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 119.07(1)(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 119.07(1)(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(21), 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.

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State Transportation Landscape Architect
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LA0001592

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Standard Plans Index
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As To Roadway
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Robert V. Robertson, Jr.
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James Christian, Division Administrator

APPROPRIATE FOR FEDERAL AID PROJECTS
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**FY 2019-20 Standard Plans for Road and Bridge Construction**

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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. |
| 425-040              | **Editorial:** Added back deleted note on "heavy wheel loads" in GENERAL NOTES. |
| 450-010              | **Sheet 1:** Added Note 13; Editorial – Note 11 |
| 450-036              | **Sheet 1:** Corrected Note # references in "END VIEW". |
| 450-045              | **Sheet 1:** Corrected Note # references in "END VIEW". |
| 450-054              | **Sheet 1:** Corrected Note # references in "END VIEW". |
STANDARD PLANS
FY 2019-20 REVISIONS LOG

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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; Changed Note 3.F.a.</td>
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<td>515-062</td>
<td><strong>Sheet 1</strong>: Corrected Note 3.H Specification reference.</td>
</tr>
<tr>
<td>515-070</td>
<td><strong>Sheet 1</strong>: Changed end hoop Note 3 to Alloy 6063-T5 to match Index 515-062.</td>
</tr>
</tbody>
</table>

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.

521-001

521-002
- **Sheet 1**: Changed Note 3.
- **Sheets 4 & 5**: Changed "Shoulder Pavement" callout to "Shoulder Pavement & Fill"
<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
</table>
| 521-010              | Redefined 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. |
| 521-509              | 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              | Sheet 1: Updated Notes.  
Sheet 2: Added Bar 5R3; Changed reinforcing.  
Sheet 3: Added Bar 5R3; Changed reinforcing. |
| 521-511              | Sheet 1: Updated Notes.  
Sheet 2: Added Note 6; changed asphalt description in SECTION B-B. |
| 521-513              | Sheet 1: Clarified Notes 1, 2, and 7; renumbered Notes 5 and 6.  
Sheet 2: Editorial  
Sheet 4: Editorial |
| 521-514              | 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. |
<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
</table>
| 521-820              | **Sheet 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.  
**Sheet 2:** New Sheet  |
| 522-001              | **Sheet 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.  
**Sheet 2:** Deleted 8" dimension behind the Return Curbs in the "LONGITUDINAL SECTION". |
| 522-002              | **Sheet 1:** Updated General Note 1.  
**Sheet 2:** Updated CR-A dimensions to match FDOT standard sidewalk widths.  
**Sheet 3:** Moved Pavement Relief Details to Sheet 6.  
**Sheet 4:** Added Sidewalk and Clarified details for CR-E.  
**Sheet 5:** Updated Notes; Clarified dimensions.  
**Sheet 8:** Added dimensions for Curb Transitions. |
| 522-003              | New Index – Information for Concrete Flared Driveways moved from old Index 000-515. |
| 536-001              | **Sheet 1:** Deleted optional conditions for washer under nuts (Notes 4 & 5); Deleted "Type II" from Table of Contents.  
**Sheet 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.  
**Sheet 10:** Changed the Steel Tube Foundation depth; Added new detail for ground strut (C Channel Shape).  
**Sheet 18:** Updated Trailing Anchorage drawing; Removed "Type II" designation  
**Sheet 22:** In Washer detail title, Removed "Type II" designation, Replaced with "Trailing Anchorage". |
| 536-002              | **Sheet 3:** Removed Departure Line  
**Sheet 4:** Removed Crash Cushion sizing information. |
| 544-001              | **Sheet 1:** Deleted Concrete Barrier and Guardrail Applications Tables; Changed the GENERAL NOTES; Updated Departure Lines, Length Restrictions, and other call outs.  
**Sheet 2:** Updated Design Length, Location Station, and other call outs. |
| 546-001              | Interim, See Roadway Design Bulletin, RDB 18-07  
**Sheet 1:** Updated all details.  
**Sheet 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              | **Sheet 1:** Changed General Notes; Changed the Under 4" and 4" and Larger Caliper Tree sizes; Changed the Stake Spacing, Anchors and Mulch callouts.  
**Sheet 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.  
**Sheet 2:** Deleted FIGURE A "Pullbox Entry Of Conduit Under Sidewalks". |
| 630-010              | **Sheet 1:** Clarified that EJB "A" is for double or triple conduit.  
**Sheet 2:** Corrected callout detailing so arrows pointed to EJB's correctly.  
**Sheet 4:** Changed Traffic Railing to Concrete Barrier. |
<p>| 634-002              | Cleared 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>
<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
</table>
| **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". |
| **676-010** | 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>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
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</thead>
<tbody>
<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>
<tr>
<td>706-001</td>
<td>Sheet 4: Changed and Deleted RPMs in the “RPM PLACEMENT AT ISLANDS”, Details &quot;G&quot; and &quot;H&quot;. 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.</td>
</tr>
<tr>
<td>715-002</td>
<td>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 &quot;ARM CONNECTION DETAIL&quot; and &quot;SECTION A-A&quot;. Deleted &quot;ARM TABLE&quot; and its Notes; Changed &quot;ARM TUBE EXTRUSIONS NOTES&quot;. Sheet 4: Changed FOUNDATION Depth Requirement; Added dual dimensions to &quot;POLE BASE ELEVATION&quot;; Deleted All Table and Added new tables; Updated NOTES. Sheet 5: Added dual dimensions to the &quot;BASE PLATE PLAN&quot;; Deleted the &quot;POLE TABLE&quot;; Updated NOTES.</td>
</tr>
<tr>
<td>715-010</td>
<td>Sheet 1: Changed Notes 2 and 4. Sheet 2: ELEVATION – Editorial; Changed &quot;POLE DESIGN TABLE&quot; – Deleted Column, Editorial; &quot;BASE PLATE AND BOLTS DESIGN TABLE&quot; – Changed some Base Plate Thicknesses. Sheet 3: &quot;SECTION E-E&quot; Changed Inside Bend Radius details.</td>
</tr>
</tbody>
</table>
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 increases in pavement superelevation will necessitate sloping the inside half of the shoulder (toward the travel way and the outer half outward), both at 0.02 for superelevations 0.06-0.09 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).

SHOULDER CONSTRUCTION WITH SUPERELEVATION

SLOPE RATIOS FOR SUPERELEVATION TRANSITIONS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>DESIGN SPEED, MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Lane &amp; 4 Lane</td>
<td>1:200 1:235 1:250</td>
</tr>
<tr>
<td>6 Lane</td>
<td>1:160 1:180 1:200</td>
</tr>
<tr>
<td>8 Lane</td>
<td>1:140 1:165 1:190</td>
</tr>
</tbody>
</table>

These transition details are to apply in all cases, except under the following conditions:
1. Curves of insufficient length.
2. Insufficient tangent length between curves.
3. Deficient transition distance between a curve and other control point(s).
4. At PCC’s or PRC’s (Runoff rates are applicable).

Transitions for these exceptions are to be as detailed in the plans.

4-LANE OR 6-LANE PAVEMENT WITH MEDIAN

Shoulder Slope 0.06 (0.05 For Medians) until Pavt. Cross Slope Reaches That Rate

Shoulder Slope Not Flatter Than 0.02 For Steeper Than 0.06

Shoulder Slope Not Match Pavt. Slope For Pavt. Slopes Greater Than 0.06 (0.05 For Medians)

Superelevated Pavement: See SHOULDER CONSTRUCTION WITH SUPERELEVATION
8-LANE PAVEMENT WITH ONE LANE SLOPED TO MEDIAN

SUPERELEVATION SECTIONS

SECTION A-A
NORMAL CROWNED SECTION

SECTION B-B
SUPERELEVATION SECTION LT. & RT.

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

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

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

SECTION F-F
FULL SUPERELEVATION LT. & RT.

SPECIAL SHOULDER
BREAK OVER DETAILS

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.
**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 Transition SECTIONS**

**SUPERELEVATION TRANSITIONS - LOW SPEED HIGHWAYS**

---

**LOW SPEED HIGHWAYS**

**SUPERELEVATION TRANSITION SECTIONS**

**UNDIVIDED FACILITIES**

**DIVIDED FACILITIES**

**PARABOLIC SECTION**

---

**Rotation Points (Typ.)**

**Roadway**

**Median**

**Auxiliary Lane**

**Travel Lane**

---

**Line 1** - Max. Superelevation Rate (0.05)

**Line 2** - Slope Of Parabola At Inside Edge Of Pavt. 

**Line 3** - Positive Superelevation Rate Less Than Max. Slope Of Parabola

**Line 4** - Adverse Superelevation

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.
Two Lanes Each Direction

**SECTION 0-A to 0-D**

- Profile Grade Refers To This Point
- Normal Section
- Superelevation Transition "L" (Varies, See Note Below)
- Superelevated Section
- Profile Grade Refers To This Point
- Theoretical Grade Line
- PC or PT of Curve
- Tangent Curve
- D Line G
- D Line F
- D Line E
- D Line D
- D Line C
- D Line B
- D Line A

Two Lanes Each Direction with Median and Auxiliary Lane

**SECTION 0-A to 0-E**

- Profile Grade Refers To This Point
- Normal Section
- Superelevation Transition "L" (Varies, See Note Below)
- Superelevated Section
- Profile Grade Refers To This Point
- Inside Travel Lane
- Inside Lane Line
- Inside Median Edge Pavement
- Outside Median Edge Pavement
- Outside Lane Line
- Outside Travel Lane
- Inside And Outside Are Relative To Curve Center

---

**EXAMPLE SUPERELEVATION SECTIONS AND PROFILES FOR LOW SPEED HIGHWAYS**

- Similar schemes should be used for roadways having other sections.
- The sections and profiles shown are examples of superelevation transitions.
- Note: Runoff rate "d" is to be applied to the outside edge of travel lane.
- Note: Inside And Outside Are Relative To Curve Center.

---

**LINE DESCRIPTION**

- **A**: Inside Travel Lane
- **B**: Inside Lane Line
- **C**: Inside Median Edge Pavement
- **D**: G Construction
- **E**: Outside Median Edge Pavement
- **F**: Outside Lane Line
- **G**: Outside Travel Lane

---

**REVISIO**

**DESCRIPTION**

**REVISED**

**INDEX SHEET**

**FY 2019-20**

**STANDARD PLANS**

**SUPERELEVATION TRANSITIONS - LOW SPEED HIGHWAYS**

**000-511 2 of 2**
TWO THRU LANES
(Shown With Shoulder Gutter)

THREE APPROACH LANES - TWO THRU LANES
(Shown Without Shoulder Gutter)

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.

   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
**TAPER - TYPE ENTRANCE**

**PARALLEL - TYPE ENTRANCE**

**LEGEND:**

- Shoulder Pavement

**SINGLE LANE RAMPS - ENTRANCE TERMINALS**


**ENTRY TERMINALS - FRICTION COURSE LOCATION**

**TAPER - TYPE ENTRANCE**
(Shown Without Shoulder Gutter)

**PARALLEL - TYPE ENTRANCE**
(Shown With Shoulder Gutter)

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

---

**DESCRIPTION:**

- Extend Friction Course 8" Into Shoulder
- 4' Shoulder Pavement
- 10' Shoulder Pavement
- Shoulder Gutter

**LAST REV**: 01/01/17

**FY 2019-20 STANDARD PLANS**

**INDEX**: 000-525

**SHEET**: 5 of 5
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)
      1. Concrete Barrier (Free-Standing or Anchored)
      2. Steel Barrier (Anchored)
      3. Water Filled Barrier (Free-Standing)
   C. 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.
   D. For Barrier Delineators, see Specification 102 IS. Mount on top of temporary barriers. Color must match adjacent longitudinal pavement marking.
   E. Remove all grass debris, loose dirt, and sand from the pavement, bridge deck, or asphalt pad surface within the barrier footprint just prior to placement of the temporary barrier.
   F. Ensure the setback distance is clear of any grass, construction debris, stockpiled materials, equipment, and objects.
   G. Transitions are required between Type K Barrier and free-standing, anchored, back-filled materials, equipment, and objects.
   H. 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.
   I. 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.
   J. Anchor abutting segments of temporary barrier terminated with a Crash Cushion as shown in Index 102-110 or the APL.
   K. The requirements of this Index do not apply to Temporary Low Profile Barrier, See Index 102-120.
   L. Setback requirements below cover most Temporary Barrier options. Provide additional setback distance for APL products that require additional setback (deflection) space.

INSTALLATION DATA

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

* For Bridge Decks see Index 102-110 or APL
DEPARTURE SHOULD BAR 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 27 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 3/8" diameter hole may be provided at the bottom of the Connection Pin, as shown, for the installation of a vandal resistance bolt.
5. CONNECTION PIN INSTALLATION: Initially set Barrier Units by using a 3/8" wooden block between ends of adjacent units. Install Connection Pin between adjacent Barrier Units as shown, then pull newly placed Barrier Unit away from adjacent Barrier Unit to remove slack between Connection Pin and Bars 6D (except as shown on Sheet 2). Do not use Barrier Units unconnected.
6. USE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.
7. REMOVAL OF BOLTS, STAKES AND KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification 936 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification 926. If a flexible pavement is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.
8. Type K Anchored to Free-Standing transitions: Use the 3-3-2-1 Anchorage Transition Detail when transitioning Free-Standing and Anchored Units or when connecting Free-Standing runs to Crash Cushions, as shown in this Index.

NOTES FOR THRIE-BEAM GUARDRAIL SPICE 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.
4. 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.
5. CONNECTION PIN INSTALLATION: Initially set Barrier Units by using a 3/8" wooden block between ends of adjacent units. Install Connection Pin between adjacent Barrier Units as shown, then pull newly placed Barrier Unit away from adjacent Barrier Unit to remove slack between Connection Pin and Bars 6D (except as shown on Sheet 2). Do not use Barrier Units unconnected.
6. USE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.
7. REMOVAL OF BOLTS, STAKES AND KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification 936 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification 926. If a flexible pavement is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.
8. Type K Anchored to Free-Standing transitions: Use the 3-3-2-1 Anchorage Transition Detail when transitioning Free-Standing and Anchored Units or when connecting Free-Standing runs to Crash Cushions, as shown in this Index.

NOTES FOR THRIE-BEAM GUARDRAIL SPICE 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.
ADHESIVE-BONDING MATERIAL SYSTEMS: When using Adhesive Bonding Material Systems for Anchor Bolts, use Type HSHV in accordance with the specification.

ANCHOR BOLTS, NUTS AND WASHERS: When using Adhesive-Bonded Anchor Bolts, use fully threaded rods in accordance with ASTM F 1554 Grade 50 or ASTM A 193 B.

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.

NOTES FOR BOLTED INSTALLATIONS:
Bridge deck shown, approach slab or rigid pavement similar; installation adjacent to drop-off shown, median transition installation similar.

ANCHOR BOLTS, NUTS AND WASHERS: When using Adhesive-Bonded Anchor Bolts, use fully threaded rods in accordance with ASTM F 1554 Grade 50. Install Anchor Bolts for through bolting in accordance with ASTM A 307 or ASTM A 193 B. Install Flat Washers in accordance with ASTM F 436 and Plate Washers in accordance with ASTM A 36 Grade 36.

Install three (3) Anchor Bolts per Barrier Unit on the traffic side of the Barrier Units as shown, except for Transition Installations. For the number and positions of Anchor Bolts required in Transition Installations see Sheets 8 and 9 and Index 102-100. Drilling through deck reinforcing steel to install Anchor Bolts is permitted. Unless otherwise shown in the Plans, at the Contractor’s option Barrier Units may be installed by through bolting (where geometrically possible) or by the use of Adhesive-Bonded Anchor Bolts. Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drain. Install Anchor Bolts and Nuts so that the maximum extension beyond the face of the Barrier Units 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. Omit this Anchor Bolt adjacent to 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.

TREATMENT AT BRIDGE DECK EXPANSION JOINT SCHEMATIC

ANCHORED INSTALLATIONS - BOLTED
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 325 Grade 50. Weld in accordance with the American Welding Society Structural Welding Code (Steel) AWS/ASME S1.1 (current edition). Weld metal are E60XX or E70XX. Nondestructive testing of welds is not required.

Install three (3) Stakes on the traffic side of the Barrier unit 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.

FREE-STANDING INSTALLATION

1. For Bridge Decks only, use Keeper Pins that are $\frac{1}{2}$" diameter, smooth steel bar in accordance with ASTM A36 or ASTM A325 Grade 50. 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.
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.
**APPRAOCH TRANSITION FROM FREE-STANDING TO ANCHORED TYPE K TEMPORARY CONCRETE BARRIERS**

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

**LEGEND:**
- *Dot indicates number and position of Bolts or Stakes*
- Do not hallucinate.
TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

DESCRIPTION:
REVISION
LAST OF STANDARD PLANS FY 2019-20
INDEX
SHAPP TRAFFIC RAILINGS
FOR FLORIDA CORRAL AND VERTICAL APPROACH TRANSITION SPLICE DETAIL

PARTIAL PLAN VIEW AT MEDIAN TRAFFIC RAILING

32" F New Jersey Shape
Median Traffic Railing
Anchored Type K Barrier

PARTIAL PLAN VIEW AT SHOULDER TRAFFIC RAILING

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 ELEVATION VIEW - FLORIDA CORRAL TRAFFIC RAILING

32" Florida Corral Traffic Railing
Anchored Type K Barrier

PARTIAL ELEVATION VIEW - VERTICAL SHAPE TRAFFIC RAILINGS

42" Vertical Shape Traffic Railing (shown).
Anchored Type K Barrier

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

REVISION 01/01/17

REV 102-110

INDEX 8 of 17

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

STANDARD PLANS

FY 2019-20

FREE-STANDING TYPE K BARRIER SHOWN: ANCHORED

BARREL SIMILAR. SEE PLANS FOR SPECIFIC REQUIREMENTS

OFFSET BLOCK BOLTED TO GUARDRAIL

OFFSET BLOCK BOLTED TO GUARDRAIL

ALIGN TOP OF TYPE K BARRIER UNIT WITH TRAFFIC RAILING AT ITS END

FILL TAPERED TOE IF PRESENT (SHOWN HATCHED) WITH CONCRETE, SEE NOTE ON SHEET 1

PARTIAL PLAN VIEW

* SEE THRIE-BEAM GUARDRAIL SPlice INSTALLATIONS, SHEET 1.

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)

32" FLORIDA CORRAL TRAFFIC RAILING (SHOWN); 32" & 42" VERTICAL SHAPE TRAFFIC RAILING (SIMILAR)

32" & 42" VERTICAL SHAPE TRAFFIC RAILING (SIMILAR)

PAVED SURFACE (TYPE VARIES)

FILL TAPERED TOE IF PRESENT (SHOWN HATCHED) WITH CONCRETE, SEE NOTE ON SHEET 1

PARTIAL ELEVATION VIEW

CROSS REFERENCES: SEE SHEET 10 FOR SECTION A-A, SECTION B-B AND SECTION C-C.

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

TRAILING END SPlice DETAIL

FOR F AND NEW JERSEY SHAPE TRAFFIC RAILINGS

AND 8' & 14' TRAFFIC RAILING / NOISE WALLS

FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS

LIMITS OF CONCRETE FILL

OFFSET BLOCK BOLTED TO GUARDRAIL

OFFSET BLOCK BOLTED TO GUARDRAIL

ALIGN TOP OF TYPE K BARRIER UNIT WITH TRAFFIC RAILING AT ITS END

FILL TAPERED TOE (SHOWN HATCHED) WITH CONCRETE, SEE NOTE ON SHEET 1

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

CROSS REFERENCES: SEE SHEET 10 FOR SECTION A-A, SECTION B-B AND SECTION C-C.
TRAILING END SPLICE DETAIL
FOR 32" F AND NEW JERSEY SHAPE TRAFFIC RAILINGS
WITH RAILING TRANSITION AND END POST

PARTIAL PLAN VIEW

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

Free-standing Type K Barrier shown; Anchored Barrier Similar, See Plans For Specific Requirements

Paved Surface (type var) Begin or End Approach Slab (approximate location)

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

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

Guardrail Splice Installations, Sheet 1.

See Thrie-Beam Guardrail Positioning

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

PARTIAL ELEVATION VIEW

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

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

TRAILING END SPLICE DETAIL
FOR 32" F AND NEW JERSEY SHAPE TRAFFIC RAILINGS
WITH RAILING TRANSITION AND END POST

Approach Slab shown, Paved Surface similar

Begin or End Bridge

Anchor Bolts (shown) or Stakes; see Partial Plan View for locations

Cross References:
See Sheet 10 for Section B-B,
Section C-C and Section E-E.
**SECTION A-A**
32" F Shape Median Traffic Railing (shown), Median Concrete Barrier Wall (similar)

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

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

**SECTION A-A**
32" & 42" Vertical Shape Traffic Railing (shown), Florida Corral Traffic Railing (similar)

**SECTION B-B**
Adjacent to Shoulder Traffic Railings

**SECTION C-C**
Adjacent to 32" F or New Jersey Shape Median Traffic Railing or Median Concrete Barrier Wall

**SECTION D-D**
32" F or New Jersey Shape Traffic Railing, Railing Transition & End Post

**SECTION E-E**
32" New Jersey Shape Traffic Railing (shown), 32" F Shape Traffic Railing (similar)

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* Shift Thrie-Beam Guardrail Splice beyond Open joint 2'-0" Min. (as shown) when 3' Min. dimension can not be obtained

* 3" Min.

* 1'-0" ± 1"
**DESCRIPTION:**

Approach Transition from Free-Standing Proprietary Temporary Barriers to Anchored Type K Temporary Concrete Barriers

Approach and Trailing End Transitions from Free-Standing Type K Temporary Concrete Barriers to Free-Standing Proprietary Temporary Barriers

Trailing End Transition from Anchored Type K Temporary Concrete Barriers to Free-Standing Proprietary Temporary Barriers

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

**LEGEND:**
- Dot indicates number and position of Bolts or Nails
**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**

**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
**DESCRIPTION:**

**APPROACH SHOULDER BARRIER ON UNDIVIDED FACILITIES**

- Free-Standing Barrier (Type K or Proprietary Temporary Barrier)
- Crash Cushion
- Edge Of Travel Way
- 2 Units
- 3 Units
- 4 Units
- 6 Units
- Anchorered Barrier
- Transition
- Barrier Type K

**APPROACH SHOULDER BARRIER ON DIVIDED FACILITIES**

- Free-Standing Barrier (Type K or Proprietary Temporary Barrier)
- Edge Of Travel Way
- 3 Units
- 4 Units
- 6 Units
- Anchorered Barrier
- Transition
- Anchorered Barrier

**INTERIOR MEDIAN BARRIER**

- Free-Standing Barrier Type K
- Overlap Reference Line
- 3 Units
- 6 Units
- 1:18

**LEGEND**

- Dot Indicates Number And Position Of Bolts Or Stakes

**DEPARTURE (TRAILING) SHOULDER BARRIER ON UNDIVIDED FACILITIES**

- Free-Standing Barrier (Other Than Type K)
- Anchorered Barrier
- Free-Standing Barrier (Type K or Proprietary Temporary Barrier)

**DEPARTURE (TRAILING) SHOULDER BARRIER ON DIVIDED FACILITIES**

- Free-Standing Barrier (Type K or Proprietary Temporary Barrier)
- Anchorered Barrier
- Free-Standing Barrier (Type K or Proprietary Temporary Barrier)

**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

SHIELDING ENDS WITH REDIRECTIVE CRASH CUSHIONS (REDIRECTIVE OPTION)

END TREATMENT WHEN SHIELDED BY A CRASH CUSHION

SHOULDERRIGHT OR LEFT (RIGHT SIDE SHOWN)
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 fall below 3000 psi will be rejected.

REINFORCING STEEL:

A. Use only steel reinforcing that meet ASTM A 615, Grade 60, with the exception of Bars 6D1, 6D2 and 6D3.
B. Bars 6D1, 6D2 and 6D3 use steel reinforcing that meets ASTM A 706, with the exception that a 2 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. At the Fabricator’s option, the entire length of Bars 6D may be galvanized or coated.
E. The minimum limit of galvanizing or coating is shown in the Bending Diagrams.
F. Install Bars 6D within 1/2 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 400 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 K1
   - Fabricator's name or symbol
   - Date of manufacture (day, month and year)
**Type K Temporary Concrete Barrier System**

**FY 2019-20 Standard Plans**

**Revision Description:**

- **Standard Plans FY 2019-20**
- **Sheet Index:**
- **Revision:**

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**Concrete Barrier Quantities**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Concrete</td>
<td>CY</td>
<td>1.29</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>218</td>
</tr>
</tbody>
</table>

The above quantities are for one Barrier Unit.

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**Plan View**

- **Anchors Blockout Detail**

**Elevation View**

- **Lifting Sleeve Assembly Detail (Optional)**

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**Notes:**

- **Section D-D**
  - Reinforcement not shown for clarity
  - Measured from end of Barrier Unit to outside edge of Bar 6C.
Field trim D19.7 to clear drain slot by 2". Reinforcement cage as shown. Place 2 ~ No. 5 Bars (12'-3" long) tied to D 19.7 inside of bottom Welded Wire.
GENERAL NOTES

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

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

3. This legally mandated relationship is unique to federally funded University patents that Department contractors use on Contracts. Pursuant to federal law, the University may pursue royalties for a valid patent. Only 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 precasting concrete barrier walls. Each barrier wall unit shall be permanently marked with an identification that is traceable to the manufacturer, the producing precast concrete plant and the date of production. This permanent identification mark will serve as certification that the unit has been manufactured in accordance with University of Florida drawings and specifications, and the approved quality control program.

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

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

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

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

8. Information regarding licensing, shop drawings, specifications, quality control and certification of compliance can be obtained from the University Of Florida: Office of Technology Licensing, P.O. Box 115500, Gainesville, Florida, 32611-5500. Telephone: 352-392-8929, Fax: 352-392-6600. Reference UF#11052.

9. The Portable Temporary Low Profile Barrier For Roadside Safety shall be paid for under the contract unit price for Barrier Wall (Temporary) Low Profile Concrete, LF, and will be full compensation for furnishing, installing, maintaining and removing barrier wall. Deflection space shall be kept clear of any grass, construction debris, stockpiled materials, equipment, and objects.

10. The Portable Temporary Low Profile Barrier For Roadside Safety shall be paid for under the contract unit price for Barrier Wall (Temporary) Low Profile Concrete, LF, and will be full compensation for furnishing, installing, maintaining and removing barrier wall. Deflection space shall be kept clear of any grass, construction debris, stockpiled materials, equipment, and objects.
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

END VIEWS

DEFLECTION SPACE AT DROP-OFFS

PLAN VIEWS OF CONNECTIONS

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 miscellaneous asphalt 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.

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 miscellaneous asphalt 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.
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

MAXIMUM CURVATURE ● MINIMUM RADIUS

CONVEX CURVATURE

CONCAVE CURVATURE

TRAFFIC SIDE

Inset A

Inset B

See Inset A

See Inset B

TRAFFIC SIDE
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

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

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

BARRIER OPENINGS AT DRIVEWAYS

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

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

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

**LEGEND**

| Type I Object Marker |

**BARRIER OPENINGS AT DRIVEWAYS**

**PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY**
## GENERAL NOTES:

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

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

3. Except for emergencies, any road closure on State Highway System shall comply with Section 335.15, F.S.
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 determine lane lengths, departure rates, lane widths, clear zone widths, taper lengths, crash cushion requirements, mark间隔ings, superelevation and other similar features.

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

Travel Way
The portion of the roadway for the movement of vehicles. For traffic control through work zone, travel lane 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 traffic lanes.

b. Auxiliary Lane: The designated widths of roadway pavement marked to separate speed change, turning, passing and climbing maneuvers from through traffic.

Detour, Lane Shift, and Diversion
A detour is the redirection of traffic onto another roadway to bypass the temporary traffic control zone. A lane shift is the redirection of 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 does not meet breakaway requirements.

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

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

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

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

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

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

OVERHEAD WORK
This traffic control is only allowed over a traffic lane when one of the following conditions exist:

OPTION 1 (OVERHEAD WORK USING A MODIFIED LANE CLOSURE)

a. Work operations are located on a utility pole, light pole, signal pole, or other structures.
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 operations allow an open traffic lane is allowed if all of the following conditions are met:

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

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

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

a. Work operations are located on a utility pole, light pole, signal pole, or their appurtenances.
b. Work operations are 1 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 edge of travel way up to 18 height.
e. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.
f. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.
g. Adequate precautions are taken to prevent parts, tools, equipment and other objects from falling into open lanes of traffic.
h. Other Governmental Agencies, Rail facilities, or Codes may require a greater clearance. The greater clearance required prevails as the rule.

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 the overhead work operations in accordance with the appropriate index drawing or detail in the plans. This option applies to, but not limited to, the following construction activities:

a. Beam, girders, segments, and bent/pipe cap placement.
b. Form and falsework placement and removal.
c. Concrete placement.
d. Railing 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 12 hour changeable message sign upstream of the work area with alternating messages, ‘Overhead Work Ahead’ and ‘Be Prepared to Stop’ followed by a traffic control officer and police vehicle with blue lights flashing during the pulling operation.

RAILROADS

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

DISTANCE SIGN

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 curvatures.

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

ABOVEGROUND HAZARD

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

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

The term ‘clear zone’ describes the unobstructed relatively flat area, impacted by construction, extending outward from the edge of the traffic lane. The table below gives clear zone widths 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 215.2.

<table>
<thead>
<tr>
<th>WORK ZONE SPEED (MPH)</th>
<th>TRAVEL LANES &amp; MULTILANE RAMPS</th>
<th>AUXILIARY LANES &amp; SINGLE LANE RAMPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-70</td>
<td>30</td>
<td>10</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>ALL SPEEDS</td>
<td>11' BEHIND FACE OF CURB</td>
<td>4' BEHIND FACE OF CURB</td>
</tr>
</tbody>
</table>

SUPERELEVATION

Horizontal curves constructed in conjunction with work zone traffic control should have the required superelevation applied to the design 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>MINIMUM RADIUS FOR NORMAL CROWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORK ZONE POSTED SPEED (MPH)</td>
</tr>
<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>65</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>35</td>
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<tr>
<td>30</td>
</tr>
</tbody>
</table>

SUPERELEVATE WHEN SMALLER Radii is Used

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.

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 who 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 weight) and restriction time frames. When the roadway is restored to normal service the State Permits Office shall be notified immediately.

LANE WIDTHS

Lane widths of through roadways should be maintained through work zone travel 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 excused by the Federal Highway Administration; 11' for freeways, and 10' for all other facilities.

HIGH-VISIBILITY SAFETY APPAREL

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

WORKERS

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

UTILITIES

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

FLAGGERS

For daytime activities, Flaggers shall wear ANSI/ISEA Class 2 apparel. For nighttime activities, Flaggers shall wear ANSI/ISEA Class 3 apparel.
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 to or stop as required before entering the work zone. 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. The 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 night-time, the STOP/SLOW paddle shall be retroreflective.

