walls, etc.

3. Mounting height of the unit and offset from the roadway must be determined on a site-by-site basis, in accordance with the manufacturer’s recommended guidelines. Offset of pole must be greater than or equal to minimum clear zone requirements.
NOTE:

1. Cabinet installed per Index 676-010 except cabinet center will be 4 feet above grade.

2. Place pole in accordance with the Standard Specification 125.4 and 125.8.2.

3. Use #10 AWG stranded copper wire for Solar Panel Array installations. Red insulation is THHN or THWN for positive 12 volts wiring; black insulation is THHN or THWN for negative 12 volts wiring. Green insulation is THHN or THWN for ground bonding of the solar panel frame to the pole and earth.

4. Solar panel should be installed facing due south with angle of tilt equal to the sum of the following equation. The Latitude of the panel's location multiplied by 0.76, plus 3.1 degrees. Equation expressed as (LAT)(0.76)+3.1°

5. Encase all wiring from the weather head to the solar panel in outdoor flexible conduit.

6. Concrete Base Requirements:
   a. 4 poles: 2'-0" x 2'-0" wide, a depth of 2'-0"
   b. 12', 15' or 20' poles: 3'-0" x 3'-0" wide, a depth of 3'-0"
   c. 20' or 35' poles: 3'-0" x 3'-0" wide, a depth of 4'-0"

SOLAR POWER POLE
WITH POLE MOUNTED CABINET
(Telemeter Sites)

PEDESTAL MOUNTED CABINET
(Portable Traffic Monitoring Sites)
### SHEET NO. CONTENTS

1. General Notes and Example
2. Center and Height
3. Column and Foundation Tables
4. Strip Base and Foundation Details
5. Driveway and Storm Drain Details
6. Connection and Wind Beam
7.6 & 9. Frequently Used Sign Clusters

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**GENERAL NOTES:**

1. **Shop Drawings:**
   - This Index is considered fully detailed. Submit Shop Drawings for minor modifications not detailed in the Plans.

2. **Aluminum Sign, Wind Bends, and Column (Post) Materials:**
   - b. Aluminum Bars and Extruded Shapes: ASTM B221, Alloy 6061-T6
   - c. Aluminum Structural Shapes: ASTM B308 Alloy 4140-T6
   - d. Galvanized: ASTM A526 Grade DH
   - e. Aluminum Weld Material: ER 5556 or 5356

3. **Sign Mounting Bolts, Nuts, and Washers:**
   - a. Aluminum Button Head or Flat Head Bolts: ASTM F468 Alloy 2024-T4
   - b. Aluminum Hex Nuts: ASTM F467 Alloy 6061-T6 or 6262-T9
   - c. Aluminum Washers: ASTM B221, Alloy 7075-T6
   - d. Stainless Steel Nuts: ASTM F904

4. **Stainless Steel Bolts, Nuts, and Washers may be used in lieu of the Aluminum Button head and flat head bolts as follows:**
   - a. Stainless Steel Bolts: ASTM F 593 Alloy Grade 2, Condition A, CW1 or SM1
   - b. Stainless Steel Nuts: ASTM F904

5. **Sign Column (Post) Bolts, Nuts, and Washers:**
   - a. Galvanized U-Bolt (Column): ASTM A449 or ASTM A193 B7 according to ASTM F2329 with nuts and washers
   - b. Galvanized (Sleeve): ASTM F668, Alloy 6061-T6 or 6262-T9 with Nuts: ASTM F467 Alloy 6061-T6 or 6262-T9 and Washers: B31.1, A325, Grade 5.6.2
   - c. Galvanized High Strength Hex Head Bolts: ASTM F3125, Grade A325, Type 1
   - d. Galvanized Hex Nut: ASTM A563 Grade O
   - e. Galvanized Washers: ASTM F936
   - f. Galvanized Bolts (Sleeve): ASTM A307 with Galvanized Hex Nuts and Washers

6. **Coatings:**
   - a. Aluminum Fasteners: Anodic coating (max 2000 microns) and chromate sealed
   - b. High Strength Steel Bolts Nuts and Washers: ASTM F3329
   - c. Other steel items (excluding stainless steel) hot-dip galvanize – ASTM A123
   - d. Repair damaged galvanizing in accordance with Specification S2

7. **BREAKAWAY SUPPORT REQUIREMENTS:**
   - Install non-frangible aluminum column (post) (larger than 7½") with breakaway supports as shown on Sheet 4. Signs shielded by barrier wall or guardrail do not require breakaway support.

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**GUIDE TO USE THIS INDEX**

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**FY 2018-19 STANDARD PLANS**

### SINGLE COLUMN GROUND SIGNS

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**NOTES AND EXAMPLE**

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**FAA 2018-19 STANDARD PLANS**

---

**INDEX**

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**SHEET NO. 700-010**

---

**1 of 9**
CALCULATION OF SIGN CLUSTER CENTROID

\[ X_C = \frac{\Sigma (X_i \times A_i)}{\Sigma A_i} \]
\[ Y_C = \frac{\Sigma (Y_i \times A_i)}{\Sigma A_i} \]

- \( X_C \) = Centroid horizontal location of sign or cluster from Aluminum Column (Post)
- \( Y_C \) = Centroid height of sign or cluster from bottom of sign cluster
- \( X_H \) = Individual sign centroid horizontal location from Aluminum Column (Post)
- \( Y_H \) = Individual sign centroid height from bottom of sign cluster

NOTES:
1. For ‘B’ & ‘C’ see Index 700-101 and Roadway Plans.
2. Do not exceed an area of 30 SF or a width of 60 inches for a sign or a sign cluster, including rotated sign panels.
3. Vertical sign spacing (1” shown on Sign Cluster detail) also applies to rotated signs.

CENTROID AND HEIGHT
**ALUMINUM COLUMN (POST) SELECTION TABLE (O.D. in.)**

<table>
<thead>
<tr>
<th>Height (ft)</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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<td>3.5</td>
<td>3.5</td>
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</table>

**COLUMN (POST) AND FOUNDATION TABLE**

<table>
<thead>
<tr>
<th>Column (Post) Scale</th>
<th>Outside Diameter (in)</th>
<th>Wall Thickness (in)</th>
<th>Embedment Depth (ft)</th>
<th>Concrete (Class)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>3.5</td>
<td></td>
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<td>3.5</td>
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<tr>
<td></td>
<td>3.5</td>
<td>6.0</td>
<td>4.5</td>
<td></td>
</tr>
</tbody>
</table>

**INSTALLING FRANGIBLE COLUMN SUPPORTS:**

Columns (posts) 3½" O.D. and less are frangible. Frangible columns may be installed by driving the post or the posts may be set in preformed holes. Backfill preformed holes with suitable material rammed in layers no thicker than 6" to provide adequate compaction or filled with flowable fill or bagged concrete.

**CANTILEVER SIGN**

**NOTE:**

1. For cantilever sign installations see Index 700-101.
2. For cantilever signs with widths greater than 8 see Index 700-011.
3. Use of driven post for cantilever sign is not permitted.
**NOTES:**

1. **Foundation Notes for Frangible Slip Base**
   - A. Place Stub into concrete to diameter and depth shown in POST AND FOUNDATION TABLE using Class I Concrete.

2. **Slip Base Fabrication Notes**
   - A. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 3/8" or less.
   - B. Either a Welded Stub Base or Bolted Stub/Sleeve Base may be used to fabricate the Slip Base.
   - C. For cast base plates bolted to foundation stubs, use a foundation stub the same size as the sign column (Post).

3. **Slip Base Assembly Instructions**
   - A. Assemble Slip Base connections in the following manner:
     - 1. Insert Post into Sleeve and connect using 2 – 1/2" diameter Sleeve Bolts.
     - 2. Slip Base Fabrication Notes:
       - 1. Foundation Notes for Frangible Slip Base:
         - A. Place Stub into concrete to diameter and depth shown in POST AND FOUNDATION TABLE using Class I Concrete.
         - B. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 3/8" or less.

4. **Slip Base Details**
   - A. **WELDED STUB BASE**
     - 1. Insert Post into Sleeve and connect using 2 – 1/2" diameter Sleeve Bolts.
     - 2. Slip Base Fabrication Notes:
       - 1. Foundation Notes for Frangible Slip Base:
         - A. Place Stub into concrete to diameter and depth shown in POST AND FOUNDATION TABLE using Class I Concrete.
         - B. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 3/8" or less.

5. **Slip Base Details**
   - A. **BOLTED STUB/SLEEVE BASE**
     - 1. Insert Post into Sleeve and connect using 2 – 1/2" diameter Sleeve Bolts.
     - 2. Slip Base Fabrication Notes:
       - 1. Foundation Notes for Frangible Slip Base:
         - A. Place Stub into concrete to diameter and depth shown in POST AND FOUNDATION TABLE using Class I Concrete.
         - B. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 3/8" or less.

6. **Slip Base Details**
   - A. **SLIP BASE AND FOUNDATION DETAIL**
     - 1. Insert Post into Sleeve and connect using 2 – 1/2" diameter Sleeve Bolts.
     - 2. Slip Base Fabrication Notes:
       - 1. Foundation Notes for Frangible Slip Base:
         - A. Place Stub into concrete to diameter and depth shown in POST AND FOUNDATION TABLE using Class I Concrete.
         - B. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 3/8" or less.

7. **Slip Base Details**
   - A. **SLIP BASE AND FOUNDATION DETAIL IN CONCRETE**
     - 1. Insert Post into Sleeve and connect using 2 – 1/2" diameter Sleeve Bolts.
     - 2. Slip Base Fabrication Notes:
       - 1. Foundation Notes for Frangible Slip Base:
         - A. Place Stub into concrete to diameter and depth shown in POST AND FOUNDATION TABLE using Class I Concrete.
         - B. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 3/8" or less.
**DETAIL "B"**

Optional Slotted Holes

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**ALUMINUM SOIL PLATE DETAIL**

- Thickness = \( \frac{3}{16} \) in.
- \( 1\frac{1}{8} \) in. \( \times \) 1 ft. 6 in.
- Optional Slotted Hole (See DETAIL "B")

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**ELEVATION**

- 2" Grout Seal
- 1/3 of Embedment Depth
- Concrete Sidewalk, Median, Etc.

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**PLAN**

- Aluminum Column (Post) (Driven to Full Embedment)
- 2" Thick Grout Seal
- Concrete Sidewalk, Median, Etc.

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**DRIVEN POST AND SOIL PLATE DETAIL**

(Frangible Post In Crossovers, Medians & Sidewalks)
WIND BEAM CONNECTION NOTES:
1. $\frac{1}{8}$" Ø Stainless Steel Hex Head Bolts with Flat Washer under Head and Lockwasher under Nut may be used in lieu of $\frac{1}{8}$" Ø Aluminum Button Head Bolts.
2. Use Nylon washers (provided by the sheeting supplier) under the button bolt heads to protect sign sheeting.
3. Slots up to 2" long are allowed in wind beams to accommodate U-Bolts for varying Column (Post) diameters.
4. Wind beams may be oriented in either direction.

BACK-TO-BACK SIGN NOTE:
Use the area and the centroid location of the largest sign to determine aluminum column (post) size.

WIND BEAM PLACEMENT NOTES:
1. Install an additional third wind beam along the $\xi$ for signs with heights greater than 30" and less than 72". For rectangular signs greater than 72" maintain a maximum wind beam spacing of 2'-6", with the additional wind beams spaced evenly between the top and bottom wind beams. For rectangular signs up to 12" in height, use only one wind beam at $\xi$ Sign.
2. Install an additional third wind beam along the $\xi$ for Yield and School signs greater than 36".
3. Install an additional third wind beam along the $\xi$ for Diamond signs 30" or greater.
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<th>Centroid</th>
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<td>10.19 SF</td>
<td>2.26 Ft.</td>
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<td>3.31 SF</td>
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<td>1.71 Ft.</td>
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**SINGLE COLUMN GROUND SIGNS**

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<td>21x15</td>
<td>2.19 SF</td>
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<td>1.75 Ft.</td>
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</table>

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<tbody>
<tr>
<td>30x30</td>
<td>4.76 SF</td>
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<td>1.95 Ft.</td>
</tr>
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</tbody>
</table>
## Single Column Ground Signs

### Description:

#### Standard Plans

**FY 2018-19**

**Index**

**Sheet** 700-010

**Index**

**Sheet** 700-010

#### Size | Area | Total Area | Centroid
--- | --- | --- | ---

| 30x15 | 3.13 SF | | |
| 45x36 | 8.99 SF | | |
| 24x12 | 2.00 SF | | |
| 30x24 | 3.20 SF | | |

| 21x15 | 2.19 SF | | |
| 30x24 | 3.99 SF | | |
| 9.18 SF | | |
| 2.23 Ft. | | |

| 30x15 | 3.13 SF | | |
| 30x24 | 3.99 SF | | |
| 9.31 SF | | |
| 2.50 Ft. | | |

| 30x20 | 4.69 SF | | |
| 6.69 SF | | |
| 1.61 Ft. | | |
| 2.28 Ft. | | |

| 30x30 | 4.69 SF | | |
| 6.69 SF | | |
| 1.61 Ft. | | |
| 2.28 Ft. | | |

| 30x30 | 6.25 SF | | |
| 9.25 SF | | |
| 2.51 Ft. | | |

| X FEET | XXX FEET | | |

| X MILES | XXX MILES | | |

| 24x24 | 4.00 SF | | |

| 36x26 | 6.75 SF | | |
| 10.50 SF | | |
| 2.06 Ft. | | |

| 36x36 | 6.75 SF | | |
| 10.50 SF | | |
| 2.06 Ft. | | |

| 36x36 | 9.00 SF | | |
| 14.06 SF | | |
| 3.06 Ft. | | |

| 30x30 | 6.25 SF | | |
| 9.25 SF | | |
| 2.51 Ft. | | |

| 36x36 | 9.00 SF | | |
| 14.06 SF | | |
| 3.06 Ft. | | |
GENERAL NOTES:
1. Refer to Index 700-010 for additional notes, assembly of base connection and material specifications not given in this Index.
2. Sleeve Bolts: ASTM A-307, 5⁄8" galvanized steel bolt (with lock nuts) or ASTM B-211 Alloy 2024-T4 or 6061-T6.
3. Place galvanized steel shims between the Sleeve and Post to obtain a tight fit between the Post and Sleeve.
4. Wind Beam and Vertical Brace: Aluminum Z 3" x 2½" x 3/38. Install Vertical Brace on 7'-0" to 8'-0" signs only.
5. Provide 2- 0.0149" Thick (28 gauge) and 2- 0.0329" Thick (21 gauge) Brass Shims Per Post. Used brass shims to plumb the post.

