Effective for Projects with Lettings in the Fiscal Year (FY) from
July 1, 2019 through June 30, 2020
NOTICE
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
The use of any design, method, process, material or device either expressed or implied by these standards that are covered by patent, copyright, or proprietary privilege is the sole responsibility of the user. Any infringement on the rights of the inventor, patentee, assignee or licensee shall be the sole responsibility of the user. For additional information refer to Subsection 7-3 of the FDOT Standard Specifications for Road and Bridge Construction.

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

Structure is defined in Section 334.03(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 requestor 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. 56900

State Transportation Landscape Architect
Jeffrey H. Casper
LA0001592

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

James Christian, Division Administrator

Approvers Approve under Federal AID Projects
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<td>AASHTO</td>
<td>American Association Of State Highway And Transportation Officials</td>
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<td>AC</td>
<td>Alternating Current</td>
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<td>ACI</td>
<td>American Concrete Institute</td>
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<td>ADA</td>
<td>Americans With Disabilities Act</td>
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<td>ADT</td>
<td>Average Daily Traffic</td>
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<td>Automated Flagger Assistance Device</td>
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<td>American National Standards Institute</td>
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<td>American Society For Testing And Materials</td>
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<td>Asphalt Treated Permeable Base</td>
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<td>American Welding Society</td>
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<td>BA</td>
<td>Breakaway</td>
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<td>b/w</td>
<td>Between</td>
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<td>Closed-Circuit Television</td>
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<td>Code of Federal Regulations</td>
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<td>CFPR</td>
<td>Carbon Fiber Reinforced Polymer</td>
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<td>cfs, CFS</td>
<td>Cubic Feet Per Second</td>
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<td>Domestic Mail Manual</td>
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<td>Domestic Mail Name</td>
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<td>E</td>
<td>Edge Of Pavement</td>
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<td>Ea or Es.</td>
<td>Each</td>
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<td>E.P. or EOP</td>
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<td>EIA</td>
<td>Electronic Industries Alliance</td>
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<td>Et. or Elev.</td>
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<td>Florida-I Beam</td>
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<td>Florida Statutes</td>
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<td>Far Side</td>
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<td>Florida Traffic Plans</td>
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<td>G</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>Hd.</td>
<td>Head</td>
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<td>H.S., HS</td>
<td>High Strength</td>
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<td>HDPE</td>
<td>High Density Polyethylene</td>
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<td>Horiz.</td>
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<td>HP</td>
<td>Horsepower or H-Pile</td>
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<td>HSP</td>
<td>High Strength Polyethylene</td>
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<td>High Strength Vertical Polyethylene</td>
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<td>Inv.</td>
<td>Invert</td>
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<td>ITS</td>
<td>Intelligent Transportation Systems</td>
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<tr>
<td>k</td>
<td>Kip</td>
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<tr>
<td>k.p</td>
<td>Kip(s)</td>
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<tr>
<td>kips</td>
<td>Kips Per Square Inch</td>
</tr>
<tr>
<td>kVA</td>
<td>Kilowatt Ampere</td>
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<tr>
<td>L</td>
<td>Length</td>
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<tr>
<td>LA</td>
<td>Limited Access</td>
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<tr>
<td>Lb or lbs.</td>
<td>Pound(s)</td>
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<td>lb/psy</td>
<td>Pounds Per Square Yard</td>
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<td>Lbf</td>
<td>Pound Force</td>
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<td>Load Bearing Ratio</td>
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<td>Linear Foot</td>
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<td>Lgh.</td>
<td>Length</td>
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<td>Long.</td>
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<td>LPS</td>
<td>Load Per Square Foot</td>
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<td>LRS</td>
<td>Long-Relaxation Strand</td>
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<tr>
<td>LS</td>
<td>Lump Sum</td>
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<tr>
<td>LSD</td>
<td>Lump Sum Per Day</td>
</tr>
<tr>
<td>Lt.</td>
<td>Left</td>
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**ABBREVIATIONS**

**FY 2019-20 STANDARD PLANS**
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<tr>
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<th>Meaning</th>
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<tr>
<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>
<td>Maximum</td>
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<td>M.E.S.</td>
<td>Mitered End Section</td>
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<tr>
<td>N.H.</td>
<td>Manhole or Mounting Height</td>
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<tr>
<td>N.H.W.</td>
<td>Mean High Water</td>
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<tr>
<td>Mid.</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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<tr>
<td>Min.</td>
<td>Minimum or Minute</td>
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<tr>
<td>Wisc.</td>
<td>Miscellaneous</td>
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<td>M.L.W.</td>
<td>Mean Low Water</td>
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<tr>
<td>mm</td>
<td>Millimeter</td>
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<td>Mod.</td>
<td>Modification</td>
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<td>M.O.T.</td>
<td>Maintenance Of Traffic</td>
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<td>Standard Penetration Number</td>
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<td>NA or N/A</td>
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<td>N.C.</td>
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<td>N.C.H.R.P.</td>
<td>National Cooperative Highway Research Program</td>
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<td>N.D.C.B.U.</td>
<td>Neighborhood Delivery And Collection Box Unit</td>
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<td>N.E.N.A.</td>
<td>National Electrical Manufacturers Association</td>
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<td>Number</td>
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<td>National Pipe Thread</td>
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<td>Near Side</td>
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<td>Not To Scale</td>
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<td>O.C.</td>
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<td>O. to O.</td>
<td>Out to Out</td>
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<td>O.B.G.</td>
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<td>Pavement</td>
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<td>P.B.R.</td>
<td>Pedestrian/Bicycle Railing</td>
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<td>P.C.</td>
<td>Point Of Curvature</td>
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<td>P.C.C.</td>
<td>Plain Cement Concrete</td>
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<td>Portable Changeable Message Sign</td>
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<td>P.R.S.</td>
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<td>P.S.I. or psi</td>
<td>Pounds Per Square Foot</td>
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<td>Pounds Per Square Inch</td>
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<td>Point of Tangency or Pressure Treated</td>
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<td>Polytetrafluoroethylene</td>
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<td>Speed, Spacing or Second</td>
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<td>Specification</td>
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<td>sq</td>
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<td>sq. ft., sq. ft.</td>
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<td>sq. in.</td>
<td>Square Inch</td>
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<td>sq. yd., sq. yd.</td>
<td>Square Yard</td>
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<td>S.R.</td>
<td>State Road</td>
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<td>S.S.</td>
<td>Stainless Steel</td>
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### Signing and Marking

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17502 715-010  High Mast Lighting

17504 639-001  Service Point Details

17505 700-031  External Lighting For Signs

17515 715-002  Standard Aluminum Lighting

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17700 635-001  Pull & Splice Box

17721 630-001  Conduit Installation Details

17723 649-010  Steel Strain Pole

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**Intelligent Transportation Systems (ITS)**

17900 695-001  Traffic Monitoring Site

**Prestressed Concrete Beams**

20010 450-010  Typical Florida-I Beam Details and Notes

20036 450-036  Florida-I 36 Beam – Standard Details

20045 450-045  Florida-I 45 Beam – Standard Details

20054 450-054  Florida-I 54 Beam – Standard Details

20063 450-063  Florida-I 63 Beam – Standard Details

20072 450-072  Florida-I 72 Beam – Standard Details
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### Square and Round Concrete Piles (Corrosion Resistant)

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| 000-510              | All Sheets: Changed Title.  
Sheet 1: Deleted "DESIGN SPEED" table and "RADIUS OF CURVE" table; Deleted subtitle.  
Sheet 2: Added Concrete Pavement note to clarify shoulder slope transitions. |
| 000-511              | All Sheets: Changed Title, Subtitles, and Renumbered.  
Sheet 1: Deleted Superelevations Rates Tabulated and Charted Values (information can be found in FDM); combined General Notes with Old Sheet 2; Deleted all callouts for "CHARTED VALUES" on Old Sheet 2.  
Sheet 2: Updated Subtitle. |
| 000-515              | Deleted Index, Criteria information moved to New FDM Chapter 214. Construction details moved to New Indexes 522-003 or 330-001. |
| 000-516              | Deleted Index and moved information to Index 330-001. |
| 102-200              | Sheet 1: "STORAGE FACILITY" Note; Changed phone number to 407-278-2727. |
| 102-600              | Sheet 3: Updated "LENGTH OF LANE CLOSURES" Note.  
Sheet 9: Changed "DROP-OFF CONDITION NOTES" Note 5. |
| 102-655              | Sheet 1: Changed Notes to remove limitations to Limited Access Facilities and Overhead work. Clarified "TRAFFIC PACING GUIDE" notes for the requirements of site specific traffic control plans. Added Note 6 to the "TRAFFIC PACING GENERAL NOTES" for short duration operations. |
| 110-100              | Changed Notes 1 and 8; Added Note 9; Changed the "Crown Dripline..." in the "TREE PROTECTION BARRIER-PLAN and ELEVATION" dimension; Changed the "No Open Trenching..." dimension; Added root pruning trenches; Changed the "Maintain Existing Grade..." call out in the "TREE PROTECTION BARRIER-ELEVATION" detail; Changed the "Crown Dripline" call out; Added Access to the "PROTECTION BARRIER FOR TREE GROUPINGS" detail; Changed Note 1 in the "TRUNK PROTECTION" detail; Added minimum requirements for barrier posts. |
| 120-001              | Sheet 1: Added "REMOVAL OF EXCESS BASE MATERIAL" details from FY 2018-19 Standard Plans, Index 000-506; Updated General Notes for plain language. Deleted DESIGN NOTES.  
Old Sheet 2: Deleted Sheet (TREATED PERMEABLE BASE OPTIONS no longer supported).  
Old Sheet 3: New Sheet 2; Deleted DESIGN NOTE.  
Old Sheet 4: New Sheet 3; Deleted DESIGN NOTE; Added Special Stabilized Subbase callout. |
| 120-002              | Sheet 1: Updated Reference to Index 160-001 in Note 5. |
| 160-001              | New Index. Previously Index 000-506; Updated Note 6 for plain language; Moved "REMOVAL OF EXCESS BASE MATERIAL" detail to Index 120-001. |
| 330-001              | New Index. Content relating to Paved or Graded Driveways moved from Sheets 5 & 6 of Old Index 000-515 and 000-516.  
All: Updated terminology from "Turnouts" to "Driveways"; Updated notes for plain language.  
Sheet 2: Added Material Types And Thicknesses Table from Old Index 000-515. Updated Asphalt Thickness values for Connections; Changed O.B.G. from type 1 to type 2. |
| 350-001              | Sheet 1: Updated Note 5 for expansion joints.  
Sheet 3: Deleted "KEYED JOINT" Detail; Updated the "JOINT ARRANGEMENT" Detail.  
Sheet 4: Updated Notes, and changed outside lane standard width to 13 ft. on all illustrations. |
<p>| 425-040              | Editorial: Added back deleted note on &quot;heavy wheel loads&quot; in GENERAL NOTES. |
| 450-010              | Sheet 1: Added Note 13; Editorial – Note 11 |
| 450-036              | Sheet 1: Corrected Note # references in &quot;END VIEW&quot;. |
| 450-045              | Sheet 1: Corrected Note # references in &quot;END VIEW&quot;. |
| 450-054              | Sheet 1: Corrected Note # references in &quot;END VIEW&quot;. |</p>
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<td><strong>Sheet 1:</strong> Editorial, moved top insert to distance shown; Corrected Note # references in &quot;END VIEW&quot;.</td>
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<td><strong>Sheet 1:</strong> Changed Note 7 and 9.C; Added Note 13.</td>
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<td><strong>Sheet 1:</strong> Editorial, deleted extra line in &quot;SECTION THRU BULKHEAD&quot;. <strong>Sheet 2:</strong> Deleted Section Modulus and Prestress after Losses columns from Table (added same to SPI); Added Jacking Forces to Table.</td>
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<td><strong>Sheet 1:</strong> Editorial, deleted extra line in &quot;SECTION THRU BULKHEAD&quot;. <strong>Sheet 2:</strong> Added Initial Jacking Stress to Table; Deleted Section Modulus and Prestress after Losses columns from Table (added same to SPI); Corrected Dimension A for Bars S4 thru S7.</td>
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<td>Added 100% acrylic aliphatic polyurethane top coating to Types 1, 4, 9, and 10 and Notes 1 &amp; 2.</td>
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<td><strong>Sheet 1:</strong> Added pocket to &quot;FILLER OUTLET DETAIL AT HORIZONTAL SURFACES&quot;.</td>
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<td><strong>Sheet 3:</strong> Updated Notes and Details previously shown on Index 711-001, Sheet 12 of 14.</td>
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<td><strong>Sheet 1:</strong> Corrected Note 3.H Specification reference.</td>
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<td><strong>Sheet 1:</strong> Changed end hoop Note 3 to Alloy 6063-T5 to match Index 515-062.</td>
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</tbody>
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Added New Sheets:
- **New Sheet 8:** Median Barrier – 56” Height Section for Barrier-Mounted Dual Sign Support Shielding.
- **New Sheet 23:** Wall Shielding Barrier- 38” Height Section - Approach and Trailing Transition.
- **New Sheet 24:** Wall Shielding Barrier – 38” Height Section – Guardrail Connection.
- **New Sheet 25:** Wall Shielding Barrier – 56” Height Section for Barrier-Mounted Sign Support Shielding.

Revisions (By New Sheet Number):
- **All Sheets:** Updated sheet numbers and sheet references for the above additions.
- **Sheet 1:** Updated Table of Contents.
- **Sheet 4:** Added Begin/End Barrier Sta. callout point.
- **Sheet 6,7,9,10:** Added Begin/End Variable Section Width callout points.
- **Sheet 9:** Added Flowable Fill option in PLAN view; Added Note to define Flowable Fill material and NS Concrete Fill material; Replaced the stirrup with a new standardized Bar 4V3 in "SECTION B-B".
- **Sheet 26:** Updated Bar 5V2 to use one larger pin diameter for constructability; Added Bar 4V3 for use with Split and Half Section barrier.

Interim, See Roadway Design Bulletin, RDB 18-06.
- **Sheet 1:** Added "GFRP - Glass Fiber Reinforced Polymer" note.

**521-002**
- **Sheet 1:** Changed Note 3.
- **Sheets 4 & 5:** Changed "Shoulder Pavement" callout to "Shoulder Pavement & Fill".
<table>
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<th>Standard Plans Index</th>
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</table>
| 521-010              | Redeveloped Standard  
**New Sheet 1**: Updated designs for all variations of single-slope and existing F-Shape barriers; Updated spacing of vertical and horizontal reinforcing steel, Added a minimum transverse joint spacing; Added leave-out concept for measurement; Added accommodation for welded wire reinforcing and variable barrier heights.  
**New Sheet 2**: Added detail for terminating at 56" height barrier sections; Added detail for continuing over 44" height barrier sections. |
| 521-422              |  
**Sheet 1**: Changed Barrier Delineator Note.  
**Sheet 2**: Editorial, sidewalk hook bars. |
| 521-423              |  
**Sheet 1**: Changed Barrier Delineator Note.  
**Sheet 2**: Editorial, "RAILING END DETAIL" and "VIEW A-A AND B-B". |
| 521-426              |  
**Sheet 1**: Changed Barrier Delineator Note. |
| 521-427              |  
**Sheet 1**: Changed Barrier Delineator Note. |
| 521-428              |  
**Sheet 1**: Changed Barrier Delineator Note.  
**Sheet 2**: Editorial |
| 521-509              | All: Reorganized sheets and renumbered; Updated sheet # references.  
**Sheet 1**: Added notes moved from other sheets; Added Note 6.  
**Sheet 2**: Changed reinforcing.  
**Sheet 3**: Changed reinforcing.  
**Sheet 4**: Changed reinforcing.  
**Sheet 5**: Changed Note references to new reinforcing bars. |
| 521-510              | All: Reorganized sheets and renumbered; Updated sheet # references.  
**Sheet 1**: Added notes moved from other sheets; Added Note 6.  
**Sheet 2**: Changed reinforcing.  
**Sheet 3**: Changed reinforcing.  
**Sheet 4**: Changed reinforcing.  
**Sheet 5**: Changed Note references to new reinforcing bars. |
| 521-511              |  
**Sheet 1**: Updated Notes.  
**Sheet 2**: Added Bar 5R3; Changed reinforcing.  
**Sheet 3**: Added Bar 5R3; Changed reinforcing. |
| 521-512              |  
**Sheet 1**: Updated Notes.  
**Sheet 2**: Added Note 6; changed asphalt description in SECTION B-B. |
| 521-513              |  
**Sheet 1**: Updated Notes. |
| 521-514              |  
**Sheet 1**: Clarified Notes 1, 2, and 7; Renumbered Notes 5 and 6.  
**Sheet 2**: Editorial  
**Sheet 4**: Editorial |
| 521-515              | Clarified Notes 1 and 2; Changed Notes 4 and 5. |
| 521-610              |  
**Sheet 2**: Added Note 4; Renumbered remaining notes; Changed pavement reference in Typical Section. |
| 521-620              |  
**Sheet 1**: Corrected Cross Reference; Deleted Note 12.  
**Sheet 2**: Corrected Note # references; Added Notes 7 and 8.  
**Sheet 3**: Changed Note 1 and 3.  
**Sheet 4**: Changed Title for End Transition; Corrected Note # references; Editorial, Note 4 |
| 521-630              |  
**Sheet 2**: Corrected dimension for Bar 5U1. |
| 521-640              | Editorial: "Traffic Railing" to "Concrete Barrier". |
| 521-660              |  
**Sheet 1**: Changed Typical Section without sidewalk to Option 1.  
**Sheet 2**: New Sheet; Added Option 2.  
**Sheet 3**: Renumbered; Changed Typical Section Title.  
**Sheet 4**: Renumbered; Added Elevation of 4H2 Bars; Changed Note 4. |
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| 521-820              | **Plan 1**: Added Bar 4P2 as a contractor option; Changed Bar 4S placement; Moved Bar Bending Details, "REINFORCING STEEL NOTES", Estimated Quantities, and DETAIL "A" to new Sheet 2.  
**Plan 2**: New Sheet |
| 522-001              | **Plan 1**: Deleted the 6" Min. for turnouts or curb ramps call out and 8" dimension behind the Return Curbs in the "LONGITUDINAL SECTION"; Deleted 4'-0" dimension from driveways; Changed curb ramp type in the "SIDEWALK WITH UTILITY STRIP" detail; Added example inlets to plan views.  
**Plan 2**: Deleted 8" dimension behind the Return Curbs in the "LONGITUDINAL SECTION". |
| 522-002              | **Plan 1**: Updated General Note 1.  
**Plan 2**: Updated CR-A dimensions to match FDOT standard sidewalk widths.  
**Plan 3**: Moved Pavement Relief Details to Sheet 6.  
**Plan 4**: Added Sidewalk and Clarified details for CR-E.  
**Plan 5**: Updated Notes; Clarified dimensions.  
**Plan 6**: Added dimensions for Curb Transitions. |
| 522-003              | New Index - Information for Concrete Flared Driveways moved from old Index 000-515. |
| 536-001              | **Plan 1**: Deleted optional conditions for washer under nuts (Notes 4 & 5); Deleted "Type II" from Table of Contents.  
**Plan 9**: Updated Trailing Anchorage design and removed "Type II" designation; Deleted Soil Plate; Added Breakaway Post and Steel Tube Foundation at Second Post Location; Deleted Offset Block at Second Post Location; Added Two Ground Strut Supports; Changed Cable Anchor Plate to Opposite Side on Double Face Trailing Anchorage.  
**Plan 10**: Changed the Steel Tube Foundation depth; Added new detail for ground strut (C Channel Shape).  
**Plan 18**: Updated Trailing Anchorage drawing; Removed "Type II" designation  
**Plan 22**: In Washer detail title, Removed "Type II" designation, Replaced with "Trailing Anchorage". |
| 536-002              | **Plan 3**: Removed Departure Line  
**Plan 4**: Removed Crash Cushion sizing information. |
| 544-001              | **Plan 1**: Deleted Concrete Barrier and Guardrail Applications Tables; Changed the GENERAL NOTES; Updated Departure Lines, Length Restrictions, and other call outs.  
**Plan 2**: Updated Design Length, Location Station, and other call outs. |
**Plan 1**: Updated all details.  
**Plan 2**: New Sheet; Added details for SHORT-TERM RAISED RUMBLE STRIPS. |
| 546-010              | **Interim**, All Sheets; See Roadway Design Bulletin, RDB 18-03 |
| 548-020              | Added durability requirements for FRP reinforcing to the FDOT MSE RETAINING WALL CLASSIFICATION TABLE. |
| 570-010              | Changed General Notes to remove Specification 162 reference. |
| 580-001              | **Plan 1**: Changed General Notes; Changed the Under 4" and 4" and Larger Caliper Tree sizes; Changed the Stake Spacing, Anchors and Mulch callouts.  
**Plan 2**: Changed the Under 4" and 4" and Larger Caliper Tree sizes; Changed the Stake Spacing, Anchors and Mulch callouts; Changed the Palm Planting Note; Changed the Min. Wood Braces callout for the Palm Planting on Slope. |
| 630-001              | **All Sheets**: Reorganized; Updated Notes.  
**Plan 2**: Deleted FIGURE A "Pullbox Entry Of Conduit Under Sidewalks". |
| 630-010              | **Plan 1**: Clarified that EJB "A" is for double or triple conduit.  
**Plan 2**: Corrected callout detailing so arrows pointed to EJB's correctly.  
**Plan 4**: Changed Traffic Railing to Concrete Barrier. |
<p>| 634-002              | Cleaned up, Reorganized, and Changed Notes. |
| 635-001              | Updated Notes; Added 6&quot; Min. Depth to Ground Rod from top of Pull and Fiber Optic Boxes. |</p>
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| 649-010              | **Sheet 1:** Note 5B Added “including plate washers”.
**Sheet 2:** ELEVATION, Deleted minimum threaded length for ‘BC’; PLAN view, Deleted “Size And” from #11 bar description; Deleted “MAXIMUM ALLOWABLE MOMENT” column from table; Changed table “STEEL STRAIN POLE DATA TABLE”.
| 649-020              | **Sheet 1:** Changed Note 2; Note 3.E Deleted “ASTM F2329 galvanizing and added “ASTM A36” plate washers; Note 3.J added “including plate washers”; Changed Note 4.
**Sheet 3:** ELEVATION corrected longitudinal bar callout, added reference to Table; Added cross reference to Tables on Sheet 2.
| 649-030              | Added DS/25/5.0 to DRILLED SHAFT Table; Updated values of bolts, BA and BC values in POLE, BASE PLATE and ARM CONNECTION Table.
| 649-031              | **Sheet 1:** Changed Notes 4.D.a, 5, and 6.B.
**Sheet 3:** Clarified ARM SPLICE length; Clarified SECTION D-D Inside Bend Radius.
| 654-001              | New Index; Moved details for Mid-Block Crossing RRFB signs from Index 700-120.
| 659-010              | Updated Notes, “SIGN MOUNTING DETAIL”, and “DETAIL OF OPPOSING SIGNS SPAN WIRE MOUNTED”; Deleted “ADJUSTABLE HANGER FOR SIGN MOUNTING” detail.
| 660-001              | All Sheets: Reorganized; Clarified Notes.
| 665-001              | **Sheet 1:** Added (See DETAIL “A”) to the Concrete Pedestal and Strain Poles; Changed the Pushbutton distance to the edge of concrete; Changed Note 2; Deleted back-to-back pushbutton mounts in DETAIL “A”.
| 666-010              | Updated Notes; Reorganized Sheet; Added optional conduit to “POLE MOUNTED CONTROLLER CABINET—CONCRETE POLE” detail.
| 700-010              | **Sheet 1:** Clarified Example Notes.
**Sheet 2:** Changed title (lower right);  
**Sheet 3:** Clarified "OFFSET SIGN" Notes and * INSTALLING FRANGIBLE COLUMN SUPPORTS Notes; Changed Wall Thk for 8” OD column.
**Sheet 4:** Clarified NOTES 1, 2.B, 3.A. Added galvanized steel to 3.A.2.c; Changed 8” post thickness and weld dimensions.
**Sheet 5:** Added U-bolt to PLAN view and Max. column O.D. to ELEVATION view.
**Sheet 6:** Deleted "WIND BEAM PLACEMENT DETAILS"; Changed Wind Beam Placement Notes; Changed “SECTION A-A” to "VIEW A-A"; Changed top cantilever dimension.
| 700-011              | **Sheet 1:** Changed Note 2; Added Note 6; Changed “SECTION C-C” callouts; Corrected Bolt Spa. dimension lines and Min. sign panel length in Sign Detail; Added break lines in column and foundation in TYPICAL SECTION; Added NPS designation for column pipes to Table.
**Sheet 2:** Added Class I Concrete for “BASE AND FOUNDATION DETAIL”; Added break lines to “STUB DETAIL”.
| 700-012              | **Sheet 1:** Corrected Note 3.D.b; Changed Note 3.C.
| 700-013              | **Sheet 1:** Corrected Note 3.C.b; Table 1 changed NPS callout style.
| 700-020              | **Sheet 1:** Changed spacing of three columns; Clarified Note 2.A and B; Changed Note 3.B.c.
**Sheet 2:** Corrected weld symbols; Clarified column sections are steel.
**Sheet 3:** Clarified Wind Beam Tables; Added nylon washer note; Changed % sign depth Wind Beam spacing.
| 700-030              | Changed Title; Deleted the 12'-0” Max – Depth of Truss in the SIDE ELEVATION; Changed Washers (changed lock to std); Changed spacing of Hangers and Wind Beams to match 700-020 changes; Changed the WIND BEAMS AND VERTICAL HANGERS Table; Deleted Max. chord spacing from SIDE ELEVATION.
| 700-040              | **Sheet 2:** Corrected callout for longitudinal bars (FC to FL) in PLAN and ELEVATION of DRILLED SHAFT.
| 700-041              | **Sheet 1:** Changed Note 4.C.a
| 700-102              | **Sheet 8:** Corrected text positioning.
**Sheet 10:** Deleted MOT-2-06 and MOT-3-06.
**Sheet 11:** Updated due to deleted signs on Sheet 10.
<table>
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<tr>
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<tr>
<td>700-103</td>
<td>Deleted Index. Criteria located to FDM 230.</td>
</tr>
<tr>
<td>700-109</td>
<td>Changed &quot;OBJECT MARKER DETAIL&quot; to show two Wind Beams. Changed Notes; Deleted redundant material information; Changed &quot;DEAD END&quot; sign requirements.</td>
</tr>
<tr>
<td>700-110</td>
<td>Changed Index Title: Changed Notes; Changed bolt callouts on &quot;SECTION A-A (Side Elevation)&quot;;</td>
</tr>
<tr>
<td>700-120</td>
<td>All: Redeveloped and Renamed Index; Added Alpha-Numeric Designation system; Clarified use of Conventional and Solar power option for all assembly types.</td>
</tr>
</tbody>
</table>
| 706-001              | **Sheet 4:** Changed and Deleted RPMs in the “RPM PLACEMENT AT ISLANDS”, Details “G” and “H”.  
**Sheet 5:** Added new sheet showing the placement of raised pavement markers at limited access crossovers.  
**Sheet 6:** Added new sheet showing the placement of blue raised pavement markers. |
| 711-001              | All: Renumbered sheets.  
**Sheet 1:** Added Route Shield details; Added "PAVEMENT MESSAGE SPACING TABLE"; Added GENERAL NOTES; Updated Pavement Message Notes.  
**Sheet 7:** Added Note 3.  
**Sheet 8:** Deleted “100’ max.” for Right Turn Lane Drop Details.  
**Sheet 9:** Updated Pavement Message spacing distance to S.  
**Sheet 10:** Changed Intersection Details to Standard Crosswalk Details. Moved Note 3 to Sheet 7.  
**Sheet 11:** Updated Pavement Message spacing distance to S.  
**Sheet 12:** Deleted Sheet. Information included on Index 509-070. |
| 715-002              | **Sheet 1:** Changed GENERAL NOTE 4.B and Note 5.C.  
**Sheet 2:** Updated all details – deleted or revised pole dimensions.  
**Sheet 3:** Added dual dimensions to “ARM CONNECTION DETAIL” and “SECTION A-A”. Deleted "ARM TABLE" and its Notes; Changed “ARM TUBE EXTRUSIONS NOTES”.  
**Sheet 4:** Changed FOUNDATION Depth Requirement; Added dual dimensions to "POLE BASE ELEVATION"; Deleted All Table and Added new tables; Updated NOTES.  
**Sheet 5:** Added dual dimensions to the “BASE PLATE PLAN”; Deleted the “POLE TABLE”; Updated NOTES. |
| 715-010              | **Sheet 1:** Changed Notes 2 and 4.  
**Sheet 2:** ELEVATION – Editorial; Changed "POLE DESIGN TABLE" – Deleted Column, Editorial; "BASE PLATE AND BOLTS DESIGN TABLE" – Changed some Base Plate Thicknesses.  
**Sheet 3:** “SECTION E-E” Changed Inside Bend Radius details. |
2-LANE, 4-LANE OR 6-LANE PAVEMENT, NO MEDIAN

NOTES:

1. These details apply to both paved and grassed shoulders. For median shoulders use 0.05 in lieu of 0.06.

2. SHOULDER ON HIGH SIDE: A shoulder slope of 0.06 downward from the edge of travel way will be maintained until a 0.07 break in slope at the pavement edge is reached due to superelevation of the pavement. As the pavement superelevation increases, the 0.07 break in slope will be maintained and the shoulder flattened until the shoulder slope reaches the minimum of 0.02 downward from the edge of travel way. Any further increase in pavement superelevation will necessitate slope the inside half of the shoulder toward the travel way and the outer half outward, both at 0.02 for superelevations 0.06 to 0.09 and both at 0.03 for superelevation 0.10. For shoulders with paved widths 5 feet or less see Special Shoulder Break Over Details on Sheet 2 of 2.

3. SHOULDER ON LOW SIDE: Maintain 0.06 cross slope across shoulder until pavement cross slope reaches 0.06. For pavement cross slopes greater than 0.06, shoulder to have same slope as pavement. See SHOULDER SLOPES ON SUPERELEVATION SECTION (Sheet 2).
8-LANE PAVEMENT WITH ONE LANE SLOPED TO MEDIAN

SECTION A-A
NORMAL CROWNEO 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 LT.
SECTION E-E
SUPERELEVATION TRANSITION LT.
FULL SUPERELEVATION RT.
SECTION F-F
FULL SUPERELEVATION LT. & RT.

HIGH SPEED ROADWAYS

SUPERELEVATION TRANSITIONS

1. For shoulders with paved widths 5 feet or less see special shoulder break over details.
2. For Concrete pavement, the first 1'-0" of the outside shoulder is cast with the outside travel lane and will have the same cross slope as the outside lane. The shoulder break over will occur at the outside edge of the outside slab.

SPECIAL SHOULDER BREAK OVER DETAILS

SLOPES OF TRAVELED WAY AND ABUTTING SHOULDERS

SHOULDER SLOPES ON SUPERELEVATION SECTIONS

a) 12 AND 10 FULL WIDTH SHOULDERS WITH 9 OR LESS PAVED WIDTHS.

b) 8 FULL WIDTH SHOULDERS WITH 4 OR LESS PAVED WIDTHS.

c) 6 FULL WIDTH SHOULDER WITH 5 PAVED WIDTH

12' AND 10' FULL WIDTH SHOULDER
WITH 9 FEET PAVED WIDTH

6' FULL WIDTH SHOULDER
WITH 5 FEET PAVED WIDTH

5' FULL WIDTH SHOULDER
WITH 5 FEET PAVED WIDTH

5' FULL WIDTH SHOULDER
WITH 5 FEET PAVED WIDTH

SPECIAL SHOULDER BREAK OVER DETAILS

1. For shoulders with paved widths 5 feet or
2. For Concrete pavement, the first 1'-0" of the
outside shoulder is cast with the outside travel lane and will have the same cross slope as the outside lane. The shoulder break over will occur at the outside edge of the outside slab.
GENERAL NOTES:
1. Obtain Superelevation 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 Plans. Should the rotation traverse the entire section and further superelevation be required, the remaining rotation of the plane shall be about the low edge of the inside travel lane. Crown is to be removed in the auxiliary lane to the outside of the curve only when the adjoining travel lanes require positive superelevation.

2. When positive superelevation is required, continue the slope of the pavement across the gutter on the high side.

3. Place short vertical curves at all angular profile breaks within the limits of the superelevation transition.

4. The variable superelevation transition length "L" has a minimum value of 30 feet for design speeds under 40 MPH and 75 feet for design speeds of 40 MPH or greater.

5. Roadway sections having lane arrangements different from those shown, but composed of a series of planes, are superelevation in a similar manner.

FOR LOW SPEED HIGHWAYS
SUPERELEVATION TRANSITION SECTIONS

UNDIVIDED FACILITIES

THREE TRAVEL LANES EACH DIRECTION WITH MEDIAN
DIVIDED FACILITIES

PARABOLIC SECTION

When this section is used, superelevation is established by rotating a tangent about the arc of the parabolic crown until the desired slope is attained (points A & B on sketch). The normal parabolic crown will be maintained outside the limits of the plane thus formed.
**EXAMPLE SUPERELEVATION SECTIONS AND PROFILES FOR LOW SPEED HIGHWAYS**

**Note:**
The sections and profiles shown are examples of superelevation transitions. Similar schemes should be used for roadways having other sections.

**PROFILES FOR LOW SPEED HIGHWAYS**

**SUPERELEVATION TRANSITIONS - LOW SPEED HIGHWAYS**
GENERAL NOTES:

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.

LEGEND:

Shoulder Pavement

SINGLE LANE RAMPS - EXIT TERMINALS
**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)
   - C. Concrete Barrier (Free-Standing or Anchored)
   - D. Steel Barrier (Anchored)
   - E. 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. Remove all grass debris, loose dirt, and sand for the pavement, bridge deck, or asphalt pad surface within the barrier footprint just prior to placement of the temporary barrier.

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

6. Transitions are required between Type K Barrier and free-standing, anchored, back-filled materials, equipment, and objects.

7. Transitions are required between Type K Barrier and permanent bridge or traffic railing. Refer to the APL for transitions allowed for Proprietary Temporary Barrier Systems.

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 slab 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.

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<td>Anchored</td>
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<tr>
<td>Free-standing</td>
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* For Bridge Decks see Index 102-110 or APL

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**ROADSIDE INSTALLATION**

**MEDIAN INSTALLATION**

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**TEMPORARY BARRIER**

**INDEX 102-100**

**STANDARD PLANS**

**FY 2019-20**

**DESCRIPTION:**

**REVISED 11/01/17**

**REVISION**

**LAST REVISION 11/01/17**

**REVISED 11/01/17**

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**Above Ground Hazard**

**Drop-Off Hazard**

**Asphalt Pad**

**Pavement or Flexible or Rigid**

**Edge of Travel Way**

**Barrier Unit**

**Above Ground Hazard Or Drop Off**

**Lateral Offset**

**Setback Distance**

**Flexible or Rigid Pavement or Asphalt Pad**

**Pavement/Asphalt Width**

**Setback Distance**

**Below Ground Hazard**

**Drop-Off Hazard**

**Asphalt Pad**

**Pavement or Flexible or Rigid**

**Edge of Travel Way**

**Barrier Unit**

**Barrier Delineators**

**Stop Distance**
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 1/2" 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 3/4" 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. REUSE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.

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 pre-bagged 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.

DETAIL OF CONNECTION BETWEEN BARRIER UNITS

CONNECTION PIN DETAIL

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

3-3-2-1 ANCHORAGE TRANSITION DETAIL

FREE-STANDING BARRIER:
- 1 Anchor

TYPE K BARRIER 3-3-2-1 TRANSITION:
- 2 Anchors
- 3 Anchors
- 4 Anchors

CRASH CUSHION OR ADDITIONAL ANCHORED TYPE K UNITS:
- 1 Anchor
- 2 Anchors
ADHESIVE-BONDING MATERIAL SYSTEMS: When using Adhesive Bonding Material Systems for Anchor Bolts, use Type HSHV in accordance with ASTM F 1554.

ANCHOR BOLTS, NUTS AND WASHERS: When using Adhesive-Bonded Anchor Bolts, use fully threaded rods in accordance with ASTM F 1554.

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. Install Anchor Bolts for through bolting in accordance with ASTM A 307 or ASTM A 194. Install Plate Washers in accordance with ASTM A 36 or ASTM A 152 Grade 36.

Install three (3) Anchor Bolts per Barrier Unit on the transverse 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 B 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 tops 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 Unit is 1/2. 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 as 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.

NOTES FOR BOLTED INSTALLATIONS:
- Bridge deck shown, approach slab or rigid pavement similar; installation adjacent to drop-off shown, median transition installation similar.
- Use Type HSHV in accordance with ASTM F 1554.

REFERENCES:
- Type HSHV: ASTM F 1554
- Fully threaded rods: ASTM F 1554

ADHESIVE BONDED Anchor INSTALLATION: See PTFE Taping Detail.

TREATMENT AT BRIDGE DECK Expansion JOINT SCHEMATIC:
- To accommodate movement at Expansion Joint, set Barrier Units with 3/8 gap at locations shown.
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 709 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.

TYPICAL BRIDGE SECTION

FREE-STANDING INSTALLATION

NOTES FOR FREE-STANDING INSTALLATION:

1. For Bridge Decks only, use Keeper Pins that are 1" diameter, smooth steel bar in accordance with ASTM A 36 or ASTM A 709 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 Installation), 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.
FLOWABLE FILL BACK-FILL ROADSIDE INSTALLATIONS

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:**

**REVISION**

**INDEX**

**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

**FY 2019-20 STANDARD PLANS**

**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
**REVISION DESCRIPTION:**

Revision of STANDARD PLANS FY 2019-20

**INDEX SHEET 102-110**

**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

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**32" F or New Jersey Shape**

** Median Traffic Railing**

Align Top of Type K Barrier Unit with Traffic Railing at its end

Align Top of Type K Barrier Unit with Traffic Railing at its end

32" F Shape Traffic Railing (shown);
32" New Jersey Shape and 42" F Shape Traffic Railings and 8' or 14' Traffic Railing / Noise Walls (similar)

* See Thrie-Beam Guardrail Positioning Detail, Sheet 10 and Notes for Thrie-Beam Guardrail Splice Installations, Sheet 1.

Anchored Type K Barrier

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**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**

---

**Approach Transition Splice Detail**

For F and New Jersey Shape Traffic Railings and 8' & 14' Traffic Railing / Noise Walls (Concrete Barrier Wall Similar)

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**Notes:**

- Anchor Bolts or Stakes (shown)
- Paved Surface (Type varies)
- Raised Sidewalk
- Vertical End Taper required for 42" Vertical Shape Traffic Railing (similar)
- Vertical End Taper required for 42" Vertical Shape Traffic Railing (similar)

---

**Drawings:**

- Particular Plan Views
- Cross References:
  - See Sheet 10 for Section A-A, Section B-B and Section C-C.
11/01/17

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM
STANDARD PLANS

DESCRIPTION:

FREE-STANDING TYPE K BARRIER SHOWN: ANCHORED

BARREL SIMILAR. SEE PLANS FOR SPECIFIC REQUIREMENTS.

32" f SHAPE TRAFFIC RAILING (SHOWN):
32" NEW JERSEY SHAPE AND 42" F SHAPE TRAFFIC RAILINGS AND 8' OR 14' TRAFFIC RAILING / NOISE WALLS (SIMILAR)

PARTIAL PLAN VIEW

1'-0" ±

LIMITS OF CONCRETE FILL

PARTIAL ELEVATION VIEW

Paved Surface (Type varies)

Fill tapered toe if present (shown hatched) with concrete, see Note on Sheet 1

FIRST BEAM GUARDRAIL SPLICE

Offset Block

bolted to guardrail

Align Top of Type K Barrier Unit with Traffic Railing at its end

TRAFFIC RAILING / NOISE WALLS

 FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS

PartIAL PLAN VIEW

1'-0" ±

TRAFFIC RAILING / NOISE WALLS (SIMILAR)

Traffic Railing / Noise Walls (similar)

32" New Jersey Shape and 42" F Shape Traffic Railings and 8' or 14' Traffic Railing / Noise Walls (similar)

PARTIAL ELEVATION VIEW

Paved Surface (Type varies)

Fill tapered toe if present (shown hatched) with concrete, see Note on Sheet 1

THREE-BEAM GUARDRAIL SPLICE

Cross References:
See Sheet 10 for Section A-A, Section B-B and Section C-C.

For F and New Jersey Shape Traffic Railings
AND 8' & 14' TRAFFIC RAILING / NOISE WALLS

Cross References:
See Sheet 10 for Section A-A, Section B-B and Section C-C.

For Florida Corral and Vertical Shape Traffic Railings
**SECTION A-A**

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

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

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

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

**SECTION A-A**

Median Concrete Barrier Wall (similar)

32" F Shape Median Traffic Railing (shown), 32" New Jersey Shape Traffic Railing (shown), Florida Corral Traffic Railing (similar)

32" F or New Jersey Shape Traffic Railing (shown), 32" F 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 B-B**

Adjacent to Shoulder Traffic Railings

**SECTION C-C**

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

32" New Jersey Shape Traffic Railing (shown), 32" F Shape Traffic Railing (shown), 32" F Shape Traffic Railing (shown), Florida Corral Traffic Railing (similar)

**SECTION D-D**

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

**SECTION E-E**

32" New Jersey Shape Traffic Railing (shown), 32" F Shape Traffic Railing (shown), 32" F Shape Traffic Railing (shown), Florida Corral Traffic Railing (similar)
APPRAOCH 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

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

LEGEND:
1. Dot indicates number and position of Bolts or Nails.

TYPE K-PROPRIETARY TEMPORARY CONCRETE BARRIER TRANSITIONS

INDEX 102-110

FY 2019-20 STANDARD PLANS

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

11 of 17
**DESCRIPTION:**

**LAST REVISION:** 01/01/17

**INDEX:** 11/01/17

**STANDARD PLANS**

**FY 2019-20**

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

**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

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

**APPROACH 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**

**FREESTANDING PROPRIETARY TEMPORARY BARRIER**

**BACK-FILLED TYPE K BARRIER**

**FREE-STANDING PROPRIETARY TEMPORARY BARRIER**
APPROACH SHOULDER BARRIER ON UNDIVIDED FACILITIES

DEPARTURE (TRAILING) SHOULDER BARRIER ON UNDIVIDED FACILITIES
(BARRIER TYPE K ON BRIDGES AND APPROACH SLABS)

DEPARTURE (TRAILING) SHOULDER BARRIER ON DIVIDED FACILITIES
(BARRIER TYPE K ON BRIDGES AND APPROACH SLABS)

CONTINUATION OF BARRIER • FROM OTHER TYPE BARRIERS TO BARRIER TYPE K
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 APL.

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

END TREATMENT WHEN SHIELDED BY A CRASH CUSHION

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 346-10.7 through 346-10.4 are not applicable.
C. Barrier Units represented by concrete acceptance strength tests which fail 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 2\(\frac{1}{2}\)" 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 362, all or part of Bars 6D.
D. In 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 37 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 600 and 521.
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 K
   - Fabricator’s name or symbol
   - Date of manufacture (day, month and year)
**Concrete Barrier Quotations**

**Item**
- Concrete
- Reinforcing Steel

**Unit**
- CY
- LB

**Quantity**
- 1.29
- 218

*The above quantities are for one Barrier Unit.*

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

**Estimated Temporary Concrete Barrier Quantities**

**Description:**
- 2 8 Lifting Sleeve Assembly
- Anchor Blockout
- Plan View
- Elevation View
- Lift/Drain Slot

**Plan View**
- Section D-D
- Lifting Sleeve Assembly Detail (Optional)

**Elevation View**
- Section Thru Lift/Drain Slot

**Anchor Blockout Detail**
- Reinforcement not shown for clarity

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

**Notes:**
- Optional Sp. used.
- Bars 6C (both sides) (Typ.)
- Bars 6C
- Bars 6C
- Anchor Blockout (Typ.)
- 2" Hole (2" NPS)
- Bars 4E (Bend to clear Bars 6D) (Typ.)
- Bars 4E (Bend to clear Bars 6D) (Typ.)
- Bars 4E (Bend to clear Bars 6D) (Typ.)
- Bars 4E (Bend to clear Bars 6D) (Typ.)

**Dimensions:**
- 10'-0" to 12'-0"
- 6'-0" to 9'-0"
- 3'-0"
- 2'-0" to 2'-3" (Lift/Drain Slot)
- 1'-0" to 1'-8" (Typ.)
Match D19.7 spacing to Bars 4A in the Elevation View, Sheet 15.

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

Field trim D17.2 to clear drain slot by 2".

Match D17.2 spacing to Bars 4A in the Elevation View, Sheet 15.

Reinforcement cage as shown.

Provide 1/8" Chamfer at top and bottom corners of Barrier.

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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. Pursuant to federal law, the University may pursue royalties for a valid patent. Only those 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 the production of concrete barrier walls. Each barrier wall unit shall be permanently marked with an identification mark that is traceable to the manufacturer, the producing 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.

2. Units shall be produced in Department-approved plants with quality control plans for the production of concrete barrier walls. Each barrier wall unit shall be permanently marked with an identification mark that is traceable to the manufacturer, the producing 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.

3. 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. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

4. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

5. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

6. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

7. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

9. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

10. Tubular markers shall be orange in color and installed along the run of barrier at the ends and at 30’ 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.

BACKSIDE AND END PICTORIAL VIEWS

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

DESCRIPTION:

- **Traffic Face**
  - CONCAVE CONNECTION
  - FLAT FACE FEMALE END
  - BEVELED FACE MALE END

**PLAN VIEWS OF CONNECTIONS**

**END VIEWS**

**DEFLECTION SPACE AT DROP-OFFS**

- **Work Zone Speed**: 45 MPH or Less
- **Offset To Travelway**: 1'-2' Preferred
- **Deflection Space**: 9"

**Notes:**

- **Limitation of Use**: This installation technique can only be used on flexible or rigid pavement.
- **Asphalt Pad**: Where existing pavement is not present, construct 2" Asphalt Pad using miscellaneouasphalt pavement in accordance with Specification Section 339 with the exception that the use of a pre-emergent herbicide is not required. Payment for asphalt pad will be included in the cost of the barrier.

**Plan View of Approach End Offset**

- **Approach Traffic**
- **Clear Zone (CZ)**
- **Flexible or Rigid Pavement**

**Flow of Work Zone**

- **Deflection Space**
- **Height To Bottom of Type 1 Object Marker**: 3/4" 18"
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

MAXIMUM CURVATURE ● MINIMUM RADIUS

TRAFFIC SIDE
CONVEX CURVATURE

Inset A

TRAFFIC SIDE
CONCAVE CURVATURE

Inset B

See Inset A

See Inset B

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 | Object Marker |

**BARRIER OPENINGS AT DRIVEWAYS**

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY
**LEGEND**

- Type I Object Marker

**PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY**

**BARRIER OPENINGS AT DRIVEWAYS**

- 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
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 335.15, F.S.

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DEFINITIONS

Regulatory Speed (In Work Zones)
The maximum permitted travel speed posted for the work zone is indicated by the regulatory speed limit sign. The work zone speed must be shown or noted in the plans. This speed should be used as the minimum design speed to ensure the maximum comfort of the work zone (i.e., to determine length of work zone, shoulder width, etc.). The posted speed limit is based on posted speed limits from the roadway or a speed limit of 30 mph or less, whichever is lower. The posted speed limit is based on posted speed limits from the roadway or a speed limit of 30 mph or less, whichever is lower.

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 zone, travel lanes 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 through traffic and to separate it from opposing traffic or occupying other travel 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 traffic onto 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 that 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 OSHAapproved. All equipment shall be appropriate to 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, 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 options is used:

OPTION 1 (OVERHEAD WORK USING A MODIFIED LANE CLOSURE)
Work under the use of a modified lane closure is allowed if all of the following conditions are met:

a. Work operation is located in a signalized intersection and limited to signals, signs, lighting and utilities.
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 a 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.

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

OPTION 4 (OVERHEAD WORK MAINTAINING TRAFFIC WITH NO ENCROACHMENT BELOW THE OVERHEAD WORK AREA)
Traffic shall be detoured, shifted, diverted or paced as to not encroach in the area above or below the overhead work operations 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, segmental and bent/curb cap placement.
b. Form and falsework placement and removal.
c. Concrete placement.
d. Rail construction located at edge of deck.
e. Structure demolition.

OPTION 5 (CONDUCTOR/CABLE PULLING ABOVE AN OPEN TRAFFIC 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 no 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 conflicts to reduce queuing on the tracks. The evaluation should include 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 curbs.

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 shall 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 FDOT Design Manual 213.2.

### OVERWEIGHT/OVERSIZE VEHICLES

Restrictions to Lane Widths, Heights or Load Capacity can greatly impact the movement of over dimensioned loads. The Contractor shall notify the Engineer in turn shall notify the State Permits Office, phone no. (850) 410-3777, 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 weights) and restriction times frames. When the roadway is restored to normal service the State Permits Office shall be notified immediately.

LAME WIDTHS

Lane widths of through roadways should be maintained through work zone travel ways wherever practical. The minimum widths for work zone travel lanes shall be as follows: 11’ for Interstates 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.

### 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>
</tr>
</thead>
<tbody>
<tr>
<td>60-70</td>
<td>70</td>
<td>18</td>
</tr>
<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>35</td>
<td>10</td>
<td>10</td>
</tr>
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### 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 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 2 apparel may be substituted for Class 2 apparel. Replace apparel that is not visible at 1,000 feet.

### MINIMUM RADIUS FOR NORMAL CROWN

<table>
<thead>
<tr>
<th>WORK ZONE POSTED SPEED (MPH)</th>
<th>MINIMUM RADIUS (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>4090</td>
</tr>
<tr>
<td>65</td>
<td>3333</td>
</tr>
<tr>
<td>60</td>
<td>2400</td>
</tr>
<tr>
<td>55</td>
<td>1840</td>
</tr>
<tr>
<td>50</td>
<td>1390</td>
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<tr>
<td>45</td>
<td>1080</td>
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<tr>
<td>40</td>
<td>830</td>
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<tr>
<td>35</td>
<td>610</td>
</tr>
<tr>
<td>30</td>
<td>430</td>
</tr>
</tbody>
</table>

### SUPERELEVATION

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

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>MINIMUM RADIUS (feet)</th>
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<tr>
<td>35</td>
<td>1390</td>
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<td>40</td>
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<td>50</td>
<td>610</td>
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<tr>
<td>55</td>
<td>430</td>
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### LENGTH OF LANE CLOSURES

For interstates and state highways with a posted speed of 55MPH or greater, lane closures must not exceed 3 miles (includes taper, buffer, and work zone) in any given direction and must not close two consecutive interchanges.

### REGULATORY SPEEDS IN WORK ZONES

Traffic Control Plans (TCP’s) 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 interspaced 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.

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’ 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 investigate the need. It will not be necessary for the District Traffic Operations Engineer (DTOE) to investigate the need. The 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). Advisory 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 FDOT Design Manual 240.
FLAGGER CONTROL
Where flaggers are used, a FLAGGER symbol or legend sign must replace the WORKERS symbol or legend sign.

The flagger must be clearly visible to approaching traffic for a distance sufficient to permit proper response by the motorist to the flagging instructions, and to permit traffic to reduce speed or stop as required before entering the work site. Flaggers shall be positioned to maintain maximum color contrast between the flagger’s high-visibility safety apparel and equipment and the work area background.

Hand-Signaling Devices
STOP/SLOW paddles are the primary hand-signaling device. The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. If the STOP/SLOW paddle is placed on a rigid staff, the minimum length of the staff, measured from the bottom of the paddle to the end of the staff that rests on the ground, must not be less than 6 ft. STOP/SLOW paddles shall be at least 24 inches wide with letters at least 6 inches high and should be fabricated from light semirigid material. The background of the STOP face shall be red with white letters and border. When used at nighttime, the STOP/SLOW paddle shall be retroreflectorized.

Flag use is limited to immediate emergencies, intersections, and when working on the centerline or shared left turn lanes where two (2) flaggers are required and there is opposing traffic in the adjacent lane. Flags, when used, shall be a minimum of 24 inches square, made of a good grade of red material, and secured fastened to a staff that is approximately 36 inches in length. When used at nighttime, the STOP/SLOW paddle shall be retroreflectorized.

Flag Stations
Flag stations shall be located far enough in advance of the work zone so that approaching road users will have sufficient distance to stop before entering the work zone. When used at nighttime, the flag station shall be illuminated.

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 when lane closures occur, at the discretion of the Party Chief.

When Traffic Control Through Work Zones is being used for survey purposes only, the END ROAD WORK sign and/or the message "Territory Ahead" shall be used.

Survey Between Active Traffic Lanes or Shared Access Turn Lanes
The following provisions apply to Main Roadway Traffic Control Work Zones. These provisions must be adjusted by the Party Chief to fit roadway and traffic conditions when the Work Zone Survey includes intersections.

(A) A STAY IN YOUR LANE (MOT-1-06) sign shall be added to the Advance Warning Sign sequence as the second most immediate sign from the work area.

(B) Elevation Surveys-Cones may be used at the discretion of the Party Chief to protect the survey equipment, and flaggers. Cones, if used, may be placed at up to 59 intervals along the break line between work zones.

(C) Horizontal Control-With traffic flow in the same direction, cones shall be used to protect the backside tripods and/or instrument. Cones shall be placed at the equipment, and up to 50 intervals for at least 200 to 300 feet towards the flow of traffic.

(D) Horizontal Control-With traffic flow in opposite directions, cones shall be used to protect the backside tripods and/or instrument. Cones shall be placed at the equipment, and up to 50 intervals for at least 200 to 300 feet in both directions towards the flow of traffic.

SIGNS
SIGN MATERIALS
Mesh signs and non-reflective vinyl signs may only be used for daylight operations. Non-reflective vinyl signs must meet the requirements of Specifications Section 994.

Retroreflective vinyl signs meeting the requirements of Specification Section 994 may be used for daylight or night operations to exceed 1 day except as noted in the Indexes.

Rigid or Lightweight sign panels may be used in accordance with the vendor APL drawing for the sign stand to which they are attached.

INTERSECTING ROAD SIGNING
Signs controlling traffic entering and leaving work zones by way of intersecting crossroads shall be adequate to drive motorist aware of work zone conditions. When work operations exceed 50 minutes, place the ROAD WORK AHEAD sign on the side street entering the work zone.

ADJOINING AND/OR OVERLAPPING WORK ZONE SIGNING
Adjoining work zones may not have sufficient spacing for standard placement of signs and other traffic control devices in their advance warning area. In some cases other areas within their traffic control zones. Where such restraints or conflicts occur or are likely to occur, one of the following methods will be employed to avoid conflicts and prevent conditions that could lead to misunderstanding on the part of the traveling public as to the intended travel way by the traffic control procedure applied:

(A) For scheduled projects the engineer in responsible charge of project design will resolve anticipated work zone conflicts during the development of the project traffic control plan. This may entail revision of plans on preceding projects and coordination of plans on concurrent projects.

(B) Unanticipated conflicts arising between adjoining in progress highway construction projects will be resolved by the Resident Engineer for projects under his residency, and, by the District Construction Engineer for in progress projects under adjoining residencies.

(C) The District Maintenance Engineer will resolve anticipated and occurring conflicts within scheduled maintenance operations.

(D) The Unit Maintenance Engineer will resolve conflicts that occur within routine maintenance works; between routine maintenance work, unscheduled work and/or permitted work; and, between unit controlled maintenance works and highway construction projects.

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.

Sign blanks 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 (R1-14) 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 when limited sight distance or the nature of the obstruction may require a motorist to bring their vehicle to a stop. Extended distance Advanced Warning Signs may be required on any type roadway, but particularly on multilane 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 FT (W20-1) sign for utility operations on or adjacent to a highway.

LENGTH OF ROAD WORK SIGN
The length of road work sign (G20-1) boaring the legend ROAD WORK NEXT_____ 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.

SPEEDING 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 END ROAD WORK sign midway to the next sign whichever is less.

GROOVED PAVEMENT AHEAD SIGN
The GROOVED PAVEMENT AHEAD sign shall be placed at the beginning of a segment of grooved pavement. The W-8-15P 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 if the work operation is less than 1 day. The sign should be placed approximately 500 feet beyond the end of a construction or maintenance project, or distance other is called for in the plans. When other Construction or Maintenance Operations occur within 1 mile of this sign should be added and placed 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:
   a. Road closure signs mounted in accordance with the vendor drawing for the Type III Barricade shown on the APL.
   b. Pedestrian advanced warning or pedestrian regulatory signs mounted on signs in accordance with the vendor drawing shown on the APL.
   c. 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 NCHRP 350 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 application, design calculations (for square tube only), and detailed 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 50, or ASTM A 576, Grade 70.

8. Sign attachment bolts, washers, nuts, and spacers shall conform with ASTM A 307 or A 36.

9. For diamond warning signs with supplement plaque (up to 3 ft² in area), use 4 lb/ft posts for up to 10 ft Clear Height (measure 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. 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.

12. Install all posts plumb.

13. The contractor may set posts in prepared holes to the specified depth with suitable backfill tamped securely on all sides, or drive 3 lb/ft sign posts and any size base post in accordance with the manufacturer's detail shown on the APL.

POST AND FOUNDATION TABLE FOR WORK ZONE SIGNS

<table>
<thead>
<tr>
<th>SIGN SHAPE</th>
<th>SIGN SIZE</th>
<th>NUMBER OF STEEL U CHANNEL POSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Octagon</td>
<td>3x3x3</td>
<td>1</td>
</tr>
<tr>
<td>Triangle</td>
<td>3x3x3</td>
<td>1</td>
</tr>
<tr>
<td>Square</td>
<td>3x3x3</td>
<td>1</td>
</tr>
<tr>
<td>Diamond</td>
<td>3x3x3</td>
<td>1</td>
</tr>
<tr>
<td>Circle</td>
<td>3x3x3</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes For Table:

1. Use 3 lb/ft posts for Clear Height up to 10 ft and 4 lb/ft posts for Clear Height up to 12 ft.

2. Use 4 lb/ft U-channel sign post with a minimum yield strength of 60 ksi.

3. Minimum foundation depth is 4.0' for 3 lb/ft posts and 4.5' for 4 lb/ft posts.

4. 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.

5. 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 Index 3), asphalt roadway, shoulder pavement or soil under sidewalk.
**PROJECT INFORMATION SIGN**

**SIGN ATTACHMENT DETAIL**

**PROJECT INFORMATION SIGN DETAIL**

**4 POST SIGN SUPPORT MOUNTING DETAIL**

**BRACKET DETAIL**

**SIGN ATTACHMENT DETAIL (WITH Z-BRACKET)**

**PROJECT INFORMATION SIGN NOTES:**

1. Road designation should be the most common designation (i.e. I-Interstate, SR-State Road or US.)

2. Italic text on signs indicate variable information specific to the project.

3. See Sheet 5 for Typical Foundation Details and Post and Foundations Table.

---

**SR-XXX IMPROVEMENTS**

**BY FDOT AND CONTRACTOR**

**COMPLETION: SEASON YR.**

**QUESTIONS OR COMMENTS**

**1-XXX-XXX-XXXX**

**CONTRACTOR**

**SEASON YEAR**

**1-XXX-XXX-XXXX**

**PROJECT INFORMATION SIGN DETAIL**

**50 MPH OR GREATER**

Use SIGN ATTACHMENT DETAIL (WITH Z-BRACKET).

**PROJECT INFORMATION SIGN DETAIL**

**45 MPH OR LESS**

Use SIGN ATTACHMENT DETAIL (WITHOUT Z-BRACKET). On Sheet 5.

---

**PROJECT INFORMATION SIGN**

**GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONES**

**FY 2019-20**

**STANDARD PLANS**

**INDEX**

**SHEET**

**102-600**

6 of 12

---

**Last Revision:**

**Date:** 01/01/17

**Description:**
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.

Manhole or other above ground obstruction

Asphalt Apron

Temporary Surface

The apron is 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, Inc.

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.

SIGNALS
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 at 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 Design Manual 240.

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 Specification 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, ruting 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 1.

DROP-OFF CONDITION DETAIL

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop-off Protection Requirements</td>
</tr>
<tr>
<td>Condition</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

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 15' 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 M4-1 and M4-2 signs shall be used as a supplement to the W8-11; this condition should never exceed 3 miles in length.

6. When permanent curb heights are ≥ 6", no channelizing device will be required. For curb heights < 6", see Table 1.

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.

DROP-OFFS IN WORK ZONES
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.

5. 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.

6. 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.

**PLACEMENT OF BUSINESS ENTRANCE SIGNS AND CHANNELIZING DEVICES AT BUSINESS ENTRANCE**

**TEMPORARY LANE SEPARATOR**
GENERAL INFORMATION FOR TRAFFIC CONTROL THROUGH WORK ZONES

**Overview**

- The details shown on this sheet are for the following purposes:
  - To provide information that supplements or supersedes that provided by the MUTCD.
  - To provide information that is necessary for workers within the work areas.

**Channelizing Device Notes**

1. The details shown on this sheet are for the following purposes:
   - For ease of identification and reference.
   - 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 1/2" 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:
   - Be used only in active work zones where workers are present.
   - Be reflective as per the MUTCD with Department-approved reflective collars when used at night.