Flag use is limited to immediate emergencies, interceptions, 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 lanes. Flags, when used, shall be a minimum of 24 inches square, made of a good grade of red material, and securely fastened in a manner that is approximately 36 inches in length. When used at nighttime, flags shall be retroreflective/corated.

Flashlight, lantern or other lighted signal that will display a red warning light shall be used at night.

Flagger Stations
Flagger 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 flagger 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 as called for on certain 102 Series of Indexes should be placed on all projects, but may be omitted where the project is for 1 day except as noted in the Indexes.

Survey Between Active Traffic Lanes or Sharrow Turn Lanes
Survey Between Active Traffic Lanes or Sharrow Turn Lanes

The following provisions apply to Main Highway Traffic Control Work Zones. These provisions must be adjusted by the Party Chief to fit roadway and traffic conditions when the Work Zone Signage includes intersections.

(A) A STAY IN YOUR LANE 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 flagging equipment. Cones, if used, may be placed up to or at 59 intervals along the break line through the work zone.

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

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

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

Retroreflective vinyl sheeting requirements of Specification Section 994 may be used for daylight or night operations to not exceed 1 day except as noted in the Indexes.

Rigid 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
The rules for the control of traffic entering and leaving work zones by way of intersecting crossroads shall be adequate to inform drivers aware of work zone conditions. When work operations exceed 60 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 areas or in some cases other areas within their traffic control zones. Where such restrictions 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 responsibility, and by the Project Engineer for projects under adjoining responsibilities.

(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 work on or adjacent to uncontrolled maintenance works and highway construction projects.

SIGN COVERING AND INTERMITTENT WORK STOPPAGE SIGNING
Existing 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.

Sign covers are incidental to work operations and are not paid for separately.

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 (R-14) warning sign should be used for the advanced warning for a lane shift. A diversion sign 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 Advance Warning Signs may be required on any type roadway, but particularly considered 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 (W21-7) 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) showing the length ROAD WORK NEXT. MILES is required for all projects of 2 miles or more. The number of miles entered should be rounded up to the nearest mile. The sign shall be located at a clear construction point.

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 ROAD WORK AHEAD sign midway to the next sign whichever is less.

GROOVED PAVEMENT AHEAD SIGN
The GROOVED PAVEMENT AHEAD sign is required 50 feet in advance of a milled or grooved pavement surface open to traffic. The WB-1SP placard shall be used in conjunction with the GROOVED PAVEMENT AHEAD sign.

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

PROJECT INFORMATION SIGN
The Project information sign shall be installed when called for in the plans.
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 II Barricade shown on the APL.
   b. Pedestrian advanced warning or pedestrian regulatory signs mounted on signs supports 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 barricades/sign combination must be crashworthy in accordance with NCHRP 550 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 APL 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 60, or ASTM A 599, Grade 1080 (with a minimum yield strength of 60 ksi). Square tube posts shall conform with ASTM A 653, Grade 50, or ASTM A 1011, Grade 50.

8. Use 3 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.

9. For diamond warning signs with supplement plaque (up to 3' x 3') 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 breakthrough 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 breakthrough splice in accordance with the manufacturer’s detail shown on the APL.

12. Install all posts plumb.

13. The contractor may set posts in preformed 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.

14. The contractor may install 3 lb/ft Steel U-Channel Posts in accordance with the manufacturer’s detail shown on the APL.

15. Use 4 lb/ft U-channel sign post with a minimum height of 7' min. and 8' max. Attach sign panel using Z-bracket detail on Sheet 6.

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

17. 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.

18. The soil plate as shown on the APL vendor drawing is not required for base posts or sign posts installed in existing rock (as defined in Note 3), asphalt roadway, shoulder pavement or soil under sidewalk.
**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).

**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.

**PROJECT INFORMATION SIGN**

**MOUNTING DETAIL**

**BRACKET DETAIL**

**SIGN ATTACHMENT DETAIL**

(WITH Z-BRACKET)
Notes:
1. The size of diamond shaped Temporary Traffic Control (TTC) warning signs shall be a minimum of 48" X 48".
2. Fluorescent orange shall be used for all orange colored work zone signs.
3. The sign shields, symbols and messages contained on this sheet are provided for ready reference to those signs used in the development of the 102 Series of indexes and are commonly used in the development of traffic control plans. For additional signs and sign detail information refer to the STANDARD HIGHWAY SIGNS MANUAL as specified in the MUTCD. Special signs for traffic control plans will be as approved by the State Traffic Plans Engineer.

The sign codes shown on this sheet are for the purpose of identifying cell names found in the Traffic Control Cell Library (TCC Cell). The STANDARD HIGHWAY SIGNS MANUAL should be referenced for the official sign codes for use in the development of traffic control plans.

See Index 700-102 for MOT sign details.
MANHOLES/CROSSWALKS/JOINTS

Manholes extending 1" or more above the traveled 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.

MANHOLES/CROSSWALKS/JOINTS

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, LS.

REMOVING PAVEMENT MARKINGS

Existing pavement markings that conflict with temporary work zone delineation shall be removed by any method approved by the Engineer, or operations extend 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 of any loss of detection within 12 hours. The contractor shall select only detection technology listed on the Department’s Approved Products List (APL) and approved by the Engineer to restore detection capabilities.

ADVANCE WARNING ARROW BOARDS

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

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

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

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

PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)

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

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

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

For additional information refer to the FDOT 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, LTD. Use of this treatment in lieu of a temporary barrier is not eligible for CSIP consideration. Conduct daily inspections for deficiencies related to erosion, excessive slopes, rutting or other adverse conditions. Repair any deficiencies immediately.

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

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

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

Table 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>X (ft)</th>
<th>D (in.)</th>
<th>Device Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-12</td>
<td>&gt; 3</td>
<td>Temporary Barrier</td>
</tr>
<tr>
<td>2</td>
<td>&gt; 12-CZ</td>
<td>&gt; 3 to 5</td>
<td>Channelizing Device</td>
</tr>
<tr>
<td>3</td>
<td>0-12</td>
<td>&gt; 5</td>
<td>Temporary Barrier</td>
</tr>
<tr>
<td>4</td>
<td>Removal of Bridge or Retaining Wall Barrier</td>
<td></td>
<td>Temporary Barrier</td>
</tr>
<tr>
<td>5</td>
<td>Removal of portions of Bridge Deck</td>
<td></td>
<td>Temporary Barrier</td>
</tr>
</tbody>
</table>

DROP-OFF CONDITION DETAIL

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 R4-1 and W8-11 sign with "UNEVEN LANES" is required at intervals of 0.5 mile maximum.

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.
**Table 3 Device Spacing**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Max. Distance Between Devices (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vertical Panels</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>

**Fixed (Surface Mounted) Channelizing Devices**

**SECTION AA**

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

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

3. 12" openings for drainage shall be constructed in the asphalt and portable temporary lane separator at a maximum spacing of 25' in areas with grades of 1% or less or 50' in areas with grades over 1% as directed by the Engineer.

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

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.
CHANNELIZING DEVICE NOTES:

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

2. The Type III Barricade shall have a 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 1-7 above the driving surface.

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

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

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

8. Cones shall:
   a. Be used only in active work zones where workers are present
   b. Be reflectorized as per the MUTCD with Department-approved reflective collars when used at night.

9. Vehicular longitudinal channelizing devices shall not exceed 36" in height. For vehicular longitudinal channelizing devices (LCDs) less than 32" in height, the LCD shall be supported 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 supplementary 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 3/4" 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:

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

<table>
<thead>
<tr>
<th>Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-100</td>
<td>Temporary Barrier</td>
</tr>
<tr>
<td>102-120</td>
<td>Low Profile Barrier</td>
</tr>
<tr>
<td>536-001</td>
<td>Guardrail</td>
</tr>
</tbody>
</table>

2. Trailer Mounted Barriers may be used to provide positive protection for workers within the work area. APL drawings may be used as a guide to develop project specific Temporary Traffic Control Plans that are signed and sealed by the Contractor's Engineer.

LONGITUDINAL CHANNELIZING DEVICE

- Use Barrier Delineators Per Note 11
- Use Barrier Delineators Per Note 11 When Placed Parallel To and Within 4 Feet Of The Edge Of Travel Way

VEHICULAR LCD

VEHICULAR/PEDESTRIAN LCD

PEDESTRIAN LCD
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.

PLACEMENT OF PAVEMENT MARKINGS

LW = Total width of travel lanes divided
by the number of travel lanes unless
other widths are shown in the plans.
OFFSET ZONE:

1. Behind an existing barrier,
2. More than 2' behind the curb,
3. 15' or more from the edge of travel way.

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. SMUDEER 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 TCZ 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.

SYMBOLS

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

INDEX

102-602

FY 2019-20 STANDARD PLANS

TWO-LANE, TWO-WAY, WORK ON SHOULDER
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 envelope length plus 300 feet, extend the Buffer Space as shown on Sheet 3.
      b. If the queuing of vehicles active railroad crossing cannot be avoided, provide a uniformed traffic control officer or flagger at the highway-rail grade crossing to prevent vehicles from stopping within the high-speed grade crossing, even if automatic train warning devices are in place.
   B. If the Work Area approaches the Centerline, use the Layout for Temporary Lane Shift in Shoulder on Sheet 3 only if the Existing Paved Shoulder width is sufficient to provide for an 11’ lane between the Work Area and the Edge of Existing Paved Shoulder. Reduce the posted speed when appropriate.

2. Temporary Raised Rumble Strips:
   A. Use when at least one of the following conditions is met concurrently:
      a. Existing Posted Speed is 55 mph or greater;
      b. Speed limit is 45 mph or less.
   B. Official vehicle;
   C. Flag-carrying vehicle;
   D. Traffic signals.

3. Additional one-way control may be provided by the following means:
   A. Flag-carrying vehicle;
   B. Official vehicle;
   C. Pilot vehicle;
   D. Traffic signals.

When flaggers are the sole means of one-way control, the flaggers must be in sight of each other or in direct communication at all times.

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. When Buffer Space cannot be attained due to geometric constraints, use additional TTC devices in accordance with other applicable TCZ Indexes.

7. ROAD WORK AHEAD and the BE PREPARED TO STOP signs 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. 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. If a railroad crossing is present, vehicles will not queue across rail tracks.
   G. AFADs are not in use.

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.

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

TABLE 1

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Maximum Spacing of Cones 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>On a Tangent</td>
<td>On a Tangent</td>
<td>On a Tangent</td>
<td>A B C D</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>50</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>40</td>
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<td>20</td>
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<tr>
<td>60</td>
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<td>50</td>
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</tr>
<tr>
<td>70</td>
<td>20</td>
<td>50</td>
<td>20</td>
<td>50</td>
</tr>
</tbody>
</table>

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

Temporary Raised Rumble Strip Set (See GENERAL NOTE 2)

Temporary Raised Rumble Strip Set (See GENERAL NOTE 2)

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

WITH TEMPORARY RAISED RUMBLE STRIPS
(When Required See GENERAL NOTE 2)

REMovable POLymer STRIPING TAPE

RUMBLE STRIP SET
OPTION - 1

MOLDED ENGINEERED POLYMER SET

RUMBLE STRIP SET
OPTION - 2

TEMPORARY RAISED RUMBLE STRIPS
SPECIAL CONDITIONS

TEMPORARY RAILROAD CROSSING BUFFER SPACE EXTENSION

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

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

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

GENERAL NOTES

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

DURATION NOTES

3. 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.
SYMBOLES

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

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

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

CONDITIONS
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF ONE TRAFFIC LANE, FOR WORK AREAS LESS THAN 200' DOWNSTREAM FROM AN INTERSECTION FOR A PERIOD OF MORE THAN 60 MINUTES.

CONDITIONS
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING 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

- Temporary Signal
- Cones or Tubular Markers At 25' Centers
- Type I Or Type II Barricades Or Vertical Panels Or Drums At 50 Centers
- All Transition Barricades Or Tubular Markers At 25' Centers Max.
- Varies (To Provide Width Needed For Turning Trucks

STOP HERE ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

Side Road

Flagger Or Temporary Signal
For Control Of Side Road

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

Type I Or Type II Barricades Or Vertical Panels Or Drums At 50 Centers

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)

STOP ON RED SIGNAL

Temporary Signal

100' Min.

500' Max.

Varies (To Provide Width Needed For Turning Trucks

24" White Removable Tape
(Location To Suit Signal Position)
SINGLE LANE CLOSURE · ROADWAY AND BRIDGES ALL LENGTHS

Temporary Signal

24" White Removable Tape
(Location To Suit Signal Position)

Work Area

Flagger Or Temporary Signal
For Control Of Side Road

Temporary Signal

All Transition Barricades

Type I Or Type II Barricades Or Vertical Panels
Or Drums At 50 Centers
At 25 Centers Max.

24" White Removable Tape
(Location To Suit Signal Position)

SINGLE LANE CLOSURE · SHORT BRIDGES

Temporary Signal

Work Area

Varies (Not On Bridge)

24" White Removable Tape
(Location To Suit Signal Position)

Varies (Min. Side Road Return Width)

SPEED LIMIT 30 MPH

SIDE ROAD

ROAD AHEAD

WORK

PRESENT

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Present Speeding Fines Doubled When Workers Present

Varies (15' Min.)

100' Min.

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'

500'
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.

**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.

**SYMBOLS**

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

**CONDITIONS**

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

1. 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 100' 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 application 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 TTC indexes.
6. If temporary structures are required on the diversion, traffic control will be in conformance with Index 105-650.
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 ½ 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 applies when work is being performed on a multilane undivided highway.

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

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

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

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

SYMBOLS

- Work Area
- Lane Identification + Direction of Traffic

CONDITIONS

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

MULTILANE, WORK OUTSIDE SHOULDER

INDEX

102-611

1 of 1
**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 1TC zone, additional 1TC devices shall be placed in accordance with other applicable TCZ Indexes.

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

**DURATION NOTES**

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

**CONDITIONS**

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

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

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

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

The same applies to undivided highways with the following exceptions:

a. Work shall be confined within one median lane.

b. Additional barricades, cones, or drums shall be placed along the centerline abutting the work area and across the trailing end of the work area.

When work on undivided highways occurs across the centerline so as to encroach on both median lanes, the inverted plan is applied to the approach of both roadways.

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

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

6. When paved shoulders having a width of 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.

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

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

9. For general TCZ requirements and additional information, refer to Index 102-400.

DISTANCE BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 to 55</td>
<td>200</td>
<td>250</td>
<td>200</td>
</tr>
<tr>
<td>45 mph</td>
<td>250</td>
<td>275</td>
<td>225</td>
</tr>
<tr>
<td>50 mph</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>*35 mph or greater</td>
<td>2400</td>
<td>1640</td>
<td>1000</td>
</tr>
</tbody>
</table>

* The ROAD WORK 1 MILE sign may be used as an alternate to the ROAD WORK AHEAD sign and the RIGHT LANE CLOSED ½ MILE sign may be used as an alternate to the RIGHT LANE CLOSED AHEAD sign.

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

SYMBOLS

- **Work Area**
- Channelizing Device (See Index 102-600)
- **Advance Warning Arrow Board**
- **Right Lane Closed Ahead**
- **Speeding fines double when workers present**

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 notes column. Where:

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

\[ L = \frac{2W}{S} \]

For work operations up to approximately 15 minutes, signs, channelizing devices, arrow board, and buffer space may be omitted if all of the following conditions are met:

a. Speed limit is 45 mph or less.

b. No sight obstructions to vehicles approaching the work area for a distance equal to the buffer space and the taper length combined.

c. Volume and complexity of the roadway has been considered.

d. The closed lane is occupied by a class 5 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GVWR) of 16,000 lb. with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

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

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE LANE ADJACENT TO EITHER SHOULDER AND THE AREA 2' OUTSIDE THE EDGE OF TRAVEL WAY.
EVEN PAVEMENT

INTERMITTENT WORK STOPPAGE - LANE REOPENED TO TRAFFIC

UNEVEN PAVEMENT

ROAD WORK

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

ARROW BOARD OPERATION DISCONTINUED AND ARROW BOARD SHALL BE REMOVED OR RELOCATED OUTSIDE THE CLEAR ZONE OR BE SHIELDED BY A BARRIERS OR CRASH CUSHION

Edward C. Logue
CONDITION NOTES

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

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

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

GENERAL NOTES

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

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

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

SYMBOLS

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

**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.
### 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 102-400.

### DURATION NOTES

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT ReQUIRING THE CLOSURE OF AT LEAST ONE MEDIAN TRAFFIC LANE.

#### CONDITIONS
- Work operations are 60 minutes or less.
- Speed is 45 mph or less.
- No sight obstructions to vehicles approaching the work area for a distance equal to twice the taper length.
- Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.
- Volume and complexity of the roadway has been considered.

### TABLE II

<table>
<thead>
<tr>
<th>Speed (mpg)</th>
<th>Spacing (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>40 mph or less</td>
<td>200</td>
</tr>
<tr>
<td>45 mph</td>
<td>250</td>
</tr>
</tbody>
</table>

#### Notes
- If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-660.
- For lateral transitions other than 12', use formula for L shown in the notes column. Where:
  \[ L = \frac{W}{S^2} \]
  \( L = \) Length of taper in feet
  \( W = \) Width of lateral transition in feet
  \( S = \) Posted speed limit (mph)

### SYMBOLS

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

### SIGNALIZED

- ROAD WORK AHEAD
- LEFT LANE CLOSED AHEAD
- WORKERS

### CONDITIONS

- Work operations are 60 minutes or less.
- Speed is 45 mph or less.
- No sight obstructions to vehicles approaching the work area for a distance equal to twice the taper length.
- Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.
- Volume and complexity of the roadway has been considered.

#### DURATION NOTES

- Work operations are 60 minutes or less.
- Speed is 45 mph or less.
- No sight obstructions to vehicles approaching the work area for a distance equal to twice the taper length.
- Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.
- 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 AT LEAST ONE MEDIAN TRAFFIC LANE.

#### Table II

<table>
<thead>
<tr>
<th>Taper Length - Merge (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:

\[ L = \frac{W}{S^2} \]

\( L = \) 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.

2. Inside travel 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.

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

4. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-460.

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

6. 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.

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.
   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

For general TCZ requirements and additional information, refer to Index 102-600.
**Table I**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Cones or Tubular Markers</th>
<th>Type I or Type II Barriers or Vertical Panes or Drums</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30 to 45</td>
<td>25</td>
<td>50</td>
</tr>
</tbody>
</table>

**Table II**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L (ft)</th>
<th>Notes (Merge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>125</td>
<td>L = WS²</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td>L = WS²</td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td>L = WS²</td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td>L = WS²</td>
</tr>
<tr>
<td>45</td>
<td>540</td>
<td>L = WS²</td>
</tr>
</tbody>
</table>

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed (mph)</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>
</tr>
<tr>
<td>45 mph</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

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

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

1. The normal procedure is to close 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.

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

WITH SIGNIFICANT RIGHT TURNING MOVEMENTS
**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A (ft)</th>
<th>B (ft)</th>
<th>C (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>200</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>45 mph</td>
<td>250</td>
<td>250</td>
<td>350</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>Speed (mph)</td>
<td>Cones or Tubular Markers</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30 to 45</td>
<td>25</td>
</tr>
</tbody>
</table>

**Table II**

<table>
<thead>
<tr>
<th>Taper Length - Merge (12' Lateral Transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mph)</td>
</tr>
<tr>
<td>-------------</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:

\[
L = \text{length of taper in feet} \\
W = \text{width of lateral transition in feet} \\
S = \text{posted speed limit (mph)}
\]

1. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left turning movements, then the left lane may be reopened as a turn bay for left turns only as shown in this detail.
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, oscillating, or strobe lights operating.
   e. Volume and complexity of the roadway has been considered.

CONDITIONS

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

SYMBOLS

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

DISTANCE BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed</th>
<th>Spacing (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>200 200</td>
</tr>
<tr>
<td>45 mph</td>
<td>150 150</td>
</tr>
</tbody>
</table>

Table I

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Cones or Barricades or Vertical Type I or Type II Panels or Drums</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>See Table I</td>
</tr>
</tbody>
</table>

Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Buffer Space (12' Lateral Transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dist. (ft)</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>25</td>
<td>135</td>
</tr>
<tr>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>35</td>
<td>230</td>
</tr>
<tr>
<td>40</td>
<td>305</td>
</tr>
<tr>
<td>45</td>
<td>360</td>
</tr>
</tbody>
</table>

L = \frac{S^2 \times W}{2}

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)

DISTANCE BETWEEN SIGNS

<table>
<thead>
<tr>
<th>Speed</th>
<th>Spacing (ft.)</th>
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<tbody>
<tr>
<td>40 mph or less</td>
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<td>45 mph</td>
<td>150 150</td>
</tr>
</tbody>
</table>

Table I

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Cones or Barricades or Vertical Type I or Type II Panels or Drums</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>See Table I</td>
</tr>
</tbody>
</table>

Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Buffer Space (12' Lateral Transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dist. (ft)</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>25</td>
<td>135</td>
</tr>
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<td>305</td>
</tr>
<tr>
<td>45</td>
<td>360</td>
</tr>
</tbody>
</table>

L = \frac{S^2 \times W}{2}

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)
1. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-600.

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'. 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.

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

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

1. These illustrations are representative of general conditions.

2. The figures illustrate closing the right shoulder or right lanes for various lane configurations. When work is required on left side of roadways, the inverted plan is to be applied. The intent of this index is to allow passing on only one side of the work convey.

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 lane.

GENERAL NOTES

1. 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.

2. 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.

3. Work, Shadow, and Advance Warning Vehicles shall have high-intensity rotating, flashing, oscillating, or strobe lights operating.

4. Functional two-way communication is required between all vehicles in the mobile operations convoy.

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

REV 10/2019

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

WORK WITHIN TRAVEL WAY, CENTER LANE OR OUTSIDE CENTERLINE

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

WORK WITHIN TRAVEL LANE

SYMBOLS

- **W** Work Vehicle
- **S** Shadow (S) Vehicle with Arrow Board
- **AW** Advance Warning (AW) Vehicle with Arrow Board and Sign Message or Changeable Message Sign
- **TMA** Truck/Trailer Mounted Attenuator (TMA)
- **→** Lane Identification And Direction Of Traffic
- **A** Arrow Board

WORK WITHIN TRAVEL WAY, CENTER LANE OR OUTSIDE CENTERLINE

MOVE/MERGE MODE

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

WORK WITHIN TRAVEL LANE

MOVE/MERGE MODE
GENERAL NOTES

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

2. 1 (min.) = WS for speeds ≤ 45 mph
   60 = for speeds ≥ 45 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 I or II barricades or vertical panels or drums may be increased to 100' within the limits of the tangent, or post mounted delineators at 50' centers may be substituted for barricades, vertical panels or drums.

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

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

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

SYMBOLS

[Icon] Work Area

- Channelizing Device (See Index 102-600)

D Work Zone Sign

■ Advance Warning Arrow Board

←Δ 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.

SCHEME APPLICATIONS

Scheme 1: Restricted Construction Limits.

Scheme 2: Unrestricted Construction Limits
And Light To Moderate Traffic.

Scheme 3: Unrestricted Construction Limits
And Moderate To Heavy Traffic.

Where: Construction Limits Are The
Outward Beginning Or Ending
Of Lane Reductions.

Where: Unless A Specific Scheme Is
Called For In The Plans, Scheme
Selection Shall Be At The Contractor’s
Option And As Approved By The
Engineer.
GENERAL NOTES

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

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

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

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

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

6. Lane identification + direction of traffic

SYMBOLS

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

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.
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.

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

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

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

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

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

**10/30/2018 9:22 AM**

**REVISION DESCRIPTION:**

**REV 11/01/17)**

**DOUBLE LANE CLOSURE**

**MULTILANE, WORK WITHIN THE TRAVEL WAY**

**END ROAD WORK**

**Pavement Markings**

- **White Reflectorized Median**

**ROAD WORK AHEAD**

**SPEEDING FINES DOUBLED WHEN WORKERS PRESENT**

**SYMBOLS**

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

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Dist (ft.)</th>
<th>L (ft.)</th>
<th>Notes (Merge)</th>
<th>Taper</th>
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<td>55</td>
<td>60</td>
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**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 end signs substituted for the right lanes closed and lane end signs.

4. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable 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 Index 102-612 for shoulder taper formulas.

**DURATION**

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

**CONDITIONS**

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

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

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

W Work Area

C Channelizing Device (See Index 102-600)

S Work Zone Sign

ıkl Work Vehicle With Flashing/Strobe Lights

Shadow (S) Or Advance Warning (AW)

Vehicle with Advance Warning Arrow Board and Sign Message

A 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 1

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. L = Length of taper in feet:
   - W5 for speeds ≤ 45 mph
   - W5/2 for speeds > 45 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 25' centers for cones or tubular markers and 30' for Type I or Type II barricades or vertical panels or drums.

5. For Case I, Conditions A, when the median width is too narrow for trucks to make turns into Lane No. 2, Sign Nos. 1, 2, 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
- Lane Number
- Lane Identification + Direction of Traffic

(C) Crosshatch - Paving Train (Milling And/Or Placement)

500' Min. 500' Min. 1000' Min. 1000' Min.

See GENERAL NOTE 5

WITH TAPER TRANSITION

These Signs Advance With Taper Transition

Same As Above

FRONT OF THE PAVING TRAIN.

These Signs Advance With Taper Transition

Same As Above

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

_Project Advance Warning Signing_

Paving Train (Milling And/Or Placement)
CONDITION A

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

CASE II

TRAFFIC TRANSITION AREA DOWNSTREAM FROM CROSSEOVER

Note: See Sheet 2 for General Notes.
GENERAL NOTES

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

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

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

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

5. Trailer mounted advance warning 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 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.

TEMPORARY CROSSOVER FOR MEDIAN WIDTHS ≥ 75'

SYMBOLS

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

REFERENCES:

- 330 Taper
- 30' Min.
- Mitered End Section

PLANS

- SECTION AA
  - Existing Roadway
  - Existing Pavement
  - Widening
  - Match Slope of Existing Paved Shoulder
  - 1:4 Or Flatter

- SECTION BB
  - Mitered End Section

LENGTH OF ACCESS LANES (FT.)

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<td>3 to 4% Upgrade</td>
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<tr>
<td>3 to 4% Downgrade</td>
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<td>920</td>
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</table>
TEMPORARY CROSSOVER FOR MEDIAN WIDTHS FROM 50' TO < 75'

MAXIMUM SPACING BETWEEN CONES AND TUBULAR MARKERS SHALL BE 25' 

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.

LENGTH OF ACCESS LANES (Ft.)

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<th>Grade</th>
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<td>3 to 4% Downgrade</td>
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</tr>
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SYMBOLS

- Temporary Pavement
- Work Zone Sign
- Channelizing Device (See Index 102-600)
- Advance Warning Vehicle
- Lane Identification + Direction of Traffic
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.

** Required For Projects > 2 Miles

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

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

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

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

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.

2. Route through traffic to temporary and existing pavement.

3. Construct transitions, excluding friction course.

Note: See Sheet 2 for General Notes.
PHASE III
1. Remove temporary marking from the existing pavement and temporary shoulder pavement. Mark pavement, install warning devices and resign as shown. Traffic to be controlled in accordance with Index 102-607. For lane width requirements see Index 102-600.

2. Route through traffic to newly constructed roadway.

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

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 ft shall be maintained and traffic controlled in accordance with Indexes 102-603 and 102-607. Minimum width for the temporary shoulders is 6 ft.

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 ft 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 To 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 IFC zone, additional IFC devices shall be placed in accordance with other applicable TCZ Indexes.

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

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

SYMBOLS

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

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

LEGEND

---- Phase I Construction
-------- Phase II Construction
--------------- Phase III Construction
1. Maintain two-lane two-way traffic along existing facility. Install construction signing.

2. Remove 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. Recruit 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.

LEGEND

SYMBOLS

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

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.
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

TWO OR MORE LANES ONE WAY
LANE DROP AND LANE SHIFTS - 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 6'.
4. Method of attaching temporary guardrail to the diversion structure to be approved by the Engineer. Cost of temporary guardrail systems, including end anchorage assemblies, transitions and attachment to temporary structures, are to be included in the contract unit price for Guardrail (Temporary) LF.
5. Provisions approved by the Engineer shall be made for the removal of storm water from the roadway(s) during construction.
6. Only temporary crash cushions approved by the Department shall be used unless specified devices called for in the plans.
7. Where the temporary structure is not required, the diversion may be constructed in accordance with Index 102-608, unless otherwise stipulated in the plans.
8. For reflective raised pavement marker application, see Indexes 102-600 and 706-001.
9. For general TCZ requirements and additional information, refer to Index 102-600.
**ROAD WORK END**

**DESCRIPTION:**

- **REV ISIO N:** 11/01/17
- **STANDARD PLANS:** FY 2019-20
- **INDEX:** 102-651

**MAINTENANCE AND CONSTRUCTION**

**MULTILANE DIVIDED:**

- **102-651 (2)**

**2**

**Sheet 1.** See Index 102-600 for clear zone requirements.

**TRAILING END CURVILINEAR ALIGNMENT Crossover**

**BUFFER LENGTH (ft):**

<table>
<thead>
<tr>
<th>Construction Zone Speed (mph)</th>
<th>64 Medium</th>
<th>88 Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>X</td>
<td>Z</td>
</tr>
<tr>
<td>70</td>
<td>607</td>
<td>388</td>
</tr>
<tr>
<td>65</td>
<td>587</td>
<td>362</td>
</tr>
<tr>
<td>60</td>
<td>562</td>
<td>343</td>
</tr>
<tr>
<td>55</td>
<td>537</td>
<td>325</td>
</tr>
<tr>
<td>50</td>
<td>511</td>
<td>299</td>
</tr>
<tr>
<td>45</td>
<td>486</td>
<td>268</td>
</tr>
<tr>
<td>40</td>
<td>461</td>
<td>239</td>
</tr>
<tr>
<td>35</td>
<td>436</td>
<td>210</td>
</tr>
<tr>
<td>30</td>
<td>411</td>
<td>181</td>
</tr>
<tr>
<td>25</td>
<td>386</td>
<td>152</td>
</tr>
<tr>
<td>20</td>
<td>361</td>
<td>123</td>
</tr>
</tbody>
</table>

**MINIMUM RADII FOR NORMAL CROSS SLOPES:**

<table>
<thead>
<tr>
<th>Construction Zone Speed Min</th>
<th>64 Medium</th>
<th>88 Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>X</td>
<td>Z</td>
</tr>
<tr>
<td>70</td>
<td>607</td>
<td>388</td>
</tr>
<tr>
<td>65</td>
<td>587</td>
<td>362</td>
</tr>
<tr>
<td>60</td>
<td>562</td>
<td>343</td>
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<tr>
<td>55</td>
<td>537</td>
<td>325</td>
</tr>
<tr>
<td>50</td>
<td>511</td>
<td>299</td>
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<tr>
<td>45</td>
<td>486</td>
<td>268</td>
</tr>
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<td>40</td>
<td>461</td>
<td>239</td>
</tr>
<tr>
<td>35</td>
<td>436</td>
<td>210</td>
</tr>
<tr>
<td>30</td>
<td>411</td>
<td>181</td>
</tr>
<tr>
<td>25</td>
<td>386</td>
<td>152</td>
</tr>
<tr>
<td>20</td>
<td>361</td>
<td>123</td>
</tr>
</tbody>
</table>

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

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

CHANGEABLE MESSAGE SIGNS

(Typical Placement and Messages)

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)

| ONE WEEK PRIOR TO PACING OPERATION | EXPECT DELAYS ON | NH | DD-DO |
| DURING DAY OF PACING OPERATION | ROAD WORK TONIGHT | EXPECT PERIODIC DELAYS |
| DURING PACING OPERATION | SLOW TRAFFIC AHEAD | BE PREPARED TO STOP |

1. Traffic pacing 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 contractor’s 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.
MAINLINE PACING DETAILS
(1 DIRECTION OF FOUR LANE ROADWAY EXAMPLE)

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

STAGE TWO
1. Once the police vehicles are in place and the traffic control officer supervisor at the work area notifies all officers to begin the traffic pacing operation, the last 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 until a point approximately 200 ft. upstream of the work area with the impact attenuators down and operating once traffic has cleared the work area.