COLUMN SELECTION AND FOOTING SIZE TABLE

<table>
<thead>
<tr>
<th>Sign Size</th>
<th>Column Size Diameter x Thickness</th>
<th>Sleeve Size Diameter x Length</th>
<th>U-bolt Diameter</th>
<th>Base Bolt Diameter x Length</th>
<th>Torque lbs.in</th>
<th>Base Plate Thickness</th>
<th>Footing Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; x 9'-0&quot;</td>
<td>4.89&quot; x 0.337&quot; (Schedule 80)</td>
<td>5.56³ x 0.5&quot;</td>
<td>½&quot;</td>
<td>½&quot; x 3½&quot;</td>
<td>270</td>
<td>1&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>4'-0&quot; x 6'-0&quot;</td>
<td>5.56³ x 0.375&quot; (Schedule 80)</td>
<td>6.62³ x 0.43&quot;</td>
<td>¾&quot;</td>
<td>¾&quot; x 4&quot;</td>
<td>443</td>
<td>1½&quot;</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

TYPICAL SECTION

SINGLE COLUMN CANTILEVER GROUND MOUNTED SIGN

SIGN DETAIL

SECTION A-A

SECTION B-B

SECTION C-C
NOTES:

1. Work with index 700-010.
2. Shop Drawings: Not required.

3. Materials:
   a. Steel Pipe: ASTM A36 or ASTM A500 Grade 36
   b. Steel Pipe (Support Post): ASTM A500 Schedule 40
   c. Aluminum Pipe: ASTM B310 Alloy 6063-T6
   d. Galvanized U-Bolts, Nuts and Plate Washers
      a. U-Bolts: ASTM A449
      b. Hex Nuts: ASTM A 567 Lock Nuts
      c. Plate Washer: ASTM A 36 or ASTM A500 Grade 36 or 50
   e. Galvanized anchor bolts, nuts and washers:
      a. Anchor Rod: ASTM F1554 Grade 55 fully threaded for Adhesive Anchors
      b. Anchor Bolt: ASTM F1554 Grade 55 Grade A Hex
      c. Nuts: ASTM A563 Heavy Hex Locking
      d. Washers: ASTM F436
   f. Adhesive Anchor Bonding Material: Specification Section 931 Type HP Adhesive
   g. Weld Material: E309X
   h. Snap-In Post Cap: UV and weather-resistant glass-filled polyester cap

4. Coating:
   a. U-Bolts, Threaded Rods, Nuts and Washers: ASTM F2329
   b. Other Steel: ASTM A123

5. Fabrication:
   a. Weld: Specification Section 460-6.4
   b. Hot dip galvanize after fabrication

6. Construction:
   a. Locate Sign Support a minimum of 5 feet from an open joint or transition (sign stationing may be adjusted to accommodate this requirement)
   b. Base plate must be flush with back of Traffic Railing
   c. Anchors in Traffic Railings:
      a. Install Adhesive Anchors in accordance with Specification section 416 except perform field test on one anchor per sign support location
      b. Use templates and tie anchors as necessary to maintain correct placement of C-I-P Embedded Anchors
      c. Do not drill into existing conduit
   d. Temporary Signs on Permanent Traffic Railings: Same as Permanent except Field testing of anchors is not required

7. Removal of Temporary Signs on Permanent Traffic Railings:
   a. Cut anchor rods flush with the top of the traffic railing
   b. Coat anchors with Type F-1 epoxy to prevent corrosion
      a. Extend coating 2 inches beyond edge of cut anchor rods
      b. Epoxy coating 1/32" thick minimum

8. Payment:
   Include the cost of all materials and labor in the cost of the single post sign assembly.

---

**SIGN LIMITATIONS TABLE**

<table>
<thead>
<tr>
<th>MAX. SIGN AREA (SF)</th>
<th>MAX. SIGN CENTROID HEIGHT (DIM. A + DIM. C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'</td>
<td>9&quot;</td>
</tr>
</tbody>
</table>

Dimension A = Distance from the centerline of the Support Post to the bottom of the sign or sign cluster.

Dimension C = Vertical distance from the bottom of the sign or sign cluster to the centroid of the sign or sign cluster.

---

**SIGN SUPPORT ASSEMBLY**

- **Dimensions**:
  - **Dimension A**: Distance from the centerline of the Support Post to the bottom of the sign or sign cluster.
  - **Dimension C**: Vertical distance from the bottom of the sign or sign cluster to the centroid of the sign or sign cluster.

- **Materials**:
  - **Support Post (5" NPS Schedule 40 Steel Pipe)**
  - **Base Plate End Plate**
  - **Bridge Deck**

---

**REV ISI ON**

10/27/2017

10:19:44 A.M.

**DESCRIPTION**

FY 2018-19

STANDARD PLANS

SINGLE POST BRIDGE MOUNTED SIGN SUPPORT

INDEX 700-012

1 of 3
**NOTES:**

1. **Existing Traffic Railings:**
   
   A. Locate existing conduit prior to drilling and adjust placement of base plate as necessary to avoid damaging existing conduit. Base plate must be flush with back of traffic railing. Maintain a minimum cover 2" from face of traffic railing to tip of Adhesive Anchor.
   
   B. For concrete parapets less than 12" thick, through bolt 1/2" Hex Head Bolts with Nuts and Washers in lieu of Adhesive Bonded Anchors. Bolt heads shall not protrude more than 1/8" beyond traffic face of railing.
   
   C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersink depth and diameter of 2 ½".

2. **New Traffic Railings:**
   
   A. Optional Couplers are shown for slipforming; keep Anchor Bolt coupler threads free of concrete.
   
   B. For concrete parapets less than 10" thick, through bolt Adhesive Anchor. Bolt heads shall not protrude more than 1/8" beyond traffic face of railing. Do not exceed a countersink depth and diameter of 2 ½".

   C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersink depth and diameter of 2 ½".

3. **36° Single-Slope Traffic Railing shown, other Traffic Railings and Parapets are similar.**

4. **Bridge Deck shown, Approach Slab and Retaining Wall are similar.**

**DESCRIPTION:**

**ELEVATION**

**PLAN**

**TYPICAL SECTION - NEW CONSTRUCTION**

**TYPICAL SECTION - EXISTING RAILING**

**TYPICAL SECTION - EXISTING RAILING**

**THROUGH BOLTING**

**ADHESIVE BOND**

**SIGN SUPPORT BRACKET**

**cadrev**
NOTES:
1. Work with Index 700-010.
2. Shop Drawings: Not required.
3. Materials:
   A. Steel Plate: ASTM A36 or ASTM A709 Grade 36
   B. Steel Pipe (Support Post): ASTM A501 Schedule 40
   C. Galvanized U-Bolts, Nuts and Plate Washer
      a. U-Bolts: ASTM A449
      b. Hex Nuts: ASTM A 563 Lock Nuts
      c. Plate Washer: ASTM A 56 or ASTM A709 Grade 36 or 50
   D. Galvanized Anchor Bolts, Nuts and Washers:
      a. Anchor Bolt: ASTM F 1554 Grade 55 Fully Threaded (for Adhesive Anchors)
      b. Anchor Bolt: ASTM F 1554 Grade 50 Grade A Hex
      c. Nuts: ASTM A563 Heavy Hex Locking
      d. Washers: ASTM F436
   E. Adhesive Anchor Bonding Material: Specification 937 Type IV Adhesive
   F. Weld Material: E70XX
   G. Snap-In Post Cap: UV and weather-resistant glass-filled polyester cap
4. Coating:
   A. U-Bolts, Threaded Nuts, Nuts and Washers: ASTM F2329
   B. Other Steel: ASTM A572
5. Fabrication:
   A. Steel, Specification 460-6.4
   B. Hot dip galvanize after fabrication
6. Construction:
   A. Locate Sign Support a minimum of 5 feet from an open joint or transition (sign
      stationing may be adjusted to accommodate this requirement)
   B. Anchor Bolts are to be installed through the top of Railing
   C. Anchors in Traffic Railings:
      a. Install Adhesive Anchors in accordance with Specification 416 except perform field
         test on one anchor per sign support location
      b. Use templates and tie anchors as necessary to maintain correct placement of C-I-P
      c. Do not drill into existing reinforcing
   D. Temporary Signs on Permanent Traffic Railings, Same as Permanent except field
      testing of anchors is not required
   E. Temporary Signs on Temporary Railings/Barriers:
      a. Install Sign Supports at the midpoint along the length of a single segment
      b. Avoid drilling through existing reinforcement; use of metal detector not required.
      c. Field testing of anchors is not required
7. Removal of Temporary Signs on Permanent Traffic Railings:
   A. Cut anchor rods flush with the top of the railing
   B. Coat anchors with Type T-1 epoxy to prevent corrosion
      a. Exceed coating 2 inches beyond edge of cut anchor rods
      b. Epoxy coating 1/16"thick minimum
8. Payment:
   Include the cost of all materials and labor in the cost of the single post sign assembly.

<table>
<thead>
<tr>
<th>TABLE 1 - SIGN PANEL AND POST SIZING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Signs</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Permanent Signs</td>
</tr>
</tbody>
</table>

PARALLEL TO DIRECTION OF TRAFFIC

PERPENDICULAR TO DIRECTION OF TRAFFIC

(Index 521-001 Median Barrier shown; others similar)
NOTES:
1. Place anchor rods in a staggered or linear pattern as necessary to avoid reinforcing.
2. Use a staggered pattern for all temporary barriers.

<table>
<thead>
<tr>
<th>Table 2 - Base Plate Type and Anchor Rod Sizing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Index No.</strong></td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>521-001</td>
</tr>
<tr>
<td>521-001</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>All listed above Plus 102-110 &amp; 102-100</td>
</tr>
</tbody>
</table>

Base Plate Type A
(Linear Anchor Rod Pattern)

Base Plate Type B
(Staggered Anchor Rod Pattern)

Base Plate Type C
(Staggered Anchor Rod Pattern)
GENERAL NOTES:
1. Verify Column lengths in the field prior to fabrication.
2. Shop drawings:
   A. Sign Support Shop drawings are not required when fabricated in accordance with this Index and support columns do not exceed the length shown in the plans by more than 2'-0".
   B. Sign Panels: Horizontal panel splices are allowed at interior wind beams for sign panels with a depth ("D") greater than 10 feet. Shop drawings required for horizontal panel splice details.
   C. When shop drawings are required, obtain approval prior to fabrication.
3. Materials:
   A. Sign Panel Mounting Materials:
      a. Aluminum Bars, and Extruded Shapes: ASTM B221, Alloy 6061-T6 or Alloy 6351-T5
      b. Aluminum Structural Shapes: ASTM B308, Alloy 6061-T6
   B. Sign Support Structure Materials:
      a. Steel Plates and Structural Shapes: ASTM A36 or ASTM A399, Grade 36
      b. Steel Weld Metallic: F450A
      c. Screws: Brass ASTM B68 or Galvanized Steel
   C. Aluminum Bolts, Nuts and Washers:
      a. Flat Head and Button Head Bolts: ASTM F 668, Alloy 2024-T4
      b. Hex Nuts: ASTM F867, 2024-T4
      c. Washers: ASTM B221, Alloy 2024-T4
   D. Stainless Steel Bolts, Nuts and Washers Alloy Group 2, Condition A, may be substituted for the Aluminum bolts as follows:
      a. Bolts: ASTM F593, CW1 or SH1
      b. Nuts: ASTM F594
      c. Washers: ASTM B221, Alloy 6061-T6
   E. High Strength (H.S.) Steel Bolts, Nuts and Washers:
      a. Galvanized Hex Head Bolts: ASTM F3125, Grade A325, Type 1
      b. Galvanized Nuts: ASTM A563 Hex, Grade DH
      c. Galvanized Washers: ASTM F436
   F. Concrete: Class 1
   G. Reinforcing Bars or Welded Wire Reinforcement (WWR) Specification 415
4. Coatings:
   A. Aluminum Fasteners: Anodic coating (0.0002 inches min.) and chromate sealed
   B. Galvanize High Strength Steel Bolts Nuts and Washers: ASTM F3125
   C. Galvanize all other steel items (excluding stainless steel) Hot-dip ASTM A123
   D. Treat damaged galvanizing in accordance with Specification 562
5. Fabrication:
   A. All Base Connections and Stub Column materials are steel unless otherwise specified.
   B. Drill or sub-punch and ream holes in Fuse Plates and Hinge Plates
   C. Weld Base Plate to Post & Stub or if using the Alternate Connection Detail weld Base Plate and Stiffeners to Post and Stub (Sheet 2)
   D. Hot dip galvanize after fabrication. Remove all drips, runs or beads on base plate within washer contact areas (including saw cuts)
6. Construction:
   A. Install the Sign Structure foundation in accordance with Specification 455. Orient Stub Post according to direction of traffic (Sheet 2)
   B. Install all high strength bolts except Base bolts in accordance with Specification 700.
   C. Assemble Post to Stub with Base Bolts and three flat washers per bolt (See Base Connection Details, Sheet 3) Tighten Base Bolts in accordance with Instructions Notes on Sheet 2.
   D. ‘35%L’ is the depth from the lowest edge of the Foundation (See Sheet 3)
1. Power for the sign lighting provided from the roadway lighting circuit.