9. Vehicular longitudinal channelizing devices shall not exceed 30' 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 50' 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 walkway. 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 1/4" 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 Index:

   - **Index**
   - **Description**
   - **100-100**
   - **Temporary Barrier**
   - **102-120**
   - **Low Profile Barrier**
   - **536-001**
   - **Guardrail**

2. Trailer Mounted Barriers may be used to provide positive protection for workers within the work areas. 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.
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 FLAGGER sign shall be substituted for the WORKERS sign. For location of flaggers and FLAGGER 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 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 ENCROACH THE AREA CLOSER THAN 15' BUT NOT CLOSER THAN 2' TO THE EDGE OF TRAVEL WAY.
GENERAL NOTES:

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

A. Railroad Crossings:
   a. If an active railroad crossing is located closer to the Work Area than the queue length plus 300 feet, extend the Buffer Space as shown on Sheet 3.
   b. If the queuing of vehicles at an active railroad crossing cannot be avoided, provide a uniformed traffic control officer or flagger at the high-side rail crossing to prevent vehicles from stopping within the high-side rail crossing, even if automatic train warning devices are in place.
   c. If the Work Area encroaches on the Centerline of the highway-rail grade crossing, even if automatic train warning devices are in place, provide a uniformed traffic control officer or flagger at the highway-rail grade crossing to prevent vehicles from stopping within the greatest attainable length, not less than 200 ft, for posted speeds greater than 25 mph.
   d. If the queuing of vehicles across an active railroad crossing cannot be avoided, provide a uniformed traffic control officer or flagger at the high-side rail crossing to prevent vehicles from stopping within the high-side rail crossing, even if automatic train warning devices are in place.

2. Temporary Raised Rumble Strips:
   a. Use when both of the following conditions are met concurrently:
      - Existing Posted Speed is 55 mph or greater;
      - Work operations are 60 minutes or less.
   b. Work duration is greater than 60 minutes.
   c. There are no sight obstructions to vehicles approaching the work area for a distance equal to the Buffer Space shown in Table 1.
   d. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

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 TCZ 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. 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.

7. ROAD WORK AHEAD and the BE PREPARED TO STOP signs may be omitted if all of the following conditions are not met:
   a. Existing Posted Speed is 55 mph or greater;
   b. Work duration is greater than 60 minutes.
   c. There are no sight obstructions to vehicles approaching the work area for a distance equal to the Buffer Space shown in Table 1.
   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.
   f. Volume and complexity of the roadway has been considered.

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.

CONDITIONS:

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

TABLE 1

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Maximum Spacing of Cylinders or Tubular Markers</th>
<th>Maximum Spacing of Type I or Type II Barricades/Panels/Drums</th>
<th>Distance Between Signs</th>
<th>Buffer Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>2 0</td>
<td>2 0</td>
<td>2 0</td>
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</tr>
<tr>
<td>70</td>
<td>2 0</td>
<td>2 0</td>
<td>5 0</td>
<td>5 50</td>
</tr>
</tbody>
</table>

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

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

- **DESCRIPTION:**
  - FY 2019-20
  - STANDARD PLANS
  - TWO-LANE, TWO-WAY WORK WITHIN THE TRAVEL WAY

- **INDEX:**
  - 102-603

- **SHEET:** 1 of 3

- **LAST REVISION:** 01/01/17
SYMBOLS:

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

TEMPORARY RAISED RUMBLE STRIPS

(When Required See GENERAL NOTE 2)

OPTION - 1

REMOVABLE POLYMER STRIPING TAPE

RUMBLE STRIP SET

OPTION - 2

MOLDED ENGINEERED POLYMER SET

RUMBLE STRIP SET

TEMPORARY RAISED RUMBLE STRIPS

* May Be omitted if ROAD WORK AHEAD sign is installed upstream within the project limits.
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.
5. Maximum spacing between channelizing devices shall be no 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:
   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 equal to A plus B.
   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 A PORTION OF ONE OR MORE TRAFFIC LANES IN AN INTERSECTION.

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>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>45 mph</td>
<td>250</td>
<td>250</td>
</tr>
</tbody>
</table>

INDEX
102-604

1 of 1
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.
   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 ON THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRE THE CLOSURE OF ONE TRAFFIC LANE, FOR WORK AREAS 200' OR MORE DOWNSTREAM FROM AN INTERSECTION FOR A PERIOD OF MORE THAN 60 MINUTES.
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 temporary 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
- Work Zone Sign
- 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.
SINGLE LANE CLOSURE • ROADWAY AND BRIDGES ALL LENGTHS

SINGLE LANE CLOSURE • SHORT BRIDGES
MOMENTARY ROADWAY CLOSURE • HAUL ROUTE CROSSING
**WORK ON SHOULDER**

* The distance between the advance warning sign and the work location should not exceed 5 miles.

**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

**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. If an Advance Warning Vehicle is operated in the shoulder, an approved Truck Mounted Attenuator will be required on both the Advance Warning and Shadow Vehicles. If an Advance Warning Vehicle is operated in the lane behind the Shadow Vehicle, an approved Truck Mounted Attenuator will be required on the Advance Warning Vehicle, but not required on the Shadow Vehicle. The Advance Warning Arrow Board and Warning Sign is required on both the Advance Warning and Shadow Vehicles.

**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 both the Advance Warning and Shadow Vehicles.
1. For speed sign applications, see Index 102-600.

2. Where the tangent distance \((T)\) exceeds 600', spacing between cones or tubular markers may be increased to 50' or spacing between Type I or Type II barricades, vertical panels or drums may be increased to 700' within limits of the tangent, or post mounted delineators at 50 centers may be substituted for the barricades, vertical panels or drums.

3. On the existing pavement, all existing markings within the realignment which conflict with the revised traffic pattern are to be removed and removable pavement markings used for marking a new centerline and edge lines.

4. Where the tangent distance \((T)\) exceeds 600' and no passing or stopping sight distance restrictions exist, the yellow reflectorized markings used to indicate the centerline of the traveled way may be replaced with yellow reflectorized markings in a broken pattern. For raised pavement marker applications see Index 102-600 and Index 706-001.

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

6. If temporary structures are required on the diversion, traffic control will be in conformance with Index 103-650.

7. For general TCZ requirements and additional information, refer to Indexes 102-600 and 706-001.

8. If posted speed for Work Zone is 45 mph or less, use "ROAD WORK 1/2 MILE" and space accordingly.

CONDITIONS WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES REQUIRE THE CLOSURE OF BOTH LANES AND A TEMPORARY DIVERSION IS CONSTRUCTED.
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

\[\text{Work Area}\]
\[\text{Lane Identification + Direction of Traffic}\]

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.
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 10’ from the edge of travelway.

3. When work is being performed on a multilane 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.

SYMBOLS

[Symbol descriptions]

Table I

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Speed Spacing (ft.)</th>
<th>Cones or Tubular Markers</th>
<th>Type I or Type II Barricades or Vertical Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30 to 40</td>
<td>25</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>45</td>
<td>25</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>50 to 70</td>
<td>25</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

L = minimum shoulder width.

Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>% ofhud (ft.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
<td></td>
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<td>40</td>
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<td>55</td>
<td>147</td>
<td>183</td>
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<td>60</td>
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<td>65</td>
<td>173</td>
<td>217</td>
</tr>
<tr>
<td>70</td>
<td>187</td>
<td>233</td>
</tr>
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</table>

Table II (continued)

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>% ofhud (ft.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>200</td>
<td>240</td>
</tr>
<tr>
<td>80</td>
<td>217</td>
<td>260</td>
</tr>
<tr>
<td>85</td>
<td>233</td>
<td>280</td>
</tr>
</tbody>
</table>

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

S = posted speed limit (mph)

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH THE AREA CLOSER THAN 15’ BUT NOT CLOSER THAN 2’ TO THE EEDGE OF TRAVEL WAY.
**INTERMITTENT WORK STOPPAGE - LANE REOPENED TO TRAFFIC**

**EVEN PAVEMENT**

**UNEVEN PAVEMENT**

**MULTILANE, WORK WITHIN TRAVEL WAY**

**MEDIAN OR OUTSIDE LANE**

**ROAD WORK**

**SPEEDING FINES DOUBLED WHEN WORKERS PRESENT**

**Hinged Or Overlay Shields**

**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.**

**Area Temporarily Reopened To Traffic 500'**

**500'**

**500'**

**102-613**

**REV 11/01/17**

**DESCRIPTION:**

**FY 2019-20 STANDARD PLANS**

**INDEX 102-613**

**SHEET 2 of 2**
**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.

**SYMBOLS**

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

**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. 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)
- Work Zone Sign
- Advance Warning Arrow Board

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.

Table I

<table>
<thead>
<tr>
<th>Device Spacing</th>
<th>Max. Distance Between Devices (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mph)</td>
<td>Cones or Tubular Markers</td>
</tr>
<tr>
<td></td>
<td>Type I or Type II</td>
</tr>
<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>
<tr>
<td>50 to 70</td>
<td>25</td>
</tr>
</tbody>
</table>

Table II

<table>
<thead>
<tr>
<th>Buffer Space</th>
<th>Buffer Length (12' Lateral Transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mph)</td>
<td>Dist. (ft)</td>
</tr>
<tr>
<td>25</td>
<td>150</td>
</tr>
<tr>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>35</td>
<td>250</td>
</tr>
<tr>
<td>40</td>
<td>300</td>
</tr>
<tr>
<td>45</td>
<td>360</td>
</tr>
<tr>
<td>50</td>
<td>425</td>
</tr>
<tr>
<td>55</td>
<td>495</td>
</tr>
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<td>60</td>
<td>570</td>
</tr>
<tr>
<td>65</td>
<td>645</td>
</tr>
<tr>
<td>70</td>
<td>730</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.

L = WS

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

1. The WORKERS legend signs 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.

   f. ROAD WORK AHEAD

   g. WORK ZONE AHEAD

   h. STOP BAR

   i. ADVANCE WARNING ARROW BOARD

   j. LANE IDENTIFICATION & DIRECTION OF TRAFFIC

   k. CHANNELIZING DEVICES

   l. ROAD WORK

   m. WORK ZONE

   n. WORKERS

   o. ROAD AHEAD

   p. ROAD WORK AHEAD

   q. ROAD AHEAD WORK

   r. ROAD WORK AHEAD

   s. ROAD WORK AHEAD

   t. ROAD WORK AHEAD

   u. ROAD WORK AHEAD

   v. ROAD WORK AHEAD

   w. ROAD WORK AHEAD

   x. ROAD WORK AHEAD

   y. ROAD WORK AHEAD

   z. ROAD WORK AHEAD

Table II

Taper Length - Merge
(12’ Lateral Transition)

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A (ft)</th>
<th>B (ft)</th>
<th>C (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td></td>
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<tr>
<td>35</td>
<td>245</td>
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<tr>
<td>40</td>
<td>320</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>560</td>
<td></td>
<td></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. Work operations shall be confined to either one lane, or lane combinations as follows:
   a. Outside travel lane;
   b. Outside auxiliary lane;
   c. Inside travel lane and adjoining auxiliary lane;
   d. Inside travel lane;
   e. Inside auxiliary lane;
   f. Inside auxiliary lane and adjoining auxiliary lane.
   \* See Sheet 3

   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.

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 102-460.

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 5 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GWVR) of 16,001 lb 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
**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed</th>
<th>Spacing (ft)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>45 mph</td>
<td>350</td>
<td>250</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

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

---

**Table I**

<table>
<thead>
<tr>
<th>Device Spacing</th>
<th>Max. Distance Between Devices (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cones or Tubular Markers</td>
<td></td>
</tr>
<tr>
<td>Type I or Type II Barricades or Vertical Poles or Drums</td>
<td></td>
</tr>
<tr>
<td>Taper</td>
<td>Tangent</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**

<table>
<thead>
<tr>
<th>12' Lateral Transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mph)</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>45</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)*

---

**Tangent**

**Taper**

**Tangent**

**Tangent**

---

**RIGHT LANE CLOSED ON FAR SIDE OF MINOR SIDE STREET**

**SPEEDING FINES**

**Doubled**

**When Workers Present**

**STOP**

**SPEEDING FINES**

**Doubled**

**When Workers Present**

---

**RIGHT LANE CLOSED ON FAR SIDE OF INTERSECTION**

**WITH SIGNIFICANT RIGHT TURNING MOVEMENTS**

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 right lane having significant right turning movements, then the right lane may be restricted to right turns only as shown in this detail.

2. For intersection approaches reduced to a single lane, left turning movements may be prohibited to maintain capacity for through vehicular traffic.

---

**DESCRIPTION:**

**11/01/17 REVISION**

**REV ISIO N**

**FY 2019-20 STANDARD PLANS**

**MULTILANE, WORK NEAR INTERSECTION MEDIAN OR OUTSIDE LANE**

**INDEX**

**102-616 SHEET 2 of 3**
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.
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 102-660.

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, 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.
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'.

5. For general TCZ requirements and additional information, refer to Index 102-660.
**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 the 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" or "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 lanes.
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 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.

**SYMBOLS**

- **W:** Work Vehicle
- **S:** Shadow (SS) 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)
- **SAW:** Shadow Vehicle with Arrow Board
- **AWM:** Arrow Board
- **A:** Road Work Ahead
- **W:** Shoulder Work Ahead

* The distance between the advance warning sign and the work location should not exceed 5 miles.
DESCRIPTION:

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.

SYMBOLS

Work Vehicle

Shadow (S) Vehicle with Arrow Board

Advance Warning (AW) Vehicle with Arrow Board and Sign Message or Changeable Message Sign

Truck/Trailer Mounted Attenuator (TMA)

Lane Identification and Direction of Traffic

Arrow Board
GENERAL NOTES

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

2. \[ L \text{ (min.)} = \frac{W S}{60} \text{ for speeds } \leq 45 \text{ mph} \]
\[ = - \quad \text{for speeds } \geq 45 \text{ mph} \]

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

3. Where the tangent distance (T) exceeds 250', spacing between Type 1 or 11 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. Where 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

- 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 REQUIRE THE CLOSURE OF ONE ROADWAY AND THE OPPOSING ROADWAY IS CONVERTED TO TEMPORARY TWO-WAY TRAVEL BY WAY OF CROSSOVERS.
GENERAL NOTES

1. TWO-WAY TRAFFIC SIGNS shall be repeated every ¼ 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 TCZ requirements and additional information, refer to Index 102-600.

SYMBOLS

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

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.

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 = WS² / 80</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></td>
</tr>
<tr>
<td>45</td>
<td>390</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>460</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>560</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>670</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>780</td>
<td></td>
</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 = Length of taper in feet
W = Width of lateral transition in feet
S = Paved speed limit (mph)
Yellow Removable Reflectorized Pavement Marking
See Duration Note

White Removable Reflectorized Pavement Marking
See Duration Note

Reduced Device Spacing Run
See General Note 4

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 posted 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.

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
- Advance Warning Arrow Board
- Stop Bar
- Lane Identification + Direction of Traffic

Duraion Note
Removable reflectorized pavement markings shall be used when closure time exceeds one daylight period.
### GENERAL NOTES

1. Work operations shall be confined to the two outside traffic lanes, leaving the adjacent lane(s) 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 ends signs.

4. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC 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 Table II for shoulder taper formulas.

### DISTRIBUTION BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Spacing (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 or less</td>
<td>2640</td>
</tr>
<tr>
<td>45</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>1640</td>
</tr>
</tbody>
</table>

** The ROAD WORK 10 MILE sign may be used as an alternate to the ROAD WORK AHEAD sign. The sign may be used as an alternate to the RIGHT LANE CLOSED AHEAD sign.

** See Table II for L values.

*** 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 (12' Lateral Transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>175</td>
<td>125</td>
</tr>
<tr>
<td>30</td>
<td>200</td>
<td>180</td>
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<tr>
<td>35</td>
<td>250</td>
<td>245</td>
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<td>40</td>
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<td>45</td>
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<td>50</td>
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<td>495</td>
<td>660</td>
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<td>60</td>
<td>570</td>
<td>720</td>
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<tr>
<td>65</td>
<td>645</td>
<td>830</td>
</tr>
<tr>
<td>70</td>
<td>730</td>
<td>930</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)

### SYMBOLES

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

### 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 TCZ 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 TCZ requirements and additional information refer to Index 102-600.

CONDITIONS

PLANNED CLOSURE NOT EXCEEDING 5 MINUTES.
SYMBOLS
- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- 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)

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.
CONDITION A

WHEN THE PAVING TRAIN IS IN LANE 3, THE U-TURNING VEHICLE SHALL CAUTIOUSLY TURN INTO LANE 2 AND PROCEED IN LANE 2 TO THE FRONT OF THE TRAIN.

CONDITION B

WHEN THE PAVING TRAIN IS IN LANE 3, THE U-TURNING VEHICLE SHALL CAUTIOUSLY TURN INTO LANE 2, AND PROCEED IN LANE 2 TO THE FRONT OF THE PAVING TRAIN.

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.

TRAFFIC TRANSITION AREA UPSTREAM FROM CROSSOVER

CASE I

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. L = length of taper in feet:

   - \( W \) = 65 for speeds ≤ 45 mph
   - \( W \) = 85 for speeds ≤ 40 mph

   Where:

   - \( W \) = 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 20' centers for cones or tubular markers and 30' for Type I or Type II barricades or vertical panels or drums.

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, 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 ‘RIGHT LANE CLOSED & MILE’ sign. Project advance warning signs (not shown) shall be located in advance of the relocated Sign No. 3.

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')
- Trailer Mounted And Actuated By Flagger Upon Approach Of The Work Vehicle
- Work Vehicle
- Lane Number
- Lane Identification + Direction of Traffic

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. 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.

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.

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, 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 ‘RIGHT LANE CLOSED & MILE’ sign. Project advance warning signs (not shown) shall be located in advance of the relocated Sign No. 3.
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 Paving Train.

CONDITION B

When the Paving Train is in Lane 2, the U-turning vehicle shall cautiously turn into Lane 2, cautiously merge into Lane 3, 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.

TRAFFIC TRANSITION AREA DOWNSTREAM FROM CROSSOVER

CASE II

Note: See Sheet 1 for 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 surfaces.

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 panel 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 located 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.

GENERAL NOTES

SYMBOLS

- Work Zone Sign
- Lane Identification + Direction of Traffic
- Temporary Pavement

LENGTH OF ACCESS LANES (FT.)

<table>
<thead>
<tr>
<th>Grade</th>
<th>$D_1$</th>
<th>$D_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% or less</td>
<td>350</td>
<td>1540</td>
</tr>
<tr>
<td>3 to 4% Upgrade</td>
<td>330</td>
<td>2310</td>
</tr>
<tr>
<td>3 to 4% Downgrade</td>
<td>710</td>
<td>920</td>
</tr>
</tbody>
</table>

TEMPORARY CROSSOVER FOR MEDIAN WIDTHS ≥ 75'

TEMPORARY CROSSOVER

INDEX

102-631

1 of 2
TEMPORARY CROSSOVER FOR MEDIAN WIDTHS FROM 50' TO < 75'

Maximum Spacing Between Cones And Tubular Markers Shall Be 25'

1. (Min.) = WS

S = Existing Posted Speed (MPH)

NOTE

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

1. Maintain two-lane two-way traffic over existing pavement. Construct new roadway within the proposed 4-lane limits, excluding the friction course. Sign as shown if roadway construction area falls within 15' of existing pavement edge. When the construction area falls more than 15' from the existing pavement edge, traffic shall be controlled in accordance with Index 102-601 or 102-602.

2. Construct shoulder pavement to provide two-lane two-way traffic over shoulder and existing pavement during Phase II roadway construction. For lane width requirements see Index 102-600. Signing as shown, with the near 1500' zone modified in accordance with Index 102-603, to be in place prior to shoulder pavement construction.

PHASE II

1. Remove existing pavement marking in areas of diversion and remark as shown. 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. Signing as shown, with the near roadway construction area falls within 15' of existing pavement edge. When the construction area falls more than 15' from the existing pavement edge, traffic shall be controlled in accordance with Index 102-601 or 102-602.

2. Route through traffic to temporary and existing pavement.

3. Construct transitions, excluding friction course.

Note: See Sheet 2 for General Notes.
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.

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.

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 not be 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 conformance with 'Drop-offs In Work Zones', see Index 102-600.

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

6. For reflectorized raised pavement marker applications, 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, see 'Pavement Markers' Index 102-600.

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
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 cannot 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.

See Sheet 3 for General Notes.
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. Recourse 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 102-615. 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 102-615.

See Sheet 3 for General Notes.
PHASE III

1. Sign and mark Phase II 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 and one-lane across (minimum) each direction for four-lane two-way cross streets.

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.

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
BARRIER AND TRANSITION LOCATED ON PAVED OR UNPAVED SHOULDERS

PLAN SHOWN FOR RIGHT LANE - INVERTED PLAN FOR LEFT LANE

TWO OR MORE LANES ONE WAY

LANE DROP · PLAN SHOWN FOR RIGHT LANE MERGE LEFT - INVERTED PLAN FOR LEFT LANE MERGE RIGHT

SYMBOLS

Lane Identification + Direction of Traffic
  Channelizing Device (See Index 102-600)

GENERAL NOTES
1. For signing information see the Plans, Specifications, MUTCD and other TCZ Indexes.
2. Where W=width of lateral transition in feet, S=posted speed limit.
PHASE III

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

GENERAL NOTES

1. All signing, 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 8'.
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.
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 work operation. The Department has frequently used this technique for setting bridge beams, overhead sign structures and replacing overhead sign panels.

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 work operation. The Department has frequently used this technique for setting bridge beams, overhead sign structures and replacing overhead sign panels.

**Symbols**

- Channelizing Device (See Index 102-600)
- Marked Police Vehicle with Flashing Blue Lights
- PCMS, Portable Changeable Message Sign
- To be placed the day of pacing operation
- Lane Identification and Direction of Traffic

**CHANGEABLE MESSAGE SIGN MESSAGE**

**(MAINLINE AND RAMPS)**

---

1. **ONE WEEK PRIOR TO PACING OPERATION**

<table>
<thead>
<tr>
<th>Message</th>
<th>Expect Delays On</th>
<th>MHH DD-DD</th>
<th>E AN - X AN</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROAD WORK TONIGHT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLOW TRAFFIC AHEAD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BE PREPARED TO STOP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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2. **DURING DAY OF PACING OPERATION**

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3. **DURING PACING OPERATION**

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**TRAFFIC PACING GENERAL NOTES**

1. **NOTICE**

This index represents the minimum requirements for traffic pacing operations on the State Highway System.

Develop a site specific traffic control plan for each pacing operation location.

**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 covered 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 signs are required to protect workers and/or 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.

6. For work durations of less than five minutes, coordinate with traffic control officer to provide resources necessary for pacing traffic. Portable changeable message signs, truck-mounted attenuators, ROAD CLOSED signs, and site specific traffic control plans are not required for such operations. Use traffic pacing distance values from the five minute column of the table on Sheet 3.

**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 plans 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 be clear that 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.

---

**CHANGEABLE MESSAGE SIGNS**

**(Typical Placement and Messages)**

---

**INDEX**

102-655

**LAST REVISION**

01/01/18

**DESCRIPTION:**

FY 2019-20 STANDARD PLANS

**THE END**
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.

2. The lead police vehicle (flashing blue lights off) shall match the speed of the last vehicles ahead of the pacing vehicles and continue forward 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) shall be moved from the travel lanes and 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.

3. The two pace setting police vehicles shall begin to slow to the pacing speed (20 mph is preferred, 10 mph minimum). After the duration of the traffic pacing operation, the last three police vehicles shall turn off their flashing blue lights. Once the two pace setting police vehicles pass 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) shall be moved from the travel lanes and 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.

4. 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 300’ in advance of the work area.

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 three police vehicles shall clear the work area and immediately move to the right shoulder or crash truck(s) shall be moved from the travel lanes and 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. In case of emergency the pace setting police vehicles shall stop once they reach the lead police vehicle. If no emergency is encountered, the pace setting police vehicles shall then come to a complete stop on the right shoulder and turn on its flashing blue lights. If required, crash truck(s) shall be moved from the travel lanes and 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.

STAGE THREE

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.

2. The contractor shall begin to clear the travel lanes of all equipment and debris in order to reopen all travel lanes.

3. The 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.

4. 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.

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 pace setting police vehicles shall then come to a complete stop on the right shoulder and turn on its flashing blue lights. If required, crash truck(s) shall be moved from the travel lanes and 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.

3. The 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.

4. 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.

5. The 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.

6. 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.
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 speed 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 travel while work is performed.

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

The maximum practical pacing operation length is 10 miles.

\[ S_r = \text{Regulatory speed (mph)} \]
\[ S_p = \text{Pacing speed (mph)} \]
\[ t_w = \text{Work duration (min)} \]
\[ L = \text{Total pacing distance in miles} \]
\[ L_c = \text{distance paced vehicles must travel before the vehicles at regulatory speed have cleared the work zone} \]
\[ t_w = \text{distance paced vehicles travel while work is performed} \]
\[ f_{HV} = \text{Heavy Vehicle Factor} \]
\[ P_t = \% \text{ Trucks} \]

**Traffic Pacing Distances**

<table>
<thead>
<tr>
<th>( S_p = 20 ) pcphpl ≤ 1,750</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_w ) (min)</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>50</td>
</tr>
</tbody>
</table>

* Calculation required, for additional guidance see FDOT Design Manual 242.

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 site 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:

\[ \text{pcphpl} = \left( \frac{\text{Hourly Directional Volume}}{2 \text{ lanes (each direction)}} \right) \times \text{Heavy Vehicle Factor} \]
GENERAL NOTES:

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 maximum 1' 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 200'.

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 Detour, place LCDs to delineate both sides of the temporary walkway.

11. For sidewalk diversions, ensure there is sufficient R/W for placement of temporary sidewalk and pedestrian longitudinal channelizing devices.

SYMBOLS
- Work Area
- Channelizing Device
- Work Zone Sign
- 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

SIDEWALK DETOUR

SIDEWALK DIVERSION

PEDESTRIAN CONTROL FOR CLOSURE OF SIDEWALKS

INDEX
102-660

1 of 1
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, Item.
* 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 Workers Present" sign in place.

### 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>315</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>350</td>
<td>A</td>
</tr>
<tr>
<td>Inside***</td>
<td>1</td>
<td>1</td>
<td>250</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>350</td>
<td>A</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.

### 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.
**TOLL PLAZA TRAFFIC CONTROL STANDARDS**

**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 should 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.

**SYMBOLS**

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

**TWO OR MORE DEDICATED LANES CLOSED**

**PCMS DISPLAY**

**MESSAGE 1:** SUNPASS LANES CLOSED
**MESSAGE 2:** USE CASH LANES

**CENTER OR RIGHT DEDICATED LANE CLOSED**

**PCMS DISPLAY**

**MESSAGE 1:** CENTER SUNPASS LANE
**MESSAGE 2:** CASH USE LANES
**MESSAGE 2:** KEEP LEFT

**INSIDE DEDICATED LANES**

**PCMS**

**MESSAGE 1:** SUNPASS LANE CLOSED
**MESSAGE 2:** USE CASH LANES

**SUNPASS ONLY 25 MPH**

**PCMS**

**MESSAGE 1:** SUNPASS LANE CLOSED
**MESSAGE 2:** USE CASH LANES

**SUNPASS**

**PCMS**

**MESSAGE 1:** SUNPASS LANE CLOSED
**MESSAGE 2:** USE CASH LANES

**SYMBOLS**

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

**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 should 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.

1. This Plan is for lane closures of any time length.

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

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.

GENERAL NOTES

SYMBOLS

- Channelizing Device (See Index 102-400)
- Work Zone Sign
- Advance Warning Arrow Board and Direction of Traffic
- Advance Warning Vehicle Equipped with Portable Changeable Message Sign
- Type III Barricades and "RAMP CLOSED" sign

PCMS DISPLAYS

** PCMS DISPLAY PRIOR TO CLOSURE

MESSAGE 1: SUNPASS ONLY Lanes
MESSAGE 2: "DATE/END"

PCMS DISPLAY DURING CLOSURE

MESSAGE 1: SUNPASS USE Lanes
MESSAGE 2: CLOSED Lanes
MESSAGE 2: USE LANE

OUTSIDE OPEN ROAD TOLLING LANES

ALL LANES CLOSED***

** 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.

*** Inverted for Inside Open Road Tolling Lanes Configuration

REV ISIO N DESCRIPTION:

LAST
REV ISIO N
01/01/17
DESCRIPTION:

FY 2019-20
STANDARD PLANS

TOLL PLAZA TRAFFIC CONTROL STANDARDS

INDEX

102-667

SHEET

3 of 6
**PCMS DISPLAYS.**

1. **PCMS DISPLAY PRIOR TO CLOSURE**
   - Message 1: ONE SUNPASS ONLY
   - Message 2: LANE OPEN "DATE/EVENT"

2. **PCMS DISPLAY DURING CLOSURE**
   - Message 1: SUNPASS ONLY
   - Message 2: LANE CAUTION

**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

**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.

**INSIDE OPEN ROAD TOLLING LANES**
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

* If the closed lane is not a dedicated lane, the 50' taper may begin at the back of the attenuator truck.

** 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.

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
- 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)

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

REV 01/01/17
DESCRIPTION:
FY 2019-20
STANDARD PLANS
TOLL PLAZA TRAFFIC CONTROL STANDARDS
102-667
5 of 6
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
PRESENT SPEEDING FINES DOUBLED WHEN WORKERS ROAD 1 MILE WORK

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 60 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

TYPICAL PCMS DISPLAY

WITH SPEED REDUCTION:
Message 1: WORKERS PRESENT AHEAD
Message 2: SPEED REDUCED NEXT X MILES

WITHOUT SPEED REDUCTION:
Message 1: WORKERS PRESENT AHEAD
Message 2: NEXT X MILES

Table I

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Max Distance Between Devices (ft.)</th>
</tr>
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<tbody>
<tr>
<td>55 to 70</td>
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</tr>
</tbody>
</table>

Table II

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Buffer Space</th>
<th>Taper Length</th>
<th>Notes</th>
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<tbody>
<tr>
<td>55</td>
<td>495</td>
<td>660</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>570</td>
<td>720</td>
<td>12L</td>
</tr>
<tr>
<td>65</td>
<td>645</td>
<td>780</td>
<td>12L</td>
</tr>
<tr>
<td>70</td>
<td>730</td>
<td>840</td>
<td>12L</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)

See Index 102-600 for general TCZ requirements and additional information.
To Hold Barrier Taut
Secure Barrier To Posts
Orange Construction Barrier
Critical Root Zone Of The Tree
No Open Trenching Under The
X" X
4' Minimum Barrier Height
Underground Utility
See Note 1
X'
Post (2' x 4' Nominal @ 4'-0" O.C. Typ.)
Tree Trunk
Tree Protection Barrier

Canopy
Protect any portion of canopy that extends beyond barrier, unless pruning is required. Pruning must be supervised by a Certified Arborist.

The Trunk
Boards And
Between The
Place Burlap
Bands (3 Minimum)
(Do Not Fasten
Protective Barrier
Form A Continuous
2" x 4" Boards To
To Maintain Taut Barrier
Install At Depth Sufficient
To Hold Barrier Taut

Critical Root Zone, See Note 1
Outside Of The Critical
Trenching May Occur

Post
Tree Protection Barrier
(Critical Note 4)

Place Burlap Between Tree
Boards And The Trunk
6" Minimum Height
Or To Lowest Branch

2" x 4" Nominal Boards

6" Minimum Height Of To Lowest Branch

TRUNK PROTECTION

Tree
Bands

NOTES:
1. Critical Root 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. Install 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 legible 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 as long as the critical root zone is protected.
9. The Critical Root Zone may be reduced, in the field, by a certified Arborist or Landscape Architect.

1. Trunk protection may be used when Tree Protection Barrier can not be reasonably erected, when approved by Engineer.
2. See Selective Clearing and Grubbing Plan for location of trunk protection, when applicable.
3. Adjust bands to allow tree growth (inspect quarterly to prevent girdling).
GENERAL NOTES

1. The location and construction of mailboxes shall conform to the rules and regulations of the United States Postal Service as modified by this Index. The USPS Domestic Mail Manual and rural delivery regulations of the United States Postal Service shall be the exclusive source of design requirements.

2. Mailboxes shall be light sheet metal or plastic construction, in traditional style. Mailboxes on rural highways shall be set with the roadside face of the box 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

3. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

4. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

5. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

6. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

7. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

8. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

9. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

10. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

11. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

12. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.

13. Mailboxes shall be light sheet metal or plastic construction, in traditional style only, and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service. 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 6” off from the edge of the traveled way a minimum distance of three feet on the right-hand side.
FLANGED CHANNEL

FRONT VIEW

SIDE VIEW

BOTTOM VIEW

END VIEW

STEEL PLATFORM

SIDE VIEW

STEEL ADAPTER PLATE

TOP VIEW

END VIEW

STEEL BRACKET

TOP VIEW

STEEL SPACER

STEEL FLANGED CHANNEL SUPPORT POSTS

Note: See General Notes for finish requirements.
REVISION DESCRIPTION:?

Last Revised: 11/01/17

Mailboxes

110-200

Mailbox Types shown on this Index

Single or Combined Wood, Flanged Channel

Or Pipe Post Types Shown On This Index

STEEL ANTI-TWIST PLATE

Nominal 2" Ø (2.375 o.d.) Steel Pipe Schedule 40 or Resistance Welded, ASTM A539 & A569, Min. 50,000 psi Yield Strength. See General Notes For Finish Requirements.

STEEL SHELF

16 7/8" Dia. (8 Req'd.)

16 7/8" Dia. (4 Req'd.)

4 1/2" x 1/2" Slots (4 Req'd.)

4 1/2" x 1/2" Slots (4 Req'd.)

STEEL PLATFORM

Nominal 2 1/2" Slotted Rd. (Stove Bolt), 2 Washers, 1 Lockwasher, 1 Nut (6 Req'd.)

2 1/2" X 4 1/2" Slotted Rd. (Stove Bolt), 2 Washers, 1 Lockwasher, 1 Nut (2 Req'd.)

STEEL BRACKET

Note: See General Notes for finish requirements

MAILBOXES

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STANDARD PLANS

110-200

3 of 3
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 Indexes 120-002 and 160-001.
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, are not permitted 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, are not permitted 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. Determine average organic content from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Perform tests 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, are designated as muck. Further, any stratum or stockpile of soil which contains pockets of highly organic material may be designated as Muck (M). Highly organic soils are not permitted within the subgrade or embankment portion of the roadbed.

NOTES:
1. All material in the shaded area is excess base to be removed.
2. There is no additional payment for removal of excess base material.

REMOVAL OF EXCESS BASE MATERIAL

SYMBOL  SOIL  CLASSIFICATION (AASHTO M 145)
S  Select  A-1, A-3, 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.
** 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. A-2-4 material should be placed below the existing water level and compacted to a height of 2 feet above the bottom of the base, and water level at time fill is placed.
* 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".

GENERAL NOTES AND FLEXIBLE PAVEMENT
**EMBANKMENT UTILIZATION**

**SYMBOL**

- **S**: Select
- **P**: Plastic
- **H**: High Plastic
- **M**: Muck

**CLASSIFICATION (AASHTO M 145)**

- **S**: A-1, A-3, A-2-4 **
- **H**: A-2-5, A-2-7, A-5 or A-7 (ALL WITH LL > 50)
- **M**: A-8

Classification listed left to right in order of preference.

**Note:** 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"; see Index 120-002. For minor collectors and local facilities this dimension may be reduced to 18".

**RIGID PAVEMENT - ASPHALT BASE OPTION**

**SYMBOL**

- **LBR**: Stabilization
- **Edgedrain**: See Index 446-001

**SOIL**

- **LBR 40**: Stabilization

**CLASSIFICATION (AASHTO M 145)**

- **LBR 40**: Stabilization

**Index 446-001**: Edgedrain

**SYMBOL**

- **S**: 0.02-0.03" Variance
- **P**: 1:4 Standard
- **H**: 1:6 Standard
- **M**: 1:2 Control Line

**CLASSIFICATION (AASHTO M 145)**

- **LBR 40**: Stabilization

**Index 446-001**: Edgedrain

**SYMBOL**

- **S**: 0.02-0.03" Variance
- **P**: 1:4 Standard
- **H**: 1:6 Standard
- **M**: 1:2 Control Line

**CLASSIFICATION (AASHTO M 145)**

- **LBR 40**: Stabilization

**Index 446-001**: Edgedrain

**SYMBOL**

- **S**: 0.02-0.03" Variance
- **P**: 1:4 Standard
- **H**: 1:6 Standard
- **M**: 1:2 Control Line

**CLASSIFICATION (AASHTO M 145)**

- **LBR 40**: Stabilization

**Index 446-001**: Edgedrain

**SYMBOL**

- **S**: 0.02-0.03" Variance
- **P**: 1:4 Standard
- **H**: 1:6 Standard
- **M**: 1:2 Control Line

**CLASSIFICATION (AASHTO M 145)**

- **LBR 40**: Stabilization

**Index 446-001**: Edgedrain
**SYMBOL** | **SOIL** | **CLASSIFICATION (AASHTO M 145)**
--- | --- | ---
S | Select | A-1, A-3, A-2-4 **
Sr | Special Select | A-3 *** With Minimum Average Lab Permeability of 5x10^{-5} cm/sec. (0.14 ft./day) as per AASHTO T 215
P+ | 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.**

**When called for in 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.

**Special Stabilized Subbase: 3" of #57 or #89 Coarse Aggregate Mixed Into Top 6".**

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**RIGID PAVEMENT - SPECIAL SELECT SOIL OPTION**

**DIVIDED ROADWAYS**

**UNDIVIDED ROADWAY**

---

**DESCRIPTION:**

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120-001

**FY 2019-20 STANDARD PLANS**

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**EMBANKMENT UTILIZATION**

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**REV ISIO**

0/01/18
Whether Or Not Shoulder Gutter Is Used
Control Line Set By Normal Shoulder Point
Whether Or Not Shoulder Gutter Is Used
Limit For Minimum Removal
Bottom Of Organic Material
Gutter Line
Back Of Proposed Or Future Sidewalk
Limit For Minimum Removal
Bottom Of Organic Material

WITH OVERBURDEN - HALF SECTION
CONSTRUCTION OF FLUSH SHOULDER ROADWAY

WITH OVERBURDEN - HALF SECTION
CONSTRUCTION OF CURBED ROADWAY

WITH OVERBURDEN - HALF SECTION
CONSTRUCTION OF CURBED ROADWAY

*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 120-003.
3. Where organic or plastic material is undercut, backfill with suitable material in accordance with Index 120-003, 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 120-003.
5. See Index 160-001 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 0.2%.

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 undercut 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.

CONSTRUCTION AND LOCATION OF UNDERDRAIN IN CURBED ROADWAY

(See Note 4)
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 beneath the haunches of the pipe, using mechanical tamp 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 #1, 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. GRANULAR BACKFILL
   A. If mechanical 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 #1, 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.

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.

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.

6. Where asphalt concrete overlays exist over full slab concrete pavement, the replacement pavement shall have an overlay constructed over the replacement slab. The overlay shall match the existing asphalt pavement thickness. The replacement friction course shall match the existing friction course, except structural course may be used in lieu of dense graded friction course.

7. All shoulder pavement, curb, curb and gutter, and their substructure disturbed by utility trench cut construction shall be restored in kind.

8. The use of flowable fill to reduce the time traffic is taken off a facility is acceptable but must have prior approval by the Engineer. Flowable fill use is allowed only when properly engineered for pavement crossings, whether straight or diagonal, and shall not be installed for significant depths or lengths. The maximum length shall be fifty (50) feet and a maximum depth of six (6) feet unless supported by an engineering document prepared by a registered professional engineer that specializes in soils engineering. The engineering document shall address the evaluation of local groundwater flow interruption and settlement potential.

9. Excavatable flowable fill is to be used when the flowable fill option is selected.
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 manholes.
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.

PARTIAL CUTS FOR RING AND COVER ADJUSTMENTS
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, A5.
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. Provide select soil where shown above and 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".
7. Limits of Stabilization for Intermediate U-Turn Crossovers and, unless otherwise specified in the Plans, at paved and unpaved private roads and unpaved public roads.

**MEDIAN STABILIZING DETAILS**
**DRIVEWAY ENTRANCES NOTES:**

1. See Plans for Driveway Width (W) and Return Radius (R). The size will be no less than 15' diameter or equivalent.

2. See the Plans for drainage pipe size and length or as determined by the Engineer.

3. Stable material may be required for graded driveways to private property as determined by the Engineer in accordance with Specification 102-8.

4. The driveway 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 the Engineer, or when not shown in the Plans.

5. Point of Connection:
   a. Construct paved driveways for all paved connecting facilities. The connecting point will be determined by the Engineer.
   b. Construct paved driveways for all business, commercial, industrial or high volume residential graded connecting facilities. Construct the connecting point 30'-0' from edge of travel way or at R/W line, whichever is less.
   c. Construct paved driveways for all side road connections. The R/W is the connecting point.
### DRIVeway TYPES

- **TYPE I** - Typical Automobile Traffic
- **TYPE II** - Typical Truck-Trailer Traffic

### AREAS FOR ONE 5' DEEP DRIVEWAY APRON (SY)

<table>
<thead>
<tr>
<th>Drive Width (ft.)</th>
<th>Intersection</th>
<th>Normal</th>
<th>Skewed</th>
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### MATERIAL TYPES AND THICKNESSES FOR PAVED CONNECTIONS

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<th>Materials</th>
<th>Minimum Thickness (in.)</th>
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<td>Optional Base (See Specification 285)</td>
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*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.

### NOTES

1. Use same material for driveway structural course and roadway overbuild or structural course, except as approved by the Engineer 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 driveway, 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. Use Class NS concrete at least 6" thick for driveways paved with Portland Cement Concrete. Construct in accordance with Specifications 347, 350, and 522.
6. The Department may require other pavement criteria where local conditions warrant.

### GENERAL NOTES:

1. Driveways are to be constructed or resurfaced for low volume (single family, duplex, farm, etc.) residential connections as directed by the Engineer.
2. Driveways construction is not required for low volume residential connections where roadway shoulders are paved.
3. Match existing paved shoulder widths ≤ 4'. For all other shoulders conditions, construct at 5' wide.
4. Connections beyond the shoulder width are to be constructed as directed by the Engineer.
5. Construct Driveway Base in accordance with Specification 286.
6. Payment for structural course and friction course is to be included in roadway pavement pay item.
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 steel bars meeting the requirements of Specification 931.
   B. Provide a standard load transfer tied joint with #4 bars 29" in length at 29" spacing or #3 bars 39" in length at 30" 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 at street intersections and other locations as indicated in the Plans. For bridge expansion joints, see Index 370-001.

6. Punch clean holes in preformed joint filler greater than bar diameter.

7. Coat and lubricate plain steel dowel bars in accordance with Specification 350.

8. Sheet metal bottom strips in accordance with Specification 931.

For bridge expansion joints, see Index 370-001.

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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 Specification 350.

8. Sheet metal bottom strips in accordance with Specification 931.

For bridge expansion joints, see Index 370-001.
**CONCRETE-CONCRETE JOINTS**

- **TAPE BOND BREAKER**
- **BACKER ROD BOND BREAKER**

**JOINT SEALS**

**CONCRETE-ASPHALT SHOULDER JOINTS**

**JOINT DIMENSIONS**

**CONCRETE PAVEMENT JOINTS**

**INDEX**

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<thead>
<tr>
<th>JOINT WIDTH</th>
<th>SEALANT BEAD THICKNESS</th>
<th>BACKER ROD DIA.</th>
<th>MINIMUM JOINT PLACEMENT DEPTH</th>
<th>BACKER ROD PLACEMENT DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>1/8</td>
<td>1/8</td>
<td>1/12</td>
<td>1/4</td>
</tr>
<tr>
<td>3/16</td>
<td>1/8</td>
<td>1/8</td>
<td>1/12</td>
<td>1/4</td>
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<tr>
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<td>1/4</td>
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<td>1/8</td>
<td>1/12</td>
<td>1/4</td>
</tr>
<tr>
<td>&gt;1</td>
<td>1/8</td>
<td>1/8</td>
<td>1/12</td>
<td>1/4</td>
</tr>
</tbody>
</table>

Unless otherwise indicated on the plans the joint width for new construction will be 1/16 for construction joints, 1/8 for all other joints.

For rehabilitation projects the joint width will be shown on the plans or established by the Engineer based on field conditions.

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.
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 ½” preformed expansion joint material.

The State Construction Office in accordance with section (C) of the Product Evaluation Procedure. 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.
CONCRETE PAVEMENT JOINTS

1. **2-THRU LINES WITH SINGLE LANE ENTRANCE RAMP**
   - Longitudinal Joint
   - Contraction Joint (Typ.)

2. **ENTRANCE TAPER WITH AUXILIARY LANE**
   - Longitudinal Joint
   - Contraction Joint (Typ.)

3. **ENTRANCE RAMP WITH ADDED LANE**
   - Longitudinal Joint
   - Contraction Joint (Typ.)

4. **2-THRU LINES WITH SINGLE LANE EXIT RAMP**
   - Longitudinal Joint
   - Contraction Joint (Typ.)

5. **EXIT TAPER WITH AUXILIARY LANE**
   - Longitudinal Joint
   - Contraction Joint (Typ.)

6. **3-THRU LINES WITH AUXILIARY LANE AND 2-LANE EXIT RAMP**
   - Longitudinal Joint
   - Contraction Joint (Typ.)

**Joint Layout at Entrance and Exit Ramp Terminals**

- Note: Transverse joint spacing should not exceed 15-ft or twenty-four times the slab thickness, whichever is less. If a lane exceeds 15-ft width, such as single lane ramps and weigh stations, longitudinal joint to be constructed in centerline of lane.
**FIGURE 10.2 - REPAIR METHOD: NONE OR CLEAN AND SEAL**

- Existing Longitudinal Joint
- Existing Transverse Joint
- Bond Breaker (Along All Longitudinal and Transverse Joints)
- Transverse Control Joint
- Epoxy Saw Overrun (Typ.)

**FIGURE 10.3 - FULL SLAB FULL DEPTH REPLACEMENT**

- Existing Longitudinal Joint
- Existing Transverse Joint
- Bond Breaker (Along All Longitudinal and Transverse Joints)
- Epoxy Saw Overrun (Typ.)

**FIGURE 10.4 - PARTIAL SLAB FULL DEPTH REPLACEMENT**

- Existing Longitudinal Joint
- Existing Transverse Joint
- Bond Breaker (Along All Longitudinal and Transverse Joints)
- Epoxy Saw Overrun (Typ.)

**FIGURE 10.5 - FULL-DEPTH REPAIR ON BOTH SIDES OF THE JOINT**

- Existing Longitudinal Joint
- Transverse Joint
- New Dowel Bars (Equally Spaced Between Existing Dowel Bar Locations)
- Full-Depth Repair Area

**FIGURE 10.6 - MULTIPLE SLAB FULL DEPTH REPLACEMENT**

- Existing Longitudinal Joint
- New Full Slab
- Tie Bar

**GENERAL NOTES**

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 sawn 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 grading, 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>CRACKING</th>
<th>SEVERITY/DESCRIPTION</th>
<th>REPAIR METHOD</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Longitudinal</strong></td>
<td>Light: no faulting, spalling &lt;9/16” wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Moderate: width &lt;1/8”, spalling &lt;3” wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Severe: width &gt;1/8”, spalling &gt;3” faulting &gt;1/2”</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td><strong>Transverse</strong></td>
<td>Light: no faulting, spalling &lt;9/16” wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Moderate: width &lt;1/8”, spalling &lt;3” wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Severe: width &gt;1/8”, spalling &gt;3” faulting &gt;1/2”</td>
<td>Replace</td>
<td>Figure 10.3, 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>Corner Breaks</strong></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 10.3 and 10.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOINT DEFICIENCIES</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spall Nonwheel Path</strong></td>
<td>Light: width &lt;1/16”, &lt; 1/2 slab depth, &lt;12” in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Moderate: width &lt;1/8”, &lt; 1/2 slab depth, &lt;12” in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Severe: width &gt;1/8”, or length &gt;12”</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>Spall Wheel Path</strong></td>
<td>Light: width &lt;1/16”, &lt; 1/2 slab depth, &lt;12” in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Moderate: width &lt;1/8”, &lt; 1/2 slab depth, &lt;12” in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Severe: width &gt;1/8”, or length &gt;12”</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SURFACE DETERIORATION</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pop Outs Nonwheel Path</strong></td>
<td>Light: Not deemed to be a traffic hazard</td>
<td>Keep under observation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Severe: Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td><strong>Pop Outs Wheel Path</strong></td>
<td>Light: Deemed to be a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td></td>
<td>Severe: Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MISCELLANEOUS DISTRESS</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Faulting</strong></td>
<td>Light: Faulting &lt;4/32”</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate: &lt;4/32” to &lt;16/32”</td>
<td>Grid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Severe: Faulting &gt;16/32”</td>
<td>Grid</td>
<td></td>
</tr>
<tr>
<td><strong>Lane To Shoulder Drop Off</strong></td>
<td>Light: Drop-off &lt;3”</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Moderate: &lt;drop-off &gt;3”</td>
<td>Build Up</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Severe: drop-off &gt;3”</td>
<td>Build Up</td>
<td></td>
</tr>
<tr>
<td><strong>Water Bleeding Or Pumping</strong></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><strong>Blowups</strong></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.

2. Pay quantity for expansion joint to be calculated across pavement at right angles to the centerline of the roadway pavement. Shoulder pavement joint included.

3. 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.

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.

1. Expansion joint to be paid for under the contract unit price for Bridge Approach Expansion Joint, LF.

2. For rehabilitation projects, the designer must indicate in the plans the number of sides to be removed, the number of slabs to be constructed/reconstructed, and the location of expansion joints.

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.

**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 sides to be removed, the number of slabs to be constructed/reconstructed, and the location of expansion joints.

2. Pay quantity for expansion joint to be calculated across pavement at right angles to the centerline of the roadway pavement. Shoulder pavement joint included.

3. 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.

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.
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

TYPICAL SECTION

* Shear Key is required only when specified in the Plans.

NOTE: See Plans for Retaining Wall Data

SHEAR KEY (Shear key shown dashed)
**Wall Joint Spacing**

Wall joint spacing 25 ft. maximum and 5 ft. 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

Front Face of Wall

3" Ø PVC Drain Pipe at 10 ft. max. spacing (Typ.)

Traffic Railing (Index 521-610, 36° Single-Slope shown, see Plans for Traffic Railing Type)

At Contractor's option, Surface Treatments may terminate 8" below ground line

**See 'Detail A'**

### V-Groove Detail

1/2 V-Groove across top and down front face of wall at joint (Typ.).

Extend V-Groove down back of wall to 8' min. below ground. (see V-Groove Detail)

### Stem Offset Values

**Stem Offset (in.) = H(Ft.)/16**

Stem as constructed

**See 'Detail A'**

### 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.

### Typical Backfill Detail

Drain shall be continuous 1 1/2' x 1 1/2' 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 wall with an adhesive approved by the Engineer.

### Typical Corner Joint Detail

* 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.**

### Typical Backfill Detail

Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with 1/2" openings

### Typical Backfill Detail

Drain shall be continuous 1 1/2' x 1 1/2' 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 wall with an adhesive approved by the Engineer.

### 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.

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Drain shall be continuous 1 1/2' x 1 1/2' 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 wall with an adhesive approved by the Engineer.

### Typical Corner Joint Detail

* 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.**
**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 346, 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 (SWM) may be substituted on an equal area basis. Do not increase bar/wire spacing for Grade 60 reinforcing steel or WW.

4. When required, for adjacent roadways, see Index 370-000 or 370-080 or as appropriate. For adjacent Type B fence see Index 550-002.

5. Joint Seal: Organic Felt bond breaker in accordance with Specification Section 400 or Type D-3 geotextile fabric in accordance with Specification Section 985. Map all contact surfaces of concrete and Organic Felt or geotextile fabric with cut-back asphalt. Stop Organic Felt or geotextile fabric 6” below top of wall.

6. Provide a continuous 1”-thick clean gravel or crushed rock drain for wall heights 2 ft. and higher. Wrap drainage layer as shown, with Type D-3 geotextile fabric in accordance with Specification Section 985. Provide 2”-Ø PVC Drain Pipe at 10 ft. max. spacing when Drainage Layer is required. Locate gravel or geotextile fabric at the inside 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.

**KEYWAY & WALL JOINT DETAIL**

**TYPICAL SECTION**

**C-I-P CONCRETE GRAVITY WALL**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>As Req.</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>As Req.</td>
</tr>
</tbody>
</table>

**BAR BENDING DIAGRAM**

**SCHEME 1**

1. 0'-0" Min. to SHW (Except for slopes steeper than 1:2 with wall heights ≥ 5', then 2'-0" Min.)

2. 1'-0" Min. to SHW

3. 1'-0" Min. to SHW

4. 1'-0" Min. to SHW

5. 1'-0" Min. to SHW

6. 1'-0" Min. to SHW

7. 1'-0" Min. to SHW

8. 1'-0" Min. to SHW

9. 1'-0" Min. to SHW

**SCHEME 2**

1. 0'-0" Min. to SHW (Except for slopes steeper than 1:2 with wall heights ≥ 5', then 2'-0" Min.)

2. 1'-0" Min. to SHW

3. 1'-0" Min. to SHW

4. 1'-0" Min. to SHW

5. 1'-0" Min. to SHW

6. 1'-0" Min. to SHW

7. 1'-0" Min. to SHW

8. 1'-0" Min. to SHW

9. 1'-0" Min. to SHW

**SCHEME 3**

1. 0'-0" Min. to SHW

2. 1'-0" Min. to SHW

3. 1'-0" Min. to SHW

4. 1'-0" Min. to SHW

5. 1'-0" Min. to SHW

6. 1'-0" Min. to SHW

7. 1'-0" Min. to SHW

8. 1'-0" Min. to SHW

9. 1'-0" Min. to SHW

**NOTES:**

1. All bar dimensions are cut to out.

2. Lap splices for Bars A must be a minimum of 3'-0".
**CONCRETE STEPS**

**DESCRIPTION:**

- **STANDARD PLANS**
- **FY 2019-20**

1. Do not use this Index for suspended (structural) steps or stairways.
2. Construct steps in accordance with Section 522 of the FDOT Standard Specifications.
3. Concrete: Class NS, Specification 347.
4. Tread Finish: Broom finish parallel to steps unless otherwise shown in Plans.
6. 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.

**PLAN AT JUNCTION OF STEPS & LANDING**

(Bottom Landing shown, Top Landing similar)

**STAIR TREAD AND RISER DETAILS**

* The greatest riser height within the flight of steps shall not exceed the smallest by more than 1/4.
* The greatest tread depth within the flight of steps shall not exceed the smallest by more than 1/4.

**NOTES:**

- Length of Landing 5'-0" Min.
- Max Landing Slope = 2%
- Max Landing Cross-Slope = 2%

- Handrail (Typ.)
- Landing
- Steps
- Cheekwall Extension
- Pedestrian Railing (Typ.)
- Cheekwall

**SECTION A-A**

- B' Cheekwall
- 8" Cheekwall
- 6'-3" Width
- 2" Min. cover (Typ.)
- #3 Bars (12" Ctrs. 2" Min. Cover)
- #4 Bars (12" Ctrs. 2" Min. Cover)
- #3 Bar Each Nosing (1 1/2" Cover)

**SECTION B-B**

- B' Cheekwall
- 8" Cheekwall
- 6'-3" Width
- 2" Min. cover (Typ.)
- #3 Bars (12" Ctrs. 2" Min. Cover)
- #4 Bars (12" Ctrs. 2" Min. Cover)
- #3 Bar Each Nosing (1 1/2" Cover)

**SECTION C-C**

- B' Cheekwall
- 8" Cheekwall
- 6'-3" Width
- 2" Min. cover (Typ.)
- #3 Bars (12" Ctrs. 2" Min. Cover)
- #4 Bars (12" Ctrs. 2" Min. Cover)
- #3 Bar Each Nosing (1 1/2" Cover)
Supplementary Details for Manholes and Inlets

**WEIGHT OF CASTINGS (lb)**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>2' OPENING</th>
<th>3' OPENING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frame</td>
<td>Cover (Std.)</td>
</tr>
<tr>
<td></td>
<td>Inside</td>
<td>Outside</td>
</tr>
<tr>
<td>I</td>
<td>155</td>
<td>190</td>
</tr>
<tr>
<td>II</td>
<td>145</td>
<td>190</td>
</tr>
<tr>
<td>III</td>
<td>90</td>
<td>190</td>
</tr>
</tbody>
</table>

- *Includes Type I Adjustable

**NOTES (FRAMES, AND COVER):**

1. The standard cover is to be used for all frames Types I, II, and III and the 2-piece cover, and is the replacement cover for all previous frames with 2' 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 1' deep seats. Installation of frame with 1' 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 5', unless otherwise noted.

**DESIGNER NOTE:**

Consider using the 2-piece cover where depths exceed 8' 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.

**COVER FOR ALL FRAMES**

- 2'-0" or 3'-0" Opening
- 2" Raised or Depressed Identification Letter
- Standard Cover
- Covers With And Without Ribs Shall Bear The Same Product Identification Number

**2-PIECE COVER**

- 2" Raised Or Depressed Identification Letter
- Identification Number
- Identification Letter Type I
- "ADJUSTABLE" On Cover
- Cover, Nonskid Surface
- ribs (Optional)
- Pick-Up Holes
- 2'-0" Or 3'-0"

**MANHOLES AND INLETS**

- Depressed Logo
- Raised Or Surface Nonskid
- Identification Letter
- 2" Raised Or Depressed Ribs
- Identification Number
- Shall Bear The Same Product Covers With And Without Ribs Identification Number

**SYMBOLS**

- FDOT
- Storm Sewer

**SECTION**

- For Manholes
  - Type I
  - Type II
  - Type III

- For Curb Inlets Types 1, 2, 3, & 4
  - Type I

- For Curb Inlets Types 7 & 8
  - Type III

**TOP VIEW**

- clips permitted on 3'-0" frame

**BOTTOM VIEW**

- raised or depressed logo

**SYMBOLS**

- FDOT
- Storm Sewer

**DESIGNER NOTE:**

Consider using the 2-piece cover where depths exceed 8' 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

MATERIALS

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 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 construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric core 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 ASTM C478 grade rings.
6. Substitution of masonry top Type 8 for masonry 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 masonry top Type 8.

DESIGN NOTES
1. Manhole Type 8 should be specified in the plans when depths shown above can be maintained.
**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**

- **Option 1:** Lap Splice: At Quarter Point (30 Bar Diameters or Vertical Wire Spacing Plus 2" for WWR)
- **Option 2:** Lap Splice: Standard 90° Hooks at Corners (8" for #5, 10" for #6, 12" for #8)
- **Option 3:** Lap Splice: Corner Spliced Bar (30 Bar Diameters, But Not Less Than Two Vertical Wire Spacings Plus 2" for WWR)

**Rebar Straight End Embedment for Top and Bottom Slabs**

- **NOTE:** Not applicable around manhole and riser openings.

**Optional Construction Joints**

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 in Section 4.1.

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 prefabricated 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.
**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 interdimensional details of an All "B" Bottom can be adjusted to reflect these inlet interior dimensions.

3. Concrete which meets the requirements of ASTM C478 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 welded wire reinforcement will be recognized as having a design strength of 70 ksi. The areas 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:

   \[
   \text{Min. Steel Area Required} = \frac{\text{Max. Smooth Welded Wire Spacing} \times \text{Max. Grade 40 Bar Spacing}}{\text{Min. Steel Area Required}}
   \]

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 State Drainage Engineer.

---

**GENERAL NOTES**

1. For square or rectangular precast drainage structures, using 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 mulls 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 AASHTO 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 except when hooks are specifically called for in the plans or standard drawings.

5. Concrete as specified in ASTM C478, (4000 psi) may be used in lieu of Class II concrete in precast items manufactured in plants which meet the requirements in accordance with Specification Section 449.

6. Precast opening for pipe shall be the pipe 60 plus 6" (a 2" tolerance). Mortar used to seal the pipe into the opening will 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 250 psi 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>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 60</th>
<th>REINFORCING BAR</th>
<th>BAR SIZE &amp; SPACING</th>
<th>EQUVALENT GRADE 40</th>
<th>REINFORCING BAR</th>
<th>MIN. STEEL AREA</th>
<th>EQUIVALENT 65 KSI SMOOTH WIRE REINFORCEMENT</th>
<th>MIN. STEEL AREA</th>
<th>EQUIVALENT 70 KSI DEFORMED WIRE REINFORCEMENT</th>
<th>MIN. STEEL AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.20</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.30</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.20</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.30</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.24</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.36</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.24</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.36</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.24</td>
</tr>
<tr>
<td>Special 1</td>
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<td>0.267</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.40</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.267</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>0.40</td>
<td>#3 @ 60&quot; Ctrs.</td>
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<td>0.37</td>
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<td>#3 @ 60&quot; Ctrs.</td>
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</tr>
<tr>
<td>D</td>
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<td>#3 @ 60&quot; Ctrs.</td>
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<td>0.53</td>
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<td>E</td>
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<td>#3 @ 60&quot; Ctrs.</td>
<td>1.095</td>
<td>#3 @ 60&quot; Ctrs.</td>
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<td>#3 @ 60&quot; Ctrs.</td>
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<td>#3 @ 60&quot; Ctrs.</td>
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<tr>
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<td>#3 @ 60&quot; Ctrs.</td>
<td>1.06</td>
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<tr>
<td>Special 2</td>
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<td>#3 @ 60&quot; Ctrs.</td>
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<td>#3 @ 60&quot; Ctrs.</td>
<td>1.24</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>1.86</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>1.24</td>
</tr>
<tr>
<td>G</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>1.46</td>
<td>#3 @ 60&quot; Ctrs.</td>
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<td>#3 @ 60&quot; Ctrs.</td>
<td>1.46</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>2.19</td>
<td>#3 @ 60&quot; Ctrs.</td>
<td>1.46</td>
</tr>
</tbody>
</table>
PICTORIAL VIEW

NOTE:
1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.
2. $h_c$ 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" ≤ $h_c ≤ 2'-0$.

RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER

DESIGNER NOTE: Use only when round structures are not practical, engineer of record approval required.

DETAILS FOR SKEWED PIPES IN RECTANGULAR STRUCTURES
SHEET A (Type B Riser Shown) (Minimum #4 Bars)

DESCRIPTION:

ROUND RISER OPENING

SECTION B-B

TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE B)

BAR LONG WAY (See Section B-B)

Bars B Long Way

Bars B Short Way

Bars A Short Way (See Section B-B)

Bars A Long Way

Bars A Short Way

SPECIAL TOP SLAB*

NOTE:

When the inside diameter of a round structure is not more than 7" 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.

SECTION A-A

(ALTERNATE A)

SECTION B-B

(ALTERNATE B)

TYPICAL SLAB TO WALL DETAILS

FOR PRECAST STRUCTURES

INDEX

425-010

1 of 5
### GENERAL NOTES

1. Standard structure bottoms 4'-0" diameter and smaller (Alt. A) and 3'-0" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type A. Rectangular structures are permitted for all structures. Round risers are designated Type B.

2. Walls of circular structures (Alt. A) constructed in place may be of brick or reinforced concrete. Rectangular and precast structures (Alt. B) shall be constructed of reinforced concrete only.

3. Wall thickness and reinforcement are for either reinforced 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 IV 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 manhole 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 ALL hooks are specifically required, reinforcement in top and bottom slab shall be straight embedment.

9. All reinforcement must have 2" minimum cover except for 3'-0" diameter precast circular units manufactured under ASTM C478, keyed construction otherwise shown. Additional bars used to restrain hole formers for precast structures with grouted pipe connections may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain structural integrity. 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, throat, risers or manhole tops shall be secured to structures as shown on Index 425-001 (Optional Construction Joins).

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 manhole 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.

### SQUARE & RECTANGULAR STRUCTURES

**Table 1**

<table>
<thead>
<tr>
<th>Type</th>
<th>Wall Length (ft)</th>
<th>Max. Depth (ft)</th>
<th>Wall Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P 1 3'-6&quot;</td>
<td>40</td>
<td>6</td>
<td>CIP (in.)</td>
</tr>
<tr>
<td>J 1 4'-0&quot;</td>
<td>40</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>J 1 5'-0&quot;</td>
<td>27</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>J 1 6'-0&quot;</td>
<td>15</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>J 1 7'-0&quot; to 9'-0&quot;</td>
<td>40</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>J 1 10'-0&quot;</td>
<td>28</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>J 1 10'-0&quot; to 12'-0&quot;</td>
<td>40</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>J 1 12'-0&quot;</td>
<td>35</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>J 1 16'-0&quot;</td>
<td>80</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>J 1 18'-0&quot;</td>
<td>25</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>J 1 20'-0&quot;</td>
<td>30</td>
<td>10</td>
<td>10</td>
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</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>Type</th>
<th>Wall Length (ft)</th>
<th>Max. Depth (ft)</th>
<th>Wall Thickness (in.)</th>
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</thead>
<tbody>
<tr>
<td>P 1 3'-6&quot;</td>
<td>40</td>
<td>6</td>
<td>CIP (in.)</td>
</tr>
<tr>
<td>J 1 4'-0&quot;</td>
<td>40</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>J 1 5'-0&quot;</td>
<td>27</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>J 1 6'-0&quot;</td>
<td>15</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>J 1 7'-0&quot; to 9'-0&quot;</td>
<td>40</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>J 1 10'-0&quot;</td>
<td>28</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>J 1 10'-0&quot; to 12'-0&quot;</td>
<td>40</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>J 1 12'-0&quot;</td>
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<td>-</td>
<td>9</td>
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<tr>
<td>J 1 16'-0&quot;</td>
<td>80</td>
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<td>10</td>
</tr>
<tr>
<td>J 1 18'-0&quot;</td>
<td>25</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>J 1 20'-0&quot;</td>
<td>30</td>
<td>10</td>
<td>10</td>
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</tbody>
</table>
TABLE 3 - MINIMUM STRUCTURE SIZES FOR SINGLE PIPE CONNECTION PER SIDE

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>RECTANGULAR</th>
<th>ROUND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Pipe</td>
<td>Diameter (D)</td>
</tr>
<tr>
<td>Side Dimension (L)</td>
<td>Number</td>
<td>or 2 To 4 Pipes</td>
</tr>
<tr>
<td>18&quot;</td>
<td>2.0&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>2.0&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>1.6/2/3</td>
<td>10&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>1.2/2/3</td>
<td>12&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>0.8/2/3</td>
<td>15&quot;</td>
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<tr>
<td>60&quot;</td>
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<td>18&quot;</td>
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<tr>
<td>66&quot;</td>
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<td>27&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>0.8/2/3</td>
<td>30&quot;</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 8'-0".

TABLE 4 - MINIMUM SIZES FOR MULTIPLE PARALLEL PIPE CONNECTIONS FOR RECTANGULAR STRUCTURE BOTTOMS

<table>
<thead>
<tr>
<th>PIPE SIZE (In.)</th>
<th>MINIMUM WALL LENGTH (L)</th>
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</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>2.0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>2.0&quot;</td>
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<tr>
<td>30&quot;</td>
<td>1.6/2/3</td>
</tr>
<tr>
<td>36&quot;</td>
<td>1.2/2/3</td>
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<tr>
<td>48&quot;</td>
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<tr>
<td>60&quot;</td>
<td>0.8/2/3</td>
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<tr>
<td>66&quot;</td>
<td>0.8/2/3</td>
</tr>
<tr>
<td>72&quot;</td>
<td>0.8/2/3</td>
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<tr>
<td>78&quot;</td>
<td>0.8/2/3</td>
</tr>
<tr>
<td>84&quot;</td>
<td>0.8/2/3</td>
</tr>
</tbody>
</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" are not required special designs.

MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>10&quot;</td>
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<tr>
<td>5&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>14&quot;</td>
</tr>
<tr>
<td>7&quot;</td>
<td>16&quot;</td>
</tr>
<tr>
<td>8&quot;</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

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.

PRECAST ROUND STRUCTURES WITH MULTIPLE PIPE CONNECTIONS

MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL PLAN VIEW

STRUCTURE SIZES FOR PIPE CONNECTIONS

LAST REVISION: 01/01/17
DESCRIPTION: FY 2019-20
STANDARD PLANS
INDEX: 425-010
SHEET: 3 of 5
SLAB AND WALL DESIGN TABLE NOTES

1. Size is the inside dimension(s) of a structure.

2. Slab reinforcement is appropriate for top, intermediate, and bottom slabs.

3. Bottom Slabs for prestressed 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 3', or 10' for wall lengths exceeding 12.

7. Wall lengths exceeding 6'-0" require two layers of reinforcing (see Table A) with 2" of cover from the horizontal bars to the inside and outside faces for each layer.

8. Wall lengths exceeding the dimensions or depths shown in Table B, or 12'-0" diameter 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 46. See Index 425-001 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.
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 border.

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 area 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 C478 (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 boxes or skewed rectangular inlet basins. Finish top of fillets flush with drain throat bottom and back 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 graded in accordance with the grading detail shown on Sheet 5, in lieu of tuck welding.

13. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type _), Each.

INLET TYPE 5 (Curb Inlet Type 6 Symmetrical With Left Half)
PRECAST DETAILS

CROSS REFERENCES:
For General Notes See Sheet 1.
For Location Of Sections DD
Thru HH See Sheet 1.

For Location Of Sections EE
Thru HH See Sheet 1.

For Location Of Sections FF
Thru HH See Sheet 1.

For Location Of Sections GG
Thru HH See Sheet 1.

For Location Of Sections HH
Thru HH See Sheet 1.
### BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>PIECE NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>WELDED WIRE REINFORCEMENT PIECE NO. 1</td>
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<tr>
<td>2</td>
<td>WELDED WIRE REINFORCEMENT PIECE NO. 2</td>
</tr>
<tr>
<td>3</td>
<td>WELDED WIRE REINFORCEMENT PIECE NO. 3</td>
</tr>
</tbody>
</table>

### CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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 DETAILS

- **Type 5 Inlet**
  - Bars 4A, 4E, and 4S
  - Welded Wire Reinforcement
  - Conventional Reinf. Bar 4F
  - Provide Conventional Reinf. For Bar 4S, 4H & 45

- **Type 6 Inlet**
  - Bars 4A, 4E, 4S, and 4F
  - Welded Wire Reinforcement
  - Conventional Reinf. Bar 4F

### ALTERNATE REINFORCING STEEL DETAILS FOR WELDED WIRE REINFORCEMENT (WWR)

- **Piece No. 1**
  - Welded Wire Reinforcement
- **Piece No. 2**
  - Welded Wire Reinforcement
- **Piece No. 3**
  - Welded Wire Reinforcement

### CONCRETE REQUIREMENTS

- Cut dotted portion of mat as required to maintain cover.
- Field cut as required to maintain cover.
- Field cut as required to maintain cover.

### ALTERNATE REINFORCING STEEL NOTES

- Smooth or Deformed wire meeting the requirements of Specification Section 931.
- Bars 4A and 4E may be combined into a single bar.

### TYPICAL SECTION SHOWING WELDED WIRE REINFORCEMENT

- Provide Conventional Reinf. For Bar 4S, 4H & 45

---

**INDEX**

**SHEET**

**DESCRIPTION:**

**FY 2019-20 STANDARD PLANS**

**425-021**

4 of 5
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 1, 2, 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.

58 Bars ACI Std. Hooks Required Each End of Straight Bars and Right End of Bent Bars: 180° Hooks, Canted 60°W.

On Odd Bars: 90° Hooks, Down, on Even Bars Numbered from Throat Side.

To Be Paid For As Inlet

To Be Paid For As Separator (No Deduction For Inlet)

Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 7), Each.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

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.

Pipe, inlets with Alt. B bottoms, Index 425-010 are recommended.

Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with Alt. B bottoms, Index 425-010 are recommended.

For supplementary details see Index 425-001.

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.

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".

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 1, 2, 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.
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" 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".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" 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.

---

**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 - 20</td>
<td>4</td>
<td>0.20</td>
<td>6' 3&quot;</td>
</tr>
<tr>
<td>20 - 30</td>
<td>4</td>
<td>0.20</td>
<td>6' 3&quot;</td>
</tr>
<tr>
<td>30 - 40</td>
<td>4</td>
<td>0.20</td>
<td>6' 3&quot;</td>
</tr>
</tbody>
</table>

---

**PLAN SECTION CC**

- **General Notes**
  - Use only in Traffic Separators Types IV and V, or in Separators constructed with Curbs Types D and F and sidewalk paving.
  - Locate inlet outside of pedestrian way.
  - All reinforcing to be Grade 60 bars with 2" min. cover.
  - Recommended maximum pipe sizes: 24" longitudinal, 30" transverse.

---

**SECTION AA**

- **Throat Detail (Section AA)**
  - Use for both precast and cast-in-place Inlets.

---

**SECTION BB**

- **Horizontal Wall Reinforcing**
  - Use for Button Side.

---

**REINFORCING STEEL DIAGRAM**

- **Top Slab Inlet**
  - Use for Horizontal Wall Reinforcing.

---

**MODIFICATION WHEN USED AS A MANHOLE**

- Use as a Manhole.
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 the dished 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 6. The typical application is on curb returns to city streets. The inlet 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 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" x 36". 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.

11/01/17

REVISION 1

425-024
CURB INLET TOP TYPE 10

GENERAL NOTES

1. 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 15' 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.
MEDIAN BARRIER INLETS TYPES 1 AND 2

PRECAST COLLAR REINFORCING DETAILS (TYPE 1)

(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

DESCRIPTION:

10'30'2018

REVISION

0x0

LAST

REVISION

11/01/17

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STANDARD PLANS

FY 2019-20

425-030

Sheet

2 of 2

Shape Optional

Haunch

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope

Grate Slope
GENERAL NOTES:
1. Where called for in the Plans, use this inlet in conjunction with Shoulder Barrier per Index 521-001 or a Wall Coping with Barrier and Junction Slab per Index 521-010. 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 be avoided 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 1/4 chamfer or tooled to 1/4 radius.
5. When Alternate C 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 Inlet 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 REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
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</thead>
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<tr>
<td>0'-6&quot;</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>6&quot;-12&quot;</td>
<td>A14</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>9'-12&quot;</td>
<td>A4</td>
<td>0.20</td>
<td>4&quot;</td>
</tr>
<tr>
<td>12'-18&quot;</td>
<td>B5.5</td>
<td>0.24</td>
<td>15/8&quot;</td>
</tr>
</tbody>
</table>

Note: All B Structure Bottom Only. See Index 425-010

SECTION A-A (WITHOUT GRATE) (Pipe Opening Shown)

SECTION B-B (Pipe Opening Not Shown)
SHOT BARRIER INLET

**DESCRIPTION:**
See Inset A (See Plate Detail)
Grouted Stud
"Ø Drilled Hole for 4 3/4" Ø Anchor Bolt or 2 1/16" Ø Hole For 4 3/4" Ø Anchor Bolt or 2 1/16" Ø Stud x 4" (2 Required)

See Inset B (See Index 425-001)
Eyebolt & Chain
2" Pitch
16-5-5
16-11-6
@ 11" ± #4 Bars 12" Long

**NOTES**
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.
GENERAL NOTES:

1. Where called for in the Plans, use this joint between the 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 joint, use a 4" square minimum cover unless otherwise specified. From or bend bars to provide 12" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier. For Bar Bending Details of Bars 5V2 & 5U4, see Index 521-001. For all others, see Sheet 2 & 3.

3. All barrier is Class II or IV concrete per Index 521-001.

4. Apply a 3" chamfer or 90° 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 bottom. Index 425-020.

6. Grates may be fabricated with reticulate bars or with either 100 weld or 80 electroforged cross bars and bearing bars as detailed on Sheet 3.

7. When Alternate G grate is specified in the Plans, the grate is to be hot-dip galvanized after fabrication, in accordance with Specification 902-9.

8. For Pay Item purposes, the depth of the barrier inlet shall be computed using the center of box grate elevation, minus either the flow line elevation of the lowest pipe flow line or the top of the sump floor elevation, whichever is greater.

9. All dimensions are for both precast and cast in place (C-I-P) inlets unless otherwise indicated. Trim or bend bars to otherwise show. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown.

10. For areas placed of bicycle traffic, provide the extended crossbar for the equivalent area of welded wire reinforcement for the joint, see Index 521-001. For all others, see Index 521-001. For all others, see Index 521-001. For all others, see Index 521-001.

11. Inlets to be paid for under the contract unit price for Inlets, Barrier, Rigid, Curb and Gutter, Each.

12. Concrete Barrier to be paid for under the contract unit price for Shoulder, Concrete Barrier, Rigid-Curb & Gutter, Each.

13. Reinforcing shown is grade 60 steel bars. For the equivalent area of welded wire reinforcement for the joint, use a 4" square minimum cover unless otherwise specified. From or bend bars to provide 12" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier. For Bar Bending Details of Bars 5V2 & 5U4, see Index 521-001. For all others, see Sheet 2 & 3.

14. All barrier is Class II or IV concrete per Index 521-001.

15. Apply a 3" chamfer or 90° radius to all exposed concrete edges.

16. For pipe connections to inlet structure bottoms, the recommended maximum pipe sizes are 18" longitudinal and 30" transverse. For larger pipes, use Alternate B bottom. Index 425-020.

17. Grates may be fabricated with reticulate bars or with either 100 weld or 80 electroforged cross bars and bearing bars as detailed on Sheet 3.

18. When Alternate G grate is specified in the Plans, the grate is to be hot-dip galvanized after fabrication, in accordance with Specification 902-9.

19. For Pay Item purposes, the depth of the barrier inlet shall be computed using the center of box grate elevation, minus either the flow line elevation of the lowest pipe flow line or the top of the sump floor elevation, whichever is greater.

20. All dimensions are for both precast and cast in place (C-I-P) inlets unless otherwise indicated. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown. Trim or bend bars to otherwise shown.

21. For areas placed of bicycle traffic, provide the extended crossbar for the equivalent area of welded wire reinforcement for the joint, see Index 521-001. For all others, see Index 521-001. For all others, see Index 521-001.

22. Inlets to be paid for under the contract unit price for Inlets, Barrier, Rigid, Curb and Gutter, Each.

23. Concrete Barrier to be paid for under the contract unit price for Shoulder, Concrete Barrier, Rigid-Curb & Gutter, Each.
OPTIONAL STEEL GRATES

CROSS BAR OPTIONS

PLAN VIEW

CROSS BAR GRATE

PLAN VIEW

RETICULINE GRATE

TOP VIEW OF INLET TOP WITHOUT GRATE

PICTORIAL VIEW OF INLET TOP

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

BAR STUB

PRECAST INLET TOP REINFORCING DETAILS

CURB AND GUTTER BARRIER INLET

INDEX

425-032

3 of 3
Gutter Inlet Type S

Recommended Maximum Pipe Sizes

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
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<tbody>
<tr>
<td>2'-9&quot; or 3'-3&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>4'-0&quot; or 5'-0&quot;</td>
<td>30&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 below and Index 425-010.

Horizontal Wall Reinforcing Schedule (Table 1)

<table>
<thead>
<tr>
<th>Wall Depth</th>
<th>Area (in²/ft)</th>
<th>Max. Spacing</th>
<th>Max. BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'-12'</td>
<td>0.20</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>9'-15'</td>
<td>0.24</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: All B Structure Bottom Only. See Index 425-010 for structure bottom details and hole reinforcement. See Index 425-010 for equivalent area for welded wire fabric. Bars to be cut or bent for 1 ½" radius.

GENERAL NOTES

1. This inlet is intended for use in shoulder gutter on facilities subject to heavy wheel loads.

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 1 ½" minimum clearance around pipe.

3. All exposed edges and corners must be ¾" chamfer or rounded to 1 ½" radius.

4. When Alternate G grate is specified in plans, the grate is to be hot-dip galvanized after fabrication.

5. For supplementary details and notes see Indexes 425-001 and 425-010.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

7. Inlets to be paid for under the contract unit price for inlets (Gutter Type S), EA. Cost of concrete apron at terminal inlets to be included in the cost of the inlet.
Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter

CONCRETE APRON AT TERMINAL INLETS
ALT. A STRUCTURE BOTTOM FOR INLET TYPE S

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>

TOP SLAB REINFORCING DIAGRAM

- Centered Opening
- Top Slab With Centered Opening
- Round Structure Bottom

Top Slab With Centered Opening

See Index 425-020 For Structure Bottom Details and Hole Reinforcement.

9½" For 5'-0"/6'-0" Structure Bottoms
11½" For 8'-0" Structure Bottoms

2 Way Reinforcement

See Tables

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 5'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥0.5'&lt;30'</td>
<td>9½&quot;</td>
<td>C</td>
</tr>
<tr>
<td>30'-40'</td>
<td>9½&quot;</td>
<td></td>
</tr>
<tr>
<td>SIZE: 6'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥0.5'&lt;8'</td>
<td>9½&quot;</td>
<td>B</td>
</tr>
<tr>
<td>8'-18'</td>
<td>9½&quot;</td>
<td>C</td>
</tr>
<tr>
<td>18'-33'</td>
<td>9½&quot;</td>
<td>E</td>
</tr>
<tr>
<td>37'-40'</td>
<td>9½&quot;</td>
<td>G</td>
</tr>
<tr>
<td>SIZE: 8'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥0.5'&lt;9'</td>
<td>11½&quot;</td>
<td>C</td>
</tr>
<tr>
<td>9'-15'</td>
<td>11½&quot;</td>
<td>D</td>
</tr>
<tr>
<td>15'-23</td>
<td>11½&quot;</td>
<td>E</td>
</tr>
<tr>
<td>23'-33</td>
<td>11½&quot;</td>
<td>G</td>
</tr>
<tr>
<td>33'-40</td>
<td>11½&quot;</td>
<td>G</td>
</tr>
</tbody>
</table>
GENERAL NOTES

1. This inlet is suitable for village swales, ditches, or other areas subject to heavy wheel loads, minimum depth. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk along the inlet. This inlet is not for use in a bicycle way.

2. When alternate "G" 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" chamfered 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/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5 - 9</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot; 5&quot;</td>
</tr>
<tr>
<td>9 - 12</td>
<td>A4</td>
<td>0.20</td>
<td>4&quot; 3&quot;</td>
</tr>
<tr>
<td>9 - 15</td>
<td>B5.5</td>
<td>0.24</td>
<td>5/10 5&quot;</td>
</tr>
</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>3&quot; Cl.</td>
</tr>
<tr>
<td>4-0&quot; or 3-3&quot;</td>
<td>2&quot; Cl.</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.

NOTE: Alt. B Structure Bottom Only. See Index 425-010 for structure bottom details and hole reinforcement. (For Pipes 30" Dia. And Larger)
ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

GUTTER INLET TYPE V

INDEX 425-041
2 of 2
ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

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>
</tbody>
</table>

SECTION AA

Top Slab With Centered Opening

Round Structure Bottom

See Index 425-010 For Structure Bottom Details and Hole Reinforcement.

9'/4" For 4'-0"/5'-0"/6'-0" Structure Bottoms

11'/4" For 8'-0" Structure Bottoms

SECTION BB

#4 Bar Each Corner

2 Way Reinforcement See Tables

2 Way Reinforcement See Tables

ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

TOP SLAB REINFORCING DIAGRAM

#4 Bar Each Corner

(2'-0" Min. Length)

#5 Hoop Bar

(Peripheral Reinforcement)

2 Way Reinforcement See Tables

#5 Hoop Bar

Centered Opening - See Table For Dimensions

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 60 (BAR) OR 65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In.²/ft.</td>
</tr>
<tr>
<td>4</td>
<td>0.20</td>
</tr>
<tr>
<td>5</td>
<td>0.27</td>
</tr>
<tr>
<td>6</td>
<td>0.33</td>
</tr>
<tr>
<td>7</td>
<td>0.45</td>
</tr>
</tbody>
</table>

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SIZE</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>95/&quot;</td>
<td>C</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>95/&quot;</td>
<td>C</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>95/&quot;</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>95/&quot;</td>
<td>B</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>95/&quot;</td>
<td>C</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>95/&quot;</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-1&quot;</td>
<td>115/&quot;</td>
<td>C</td>
</tr>
<tr>
<td>4'-0&quot;</td>
<td>115/&quot;</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>115/&quot;</td>
<td>D</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>115/&quot;</td>
<td>E</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>115/&quot;</td>
<td>G</td>
</tr>
</tbody>
</table>
DITCH BOTTOM INLET TYPE B

**SECTION EE**

**CONCRETE INLET PAVEMENT AND SODDING**

- Sod
- Concr. Inlet Pavt.
- Traversable Inlet Top (Single Slot Shown)

**ESTIMATED QUANTITIES**

For Informational Purposes Only

<table>
<thead>
<tr>
<th>SLOT TYPE</th>
<th>SY</th>
<th>CY</th>
<th>SY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Slot</td>
<td>6.2</td>
<td>0.9</td>
<td>14</td>
</tr>
<tr>
<td>Double Slot</td>
<td>8.1</td>
<td>1.1</td>
<td>19</td>
</tr>
</tbody>
</table>

**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>
<th>BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>4</td>
<td>0.20</td>
<td>12</td>
<td>6</td>
<td>3/8</td>
</tr>
<tr>
<td>3 - 6</td>
<td>4-1/2</td>
<td>0.20</td>
<td>12</td>
<td>8</td>
<td>3/8</td>
</tr>
<tr>
<td>6 - 9</td>
<td>4-1/2</td>
<td>0.24</td>
<td>30</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>9 - 12</td>
<td>5-1/2</td>
<td>0.24</td>
<td>30</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>12 - 15</td>
<td>Special</td>
<td>0.267</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
</tbody>
</table>

**SECTION BB**

**SECTION CC**

**SECTION DD**

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>36&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 above and Index 425-010.
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” chamfered or rounded to ¾” radius.

4. When Alternate 6 grades are specified in the plans, the grades 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 grates 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 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, SF.

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 grates 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 at other elevations, details for ditch modifications and underdrains will 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 grates that are determined by the Maintenance Engineer to be functionally sound, and their reuse is so directed by the Maintenance Engineer. Existing grates approved for reuse and new grates may be mixed, matched or replaced as directed by the Maintenance Engineer.
**TOP SLAB OPENINGS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN</td>
<td>MAX</td>
</tr>
<tr>
<td>6'-0&quot; to 8'-0&quot;</td>
<td>7'-8&quot; x 4'-2&quot; to 7'-10&quot; x 4'-2&quot;</td>
</tr>
</tbody>
</table>

**TOP SLAB REINFORCING DIAGRAM**

- #5 Hoop Bar (Peripheral Reinforcement)
- #8 Bars
- 2 Way Reinforcement
- See Tables
- Centered Opening: See Table for Dimensions
- #5 Bar Each Corner
- (2'-0" Min. Length)

**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>0.37</td>
</tr>
<tr>
<td>D</td>
<td>0.53</td>
</tr>
<tr>
<td>E</td>
<td>0.73</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)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 8'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 &lt; 8</td>
<td>9/16</td>
<td>B</td>
</tr>
<tr>
<td>8 &lt; 12</td>
<td>9/16</td>
<td>C</td>
</tr>
<tr>
<td>12 &lt; 20</td>
<td>9/16</td>
<td>D</td>
</tr>
<tr>
<td>20 &lt; 30</td>
<td>9/16</td>
<td>E</td>
</tr>
<tr>
<td>30 &lt; 40</td>
<td>9/16</td>
<td>G</td>
</tr>
</tbody>
</table>

| SIZE: 6'-0" |               |                       |
| 0.5 < 6    | 11/16          | C                     |
| 6 < 10     | 11/16          | D                     |
| 10 < 18    | 11/16          | E                     |
| 18 < 30    | 11/16          | F                     |
| 30 < 40    | 11/16          | G                     |

**DIMENSIONS**

- 3'-8" x 4'-2"
- 3'-10" x 4'-2"
- 6'-0" Min. To 8'-0" Max

**OTHERS SHOWN:**
- Centered Inlet
- Structure Bottom
- #5 Hoop Bar
- 2 Way Reinforcement
- #8 Bars @ 5" Spacing

**C-I-P**

- Prestressed
- Precast
- 3'-8" Or 4'-2" (Unless Otherwise Shown In The Plans)

**GENERAL**

- 6'-0" Min. To 8'-0" Max
- Shown In The Plans
SCHEDULES (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCH</th>
<th>AREA (in²/ft²)</th>
<th>MAX SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-14</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
</tbody>
</table>

**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)

SCHEDULES (TABLE 2)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCH</th>
<th>AREA (in²/ft²)</th>
<th>MAX SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-15</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
<tr>
<td>0'-19</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot; 5&quot;</td>
</tr>
<tr>
<td>10'-15</td>
<td>2A4</td>
<td>0.24</td>
<td>30&quot; 5&quot;</td>
</tr>
</tbody>
</table>

**TYPE D**

Recommended Maximum Pipe Size:

3'-1" Wall - 24" Pipe
4'-1" Wall - 36" Pipe

SCHEDULES (TABLE 3)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCH</th>
<th>AREA (in²/ft²)</th>
<th>MAX SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-15</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
<tr>
<td>0'-14</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot; 5&quot;</td>
</tr>
<tr>
<td>10'-15</td>
<td>A6</td>
<td>0.24</td>
<td>60&quot; 5&quot;</td>
</tr>
</tbody>
</table>

**TYPE E**

Recommended Maximum Pipe Size:

3'-0" Wall - 24" Pipe
4'-0" Wall - 36" Pipe

DITCH BOTTOM INLET TYPES C, D, E AND H
### Horizontal Wall Reinforcing Schedules (Table 4)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX SPACING BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-3&quot;</td>
<td>D3.5</td>
<td>0.24</td>
<td>3/8&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>3'-7&quot;</td>
<td>D6.5</td>
<td>0.37</td>
<td>6/0&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>7'-15&quot;</td>
<td>D14.5</td>
<td>0.53</td>
<td>4/0&quot;</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

**TYPE H (2 & 3-Grate Inlet)**

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 6'-7" Wall - 1-30" Pipe
Or 2-24" Pipe (5-3'-5')

### Horizontal Wall Reinforcing Schedules (Table 5)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX SPACING BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-3&quot;</td>
<td>C3.5</td>
<td>0.37</td>
<td>3/8&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>3'-10&quot;</td>
<td>D6.5</td>
<td>0.53</td>
<td>4/0&quot;</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

**TYPE H (4-Grate Inlet)**

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 8'-0" Wall - 1-38" Pipe
Or 2-30" Pipe (5-4'-3')

---

**General Notes**

See Sheet 3 of 7.
Steel Grates are required on Inlets with traversable slots and on Inlets where bicycle traffic is anticipated.

**GENERAL NOTES**

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. Where debris is a problem Inlets should be constructed with slots. Slot Inlets located within roadway clear zones and areas subject to pedestrians shall have traversable slots. The traversable slot modification is not adaptable to Inlet Type H. Slots may be constructed at either or both ends as shown on plans. Traversable slots shall not be used in areas subject to occasional bicycle traffic.

3. Steel grates are to be used on all Inlets where bicycle traffic is anticipated. Steel grates are to be used on all 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 Alternating 6 grate 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 1/8” chamfer or tooled to 1/4” 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 INSERTS (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, $.

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 1½” clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.
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 1 conversion is to add the traversable slot to an existing inlet where top removal, change in grade elevation and ditch transitions are not required. Case 2 will normally be applicable to ditches with flatter grades adjoining the inlet. Case 3 will normally be applicable to ditches with steeper 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.

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 partial cost and are to be paid for separately.

3. Concrete inlet pavement and sodding shall be paid 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/Task 2) (Partial), each.

Sodding shall be paid for under the contract unit price for Performance Turf, SY. Ditch pavement shall be paid for separately from the inlet by pavement type(s) and paid for as inlets partial, each. Case shall not be included in the pay item description.

SINGLE SLOT SHOWN (DOUBLE SLOTS SYMMETRICAL ABOUT CENTERLINE)

SECTION CC (CASE 2)

Break Angle Not To Exceed 3° (1:20)

Minimum Grade For Transition Ditch 0.10% Unless Existing Ditch Is Flatter.

UNIT PRICE AND PAYMENT FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

1. Existing inlets converted to traversable slot types 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 partial cost and are to be paid for separately.

3. Concrete inlet pavement and sodding shall be paid 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/Task 2) (Partial), each.

Sodding shall be paid for under the contract unit price for Performance Turf, SY. Ditch pavement shall be paid for separately from the inlet by pavement type(s) and units as called for in the plans.

SINGLE SLOT SHOWN (DOUBLE SLOTS SYMMETRICAL ABOUT CENTERLINE)

SECTION CC (CASE 3)

TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

INDEX

FA 2019-20
STANDARD PLANS

DITCH BOTTOM INLET TYPES C, D, E AND H

REV 01/01/17

FA DOT

425-052
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ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D, & E

INLETS C, D, & E

ALT. B STRUCTURE BOTTOM FOR

PIPE OPENING SCHEMATIC

SECTION BB

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN.</th>
<th>MAX.</th>
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<td>2'-0&quot; x 3'-1&quot;</td>
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TOP SLAB REINFORCING DIAGRAM

TOP SLAB REINFORCING SCHEDULE

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<tr>
<th>SCHEDULE</th>
<th>GRADE 60 (BAR)</th>
<th>70 KSI (WIRE FABRIC)</th>
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<td>C</td>
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TOP SLAB WITH CENTERED OPENING

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<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
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<td>≥0.5'-40'</td>
<td>C</td>
</tr>
<tr>
<td>0.5'-30'</td>
<td>≥0.5'-40'</td>
<td>C</td>
</tr>
<tr>
<td>0.5'-20'</td>
<td>≥0.5'-40'</td>
<td>B</td>
</tr>
<tr>
<td>0.5'-10'</td>
<td>≥0.5'-40'</td>
<td>C</td>
</tr>
<tr>
<td>0.5'-5'</td>
<td>≥0.5'-40'</td>
<td>C</td>
</tr>
<tr>
<td>30'-40'</td>
<td>≥0.5'-40'</td>
<td>D</td>
</tr>
<tr>
<td>23'-30'</td>
<td>≥0.5'-40'</td>
<td>E</td>
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<tr>
<td>18'-23'</td>
<td>≥0.5'-40'</td>
<td>G</td>
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SECTION AA

ALT. B STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

See Index 425-010 for structure bottom details and hole reinforcement.

See Index 425-010 for structure bottom details and hole reinforcement.

ALT. B STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

PIPE OPENING SCHEMATIC

DITCH BOTTOM INLET TYPES C, D, E AND H

INDEX 425-052

7 of 7
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 fill bar when clearance or gap is greater than 1/2", 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. Bars to be cut or bent for 12" clearance around pipe opening. Provide the additional #4 bar above and at each side of pipe opening, as shown.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

PAVEMENT AND SODDING

STEEL GRATE

Steel Grating, Straight Bars 3 x 3/16" Rebar Grille Bars 2 x 3/16"

SECTION AA

SECTION BB

SECTION CC

SECTION DD

HORIZONTAL WALL REINF. SCHEDULES

TYPE F INLET (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX SPACING</th>
<th>BAR</th>
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<td>0 - 4&quot;</td>
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<td>12&quot;</td>
<td>#4</td>
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<tr>
<td>4 - 7&quot;</td>
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<td>0.20</td>
<td>8&quot;</td>
<td>#4</td>
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<td>7 - 12&quot;</td>
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<tr>
<td>12 - 18&quot;</td>
<td>Special 1</td>
<td>0.267</td>
<td>5&quot;</td>
<td>#4</td>
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RECOMMENDED MAXIMUM PIPE SIZES

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>INLET INSIDE WIDTH</th>
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</thead>
<tbody>
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<td>2&quot; - 3&quot;</td>
<td>18&quot;</td>
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<td>4&quot; - 6&quot;</td>
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<tr>
<td>4&quot; - 12&quot;</td>
<td>42&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.

INDEX

425-053
STEEL GRATE

5" Steel Decking, Weight 630 Lbs.
Main Bars 5" x 1/2"
Intermediate Bars 1/2" x 1/4"
Reticuline Bars 1/4" x 1/4"

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
<th>BARS</th>
<th>MM</th>
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</thead>
<tbody>
<tr>
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<td>A12</td>
<td>0.20</td>
<td>12'</td>
<td>8</td>
<td></td>
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<tr>
<td>3 - 7</td>
<td>M</td>
<td>0.20</td>
<td>8'</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7 - 10</td>
<td>B5.5</td>
<td>0.24</td>
<td>10'</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10' - 15</td>
<td>C6.5</td>
<td>0.37</td>
<td>15'</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Construction joints permitted between these limits—See Index

A6 0.20 0.20 0.24 6" 5"
The image contains a detailed plan for a ditch bottom inlet type J, with specific instructions and specifications. Here is a summary of the key points:

- **PLAN**: The plan shows the layout of the inlet with various dimensions and notes for construction. It includes a section labeled **SECTION AA** and **SECTION BB**.

- **INSET A** (PRECAST OPTION): Details the precast option for the inlet, with specifications for steel grating, reinforcing, and other components.

- **HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)**: Provides a schedule for reinforcing bars, including pipe depth, schedule, area, and maximum spacing.

- **RECOMMENDED MAXIMUM PIPE SIZES**:
  - For 2'-11" or 3'-3" pipe, the maximum size is 24".
  - For 3'-10" or 4'-0" pipe, the maximum size is 30".

- **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. It is not for use in areas subject to bicycle traffic. It 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.
  3. All exposed edges and corners shall be 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)

SECTION DD

Ditch Block (low Side Of Inlet On Continuous Ditches)

PAVEMENT & SODDING

STEEL GRATING

Main Bars 9" x 5/8" (Notched For Cross Bars)
Cross Bars 13/16" 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 located at locations having high flow rates, usually where an embankment would not be utilized without hazardous intake.

2. Inlet length (L) shall be set by the designer for the greater of either curvilinear 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 1/2" chamfer or tooled to 1/4" radius.

5. Inlet and anti-vortex wall to be Class II Concrete.

6. All reinforcing is Grade 60 with 3% min. reinforcement, unless otherwise noted. See Index 425-081 for equivalent area of expanded wire fabric (EWF). 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 4x4.5 channel at 15" bar spacing.

8. Channels and bars for grate shall be ASTM A242/A242M, A572/A572M or ASAB/ASMA, 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).


INLET LENGTHS (L) LESS THAN OR EQUAL TO 9’ (SINGLE LAYER WALL REINFORCING)

INLET LENGTHS (L) GREATER THAN OR EQUAL TO 9’ (DOUBLE LAYER WALL REINFORCING)
1. For additional details see Index 425-052.

2. Inlet to be paid for under the contract unit price for Inlets (Ditch Bottom Type C Modified), EA. Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.

Handrail Requirements

See Plans For Handrail Requirements

4" - 45° Haunch

Anchor Bolts

Unsupported Edge

INLET TYPE C (MODIFIED)

Notes:
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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</thead>
<tbody>
<tr>
<td>15</td>
<td>4-9</td>
<td>2.3</td>
</tr>
<tr>
<td>18</td>
<td>5-3</td>
<td>2.6</td>
</tr>
<tr>
<td>24</td>
<td>6-3</td>
<td>3.3</td>
</tr>
</tbody>
</table>

BACK OF SIDEWALK DRAINAGE

Pipe size: 24" diameter

Concrete quantities shown are for maximum wall heights, and shall be basis for estimate and payment.

Riprap quantities shown are for estimate purposes only. Cost of riprap to be included in cost of the endwall.

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.
YARD DRAIN ITEM INCLUDES:
1. 15" x 15" x 12" Concrete or PVC Tee & long.
2. Grade 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 Cfs).
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"),
   or PVC Pipe For Back Of Sidewalk Drainage (4"), 17.
**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 gulvertail 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 1/2".

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/O SIDEWALK INLET (CLOSED FLUME) TYPE II
SINGLE BARREL FLUME DEPICTED

ENDWALL

SECTION AA

SECTION BB

CLOSED FLUME INLET

REVISION

DESCRIPTION:

REVISION

LAST

11/01/17

OF

STANDARD PLANS

FY 2019-20

INDEX

425-061

SHEET

2 of 3
INTERMEDIATE-WALL REINFORCING

NOTE: See Barrel Flume For Base Dimensions.
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 not 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.
**DIMENSIONS**

<table>
<thead>
<tr>
<th>Height (as specified in the plans)</th>
<th>D</th>
<th>E</th>
<th>L</th>
<th>S</th>
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<td>6 1/8&quot;</td>
<td>6</td>
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<td>14</td>
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</tbody>
</table>

**TOP VIEW**

- 8 Holes For Expansion Anchors

**SIDE VIEW**

- 3/4" x 3/4" (3 Slots)
- Steel Sheet 0.1345" Thick (10 Gage) (6 Holes)

**END VIEW (FRONT)**

- 3/4" Dia. (6 Holes)

**SIDE PANEL**

**FRONT VIEW**

- Steel Sheet 0.1345" Thick (10 Gage) (6 Holes)
- 2 1/4" Diameter (3 Holes)

**END VIEW**

- Top Flange (Cut Away)
- Bottom Flange
- Front Panel Width Varies, See General Notes

**TOP PANEL**

- FLAT BAR

- 1/2" thick x 1 1/2" wide
NOTES:
1. These details are for construction field expediency 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 C476. 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 "Organization" 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.

1"-0" Minimum Clearance Between Obstruction And Flow Line Of Outlet Pipe

2'-0" Minimum Clearance On One Side Of Utility For Maintenance And No Less Than 1"-0" Clearance on the Other Side

Grout When Box Precast

No Joints Allowed Within Structure

Flow Line Of Outlet Pipe

Casing Is Used

Sump is completely blocked

See Plan For Structure Type

Section A-A

Section B-B

Utility conflict Condition I
(Nonpressure Or Nonfluid Carrier Installations)

Utility Conflict Condition II
(Pressure Or Fluid Carrier Installations)

See Plan For Structure Type

10/12/2019
11/01/17
11/01/17
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

LONGITUDINAL SECTION

SECTION AA

SECTION BB

SAFETY MODIFICATIONS
FOR INLET IN BOX CULVERTS
**Concrete Gutter and Drains at Retaining Walls**

- **Note:** PVC pipe, Schedule 40, to be paid for under the contract.

**Method for Setting Limits of Variable Front Slopes at Drainage Structures**

1. \( L = 10 \times H \) (No Maximum)
2. \( L = 10 \times Ditch \) Offset (Maximum \( L = 100' \))

**Sections AA and BB**

- **Section AA:**
  - Front Slope (1:2 Std.)
  - 4" Pipes
  - Retaining Wall
  - Expansion Material
  - Sidewalk

- **Section BB:**
  - Front Slope (1:2 Std.)
  - 3" Conc. Ditch Pavt.
  - Retaining Wall

**Section CC**

- **Note:** Filling or excavation of variable slopes to be done during normal grading operations.

**SIDE VIEW**

- **Pipe Dia.**
  - 18" 24" 30" 36" 42"
- **Grate (Lbs.)**
  - 46 58 74 90 111

**Guard at Pipe Ends**

**Unit Price for Polyvinyl Chloride Pipe Culvert (4"), LF.**

- **PVC pipe, Schedule 40, to be paid for under the contract.**

**Table:**

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>18&quot;</th>
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<th>30&quot;</th>
<th>36&quot;</th>
<th>42&quot;</th>
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<tr>
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<td>58</td>
<td>74</td>
<td>90</td>
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### Railroad Clearances Below Bottom of Rail

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<th>Clearance Below Bottom of Rail (Ft/In)</th>
<th>Strength</th>
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<tr>
<td>Alabama &amp; Gulf Coast Railway (Rail America)</td>
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<tr>
<td>All Railway &amp; Bay Line Railroad (Genesee &amp; Wyoming)</td>
<td>5.5 / 4.5††††</td>
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<td>CSX Transportation</td>
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<td>First Coast Railroad (Genesee &amp; Wyoming)</td>
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<tr>
<td>Florida Midland, Central, &amp; Northern Railroads</td>
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<td>V</td>
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<td>IV</td>
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<tr>
<td>Florida West Coast Railroad Company</td>
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<tr>
<td>Georgia &amp; Florida Railway, Inc.</td>
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<td>V</td>
</tr>
<tr>
<td>Norfolk Southern (NS) Railway Corporation</td>
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<td>V</td>
</tr>
<tr>
<td>Port of Palm Beach District Railroad</td>
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<td>IV</td>
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<td>Seminole Gulf Railway (LP)</td>
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<tr>
<td>Talleyrand Terminal Railroad (Genesee &amp; Wyoming)</td>
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<td>South Florida Regional Transportation Authority</td>
<td>5.5</td>
<td>V</td>
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</tbody>
</table>

†††† - Distance standard for yard and industrial tracks.
†††↑ - 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.

---

**METHOD FOR DETERMINING THE LENGTH OF SPECIAL PIPE REQUIRED UNDER RAILROADS**

**INLETS, MANHOLES OR JUNCTION BOXES ON INTEGRAL PRECAST CONCRETE RISER FOR CONCRETE PIPE**
**U-TYPE CONCRETE ENDWALLS WITH GRATES 15" TO 30" PIPE**

**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, all bars 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. Precast of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop draw 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 C35 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
Quantities shown are for estimating purposes only.

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. Reinforcing No. 4 bars with 2" clearance except as noted.
4. All angles, channels and bars shall be ASTM A242/A242M, A572/A572M 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.
5. Channel section C 3x6 may be substituted for C 4x5.4 channel.
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 C476 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 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.
**DEVELOPMENT DESCRIPTION:**

- **STANDARD PLANS FY 2019-20**
- **SHEET 11/01/17**

**DIMENSIONAL DETAILS**

**U-TYPE CONCRETE ENDWALLS BAFFLES & GRATE OPTIONAL 15" TO 30" PIPE**

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<tr>
<th>Pipe Size D</th>
<th>X Baffle Y Baffle</th>
<th>Reinforcement Steel</th>
<th>Concrete Cu. Yd.</th>
<th>Reinforcement Lbs.</th>
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<td>12&quot;</td>
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**DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL**

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<th>Rate Of Slope</th>
<th>Pipe Size</th>
<th>L</th>
<th>H</th>
<th>W</th>
<th>Baffle Locations (When Required)</th>
<th>Class I Concrete Cu. Yd.</th>
<th>Reinforcement Lbs.</th>
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<td>1.23</td>
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**BENDING DIAGRAM**

- **24" AND 30" PIPE**
- **15" AND 18" PIPE**
- **15" AND 18" PIPE**

- **SIDE VIEWS AND BACKWALL SECTIONS**
- **REINFORCING DETAILS**

- **ENDWALLS WITH AND WITHOUT BAFFLES FOR 1:3, 1:4 AND 1:6 SLOPES**

- **END VIEW**
- **SECTION AA**
STEEL GRATING USE CRITERIA

1. Provide positive debris control at all upgrades openings. Do not install grates unless one or more 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 and/or drift is negligible.

   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.

   F. 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.

<table>
<thead>
<tr>
<th>Rate Of Slope</th>
<th>Size of Pipe D</th>
<th>G</th>
<th>2 Each Bars @ 3'4 lb/ft</th>
<th>(X) Channels @ 3'4 lb/ft</th>
<th>2 Angle @ 3'4 lb/ft</th>
<th>Total Weight (lb)</th>
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<td>5</td>
<td>7½&quot;</td>
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<tr>
<td></td>
<td>30' 3'-11½&quot;</td>
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<td>4'-6&quot;</td>
<td>77</td>
<td>7</td>
<td>9½&quot;</td>
</tr>
</tbody>
</table>
ENERGY DISSIPATOR 30" TO 72" PIPE
U-TYPE CONCRETE ENDWALL

GENERAL NOTES

1. U-type concrete endwall energy dissipators are intended for use outside the clear zone.

2. Chamfer all exposed edges.

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. Reinforcing steel shall have 2" min. cover.

5. Endwall to be paid for under the contract unit price for Class I Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LR. Riprap to be paid for under the contract unit price for Riprap (Sand-Cement) (Roadway), CY. Cost of plastic filter fabric to be included in the contract unit price for riprap.

6. 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 | Area (ft²) | Dimensions | Concrete Class I (CY) | Reinforcing Steel (lb) | Sand-Cement Riprap (CY)
--- | --- | --- | --- | --- | ---
30 | 4.91 | 30 | 9.0 | 6.3 | 10.8 | 14.7 | 6.1 | 3.4 | 1.4 | 1-2 | 2-6 | 3-0 | 1-12 | 6 | 65 | 77 | 7 | 3 | 6.72 | 7.26 | 10.8
36 | 7.07 | 36 | 10.5 | 7.3 | 12.4 | 14.5 | 5.3 | 3.7 | 1.7 | 1-2 | 3-0 | 3-6 | 2-3 | 7 | 75 | 88 | 8 | 3 | 10.24 | 10.72 | 12.6
42 | 8.66 | 42 | 11.0 | 8.0 | 13.6 | 16.0 | 6.0 | 4.6 | 2.2 | 2-6 | 3-0 | 3-11 | 2-6 | 8 | 85 | 99 | 9 | 8 | 14.82 | 15.92 | 17.5
48 | 12.27 | 48 | 13.2 | 9.6 | 14.8 | 17.6 | 6.5 | 5.7 | 3.5 | 2-10 | 3-0 | 3-11 | 2-6 | 9 | 95 | 109 | 10 | 8 | 20.16 | 20.90 | 22.7
54 | 15.90 | 54 | 14.8 | 9.6 | 17.4 | 21.4 | 7.4 | 6.3 | 3.5 | 3-0 | 4-11 | 3-0 | 10 | 109 | 125 | 12 | 8 | 27.19 | 26.99 | 27.2
60 | 19.63 | 60 | 16.1 | 10.9 | 18.0 | 22.6 | 8.0 | 7.5 | 4.5 | 3-0 | 4-11 | 3-0 | 11 | 119 | 137 | 13 | 8 | 34.49 | 33.52 | 32.5
66 | 23.76 | 66 | 18.2 | 11.8 | 20.4 | 25.0 | 8.6 | 8.6 | 3.7 | 3-0 | 5-3 | 3-0 | 12 | 129 | 148 | 14 | 8 | 43.82 | 42.72 | 38.6
72 | 28.27 | 72 | 18.6 | 12.3 | 22.6 | 3.0 | 12 | 12.9 | 6-11 | 2-9 | 2-9 | 3-0 | 6-2 | 3-9 | 12 | 129 | 148 | 8 | 8 | 50.88 | 49.42 | 44.5
U-TYPE CONCRETE ENDWALL
ENERGY DISSIPATOR 30" TO 72" PIPE

BENT BARS TABLE

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 Bars: C\text{3}, D\text{1}, D\text{2}, D\text{4}, D\text{5}

 Note: All bar dimensions are cut to out.

Bar C\text{5}

Note: Bars A\text{3}, A\text{4}, A\text{5}, B\text{1}, B\text{4}, B\text{5} are straight bars.
**GENERAL NOTES**

1. Flared end sections shall conform to the requirements of ASTM C76, with the exception that dimensions and reinforcement shall be as prescribed in the table above. Circumferential reinforcement may consist of either one cage of steel 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 straight sections 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 manufactures are different, the compatibility of joint designs shall be certified to by the manufacturer of the flared end sections.
   
   b. Joints sealed with prefabricated plastic gaskets. The gaskets shall meet the requirements of Section 942-3 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 pipe culvert. When non-reinforced 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 when 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 signed 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.

**REINFORCED CONCRETE JACKET DETAIL**

**SECTION AA**

**FLARED END SECTION**

**SECTION BB**

**SECTION CC**

**END VIEW**

**OPTIONAL SHAPE**

**PLAN**

**STRAIGHT FLARE**

**WEIGHT**

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**INDEX 430-020**

1 of 1
### Dimensions and Quantities

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**VALUES SHOWN FOR ESTIMATING Pipe QUANTITIES and are for information only**

- **SLOPE:**
  - 1:4 Miter: To Ø Pipe For Pipes 18" and Smaller.
  - 1:2 For Pipes 24" and Larger.

- **NOTES:**
  - See Sheet 5 For Details and Notes.
  - See Sheet 6 For Details And Notes.

### Single and Multiple Round Corrugated Metal Pipe

**TOP VIEW - SINGLE PIPE**

- Concrete Slab, 3' Or 5!/2" Thick, Reinforced with WWF 6x6-WI.4xWI.4

**TOP VIEW - MULTIPLE PIPE**

- Concrete Slab, 3' Or 5!/2" Thick, Reinforced with WWF 6x6-WI.4xWI.4

**SECTION**

- Ø Pipe to Be Included Under Unit
- Price For Mitered End Section

- Rerolled End Required

**INDEX**

- 430-021

**REV**

- 2 of 6
SLOPE \( V = \text{Slope} \) See Plans

- Slope: 1:4 (Major Axis) For Pipes 24"x38" and Smaller.
- Slope: 1:2 (Major Axis) For Pipes 24"x38" and Smaller.
- Slope: 1:1 For Pipes 34"x53" and Larger.

- Pipe Reinforced With WWF 6x6-WI.4xWI.4

- Concrete Slab, 3" Or 5" Thick, Reinforced With WWF 6x6-WI.4xWI.4

- See Sheet 6 For Details and Notes.
### QUANTITIES FOR 3" THICK CONCRETE SLABS (CY)

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### DESCRIPTION:

**INDEX**

- **CROSS DRAIN MITERED END SECTION**
- **REVISION** 6
- **REVISION DATE** 11/01/17
- **STANDARD PLANS** FY 2019-20
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 live 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 SS 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.

DESIGN NOTES

1. Mitered end sections for pipe sizes 15", 18" and 24" round or equivalent pipe arch or elliptical pipe are permitted within the clear zone. When the slope intersection permits, the mitered end section may be located with the culvert opening as close as 8' beyond the outside edge of the shoulder.

2. Include slope and ditch transitions when the normal roadway slope must be flattened to place end section outside clear zone. See Slope and Ditch Transitions detail.

CONCRETE PIPE CONNECTOR

SPECIAL DETAILS AND NOTES

ANCHOR DETAIL

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 washers to be placed on inside wall of pipe. Notes in the mitered end pipe are to be drilled or punched; burning not permitted.
### Dimensions & Quantities

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<th>B</th>
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- **Grate Sizes**
  - Standard Weight Pipe
  - Extra Strong Pipe
  - Single Pipe
  - Double Pipe
  - Triple Pipe
  - Quad Pipe

- **Concrete (CY)**
  - Standard Weight Pipe
  - Extra Strong Pipe
  - Single Pipe
  - Double Pipe
  - Triple Pipe
  - Quad Pipe

### Notes
- **Transition And Pavement**
  - Transition A and B Pavement

- **Construction Joints Permitted**
  - Single Joint
  - Triple Joint
  - Quad Joint

- **Values shown for estimating pipe quantities and are for information only.**

- **Values permitted to allow use of 8' standard pipe lengths.**
  - Ø 10.49

- **Concrete slab shall be deepened to form bridge across crown of pipe.**

- **Concrete slab, 3' thick, reinforced with WR 6x8-814x814.**

### Diagrams
- **Top View-Single Pipe**
- **Top View-Multiple Pipe**

**SIDE DRAIN MITERED END SECTION**

**SINGLE AND MULTIPLE ROUND CONCRETE PIPE**

**INDEX 430-022**

**Sheet 1 of 7**
DIMENSIONS & QUANTITIES

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<td>6' Sod</td>
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<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

NOTE: See Sheets 6 and 7 for details and general notes.

SINGLE AND MULTIPLE CORRUGATED METAL PIPE-ARCH

SIDE DRAIN MITERED END SECTION

**TOP VIEW-SINGLE PIPE**

**TOP VIEW-MULTIPLE PIPE**
**SYSTEM DESCRIPTION:**

CONCRETE PIPE (ROUND)

<table>
<thead>
<tr>
<th>Drain Size</th>
<th>s</th>
<th>n</th>
<th>l</th>
<th>t</th>
<th>La</th>
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<tbody>
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<td>12&quot;</td>
<td>2</td>
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<td>2-10&quot;</td>
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<tr>
<td>14&quot;</td>
<td>2</td>
<td>4</td>
<td>0-0&quot;</td>
<td>6-11&quot;</td>
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<tr>
<td>16&quot;</td>
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<td>6</td>
<td>6-11&quot;</td>
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<td>2</td>
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<td>6-11&quot;</td>
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ELLIPTICAL CONCRETE PIPE

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<th>l</th>
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<td>3</td>
<td>2-10&quot;</td>
<td>2-0&quot;</td>
<td></td>
</tr>
<tr>
<td>14&quot;</td>
<td>2</td>
<td>4</td>
<td>0-0&quot;</td>
<td>6-11&quot;</td>
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</tbody>
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**CORRUGATED METAL PIPE (ROUND)**

<table>
<thead>
<tr>
<th>Drain Size</th>
<th>s</th>
<th>n</th>
<th>l</th>
<th>t</th>
<th>La</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3</td>
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<tr>
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<tr>
<td>20&quot;</td>
<td>2</td>
<td>6</td>
<td>6-11&quot;</td>
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**CORRUGATED METAL PIPE (ARCH)**

<table>
<thead>
<tr>
<th>Drain Size</th>
<th>s</th>
<th>n</th>
<th>l</th>
<th>t</th>
<th>La</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td>1-8&quot;</td>
<td>2-0&quot;</td>
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</tr>
<tr>
<td>21&quot;×17&quot;</td>
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<td>3</td>
<td>2-10&quot;, 3-9&quot;, 5-3&quot;</td>
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<td></td>
</tr>
<tr>
<td>28&quot;×20&quot;</td>
<td>4</td>
<td>5</td>
<td>5-3&quot;, 6-3&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** 3/8" 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:

| Bolt Length | 3/8", 5/16", 7/32" |

**Details for Concrete & Corrugated Metal Pipe**

- **#3 Steel Bars**
- **Wire Mesh**
- **#3 Bars**
- **Shell Thickness Varies**
- **Galvanized Bolt & Washer, Install with Chamfered Face Down**
- **#3 Steel Bar**
- **Galvanized Bolt**
- **Pipe Grate**
- **Saddle**
- ** Spacer Bar (Tack Weld)**
- **76° To 90° Bend**
- **Spreader Bar (Top & Side)**
- **Ref.**
- **Ref.**

**FOR ALL SIZES OF SINGLE AND MULTIPLE DRAIN PIPE FASTENER UNIT**

- **Details for Concrete & Corrugated Metal Pipe**
- **Sheet Index 430-022**
Notes:
- Anchors required for CMP only.
- Anchors, washers 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.
- Holes in the mitered end pipe are to be drilled or punched; burning not permitted.

ANCHOR DETAIL

FOR SINGLE & MULTIPLE DRAIN PIPE
GRATE DETAIL
See General Notes, Sheet 7.

CONCRETE PIPE CONNECTOR DETAIL

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE
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 line 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.

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 85 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 section 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 3D will not result between the toe points of the mitered end sections.

4. Provide ditch transitions on all grades in excess of 3%.
ENDWALL DIMENSIONS (EXCLUSIVE OF MULTIPLE PIPE SPACING)

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 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 1/8.

5. 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.

6. On outfall ditches with side slopes flatter than 1:1½, 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 Tabulated Value

<table>
<thead>
<tr>
<th>Endwall Skew to Pipe</th>
<th>Use Tabulated Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° to 3°</td>
<td>0°</td>
</tr>
<tr>
<td>4° to 6°</td>
<td>15°</td>
</tr>
<tr>
<td>7° to 16°</td>
<td>30°</td>
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<tr>
<td>17° or over</td>
<td>45°</td>
</tr>
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</table>

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.

ENDWALL POSITIONS FOR SINGLE AND MULTIPLE

PIPE AND SPACING FOR MULTIPLE PIPE

LEGEND

- Pipe Skew
- Center To Center Spacing
- X Centerline To Centerline Dimension At Face Of Headwall

STANDARD LOCATION CONTROL

TOP VIEW

END VIEW (ENLARGED)
## DATA AND ESTIMATED QUANTITIES FOR ONE ENDWALL

### ROUND CONCRETE AND CORRUGATED METAL PIPE

#### Class 1 Concrete (CY)

<table>
<thead>
<tr>
<th>Opening Area</th>
<th>Dimensions</th>
<th>Single</th>
<th>Double</th>
<th>Triple</th>
<th>Quadruple</th>
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</thead>
<tbody>
<tr>
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<td><strong>Inch</strong></td>
<td><strong>Concrete</strong></td>
<td><strong>Concrete</strong></td>
<td><strong>Concrete</strong></td>
<td><strong>Concrete</strong></td>
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<td>4.00</td>
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### CORRUGATED METAL PIPE ARCH

#### Class 1 Concrete (CY)

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<th>Number Of Pipe</th>
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<th>Opening Area</th>
<th>Dimensions</th>
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<tbody>
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<td><strong>Concrete</strong></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>18'</td>
<td>15°</td>
<td>1.20</td>
<td>2.80</td>
<td>5.60</td>
<td>8.40</td>
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<td></td>
</tr>
<tr>
<td>24'</td>
<td>30°</td>
<td>1.60</td>
<td>3.60</td>
<td>7.20</td>
<td>10.80</td>
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<tr>
<td>36'</td>
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<td>5.60</td>
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### CONCRETE ELLIPTICAL PIPE

#### Class 1 Concrete (CY)

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<th>Dimensions</th>
<th>Single</th>
<th>Double</th>
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<tbody>
<tr>
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<td><strong>Degree</strong></td>
<td><strong>Concrete</strong></td>
<td><strong>Concrete</strong></td>
<td><strong>Concrete</strong></td>
<td><strong>Concrete</strong></td>
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<tr>
<td>12'</td>
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<td>0.80</td>
<td>2.00</td>
<td>4.00</td>
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<tr>
<td>18'</td>
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</tr>
<tr>
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<tr>
<td>36'</td>
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<td>5.60</td>
<td>11.20</td>
<td>16.80</td>
<td></td>
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</tr>
</tbody>
</table>

Note: Use the guidelines of general Note B for selecting tabular quantities.
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 C476 (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 1/8 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 .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 and Reinforcing Steel (Roadway), LB.