STAGE THREE
1. The two pace setting police vehicles shall begin to slow to the pacing speed (20 mph is preferred, 10 mph minimum), for the duration of the traffic pacing operation.

STAGE FOUR
1. When the pace setting police vehicles are within approximately two miles of the work area they shall notify the mainline traffic control officer supervisor and begin to clear the travel lanes of all equipment and debris in order to reopen all travel lanes.

2. In case of emergency the pace setting police vehicles shall come to a complete stop once they reach the lead police vehicle. If no emergency is encountered, the crash truck(s) shall be moved from the travel lanes and the two pace setting police vehicles shall clear the work area and immediately move to the right shoulder or an area designated by the traffic control officer supervisor and turn off the flashing blue lights. Once the two pace setting police vehicles pass the work area, the traffic control officer supervisor shall instruct the lead and last police vehicles to turn off their flashing blue lights.

RAMP PACING DETAILS

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

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

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

<table>
<thead>
<tr>
<th>No. Of Traffic Control Officers With Vehicles</th>
<th>Function</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supervisor</td>
<td>Work Area</td>
</tr>
<tr>
<td>1 Lead Vehicle</td>
<td>Varies</td>
<td>Mobile Operation</td>
</tr>
<tr>
<td>1 for each travel lane</td>
<td>Pacing Operation</td>
<td>Mobile operation beginning x miles upstream and terminating at the work area</td>
</tr>
<tr>
<td>1 Stationed at the Beginning of Pacing Operation</td>
<td>Advanced Warning to Motorist</td>
<td>Stationed at the Beginning of Pacing Operation</td>
</tr>
<tr>
<td>1 for each entrance ramp</td>
<td>Entrance Ramp Roadblocks</td>
<td>One at each of the entrance ramps upstream of the work area</td>
</tr>
</tbody>
</table>
DESIGN CONSIDERATIONS:
The design shall evaluate the actual distance required for the pacing operation based on site specific features such as: roadway geometrics, pacing speeds, regulatory speeds, interchange spacing, work duration, availability of traffic control officers, traffic volumes and maximum 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 materials to be installed shall be on-site before the traffic pacing operation begins.

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

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

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

The maximum practical pacing operation length is 10 miles.

\[ S_f = \text{Regulatory speed (mph)} \]
\[ S_p = \text{Pacing speed (mph)} \]
\[ t_w = \text{Work duration (min)} \]
\[ L = \text{Total pacing distance in miles} \]
\[ L = \frac{w}{60} + \frac{S_p}{S_f} \times \frac{S_p}{S_f} \]
\[ L = L_c + L_w \]
\[ L_c = \text{distance paced vehicles must travel before the vehicles at regulatory speed have cleared the work zone} \]
\[ L_w = \text{distance paced vehicles travel while work is performed} \]
\[ t_w = \text{Work duration (min)} \]
\[ f_{HV} = \text{Heavy Vehicle Factor} \]
\[ f_{HV} = 1 + \frac{w}{100} \times 0.5 \]
\[ P_t = \% \text{ Trucks} \]

<table>
<thead>
<tr>
<th>( S_f )</th>
<th>( f_{HV} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2.3</td>
</tr>
<tr>
<td>65</td>
<td>2.4</td>
</tr>
<tr>
<td>60</td>
<td>2.5</td>
</tr>
<tr>
<td>55</td>
<td>2.6</td>
</tr>
<tr>
<td>60</td>
<td>5.2</td>
</tr>
</tbody>
</table>

NOTES FOR TABLE:
\( f_{HV} \) 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. \( f_{HV} \) 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:

\[ \text{pcphpl} = \left( \frac{\text{Hourly Directional Volume}}{2 \text{ Lanes (each direction)}} \right) \times \text{Heavy Vehicle Factor} \]
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 display(s) controlling closed crosswalks.
4. For post mounted signs located near or adjacent to a sidewalk, maintain a minimum 2-foot 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 devices across the full width of the closed sidewalk. For temporary walkways, similar to the Sidewalk Diversion, place LCDs to delineate both sides of the temporary walkway.
11. For sidewalk diversions, ensure that there is sufficient R/W for placement of temporary sidewalk and pedestrian longitudinal channelizing devices.

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

**GENERAL NOTES:**

1. Place a Sidewalk Detour and Pedestrian Detour to cross a closed crosswalk and closed sidewalk.
2. For spacing of vehicular Channelizing Devices, see applicable vehicular temporary traffic control Indexes.
3. Cover or deactivate pedestrian traffic signal display(s) controlling closed crosswalks.
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11. For sidewalk diversions, ensure that there is sufficient R/W for placement of temporary sidewalk and pedestrian longitudinal channelizing devices.

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9. Meet the requirements of Index 322-002 for temporary curb ramps.
10. Place pedestrian longitudinal channelizing devices across the full width of the closed sidewalk. For temporary walkways, similar to the Sidewalk Diversion, place LCDs to delineate both sides of the temporary walkway.
11. For sidewalk diversions, ensure that there is sufficient R/W for placement of temporary sidewalk and pedestrian longitudinal channelizing devices.
**GENERAL NOTES**

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 or 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 or 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. If 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 ensure 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, I.S.

**SYMBOLS**

- Work Zone Sign

---

**LENGTH OF ACCESS LANES (FT.)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>D1</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% or less</td>
<td>590</td>
<td>1340</td>
</tr>
<tr>
<td>3 to 4% Upgrade</td>
<td>630</td>
<td>1330</td>
</tr>
<tr>
<td>3 to 4% Downgrade</td>
<td>710</td>
<td>925</td>
</tr>
</tbody>
</table>
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

Present

When

Workers

Doubled

Speeding

Fines

500 FT WORK PLAZA

PLAZA WORK

1000 FT

Dedicated Lane(s) in Center

Dedicated Lane(s) on Inside

(Single Left Lane Closure)

Symbols

Work Area

Channelizing Device (See Index 102-600)

Work Zone Sign

Advance Warning Arrow Board

Advance Warning Vehicle Equipped with

Lane Identification + Direction of Traffic

Advance Warning Arrow Board and

Truck/Trailer Mounted Attenuator

Portable Changeable (Variable) Message Sign

PCMS Display A

MESSAGE 1: SUNPASS LANE(S) CLOSED

MESSAGE 2: USE CASH LANE(S)

PCMS Display B

MESSAGE 1: SUNPASS OR USE LANE(S) CLOSED

MESSAGE 2: ALL LANE(S) PLAZA

PCMS Display C

MESSAGE 1: SUNPASS OR USE LANE(S) CLOSED

MESSAGE 2: KEEP LEFT/RIGHT

GENERAL NOTES

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

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

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

4. A truck/trailer mounted attenuator is required.

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

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

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></td>
<td>1</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td>Inside***</td>
<td></td>
<td>2</td>
<td>350</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>350</td>
<td>A</td>
</tr>
</tbody>
</table>

* 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.

*** See Index 102-667 Sheet 2 for Right or Center Inside Dedicated Lane Closed, or Two or More Inside Dedicated Lanes Closed Configurations.
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

1.000 FT CLOSED LEFT LANE
1/2 MILE CLOSED LANE
PLAZA WORK 1 MILE

REV IS IO N DESCRIPTION:

TOLL PLAZA TRAFFIC CONTROL STANDARDS

11/01/17

PCMS*: Throat Opening
Beginning of Plaza

**

PCMS DISPLAYS

MESSAGE 1: CENTER SUNPASS LANE AT PLAZA
MESSAGE 2: CLOSED LANE(S) LEFT

TWO OR MORE DEDICATED LANES CLOSED

CENTER OR RIGHT DEDICATED LANE CLOSED

SYMBOLS

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 that exceed three hours.

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

4. A truck/trailer mounted attenuator is required.

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

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

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

INSIDE DEDICATED LANES
**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.**

**Inverted for Inside Open Road Tolling Lanes Configuration**

**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.

**SYMBOLS**

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

**PCMS DISPLAYS**

**PCMS DISPLAY PRIOR TO CLOSURE**

MESSAGE 1: SUNPASS MESSAGE 2: LANE

**PCMS DISPLAY DURING CLOSURE**

MESSAGE 1: SUNPASS MESSAGE 2: USE LANE CLOSED

**OUTSIDE OPEN ROAD TOLLING LANES**
** Symbol Definitions: **

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

** PCMS Displays: **

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

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

** 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 **

** Plata Plaza Traffic Control Standards **

** Standard Plans **

** FY 2019-20 **

** Index **

** Sheet **
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

AHEAD WORK PLAZA CLOSED LEFT LANE

10/30/18 9:23:41 AM REVISION DESCRIPTION:

REV 11/01/17

TOLL PLAZA TRAFFIC CONTROL STANDARDS

SYMBOLS

Work Area

Channelizing Device (See Index 102-600)

Work Zone Sign

Lane Identification + Direction of Traffic

Advance Warning Vehicle Equipped with

Advance Warning Arrow Board

and Truck/Trailer Mounted Attenuator

EXHIBIT A

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

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

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

EXHIBIT B

DEDICATED LANE INSIDE OR OUTSIDE - ONE LANE CLOSED

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

GENERAL NOTES

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

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

3. A truck/trailer mounted attenuator is required.

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

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

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

MAINLINE PLAZAS & RAMP PLAZAS

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**

1. Truck/Trailer Mounted Attenuator

2. Advance Warning Vehicle Equipped with

3. Advance Warning Arrow Board and

4. Truck/Trailer Mounted Attenuator

5. Work Not Done Within Travel Lane - One Lane Closed

6. Work Done Within Travel Lane - One Lane Closed

**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

**TOLL PLAZA TRAFFIC CONTROL STANDARDS**

INDEX 102-667

SHEET 6 of 6
GENERAL NOTES:

1. Use the MAS for lane closures of 5 days or more on multiline 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 Area
- 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

Table I

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Cones or Tubular Markers</th>
<th>Type I or Type II Barricades or Vertical Panels or Drums</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 to 70</td>
<td>25</td>
<td>50</td>
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<tr>
<td></td>
<td>50</td>
<td>100</td>
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Table II

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Buffer Space</th>
<th>Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dist. (ft.)</td>
<td>L (ft.)</td>
<td>Notes (Merge)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>55</td>
<td>495</td>
<td>660</td>
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<tr>
<td>60</td>
<td>570</td>
<td>720</td>
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<td>65</td>
<td>645</td>
<td>780</td>
</tr>
<tr>
<td>70</td>
<td>720</td>
<td>840</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 100 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)
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. Inspect trunk protection and tree quarterly to prevent girdling. Adjust bands to allow tree growth as needed.
6. See plans for any additional requirements or modifications within the tree protection area.
7. Place weather resistant sign every 50' along the barrier, with 6" minimum text height and provide text in English and Spanish. Sign should read "Keep Out Tree Protection Area".
8. Alternate tree protection systems approved by the Engineer may be used in lieu of the tree protection barrier detailed on this Index 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).
The location and construction of mailboxes shall conform to the rules and regulations of the United States Postal Service as modified by this Index.

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

The contractor shall give the Postmaster of the delivery route(s) written notice of project construction 7 days prior to the beginning of work, with Saturdays, Sundays and Holidays excluded.

The Contractor shall furnish and install one mailbox in accordance with this Index at each mail patron delivery location and maintain the box throughout the contract period. The Contractor shall apply box numbers to each patron box in accordance with identification specifications of the Domestics Mail Manual of the U.S. Postal Service, where local street names and house numbers are authorized by the Postmaster as a postal address, the Contractor shall inscribe the house number on the box. If the box is located on a different street from the patrons residence, the Contractor shall inscribe the street name and house number on the box.

The Contractor shall coordinate removal of the patrons existing mailboxes. Immediately after installing the new mailboxes the Contractor must notify each “Mail Delivery Patron” by Certified Mail that removal of the existing mailboxes must be accomplished in 21 days after receipt of notices. Patrons shall have the option of removing their existing mailboxes or leaving the mailboxes in place for removal by the Contractor, removal by the Contractor shall be included in the contract unit price for Mailboxes, Each. The Contractor shall dispose of mailboxes and supports in areas provided by him.

Reuse of existing mailboxes by the Contractor will not be a requirement under any construction project; however where an existing mailbox meets the design requirements of this Index and is structurally and functionally sound, the Contractor at his option may elect to reuse the existing mailbox in lieu of constructing a new mailbox. Any use of existing mailboxes must be approved by the Engineer.

Mailboxes shall be light steel 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 (OMM).

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

a. Shoulder width plus 8" to 12".

b. 10' for ADT over 10,000 vpd.

6' for ADT 100 to 10,000 vpd.

6' for ADT under 100 vpd.

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

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

Mailboxes shall be set with the bottom of the box between 42" and 48" above the main step surface, unless the U.S. Postal Service establishes other height restrictions.

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.

Lightweight newspaper receptacles may be mounted below the mailbox on the mail patron's property, in conformance with the USPS Domestic Mail Manual. Lightweight newspaper receptacles are to be suited to support post finish.

Neighborhood Delivery and Collection Box Units (NDCBU) are a specialized multiple mailbox installation that must be located outside the highway and street clear zones. The location of NDCBUs is the sole responsibility of the Postmaster for the delivery route under consideration.

Mailboxes shall be spaced a minimum distance of the greater of:

a. 6' for ADT under 100 vpd.

b. 10' for ADT over 10,000 vpd.

When a mailbox is new, reused, salvaged, reset or relocated. Payment shall be per mailbox.

Concrete, block, brick, stone or other rigid foundation structure or encasement, either above or below the shoulder ground line, will not be permitted for mailboxes on rural highways. On urban roads and streets where mailbox support posts are set within rigid pavement back of curb, the support posts shall be separated from the pavement by a minimum of 7" of expansion material.

Support posts shall not be fitted nor installed with surface mount base plates.

At driveway entrances mailboxes shall be placed on the far side of the driveway in the direction of the delivery route. At intersecting roads mailboxes shall be located 100' or more from the centerline of the intersecting road on the far side in the direction of the delivery route, with the distance increased to 200' when the route volume exceeds 400 vehicles per day.

Wood and steel support posts for both single and double mailbox mountings shall be embanked no more than 2' into the ground. Wooden support posts shall be in conformance with the material and dimensional requirements of Section 952 and the treatment requirements of Section 955 of the Standard Specifications.

Steel support posts shall have an external finish equal to or better than two coats of weather resistant, air dried or baked, paint or enamel. Surface(s) shall be cleaned of all loose scale prior to finishing. The Postal Service prefers that posts be painted white, but other colors may be used when approved by the Engineer. When galvanized posts are used painting is not required.

Mouting brackets, plates, platforms, shelves and accessory hardware surface finishes are to be suited to support post finish.

Mailboxes shall be paid for under the contract unit price for Mailboxes. Each. Payment shall be full compensation for boxes, posts and accessory items required.

The above compensation shall include any work and cost incurred by the contractor for removal and disposal of existing mailboxes.

There shall be no payment participation for NDCBU furnishing, assembly, installation, resetting or relocation.
### STEEL PLATFORMS

**Bracket**
- 1 Nut (4 Req'd.)
- 2 Washers, 1 Lockwasher,
- "Hex Bolt, 4-18 x 2" 16" 5"

**For Finish Requirements**
See General Notes

**FLANGED CHANNEL**
- 2 Lb. Per Foot

### STEEL ADAPTER PLATE

**Bracket**
- 1 Lockwasher, 1 Nut (10 Req'd.)

**For Finish Requirements**
See General Notes

**FLANGED CHANNEL**
- 2 Lb. Per Foot

### STEEL SPACER

### STEEL BRACKET

**Bracket**
- 1 Nut (3 Req'd.)
- 2 Washers, 1 Lockwasher,
- "Hex Bolt, 4-18 x 2" 16" 5"

**For Finish Requirements**
See General Notes

**FLANGED CHANNEL**
- 2 Lb. Per Foot

### STEEL FLANGED CHANNEL SUPPORT POSTS

**Bracket**
- 1 Lockwasher, 1 Nut (10 Req'd.)

**For Finish Requirements**
See General Notes

**FLANGED CHANNEL**
- 2 Lb. Per Foot

### POST SPACING

**FLANGED CHANNEL**
- 2 Lb. Per Foot

### SINGLE OR COMBINED WOOD, FLANGED CHANNEL OR PIPE POST TYPES SHOWN ON THIS INDEX

**ELEVATION**

**SIDE VIEW**

**BOTTOM VIEW**

### REMARKS

1. See General Notes for finish requirements.
2. For platforms, use 3/4" nominal pipe.
**REVISION DESCRIPTION:**

**LAST**

**REVISION**

**11/01/17**

**STANDARD PLANS**

**MAILBOXES**

**INDEX**

**SHEET**

**FY 2019-20**

**110-200**

**3 of 3**

---

**Muffler Clamp** (2 Reqd.)
- For Finish Requirements.
- Yield Strength. See General Notes
  - ASTM A569 & A669, Min. 50,000 psi
- Schedule 40 Or Resistance Welded,
  - Nominal 2" Ø (2.375 o.d.) Steel Pipe

**1 Nut (2 Reqd.)**
- 2 Washers, 1 Lockwasher,
- 1/2" x 3" Hex Bolt,
- Anti-Twist Plate
  - (Flange To Inside)

**Bracket** (Flange To Inside)
- Platform

**Platform**
- Shelf
- 1 Nut (6 Reqd.)
- 2 Washers, 1 Lockwasher,
- 1/2" x 4" Hex Bolt,
- (Stove Bolt)
- 2 Washers,
- 3/8" x 3"
- Slotted Rd. Hd. Bolt

**Muffler Clamp** (2 Reqd.)
- 1 Lockwasher, 1 Nut (6 Reqd.)
- (Stove Bolt)
- 2 Washers,
- 3/8" x 3"
- Slotted Rd. Hd. Bolt

---

**STEEL PIPE AND WOOD SUPPORT POSTS**

---

**Note:** See General Notes for finish requirements.
GENERAL NOTES:

1. Roadway dimensions are representative. Subgrade dimensions and control lines are standard. The details shown on this Index do not supersede the details shown in the Plans or 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 roadway. 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 roadway.

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)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SOIL</th>
<th>CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Select</td>
<td>A-1, A-3, A-2-4**</td>
</tr>
<tr>
<td>H</td>
<td>High Plastic</td>
<td>A-2-5, A-2-7, A-5 Or A-7 (ALL WITH LL &gt; 50)</td>
</tr>
<tr>
<td>M</td>
<td>Muck</td>
<td>A-8</td>
</tr>
</tbody>
</table>

Classification listed left to right in order of preference.

See General Notes Nos. 4 & 5 for utilization of soils classified as organic material or muck.

** Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadway when approved by the District Materials Engineer. A-2-4 material placed below the existing water level must be nonplastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

* For cut sections this dimension may be reduced to 24", see Index 120-002. For minor collectors and local facilities this dimension may be reduced to 18".

GENERAL NOTES AND FLEXIBLE PAVEMENT
EMBANKMENT UTILIZATION

SYMBOL

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SOIL</th>
<th>CLASSIFICATION (AASHTO M145)</th>
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</thead>
<tbody>
<tr>
<td>S</td>
<td>Select</td>
<td>A-1, A-3, A-2-4 **</td>
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<tr>
<td>H</td>
<td>High Plastic</td>
<td>A-2-5, A-2-7, A-5 Or A-7 (ALL WITH LL &gt; 50)</td>
</tr>
<tr>
<td>M</td>
<td>Muck</td>
<td>A-8</td>
</tr>
</tbody>
</table>

Classification listed left to right in order of preference.

** See General Notes Nos. 4 & 5 for utilization of soils classified as organic material or muck.

** Certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadway when approved by the District Materials Engineer. A-2-4 material placed below the existing water level must be nonplastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

* For cut sections this dimension may be reduced to 24"; see Index 120-002. For minor collectors and local facilities this dimension may be reduced to 18".
DIVIDED ROADWAYS

UNDIVIDED ROADWAY

SYMBOL  SOIL  CLASSIFICATION (AASHTO M 145)
S  Select  A-1, A-3, A-2-4 **
S+ Special Select  A-3 *** With Minimum Average Lab Permeability of 5x10^-7 cm/sec (0.14 ft./day) as per AASHTO T 215
H  High Plastic  A-2-5, A-2-7, A-5 or A-7 (ALL WITH LL>50)
M  Muck  A-8

Classification listed left to right in order of preference.

See General Notes Nos. 4 & 5 for utilization of soils classified as organic material or muck.

*** When 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 15% passing the No. 200 U.S. Standard sieve.

Special Stabilized Subbase: 3" of #57 or #89 Coarse Aggregate Mixed Into Top 6".
Whether Or Not Shoulder Gutter Is Used
Control Line Set By Normal Shoulder Point
Whether Or Not Shoulder Gutter Is Used

Bottom Of Organic Material
Limit For Minimum Removal

WITH OVERBURDEN - HALF SECTION
CONSTRUCTION OF FLUSH SHOULDER ROADWAY

WITHOUT 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 120-001.
3. Where organic or plastic material is undercut, backfill with suitable material in accordance with Index 120-001, unless otherwise shown on the plans.
4. The term "Plastic Material" used in this Index in conjunction with removal of plastic soil is as defined under soil classifications for Plastic (P) and High Plastic (H) on Index 120-001.
5. See Index 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. The average organic content from the test results from a minimum of three randomly selected samples from each stratum. Perform tests in accordance with AASHTO T267 on the portion of a sample passing the No. 4 sieve.
7. In areas of curbed roadway, where underdrain is to be constructed beneath the proposed pavement, the grade of the underdrain filter material will not extend above the bottom of the stabilized section of the subgrade. Gradation of the filter material must conform to Standard Specifications. The minimum grade of underdrain pipe is 0.02.
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, it is impractical to leave the plastic material in the median, total removal of this material shall be approved by the Engineer.

4. Refer to roadway cross sections to determine whether minimum or preferable removal is used.

5. Where the Preferable Removal method is shown in the plans and it is impossible to place the underdrain at the Outer Cut Limit due to conflict with storm drain trunk lines, remove to Inner Cut Limit and place underdrain at location shown for Minimum Removal. (See Special Removal Detail)

6. Cross slopes of 0.02 shown above are minimums. Follow the cross slope of the pavement to the extent possible.
NOTES: PAVEMENT REMOVAL AND REPLACEMENT
1. Pavement shall be mechanically sawed.
2. The replacement asphalt shall match the existing structural and friction courses for type and thickness in accordance with current FDOT asphalt mix specifications.
3. The 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 tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding.
C. In Stage #2, construct compacted fill along the sides of the pipe and up to the bottom of the base, with the upper 12" receiving Type B Stabilization. In lieu of Type B Stabilization, the Contractor may construct using Optional Base Group 3.

2. FLOWABLE FILL
A. If compaction cannot 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

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 settlement.
3. These details do not apply to utility cuts longitudinal to the centerline of the roadway which may require the additional use of geotextiles, special bedding and backfill, or other special requirements.
4. Method of construction must be approved by the Engineer.
5. Some pipe may require special granular backfill up to 6" above top of pipe. Geotextiles may be required to encapsulate the special granular material.

TRENCH CUTS AND RESTORATIONS ACROSS ROADWAYS

INDEX

125-001
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

NONTRENCH PAVEMENT CUTS FOR UNDERGROUND UTILITY STRUCTURES IN PAVEMENT

UTILITY ADJUSTMENTS THRU EXISTING PAVEMENT

STANDARD PLANS

INDEX 125-001

F Y 2019-20

REVISED 8/11/17

LAST REVISED 11/01/17

DESCRIPTION:
Threaded or Socket Type Cap. 
Stamp or label with Installation Date, Location and Identification Number. 
(Threaded Type Caps to be hand tightened.)

2½ Steel or PVC Schedule 40 Pipe (Casing). 
Casing to be installed in 5’ sections, as required. 
(Threaded or Socket Type Fittings (PVC Socket Type shown) PVC casing sections not permitted below steel sections)

6-2”x8” Treated Timbers

2”x6” Treated Timber

½ Dia. Bolt, Nut & Washer (Bolt thread end up)

STEM AND PLATE OPTIONS

TIMBER PLATE

STEEL PLATE

STEEL PLATE

STEEL PLATE

Fill Within 2’ Of Stem Shall Be Compacted By Hand To Required Density

Surcharge (Compacted Fill)

Top Of Strata To Be Surcharged

Plate To Be Sealed (Level) After Clearing And Grubbing & Demucking Operations And Prior To Placing First Fill Lift

Installation

Notes:

1. Elevation of the top of each length of marker pipe shall be determined as soon as it is installed and also immediately before the next length of marker pipe is added.

2. Settlement plate locations shall be flagged and protected from construction vehicles and equipment. If settlement plates are disturbed, they shall be replaced in kind.

3. Oakum used to construct seal should not have a mesh covering (plastic or other synthetic material).

4. The settlement plates shall be paid for under the contract unit price for Settlement Plate Assembly, AS.

Plan

Timber Plate

Steel Plate

Steel Plate

Steel Plate

Timber Plate

Top Of Lift Or Top Of Full Surcharge

2 Min.

Fill Within 2’ Of Stem

Plate To Be Sealed (Level) After Clearing

And Grubbing & Demucking Operations

And Prior To Placing First Fill Lift

Notes:

Oakum Seal

Iron Pipe Cap

2”x6” Treated Timber (See Detail Above)

½ Dia. Hole

½ Dia. Bolt, Nut & Washer. Deform thread or use Jam Nut

1½ x 24

1½ x 24

1½ x 24

Oakum Seal

Iron Pipe Cap

Iron Pipe Cap

Ø ½ x 24

Ø ½ x 24

Ø ½ x 24

Oakum Seal

Iron Pipe Cap

Iron Pipe Cap

Iron Pipe untwisted this end

1. Elevation of the top of each length of marker pipe shall be determined as soon as it is installed and also immediately before the next length of marker pipe is added.

2. Settlement plate locations shall be flagged and protected from construction vehicles and equipment. If settlement plates are disturbed, they shall be replaced in kind.

3. Oakum used to construct seal should not have a mesh covering (plastic or other synthetic material).

4. The settlement plates shall be paid for under the contract unit price for Settlement Plate Assembly, AS.
MEDIAN STABILIZING DETAILS

NOTES:
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".
**DRIVEWAY ENTRANCES NOTES:**

1. See Plans for Driveway Width (W) and Return Radius (R).

2. See the Plans for drainage pipe size and length or as determined by the Engineer. The size will be no less than 15” diameter or equivalent.

3. Stable material may be required for graded driveways to private property as directed 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>Normal</th>
<th>Skewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>28</td>
<td>31</td>
</tr>
<tr>
<td>14</td>
<td>27</td>
<td>32</td>
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<td>48</td>
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<td>52</td>
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<td>62</td>
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<td>56</td>
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<td>56</td>
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<td>58</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>60</td>
<td>62</td>
<td>72</td>
</tr>
</tbody>
</table>

**MATERIAL TYPES AND THICKNESSES FOR PAVED CONNECTIONS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Materials</th>
<th>Minimum Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td>Asphalitic Concrete</td>
<td>1/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Roadway*</td>
</tr>
<tr>
<td></td>
<td>Optional Base (see Specification 295)</td>
<td>0.66, 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.66, 3</td>
</tr>
</tbody>
</table>

* 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, 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 N6 concrete at least 6" thick for driveways paved with Portland Cement Concrete. Construct in accordance with Specifications 347, 350, and 522.

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

**RESURFACING EXISTING DRIVEWAY**

**SECTION AA - NEW CONSTRUCTION**

**SECTION AA - RESURFACING**

**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.
LONGITUDINAL JOINTS

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 36" spacing or #3 bars 36" in length at 38" spacing.
4. Transverse joints are to be spaced at a maximum of 15'. Dowels are required at all transverse joints unless otherwise noted in the plans.
5. Expansion joints to be placed 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.

Notes:
- For bridge expansion joints, see Index 370-001.
- Punch clean holes in preformed joint filler greater than bar diameter.
- Coat and lubricate plain steel dowel bars in accordance with Specification 350.
- Sheet metal bottom strips in accordance with Specification 931.

TRANSVERSE JOINTS

PLAIN STEEL DOWEL BAR LAYOUT

Dowel Bars Caps

Metal

Plain Steel Dowel Bar

Puncture And Push Down 1/8" On Both Sides

Plastic

Plain Steel Dowel Bar

Bar Stop

Dowel Bars Layout

CONCRETE PAVEMENT JOINTS

NOTE: (See Note 6)

Diameter

1/2" 1/2"

Length

18"

Pavement Thickness

1/2" 1/2"

2' - 3'

3' - 6'

6" - 10"

Bar Stop

Plain Steel Dowel Bar

Expansion Joints Only (See Note 8)

Dowel Bar Layout

Bend Up Against End Of Pavement After Forms Are Removed

Sheet Metal Bottom Strip

Initial 1/4" Saw Cut Or 1/2" Max.

Fored Groove (Depth 1/4 to 1/2 D)

Approved Tie Bar Support

Approved Dowel Support And Spacer

Preformed Joint Filler

Plain Steel Dowel Bar

Metal Or Plastic Cap

Expansion Joints Only (See Note 8)

3" To 9"

3" To 9"
CONCRETE-CONCRETE JOINTS

FOR NEW PROJECTS

PREFORMED ELASTOMERIC COMPRESSION SEAL

FOR NEW AND REHABILITATION PROJECTS

BACKER ROD BOND BREAKER

CONCRETE-ASPHALT SHOULDER JOINTS

JOINT SEAL DIMENSIONS

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 1.6.

d = w = \[ \frac{w}{t} \] ± 2 unless specified otherwise in the plans.

For rehabilitation projects, the joint width will be shown on the plans or established by the Engineer based on field conditions. Dimension d will be shown in the plans or established by the Engineer based on field conditions. Dimension w will be shown in the plans or established by the Engineer based on field conditions.