2. Indicate sign location and a pull box location for connection to the sign lights in the lighting plans.

3. Lighting contractor installs pull box and loop 2' of lighting circuit conductors in the pull box for connection by the signing contractor.

4. Signing contractor furnishes and installs the luminaires, Nema 3R enclosure, 30 amp breaker, conduit, conductors and all other electrical equipment necessary for connection to the lighting circuit.

Roadway Lighting included in contract:

1. Power for the sign lighting provided from the roadway lighting circuit.

2. Indicate sign location and a pull box location for connection to the sign lights in the lighting plans.

3. Lighting contractor installs pull box and loop 2' of lighting circuit conductors in the pull box for connection by the signing contractor.

4. Signing contractor furnishes and installs the luminaires, Nema 3R enclosure, 30 amp breaker, conduit, conductors and all other electrical equipment necessary for connection to the lighting circuit.

Roadway Lighting not included in contract:

1. Signing plans include the pay item numbers to furnish and install conduit, conductors, ground rods, pull boxes and service point equipment.

2. Signing plans indicate the location of the service point equipment and circuit runs.

3. Signing contractor provides all electrical equipment necessary for connection of the sign lights.
NOTES
1. Install hanger pipe to each vertical beam crossed with a 5/8"-bolt, lock washers and hex nuts. Cap both ends of the horizontal pipe.

2. Materials:
   A. Steel Pipe: ASTM A53 (Grade A or B)
   B. Steel Plate: ASTM A36
   C. Hex Nuts: ASTM A563
   D. Bolts: ASTM A325
   E. Washers: ASTM F436


4. All pipe dimensions are NPS.

5. Chart 1.0 to 5.0 (min.)

2.5" U-Bolt With Washers And Double Nuts (2 Bolts Req'd)

6. Washers: ASTM F436

7. Hex Nuts: ASTM A563

8. Bolts: ASTM A325

9. Steel Plate: ASTM A36

10. Steel Pipe: ASTM A53 (Grade A or B)

11. Materials;
NOTES:

1. Work this Index in conjunction with CANTILEVER SIGN STRUCTURE DATA TABLES in the Plans and Index 700-030.
2. Handholes are required at pole base for DNS Structures. Refer to Index 700-090 for Handhole Details.

3. Shop Drawings are required.

   Obtain Shop Drawing approval prior to fabrication. Include the following:
   A. Upright Pipe height ('A') and Foundation elevations. Verify dimension in the field prior to submittal to ensure minimum vertical clearances of the sign panel over the roadway.
   B. Height of the foundation above adjacent ground.
   C. Anchor bolt orientation with respect to centerline of truss and the direction of traffic.
   D. Chord Splices
   E. Handholes at pole base (when required).

4. Materials:

   A. Sign Structure:
      a. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A36, Grade B (min.)
      b. Steel Angles and Structural Plates and Bars: ASTM A709 Grade 36
      c. Weld Material: E70XX
   B. Bolts, Nuts and Washers:
      a. High Strength Bolts: ASTM F3125, Grade A325 Type 1
      b. Nuts: ASTM AS83 Grade DH Heavy-Hex
      c. Washers: ASTM F436 Type 1, one under turned element
   C. Anchor Bolts, Nuts and Washers
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM AS83 Grade 4 Heavy-Hex (1 per bolt)
      c. Plate Washers, ASTM A46 (2 per bolt)
   D. Concrete:
      a. Spread Footing Concrete: Class IV
      b. Drilled Shaft Concrete: Class IV (Drilled Shaft)
   E. Reinforcing Steel: Specification Section 415
   F. Hot Dip Galvanize after fabrication.

5. Fabrication:

   A. Welding: Specification Section 460-6.4
   B. Chord Splices: "SD" Panel from upright is the closest panel in which a chord splice may be used. See Plans for CANTILEVER SIGN STRUCTURE DATA TABLE: Minimum splice spacing is two truss panel lengths apart.
   C. Upright Splices: Not allowed
   D. Structural bolt hole diameters: Bolt diameter plus 1/8".
   E. Anchor bolt hole diameters: Bolt diameter plus 1/4".
   F. Hot Dip Galvanize after fabrication.
   G. Shop assemble the entire structure after galvanizing to validate/document alignment and clearance for bolted connections as well as contact between connecting plates. Take remedial action, if necessary, prior to shipment.
   H. Disassemble, as necessary, and secure components for shipment.

6. Coatings:

   A. Bolts, Nuts and Washers: ASTM F3125
   B. All other steel, including Plate Washers, hot dip galvanize: ASTM A123

7. Construction:

   A. Construct foundation in accordance with Specification Section 455, except payment is included in the cost of the structure.
   B. Prior to erection, record the as-built anchor locations and submit to the Engineer.
   C. Place backfill above spread footings prior to installation of the sign panels. Do not remove or reduce backfill without prior approval of the Engineer.
   D. Tighten nuts and bolts in accordance with Specification Section 700.
   E. High Strength Bolts are not permitted.
   F. Install Aluminum Sign Panels as shown in Production Plans.
   G. Place structural grout pad with drain between top of foundation and bottom of baseplate in accordance with Specification Section 849-1.
CANTILEVER ASSEMBLY

SECTION A-A
(With Gusset Plates And Web Angles Omitted For Clarity)

NOTE:
1. Wrap fillet weld around the stiffener termination on the tube wall.
2. Truss Chord Bolts:
   A. Top and Bottom: Install 'TC' hex head bolts.
   B. Back: Install 'TB' hex head bolts.

UPRIGHT-TRUSS CONNECTION DETAIL
(Web Members From Back Truss Chord Omitted For Clarity)

NOTE:
1. Wrap fillet weld around the stiffener termination on the tube wall.
2. Truss Chord Bolts:
   A. Top and Bottom: Install 'TC' hex head bolts.
   B. Back: Install 'TB' hex head bolts.

CANTILEVER SIGN STRUCTURE

STANDARD PLANS

FY 2018-19

INDEX 700-040

SHEET 3 of 5
CANTILEVER ASSEMBLY

SPlice CONNECTION NOTES:
1. Only 6 bolts are shown in detail for clarity. (One Half Each Side Of Splice)
2. Splices are not permitted for trusses less than or equal to 40', Splice optional for trusses greater than 40'.

TRUSS PLUG DETAIL

UPRIGHT CAP DETAIL
NOTES:
1. Work this Index in conjunction with SPAN SIGN STRUCTURE DATA TABLES in the Plans and Index 700-030.
2. Handholes at the pole base are required for DMS Structures. Refer to Index 700-090 for Handhole Details.

3. Shop Drawings are required.

Obtain Shop Drawing approval prior to fabrication. Include the following:
A. Upright Pipe heights ('C' & 'B') and foundation elevations: Verify with Engineer.
B. Splice detail: Ensure minimum vertical clearances of the sign panel over the roadway.
C. Height of the foundation above adjacent ground.
D. Method to be used to provide the required parabolic camber (see Camber Diagram).
E. Handholes at pole base (when required).

4. Materials:
A. Sign Structure:
   a. Upright and Chords (Steel Pipe): API 5L X42 PSLL, 42 ksi yield or ASTM A500, Grade B (Min).
   b. Steel Angles and Plates: ASTM A36 grade 36
   c. Weld Material: E70XX
B. Bolts, Nuts and Washers:
   a. High Strength Bolts: ASTM F1554 Grade 55, threaded full length
   b. Nuts: ASTM A563 Grade A Heavy-Hex
   c. Washers: ASTM F436, Type 1, one under turned element
C. Anchor Bolts, Nuts and Washers:
   a. Anchor Bolts: ASTM A325, Type 1, one under turned element
   b. Nuts: ASTM A563 Grade A Heavy-Hex
   c. Plate Washers: ASTM A307 (3 per bolt)
D. Concrete: Class IV (Drilled Shaft)
E. Reinforcing Steel: Specification Section 415
F. Hot Dip Galvanize after fabrication.
G. Shop assemble the entire structure after galvanizing to validate/document alignment and clearances for bolted connections.
H. Disassemble as necessary and secure components for shipment.

5. Fabrication:
A. Welding: Specification Section 460-6.4
B. Chord Splices: Minimum splice spacing is three truss panel lengths apart and three truss panel lengths from the uprights.
C. Upright splice: Not allowed
D. Structural bolt hole diameters: Bolt diameter plus 1/2".
E. Anchor bolt hole diameters: Bolt diameter plus 1/2".
F. Hot Dip Galvanize after fabrication.
G. Shop assemble the entire structure after galvanizing to validate/document alignment and clearances for bolted connections as well as contact between connecting plates. Take remedial action, if necessary, prior to shipment.
H. Disassemble as necessary and secure components for shipment.

6. Coatings:
A. Bolts, Nuts and Washers: ASTM F2329
B. All other steel, including Plate Washers, hot dip galvanize: ASTM A123

7. Construction:
A. Construct foundation in accordance with Specification Section 455 Drilled Shaft. Excavation is included in the cost of the structure.
B. Prior to erection, record the as-built anchor locations and submit to the Engineer.
C. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
D. Tighten nuts and bolts in accordance with Specification Section 700.
E. Install Aluminum Sign Panels as shown on the Elevation drawing per Production Plan.
F. After installation, place wire screen between top of foundation and bottom of sign panel in accordance with Specification Section 649-6.

8. Additional:
A. Use Shop Drawings for fabrication. Include all hardware items in the shipment.
B. Obtain Shop Drawing approval prior to fabrication. Include the following:
   a. Upright Pipe heights ('C' & 'B') and foundation elevations: Verify with Engineer.
   b. Splice detail: Ensure minimum vertical clearances of the sign panel over the roadway.
   c. Height of the foundation above adjacent ground.
   d. Method to be used to provide the required parabolic camber (see Camber Diagram).
   e. Handholes at pole base (when required).

CAMBER DIAGRAM
**NOTES:**

1. See Traffic Plans for elevation at top of Foundation.

2. Install Drilled Shaft with a 2'-0" minimum from top elevation of the drill shaft to the finished grade, unless specified otherwise in the plans.

3. The shaft length is based on 2'-0" height from top elevation of the drill shaft to the finished grade.

4. Wrap fillet weld around the stiffener termination on the tube wall (Typ).

---

2'-0" Lap (Min.)

5"

7"

6" Cover

4" Cover

6 Spaces @ 4"

#5 Tie Bars

20" Max.

Spaces @ Remaining

#5 Tie Bars

Double Nut (Typ.)

---

Center Of Drilled Shaft

Foundation Elevation (See Note #1)

2'-0" (Min.)

Drilled Shaft

Foundation

---

DRILLED SHAFT

ELEVATION

Foundation

ELEVATION

Drilled Shaft

---

PLAN

---

> **SPAN SIGN ASSEMBLY**

---

SPAN SIGN STRUCTURE

---

BASE PLATE CONNECTION

---

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SPAN SIGN ASSEMBLY

Upright-Truss Connection

SPAN SIGN STRUCTURE

NOTES:
1. Wrap fillet weld around the stiffner termination on the tube wall.
2. Truss Chord Bolts: "LB" or "RB" Hex Head Bolts 1A or 8B.
3. Right Upright Truss connection shown, Left Upright Truss connection similar.
SPAN SIGN ASSEMBLY

NOTES:
1. Out-of-plane members are not shown for clarity.
2. Back truss chord and attached angles are not shown for clarity.
3. Wrap fillet weld around plate termination on the tube wall.