NOTE: All bar dimensions are out to out.
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 C498 (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 8" 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.
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, shall require the approval of the State Drainage Engineer prior to construction. For precast units, 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 1/8" 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

BENDING DIAGRAM

OPTIONAL ENTRANCE FOR CONCRETE PIPE

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
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<th>LOCATION</th>
<th>BENDING</th>
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<td>48</td>
<td>4'-11&quot;</td>
<td>Footing</td>
<td>Straight</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>10'-5&quot;</td>
<td>Wall</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
<td>8'-3&quot;</td>
<td>Wall</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2'-6&quot;</td>
<td>Wall</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
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<td>Wall</td>
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ESTIMATED QUANTITIES

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<th>CMP</th>
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</thead>
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<td>1249</td>
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<tr>
<td>Reinforcing Steel</td>
<td>Lb.</td>
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</table>

NOTE: All bar dimensions are out to out.
SECTION BB

PLAN
(Showing Bars In Footing)

HALF ELEVATION
(Showing Bars In Back Face Of Wall)

TYPICAL SECTION
THRU ENDWALL

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
<th>LOCATION</th>
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<tbody>
<tr>
<td>A</td>
<td>3</td>
<td>85</td>
<td>6'-11&quot;</td>
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<td>4'-6&quot;</td>
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</tr>
<tr>
<td>C</td>
<td>5</td>
<td>38</td>
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<td>4</td>
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<td>4</td>
<td>8</td>
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<td>straight</td>
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<td>F</td>
<td>4</td>
<td>8</td>
<td>7'-6&quot;</td>
<td>wall</td>
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BENDING DIAGRAM

ESTIMATED QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>RCP</th>
<th>CMP</th>
</tr>
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<tr>
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<tr>
<td>Reinforcing Steel</td>
<td>Lb.</td>
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</tr>
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</table>

NOTE: All bar dimensions are out to out.

NOTE: Cut and Field Bend Bars B As Shown.

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, 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 429-001 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 1/4" 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.

BENDING DIAGRAM

ESTIMATED QUANTITIES

<table>
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<th>ITEM</th>
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<th>RCP</th>
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NOTE: All bar dimensions are out to out

10'-2" 5'-8" 2'-2" 2'-2" 20'-0" 40'-0" 20'-0" 10" 2" Cl. 9'-8" 2'-0" 8" 3" Cl. 11" 7'-0" 2'-0" 20'-0" 20'-0" 6" 1'-8" 3'-10" 1'-8" 6'-4" 3'-10" 6'-4" 7'-0" 10" 2" Cl. 10" 10" V-Groove Top and Sides Symmetrical about ξ Field Bend V_b @ 18" Ctrs. H @ 18" V_c @ 15" Ctrs. V_c @ 15" Ctrs. H @ 18" V_c @ 18" Ctrs. Note: Cut and field bend Bars H as shown
contract unit price for Performance Turf, SY. Sodding to be in accordance with Index 524-001, and paid for under the contract unit price for Class I Concrete. Endwall to be paid for under the contract unit price for Class I Concrete. Substitute for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

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.

Chamfer all exposed edges.

Winged concrete endwalls are intended for use outside the clear zone.

Concrete Endwall with U-Type Wings for Pipe Culverts

<table>
<thead>
<tr>
<th>Opening</th>
<th>Area (ft²)</th>
<th>Wall</th>
<th>Footing</th>
<th>Concrete, Class I, Total (CY)</th>
<th>Steel Tie Bars</th>
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</tr>
<tr>
<td>18°</td>
<td>1.8</td>
<td></td>
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<td></td>
<td>none</td>
</tr>
<tr>
<td>24°</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
<td>none</td>
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<td>30°</td>
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Concrete Endwall with 45° Wings for Pipe Culverts

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</thead>
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<tr>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>48°</td>
<td>12.5</td>
<td></td>
<td></td>
<td></td>
<td>none</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. Winged concrete endwalls are intended for use outside the clear zone.
2. Chamfer all exposed edges.
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.
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. Laps 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. Drill 1½" 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 J Concrete (Endwalls), CY and Reinforcing Steel (Roadways), 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.
TRENCH DRAIN

PREFORMED POLYETHYLENE ALTERNATE
ROUND ALTERNATE
PREFORMED CHANNEL WITH 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 12" throughout varying the depth of the channel neck. Type II may also be used in those locations if an independent laboratory certifies that the grate 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 II 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 invert shall be sloped 0.6% or steeper toward the outlet regardless of the surface slope.

3. Trench drain may be stubbed directly into drainage 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 drains 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 drain 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, designer shall detail in 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.
WITHIN TYPE E CURB

WITHIN TYPE F CURB

WITHIN DROP CURB

ADJACENT TO TRAFFIC SEPARATOR

ROUND PIPE ALTERNATE SHOWN, BUT PREFORMED POLYETHYLENE ALTERNATE ACCEPTABLE

TYPICAL LOCATIONS FOR TYPE I
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. Fine aggregate shall be quartz sand meeting the requirements of Sections 902-4 of the Standard Specifications.

3. Coarse aggregate shall be gravel or stone meeting the requirements of Sections 901-2 or 901-3. The gradation shall meet Section 901, Grades 4, 467, 5, 56 or 57 stone unless otherwise shown restricted in the plans.

4. Underdrain Types 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. See 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.

8. All filter fabric joints shall overlap a minimum of 1'. The internal filter fabric of Type V underdrain shall overlap into the course aggregate or the fine aggregate a minimum of 1'.

9. Underdrain outlet pipes shall be nonperforated and all bends shall be made using 90 deg. bends. 90 deg. bends shall be constructed with two 45 deg. elbows separated by 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, sock, 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 for concrete aprons, stubbing into drainage structures, backfill in place, and disposal of excess materials.

The contract unit price for Underdrain Inspection Box, EA, shall be for the number completed and accepted.

GENERAL NOTES

1. The type of underdrain should be selected to meet design water removal rate and soil conditions. Caution is prescribed in the use of these typical sections since special designs may be required to satisfy project conditions.

2. Type I underdrain is intended for minimum water removal conditions.

3. Type II underdrain is intended for moderate water removal conditions. Where reactive conditions may create chemical clogging, the use of an inert material and/or elimination of the filter fabric may be necessary.

4. Type III underdrain is intended for maximum water removal conditions. Filter fabric is required between the coarse aggregate or fine aggregate including those described in general notes 2 and 3. Design note 3 applies for reactive conditions.

5. Type V underdrain is intended for use in detention basins and other locations which require a filtration system. The standard fine aggregate specified for Type V underdrain conforms to filtration requirements of Chapter 62-25 FAC.

6. 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.

7. The designer should specify the flow line elevations at the beginning, bends, junctions and ends of underdrain pipes and outlet pipes.

8. The designer should evaluate whether an external filter fabric envelope is required around underdrain Types I and III. When required, fabric shall be specified in the plans.
Rev: 01/01/17

REVISION
DESCRIPTION:

UNDERDRAIN INSPECTION BOX

TYPICAL URBAN INSTALLATION

Concrete Apron (12" Max.)
Curb & Gutter

TYPICAL INSTALLATION ON SLOPES

Concrete Apron (12" Max.)
Curb & Gutter

TYPICAL TOP AND APRON

Concrete Apron
Grout

PERMISSIBLE TOP ADJUSTMENT

Concrete Apron
Grout

TOP VIEW

Grout

PERMISSIBLE TOP ADJUSTMENT

Concrete Apron
Grout

TOP VIEW

Grout

GENERAL NOTES

1. Light duty cast iron cover and frame, see Specifications Section 982.

2. Concrete shall be Class 1, except ASTM C490 (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.

3. Concrete apron to be included in the contract unit price for Underdrain Inspection Box.

4. All covers shall be furnished with pick holes. Fitted lifts or handles are not permitted.

5. 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.
SLOTTED PIPE OPTIONS

**Option A - Round Pipe**

**Option B - Round or Elliptical Pipe**

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**Elliptical Pipe**

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**Round Pipe**

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A curved cut is acceptable provided the control dimension is maintained (Typical for Elliptical & Round Pipe).
SKIMMERS FOR FRENCH DRAIN OUTLETS

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 1/2 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 acrylonitrite 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 15", 18" and 24".

TYPE I SKIMMER

OUTLET PIPE A B

18" 17" 42°
24" 19" 48°
30" 18" 54°
36" 21° 60°

TYPE II SKIMMER

1. Neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket neatly to extend 1/2 inch beyond the joint on all sides.

2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket neatly to extend 1/2 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 acrylonitrite 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.

FY 2019-20 STANDARD PLANS
24" STEEL WELL GRATE

Heavy duty "bee hive" grate

Openings: 1-½" maximum

Total Opening: 1.7 sq ft minimum

For 24" well, outer diameter = 29'

Steel grate to be installed over 24" deep well.

Steel grate to be hot dipped galvanized after fabrication, see Specification Section 962.

STRUCTURE WITH NO OUTFLOW

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.

Note: Deep well encased and open lengths as specified in plans. Contractor is to verify design capacity.
**DESCRIPTION:**
This Index 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

  **Prestressing Steel:**
  - ASTM A616 Grade 60

**REINFORCING 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.

- **Types "B1", "B2", "C1" & "C2"**
  - 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 1/2" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 1/2". No changes shall be made to the tongues or grooves.
TYPICAL PILE

SPACING FOR
Bars S

STANDARD PILE

SPACING FOR
Bars S

STARTER PILE

WALL THICKNESS

STRAND DIA.

MAXIMUM

D

TOTAL # OF
STRANDS

INITIAL (JACKING
FORCE (kips)

T=10 in.

0.5

28-0'

6

3/16

14

31

T=12 in.

0.5

31-0'

7

2/32

16

31

0.6

30-0'

5

4/32

12

44

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 931 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 A see Sheet Pile Data Table in Structures Plans.

BAR BENDING DIAGRAMS

SECTION A-A

SECTION B-B

SECTION C-C

TYPE "A" STANDARD SECTION

TOTAL # OF STRANDS

INITIAL (JACKING FORCE (kips)

PRECAST CONCRETE SHEET PILE WALL

CONVENTIONAL

PRECAST CONCRETE SHEET PILE WALL

CONVENTIONAL

PRECAST CONCRETE SHEET PILE WALL

CONVENTIONAL

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CONVENTIONAL

PRECAST CONCRETE SHEET PILE WALL

CONVEN...
**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 0° angles between 15° and 75°. For 0° 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 S are #4.

5. Values for Stirrup Dimensions are shown for 0° 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 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, S3 and S4 will be the same but opposite hand.

9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structure Plans.

**PRECAST CONCRETE SHEET PILE WALL**

**CONVENTIONAL**

**INDEX**

**455-400**

**3 of 4**

**STIRRUP DIMENSIONS**

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
<th>R8</th>
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<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>1 15%</td>
<td>10'</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1 15%</td>
<td>10'</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
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<td>21/2&quot;</td>
<td>21/2&quot;</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>115%</td>
<td>7'9&quot;</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
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<tr>
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<td></td>
<td>S2</td>
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<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
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<tr>
<td></td>
<td>S3</td>
<td>115%</td>
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<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>115%</td>
<td>7'9&quot;</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
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</tr>
<tr>
<td>60°</td>
<td>S1</td>
<td>1 0%</td>
<td>6'0&quot;</td>
<td>10'</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1 0%</td>
<td>6'0&quot;</td>
<td>10'</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
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<tr>
<td></td>
<td>S3</td>
<td>1 0%</td>
<td>6'0&quot;</td>
<td>10'</td>
<td>7'9&quot;</td>
<td>23/4&quot;</td>
<td>23/4&quot;</td>
<td>21/2&quot;</td>
<td>21/2&quot;</td>
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<td></td>
<td>S4</td>
<td>1 0%</td>
<td>6'0&quot;</td>
<td>10'</td>
<td>7'9&quot;</td>
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<td>23/4&quot;</td>
<td>21/2&quot;</td>
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</table>

**SECTION A-A**

**SECTION B-B**

**DETAIL "D"**

**TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND**
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.

**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".**

Notes: All Bar dimensions are out-to-out.
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'c ≥ 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 ƀ" to
allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 Arbor. No changes shall be made
to the tongues or grooves.

NOTES AND DETAILS

DETAIL "A" (Section Taken Above Dimension X)
NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead.
See Bulkhead plans for actual Plan View.

DETAIL "A" (Section Taken Below Dimension X)
Type "C2" Shown, Type "C1" Opposite Hand

PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS
Two-Point Pick-up, Tie Down and Support Points
Single Point Pick-up

SECTION THRU BULKHEAD
(Showing Plastic Filter Fabric)
STIRRUP DIMENSIONS (T = 10")

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<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
<th>R8</th>
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<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>11½</td>
<td>4½</td>
<td>7-4½</td>
<td>5½</td>
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<td>7-4½</td>
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<td>3½</td>
<td>2½</td>
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STIRRUP DIMENSIONS (T = 12")

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<th>R5</th>
<th>R6</th>
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<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>11½</td>
<td>10½</td>
<td>10-4½</td>
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<td>2½</td>
<td>1½</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>11½</td>
<td>10½</td>
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<td>7½</td>
<td>5½</td>
<td>3½</td>
<td>2½</td>
<td>1½</td>
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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 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 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 Bar 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.

**TYPE "B1" AND "B2" - VARIABLE ANGLE CORNER PILE**

**SHEET PILE DIMENSIONS**

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<th>10</th>
<th>12</th>
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</thead>
<tbody>
<tr>
<td>Ø (in.)</td>
<td>3½</td>
<td>4½</td>
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</tbody>
</table>

**SECTION A-A**

**SECTION B-B**

**DETAIL "D"**

(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)

**ELEVATION**

(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)

**STANDARD PLANS**

FY 2019-20

(PRECAST CONCRETE SHEET PILE WALL (CFRP/GFRP & HSS&GFRP)

INDEX 455-440

PREV 3 of 4
This A4 bar ends here if T = 12”

Bar A4 (not shown in elevation) is included only if T = 12”.

** This Bar A4 shall be 1’-2” shorter than other A4 bars for T = 12”.

VARIES 1’-2”

** This Bar A4 is half included only if T = 12”.

* This Bar A4 (not shown in elevation) is included only if T = 12”.

BAR BENDING DIAGRAMS

STIRRUPS S

(2 - Piece)

STIRRUPS S

(3 - Piece)

6 sp. @ 4”

STIRRUP DIMENSIONS

<table>
<thead>
<tr>
<th>B (in.)</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>S2</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>S3</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>S4</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>S5</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

Note: All Bar dimensions are out-to-out.

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
**GENERAL NOTES FOR CONCRETE PAVEMENT SUBDRAINAGE**

1. No trench greater than 2' in depth will be allowed overnight. Trenches shall be backfilled at all times.

2. Concrete pavement subdrainage shall be constructed adjacent to the low edge of the roadway pavement and under travel lanes, auxiliary pavement, shoulders, as called for in the plans. When the low edge shifts between outside and inside of pavement the 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 and crossroad terminals.

3. 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%).

4. Immediately prior to placing the filter fabric the entire vertical face of the concrete pavement shall be cleaned to remove adhering base materials and soil.

5. The Contractor shall devise a procedure for holding the filter fabric in position on the vertical face of the trench. The procedure must be approved by the Engineer prior to placement of the draincrete.

6. The upper end of each separate run of the concrete pavement subdrainage pipe shall be capped.

7. Outlet pipes shall be constructed at a maximum of 500' intervals. Elbows or bends shall be used to connect the outlet pipe to the concrete pavement subdrainage 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.

8. Existing shoulder that is removed for the construction of outlet pipes shall be replaced with Type SP asphaltic concrete at the rate of 500 LB per SY.

The contract unit price for Edgedrain Outlet Pipe (4") LF shall be full compensation for removal of existing shoulder pavement, trench excavation, pipe and fitting, concrete apron, hardware cloth, sod, stubbing into existing inlets and paved ditches, restoration of ditch pavement, backfill in place, and disposal of excess materials.

**CONCRETE PAVEMENT SUBDRAINAGE**

**INDEX**

**F Y 2019-20 STANDARD PLANS**

**446-001**

**1 of 4**
NOTES FOR DRAINCRETE PAVEMENT SUBDRAINAGE

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

NEW CONSTRUCTION:

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 Joints, LF.
NOTES FOR DRAINCRETE PAVEMENT SUBDRAINAGE

1. The edgdrain 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 edgdrain 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 Edgdrain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess material, filter fabric, draincrete edgdrain pipe and fittings and draincrete.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 3 of 4.

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.
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 or Cement Treated Permeable Base.

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.

CONCRETE TRAVEL LANE, SHOULDERS, AND AUXILIARY PAVEMENT

ASPHALT SHOULDERS

TREATED PERMEABLE BASE SUBDRAINAGE
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, travelling 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 2.11, "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.

SEQUENCE CHART
**FIGURE A**

**MONOTUBE SUPPORT MOUNTING**

- Pole Clamp With Wire Entrance
- Louvered Backplates
- Signal Control Cable

**FIGURE B**

**SIGN PANEL MOUNTING ASSEMBLY**

- 1/8" Dia. Holes
- 3/16 x 1 1/2 x 1/8 Angle
- 1 1/2" Slotted Holes in Sign Mounting Angle
- Hex Bolt, Nuts & Lock Washer
- 1/2" x 3" Hi-Tensile Steel Clamps
- Bolt, Nuts & Lock Washer

**FIGURE C**

**STOP HERE ON RED**

- Signal Head (12")
- 1 1/2" Nipple
- "T" With Cap
- Louvered Backplates
- Pole Clamp With Wire Entrance

**FIGURE D**

**FIGURE E**

**FIGURE F**

**FIGURE G**

**DRAW BRIDGE AHEAD**

- 12" Signal Head With Visor
- 1 1/2" Nipple
- "T" With Cap
- Louvered Backplates
- Signal Control Cable

**DESCRIPTION:**

Transportation Control Devices for Movable Span Bridge Signals

- Bridge Mounting Details Not Shown
- Measured from the bottom of the sign to the near edge of the pavement. Horizontal distance between edge of the pavement and inside edge of sign will vary with condition at job site.

**REV IS IO N**

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BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND
TO BE USED WITH TYPE I 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 hoisted.  The number of lights shall vary accordingly to length of the gate arm.
2. Alternating 16" pattern of fully reflectorized red and white stripes.

GATE & ARM DETAIL

TYPICAL LAMP PLACEMENT
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 outside sidewalk. Over 6': 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 17'-6" from above the Crown of Roadway to the lowest point of the Overhead Signal Unit.

TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NOTES:
1. Place an additional W10-1 sign where intersections occur between the R/R pavement message and the tracks.
2. Place FTP-61-06 or FTP-62-06 sign 100' in advance of crossing for urban conditions and 300' in advance of crossing for rural conditions. See Index 700-102 for sign details.

Design Speed (mph) | Distance "A" (ft)
--- | ---
60 | 400
55 | 350
50 | 250
45 | 175
40 | 125
35 | 75

<table>
<thead>
<tr>
<th>URBAN (mph)</th>
<th>Distance (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>250</td>
</tr>
<tr>
<td>55</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>45</td>
<td>100</td>
</tr>
<tr>
<td>40</td>
<td>75</td>
</tr>
<tr>
<td>35</td>
<td>50</td>
</tr>
</tbody>
</table>

RELATIVE LOCATION OF CROSSING TRAFFIC CONTROL DEVICES

NOTE:
1. Place an additional W10-1 sign where intersections occur between the R/R pavement message and the tracks.
**RAILROAD GATE ARM LIGHT SPACING**

<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&quot;</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>16-32 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>26&quot;</td>
<td>41&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>28&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>28&quot;</td>
<td>5&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>29-33 Ft.</td>
<td>30&quot;</td>
<td>6&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>32-36 Ft.</td>
<td>30&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>36&quot;</td>
<td>9&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>10&quot;</td>
<td>10&quot;</td>
</tr>
</tbody>
</table>

**NOTE:**

**MEDIAN SIGNAL GATES FOR**
MULTILANE UNDIVIDED URBAN SECTIONS
(THREE OR MORE DRIVING LANE IN ONE DIRECTION, 45 MPH OR LESS)
FUNCTIONAL BLOCK DIAGRAM

TYPICAL PLAN

NOTE:
1. "STOP AHEAD" is standard and preferred sign message. Another message may be approved when appropriate for specific situations.

The Distance Is Measured Along Right Edge Of Pavement From RR Stop Bar To Sign Advance Warning Sign.

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>

TYPICAL PLAN

NOTE:
- Conduct and cable from the normally closed relay of RR controller cabinet to the junction box shall be furnish & installed by RR.
- Pull Boxes 200' Nominal Spacing
- RR Control Cabinet To Contain Normally Closed Relay.
- (Furnished By RR)

TYPICAL PLAN

NOTE:
- Pull Box
- Crushed Rock
- 1" PVC Conduit
- Pull Box
- From RR Stop Bar To Sign Advance Warning Sign.

SIDE VIEW

FRONT VIEW

PASSIVE STATE (TRAIN CIRCUIT NOT ACTUATED)

ACTIVE STATE (TRAIN CIRCUIT ACTUATED)

REV ISIO N

DESCRIPTION:

REV ISIO N

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ADVANCE WARNING FOR RR CROSSING

R E V I S I O N

REVISION

SHEE T

FY 2019-20

STANDARD PLANS

REV I SIO N

DESCRIPTION:

REV I SIO N

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ADVANCE WARNING FOR RR CROSSING

R E V I S I O N

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STANDARD PLANS
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&quot; x 1½&quot; x 1/8&quot;</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>HSS 5&quot; x 1½&quot; x 1/8&quot;</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>HSS 5&quot; x 1½&quot; x 1/8&quot;</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 2½&quot; x 0.125&quot;</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail Joint/Splice Sleeves</td>
<td>HSS 2&quot; x 2&quot; x 1/8&quot;</td>
<td>2.000&quot; x 2.000&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Post Connection Sleeve</td>
<td>HSS 1.500 x 0.125&quot;</td>
<td>1.500&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>3½&quot; NPS (Sch. 40)</td>
<td>3.135&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>3½&quot; Ø Round Bar</td>
<td>3.000&quot;</td>
<td>0.140&quot;</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>3½&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 (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

TABLE 1 NOTES:
(1) 0.125" wall thickness permitted for rails with post spacings less than 5'-8", except that Post Connection Sleeve must be 1½" NPS (Sch. 40).
**Handrail Required for Ramps**

Handrail required for ramps (handrail continuous at landings between runs)

**Handrail** ~ 1 NPS Sch. 40

Post ~ 30'-0" Max. for Slopes > 6.25%

40'-0" Max. for Slopes ≤ 6.25%

**Note:** Non-continuous corners are permitted when handrails are not required.

**DETAIL FOR NON-CONTINUOUS RAILING AT CORNERS**

**Typical Railing Details & Railings on Grades 0% to 5%**

(Typ. - Picket Railing Shown, Other Types Similar)

**ELEVATION**

(Showing Outside Face of Railing with Type "A" Posts)

**Ramp Requirements**

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 = 3%

**Typical Railing Details**

For post, rail & picket or infill panel details

See "Typical Railing Details" for post, rail & picket or infill panel details

**Railing on Grades Steeper Than 5%**

(Typ. - 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.

** Construction joint offset **

[Details and specifications provided in the image]
RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" Min. behind railing.

DETAIL "L" - PLAN VIEW
HANDRAIL TERMINATION

Flatten handrail termination to 1/2" Max. width.

1/2" Ø Vent/Weep hole in bottom of handrail.

See "Typical Railing Details", Sheet 2 for post, rail & picket details.

1'-6" Min. Handrail Extension

Equal to one tread length

See Index 400-021 or Contract Plans for Step Details.

DETAIL "J" - ELEVATION VIEW
TOP RAIL TERMINATION

Top Rail Cap

Round over corners to remove sharp edges (Typ.).

See Detail "L" for post, rail & picket details.

Equal spacing

9'-0" Max. on Steps

Steel Handrail required for three or more steps.

DETAIL "K" - ELEVATION VIEW
BOTTOM RAIL CONNECTION
(Intermediate Rail Similar)

Bottom Rail (Typ.)

Equal spacing

5'-0" Max. on Steps

Steel Handrail required for three or more steps.

See "Typical Railing Details", Sheet 2 for post, rail & picket details.

Equal to one tread length

Steel Handrail Continuous At Landing

Length Of Landing

See "Typical Railing Details", Sheet 2 for post, rail & picket details.

Top Rail termination

See Detail "J"

Handrail Termination. See Detail "L"

Top Rail Cap

Length Of Landing 5' Min.

See Index 400-021 or Contract Plans for Step Details.

ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

9" Min. thick wall

7'-3" (Max.) ~ PBR

Round over corners to remove sharp edges (Typ.).

See Index 400-021 or Contract Plans for Step Details.

Flatten handrail termination to 1/2" Max. width.

1/2" Ø Vent/Weep hole for welded connection

Cut rail sleeve to match inside face of post or weld rail directly to post.
**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 6" centers is based on a 3/8" Ø Bar for standard applications. When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).

**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>A 392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh x No. 9 gage (coated wire diameter)</td>
<td>A 491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>Ties @ 1'-0&quot; center (Post and End Rail)</td>
<td>F 626</td>
<td>Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric.</td>
</tr>
<tr>
<td>Ties @ 2'-0&quot; center (Intermediate &amp; Bottom Rail)</td>
<td>F 668</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>F 626</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>F 626</td>
<td>1/2&quot; (Min. thickness) x 3/8&quot; (Min. width) x 2'-3&quot; (Min. length) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F 626</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.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays, and Sun Segment may be formed in a single panel from 1/2 steel plate pattern cut with laser or plasma CNC, welded to a 1x1x5/8 Angle Border or the 1x1x5/8 Channel Border shown.

TYPE 4 - BROADWAY INFILL PANEL

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)

TYPICAL SECTION ON RETAINING WALL (Case II)

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)

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>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>4½&quot;</td>
<td>3½&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4½&quot;</td>
<td>4½&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

* 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".

** When required; measured from top of sidewalk.
1. Shop Drawings are required, see Specification Section 515.
2. For bridge mounted railings, work this Index with Index 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum)
3. Materials:
   a. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM 6221 or ASTM D429
   b. Top, bottom and intermediate rail corner bends with maximum 4'-0" post spacing may be Alloy 6063-T6
   c. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
   d. Perforated panels (Type S) Alloy 3003-H14
   e. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   f. Aluminum screws: Alloy 2024-T4 or 7075-T73
   g. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
      a. Hex Head Bolts: ASTM A 307
      b. 3/8" diameter single bolt option, Grade 36
      c. 5/8" diameter four bolt option, Grade 55
     Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
     d. Hex Nuts: ASTM A3563
     e. Flat Washers: ASTM F436
     f. Plate Washers: ASTM A36 or ASTM A706 Grade 36
   g. Shims: ASTM B209 Alloy 6061 or 6063
   h. Bearing Pads: Provide 1/2" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
   1. 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 3'/0" for standard installations and 3'/0" when a 4' sphere requirement is indicated in the Data Tables.
   5. Locate railing expansion Joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
   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.
   4. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K" for Post Type "A" & "B".
   7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K" for Post Type "A" & "B".
   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.

3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL (42" Height shown, 48" Height Similar)

TABLE 1 NOTES:
(1) Alloy 6061-T6 or 6063-T52 & T6 may be substituted for Alloy 6063-T5.
(2) 0.188" wall thickness permitted for rails with post spacings less than 5'-9".
(3) 1" NPS (Sch. 40) non-slit rail sleeves may be substituted when welded connection Detail "K" is utilized.

Table 1 - Railing Members

<table>
<thead>
<tr>
<th>ALLOY</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>RT 2x2x0.250</td>
</tr>
<tr>
<td></td>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1'/0&quot;x1.25</td>
</tr>
<tr>
<td></td>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
</tr>
<tr>
<td></td>
<td>Top Rail</td>
<td>6063-T5</td>
<td>2-3/8&quot; NPS (Sch. 10)</td>
</tr>
<tr>
<td></td>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2-3/8&quot; NPS (Sch. 10)</td>
</tr>
<tr>
<td></td>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</td>
</tr>
<tr>
<td></td>
<td>Intermediate &amp; Bottom Rail Post Connection Sleeve</td>
<td>6063-T5</td>
<td>1.50 OD x 0.125 Wall (1)</td>
</tr>
<tr>
<td></td>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1-1/2&quot; NPS (Sch. 40)</td>
</tr>
<tr>
<td></td>
<td>Handrail Support Bar</td>
<td>6063-T6</td>
<td>2-3/8&quot; Round Bar</td>
</tr>
<tr>
<td></td>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6063-T6</td>
<td>2-3/8&quot; Round Bar</td>
</tr>
<tr>
<td></td>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6063-T5</td>
<td>Varies (See Details)</td>
</tr>
</tbody>
</table>

3" ROUND TOP CAP RAIL  TOP CAP RAIL INNER SPICE SLEEVE  ALTERNATE TOP RAIL SECTION

INDEX
515-062 1 of 9

FY 2019-20 STANDARD PLANS PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

CROSS REFERENCES:
Detail "A", Sheet 4
Detail "B", Sheet 4
Detail "K", Sheet 3

INDEX
515-062 1 of 9
Handrail required for ramps (Handrail continuous at landings between runs)

5'-0" Min. ~ 1" Max.

Post Spacing

SHBR

PBR

5'-0" Max. ~ Type "B" or "C" Post

6'-0" Max. ~ Type "B" or "C" Post

6'-0" Max. ~ Type "B" or "C" Post

1'-0" Min. ~ 1" Max.

Slope > 6.25%

Ramp

Intermediate Landing

5'-0" Min.

30'-0" Max. for Slopes > 6.25%

40'-0" Max. for Slopes ≤ 6.25%

5'-0" Min.

5'-0" Max. for Slopes > 6.25%

40'-0" Max. for Slopes ≤ 6.25%

Top Landing

Ramp

Landings

For slopes greater than 5%:
Max. landing slope = 8.33%
Max. landing cross-slope = 2.0%

Handrail required for ramps (Handrail continuous at landings between runs)

Top of Intermediate Rail

Expansion Joint (Typ.)

Top of Sidewalk

Min. from free end of concrete

Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.

Bottom & Intermediate Rail

Foundation Expansion Joint

Minimum from free end of concrete

See "Typical Railing Details" for post, rail & picket or infill panel details

Infill Panel Type Varies, See Data Table in Plans (Pickets Shown)

For slopes greater than 5%:
Max. landing slope = 2%
Max. landing cross-slope = 2%

See Plans for continuation or termination limits of railing

Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

Top of Sidewalk or Bikeway

Ground Line

Notes:
- Non-continuous corners are permitted when handrails are not required.

ELEVATION

(Showing Outside Face of Railing with Type "A" Posts)

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

RAILINGS ON GRADES STEEPER THAN 5%

(5'-0" Max. ~ Type "B" or "C" Post)

5'-0" Max. ~ Type "A" Post or 5'-0" (Max.) ~ Type "B" or "C" Post

1'-0" Min. ~ 1" Max.

Top Landing

Ramp

Rail Expansion Joint (Typ.)

See Detail "B", Sheet 4

See Plans for continuation or termination limits of railing

RAMP REQUIREMENTS

For slopes greater than 5%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%

INTERMEDIATE LANDING REQUIREMENTS

Max. landing slope = 2%
Max. landing cross-slope = 2%

Foundation Expansion Joint

Top of Intermediate Rail

Top of Sidewalk

Min. from free end of concrete

See "Typical Railing Details" for post, rail & picket or infill panel details

Infill Panel Type Varies, See Data Table in Plans (Pickets Shown)

See Plans for continuation or termination limits of railing

Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

End Hoop

Top Rail

Foundation Expansion Joint

Minimum from free end of concrete

Expansion Joint (Typ.)

Top of Sidewalk

Min. from free end of concrete

See "Typical Railing Details" for post, rail & picket or infill panel details

Infill Panel Type Varies, See Data Table in Plans (Pickets Shown)

See Plans for continuation or termination limits of railing

Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

End Hoop

Top Rail

Foundation Expansion Joint

Minimum from free end of concrete

Expansion Joint (Typ.)

Top of Sidewalk

Min. from free end of concrete

See "Typical Railing Details" for post, rail & picket or infill panel details

Infill Panel Type Varies, See Data Table in Plans (Pickets Shown)

See Plans for continuation or termination limits of railing

Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).

End Hoop

Top Rail

Foundation Expansion Joint

Minimum from free end of concrete

Expansion Joint (Typ.)

Top of Sidewalk

Min. from free end of concrete

See "Typical Railing Details" for post, rail & picket or infill panel details

Infill Panel Type Varies, See Data Table in Plans (Pickets Shown)

See Plans for continuation or termination limits of railing

Rail expansion joints to be located in panels above structure expansion joints * (35'-0" maximum spacing).
**DETAIL A** - RAIL CONNECTIONS

*Showing Inside Face of Railing*

(Pickets/Panels and 4-Bolt Anchorage Not Shown For Clarity)

**NOTES:**

1. Base Plate A - for slopes ≤ 8.33%.
2. Base Plate B - for slopes > 8.33%.
3. **Embedded length may be 4" for plug welded connection.**

---

**INDEX**

CROSS REFERENCE:

For location of Details "B", See Sheet 2.
BASE PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

COUNTERSUNK HOLES FOR 3/8" Ø x 1" MIN. SET SCREWS (TYP.)

PLAN

SECTION "I-1"

SECTION "I-2"

VIEW "I"

TOP PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

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.

Countersunk holes for 3/8" Ø x 1½" Self-Tapping Screws (Min. 1" deep, 1½" Max.)

Optional intermittent weld in-lieu of Self-Tapping screws between posts.
SECTION A-A

See Detail "1B"

See Detail "1A"

A

(Typ.)

Picket Spacing *

Post

Intermediate Rail

45° Beveled End Permitted
(Shown dashed)

(Shown dashed)

Post & Anchor Bolt

Picket ~ 3/8" Ø Bar (Typ.)

Anchor Bolt

3/8" Thick Bearing Pad

DETAIL "1A"
(Top of Picket Connection)

DETAIL "1B"
(Bottom of Picket Connection)

3" Nominal Opening

Equal Clear Openings at Posts

2 3/4" min. ~ 5 3/4" max. (Typ.)

Ties @ 1'-0" center
(Post and End Rail)

Ties @ 2'-0" center (Intermediate & Bottom Rail)

SECTION A-A

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
</tr>
<tr>
<td></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></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.

NOTES:
1. See Plans for Infill Panel option required.

TYPE 1 - PICKET INFILL PANEL

* Picket Spacing of 6 3/4" centers is based on a 3/8" Ø Bar for standard applications.
When shown in the Contract Plans a 4 3/8" picket spacing may be required. See Note 4 (Sheet 1).

TYPE 2 - CHAIN-LINK (Continuous Infill Panel)
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 
1/2" plate (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the 1½x1½ Channel Border shown.

NOTES:
1. See Plans for Infill Panel Option required.
TYPE 5 - PERFORATED INFILL PANEL

Seal welding mitered corners is permitted.
1'-0" * 5'-0" Std. ~ 3'-0" Min. Clear Between Handrails

Bolts & Post

Full size Shim Plates when required for height adjustment

Detail "D" (Optional Shimming Detail for Cross Slope Correction) (Used in lieu of Beveled Shim Plates)

1 1/2" Thick Bearing Pad

Edge Shim (8" long x 1/2" wide x thickness as needed)

1/2" Thick Bearing Pad

Minimum #4 Bars @ 1'-0" (Max) spacing for Case IIa

Inside Face of Concrete Structure or Sidewalk

See Concrete Structure Plans for actual dimensions and reinforcing details

TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

TYPICAL SECTION ON RETAINING WALL (Case II)

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)

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>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&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4 1/2&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>

* 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".

** When required, measured from top of sidewalk (Typ.)
NOTES:
1. Shop Drawings are required.
2. Work with Specification 515.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T4 or 7075-T6 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   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 6063-T5 is permitted.
4. Materials 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>0.154&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½ NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1½ NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½ NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1½ Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>
5. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A 307 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.
8. Caliper:
   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 "E") only one 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 top and bottom rails and handrails to match the alignment radius.
   F. 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.
   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.
TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

ELEVATION

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.
Railing Continuation Beyond Steps
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" min. behind railing

Guiderail on Steps & Stairs

Handrail Continuation
See Detail "A" (Typ.)

Equal to one tread length

Handrail Termination
See Detail "A" (Typ.)

Elevation
(At-Grade Steps)

Guiderail on Steps & Stairs

Alternate End Treatment

Handrail Continuation
See Detail "A" (Typ.)

Equal to one tread length

Handrail Termination
See Detail "A" (Typ.)

Elevation
(At-Grade Steps)
PIPE GUARDERAIL (ALUMINUM)

**GUARDERAIL & ANCHOR BOLTS**

- Optional 4-Bolt Anchorage (Shown Dashed)
- 6" Standard, 3" for ramps requiring handrails
- Slope 2% Max. (away from drop-off)

**BASE PLATE WITH SHIM PLATES (AS REQUIRED) (Typ.)**

- 1/4" Thick Bearing Pad (Typ.)
- 6" Standard, 3" for ramps
- Slope 2% Max. (away from drop-off)

**SIDEWALK ANCHORAGE DETAIL**

- 2 - 5/16" Anchor Bolts (Typ.) with Hex Nuts & Washers.
- Full size Shim Plates when required for height adjustment

**SIDEWALK ANCHORAGE DETAIL OPTION 1**

- 3/8" Core Drilled Hole (1/2" Min.) clear hole in accordance with Specification 416
- 3/8" Core Drilled Hole (1/2" Min.) clear hole in accordance with Specification 416
- Seal end of post with plastic or aluminum plug

**SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3**

- 3/8" Core Drilled Hole (1/2" Min.) clear hole in accordance with Specification 416
- Seal base of hole (Option 2 & 3) and end of post (Option 2) prior to epoxy filling to prevent leakage
- 6" Foundation embedment permitted (Option 3)

**NOTES:**

- 2 - 5/16" x 8" or 4 - 5/16" x 6" Steel Anchors: Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted
- The minimum embedment for Adhesive Anchors is 6" for 2-Bolt Anchorage or 8" for 4-Bolt Anchorage.
NOTES:

1. Shop Drawings are required, refer to Specification 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 A709 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

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poles</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrails Joint/Splice Sleeves</td>
<td>3&quot; NPS (Sch. 40)</td>
<td>1.715&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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 "E") 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 90° 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°, position 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 5%.
   B. Three or more steps.

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.
TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

See Plans for continuation or termination limits of railing.

See "Typical Railing Details" for post & rail details.

RAMP REQUIREMENTS

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% TO 8.33%

STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints (in Index 400-011) Gravity
  Wall are not considered to be expansion joints.

For Details "C", "D" and "E", see Sheet 4.
GUIDERAIL ON STEPS & STAIRS

- Steel Handrail required for three or more steps (handrail and cheekwalls continuous at landings).
- Handrail Continuous (At Landing)
  - See Typical Railing Details, Sheet 2 for post & rail details.
- Handrail Termination
  - See Typical Railing Details, Sheet 2 for post & rail details.
- Handrail Termination
  - See Typical Railing Details, Sheet 2 for post & rail details.
- Handrail Termination
  - See Typical Railing Details, Sheet 2 for post & rail details.

RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

- Concrete sidewalk to extend 6" min. behind § railing.
- See "Typical Railing Details", Sheet 2 for post & rail details.

ELEVATION
(At-Grade Steps)

- See Index 400-021 or Contract Plans for Step Details.
- See Index 400-021 or Contract Plans for Step Details.
- See Index 400-021 or Contract Plans for Step Details.

ALTERNATE END TREATMENT

- See Detail "A" (Typ.)
- See Detail "A" (Typ.)
- See Detail "A" (Typ.)
- Handrail Termination, See Detail "A" (Typ.)

PIPE GUIDERAIL (STEEL)
**TYPICAL SECTION ON CONCRETE SIDEWALK**

- Edge Shim (as req'd) x 3/8" wide x 1/8" thickness (as required)
- 3/8" Ø Anchor Bolts (**)
- with Hex Nuts & Washers
- 1/2" Thick Bearing Pad (Typ.)
- Full size Shim Plates when required for height adjustment
- 5/8" Min. Beveled Build-up (Typ.)

**TYPICAL SECTION ON GRAVITY WALL**

- (Other Retaining Walls Similar)

**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 - 3/8" Ø x 6" Steel Anchors:**
  - Galvanized Steel Bolts (As Shown) (C-I-P);
  - Galvanized U-Bolts Permitted (C-I-P);
  - Galvanized Adhesive Anchors Permitted (**): Expansion Anchors Not Permitted.

- ***The minimum embedment for adhesive anchors is 6" for 2-Bolt Anchorage or 4" for 4-Bolt Anchorage.***
CURB AND GUTTER

REVISION
DESCRIPTION:
REV IS IO N
STANDARD PLANS
FY 2019-20

11/01/17
Sheet 1/2

CONCRETE CURB AND GUTTER

CONCRETE CURB

Note: For use adjacent to concrete or flexible pavement, concrete shown. Expansion joint, preformed joint filler and joint seal are required between curb and concrete pavement only, see Sheet 2.

DROP CURB

SECTION BB

SECTION CC

SECTION AA

Note: To be paid for as parent curb.

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.

Rotates entire section so that gutter cross slope matches slope of adjacent
circulating roadway pavement.

For use adjacent to concrete or flexible pavement. For details depicting
usage adjacent to flexible pavement, see Sheet 2. Expansion joint, preformed
joint filler and joint seal are required between curb & gutter and concrete
pavement only, see Sheet 2.

STANDARD PLANS

1'-10"

7-3/4"

6" 1'-6"

1'-0"

1'-2"

1'-0"

6" 3'-6"

2'-0"

1'-10"

7-3/4"

6" 1'-6"

1'-0"

1'-2"

1'-0"

6" 3'-6"

2'-0"

1'-10"

7-3/4"

6" 1'-6"

1'-0"

1'-2"

1'-0"

6" 3'-6"

2'-0"

1'-10"

7-3/4"

6" 1'-6"

1'-0"

1'-2"

1'-0"

6" 3'-6"

2'-0"

1'-10"

7-3/4"

6" 1'-6"

1'-0"

1'-2"

1'-0"

6" 3'-6"

2'-0"
**GENERAL NOTES**

1. For curb, gutter and curb & gutter provide 18'-0" to 24'-0" 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 Specification 520.

2. Ends of Curbs Types B and D shall transition from full to zero heights in 3'.

**CONTRACTION JOINT IN CURB**

- Type A
- Type B
- Type D

**CONTRACTION JOINT IN CURB AND GUTTER**

- Type A
- Type B
- Type D

**Curb and Gutter Endings**

- Curb Type A
- Curb Types E & F

**Contraction Joint in Curb and Gutter**

- Shoulder Gutter
- Type E
- Type F

Sawcuts should be avoided within valley gutter and within curb and gutter endings.

**Expanion Joint Between Gutter and Concrete Pavement**

- Joint Seal
- Preformed Joint Filler

**Curb and Gutter and Type A Curb Adjacent to Flexible Pavement**

- Concrete Bumper Guard
- Asphalitic Concrete Curb
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.

DETAIL OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER
(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPRACTICAL)
Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping the Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

The Engineer During Construction.

Slope To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Prop. Past. Or Superelevated Portion Of New 4-Lane Pavt.

Prop. Median Pavt. Warp Surface If Necessary To Drain To Prop. Flumes

Limit Of The Median Curb Or Curb And Gutter. Construct A Drainage Warp The Surface Of The Median Pavement If Necessary, Within

Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping the Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

The Engineer During Construction.

Slope To Approx. Match That Of Adjoining Pavt. (Breakover 0.02 Min., 0.05 Max.)

Prop. Past. Or Superelevated Portion Of New 4-Lane Pavt.

Prop. Median Pavt. Warp Surface If Necessary To Drain To Prop. Flumes

Limit Of The Median Curb Or Curb And Gutter. Construct A Drainage

Provide Smooth Section

Match Existing Grade

Prop. Past.

Median

Exist. Or New Part.

Grade Established In Detail Plans

Median Width As Indicated In Detail Plans

Runoff

SECTION AA

Runoff

SECTION BB

(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. Sed 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:

REV 520-010

FY 2019-20

STANDARD PLANS

MEDIAN OPENING FLUME

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REV 01/17

DESCRIPTION:

REV 01/17

LAST

REVISION 01/17

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520-010

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PUBLIC RD. OR CROSSOVER
### Standard Plans

#### Type I - Concrete Traffic Separator

- **Option I**
  - Pitch: 
  - 2'-3" or 3'-0"
  - 6'-0"
  - 12 MIn., 18" Max.
  - Tool Edge Permitted (Typ.)

- **Option II**
  - Pitch: 
  - 2'-3" or 3'-0"
  - 6'-0"
  - 12 MIn., 18" Max.
  - Tool Edge Permitted (Typ.)

#### Type IV - Concrete Traffic Separator

- **Option I**
  - Pitch: 
  - 2'-3" or 3'-0"
  - 6'-0"
  - 12 MIn., 18" Max.
  - Tool Edge Permitted (Typ.)

- **Option II**
  - Pitch: 
  - 2'-3" or 3'-0"
  - 6'-0"
  - 12 MIn., 18" Max.
  - Tool Edge Permitted (Typ.)

---

#### Notes:

1. Separators Type I and IV are to be used with flexible pavement. Separators Types II and V are to be used with rigid pavement.

2. Either Option I or Option II may be used for Types I and IV separators except when a specific option is called for in the Plans.

3. For all separators provide 1/2" contraction joints at 20' centers (max.). Contraction joints adjacent to concrete pavement on tangents and flat curves to match the pavement joints, with intermediate joints not to exceed 10' centers.

---

#### Standard Plans

- **FY 2019-20**

---

#### Index

- **520-020**
LONGITUDINAL SECTION (NOSE)

TYPE II - CONCRETE TRAFFIC SEPARATOR

TRANSVERSE SECTION

LONGITUDINAL SECTION (NOSE)

TYPE V - CONCRETE TRAFFIC SEPARATOR

TRANSVERSE SECTION

ROADWAY INSTALLATIONS - RIGID PAVEMENT
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 edge 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 rebar as required to maintain cover.

Notes:
- 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.
- 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 edge of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.
- See Structures Plans, Superstructure Sheets for actual dimensions and joint orientation.
- Option II is not permitted on bridge decks with prestressing steel.
- Bar Spacing:
  - 4'-0" @ 3 equal spaces (continuous)
  - 6'-0" @ 5 equal spaces (continuous)
  - 8'-0" @ 7 equal spaces (continuous)
- At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.
- Field bend and cut rebar as required to maintain cover.
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:
   - 8'-6" @ 7 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 4'-0" @ 3 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.

---

**LONGITUDINAL SECTION (NOSE)**

**OPTION I**

**TRANSVERSE SECTION**

---

**LONGITUDINAL SECTION (NOSE)**

**OPTION II**

---

**REINFORCING STEEL**

(Bridge Deck Shown, Approach Slab Similar)

---

**DETAIL AT EXPANSION JOINTS**

(Strip Seal Shown, Other Armored Joint Types Similar)

---

**DETAIL AT Poured JOINT WITH**

**BACKER ROD EXPANSION JOINTS**

BRIDGE INSTALLATIONS - TYPE "F" CURB

FY 2019-20
STANDARD PLANS

TRAFFIC SEPARATORS

INDEX
520-020

4 of 5
See Note
Length As Required

NOTE:
Length of Bars 4C is 6'-10" for 8'-6" Separator.
Length of Bars 4C is 4'-4½" for 6'-0" Separator.
Length of Bars 4C is 2'-4½" for 4'-0" Separator.

NOTE:
Length of Bars 4E is 6'-11" for 8'-6" Separator.
Length of Bars 4E is 4'-5" for 6'-0" Separator.
Length of Bars 4E is 2'-5" for 4'-0" Separator.

ALTERNATE REINFORCING STEEL DETAILS
(Welded Reinforcing Steel)

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

DRAINAGE JOINT DETAIL
(For 5" Opening Or Less)

DOWEL DETAIL

ESTIMATED TRAFFIC SEPARATOR QUANTITIES:

CONCRETE:

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<thead>
<tr>
<th>Type</th>
<th>4'-0&quot; Width</th>
<th>6'-0&quot; Width</th>
<th>8'-0&quot; Width</th>
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<tr>
<td>Type I</td>
<td>0.026 CY per ft</td>
<td>0.089 CY per ft</td>
<td>0.132 CY per ft</td>
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<tr>
<td>Type II</td>
<td>0.133 CY per ft</td>
<td>0.257 CY per ft</td>
<td>0.350 CY per ft</td>
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</table>

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 Specifications 416 and 937.
3. The dowel hole diameter is to meet adhesive bonding material system manufacturer's requirements.
GENERAL NOTES:

1. BARRIER 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).

   The default reinforcing details shown herein, including bar shapes and lap splice positions, are intended to show required steel locations and provide for a constructible design. However, with the approval of the Engineer, alternate steel configurations may be used in the same locations shown herein, given that the equivalent strength reinforcing is provided and the cover, maximum spacing, and continuity requirements are maintained.

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.

GENERAL NOTES (CONTINUED):

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 Joint 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 Tall 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 ± ½" from the locations shown.

7. DOWELED JOINTS: As shown in the Dowel Details on Sheets 2 & 13, install WC 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" deep 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 12 inches of the subgrade to at least 98% of the maximum density determined by FM 1-1-180, Method D.

10. FOOTING BOTTOM CONCRETE COVER: At the bottom of footing footings shown throughout this Index, up to 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 ± ½", 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 thru 425-032.


15. BARRIER END MARKERS: For all free ends of concrete barriers that are not shielded with an end treatment or connection to another barrier or traffic railing type, install a Type 3 Object Marker on the end face per Specification 705.

16. BARRIER DELINATORS: Install Barrier Delinators in accordance with Specification 705. For median barriers, mount the delinators on the top of the barrier, at the centerline of barrier, with reflective sheeting facing traffic on both approaches. For shoulder barriers and split sections, mount the delinators on the top of the barrier, with the roadway side of the delinator located 2" from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.

17. TOLL SITES: Where called for in the Plans, substitute the steel reinforcing bars shown herein with GRFP reinforcing bars of the same size. Construct GRFP reinforcing bars in accordance with Specification 932, and use a 4½" inner diameter for bar bends. Where required to fit pull boxes while maintaining bar spacing and concrete cover, trim GRFP bars as defined in the Plans.

At toll site locations, the use of Median Barriers on outside shoulders is permitted where called for in the Plans. Shoulder Pavement shown herein may be substituted with material for an alternate usage where defined in the Plans.
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 Dowelled Joints at 100-foot maximum intervals. Place steel reinforcing with a longitudinal 3” cover adjacent to the joint face(s) in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

   For the dowel into the first casting, the dowel may be cast-in-place for new concrete or placed into a 1”Ø x 13”±1/16” drilled hole for cured concrete. For drilled holes larger than 1”, secure the dowel with adhesive in accordance with Specification 416. No load testing is required.

   For the dowel connection into the second casting, use a 1”Ø Schedule 80 PVC pipe with a sealed cap, cast-in-place as shown.

4. OPTIONAL LONGITUDINAL JOINT: When a longitudinal joint is placed above the footing, use the Optional 3/4” Dowelled Joint Similar by Opposite Hand (See Note 3) for the dowel connection into the second casting, the dowel may be cast-in-place for new concrete or placed into a 1”Ø x 13”±1/16” drilled hole for cured concrete. For drilled holes larger than 1”, secure the dowel with adhesive in accordance with Specification 416. No load testing is required.

5. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 3/4” Dowelled Joint.

6. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with the 38” Height Median Barrier shown herein.

7. CRASH CUSHION CONNECTIONS: Connect Crash Cushions per Index 544-001 in conjunction with the 38” Height Median Barrier shown herein.

8. FREE ENDS: When the barrier end does not terminate with a Traffic Railing Formation, 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 26.
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 Qty. = 0.20 CY/FT
Steel Qty. = 11.8 LB/FT

VIEW B-B
REDUCED SECTION OF END TRANSITION FOR GUARDRAIL
(End of Barrier)
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.

NOTES:

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

ELEVATION - SLOPED END TREATMENT

PLAN - SLOPED END TREATMENT
(Only Top & Bottom Longitudinal Bars Shown for Clarity, See Section Views for All Longitudinal Steel Locations)
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 Tall Height Median Barrier sections of Sheet 2 using a 5V Dowelled Joint.

3. SHORT GRADE-SEPARATED SECTIONS: Bars 4C1 and the two uppermost longitudinal bars may be omitted for segments 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.

   a. 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.

   b. 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.

   c. Grade separation Heights of Y ≥ 9' 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.

MEDIAN BARRIER - GRADE-SEPARATED

TALL GRADE-SEPARATED SEGMENT FOR Y ≤ 9"

TALL GRADE-SEPARATED HEEL FOOTING SECTION FOR Y ≤ 9"

TALL GRADE-SEPARATED TOE FOOTING SECTION FOR Y ≤ 4'-0"

DIMENSION TABLE

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<th>Max. Height, Y</th>
<th>6'-0&quot;</th>
<th>7'-0&quot;</th>
<th>8'-0&quot;</th>
<th>9'-0&quot;</th>
<th>10'-0&quot;</th>
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<tr>
<td>Footing Width, W</td>
<td>3'-3&quot;</td>
<td>3'-4&quot;</td>
<td>3'-5&quot;</td>
<td>3'-6&quot;</td>
<td>3'-7&quot;</td>
<td>3'-8&quot;</td>
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</tr>
</tbody>
</table>

NOTE:

- Field bending as Reqd.
- Pavement Shoulder
- Concrete Barrier
- Joint
- Cover Varies
- Sp. & B 'tto (Footing Top)
- Sp. Max. (Typ.)
- 4V1 @ 12" Sp. Max.
- 4U2 @ 12" Sp. Max.
- 4C1

CONCRETE BARRIER
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, 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 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 4'-0" 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
MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED DUAL SIGN
SUPPORT SHIELDING - MINIMUM WIDTH

NOTES:

1. PROJECT SPECIFIC DESIGN: For the base plate, anchor bolts, foundation design, and additional reinforcing required for the barrier, 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 taper as required to maintain a 4" 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. See 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. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. All longitudinal reinforcing locations, see the Section Views.
NOTES:

1. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements. The overall length and width of the barrier's taper and parallel segments is governed by the 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. PLAN VIEW: Only outermost longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

4. 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.

5. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.

MEDIAN BARRIER - 38° HEIGHT SPLIT SECTION
FOR STAND-ALONE SIGN SUPPORT SHIELDING
**DESCRIPTION:**

**REVISION**

**INDEX**

**SHEET**

**CONCRETE BARRIER**

**FY 2019-20 STANDARD PLANS**

**LAST REVISION:** 11/01/18

**MEDIAN BARRIER - 44" HEIGHT**

**SPLIT SECTION FOR PIER SHIELDING**

**NOTES:**

1. **SECTION VIEWS:** See Sheet 11 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.

**PLAN**

(See Section Views on Sheet II for All Longitudinal Steel Locations)
NOTES:

1. GENERAL: Work with the Plan and Elevation views on Sheet 10.

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 10.

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.
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

NOTE:
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, 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.
SECTION A-A
38" HEIGHT SHOULDER BARRIER
(See Sheet 14 for Reinforcing Steel Details)

NOTES:
1. BARRIER RUN SEGMENT: Either the 38" Height Shoulder Barrier or the differing Shoulder Barrier sections shown throughout the Index may be placed within this segment as required per the Plans.
2. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 14.
3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Place steel reinforcing with a longitudinal 3" cover adjacent to the joint face in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.
4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1/4" Doweled Joint.
5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001.
6. CRASH CUSHION CONNECTIONS: Connect Crash Cushions per Index 544-001 in conjunction with the 120 deg End Transition for Guardrail as shown herein.
7. FREE ENDS: When the barrier end does not terminate with a Traffic Railing Connection, Guardrail Connection, or Crash Cushion Connection as called for in the Plans, terminate in accordance with the Free End Reinforcing Note on Sheet 14.
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 13. The Section Option Footings shown on Sheet 15 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 26.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION

(Longitudinal Steel Not Shown for Clarity)
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 13.

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 2-1/2" length to maintain the cover shown.
NOTE:
1. GENERAL: See the applicable Notes on Sheet 15.
44" Height
REAR-FLUSH SECTION
EMBEDDED IN FOOTING

SECTION C-C
ABOVE-GROUND HAZARD

44" Height Rear-Flush Section
(See Sheet 16)

PLAN - ROUND PIERS EXAMPLE
(SQUARE PIERS SIMILAR)
(For All Longitudinal Steel Locations,
See the Section Views)

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
NOTES:

1. GENERAL: Construct the Connections as required per the Plans to connect existing F-Shape sections to Single-Slope Shoulder Barrier 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 13.

3. TRAFFIC RAILING CONNECTION: For the Option 'B' connection, use a Doweled Joint per Sheet 13 and the additional Free End Reinforcing with reduced bar spacing per Sheet 14.

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.
Curb and Gutter Barrier Notes:

1. Section Views: For additional Views A-A and B-B, see Sheet 21.

2. Expansion Joints: Place 1/8" 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 21.

3. Dowelled Joints: See the General Notes on Sheet 1 for usage of joint types. Where required, install 1/3 Dowelled Joints as defined on Sheet 13.

4. Traffic Railing Connections: Align the barrier and Traffic Railing faces and connect with the 1/3 Dowelled Joint per Sheet 13.

5. Guardrail Connections: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3/4" 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 Free End Reinforcing Note on Sheet 21.

Curb and Gutter Barrier Notes:

1. GENERAL: Place 2" 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 29" (±1/2") 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 distributing additional vertical reinforcement evenly on each side of the Drainage Slot.

3. Dowelled Joints: See the General Notes on Sheet 1 for usage of joint types. Where required, install 1/3 Dowelled Joints as defined on Sheet 13.

4. Traffic Railing Connections: Align the barrier and Traffic Railing faces and connect with the 1/3 Dowelled Joint per Sheet 13.

5. Guardrail Connections: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3/4" 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 Free End Reinforcing Note on Sheet 21.

DRAINAGE SLOT DETAILS

DRAINAGE SLOT NOTES:

1. GENERAL: Place 2" 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 29" (±1/2") 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 distributing additional vertical reinforcement evenly on each side of the Drainage Slot.

1. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 21.

2. EXPANSION JOINTS: Place 1/8" 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 21.

3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install 1/3 Dowelled Joints as defined on Sheet 13.

4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1/3 Dowelled Joint per Sheet 13.

5. GUARDRAIL CONNECTIONS: Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3/4" 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 Free End Reinforcing Note on Sheet 21.

CURB AND GUTTER BARRIER
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 20.

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 SV2 and SU4 to 6" for 5 Spaces, placed with 3" cover from the barrier's end face.

3. BAR BENDING DIAGRAMS: For additional details for bars SV2 and SU4, see the Bar Bending Diograms on Sheet 26.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION
(Longitudinal Steel Not Shown for Clarity)
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 S/2 & S/12 at the same 9" longitudinal spacing.

2. BAR BENDING DIAGRAMS: For additional details on Bars S/2 & S/12, see the Bar Bending Diagrams on Sheet 26.

NOTES:

- For additional information, see Sections for All Longitudinal Steel Locations.

- See Sections for All Similar by Opposite Hand.
NOTES:

1. TAPER SEGMENTS AND OFFSET SEGMENT: The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. CONNECTION TO SHOULDER BARRIER SECTIONS: Connect to Shoulder Barrier 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.

4. FREE ENDS: Where shown in the Plans, terminate the Single-Faced Section with a transverse end face. Place a stirrup bar with a 3" cover from the end face. Place longitudinal bars with a 3" cover from the end face.

5. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.

WALL SHIELDING BARRIER - 38° HEIGHT SECTION - APPROACH & TRAILING TRANSITION
NOTES:

1. TAPER SEGMENTS AND OFFSET SEGMENT: The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. CONNECTIONS TO DIFFERENT CONCRETE BARRIER SECTIONS: Connect to aligning barrier 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.

4. FREE ENDS: Where shown in the Plans, terminate the Single-Faced Section with a transverse end face. Place a stirrup bar with a 3" cover from the end face. Place longitudinal bars with a 3" cover from the end face.

5. GUARDRAIL CONNECTIONS: Within the Shoulder Barrier Segment for Guardrail, install Shoulder Barrier as shown per Sheet 3, including the corresponding End Transition for Guardrail. Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001.

6. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 123. Use only concrete fill behind the Shoulder Barrier Segment, do not use flowable fill at this location.
1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plan.

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 4½" 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. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined in the Plans.

4. TRANSITION SEGMENTS: The Transition Segments shown are examples only. For the actual approach and trailing transition taper rate, length, and width, see the details in the Plans.

5. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.
**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.
3. Use standard inner diameters for bar bending unless otherwise shown.

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**BILL OF REINFORCING STEEL**

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**REINFORCING BAR BENDING DIAGRAMS**
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. FOUNDATION: Compact the top 12 inches of the subgrade to at least 98% of the maximum density determined by FM 1-T 180, Method D.