Table: BACKER ROD BOND BREAKER (CONCRETE-CONCRETE JOINTS)

<table>
<thead>
<tr>
<th>JOINT WIDTH</th>
<th>SEALANT BEAD THICKNESS</th>
<th>BACKER ROD DIA.</th>
<th>MINIMUM JOINT DEPTH</th>
<th>BACKER ROD PLACEMENT DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \frac{w}{t} ]</td>
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<td>[ \frac{w}{t} ]</td>
</tr>
</tbody>
</table>

Unless otherwise indicated on the plans, the joint width for new construction will be \[ \frac{w}{t} \] for construction joints, \[ \frac{w}{t} \] 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.
CONCRETE PAVEMENT JOINTS

**ALTERNATE KEYWAY AND HOOK BOLT**

**STEEL HOOK BOLT ASSEMBLY**

**CONTRACTION ASSEMBLY**

**EXPANSION ASSEMBLY**

**JOINT LAYOUT**

**JOINT LAYOUT**

**JOINT ARRANGEMENT**

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.

**NOTES**

Anchor bolts shall be Grade C in accordance with ASTM A 307.

Threaded sleeves shall develop the full strength of the bolt and meet the material and thread requirements of ASTM A 563.

After the concrete has set to the extent that the Keyway will retain its shape, the hex bolt and plastic insert shall be removed. The remaining portion of the hook bolt assembly shall be installed immediately prior to placing of concrete in the adjacent lane.

Note: 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 Engineer.

**REFERENCE**

FY 2019-20

STANDARD PLANS

INDEX

350-001

3 of 4
CONCRETE PAVEMENT JOINTS

DESCRIPTION:

2-THRU LANES WITH SINGLE LANE ENTRANCE RAMP

CONTRACTION JOINT (Typ.)

ENTRANCE TAPER WITH AUXILIARY LANE

ENTRANCE RAMP WITH ADDED LANE

EXIT TAPER WITH AUXILIARY LANE

2-THRU LANES WITH SINGLE LANE EXIT RAMP

CONTRACTION JOINT (Typ.)

3-THRU LANES WITH AUXILIARY LANE AND 2-LANE EXIT RAMP

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.
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 grinding, then the slab replacement shall be performed first.

7. During slab replacement operations, fill any saw cut overrun into adjacent slabs with epoxy.

8. Install tie bars at longitudinal joints when two full adjacent or multiple replaced slabs.
### Slab Repair and Replacement Criteria

<table>
<thead>
<tr>
<th>Distress Pattern</th>
<th>Severity/Description</th>
<th>Repair Method</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cracking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitudinal</td>
<td>Light: &lt;½&quot;, no faulting, spalling &lt;½&quot; wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Moderate: ½&quot; width &lt;½&quot;, spalling &lt;3&quot; wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Severe: width &gt;½&quot;, spalling &gt;3 faulting &gt;½&quot;</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td>Transverse</td>
<td>Light: &lt;½&quot;, no faulting, spalling &lt;½&quot; wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Moderate: ½&quot; width &lt;½&quot;, spalling &lt;3&quot; wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Severe: width &gt;½&quot;, spalling &gt;3 faulting &gt;½&quot;</td>
<td>Replace</td>
<td>Figure 10.3, 10.4 and 10.5</td>
</tr>
<tr>
<td>Corner Breaks</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>Intersecting Random Cracks (Shattered Slab)</td>
<td>Cracking patterns that divide the slab into three or more segments.</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>Joint Deficiencies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spall Nonwheel Path</td>
<td>Light: spall width &lt;½&quot;, &lt;½ slab depth, &lt;12&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Moderate: ½&quot; &lt;spall width &lt;3&quot;, &lt;½ slab depth, &lt;12&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Severe: spall width &gt;3&quot; or length &gt;12&quot;</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Spall Wheel Path</td>
<td>Light: spall width &lt;½&quot;, &lt;½ slab depth, &lt;12&quot; in length</td>
<td>None</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Moderate: ½&quot; &lt;spall width &lt;3&quot;, &lt;½ slab depth, &lt;12&quot; in length</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td></td>
<td>Severe: spall width &gt;3&quot; or length &gt;12&quot;</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td><strong>Surface Deterioration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pop Outs Nonwheel Path</td>
<td>Light: Not deemed to be a traffic hazard</td>
<td>Keep under observation</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>
<tr>
<td>Pop Outs Wheel Path</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>
<tr>
<td><strong>Miscellaneous Distress</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Faulting</td>
<td>Light: Faulting &lt;4/32&quot;</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Moderate: 4 &lt;Faulting &lt;16/32&quot;</td>
<td>Grid</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Severe: Faulting &gt;16/32&quot;</td>
<td>Grid</td>
<td>N/A</td>
</tr>
<tr>
<td>Lane To Shoulder Drop Off</td>
<td>Light: 0 &lt;drop-off &lt;1&quot;</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Moderate: 1&quot; &lt;drop-off &lt;3&quot;</td>
<td>Build Up</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Severe: drop-off &gt;3&quot;</td>
<td>Build Up</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Bleeding Or Pumping</td>
<td>Seeping or ejection of water through joints or cracks.</td>
<td>Install appropriate drainage, edge drain, permeable subbase, reseal joints, etc.</td>
<td>N/A</td>
</tr>
<tr>
<td>Blowups</td>
<td>Upward movement at transverse joints or cracks often accompanied by shattering of the concrete.</td>
<td>Full Depth</td>
<td>Figure 10.3 and 10.4</td>
</tr>
</tbody>
</table>
Design Notes
1. For rehabilitation projects, the designer must indicate in the plans the number of slabs to be removed, the number of subslabs to be constructed/reconstructed, and the location of expansion joints.

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

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 subslab, 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.

Section AA
Expansion Joint

Reinforcing Steel

<table>
<thead>
<tr>
<th>Mark</th>
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<td></td>
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</tr>
<tr>
<td>D</td>
<td>5</td>
<td>6D</td>
<td>10</td>
<td>30'</td>
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</tbody>
</table>

Note: *Finish surface smooth. Cure with heavy coating of wax base white pigmented curing compound. Apply second application immediately prior to placing pavement.*

Optional Seals

Compress Seal Detail

Joint Dimensions

Compression Seal Detail

Reinforcing Steel

Note: *All contacting surfaces between the compression seal and concrete shall be thoroughly coated with a lubricant-adhesive.*

Detail Showing Sheet Metal Strip

Note: *Immediately prior to placing the seal, the joint shall be thoroughly cleaned of all foreign material. Immediately after the seal is placed, sheet metal strip shall be bent up against the pavement edge.*

The sheet metal strip shall be a minimum 16 gauge steel, 12" wide and shall be galvanized in accordance with AWS A-526, Coating Designation G90.
**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.

*Shear Key is required only when specified in the Plans.*
**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**
  - 3\(\frac{3}{8}\) PVC Drain Pipe at 10 ft. max. spacing (Typ.)
  - See Typical Backfill Detail
  - Traffic Railing (Index 521-610, 36\(^\circ\) Single-Slope shown, see Plans for Traffic Railing Type)

**Ground Line**

- Top of Footing
- Level (Typ.)

**Vertical Line**

- Front Face of Wall
- Stem Offset (in.) = \(H\) (Ft.)/16
- Stem as constructed
- Stem Offset (for \(H < 20\) Ft.)

**V-Groove Detail**

- \(45^\circ\) (Typ.)
- Front Face of Wall
- Vertical Line
- Stem Offset
- Vertical Line
- Stem as constructed
- Stem Offset (in.) = \(H\) (Ft.)/16

**Stem Offset Values**

- (for \(H < 20\) Ft.)

**Section A-A**

- WALL JOINT DETAIL
- 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**
- (required at footing step)

**Traffic Railing/Junction Slab Detail**

- (36\(^\circ\) Single-Slope shown, other Traffic Railings similar)
- 3\(\frac{3}{8}\) PVC Drain Pipe. Slope down \(\frac{3}{8}\) from back to front of wall and extend \(\frac{3}{8}\) beyond both front face and back face of wall.
- Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with \(\frac{3}{8}\) openings
- See Roadway Plans for drainage requirement

**Typical Backfill Detail**

- Drain shall be continuous 1.5 x 1.5 clean, broken stone or gravel, graded and placed to allow free drainage. Place Type D-3 (see Specification Section 985) geotextile fabric, \(1^-\) wide and full height of fill, to the back of wall with an adhesive approved by the Engineer.

**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 Corner Joint Detail**

**Expansion Joint Detail**

- Drainage requirement
- Limits of Excavation
- Plastic sleeve
- Attach Type D-5 (see Specification Section 985) Geotextile fabric, \(1^-\) wide and full height of fill, to the back of wall with an adhesive approved by the Engineer.

**At Contractor's option, Surface Treatments may terminate 6" below ground line Limits of Excavation**

- Slope backfill layers transversely and longitudinally as necessary to drain and prevent ponding during backfilling.

- Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with \(\frac{3}{8}\) openings

**Traffic Railing (Index 521-610, 36\(^\circ\) Single-Slope shown, see Plans for Traffic Railing Type)**

- Junction Slab
- (36\(^\circ\) Single-Slope shown, other Traffic Railings similar)

**D-3 Fabric**

- 3\(\frac{3}{8}\) PVC Drain Pipe at 10 ft. max. spacing (Typ.)
- See Typical Backfill Detail

**STANDARD PLANS**

**Cantilever Retaining Wall (C-I-P)**
**GENERAL NOTES**

1. C-I-P Gravity Walls constructed as extensions of reinforced concrete retaining walls, except walls of proprietary designs, shall have the same face texture and finish as the reinforced concrete retaining wall.

2. Concrete for Gravity Wall shall be Class NS per Section 347. Concrete for Scheme 3 Junction Slab and Traffic Railing shall be Class II per Section 348, unless otherwise specified in the plans.

3. Reinforcing steel shall meet the requirements of Specification Section 931 (Grade 40 or 60). Smooth or Deformed Welded Wire Reinforcement (WWR) may be specified on an equal area basis. Do not increase bar/wire spacing for Grade 60 reinforcing steel or WWR.

4. When required, for adjacent guiderails, see index 515-070 or 515-080 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 the top of wall.

6. Provide a continuous 1" thick clean gravel or crushed rock drain for wall heights > 3', and longer. Wrap drainage layer as shown, with Type D-3 geotextile fabric in accordance with Specification Section 985. Provide RCP galvanized mesh with 2' openings, at the inside end of the PVC Drain Pipe. Provide 2" PVC Drain Pipe (SCH 40) at 10 ft. max. spacing (when Drainage Layer is required). Locate or orient 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**

(TOP VIEW)

---

**TYPICAL SECTION**

C-I-P CONCRETE GRAVITY WALL

---

**BILL OF REINFORCING STEEL**

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<table>
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<th>フリー</th>
<th>BENDING DIAGRAM</th>
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<tr>
<td>BAR A</td>
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</tr>
<tr>
<td>BAR B</td>
<td></td>
</tr>
</tbody>
</table>

---

**SCHEME 1**

(No Traffic Loading Effects & Upper Slopes ≤ 1:1½)

---

**SCHEME 2**

(With Traffic Loading or Upper Slopes > 1:1½)

---

**SCHEME 3**

(With Traffic Railing)

---

**ESTIMATED QUANTITIES FOR C-I-P WALL**

<table>
<thead>
<tr>
<th>HEIGHT (FT.)</th>
<th>SCHEME 1</th>
<th>SCHEME 2</th>
<th>SCHEME 3</th>
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<tr>
<td>0</td>
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<tr>
<td>3</td>
<td>0.32 (0.43)</td>
<td>0.47 (0.65)</td>
<td>0.43 (0.67)</td>
</tr>
<tr>
<td>4</td>
<td>0.43 (0.53)</td>
<td>0.65 (0.89)</td>
<td>0.60 (0.89)</td>
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</table>

---

**NOTE 4**

See General Note 4

---

**NOTE 5**

See General Note 5
CONCRETE STEPS

**STAIR TREAD AND RISER DETAILS**

- Tread depth: **4" Min.**
- Tread width: **12"**
- Riser height: **3" Min.**
- Riser pitch: **8° Min.**
- Handrail: Broom finish parallel to steps, unless otherwise shown in Plans.

**NOTES:**

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)

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**ELEVATION**

Length of Intermediate Landing

Max Landing Slope = 2%
Max Landing Cross-Slope = 2%

**NOTICE:** Provide a maximum of 12 risers between landings.
Supplementary Details for Manholes and Inlets

**Manholes and Inlets Suppementary Details for FDOT Storm Sewer**

- **Identification Letter**
  - 2" Raised or Depressed Identification Letter Type I Adjustable Shall Include "ADJUSTABLE" on Cover
  - Identification Type I

- **Identification Number**
  - 2" Raised or Depressed Identification Number
  - Covers with and without ribs shall bear the same product identification number

- **Nonskid Surface**
  - Nonskid Surface

- **Ribs (Optional)**
  - Ribs (Optional)

- **Pick-Up Holes**
  - Pick-Up Hole

- **Covers with Nonskid Surface**
  - Standard Cover

- **Depressed Logo**
  - Depressed Logo

- **Raised Or Depressed Logo**
  - Raised Or Depressed Logo

- **Sections**
  - For Manholes
    - **Type I**
  - For Curb Inlets Types 1, 2, 3, & 4
    - **Type II**
  - For Curb Inlets Types 7 & 8
    - **Type III**

- **2-Piece Cover**
  - For Use with Types I, II, and III frames with 3'-0" opening

- **Weight of Castings (lb)**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>2' Opening</th>
<th>3' Opening</th>
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<tr>
<td></td>
<td>1'</td>
<td>2'</td>
</tr>
<tr>
<td>I</td>
<td>155</td>
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<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, III and the 2-piece cover, and is the replacement cover for all previous frames with 1' 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 3'-0" cover, unless the 2-piece cover is called for in the plans, except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

- **Designer Note:**

  Consider using the 2-piece cover where depths exceed 5' 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.
FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT

SECTION

Note: See Slab Designs Index 425-010.

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 slot openings are to be omitted when top is used over a junction box.

3. Manhole top Type 8 may be of cast-in-place or precast concrete construction or brick construction. For concrete construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric cone may be used.

4. Manhole tops shall be secured to structures by optional construction joints as shown on Sheet 3.

5. Frames can be adjusted a maximum 12" height with brick or precast construction or brick construction. For concrete construction, the bottom slab shall be of Class II concrete. Concrete as specified in ASTM C478 may be used for precast units; see General Note 3.

6. Substitution of Manhole top Type 8 for Manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.

7. Substitution of Manhole top Type 7 for Type 8 is allowed if the minimum thickness (h) above pipe opening cannot be maintained with manhole top Type 8.

DESIGN NOTES

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

FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT

Note: Cost of pipe, fittings and sandbagging to be included in the contract unit price for inlets.

EYE BOLT AND CHAIN REQUIREMENTS

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<tr>
<th>Index Number</th>
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IEEE BOLT AND CHAIN FOR LOCKING GRATES TO INLETS

| Bevel Cut Upper Stub To Match Forming For Apron Face |
| Cap Grouting Grafting Or Upper Stub Not Required |
| Bevel Base Material |
| Covering Of Opening With Structural Course Material |

TEMPORARY DRAINS FOR SUBGRADE AND BASE

PIPE TO STRUCTURE JOINT

INDEX

425-001

FY 2019-20 STANDARD PLANS

SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS

INSET A

NOTES:

- When Alternate "I" grate is specified, the chain, bolt, nuts, washer and cold shits shall be galvanized in accordance with Section 425 of the Standard Specifications.
- Cost of eyebolt and chain to be included in the contract unit price for inlets.
SEPARATE RISER SEGMENTS WITH CONSTRUCTION JOINTS OTHER THAN DOWEL OPTION

1. One or more types of joints may be used in a single structure, except brick wall structure. Brick wall construction is permitted on circular units only.
2. All grouted joints are to have a maximum thickness of 1".
3. Keyways are to be a minimum of 1/2" deep.
4. Joint dowels are to be #4 bars, 12" long with a minimum of 6 bars per joint approximately evenly spaced for circular structures or at maximum 12" spacing for rectangular structures. Bars may be either Adhesive Bonded Dowels in accordance with Specification Section 416, or placed approximately 6" into fresh concrete leaving the remainder to extend into the secondary cast. Welded wire reinforcement may be substituted for the dowel bar in accordance with the equivalent steel area table on Sheet 4.
5. Minimum cover on dowel reinforcing bars is 2" to outside face of structure.
6. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 934 of the Specifications.
7. Insert products approved by the Engineer may be used in lieu of dowel embedment.

OPTIONAL CONSTRUCTION JOINTS

REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS

NOTE: NOT APPLICABLE AROUND MANHOLE AND RISER OPENINGS

WALL REINFORCING SPLICE DETAILS
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 lapped in accordance with Option 1 or 2 as shown in the Wall Reinforcing Splice Details.

2. Horizontal steel in the walls of rectangular structures shall be lap spliced in accordance with Option 1 or 2 as shown in the Wall Reinforcing Splice Details.

3. Welding of splices and laps is permitted. The requirements and restrictions placed on welding in AASHO M259 shall apply.

4. Robar readies and 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 on the plans or standard drawings.

5. Concrete as specified in ASTM C478, (4000 psi) may be used in lieu of ACI 211.2 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 OD plus 6" (± 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 or mortar construction to seal openings less than 240° wide.

7. By 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 elevation of 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.
DEVELOPER NOTE: Use only when round structures are not practical, engineer of record approval required.

PICTORIAL VIEW

NOTE: 1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.

2. $h_2$ may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.

3. For inlet segments at finish grade elevation substitute a #8 Bar for the top corner bar when 1'-0" ≤ $h_2$ < 2'-0".

RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER

PLAN VIEW FOR SKEWS ≤ 45° (Not Centered)

PLAN VIEW FOR SKEWS > 45° (Not Centered)

SECTION AA (Pipes Not Shown For Clarity)
TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE A)

NOTE:
- Not Applicable For Type A, B, C, D & E Ditch
- Bottom Slab or Type 5 & 6 Gutter Slabs

TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE B)

SECTION B-B

(SPEED A R ISER ShOWN)

6" Bottom Slab

ROUND RISER OPENING

SQUARE OPENING WITH CORNER FILLETS

TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE B)

SECTION A-A

(ALTERNATE A)

SECTION B-B

(ALTERNATE B)

TYPICAL SLAB TO WALL DETAILS

FOR PRECAST STRUCTURES

NOTE:
- When the inside diameter of a round structure is not more than 1'-6" larger than the opening in the riser or top slab, the top of the structure or riser shall be constructed according to the "Special Top Slab" details on this sheet.

NOTE:
- Provide one extra #4 bar reinforcement each side of each opening and two extra #4 bars at 3" min. spacing above each opening.
**GENERAL NOTES**

1. Standard structure bottoms 4'-0" diameter and smaller (Alt. A) and 3'-6" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type J. Risers are permitted for all structures. Round risers are designated Type B.

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

3. Wall thicknesses and reinforcement are used for both reinforced-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 used 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 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 ACI hooks are specifically required, reinforcement in top and bottom slab shall be straight embedment.

9. All reinforcement must have 2" minimum cover except for 7'-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 cover. Exposed ends of reinforcing at precast pipe openings and grouted joints must be removed to 1" below the concrete surface and sealed with a Type F epoxy in accordance with Specification Section 926. Horizontal steel in rectangular structures shall be lapped a minimum of 30 bar diameters or by standard hooks at corners.

10. The corner fillets shown are necessary for rectangular structures used with circular risers and inlet throats and when used on skew with rectangular risers, inlets and inlet throats. Fillets will be required in the top slab of the Alt. A structure bottoms when used with the Alt. B risers. Each fillet shall be reinforced with two #5 bars.

11. Inlet walls, throats, risers or manhole tops shall be secured to structures as shown on Index 425-001 (Optional Construction Joints).

12. Structures with depths over 14' below the mean high water table are to be checked for flotation by the designer of the drainage project.

13. Units larger than specified standards may be substituted at the contractor’s option when these units will not cause or increase the severity of utility conflicts. Such larger units shall be furnished at no additional cost to the Department. Larger Alt. A units cannot replace Alt. B units without approval of the Engineer. This note applies to this Index only.

14. For 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.

---

**ROUND STRUCTURE BOTTOMS (ALTERNATE A) & ROUND RISERS – TABLE 1**

<table>
<thead>
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<th>Structure Bottom Diameter (ft)</th>
<th>Cast-In-Place Items</th>
<th>Precast Items</th>
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<td>Riser Class III Concrete</td>
<td>A_1 (in.^2/ft.²)</td>
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<tr>
<td></td>
<td>A_2 (in.^2/ft.²)</td>
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<tr>
<td></td>
<td>A_3 (in.^2/ft.²)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A_4 (in.^2/ft.²)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A_5 (in.^2/ft.²)</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>3'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>6'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>9'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>12'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**SQUARE & RECTANGULAR STRUCTURES (ALTERNATE B) – TABLE 2**

<table>
<thead>
<tr>
<th>Type</th>
<th>Wall Length (ft)</th>
<th>Max. Depth (ft)</th>
<th>Wall Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CIP (in.)</td>
<td>Precast (in.)</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>3'-0&quot;</td>
<td>46</td>
<td>6</td>
</tr>
<tr>
<td>J</td>
<td>4'-0&quot;</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>J</td>
<td>5'-0&quot;</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>J</td>
<td>6'-0&quot;</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>J</td>
<td>9'-0&quot; to 12'-0&quot;</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>13'-0&quot;</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>J</td>
<td>15'-0&quot;</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>J</td>
<td>20'-0&quot;</td>
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<td>9</td>
</tr>
<tr>
<td>J</td>
<td>20'-0&quot;</td>
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2 of 5
### TABLE 3 - MINIMUM STRUCTURE SIZES FOR SINGLE PIPE CONNECTION PER SIDE

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>Diamater (D)</th>
<th>Single Pipe Per Side</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>2 1/2&quot;</td>
<td>8&quot;</td>
<td>15&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>3 1/2&quot;</td>
<td>10&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>4 1/2&quot;</td>
<td>12&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>5&quot;</td>
<td>14&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>6&quot;</td>
<td>16&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>7 1/2&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>9&quot;</td>
<td>20&quot;</td>
<td>18&quot;</td>
</tr>
</tbody>
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**Note:**
- Horizontal Wall Reinforcing (Vertical Wall Reinforcing Not Shown For Clarity)

---

### TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>Wall Thickness</th>
<th>Maximum Thckness</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>16&quot;</td>
<td>16&quot;</td>
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<td>24&quot;</td>
<td>20&quot;</td>
<td>20&quot;</td>
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<td>30&quot;</td>
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<td>36&quot;</td>
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<td>42&quot;</td>
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<td>32&quot;</td>
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<td>36&quot;</td>
<td>36&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>40&quot;</td>
<td>40&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>44&quot;</td>
<td>44&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>48&quot;</td>
<td>48&quot;</td>
</tr>
</tbody>
</table>

**Note:**
- 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.

---

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

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MINIMUM WALL LENGTH (L) FOR NUMBER OF PARALLEL PIPES</th>
<th>(Pipe Spacing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
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<tr>
<td>24&quot;</td>
<td>8&quot;</td>
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<td>42&quot;</td>
<td>14&quot;</td>
<td>14&quot;</td>
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<tr>
<td>48&quot;</td>
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<tr>
<td>60&quot;</td>
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<td>18&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>20&quot;</td>
<td>20&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
</tr>
</tbody>
</table>

**Note:**
- Provide Extra Reinforcing (Vertical Wall Reinforcing Not Shown For Clarity)

---

### TABLE 3 NOTES:
1. For Round Structures sizes with variable angles between pipes 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 4'-0".

---

### TABLE 3-MINIMUM STRUCTURE SIZES FOR PIPE CONNECTIONS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MINIMUM WALL LENGTH (L)</th>
<th>PIPE O.D. + 6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>8&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
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<tr>
<td>30&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
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<tr>
<td>36&quot;</td>
<td>14&quot;</td>
<td>14&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>16&quot;</td>
<td>16&quot;</td>
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<tr>
<td>48&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>20&quot;</td>
<td>20&quot;</td>
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<tr>
<td>72&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
</tr>
</tbody>
</table>

**Note:**
- Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.

---

### TABLE 4 NOTES:
1. Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.
2. Wall lengths exceeding 20'-0" require special designs.

---

### STRUCTURE SIZES FOR PIPE CONNECTIONS

**FY 2019-20 STANDAR Plans**

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

**DESCRIPTION:**

**INDEX:** 425-010 3 of 5
### SLAB DESIGNS - SQUARE AND RECTANGULAR STRUCTURES (TABLE 6)

**(ALL SLABS 8” THICK EXCEPT AS NOTED - REINFORCING PARALLEL TO SHORT WAY AND LONG WAY)**

<table>
<thead>
<tr>
<th>SHORT-WAY</th>
<th>LONG-WAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLAB DEPTH</td>
<td>SCHEDULE</td>
</tr>
<tr>
<td>≥0.5’ &lt; 10’</td>
<td>B5.5</td>
</tr>
<tr>
<td>10’ &lt; 16’</td>
<td>E5</td>
</tr>
<tr>
<td>16’ &lt; 22’</td>
<td>F5</td>
</tr>
<tr>
<td>22’ &lt; 28’</td>
<td>D7</td>
</tr>
<tr>
<td>28’ &lt; 34’</td>
<td>G5</td>
</tr>
<tr>
<td>34’ &lt; 40’</td>
<td>E5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHORT-WAY</th>
<th>LONG-WAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLAB DEPTH</td>
<td>SCHEDULE</td>
</tr>
<tr>
<td>8’ &lt; 14’</td>
<td>C6.5</td>
</tr>
<tr>
<td>14’ &lt; 20’</td>
<td>C6.5</td>
</tr>
<tr>
<td>20’ &lt; 26’</td>
<td>B5.5</td>
</tr>
<tr>
<td>26’ &lt; 32’</td>
<td>A6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHORT-WAY</th>
<th>LONG-WAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLAB DEPTH</td>
<td>SCHEDULE</td>
</tr>
<tr>
<td>9’ &lt; 15’</td>
<td>D7</td>
</tr>
<tr>
<td>15’ &lt; 21’</td>
<td>A6</td>
</tr>
<tr>
<td>21’ &lt; 27’</td>
<td>G5</td>
</tr>
<tr>
<td>27’ &lt; 33’</td>
<td>E5</td>
</tr>
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</table>

### SLAB DESIGNS - ROUND STRUCTURES (TABLE 7)

<table>
<thead>
<tr>
<th>SHORT-WAY</th>
<th>LONG-WAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLAB DEPTH</td>
<td>SLAB THICKNESS</td>
</tr>
<tr>
<td>SIZE: 3’ DIA.</td>
<td>SCHEDULE</td>
</tr>
<tr>
<td>≥0.5’ &lt; 8’</td>
<td>D4.5</td>
</tr>
<tr>
<td>8’ &lt; 14’</td>
<td>B5.5</td>
</tr>
<tr>
<td>14’ &lt; 20’</td>
<td>F5</td>
</tr>
<tr>
<td>20’ &lt; 26’</td>
<td>D7</td>
</tr>
<tr>
<td>26’ &lt; 32’</td>
<td>A6</td>
</tr>
</tbody>
</table>

### SLAB AND WALL DESIGN TABLE NOTES

1. Size is the inside dimensions of a structure.

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

3. Bottom Slabs for precast 3’-6” x 3’-6” rectangular structures at 15’ depth or less, may be 6” thick.

4. Slab depth is measured from finished grade to top of slab.

5. Wall depth is measured to the top of the bottom slab for boxes and to the top of the intermediate slab for risers.

6. Wall height is the distance between top of lower slab to bottom of upper slab. Maximum wall height is 12’ for wall lengths exceeding 3’, or 10’ for wall lengths exceeding 12.

7. Wall lengths exceeding 6’-0” require two layers of reinforcing (See Table 6) 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 6 will 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 6D. See Index 425-001 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.
**WALL DESIGNS - RECTANGULAR STRUCTURES (TABLE 8)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 3'-6&quot; &amp; RISERS</td>
<td>SIZE: 10'-0&quot;</td>
<td>SIZE: 10'-0&quot;</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Outside</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Outside</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Outside</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Outside</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VERTICAL REINFORCING</th>
<th>HORIZONTAL REINFORCING</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
</tr>
<tr>
<td>Inside</td>
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<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
</tr>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
</tr>
</tbody>
</table>

**REINFORCING SCHEDULE**

```
<table>
<thead>
<tr>
<th>GRADE 60 AREA (in.²)</th>
<th>MAXIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 KSI (ft.)</td>
<td>70 KSI (ft.)</td>
</tr>
<tr>
<td>GR 60 BARS (8&quot;)</td>
<td>WWR EQUIV. AREA*</td>
</tr>
<tr>
<td>8&quot;</td>
<td>A12</td>
</tr>
<tr>
<td>6&quot;</td>
<td>A6</td>
</tr>
<tr>
<td>4&quot;</td>
<td>A4</td>
</tr>
<tr>
<td>2&quot;</td>
<td>A2</td>
</tr>
</tbody>
</table>
```

**SCHEDULE**

- **GRADE 60 BARS OR 65 KSI & 70 KSI**
- **WELDED WIRE REINFORCING**

**WALL REINFORCING SPLICE DETAILS**

(Alternate B)

| Structure Wall |
| Single Layer Wall Reinforcing |
| Double Layer Wall Reinforcing |
| Lap Splice: (Double Layer Wall Reinforcement) |

**Option 1:** Lap Splice: At Quarter Point (Use Bar Spacing Plus 2" For WWR)

**Option 2:** Lap Splice: With Standard 90° Hooks At Corners (WWR For #4!s, 10" For #6!s)

**Option 3:** Lap Splice: Corner Spliced Bar (10 Bar Diameters, But Not Less Than Two Vertical Wire Spacing Plus 2" For WWR)

---

**DESCRIPTION:**

- Inside
- Outside
- Inside
- Outside
- Inside
- Outside
- Inside
- Outside
- Inside
- Outside
- Inside
- Outside
- Inside
- Outside
- Inside
- Outside
- Inside
- Outside

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**SHEET:**

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**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 C496 (4,000 psi) may be used in lieu of Class I1 concrete for precast units, manufactured in plants which meet the requirements of Section 449 of the Specifications.

6. Corner fillets are required at inlet opening for precast units or C-I-P units used in conjunction with circular inlet bottoms or skewed rectangular inlet boxes. Finish top of fillets flush with drain throat bottom and match slope.

7. For inlet bottoms see Index 425-010. Inlet tops are to be used with Type P bottoms, or Type J bottoms with 3'-6" square (Type B), 3'-6" or 4' round (Type A) risers or top slab openings.

8. These inlet tops are designed for use with standard curb and gutter Type E and Type F. Locate inlet outside of pedestrian crosswalks. For Type E curb, transition the shape of the curb over the gutter transition length to match the face of the inlet (Type F).


10. All steel used for frame and grate shall meet the requirements of ASTM A36/A36M.

11. Either cast iron grates or steel grates may be used.

12. When Alternate "G" grate is specified in the plans either the cast iron grate and galvanized steel frame or the galvanized steel grate and frame must be used. Grates are to be grouted in accordance with the grouting detail shown on Sheet 5, in lieu of tack welding.