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<thead>
<tr>
<th>Bolt Diameter (in.)</th>
<th>Distance (in.)</th>
<th>EA</th>
<th>EB</th>
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<td>1/2</td>
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</tr>
</tbody>
</table>

SPAN SIGN STRUCTURE

SECTION B-B (SECTION C-C SIMILAR) (SEE NOTE #1)

Span Length, \( A \), Comprised of \( D \) Equal Panels

The Number of Panels Rounded Down To the Closest Whole Number For An odd Number Of Panels

The Number of Panels For An Even Number Of Panels

FRONT ELEVATION

SIDE ELEVATION

TRUSS

BACK-SIDE SIGN MOUNTING

DETAIL 'D'

DETAIL 'E'

DETAIL 'F'

DETAIL 'G'

DETAIL 'H'

DETAIL 'I'

DETAIL 'J'

DETAIL 'K'

DETAIL 'L'

1/2 \# H-Bolt With Double Nuts And Washers (Typ.)

Provide this Detail for all Back Mounted Signs at Sign Hanger

See Index 700-031 For Sign Luminaire Mounting Details

See Index 700-030

Aluminum Zee Sign Hanger

See Detail 'K'

Plate Is Skewed To Plane Of View

See Note #1

See Note #2

See Note #3
Mast Arm Assembly

Span Wire Assembly

Notes:
1. Free-swinging, internally-illuminated street signs shall only be installed on the signal pole for span wire assemblies. For mast arm assemblies the street sign may be installed on the arm or pole.

2. Free-swinging, internally-illuminated street signs shall meet the requirements of Section 700 of the Standard Specifications for Road and Bridge Construction.

3. Pole attachments and cantilever arm (or truss) assemblies may be accepted by Contractor certification provided the signs being supported meet the weight and area limitations included in Section 700 for Acceptance by Certification.

4. Pole attachments and cantilever arm (or truss) assemblies supporting signs not meeting the weight or area limitations included in Section 700 for Acceptance by Certification require the submission of structural calculations and Shop Drawings that have been prepared by and sealed by the Specialty Engineer.
GENERAL NOTES:
1. Work this Index with Specification 700.
2. Furnish and install the Dynamic Message Sign (DMS) sign structure in accordance with Index 700-040 or 700-041. Locate foundations at locations shown in the Plans.
3. Shop Drawings are required:
   A. Include the DMS geometry.
   B. Catwalk design in accordance with AISC, AASHTO, and OSHA requirements as applicable.
   C. Do not start fabrication until the shop drawings are approved.
4. Extend Catwalk from DMS to outer edge of paved shoulder and not less than 4 feet in length.
5. If required, install guardrail at location shown in the Plans and in accordance with index 536-002.
6. Materials:
   A. Sign Mounting Components:
      a. Aluminum Structural Shapes: ASTM B308, Alloy 6061-T6
      b. Vertical Hangers: ASTM A404, Grade 46
      c. U-Bolts: ASTM A449 or A193 B7
      d. Steel Bolts, Nuts, and Washers:
         1. High Strength Bolts: ASTM F3125, Grade A325, Type 1
         2. Nuts: ASTM F563
         3. Washers: ASTM F463 (Flat Washer)
   B. Coatings:
      a. All nuts, bolts and washers ASTM F2329
      b. All other steel items ASTM A123
      c. Bolt Hole Diameters: Bolt plus 0.5" before galvanizing

7. Installation:
   A. See project requirements for location of DMS Cabinet.
   B. Field Adjust pole-mounded DMS cabinet height to achieve best access for maintenance personnel given site condition as directed by the Engineer. Avoid conflicts with stiffeners, handholes and maintenance of other poles.
   C. Locate the sign horizontal on the structure as shown in the Plans. Vertically center the sign enclosure with the centerline of the truss.
   D. Before erection, field drill the bolt holes in the vertical hangers and horizontal mounting member attached to the sign enclosure. Field locate holes to allow vertical hanger placement as shown on the Plans with no conflicts with posts or splice plates.
   E. Locate threaded couplings on sign side of upright above the sign trunk.
   F. Connect grounding conductors to the steel framework that has been cleaned to base metal by use of bonding plates having contact area of not less than 8 square inches or by welding or brazing. Drilling and tapping the steel structure to accept a threaded connector is also an acceptable method.
   G. If steel framework is to be drilled and tapped to accept a threaded connector, the threaded connector shall be galvanized and have at least 3 threads fully engaged and secured with a jam nut to the steel framework.
   H. Bends in the conduit must be greater than the minimum bending radius for the cable contained in the conduit.
   I. Completely encase all data, fiber optic and power cables for the DMS within the sign structure or in conduit.
   J. Transition conduits to foundation to indicate conduit locations.
   K. Transition conduit in foundation to indicate underground conduit with appropriate reducer outside the limits of the foundation.

AIR TERMINAL (Typ.)
(See Sheet 3)

CANTILEVER ISOMETRIC VIEW

CANTILEVER SIGN STRUCTURE
(See Note 5)

GUARDRAIL (See Note 5)

DYNAMIC MESSAGE SIGN WALK-IN

SPAN ISOMETRIC VIEW

DYNAMIC MESSAGE SIGN ASSEMBLY
NOTE: Actual number and direction of travel lanes varies.
**GROUND MOUNTED CABINET**

- Air Terminal
- Dynamic Message Sign (DMS) (See DETAIL "A")
- Ground Rod B
- Ground Rod A
- Primary Ground Rod Assembly (See DETAIL "D")
- Fiber Optic Pull Box (See DETAIL "B")
- Concrete Slab
- 2'-0" Max.
- 3'-0" Max.
- 40'-0" (Typ.)
- 12" Min.
- To Ground Rod C As Required
- To Ground Rod D As Required
- Ground Rod B As Required
- Fiber Optic Communications Conduits (2" PVC)
- Power Conduit (2" PVC)
- Transition Conduit Outside Of Foundation (Typ.)
- Foundation (Typ.)
- Outside Of Transition Conduit
- (AS Shown On Plans)
- Fiber Optic Pull Box (See DETAIL "B")

**POLE MOUNTED CABINET**

- Air Terminal (Typ.)
- Dynamic Message Sign (DMS)
- Sign Structure
- Span Or Cantilever
- Sign Structure
- Span Or Cantilever
- Sign Structure
- 2" PVC Conduit with #3 AWG Tin-Plated Bare Solid Copper Ground Wire Bonded to DMS structure and Ground Rod With Exothermic Weld
- Handhole (See DETAIL "E")
- 2" PVC Conduit with #2 AWG Tin-Plated Bare Solid Copper Ground Wire
- No More Than 10" Below Cabinet
- Ground To The DMS Structure,
- Surface Mount The Cabinet
- Conduit Entrance Location
- Per DMS Manufacturer
- Dynamic Message Sign (DMS) (See DETAIL "A")
- Ground Rod C
- Ground Rod D
- Foundation (Typ.)
- Outside Of Transition Conduit
- (AS Shown On Plans)
- Fiber Optic Communications Conduits (2" PVC)
- Power Conduit (2" PVC)
- Pole Mounted Cabinet
- Ground Rod B
- Primary Ground Rod Assembly (See DETAIL "C")
- Ground Rod A
- Foundation (Typ.)
- 12" Min.
- 3'-0" Max.
- 40'-0" (Typ.)

**DETAIL "A"**

- Air Terminal
- Dynamic Message Sign (DMS)
- Door Latch/handle
- Handrail
- Post
- Grating
- Catwalk
- Fiber Optic Pull Box (See DETAIL "B")

**DYNAMIC MESSAGE SIGN GROUNDING AND CONDUIT DETAIL**

**GROUND MOUNTED CABINET**

- Air Terminal
- Dynamic Message Sign (DMS)
- Sign Structure
- Span Or Cantilever
- Sign Structure
- Span Or Cantilever
- Sign Structure
- 2" PVC Conduit with #3 AWG Tin-Plated Bare Solid Copper Ground Wire Bonded to DMS structure and Ground Rod With Exothermic Weld
- Handhole (See DETAIL "E")
- 2" PVC Conduit with #2 AWG Tin-Plated Bare Solid Copper Ground Wire
- No More Than 10" Below Cabinet
- Ground To The DMS Structure,
- Surface Mount The Cabinet
- Conduit Entrance Location
- Per DMS Manufacturer
- Dynamic Message Sign (DMS) (See DETAIL "A")
- Ground Rod C
- Ground Rod D
- Foundation (Typ.)
- Outside Of Transition Conduit
- (AS Shown On Plans)
- Fiber Optic Communications Conduits (2" PVC)
- Power Conduit (2" PVC)
- Pole Mounted Cabinet
- Ground Rod B
- Primary Ground Rod Assembly (See DETAIL "C")
- Ground Rod A
- Foundation (Typ.)
- 12" Min.
- 3'-0" Max.
- 40'-0" (Typ.)

**POLE MOUNTED CABINET**

- Air Terminal (Typ.)
- Dynamic Message Sign (DMS)
- Sign Structure
- Span Or Cantilever
- Sign Structure
- Span Or Cantilever
- Sign Structure
- 2" PVC Conduit with #3 AWG Tin-Plated Bare Solid Copper Ground Wire Bonded to DMS structure and Ground Rod With Exothermic Weld
- Handhole (See DETAIL "E")
- 2" PVC Conduit with #2 AWG Tin-Plated Bare Solid Copper Ground Wire
- No More Than 10" Below Cabinet
- Ground To The DMS Structure,
- Surface Mount The Cabinet
- Conduit Entrance Location
- Per DMS Manufacturer
- Dynamic Message Sign (DMS) (See DETAIL "A")
- Ground Rod C
- Ground Rod D
- Foundation (Typ.)
- Outside Of Transition Conduit
- (AS Shown On Plans)
- Fiber Optic Communications Conduits (2" PVC)
- Power Conduit (2" PVC)
- Pole Mounted Cabinet
- Ground Rod B
- Primary Ground Rod Assembly (See DETAIL "C")
- Ground Rod A
- Foundation (Typ.)
- 12" Min.
- 3'-0" Max.
- 40'-0" (Typ.)
DESCRIPTION:

REVISION:

LAST

REVISION

35x51

10/27/2017

10:20:03 AM

11/01/17

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STANDARD PLANS

DYNAMIC MESSAGE SIGN WALK-IN

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REVIEW

01/01/17

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11/01/17

10/27/2017

10:20:03 AM

Finished Grade

2" Min. - 8" Max.

Pull Box

Grounding Conduit

Ground Rod

(Pole Mounted Cabinet Configuration Shown)

DETAIL "B"

#2 AWG Tin-Plated Bare Solid Copper Wire To Ground Mounted Cabinet

Exothermic Weld (Typ.)

Primary Ground Rod

#2 AWG Tin-Plated Bare Solid Copper Wire Continues To The Base Of The DMS Structure

#2 AWG Tin-Plated Bare Solid Copper Wire To Ground Rods B, C And D As Required (Connections May Be Combined)

DETAIL "C"

20 Radius Each "Sphere Of Influence"

Ground Rod C

Primary Ground Rod A

Ground Rod B

#2 AWG (Typical)

Ground Rod D

Sign Structure Foundation

TYPICAL (20 Rods, 40 Spacing)

GROUND ROD ARRAY DETAIL

DETAIL "D"

SECTION A-A

DETAIL "E"

Pole

Partial Penetration Weld (Typ.)

Tack Weld

Cover Clip

Handhold Frame

11 Gage Stainless Steel Hex Head Screw (Typ.)

(Thru Handhole)

COVER

FRAME

11 Gage Manhole Cover

Handhold Frame

1/4" Stainless Steel Hex Head Screw (Typ.)
Zee Beam Aluminum Zee 4½x3½x3.37 (Typ.)
Horizontal Member Attached To The Internal Framework And Included With The DMS Sign

Vertical Hanger Galvanized W6x6 (Typ.)
Hanger @ 5' (Max.) Spacing

2-½" Ø U-Bolts With Double Nuts and Washers

Provide 2-½" Ø Bolts
Field Drill Holes And

Top Truss Chord

2-½" Ø U-Bolts
Back Face Of DMS Sign Enclosure
Horizontal Member Attached To The Internal Framework And Included With The DMS Sign

Bottom Truss Chord

SECTION B-B

SECTION C-C

SECTION D-D

DYNAMIC MESSAGE SIGN END VIEW

DYNAMIC MESSAGE SIGN WALK-IN
**GENERAL NOTES:**

1. Single-Column Signs shown, Multi-Column Signs similar.
   These typical sections serve as a guide for locating the traffic signs required under various roadside conditions. For size and details of sign construction and footing, refer to the appropriate Index and Plans.
2. Verify the length of sign supports in the Field prior to fabrication.
3. Install ground signs at an angle of 1 to 4 degrees away from the traffic flow (use illustrations). Install shoulder mounted signs rotated counterclockwise and median mounted signs rotated clockwise. Install signs on a curve as noted above from the perpendicular to the motorist line of sight.

4. The setback for Stop and Yield signs may be reduced to 3 minimum from the edge of traveled way if required for visibility in business or residential sections with no curb and speeds of 30 MPH or less.