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 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 sheeting 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 footing. 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.
EXPLANATION:

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 6'-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.
PIER PROTECTION BARRIER

CONNECTION TO CONCRETE BARRIER

CONNECTION TO GUARDRAIL

ELEVATION - 44" PPB
(See Sheet 4)

ELEVATION - 56" PPB
(See Sheet 4)

ELEVATION - 44" PPB
(See Sheet 5)

ELEVATION - 56" PPB
(See Sheet 5)

PLAN
(Footing Not Shown,
See Sheet 6 for Options)

PLAN
(Footing Not Shown,
See Sheet 6 for Options)
BARRIER DETAILS - CONNECTION TO CONCRETE BARRIER

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 footing and stem details.

BARRIER DETAILS - CONNECTION TO CONCRETE BARRIER

SEE SHEET 6 FOR THE SUPPORTING STEM AND FOOTING DETAILS.

SEE SHEET 6 FOR FOOTING AND STEM DETAILS.
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.

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.
**SECTION E-E**

**REAR-FLUSH FOOTING OPTION**

Concrete Qty. = 0.24 CY/FT (Below Gutter Line)
Steel Qty. = 63.5 LB/FT (Including Bars SU)

**SECTION F-F**

**SYMMETRICAL FOOTING OPTION**

Concrete Qty. = 0.24 CY/FT (Below Gutter Line)
Steel Qty. = 62.6 LB/FT (Including Bars SU)

**NOTES:**

1. **GENERAL:** Install the footing options per project-specific requirements, as defined on Sheet 2 and specified per the Plans.

2. **OPTIONAL SLIP FORMING SUPPORT:** The 1'-0" depth spread footing may be extended by 2' laterally beyond the face of the stem to provide support for a subsequent slip forming operation above. Do not adjust the steel reinforcement location for the additional concrete.

3. **GUARDRAIL CONNECTION TAPERED TOE:** For tapering the barrier as shown on Sheet 5, View D-D, bend Bars SU away from the stem face as required. For this case, the cover requirement is variable for one side of the stem (only at the tapered toe locations).
Notes:

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")

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 CONNECTIONS: 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.

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)
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. GENERAL: Construct Opaque Visual Barrier (OVB) in accordance with Specification 521, and use either cast in place or precast panels. Cast OVB concrete monolithically with the Concrete Barrier or Traffic Railing, using an ASTM C 680, Class 5, Type III Organic Felt bend breaker as needed.

2. DOWEL BAR CONNECTION: For the embedment in Concrete Barrier or Traffic Railing concrete, dowel bars must be either cast in place for new concrete or grouted in place for existing concrete. Embed the dowel bars to the corresponding depths shown, and use the bar lengths provided in the Dowel Bar Length Table.

3. TRANSVERSE JOINTS: Place Transverse Joints with a maximum spacing of 50'-0" and a minimum spacing of 20'-0". Use a consistent spacing where practical. Without violating the above spacing requirements, place Transverse Joints matching the location and width of open joints in the supporting Concrete Barrier or Traffic Railing.

4. SLOPED AND TREATMENTS: Regardless of the traffic direction, place Signed End Treatments on all exposed ends of OVB, excluding leave-outs for barrier-mounted signs and light poles. See Note 7 below.

5. BARRIER-MOUNTED SIGNS AND LIGHT POLES: Where signs and barrier-mounted light pole structures conflict with placement of OVB, end and restart the OVB with a transverse vertical face located a longitudinal distance of 2" from the base of the structure. Follow the same reinforcing scheme and concrete cover requirements for the Transverse Joint shown herein. See Note 7 below.

6. LARGE BARRIER-MOUNTED SIGN SUPPORTS: See Sheet 2 for details. See Note 7 below.

7. LEAVE-OUTS: OVB leave-outs are longitudinal gaps in OVB segments required to accommodate barrier-mounted signs and light pole placement. Leave-outs up to 15 feet in length are included in OVB length measurement.

8. ASYMMETRICAL CONCRETE BARRIER SECTIONS: When mounting on top of an asymmetrical Concrete Barrier section (not shown), align the centerline of the OVB with the centerline of the top face of the Concrete Barrier section.

9. SPLIT CONCRETE BARRIER SECTIONS: For split Concrete Barrier sections that run separately for vertical structures, bridges, etc., OVB is only required on top of one of the Concrete Barrier sections. Place OVB on top of the Concrete Barrier section with the highest elevation. Longitudinally overlapping OVB runs are permitted where called for in the Plans, which are designated with overlapping Begin and End Station OVB Callouts.

10. VERTICAL REINFORCING: Place vertical No. 3 bars with the spacing shown, except that No. 3 bars at the dowel bar locations may be shifted longitudinally or they may be omitted at the option of the Contractor.

11. OPTIONAL BENT WIRE REINFORCEMENT: With the approval of the Engineer, the No. 3 bars shown herein may be replaced with welded wire reinforcement in accordance with Specification 415. Use welded wire reinforcement of equal or greater strength than the bars being replaced, maintain the same cover requirements with equivalent or smaller spacing.

12. VARIABLE HEIGHT CONCRETE BARRIERS: See Sheet 2 for details.

13. CONCRETE BARRIER AND TRAFFIC RAILING TRANSITIONS BETWEEN DIFFERING SECTIONS: Transition the OVB section using a method similar to the OVB Linear Transition shown in Elevation View 'B' on Sheet 2. Adjust the longitudinal length of the transition as required.
ELEVATION VIEW 'A' - OVB END SEGMENT AT CONCRETE BARRIER
HEIGHT TRANSITION FROM 38" HEIGHT TO 56" HEIGHT SECTION
(REVERSE DIRECTION SIMILAR BY OPPOSITE HAND)

1. LATERAL DIMENSIONS: Maintain the OVB section width and lateral placement as defined on Sheet 1.

2. DOWEL BAR LENGTHS & CONNECTIONS: For the differing OVB section heights, trim or adjust the dowel bar lengths as required to meet the clearances shown while maintaining the dowel bar connection requirements of Sheet 1.

Elevation View 'A' - For the two dowel bars closest to the OVB end location, use full dowel bar lengths and bend as shown to maintain clearances. Overlapping dowel bars may deviate from the lateral centerline as required.

3. DOWEL BAR SPACING:

Elevation View 'A' - The dowel locations shown in this detail are examples only, and may shift to maintain the spacing pattern that is governed by adjacent OVB. Maintain the dowel bar spacing scheme as defined on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.

4. SEGMENT LENGTHS:

Elevation View 'B' - The length of the reduced-section OVB segment is governed by the length of linear width and height transition of the Concrete Barrier.

Elevation View 'B' - The length of the reduced-section OVB segment is governed by the length of Concrete Barrier with 44" Height Section.

5. VERTICAL REINFORCING: For the differing OVB section heights, trim or adjust the vertical No. 3 Bar lengths as required to meet the clearances shown.

Elevation View 'A' - For the two dowel bars closest to the OVB end location, use full dowel bar lengths and bend as shown to maintain clearances. Overlapping dowel bars may deviate from the lateral centerline as required.

6. TRANSVERSE JOINTS:

Follow the requirements of Sheet 1.

Elevation View 'A' - Do not place Transverse Joints within the End Segment.

Elevation View 'B' - Maintain the Transverse Joint spacing scheme as defined on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.
NOTES:
1. Work this Index with Indexes 521-512 through 521-515.
2. The Concrete Barrier/Noise Wall and joints shall be constructed plumb.
3. Concrete:
   A. Class II for slightly aggressive environments.
   B. Class IV for moderately or extremely aggressive environments.
4. Provide $\frac{3}{8}$ Open Joints spaced between 30 feet minimum to 90 feet maximum. Align Open Joints with construction joints in the Junction Slab or Footing. Provide additional reinforcing (see Sheet 2) at each open joint.
5. Install Barrier Delineators 2'-4" above the riding surface in accordance with Specification Section 705. Match the Barrier Delineators color (White or Yellow) to the near edgeline.
6. Slip forming of the barrier portion is permitted.
   A. Stem walls may be widened, at no additional cost, to accommodate slip forming.

CROSS REFERENCE:
For Section A-A see Sheet 3.
For Section C-C and Detail "A" see Sheet 5.
For Wall mounted Barrier/Noise Wall Details see Index 521-512.
For Footing mounted Barrier/Noise Wall Details see Index 521-513 (T-Shaped), 521-514 (I-Shaped) or 521-515 (Trench).

PLAN
(Reinforcing Steel not shown for clarity)

ELEVATION
(INSIDE FACE OF CONCRETE BARRIER/NOISE WALL WITH T-SHAPED FOOTING SHOWN,
(Other footings similar, Reinforcing steel not shown for clarity)
ELEVATION OF BARRIER/NOISE WALL REINFORCING STEEL AT OPEN JOINT
(Bars 5S1 in Barrier not shown for clarity)
(Footing or Junction Slab Details not shown)

ELEVATION OF BARRIER/NOISE WALL END TAPER (ADJACENT TO CONCRETE BARRIER SHOWED 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 V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V only applies when Single-Slope Concrete Barrier 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 CONCRETE BARRIER/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. Bars 5V for Junction Slab, L-Shape and Trench footings are similar.
3. Foundation Details:
   Index 521-512 (Junction Slab)
   Index 521-513 (T-Shape)
   Index 521-514 (L-Shape)
   Index 521-515 (Trench)

VIEW B-B
END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT
(T-Footing shown, Junction Slab, L or Trench Footings similar)
### REINFORCING STEEL BENDING DIAGRAMS

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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</thead>
<tbody>
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<td>R1</td>
<td>5</td>
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<tr>
<td>R2</td>
<td>5</td>
<td>5'-2½&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>4'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>As Req.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>V (Rail)</td>
<td>5</td>
<td>6'-6½&quot;</td>
</tr>
<tr>
<td>V (T-Footings)</td>
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<td>7'-4½&quot;</td>
</tr>
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---

**BILL OF REINFORCING STEEL**

**STIRRUP BAR 5V**

End Sturrup Bar 5V
To Be Field Cut
(Railing End Transition)

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bar 5R shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars S1 may be continuous or spliced at the construction joints. Lap splices for Bar 5R, S1 and SW shall be a minimum of 2'-2".
5. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

---

**ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES**

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<tr>
<th>ITEM</th>
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<tbody>
<tr>
<td>Concrete (Railing)</td>
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<tr>
<td>Concrete (Noise Wall)</td>
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<tr>
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<tr>
<td>Additional Rein. @ Open Joint</td>
<td>LB</td>
<td>226.85</td>
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(The above quantities are based on the Concrete Barrier/Noise wall typical section, excluding junction slab or footing.)

---

**CROSS REFERENCE:**

See Index 521-512 for Junction Slab Details and Indexes 521-513 thru 521-515 for additional footing details.
**DETAIL "A" NOTES:**

1. Begin placing Railing Bars 5V at the railing end and proceed toward the guardrail (thrie beam) terminal connector to ensure placement of guardrail bolt holes. Pair Bars 5R with Bars 5V as shown. Clearance of Bars 5R & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if 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 Concrete Barrier/Barrier continues beyond the End Taper. See the Plan Sheets.

4. Field cut Bars 5R2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R1 front leg (more plumb) to maintain cover and tie to S1 Bars. (See Sheet 1 Notes 1 and 2)

**PLAN - RAILING END TRANSITION**

(Showing Bars 5R and Bars 5S1)  
(Bars 5V not shown for Clarity)

**SECTION C-C**  
THRU NOISE WALL END TAPER

**PLAN - RAILING END TRANSITION**  
(Showing Bars 5R and Bars 5S1)  
(Bars 5V not shown for Clarity)
**Concrete Barrier/Noise Wall Notes**

1. Construct the Concrete Barrier/Noise Wall and joints plumb; do not construct the Concrete Barrier/Noise Wall perpendicular to the roadway surface.

2. CONCRETE: Concrete will be in accordance with Specification Section 346.
   - Class II concrete for slightly aggressive environments.
   - Class IV concrete for moderately or extremely aggressive environments.

3. 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.

4. Construct 1/2" 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.

5. 14'-0" Noise Wall End Taper is required when adjacent to an 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.

6. Work this Index with Index 521-510 – Concrete Barrier/Noise Wall (8'-0") and one or more of the following:
   - Index 521-513 – Concrete Barrier/Noise Wall T-Shaped Spread Footing,
   - Index 521-514 – Concrete Barrier/Noise Wall L-Shaped Spread Footing or
   - Index 521-515 – Concrete Barrier/Noise Wall Trench Footing.

---

**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**

(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 521-513, 521-514 and 521-515 for footing reinforcement.
3. ¾ Open Joint may be omitted when 6'-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 521-510 for reinforcement details and spacing. Bars S522 are not required when ¾ Open Joint is omitted.
4. Bar spacing shown is along the Gutter Line.
CROSS REFERENCE:
For locations of Section A-A and Detail "A", see Sheet 1.

TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL

SECTION A-A

NOTES:
1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 3'-0" Open Joints, plug the lower 3" portion of the open joint by filling it with mortar in accordance with Specification Section 400.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
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<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tr>
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<tr>
<td>R2</td>
<td>5</td>
<td>6'-8&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>10'-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>
</tbody>
</table>

BARS S51 & S52

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 S9 may be continuous or spliced at construction joints. Lap splices for Bars S9, and S51 will be a minimum of 3'-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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<tbody>
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<td>Concrete (Concrete Barrier)</td>
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</tr>
<tr>
<td>Concrete (Noise Wall, excluding any thickening)</td>
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<tr>
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<tr>
<td>Bars R1, R2, R3, S1 &amp; V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint (Railing/Noise Wall)</td>
<td>1.8</td>
<td>397.38</td>
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CROSS REFERENCE:
For locations of Section A-A and Detail "A", see Sheet 1.
SECTION B-B
TYPICAL SECTION THRU JUNCTION SLAB AND RETAINING WALL

REINFORCING STEEL BENDING DIAGRAMS

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 Deformed WWR when approved by the Engineer. Deformed WWR must meet the requirements of Specification Section 931.

NOTE: See Index 521-510, Detail "A" for details.

ESTIMATED JUNCTION SLAB QUANTITIES

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<tr>
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<tr>
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<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>23.36</td>
</tr>
</tbody>
</table>

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. Actual width varies depending on type of Retaining Wall used.
4. See Index 521-510 for Bars 5V and Bars 5S1.
5. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade.
6. For Asphalt: Shoulder or Roadway Pavement will be SuperPave Structural asphalt. Variable thickness asphalt will be structural overbuild.
7. If slip forming is used, submit shop drawings for approval showing Expansion Joint support details and 2½" side cover with adjusted Typical Section dimensions.

CROSS REFERENCE:
For location of Section B-B, see Sheet 1.
1. Construct the Spread Footing level transversely and plumb vertically; do not construct the spread footing perpendicular to the roadway surface.

2. Concrete will be in accordance with Specification Section 346.
   A. Class II concrete for slightly aggressive environments.
   B. Class IV concrete for moderately or extremely aggressive environments.

3. 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" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Construct V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1" Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.

6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

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 Barrier/Noise Wall. See Section B-B for details.

8. See Index 521-510 for Bars 5V2.

9. Placement of 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. Use 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")
**BILL OF REINFORCING STEEL**

<table>
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<td>A</td>
<td>5</td>
<td>6'-8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>AS REqd.</td>
</tr>
<tr>
<td>U</td>
<td>5</td>
<td>1'-0&quot;</td>
</tr>
</tbody>
</table>

**BAR V-GROOVE AND PREFORMED EXPANSION JOINT FILLER**

- **Concrete Footing**
  - Top of Spread Footing (Const. Joint Required)
  - 14'-0" or 8'-0" Traffic Railing/Noise Wall
  - Bar 5V2 (Field Bent) (Typ.)
  - 3" Cover (Total & Sides)
  - 2.5" Cover
  - Stem Wall
  - End Stirrup Bar 5V2
  - Bars 5S1 (Field Bent) (Typ.)

**DETAIL **A**

- (Showing Locations of 3/4" V-Grooves and 1/8" Preformed Expansion Joint Filler)

**PARTIAL END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT**

- (Showing Bars 5V2, and Bars 5B inside of Stirrup Bars 5V2)

**NOTES:**

1. Match Cross Slope of Travel Lane or Shoulder.
2. See Sheet 1, Notes 8 & 9.

**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.

**ESTIMATED T-SHAPED SPREAD FOOTING QUANTITIES**

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<tr>
<th>ITEM</th>
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<td>Reinforcing Steel (Typical)</td>
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</tr>
<tr>
<td>ADDITIONAL Reinf. @ Expansion Joint</td>
<td>LB</td>
<td>33.38</td>
</tr>
</tbody>
</table>

**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.
PLAN - OPTION B
SPREAD FOOTING ADJACENT TO SKewed APPROACH SLab AND WITH BARRIER WALL INLET
(Option A Similar) (Bars S1 Not Shown)

NOTES:
1. Construct the Spread Footing level transversely; do not construct the spread footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
   a. Class II concrete for slightly aggressive environments.
   b. Class IV concrete for moderately or extremely aggressive environments.
3. 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 2" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. 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.
6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
7. Shoulder or Roadway Pavement and 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 B. The full length of the spread footing (3'-0" minimum depth) 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 is required.
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.
**TYPICAL SECTION THRU SPREAD FOOTING - OPTION A**
(Bars 5R and 5S 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 (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 AND BARRIER WALL INLET - OPTION A**
(Reinforcing Steel not shown for clarity (See Note 3))

**CONCRETE BARRIER/NOISE WALL L-SHAPED SPREAD FOOTING**

---

**REVISED 01/01/17**

**14'-0" or 8'-0" Concrete Barrier/Noise Wall**

---

**DESIGNER:**

**CONTRACTOR:**

**ENGINEER:**

**CONSTRUCTION:**
**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.

**DETAIL "A"**
(Option A Shown, Option B Similar)

(Spread Footing expansion joints are required at 1/8" open joints in Concrete Barrier/Noise Wall)
SECTION A-A
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.

ESTIMATED L-SHAPED SPREAD FOOTING QUANTITIES

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* Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE: For location of Section A-A, see Sheet 1.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<thead>
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<td>F</td>
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<td>S3</td>
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<td>5</td>
<td>13'-10&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>5</td>
<td>12'-10&quot;</td>
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</table>

DOWEL 1" Ø Smooth Bar 2'-0"

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.
**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
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</tr>
<tr>
<td>T</td>
<td>5</td>
<td>12'-7&quot;</td>
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Dowel: 1" Ø Smooth Bar 2'-0"

---

**NOTES**

1. Construct the Trench Footing plumb, do not construct the Trench Footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
   - A. Class IIf concrete for slightly aggressive environments.
   - B. Class VI concrete for moderately or extremely aggressive environments.
3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A615 Grade 60 smooth round bar or FRP smooth round bar with a minimum shear strength of 22 ksi in accordance with ASTM D7617.
4. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Shear Keys in footing are required when FRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Scope on Shear Key must be constant and between 5" to 45° from the transverse vertical plane.
6. Construct ½ V-Grooves plumb and at 30'-0" maximum intervals as shown.
7. Fill is required a distance of 4'-0" on both sides for the entire depth of the trench footing. See Typical Section for details.
8. Match Cross Slope of travel lane or shoulder.
9. Space V-Grooves equally between 2" Expansion Joints and/or Begin or End Trench Footing. V-Groove locations are to coincide with V-Groove locations shown. Space V-Grooves equally between 1" Ø Dowels.
10. Place Dowel Load Transfer Devices at expansion joints (Typ.) (See Note 3).

---

**ESTIMATED TRENCH FOOTING QUANTITIES**

<table>
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<th>ITEM</th>
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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 splice for Bars 5B will be a minimum of 2'-2".
4. The Contractor may use Deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 931 when approved by the Engineer.
5. Construct 2" Expansion Joints plumb and perpendicular or radial to Gutter Line.
6. Construct ½ V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between ² Expansion Joints and/or Begin or End Trench Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Fill is required a distance of 4'-0" on both sides for the entire depth of the trench footing. See Typical Section for details.
8. Match Cross Slope of travel lane or shoulder.
9. Space shown is along the Gutter Line.
10. 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").

---

**EXPANSION JOINT DETAIL**

(Trench Footing expansion joints are required at ⅜ open joints in Concrete Barrier/Noise Wall)

---

**TYPICAL SECTION THRU TRENCH FOOTING**

(Bars SR and SSI in Concrete Barrier/Noise Wall not shown for clarity)

---

**PLAN**

(Bars SSI Not Shown)

---

**DETAIL **"A"

(Showing locations of ½ V-Grooves and ¼ Preformed Expansion Joint Filler)

---

**NOTE INDEX**

INDEX 521-515

**DESCRIPTION:**

FY 2019-20

STANDARD PLANS

INDEX 521-515

1 of 1
PRECAST COPING - PARTIAL ELEVATION VIEW

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).

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.

**C-I-P COPING USED WITH PRECAST COPING**

Note: When precast coping units do not fill 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.

**BILL OF REINFORCING STEEL**

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<th>LENGTH (# E)</th>
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<td>Panel width + 4&quot;</td>
<td>Panel width + 4&quot;</td>
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<td>4</td>
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<td>Dim. C - 6&quot;</td>
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**FIELD BENDING DIAGRAMS**

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments

**FIELD BENDING DIAGRAMS**

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments

**FIELD BENDING DIAGRAMS**

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments
Coping

"Open Joint in Precast 1 0/3 0/2 0/1 8 Preformed Expansion SHEET 3"

DESCRIPTION:
"Open joints in Concrete Barrier)
"Open Joint (See Note 5)
Shear Key
Optional

1" Ø Dowel Load Transfer

REVISION

Index 400-091 - Approach Slabs (Rigid Pavement Approaches)
Index 400-090 - Approach Slabs (Flexible Pavement Approaches)

11. The following Indexes contain details of the intersection of the retaining wall at approach slabs:

Drawings for number and spacing of Dowel Bars 4D.
Field cut reinforcing as required to maintain 2" minimum cover to the top of the buildup concrete. See Wall Company

9. Spacing shown is along the Gutter Line.

8. Shoulder or Roadway Pavement is required on top of the junction slab for its entire length on the traffic

7. Construct ƀ" V-Grooves in junction slabs and C-I-P copings plumb and perpendicular or radial to the

6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

5. Shear Keys in junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are

4. Provide Class II concrete for slightly aggressive environments or Class IV for moderate or extremely

3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A 36 smooth round bar, or GFRP smooth

2. Provide Class I concrete for slightly aggressive environments or Class IV for moderate or extremely

1. Construct the expansion joints, V-Grooves and face of coping plumb.

JUNCTION SLAB NOTES:
1. Construct the expansion joints, V-Grooves and face of coping plumb.
2. Provide Class I concrete for slightly aggressive environments or Class IV for moderate or extremely
3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bar, or GFRP smooth
4. Construct 2" Expansion Joints in junction slabs and C-I-P copings plumb and perpendicular or radial to the
5. Shear Keys in junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are
6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
7. Construct ½" V-Grooves in junction slabs and C-I-P copings at 30'-0" maximum intervals as shown. Provide 3xP mortars
8. Shear Keys in junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are
9. Spacing shown is along the Gutter Line.
10. For Precast Coping only, provide Dowel Bars #4D embedded 1'-0" and extended 9" 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
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)

PARTIAL PLAN VIEW FOR 36" SINGLE-SLOPE CONCRETE BARRIER
(Precast Coping Shown, C-I-P Coping Similar) (Concrete Barrier not Shown for Clarity)

PARTIAL ELEVATION VIEW
(Precast Coping and Junction Slab Reinforcing not Shown for Clarity)
(Precast Coping Shown, C-I-P Coping Similar)

CROSS REFERENCE: For Detail "A", see Sheet 2.

LAST REVISION: 01/01/17
DESCRIPTION:

FY 2019-20
STANDARD PLANS

CONCRETE BARRIER/JUNCTION SLAB - WALL COPING

INDEX 521-610
SHEET 1 of 3

SINGLE SLOPE CONCRETE BARRIERS
CONCRETE BARRIER/JUNCTION SLAB
WALL COPING

NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction 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), Junction Slab may be thickened to match finished grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. For Asphalt: Shoulder or Roadway Pavement will be SuperPave Structural asphalt. Vary the Junction Slab slope based on roadway cross slope to maintain a minimum 1'-6" thickness at the edge of the slab.
5. Minimum length of Junction Slab between expansion joints is 30'-0".
6. 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 615. Mechanical couplers shall develop 125% of the bar yield strength.
7. Contractor to maintain stability of precast coping/Concrete Barrier 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.
8. 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.
9. Angle varies ~ 0° min., 25° max.

TYPICAL SECTION THRU PRECAST 36" SINGLE-SLOPE CONCRETE BARRIER AND COPING WITH C-I-P JUNCTION SLAB

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction 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), Junction Slab may be thickened to match finished grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. For Asphalt: Shoulder or Roadway Pavement will be SuperPave Structural asphalt. Vary the Junction Slab slope based on roadway cross slope to maintain a minimum 1'-6" thickness at the edge of the slab.
5. Minimum length of Junction Slab between expansion joints is 30'-0".
6. 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 615. Mechanical couplers shall develop 125% of the bar yield strength.
7. Contractor to maintain stability of precast coping/Concrete Barrier 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.
8. 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.
9. Angle varies ~ 0° min., 25° max.

PARTIAL END VIEW OF CONCRETE BARRIER END TRANSITION FOR GUARDRAIL ATTACHMENT
(Precast Coping Shown, C-I-P Coping Similar)

PLAN - RAILING END TRANSITION
(Showing Bars V and S)

PLAN - RAILING END TRANSITION
(Showing Bars P and S)

PRECAST COPING

C-I-P COPING

DETAIL "A"

(Showing Locations of ½" V-Grooves and ⅛ Preformed Expansion Joint Filler)
COPING 4'-10" 3'-6" 11'-6"

SHEET 3

DESCRIPTION:

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 4" asphalt depth at the 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 36" 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 2" side cover with and handling. Maintain 2" minimum concrete cover.

NOTE:

The above concrete quantities are based on a max. superelevation joint (Steel Dowels)

TRANSFER DEVICES AT EXPANSION JOINTS (Typ.)

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

MARK SIZE LENGTH

PRECAST COPING FOR SINGLE-SLOPE

(C36") (C42")

C-1-P COPING FOR SINGLE-SLOPE

(C36") (C42")

A 5 5-3" 5-5" 7-10" 8-0"
B 5 11'-0" 9-6" AS REQD AS REQD
C 5 4-10" 4-10" N/A N/A
D 5 4-10" 4-10" 4-10" 4-10"
L 5 4-5" 4-5" 8-3" 4-5"
P 4 5-11" N/A 5-11" N/A
S 5 N/A 7-0" N/A
T 5 N/A 7-0" N/A
V1 4 5-9" N/A 5-9" N/A
V2 5 N/A 6-4" N/A 6-4"

1" Ø DOWEL

STIRRUP BAR

BAR 5A

BARS 5L

STIRRUP BAR

BAR 5A

BARS 5L

REINFORCING STEEL NOTES:

1. All dimensions in the bending diagrams are not to scale.
2. All reinforcing steel at expansion and open joints will have a 2" minimum cover.
3. Lap splices for Bars 5A & 5B will be a minimum of 2'-2".
4. For Precast Copings only, lap splice Bars 5A with Bars SC. Lap splice 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-1-P Copings.
6. Dimension shown in for lap splice option. For mechanical coupler option, this dimension is 1'-10".
7. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-10".
8. When approved by the Engineer, the Contractor may use deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 931.
9. Contractor may use a single #5 stirrup in lieu of two bars for 4P and 4V1.

ESTIMATED QUANTITIES FOR C-1-P

ITEM QUANTITY QUAN...
EXPANSION JOINT DETAIL

(Raised Sidewalk expansion joints are to coincide with 1/2" open joints in Concrete Barrier)

** Stay-In-Place Plastic Preformed Bond Breakers are permitted to form joints.

RAISED SIDEWALK NOTES:
1. When a 42" Vertical Shape is used with a precast coping, increase spacing 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 1/2" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown.
6. 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 or skewed.
7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 922.
8. Construct 1/2" V-Grooves in raised sidewalk and C-I-P coping at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Raised Sidewalk. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier.
9. Spacing shown is along the Gutter 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 buildup concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. Finish Sidewalks in accordance with Specification Section 522.
12. 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 4.
END VIEW OF 32" VERTICAL SHAPE END TRANSITION FOR GUARDRAIL ATTACHMENT (Showing Bars SS, Bars ST and Bars SX) (Precast Coping Shown, C-I-P Coping Similar)

NOTE: See Sheet 4 for End Transition Elevation.

TYPICAL SECTION THRU PRECAST COPING WITH C-I-P RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS

32" VERTICAL SHAPE (Precast Coping Shown, 42" Vertical Shape Similar)

STANDARD PLANS
FY 2019-20

CONCRETE BARRIER/RAISED SIDEWALK
- WALL COPING

INDEX 521-620

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 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 SX to clear construction joint for 42" Vertical Shape.
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 2½", fill gap with full depth Expanded Polystyrene to provide a maximum 2½" air gap.
7. For Inclusion Railings, see Index 515-821 and 515-822.
8. Begin placing Railing Bars ST and SX 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 SX shall be made immediately adjacent to Begin or End Bridge. Cut, shift and rotate Bars ST and SX as required to maintain cover in End Transition.

ESTIMATED QUANTITIES FOR PRECAST COPING

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The above concrete quantities are based on a Type D Concrete Curb (See Note 2).
### ESTIMATED QUANTITIES FOR C-I-P COPING

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<tr>
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The above concrete quantities are based on a Type D Concrete Curb on a level Retaining Wall (See Note 1).

### NOTES:
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 6'-6" dimension is based on a 42" Vertical Shape 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 ST 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 ST shall be made immediately adjacent to Begin or End Retaining Wall Cut and rotate Bars ST and STS as required to maintain cover in End Transition.

### BUILDUP FOR STEPPED MSE WALL PANELS AND C-I-P COPING

- Optional Keyway
- Construction Joint Permitted
- Buildup for Stepped MSE Wall Panels (0" min., 11/2" max.)
- Expanded Polystyrene (2"")
- Smooth or Textured Face of Wall

### TYPICAL SECTION THRU C-I-P COPING AND RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS

(42" Vertical Face Shown, 32" Vertical Face Similar)
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

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<tr>
<td>L</td>
<td>5</td>
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<td>1&quot; Ø Dowel Smooth Bar</td>
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**BILL OF REINFORCING STEEL**

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<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>23.38</td>
</tr>
</tbody>
</table>

**CONCRETE BARRIER/RAISED SIDEWALK**

**PRECAST COPING**

**DETAIL "B"**

**PRECAST COPING**

**DETAIL "A"**

**VERTICAL SHAPE**

**END TRANSITION ELEVATION FOR 32" VERTICAL SHAPE**

(Guardrail Not Shown For Clarity)

**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 will be a minimum of 2'-2".
5. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 2'-2".
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.
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 2" 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 1/2" V-Grooves in sidewalk and C-I-P coping. Space V-Grooves at 30'-0" Maximum intervals equally spaced between 2" 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. For C-I-P Coping only, 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 S IDEWALK AND RETAINING WALL (MSE Wall Shown, other Wall Types Similar)

It is the Contractor's responsibility to ensure Soil Reinforcement is placed a minimum of 2" below the Stabilized Subbase.

Reinforcement 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 5B2 and 5S will be a minimum of 2'-2".
4. For Precast Coping only, lap splice Bars 5L with Bars 5A. Lap splices will be a minimum of 2'-2".
5. The Contractor may use Deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

PARAPET WITH C-I-P SIDEWALK - WALL COPING

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 Parapet/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 2" side cover with adjusted Typical Section dimensions.
**Plan View**

(Junction Slab Shown, Raised Sidewalk Similar)

Bar 5U3 (Rotate as required to clear junction slab reinforcing)

1" Preformed Expansion Joint Filler (Typ. all Sides)

Bars 5B1 (See Note 4)

Bars 4V1 or 5V1 (Typ.)

Bars 5B2 (Field cut as required to clear Barrier Wall Inlet) (Typ.)

Bars 5B1 (See Note 4)

Coping

Gutter Line

**SECTION A-A**

SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL

(Junction Slab Shown, Raised Sidewalk Similar)

**Bill of Reinforcing Steel**

<table>
<thead>
<tr>
<th>MARK</th>
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<th>LENGTH</th>
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<tbody>
<tr>
<td>S2</td>
<td>16</td>
<td>4</td>
<td>10'-0&quot;</td>
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<tr>
<td>U2</td>
<td>11</td>
<td>5</td>
<td>VARIES</td>
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<tr>
<td>U3</td>
<td>4</td>
<td>5</td>
<td>12'-10&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 open joints will have a 2" minimum cover.
3. See Index 521-610, 521-620 & 521-630 for Bars 5A, 5B, 5C and 5L.
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.

**Notes:**

1. Spacing shown is along the Gutter Line. Spacing shown is for C-I-P Junction Slab. For C-I-P Raised Sidewalks or Sidewalks, match bar spacing and size shown in Typical Sections (i.e., 11 ~ Bars 5U2 and 15 ~ Bars 452 @ 6" spacing for Raised Sidewalks).
2. Dimensions shown are for junction slab. Increase width as required for C-I-P Raised Sidewalk and Sidewalks.
3. Actual location & width vary depending on type of Retaining Wall used.
4. See Index 521-610 for Bars 4V1 or 5V1 and 5B1.
5. Organic Felt bond breaker (Top) & Expanded Polystyrene shown hatched (2" Side).
6. Locate % Barrier Wall Inlet a minimum of 10'-0" away from % Expansion Joint in Junctions Slab, Raised Sidewalk or Sidewalk, C-I-P Coping and Traffic Railing or Concrete Parapet.
7. Work this Index with the following as appropriate:
   - Index 521-610
   - Index 521-620
   - Index 521-630
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.
   Coating: Galvanize 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 Concrete Barrier 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 Concrete Barrier and Coping Section. For Estimated Quantities, see Sheet 3.

12. Pedestal details for other Concrete Barriers or pedestrian/bicycle railings are similar.

13. Unless otherwise noted, Concrete Barrier (36” Single-Slope) is shown in all Views and Sections.

<table>
<thead>
<tr>
<th>TABLE 1 DESIGN LIMITATION FOR ANCHOR BOLTS (1” Dia.)</th>
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<td>140</td>
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<tr>
<td>160</td>
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<tr>
<td>160</td>
</tr>
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</table>

* Above Natural Ground
** Use 1(12)x18 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)
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 41 are only required when pedestals are behind a Concrete Barrier or Concrete Barrier/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 521-512 (Concrete Barrier/Noise Wall), Index 521-610 (Single-Slope), Index 521-630 (Concrete Parapet), Index 521-620 (Vertical Shape), and Index 521-630 (Concrete Parapet).
**Bill of Reinforcing Steel**

<table>
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<tr>
<td>M2</td>
<td>4</td>
<td>10</td>
<td>3'-6&quot;</td>
</tr>
</tbody>
</table>

**Reinforcing Steel Notes:**
1. All bar dimensions in the bending diagrams are out to out.
2. Lap splices for Bars 4G1, 4G2, 4G3, 4G4 & 4G5 will be a minimum of 1'-4".
3. 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 Quantities**

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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<td>Concrete (Thickened Junction Slab)</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>334.09</td>
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</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 the thickened concrete quantity as required.)
GENERAL NOTES:
1. Construct sidewalks in accordance with Specification 522. Use 6" concrete for sidewalks and Curbing. Sidewalks Laid 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 Driveways see Index 522-003.
4. Bond breaker material can be any impermeable coated or sheet membrane or preformed material having a thickness of not less than 6 mils and not more than 16 mils.
5. Construct sidewalks with Edge Beam through the limits of any surface mounted Pedestrian/Bicycle Railings or Pipe Guardrail shown in the plans. (See RAILING DETAIL).

LEGEND:

- 4" Thick Sidewalk
- 6" Thick Sidewalk
- Utility Strip
- OPEN JOINTS
- SAWED JOINTS
- LONGITUDINAL SECTION

SIDEWALK JOINTS

GENERAL NOTES AND CONCRETE SIDEWALK ON CURBED ROADWAYS
**LEGEND:**

A- 1/2" Expansion Joints (Preformed Joint Filler) between the sidewalk and driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).

B- 1/2" Dummy Joints, Tooled

C- 1/4" Formed Open Joints

D- 16" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 6' Centers

E- 16" Saw Cut Joints, 1/2" Deep (within 12 hours) Max. 30' Centers

F- 1/2" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.

**SIDEWALK JOINTS**

---

**CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS**

**PLAN**

**CONTINUOUS SIDEWALK**

**DISCONTINUOUS SIDEWALK**

**LONGITUDINAL SECTION**

**SECTION C-C**
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, provide 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. Maintain a single longitudinal slope along each side of the curb ramp.
   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, curb and gutter, or sidewalk to the nearest joint beyond the curb transition or to the extent that no remaining section 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 Warnings:
   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.
CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS

NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX 522-002 SHEET 3 of 8
NOTES:
1. Crosswalk Width and Configuration Vary; Must Conform to Index 711-001.
2. 15' Radius Curve Shown for CR-L.
3. For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details, on Sheet 3.
LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS

(See CR-F, CR-G & CR-K Respectively For Detectable Warning Details/Options)

DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS

NOTE: Remove Elevated Pavement By Spading And Rolling, Smooth Milling, or Grinding.

SECTION C-C

PAVEMENT RELIEF DETAILS

CURB RAMPS WITHOUT SIDEWALKS AND FLUSH SHOULDER SIDEWALKS

NOTE: 11/01/18

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX 522-002

F Y 2019-20

STANDARD PLANS

SHEET 6 of 8
NOTES:

1. Cross Slope of the median crossing not to exceed 0.02.

2. Running Slopes:
   
   A. Slopes ≤ 0.05: For roadway cross sections where 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.

MEDIAN CROSSINGS

SECTION F-F

MEDIAN CROSSING
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 711-001.

3. Flangeway Gap may be up to 3" for Freight-only Railways.
GENERAL NOTES:
1. Work this Index with Specification 522.
2. Refer to Index 520-001 for drop curb details and Index 522-001 for joints between driveway, sidewalks, and curb.
3. Existing Curb and Gutter:
   Remove existing curb and gutter to either the nearest joint beyond the flared point or to where no remaining section is less than 3 feet long.
4. Grades and cross slopes shown are maximums.
5. Longitudinal Joints:
   Construct 12" open joints placed at equal (20 max) intervals for driveways over 20 wide. Match joints in curb and gutter to match joints in driveways.
6. Transverse Joints:
   Construct 12" open joints at 10' Centers and 12" expansion joint filler every 5th joint.
7. Construct driveways (6" thick concrete) to a uniform width (W) to the R/W line or the extent shown in the Plans.
8. Width of Sidewalk Thru Driveway is 4'-0" minimum. Match sidewalk width when shown in Plans or when utility strip width is equal to or greater than the depth of the Driveway Apron.
9. Alpha-Numeric Identification:
   Concrete flared driveway Alpha-Numeric Identifications (e.g. G4) are provided for reference purposes in the Plans.

Legend:
- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip
- Grade of Apron
- Grade of Driveway (Per Plans)

11/01/18

522-003

Concrete Flared Driveways Alpha-Numeric Identifications (e.g. G4) are provided for reference purposes in the Plans.
**CONCRETE FLARED DRIVEWAYS**

**DESCRIPTION:**

- Sidewalk Flare
- Drop Curb
- Match Driveway Flare
- Sidewalk Flared Driveway (6" Thick Concrete)
- Utility Strip

**LEGEND:**

- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip

**REV IS IO N:**

11/01/18

**INDEX:**

522-003

**SHEET:**

2 of 4
SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE:
5’ sidewalks shown.
NOTE:
5' sidewalks shown.

SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

DRIVEWAY SECTIONS ON CURBED FACILITIES WITH SIDEWALKS
**Standard Paved Ditch**

**DESCRIPTION:**

- For use only where side slopes are 1:4 or flatter. Point "A" and "B" are to be located on the same elevation and should be used to locate the paved section.

1. **Riprap (Sand-Cement)**
2. **Riprap (Ditch Lining)**

**4' Ditch Bottom Width**

**5' Ditch Bottom Width**

**6' Median Swale**

**1:6 Front Slopes; 1:4 Back Slope**

**1:4 Front Slopes & Back Slope**

**S-shoulder Line**

**Arc Length**

**At Locations Other Than Junction with Lateral Ditch**

**PROFILE OF DITCH PAVEMENT**

**WEEP HOLE ARRANGEMENT**

- Weep holes shall be placed as shown on the plans.
- When weep holes with aggregate are used, place filter fabric (See Table 1) below the pavement. See Specification 985 for fabric requirements and application.

**Section Mattig for Ditch**

**فايل: 524-001**

**General Notes**

1. Type of ditch pavement shall be as shown on plans.
2. In concrete ditch pavement, contraction joints are to be spaced at 25' maximum intervals, or as directed by the Engineer. Construction joints may be either formed (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.
3. Lip at end of ditch pavement shall normally be located downstream of DPP, or on flatter grades where there is a decrease in ditch velocity.
4. Trenches are to be used with all ditch paving. A trench shall not be required adjacent to drainage structures.
5. When directed by the Engineer, weep hole spacing may be reduced to 5' minimum.
6. For junction of R/W ditch spillway and lateral ditch, sides of paving to be 1' high minimum.
7. For ditch pavements requiring filter fabric (See Table 1) place the filter fabric directly beneath the pavement for the entire length and width of the pavement. See Specification 985 for fabric requirements and application.
8. When weep holes with aggregate are used, place filter fabric below the aggregate to form a mat continuous with the pavement filter fabric or underlapping the pavement filter fabric, if present.
9. Ditch pavement requiring reinforcement shall be detailed in the plans.
10. Cost of plastic filter fabric to be included in the contract unit price for ditch pavement.
11. Sodding is to be paid for under contract unit price for Performance Turf, SY.

**Table 1: Ditch Pavement**

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Dimensions</th>
<th>Payment Unit</th>
<th>Basis of Estimate</th>
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<th>Fabricity Range</th>
<th>References &amp; Remarks</th>
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<tbody>
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<td>Specification 539</td>
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</table>
BONDED OPTION

NAILED OPTION

Note: Either option may be used unless otherwise called for in the plans.

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE

TABLE 2: SOD QUANTITIES (SY)

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<tr>
<td>16</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
</tr>
</tbody>
</table>

SOD PLACEMENT AT PIPE/CULVERT END TREATMENTS

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.

2. Construct Noise Walls in accordance with the requirements of Specification Section 534, and Auger 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: +/- ½"
   B. Thickness: +/- ½"
   C. Plane of side mold: +/- 1/16"
   D. Openings: +/- 1/16"
   E. Out of Square: 1/8" per 6 ft., but not more than 3/8" Total along any side
   F. Warp: 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" SPLIT FACE RUNNING BOND BLOCK

Type "D" FRACTURED GRAINITE

Type "E" WIRE-CUT BRICK

Type "F" CUT CORAL BLOCK (RUNNING BOND)

Type "G" VERTICAL FRACUTED FIN

Type "H" TRAPEZOID VERTICAL FINS W/ FRACTURED FACE (COLORADO DRAG AGGREGATE)

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.
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.
**Noise Walls - Precast**

**Typical Elevation**

- **Post & Pile**
- **Neoprene Pads**
- **Top Panel**
- **Bottom Panel**
- **Finished Grade**
- **R/W Line**

**Section A-A**

- **Auger Cast Pile**
- **V-Groove & 1" Ø Polyeyleene Rod (continuous)**
- **Precast Cap**

**Section B-B**

- **Post & Pile**
- **Neoprene Pads**
- **Fill with Non-Shrink Grout**
- **Roadway face of wall, Front Face of Post**
- **Nominal embedment (not including tolerances)**

**Plan**

- **Post & Pile**
- **L (Top-Installed)**
- **L (Side-Installed)**
- **Roadway face of wall, Front Face of Post**

**With Post Cap**

- **Step**
- **Top of post**
- **Top of Wall Elevation**
- **Elevation Step at Top of Wall**

**Without Post Cap**

- **Step**
- **Top of wall and post elevation**
- **Elevation Step at Bottom of Wall**

**Typical Details**

- **Bearing Pads (Typ.)**
- **4" L (Top-Installed)**
- **8" L (Side-Installed)**
- **Auger Cast Pile**
- **Non-roadway face of wall, Back Face of Panel**

**Note:**

See the plans for required post spacings (S).
**NOTE:**
At the Contractors 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.)

**TYPICAL PANEL ELEVATION**

* In lieu of using 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 height (H) 0.207 H 0.586 H 0.207 H)

**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.

**SECTION D-D**

(Showing Flush Type Panel)

**SECTION D-D**

(Showing Recessed Type Panel)
NOTE:
The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2\(\Delta\)) between panels exceeds 7\(^\circ\).

NOTE:
The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2\(\Delta\)) between panels exceeds 20\(^\circ\).

PIVOTING DETAILS
(Flush Type Panel)

PIVOTING DETAILS
(Recessed Type Panel)
DRAINAGE HOLES TYPES A, B, C & D
(Front Face of Wall Shown)
(Two Holes Shown, One Hole Similar)

GRATING NOTES:
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 Ɓ" 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 HOLE DETAILS

BAR BENDING DETAILS (#3 Bars)
**TYPICAL POST**

*Low Clearance Option*

- 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".

**STANDARD POST REINFORCEMENT**

(Standard Post Shown, 45° Corner Posts Similar)

**STANDARD POST DETAILS**

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
POST PLACEMENT & PILE REINFORCING STEEL DETAILS

POST PLACEMENT & PILE REINFORCING STEEL DETAILS

TYPICAL POST

STANDARD POST PLACEMENT IN AUGER CAST PILE

(H-Post Shown, 45° Corner Posts Similar)

LOW CLEARANCE OPTION

NOTE:
1. For Pile Length Tables, see Sheets 15 and 16.

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

Exposed Precast Post Reinforcement (Typ.)

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.)

10 – #9 Bars (Typ.)

* Top of Wall

Post & Pile

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Finished Grade

Top of Wall

Precast Post

Top of Wall

Precast Post

Precast Post

Precast Post

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Finished Grade

Top of Wall

Precast Post

Top of Wall

Precast Post

Precast Post

Precast Post

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

Exposed Precast Post Reinforcement (Typ.)

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.)

10 – #9 Bars (Typ.)

* Top of Wall

Post & Pile

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Finished Grade

Top of Wall

Precast Post

Top of Wall

Precast Post

Precast Post

Precast Post

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

Exposed Precast Post Reinforcement (Typ.)

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.)

10 – #9 Bars (Typ.)

* Top of Wall

Post & Pile

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Finished Grade

Top of Wall

Precast Post

Top of Wall

Precast Post

Precast Post

Precast Post

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

Exposed Precast Post Reinforcement (Typ.)

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.)

10 – #9 Bars (Typ.)

* Top of Wall

Post & Pile

Top of Precast Collar, Elev. A

Top of Auger Cast Pile

Finished Grade

Top of Wall

Precast Post

Top of Wall

Precast Post

Precast Post

Precast Post

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

30° Ø Auger Cast Pile

36° Ø Auger Cast Pile

Exposed Precast Post Reinforcement (Typ.)

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.), See Section P-P

10 – #9 Bars (Typ.)

10 – #9 Bars (Typ.)
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.
### NOISE WALLS - (PRECAST)

#### TYPICAL POST

- **Bars A (Typ.)**
- **Bars B (Typ.)**
- **Bars P5 (Pairs)**
- **#4 Bars (Typ.)**

**Dimensions:**
- Top of Wall
- Post Length
- Post P5 @ 7½" Max.
- #4 Bars
- Bars A and Bars B
- Bars P5 (Pairs)
- Top of C-I-P Collar (Elev. A)
- Bars P5 @ 7½" Max.

**Texture (when required):**

**5 ½" Chamber**

**SECTION S-S**

**LOW CLEARANCE OPTION**

* 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".

**90° CORNER POST REINFORCEMENT**

(Post Surface Features Not Shown For Clarity)

**90° CORNER POST DETAILS**

1. For Post Reinforcing, see Sheets 15 and 16.
2. For Pile Length Tables, see Sheets 15 and 16.
3. Reduce typical panel length or adjust pile spacing at each 90° Corner Post.
4. Match texture thickness with appropriate Panel Face.

**INDEX**

FY 2019-20

STANDARD PLANS

NOISE WALLS - (PRECAST)

534-200

Sheet 11 of 16
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".

- Top of Wall
- Typical Post
- Bearing Pad (Typ.)
- Top of Auger Cast Pile
- Top of Collar, Elev. A (see Note 2)
- Bars P6 (Pairs)
- 4" Cover (Typ.)
- 30" Ø Auger Cast Pile
- Top of Wall & Pile
- Top of Collar
- Auger 30" Ø
- Hole per Plan
- Finished Grade
- * Wall & Pile
- Exposure Precast Post Reinforcement
- Hole per Plan
- Pile Length (see Note 1)
- Exposed Precast Post Reinforcement
- ELEVATION
- 90° CORNER TYPICAL POST PLACEMENT DETAILS
- 3'-6"
- 1'-0"
- 9'-6"
- 3'-6"
- 1'-0"
- 11'-0"
- 10'-0"
- 9'-6"
- 3'-6"
- Tie Bars (Typ.)
- (Min. #3 Bars)
- SECTION T-T
- C-I-P COLLAR
- 9'-6"
- 11'-0"
- 3'-6"
- 1'-0"
- 9'-6"
- 3'-6"
- 11'-0"
- 3'-6"
- SECTION U-U
- 9'-6"
**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*

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**SECTION W-W**

**SECTION V-V**

**ELEVATION**

---

**REV ISIO N DESCRIPTION:**

- **REVISION:**
- **LAST:**
- **OF:**
- **STANDARD PLANS:**
- **FY 2019-20**
- **NOISE WALLS - (PRECAST)**
- **INDEX:** 534-200
- **SHEET:** 13 of 16
**Noise Walls - (Precast)**

**Section C-C**

TYPE "A" CAP DETAILS

**Pictorial View**

**Section C-C**

TYPE "B" CAP DETAILS

**Pictorial View**

**Section C-C**

TYPE "C" CAP DETAILS

**Pictorial View**

**Plan View**
(Type "A" Cap Shown, Type "B" & "C" Caps Similar)

**View A-A Shown, View B-B Similar**
(Type "A" Cap Shown, Type "B" & "C" Caps Similar)

**Cap Placement Detail**
(Type "B" Cap Shown, Type "A" & "C" Caps Similar)

Set cap on ½ mortar bed
(ASTM C 1329, Type S)

Precast Cap (center cap about post)

Top of post

Precast Post

Precast Wall Panel
### PILE/POST ELEVATION

* See Sheet 1, Note 4.

### TABLE 1A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 130 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>SIZE</td>
<td>DIM 'A'</td>
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<td>13'-0&quot;</td>
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<td>14'-0&quot;</td>
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<tr>
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<td>21</td>
<td>22'-0&quot;</td>
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<tr>
<td>22</td>
<td>23'-0&quot;</td>
<td>23'-0&quot;</td>
</tr>
</tbody>
</table>

### TABLE 1B - PILE LENGTHS (Feet) - WIND SPEED = 130 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL DEPTH &amp; REINFORCING SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOIL 1</td>
</tr>
<tr>
<td>10'-0&quot; POST SPACING</td>
</tr>
<tr>
<td>SIZE</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
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<tr>
<td>14</td>
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<tr>
<td>15</td>
</tr>
</tbody>
</table>

### TABLE 18 - PILE LENGTHS (Feet) - WIND SPEED = 130 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SIZE</td>
</tr>
<tr>
<td>10'-0&quot; POST SPACING</td>
<td>12</td>
</tr>
<tr>
<td>20'-0&quot; POST SPACING</td>
<td>22</td>
</tr>
</tbody>
</table>
### Table 2A - Table of Post Reinforcing Steel

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BARS A</td>
<td>BARS B</td>
</tr>
<tr>
<td></td>
<td>12'</td>
<td>13'-0&quot;</td>
<td>#6</td>
</tr>
<tr>
<td></td>
<td>14'-0&quot;</td>
<td>#6</td>
<td>#6</td>
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<tr>
<td></td>
<td>15'-0&quot;</td>
<td>#6</td>
<td>#6</td>
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<td>16'-0&quot;</td>
<td>#6</td>
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<tr>
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<td>22'-0&quot;</td>
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</tbody>
</table>

### Table 3A - Table of Pile Lengths (Feet) - Wind Speed = 170 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BARS A</td>
<td>BARS B</td>
</tr>
<tr>
<td></td>
<td>12'</td>
<td>13'-0&quot;</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>14'-0&quot;</td>
<td>#5</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>15'-0&quot;</td>
<td>#5</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>16'-0&quot;</td>
<td>#5</td>
<td>#5</td>
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<tr>
<td></td>
<td>17'-0&quot;</td>
<td>#5</td>
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<td>20'-0&quot;</td>
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<tr>
<td></td>
<td>22'-0&quot;</td>
<td>#5</td>
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</tbody>
</table>

### Table 2B - Table of Pile Lengths (Feet) - Wind Speed = 150 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BARS A</td>
<td>BARS B</td>
</tr>
<tr>
<td></td>
<td>12'</td>
<td>13'-0&quot;</td>
<td>#6</td>
</tr>
<tr>
<td></td>
<td>14'-0&quot;</td>
<td>#6</td>
<td>#6</td>
</tr>
<tr>
<td></td>
<td>15'-0&quot;</td>
<td>#6</td>
<td>#6</td>
</tr>
<tr>
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<td>16'-0&quot;</td>
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<td>20'-0&quot;</td>
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<tr>
<td></td>
<td>22'-0&quot;</td>
<td>#6</td>
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</table>

### Table 3B - Table of Pile Lengths (Feet) - Wind Speed = 190 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BARS A</td>
<td>BARS B</td>
</tr>
<tr>
<td></td>
<td>12'</td>
<td>13'-0&quot;</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>14'-0&quot;</td>
<td>#5</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>15'-0&quot;</td>
<td>#5</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>16'-0&quot;</td>
<td>#5</td>
<td>#5</td>
</tr>
<tr>
<td></td>
<td>17'-0&quot;</td>
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<tr>
<td></td>
<td>18'-0&quot;</td>
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<tr>
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<td>19'-0&quot;</td>
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</tr>
<tr>
<td></td>
<td>22'-0&quot;</td>
<td>#5</td>
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</tr>
</tbody>
</table>

### Table 4 - Pile Depth & Reinforcing Summary

- Bars D and Bars E are for 40' Corner Posts only.
- See standard plans for specific requirements.

**Note:**
1. Bars D and Bars E are for 40' Corner Posts only.
2. See Contract Plans for project wind speed.
   - Soil 2 = Medium Dense Gravelly Soil, N = 10 to 40.

<table>
<thead>
<tr>
<th>SOIL 1</th>
<th>SOIL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'</td>
<td>30'</td>
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<tr>
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<td>30'</td>
<td>30'</td>
</tr>
<tr>
<td>30'</td>
<td>30'</td>
</tr>
</tbody>
</table>
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 feet only at changes in horizontal alignment, wall terminations or to accommodate steep grades.
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 4'-0".
B. Only when reduced overhead 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 and Precast Spread Footings:
   i. 2,500 psi for horizontally cast panels and precast spread footings.
   ii. 2,000 psi for vertically cast panels or when tilt-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 Special Post Spacing (See General Note 3) 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 of 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: +/- 3/8".
B. Thickness: +/- 1/32".
C. Plane of side mold: +/- 1/16".
D. Openings: +/- 3/32".
E. Out of Square: 1/16" per 6 ft., but not more than 3/32" total along any side.
F. Warping: 7" 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.

MASONRY OPTION NOTES (CONT.):

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 #12 (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 963. Install Dowel Load Transfer Devices in accordance with Specification Section 250.
J. For spread footings, use a walk-behind compactor of at least 600 lbs. in weight. Obtain a minimum density of 95% of the maximum dry density as determined by FM T-178. Perform soil density tests at 10 foot intervals.
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 tooling joints.
L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TEK 8.2-8 applicable to the type of stain on the exposed surface.
M. During construction, cover tops of walls, with waterproof sheeting at the end of each day's work, or when construction is not in progress. Extend sheeting of a minimum of 2 feet down each side and secure in place.
N. Comply with Hot Weather Requirements in ACI 530.1.

13. MATERIALS:
A. Concrete Masonry Units (CMU): Provide normal weight blocks.
B. Cast-In-Place Concrete: Class II for slightly to moderate aggressive environments or Class IV for extremely aggressive environments.
C. Mortar: Type S, meeting requirements of ASTM C1299.
D. Grout: Type S, coarse grout.
E. Aggregate for Grout: Meet the requirements of ASTM C404 or Specification Section 901 size 8 or 89.

14. STORAGE OF MATERIALS:
A. Store CMU's on elevated platforms in a dry location or under cover.
B. If units become wet, do not install until they are dry.
C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp or exceeded the manufacturers shelf life.
D. Store masonry accessories and reinforcing to prevent corrosion and accumulation of dirt and oil.

GENERAL WALL ELEVATION (Precast Option with Single Height Panel Shown, Others Similar)
DRAINAGE HOLES TYPES A, B, C & D

* Hole Types A, B, C, & D refer to distance from bottom of panel/wall to center of the pipe.

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.
PIVOTING JOINT DETAILS

NOTE: Shop Drawings shall include specific pivoting point details of panel ends at locations where the deflection angle (2°) between panels exceeds 20°.

TYPICAL ELEVATION
(Front Face Shown, Textured Finish not Shown for Clarity)

SECTION D-D
SECTION E-E

TYPICAL PLAN

* Nominal embedment (not including tolerances)
NOTE:
At the Contractor's option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

Horizontal Steel - #4 Bars @ 7 1/2" (As=0.32 in²/ft²) (Typ.)

NOTE:
In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then lifted 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 in²/ft²).

Details:
- Vertical Steel ~ #4 Bars @ 10" (As=0.24 in²/ft²) (Typ.)
- Horizontal Steel ~ #4 Bars @ 7 1/2" (As=0.32 in²/ft²) (Typ.)
- In lieu of utilizing the standardpick up points below, panels may be cast vertically or cast horizontally then lifted 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 in²/ft²).

Sections:
- Section F-F
- Section G-G

Details:
- Detail "B" - Side-Installed (Typ. Both Ends)
- Detail "B" - Top-Installed (Typ. Both Ends)

Reinforcing Mat:
- $R = \frac{4}{\text{in}}$

Texture:
- Front Face

Panel Height (H):
- 0.207 H
- 0.586 H
- 0.207 H

Panel Length (L) (19'-2" Max.):
- 0.207 L
- 0.586 L
- 0.207 L

STANDARD PICK UP POINTS FOR PANELS
(Panels shall be rotated about long axis only)
### TYPICAL POST SECTION

(H Section)

### SECTION H-H

(Section - Above Collar)

- Roadway face of wall
- Front Face Post Texture (Formed)

### LOW CLEARANCE OPTION

- Post Length (H Section) (See Note 1)

**NOTES:**
1. See Shop Drawing for Post Lengths.

### 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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<tr>
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<tr>
<td>170</td>
<td>15'-0&quot;</td>
<td>#6</td>
<td>#3</td>
<td>#4</td>
</tr>
</tbody>
</table>

### BAR BENDING DETAILS

- Bar P1
  - Bar Length = 2-3½'
  - All bar lengths in bending diagrams are out-to-out.
- Bar P2
  - Bar Length = 8-0'
  - All bars not shown in the bending diagrams are straight.

### SECTION I-I

- Precast Collar

### SECTION J-J

- Perimeter Walls

---

**PRECAST OPTION - STANDARD POST DETAILS**

**INDEX**

534-250

**SHEET**

6 of 10
NOTES:
1. For Reinforcing Steel Sizes, and Foundation Dimensions, see Table 1 Sheet 6.
2. For location of Section H-H and I-I, see Sheet 6.
3. The Bearing area beneath Neoprene Pads is formed by top of Auger Cast Pile Grout.

SPECIAL POSTS FOR 90° CORNERS

SECTION H-H

SPECIAL POST FOR 45° CORNERS

SECTION I-I

SPACKED OPTION - SPECIAL CORNER POSTS

PRECAST OPTION - SPECIAL CORNER POSTS

PERIMETER WALLS
Table 2

<table>
<thead>
<tr>
<th>Wind Speed Category</th>
<th>Masonry Walls (8x8x16)</th>
<th>Foundations</th>
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<tr>
<td></td>
<td>Bars V1</td>
<td>V2</td>
</tr>
<tr>
<td>170</td>
<td>#5</td>
<td>2-3</td>
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<tr>
<td>170</td>
<td>#5</td>
<td>1-4</td>
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</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.

Bar Bending Detail

All bar dimensions in bending diagram are out to out.
All bars not shown in the bending diagrams are straight.

Masonry Option

Precast Post Cap (Typ.)
(See Sheet 2)

Control Joint (Typ.)

Joint Stabilizing Anchor

Section M-M
Pilaster Reinforcing and Wall Control Joint Detail

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.

Masonry Walls (8x8x16)

Bar F1
Length = 5'-2"
Notes:
1. For reinforcing sections K-K and L-L see Sheet 9.
2. Provide and install ½" Preformed Expansion Joints with 2 – 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.

REINFORCING AT PILASTER WITH EXPANSION JOINT
(Step Shown, without Step Similar)
(T-Footing Shown, Trench Footing Similar)

See Detail C
Slope Mortar Cap to drain
Bond Beam (Typ.)
Bars V1 Paired with Bars F1 (Typ.)