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

SECTION EE

SECTION FF

SECTION GG

SECTION HH
(Type 5 Inlet Only)

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

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>TYPE 5 INLET</th>
<th>TYPE 6 INLET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NO.</td>
<td>LENGTH</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>25</td>
<td>3'-1&quot;</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>6</td>
<td>1'-3&quot;</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>25</td>
<td>1'-11&quot;</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>4</td>
<td>1'-5&quot;</td>
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<td>E</td>
<td>4</td>
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<td>H</td>
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<td>2'-3&quot;</td>
</tr>
<tr>
<td>I</td>
<td>4</td>
<td>10</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>J</td>
<td>4</td>
<td>7</td>
<td>3'-2&quot;</td>
</tr>
</tbody>
</table>

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. Bars 4A and 4E may be combined into a single bar.
3. Welded Wire Reinforcement consists of Smooth or Deformed wire meeting the requirements of Specification Section 931.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILLET OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>TYPE 5 INLET</th>
<th>TYPE 6 INLET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NO.</td>
<td>LENGTH</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>25</td>
<td>3'-1&quot;</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>6</td>
<td>1'-3&quot;</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>25</td>
<td>1'-11&quot;</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
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<td>G</td>
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</tr>
<tr>
<td>I</td>
<td>4</td>
<td>10</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>J</td>
<td>4</td>
<td>7</td>
<td>3'-2&quot;</td>
</tr>
</tbody>
</table>

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. Bars 4A and 4E may be combined into a single bar.
3. Welded Wire Reinforcement consists of Smooth or Deformed wire meeting the requirements of Specification Section 931.

WELDED WIRE REINFORCEMENT PIECE NO. 1

WELDED WIRE REINFORCEMENT PIECE NO. 2

WELDED WIRE REINFORCEMENT PIECE NO. 3

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE NO. 1

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE NO. 2

PLACEMENT SCHEMATIC FOR WELDED WIRE REINFORCEMENT PIECE NO. 3

TYPICAL SECTION SHOWING WELDED WIRE REINFORCEMENT
CROSS REFERENCES:
For Location Of Section GG and QQ
See Sheet 1.
GENERAL NOTES

1. This inlet is used in Traffic Separators Types I and II; or, in separators constructed with Curbs Types A, B and E and sidewalk paving which cannot accommodate inlets except 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 1/2".

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.

Inlet to be paid for as Separator (No Deduction for Inlet)

To Be Paid For As Inlet

---

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE (IN/FT)</th>
<th>AREA</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>6 - 10</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>10 - 13</td>
<td>A4</td>
<td>0.20</td>
<td>4&quot;</td>
</tr>
<tr>
<td>10 - 15</td>
<td>B5.5</td>
<td>0.24</td>
<td>5/8&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL DIAGRAM**

**TOP SLAB OF INLETS**

**SECTION AA**

**SECTION BB**

---

**CURB INLET TYPE 7**

**INDEX**

425-022

**SHEET**

1 of 1
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, 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 12".

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.

REINFORCING STEEL DIAGRAM

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>6&quot;</td>
<td>#4 Bars</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>8&quot;</td>
<td>#6 Bars</td>
<td>0.20</td>
<td>4&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>#8 Bars</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>#6 Bars</td>
<td>0.20</td>
<td>4&quot;</td>
</tr>
</tbody>
</table>

For Bottom Slab Rebar Embedment Options See Optional Construction Joints, Index 425-001.

NOTE:

- Horizontal Shock Reinforcement See Directives for Equivalent Area of Welded Wire Fabric.
- Top Slab Rebar for Separators Required.

PLAN

SECTION CC

SECTION AA

SECTION BB

MODIFICATION WHEN USED AS A MANHOLE

Pavement Transition To Inlet

Top Slab Of Inlet Reinforcing Steel Diagram

THROAT DETAIL (SECTION AA)

REINFORCING STEEL DIAGRAM

TOP SLAB OF INLET

HORIZONTAL WALL REINFORCING

SCHEDULE (TABLE 1)
**FRAME AND GRATE**

- **TOP VIEW**
  - Longitudinal Section
  - Transverse Section
  - Section AA
  - Section BB

**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 through 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. Top slabs shall be cast-in-place or precast concrete.

4. All steel in slab tops shall have a 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 or riser wall.

6. When used on a structure with dimensions larger than those detailed above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 24"x36". The "Special Top Slab" on Index 425-010 is not permitted.

7. Frame may be adjusted with one to six courses of brick.

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible, right or left.

**GRATE DETAIL**

- **SECTION**
  - Top Slabs
  - Top View
  - Detail A
  - Detail B
REVISION DESCRIPTION:

1. This inlet is primarily intended for locations with light flows where right of way does not permit the use of throated Curb Inlet Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward predominant flow.

3. For structure bottoms see Index 425-010. For supplemental details see Index 425-001.

4. All steel in slab tops shall have 1½” minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom or riser walls.

6. When used on a structure with dimensions larger than those detail above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 22”x24”. The “Special Top Slab” on Index 425-010 is not permitted.

7. Frame may be adjusted with one to six courses of brick.

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible.

CURB INLET TOP TYPE 10

GRATE DETAIL

GREATNESS CURVE

1. This inlet is primarily intended for locations with light flows where right of way does not permit the use of throated Curb Inlet Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward predominant flow.

3. For structure bottoms see Index 425-010. For supplemental details see Index 425-001.

4. All steel in slab tops shall have 1½” minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom or riser walls.

6. When used on a structure with dimensions larger than those detail above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 22”x24”. The “Special Top Slab” on Index 425-010 is not permitted.

7. Frame may be adjusted with one to six courses of brick.

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible.
PRECAST COLLAR REINFORCING DETAILS (TYPE 1)

C-I-P COLLAR REINFORCING DETAILS SIMILAR

PRECAST COLLAR REINFORCING DETAILS (TYPE 2)

C-I-P COLLAR REINFORCING DETAILS SIMILAR

TOP VIEW OF INLET COLLAR WITHOUT GRATE

ISOMETRIC VIEW OF INLET COLLAR (TYPE 1)

ISOMETRIC VIEW OF INLET COLLAR (TYPE 2)

SECTION DD

SECTION EE

VIEW FF

VIEW JJ

VIEW KK

VIEW LL

PRECAST COLLAR REINFORCING DETAILS (TYPE 1)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

PRECAST COLLAR REINFORCING DETAILS (TYPE 2)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)
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 521-610. Use of the inlet adjacent to other Concrete Barrier or Traffic Railing types requires approval of the Drainage Engineer. The inlet is suitable for bicycle and occasional pedestrian traffic, with roller bar installation (see INSET B), but should not be placed in a designated pedestrian travel way.

2. All exposed edges and corners shall be 1/2 chamfer or tooled to 1/4 radius.

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, DE and EE.

4. When Alternate G grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication. Field installation of the filter bar called for in Inset B will not be permitted, thereby requiring tolerance adjustment during fabrication and/or casting, or, matching grate to structure prior to galvanizing.

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

6. All dimensions to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

7. For supplemental details see Indexes 425-001 and 425-010.

8. Inlet bottoms and/or tops may be either precast or cast-in-place inlets unless otherwise noted.

9. All reinforcing is Grade 60 bars. See Index 425-001 for equivalent area of welded wire fabric.

10. 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.

11. All exposed edges and corners shall be 1/2 chamfer or tooled to 1/4 radius.

12. When Alternate G grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication. Field installation of the filter bar called for in Inset B will not be permitted, thereby requiring tolerance adjustment during fabrication and/or casting, or, matching grate to structure prior to galvanizing.

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

14. Table 1: Horizontal Wall Reinforcing Schedule

<table>
<thead>
<tr>
<th>Wall Depth</th>
<th>Schedule</th>
<th>Area (sq ft)</th>
<th>Max. Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-5'</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>5'-10'</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>
| 10'-15'    | B5.5     | 0.24         | 5 1/2"

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

INLET WITH STRUCTURE BOTTOM

SHOULDER BARRIER INLET

A6

0.20

6"
SHOULDER BARRIER INLET

REV 01/17

DESCRIPTION:

TOLERANCE

Non-Chamfered

General Note 1)

For Alt. G Grates

(See Sheet 1, General Note 1)

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 A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

GENERAL NOTES:

For Std. Grates

(4 Welds T&B Min.)

For Alt. G Grates

(Seal Weld Prior To Galvanizing)

All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

GENERAL NOTES:

For Std. Grates

(4 Welds T&B Min.)

For Alt. G Grates

(Seal Weld Prior To Galvanizing)

All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

GENERAL NOTES:

For Std. Grates

(4 Welds T&B Min.)

For Alt. G Grates

(Seal Weld Prior To Galvanizing)

All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

GENERAL NOTES:

For Std. Grates

(4 Welds T&B Min.)

For Alt. G Grates

(Seal Weld Prior To Galvanizing)

All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

GENERAL NOTES:

For Std. Grates

(4 Welds T&B Min.)

For Alt. G Grates

(Seal Weld Prior To Galvanizing)

All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

GENERAL NOTES:

For Std. Grates

(4 Welds T&B Min.)

For Alt. G Grates

(Seal Weld Prior To Galvanizing)

All reinforcing steel bars shown are #4 bars.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 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 F598) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.
GENERAL NOTES:

1. Where called for in the Plans, use this inlet in conjunction with Curv 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 Dowelled Joint.

2. Reinforcing shown is grade 60 steel bars. For the equivalent area of welded wire reinforcement for the inlet, see Index 426-001. Reinforcing shall have 2" minimum cover unless otherwise shown. Trim or bend bars to provide 1/2" clearance around pipe openings. The cost for additional reinforcing shall be 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 32" chamfer or 3/4" radius to all exposed concrete edges.

5. For pipe connections to inlet structures, the recommended minimum pipe sizes are 18" longitudinal and 30" transverse. For larger pipe, use Alternate B bottoms, Index 425-031.

6. Grates may be fabricated with reticulated bars or with either 100% welded or 100% electroforged cross bars and bearing bars as detailed on Sheet 3.

7. When Alternate 5 grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication, in accordance with Specification 962-9.

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.

9. All dimensions are for both precast and cast-in-place (C-I-P) inlets unless otherwise indicated. Trim or bend bars to maintain 2" clearance around pipe.

10. For inlets placed in areas of bicyclist traffic, provide the extended crossbar or extended inside foot as Alternate B bottoms, Index 425-032. For all others, see Index 425-001.

11. Reinforcing shown is grade 60 steel bars. For the equivalent area of welded wire reinforcement for the inlet, see Index 426-001. Reinforcing shall have 2" minimum cover unless otherwise shown. Trim or bend bars to provide 1/2" clearance around pipe openings. The cost for additional reinforcing shall be 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.

12. Concrete Barrier to be paid for under the contract unit price for Inlets, Barrier, Rigid, Curb & Gutter, Each.
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
GENERAL NOTES

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

2. When alternate "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 1½".

4. All exposed edges and corners shall be 1½" chamfered or tooled to 1¼" 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>SCHEULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0’ - 5’</td>
<td>A12</td>
<td>0.20</td>
<td>12”</td>
<td>8”</td>
</tr>
<tr>
<td>5’ - 9’</td>
<td>A6</td>
<td>0.20</td>
<td>8”</td>
<td>5”</td>
</tr>
<tr>
<td>9’ - 12’</td>
<td>A4</td>
<td>0.20</td>
<td>6”</td>
<td>3”</td>
</tr>
<tr>
<td>12’ - 15’</td>
<td>B5.5</td>
<td>0.24</td>
<td>5½’</td>
<td>5”</td>
</tr>
</tbody>
</table>

Note:
- Table 1:
- Minimum pipe 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.

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></td>
</tr>
<tr>
<td>4'-0&quot; Or 3'-10&quot;</td>
<td></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)

INLET WITH STRUCTURE BOTTOM

PLAN
(CAST-IN-PLACE INLET SHOWN WITHOUT GRATE; PRECAST INLET SIMILAR)

SECTION BB
(CAST-IN-PLACE INLET SHOWN PRECAST INLET SIMILAR)

(Pipe Opening Not Shown)

SECTION AA
(CAST-IN-PLACE INLET)

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STANDARD PLANS

GUTTER INLET TYPE V

GENERAL NOTES

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

2. When alternate "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 1½".

4. All exposed edges and corners shall be 1½" chamfered or tooled to 1¼" 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>SCHEULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0’ - 5’</td>
<td>A12</td>
<td>0.20</td>
<td>12”</td>
<td>8”</td>
</tr>
<tr>
<td>5’ - 9’</td>
<td>A6</td>
<td>0.20</td>
<td>8”</td>
<td>5”</td>
</tr>
<tr>
<td>9’ - 12’</td>
<td>A4</td>
<td>0.20</td>
<td>6”</td>
<td>3”</td>
</tr>
<tr>
<td>12’ - 15’</td>
<td>B5.5</td>
<td>0.24</td>
<td>5½’</td>
<td>5”</td>
</tr>
</tbody>
</table>

Note:
- Table 1:
- Minimum pipe 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.

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></td>
</tr>
<tr>
<td>4'-0&quot; Or 3'-10&quot;</td>
<td></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)

INLET WITH STRUCTURE BOTTOM

PLAN
(CAST-IN-PLACE INLET SHOWN WITHOUT GRATE; PRECAST INLET SIMILAR)

SECTION BB
(CAST-IN-PLACE INLET SHOWN PRECAST INLET SIMILAR)

(Pipe Opening Not Shown)

SECTION AA
(CAST-IN-PLACE INLET)

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FY 2019-20
STANDARD PLANS

GUTTER INLET TYPE V

GENERAL NOTES

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

2. When alternate "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 1½".

4. All exposed edges and corners shall be 1½" chamfered or tooled to 1¼" 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>SCHEULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0’ - 5’</td>
<td>A12</td>
<td>0.20</td>
<td>12”</td>
<td>8”</td>
</tr>
<tr>
<td>5’ - 9’</td>
<td>A6</td>
<td>0.20</td>
<td>8”</td>
<td>5”</td>
</tr>
<tr>
<td>9’ - 12’</td>
<td>A4</td>
<td>0.20</td>
<td>6”</td>
<td>3”</td>
</tr>
<tr>
<td>12’ - 15’</td>
<td>B5.5</td>
<td>0.24</td>
<td>5½’</td>
<td>5”</td>
</tr>
</tbody>
</table>

Note:
- Table 1:
- Minimum pipe 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.

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></td>
</tr>
<tr>
<td>4'-0&quot; Or 3'-10&quot;</td>
<td></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)

INLET WITH STRUCTURE BOTTOM

PLAN
(CAST-IN-PLACE INLET SHOWN WITHOUT GRATE; PRECAST INLET SIMILAR)

SECTION BB
(CAST-IN-PLACE INLET SHOWN PRECAST INLET SIMILAR)

(Pipe Opening Not Shown)

SECTION AA
(CAST-IN-PLACE INLET)
GUTTER INLET TYPE V

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE MIN</th>
<th>OPENING SIZE MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<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>
</tr>
</tbody>
</table>

Centered Inlet
Structure Bottom

Centered Opening
- Top Slab With Reinforcing Details
- Hole Reinforcement.

See Index 425-010 For Structure Details

Round Structure Bottom
- See Table For Dimensions
- Hole Reinforcement.

9½ For 3'-0" x 6'-0" Structure Bottoms
11½ For 8'-0" Structure Bottoms

Top Slab With Centered Opening

Top Slab With
Centered Opening

SECTION AA

SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

TOP SLAB WITH CENTERED OPENING

| SIZE: 5'-0" |
| 2'-11" x 4'-0" | 2'-11" to 4'-0" |
| 3'-3" x 3'-10" |

#4 Bar Each Corner
(2'-9" Min. Length)

2 Way Reinforcement
See Tables

TOP SLAB REINFORCING DIAGRAM

#5 Hoop Bar
(Peripheral Reinforcement)

CENTERED OPENING

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>GRADE 60 (BAR)</th>
<th>70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEDULE</td>
<td>(lb/ft)</td>
</tr>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| SIZE: 6'-0" |
| 2'-11" x 4'-0" | 2'-11" to 4'-0" |
| 3'-3" x 3'-10" |

#4 Bar Each Corner
(2'-9" Min. Length)

2 Way Reinforcement
See Tables

SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

DESCRIPTION:
# Ditch Bottom Inlet Type A

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot;</td>
<td>18&quot;</td>
<td>3'-1&quot; 18&quot; Where An 18&quot; pipe enters a 2'-0&quot; wall (See Index 425-001)</td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail right and index 425-010.*

**GENERAL NOTES**

1. This inlet is designed for ditches, medians, or other area subject to heavy wheel loads on limited access facilities where debris may be a problem. This inlet is not for use in areas subject to pedestrian and/or bicycle traffic.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Cut or bend bars out of way of pipe to clear pipe by 1 1/2". See Index 425-001 for equivalent area of welded wire fabric.

3. All exposed edges and corners shall be 1/4" chamfered or tooled to 1/4" radius.

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

5. Cost of ditch paving to be included in the cost of Inlet. Sodding to be paid for under contract unit price for Performance Turf, ST.

6. For supplemental details see Index 425-001.

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

8. Inlet to be paid for under the contract unit price for inlets (DT Bot Type A), EA.

**HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH (in.)</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10 - 15</td>
<td>A16</td>
<td>0.20</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

**INDEX**

425-050

**SHEET**

1 of 2
### Top Slab Openings

<table>
<thead>
<tr>
<th>Diameter Min.</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>

### Top Slab Reinforcing Schedule

<table>
<thead>
<tr>
<th>Slab Diameter</th>
<th>Slab Thickness</th>
<th>Reinforcing Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 KSI &amp; 70 KSI</td>
<td>GRADE 60 (BAR) OR</td>
<td>(WIRE FABRIC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 WAYS)</td>
</tr>
<tr>
<td>6-0&quot;</td>
<td>9 1/2&quot;</td>
<td>C</td>
</tr>
<tr>
<td>6-0&quot;</td>
<td>9 1/2&quot;</td>
<td>D</td>
</tr>
<tr>
<td>6-0&quot;</td>
<td>9 1/2&quot;</td>
<td>E</td>
</tr>
<tr>
<td>6-0&quot;</td>
<td>9 1/2&quot;</td>
<td>F</td>
</tr>
<tr>
<td>6-0&quot;</td>
<td>9 1/2&quot;</td>
<td>G</td>
</tr>
</tbody>
</table>

### Top Slab Reinforcing Diagram

#### Section AA

- Centered Inlet
- Structure Bottom
- #4 Bar Each Corner (2'-0" Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement - See Table For Dimensions

#### Section BB

- Top Slab Reinforcement
- See Tables

### Alt. A Structure Bottom For Inlet Type A

- Centered Opening
- Top Slab With Centered Opening
- Round Structure Bottom
- See Index 425-010 For Structure Bottom Details and Hole Reinforcement.
- 9 1/2" For 4'-0", 5'-0", 6'-0" Structure Bottoms
- 11 1/2" For 8'-0" Structure Bottoms
- 2 Way Reinforcement - See Tables
- #6 Bars @ 5" Spacing
**CONCRETE INLET PAVEMENT AND SODDING**

**SECTION EE**

**DITCH BLOCK**

**ESTIMATED QUANTITIES**

For Informational Purposes Only

<table>
<thead>
<tr>
<th>SLOT TYPE</th>
<th>PAVEMENT</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>
<td></td>
</tr>
<tr>
<td>Double Slot</td>
<td>8.1</td>
<td>1.1</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

**Concrete Inlet Pavement and Sodding**

**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 BARS WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>A10</td>
<td>0.08</td>
<td>12</td>
</tr>
<tr>
<td>3 - 5</td>
<td>A6</td>
<td>0.20</td>
<td>6'</td>
</tr>
<tr>
<td>5 - 9</td>
<td>85.5</td>
<td>0.24</td>
<td>5½'</td>
</tr>
<tr>
<td>9 - 13</td>
<td>Special</td>
<td>0.057</td>
<td>5'</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>3'-6&quot;</td>
<td>20&quot;</td>
</tr>
<tr>
<td>4'-2&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 above and Index 425-010.

**SECTION BB**

**SECTION CC**

**SECTION DD**

**STEEL GRATE**

**Recommended sizes**

For larger pipe see bottom detail above and Index 425-010.
The general purpose of the inlet top designs are:

1. 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.

2. Provide full grate and horizontal slot designs for new construction.

3. 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.

4. 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.

5. When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.

6. Sod will be paid for under the contract unit price for Performance Turf, SY.

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

8. When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.

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

**GENERAL NOTES**

**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 a different elevation, the designer will stipulate the minimum elevation of top to be constructed at each individual inlet location.

3. 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.

**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 Engineer.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for min. 1½ clearance around pipe.

3. All exposed edges and corners shall be ½ chamfer or tooled to ½ radius.

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

5. Cost for constructing grates 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., and shall include the cost for the removal and stockpiling or disposal of insufficient material from the existing grate box to facilitate construction of the required grate top; construction of the required echelon or echelon; 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. Sod will be paid for under the contract unit price for Performance Turf, SY.

7. All exposed edges and corners shall be ½ chamfer or tooled to ½ radius.

8. When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.

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

**TRAVERSABLE TOPS FOR INLETS TYPE B AND FOR CONVERSIONS OF EXISTING INLETS TYPE B AND TYPE X**

 SECTION AA  SINGLE SLOT

- Inlet Box (Line Type Indicates Existing Box To Facilitate Depiction Of Partial Construction On Existing Inlets)

- On new boxes, the traversable top may be cast as a monolithic unit or cast in segments, and the location of this line may be lower to facilitate handling and placement; however, the slot depth is to remain at 9 inches. See Index 425-001 for top to wall connection. For converting to traversable tops on existing inlets, remove concrete to this line and expose the existing reinforcement. Reshape or splice in reinforcement to penetrate the rim and returns of the grate seat, and bend the reinforcement into the slot shelf to extend into the abutting throat pavement.

- 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.

   d. 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.

   e. All exposed edges and corners shall be ½ chamfer or tooled to ½ radius.

   f. When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.

   g. Sod will be paid for under the contract unit price for Performance Turf, SY.

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

Structure Bottom

Centered Opening:

See Table For Dimensions

#5 Hoop Bar
(Peripheral Reinforcement)

#8 Bars

2 Way Reinforcement
See Tables

#4 Bars Each Corner
(2'-0" Min. Length)

2 Way Reinforcement
See Table For Dimensions

#5 Hoop Bar

TOP SLAB OPENINGS

DIAMETER | OPENING SIZE
---------|-------------
6'-0" to 8'-0" | 7'-8" x 4'-2"
7'-10" to 9'-0" | 8'-5" x 4'-2"

ALTERNATE A STRUCTURE BOTTOM FOR INLET TYPE B

CENTRAL OPENING

TOP SLAB WITH CENTERED OPENING

SLAB DEPTH | SLAB THICKNESS | REINFORCING (2 WAYS) SCHEDULE
-------------|---------------|-------------------------------
0.5 < B | 9/16 | B
B < 18" | 5/8 | C
18" < 30" | 3/4 | D
30" < 37" | 7/8 | E
37" - 40" | 1" | F

SIZE: 6'-0"

TOP SLAB REINFORCING SCHEDULE

SCHEDULE | GRADE 40 (BAR) ON 65 KSI & 70 KSI (WIRE FABRIC)
---------|-------------------------------------------------
A | 0.20
B | 0.24
C | 0.27
D | 0.53
E | 0.73
F | 1.06
G | 1.45

REVISED 11/01/17

DITCH BOTTOM INLET TYPE B

INDEX 425-051

STANDARD PLANS

FY 2019-20

LAST REVISION 11/01/17

DESCRIPTION:

SECTION AA

SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE B

MAX.

MIN.
**DITCH BOTTOM INLET TYPES C, D, E AND H**

- **TYPE C**
  - Recommended Maximum Pipe Size:
    - 2'-0" Wall - 18" Pipe
    - 3'-1" Wall - 24" Pipe (18" where an 18" pipe enters a 2'-0" wall)
  - 2'-0" Wall - 36" Pipe
  - 3'-1" Wall - 36" Pipe

- **TYPE D**
  - Recommended Maximum Pipe Size:
    - 3'-1" Wall - 24" Pipe
    - 4'-1" Wall - 36" Pipe

- **TYPE E**
  - Recommended Maximum Pipe Size:
    - 3'-0" Wall - 24" Pipe
    - 4'-0" Wall - 36" Pipe

**SCHEDULES (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'-15'</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
<tr>
<td>0'-15'</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>30&quot; 5&quot;</td>
</tr>
</tbody>
</table>

**SCHEDULES (TABLE 2)**

**SCHEDULES (TABLE 3)**
**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'-0&quot;</td>
<td>C2.5</td>
<td>0.43</td>
<td>60&quot; @ 12&quot; Ctrs.</td>
<td></td>
</tr>
<tr>
<td>0'-5&quot;</td>
<td>C3.5</td>
<td>0.37</td>
<td>60&quot; @ 10&quot; Ctrs.</td>
<td>2</td>
</tr>
<tr>
<td>0'-10&quot;</td>
<td>D4.5</td>
<td>0.53</td>
<td>40&quot; @ 12&quot; Ctrs.</td>
<td>4</td>
</tr>
</tbody>
</table>

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 5)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING BARS</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-0&quot;</td>
<td>C3.5</td>
<td>0.37</td>
<td>40&quot; @ 10&quot; Ctrs.</td>
<td>3</td>
</tr>
<tr>
<td>0'-5&quot;</td>
<td>D4.5</td>
<td>0.53</td>
<td>20&quot; @ 12&quot; Ctrs.</td>
<td>4</td>
</tr>
</tbody>
</table>

**TYPE H (2 & 3-GRATE INLET)**

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 6'-0" Wall - 1-60" Pipe
- Or 2-24" Pipe (5'-3")

**TYPE H (4-GRATE INLET)**

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 6'-0" Wall - 1-60" Pipe
- Or 2-30" Pipe (5'-4')

**GENERAL NOTES**

See Sheet 3 of 7.

**DESCRIPTION:**
FY 2019-20
STANDARD PLANS
DITCH BOTTOM INLET TYPES C, D, E AND H

**INDEX**
425-052

**SHEET**
2 of 7
1. These inlets are suitable for bicycle traffic and are to be used in ditches, medians, and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to any heavy wheel loads. These inlets may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. Inlets subject to minimal debris should be constructed without slots. Where debris is a problem inlets should be constructed with slots. Slotted 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 Alternate 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 is 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 inlet partial. For conversion work and method of payment see TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS.

8. Sodding to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, $.07.

9. For supplementary details see Index 425-001.

10. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.

NOTE: Steel Grates Are Required On Inlets With Traversable Slots And On Inlets where Bicycle Traffic Is Anticipated.

GENERAL NOTES

STEEL GRATES

CAST IRON GRATES

STEEL GRATES

STEEL GRATES
FOR TRAVERSABLE SLOTS
PAVEMENT AND SODDING QUANTITIES
FOR TRAVERSABLE SLOTS

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Pavement</th>
<th>Sod</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Slot</td>
<td>Double Slot</td>
</tr>
<tr>
<td></td>
<td>SY</td>
<td>CY</td>
</tr>
<tr>
<td>C</td>
<td>4.82</td>
<td>0.77</td>
</tr>
<tr>
<td>D</td>
<td>5.99</td>
<td>0.91</td>
</tr>
<tr>
<td>E</td>
<td>3.98</td>
<td>0.91</td>
</tr>
</tbody>
</table>

DITCH BOTTOM INLET TYPES C, D, E AND H

PLAN VIEW
SECTION AA
SECTION BB
SECTION CC

TRAVERSABLE SLOTS
**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 grate elevation and ditch transitions are not required. Case 2 will normally be applicable to ditches with steeper grades adjoining the inlet. Case 3 will normally be applicable to ditches with 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. Where the existing inlet top is above the existing ditch (Case 2) but borrow material will be required to adjust the ditch (Case 3), and vertical clearance or other conditions do not prevent removal of the inlet top, the designer should call for Case 2. The designer shall determine if ditch reconstruction is required more than 35 feet beyond any traversable slot side and shall include separate pay items in the plans to cover this cost for that portion of required ditch reconstruction exceeding the 35 foot limit. The designer shall also determine whether ditch pavement is required for ditch restoration within the 35 foot limit and include that pavement under a pay item separate from the inlet partial.

When the determination ditch concept is to be used with Case 3, the designer shall stipulate Case 3 (Detention) in the plans.

The designer shall determine whether light soil or other conditions exist at each individual inlet indicates the need for underdrain in Case 3 conversions and shall call for underdrain, Type 1 in the plans.

**Method of Payment for Traversable Slot Inlets (Partial) for Existing Inlets**

1. Existing inlets converted to traversable slot tops under Cases 1, 2 and 3 shall be paid for as inlets partial, each. Case shall not be included in the pay item description.

2. All ditch reconstruction work within 35 feet of each traversable slot conversion, whether required by these details or as a 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 in accordance with the sections on this detail and with the Plans on Sheet 4 and Sections AA, BB and CC (as Case 1) and tabular quantities on Sheet 5.

4. Unit price and payment shall constitute full compensation for inlet conversion (including concrete inlet paving and replacement grate(s), ditch reconstruction, restoration of disturbed turf, and shall be paid for under the contract price for Inlets (DT Bid) (Type __) (Partial), each. Sodding shall be paid for under the contract unit price for Performance Turf, ST.

Ditch pavement shall be paid for separate from the inlet by pavement type(s) and entered as called for in the plans.
ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D AND E

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

**TOP SLAB OPENINGS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
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<tbody>
<tr>
<td>4'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
</tr>
</tbody>
</table>

**TOP SLAB REINFORCING DIAGRAM**

- #4 Bar Each Corner (2' Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement See Tables

**TOP SLAB REINFORCING SCHEDULE**

<table>
<thead>
<tr>
<th>GRADE 60 (BAR) OR 70 KSI (WIRE FABRIC)</th>
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<tr>
<td>SCHEDULE</td>
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<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

**TOP SLAB WITH CENTERED OPENING**

- #5 Hoop Bar Each Corner
- #4 Bars

**SECTION BB**

- Centered Opening See Tables

See Index 425-010 for structure bottom details and hole reinforcement.
2. Cost of paving to be included in cost of inlet.
1. Pavement and/or sod to be used only where called for in the plans.

General Notes:
1. These inlets are designed for use in ditches, medians, pavement areas, or other areas subject to heavy wheel loads, minimal debris, and bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. When inlet is placed in areas subject to bicycle traffic, install filler bar when clearance or gap is greater than 1/2 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 3/4 chamfer or toed in 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 1 1/2" 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.