5. The mounting heights are measured from the bottom of the sign panel to a horizontal line extended from the edge of traveled way or from the ground surface at the back of curb. If the standard heights cannot be met, the minimum heights are as follows:

   - 7' - Expressway & Freeway Systems Other Roadway Systems
   - 6' - Urban (including residential with parking and/or pedestrian activity)

6. Do not install sign supports in the bottom of ditches.

7. Install sign supports so they do not reduce the accessible width of sidewalks or shared use paths to less than 4’ min. clear width.

---

**CASE I**

Use On Mainline Freeways And Express Way Systems

**CASE II**

Use In All Rural, Freeways And Expressway Ramps

**CASE III**

Use On All Roads With Signs Mounted Behind Sidewalk

**CASE IV**

Use On All Rural, Freeway And Express Systems

**CASE V**

Use In Business Or Residential Areas Only

**CASE VI**

Use On All Roadway With Signs Behind Guardrail

**CASE VII**

REST AREA AND EXIT GORE SIGNS
Use On All Rural, Freeway And Express Systems

**CASE VIII**

Use On Island Or Curbed Median

**CASE IX**

MILE POST MARKER
Use In All Interstate Rural Roads, Freeways And Expressway Systems

**CASE X**

WRONG WAY SIGNS
Use On Interstate Exit Ramps

For more information refer to Section 2H of the MUTCD.

NOTE:

- For separators <6'-0", center the sign within the separator, center sign column on island

For size and details of sign construction and footing, refer to the appropriate Index and Plans.

For more information refer to Section 2H of the MUTCD.

NOTE:

- If median width does not allow standard offset from both roadway, center sign in median.
1. Stroke width of State Outline shall be 1".
2. 24" x 24" panel shall only be used for a 3 digit route when the panel is to be used on a sign cluster with other 24" x 24" panels.
3. 190' Radii
4. When two or more County Route Markers are mounted together, use the dimensions of the largest marker for all other markers.

2. Color: Yellow Legend and Border on Blue Background.
3. When used on a guide sign, marker must be overlaid on a rectangular Yellow Background as shown in chart.
4. When two or more County Route Markers are mounted together, use the dimensions of the largest marker for all other markers.

GUIDE SIGN USE

FTP-17-06 - FLORIDA ROUTE MARKER

FTP-18-06 - COUNTY ROUTE MARKER (M1-6)
**DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2018-19 SHEET INDEX**

**SPECIAL SIGN DETAILS**

- **FTP-38-06**: Black Legend and Border
  - White Background
  - 4" Series D Legend
  - White Legend and Border

- **FTP-39-06**: Black Legend and Border
  - White Background
  - 4" Series D Legend
  - White Legend and Border

- **FTP-40-06**: Black Legend and Border
  - White Background
  - 3" Series C Legend

- **FTP-41-06**: Black Legend and Border
  - White Background
  - 2" Series C Legend

- **FTP-42-06**: Black Legend and Border
  - White Background
  - 2" Series C Legend

- **FTP-43-06**: Black Legend and Border
  - White Background
  - 3" Series D Legend

- **FTP-44-06**: Black Legend and Border
  - White Background
  - 4" Series C Legend

- **FTP-45-06**: Black Legend and Border
  - White Background
  - 4" Series D Legend

- **FTP-46-06**: Black Legend and Border
  - White Background
  - Green Florida Symbol

- **FTP-47-06**: Black Legend and Border
  - White Background
  - Green Florida Symbol

- **FTP-48-06**: Black Legend, Border and Man Belt Symbol
  - Green Background
  - White Legend and Symbol

- **FTP-49-06**: Black Legend, Border and Man Belt Symbol
  - Green Background
  - Municipality Name Optional

**INDEX SHEET**

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**NOTES:**

1. Signs must comply with Rule 14-51, Florida Administrative Code.
2. Use 6" Type C lettering.
4. See Index 700-020 for Multi-Column Ground Sign for foundation and connection details.
5. See Index 102-600, Work Zone Sign Supports, for Temporary 3-Post Sign Support assembly and foundation details. Galvanize Steel U-Channel in accordance with ASTM 123.

---

**DESIGN FOR TOURIST ORIENTED DIRECTIONAL SIGNS**

<table>
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<tr>
<th>Options for Aluminum Round Tube, Steel I Beam and Steel U-Channel</th>
<th>Total Area (SF)</th>
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</tr>
</tbody>
</table>

* Limited to 22 SF Total Sign Area.
**Note:**
Two assemblies are required; one for each side of the ramp, showing those services in each particular direction from the ramp terminal.

Ramp mounted signs shall be installed to avoid conflict with existing signs and in no case should they be placed within 100' of another sign.

GENERAL NOTES

1. Only those services meeting criteria established by the Department and approved by the State Traffic Operations Engineer for each interchange shall be shown. Symbol signs for motorist services shall always appear in the following order reading from left to right and top to bottom: Gas, Food, Lodging, Phone *, Hospital, Camping.

2. Symbols shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

3. All motorist service signs to have White Legend and Border with Blue Background.

4. For mounting details see Index 700-020 for Type "A" breakaway or Index 700-010 for Type "C" Frangibility.

**Note:**
* The phone symbol shall not be shown whenever any Gas, Food, Lodging or Camping symbol appears.

**Note:**
They may be used for an exit. The symbol signs shall be suspended from the guide sign panel or existing wind beams. Symbol signs are not to be connected to existing sign posts.

The mounting height of the guide sign shall be increased, where necessary, to provide 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

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4. For mounting details see Index 700-020 for Type "A" breakaway or Index 700-010 for Type "C" Frangibility.

**GENERAL NOTES**

1. Only those services meeting criteria established by the Department and approved by the State Traffic Operations Engineer for each interchange shall be shown. Symbol signs for motorist services shall always appear in the following order reading from left to right and top to bottom: Gas, Food, Lodging, Phone *, Hospital, Camping.

2. Symbols shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

3. All motorist service signs to have White Legend and Border with Blue Background.

4. For mounting details see Index 700-020 for Type "A" breakaway or Index 700-010 for Type "C" Frangibility.

**GENERAL NOTES**

1. Only those services meeting criteria established by the Department and approved by the State Traffic Operations Engineer for each interchange shall be shown. Symbol signs for motorist services shall always appear in the following order reading from left to right and top to bottom: Gas, Food, Lodging, Phone *, Hospital, Camping.

2. Symbols shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

3. All motorist service signs to have White Legend and Border with Blue Background.

4. For mounting details see Index 700-020 for Type "A" breakaway or Index 700-010 for Type "C" Frangibility.

**GENERAL NOTES**

1. Only those services meeting criteria established by the Department and approved by the State Traffic Operations Engineer for each interchange shall be shown. Symbol signs for motorist services shall always appear in the following order reading from left to right and top to bottom: Gas, Food, Lodging, Phone *, Hospital, Camping.

2. Symbols shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

3. All motorist service signs to have White Legend and Border with Blue Background.

4. For mounting details see Index 700-020 for Type "A" breakaway or Index 700-010 for Type "C" Frangibility.
WELCOME CENTER SIGNING

FOR LIMITED ACCESS HIGHWAYS

Notes:
1. Sign FTP-10-06 shall be located on the Welcome Center grounds in proximity to the building and as far from the main line roadway as possible (2 signs back to back).
2. Sign FTP-12-06 shall be located on the Welcome Center grounds in proximity to the building and as far from the main line roadway as possible (2 signs back to back).
3. Sign FTP-10-06, 11-06, 12-06 shall be located as limited access highways only.
4. All legend to be Series E.
5. See Index 700-102 for sign details.

1. All legend to be Series E.
2. See Index 700-102 for sign details.

Note: Roadway not drawn to scale
Distances shown are adequate for driver communication but may be altered slightly if conditions require.

Note: Sign FTP-14-06 shall be used as a supplemental guide sign at interchanges which have a Tourist Information Center approved for such signing (locate half-way between normal guide signs).
STATE OF FLORIDA
WELCOME CENTER
1 MILE

STATE OF FLORIDA
OFFICIAL
WELCOME CENTER

SIGN NO. FTP-15A-06
SIGN NO. FTP-12-06
SIGN NO. FTP-15B-06
SIGN NO. FTP-15C-06

1/2 MILE

FOR PRIMARY HIGHWAYS

Notes:
1. Signs and sign structures shall be erected in accordance with the details shown on Index 700-020.
2. Sign FTP-12-06 shall be located on the Welcome Center grounds in proximity to the building and as far from the Main Line Roadway as possible (2 signs back to back).
3. All legend to be Series E.
4. One sign FTP-15A-06 or FTP-06 should be used depending on speed, roadside development & geometric conditions.

FTP-15A-06
FTP-15B-06
FTP-15C-06
FTP-12-06

2,240'
2,240'

50' Minimum For Rural Conditions
800' Maximum For Rural Conditions

FTP-12-06
One-Way Traffic

2-Way Traffic
NOTES:
1. Roadways with Two-Way Traffic:
   No passing zone should be extended 1570' in advance of narrow bridge.
2. If the bridge or the approach is on a curve, delineators shall be installed for a distance of 1570' in advance of narrow bridge on the outside portion of the roadway. Spacing shall be 100' between delineators.
3. Delineators are to be placed not less than 2' or not more than 8' outside the outer edge of pavement.
4. Object markers on both sides of roadway shall face traffic approaching bridge.
5. The OM-3R & OM-3L object markers shall be installed 4' above the roadway edge. The panels may be post mounted at the bridges.
SIGN LOCATIONS TYPICAL

2. Location of Sign No. 3 may require some field adjustment.
3. The Cross Road is the last detour to route around the restricted bridge.
4. Location of Sign No. 2 should be established from the Cross Road for the following approximate distances: Interstate=1 Mile Non-Interstate=1/2 Mile.
5. See Index 700-102 for sign details.
WEIGH STATION SIGNING

4 - LANE DIVIDED INSTALLATION

2 - LANE INSTALLATION

MEDIAN INSTALLATION

WEIGHT STATION SIGNING

FY 2018-19
STANDARD PLANS

TYPICAL SIGNING FOR TRUCK WEIGH AND INSPECTION STATIONS

INDEX
700-108
 sheet
1 of 2
CASE I Type I Object Markers shall consist of nine yellow reflectors mounted on a yellow reflective background or consist of a retroreflective panel of the same size.

CASE II End of Road Markers shall consist of nine red reflectors mounted on a red reflective background or consist of a retroreflective panel of the same size.

NOTES:
1. This index applicable to residential and minor streets only. Major streets to be evaluated on a case by case basis.
2. "T"-Intersection-Two-Way arrows and reflectors are optional. The need should be based on a review of each location.
3. For additional details on aluminum round post, sign panel material and bolts, nuts and washers see Index 700-010.
4. Case I Installation - The arrow panels and object markers shall be located approximately 20', but not less than 12' from the edge of the travel lane.
5. Dead end sign shall be posted a sufficient advance distance to permit the vehicle operator to avoid the dead end by turning off, if possible, at the nearest intersecting street.
6. For pavement marking see Index 711-001.
7. No guardrail is required unless special field conditions require its use.

**DESCRIPTION:**

**FY 2018-19 STANDARD PLANS**

**TRAFFIC CONTROLS FOR STREET TERMINATIONS**

**INDEX**

**SHEET**
Mounting of Exit Numbering Panels To Highway Signs

ELEVATION

GENERAL NOTES

MATERIALS:
All aluminum materials shall meet the requirements of the Aluminum Association Alloy 6061-T6 and also the following ASTM specifications for the following: Sheets and plates B209, extruded shapes B221 and standard structural shapes B209.

ALUMINUM BOLTS, NUTS & LOCK WASHERS:
Aluminum bolts shall meet the requirements of the Aluminum Association Alloy 2024-T4 (ASTM F468). The bolts shall have an anodic coating of at least .0002" thick and be chromate sealed. Lockwashers shall meet the requirement of Aluminum Association Alloy 7075-T6 (ASTM B221). Nuts shall meet the requirement of Aluminum Association Alloy 6061-T6 (ASTM F467) or 6061-T6.

SIGN FACE:
All sign face corners shall be rounded. See sign layout sheet for dimension "L" and sign face details. For mounting details refer to Index 700-030.
GENERAL NOTES:

1. Use aluminum materials that meets the requirements of Aluminum Association Alloy 6061-T6 (ASTM B209, B221, B308 or B429), except as noted in the Plans.

2. Install sign panel, wind beam and columns in accordance with Index 700-010 and Specifications 700.

3. Install sign column so that the height and offset are in accordance with Index 700-011.

4. When aluminum column (post) are installed with a frangible transformer bases, engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

5. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.

6. Install a concrete slab around all flashing beacon assemblies on slopes 6:1 or greater. The minimum slab dimension is 4'-0" by 5'-0".

7. Install a concrete slab around all pull boxes. The minimum slab dimension is 4'-0" by 4'-0". In urban areas where space is limited slab dimensions may be adjusted as shown in the Plans.

8. For beacon assemblies connected to conventional power, provide single pole non-fused watertight breakaway electrical connectors in the frangible transformer base.