See Detail D
Solid 8"x4"x16" block (Typ.)

Bars F3 Spaced @ 5Y (Typ.)

See Detail C
Slope Mortar Cap to drain
Bond Beam (Typ.)

Bars V1 Paired with Bars F2 (Typ.)

Top of Footing

EXPANSION JOINT DETAILS

Approved metal or fiber cap

1/2" Preformed Expansion Joint

1/2" Dowel Load Transfer Devices
(See Typical Sections for details)

Approved metal or fiber cap

PREPARED EXPANSION JOINT & Dowel Load Transfer Device Shown

Top of Footing

Notes:
1. For location of Sections K-K and L-L see Sheet 9.
2. Provide and install ½" Preformed Expansion Joints with 2 – 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 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 the 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. Guardrail components included on the APL, which are compatible with this Index, may also be identified as 31" or MGS Guardrail.


4. BUTTON-HEAD BOLTS: Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 22. Place washers under nuts. 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 967. Place washers under nuts.

6. MISCELLANEOUS ASPHALT PAVEMENT: Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ±0.012" depth and in accordance with Specification 399.

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 treatments is required for the bolt(s) protruding from the back face of the posts:

   a. After tightening the nut, trim the protruding post bolt flush with the nut, then galvanize per Specification 562.

   b. Use post bolts 15" in length and countersink the washer and nut between 1 1/2" and 1 3/4" deep into the back face of the post.

   c. Use 15" post bolts with sleeve nuts and washers.

When End Treatment posts are within 4'-0" of a sidewalk or shared use path, steel posts are not permitted within the End Treatment segment. Terminate the Pipe Rail outside of End Treatment 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. 3" 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 Railings 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 423-405.

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'-3". Provide an immediate transition to the required midspan splice using the available panel options on Sheet 4 (9'-45" or 15'-71/2" 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 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 tip of the panel's post bolt slots at the approach/trailing ends).
GENERAL GUARDRAIL

INSTALLED ELEVATION

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. MIDSAPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

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 sidewalks, or shallow depth conditions are encountered, see Sheet 21 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
LOW-SPEED GUARDRAIL DETAILS

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 8'-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 Face, W-Beam, Modified Thire-Beam, Deep Posts at Slope Breaks, Pipe Rail, and/or Rub Rail.

INSTALLED PLAN

LOW-SPEED GUARDRAIL INSTALLED ELEVATION

INSTALLED SECTION

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 8'-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 Face, W-Beam, Modified Thire-Beam, Deep Posts at Slope Breaks, Pipe Rail, and/or Rub Rail.

LOW-SPEED, TL-2 GUARDRAIL DETAILS
**DESCRIPTION:**

**THREE-BEAM PANEL SECTION**

- W-Beam & Post Bolt Slot (Typ.)
- W-Beam & Post Bolt Slot (Symmetrical)
- W-Beam & 29/32 x 1 5/16 Splice Bolt Slot (Typ.)

**W-Beam Panel Elevation**

- W Spaces @ 3'-11/2" (See Table 1)
- W-Beam Panel Section

**THREE-BEAM PANEL ELEVATION**

- W Spaces @ 3'-11/2" (See Table 1)
- THREE-BEAM PANEL ELEVATION

**THREE-BEAM TRANSITION PANEL ELEVATION**

(Reverse Direction Similar by Opposite Hand)

**W-Beam Panel Elevation**

- W Spaces @ 3'-11/2" (See Table 1)
- W-Beam Panel Section

**Notes:**

1. **MATERIALS:**
   - Use corrugated steel panels in accordance with Specification 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 3/8" Ø Cable Anchor Plate Bolt Holes only where required for installation of the Cable Anchor Plate shown on Sheet 9, 10, & 11.

3. 29/32 x 1 5/16 slots may substitute for the 3/8" Ø holes shown.

**Panel Summary Table:**

<table>
<thead>
<tr>
<th>Panel Type</th>
<th>Number of Spaces</th>
<th>Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'-3&quot; W-Beam</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>9'-4&quot; W-Beam</td>
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<td>12</td>
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<tr>
<td>12'-6&quot; W-Beam</td>
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<tr>
<td>15'-7&quot; W-Beam</td>
<td>5</td>
<td>12</td>
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<tr>
<td>18'-0&quot; Thrie-Beam</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>21'-0&quot; Thrie-Beam</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>24'-0&quot; Thrie-Beam</td>
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<td>25'-0&quot; Thrie-Bean</td>
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<tr>
<td>Thrie-Beam Trans.</td>
<td>2</td>
<td>10</td>
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</table>

**Panel Details:**

- INCLUDE 'N' Spaces @ 3'-1" (Typ.)
- See Table 1

**Standard Plans**

- GUARDRAIL

**FY 2019-20**

**LAST REVISION:**

01/01/17
**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 the specified type(s) of Standard Posts are available on the APL. Use a single post material type consistently per each run of guardrail. The Standard Post 'L' may be substituted with a 1'-6" Thrie-Beam Block (See Sheet 13). Where specified in the Plans, use the Deep Post 'L' for Slope Break Conditions as shown on Sheet 6.

**MODIFIED THRIE-BEAM SYSTEM**

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 the specified type(s) of Standard Posts are available on the APL. Use a single post material type consistently per each run of guardrail. The Standard Post 'L' may be substituted with a 1'-6" Thrie-Beam Block (See Sheet 13).

2. 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 1/2" from the face of the tightened nut. Trim the threaded portion as needed and galvanize in accordance with Specification 562.

3. BOLT HOLES: 5/16" Bolt Holes shown in this Index may be substituted with 1/4" Bolt Holes. Double Faced Guardrail: Install Stud Bolts with the Button-Head located on the side nearest the traffic lane. The bolts' threaded portion is not permitted to extend beyond 1/2" from the face of the tightened nut. Trim the threaded portion as needed and galvanize in accordance with Specification 562.

4. MODIFIED THRIE-BEAM 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.

5. BLOCK STOP-NAIL: Drive one nail per Standard Offset Block as shown to prevent Block Rotation. Use steel 3½" Type 36 nails with ASTM A153 hot-dip galvanized. For steel posts, drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange.

6. MODIFIED THRIE-BEAM 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-NAIL: Drive one nail per Standard Offset Block as shown to prevent Block Rotation. Use steel 3½" Type 36 nails with ASTM A153 hot-dip galvanized. 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 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.

**NOTES:**

**SECTIONS A-A**

**NAMES:** Thrie-Beam Panel & Nested Back-Up Plate (See Note 5)
GUARDRAIL TYPES - MOUNTING heights & POST DEPTHS

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 and Double Faced)</td>
<td>3'-10&quot;</td>
<td>7'-1&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>Thrie-beam (Single and Double Faced)</td>
<td>3'-10&quot;</td>
<td>1'-9&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Modified Thrie-beam</td>
<td>3'-17&quot;</td>
<td>2'-9&quot;</td>
<td>6'-9&quot;</td>
</tr>
<tr>
<td>Timber Deep Post</td>
<td>4'-10&quot;</td>
<td>See Above</td>
<td>7'-6&quot;</td>
</tr>
<tr>
<td>Steel 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. 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.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post space 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 - SHOULders

SLOPE BREAK CONDITION

3. TIMBER DEEP POST

GUARDRAIL SECTIONS - CURB & Gutter

GUARDRAIL SECTIONS - TYPICAL

TYPICAL GRADING & PAV. PLACEMENT DETAIL

(See Note 2)

TYPICAL SIDEWALK DETAIL

(Work with other Sections as Regd.)

BEHIND CURB

(Typ. Curb Shown)

ADJACENT TO SHOULDER GUTTER

(Shown in Median)

GUARDRAIL SECTIONS - FULLY PAVED SHOULDER

UNPAVED OR PARTIALLY PAVED SHOULDER

SHOULDER GUTTER

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 Begin/End Guardrail Station indicated in the plans.
   The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The predetermined Length of Flared Approach Terminals includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across 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 Transverse Join-Outs, 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.

   Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.

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 not substitute for TL-3 installations.

4. IMPACT HEAD END DELINERATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 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.


1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) ¡ placed at the Begin/End Guardrail Station indicated in the plans.

   The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The predetermined Length of Flared Approach Terminals includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across 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 Transverse Join-Outs, 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.

   Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.

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 not substitute for TL-3 installations.

4. IMPACT HEAD END DELINERATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 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.


1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) ¡ placed at the Begin/End Guardrail Station indicated in the plans.

   The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The predetermined Length of Flared Approach Terminals includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across 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 Transverse Join-Outs, 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.

   Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.

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 not substitute for TL-3 installations.

4. IMPACT HEAD END DELINERATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 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.


1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) ¡ placed at the Begin/End Guardrail Station indicated in the plans.

   The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The predetermined Length of Flared Approach Terminals includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across 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 Transverse Join-Outs, 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.

   Install adjacent grading, gutters, and/or curbing as shown herein, unless otherwise specified in the plans.

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 not substitute for TL-3 installations.

4. IMPACT HEAD END DELINERATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 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.


Guardrail Face of (Min.)


Guardrail Face of (Min.)

1:10 (to Typical Front Slope Break)

Front Slope Break


25'-0' Taper Length

Guardrail

Face of Type E Curb

Limit Type E Curb (Only)

General Guardrail

Limit Type E Curb (Min.)

Guardrail

Type E Curb (Only)

Approach Terminal Assembly

'CURBED' SEGMENT - PLAN VIEW

APPENDIX TERMINAL GEOMETRY CURBED AND DOUBLE FACED

Approach Terminal Assembly

'DOUBLE FACED' SEGMENT - PLAN VIEW

END TREATMENT - APPROACH TERMINAL GEOMETRY CURBED AND DOUBLE FACED

Notes:

1. GENERAL: See Notes 1 through 3 on Sheet 7.

2. CURBED SEGMENTS: Type E curb is required within the limits shown. When a different curb type is called for outside of the Type E curb limits, transition the curb shape linearly, over a nominal distance ranging 5'-0" to 10'-0".

3. TAPER LENGTH: For Curbed Segments, taper the guardrail way from the roadway where shown to place the inside edge of the Impact Head at 5" behind the face of the curb. Where additional lateral offset is required to fit the Approach Terminal Assembly hardware, such as a soil plate, place the Impact Head as close to the curb as the hardware allows, not to exceed 2'-6" from the face of curb.

4. GUARDRAIL HEIGHT TAPER: For Curbed Segments, the connecting general guardrail Mounting Height, 'H', is typically measured from the top of gutter (or Sheet 6 Type E Curb to the face of curb). The General Guardrail Height Taper at the Approach Terminal Assembly 'H' is measured from the Misc. Asphalt Pavt. (See Section A-A). Linearly taper the difference in Mounting Height over a minimum length of 12'-0", starting where indicated herein.

5. DOUBLE FACED SEGMENT: Connect to Double Faced General Guardrail. Use consistent Posts and Offset Block types as specified in the AP. Drawings over the entire length of End Treatment 'LE'. Posts and Offset Blocks in the adjoining general guardrail segment may be different from those inside of the 'LE'. A change in post type between timber and steel is permitted, immediately outside of the 'LE' segment.

Maintain the 1:10 maximum grading as shown in Section B-B throughout segment 'LE'. Where required, transition to differing adjacent slopes linearly, over a minimum longitudinal length of 25'-0".

6. IMPACT HEAD END DELINEATOR: Apply Yellow retroreflective sheeting to the nose of the End Terminal Assembly in accordance with Specification 538.

7. SINGLE FACED 'PARALLEL' AND 'FLARED' SEGMENTS: See Sheet 7.
NOTES:
1. COMPONENT DETAILS: For additional component details, see Sheet 10.
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 by either of the following methods:
   a. Excavate, backfill, and compact material to provide full passive soil resistance to the surface of the Tube.
   b. Drive the Tube 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 the End Treatment, install a Rounded End Unit (Flared End Unit not permitted for this case).
6. END DELINERATOR: Mount retroreflective sheering to the approach face of the End Unit in accordance with Specification Sections 136 and 967.
**DESCRIPTION:**

- **SECTION**: 1'
- **SECTION**: 2'
- **SECTION**: 3'
- **SECTION**: 4'
- **SECTION**: 5'
- **SECTION**: 6'
- **SECTION**: 7'
- **SECTION**: 8'
- **SECTION**: 9'
- **SECTION**: 10'
- **SECTION**: 11'

**NOTES:**

1. **INSTALLATION**: Use components as shown on Sheets 9 & 11.
   - Use Short Timber Breakaway Posts and Steel Tube Foundations in accordance with Specification 536.
   - Use Hex Nuts, Hex Jam Nuts, and Washers in accordance with the AASHTO-AGC-ARTBA Guide to Standardized Barrier Hardware with English unit equivalents of components FNX24a and FWC24a, respectively. Two Hex Nuts may be used for the Hex Jam Nut System.
   - Use Short Timber Breakaway Posts as shown on Sheet 4.
   - Use Steel Plates, Channels, and Cable Assemblies in accordance with Specification 967.

2. **MATERIALS**: Use short timber breakaway posts and steel tube foundations in accordance with specification 536. Use hex nuts, hex jam nuts, and washers in accordance with the AASHTO-AGC-ARTBA Guide to Standardized Barrier Hardware with English unit equivalents of components FNX24a and FWC24a, respectively. Two hex nuts may be used for the hex jam nut system.

3. **PLATE STOP-NAILS**: To prevent rotation of the Bearing Plate, drive steel 2" x 8d nails with ASTM A53 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 assembly application.

5. **SOIL PLATE BOLT HOLES**: For trailing anchorage installations as shown on Sheet 9, the two bolt holes shown may be substituted with a single bolt hole located at the tube centerline.
Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.

**NOTES:**

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 W-Beam detail, see Sheet 22.
3. **MATERIALS:** Use steel End Shoes, Plates, Tubes, and studs in accordance with Specifications 967.
4. **PARTIAL CABLE ASSEMBLY:** The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length 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 Hex Jam Nut System as defined on Sheet 10.

5. **SPECIAL END SHOE MOUNT:** Punch a 5/8" hole in the W-Beam Panel as needed to secure the Special End Shoe with the 5/8" Hex-Head Bolt. Galvanize hole per Specification 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 breakaway post.
7. **END DELINERATER:** Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 386 and 967.
8 FOOT RADIUS
CRT SYSTEM
PLAN VIEW

16 FOOT RADIUS
CRT SYSTEM
PLAN VIEW

24 FOOT RADIUS
CRT SYSTEM
PLAN VIEW

32 FOOT RADIUS
CRT SYSTEM
PLAN VIEW

CRT SYSTEM SUMMARY TABLE:

<table>
<thead>
<tr>
<th>RETURN RADIUS</th>
<th>LENGTH OF SHOP-BENT PANELS (FT)</th>
<th>QUANTITY OF CRT POSTS</th>
<th>AREA CLEAR OF HAZARDS (L x W, FT²)</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>
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<tr>
<td>24</td>
<td>37.5</td>
<td>8</td>
<td>40 x 20</td>
</tr>
<tr>
<td>32</td>
<td>50.0</td>
<td>10</td>
<td>50 x 20</td>
</tr>
</tbody>
</table>

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 aboveground hazards within the Min. Clear Area limits shown. Maintain a slope not steeper than 1:10 from the posts.

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 967. Use steel panels and hardware in accordance with Specification 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 1/2" Button-Head Bolt only at the location shown).

6. SHOP-BENT PANELS: Install Shop-Bent panels where indicated using 12'-0" or 25'-0" W-Beam Panels. Splice at post locations where indicated using 1-1/4" or 2-1/4" 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.
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail shall be shown in the plans.

The layouts shown 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, 521-404, and 521-405.

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 an example Curb Transition to Shoulder Gutter from Section D-D to E-E. But this 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 where shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 521-402 thru 521-408, 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 'L'.

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.

APPRAOCH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2

GUDRAIL

INDEX 536-001

SHEET 14 of 22
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 18 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail has the same offset as the Approach Transition segment, then no taper is required.

2. THRIE-BEAM TERMINAL CONNECTOR: See Sheet 13 for details. The installed bolt's threaded portion is not permitted to extend beyond 1/8" from the face of the nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.

3. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. End Treatments or Reduced Post Spacing Guardrail segments may be substituted for conventional guardrail shown herein if indicated in the plans.

APPROACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL
**TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW**

**MEDIAN OR OUTSIDE SHOULDERS**

(Mirror Horiz. and Vert. for Opposite Direction and/or Side of Road)

**NOTES:**

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 case where this segment's offset differs from the Approach Transition offset, linearly taper the guardrail 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 per Sheet 13 or 14 as called for in the plans.

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 as shown on Sheet 8.

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.

9. **INSTALLATION OF APPROACH ENDS:** Install a Flared End Unit where shown, as defined on Sheet 9.

**SECTION H-H BRIDGE ABUTMENT LAYOUT TO RIGID BARRIER - APPROACH ENDS**

**NOTE:**

- 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.

- Construct this segment if shown in the plans. For the case where this segment's offset differs from the Approach Transition offset, linearly taper the guardrail between the Begin/End Taper Stations and offsets as specified in the plans.

- Install the Approach Transition as shown per Sheet 13 or 14 as called for in the plans.

- 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.

- 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.

- 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.

- 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 as shown on Sheet 8.

- 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.

- Install a Flared End Unit where shown, as defined on Sheet 9.
NOTES:

1. See the applicable Notes on Sheet 17.

2. LENGTH OF TRAILING ANCHORAGE, 'LT': Install the Trailing Anchorage 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.

5. See the applicable Notes on Sheet 17.
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. Panel Rub Rail options may be used (consistent type per project). Where Double Sided Rub Rail is called for, thread the Panel & Post Slots (top) (not Req’d. Per Splice).

3. MATERIALS: Use steel components in accordance with Specification 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.
GENERAL PIPE RAIL SECTION

2" NPS Pipe Rail

Mount Bracket

End Fixture

See “Mount Section Detail”

Face of Guardrail

Offset Block

Steel Post

PIECE RAIL INSTALLED ELEVATION
(End Segment Shown)

2" NPS Pipe Rail

End Fixture

MOUNT BRACKET DETAIL

ELEVATION

SECTION

END FIXTURE DETAIL

PIECE RAIL INSTALLED PLAN
END AT STEEL POST OPTION

2" NPS Pipe Rail

End Fixture

Steel Post

ELEVATION

SECTION

PLAN

STEEL POST FLANGE

MOUNT BRACKET

Steel Post Flange

2" NPS Pipe Rail

End Fixture

Steel Post

MOUNT SECTION DETAIL

NPS Pipe Rail

End Fixture

Steel Post

MOUNT ELEVATION DETAIL

(Back View - Mirrored)

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), and Approach Transition (LA) 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.
(Typ.) 3. BASE PLATE MOUNT: Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specification 356. Use 4" Hex-Head Bolts for structures less than 8' deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 4½" Bolt Slot(s) 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 536.

5. MATERIALS: Use steel base plates in accordance with Specification 356.

**SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT**

**NOTES:**

1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) located atop curbs, rises, pipe footings, or similar obstructions, 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 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, the Special Steel Post 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 356. Use 4" Hex-Head Bolts for structures less than 8' deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 4½" Post Bolt Slot(s) 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 536.

5. MATERIALS: Use steel base plates in accordance with Specification 356.

**SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT**

**NOTES:**

1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) contacting with underground utilities or other underground obstructions, an Encased Post may be required. The required post height will be dependent on the extent of the obstruction. The concrete foundation must be cast 1'-6" below the ground surface at the required post depth as shown. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

2. FOUNDATION: Use a concrete foundation (Typ.) of at least 1'-6" x 1'-6" x 8" thick. The concrete foundation must be cast 1'-6" below the ground surface at the required post depth as shown. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

3. MATERIALS: Use concrete in accordance with Specification 347. Ensure the concrete is properly compacted and cured to provide full passive resistance.

**INSTALLATION SECTION**

**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 536.

2. For the required 1'-6" x 1'-6" Leave-Out, smoothly cut the existing concrete surface or turn-up the square shape when an application has new surrounding concrete. Ensure Flowable Fill surface is smooth and even with the adjacent concrete surface.

**MATERIALS:** Use Non-Excavatable Flowable Fill in accordance with Specification 121, not to exceed 150 psi.
NOTES:

1. INSTALLATION: Install Barrier Delineators as shown in accordance with the plans, with Specifications 536, 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 993.

3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edgeline.

4. MOUNT LOCATIONS: Mount Barrier Delineators at posts as shown, starting with Post (2) 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
   Additionally, place a Barrier Delineator on Post (2) of the Trailing 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 SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing segments. They are required for General segments. To show Midspan Splices in General segments, use one (1) General panel length (9'-0" or 10'-1") or add an additional Transition spaced post where required.

7. 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 5/8" Panel Post Bolt Slots in the panels only where required for mounting and in accordance with Specification 596.

**BARRIER DELINEATORS**

**DETAIL 'S' – HALF SPACING ELEVATION**

**DETAIL 'S' – QUARTER SPACING ELEVATION**

**REDUCED POST SPACING FOR HAZARDS**

**NOTES:**

1. INSTALLATION: Work these details with the plans, where shown. For the remainder of the plans not corresponding exactly to post locations in construction, extend the Reduced Post Spacing segments to the nearest post(s) before the Begin Station and/or after the End Station called for.

2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing segments. They are required for General segments. To show Midspan Splices in General segments, use one (1) General panel length (9'-0" or 10'-1") 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 5/8" Panel Post Bolt Slots in the panels only where required for mounting and in accordance with Specification 596.
NOTES FOR GUARDRAIL TRANSITIONS CONNECTING TO TRAFFIC RAILING RETROFITS ON EXISTING BRIDGES

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 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 Retrofits 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.

3. The special steel post for roadway thrie-beam transitions detailed on this sheet is specific to particular scheme. The associated pictorial views show the variations.

4. 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.

5. 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.

GENERAL NOTES

1. The transition detail shown on this sheet shows all the standard post spacings within the typical thrie-beam approach transitions connecting to existing bridges with retrofit traffic railings, and (b) depict the typical alignment for approaching traffic railings.

2. The curb and gutter flare shown on this sheet is typical of flares that are to be constructed when approach slabs curbs extend to the beginning of the slab, and where other treatment to curb blunt ends are not in place.

3. The special steel post for roadway thrie-beam transitions detailed on this sheet is specific to all transitions 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. 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.
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

UNDIVIDED ROADWAY - DETAIL S

DIVIDED ROADWAY - DETAIL I

GUARDRAIL APPLICATIONS FOR BRIDGES WITH LESS THAN FULL WIDTH SHOULDERS AND CONCRETE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

INDEX 536-002 2 of 27
MEDIAN CONFIGURATIONS FOR EXISTING BRIDGES

**MEDIAN WITH 10' BRIDGE SHOULDERS**

- **Guardrail Panels And Length (See Table Below)**
- **Crash Cushion**
- **10' Min.**

**MEDIAN WITH 6' BRIDGE SHOULDERS**

- **Guardrail Panels And Length (See Table Below)**
- **Crash Cushion**
- **10' Min.**

**GUARDRAIL LENGTHS**

<table>
<thead>
<tr>
<th>MEDIAN WIDTH (Ft.)</th>
<th>6' BRIDGE SHOULDERS</th>
<th>10' BRIDGE SHOULDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 ft. Taper Rate</td>
<td>115 ft. Taper Rate</td>
</tr>
<tr>
<td></td>
<td>Panels (No.)</td>
<td>Length (Ft.)</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>254.75</td>
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<td>25</td>
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</tr>
<tr>
<td></td>
<td>30</td>
<td>182.75</td>
</tr>
</tbody>
</table>

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

**APPENDIX GUARDRAIL TREATMENTS FOR BRIDGES WITH CONCRETE TRAFFIC RAILING**

**EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN NARROW MEDIAN WITH FLUSH SHOULDERS**

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 anchorage or end shielding requirements shall be determined on a site-specific basis. 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.
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEX 460-471 - SCHEME 1

SEE INDEX 460-471 - SCHEME 2

SEE INDEX 460-471 - SCHEME 3

SEE INDEXES 460-472 & 460-475 - SCHEME 1

SEE INDEXES 460-472 & 460-475 - SCHEME 2

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

SEE INDEXES 460-473 & 460-476 - SCHEME 2
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

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)

SEE INDEX 460-474 - SCHEME 1

SEE INDEX 460-474 - SCHEME 2

SEE INDEX 460-474 - SCHEME 3

Face Of Rail Offset
See Indexes For Face Of Rail Offset

Existing Curb
See Indexes For Face Of Rail Offset

Existing Approach Slab

Traffic Railing (Thrie-Beam Retrofit)

Roadway Guardrail Transition

Existing Flared Wing Wall Removed
Front Face Of Existing Backwall & Begin Or End Existing Bridge
Existing Railing And Flared Wing Post Removed

Existing Integral Approach Slab Wide Curb
Remove Portion Of Curb As Required For Post Placement. Area Of Curb Removal To Be Finished Smooth And Even With Adjoining Area.

Special Steel Post For Roadway
Thrie-Beam Transitions

Edge Of Existing Approach Slab Varies
Configurations Varies

See Index 460-474 - SCHEME 3

See Index 460-474 - SCHEME 1

See Index 460-474 - SCHEME 2
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 1

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2
PICTORIAL VIEWS OF GUARDRAIL APPROACH
TRANSITIONS AND CONNECTIONS FOR BRIDGE
TRAFFIC RAILING (THRIE-BEAM RETROFIT)

See Indexes 460-472, 460-473, 460-475 & 460-476 - Schemes 3 & 4

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition

Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks Center Post Located Flush With Back Of Rail For All Schemes Of Indexes 460-472 & 460-473

Intermediate Post May Be Required See Indexes 460-472, 460-473, 460-475 Or 460-476 For Alternate Spacing

Roadway Guardrail Transition
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
Note:

*21" x 12" x 5/8" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 9/16" x 12" Long HS

Hex Bolts And Nuts (5 Reqd.) With 2 1/4" CD Plain Round Washers Under Heads And Nuts

PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 2" x 12" x 18' Three-Beam Terminal Connector Plate (Back-Up Plate), And 3/4" x 12" Long
* 5/8” Hex Bolts And Nuts (5 Req'd.) With 2" x 30 Plain Round Washers Under Heads And Nuts

SEE INDEX 521-405 OR 521-482 - SCHEME 2

SEE INDEX 521-405 OR 521-482 - SCHEME 3
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
"21" x 12" x ½" Thrie-Beam Terminal Connector Plate (Back-Up Plate), and ½" HS Hex Bolts And Nuts (12" Long For Scheme 1 And Length To Fit For Schemes 2 And 3) With 2½" OD Plain Round Washers Under Heads And Nuts

SEE INDEX 521-483 - SCHEME 1

SEE INDEX 521-483 - SCHEME 2

SEE INDEX 521-483 - SCHEME 3
DESCRIPTION:

PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

END OF TERMINAL CONNECTOR IDENTIFIED
IN THE PLANS BY STATION LOCATION

EXISTING RAILING AND PARALLEL WING POST REMOVED

TRAFFIC RAILING (VERTICAL FACE RETROFIT) CONSTRUCTED

SEE INDEX 531-481 - SCHEME 2

PICTORIAL VIEW

TRAFFIC RAILING (VERTICAL FACE RETROFIT)

SEE INDEX 521-481 - SCHEME 2

PICTORIAL VIEW

TRAFFIC RAILING (VERTICAL FACE RETROFIT)

SEE INDEX 521-481 - SCHEME 1

PICTORIAL VIEW

TRAFFIC RAILING (VERTICAL FACE RETROFIT)

PICTORIAL VIEW

TRAFFIC RAILING (VERTICAL FACE RETROFIT)

* POST BOLTS AT FIRST STANDARD (3'-1"") POST HOLE LOCATION ON BRIDGE
(7" MIN. FROM END OF BRIDGE). USE 3/8" NS 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)
Instructions (SPI 536-002)
Structural Adequacy prescribed in the Standard Plans

Traffic Railing (Vertical Face Retrofit) Constructed

Roadway Guardrail Transition

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
(7" Min. From End Of Bridge). Use 1/8" HS Hex Bolts And Nuts
With 2 1/8" 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 (3'-1"") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use 3/8" HS Hex Bolts And Nuts With 2½" OD Plain Round Washers Under Heads And Nuts.
TRAILING END GUARDRAIL AND ANCHORAGE WHEN OTHER HAZARDS PRESENT

GUARDRAIL TRAILING END ANCHORAGE IN ABSENCE OF OTHER HAZARDS

GUARDRAIL TRAILING END ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)
GUARDRAIL TRANSITIONS TO SAFETY SHAPE TRAFFIC RAILINGS ON EXISTING BRIDGES

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 1/2" x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/8" thick and meet the requirements of Specification 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 three-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.

GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR EXISTING FLAT SLAB, PRESTRESSED BEAM AND GIRDER BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

APPROACH 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 NOTATION – Index 536-001. The nested rails shall not be bolted to the blocks and posts at posts (a), (e) and (e). The details shown are for approach slabs with internal edge slips extending beyond parapet type traffic railing terminals.

Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

Use Of Schemes II And III Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

GUARDRAIL TRANSITIONS TO EXISTING FLAT SLAB BRIDGES

SCHEME I

Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

SCHEME II

SCHEME III
GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 544 and the "Summary of Permanent Crash Cushions" table in the Plans.

2. TRANSITION PANEL: Where crash cushions are placed between two-way traffic or adjacent to two-way two-lane traffic, place a Transition Panel from the Concrete Barrier to the Crash Cushion on the downstream side of the barrier end (as shown). Follow the requirements of the APL drawing.

3. MANUFACTURER'S TRANSITION: Construct the proprietary guardrail transition only if shown in the applicable APL drawing. See Note 4 below.

4. STANDARD GUARDRAIL TRANSITION: If the APL drawing does not provide a guardrail transition to w-beam guardrail, construct the Standard Guardrail Transition segment from thrie-beam to w-beam as shown per Sheet 2. This 21'-10" segment must remain parallel to the roadway.

If the APL drawing does not provide a guardrail transition to w-beam guardrail, replace the Standard Guardrail Transition segment with a w-beam guardrail segment at 6'-3" post spacing, except that Post (10) will remain where shown herein if it is located at a guardrail begin or end taper station callout per the Plans. This 21'-10" segment must also remain parallel to the roadway.

5. LENGTH OF END TREATMENT: For Crash Cushions, the Length of End Treatment includes all proprietary elements of the design as shown in the APL drawing, including the manufacturer's transition of guardrail if applicable.

The actual Length of End Treatment varies per Crash Cushion type, but an estimated Length of End Treatment is generally shown in the Plans to provide sufficient space for the Contractor's option of differing Crash Cushion types.

6. LENGTH RESTRICTION: In the "Summary of Permanent Crash Cushions" table, if a value is provided in the Length Restriction column, then select a Crash Cushion from the APL which has a Length of End Treatment less than or equal to the value shown. If the table instead shows not applicable (N/A), then Crash Cushion selection is unrestricted regarding length.

7. CRASH CUSHION STATION: The Crash Cushion Station point shown herein corresponds to the station provided in the "Summary of Permanent Crash Cushions" table in the Plans.

DESCRIPTION:

PERMANENT CRASH CUSHION APPLICATIONS

CONCRETE BARRIER APPLICATION

GUARDRAIL APPLICATION

CRASH CUSHION DETAILS

INDEX 544-001

LAST REVISION 01/01/18

REV H: 1

FY 2019-20

STANDARD PLANS

1 of 2
NOTE:

Work this Sheet with the details and General Notes on Sheet 1.
OPTION ST1 - ASPHALT SET

OPTION ST2 - PREFORMED THERMOPLASTIC SET

OPTION ST3 - REMOVABLE POLYMER STRIPING TAPE SET

NOTES:

1. Construct short-term raised rumble strips where noted in the Plans and in accordance with Specification 546.

2. See Sheet 1 for placement and additional details.

3. Use color white for Prefomed Thermoplastic and Removable Polymer Striping Tape Sets.

OPTIONAL MATERIALS DETAILS

SHORT-TERM RAISED RUMBLE STRIPS
NOTES:

1. 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 1,000 feet in advance of bridge ends 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.

4. 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.

RUMBLE STRIP DEPTH TABLE

<table>
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<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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</tr>
<tr>
<td>B</td>
<td>3 (±1/2)</td>
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</tbody>
</table>

RUMBLE STRIP DETAILS

PLAN VIEW

SECTION A-A

RUMBLE STRIP ARRAY DETAILS

CONTINUOUS ARRAY

CENTER TO CENTER

12” (±1") Grinding

12” (±1") Gap

Continuous Grinding

RUMBLE STRIP DEPTH TABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
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<tr>
<td>B</td>
<td>3 (±1/2)</td>
</tr>
</tbody>
</table>

RUMBLE STRIP PLACEMENT

(Plan View)

RUMBLE STRIP DETAILS

SKIP ARRAY

CENTER TO CENTER

12” (±1") Gap

12” (±1") Grinding

RUMBLE STRIP DEPTH TABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
</tr>
</thead>
<tbody>
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<td>A</td>
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<td>B</td>
<td>3 (±1/2)</td>
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</table>

RUMBLE STRIP ARRAY DETAILS

CONTINUOUS ARRAY

CENTER TO CENTER

12” (±1") Gap

12” (±1") Grinding

RUMBLE STRIP DETAILS

SKIP ARRAY

CENTER TO CENTER

12” (±1") Gap

12” (±1") Grinding

RUMBLE STRIP DEPTH TABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
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<td>A</td>
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<tr>
<td>B</td>
<td>3 (±1/2)</td>
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</tbody>
</table>

RUMBLE STRIP PLACEMENT

(Plan View)
NOTE:
See the Plans for the Placement Type to be used.

EDGE LINE RUMBLE STRIP PLACEMENT TYPES

TYPE "A1" (Plan View)
- 6" White

TYPE "B1" (Plan View)
- 6" Yellow

TYPE "C1" (Plan View)
- 6" White

CENTERLINE RUMBLE STRIP PLACEMENT TYPES

TYPE "D1" - PASSING (Plan View)
- 6" Double Yellow

RUMBLE STRIP DETAILS

PLAN VIEW

RUMBLE STRIP ARRAY DETAILS

CONTINUOUS ARRAY
(Outside Shoulder Edge Lines)

Continuous Grinding

SKIP ARRAY
(Outside Shoulder Edge Lines)

Surface

SECTION B-B

CYLINDRICAL FOR ARTERIALS AND COLLECTORS

GROUND-IN RUMBLE STRIPS

INDEX 546-010

SHEET 2 of 3

FY 2019-20
STANDARD PLANS

04/04/18
**Rumble Strip Details**

**Rumble Strip Array Details**

**Edge Line Rumble Strip Placement Types**

**Centerline Rumble Strip Placement Types**

**NOTE:**

See the Plans for the Placement Type to be used.

---

**Rumble Strip Depth Table**

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<tr>
<td>G</td>
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<tr>
<td>H</td>
<td>7⁄8</td>
</tr>
<tr>
<td>I</td>
<td>7⁄8</td>
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</tbody>
</table>

---

**Edge Line Rumble Strip Placement Types**

**Centerline Rumble Strip Placement Types**

**Continuous Array**

(Outside Shoulder Edge Lines)

**Skip Array**

(Outside Shoulder Edge Lines)

**Continuous Array**

(Centerlines and Inside Shoulder Edge Lines)
NOTES

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 Chapter 3 of the FDOT Structures Design Guidelines.

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’s, 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 strip/mesh may be skewed (10°) maximum to avoid the post locations if authorized by the Engineer.
7. 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.
8. If existing or future structures, piles, foundations or guardrail posts are placed 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.
9. The Contractor is responsible for gradually displacing upper layers 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 super-elevation and/or soil mixing are anticipated.
10. For concrete-facing panel surface treatment, see Wall Control Drawings. Extend surface treatment a minimum of 6” below final ground line.
11. 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.
12. The top of the leveling pad or footing will be 2'-0" minimum below final ground line.
13. The top of the leveling pad or footing will be 2'-0" minimum below final ground line.
14. 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 proposed method will be reviewed and approved by the Engineer and Wall Company.
15. The Contractor will be responsible for ensuring that the protection method is appropriate for the site conditions.
16. Work this Index with Index 521-600 thru 521-650.

SHOP DRAWINGS:
See Specification Section 548 for shop drawing requirements.
NOTES

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 FDOT 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’s, 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 layers of soil reinforcement downward (15° maximum from horizontal) to avoid pulling 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.

TYPICAL RETAINING WALL SECTION
(Showing Limits of the Reinforced Soil Volume)

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’s, 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 layers of soil reinforcement downward (15° maximum from horizontal) to avoid pulling 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.
1. This fence to be provided generally in rural areas. For supplemental information see Specifications 550.

2. Fabric shall be woven wire, either galvanized steel, meeting the requirements of ASTM A126, No. 9 Grade 60, Design Number 1047-4-8, with Class 2 zinc coating; No. 12.5 Grade 173, Design Number 1047-6-12.5, with a 1.0 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 Number 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 curvatures 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 a 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 of a different material. 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. The woven wire shall meet the material requirements of Specification 964. Timber line posts are to be minimum 4" diameter. Timber corner, pull, approach and end posts are to be a minimum 3" diameter. Timber braces are to be minimum 4" diameter.

6. Steel posts and braces shall be standard steel posts, galvanized at 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.; fully furred studwall, anchor plate attached, ASTM A702 (18 in.);
   (B) Approach posts: 2½"x1½"x⅝" angles, 8 long; fabricated for attaching brace with necessary hardware, clamps, etc.;
   (C) Pull, end and corner posts: 2½"x3½"x⅝" angles, 8 long; fabricated for attaching brace with necessary hardware, clamps, etc.;
   (D) Brace: 2½"x3½"x⅝" angles with necessary hardware and fabricated for attaching to post.
   (E) The pull, corner, approach and end posts are to be set in concrete as per detail. Also see General Note 15.

7. Recycled plastic posts shall meet the following material requirements: line posts shall have a minimum section of 4" round or 2" square. Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The straightness of the post shall comply with Specification 958 for timber post. Rigid plastic posts shall meet the requirements of the latest edition of the Southern Pine Inspections Bureau's Standard Grading Rules for Southern Pine lumber for No. 2SR Stress Rated Grade Timber. Plastic posts can be set by either digging and tamp backfill or by driving into full depth preformed holes 12½ to 15½ times greater in diameter than cross section of post.

8. Staples for fabric and Barb Wire connection to plastic line posts shall be the same size, count and location as that for timber posts.

9. 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. Pre-stressed concrete posts shall be Class 3 concrete. Prestressed posts shall be Class 11 concrete. Lengths of concrete post to be as indicated for timber posts.

10. Aluminum post, braces and accessory framing hardware shall not be used unless the plans specifically detail their application or the Engineer specifically approves their incorporation in fence construction or repair. Aluminum framed gates are permitted as described in General Note 19.
GENERAL NOTES

1. This fence to be used generally in urban areas.

2. For supplemental information refer to Specification 550.

3. Chain link fabrics, post, truss rods, tension wires, tie wires, stretcher bars, gates, and all miscellaneous fittings and hardware shall meet the requirements of AASHO and ASHTO as shown or specified in the plans.

4. Fence Component Options:
   - A. Line post options:
     1. Galvanized steel pipe, Schedule 40- 15/8" nominal dia., zinc galvanized at the rate of 1.0 oz./ft², ASTM A669/A669M, A653/A653M or ungrounded stock of discontinued A446/A446M base materials, ASTM F669 Group IV (Alternative Design): Fence industry 15/8" OD, 1.050" nominal dia., coated at the rate of 0.40 oz./ft². AASHTO M111.
     2. Aluminum alloy pipe- 1 ¾" nominal dia., ASTM B221, Alloy 6063, 7010 T6.
   - B. Corner, end, and pull post options:
     1. Steel C-1, 15/8" x 1.8 oz./ft² zinc; AASHTO M111 (or, 0.7 oz./ft² zinc- 5% aluminum-mischmetal; ASTM F1043 and Detail).
     2. Steel H-Beam- 15/8" x 1.8 oz./ft² zinc; AASHTO M111 and Detail.
   - C. Rail options:
     1. Steel pipe No. 9 gage 2" nominal dia. zinc galvanized at the rate of 1.8 oz./ft², ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
     2. Aluminum coated steel pipe, ASTM A653 steel, 2 Tables Schedule 40, 2" nominal dia., coated at the rate of 0.40 oz./ft², AASHTO M111.
     3. Aluminum alloy pipe- 2" nominal dia., ASTM B221 or B222, Alloy 6063, T6.
     4. Steel H-Beam- 2" x 1.8 oz./ft² zinc; AASHTO M111 and Detail.
   - D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options except as described in Note 10):
     1. AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.8 oz./ft², ASTM F1083, and AASHTO M111.
     2. AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft². AASHTO M111.
     3. AASHTO M181 Type III - Polyvinyl Chloride (PVC) Coated Steel, No. 9 gage (coated core wire diameter), core wire-zinc coated steel, PVC coating: M181 Class A (either extruded or bonded) or Class B (bonded). See table right. Unless the plans call for M181 standard colors medium green, dark green or black the coating color shall be soft gray matching that of the polymer film topcoated min. thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.

5. Tension wire options:
   - F. Tie wire and hog ring options:
     1. Steel wire No. 9 gage zinc galvanized at the rate of 1.2 oz./ft², AASHTO M111.
     2. Aluminum alloy wire with a diameter of 0.1875" or larger conforming to the requirements of ASTM B241 or B221, Alloy 6063, T6.
     3. Aluminum alloy wire with a diameter of 0.1442" or larger conforming to the requirements of ASTM B241, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H193.

6. Pole cap options:
   - Note: Tubular post illustrated.

7. Ties @ 2' Centers

8. Ties @ 12" Centers

9. 14 Ga x 3/8" Tension Bands 5 Per Bar Equally Spaced (≤ 15")

10. Varied: 2" Max. 6" Min.

11. 16 Ga x 3/8" Tension Bands, 5 Per Bar Equally Spaced (≤ 15")

12. Concrete Base

13. Crowned 1" Above Ground

14. Corner or End Post

15. 12" Tension Wire, Bar Each Side

16. Post Cap

17. Spacing (≤ 15")

18. Equally

19. 5 Per Bar

20. 14 Ga x 3/8" Tension Bands 5 Per Bar Equally Spaced (≤ 15")

21. Chain Link Fabric No. 9 Gage

22. Ties @ 2' Centers

23. Ties @ 2' Centers

24. 3/4" Truss Rod

25. Crowned 1" Above Ground

26. Concrete Base

27. Varied: 2" Max. 6" Min.

28. 10' Max.

29. 10' Max.

30. 10' Max.

31. 10' Max.

32. 10' Max.

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113. 10' Max.

114. 10' Max.

115. 10' Max.

116. 10' Max.

117. 10' Max.

118. 10' Max.

119. 10' Max.

120. 10' Max.
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.

Combination 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 either the line post 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-387. Materials for Class NS concrete may be proportioned by volume and/or by weight.

7. Line post shall be 8'-6" long (Standard). Line post are to be set in concrete as described above or by the following methods:
(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 3.8 shall be 9'-6" long.

8. Pull post shall be at breaks in vertical grades of 15° or more, or at approximately 350' centers except that the 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 at 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 approved by the Engineer. Payment shall include the gates, single or double, all necessary hardware for installation and any additional length and/or wire 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.

<table>
<thead>
<tr>
<th>TYPE III VINYL COATED FABRIC</th>
<th>AASHTO M181 Table 4 Redefined As Follows</th>
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<tbody>
<tr>
<td>Specified Diameter of Metallic Coated Core Wire</td>
<td>Minimum Weight of Zinc Coating</td>
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<td>mm)</td>
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DESIGN NOTE

This Index details fencing that is constructed with chain link fabric 6' (nominal) in height with specific ground clearance. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

NOTES

Attachments to be used only when called for in the 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 on controlled access right of way line.
(d) Outward on limited access right of way line.
(e) Outward on pedestrian way.
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.

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, 10" Embedment:
   Headed Bolts, U-Bolts or Cluster Plates.
   Anchors (Galvanized Steel):
   Steel 1/2" x (ASTM A36) Galvanized or
   Aluminum 1/2" x Alloy 6061-T6

TOP VIEW
FOUR ANCHOR PLATE OPTION

TOP VIEW
TWO ANCHOR PLATE OPTION

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

BARB WIRE ATTACHMENT

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):
   Headed Bolts, U-Bolts or Cluster Plates.
   Anchors (Galvanized Steel):
   Steel 1/2" x (ASTM A36) Galvanized or
   Aluminum 1/2" x Alloy 6061-T6

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

STEEL

| Area (Sq. In.) | 734 |
| Weight (lb/ft.) | 2.72 ± 5% |
| Tensile Strength (psi Min.) | 80,000 |
| Yielding Point (psi Min.) | 40,000 |

ALUMINUM

| Area (Sq. In.) | 724 |
| Weight (lb/ft.) | 0.91 ± 5% |
| Tensile Strength (psi Min.) | 30,000 |
| Yielding Point (psi Min.) | 22,000 |

Steel 1/2" (ASTM A36) Galvanized or
Aluminum 1/2" x Alloy 6061-T6

1/2" Dia. Hole For 1/2" Anchors,
Nuts And Washers (2 Req.)

1/2" Dia. Hole For 1/2" Anchors,
Nuts And Washers (2 Req.)

Steel 1/2" (ASTM A36) Galvanized or
Aluminum 1/2" x Alloy 6061-T6

1/2" Dia. Hole For 1/2" Anchors,
Nuts And Washers (2 Req.)

Fence To Be Mounted On
Restraint Side Unless
Otherwise Called For In
Plans (See Notes)
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.

2. Gate components shall meet or exceed the protective coatings specified on Index 550-002. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing providing 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 either Class NS concrete in accordance with Specification 347 or a packaged, dry material meeting the requirements of a concrete under ASTM C-387. Materials for Class NS concrete may be proportioned by volume or by weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.
**Description:**

**Revision Last of Standard Plans FY 2019-20**

**Sheet Index**

11/01/17

**Fencing Terminals at Bridge Ends (Roadway)**

- Locate fence along slope where top of fence approx. equals tops of headwall.
- Terminate fence where culvert drop height approx. equals fence height.

**Fencing Terminals at Box Culverts**

- Fencing terminals at cross drain with excavated outfall ditches or as shown in plans.

**Fencing Details at Culvert**

- For heights of headwalls 4' or less:
  - When height of headwall is 4' or less, the fence shall not be tied to the headwall, but shall span the lateral ditch.

**Index**

550-004 1 of 2
REVISION DESCRIPTION:

REVISED:

INDEX

STANDARD PLANS

FENCE LOCATION

11/01/17

FENCE TERMINALS AT RURAL INTERCHANGES

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

6" Where Footing Permits

FENCING TERMINALS AT URBAN INTERCHANGES

6' Varies

6" Where Footing Permits

NOTE: LA R/W along the crossroad will extend a minimum 300' beyond the end of the acceleration or deceleration ramp. For interchange quadrants having a ramp, the radius point of the LA R/W will establish 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.

Note A - The indicated distance shall be sufficient to provide satisfactory dimensions, if practical.

Note B - The indicated distance shall be identical to the above noted dimension, if practical.

Approximately Equals Fence Height.

NOTE: LA R/W along the crossroad will extend a minimum 300' beyond the end of the acceleration or deceleration ramp. For interchange quadrants having a ramp, the radius point of the LA R/W will establish 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.

Note A - The indicated distance shall be sufficient to provide satisfactory dimensions, if practical.

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 Specification 570.

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>lbs/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Group</td>
<td></td>
</tr>
<tr>
<td>Black-Eyed Susan (Rudbeckia hirta)</td>
<td>2</td>
</tr>
<tr>
<td>Lance Leaf Tickseed (Coreopsis lanceolata)</td>
<td>10</td>
</tr>
<tr>
<td>Gold Gem Tickseed (Coreopsis basalis)</td>
<td>10</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
</tr>
<tr>
<td>Soft Hair Coneflower (Rudbeckia mollis)</td>
<td>2</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
</tr>
<tr>
<td>#2 Group</td>
<td></td>
</tr>
<tr>
<td>Annual Phlox (Phlox drummondii)</td>
<td>10</td>
</tr>
<tr>
<td>Moss Verbena (Verbena tenax)</td>
<td>6</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Wildflower seeding rates are for restoring impacted wildflower areas.
**SHOULDER AND SLOPE TREATMENT FOR SUPERELEVATED ROADWAYS**

**TRANSVERSE SECTION**

**LONGITUDINAL SECTION**

**OVERLAPPED SOD FLUME**

**SHOULDER AND SLOPE TREATMENT IN SAG VERTICAL CURVES**

**TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING**

**RURAL UNDIVIDED**

**RURAL DIVIDED**

**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>6° or Greater</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5° or Greater</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>4° or Greater</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>3° or Greater</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>2° or Greater</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>1° or Greater</td>
<td></td>
</tr>
</tbody>
</table>

**SHOULDER AND SLOPE TREATMENT FOR SUPERELEVATED ROADWAYS**

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 take precedence.
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.
C O M P L E T E D  S H O U L D E R

2'-8" See Pattern Detail
Less Than 3' Overlay

Backfill (Excavated Turf and Topsoil)

Sod (Avg. Depth 1½"
(Strengthening or asphalt overlay depth may require trenching under sod to attain the 1" drop at the edge of pavement.)

Drop-Off (ig Min., 1' Max.)

TREATMENT I

CRITERIA FOR USING TREATMENT I

Project
- A resurfacing, widening and resurfacing or construction of shoulder pavement
- Is rural or is urban without curb and gutter
- Resurfacing build-up is less than 3"

SHOULDER OPTION 1

3' Or More Overlay

TREATMENT II

Drop-Off (ig Min., 1' Max.)

Width Called For In The Plans (Shoulder Width Plus 2 Min.)

CRITERIA FOR USING TREATMENT II

Project
- A resurfacing or construction of shoulder pavement
- Is rural or is urban without curb and gutter
- Resurfacing build-up is 3" or more

SHOULDER OPTION 2

3' Or More Overlay

GENERAL NOTES

1. Treatment I:
- If trenching under sod is necessary to achieve the required Drop-Off, excavated topsoil is 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.

2. Treatment II:
   - A. Borrow must meet the requirements for a "Select" material in accordance with Index 120-001 and Specification 120.
   - B. Borrow may be used in lieu of excavated turf and topsoil when economically feasible. There will be no additional payment for substituting borrow for excavated turf and topsoil.

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 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.

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 570-001.
   - B. Establish turf in accordance with Specification 570.
GENERAL NOTES:

1. All dimensions 6" and less are exaggerated for illustrative purposes only. All dimensions provided for wood materials are nominal.

2. Remove plant containers prior to planting. If plants are not container grown, remove a minimum of the top 1/3 of burlap, fabric, or wire mesh.

3. Allow no more than 1" of soil to cover the uppermost root on all trees. Set the top of rootball 1"-2" above finish grade after settling and set plumb to the horizon.

4. Backfill with loosened existing soil or as shown in the plans. 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, contact Engineer prior to planting.

5. Except when a permanent, subsurface or drip irrigation system is provided, construct soil rings 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. Construct a 3" deep layer of mulch placed 2" off the edge of the trunk flare, around the base of shrub, or solidly around ground cover. Never pile mulch against the tree trunk.

7. Install guyings with minimum 1" wide nylon or polypropylene straps. Check straps monthly and adjust as required to eliminate girdling of tree. Locate all wood stakes or anchors beyond the edge of soil ring in undisturbed soil and located below finished grade, unless otherwise specified. 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.

8. Relocated Trees and Palms: Brace relocated trees and palms in accordance with the Contract Documents. Remove bracing at the conclusion of the contract or as directed by the Engineer. Bracing or straps must not damage or become embedded in the tree bark.
2 x 4 Wood Braces (Minimum of Three Wood Braces) Spaced at 120° Apart. Saw Cut Ends at Proper Angle to Allow for Flush Connection to Wood Batten. Nail Wood Braces Securely to Wood Batten.

For Palms Over 28 Clear Trunk, Increase Wood Braces (to 4" x 4"
Minimum. Use Four Braces With Minimum Length of 16" Spaced at 90° Apart.

Mulch Remove Existing Vegetation Prior to Planting.

Soil Ring for Water Collection

Wood Stake (Typ.)

Existing Soil

Soil Backfill

**DETAIL "A"**

**DETAIL "B"**

Note: Stake Tree Firm, Existing Soil.

2 x 4 Wood Brace

Finished Grade

2" x 4" Min. Wood Stake, Min. 30" Depth

Existing Soil

Safety Flags

Straps Securely Fastened to Tree (Typ.)

Place Root Flare 2" Above Projected Slope

**ELEVATION**

*Note:* May be used on large caliper canopy trees pending slope and rootball width, adjust banding every 6 months or as needed (for fast growing species) to prevent girdling. Slope provided as Rise:Run.
GENERAL NOTES:
1. Install conduit in accordance with Specification 630.
2. When installing conduit under sidewalk by open trench, replace the entire sidewalk slab.
3. Trench not to be open more than 250' at a time when construction area is subject to vehicular or pedestrian traffic.
4. Sawcut asphalt at the edges of the trench to leave neat lines.
5. Sawcut asphalt at the edges of the trench to leave neat lines.
6. Sawcut asphalt at the edges of the trench to leave neat lines.
7. Sawcut asphalt at the edges of the trench to leave neat lines.
8. Sawcut asphalt at the edges of the trench to leave neat lines.
9. Sawcut asphalt at the edges of the trench to leave neat lines.
10. Sawcut asphalt at the edges of the trench to leave neat lines.
11. Sawcut asphalt at the edges of the trench to leave neat lines.
12. Sawcut asphalt at the edges of the trench to leave neat lines.
13. Sawcut asphalt at the edges of the trench to leave neat lines.
14. Sawcut asphalt at the edges of the trench to leave neat lines.
15. Sawcut asphalt at the edges of the trench to leave neat lines.
16. Sawcut asphalt at the edges of the trench to leave neat lines.
17. Sawcut asphalt at the edges of the trench to leave neat lines.
18. Sawcut asphalt at the edges of the trench to leave neat lines.
19. Sawcut asphalt at the edges of the trench to leave neat lines.
20. Sawcut asphalt at the edges of the trench to leave neat lines.
21. Sawcut asphalt at the edges of the trench to leave neat lines.
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23. Sawcut asphalt at the edges of the trench to leave neat lines.
24. Sawcut asphalt at the edges of the trench to leave neat lines.
25. Sawcut asphalt at the edges of the trench to leave neat lines.
26. Sawcut asphalt at the edges of the trench to leave neat lines.
27. Sawcut asphalt at the edges of the trench to leave neat lines.
28. Sawcut asphalt at the edges of the trench to leave neat lines.
29. Sawcut asphalt at the edges of the trench to leave neat lines.
30. Sawcut asphalt at the edges of the trench to leave neat lines.
**CONDUIT INSTALLATION DETAILS**

**STANDARD PLANS**

**FY 2019-20**

**INDEX**

**DESCRIPTION:**

**1 0 /2 4 /2 0 1 8**

**REV IS IO N**

**3:4 5 :2 7 PM**

---

**PLACEMENT WITHIN THE UTILITY STRIP**

**PLACEMENT UNDER SIDEWALK**

**PLACEMENT BEHIND GUARDRAIL**

**PLACEMENT IN FRONT OF GUARDRAIL**

**VERTICAL CLEARANCE NOTE:**

Maintain 1'-0" minimum vertical clearance when crossing over pipe and or utilities. If minimum vertical clearance cannot be maintained, conduit is to be routed under pipe maintaining 1'-0" minimum vertical clearance.

---

**630-001**

CONDUIT INSTALLATION DETAILS

2 of 4
**NOTES:**

1. **Pavement Removal:*** The removal and replacement of the additional pavement width (e.g., 6’ Width either side of trench) will not be required when the trench can be constructed without disturbing the asphalt surface on either side.

2. **Placement Under Existing Pavement:*** Place conduit prior to installation of base and pavement, unless otherwise shown in the Plans or approved by the Engineer.
**NOTES:**

1. Where conduits are to be installed over existing underground structures (e.g., drainage pipes or utility lines) which are less than 2'-6" deep, encase the conduit in Class NS concrete for the entire length of conduit that is installed at a depth of less than 2'-6" deep.

2. Place 3" Warning Tape when new conduit is installed at a depth of 1'-6" or greater, and the new conduit is not encased in concrete.
Catenary Or Messenger Wire

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug Inside For Grounding

Prestressed Concrete Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Tapped Lug For Grounding

LOAD (See Note 1)

LOAD (See Note 1)

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

No. 6 Bare Copper Ground Wire

Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Head

8" To 12" Strip Coil Or Drip Loop

Louvered Backplates

Signal Head (If Required)

Tether Wire Clamp (If Required)

S" Hook

Split Clamp

Drilled Shaft (See Index 649-010)

Finished Grade

Class NS Concrete Foundation

Drilled Shaft (See Index 649-010)

Finished Grade

%6 Ø X 20" Grounding Electrode (Copperclad)

%6 Ø X 20" Grounding Electrode (Copperclad)

Clamps And Cleviss
(See Index 649-010)

Clamps And Cleviss
(See Index 649-010)

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug For Grounding

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

No. 6 Bare Copper Ground Wire

Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Head

8" To 12" Strip Coil Or Drip Loop

Louvered Backplates

Signal Head (If Required)

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%6 Ø X 20" Grounding Electrode (Copperclad)

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Clamps And Cleviss
(See Index 649-010)

Clamps And Cleviss
(See Index 649-010)

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug For Grounding

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

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Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

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8" To 12" Strip Coil Or Drip Loop

Louvered Backplates

Signal Head (If Required)

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Clamps And Cleviss
(See Index 649-010)

Clamps And Cleviss
(See Index 649-010)

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug For Grounding

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

No. 6 Bare Copper Ground Wire

Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Head

8" To 12" Strip Coil Or Drip Loop

Louvered Backplates

Signal Head (If Required)

Tether Wire Clamp (If Required)

S" Hook

Split Clamp

Drilled Shaft (See Index 649-010)

Finished Grade

Class NS Concrete Foundation

Drilled Shaft (See Index 649-010)

Finished Grade

%6 Ø X 20" Grounding Electrode (Copperclad)

%6 Ø X 20" Grounding Electrode (Copperclad)

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 10' or greater.

4. Use only stainless steel hardware on all signal attachments.

5. Hole for eyebolt will require field reaming for 1" & 1 1/4" 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 2-3" drain holes in the bottom of the installed signals.

9. Method of framing corner Strain Poles angles 10° to 120°.

Index 649-010

Clamps And Cleviss
(See Index 649-010)

Clamps And Cleviss
(See Index 649-010)

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug For Grounding

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

No. 6 Bare Copper Ground Wire

Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Head

8" To 12" Strip Coil Or Drip Loop

Louvered Backplates

Signal Head (If Required)

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S" Hook

Split Clamp

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%6 Ø X 20" Grounding Electrode (Copperclad)

%6 Ø X 20" Grounding Electrode (Copperclad)

Clamps And Cleviss
(See Index 649-010)

Clamps And Cleviss
(See Index 649-010)

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug For Grounding

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

No. 6 Bare Copper Ground Wire

Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Head

8" To 12" Strip Coil Or Drip Loop

Louvered Backplates

Signal Head (If Required)

Tether Wire Clamp (If Required)

S" Hook

Split Clamp

Drilled Shaft (See Index 649-010)

Finished Grade

Class NS Concrete Foundation

Drilled Shaft (See Index 649-010)

Finished Grade

%6 Ø X 20" Grounding Electrode (Copperclad)

%6 Ø X 20" Grounding Electrode (Copperclad)

Clamps And Cleviss
(See Index 649-010)

Clamps And Cleviss
(See Index 649-010)

Steel Strain Pole

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire

Crimp Type Electrical Connector

Tapped Lug For Grounding

Catenary Or Messenger Wire

Elevator With Nut
And Washer (Typ.)

Tether Wire Clamp (If Required)

Automatic Compression Type Clamp (Feed Through Deadend)

No. 6 Bare Copper Ground Wire, Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)

Catenary Wire

Signal Cable

No. 6 Bare Copper Ground Wire

Pigtail Min. Of 24"

Crimp Type Electrical Connector

Locking Cable Ties Or Lashing Wire (See Note 3)
NOTES:

1. Meet all grounding requirements of Specification 620.
2. If accessible, ground the messenger wire of the interconnect cables to the copper ground wire of the pole or to the external wire extending down the pole.
3. When utilizing the external ground wire, install a piece of 1/2" conduit extending up 8' from the finish grade to protect the ground wire connecting the messenger wire to the ground rod.
4. Use either locking cable ties or lashing wire, placed no further than 12" apart. Except at the point of cable drop or terminations, place one (1) at the point where the cables separate from the messenger wire and place another at a maximum distance of 4' from that tie.
5. When installing Figure 8 interconnect cable, only use locking cable ties.
6. Lashing wire should normally be used for distances of 12' or greater.

CABLE DROP AND TERMINATION WITH FIGURE 8 CABLE

CABLE DROP AND TERMINATION WITH MESSENGER WIRE AND COMPRESSION CLAMP

CABLE DROP AND TERMINATION WITH MESSENGER WIRE AND SUSPENSION CLAMP
1. Provide fiber optic splice boxes with cable hanger racks designed to support cables and splice enclosures.