Recommended Maximum Pipe Sizes:

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-6&quot; (Type F)</td>
<td>18&quot;</td>
</tr>
<tr>
<td>4'-0&quot; (Type F)</td>
<td>30&quot;</td>
</tr>
<tr>
<td>4'-10&quot; / 5'-0&quot; (Type G)</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.
STEEL GRATE

5" Steel Decking, Weight 830 Lbs. Main Bars 5" x 10" Intermediate Bars 1½" x 10", Reticuline Bars 1½" x 10"

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
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<tr>
<td>0 - 3</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>3 - 7</td>
<td>A6</td>
<td>0.20</td>
<td>8&quot;</td>
</tr>
<tr>
<td>7 - 10</td>
<td>B5.5</td>
<td>0.24</td>
<td>5&quot;</td>
</tr>
<tr>
<td>10 - 19</td>
<td>C6.5</td>
<td>0.37</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

NOTE: 425-001 For Minimum Dimensions

CONSTRUCTION JOINTS PERMITTED BETWEEN THESE LIMITS - SEE INDEX

HORIZ. WALL REINF.

A12

AREA        MAX. SPACING

2" Cl. (Typ.)         5'-0"         4"        1 0/3 0/2 01 8 :4 5 :4 4  A M

REV: 11/01/17

STANDARD PLANS

DITCH BOTTOM INLET TYPES F AND G

INDEX 425-053 2 of 2

TYPE G INLET (TABLE 2)
**GENERAL NOTES**

1. This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. All reinforcing Grade 60 bars with 2” min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1½”.

3. All exposed edges and corners shall be 12” chamfer or tooled to 1½” radius.

4. When alternate G 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.

---

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
<th>WALL DEPTH</th>
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</thead>
<tbody>
<tr>
<td>2'-11” or 3'-3”</td>
<td>24”</td>
<td>0’ - 4’</td>
</tr>
<tr>
<td>3'-10” or 4'-0”</td>
<td>30”</td>
<td>4’ - 9’</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 Structure Bottom detail below and Index 425-010.

---

**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’ - 4’</td>
<td>A12</td>
<td>0.20</td>
<td>12”</td>
</tr>
<tr>
<td>4’ - 9’</td>
<td>A8</td>
<td>0.20</td>
<td>6”</td>
</tr>
<tr>
<td>9’ - 12’</td>
<td>A4</td>
<td>0.20</td>
<td>3”</td>
</tr>
<tr>
<td>9’ - 15’</td>
<td>B5.5</td>
<td>0.24</td>
<td>5½”</td>
</tr>
</tbody>
</table>

---

**INLET WITH STRUCTURE BOTTOM**

1. This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. All reinforcing Grade 60 bars with 2” min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1½”.

3. All exposed edges and corners shall be 12” chamfer or tooled to 1½” radius.

4. When alternate G 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.
1. Ditch Bottom Inlet Type J
2. Ditches (Paved or Unpaved)
3. Side Slope
4. Toe Wall Required (Paved or Unpaved Ditches)
5. Ditch Block (Low Side of Inlet on Continuous Ditches)
6. Weld Main Bars to Cross Bar
7. Sod All Around
8. Steel Grating
9. Preformed Joint Filler
10. 3" Conc. Ditch Pavt.
GENERAL NOTES

1. This inlet is to be located at locations having high flow rates, usually where an embankment could not be utilized without hazardous intake.

2. Inlet length (L) shall be set by the designer for the greater of either culvert requirement or inlet pool not to exceed 12' depth. Structures over 6 feet in depth are to be checked for flotation by the designer of project drainage.

3. This inlet is not intended for use with Index 425-010 structure bottoms.

4. All exposed edges and corners shall be 1/4" 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 7" min. cover unless otherwise noted. See Index 425-081 for equivalent area of welded wire fabric (WWF).

7. Channel section C 3x6 at 14" max. bar spacing may be used as an alternate for the C 4x5.4 channel at 15" bar spacing.

8. Channels and bars for grate shall be ASTM A242/A242M, A572/A572M or A588/A588M, Grade 50 steel, and galvanized in accordance with Specification Section 975.

9. Fence enclosure shall be Fence Type B (Index 350-002). All posts to be set in concrete. A minimum of 10 posts required. Corner and approach 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 under the contract unit price for Inlets (DT Bot) (Type K).

11. Anchor Bolts shall be ASTM F1554 Grade 36 fully threaded headless bolts, installed in accordance with Specification Sections 416 and 937. Nuts shall be ASTM A563 or A194 and washers shall be ASTM F436 or alternate for the C 4x5.4 channel at 15" bar spacing.

INDEX 425-055

INLET LENGTHS (L) GREATER THAN OR EQUAL TO 9' (DOUBLE LAYER WALL REINFORCING)

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

PLAN

SECTION AA

SECTION BB

INLET LENGTHS (L) LESS THAN OR EQUAL TO 9' (SINGLE 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.
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.

<table>
<thead>
<tr>
<th>Pipe Size (in)</th>
<th>Concrete Class I (CY)</th>
<th>Sand-Cement Riprap (CY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>6'-9&quot;</td>
<td>2.3</td>
</tr>
<tr>
<td>18</td>
<td>5'-3&quot;</td>
<td>2.6</td>
</tr>
<tr>
<td>24</td>
<td>3'-3&quot;</td>
<td>3.3</td>
</tr>
</tbody>
</table>

1/2" Preformed Joint Filler
See Plans For Handrail Requirements

Riprap-Half Plan Shown
See Plans For Handrail Requirements

SPECIAL CONCRETE ENDWALL

BACK OF SIDEWALK DRAINAGE
**YARD DRAIN ITEM INCLUDES:**

1. 15" x 15" x 12" Concrete or PVC Tee 4' long.
2. Grate diameter = 14-3/4"  
   Thickness = 2-3/8"  
   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.

**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”), 15” or PVC Pipe For Back Of Sidewalk Drainage (4”), 15”

**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.
**DESIGN NOTES**

1. These inlets are designed for use with Type F curb and gutter only. Locate inlet outside of curb ramp area.

   The Single Barrel Flume is intended for locations with light to moderate flows. Multiple Barrel Flumes must be selected to meet design heavy flows.

2. Designer must specify Flume Type, "D" dimension, number of barrels and guiderail requirements in plans.

3. Designer must specify where energy dissipating bricks are required.

**GENERAL NOTES**

1. The finished grade and slope of the inlet top are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.

2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.

3. All steel shall have 2" minimum cover unless otherwise shown. Inlets can be either cast-in-place or precast concrete. Chamfer all exposed edges 90°.

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
**INTERMEDIATE-WALL REINFORCING**

**NOTE:** See Barrel Flume For Base Dimensions.

---

**CLOSED FLUME INLET**

**DESCRIPTION:**

**REVISED:**

**INDEX**

**SHEET**
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 side 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 not be 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>H</th>
<th>D</th>
<th>E</th>
<th>L</th>
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<td>31</td>
<td>14</td>
</tr>
</tbody>
</table>

3\(\frac{1}{2}\) " Thick x 1\(\frac{1}{2}\) " Wide

FLAT BAR

TOP VIEW

END VIEW (FRONT)

SIDE VIEW

SIDE PANEL

FRONT VIEW

FRONT PANEL

DESCRIPTION:

SKIMMER FOR OUTLET CONTROL STRUCTURES

REVISED

425-070

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REV

LAST

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STANDARD PLANS
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 C475. 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 impractiability 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 "Organizations" 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.

UTILITY CONFLICT CONDITION I
(Nonpressure or Nonfluid Carrier Installations)

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 C475. 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 impractiability 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 "Organizations" on the menu to the right.

UTILITY CONFLICT CONDITION II
(Pressure or Fluid Carrier Installations)

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 C475. 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 impractiability 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 "Organizations" on the menu to the right.
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

LONGITUDINAL SECTION

SECTION AA

SECTION BB
**CONCRETE GUTTER AND DRAINS AT RETAINING WALLS**

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

**UNIT PRICE:** Polyvinyl Chloride Pipe Culvert (4”), LF.

**MINIMUM EMBEDMENT: 2’-10”**

**SYMMETRICAL ABOUT PIPE:** Vert Bars & Plate Holes

**VERT BARS & PLATE HOLES:**

- **Grate (Lbs.):**
  - 48
  - 58
  - 74
  - 89
  - 117

**FEET:**

- **Pipe Dia.:**
  - 18" for 42" Pipe
  - 24" for 36" Pipe
  - 30" for 30" Pipe
  - 36" for 24" Pipe
  - 42" for 18" Pipe

**Note:** Guards to be constructed only at locations specifically called for in plans.

---

**MISCELLANEOUS DRAINAGE DETAILS**

**DESCRIPTION:**

- **REVISION:** FY 2019-20
- **STANDARD PLANS**
- **INDEX:** 430-001
- **SHEET:** 2 of 3

**REV ISIO N INDEX**

- **REV 0:** 11/01/17
- **REV 1:** 02/01/17
- **REV 2:** 03/01/17

---

**PLAN**

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

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

**SIDE VIEW**

- **SECTION BB**
  - 1/2" PVC Pipe Sleeve
  - 1/2" x 14" Bolt With Nut And Washers
  - 6/" Anchor with nuts and washers
  - 6/" Minimum Embedment
  - Hex Bolt:
    - Cast-In-Place
    - Adhesive-Bonded Anchor
      - Fully Threaded Rod Installed In Accordance With Specification
  - Section 416

**SECTION - STEEL PLATE**

**CLIP DETAIL**

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

**METHOD FOR SETTING LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES**

- **L=Length Of Transition**
  - 1.  L=10xH (No Maximum)
  - 2.  L=10xDitch Offset (Maximum L=100')

**GUARD AT PIPE ENDS**

**SIDE VIEW**

**NOTE:** Filling or excavation of variable slopes to be done during normal grading operations.
<table>
<thead>
<tr>
<th>RAILROAD COMPANY</th>
<th>CLEARANCE BELOW BOTTOM OF RAIL (FEET)</th>
<th>STRENGTH</th>
<th>ASTM (C76) CLASS</th>
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</thead>
<tbody>
<tr>
<td>Alabama &amp; Gulf Coast Railway (Rail America)</td>
<td>5.5</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>All Railway &amp; Bay Line Railroad (Genesee &amp; Wyoming)</td>
<td>5.5 / 4.5^m</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>CSX Transportation</td>
<td>5.5</td>
<td>V</td>
<td></td>
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<tr>
<td>First Coast Railroad (Genesee &amp; Wyoming)</td>
<td>5.5 / 4.5^m</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Florida Midland, Central, and Northern Railroads (Pennsy Railroad)</td>
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<td>V</td>
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<tr>
<td>Florida East Coast (FEC) Railway Company</td>
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<td>IV</td>
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<tr>
<td>Florida West Coast Railroad Company</td>
<td>5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Georgia &amp; Florida Railway, Inc.</td>
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<td></td>
</tr>
<tr>
<td>Norfolk Southern (NS) Railway Corporation</td>
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<td>Port of Palm Beach District Railroad</td>
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<tr>
<td>Seminole Gulf Railway (LP)</td>
<td>6.0</td>
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<tr>
<td>South Central Florida Express</td>
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<tr>
<td>Talleyrand Terminal Railroad (Genesee &amp; Wyoming)</td>
<td>5.5 / 4.3^m</td>
<td>V</td>
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<tr>
<td>South Florida Regional Transportation Authority (Tri-County Commuter Rail)</td>
<td>5.5</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

(1) - Distance standard for yard and industrial tracks.
(2) - Clearance is for casing pipe. All subgrade carrier pipelines and wirelines will be installed within a casing pipe which will extend from Right-Of-Way line to Right-of-Way line.

MINIMUM LENGTH OF SPECIAL PIPES REQUIRED
(To Be In Increments Of 6')

METHOD FOR DETERMINING THE LENGTH OF SPECIAL PIPE REQUIRED UNDER RAILROADS

INLETS, MANHOLES OR JUNCTION BOXES
ON INTEGRAL PRECAST CONCRETE RISER FOR CONCRETE 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, grates shall be galvanized in accordance with Section 975 and 425.3.2 of the Standard Specifications.

4. Endwall to be paid for under the contract unit price for U-Endwall, Each. Payment shall include cost of concrete, reinforcing steel, grate, and accessories. Quantities shown are for estimating purposes only.

5. Sod slopes 5' each side and above endwall. Sodding to be paid for under contract unit price for Performance Turf, SY.

6. Precasting of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index 425-001 for opening and grading details.

7. Concrete shall be Class I except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

SIDE VIEW

TOP VIEW
GRATE TYPE NO. 1

Pipe Size | Grate Bars, Req'd | Grate (lb)
--- | --- | ---
15" | 2 | 28.93

Bars to be evenly spaced across dimension 'O'.

All bars 1/2" x 2".

SECTION AA

TOP VIEW
GRATE TYPE NO. 2

Pipe Size | Grate Bars, Req'd | Grate (lb)
--- | --- | ---
18" | 3 | 31.69

Bars to be evenly spaced across dimension 'O'.

All bars 1/2" x 2".

TABLE OF DIMENSIONS AND QUANTITIES

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>A</th>
<th>B</th>
<th>Grade</th>
<th>No. of Grates Req'd</th>
<th>Total Grade Wt. (lb)</th>
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<tbody>
<tr>
<td>&quot;</td>
<td>A</td>
<td>&quot;</td>
<td>(FY)</td>
<td>Type No. 1</td>
<td>Type No. 2</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. This endwall is to be used only in the clear zone for the drainage of medians and other areas having low design velocities and negligible debris.

2. Reinforcing steel: All bars are size #4. Spacings shown are center to center. Laps to be 1'-5" minimum. Cover is 2" except as noted. Square welded wire fabric (two cages max.) having an equivalent cross sectional area (0.20 sq. in.) may be substituted for bar reinforcement.

3. Grates shall be ASTM A242/A242M, A572/A572M or ASTM A588/A588M, Grade 50 steel. When "Alt. G" grates are specified in the plans, grates shall be galvanized in accordance with Section 975 and 425.3.2 of the Standard Specifications.

4. Endwall to be paid for under the contract unit price for U-Endwall, Each. Payment shall include cost of concrete, reinforcing steel, grate, and accessories. Quantities shown are for estimating purposes only.

5. Sod slopes 5' each side and above endwall. Sodding to be paid for under contract unit price for Performance Turf, SY.

6. Precasting of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index 425-001 for opening and grading details.

7. Concrete shall be Class I except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
Quantities shown are for estimating purposes only.

When called for in the plans, steel grating, baffles and accessories. Each. Payment shall include cost of concrete, reinforcing steel, and

Endwall to be paid for under the contract unit price for U-Endwall, 9.

Performance Turf, SY. Sodding shall be in accordance with Index 524-001, and paid for

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

plans galvanize in accordance with Section 975 and 425-3.2 of the

Standard Specifications.

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.

All reinforcing No. 4 bars with 2" clearance except as noted.

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.

Channel section C 3x6 may be substituted for C 4x5.4 channel.

Contract unit price for U-Endwall, 9.

Joint Construction

Y Baffle

X Baffle

Permitted

Joint Construction

Bars V

Bars H

Bars V

Bars H

Bars V

Bars H

Bars V

Bars H

With Baffles

Without Baffles

D 1.23 1.77 3.14 4.91

Pipe Size

Area 5'-9" 6'-6" 8'-0" 9'-6"

In.

W 3'-3" 3'-9" 4'-9" 5'-9"

H 3'-7" 3'-10" 4'-4" 4'-10"

L 2'-5" 2'-8" 3'-0" 3'-6"

Pipe Size

Area 1'-3" 1'-6" 2'-0" 2'-6"

In.

Dimensions and quantities for one U-endwall

Dimensions and quantities for one U-endwall

GENERAL NOTES

1. Baffles to be constructed only when called for in plans.

2. When steel grating is required on endwall see Sheet 3 of 3 for
details.

3. All reinforcing No. 4 bars with 2" clearance except as noted.

4. All angles, channels and bars shall be ASTM A242/A242M, A572/A572M 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.

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.

Sodding shall be in accordance with Index 524-001, and paid for

under the contract unit price for Performance Turf, SY.

Endwall to be paid for under the contract unit price for U-Endwall, 9.

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

**REVISION DESCRIPTION:**

- **LAST REV:** 01/17
- **STANDARD PLANS:**

**PLAN:**

- **Sta./Offset Location:**

**SECTION AA:**

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

**DIMENSIONAL DETAILS**

**DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL**

<table>
<thead>
<tr>
<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>Reinf. Steel Lbs.</th>
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</thead>
<tbody>
<tr>
<td>1:3</td>
<td>15&quot;</td>
<td>2.13</td>
<td>5'-3&quot;</td>
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<td>1.85</td>
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**DIMENSIONS AND QUANTITIES FOR BARRIERS**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>D</th>
<th>Area (Sq. Ft.)</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>Bars H</th>
<th>Bars N</th>
<th>X Baffle</th>
<th>Y Baffle</th>
<th>Reinf. Steel Lbs.</th>
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<tbody>
<tr>
<td>15&quot;</td>
<td>1.23</td>
<td>5'-3&quot;</td>
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**PERMITTED CONSTRUCTION Joints:**

- **Baffle X:** Y
- **Baffle Y:** X

**SIDE VIEWS AND BACKWALL SECTIONS**

**REINFORCING DETAILS**

**DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL**

<table>
<thead>
<tr>
<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>Reinf. Steel Lbs.</th>
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<tbody>
<tr>
<td>1:3</td>
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<td>2.13</td>
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<td>3'-11&quot;</td>
<td>3'-11&quot;</td>
<td>3'-11&quot;</td>
<td>3.34</td>
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</tbody>
</table>
STEEL GRATING USE CRITERIA

1. Provide positive debris control at all upgradable 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 transport is considered a minor problem.

D. Runoff to culvert is minor except on an infrequent basis (10 to 15 year frequency); for example a drainage basin in flat sandy terrain with normally low ground water table.

E. Areas where culvert blockage with resultant backwater would not seriously affect roadway embankment, traffic operation or upland property.

2. Steel grating to be used only where called for in plans.

<table>
<thead>
<tr>
<th>Rate</th>
<th>Pipe D</th>
<th>G</th>
<th>2 Each Bar @ 3/4 lb/ft</th>
<th>(X) Channels @ 3.62 lb/ft</th>
<th>2 Angle @ 3.62 lb/ft</th>
<th>Total Weight (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:6</td>
<td>15° 2-3/4</td>
<td>9-3</td>
<td>3-3</td>
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STEEL GRATE

ANCHOR BOLT DETAIL

ELEVATION

MOUNTING FOR STEEL GRATE

END VIEW

ANALYSIS OF CLEARANCES

2: GRATING OPTIONAL 15” TO 30” PIPE

DESCRIPTION:

"BAR TO CHANNEL WELD"

6" Bar 2" x 5.4 lb/ft

"BAR TO BAR WELD"

3 lb 3'-3"

"CHANNEL TO ANGLE WELD"

11'-3" 16'-3" 13'-3" 10'-3" 7'-3" 6'-3" 5'-3" 4'-3" 3'-3" 2'-3" 1'-3" 0'-3"

"U-TYPE CONCRETE ENDWALLS BAFFLES"

INDEX

430-011
ENERGY DISSIPATOR 30" TO 72" PIPE

U-TYPE CONCRETE ENDWALL

PERSPECTIVE

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), LB. 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** | **Q (Max) (CFI)** | **Dimensions** | **Concrete Class I (CY)** | **Reinforcing Steel (LB)** | **Sand-Cement Riprap (CY)**
--- | --- | --- | --- | --- | ---
30 | 4.91 | 9.0 | 6.3 | 10.8 | 4.7 | 6.1 | 3.4 | 1.4 | 1.4 | 2.6 | 3.0 | 1.11 | 6 | 65 | 7 | 7 | 3 | 6.72 | 7.26 | 10.8
36 | 7.07 | 85 | 10-5 | 7-3 | 12-4 | 5-3 | 7-1 | 10-10 | 1-7 | 1-2 | 3-0 | 3-6 | 2-3 | 7 | 75 | 8 | 8 | 3 | 10.24 | 10.72 | 12.6
42 | 8.62 | 115 | 11-10 | 8-6 | 16-6 | 6-10 | 8-11 | 11-11 | 2-6 | 1-2 | 3-0 | 4-5 | 2-10 | 8 | 85 | 9 | 9 | 4 | 14.92 | 14.19 | 17.5
48 | 12.57 | 157 | 13-12 | 9-6 | 15-8 | 8-6 | 8-11 | 12-11 | 2-0 | 1-2 | 3-0 | 4-5 | 2-10 | 9 | 95 | 10 | 10 | 5 | 20.35 | 20.60 | 22.7
54 | 15.90 | 191 | 14-8 | 9-6 | 17-4 | 7-4 | 10-0 | 5-9 | 2-2 | 1-10 | 3-0 | 4-11 | 3-0 | 10 | 105 | 10 | 10 | 6 | 27.19 | 26.99 | 27.2
60 | 19.63 | 236 | 16-1 | 10-9 | 19-0 | 8-0 | 11-0 | 5-11 | 2-5 | 1-11 | 3-0 | 5-4 | 3-4 | 11 | 115 | 11 | 11 | 6 | 34.49 | 33.52 | 32.5
66 | 22.76 | 285 | 17-3 | 11-8 | 20-6 | 8-6 | 12-7 | 3-11 | 2-1 | 3-0 | 5-9 | 3-7 | 12 | 125 | 12 | 12 | 6 | 43.82 | 43.72 | 38.5
72 | 26.27 | 339 | 18-6 | 12-3 | 22-0 | 9-3 | 12-9 | 6-11 | 2-9 | 2-2 | 3-0 | 6-2 | 3-9 | 12 | 125 | 12 | 12 | 6 | 50.88 | 51.88 | 44.5

(Plan Views)

Fence Type B when called for in plans.

Slope: 1-3 (Typical)

Fill slope varies.

Max. physical slope on pipe to be 4:1.

Layer of plastic filter fabric (cost to be included in contract unit price for riprap).

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), LB. 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.
REINFORCED CONCRETE JACKET DETAIL

FLARED END SECTION

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 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 end 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 manufacturers are different, the compatibility of joint designs shall be certified by the manufacturer of the flared end sections.
   b. Joints sealed with preformed plastic gaskets. The gaskets shall meet the requirements of Section 942-2 of the Specifications and the minimum sizes for gaskets shall be as that specified for equivalent sizes of elliptical pipe.
   c. Reinforced concrete jackets, as detailed on this drawing. Cost of the reinforced concrete jacket to be included in the contract unit price for the flared end section. When non-coated corrugated metal pipe is called for in the plans, the pipe shall be bituminous coated in the jacketed area as specified on Index 430-001. Bituminous coating to be included in the contract unit price for the pipe culvert. Concrete jacket shall be as specified on Index 430-001. Cost of concrete and reinforcement shall be included in the contract unit price for the pipe culvert.

3. Toe walls shall be constructed 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 skewed pipe culverts the flared end sections shall be placed in line with the pipe culvert. Side slopes shall be warped as required to fit the flared end sections.

5. Flared End Section to be paid for under the contract unit price for Flared End Section (Concrete), EA. Sizing shall be in accordance with Index 524-001, and paid for under the contract unit price for Performance Turf, SY.

INDEX 430-020
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**DIMENSIONS AND QUANTITIES**

**SD CONCRETE SLAB CY**

- Single Pipe: 3.50
- Double Pipe: 3.50
- Triple Pipe: 3.50
- Quad. Pipe: 3.50

**SODDING (SFT)**

- Single Pipe: 3.50
- Double Pipe: 3.50
- Triple Pipe: 3.50
- Quad. Pipe: 3.50

**NOTE:** See Sheet 6 For Details And Notes.

---

**SLOPE: 1:4 Miter:** To #4 Pipe For Pipes 18" And Smaller. 1:2 For Pipes 24" And Larger.

**SLOPE: 1:2 Miter:** To #2 Pipe For Pipes 24" And Larger.

**SLOPE: 1:1 Miter:** To #1 Pipe For Pipes 18" And Smaller.

---

**SECTION**

- Concrete Slab, 3" Or 5/8" Thick, Reinforced With WWF 6x6-WI.4xWI.4

---

**NOTE:** See Sheet 6 For Details And Notes.
### Dimensions & Quantities

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**Slope: 1:4**

**1.5" x 1.5" R**

### Edge of Pipe

- **Depth Around Outside:**
  - **3" or 5"**
  - **Rise:**
    - **48"**
      - **48"**
        - **12"**
          - **12"**
            - **12"**
              - **12"**
            - **11"**
          - **10"**
        - **9"**
      - **43"**
        - **43"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **38"**
        - **38"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **33"**
        - **33"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **28"**
        - **28"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **23"**
        - **23"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **18"**
        - **18"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **13"**
        - **13"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **8"**
        - **8"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**
      - **3"**
        - **3"**
          - **10"**
          - **10"**
          - **10"**
        - **9"**

### Shear Forces

- **Slab: 3" or 5" Thick, Reinforced With WWF 6x6-WI.4xWI.4**

### TOP VIEW - SINGLE PIPE

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

**Mitered With WWF 6x6-WI.4xWI.4**

**Note:** See Sheet 5 For 3" Slab Quantities

**See General Note 3.**

### TOP VIEW - MULTIPLE PIPE

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

**Note:** See Sheet 6 For Details and Notes

### Single and Multiple Elliptical Concrete Pipe

**CROSS DRAIN MITERED END SECTION**

- **Pipe: 3" or 5"**
- **Reinforced With WWF 6x6-WI.4xWI.4**

**Note:** See Sheet 3 For 3" Slab Quantities

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

**Last Revision 01/01/17**

**Description:** FY 2019-20

**Index:** 430-021

**Sheet:** 4 of 6
### Quantities for 3" Thick Concrete Slabs (Cy)

#### Round-Concrete

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**Note:** The table above provides the quantities for various slopes and types of concrete slabs. The values are given in cubic yards (Cy) and are specific to the thickness and type of concrete specified. For a comprehensive understanding, refer to the standard plans and cross drain mitered end section details included in the document.
GENERAL NOTES
1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of cross drain pipe; corrugated steel pipe mitered end sections may be used with any type of cross drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of cross drain pipe except steel pipe. When bituminous coated metal pipe is specified for cross drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the cross drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPPP). 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 KS 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.

TRANSITIONS
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 Transition detail.

ANCHOR DETAIL
1. Anchors required for CMP only.

Anchor, washer and nuts to be galvanized steel.

Bend anchor where required to center in concrete slab. Damaged surfaces to be repaired after bending. Anchors are to be spaced a distance equal to four (4) corrugations. Place the anchors in the outside crest of corrugation.

Flat washers to be placed on inside wall of pipe.

Holes in the mitered end pipe are to be drilled or punched; burning not permitted.

SPECIAL DETAILS AND NOTES
SIDE DRAIN MITERED END SECTION

SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE

DIMENSIONS & QUANTITIES

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CONTRACTOR'S INFORMATION

- Values shown for estimating pipe quantities and are for information only.
- These sizes are restricted to inlet and outlet treatment for water management systems or similar applications.
- See Sheets 6 and 7 for details and general notes.

NOTE: See Sheets 6 and 7 for details and general notes.
## Dimensions & Quantities

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### Notes
- **Construction Joint Permitted** unless approved by the engineer.
- **No Pipe Joint Permitted** for information only.
- **Values shown for estimating pipe quantities and are for information only.**

## Single and Multiple Elliptical Concrete Pipe

### Top View - Single Pipe

1. **Concrete Pipe**
2. **Saddle**
3. **Connector**
4. **Construction Joint Permitted**

### Top View - Multiple Pipe

1. **Concrete Slab, 3" Thick, Reinforced with WWF 6x6-W1.4xW1.4**
2. **Pipe**
3. **Fastener**
4. **Saddle**

### Side Drain Mitered End Section

- **Concrete Slab, 3" Thick, Reinforced with WWF 6x6-W1.4xW1.4**
- **Grate**
- **Construction Joint Permitted**

### Section

- **Not Less Than R**
- **Pipe**
- **Fastener**

### Table

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

### FY 2019-20

**STANDARD PLANS**

**SIDE DRAIN MITERED END SECTION**

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

REVISE

#3 Steel Bars

Wire Mesh

**TOP VIEW**

\[ \text{Galvanized Bolt Hex Head Bolt Shown: Either Hex Head Or Square Head Bolt May Be Used. Only Hex Nut To Be Used.} \]

**END VIEW**

**SIDE VIEW**

The specified weld shall be made when the fabricated unit is subject to hazardous hauls and repeated handling. Tack welds are permitted for local or job site fabrication. Galvanizing over welded surface not required.

**BOTTOM VIEW**

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

**DETAILS FOR CONCRETE & CORRUGATED METAL PIPE**

**SIDE DRAIN MITERED END SECTION**

**LAST UPDATE:** 01/01/17

**REVISION:** FY 2019-20

**INDEX:** 430-022

**SHEET:** 5 of 7
FOR SINGLE & MULTIPLE DRAIN PIPE

ANCHOR DETAIL

- Hex Nuts (2 Req'd.)
- Flat Washer (1 Req'd.)
- 9/16" x 6" Bolt

Notes:
- Anchors required for CMP only.
- Anchor, washer and nuts to be galvanized steel.
- Bend anchor where required to center in concrete slab.
- Damaged surfaces to be repaired after bending.
- Anchors are to be spaced a distance equal to four (4) corrugations.
- Place the anchors in the outside crest of corrugation.
- Flat washer to be placed on inside wall of pipe.
- Holes in the mitered end pipe are to be drilled or punched; burning not permitted.

CONCRETE PIPE CONNECTOR DETAIL

- Bolt diameters shall be 7/16" for 15" to 36" pipe and 1/2" for 42" to 60" pipe.
- Two connectors required per joint, located 60° right and left of bottom center of pipe.
- Bolt holes in pipe shell are to be drilled.

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

- All bars, bolts, nuts and washers are to be galvanized steel.
- Bolt diameters shall be 7/16" for 15" to 36" pipe and 1/2" for 42" to 60" pipe.
- Two connectors required per joint, located 60° right and left of bottom center of pipe.
- Bolt holes in pipe shell are to be drilled.
GENERAL NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of side drain pipe; corrugated steel pipe mitered end sections may be used with any type of side drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of side drain pipe except steel pipe. When bituminous coated metal pipe is specified for side drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the side drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically 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. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.

4. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.

5. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

6. When existing multiple side drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

7. Class NS concrete cast-in-place reinforced slabs are required for all sizes of side drain pipes.

8. Install grates on all round pipes 36" 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.

NOTES & INFORMATION

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 1). 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.

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 30' will not result between the toe points of the mitered end sections.

4. Provide ditch transitions on all grades in excess of 3%.
GENERAL NOTES

1. Endwall dimensions, locations and positions are for round and elliptical concrete pipe and for round and pipe-arch corrugated metal pipe. Round concrete pipe shown.

2. Front slope and ditch transitions shall be in accordance with Index 430-001.

3. Endwalls may be cast in place or precast concrete. Reinforcing steel shall be Grades 40 or 60. Additional reinforcement necessary for handling precast units shall be determined by the Contractor or the supplier. Cost of reinforcement shall be included in the contract unit price for Concrete, (Endwalls).

4. All exposed corners and edges of concrete are to be chamfered 1/2".

5. Concrete shall be Class I, except ASTM 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:

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<td>45°</td>
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</tbody>
</table>

   For special endwall locations, use Tabulated Value.