9. Install the connection of controller cabinet and solar panel to the column in accordance with manufacturer's recommendations.

10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.

11. Orient solar panel to face South for optimal exposure to sunlight.
**CONVENTIONAL POWERED WARNING SIGN DETAILS**

- **Front View**
  - 12" Yellow Flashing Beacon
  - Beacon Controller
  - Sign Panel (48" x 48")
  - Pull Box
  - Transformer Base and Foundation (See DETAIL 'A')

- **Side View**
  - 12" Yellow Flashing Beacon
  - Beacon Controller
  - 3'-0"
  - Ground Wire #6 TW Green
  - #6 TW Green Ground Wire
  - Anchor Bolt "X 18" 4
  - 12" Bed of Pearock or Crushed Stone For Drainage.
  - U.L. Approved Ground Rod 1/2 Diameter 20' Long Copper Clad with Approved Ground Connection (At all Pull Boxes)
  - Concrete Apron (Typ.)
  - Finished Grade
  - Pull Box
  - Circuit Conductors In Schedule 40 PVC Conduit. Circuit Conductors and Conduit Size as Shown in Plans. (Typical)

- **POLE WIRING AND FOOTING DETAIL**

**DESCRIPTION:**

CONVENTIONAL POWERED WARNING SIGN DETAILS

**REVISION:**

**LAST:**

**REVIEW:**

**FY 2018-19**

**STANDARD PLANS**

**INDEX:** 700-120

**SHEET:** 2 of 9

---

2/14/2020 9:35:44 A.M.
TABLE 1

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<th>Column Size</th>
<th>Footing Depth</th>
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<td>4.5&quot;</td>
<td>4'</td>
</tr>
<tr>
<td>8.5'</td>
<td>5&quot;</td>
<td>4.5'</td>
</tr>
</tbody>
</table>

NOTES:
1. Install the sign column slip base in accordance with Index 700-010.
2. Use beacon and beacon controllers that are listed on the Approved Products List (APL).
3. Details show a typical warning sign with two flashing beacon heads. When only one beacon is required, install upper beacon.

SOLAR POWERED WARNING SIGN DETAILS
NOTES:
1. Install a separate pole for mounting the solar panel, controller and batteries for all flashing beacon assemblies with solar panels, controllers and batteries weighing more than 170 lbs.
2. Install the auxiliary pole as close to the right of way as possible.
3. Install the auxiliary pole so that the height is the same as the column for the beacon assembly.
4. Payment for the separate pole, foundation, conduit and wiring are included in the cost of the electronic warning sign with flashing beacon.

DESCRIPTION:
- **Pull Box**
- **12" Yellow Flashing Beacon**
- **Sign Panel (48" x 48")**
- **Nominal 4" (Sch. 40) Aluminum**

**Batteries**
- **Control Unit and Controller**, **Solar Cabinet For Beacon**

**Solar Panel**
- **5'-0"**
- **Aluminum (Sch. 40)**

**Transformer Base and Foundation**
- (See Note #6, Sheet 1)

**Concrete Slab**
- (See Note #6, Sheet 1)

**Finished Grade**

**POLE AND CONCRETE SLAB DETAIL FOR POLES ON SLOPES**

**SOLAR POWERED BEACON WITH AUXILIARY POLE AND CONCRETE SLAB DETAIL**
NOTES:
1. A transformer base is required for both conventional powered and solar powered applications. (Conventional Power Shown)
2. Use Rectangular Rapid Flashing Beacon (RRFB) equipment and hardware that are listed on the Approved Products List (APL).
3. Install the RRFB in pairs, one on either side of approach traffic.
4. Install controller on the backside of post from approach traffic.
5. Install a 30" X 30" W11-2 sign on single lane facilities and a 36" X 36" W11-2 sign for multi-lane facilities.
6. Install push button and R10-25 sign in accordance with Index 663-001.

Solar Battery Compartment
(FT Installed) and Controller

Back to Back Signs Shown for Clarity of Installation.
Refer to Plans for Where Back to Back is Required.

Transformer Base and Foundation
(See Sheet 2 For Details)

Approach Traffic
NOTES:
1. A transformer base is required for both conventional powered and solar powered applications. (Conventional Power Shown)
2. Use beacons and beacon controllers that are on the Approved Products List (APL).
NOTES:

1. A transformer base is required for both conventional powered and solar powered applications. (Conventional Power Shown)

2. Use speed feedback display, beacons, beacon controllers and installation hardware that are on the Approved Products List (APL).

3. For posted speeds less than 45 mph, install a speed feedback display with numeral heights of 15" and for posted speeds 45 mph or greater, install a speed feedback display with numeral heights of 18".

4. Only speed display units weighing 62 lbs. or less may be mounted with a 5'-0' clearance. Mount speed display units that weigh more than 62 lbs. with a 7'-0" clearance.

5. The beacon controller and solar batteries may be in the same compartment.
NOTES:

1. A transformer base is required for both conventional powered and solar powered applications. (Conventional Power Shown)

2. Use speed feedback display, beacon controllers and installation hardware that are on the Approved Products List (APL).

3. For posted speeds less than 45 mph, install a speed feedback display with numeral heights of 15" and for posted speeds 45 mph or greater, install a speed feedback display with numeral heights of 18".

4. Only speed display units weighing 62 lbs. or less may be mounted with a 5'-0" clearance. Mount speed display units that weigh more than 62 lbs. with a 7'-0" clearance.

5. The beacon controller and solar batteries may be in the same compartment.
GENERAL NOTES:
1. Offset all RPMs 1" from solid longitudinal lines unless otherwise noted or shown.
2. Spacing may be reduced for sharp curves if required.
3. For placement of RPMs on ramps, see Index 711-003.
4. Make the traffic face of the RPM the same color as the pavement marking that it is supplementing.

LEGEND:
B/C = BACK OF CURB
EOP = EDGE OF PAVEMENT
RPM = RAISED PAVEMENT MARKER
W/R = WHITE/RED RPM
Y/Y = YELLOW/YELLOW RPM
W/Y = WHITE/YELLOW RPM
MD/Y = MULTI-DIRECTIONAL YELLOW RPM
RPM PLACEMENT AT INTERSECTIONS

RPM PLACEMENT AT TRAFFIC CHANNELIZATION AT GORE
(Traffic Flows In Same Direction)

RPM PLACEMENT AT TRAFFIC SEPARATION
(Traffic Flows In Opposite Direction)

NOTE:
1. Center the Raised Pavement Markers between chevrons and crosshatching.

LEGEND:
B/C = BACK OF CURB
EDP = EDGE OF PAVEMENT
RPM = RAISED PAVEMENT MARKER
W/R = WHITE/RED RPM
Y/Y = YELLOW/YELLOW RPM
Y/R = YELLOW/RED RPM
MD/Y = MONO-DIRECTIONAL YELLOW RPM

NOTE:
Right side of the roadway shown. For the left side of roadway, the pavement marking is yellow and oriented opposite hand.
NOTES:
1. For Type "C" Curb, install RPMs along the pavement edge marking using the same spacing shown.
2. Orient traffic faces of RPMs in curb median radii to be parallel to direction of travel lanes.
RPM PLACEMENT AT ISLANDS
(When called for in the Plans)

NOTES:
1. For Type "E" Curb install RPMs along the pavement edge marking using the same spacing shown.
2. Orient traffic faces of RPMs in medium radii to be parallel to direction of travel lanes.

<table>
<thead>
<tr>
<th>POSTED SPEED LIMIT</th>
<th>RPM</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 OR LESS</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>50 OR MORE</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

RPM PLACEMENT AT TRAFFIC SEPARATORS
(When called for in the Plans)

LEGEND:
B/C = BACK OF CURB
BOP = EDGE OF PAVEMENT
RPM = RAISED PAVEMENT MARKER
W/R = WHITE/RED RPM
Y/Y = YELLOW/YELLOW RPM
Y/R = YELLOW/RED RPM
MD/Y = MONO-DIRECTIONAL YELLOW RPM

For Illustrative Purpose Only
NOTES:
1. When an arrow and a pavement message are used together, locate the arrow 25' downstream from the pavement message. Measure the distance from the base of the arrow to the base of the pavement message.
2. Place stop message 29' back from the stop line.
3. Dimensions are within 1" ±.
4. All grids are 6" x 6".

11 S.F. 20 S.F. 20 S.F. 23 S.F. 22 S.F. 20 S.F. 43 S.F.

PAVEMENT MESSAGE AND ARROW DETAILS

PAVEMENT MARKINGS
### PAVEMENT MARKING LINES

- **Solid Edge Line or Lane Line**
- **Solid Channelizing Line**
- **Two-Lane Passing Prohibited Lines**
- **Double Solid Lines**
- **12" Solid Pedestrian Crosswalk Line**
- **24" Solid Stop Line**
- **2'-4' Dotted Guide Line**
- **Solid Channelizing Line**
- **6'-10' Dotted Extension Line**
- **3'-9' Dotted Interchange Line**
- **3'-9' Dotted Lane Drop Line**
- **10'-30' Skip Line**

### CONTRAST MARKINGS WITH ALTERNATING SKIP PATTERN

(10'-30' Skip Line Shown, Dotted Lines Similar)

- **Yield Lines** consist of five - 18" X 27" white triangles which face traffic. Equally space triangles within traffic lane. When a bike lane is present, add one additional triangle in the center of the bike lane.
**DESCRIPTION:**

**REVISION:**

**INDEX:**

**PAVEMENT MARKINGS**

**PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS**

**STRIPING FOR BUFFERED BIKE LANE**

**STRIPING WITH NO SHOULDER OR BIKE LANE**

**NOTES:**

1. Lane widths (X) may not be same for each lane in the section.
2. For placement of RPMs, see Index 706-001.
NOTES:
1. Lane widths (X) may not be same for each lane in the section.
3. For placement of RPMs, see Index 706-001.
4. For placement of Express Lane markers and associated RPMs, see the Plans.

INTERSECTION APPROACH STRIPING WITH TURN 
LANES AND BUFFERED BIKE LANE KEY HOLE

BUFFERED EXPRESS LANE STRIPING

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS
PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

CURB AND GUTTER SHOWN
NOTE:
1. Apply yellow reflective paint to the noses of curbed medians, traffic separators, and raised islands. When applying yellow reflective paint in conjunction with Raised Pavement Markers, see Index 706-001.
2. Use yellow retro-reflective sheeting on both sides of the delineator. Install the post so that the top is 4' above the grade at the edge of the pavement.
Use Stop Line At Signalized Intersection Only

24" White
6" White
6" Double Yellow

For use in congested urban areas where available storage length between intersections is limited and a permanent point of transition from the two-way turning lane to the exclusive turning lane can not be determined.

300' Max. Intervals Between Double Arrows

25'
10'
10'

24" White
8" White
6" White

300' Max. Intervals Between Double Arrows

25'
10'
10'

300' Max. Intervals Between Double Arrows

24" White
8" White
6" White

See DETAIL "C"

18" White
6" Yellow

See DETAIL "C"

6" Double Yellow

6" Yellow (10'-30')

6" White

50' Min
25' Min
50'
8' 12' 8'

18" White
6" Yellow

Use Stop Line At Signalized Intersection Only

12" White (3'-9')

100' Max

300' Max. Intervals Between Double Arrows

For use in rural & suburban areas where an adequate storage lane length can be specifically determined.

Two Way Left Turn Lane
(With Single Lane Left Turn Channelization)

Right Turn Lane Drop and Island Details
Left Turn Lane Drop Is Mirror Image

Right Turn Lane and Island Details

Traffic Channelization at Gore

FY 2018-19
STANDARD PLANS
PAVEMENT MARKINGS

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Sheet
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Last Revision:
11/01/17

Revision:
11/01/17

Description:

9/31/2018
6:29:11 AM

11/01/17

PAVEMENT MARKINGS
NOTE:

Make pavement markings yellow for left roadway centered on existing roadway. Right roadway centered on existing roadway is similar with white pavement markings.

### MARKINGS FOR TRAFFIC SEPARATION

#### DETAIL "D"

- 6" Pavement Marking (See Note)
- Edge of Pavement

#### DETAIL "E"

- 6" Double Yellow
- 6" Yellow
- 6" White (10'-30')
- 6" Yellow (10'-30')
- 6" White (10'-30')

#### SCHEMES FOR TRANSITION - 2 LANE / 4 LANE ROADWAY

**LEFT ROADWAY CENTERED ON EXISTING ROADWAY**

- 15:1 Taper (4:1 Min., Not Less Than 50')
- White Delineators Shall Be Used Throughout The Transition Where 85th Percentile Approach Speeds Are Greater Than 50 mph

**RIGHT ROADWAY CENTERED ON EXISTING ROADWAY**

- 15:1 Taper (4:1 Min., Not Less Than 50')
- White Delineators Shall Be Used Throughout The Transition Where 85th Percentile Approach Speeds Are Greater Than 50 mph

### FDOT STANDARD PLANS

- FY 2018-19
- PAVEMENT MARKINGS

### INDEX

- 711-001

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NOTES:
1. For crosswalk width, exceed width of the adjacent sidewalk, but do not make width less than 4' for intersection crosswalks and 10' for midblock crosswalks. Measure width from the inside of the transverse crosswalk markings.
2. When the Special Emphasis Crosswalk is not perpendicular to the lane lines, make the longitudinal markings parallel to the lane lines.
3. Extend double yellow centerlines 100' back from intersection on all approaches or 50' for unmarked cross roads.
4. Refer to Index 522-002 when Curb Ramps are present.