2. Install a 1'-0" wide (Min) concrete apron around all boxes using Class NS concrete. Slope the apron away from the box.

3. Where multiple pull boxes are placed side by side, maintain at least 8" between the pull boxes.

4. Rectangular boxes shown, others similar.
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.

SERVICE POINT DETAILS

DETAIl A
AERIAL FEED

Concrete Pole Prestressed Type P-II, 30' Long

Clevis With Insulators

Conductor Weatherhead Height
As Required By Power Company

Meter As Required Height Specified
By Power Company

Service Disconnect

As Required By Power Company

CONDUCTOR WEATHERHEAD HEIGHT

#6 AWG Insulated Grounding Electrode Conductor In 1" Rigid Galvanized Steel Conduit

#6 AWG Insulated Grounding Electrode Conductor In 1" Rigid Galvanized Steel Conduit

Concrete Pole, Prestressed Type P-II, 12' Long

Meter As Required Height Specified
By Power Company

Service Disconnect

CONDUCTOR WEATHERHEAD HEIGHT

As Required By Power Company

CONDUCTION IN GROUNDING ELECTRODE

#6 AWG Insulated Grounding Electrode Conductor In 1" Rigid Galvanized Steel Conduit

Concrete Pad, Prestressed Type P-II, 12' Long

Connection For Pole Ground, Bond Wire, And Ground Rod

Connection For Pole Ground, Bond Wire, And Ground Rod

Concrete Pad

Grade

U.L. Approved Ground Rod, 1/4 Dia 40' Long Copper Clay (All Service Points)

#6 AWG Insulated Grounding Electrode Conductor In 1" Rigid Galvanized Steel Conduit

Concrete Pad

Grade

12" Bed Of Pea Rock Or Crushed Stone For Drainage (Typ.)

U.L. Approved Ground Rod, 1/4 Dia 40' Long Copper Clay (All Service Points)

Concrete Pad

Grade

12" Bed Of Pea Rock Or Crushed Stone For Drainage (Typ.)

DETAIl B
UNDERGROUND FEED
**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. Bond all elements together to form an Intersection Grounding Network in accordance with Specification 620. The bond wire shall be run in conduit with the Electrical Service Wire or Signal Cable.
4. Meet all grounding requirements of Specification 620.
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.
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. Submit shop drawings for minor modifications not detailed in the plans.
3. Materials:
   A. Concrete: Class V Special or Class VI
   B. Prestress Strands & Spiral Reinforcing: Specification Section 641
   C. Hand and coupler cover plates: Non-corrosive material
   D. Screws: Round headed, chrome plated
4. Fabrication:
   A. Pole Taper for pole width, strands, reinforcing and void: 0.081 in/ft per face.
   B. Concrete Taper 1° minimum
   C. Spiral Reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
   D. The design dimensions for Front Face (FF) and Back Face (BF) of the poles may vary transversely from the section shown by ± ¼" to assist with removal from forms. Balance addition and subtraction of the face widths to maintain section areas shown.
   E. Tie ground wires to the interior of reinforcing steel to prevent displacement during concreting operations.
   F. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
   G. Provide cover plates and screws for hand hole and couplers. Attach cover plates to the poles using lead anchors or embedded threaded inserts.
   H. Provide aluminum identification tags on the poles with the following information:
      a. Financial Project ID
      b. Pole Manufacturer
      c. Standard Pole Type Number
      d. Pole Length (L)
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-II A (12 FT.) & P-II B (36 FT.) ELEVATION**
(Strands Not Shown)

**PECETAL POLE P-III C (12 FT.) ELEVATION**
(Strands 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 of 4 ft. (for P-II A & P-I C) or 10 ft. (for P-II B) from the Tip End.

* Dimension may vary from 2 1/4" to 3 1/2" to accommodate smaller radius at optional stepped (PVC) void. The void diameter shall not be less than 2".

**SERVICE AND PEDESTAL POLE TYPE P-II**
SPiral Reinforcing Elevation
(StAmnds, Holes, and Fixtures Not Shown)

Pole Length Dim. L
Pole Height Dim. H
Depth Dim. D

20% L

20% L

Tip End (Top)
Back Face

Front Face

Identification Markings

A

A

Final Grade Location

Pole Elevation
(StAmnds and Reinforcing Not Shown)

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 33.3% L from Tip End.

* Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optional stepped (PVC) void.
The void diameter shall not be less than 2½".

Transfer (4 strands total) 0.5 in. ~ 31 kips Before Prestressed Strand:

Support Locations (Strands and Reinforcing Not Shown)

POLE TYPE P-III

POLE ELEVATION

STRAND LEGEND

- Prestressed Strand:
  0.5 in. ~ 31 kips Before Transfer (4 strands total)

NOTES:

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POLE ELEVATION

( Typical Square Section)
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 8 ksi minimum strength at transfer.
   B. Prestressing Strands: ASTM A416, Grade 270 low relaxation.
   C. Reinforcing Steel: ASTM A615, Grade 60
   D. Spiral Reinforcing: ASTM A134 Cold-Drawn
   E. Bolts: ASTM F1554, Grade 55
   F. Washers: ASTM F2339
   G. Coverplates: Class A Heavy Hex
   H. Steel plates and Pole Cap: ASTM A325 or ASTM A709, Grade 50
   I. Galvanization: Nuts and washers: ASTM F2339
   J. 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 splices to consist of a 2'-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 Class 3 surface finish in accordance with Specification 400.
   E. Provide a 1" minimum cover.
   F. Provide handhole 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.
   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:
      - Rod Coatings: ASTM A554
      - Quality Control Program:
      - Financial Project ID
      - Pole Manufacturer
      - Pole Length
   H. Tie ground wires to the interior of reinforcing steel as necessary to prevent displacement during concrete operations.
   I. Storage, Handling and Erection locations shown may vary within ± 3".

8. Cabinet Installation:
   A. Splice fiber optic cables in cabinet to preterminater patch panel.
   B. Furnish and install Surge Protection Devices (SPDs) on all cabling in cabinet.
   C. Furnish and install secondary SPDs protection on outlets for equipment in cabinet.
   D. Insure that all electronic equipment power is protected and conditioned with SPDs.
   E. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   F. Furnish and install Surge Protection Devices (SPDs) on all cabling in cabinet.
   G. Sizes and types of conduits and innerducts for network communications between the pullbox and cabinet are stated in the Contract Documents.
   H. 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:
      - Financial Project ID
      - Pole Manufacturer
      - Pole Length

9. Lowering Device Installation:
   A. Place the lowering cable that moves within the pole in an interior conduit to prevent it from tangling with any electrical wire that is in the pole. Ensure that any electrical wire within the pole is loaded 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, etc.) with lowering device manufacturer.
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). Increase the burial depth in accordance with the Additional Burial Depth Due To Ground Slope table for foundations with slopes 1:5 and steeper. Use the higher value for slope or diameter values that fall between those shown on the table.

Additional Burial Depth Due To Ground Slope

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<th>Ground Slope</th>
<th>Additional Burial Depth (Feet)</th>
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12-Sided Pole Design Table

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Round Pole Design Table

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12-Sided Pole Design Table (See Note 1)

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Round Pole Design Table (See Note 2)

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NOTES:
1. Install all handhole and opening covers prior to shipping.
2. Install ½" Ø x 5" long stud with hex nut in insert before shipment.
3. As an alternate, embed 6½" 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.

ASSEMBLY

1. Install all handhole and opening covers prior to shipping.
2. Install ½" Ø x 5" long stud with hex nut in insert before shipment.
3. As an alternate, embed 6½" 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.

HANDHOLE DETAIL

ELEVATION

LOWERING DEVICE TENON

ELEVATION

CAP PLATE DETAIL

(Pole Top Detail)

TENON CAP

PLAN VIEW

TENON COVER

POLE TOP DETAIL

HANDHOLE DETAIL

CONCRETE CCTV POLE

ASSEMBLY

1. Install all handhole and opening covers prior to shipping.
2. Install ½" Ø x 5" long stud with hex nut in insert before shipment.
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4. Handhole frame may be Cast Aluminum 356.2.

HANDHOLE DETAIL

ELEVATION

LOWERING DEVICE TENON

ELEVATION

CAP PLATE DETAIL

(Pole Top Detail)
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 200 ksi: ASTM A1011, Grade 50, 55, 60 or 65
      - B. Greater than or equal to 200 ksi: ASTM A572, Grade 50, 55, 60 or 65
   B. Steel Plates: ASTM A36
   C. Bolt Metal: EN1092
   D. Bolts, Nuts, and Washers:
      - High Tensile Bolts, ASTM F3125, Grade A325, Type 1
      - Nuts: ASTM A663 Grade DH Heavy-Hex
      - Washers: ASTM F1436 Type 1, one under turned element
   E. Anchor Bolts, Nuts, and Washers:
      - Anchor Bolts: ASTM F1554, Grade 55
      - Nuts: ASTM A663 Grade A Heavy-Hex (3 per anchor bolt)
      - Plate Washers: ASTM A193 Grade B (per bolt), Split-lock washers and self-locking nuts are not permitted
   F. Handhole Frame: ASTM A409 or ASTM A36, Grade 36
   G. Handhole Cover: ASTM A531, Grade 50, 60, or 65
   H. Aluminum Pole Caps and Nut Covers: ASTM B26, 319, F
   I. Threaded Bars/ Studs: ASTM A36 or ASTM A327
   J. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
   K. Reinforcing Steel: Specification 115
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:
      - Bolts (except Anchor Bolts): Bolt diameter plus 1/8", prior to galvanizing
      - Anchor Bolts: Bolt diameter plus 1/2", maximum
   D. Locate handhole 100° from 3" wire entrance pipe.
   E. Identification Tag:
      - Submit details for approval.
   F. Provide 2" x 4" (Max.) aluminum identification tag.
   G. Secure to pole with 8/16" diameter stainless steel rivets or screws.
   H. All Nuts, Bolts, Washers, and Threaded Bars/ Studs: ASTM F2329
   I. All other steel items including plate washers: ASTM A123
5. Coatings:
   A. Foundation: Specification 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 649-6.
**POLE ASSEMBLY**

**NOTE:**
1. Double nuts: Bottom nut may be half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

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**FOUNDATION AND BASE DETAILS**

**STEEL STRAIN POLE DATA TABLE**

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<th>POLE</th>
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**SECTION A-A**

**SECTION B-B**

**JOINT WELD DETAIL**

**DETAIL 'A'**

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**LAST REVISION:** 11/01/18

**DESCRIPTION:**

**FY 2019-20 STANDARD PLANS**

**INDEX:** 649-010

**SHEET:** 2 of 3
**NOTES:**

1. Clamps have been sized for Design Cable 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. All 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.

**CLAMP THICKNESS TABLE**

<table>
<thead>
<tr>
<th>Diameter (in.)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>25</td>
<td>3/8</td>
</tr>
<tr>
<td>3/4</td>
<td>35</td>
<td>3/8</td>
</tr>
<tr>
<td>1/2</td>
<td>50</td>
<td>3/4</td>
</tr>
</tbody>
</table>

**POLE ASSEMBLY**

**HANDHOLE**

**WIRE ENTRANCE DETAIL**

**POLE TOP**

**ATTACHMENT DETAILS**

**DESIGNATION:**

FA 20-09

**STANDARD PLANS**

FY 2019-20

**INDEX**

649-010

**SHEET**

3 of 3

---

**DESCRIPTION:**

LAST REVISION 01/01/17

STEEL STRAIN POLE
GENERAL NOTES:
1. Work this Index with Specification 649.
2. This Index is considered fully detailed; only submit shop drawings for minor modifications not detailed in the Plans.

Materials:
A. Pole: ASTM A1011 Grade 50, 55, 60 or 65 (less than 1½") or ASTM A372 Grade 50, 60 or 65 (greater than or equal to 1½") or ASTM A395 Grade A (55 ksi yield) or Grade B (60 ksi yield).
B. Steel Plates and Pole Cap: ASTM A6 or ASTM A709 Grade 50.
C. Weld Metal: E70XX.
D. Bolts: ASTM F3125, Grade A325, Type 1.
Nuts: ASTM A490.
E. Anchor Bolts: ASTM F554 Grade 55 with ASTM A563 Grade A heavy hex nuts and ASTM A36 plate washers.
F. Handhole Frame: ASTM A109 Grade 36 or ASTM A36.
G. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65.
H. Stainless Steel Screws: AISI Type 316.
I. Reinforcing Steel: ASTM A615 Grade 60.
J. Galvanization: Bolts, nuts and washers: ASTM F3328. All other steel including plate washers: ASTM A123.
K. Concrete: Class IV (Drilled Shaft) for all environment classifications.

Fabrication:
A. Writing:
   a. Specification Section 460-4.4 and
B. Poles:
   a. Round or 16-sided (Min.)
   b. Taper pole diameter at 0.14 inches per foot
   c. Fabricate pole longitudinal seam welds if maximum with 60 percent minimum penetration or fusion welds except as follows:
      1. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection
      2. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of one and one-half times the inside diameter of the female section plus 6 inches.
   d. Pole shaft may be either one or two sections (with telescopic field splices)
   e. Circumferentially welded pole shafts and laminated pole shafts are not permitted
C. Identification Tag: (Submit details for approval)
   a. 2" x 4" (Max.) aluminum tag
   b. Locate on the inside of the pole and visible from the handhole
   c. Secure with ½" 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. Manufacturers’ Name
      5. Yield Strength (Fy of Steel)
      6. Base Wall Thickness
   D. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus ½" and anchor bolt holes are bolt diameter plus ⅞" (Max) prior to galvanizing.

Pole Installation:
A. Do not install additional wire access holes (not shown in this Index) with a diameter that exceeds 1½" 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 Park Stands 2" below the top of the handhole.
D. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus ½" and anchor bolt holes are bolt diameter plus ⅞" (Max) prior to galvanizing.

6. Cabinet Installation:
A. Splice fiber optic cables in cabinet to preterminator patch panel.
B. Furnish and Install Surge Protection Devices (SPDs) on all cabling in cabinet.
C. Furnish and install secondary SPDs protection on outlets for equipment in cabinet.
D. Ensure that all electronic equipment power is protected and conditioned with SPDs.
E. Install the pole mounted cabinet with the hinges next to the pole.
F. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
G. Sizes and types of conduits and inner ducts for network communications between the pull box and cabinet are stated in the Contract Documents.
H. Do not install additional wire access holes (not shown in this Index) with a diameter that exceeds 1½" in diameter.
I. Work this Index with Specification 649.

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 wire within the pole is routed securely and free from slack.
B. Install lowering device 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, plate mounting plates, parking stands, etc.) with lowering device manufacturer.
**SHAFT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>4' Shaft Diameter</th>
<th>5' Shaft Diameter</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>72</td>
<td>78</td>
<td>6</td>
</tr>
<tr>
<td>65</td>
<td>72</td>
<td>87</td>
<td>6</td>
</tr>
<tr>
<td>70</td>
<td>72</td>
<td>97</td>
<td>6</td>
</tr>
</tbody>
</table>

**ADDITIONAL SHAFT DEPTH DUE TO GROUND SLOPE**

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4' Shaft Diameter</th>
<th>5' Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>4'</td>
<td>5'</td>
</tr>
<tr>
<td>1:4</td>
<td>4'</td>
<td>6'</td>
</tr>
<tr>
<td>1:3</td>
<td>4'</td>
<td>7'</td>
</tr>
<tr>
<td>1:2</td>
<td>4'</td>
<td>8'</td>
</tr>
</tbody>
</table>

**FOUNDATION NOTES:**

1. Shaft Length is based on 1'-0" height above the finished grade.
2. Shaft Design Table Shaft Length is based on level ground (flatter than 1:5). Increase the shaft depth in accordance with the Additional Shaft Depth Due To Ground Slope Table for foundations with slopes 1:5 and steeper. Use the higher value for slope or diameter values that fall between those shown on the table.

**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 Circle (in.)</th>
<th>Number of Anchor Bolt</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>22</td>
<td>1.25</td>
<td>2.0</td>
<td>6</td>
<td>1.25</td>
<td>1.25</td>
<td>2.25</td>
</tr>
<tr>
<td>65</td>
<td>22</td>
<td>2.25</td>
<td>2.5</td>
<td>6</td>
<td>2.25</td>
<td>2.25</td>
<td>2.75</td>
</tr>
<tr>
<td>70</td>
<td>22</td>
<td>3.25</td>
<td>3.0</td>
<td>6</td>
<td>3.25</td>
<td>3.25</td>
<td>3.25</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>15' 0&quot; 0.25</td>
<td>15' 0&quot; 0.25</td>
<td>15'</td>
</tr>
<tr>
<td>60</td>
<td>18' 0&quot; 0.25</td>
<td>18' 0&quot; 0.25</td>
<td>18'</td>
</tr>
<tr>
<td>70</td>
<td>21' 0&quot; 0.25</td>
<td>21' 0&quot; 0.25</td>
<td>21'</td>
</tr>
</tbody>
</table>

**ELEVATION**

Cable Raceway

Dome Type CCTV Camera

Air Terminal (See Sheet 6)

Fixed Mounting Bracket

7" x 7" x 1/2" Handhole, 90° from the lowering Arm and Away From Approaching Traffic

Top of Foundation

7'-0" Finish Grade

See Shaft Design Table
NOTES:
1. Shaft Length is based on 1'-0" height above the finished grade.
2. Double Nuts: Bottom nut may be half-height (jam nut). Provide individual nut covers (not shown) for each bolt.
3. Conduit and CSL Tubes not shown for clarity.
4. Work these details with data Table on Sheet 2.
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.
Dome Type CCTV Camera

2'-0" M in. (Drilled Shaft)

Finished Grade

CCTV Pole

Ground Mounted Cabinet

2'-0" M in. (Drilled Shaft)

Finished Grade

Ground Rod A

Primary Ground Rod

Ground Rod B

Ground Rod C

Ground Rod D

Fiber Optic Communications

Base as Required.

Bare Solid Copper Wire

#2 AWG Tin-Plated

Exothermic Weld (Typ.)

Primary Ground Rod

Ground Rod A

Ground Rod B

Ground Rod C

Ground Rod D

Composite Camera Cable

Ground Box (See DETAIL "B")

Detail "C"

Pole Mounted CCTV Cabinet (See DETAIL "E")

Composite Camera Cable

Pole Plate With Stainless Steel Band

CCTV Pole

Composite Camera Pull Box

Pull Box (See DETAIL "B")

Detail "D"

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GROUND MOUNTED CABINET

POLE MOUNTED CABINET

STEEL CCTV POLE GROUNDING

STEEL CCTV POLE

SIDE VIEW

DETAIL "E"

DETAIL "D"

DETAIL "C"

DETAIL "B"
### ARM AND BASE PLATE

<table>
<thead>
<tr>
<th>Arm ID</th>
<th>Arm Length (ft)</th>
<th>Total Arm Length (ft)</th>
<th>Arm</th>
<th>Arm Extension</th>
<th>Base Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/0/5</td>
<td>30</td>
<td>11</td>
<td>0.250</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>A/0/5/4</td>
<td>30</td>
<td>12</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>A/0/5/1/N</td>
<td>30</td>
<td>12</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>A/0/5</td>
<td>40</td>
<td>13</td>
<td>0.250</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>A/0/5/1/N</td>
<td>40</td>
<td>13</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>A/0/5/5</td>
<td>50</td>
<td>13</td>
<td>0.250</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>A/0/5/1/N</td>
<td>50</td>
<td>13</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>A/0/5/6</td>
<td>60</td>
<td>13</td>
<td>0.250</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>A/0/5/1/N</td>
<td>60</td>
<td>13</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>A/0/5/7</td>
<td>70</td>
<td>13</td>
<td>0.250</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>A/0/5/1/N</td>
<td>70</td>
<td>13</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
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<td>A/0/5/8</td>
<td>80</td>
<td>13</td>
<td>0.250</td>
<td>22</td>
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<tr>
<td>A/0/5/1/N</td>
<td>80</td>
<td>13</td>
<td>0.250</td>
<td>30</td>
<td>36</td>
</tr>
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</table>

### POLE, BASE PLATE AND ARM CONNECTION

<table>
<thead>
<tr>
<th>Pole ID</th>
<th>P=Pu/No</th>
<th>S=SingleArm</th>
<th>D=DoubleArm</th>
<th>L=Length</th>
</tr>
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<tbody>
<tr>
<td>P1/S</td>
<td>25</td>
<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P1/D</td>
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<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P1/D/L</td>
<td>25</td>
<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P2/S</td>
<td>25</td>
<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P2/D</td>
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<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
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<tr>
<td>P2/D/L</td>
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<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P3/S</td>
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<td>0.75</td>
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<tr>
<td>P3/D</td>
<td>25</td>
<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P3/D/L</td>
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<td>0.438</td>
</tr>
<tr>
<td>P4/S</td>
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<td>P4/D</td>
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<td>P4/D/L</td>
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<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
</tr>
<tr>
<td>P5/S</td>
<td>25</td>
<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
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<tr>
<td>P5/D</td>
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<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
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<tr>
<td>P5/D/L</td>
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<td>37.5</td>
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<td>0.438</td>
</tr>
<tr>
<td>P6/S</td>
<td>25</td>
<td>37.5</td>
<td>0.75</td>
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<td>P6/D/L</td>
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<td>25</td>
<td>37.5</td>
<td>0.75</td>
<td>0.438</td>
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</tbody>
</table>

### DRILLED SHAFT

<table>
<thead>
<tr>
<th>Drilled Shaft ID</th>
<th>DA (ft)</th>
<th>DB (ft)</th>
<th>RA</th>
<th>RB</th>
<th>RC</th>
<th>RD (ft)</th>
<th>RE</th>
<th>RE (ft)</th>
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<tbody>
<tr>
<td>DS/12/4.0</td>
<td>12</td>
<td>4.0</td>
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<td>8</td>
<td>12</td>
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<tr>
<td>DS/12/4.5</td>
<td>12</td>
<td>4.5</td>
<td>11</td>
<td>14</td>
<td>8</td>
<td>12</td>
<td></td>
<td></td>
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<tr>
<td>DS/14/5.0</td>
<td>14</td>
<td>5.0</td>
<td>11</td>
<td>18</td>
<td>10</td>
<td>8</td>
<td></td>
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<tr>
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<td>16</td>
<td>5.0</td>
<td>11</td>
<td>18</td>
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<td>10</td>
<td>8</td>
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<tr>
<td>DS/25/5.0</td>
<td>25</td>
<td>5.0</td>
<td>11</td>
<td>18</td>
<td>10</td>
<td>8</td>
<td></td>
<td></td>
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</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>LH (ft)</th>
<th>LJ (ft)</th>
<th>LL (ft)</th>
<th>US (ft)</th>
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<tbody>
<tr>
<td>30</td>
<td>10</td>
<td>3</td>
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<td>0.5</td>
<td>8</td>
<td>0.5</td>
<td>0.75</td>
<td>0.25</td>
<td>0.25</td>
<td>0</td>
</tr>
</tbody>
</table>
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 Conduit are not shown for simplicity.

4. Materials:
   A. Poles, Mast Arms and Raccings:
      a. Less than 3/16" ASTM A1011 Grade 50, 55, 60 or 65
      b. Greater than equal to 3/16" ASTM A52 Grade 50, 55, 60 or 65
      c. ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield)
   B. Steel Plates: ASTM A36
   C. Weld Metals: E70XX
   D. Bolts, Nuts and Washers:
      a. High Strength Hex Head Bolts: ASTM F3125, Grade A325, Type 1
      b. Nuts: ASTM A563 Grade A Heavy-Hex
      c. Washers: ASTM F436 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade A Heavy-Hex
      c. Plate Washers: ASTM A963 DH Heavy-Hex
   F. Threaded Bars/Studs: ASTM A307
   G. Handhole Frame: ASTM A1009 or ASTM A496, Grade 36
   H. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65
   I. Aluminum Pole Cap and Nut Covers: ASTM B26 (319-F)
   J. Stainless Steel Screws: AISI Type 316
   K. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
   L. Reinforcing Steel: Specification 415

5. Fabrication:
   A. Welding:
      a. Specification Section 460-6.4 and
      b. AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals Section 14.4.4
   B. Poles and Mast Arms:
      a. Round or 12-sided (Min.)
      b. Taper pole diameter at 0.14 inches per foot
      c. Upright poles must be a single section. For arms and upright poles, circumferential welds and laminated sections are not permitted.
      d. Arms may be either one or two sections. See Sheet 4 for telescopische split details
      e. Fabricate longitudinal seam welds with 60 percent minimum penetration or fusion welds except:
         1. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection.
         2. Use full-penetration groove welds on the female end section of telescopic (i.e., stile type) field splices for a maximum length of one and one-half times the inside diameter of the female section plus 6 inches.
      f. Locate longitudinal seams weld along the:
         1. Lower quadrant of the arms.
         2. Same side of the pole as the arm connections.
      g. Fabricate straight welds perpendicular from arm on single arm pole, perpendicular from the first arm of double arms poles facing away from traffic or see special instructions on the Mast Arm Tabulation Sheet.
      h. Provide a 2-3" or 4" hole at the top of the pole for signal wiring support (See Sheet 6).
      i. First and Second arm camber angle = 2°
      j. Bolt holes diameters as follows:
         1. Bolts (except Anchor bolts): Bolt diameter plus 1/16" prior to galling.
         2. Anchor Bolts: Bolt diameter plus 1/16" (Max.).
   C. Coatings:
      a. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F2329
      b. All other steel items including plate washers ASTM A123

6. Construction:
   A. Foundation: Specification 455 Drilled Shaft, except that payment is included in the cost of the Mast Arm.
   B. Install Pole vertically.
   C. Place structural gusset plate between top of foundation and bottom of gusset plate in accordance with Specification 649-7
   D. Attach Sign Panels and Signals centered on the elevation of the Mast Arm.
   E. Wire Access holes are 1/16" or less in diameter.
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 A-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

SECTION A-A

DOUBLE NUT (Typ.)

#5 Tie Bars
3/8" Spacing @ 4'

(4 Anchor Bolts)

PLAN

ELEVATION

FOUNDATION

BASE PLATE CONNECTION
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).
DOUBLE ARM CONNECTION & SPLICE DETAILS

SECTIONS:

- **SECTION E-E**
  - Face of Arm Base Plate at Arm Edge
  - Second Arm Connection Angle
  - See DETAIL 'D'

- **SECTION F-F**
  - Connection Plates (Typ.) Offset to Avoid Side
  - Connection Bolt Ø Threaded Bar/Stud
  - With Self Locking Nut
  - 4" Ø Wiring Hole
  - Connection Bolt Ø 'SP'

- **SECTION G-G**
  - Double Arm Connection Bolt Ø 'SP'
  - Full Penetration Weld (Typ.)
  - Minimum Internal Bend Radius = 5x Wall Thickness (1" Min.)
  - Seam Weld (Typ.)
  - Maximum Internal Bend Radius = 5x Wall Thickness (1" Min.)

**DETAIL 'D'**
- Pole Connection Plate
- Edge Of Top Plate
- 'SF' Dia. Connection Bolt
- Provided for Lamellar Tearing in Connection Plate when
- Sheet Weight is Measured.
- Connection Plate Ø 'SP'
- Center of First Mast Arm Extension
- Center Of Second Mast Arm Extension

**DETAIL 'E'**
- Pole Connection Plate
- Side Connection Plate
- Edge Of Top Plate
- Backing Ring
- Connection Plate Ø 'SP'
- Center of Pole
- Minimum Internal Bend Radius = 5x Wall Thickness (1" Min.)
- Seam Weld (Typ.)
- Inside Radius Measured Center To Flat
- Outside Diameter 'SD', 'SH' - Tip Diameters
- Inside Diameter 'SB', 'SF' - Base Diameters

**DETAIL 'F'**
- Pole Connection Plate
- Connection Plate Ø 'SP'
- Center of Pole
- Minimum Internal Bend Radius = 5x Wall Thickness (1" Min.)
- Seam Weld (Typ.)
- Inside Radius Measured Center To Flat
- Outside Diameter 'SD', 'SH' - Tip Diameters
- Inside Diameter 'SB', 'SF' - Base Diameters

**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 Ø First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

**DOUBLE ARM CONNECTION & SPLICE DETAILS**

**MAST ARM ASSEMBLIES**
**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 3/8" thick plate with the same flange width, height, and length as the MC 10x33.6 Channel section.

4. 'LL' measure counter clockwise from First Mast Arm.

---

**SECTION H-H**

**SECTION I-I**

**DETAIL 'G'**

**LUMINAIRE ELEVATION**

**LUMINAIRE ORIENTATION**

**LUMINAIRE CONNECTION ELEVATION**

**LUMINAIRE ARM AND CONNECTION DETAILS**

**REVISION:** 3/01/17

**DESCRIPTION:** FY 2019-20 STANDARD PLANS

**INDEX:** 649-031

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**MAST ARM ASSEMBLY**

**MAST ARM ASSEMBLIES**

**STANDARD PLANS**

**REVISIO N INDEX S H EET**
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 and for locations.
3. Terminal Compartment Frame Height 2'-0" minimum to 2'-6" 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.

MAST ARM ASSEMBLY

COVER

Frame

Handhole

SECTION J-J

HANDHOLE

SECTION K-K

FRAME

COVER

HANDHOLE

POLE TOP

COVER

INDEX

FY 2019-20

Mast Arm Assemblies

STANDARD PLANS

INDEX

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Last revision 01/01/17

래스트 확인: 01/01/17
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. Repair drilled or punched holes in galvanized steel poles or pedestals in accordance with Specifications 562.
3. Meet grounding requirements of Specifications 620.
4. See APL for Department-approved Pedestrian Signal Assemblies and hardware.
5. Construct footing with Class I Concrete, footing may be Cast-In-Place (CIP) or Precast.
6. For Steel Strain Poles see Index 649-010.
7. For Prestressed Concrete Poles see Index 641-010.
8. Install 4 – 3/8 x 18” Anchor Bolts With Double Nuts. (ASTM F1554 Grade 55)
9. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.
NOTES:

1. A transformer base is required for both conventionally-powered and solar-powered applications (conventional power shown).
2. Install the RRFB in pairs, one on either side of approach traffic.
3. Install controller on the backside of post from approach traffic.
4. Install a 30" x 30" W11-2 sign on two-lane roadways and a 36" x 36" W11-2 sign for multilane roadways.
5. Install push button and R10-25 sign in accordance with Index 660-003.
6. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

7. Meet the requirements of Specifications 446 for aluminum poles and transformer bases.
8. 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. 
9. For assemblies connected to conventional power, provide single pole non-fused watertight breakaway electrical connectors in the fragile transformer base. 
10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors. 
11. For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight. 

3. Install controller on the backside of post from approach traffic.
4. Install a 30" X 30" W11-2 sign on two-lane roadways and a 36" X 36" W11-2 sign for multilane roadways.
5. Install push button and R10-25 sign in accordance with Index 660-003.
6. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

7. Meet the requirements of Specifications 446 for aluminum poles and transformer bases.
8. 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. 
9. For assemblies connected to conventional power, provide single pole non-fused watertight breakaway electrical connectors in the fragile transformer base. 
10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors. 
11. For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.
NOTES:

1. Materials:
   A. Sign panels, wind beams and associated hardware: See Index 700-020
   B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL
   C. Wire and additional hardware requirements: See Specification 634

2. Type B and C Attachments:
   A. Extend wind beams to within 6" of the sign edge.
   B. Number of sign hangers required based on sign width:
      a. Sign width < 4'-0": One
      b. 4'-0" ≤ sign width ≤ 7'-0": Two
   C. Number of wind beams required based on sign depth:
      a. Sign depth < 3'-6": One
      b. 3'-6" ≤ Sign depth ≤ 7'-0": Two

3. Type D Attachments:
   Maximum sign width = 7'-0"

4. Align the bottom edges of signs to approximately the same elevation.

5. Use a minimum of 2 bolts with a minimum spacing of 2" for overlapped connection of the adjustable hangers.

DESCRIPTION:

A. Sign panels, wind beams and associated hardware: See Index 700-020
B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL
C. Wire and additional hardware requirements: See Specification 634

TYPICAL INSTALLATIONS FOR SIGN PANEL(S) MOUNTED ON SPAN WIRE

SPAN WIRE MOUNTED SIGN DETAILS

INDEX 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.
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 entry points shall be sealed in accordance with Specification 630.

Fixed Mounting Bracket Must Be Designed To Match Mounting Provisions For CCTV Camera

Camera Connector Harness Supplied To Match Camera

Camera Cabling To

Pole Plate With Stainless Steel Band
(Or Method Approved By Engineer)

Calibrated To Camera

Fixed Mounting Bracket Detail
Not To Scale

SECTION AA

Varies (2 Max.)

Camera Mounting With Fixed Bracket

The Contractor Shall Coordinate Brackets Design And Flange Connection With CCTV Camera Manufacturer For Mounting The CCTV Camera Housing

For Concrete Poles, Hole With Nipple Grommet For Steel Poles.

Nipple Grommet For Steel Poles.

Provisions For CCTV Camera Designed To Match Mounting

Fixed Mounting Bracket Must Be

Strain Relief Fitting

CCTV Fitting
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 an Intermediate Pullbox, splice to shielded lead-in wire and continue to the controller cabinet.

2. Provide sufficient saw-cut width to allow unforced placement of loop wires or lead-in cables into the saw-cut. Except across expansion joints, saw-cut to a standard depth of 3", but no more than 4' below the top of the final surface.

3. On resurfacing or new roadway construction projects, install the loop wires and lead-in cables in the asphalt structural course prior to the placement of the asphalt friction course. Place the loop wires and lead-in cables in a saw cut in the structural course.

4. Use nonmetallic hold down material to secure loop wires and lead-ins to the bottom of saw-cuts. Place the hold down material approximately 12" intervals around loops and 24" intervals on lead-ins.

5. The minimum distance between the twisted pairs of loop lead-in wire is 6" from the loop to 12" from the pavement edge or curb.

6. Splice Connections in pull boxes with UL listed, watertight, insulated enclosures. Place one enclosure over the end of each conductor and place a second enclosure over the exposed end of the shielded cable. As an alternate, a larger diameter enclosure that will accommodate both the splices of the conductors and the exposed end of the shielded cable may be used.

7. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.

8. Alternative installations may be approved by the State Traffic Operations Engineer.

NOTES:

1. Drill a hole 1" larger in diameter than the rigid conduit to be used through the roadway asphalt (or concrete) surface and back at an appropriate angle to intercept the trench or pull box hole.

2. Install the conduit at least 6" into the roadway pavement and approximately 2" below the top of the roadway surface.

3. The departure angle of the conduit from the roadway is between 30° to 45°.

4. The minimum distance between the twisted pairs of loop lead-in wire is 6" from the loop to 12" from the pavement edge or curb.

5. Use a nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

6. Splice 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. As an alternate, a larger diameter enclosure that will accommodate both the splices of the conductors and the exposed end of the shielded cable may be used.

7. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.

8. Alternative installations may be approved by the State Traffic Operations Engineer.
**LOOP TYPES, EXPANSION JOINTS, AND DETAILS**

**DESCRIPTION:**

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 C 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. When shown in the Plans, the leading edge of loop Types A, C, D, & F may extend past the stop line a maximum of 10' and the length of these loops may be extended to a maximum of 60'.

7. Do not install loop lead-in wires in the same pull box with signal power cable.

**CONCRETE PAVEMENT EXPANSION JOINTS**

**VERTICAL SECTION**

**LOOP CORNER AND LEAD-IN DETAILS**

**Comparison of Loop Types**

- **Type A**
  - Stop Line
  - 2 Turns
  - 3' - 6"

- **Type B**
  - Variable
  - 4 Turns
  - 3' - 6"

- **Type C**
  - Variable
  - 2 Turns
  - 4 Turns

- **Type D**
  - Stop Line
  - 2 Turns
  - 4 Turns

- **Type E**
  - Stop Line
  - 3 Turns
  - 6"

- **Type F**
  - Stop Line
  - 2 Turns
  - 4 Turns

- **Type G**
  - Shielded lead-in
  - Variable
  - Stop Line

**NOTE:**

- Loops To Pullbox: Pullbox Specified Under Separate Key Items.

**PLAN**

- Loop Wires
- Sealant
- Soft-Setting Sealer Injected Into Deep Section of Groove Over Wire

**LOOP TYPES**

- 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 C 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. When shown in the Plans, the leading edge of loop Types A, C, D, & F may extend past the stop line a maximum of 10' and the length of these loops may be extended to a maximum of 60'.

- 7. Do not install loop lead-in wires in the same pull box with signal power cable.
NOTES:

1. Mount Signs above the detectors. See Index 700-102 for sign details.
2. Install Pushbuttons and Pedestrian Actuation Signs with faces parallel to the crossing direction.
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.
SIGNALIZED INTERSECTION

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
TF Timing Function Number
Ø Phase Number
G Green Arrow (Left or Right)
R Red Arrow
Y Yellow Arrow

SIGNAL CLEARANCE TABLE
(Blank Indicates No Clearance Required)

<table>
<thead>
<tr>
<th>SIGNAL INDICATIONS</th>
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<td>R</td>
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</table>

STANDARD SIGNAL OPERATING PLANS

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SHEET 1 of 2

[Diagram of signal clearance table and signalized intersection diagram with legend and vehicle movement numbers.]
NOTES:
1. If cabinet mounting requires relocation of hole in concrete pole, fill existing hole with concrete or cover with a noncorrosive cover plate.
2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.

NOTES:
1. Service Slab: slope 1:2 to 1:3 for drainage. Not required in sidewalk, pavement areas, or where R/W is restricted.
2. The number, size and orientation of conduit sweep will vary according to site condition or locations. Provided two spare 2" PVC conduits in all bases. Place the exits of the spare conduits in the direction of the center-rear of the cabinet base and into a pull box. If obstructions prevent the spare conduit from exiting to the rear, or the rear of the cabinet is located on the R/W line, locate as directed by the Engineer. Cap all spare conduit sweeps with a weatherproof fitting.

NOTES:
1. Retrofit existing controller cabinets in accordance with Specification 678.
2. Retrofit installation procedure for signalized intersection controller cabinet are located at: http://www.fdot.gov/traffic/doc_library/doc_SignalizedIntersectionController.html

NEW CONTROLLER CABINET
GROUND MOUNTED CONTROLLER CABINET
EXISTING CONTROLLER CABINET
PEDESTAL MOUNTED CABINET

CABINET INSTALLATION DETAILS
CABINET LAYOUT DETAILS (Four Lanes or Less)

1. Traffic monitoring site cabinet includes:
   A. One adjustable shelf; (equipped as shown)
   B. One backplane assembly; (equipped as shown)
   C. One J1 receptacle with mounting bracket;
   D. One J1 equipment cable 5 ft. long (Reference Sheet 4);
   E. All associated wiring and wiring harnesses.

2. Basic backplane assembly consists of:
   A. Two inductive loop terminal strips;
   B. One piece sensor terminal strip;
   C. One battery terminal strip;
   D. One solar panel terminal strip.

3. The contractor is responsible for contacting the TMS Manager at the Transportation Statistics 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 4).

NOTE:
Fabricate bracket out of 3/8 - 1/2 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.
1. Traffic monitoring site cabinet includes:
   A. One adjustable shelf (equipped as shown)
   B. Two backplane assemblies (equipped as shown)
   C. Two J1 receptacle with mounting bracket
   D. One J1 equipment cable 5 ft. long (Reference Sheet 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 Statistics 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 4 for pinout charts, receptacle, and plug details).

CABINET LAYOUT DETAILS (Five to Eight Lanes)
NOTES:
1. Reference Sheet 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.

CABINET BACKPLANE DETAIL

Loop Leads From Lanes 1 & 2

(See Note 3)

Loop Leads From Lanes 3 & 4

(See Note 3)

Piezo Sensor Leads From Lanes 1 - 4

(See Note 3)

Surge Suppressor (Typ.)

To 8 Receptacle

8" Gnd Wht

Loop 1a

Loop 1b

Loop 2a

Loop 2b

Loop 3a

Loop 3b

Loop 4a

Loop 4b

Gnd

Ven. Sen. 1

Ven. Sen. 2

Ven. Sen. 3

Ven. Sen. 4

Battery Terminal

Solar Power Voltage Regulator

Solar Terminal

Ground

8 in. x 24 in. x 1/8 in.
Thick Aluminum Backplane

Inductive Loop Lead-In And
Piezo Sensor Leads From Roadway

Voltage Regulator

8 in. x 24 in. x 1/8 in.
Thick Aluminum Backplane

BAGRINI.

1. Reference Sheet 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.

CABINET BACKPLANE DETAIL

Loop Leads From Lanes 1 & 2

(See Note 3)

Loop Leads From Lanes 3 & 4

(See Note 3)

Piezo Sensor Leads From Lanes 1 - 4

(See Note 3)

Surge Suppressor (Typ.)

To 8 Receptacle

8" Gnd Wht

Loop 1a

Loop 1b

Loop 2a

Loop 2b

Loop 3a

Loop 3b

Loop 4a

Loop 4b

Gnd

Ven. Sen. 1

Ven. Sen. 2

Ven. Sen. 3

Ven. Sen. 4

Battery Terminal

Solar Power Voltage Regulator

Solar Terminal

Ground

8 in. x 24 in. x 1/8 in.
Thick Aluminum Backplane

Inductive Loop Lead-In And
Piezo Sensor Leads From Roadway

Voltage Regulator

8 in. x 24 in. x 1/8 in.
Thick Aluminum Backplane

BAGRINI.
1. The contractor is responsible for contacting the EMS Manager in the Transportation Statistics 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 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.

**NOTES:**

- The contractor is responsible for contacting the EMS Manager in the Transportation Statistics Office for lane number information and verification.
- The equipment cable can accommodate up to four lanes of inductive loop and piezo sensor inputs (Reference Sheet 1 for cabinet layout).
- 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)
- Numbers in parenthesis in the pinout chart identify lane numbers when a second backplane for lanes 5 through 8 is required.
- Cable ends must be fabricated to fit the vehicle Speed/Classification Unit.

**DESCRIPTION:**

- **OPTION A**
  - 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) yellow
      - N: Loop 4a (8a) purple
      - O: Loop 4a (8a) w/grey
      - P: Loop 4b (8b) w/brown
      - Q: Piezo 1 (5) sh/w/orange
      - R: Piezo 1 (5) (+) w/blue
      - S: Piezo 2 (6a) (+) w/red
      - T: Piezo 2 (6a) sh/w/red
      - U: Piezo 2 (6b) (+) w/black
      - V: Piezo 2 (6b) (+) w/red
      - W: Piezo 3 (7a) (+) red/green
      - X: Piezo 3 (7b) sh/red/yellow
      - Y: Piezo 4 (8b) (+) red/green
      - Z: Piezo 4 (8b) (+) red/green
      - A: Piezo 3 (7a) sh/red/yellow
      - B: Piezo 4 (8b) (+) red/green
      - C: Piezo 1 (5) (+) w/blue
      - D: Gnd
      - E: Gnd
      - F: Gnd
      - G: Gnd
      - H: Gnd
      - I: Gnd
      - J: Gnd
      - K: Gnd
      - L: Gnd
      - M: Gnd
      - N: Gnd
      - O: Gnd
      - P: Gnd
      - Q: Gnd
      - R: Gnd
      - S: Gnd
      - T: Gnd
      - U: Gnd
      - V: Gnd
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      - c: Gnd
      - d: Gnd
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      - m: Gnd
      - n: Gnd
      - o: Gnd
      - p: Gnd
      - q: Gnd
      - r: Gnd
      - s: Gnd
      - t: Gnd
      - u: Gnd
      - v: Gnd
      - w: Gnd
      - x: Gnd
      - y: Gnd
      - z: Gnd
  - **OPTION B**

  1. The contractor is responsible for contacting the EMS Manager in the Transportation Statistics 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 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.
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 will be cut wide enough to allow unforced placement of the wire into the bottom of the slot. Four turns of #14 AWG (the maximum recommended size), spaced 0.30" apart, will be installed in the slot. Place short pieces of backer rod (2" to 3" in length) every 18" to 24" to hold the loop wire in the bottom of the slot.

3. Twist loop leads at the rate of 8 to 16 times per foot. Leads that are within 150' of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances greater than 150', the loop wire is twisted 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 color for lane 1 and two rounds for lane 2, etc. The lead loop in lane 1 would have one round of tape and a second round of a contrasting colored tape for the lead loop in lane 1. 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 axle sensor slot at full width 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.

NOTES:

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 will be cut wide enough to allow unforced placement of the wire into the bottom of the slot. Four turns of #14 AWG (the maximum recommended size), spaced 0.30" apart, will be installed in the slot. Place short pieces of backer rod (2" to 3" in length) every 18" to 24" to hold the loop wire in the bottom of the slot.

3. Twist loop leads at the rate of 8 to 16 times per foot. Leads that are within 150' of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances greater than 150', the loop wire is twisted 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 color for lane 1 and two rounds for lane 2, etc. The lead loop in lane 1 would have one round of tape and a second round of a contrasting colored tape for the lead loop in lane 1. The trailing loop would not have a second contrasting colored band of tape.

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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.
NOTES:
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 No. 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: $\text{Latitude of the panel's location,}$ multiplied by $0.76$, plus $3.1$ degrees. Equation expressed as $(\text{LAT}) \times (0.76) + 3.1°$.
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. 30' or 35' poles: 3'-0" X 3'-0" wide, a depth of 4'-0"

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. 30' 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)
**STEP 1:** Calculate the area and the centroid for an individual sign or a sign cluster. Note that the centroid and areas have been calculated for frequently used sign clusters. These are shown on Sheets 7, 8, and 9.

**STEP 2:** Determine the height \( H \) from groundline to the centroid of the individual sign or sign cluster.

Assume: \( B = 1 \) ft., \( C = 7 \) ft.

\[
H = B + C = D = 10.26 \text{ ft.} \quad \Rightarrow \quad \text{USE 11 FT.}
\]

**STEP 3:** Refer to the Aluminum Column (Post) Selection Tables and find the intersection point. See Sheet 3.

**STEP 4:** For sign assemblies with signs oriented in two directions, only the sign with the largest area should be analyzed to determine the Column (Post) requirements.

**GENERAL NOTES:**

1. **Shop Drawings:**
   This Index is considered fully detailed. Submit Shop Drawings only for minor modifications not detailed in the Plans.

2. **Aluminum Sign, Wires, Beans and Column (Post) Materials:**
   - A. Aluminum Plates: ASTM B209, Alloy 6061-T6
   - B. Aluminum Bars and Extruded Shapes: ASTM B221, Alloy 6061-T6
   - C. Aluminum Structural Shapes: ASTM B808, Alloy 6061-T6
   - D. Light Aluminum: ASTM B826, Alloy 5056-T6
   - E. Aluminum Weld Material: ER 5556 or 3556

3. **Sign Mounting Bolts, Nuts and Washers:**
   - A. Aluminum Button Head and Flat Head Bolts: ASTM F468, Alloy 2024-T4
   - B. Aluminum Hex Nuts: ASTM F467, Alloy 6061-T6 or 6262-T9
   - C. Stainless Washers: ASTM B221, Alloy 7075-T6

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 Group 2, Condition A, CW1 or SM1
   - B. Stainless Steel Nuts: ASTM F 594

5. **Sign Column (Post) Bolts, Nuts and Washers:**
   - A. Stainless Steel Bolts: ASTM F 593 Alloy Group 2, Condition A, CW1 or SM1
   - B. Stainless Steel Nuts: ASTM F 594

6. **Coatings:**
   - A. Aluminium Fasteners: Anodic coating (0.0002 inches min.) and chromate sealed
   - B. High Strength Steel Bolts and Washers: ASTM F 3329
   - C. All other steel items (excluding stainless steel): Hot dip galvanizing - ASTM A123
   - D. Repair damaged galvanizing in accordance with Specification 363

7. **Breakaway SUPPORT REQUIREMENTS:**
   Install non-frangible aluminum column (post) (larger than 3") with breakaway supports as shown on Sheet 4. Signs shielded by barrier wall or guardrail do not require breakaway support.

**GUIDE TO USE THIS INDEX**

**SHEET**

1. General Notes and Design Example
2. Design Example - Centroid
3. Column and Foundation Tables
4. Shop Base and Foundation Details
5. Drive Post and Soil Plate Details
6. Wide Beam Connections

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**SHEET 700-010**

1 of 9
**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.

---

**CALCULATION OF SIGN CLUSTER CENTROID**

\[
\bar{X}_C = \frac{\sum (X_i \times A_i)}{\sum A_i}, \quad \bar{Y}_C = \frac{\sum (Y_i \times A_i)}{\sum A_i}
\]

- \(X_i\) = Area of individual sign
- \(Y_i\) = Height of the edge of pavement from the mounting elevation
- \(C\) = Height of the centroid of the sign or cluster from the edge of pavement elevation
- \(a\) = Individual sign height
- \(h\) = Height of the centroid of the sign or cluster from the bottom of the sign or cluster
- \(b\) = Individual sign width
- \(\bar{X}_C\) = Centroid horizontal location of sign or cluster from Aluminum Column (Post)
- \(\bar{Y}_C\) = Centroid height of sign or cluster from bottom of sign cluster
- \(\bar{X}_H\) = Individual sign centroid horizontal location from Aluminum Column (Post)
- \(\bar{Y}_H\) = Individual sign centroid height from bottom of sign cluster

---

**TYPICAL SECTION**

- **CENTROID**
- **SIGN CLUSTER**
- **TYPICAL SECTION**

---

**DESIGN EXAMPLE - CENTROID**

**SINGLE COLUMN GROUND SIGNS**

**INDEX 700-010**

**SHEET 2 of 9**

**FY 2019-20**

**STANDARD PLANS**

**REV 2/28/18**

**LAST REVIEW 11/01/18**

**DESCRIPTION:**
**OFFSET SIGN**

**NOTE:**
- For offset sign placement see Index 700-010.
- Set signs with driven posts require a soil plate.

**Driven Post**

**Foundation Alternatives**

**Embedment Depth (ft)**

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<td>3.0</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>4</td>
<td>4.0</td>
<td>6&quot; (Min.)</td>
</tr>
</tbody>
</table>

**COLUMNS AND FOUNDATION TABLES**

**Foundation Table**

- Include the foundation table in your project documents or add a foundation table to your plans.
- Provide notes specifying the foundation requirements and construction details.

**Notes:**
- All columns shall be founded in accordance with provisions of these standards.
- Columns that are not listed shall be designed and constructed according to standard practices.
- Refer to the foundation table for detailed information on the required foundation details.
NOTES:

1. Foundation Notes for Slip Base:
   A. Place Stub into concrete foundation given in the 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 1/8" or less.
   B. Either a Welded Stub Base or Bolted Stub/Sleeve Base may be used in 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 the Slip Base as follows:
      1. Insert Post into Sleeve and connect using 2 ~ 3/8" diameter Sleeve Bolts. (See Detail 'A':
         a. Place washer on each Base Bolt between the bottom Base Plate and the Base Bolt head.
         b. Place the next washer between the Bottom Base Plate and the Bolt Keeper Plate.
         c. Use brass or galvanized steel shims to plumb the post.
         d. Add the top base plate section.
         e. Place the third washer between the Top Base Plate and the Nut.
   B. Orient the Bolt Keeper Plates in the Direction of Traffic.
   C. Tighten Base Bolts as follows:
      1. Tighten Base Bolts to the maximum possible with a 12" wrench (this will bed the washers and shims and clear the bolt threads).
      2. Loosen each Base Bolt one turn.
      3. Under the supervision of the Engineer, use a calibrated wrench to tighten bolts to the torque prescribed in the SLIP BASE DETAILS Table. Over tightened Base Bolts are not permitted.
      4. Distort bolt threads at the junction with nuts to prevent loosening. Repair damaged galvanizing.
      D. Obtain a tight sleeve connection by placing 4 galvanized steel shims between the column (post) and sleeve. Place the shims evenly around the perimeter of the column (1 between each bolt hole). Use shims that are 1" shorter than the height of the sleeve.
Optional Slotted Holes

DETAIL "B"

ALUMINUM SOIL PLATE DETAIL

DRIVEN POST DETAIL

(Fragile Post in Crossovers, Medians & Side Walks)

PLAN

3 1/2" O.D. Max.
Aluminum Column (Post)

U Bolt

2" Hole

Aluminum Soil Plate

Concrete Sidewalk, Median, Etc.

ELEVATION

3 1/2" O.D. Max.
Aluminum Column (Post)

(Driven to Full Embedment)

2" Grout Seal

1/3 of Embedment Depth

Concrete Sidewalk, Median, Etc.

D R I V E N  P O S T  A N D  S O I L  P L A T E  D E T A I L

SINGLE COLUMN GROUND SIGNS

INDEX

700-010

5 of 9
WIND BEAM CONNECTIONS DETAILS

NOTES:
1. 5/8" Ø Stainless Steel Hex Head Bolts with Flat Washer under Head and Washer under Nut may be used in lieu of 1/2" Ø Aluminum Button or Flat Head Bolts.
2. Use Nylon washers (provided by the sheeting supplier) under the button bolt heads to protect sign sheathing.
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.
5. For rectangular signs greater than 60" install a third wind beam evenly spaced between the top and bottom wind beams. For rectangular signs up to 12" in height, use only one wind beam at top or bottom. For rectangular signs greater than 12" in height, use only one wind beam at top or bottom.

SINGLE SIGN DETAIL

BACK-TO-BACK SIGN DETAIL

NOTE: Use the area and the centroid location of the largest sign to determine aluminum column (post) size.
### Single Column Ground Signs

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<tr>
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#### Diagrams

- [Diagram of Sign 1](#)
- [Diagram of Sign 2](#)
- [Diagram of Sign 3](#)
- [Diagram of Sign 4](#)
- [Diagram of Sign 5](#)
- [Diagram of Sign 6](#)
- [Diagram of Sign 7](#)
- [Diagram of Sign 8](#)
### Single Column Ground Signs

<table>
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</tr>
<tr>
<td>30x30</td>
<td>4.69 SF</td>
<td>10.69 SF</td>
<td></td>
</tr>
<tr>
<td>36x36</td>
<td>9.00 SF</td>
<td>14.00 SF</td>
<td></td>
</tr>
<tr>
<td>30x24</td>
<td>5.00 SF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Description

- **Size**: The dimensions of the signs are provided in various formats (e.g., 30x15, 45x36).
- **Area**: The area of each sign is calculated and listed.
- **Total Area**: The total area for each sign is also provided.
- **Centroid**: The centroid of each sign is noted, indicating the center point of the sign.

### Notes

- The signs are oriented for readability, with proper spacing and alignment for drivers to see clearly.
- The text "EAST TO EAST TO INTERSTATE 75" appears to be a part of the signage, guiding drivers towards Interstate 75.
- The speed limit of 35 MPH is indicated, ensuring safe driving conditions.
- The signs are designed with varying sizes and areas to accommodate different types of information and to ensure visibility at different distances.

### Additional Details

- The document includes a revision date of 01/01/17, indicating the last update to the standards plan.
- The sheet index is 700-010, suggesting it is part of a larger set of plans.
- The image shows a diagram of the signs, including symbols and texts that are crucial for understanding the directions and information provided.
GENERAL NOTES:
1. Refer to Index 700-010 for additional notes, assembly of base connection and material specifications not given in this Index.
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 2 3/8 x 3 3/8. 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.
6. Use nylon washers under the button bolt heads to protect sign sheeting. Use aluminum washers under nut.

COLUMN SELECTION AND FOOTING SIZE TABLE

<table>
<thead>
<tr>
<th>Sign Size</th>
<th>Column Size</th>
<th>Sleeve Size</th>
<th>U-bolt</th>
<th>Base Bolt</th>
<th>Torque lbs.in</th>
<th>Base Plate Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; x 9'-0&quot;</td>
<td>4 NPS Schedule 80 (4.5&quot; x 0.337&quot;)</td>
<td>5 NPS Schedule 120 (5.562&quot; x 0.375&quot;)</td>
<td>1/2&quot;</td>
<td>3/4&quot; x 3/4&quot;</td>
<td>270</td>
<td>1&quot;</td>
</tr>
<tr>
<td>4'-0&quot; x 8'-0&quot;</td>
<td>4 NPS Schedule 80 (4.5&quot; x 0.337&quot;)</td>
<td>5 NPS Schedule 120 (5.562&quot; x 0.375&quot;)</td>
<td>1/2&quot;</td>
<td>3/4&quot; x 3/4&quot;</td>
<td>445</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>4'-0&quot; x 7'-0&quot;</td>
<td>4 NPS Schedule 80 (4.5&quot; x 0.337&quot;)</td>
<td>5 NPS Schedule 120 (5.562&quot; x 0.375&quot;)</td>
<td>1/2&quot;</td>
<td>3/4&quot; x 3/4&quot;</td>
<td>270</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

FIGURE 4.2-10: Foundation Column (See Sheet 2)
NOTES:
1. Work with index 700-010.
2. Shop Drawings: Not required.
3. Materials:
   A. Steel Pipe: ASTM A36 or ASTM A709 Grade 36
   B. Steel Pipe (Support Post): ASTM A500 Schedule 40
   C. Aluminum Pipe: ASTM B429 Alloy 6063-T6
   D. Galvanized U-Bolts, Nuts and Plate Washers
      a. U-Bolts: ASTM A449
      b. Hex Nuts: ASTM A 563 Lock Nuts
      c. Plate Washer: ASTM A 36 or ASTM A709 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 931 Type HF Adhesive.
   G. Weld Material: E70XX
   H. Snap-In Post Cap: UV and weather-resistant glass-filled polyester cap
4. Coatings:
   A. U-Bolts, Threaded Rods, Nuts and Washers: ASTM F2132
   B. Other Steel: ASTM A123
5. Fabrication:
   A. Weld: 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. Base plate must be flush with back of Traffic 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 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 1/16" 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>MAX. SIGN AREA (SF)</th>
<th>MAX. SIGN CENTROID HEIGHT (DIM. A + DIM. C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'</td>
<td>9'-7&quot;</td>
</tr>
</tbody>
</table>

Dimension A = Distance from 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**

**SIGN LIMITATIONS TABLE**

<table>
<thead>
<tr>
<th>MAX. SIGN AREA (SF)</th>
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**SIGN SUPPORT ASSEMBLY**

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</thead>
<tbody>
<tr>
<td>2'</td>
<td>9'-7&quot;</td>
</tr>
</tbody>
</table>

Dimension A = Distance from 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.
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 5/8" Heavy Hex Head Bolts with Nuts and Washers in lieu of Adhesive Bonded Anchors. Bolt heads shall not protrude more than 1/2" 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 1/4".

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.
   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 1/4".

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.

1. Locate existing conduit prior to drilling and adjust placement of base plate as necessary to avoid damaging existing conduit.
2. Existing Traffic Railings:
   A. At least 2" from face of traffic railing to tip of Adhesive Anchor.
   B. For concrete parapets less than 12" thick, through bolt 5/8" Heavy Hex Head Bolts with Nuts and Washers in lieu of Adhesive Bonded Anchors. Bolt heads shall not protrude more than 1/2" 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 1/4".

2. New Traffic Railings:
   A. Optional Couplers are shown for slip-forming; keep Anchor Bolt coupler threads free of concrete.
   B. For concrete parapets less than 10" thick, through bolt Adhesive Anchor.
   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 1/4".