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 DIMENSIONS (EXCLUSIVE OF MULTIPLE PIPE SPACING)

STANDARD LOCATION CONTROL

PIPE AND SPACING FOR MULTIPLE PIPE

ENDWALL POSITIONS FOR SINGLE AND MULTIPLE
## ROUND CONCRETE AND CORRUGATED METAL PIPE

### DATA AND ESTIMATED QUANTITIES FOR ONE ENDWALL

<table>
<thead>
<tr>
<th>Class</th>
<th>Concrete (CT)</th>
<th>Number and Type of Pipe and Swage Angle of Pipe</th>
<th>Single</th>
<th>Double</th>
<th>Triple</th>
<th>Quadruple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric</td>
<td>Concrete</td>
<td>Metal</td>
<td>Concrete</td>
<td>Metal</td>
<td>Concrete</td>
<td>Metal</td>
</tr>
<tr>
<td>0°</td>
<td>15°</td>
<td>45°</td>
<td>60°</td>
<td>0°</td>
<td>15°</td>
<td>45°</td>
</tr>
<tr>
<td>1</td>
<td>1.14</td>
<td>1.52</td>
<td>2.42</td>
<td>1.14</td>
<td>1.52</td>
<td>2.42</td>
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<tr>
<td>2</td>
<td>1.24</td>
<td>1.52</td>
<td>2.42</td>
<td>1.24</td>
<td>1.52</td>
<td>2.42</td>
</tr>
<tr>
<td>3</td>
<td>1.24</td>
<td>1.52</td>
<td>2.42</td>
<td>1.24</td>
<td>1.52</td>
<td>2.42</td>
</tr>
<tr>
<td>4</td>
<td>1.24</td>
<td>1.52</td>
<td>2.42</td>
<td>1.24</td>
<td>1.52</td>
<td>2.42</td>
</tr>
</tbody>
</table>

### CORRUGATED METAL PIPE ARCH

### CONCRETE ELLIPTICAL ENDWALL

### STRAIGHT CONCRETE ENDWALLS: SINGLE AND MULTIPLE PIPE

**Note:** Use the guidelines of the general rule 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 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 1⁄2" unless otherwise shown.

6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of .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.

**GENERAL NOTES**
**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD</th>
<th>LENGTH</th>
<th>LOCATION</th>
<th>BENDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>#2</td>
<td>11</td>
<td>6'-2&quot;</td>
<td>Footing</td>
<td>Straight</td>
</tr>
<tr>
<td>B</td>
<td>#2</td>
<td>9</td>
<td>40'-2&quot;</td>
<td>Footing</td>
<td>Wall</td>
</tr>
<tr>
<td>B</td>
<td>#4</td>
<td>4</td>
<td>17'-9&quot;</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>B</td>
<td>#4</td>
<td>6</td>
<td>6'-6&quot;</td>
<td>Wall</td>
<td>Field</td>
</tr>
<tr>
<td>B</td>
<td>#4</td>
<td>2</td>
<td>2'-2&quot;</td>
<td>Wall</td>
<td>Field</td>
</tr>
<tr>
<td>A</td>
<td>#2</td>
<td>8</td>
<td>14'-0&quot;</td>
<td>Field</td>
<td>Field</td>
</tr>
<tr>
<td>C</td>
<td>#4</td>
<td>29</td>
<td>9'-0&quot;</td>
<td>Footing &amp; Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>G</td>
<td>#4</td>
<td>30</td>
<td>7'-6&quot;</td>
<td>Footing &amp; Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>I</td>
<td>#4</td>
<td>16</td>
<td>4'-6&quot;</td>
<td>Footing &amp; Wall</td>
<td>Straight</td>
</tr>
</tbody>
</table>

**BENDING DIAGRAM**

- Bars B @ 12"
- Bars C @ 12"
- Bars D @ 18"
- Dowel Bars E

**ESTIMATED QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>RCP</th>
<th>CMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Cu. Yd.</td>
<td>13.7</td>
<td>13.8</td>
</tr>
<tr>
<td>CMP</td>
<td>Lb.</td>
<td>824</td>
<td>824</td>
</tr>
</tbody>
</table>

**NOTE:** See Sheet 1 of 2 for General Notes.
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II except ASTM C492 (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 2” unless otherwise shown.

6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12” beyond shall have a continuous bituminous coating of 0.004” minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.
### BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD</th>
<th>LENGTH</th>
<th>LOCATION</th>
<th>BENDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>80</td>
<td>42'-6&quot;</td>
<td>Footing</td>
<td>Straight</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>12</td>
<td>42'-0&quot;</td>
<td>Footing &amp; Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>22</td>
<td>3'-11&quot;</td>
<td>Wall</td>
<td>Bend</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>22</td>
<td>11'-0&quot;</td>
<td>Wall</td>
<td>Bend</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>8</td>
<td>1'-4&quot;</td>
<td>Wall</td>
<td>Straight</td>
</tr>
</tbody>
</table>

### BENDING DIAGRAMS

- Field Bend
- 4'-6" Field Bend
- Bar A
- Bar B
- Bar C

### ESTIMATED QUANTITIES

- **Reinforcing Steel**: 1,406 Cu. Yd. for Class II Concrete

- **Note**: All bar dimensions are out to out.

### OPTIONAL ENTRANCE FOR CONCRETE PIPE

- Note: See Sheet 1 of 2 for General Notes.
GENERAL NOTES

1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 449-001 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 1/4 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 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.
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast units, shall require the approval of the State Drainage Engineer prior to construction. 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.

5. Chamfer: All exposed edges and corners to be chamfered 45° unless otherwise shown.

6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast units manufactured in plants meeting the requirements of Section 489 of the Specifications.
WINGED CONCRETE ENDWALLS SINGLE ROUND PIPE

GENERAL NOTES

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

2. Chamfer all exposed edges 90°.

3. Concrete shall be Class I, except ASTM C478 (4000 psi) Concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 469 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 Tar, ST.

PLAN
CONCRETE ENDWALL WITH U-TYPE WINGS FOR PIPE CULVERTS

TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES
PIPE CULVERT ENDWALLS WITH U-TYPE WINGS

<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>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>H</td>
<td>G</td>
<td>K</td>
<td>F</td>
<td>I</td>
</tr>
<tr>
<td>12</td>
<td>0.8</td>
<td>3'8&quot;</td>
<td>2'-0&quot;</td>
<td>1'-0&quot;</td>
<td>1'-3&quot;</td>
</tr>
<tr>
<td>15</td>
<td>1.2</td>
<td>3'-11&quot;</td>
<td>2'-3&quot;</td>
<td>1'-5&quot;</td>
<td>1'-3&quot;</td>
</tr>
<tr>
<td>18</td>
<td>1.8</td>
<td>4'-2&quot;</td>
<td>2'-6&quot;</td>
<td>1'-8&quot;</td>
<td>1'-3&quot;</td>
</tr>
</tbody>
</table>
| 24      | 3.1        | 4'-8" | 3'-0" | 2'-6"  | 1'-6"  | 3'-4" | 1.01 | 1.13 | 1.06 | 1.16 | 2-#6 Bars x 2'-0"
| 30      | 3.9        | 5'-2" | 3'-6" | 3'-3"  | 2'-6"  | 4'-5" | 1.33 | 1.44 | 1.45 | 1.51 | 2-#6 Bars x 2'-0"
| 36      | 4.7        | 5'-8" | 4'-0" | 4'-0"  | 2'-9"  | 5'-11" | 1.73 | 1.93 | 1.84 | 1.96 | 2-#6 Bars x 2'-0"
| 42      | 5.6        | 6'-2" | 4'-6" | 4'-9"  | 2'-0"  | 6'-8" | 2.19 | 2.32 | 2.32 | 2.43 | 2-#6 Bars x 3'-0"
| 48      | 6.8        | 6'-8" | 5'-0" | 5'-6"  | 2'-0"  | 6'-8" | 2.64 | 2.78 | 2.81 | 2.95 | 2-#6 Bars x 3'-0"

PLAN
CONCRETE ENDWALL WITH 45° WINGS FOR PIPE CULVERTS

TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES
PIPE CULVERT ENDWALLS WITH 45° WINGS

<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>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>H</td>
<td>G</td>
<td>K</td>
<td>F</td>
<td>I</td>
</tr>
<tr>
<td>15°</td>
<td>1.2</td>
<td>2'-3&quot;</td>
<td>3'-3&quot;</td>
<td>1'-0&quot;</td>
<td>1'-3&quot;</td>
</tr>
<tr>
<td>18°</td>
<td>1.6</td>
<td>2'-6&quot;</td>
<td>3'-10&quot;</td>
<td>1'-2&quot;</td>
<td>1'-3&quot;</td>
</tr>
</tbody>
</table>
| 24"     | 3.1        | 3'-0" | 4'-4"  | 1'-5"  | 2'-1"  | 3'-4" | 1.01 | 1.06 | 1.06 | 2-#6 Bars x 2'-0"
| 30"     | 4.9        | 3'-6" | 4'-10" | 2'-9"  | 3'-4"  | 5'-2" | 1.22 | 1.29 | 1.29 | 2-#6 Bars x 2'-0"
| 36"     | 5.1        | 4'-0" | 4'-4"  | 3'-11" | 2'-0"  | 6'-0" | 1.42 | 1.47 | 1.47 | 2-#6 Bars x 2'-0"
| 42"     | 5.6        | 4'-6" | 5'-10" | 3'-3"  | 3'-6"  | 2'-6" | 2.34 | 2.47 | 2.47 | 2-#6 Bars x 2'-0"
| 48"     | 6.8        | 5'-8" | 6'-10" | 4'-3"  | 4'-6"  | 2'-6" | 2.74 | 2.90 | 2.90 | 2-#6 Bars x 2'-0"
ANCHOR BOLT DETAIL

DESCRIPTION:

P-8 " SHEET 
10 Lbs. Channels @ 5.4 Lbs./LF

M-4" 16"
2 " Lbs. F

SECTION AA

GRADE SEAT DETAIL

ANCHOR BOLT DETAIL

DIMENSIONS AND QUANTITIES PER GRADE

<table>
<thead>
<tr>
<th>Slope</th>
<th>Pipe Size</th>
<th>Quantity</th>
<th>Channel @ 5.4 Lbs./LF</th>
<th>Bars @ 3.4 Lbs./LF</th>
<th>Total Weight-Lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:6</td>
<td>18&quot;</td>
<td>10</td>
<td>2.69&quot;</td>
<td>11.7&quot;</td>
<td>9.4&quot;</td>
</tr>
<tr>
<td>15&quot;</td>
<td>22</td>
<td>139</td>
<td>11.5&quot;</td>
<td>3.5&quot;</td>
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<tr>
<td>18&quot;</td>
<td>15</td>
<td>134</td>
<td>14.4&quot;</td>
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<td>18</td>
<td>126</td>
<td>16.4&quot;</td>
<td>4.6&quot;</td>
<td>15.4</td>
</tr>
</tbody>
</table>

SECTION BB

GENERAL NOTES

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 I Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB. Cost of Adhesive-Bonded Dowels is 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, SF.

SAFETY MODIFICATIONS FOR ENDWALLS

DIMENSIONS AND QUANTITIES PER U-ENDWALL

<table>
<thead>
<tr>
<th>Slope</th>
<th>Pipe Size</th>
<th>G</th>
<th>M</th>
<th>D</th>
<th>R</th>
<th>Class I Concrete-CY</th>
<th>Reinforcing Steel-Lbs.</th>
<th>Sod</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:6</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>15&quot;</td>
<td>22&quot;</td>
<td>139</td>
<td>3.3&quot;</td>
<td>11.7&quot;</td>
<td>10 Lbs.</td>
</tr>
<tr>
<td>15&quot;</td>
<td>22&quot;</td>
<td>167</td>
<td>10&quot;</td>
<td>22&quot;</td>
<td>134</td>
<td>4.6&quot;</td>
<td>14.4&quot;</td>
<td>20 Lbs.</td>
</tr>
<tr>
<td>30&quot;</td>
<td>18&quot;</td>
<td>217</td>
<td>12.7&quot;</td>
<td>227</td>
<td>114</td>
<td>5.4&quot;</td>
<td>16.4&quot;</td>
<td>30 Lbs.</td>
</tr>
</tbody>
</table>

INDEX 430-090

SAFETY MODIFICATIONS FOR ENDWALLS

INDEX 430-090

1 of 1
PREFORMED POLYETHYLENE ALTERNATE

SEE SHEET 2 FOR TYPICAL LOCATIONS

TYPE I (NON-REMOVABLE GRATE)

GENERAL NOTES

1. Trench drain is intended for use in gutters and driveways as shown on the typical locations on Sheet 2. Type I is intended for use in Type E, F and drop curbing, and adjacent to traffic separators and standard barrier walls. The width of the channel grate for Type I Trench Drain shall be 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 grating used has an open area equal to at least 0.27 square feet per linear foot. Type II is primarily intended for use in valley gutter across driveway openings and drop curbing. Type I may also be used in those locations. The width of the channel grate for Type 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 inverts 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.

PREFORMED CHANNEL WITH REMOVABLE GRATE

SEE SHEET 2 FOR TYPICAL LOCATIONS

TYPE II

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**

**WITHIN VALLEY GUTTER**

TYPICAL LOCATIONS FOR TYPE I

ROUND PIPE ALTERNATE SHOWN, BUT PREFORMED POLYETHYLENE ALTERNATE ACCEPTABLE

*As Necessary To Provide 6" Of Concrete On This Side Of Drain*
1. The underdrain pipe shall be either 4” smooth or 5” corrugated tubing unless otherwise shown in the plans. The size to be furnished shall 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 8” corrugated interior
   6” smooth interior equivalent to 10” 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 Type I, II, III and V shall be in accordance with Section 440.

5. Filter fabric shall be Type D-3 (See Specifications Section 985). The internal filter fabric of Type V underdrain shall have a permeability 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 coarse 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. elbows (45 deg.) elbows. 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, 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 gradation requirements of Chapter 62-25 FAC.

6. The designer shall 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 shall 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.

DESIGN 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, 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.

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6. The designer shall 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 shall 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.
Concrete Apron (12" Max.)

Curb & Gutter

Slope Varies

Concrete Apron

Slope Varies

Concrete Apron

Grout

Underdrain

Center of Box

Sta./Offset Location

TYPICAL URBAN INSTALLATION

PERMISSIBLE TOP ADJUSTMENT

Typical Opening. One or More Sides. See Plans For Required Openings. Grout Fill To Be Included In Cost Of Box.

Concrete Apron

A Maximum Of Two (2) Adjustment Courses Of Brick Will Be Permitted

Concrete Apron

Concrete Apron

Grout

Underdrain

Underdrain Inspection Box To Box

Underdrain Inspection Box To Box

12"

12"

12"

12"

28½" or 28½"

23½" or 21½"

6"

6"

6"

6"

TYPICAL INSTALLATION ON SLOPES

TYPICAL TOP AND APRON

3" Concrete Apron

Slope Varies

1:12

Underdrain

Bullet Pipe

Cast Or Field Cut 4" Wide Slots (2) For Hinge Covers. Grout Around Hinge Covers.

Underdrain

28½" or 28½"

23½" or 21½"

12" (Max.)

6"

4"

24"
GENERAL NOTES

1. Pipe shall be any of the optional types permitted in Section 443 of the Specifications unless otherwise restricted in the plans. Dissimilar types of pipe will not be permitted in a continuous run of pipe.

2. Concrete pipe shall be placed with the slots positioned on sides.

3. Alignment joints are standard (gaskets not required). Recorrugation of metal pipe ends not required.

4. The contractor may submit other methods of providing slots having equal or greater area of opening, for approval by the Engineer.

5. Filter fabric shall be Type D-3 meeting the requirements of Section 985. All filter fabric joints shall lap a minimum of one (1) foot.

6. The standard cross section shall be constructed unless other section(s) described or detailed in the plans.

7. For supplemental details see Index 430-001.

8. The contractor shall take the necessary precautions to prevent contamination of the trench with sand, silt and foreign materials.

9. French drains shall be paid for under the contract unit price for French Drains, LF. The unit price shall include the cost of pipe, pipe plugs, pipe fittings, coarse aggregate and filter fabric in place, and the cost for trench excavation, backfill and compaction. The unit price shall also include the cost for disposal of surplus excavated materials and cost for restoration of pavement removed or damaged by French drain construction, but shall not include payments for items paid for elsewhere.

DESIGN NOTES

1. Pipe invert should be at or above the water table whenever possible.

2. French drains with minor dimensional changes or otherwise different from the standard cross-section shall be either described or detailed in the plans. French drains with significantly different cross-sections shall be detailed in the plans.
**French Drain**

**SLOTTED PIPE OPTIONS**

**SIDE VIEW**

**SECTION AA**

**SECTION BB**

**OPTION A - ROUND PIPE**

**OPTION B - ROUND OR ELLIPTICAL PIPE**

**ELLIPICAL PIPE**

**ROUND PIPE**

<table>
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<th>Max.</th>
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</tr>
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<td>18&quot;</td>
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</tr>
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<td>24&quot;</td>
<td>26&quot;</td>
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</tr>
<tr>
<td>38&quot;x10&quot;</td>
<td>24&quot;</td>
<td>26&quot;</td>
<td></td>
</tr>
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</table>

**Note:** A curved cut is acceptable as long as the control dimension is maintained (Typical for Elliptical & Round Pipe).

**SIDE VIEW**

**SECTION AA**

**SECTION BB**

**OPTION A - ROUND PIPE**

**OPTION B - ROUND OR ELLIPTICAL PIPE**
SKIMMERS FOR FRENCH DRAIN OUTLETS

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 nearly to extend ½ inch beyond the joint on all sides.

3. Skimmer baffles, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrile butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.

4. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.

5. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.

6. All costs for furnishing and installing a Frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.

7. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.

GENERAL NOTES

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.

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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 skimmer are to be used only with outlet pipe diameters of 15", 18", and 24".

DIMENSION TABLE

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<th>B</th>
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<td>24&quot;</td>
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<tr>
<td>36&quot;</td>
<td>21&quot;</td>
<td>60°</td>
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</table>
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 well grate to be installed over 24" deep well.

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

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

REINFORCING STEEL
- ASTM A615 Grade 60

PRESTRESSING STEEL
- ASTM A416 Grade 270 (Low-Relaxation Strand)

DESIGN PARAMETERS:
Type "A"
- Concrete Compressive Strength at release of prestressing: 4000 psi minimum
- Uniform compression after prestressing losses: 1000 psi minimum
- Pick-up, Storage and Transportation: 0.0 psi tension with 1.5 times pile self weight
- Types "B1", "B2", "C1" & "C2" Pick-up, Storage and Transportation: Minimum compressive strength f'c = 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" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5". No changes shall be made to the tongues or grooves.

DETAIL "A" (Showing Plastic Filter Fabric)
(Cap and Anchoring System Not Shown)
(Section Taken Above Dimension X)
NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Plan View.
**TYPICAL PILE**

**STRAIGHT PILE**

- Spaced at 1'-0" Maximum
- 6 sp. @ 4'

<table>
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<tr>
<th>WALL THICKNESS</th>
<th>STRAND DIA. (in.)</th>
<th>MAXIMUM (in.)</th>
<th>n</th>
<th>D (in.)</th>
<th>TOTAL # OF STRANDS</th>
<th>INITIAL (JACKING) FORCE (Kip)</th>
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<td>0.5</td>
<td>28-0'</td>
<td>6</td>
<td>3/8</td>
<td>14</td>
<td>31</td>
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<td></td>
<td>0.6</td>
<td>27-0'</td>
<td>4</td>
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<td>10</td>
<td>44</td>
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<td>31-0'</td>
<td>7</td>
<td>23/32</td>
<td>16</td>
<td>31</td>
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<td>30-0'</td>
<td>5</td>
<td>4</td>
<td>12</td>
<td>44</td>
</tr>
</tbody>
</table>

**TYPICAL PILE**

- Spaced at 1'-0" Maximum
- 6 sp. @ 4'

**STARTER PILE**

- Slope only on the tongue side
- 2 - Bars A
- Prestressed Strands

**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.
STIRRUP DIMENSIONS (T = 12"

SECTION A-A

SECTION B-B

PRECAST CONCRETE SHEET PILE WALL

(Conventional)

TYPE "B1" & "B2" - VARIABLE ANGLE CORNER PILE

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 13° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-to-out.
4. Bars A are #8 and Bars S are #4.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60° only.
6. At the Contractor's option Bars S may be fabricated as a 2 piece bar with a minimum lap length of 1'-4", as shown in Bar Bending Diagrams.
7. If Type "B1" or "B2" pile is used as a Starter Pile show torque on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3 & S4 in shop drawings.
8. If torque must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.
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 (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".
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 limerock 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 1/8" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5/8". No changes shall be made to the tongues or grooves.
NOTES:
1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are GFRP #5
4. Bars S are GFRP #4 and may be a single closed bar (hoop) with equivalent area and tensile strength.
5. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

Alternate symmetrical strand patterns:
(1) 4 sp. @ 2" & 1 sp. @ 8"  
(2) 2 sp. @ 4" & 1 sp. @ 8"   
(3) 4 sp. @ 2" & 2 sp. @ 4"

* Based on lifting using single point pick-up.

---

Sheet Pile Dimensions

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<thead>
<tr>
<th>Sheet Pile Dimensions</th>
<th>(in.)</th>
<th>(in.)</th>
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<tbody>
<tr>
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<tr>
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Bar Bending Diagrams

DIMENSION A

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DIMENSION B

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<tbody>
<tr>
<td>T=12 in.</td>
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Typical Tongue

Typical Groove

Detail "D" (Typical Tongue)

Detail "E" (Typical Groove)

Type "A" Standard Section
ELEVATION
(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)

BAR BENDING DIAGRAMS

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<tr>
<th>Ø</th>
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STIRRUP DIMENSIONS (T = 10")

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STIRRUP DIMENSIONS (T = 12")

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NOTES:
1. This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
2. The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-to-out.
4. Bars A are CFRP & GFRP and Bars B are GFRP & HSSS/GFRP.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
6. Bars S are fabricated as a 2 piece stirrup with a minimum lap length of Ø", 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 cap on both sides of pile from Dim X downward. Show dimensions for Bars S2, S3 & S4 in shop drawings.
8. If Ø angle must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
9. For Dimensions L, X and Ø angle Ô, see Sheet Pile Data Table in Structures Plans.

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

INDEX 455-440

SYMBOLS

- C:C
- V:V
- A:A
- B:B
- S:S
- T:T
- 11º Slope to this point
- Pick-up Strand(s)
- B:Bars
- T:Type
- R:Reinforcement
- FY 2019-20

DESCRIPTION:

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

SYMBOLS

- C:C
- V:V
- A:A
- B:B
- S:S
- T:T
- 11º Slope to this point
- Pick-up Strand(s)
- B:Bars
- T:Type
- R:Reinforcement
- FY 2019-20

DESCRIPTION:

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

SYMBOLS

- C:C
- V:V
- A:A
- B:B
- S:S
- T:T
- 11º Slope to this point
- Pick-up Strand(s)
- B:Bars
- T:Type
- R:Reinforcement
- FY 2019-20
Notes:
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.
8. This Bar A4 shall be 1'-2" shorter than other A4 bars for T = 12".
9. ** This Bar A4 (not shown in elevation) is included only if T = 12".

BAR BENDING DIAGRAMS

** STIRRUPS S

(2 - Piece)

*** STIRRUPS S

(3 - Piece)

Reserved for future use

BAR MARK

T (in.) 

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Section D-D (T=12")

Sheet Pile Dimensions:

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For Dimensions L and X see Sheet Pile Data Table in Structures Plans.
GENERAL NOTES FOR CONCRETE PAVEMENT SUBDRAINAGE

1. No trench greater than 2' in depth will be allowed overnight. Trenches shall be barricaded 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 and shoulders, as called for in the plans. When the low edge shifts between outside and inside edges of pavement the concrete pavement subdrainage shall extend 50' beyond and begin 50' before the flat point (100' overlap).

Concrete pavement subdrainage shall be placed on the low side of ramps of 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 90° 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 pavement 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") 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.

NOTE: For Section AA see following Sheets.

Asphaltic Type SP Pavement

Concrete

Edgedrain 4" Width

Perimeter Sod

Edgedrain Outlets (Nonperforated) Length Varies

6" Bend

45° Elbow or 90° Bend

Concrete (0.19 CY-1:4 Slope)

4" Thick

3' Double Pipe

2' Single Pipe

1:6 Slope

1:4 Slope

Trough For 1:4 Slope

Trough For 1:6 Slope

Ramp For 1:6 Slope

3.5' Min.

2.5' Min.

2' Min.

21° Min.

12 Bevel

1:2 Bevel For 1:6 Slope

Galvanized Hardware Cloth

5.5 SF For 1:6 Slope

4.5 SF For 1:4 Slope

4" Dia. Minimum Outlet Pipe

(Nonperforated)

4" Dia. Minimum Outlet Pipe

(Nonperforated)

4" Dia. Outlet Pipe

(Nonperforated)

1' R

1' R

[less is acceptable to provide minimum 0.1% outlet pipe slope]

1.75' std. for grassed ditches; 0.5' std. for paved ditches

1:2 Pipe Bevel For 1:6 Slope

Trough Slope Shall Match Outlet Pipe Slope

Subdrainage Pipe Shall Be Capped.

When directed by the Engineer, outlet pipes shall be stubbed into existing inlets or into existing ditch pavements at an elevation 6" above the inlet flowline or ditch bottom. Concrete apron and bordering sod are not required for stubbed outlets, but replacement sodding will be required at trenches for pipes stubbed into paved ditches.

In sag vertical curves separate outlet pipes for concrete pavement subdrains from opposite directions shall use a single apron unless otherwise shown in the plans or otherwise directed by the Engineer.

Backfill around outlet pipes shall be of cohesive soils, draincrete will not be permitted.

Existing pavement 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") 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.
NOTES FOR DRAINCRETE PAVEMENT SUBDRAINAGE

NEW CONSTRUCTION

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

NEW CONSTRUCTION:

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 1 of 4.

FOR REHABILITATION:

1. The contract unit price for Edgdrain (Draincrete) LF shall be full compensation for removal of existing shoulder pavement, trench excavation, disposal of excess materials, filter fabric, draincrete edgdrain pipe and fittings, and draincrete, necessary for edgdrain construction.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

Shoulder joint seal shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.

Shoulder joint seal shall be paid for under the contract unit price for Pavement Joint, LF.
NOTES FOR DRAINCRETE 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.

NEW CONSTRUCTION:

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 1 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.

METHOD OF PAYMENT:

1. Shoulder pavement shall be paid for under the contract unit price for Optional Base.

2. Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

3. Shoulder pavement shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.
CONCRETE TRAVEL LANE, SHOULDERS, AND AUXILIARY PAVEMENT

TIED AND SEALED LONGITUDINAL JOINT (See Index 350-001)
Concrete Pavement

FILTER FABRIC
Stabilization
Separation Layer 2" Type SP
12" Stabilization

Concrete Pavement

4" ATPB or CTPB
4" Dia. Special Perforated Pipe
(Noncorrugated Or Smooth Lined Corrugated Only) See Sheet 1 of 4

FTF FILTER FABRIC TYPE D-3
(See Specifications Section 985)

CTPB CONCRETE TREATED PERMEABLE BASE
Stabilization
Joint for ATPB Construction Optional joint for CTPB. Cover with Type D-3 Filter Fabric if left exposed for over 5 days.

STABILIZATION

4" Dia. Special Perforated Pipe
(Noncorrugated Or Smooth Lined Corrugated Only) See Sheet 1 of 4

ASPHALT SHOULDERS
TREATED PERMEABLE BASE SUBDRAINAGE

CONCRETE PAVEMENT SUBDRAINAGE

GENERAL NOTES FOR TREATED PERMEABLE BASE EDGEDRAIN

NEW CONSTRUCTION

1. The contractor shall confine the construction of edgedrain to an area in which the entire operation can be carried out in (5) work days, unless another construction period is called for 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, CT or Cement Treated Permeable Base, CT.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

2. Shoulder pavement and separation layer shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.

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, CT or Cement Treated Permeable Base, CT.
NOTES:
1. A bypass switch shall be installed to override each timing interval in case of a malfunction.
2. "STOP HERE ON RED" is omitted in Type I operation and TRAFFIC SIGNALS are omitted in Type II operation.
3. The time between beginning of flashing yellow on "Drawbridge Ahead" sign and the clearance of traffic signal to red, or beginning of flashing red should not be less than the travel time of a passenger car, from the sign location to the stop line, traveling at the 85 percentile approach speed.
4. Beginning of operation of drawbridge gates shall not be less than 15 seconds after steady red or 20 seconds after flashing red (actual time may be determined by the bridge tender.)
5. Time of gate lowering and raising is dependent upon gate type.
6. Time of bridge opening is determined by the bridge tender.
7. Each gate shall be operated by a separate switch.
8. On each approach (Type II), all four red signals shall be on the same two circuit flashers, with the two top signals on one circuit, and the two bottom signals on the alternately flashing circuit.
9. A Drawbridge Ahead sign is required for both types of signal operation. However, a flashing beacon shall be added to the sign when physical conditions prevent a driver traveling at the 85% approach speed from having continuous view of at least one signal indication for approximately 15 seconds.
10. Requirements on gate installation are contained in Section 4I of the "Manual on Uniform Traffic Control Devices".
11. In accordance with Traffic Engineering Manual (Topic Number 750-000-005) Section 2.1, "SLIPPERY WHEN WET" shall be placed in advance of all MOVABLE and NONMOVABLE STEEL DECK BRIDGES. *Field conditions may require adjustment of this standard distance.*

SEQUENCE CHART

LEGEND:
1. TRAFFIC SIGNALS - Mast Arm Mounted (Off Bridge)
2. DRAWBRIDGE SIGN - Monotube Support Mounted (On Bridge)
3. DRAWBRIDGE AHEAD SIGN WITH YELLOW FLASHING BEACON
4. STOP HERE ON RED SIGN WITH YELLOW FLASHING BEACON
5. ENTRANCE GATE
6. EXIT GATE
7. 24" THERMOPLASTIC STOP BAR

\[\text{SEQ} \]
FIGURE - A
MONOTUBE SUPPORT MOUNTING

FIGURE - B
SIGN PANEL MOUNTING ASSEMBLY

FIGURE - C
STOP HERE ON RED

FIGURE - D
Pole Clamp With Wire Entrance

FIGURE - E
Pole Clamp With Wire Entrance

FIGURE - F
Bridge Mounting Details Not Shown

FIGURE - G
DRAW BRIDGE AHEAD

Description:

- 12" Signal Head With Visor
- Lens With Visor
- 3/4" x 3" Hi-Tensile Steel Clamps
- 1 1/2" Nipple
- 1/2" Washers & Lock Washers
- 3/8" Dia. Holes
- 24" x 30" Louvered Backplates
- 300# With Cap
- 15'-6" x 30'-0"
- 10'-0" x 15'-0"
- 15'-0" x 15'-0"
- Varies
- 30" x 24" Louvered Backplates

* Measured from the bottom of the sign to the near edge of the pavement. Horizontal distance between edge of pavement and inside edge of sign will vary with condition at job site.