INTERSECTION DETAILS

SPECIAL EMPHASIS CROSSWALK DETAILS

STANDARD MARKINGS

SPECIAL EMPHASIS MARKINGS

PAVEMENT MARKINGS

REVISED
01/01/17

DESCRIPTION:
FY 2018-19
STANDARD PLANS

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10 of 14
**Queue Length**

**Stop Bar (If Required)**

6" White

6" White

6" White

6" White

6" White

6" White

6" White

12" White (Typ)

6" Pavement Marking (See Note 2)

Taper 50'

Begin Lane Line

25'

L1

L2

L

6" White

Stop Bar (If Required)

Queue Length **

**Queue Length is Measured From The Median Nose Radial Point or When A Stop Bar Is Required, From The Stop Bar.**

**ARROW SPACING**

1. This Index also applies to right turn lanes.

2. Make pavement marking yellow for left-turn lanes and white for right-turn lanes.

**NOTES:**

1. **SINGLE LEFT TURNS**

**DOUBLE LEFT TURNS**

**TURN LANE MARKINGS**

**URBAN CONDITIONS**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Clearance Distance</th>
<th>Brake To Stop Distance</th>
<th>Total Decel. Distance</th>
<th>Clearance Distance</th>
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<td>35</td>
<td>70'</td>
<td>75'</td>
<td>145'</td>
<td>110'</td>
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**RURAL CONDITIONS**

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<th>Brake To Stop Distance</th>
<th>Total Decel. Distance</th>
<th>Clearance Distance</th>
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<tr>
<td>35</td>
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<td>145'</td>
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<tr>
<td>65</td>
<td>170'</td>
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</table>
**RAILROAD CROSSING AT 2-LANE ROADSIDE**

The Railroad Traffic Control Device is to be located a minimum of 12' from the Railroad Centerline. See Index 509-070 for Protection Devices.

**RAILROAD CROSSING AT 4-LANE ROADSIDE**

The Railroad Traffic Control Device is to be located a minimum of 12' from the Railroad Centerline. See Index 509-070 for Protection Devices.

**NOTES:**

1. Do not include transverse markings in pavement message quantities.
2. When dynamic devices are not present or are to be installed, place the crossbucks at the future location of the RR gate or signal and gate in accordance with Index 509-070.
3. Place an additional W10-1 sign where street intersections occur between the RR pavement message and the tracks.
4. Place FTP-61-06 sign or FTP-62-06 sign 100' in advance of the crossing for urban locations and 330' in advance of the crossing for rural locations.

**TYPICAL MARKINGS FOR R/R CROSSING**

Similarly, Pavement Markings symmetrical about R/R Centerline.

**TERMINATION OF TWO WAY LEFT TURN AT R/R CROSSINGS**

<table>
<thead>
<tr>
<th>DESIGN SPEED (MPH)</th>
<th>'A' IN FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>460</td>
</tr>
<tr>
<td>55</td>
<td>325</td>
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</tr>
<tr>
<td>10</td>
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</table>

*Does not include 24" bars.
NOTES:

1. Dimensions are to the centerline of markings.
2. An Access Aisle is required for each accessible space when angle parking is used.
3. Criteria for pavement markings only, no public sidewalk curb ramp locations. For ramp locations refer to plans.
4. Tint blue pavement markings to match color 15180 of Federal Standards 595a.
5. Mount FTP-22-06 sign below the FTP-21-06 sign.

FOR ACCESSIBLE MARKINGS - SEE ABOVE

"DIMENSIONS"

<table>
<thead>
<tr>
<th>Angle</th>
<th>45°</th>
<th>90°</th>
<th>135°</th>
<th>180°</th>
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<tr>
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<td>5'-9&quot;</td>
<td>23'-7&quot;</td>
<td>13'-10&quot;</td>
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FORWARD-IN PARKING

REVERSE-IN PARKING

Use of pavement symbol in accessible parking spaces is optional, when used the symbol shall be 3' or 5' high and white in color.

UNIVERSAL SYMBOL OF ACCESSIBILITY
NOTES:
1. All grids are 4" x 4".
2. Pavement Marking Should Not Extend Into Opposing Lane.

SCHOOL PAVEMENT MARKING

MARKINGS FOR SCHOOL ZONES

SINGLE-LANE APPROACH

TWO-LANE APPROACH

MULTI-LANE APPROACH
(Three or More)
NOTES:
1. All bicycle markings and pavement messages shall be white.
2. All bicycle markings shall be preformed thermoplastic.
3. All grids are 4" x 4".

---

STANDARD PAVEMENT MARKING MESSAGE LAYOUTS

Shared Lane Marking (SLM)

Helmeted Bicyclist Symbol

Bike Lane Arrow

Railroad Crossing
(For Shared Use Path Only)
APPRAOCH TO INTERSECTIONS DETAILS

BUFFERED BIKE LANES

CENTER OF SOLID LINE AND DOTTED LINE

2'-4' DOTTED LINE

STOP LINE

RETURN CURB RADIUS

6" WHITE SOLID LINE

8" WHITE SOLID LINE

LANE WIDTH

SHARED LANE 130'

SIDEWALK

EOP

FAR SIDE OF INTERSECTION DETAIL

5' MIN. FROM CURB RADIUS RETURN
GENERAL NOTES:

1. Make the traffic face of the raised pavement marker (RPM) the same color as the pavement marking that it is supplementing.

2. See Index 706-001 for additional information on RPMs.
PARALLEL ACCELERATION AND DECELERATION LANE

TYPICAL MARKINGS AT DUAL LANE EXITS

TYPICAL LANE DROP MARKINGS AT EXIT RAMPS

INTERCHANGE MARKINGS

FY 2018-19
STANDARD PLANS

INDEX
711-003

SHEET 3 of 7

REVISED 10/27/2017

DESCRIPTION:

STANDARD PLANS

REVISED 11/01/17

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INTERCHANGE MARKINGS

REVISED 10/27/2017

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INTERCHANGE MARKINGS

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DESCRIPTION:

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INTERCHANGE MARKINGS
NOTES:

1. Place the Wrong Way Arrow at the physical gore or 100'-0" from the theoretical gore.

2. Post delineators spaced at 40' on curves of the entrance and exit of ramps. The spacing on the tangent portion of the ramp section is 300'-0". All delineators are to be setback 4' from shoulder break. Post delineators should not be discontinued in sections with guardrail.

TYPICAL CURVED EXIT RAMPS
NOTES:

1. Place the Wrong Way Arrow at the end of the physical gore or 100'-0" from the end of theoretical gore.

2. Post delineators spaced at 40' on curves. The spacing on the tangent portion of the ramp section is 300'-0". All delineators are to be setback 4' from shoulder break. Post delineators should not be discontinued in sections with guardrail.

TYPICAL INTERSECTION
NOTE:
Do not place wrong way arrows in between consecutive directional arrows.
1. This Index shows layouts for 1, 2, and 3 lane with and without auxiliary lane.

2. The message consist of white letters and numbers with black contrasting material.

3. The "EXIT NUMBER" position remains the same distance from the beginning of taper regardless of the number of lines of information.

4. All grids are 4" x 4".
**Wire Diagram**

- Luminaire
- Luminaire Cable
- Breakaway Fuseholders with solid copper slugs (10 Amp fuse)
- Strain Relief Fitting (See Note #2)
- Polar Ground Conductor
- Ground Rod
- Equipment Ground Conductor

**Wiring Details**

- 12" bed of Pearock or crushed stone for drainage
- #6 TW Green Bonding Ground
- #6 TW Ground Wire
- Strain Relief Fitting (See Note #2)
- Surge Protective Device (SPD)

**Notes:**
1. Barrier wall or bridge mounted poles: The wiring shall be in accordance with Section 992 of the Standard Specifications.
2. Provide cable length to remove fuseholders from transformer base, pole base or pull box for maintenance. Remove slack from the luminaire cable to prevent tension on the fuseholders if the pole breaks away. Pull excess cable into pull box tighten strain relief fittings or cable clamps at both ends of conduit to prevent cable from slipping.
NOTES:
1. Use compacted select material in accordance with Index 120-001.
2. Concrete shall be Class N5 with a minimum strength at 28 days of f'c=2.5 ksi.
3. Outside edge of slab shall be cast against formwork.
4. The pull box shown is 13" x 24"; others approved under Section 635 of the Standard Specifications may be used.
5. Slabs to be placed around all Poles and Pull Boxes in rural locations. In urban areas or where space is limited slab dimensions may be adjusted as shown in the plans.
6. Concrete for slabs around pull boxes shall be included in the price of pull box.

SLAB DIMENSIONS

SELECT MATERIAL

SECTION A-A

SLAB DETAILS FOR INTERMEDIATE PULLBOX LOCATIONS
NOTES:
1. Use compacted select material in accordance with Index 700-001.
2. Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
3. Outside edge of slab shall be cast against formwork.
4. The pull box shown is 1' x 2'; others approved under Section 635 of the Standard Specifications may be used.
5. Slabs to be placed around all Poles and Pull Boxes. In urban areas or where space is limited slab dimensions may be adjusted as shown in the plans.
6. Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.
7. The expansion joint shall consist of 1/2" of closed-cell polyethylene foam expansion material. The top 1/2" of expansion material shall be removed after pouring the slab and sealed with an APL approved Type A sealant meeting the requirements of Section 932.

Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.

Use compacted select material in accordance with Index 700-001.
GENERAL NOTES:

1. Poles are designed to support the following:
   a. Luminaire Effective Projected Area (EPA): 1.55 SF

2. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not included in the Plans.

3. Materials:
   a. Pole, Pole Connection Extrusions and Arm Extrusions: ASTM B221, Alloy 6063-T6
   b. Bars, Plates, Stiffeners and Backer Ring: ASTM B221, Alloy 6063-T6
   c. Caps and Covers: ASTM B-20, Alloy 319-F
   d. Steel Bearing Plates: ASTM A36 or ASTM A36 Grade 36
   e. Aluminum Weld Material: ER 4043
   g. Bolts, Nuts and Washers: Bolts: ASTM F1554 Grade 55, Nuts: ASTM A563 Grade DH Heavy-Hex
   h. Anchor Bolts, Nuts and Washers:
      1. Anchor Bolts: ASTM F1554 Grade 55
      2. Nuts: ASTM F1554 Grade DH Heavy-Hex
   i. Stainless Steel Fasteners: ASTM F593 Alloy Group 2, Condition A, CW1 or SH1
   j. Concrete: Class 1
   k. Reinforcing Steel: Specification Section 415
   l. Steel Bearing Plate
   m. Pom-Pom Washers
   n. Caps and Covers: ASTM B-26, Alloy 319-F
   o. Bars, Plates, Stiffeners and Backer Ring: ASTM B221, Alloy 6063-T6
   p. Pole, Pole Connection Extrusions and Arm Extrusions: ASTM B221, Alloy 6063-T6

4. Fabrication:
   a. Weld Arm and Pole (Alloy 6063) in the T4 temper using 4043 filler. Age the Arm and Pole artificially to the T6 temper after welding.

5. Coatings/Finish:
   a. Pole and Arm Finishes: 50 grit satin rubbed.
   b. Galvanize Steel Bolts, Screws, Nuts and Washers, ASTM F2229
   c. Hot Dip Galvanize EJB and other steel items including poles, ASTM A123

6. Construction:
   a. Foundation: Specification Section 455, except payment for the foundation is included in the cost of the pole.
   b. Frangible Base, Base Shoe, and Clamp:
      1. Certify that the Clamp, Frangible Transformer Base, and Base Shoe Design are capable of providing the required load capacity.
      2. Certify that the Base conforms to the current FHWA required AASHTO Frangibility Requirements, tested under NCHRP Report 350 Guidelines (e.g. Akron Foundry TB1-17).
      3. Do not erect pole without clamp attached.

7. Embedded Junction Box (EJB): Install EJBs per Note 4 and in accordance with Specification Section 635, as shown on the following Sheets.

8. Wind Speed by County:
   a. 120 MPH
   b. 140 MPH
   c. 160 MPH
      1. Brevard, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota and St. Lucie Counties.

   a. Tests demonstrating a pole with a 0.06" wall thickness achieves and ultimate moment capacity of 44 kip*ft in the strong axis and 37 kip*ft in the weak axis.
   b. Tests demonstrating a pole with a 0.07" wall thickness achieves an ultimate moment capacity of 44 kip*ft in the strong axis and 37 kip*ft in the weak axis.
   c. Test results showing the pole does not buckle at the shape transition area under the ultimate moment capacity loads.
   d. Complete details and calculations for the reinforced 4x5" (Min.) handhole located 1'-6" above the base plate.
   e. Locate on the inside of the Transformer base and visible from the door opening.
   f. Secure to transformer base with 1/2 diameter stainless steel rivets or screws.
   g. Include the following information on the ID Tag:
      1. Project Name
      2. Pole Height
      3. Manufacturer's Name
STANDARD ROADWAY ALUMINUM LIGHT POLE W/ARM

STANDARD ROADWAY ALUMINUM LIGHT POLE W/TOP MOUNT

MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE ON CYLINDRICAL FOUNDATION

MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE ON SPREAD FOOTING FOUNDATION

SECTION A-A

ELEVATIONS
NOTE:
Pole wall thicknesses shown in the POLE TABLE are nominals and shall be within the Aluminum Association Tolerances. Thicker walls are permitted and tapered walls may be used provided the minimum Aluminum Association thicknesses are not violated.