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.
SIGN SUPPORT ASSEMBLY

BASE PLATE

U-BOLT PLATE WASHER

END PLATE

SIGN SUPPORT WELDMENT DETAIL

SINGLE POST BRIDGE MOUNTED SIGN SUPPORT

FY 2019-20

STANDARD PLANS

INDEX

700-012

3 of 3
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 A53 Grade B Schedule 40
   C. Galvanized U-Bolts, Nuts and Washer
      a. U-Bolts: ASTM A449
      b. Hex Nuts: ASTM A 563 Lock Nuts
      c. Plate Washer: ASTM A 36 or ASTM A709 Grade 36 or 50
   D. Galvanized Anchor Bolts, Nuts and Washers:
      a. Anchor Rod: ASTM F1554 Grade 55 Fully Threaded (for Adhesive Anchors)
      b. Anchor Rod: ASTM A 36 Grade 50 Grade A Hex
      c. Nuts: ASTM A 363 Heavy Hex Locking
   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 Rods, Nuts and Washers: ASTM F2329
   B. Other Steel: ASTM A123

5. Fabrication:
   A. Weld: 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. Base plate must be flush with 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 template and cut anchors as necessary to maintain correct placement of C-F-P Embedded Anchors
      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
   F. Embodied Anchors:
      a. Install Adhesive Anchors in accordance with Specification 416 except perform field test on one anchor per sign support location
      b. Use template and cut anchors as necessary to maintain correct placement of C-F-P Embedded Anchors
      c. Do not drill into existing reinforcing
   G. Snap-In Post Cap: UV and weather-resistant glass-filled polyester cap

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 F-1 epoxy to prevent corrosion
   C. Coat coating 2 inches beyond edge of cutting anchor rods

8. Payment:
   Include the cost of all materials and labor in the cost of the single post sign assembly.

### TABLE 1 - SIGN PANEL AND POST SIZING

<table>
<thead>
<tr>
<th>Temporary Signs</th>
<th>Max. Sign Area (SF)</th>
<th>Post (NPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 24</td>
<td>≤ 30</td>
</tr>
<tr>
<td>Permanent Signs</td>
<td>&gt; 24</td>
<td>&gt; 30</td>
</tr>
<tr>
<td></td>
<td>135 ≤ Sign ≤ 20</td>
<td>35</td>
</tr>
</tbody>
</table>

---

[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>INDEX</th>
<th>Type/Application</th>
<th>Base Plate Type</th>
<th>Anchor Rod Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>521-001</td>
<td>Full Wall</td>
<td>A</td>
<td>1&quot;</td>
</tr>
<tr>
<td>521-001</td>
<td>Cantilever or L-Wall</td>
<td>B</td>
<td>2&quot;</td>
</tr>
<tr>
<td></td>
<td>Temporary Signs</td>
<td>C</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

**TABLE 2 - BASE PLATE TYPE AND ANCHOR ROD SIZING**

**BASE PLATE TYPE A**
(Linear Anchor Rod Pattern)

**BASE PLATE TYPE B**
(Staggered Anchor Rod Pattern)

**BASE PLATE TYPE C**
(Staggered Anchor Rod Pattern shown)
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 Metal: E70XX
      c. Sheet Brass ASTM B63 or Galvanized Steel
   C. Aluminum Bolts, Nuts and Washers:
      a. Flat Head and Button Head Bolts: ASTM F 468, Alloy 2024-T4
      b. Hex Nuts: ASTM F467, 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 F3125, Grade A325, Type 1
      b. Nuts: ASTM F594, Grade A325
      c. Washers: ASTM B221, Grade DH
   E. Galvanized Washers: ASTM F436
   F. Galvanized High Strength Steel Bolts, Nuts and Washers: ASTM F2329
   G. Reinforcing Bars or Welded Wire Reinforcement (WWR): Specification 415

4. Coatings:
   A. Aluminum Fasteners: Anodic coating (0.0002 inches min.) and chrome sealed
   B. Galvanize High Strength Steel Bolts Nuts and Washers: ASTM F2329
   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. Tighten 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.

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**State of Florida**

**Welcome Center**

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**Multi-Column Sign Assembly**

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**FY 2019-20 Standard Plans**

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**Index 700-020**

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**Sheet 1 of 3**
MULTI-COLUMN SIGN ASSEMBLY

FOUNDATION NOTES:
The Contractor may use Welded Wire Reinforcement (WWR) for foundation reinforcing.

At the Contractor's option, the #4 tie bars at 12" o.c. may be replaced by D10 Spiral Wire @ 6" pitch, with three flat turns at the top and one flat turn at the bottom in accordance with Specification 415.

INSTRUCTIONS NOTES:
1. Assembly of Base Instructions:
   A. Place one washer on each base bolt between the bottom base plate and the head of high strength base bolt. Place the next washer between the bottom base plate and the bolt keeper plate, and the top base plate section and place the third washer between the top base plate and the nut.

B. Shim as required to plumb column. Provide 2-0.0149" thick (28 gauge) and 3-0.0329" thick (31 gauge) shims per column

2. H.S. Base Bolt L1 Tightening Instructions:
   A. Tighten base bolts to the maximum possible with a 12" to 15" wrench this will bed the washers and shims and clear the bolt threads.

B. Loosen each base bolt one turn.

C. Under the supervision of the Engineer, use a calibrated wrench to tighten bolts to the torque prescribed in the Table. Over tightened Base Bolts will not be permitted.

D. Burr threads at junction with nut to prevent nut loosening. Treat damaged galvanizing
MULTI-COLUMN SIGN ASSEMBLY

MULTI-COLUMN SIGN BACK PANEL

WIND BEAM, BACKING STRIP & FUSE/HINGE PLATE DETAILS

FUSE (HINGE) PLATE DATA

<table>
<thead>
<tr>
<th>Steel Section</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>n</th>
<th>1_2</th>
<th>1_3</th>
<th>1_4</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 3x5.7</td>
<td>7/16&quot;</td>
<td>5/8&quot;</td>
<td>1&quot;</td>
<td>1 1/16&quot;</td>
<td>1 1/16&quot;</td>
<td>3/8&quot;</td>
<td>7/16&quot;</td>
<td>9/16&quot;</td>
</tr>
<tr>
<td>W 6x12</td>
<td>7/16&quot;</td>
<td>5/8&quot;</td>
<td>1&quot;</td>
<td>1 1/16&quot;</td>
<td>1 1/16&quot;</td>
<td>3/8&quot;</td>
<td>1 3/16&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>W 8x12</td>
<td>7/16&quot;</td>
<td>5/8&quot;</td>
<td>1&quot;</td>
<td>1 1/16&quot;</td>
<td>1 1/16&quot;</td>
<td>3/8&quot;</td>
<td>1 3/16&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>W 10x14</td>
<td>7/16&quot;</td>
<td>5/8&quot;</td>
<td>1&quot;</td>
<td>1 1/16&quot;</td>
<td>1 1/16&quot;</td>
<td>3/8&quot;</td>
<td>1 3/16&quot;</td>
<td>3/8&quot;</td>
</tr>
</tbody>
</table>

WIND BEAM SIZE BASED ON SIGN LENGTH (L)

<table>
<thead>
<tr>
<th>L &lt; 12'</th>
<th>L õ 12'</th>
<th>L õ 20'</th>
<th>L õ 25'</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Columns</td>
<td>2 Columns</td>
<td>4 Columns</td>
<td>4 Columns</td>
</tr>
<tr>
<td>2-1/8&quot; x 5-7/8&quot; x 10'9&quot;</td>
<td>4-3/8&quot; x 8-3/8&quot; x 18'</td>
<td>2-1/8&quot; x 5-7/8&quot; x 10'9&quot;</td>
<td>4-3/8&quot; x 8-3/8&quot; x 18'</td>
</tr>
</tbody>
</table>

NUMBER OF WIND BEAMS BASED ON SIGN DEPTH (D)

<table>
<thead>
<tr>
<th>D &lt; 8&quot;</th>
<th>8&quot; &lt; D õ 12&quot;</th>
<th>12&quot; &lt; D õ 18&quot;</th>
<th>18&quot; &lt; D õ 20&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Beams</td>
<td>3 Beams</td>
<td>4 Beams</td>
<td>5 Beams</td>
</tr>
</tbody>
</table>

INDEX

FY 2019-20
STANDARD PLANS

MULTI-COLUMN GROUND SIGN

700-020 3 of 3
**PLACEMENT OF SIGN LIGHTS**

1. This Index details a bottom luminaire support structure. For signs requiring top luminaire support structures, the detail can be reversed.

2. Luminaire spacing and arm length is shown on Guide Sign Worksheet.

3. Signing contractor provides all electrical equipment necessary for connection of the sign lights.

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.

**SIGN LIGHTING INSTALLATION**

**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 loops 2' of lighting circuit conductors in the pull box for connection by the signing contractor.

**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” U-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. Bolts: ASTM A307
   D. Hex Nuts: ASTM A563
   E. Washers: ASTM F436


4. All pipe dimensions are NPS.

5. Chord O.D. ± 2” (Max.)

6. Unless otherwise shown in Plans (6’-0” Max.)

LUMINAIRE SUPPORT STRUCTURE

Varies by luminaire type

1. Install hanger pipe to each vertical beam crossed with a 5/8” U-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
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   D. Hex Nuts: ASTM A563
   E. Washers: ASTM F436


4. All pipe dimensions are NPS.

5. Chord O.D. ± 2” (Max.)

6. Unless otherwise shown in Plans (6’-0” Max.)

LUMINAIRE SUPPORT STRUCTURE

Varies by luminaire type
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.

   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
      i. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A500, Grade B (Min.)
      ii. Steel Angles and Structural Plates and Bars: ASTM A572 Grade 36
      iii. Weld Material: E70XX
   b. Bolts, Nuts and Washers
      i. High Strength Bolts: ASTM F3125, Grade A325 Type 1
      ii. Nuts: ASTM A597 Grade DH Heavy-Duty
      iii. Washers: ASTM F846 Type 1, one under turned element
   c. Anchor Bolts, Nuts and Washers
      i. Anchor Bolts: ASTM F2554 Grade 55
      ii. Nuts: ASTM A563 Grade 6 Heavy-Flok
      iii. Plate Washers, ASTM A426 (2 per bolt)
   d. Concrete
      i. Spreader Footing Concrete: Class IV
      ii. Drilled Shaft concrete: Class IV (Drilled Shafts)
      iii. Reinforcing Steel: Specification 415

5. Fabrication:

   a. Welding: Specification 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 TABLES. Minimum splice spacing is two truss panel lengths apart.
   c. Upright Splices: Not allowed
   d. Structural bolt hole diameters: Bolt diameter plus 1/4".
   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 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 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 700.
   e. Split-Lock Washers are not permitted.
   f. Install Aluminum Sign Panels as shown in the Plans.
   g. Place structural grout pad with drain between top of foundation and bottom of baseplate in accordance with Specification 649-7.

ISOMETRIC VIEW

CANTILEVER SIGN ASSEMBLY
CANTILEVER ASSEMBLY

PLAN

Directions of Travel

SIDE ELEVATION

NOTES:
1. Construction joint allowed, roughen surface to 1/4" minimum amplitude prior to pour.
2. See Traffic Plans for elevation at top of Foundation.
3. 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.
4. The shaft length is based on 2'-0" height above finished grade.
5. Structural Grout Pad dimension may be modified to be less than 3" where the footprint of the Drilled Shaft does not provide adequate clearance for accessibility considerations.
6. Wrap fillet weld around the stiffener termination on the tube wall.

FOOTING AND PEDESTAL

FOUNDATION

BASE PLATE CONNECTION
**UPRIGHT-TRUSS CONNECTION DETAIL**

**SECTION A-A**

(With Gusset Plates And Web Angles Omitted For Clarity)

**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 ASSEMBLY**

**SECTION A-A**

(With Gusset Plates And Web Angles Omitted For Clarity)

**DETAIL 'C'**

**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**

**R E V I S I O N**

**DESCRIPTION:**

**LAST REVISON**

**INDEX**

**SHEET**

**CANTILEVER SIGN STRUCTURE**

**STANDARD PLANS**

**FY 2019-20**

**INDEX**

**SHEET**

3 of 5
TRUSS NOTES:
1. Out-of-plane members are not shown for clarity.
2. Wrap fillet weld around plate termination on the tube wall.
3. Chord Splices not shown.

TRUSS NOTES:
1. Out-of-plane members are not shown for clarity.
2. Wrap fillet weld around plate termination on the tube wall.
3. Chord Splices not shown.

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<tr>
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<th>Distance</th>
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<td>11/32&quot;</td>
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</tr>
<tr>
<td>1/8&quot; x 1/4&quot;</td>
<td>1/8&quot;</td>
<td>11/32&quot;</td>
</tr>
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</table>

See Upright-Truss Connection Detail (Sheet 3)

See Upright-Truss Connection Detail (Sheet 3)
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 Plan and Index 700-020.

2. Handholes at the pole base are required for DMS Structures. Refer to Index 700-090 for Handhole Details.

3. Shop Drawings are required.

   a. Obtain Shop Drawing approval prior to fabrication. Include the following:
      - A. Upright Pipe height ("C" & "B") and foundation elevations: Verify 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. 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, X52, 42 ksi yield or ASTM A500, Grade B (Min).
      - B. Steel Angles and Plates: ASTM A709 grade 36
      - C. Weld material: E70XX

   b. Bolts, Nuts, and Washers:
      - A. High Strength Bolts: ASTM F3125, Grade 55 or ASTM A574, Grade 70
      - B. Nuts: ASTM A563, Grade A Heavy-Hex
      - C. Washers: ASTM F436, Type 1, one under turned element

   c. Anchor Bolt, Nut, and Washers:
      - A. Anchor Bolt: ASTM A325, Grade 5
      - B. Nuts: ASTM A563, Grade DH Heavy-Hex
      - C. Washers: ASTM A36 (2 per bolt)

   d. Concrete: DPC: Class IV (Drilled Shaft)

   e. Reinforcing Steel: Specification A515

5. Fabrication:

   a. Welding: Specification 460-6.4

   b. Chord Splices: Minimum splice spacing is three truss panel lengths apart; three truss panel lengths from the uprights.
   - C. Upright Splice: Not allowed
   - D. Structural bolt hole diameters: Bolt diameter plus 3/16".
   - E. Anchor bolt hole diameters: Bolt diameter plus 1/16".
   - 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 455 Drilled Shaft, 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. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
   - D. Tighten nuts and bolts in accordance with Specification 700.
   - E. Install Aluminum Sign Panels as shown in the Plans.
   - F. After installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification 649-6.

8. Foundation:

   a. Anchor bolt orientation with respect to centerline of truss and the direction of traffic.
   - B. Height of the foundation above adjacent ground.
   - C. Anchor bolt orientation with respect to centerline of truss and the direction of traffic.
   - D. Method to be used to provide the required parabolic camber (see Camber Diagram).
   - E. Handholes at pole base (when required).

   a. Foundation in accordance with Specification 455 Drilled Shaft, 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. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
   - D. Tighten nuts and bolts in accordance with Specification 700.
   - E. Install Aluminum Sign Panels as shown in the Plans.
   - F. After installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification 649-6.
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 above finished grade.

4. Wrap fillet weld around the stiffener termination on the tube wall (Typ).

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 above finished grade.

4. Wrap fillet weld around the stiffener termination on the tube wall (Typ).
SPAN SIGN ASSEMBLY

SPAN SIGN STRUCTURE

Upright-Truss Connection

1. Wrap fillet weld around the stiffener termination on the tube wall.
2. Truss Chord Bolts: 'LB' or 'RB' Hex Head Bolts 'LA' or 'RA'.
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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SPAN SIGN STRUCTURE

DETAIL 'D'

DETAIL 'E'

DETAIL 'F'

DETAIL 'G'

DETAIL 'H'

DETAIL 'I'

DETAIL 'J'

DETAIL 'K'

DETAIL 'L'

DETAIL 'M'

DETAIL 'N'

DETAIL 'O'

DETAIL 'P'

DETAIL 'Q'

TRUSS

SIDE ELEVATION

BACK-SIDE SIGN MOUNTING

FRONT ELEVATION

(See Note 1)

(See Note 2)

(See Note 3)

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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SPAN SIGN STRUCTURE

DETAIL 'D'

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DETAIL 'Q'

TRUSS

SIDE ELEVATION

BACK-SIDE SIGN MOUNTING

FRONT ELEVATION

(See Note 1)

(See Note 2)

(See Note 3)

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.
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DETAIL 'Q'

TRUSS

SIDE ELEVATION

BACK-SIDE SIGN MOUNTING

FRONT ELEVATION

(See Note 1)

(See Note 2)

(See Note 3)
SPAN SIGN ASSEMBLY

UPRIGHT CAP DETAIL

SPLICE CONNECTION DETAIL

TRUSS PLUG DETAIL

UPRIGHT PIPE DETAIL

SIDE ELEVATION

SECTION D-D

UPRIGHT CAP DETAIL
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 meet the requirements of Specification 700.
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 Specification 700 for "Acceptance by Certification" require the submittal of structural calculations and Shop Drawings that have been prepared by and sealed by the Specialty Engineer.
GENERAL NOTES:
1. Mark 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 8 feet in length.
5. If required, install guardrail at location shown in the Plans and in accordance with Index 536-001.
6. Materials
   A. Sign Mounting Components:
      a. Aluminum Structural Shapes: ASTM B308, Alloy 6061-T6
   B. Vertical Hangers: ASTM A404, Grade 36
   C. (a) Bolts: ASTM 4449 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)
   E. Coatings:
      a. All nuts, bolts and washers ASTM F2329
      b. All other steel items ASTM A123
      c. Bolt hole Diameters: Bolt plus 1/2" before galvanizing
7. Installation:
   A. See project requirements for location of DMS Cabinet.
   B. Field Adjust pole-mounted 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 anchor bolts.
   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 structure. Field locate holes to allow vertical hanger placement as shown on the Plans with no conflicts as shown on the Plans with no conflicts with gusset or splice plates.
   E. Locate threaded couplings on sign side of upright above the sign structure.
   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. If steel framework is to be drilled and tapped to accept 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.
   G. Bolts in the conduit must be greater than the minimum bending radius for the cable contained in the conduit.
   H. Completely encase all data, fiber optic and power cables for the DMS within the sign structure or in conduit.
   I. Transition conduit in foundation to indicate underground conduit with appropriate reducer outside the limits of the foundation.
   J. Permanently stamp/mark foundation to indicate conduit locations.
   K. Transition conduit in foundation to indicate underground conduit with appropriate reducer outside the limits of the foundation.

DYNAMIC MESSAGE SIGN ASSEMBLY

AIR TERMINAL (TYPE)
(COUNT SHEET 3)

CANTILEVER SIGN STRUCTURE
(SEE INDEX 700-040)

GUARDRAIL (SEE NOTE 5)

SPAN ISOMETRIC VIEW

DYNAMIC MESSAGE SIGN WALK-IN

INDEX 700-090

1 of 5
NOTE: Actual number and direction of travel lanes varies.
Zee Beam Aluminum Zee 4½x3½x3½ (Typ.)
Horizontal Member Attached To The Internal Framework And Included With The DMS Sign

Vertical Hanger Galvanized W6x9 (Typ.)
Hanger @ 5' (Max.) Spacing

2½" Ø U-Bolts With Double Nuts And Washers

Provide 2 ~½" Ø Bolts
Field Drill Holes And

Vertical Hanger Spacing 9-3/8" (Max.)
Quantities And Spacing Of The Members Will Be Dictated By Locations Of
Truss Connection Plates, Splices And 9-3/8" (Max.) Spacing

(Countlerver Sign Structure Shown, Span Sign Structure Similar)

HANGER LOCATION DETAIL

SECTION B-B

DYNAMIC MESSAGE SIGN END VIEW

SECTION C-C

SECTION D-D

DYNAMIC MESSAGE SIGN WALK-IN
CASE I
Use On Mainline Freeways And Express Way Systems

CASE II
Use In All Rural Roads, Freeways And Expressway Ramps

CASE III
Use In 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

NOTE:
- If median width does not allow standard offset from both roadway, center sign in median.
- Use On Mainline Freeways And Express System.

NOTE:
- 14'-0" Lateral Offset on all freeway and expressway ramps.

NOTE:
- 14'-0" (Max.)

NOTE:
- Case I
- Use On Mainline Freeways And Express Way Systems

NOTE:
- Case II
- Use In All Rural Roads, Freeways And Expressway Ramps

NOTE:
- Case III
- Use In All Roads With Signs Mounted Behind Sidewalk

NOTE:
- Case IV
- Use On All Rural, Freeway And Express Systems

NOTE:
- Case V
- Use In Business Or Residential Areas Only

NOTE:
- Case VI
- Use On All Roadway With Signs Behind Guardrail

NOTE:
- Case VII
- REST AREA AND EXIT GORE SIGNS
- Use On All Rural, Freeway And Express Systems

NOTE:
- Case VIII
- Use On Island Or Curbed Median

NOTE:
- For more information refer to Section 2H of the MUTCD.

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 yield prior to fabrication.

3. Install ground signs at an angle of 1 to 4 degrees away from the traffic flow (see illustrations). Install shoulder mounted signs rotated clockwise 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 Travelled 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 Travelled 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
   - 9' - Urban (including residential with parking and/or pedestrian activity)
   - Expressway And Freeway Systems:
     - If a secondary sign is mounted below the major sign, mount the major sign so that the bottom of the sign is at least 8' above the edge of the traveled way and the secondary sign at least 8' above the edge of the traveled way.
   - Other Systems:
     - Rural, mount the secondary sign at least 5' above the edge of the traveled way.
     - Urban, mount the secondary sign at least 7' above the edge of the traveled way.

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.
NOTES:
1. Stroke width of State Outline shall be 1".
2. 2/3" Radii.
4. Color: Yellow Legend and Border on Blue Background.
5. When used on a guide sign, marker must be overlaid on a rectangular Yellow Background as shown in chart.
6. Border on Blue Background.
7. When two or more County Route Markers are mounted together, use the dimensions of the largest marker for all other markers.

INDEPENDENT USE FOR FREEWAY

1 OR 2 DIGITS

INDEPENDENT USE OTHER THAN FREEWAY

3 OR 4 DIGITS

NOTES:
1. Series D Legend.
2. The 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. 1/8" Radii.
4. When used on a guide sign, marker must be overlaid on a rectangular Yellow Background as shown in chart.
5. Florida marker shall have Black Legend with White Background.

INDEX

SPECIAL SIGN DETAILS
SPECIAL SIGN DETAILS

FTP-40-06
3'-0" X 4'
6" Radii 3/4" Border
3" and 6" Series C Legend
White Background
Black Legend and Border

FTP-41-06
2'-6" X 3'
3" Radii 1/4" Border
2" and 4" Series C Legend
White Background
Black Legend and Border

FTP-42-06
4" X 4'
3" Radii Top 4" Series C Legend
Bottom 7" Series FW Legend
White Background
Blue Legend and Border

FTP-43-06
4" X 4'
4" Radii 1" Border
Bottom 6" Series D Legend
White Legend and Border

FTP-44-06
9" X 6'
9" Radii 3/4" Border
9" Series D Legend
White Background
Black Legend and Border

FTP-45-06
4" X 3'
3" Radii 1/4" Border
4" Series C Legend
White Background
Black Legend and Border

FTP-46-06
3'-0" X 4'
3" Radii 1/4" Border
3" Series D Legend
Green Florida Symbol
Black Legend, Border and Man Belt Symbol

FTP-47-06
2' X 2'-6"
3" Radii 1/4" Border
2" Series D Legend
Green Florida Symbol
Black Legend, Border and Man Belt Symbol

FTP-48-06
3'-6" X 3'
6" Radii
4" Series C Legend
Green Background
Black Legend, Border and Symbol

FTP-49-06
3'-6" X 3'
6" Radii
4" Series C Legend
Municipality Name Optional
White Legend, Border and Symbol

FTP-50-06
4" X 4'
4" Radii 1/2" Border
4" Series C Legend
Yellow Background
Black Legend and Border
No Obstruction To Text Or Symbols From Holes Or Bolts. Sign Mounting Holes Can Be Punched Or Field Drilled With No Obstruction To Text Or Symbols From Holes Or Bolts.


Black Legend and Border. Yellow Background. White Legend and Border. White Legend and Border.
VENDING FREE COFFEE

SAFETY BREAK

MACHINES

EVACUATION ROUTE

FTP-74-06
3'-0" x 3'-0"
4" Radii ½' Border
White Legend and Border
6" Series D Legend
White Legend and Border

FTP-75-06
6'-6" x 1'-3"
3" Radii
Blue Background
White Legend
7" Series D Legend
White Legend

FTP-76-06
6'-6" x 1'-3"
3" Radii
Blue Background
White Legend
8" Series D Legend
White Legend

FTP-77-06
3'-0" x 3'
5" Radii ½' Border
White Legend and Black Border
4" Series C Legend
White Legend

FTP-78-06
3' x 3'
6" Radii ½' Border
White Legend and Blue Circle Background
White Legend and Black Border
3" Radii

FTP-79-06
6' x 6'
6" Radii ½' Border
White Legend and Blue Circle Background
White Legend and Black Border
3" Radii

FTP-80-06
3' x 3'
5" Radii ½' Border
Top Yellow Background with Black Legend and Black Border
Bottom White Background with Black Legend and Border
10" Series D Legend
White Legend

FTP-81-06
5' x 5'
5" Radii ½' Border
Top Yellow Background with Black Legend and Black Border
Bottom White Background with Black Legend and Border
6" Series D Legend
White Legend

FTP-82-06
2' x 2'
5" Radii ½' Border
White Legend and Black Border
5" Series D Legend
White Legend

FTP-83-08
18' x 10'-0"
6" Radii ½' Border
Black Legend and Border
Green Background
White Legend
10" Series D Legend
White Legend

FTP-84-09
5' x 5'
5" Radii ½' Border
Black Legend and Border
Yellow Background
Black Legend and Border
5" Series D Legend
White Legend

WHITE LEGEND AND BORDER
BLUE BACKGROUND
6" SERIES D LEGEND
1" RADIi
5'-6" X 2'-6"
FTP-74-06

WHITE LEGEND
BLUE BACKGROUND
6" SERIES D LEGEND
1" RADIi
5'-6" X 1'-3"
FTP-75-06

WHITE LEGEND
BLUE BACKGROUND
8" SERIES D LEGEND
1" RADIi
5'-6" X 1'-3"
FTP-76-06

WHITE LEGEND
BLUE BACKGROUND
WHITE LEGEND
4" SERIES C LEGEND
WHITE LEGEND
FTP-77-06

WHITE LEGEND
BLUE BACKGROUND
6" SERIES D LEGEND
1" RADIi
5'-6" X 2'-6"
FTP-78-06

WHITE LEGEND
BLUE BACKGROUND
8" SERIES D LEGEND
1" RADIi
5'-6" X 1'-3"
FTP-79-06

WHITE LEGEND
BLUE BACKGROUND
4" SERIES C LEGEND
1" RADIi
3' X 3'
FTP-80-66

WHITE LEGEND
WHITE BACKGROUND WITH BLUE CIRCLE BACKGROUND
4" SERIES C LEGEND
4" RADIi
3' X 3'
FTP-81-66

WHITE LEGEND
WHITE BACKGROUND WITH BLACK LEGEND AND BORDER
2" SERIES D LEGEND
3" RADIi
2' X 2'
FTP-82-66

WHITE LEGEND
GREEN BACKGROUND
10" SERIES E LEGEND
8" RADIi
10'-0" X 5'-0"
FTP-83-66

WHITE LEGEND AND BLACK BORDER
WHITE BACKGROUND
5" SERIES D LEGEND
1.5" RADIi
2' X 3'
FTP-84-08

WHITE LEGEND AND BLACK BORDER
YELLOW BACKGROUND
5" SERIES D LEGEND
1.5" RADIi
3' X 3'
FTP-85-08

INDEX
700-102
SHEET
9 of 11

DESCRIPTION:
REVISED
11/01/17
STANDARD PLANS
FY 2019-20
SPECIAL SIGN DETAILS
11/01/17
REVISED
STANDARD PLANS
**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.

**One Post Service Signs**
See Detail "D".

**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.

5. The mounting height of the advance guide sign shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

6. 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.

7. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

8. When approved for attachment to the advance guide sign, up to 3 services 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.

9. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

10. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

11. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

12. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

13. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

14. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

15. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

16. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

17. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

18. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

19. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

20. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

21. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

22. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

23. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

24. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

25. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

26. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

27. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

28. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

29. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

30. The symbol signs shall be increased, where necessary, to provide a minimum of 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.
Welcome Center Signing

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. 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.

Note: Roadway not drawn to scale.
Distances shown are adequate for driver communication but may be altered slightly if conditions require.

Legend:
- E for series E
- FTP-10-06, FTP-11-06, FTP-12-06, FTP-13-06

Tourist Information Center
NEXT RIGHT

Sign FTP-14-06

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).
WELCOME CENTER SIGNING

STATE OF FLORIDA
WELCOME CENTER
1 MILE

STATE OF FLORIDA
OFFICIAL
WELCOME CENTER

SIGN FTP-15A-06
SIGN FTP-12-06

1/2 MILE
SIGN FTP-15B-06

SIGN FTP-15C-06

FTP-15A-06
FTP-15B-06
FTP-15C-06
FTP-12-06

2,240'
2,240'

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 15B-06 should be used depending on speed, roadside development & geometric conditions.

FOR PRIMARY HIGHWAYS

S 800' Maximum For Rural Conditions
50' Minimum For Rural Conditions
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. Delineators are to be placed not less than 2' or not more than 8' outside the outer edge of pavement.

3. Object markers and delineators on both sides of roadway shall face traffic approaching bridge.

4. 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 3 may require some field adjustment.
3. The Cross Road is the last detour to route around the restricted bridge.
4. The location of Sign 2 should be established from the Cross Road the following approximate distances: Interstate-1 Mile Non-Interstate-1/2 Mile.
5. See Index 700-102 for sign details.
DESCRIPTION:

WEIGH STATION
1 MILE

WEIGH STATION
NEXT LEFT

WEIGH STATION
NEXT RIGHT

ALL TRUCKS
ENTER
WEIGH STATION

ALL TRUCKS

WEIGH STATION

THREE LANE INSTALLATION

MEDIAN INSTALLATION

1500' Min.

WEIGH STATION

1000 FT

WEIGH STATION
1 MILE

TYPICAL SIGNING FOR TRUCK WEIGH
AND INSPECTION STATIONS

REVISED 11/01/17
TYPICAL SIGNING FOR TRUCK WEIGH AND INSPECTION STATIONS

INSTRUCTION STATION SIGNING

11/01/17

REV ISIO N

DESCRIPTION:
TYPE 1 OBJECT MARKER PLACEMENT

NOTES:

1. Index applicable to residential and minor streets only. Major streets to be evaluated on a case-by-case basis.

2. Install Object Markers in accordance with Index 700-010 Major streets to be evaluated on a case-by-case basis.

3. See Index 711-001 for pavement markings.

TYPE 4 OBJECT MARKER PLACEMENT

OBJECT MARKER DETAIL

TRAFFIC CONTROLS FOR STREET TERMINATIONS

INDEX 700-109

1 of 1
NOTES:
1. Work with Index 700-030.

2. Materials (Aluminum):
   A. Sheets and Plates: ASTM B209 Alloy 6061-T6
   B. Standard Structural Shapes: ASTM B308 Alloy 6061-T6
   C. Extruded Shapes: ASTM B321 Alloy 6061-T6
   D. Bolts, Nuts, and Washers:
      a. Bolts: ASTM F468 Alloy 2024-T4 with minimum
         0.002-inch-thick anodic coating, chromate sealed
      b. Washers: ASTM B221 Alloy 2024-T4
      c. Nuts: ASTM F467 Alloy 6061-T6 or 6262-T9

3. Fabrication:
   A. See sign layout sheet for dimension "L" and sign face
      details in the Plans.
   B. Round all sign corners.

4. For right exits, install the Exit Numbering Panel to the
   top right side of the Highway Sign.

5. For left exits, install the Exit Numbering Panel to the
   top left side of the Highway Sign.

---

DESCRIPTION:

1. Work with Index 700-030.

2. Materials (Aluminum):
   A. Sheets and Plates: ASTM B209 Alloy 6061-T6
   B. Standard Structural Shapes: ASTM B308 Alloy 6061-T6
   C. Extruded Shapes: ASTM B321 Alloy 6061-T6
   D. Bolts, Nuts, and Washers:
      a. Bolts: ASTM F468 Alloy 2024-T4 with minimum
         0.002-inch-thick anodic coating, chromate sealed
      b. Washers: ASTM B221 Alloy 2024-T4
      c. Nuts: ASTM F467 Alloy 6061-T6 or 6262-T9

3. Fabrication:
   A. See sign layout sheet for dimension "L" and sign face
      details in the Plans.
   B. Round all sign corners.

4. For right exits, install the Exit Numbering Panel to the
   top right side of the Highway Sign.

5. For left exits, install the Exit Numbering Panel to the
   top left side of the Highway Sign.
GENERAL NOTES:
1. Install sign assemblies based on Alpha-Numeric Type designation shown in the Plans (e.g., Type A1).
   Assembly Type is based on Power Configuration 'Alpha' Identification shown above and Numerical Identification shown on Sheet 3 thru B.
2. Install sign panel and wind beam in accordance with Index 700-030 and Specification 700.
3. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.
4. Meet the requirements of Specification 646 for aluminum poles and transformer bases.
5. Install a concrete slab around all roadside assemblies on slopes 6:1 or greater. The minimum slab dimension is 4'-0" by 5'-0".
6. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.

POWER CONFIGURATION 'A' NOTES:
1. Install a separate pole for mounting the solar panel, controller and batteries for all roadside assemblies with solar panels, controllers and batteries weighing more than 170 lbs.
2. Install the auxiliary pole as close to the right of way boundary as possible.
3. Install the auxiliary pole so that the height is the same as the column for the roadside assembly.
4. Orient solar panel to face South for optimal exposure to sunlight.
5. The controller and the solar batteries may be located in the same compartment.

POWER CONFIGURATION 'B' NOTES:
1. Install a separate pole for mounting the solar panel, controller and batteries for all roadside assemblies with solar panels, controllers and batteries weighing more than 170 lbs.
2. Install the auxiliary pole as close to the right of way boundary as possible.
3. Install the auxiliary pole so that the height is the same as the column for the roadside assembly.
4. Orient solar panel to face South for optimal exposure to sunlight.
5. The controller and the solar batteries may be located in the same compartment.

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<th>Description</th>
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<td>Conduit, Wiring, and Foundation Details</td>
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<tr>
<td>3</td>
<td>Roadside Sign Assembly-1</td>
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<td>Roadside Sign Assembly-2</td>
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<td>5</td>
<td>Roadside Sign Assembly-3</td>
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<td>Roadside Sign Assembly-4</td>
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<td>7</td>
<td>Roadside Sign Assembly-5</td>
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<td>8</td>
<td>Roadside Sign Assembly-6</td>
</tr>
<tr>
<td>9</td>
<td>Overhead Sign Assembly</td>
</tr>
</tbody>
</table>
CONDUIT, WIRING, AND FOUNDATION DETAILS

DETAIL "A"

- Transformer Base
- #6 Ground Wire
- Strain Relief Fitting
- Concrete Apron (Typ.)
- Circuit Conductors in Schedule 40 PVC
- Reliefs
- Strain Relief Fitting
- U.L. Approved Ground Rod
- #6 Ground Wire
- 1-1/2" Bed of Prewor or Crushed Stone For Drainage
- To Power Service or Auxiliary Pole
- U.L. Approved Ground Rod
- #6 Ground Wire
- 1-1/2" Bed of Prewor or Crushed Stone For Drainage
- To Power Service or Auxiliary Pole

DETAIL "B"

- Transformer Base
- #6 Ground Wire
- Strain Relief Fitting
- Nominal 4" (Sch. 40) Aluminum
- Conduit for Future Use
- Cap Conduit
- To Power Service or Auxiliary Pole

DESCRIPTION:
- ENHANCED HIGHWAY SIGNING ASSEMBLIES
- STANDARD PLANS
- FY 2019-20
- INDEX 700-120
- SHEET 2 of 9
WARNING SIGN

12" Yellow Flashing Beacon

Sign Panel (48" x 48")

W-16.13P (24" x 18") Sign
(When Shown in Plans)

Nominal 4" (Sch. 40) Aluminum

Beacon Controller

NOTE:
Type A1 Assembly (conventionally-powered) is shown.
Type B1 Assemblies (solar-powered) similar.
NOTE:
Type A2 Assembly (conventionally-powered) is shown.
Type B3 Assemblies (solar-powered) similar.
NOTES:

1. Type A3 Assembly (conventionally-powered) is shown. Type B3 Assemblies (solar-powered) similar.

2. Use electronic speed feedback sign with 15" high numerals for posted speed of 45 mph or less, and 18" high numerals for posted speeds greater than 45 mph.
NOTE:
Type A4 Assembly (conventionally-powered) is shown. Type B4 Assemblies (solar-powered) similar.
NOTES:

1. Type A5 Assembly (conventionally-powered) is shown. Type B5 Assemblies (solar-powered) similar.

2. Use electronic speed feedback sign with 15” high numerals for posted speed of 45 mph or less, and 18” high numerals for posted speeds greater than 45 mph.
NOTES:

1. Type A6 Assembly (conventionally-powered) is shown. Type B6 Assemblies (solar-powered) similar.

2. Use electronic speed feedback sign with 15" high numerals for posted speed of 45 mph or less, and 18" high numerals for posted speeds greater than 45 mph.
OVERHEAD SCHOOL SIGN ASSEMBLY

NOTES:

1. Flasher unit and cabinet to be placed on the strain pole supporting overhead sign assembly or on service pole. The flasher unit not to overhang private property or sidewalk.

2. Optional flashing beacon will be called for in the Plans. They may be placed within or below the panel, or face to the rear.

OVERHEAD SIGN ASSEMBLY
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/R = YELLOW/RED RPM
Y/Y = YELLOW/YELLOW RPM
W/R = WHITE/RED RPM
MD/Y = MND-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)

RPM PLACEMENT AT ROADSIDE CROSSHATCHING

NOTE:
1. Center the Raised Pavement Markers between chevrons and crosshatching.

LEGEND:
B/C = BACK OF CURB
EDG = 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)

RPM PLACEMENT AT TRAFFIC SEPARATORS
(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 median radii to be parallel to direction of travel lanes.

<table>
<thead>
<tr>
<th>POSTED SPEED LIMIT MPH</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 OR LESS</td>
<td>10</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>50 OR MORE</td>
<td>40</td>
</tr>
</tbody>
</table>

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/W = MONO-DIRECTIONAL WHITE RPM
MD/Y = MONO-DIRECTIONAL YELLOW RPM
RPM PLACEMENT FOR CROSSES ON LIMITED ACCESS ROADWAYS

SEE DETAIL "L"
NOTES FOR PAVEMENT MESSAGES:

1. When an arrow and a pavement message are used together, locate the arrow a distance of "S" downstream from the pavement message. Measure the distance from the base of the arrow to the base of the pavement message. See the Pavement Message Spacing Table for "S" value.

2. Place all pavement messages 25' back from the stop line.

3. Dimensions are within 1" ±.

4. All grids are 4" x 4".

5. All pavement messages must be white except route shields.

6. Increase width of route shield for routes with three digits.

GENERAL NOTE:

1. See Index 509-070 for pavement markings at railroad crossings.
CONTRAST MARKINGS WITH ALTERNATING SKIP PATTERN
(10'-30' Skip Line Shown, Dotted Lines Similar)

YIELD LINES

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.
PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

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.
2. For placement of RPMs, see Index 706-001.
3. 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
Curb And Gutter

CURB AND GUTTER SHOWN

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

DESCRIPTION:

REVISED

FY 2019-20

STANDARD PLANS

PAVEMENT MARKINGS

INDEX

711-001

5 of 13

PAVEMENT MARKINGS

STANDARD PLANS

FY 2019-20

REVISED

DESCRIPTION:

CURB AND GUTTER SHOWN

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS
PAVEMENT MARKINGS AND DELINEATORS FOR MEDIAN CROSSOVER

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.
3. Extend double yellow centerlines 100' back from intersection on all approaches or 50' for unmarked cross roads.

DETAIL "A"

DETAIL "B"
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

Traffic Channelization at Gore
**LEFT ROADWAY CENTERED ON EXISTING ROADWAY**

**RIGHT ROADWAY CENTERED ON EXISTING ROADWAY**

**SCHEMES FOR TRANSITION - 2 LANE / 4 LANE ROADWAY**

**MARKINGS FOR TRAFFIC SEPARATION**

**NOTE:**

- Make pavement markings yellow for left roadway centered on existing roadway. Right roadway centered on existing roadway is similar with white pavement markings.

**NOTE:** See Sheet 1 for "S" value.

---

**Table: Design Speeds, Posted Speed Limit, and Length 'L' in feet**

<table>
<thead>
<tr>
<th>Design Speed (MPH)</th>
<th>Posted Speed Limit (MPH)</th>
<th>Length 'L' (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>55</td>
<td>55</td>
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</tr>
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<td>50</td>
<td>55</td>
<td>40</td>
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<tr>
<td>45</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>40</td>
<td>65</td>
<td>45</td>
</tr>
<tr>
<td>30</td>
<td>65</td>
<td>50</td>
</tr>
</tbody>
</table>

**Design Speed 'S' (MPH):**
- 40 or less: \( L = \frac{W^2}{60} \)
- 45 or greater: \( L = WS \)
NOTES:

1. For crosswalk width, exceed width of the adjacent sidewalk, but do not make width less than 6' 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. Refer to Index 522-002 when Curb Ramps are present.
**Queue Length**

- If required, clearances are calculated from the stop bar to brake to stop area.
- 

**Stop Bar (If Required)**

- Clearances are calculated from the stop bar location.

**Double Left Turns**

- Through lane becomes exclusive left turn.
- Through lane becomes optional left turn.

**Turn Lane Markings**

- [Diagram showing turn lane markings]

### Arrow Spacing

1. Length of arrows varies with design speed and lane width.
2. Arrow spacing should be evenly spaced between first and last arrow.
3. Turn lanes longer than 200' add one arrow for each 100' additional length.

**Notes:**

- [List of notes related to turn lane markings]
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>19-1/2&quot;</th>
<th>9-9/16&quot;</th>
<th>10-1/16&quot;</th>
<th>10-1/8&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>45°</td>
<td>12-9/16&quot;</td>
<td>7-9/16&quot;</td>
<td>27-9/16&quot;</td>
<td>17-9/16&quot;</td>
</tr>
<tr>
<td>60°</td>
<td>20-1/16&quot;</td>
<td>10-5/16&quot;</td>
<td>5-9/16&quot;</td>
<td>23-9/16&quot;</td>
</tr>
</tbody>
</table>

Use of pavement symbol in accessible parking spaces is optional, when used the symbol shall be 3' or 5' high and white in color.

Pavement Marking for Parking

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)
BICYCLE MARKINGS

APPROACH TO INTERSECTIONS DETAILS

BUFFERED BIKE LANES

FA R SIDE OF INTERSECTION DETAIL

STOP LINE
RETURN OR RADIUS CURB
RETURN OR STOP LINE

CENTERS OF SOLID LINE AND DOTTED LINE

RETURN CURB
RETURN OF STOP LINE

LANE WIDTH

LANE WIDTH

LANE WIDTH

LANE WIDTH

LANE WIDTH

LANE WIDTH

LANE WIDTH

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".

NOTES:

**Shared Lane Marking (SLM)**

**Helmeted Bicyclist Symbol**

**Bike Lane Arrow**

**Railroad Crossing**

(For Shared Use Path Only)

---

**STANDARD PAVEMENT MARKING MESSAGE LAYOUTS**
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.
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.
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 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.
**NOTE:**

Do not place wrong way arrows in between consecutive directional arrows.

---

**TYPICAL PARTIAL CLOVERLEAF/TRUMPET EXIT RAMP**

**DESCRIPTION:**

**INTERCHANGE MARKINGS**

**INDEX:**

711-003

**SHEET:**

6 of 7

**REVISED:**

11/01/17

**LAST REVISED:**

01/01/17

**REVISION DATE:**

**FDOt**

FY 2019-20

STANDARD PLANS
**NOTES:**

1. This Index shows layouts for 1, 2, and 3 lane exits regardless of the number of lanes.
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".

---

**EXIT RAMP WITHOUT AUXILIARY LANE**

**EXIT RAMP WITH AUXILIARY LANE**

---

**MAT DIMENSIONS**

**MESSAGE SIZE AND SPACING**

---

**10/21/17**

**10/21/17**

**INTERCHANGE MARKINGS**

**INDEX 711-003**

**7 of 7**
DESCRIPTION:

WIRING DIAGRAM

- **Luminaire**
- **Luminaire Cable**
- **Breakaway Fuseholders**
- **Strain Relief Fitting (See Note 2)**
- **PVC Conduit**
- **Pull Box**
- **Equipment Ground Conductor**
- **Ground Rod**
- **Pole Ground Conductor**
- **Equipment Ground Conductor**

**METAL POLE WIRING DETAIL**

- **Pole**
- **Luminaire Cable**
- **Breakaway Fuseholders**
- **Strain Relief Fitting (See Note 2)**
- **PVC Conduit**
- **Ground Rod**
- **Luminaire**
- **Access Panel**
- **Surge Protective Device (SPD)**
- **Breakaway Fuseholders on Neutral side with solid copper slug (Line To Neutral Service). Slugs to be same size as 10 Amp fuse.**
- **Breakaway Fuseholder on 480V side with a 10 Amp slow blow fuse for line to line service both lines to be fused.**

**NOTES:**

1. Barrier wall or bridge mounted poles: The wiring shall be in accordance with Specification 992.
2. Provide cable length to remove fuseholders from transformer base, pole base or pullbox for maintenance. Remove slack from the luminaire cable to provide 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 Specifications 635 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

SLAB DETAILS FOR INTERMEDIATE PULLBOX LOCATIONS

SECTION A-A
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 Specification 635 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 Specification 932.

Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.
GENERAL NOTES:

1. Poles are designed to support the following:
   a. Luminaire Effective Projected Area (EPA): 1.55 SF
   b. Weight: 75 lb.

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 or Alloy 6061-T6
   b. Bars, Plates, Stiffeners and Backer Ring: ASTM B221, Alloy 6063-T6
   c. Caps and Covers: ASTM B-26, Alloy 319-F
   d. Steel Bearing Plate: ASTM A709 or ASTM A36 Grade 36
   e. Aluminum Weld Material: ER 4043
   g. Bolts, Nuts and Washers:
      - Anchor Bolts, Nuts: ASTM F3325, Grade A35, Type 1
      - Nuts: ASTM F3363 Grade DH Heavy-Hex
      - Washer: ASTM A325
   h. Stainless Steel Fasteners: ASTM F593 Alloy Group 2, Condition A, CW1 or SH1
   i. Nut Covers: ASTM B26 (319-F)
   j. Concrete: Class 1
   k. Reinforcing Steel: Specification 415

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.
   b. Weld all seams continuously and grind smooth.
   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 4" x 6" (Min.) handhole located 1'-6" above the base plate.
   e. Test demonstrating a pole with a 1/2" wall thickness achieves an ultimate moment capacity of 36 kip*ft in the strong axis and 30 kip*ft in the weak axis.
   f. Test demonstrating a pole with a 3/4" wall thickness achieves an ultimate moment capacity of 44 kip*ft in the strong axis and 30 kip*ft in the weak axis.
   g. Perform all welding in accordance with AWS D1.2.

5. Coatings/Finish:
   a. Pole and Arm Finish: 50 grit satin rubbed.
   b. Galvanize Steel Bolts, Screws, Nuts and Washers: ASTM F2129
   c. Hot Dip Galvanize EJB and other steel items including poles and plate washers: ASTM A123

6. Construction:
   a. Foundation: Specification 635. Except payment for the foundation is included in the cost of the pole.
   b. Frangible Base, Base Shoe, and Clamp:
      - Certify that the Clamp, Frangible Transformer Base, and Base Shoe Design are capable of providing the required 5000 psi.
      - Certify that the Base conforms to the current FHWA required AASHTO Frangibility Requirements, tested under MQCR Report 350 Guidelines (e.g. Akron Foundry T81-71).
      - Do not erect pole without luminaire attached.

7. Embedded Junction Box (EJB): Install EJBs per Note 4 and in accordance with Specification 635, as shown on the following Sheets.

8. Wind Speed by County:
   a. 120 MPH
      - Holmes, Lake, Levy, Manatee, Marion, Okaloosa, Okeechobee, Orange, Osceola, Pasco, Pinellas, Polk, Santa Rosa, Seminole, St. Johns, Sumter, Volusia, Walton and Washington Counties.
   b. 140 MPH
   c. 160 MPH
      - Brevard, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota and St. Lucie Counties.
**ARM CONNECTION DETAIL**

- **Press on or Welded Cap at Lower Arm**
- **4" Min. Radius at Bend**

**DIMPLE DETAIL**

**Dimple (see Detail)**

**SECTION A-A**

- **Connection at Lower Arm Similar**
- **Connection Extrusion**

**ARM ELEVATION**

- **Fixture Arm Length = 8', 10', 12' or 15'**
- **3'-0" / 4 (Fixture Arm Length - 3'-0") / 4**

**VIBRATION DAMPER ELEVATION**

- **ASTM 0287 PVC Type 65500**

**HIGH TEMP VINYL CAP DETAIL**

- **10' x 1½" long**
- **ASTM A36 Hot Rolled Rod**
- **4' x 12" long Sch. 10 Aluminum Pipe ASTM B221 Alloy 6063-16**

**ARM TUBE EXTRUSIONS NOTES:**

At the pole connections, provide arm tube extrusions with dimensions as shown, uniformly transition elliptical section to a cylindrical section at the arm connection.

The fabricator may substitute elliptical cross sections other than those tabulated, provided the section properties about the vertical axis and the area of the section equal or exceed that of the required section, and provide minimum wall thickness of ¼ nominal and within the Aluminum Association Tolerances.

The outside diameter about the minor axis should be held at 2½' at the upper and lower arms.

---

**REV IS IO N**

**LAST REV ESION 04/03/18**

**DESCRIPTION:**

**FY 2019-20**

**STANDARD ALUMINUM LIGHTING**

**INDEX 715-002**

**SHEET 3 of 8**
ARM-POLE TABLE

### FOR STANDARD ALUMINUM LIGHT POLES WITH ARM

<table>
<thead>
<tr>
<th>Wind Speed and Arm Lengths (ft)</th>
<th>120 mph</th>
<th>140 mph</th>
<th>160 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly Height (ft)</td>
<td>8, 10, 12, 15</td>
<td>8, 10, 12, 15</td>
<td>8, 10, 12, 15</td>
</tr>
<tr>
<td>20</td>
<td>A1-P1</td>
<td>A1-P1</td>
<td>A1-P2</td>
</tr>
<tr>
<td>35</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A2-P1</td>
</tr>
<tr>
<td>40</td>
<td>A1-P2</td>
<td>A1-P1</td>
<td>A2-P2</td>
</tr>
<tr>
<td>45</td>
<td>A1-P2</td>
<td>A2-P1</td>
<td>A2-P2</td>
</tr>
<tr>
<td>50</td>
<td>A2-P1</td>
<td>A2-P1</td>
<td>A2-P2</td>
</tr>
</tbody>
</table>

**ARM POLE NOTES:**
1. See ARM SECTION detail on Sheet 3 for all A1 and A2 Values.
2. See Pole Table for all P1, P2, and P3 values.

---

**POLE TABLE**

<table>
<thead>
<tr>
<th>Pole</th>
<th>Wall Thickness</th>
<th>Top of Base Shoe Weld</th>
<th>Inside of Base Shoe Weld</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0.100</td>
<td>⅜</td>
<td>½</td>
</tr>
<tr>
<td>P2</td>
<td>0.250</td>
<td>⅞</td>
<td>⅜</td>
</tr>
<tr>
<td>P3</td>
<td>0.313</td>
<td>⅞</td>
<td>⅞</td>
</tr>
</tbody>
</table>

**POLE NOTES:**
1. Pole wall thicknesses shown are nominal and must be within the Aluminum Association tolerances.
2. Thicker walls are permitted and tapered walls may be used in accordance with the minimum Aluminum Association thicknesses.

---

**FOUNDATIONS:**

1. Depths shown are for slopes equal to or flatter than 1:6. For slopes steeper than 1:4 and equal to or flatter than 1:2 and 2'-6" to foundation depths shown.
2. Foundation Tie Bars: #4 Tie Bars @ 12" centers (max.) or D10 (or #10) spiral @ 6" pitch. 3 flat turn top and 1 flat turn bottom.

---

**POLE BASE DETAILS FOR ROADWAY ALUMINUM LIGHT POLE**

**POLE AND BASE DETAILS FOR ROADWAY ALUMINUM LIGHT POLE**
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.
4. Pole wall thicknesses shown are nominal and shall be within the Aluminum Association Tolerances. Thicker walls are permitted and tapered walls may be used in accordance with the minimum Aluminum Association thicknesses.

BASE PLATE DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE
1. For Bearing Plate and Base Plate
   Details, see Sheet 5.

2. For connections to adjacent Median Barrier, use the Doweled Joint detail
   (see Sheet 5) to achieve the required continuity. If a continuous concrete pour is not
   possible, 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.
**Plan**

(Reinforcing steel not shown)

- Provide dowel bars @ construction joint
- Median Barrier (Index 521-001)

**Foundation Table**

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Design Height (FT)</th>
<th>Foundation Depth (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>140</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>160</td>
<td>40</td>
<td>9</td>
</tr>
</tbody>
</table>

**Foundation Details**

- BARRIER MOUNTED ALUMINUM LIGHT POLE
- CYLINDRICAL FOUNDATION DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE

**Notes:**

1. For Bearing Plate and Base Plate details, see Sheet 3.
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.

**Section C-C**

- Cylindrical concrete may be cast-in-place or Precast with 'Flowable Fill' Backfill

**View B-B**

(Anchor Bolts and Barrier Longitudinal Steel & Stirrups Not Shown)
Details for Traffic Railing (Median 36" Single-Slope) Mounted Aluminum Light Pole

**At the Contractor's option, Bars 5W may be fabricated as a two piece bar with a 1'-2" lap splice at the bottom legs.**

**Shift horizontally to avoid Anchor Bolts**

---

**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 Conduit, EJB and supplemental reinforcing details.

---

**Sections:**

**Section D-D**

(Longitudinal and transverse deck reinforcing steel not shown)
HIGH MAST 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 180 lbs (Max.)
   b. Eight (8) cylindrical luminaires with a maximum effective projected area of 1.5 sf and 71 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 Backing Rings:
      i. Less than 7"; ASTM A1011 Grade 50, 55, 60 or 65
      ii. Greater than or equal to 7"; ASTM A572 Grade 50, 55, 60 or 65
      iii. ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield)
   b. Steel Plates: ASTM A500 or ASTM A36
   c. Pole Caps: ASTM A1011 Grade 50, 55, 60, or 65 or ASTM B209
   d. Weld Metal: E70XX
   e. Stainless Steel Screws: AISI 316
   f. Anchor Bolts, Nuts and Washers:
      i. Anchor Bolts: ASTM F1554 Grade 55
      ii. Nuts: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      iii. Plate Washer: ASTM A36 (4 per anchor bolt)
   g. Nut Covers: ASTM B163 (319-F)
   h. Concrete: Class IV (Drilled Shaft)
   i. Reinforcing Steel: Specification 415

4. Fabrication:
   a. Welding:
      i. Specification Section 460-6.4 and
      ii. AISC Y102 Specification for structural supports for highway signs, luminaires, and traffic signals section 14.4.4
   b. Poles:
      i. Round or 16-sided (Min.)
      ii. Taper pole diameter at 0.14 inches per foot
      iii. Pole shaft may be up to three sections using telescopic field splices
      iv. Circumferentially welded pole shafts and laminated pole shafts are not permitted
      v. Fabricate Pole longitudinal seam welds (2 maximum) with 60 percent minimum penetration or fusion welds except as follows:
         i. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection and use full-penetration grove welds on the female end section
         ii. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of 42 inches.
   c. Identification Tag: (Submit details for approval)
      i. 2" x 4" (Max) aluminum tag
      ii. Locate on the inside of the pole and visible from the handhole
      iii. Use with 1/8" diameter stainless steel rivets or screws.
      iv. Include the following information on the ID Tag:
         a. Financial Project ID
         b. Pole Type
         c. Manufacturer's Name
         d. Total Length (Ft of Steel)
         e. Base Rail Thickness
   d. Poles and Backing Rings:
      i. Greater than or equal to 3" (Max) anchor bolts holes are bolt diameter plus 1/16" and anchor bolts holes are not permitted
      ii. Use full-penetration groove welds within 6 inches of the circumferential tube-to-plate connection and use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of 42 inches.
      iii. Use with 1/8" diameter stainless steel rivets or screws.
   e. High Mast Light Fixtures:
      i. Eight (8) cylindrical luminaires with a maximum effective projected area of 1.5 sf and 71 lbs each.

5. Coating:
   a. Galvance Anchor Bolts, Nuts and Washers: ASTM F2129
   b. Hot Dip Galvanize all other steel items including plate washers: ASTM A123
   c. Stainless Steel Screws: AISI 316

6. Construction:
   a. Foundation: Specification 455 Drilled Shaft, except that payment is included in the cost of the Structure.
   b. After Installation: Place wire screen between top of foundation and bottom of baseplate in accordance with Specification 449-6.

7. Wind Speed by County:
   a. 130 MPH
   b. 150 MPH
   c. 170 MPH
      i. Broward, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota and St. Lucie Counties.

STANDARD POLE DESIGN NOTES
POLE DESIGN TABLE*

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Base Dia (in.)</th>
<th>Minimum Splice Length 1</th>
<th>Base Dia (in.)</th>
<th>Minimum Splice Length 2</th>
<th>Base Dia (in.)</th>
<th>Minimum Splice Length 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td>80</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>11</td>
<td>0.250</td>
<td>13</td>
<td>0.250</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>10</td>
<td>0.250</td>
<td>15</td>
<td>0.250</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>12</td>
<td>0.250</td>
<td>17</td>
<td>0.313</td>
</tr>
<tr>
<td>150 mph</td>
<td>80</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>11</td>
<td>0.313</td>
<td>13</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>10</td>
<td>0.313</td>
<td>15</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>16</td>
<td>0.313</td>
<td>18</td>
<td>0.313</td>
</tr>
<tr>
<td>170 mph</td>
<td>80</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>11</td>
<td>0.313</td>
<td>13</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>10</td>
<td>0.313</td>
<td>15</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>16</td>
<td>0.313</td>
<td>18</td>
<td>0.313</td>
</tr>
</tbody>
</table>

* Diameter Measured Flat to Flat

BASE PLATE AND BOLTS DESIGN TABLE

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Diameter (in.)</th>
<th>Base Plate Thickness (in.)</th>
<th>Bolt Circle Diameter (in.)</th>
<th>No. Bolts</th>
<th>Bolt Diameter (in.)</th>
<th>Bolt Embedment Length (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td>80</td>
<td>3.000</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>3.375</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>3.875</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td>150 mph</td>
<td>80</td>
<td>3.000</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>3.375</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>3.875</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td>170 mph</td>
<td>80</td>
<td>3.000</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>3.375</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>3.875</td>
<td>2.000</td>
<td>1.75</td>
<td>8</td>
<td>0.250</td>
<td>0.313</td>
</tr>
</tbody>
</table>

SHAFT DESIGN TABLE

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter</th>
<th>Shaft Length</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td>80</td>
<td>4'-0&quot;</td>
<td>13'-0&quot;</td>
<td>14- #11</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4'-6&quot;</td>
<td>14'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>16'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td>150 mph</td>
<td>80</td>
<td>4'-0&quot;</td>
<td>13'-0&quot;</td>
<td>14- #11</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4'-6&quot;</td>
<td>14'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>16'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td>170 mph</td>
<td>80</td>
<td>4'-0&quot;</td>
<td>13'-0&quot;</td>
<td>14- #11</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4'-6&quot;</td>
<td>14'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>16'-0&quot;</td>
<td>16- #11</td>
</tr>
</tbody>
</table>

NOTE:
Shaft Design Table Shaft Length is based on level ground (flatter than 1:5).
Increase the shaft depth in accordance with the Additional Shaft Depth Due to Ground Slope Table for foundations with slopes 1:5 and steeper. Use the higher value for slope or diameter values that fall between those shown on the table.

ADDITIONAL SHAFT 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>4'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>1:4</td>
<td>4'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>4'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>1:2</td>
<td>4'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
</tbody>
</table>
NOTES:
1. 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 tops. 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.

Luminaire support ring

Cover

2" slip fitter

Power Cable Terminator

600 Volt rated Pole Cable. Size of conductors to be determined by luminaire load.

Luminaire support ring

2" Slip/Fitter Assembly
(equally spaced around ring)
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 Specification 635 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 Specification 932.
CROSSING SURFACES

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Concrete</td>
</tr>
<tr>
<td>R</td>
<td>Rubber</td>
</tr>
<tr>
<td>RA</td>
<td>Rubber/Asphalt</td>
</tr>
<tr>
<td>TA</td>
<td>Timber/Asphalt</td>
</tr>
</tbody>
</table>

STOP ZONE FOR RUBBER CROSSING

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Zone Length (Distance From Stop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 or Less</td>
<td>250'</td>
</tr>
<tr>
<td>50 - 55</td>
<td>350'</td>
</tr>
<tr>
<td>60 - 65</td>
<td>500'</td>
</tr>
<tr>
<td>70</td>
<td>600'</td>
</tr>
</tbody>
</table>

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.

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.
Crossing Shoulder Pavement
(Except Area Occupied By Crossing Surfacing Material):
a. To Shoulder Line For Outside Shoulders Less Than 8' Wide.
b. To 8' Maximum Width For Outside Shoulders 8' Or Wider
(Regardless Of Approach Shoulder Pavement Width).
c. For Median Shoulders.

* Where the existing shoulder is substandard for the facility type, the shoulder width is to be widened to accommodate crossing shoulder pavement.

Beveled Edge (1:4 Slope)

Shoulder Line

Shoulder Pavement

Edge Of Travel Way

Crossing Shoulder Pavement

RR Crossing Material

Friction Course

Overbuild

Exist. Rdwy. Past

Type SP Asphalt (500 lb/ST)

Filter Fabric (Optional With RR Company)

Ballast

Cap Or Expansion Material (When Required By Crossing Type)

SECTION VIEW

TYPICAL CROSSING MATERIAL REPLACEMENT AT RR CROSSINGS

VERTICAL ROADWAY ALIGNMENT THROUGH A RAILROAD CROSSING

HALF PLAN
ROADWAYS WITH FLUSH SHOULDERS

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 superelevation 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 superelevated, or a roadway approach section that is not level, will necessitate a site specific analysis for rail clearances.

Note: For location of railroad signals, gates or signals and gates see Index 509-070

HALF PLAN
CURVED ROADWAYS