NOTE:
1. For locations of Bearing Plates, Base Plates and Detail 'A' see Sheets 6 & 7.
2. Double Nuts: The bottom hex nut may be substituted by a half height 'Jam' nut.
3. Provide individual nut covers (not shown) for each bolt.
**PLAN**

Median Barrier (Index 521-001)

- Bars 5W1 @ 8" (Typ.)
- Bars 5V @ 8" (Typ.)
- #5 Bars @ 8" (Typ.)
- 2 Sp. @ 16" ± spacing Bars 5V & 5W1

Median Barrier (Index 521-001)

- 20'-0" Min.
- 2 Sp. @ 16" ±
- 7 Sp. @ 8" ±
- 2 Sp. @ 16" ±

**ELEVATION**

- Optional Const. Jt. (See Note 2)

**END VIEW**

- Anchor Bolts
- Base Plate
- Bars 5V
- 2" Ø Conduit
- 2" Ø Conduit

**SPREAD FOOTING DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE**

- 7 Sp. @ 8" ± Embeded Junction Box

**EMBEDDED JUNCTION BOX DETAILS**

- 3" Cover (Typ.)
- 4" Cover (Typ.)

**NOTES:**

1. For Bearing Plate and Base Plate Details, see Sheet 5.

2. For connections to adjacent Median Barrier, use the Doweled Joint detail per Index 521-001. Alternatively, a continuous concrete pour or a construction joint may be substituted; these alternatives require the Median Barrier's longitudinal steel to lap a minimum of 2'-0" with the longitudinal steel shown herein.

**REVISION DESCRIPTION:**

- FY 2018-19
- STANDARD PLANS
- STANDARD ALUMINUM LIGHTING

**INDEX:**

- 715-002

**SHEET:**

- 6 of 8
NOTE: Deviate 2" Ø Conduit to avoid cylindrical foundation.

Provide dowel bars @ construction joint.

Median Barrier (Index 521-001)

2'-0" Min.

Optional Construction Joint (Typ.)

(See Note 2)

1" Conduit

Fairgrounding

Footing Depth

Foundation Depth

1" Cover

1" Chamfer

#4 Bars (Typ.)

VIEW B-B

1'-6" Ø Anchor Bolts

4 - 1-3/8" Ø Anchor Bolts

#5 Bars, 6'-10" long (Typ.)

Bars 5V @ 8" Sp. Max (Typ.)

SECTION C-C

NOTES:

1. For Bearing Plate and Base Plate Details, see Sheet 3.

2. For connections to adjacent median barrier, use the dowelled joint detail per Index 521-001. Alternatively, a continuous concrete pour or a construction joint may be substituted; these alternatives require the median barrier's longitudinal steel to lap a minimum of 2'-0" with the barrier's longitudinal steel to lap a minimum of 2'-0" with the median barrier's longitudinal steel to lap a minimum of 2'-0" with the median barrier's longitudinal steel.

Cylindrical Foundation Details for Median Barrier Mounted Aluminum Light Pole

Foundation Table

Wind Speed (MPH)

Design Mounting Height (FT)

Foundation Depth (FT)

120
40
9

140
40
9

160
40
9
NOTES:
1. For Base Plate Details, Bearing Plate Details, and Detail 'A', see Sheet 5.
2. See Index 521-426 for details of adjacent Traffic Railing (Median 36" Single-Slope) and for angles 'A' and 'B'.
3. See Index 630-010 for Cons. Joint positions, see Index 630-010 for Conduit, EJB and supplemental reinforcing details.

** Shift horizontally to avoid Anchor Bolts

*** Shift horizontally to avoid Anchor Bolts

*At the Contractor's option, Bars SW may be fabricated as a two piece bar with a 1'-2" lap splice at the bottom legs.
HIGHMAST LIGHTING NOTES:

1. Poles are designed to support the following:
   - A. One (1) cylindrical head assembly with a maximum effective projected area of 6 sf and 140 lbs (Max.)
   - B. Eight (8) cylindrical luminaires with a maximum effective projected area of 1.5 sf and 77 lbs each.

2. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

3. High Mast Structure Materials:
   - A. Poles and Bucking Rings:
     - Less than \( \frac{70}{8} \)\%: ASTM A1011 Grade 50, 55, 60 or 65
     - Greater than or equal to \( \frac{70}{8} \)\%: ASTM A572 Grade 50, 55, 60 or 65
   - B. Stainless Steel Screws: ASTM A304
   - C. Pole Caps: ASTM A1011 Grade 50, 55, 60, or 65 or ASTM A820
   - D. Bolt: \( \phi \) Bolt, ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
   - E. Plate Washer: ASTM A36 (4 per anchor bolt)
   - F. Nut Covers: ASTM B36 (319-F)
   - G. Holes for Anchor Bolts: Anchor Bolt diameter plus \( \frac{1}{2} \)\% (Max.) prior to galvanizing.

4. Fabrication:
   - A. Welding: Specification Section 460-6.4
   - B. Poles:
     - Round or 16-sided (Min.)
     - Pole Taper: Diameter changing at 0.14 inches per foot.
     - Two longitudinal seam welds (Max.)
   - C. Longitudinal Seam Welds: within 6" of pole to base must be complete penetration welds.
   - D. Circumferentially welded pole shaft, bolt splices and laminated pole shafts are not permitted.
   - E. Identification Tag: (Submit details for approval.)
   - F. Reinforcing Steel: Specification Section 415
   - G. Nut Covers: ASTM B26 (319-F)
   - H. Concrete: Class IV (Drilled Shaft)
   - I. Stainless Steel Screws: AISI 316
   - J. Steel Plates: ASTM A709 or ASTM A36
   - K. Stainless Steel Screws: ASTM A193 Grade B7
   - L. Bolt: \( \phi \) Bolt, ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)

5. Coating:
   - A. Galvanize Anchor Bolts, Nuts and Washers: ASTM A325
   - B. Hot Dip Galvanize after Fabrication
   - C. Hot Dip Galvanize after Fabrication

6. Construction:
   - A. Foundation: Specification Section 455 Drilled Shaft
   - B. After Installation: Place wire screen between top of foundation and bottom of baseplate in accordance with Specification Section 649-6
   - C. Identification Tag: (Submit details for approval.)
   - D. Secures to pole with \( \phi \) specialty stainless steel rivets or screws.
   - E. Include the following information on the ID Tag:
     - 1. Financial Project ID
     - 2. Pole Type
     - 3. Pole height
     - 4. Manufacturer’s Name
     - 5. Fe of Steel
     - 6. Base Wall Thickness

7. Wind Speed by County:

   - 130 MPH
   - 150 MPH
   - 170 MPH
     - Brevard, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota, and St. Lucie Counties.

STANDARD POLE DESIGN NOTES

FY 2018-19 STANDARD PLANS

HIGH MAST LIGHTING

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LAST
REVISION
01/17

DESCRIPTION:

REV

10 /27 /2017

10 :20 :50 A M

11/01/17

STANDARD PLANS

1038x12
For Pull Boxes between Poles refer to Index 715-001.

1. Slabs to be placed around all Poles and Pull Boxes.

2. Specifications For Road And Bridge Construction.

3. Interrod distances must be a minimum of 10'

NOTES:
1. At all pull boxes and pole bases, ends of conduit shall be sealed in accordance with Section 630 of the Standard Specifications For Road And Bridge Construction.
2. Slabs to be placed around all Poles and Pull Boxes.
3. For Pull Boxes between Poles refer to Index 715-001.

WIRING DETAILS
The contractor's attention is directed to those plan sheets detailing the mounting of luminaires at the pole top. Particular attention is directed to alignment of luminaire light distributions. Special attention must be exercised in the physical alignment of these luminaires to ensure that the approved photometric layout is physically produced at each lighting standard in the field. A marking shall be placed on the external face of the refractor to allow visual inspection of alignment. The marking shall correspond to the 0° axis of the refractor.

A surge protector shall be located in the pole with the circuit breaker. The surge protector shall be mounted at the front near a hand hole for easy access.

HIGH MAST POLE WIRING DIAGRAM

All hardware for mounting heavy duty drill to pole shall be Stainless Steel. 5/8" heavy duty reversible or 1 HP Portable Motor(s) per project.

Step-down transformer provided with 320% grounded receptacle for electric drill & receptacle for supply cable. (see schematic) 25' minimum remote control cable same as Pole Cable.

Remote control switch

SCHEMATIC OF REMOTE AUXILIARY POWER UNIT

SUPPLY CABLE RECEPTACLE

REMOTE CONTROL SWITCH

A 250 Volt rated Circuit Breaker Cable. Size of conductors to be determined by luminaire load.

600 Volt rated Circuit Breaker Cable. Size of conductors to be determined by luminaire load.

HIGH MAST LIGHTING

LOWERING DETAILS

FY 2018-19

STANDARD PLANS

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5 of 6
NOTES:

1. Use compacted select material in accordance with Index 120-001.
2. Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
3. Outside edge of slab shall be cast against formwork.
4. The pull box shown is 13" x 24"; others approved under Section 635 of the Standard Specifications may be used.
5. Slabs to be placed around all Poles and Pull Boxes. In urban areas or where space is limited slab dimensions may be adjusted as shown in the plans.
6. Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.
7. The expansion joint shall consist of ½ of closed-cell polyethylene foam expansion material. The top ½ of expansion material shall be removed after pouring the slab and sealed with an APL approved Type A sealant meeting the requirements of Section 932.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.

SLAB DIMENSIONS

SHAFT LOCATION

SECTION C-C

PULL BOX LOCATION

SLAB DETAILS

SLAB DETAILS

HIGH MAST LIGHTING

FY 2018-19

STANDARD PLANS

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### CROSSING SURFACES

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<th>Definition</th>
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<td>Rubber</td>
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<tr>
<td>RA</td>
<td>Rubber/Asphalt</td>
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<tr>
<td>TA</td>
<td>Timber/Asphalt</td>
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### STOP ZONE FOR RUBBER CROSSING

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<tr>
<td>60 - 65</td>
<td>500'</td>
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<tr>
<td>70</td>
<td>600'</td>
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### GENERAL NOTES

1. The Railroad Company will furnish and install all track bed (ballast), crossties, rails, crossing surface panels and accessory components. All pavement material, including that through the crossing, will be furnished and installed by the Department or its Contractor, unless negotiated otherwise.

2. When a railroad grade crossing is located within the limits of a highway construction project, a transition pavement will be maintained at the approaches of the crossing to reduce vehicular impacts to the crossing. The transition pavement will be maintained as appropriate to protect the crossing from low clearance vehicles and vehicular impacts until the construction project is completed and the final highway surface is constructed.

3. The Central Rail Office will maintain a list of currently used Railroad Crossing Products and will periodically distribute the current list to the District Offices as the list is updated.

4. The Railroad Company shall submit engineering drawings for the proposed crossing surface type to the Construction Project Engineer and/or the District Rail Office for concurrence along with the list of Railroad Crossing Products. The approved engineering drawings of the crossing surface type shall be made a part of the installation agreement.

5. Sidewalks shall be constructed through the crossing between approach sidewalks of the crossing. Sidewalks shall be constructed with appropriate material to allow unobstructed travel through the crossing in accordance with ADA requirements.

6. Install pavement in accordance with the Specifications.

7. The Department will participate in crossing work, that requires adjustments to rail outside of the crossing, no more than 50 feet from the edge of the travel way.

Notes:

1. Type R Crossings are NOT to be used for multiple track crossings within zones for an existing or scheduled future vehicular stop. Zone lengths are charted above.

2. Single track Type R Crossings within the zones on the chart may be used unless engineering or safety considerations dictate otherwise.
HALF PLAN
ROADWAYS WITH FLUSH SHOULDERS

SECTION VIEW

TYPICAL CROSSING MATERIAL REPLACEMENT AT RR CROSSINGS

VERTICAL ROADWAY ALIGNMENT THROUGH A RAILROAD CROSSING

To prevent low-clearance vehicles from becoming caught on the tracks, the crossing surface should be at the same plane as the top of the rails for a distance of 2 feet outside the rails. The surface of the highway should also not be more than 3 inches higher or lower than the top of the nearest rail at a point 30 feet from the rail unless track superlevelation makes a different level appropriate. Vertical curves should be used to traverse from the highway grade to a level plane at the elevation of the rails. Rails that are superlevelled, or a roadway approach section that is not level, will necessitate a site specific analysis for rail clearances.