Revision 11/01/17

FDOT

FY 2019-20
STANDARD PLANS

TRAFFIC CONTROL DEVICES FOR MOVABLE SPAN BRIDGE SIGNALS

INDEX
508-T01

2 of 3
**DRAWBRIDGE SIGNAL**

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

TO BE USED WITH TYPE 1 OPERATION, AS SHOWN ON PREVIOUS SHEET

MONOTUBE SUPPORT MOUNTING

**NOTES:**

1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only when gate arm is in the lower position or in the process of being lowered. The number of lights shall vary accordingly to length of 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 12'-6" from above the Crown of Roadway to the lowest point of the Overhead Signal Unit.

TRAFFIC CONTROL DEVICES FOR CURBED ROADWAY
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.

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RELATIVE LOCATION OF CROSSING TRAFFIC CONTROL DEVICES

RAILROAD CROSSING AT TWO-LANE ROADWAY

RAILROAD CROSSING AT MULTILANE ROADWAY

RAILROAD CROSSING PAVEMENT MESSAGE
**RAILROAD GATE ARM LIGHT SPACING**

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**NOTE:**


**MEDIAN SECTION AT SIGNAL GATES**

**MEDIAN SIGNAL GATES FOR**

MULTILANE UNDIVIDED URBAN SECTIONS

(THREE OR MORE DRIVING LANES IN ONE DIRECTION, 45 MPH OR LESS)
### TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post &quot;A&quot;</td>
<td>HSS 2½ x 2½ x ½</td>
<td>2.50&quot; x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS 2½ x 2½ x ½</td>
<td>2.50&quot; x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>2½&quot; NPS (Sch. 40)</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>HSS 3.000 x 0.120</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 2.500 x 0.123</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>HSS 2 x 2 x ¾</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>HSS 1.500 x 0.123</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>3½&quot; NPS (Sch. 40)</td>
<td>3.125&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>2½&quot; NPS (Sch. 40)</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>3½&quot; Ø Round Bar</td>
<td>3.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>3½&quot; Ø Round Bar</td>
<td>3.750&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 3½" NPS (Sch. 40).

---

### 3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL

(42" Height shown, 48" Height Similar)

---

**NOTES:**

1. Shop Drawings are required; see Specification Section 515.
2. For bridge mounted railings work this Index with Index 515-051 Bridge Bicycle/Pedestrian Railing.
3. Materials:
   - A. Pipe Rails and Pickets: ASTM A500 Grade B, C or D, or ASTM A53 Grade B for standard weight pipe (Schedule 40) and ASTM A501 for bars.
   - B. Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A511.
   - C. Steel Plate: ASTM A36 or ASTM A709 Grade 36.
   - D. U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
   - E. Stainless steel (SS) screws: Type 316 or 18-8 Alloy.
4. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   - a. Hex Head Bolts: ASTM A307
   - b. Four bolt option, Grade 55
5. For bridge mounted railings work this Index with Index 515-051 Bridge Bicycle/Pedestrian Railing.
6. Materials:
   - A. Pipe Rails and Pickets: ASTM A500 Grade B, C or D, or ASTM A53 Grade B for standard weight pipe (Schedule 40) and ASTM A501 for bars.
   - B. Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A511.
   - C. Steel Plate: ASTM A36 or ASTM A709 Grade 36.
   - D. U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
   - E. Stainless steel (SS) screws: Type 316 or 18-8 Alloy.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K".
8. Materials:
   - a. Hex Nuts: ASTM A563
   - b. Plate Washers: ASTM A36 or ASTM A706 Grade 36.
9. Materials:
   - a. Bearing Pads: 3½" Plain, Fabric Reinforced or Fabric Laminated pads that meet the requirements of Specification Section 932 for Ancillary Structures.
10. Materials:
    - a. Flex Hinges: ASTM B209 Alloy 6061
11. Materials:
    - a. Bearing Pads: 3½" Plain, Fabric Reinforced or Fabric Laminated pads that meet the requirements of Specification Section 932 for Ancillary Structures.
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)
**Railing Requirements**

**Handrail Required for Ramps**
- Continuous at landings between runs
- NPS Sch. 40 Post

**Maximum Dimensions**
- 30'-0" Max. for Slopes > 6.25%
- 40'-0" Max. for Slopes ≤ 6.25%

**Handrail**
- Minimum 1" NPS Sch. 40 Post

**Intermediate Landings**
- Minimum 3'-0" Clear Openings at Posts

**Expansion Joints**
- Rail expansion joints to be located in panels above structure expansion joints (3'-0" maximum spacing).

**Ramp Requirements**
- For slopes greater than 5%:
  - Max. ramp slope = 8.33%
  - Max. ramp cross-slope = 2.0%

**Landings Requirements**
- Max. landing slope = 2%
- Max. landing cross-slope = 3%

**Detail for Non-Continuous Railing at Corners**

**Typical Railing Details & Railings on Grades 0% to 5%**

**Notes:**
- Non-continuous corners are permitted when handrails are not required.

---

**Expanded Elevation at Corners**

---

**Elevation**

(Showing Outside Face of Railing with Type "A" Posts)

---

**Typical Railing Details & Railings on Grades Steeper Than 5%**

(Showing Inside Face of Railing with Type "A" Posts)

---

**Description:**

- **Rev. Last Sheet:** 11/01/16
- **Revision:** 515-052
- **Index:** FY 2019-20
- **Standard Plans:** PEDESTRIAN/BICYCLE RAILING (STEEL)
**RAIL TERMINATION DETAILS**

**RAILING CONTINUATION BEYOND STEPS OR STAIRS**
(Bottom shown, Top similar)

- Handrail termination (Typ.) See Detail "L" or Contract Plans for Step Details
- Flatten handrail termination to 1/2" Max. width
- Varies - Approx.
- Handrail termination (Typ.) See Detail "L"
- Elevation View

- 1'-6" Min. Handrail Extension
- 9-0" Max. on Steps
- Equal to one tread length

- See "Typical Railing Details", Sheet 2 for post, rail & picket details

- 1'-0" Min. Bottom Landing
- 2'-10"
- 3'-6"
- 6'-0"

- Concrete sidewalk to extend 6" Min. behind railing

**DETAIL "L" - PLAN VIEW**

**HANDBRAIL TERMINATION**

- Handrail termination (Typ.) See Detail "L"
- 1'-6" Min. Handrail Extension
- 9-0" Max. on Steps
- Equal to one tread length
- Varies - Approx.

- See "Typical Railing Details", Sheet 2 for post, rail & picket details

- 1'-0" Min. Bottom Landing
- 2'-10"
- 3'-6"
- 6'-0"

**ELEVATION**

(At-Grade Steps shown, Elevated Stairs similar)

- Steel Handrail required for three or more steps
- Round over corners to remove sharp edges (Typ.)
- 1/8" Ø Vent/Weep hole for welded connection

- See "Typical Railing Details", Sheet 2 for post, rail & picket details

- Not considered an expansion joint for railing fabrication (Typ.)

**ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOped WALLS**

- 9" Min. thick wall
- Varies ~ Approx.
- Equal spacing
- 5'-0" Max. on Steps

- Steel Handrail required for three or more steps
- Round over corners to remove sharp edges (Typ.)
- 1/8" Ø Vent/Weep hole for welded connection

- See "Typical Railing Details", Sheet 2 for post, rail & picket details

- Not considered an expansion joint for railing fabrication (Typ.)

**RAILINGS ON STEPS & STAIRS**

**DESCRIPTION:**

**PEDESTRIAN/BICYCLE RAILING (STEEL)**

**REVISION:**

**INDEX:**

**SHEET:**

**515-052**
**SECTION A-A**

**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 6\(\frac{1}{2}\)" centers is based on a \(\frac{3}{4}\)" Ø Bar for standard applications.

When shown in the Contract Plans a 4\(\frac{1}{2}\)" picket spacing may be required. See Note 4 (Sheet 1).

**TYPE 2 - CHAIN-LINK (Continuous Infill Panel)**

<table>
<thead>
<tr>
<th>TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS</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>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter)</td>
</tr>
<tr>
<td>Tie Wires</td>
</tr>
<tr>
<td>Tension Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
</tr>
</tbody>
</table>

**CHAIN-LINK PANEL NOTE:***

Chain-Link Fence Fabric shall be continuous along limits of railing. Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
SECTION A-A

See Detail "3A"

DETAIL "3A" INTERMEDIATE RAIL/RAY CONNECTION

SECTION A-A

See Detail "3B"

DETAIL "3B" BOTTOM RAIL/RAY CONNECTION

SECTION A-A

See Detail "3C"

DETAIL "3C" RAY/ARC CONNECTION

SECTION A-A

DETAIL "3D" ARC/POST CONNECTION (Continuous Top Rail)

SECTION A-A

Detail "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT

SECTION C-C

DETAIL "3F" PANEL/SPLICE CONNECTION

SECTION A-A

DETAIL "4A" PANEL/RAIL CONNECTION (Top Shown, Bottom Similar)

SECTION B-B

DETAIL "3A" PANEL END CAP

NOTES:

1. See Plans for Infill Panel Option required.

DESCRIPTION:

TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 3/16 steel plate pattern cut with laser or plasma CNC, welded to a 1x1x3/16 Angle Border or the 1x1x3/16 Channel Border shown.

TYPE 4 - BROADWAY INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 3/16 steel plate pattern cut with laser or plasma CNC, welded to a 1x1x3/16 Angle Border or the 1x1x3/16 Channel Border shown.

PEDESTRIAN/BICYCLE RAILING (STEEL)

REV: 11/01/16

INDEX 515-052

SHEET 6 of 8
NOTES:
1. See Plans for Infill Panel Type required.
3D VIEW OF RAILING WITH TYPE 1 - PICKET INFILL PANEL
(42" Height shown, 48" Height Similar)

### TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>RT 2 x 2 x 0.250</td>
<td>2.00&quot; x 2.00&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1½ x 2 x 0.125</td>
<td>1.50&quot; x 2.00&quot;</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>3½&quot; x 7&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6063-T5</td>
<td>2½ NPS (Sch. 10)</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2½ Round Top Cap Rail</td>
<td>3.000&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2½ NPS (Sch. 10)</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.00 OD x 0.125 Wall</td>
<td>3.000&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>2.50 OD x 0.125 Wall</td>
<td>2.500&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Top Cap Rail Inner Sleeve</td>
<td>2.800&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>6061-T6</td>
<td>RT 2 x 2 x 0.250</td>
<td>2.00&quot; x 2.00&quot;</td>
</tr>
<tr>
<td>Incl. &amp; Bottom Rail Post Connection Sleeve</td>
<td>6063-T5</td>
<td>1.50 OD x 0.125 Wall</td>
<td>1.500&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1½ OD x 0.125 Wall</td>
<td>1.500&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>6061-T6</td>
<td>1½ NPS (Sch. 40)</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6061-T6</td>
<td>½ Round Bar</td>
<td>0.750&quot;</td>
</tr>
<tr>
<td>Pickets (Type 3 Infill Panel)</td>
<td>6061-T6</td>
<td>½ Round Bar</td>
<td>0.750&quot;</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6063-T5</td>
<td>Varies (See Details)</td>
<td>Varies</td>
</tr>
</tbody>
</table>

### NOTES

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 B221 or ASTM B429.
   b. Top, bottom and intermediate rail corner bends with maximum 4'-0" post spacing may be Alloy 6063-T6.
   d. Perforated panels (Type 5) Alloy 3003-H14.
   e. Stainless steel (SS) screws: Type 316 or 18-8 Alloy.
   g. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.

### CROSS REFERENCES:

- Detail *A*, Sheet 4
- Detail *B*, Sheet 4
- Detail *K*, Sheet 3

### INSTALLATION:

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 5¼" for standard installations and 5¾" when a 4" sphere requirement is indicated in the Data Tables.
2. Locate railing expansion joints between the posts or either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
3. Field splices are similar to the Expansion Joint Detail 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".
5. 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.
6. 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.
7. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
8. Handrails are required and must be continuous at landings for:
   - Grades Steeper than 5%.
   - Three or more steps.
9. Installation: Cutting of reinforcing steel is permitted for post installed anchors.
10. Locate railing expansion joints between the posts or either side of the deck expansion joint. Maximum spacing between expansion joints is 35'-0".
11. Handrails are required and must be continuous at landings for:
   - Grades Steeper than 5%.
   - Three or more steps.
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

### STANDARD PLANS

- PEDESTRIAN/BICYCLE RAILING (ALUMINUM)
- PEDESTRIAN/BICYCLE RAILING (ALUMINUM)
**Handrail required for ramps (Handrail continuous at landings between runs)**

- **Continuous at landings between runs**
- 1 NPS Sch. 40 Post
- 30'-0" Max. for Slopes > 6.25%
- 40'-0" Max. for Slopes ≤ 6.25%

**North Face of Railing with Type \( A \) Posts**

- See Plans for continuation or termination limits of railing
- See "Typical Railing Details" for post, rail & picket or infill panel details

**Handrail required for ramps**

- Handrail = 1/2 NPS Sch. 40
- Horizontal handrail extension at landing
- See Plans for continuation or termination limits of railing

**RAMP REQUIREMENTS**

- For slopes greater than 5%:
  - Max. ramp slope = 6.25%
  - Max. landing slope = 6.2%
  - Max. landing cross slope = 2%

**LANDING REQUIREMENTS**

- See Note 4, Sheet 1

**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.**

**ELEVATION**

(Showing Outside Face of Railing with Type \( A \) Posts)

**TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%**

(Typ. - Picket Railing Shown, Other Types Similar)

**RAILINGS ON GRADES STEEPER THAN 5%**

(Typ. - Picket Railing Shown, Other Types Similar)
RAILINGS ON STEPS & STAIRS

DESCRIPTION:

ALUMINUM HANDRAIL TERMINATION DETAILS

1. RAILING CONTINUATION BEYOND STEPS OR STAIRS
   (Bottom shown, Top similar)

2. Handrail termination
   (Typ.) See Detail "L"

3. Top Rail Cap
   Round over corners to remove sharp edges (Typ.)

4. Rail Termination (End Cap) or Splice when rail continues on
   (shown dotted)

5. Cut rail sleeve to match inside face of post or weld rail
directly to post

6. Aluminum Handrail required for three or more steps

7. Leveling Channel
   (Typ.) See Detail, Sheet 4

8. Not considered an expansion joint for railing fabrication (Typ.)

9. See "Typical Railing Details", Sheet 2 for post, rail & picket details

10. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details

11. See Typical Railing Details, Sheet 2 for post, rail
    & picket details

12. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details

13. See Index 400-021 or Contract Plans for Step Details

14. See Index 400-021 or Contract Plans for Step Details

15. See Index 400-021 or Contract Plans for Step Details

16. See Index 400-021 or Contract Plans for Step Details

17. See Index 400-021 or Contract Plans for Step Details

18. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details

19. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details

20. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details

21. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details

22. See "Typical Railing Details", Sheet 2 for post, rail
    & picket details
BASE PLATE DETAILS FOR TYPE "C" POST

(Screws Not Shown For Clarity)

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.
**SECTION A-A**

Picket Spacing *(Typ.)*

- **6 Bü O.C. (Max.)**
- **Post:** 3-but Ø Max.
- **Intermediate Rail:** 1¾Ø Max.
- **Picket - 3½ Ø Bar (Typ.)**
- **Post & Anchor Bolt:**
- **Picket ~ 1½ Ø Bar (Typ.)**
- **Anchor Bolt:**
- **Base Plate:**
- **45° Beveled End Permitted (shown dashed)**
- **Interim Rail:**
- **See Detail "1B"**

**DETAIL "1A"**
(Top of Picket Connection)

- **Post & Anchor Bolt**
- **Picket ~ 1½ Ø Bar (Typ.)**
- **Anchor Bolt**
- **45° Beveled End Permitted (shown dashed)**
- **Base Plate**
- **½ Thick Bearing Pad**

**DETAIL "1B"**
(Bottom of Picket Connection)

- **Ties @ 1'-0" center (Post and End Rail)**
- **Ties @ 2'-0" center (Intermediate & Bottom Rail)**

**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 6 Bü centers is based on a ½ But Bar for standard applications.

When shown in the Contract Plans a 4½ But picket spacing may be required. See Note 4 (Sheet 1).

**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.

**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</td>
<td>A392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td></td>
<td>A491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td></td>
<td>F668</td>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter) - See Plans for specified color of PVC</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F626</td>
<td>Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F626</td>
<td>3½ x 3½ (min. thickness) x 3½ (min. width) x 2'-3&quot; (min. height) Steel Bars</td>
</tr>
<tr>
<td>Miscellaneous Fence Components</td>
<td>F626</td>
<td>Zinc-Coated Steel</td>
</tr>
</tbody>
</table>

**CHAIN-LINK PANEL NOTE:**

Chain-Link Fence Fabric shall be continuous along limits of railing.

Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 1/8" plate (ASTM B209 Alloy 6061-16 or 1601) pattern cut with laser or plasma CNC, welded to a 1x1x1/8 Angle Border or the 3x3x1/8 Channel Border shown.

SECTION A-A

DETAILED "3A" INTERMEDIATE RAIL/RAY CONNECTION

DETAILED "3B" BOTTOM RAIL/RAY CONNECTION

DETAILED "3C" RAY/ARC CONNECTION (Continuous Top Rail)

SECTION C-C

DETAILED "3D" ARC/POST CONNECTION (Continuous Top Rail)

DETAILED "3E" PANEL END CONNECTION AT POST WITH EXPANSION JOINT

SECTION A-A

DETAILED "4A" PANEL/RAY CONNECTION (Top Shown, Bottom Similar)

SECTION B-B

PANEL ADJUSTMENT FOR RAILINGS ON GRADES

NOTES:

1. See Plans for Infill Panel Option required.
**ANCHOR BOLT TABLE**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A&quot;</td>
<td>B&quot;</td>
</tr>
<tr>
<td>I</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>1'2&quot;</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>41/2&quot;</td>
<td>41/2&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.

### RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (sch 40)</td>
<td>2.375&quot;</td>
<td>0.154&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>Handrail 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</td>
<td>2&quot; NPS (sch 40)</td>
<td>1.315&quot;</td>
<td>0.133&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>

4. 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 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. Fabrication:
      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
      e. Aluminum Shims: ASTM B209, Alloy 6061
      f. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications 515 & 932.

5. 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.

6. Cutoff of reinforcing steel is permitted for post installed anchor bolts.
**Typical Railing Details & Railings on Grades 0% to 5%**

- **Post Spacing** (Typ.): 6'-0" (Max.) – Equal Panels
- **Handrail** (Typ.): 1'-6" (Typ.)
- **Rail Expansion Joint** (Typ.): see Detail "C" Sheet 4
- **Rail Expansion Joint (Typ.)**:
  - 1'-6" (Max.)
  - Min. from free end of concrete
- **Continuity Field Splice** (as required) see Detail "E" Sheet 4 (Typ.)

**Railings on Grades Steeper Than 5% to 8.33%**

- **Ramp Requirements**
  - Max. landing cross-slope = 2%
  - Max. landing slope = 8.33%
  - Max. ramp cross-slope = 2.0%

- **Landing Requirements**
  - Max. landing slope = 2%
GUIDERAIL ON STEPS & STAIRS

RAILING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ELEVATION
(At-Grade Steps)

Handrail Continuation
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

Handrail Termination
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

Handrail Termination
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

Handrail Termination
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

Handrail Termination
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

Handrail Termination
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details

GUIDERAIL ON STEPS & STAIRS

Handrail Termination
See Detail "A" (Typ.)

Varies - Equal spacing
6'-0" Max. on Steps

At Landing

9" Min. Wide cheekwall both sides

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

See "Typical Railing Details", Sheet 2 for post & rail details

See Index 400-021 or Contract Plans for Step Details

ALTERNATE END TREATMENT

Concrete sidewalk to extend 6" min. behind handrail

See "Typical Railing Details", Sheet 3 for post & rail details

See Index 400-021 or Contract Plans for Step Details
PIPE GUIDERAIL (ALUMINUM)

**SECTION B-B**
(Handrail Connection)

**SECTION C-C**
BASE PLATE DETAIL
(2-Bolt Anchorage)

**SECTION C-C**
BASE PLATE DETAIL
(4-Bolt Anchorage)

**SHIM PLATE DETAIL**
(2-Bolt Anchorage)

**SHIM PLATE DETAIL**
(4-Bolt Anchorage)

**PLATE WASHER DETAIL**

**ALTERNATE BASE PLATE DETAIL**
(Recommended for Steep Slopes)

**DETAIL "D"**
(FIELD SPLICE SLIP JOINT SIMILAR)

**DETAIL "D"**
(EXPANSION JOINT)

**DETAIL "E"**
(CONTINUITY FIELD SPLICE)

**DETAIL "C"**
(RAIL CONNECTIONS)

**DETAIL "B"**
(RAIL AND HANDRAIL)
(Showing Sloped Condition for Ramps with 2-Bolt Anchorage)

**CROSS REFERENCE:**
For locations of Details "C", "D" and "E", see Sheet 2.
DESCRIPTION:

**PIPE GUIDERAIL (ALUMINUM)**

**TYPICAL SECTION ON CONCRETE SIDEWALK**

- Edge Shim (8" long x ½" wide x thickness as reqd.)
- 2 - ½" Ø Anchor Bolts (**), with Hex Nuts & Washers.
- Base Plate
- Full size Shim Plates when required for height adjustment
- ½" Thick Bearing Pad (Typ.)

**TYPICAL SECTION ON GRAVITY WALL** (Other Retaining Walls Similar)

- 2 ~ ½" Ø Anchor Bolts (**), with Hex Nuts & Washers.
- Base Plate with Shim plates (as required) (Typ.)
- ½" Thick Bearing Pad (Typ.)
- 6" Standard, ¾" for Ramps requiring handrails

**TYPICAL SECTION ON STEPS & STAIRS**

- Epoxy Mortar (Type F) in accordance with Specification 926
- 3½" Ø Core Drilled Hole (M in.), clean hole in accordance with Specification 416
- Seal end of post with a plastic or aluminum plug

**SIDEWALK ANCHORAGE DETAIL OPT. 1**

- Epoxy Mortar (Type B or F) in accordance with Specification 926
- 3½" Ø Core Drilled Hole (M in.), clean 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 ~ ½" Ø x 8" or 4 ~ ½" Ø x 6" Steel Anchors: Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted
- **Steel Anchors**
- **Steel Anchors**

**SIDEWALK ANCHORAGE DETAIL OPT. 2 & 3**

- 2 Bolt Anchorage or 4" for 4-Bolt Anchorage.
- The minimum embedment for Adhesive Anchors is 6" for 2-Bolt Anchorage or 6" for 4-Bolt Anchorage.

**SIDEWALK ANCHORAGE DETAIL**

- **Post**
- Epoxy Mortar (Type F) in accordance with Specification 926
- 3½" Ø Core Drilled Hole (M in.), clean 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)

**DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION)** (Used in lieu of Beveled Shim Plates)

- Edge Shim (8" long x ½" wide x thickness as reqd.)
- 2 ~ ½" Ø Anchor Bolts (**), with Hex Nuts & Washers.
- Base Plate
- Full size Shim Plates when required for height adjustment
- ½" Thick Bearing Pad (Typ.)

**SIDEWALK ANCHORAGE DETAIL OPT. 2 & 3**

- Epoxy Mortar (Type B or F) in accordance with Specification 926
- 3½" Ø Core Drilled Hole (M in.), clean hole in accordance with Specification 416
- Seal end of post with a plastic or aluminum plug
- 6" foundation embedment permitted (Option 3)
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 Tubing.

   Handrail Support Bars: ASTM A36

   Railing Member Dimensions Table

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>2.375&quot;</td>
<td>0.154&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>1¾&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.125&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>

D. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A307 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 F156
   e. Aluminum Shims: ASTM B209, Alloy 6061
   f. Bearing Pads: Plain, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications 515 and 932.

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 maximum 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 9" bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
   F. For changes in tangential longitudinal alignment greater than 45°, positioned posts a maximum of 2'-0" each side of the corner, not at the corner apex.

4. Handrails are required and must be continuous at landings for:
   A. Grades Steeper than 5%.
   B. Three or more steps.

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.
PIPE GUARDERAIL (STEEL)

1. NOTE: NPS = Nominal Pipe Size

2. STRUCTURES EXPANSION JOINTS NOTE:
   * Keyed construction joints in Index 400-011 Gravity
   Wall are not considered to be expansion joints.

3. CROSS REFERENCE:
   For Details "C", "D" and "E", see Sheet 4.

4. ELEVATION

   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

   Wall are not considered to be expansion joints.

   For slopes greater than 5%:
   Max. landing slope = 2%
   Max. ramp slope = 8.33%
   Max. ramp cross-slope = 2.0%
PIPE GUIDERAIL (STEEL)

**Railing Continuation Beyond Steps**
(Bottom shown, Top similar)

- Steel Handrail required for three or more steps (handrail and cheekwalls continuous at landings)
- Handrail Termination
- See Detail "A" (Typ.)

**Handrail Termination**

- Handrail Continuous
- 8" Min. Wide cheekwall both sides
- See Index 400-021 or Contract Plans for Step Details

**Elevation**
(At-Grade Steps)

- Handrail Termination
- See Detail "A" (Typ.)

**Alternate End Treatment**

- Handrail Termination
- See Detail "A" (Typ.)

**Guiderail on Steps & Stairs**

**Description:**

FY 2019-20

STANDARD PLANS

INDEX 515-080

SHEET 3 of 5
PIPE GUIDERAIL (STEEL)

**SECTION B-B**
(Handrail Connection)

**SECTION C-C**
(BASE PLATE DETAIL)
(2-Bolt Anchorage)

**SECTION C-C**
(BASE PLATE DETAIL)
(4-Bolt Anchorage)

**SHIM PLATE DETAIL**
(2-Bolt Anchorage)

**SHIM PLATE DETAIL**
(4-Bolt Anchorage)

**PLATE WASHER DETAIL**
(Recommended for Steep Slopes)

**ALTERNATE BASE PLATE DETAIL**

**DETAIL "D" - EXPANSION JOINT**
(FIELD SPlice SLIP JOINT SIMILAR)

**DETAIL "E" - CONTINUITY FIELD SPlice**

**DETAIL "C" - RAIL CONNECTIONS**
(Handrail and 4-Bolt Anchorage Not Shown)

**DETAIL "B" - RAIL AND HANDRAIL**
(Showing Sloped Condition For Ramps with 2-Bolt Anchorage)

**CROSS REFERENCE:**
For locations of Details "C", "D" and "E", see Sheet 2.
**Pipe Guide Rail (Steel)**

**TYPICAL SECTION ON CONCRETE SIDEWALK**

- Edge Shim (1/2 in. wide x 1/2 in. thickness as req.)
- Optional 4-Bolt Anchorage (Shown Dashed)
- 4" Sidewalk with Thickened Edge
- Slope 2% Max. (Away from drop-off)

**TYPICAL SECTION ON GRAVITY WALL**

- 2 - 3/8" Ø Anchor Bolts (**) with Hex Nuts & Washers
- 1/8" Thick Bearing Pad (Typ.)
- Full size Shim Plates when required for height adjustment

**TYPICAL SECTION ON STEPS & STAIRS**

- 2" for Ramps
- 5'-0" Std. - 3'-0" Min. Clear Between Handrails
- 3'-6" 7/16" for Handrails requiring handrails
- 1/2" Thick Bearing Pad (Typ.)
- Back Face of Gravity Wall
- **Steel Anchors**

**DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION) (Used in lieu of Beveled Shim Plates)**

- 3/8" Ø Core Drilled Hole (1/2"), clean hole in accordance with Specification 416
- Seal of hole (Option 2 & 3) and end of post (Option 2) prior to epoxy filling to prevent leakage
- Seal end of post with a plastic or galvanized steel plug

**OPTIONAL SIDEWALK ANCHORAGE DETAIL**

- 1/8" Min. Beveled Build-up (Typ.)
- Epoxy Mortar (Type F) in accordance with Specification 926
- 3" Min. Embedment

**SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3**

- 3/8" Ø Core Drilled Hole (1/2"), clean 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 ~ 3/8" Ø x 8" 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.
- **2 ~ 3/8" Ø x 8" 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.***

**TYPICAL SECTION ON GRAVITY WALL**

- 3'-6" 7/16" for Handrails requiring handrails
- 2'-10" Width of Structure at 6" Embedment Depth
- Slope 2% Max. (Away from drop-off)
- Slope 2% Max. (Away from drop-off)
- Drop-off (Varies)
- Width of Structure at 6" Embedment Depth
- 45˚
- 9°
- 9°
- 6" Embedment Depth

**SIDEWALK ANCHORAGE DETAIL**

- 3'-6" 7/16" for Handrails requiring handrails
- 2'-10" Width of Structure at 6" Embedment Depth
- Slope 2% Max. (Away from drop-off)
- Slope 2% Max. (Away from drop-off)
- Drop-off (Varies)
- Width of Structure at 6" Embedment Depth
- 45˚
- 9°
- 9°
- 6" Embedment Depth
**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.

* Rotate 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.

**CONCRETE CURB**

Note: For use adjacent to concrete or flexible pavement, concrete shown. Expansion joint, preformed joint filler and joint seal are required between curbs and concrete pavement only, see Sheet 2.
**GENERAL NOTES**

1. For curb, gutter, and curb & gutter provide 1' - 1/2' contraction joints at 10' centers (max.) Contraction joints adjacent to concrete pavement on tangents and flat curves are to match the pavement joints, with intermediate joints not to exceed 10' centers. Curb, gutter and curb & gutter expansion joints shall be located in accordance with 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**: 4' Min., 5' Max.
- **TYPE B**: 3' Min., 3' Max.
- **TYPE D**: 2' Min., 3' Max.

**EXPANSION JOINT BETWEEN GUTTER AND CONCRETE PAVEMENT**

- **Applications**:
  - Applies to both high and low sides of pavement, low side shown.
  - Applies to shoulder gutter only where adjoining traffic lanes.

**CURB AND GUTTER AND TYPE A CURB ADJACENT TO FLEXIBLE PAVEMENT**

- **Concrete Bumper Guard**: #4 Bars, 18' Long
- **Asphaltic Concrete Curb**: 6-0'

**CURB AND GUTTER ENDINGS**

- **Curb Type A**: Flared End, Straight End
- **Curb and Gutter Types E & F**: Flared End, Straight End

**Sawcuts should be avoided within valley gutter and within curb and gutter endings.**

**Shoulder Gutter**

- **Type E**: 2 1/2' Min.
- **Type F**: 3' Min.

**Depth Of Sawcut**

- 2 1/2' Min.
- 3' Min.
- 5' Max.
- 0' Min.

**Profile**

- **Flared End**: Top Of Curb, Gutter
- **Straight End**: Top Of Curb, Gutter
DETAIL OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER
(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPractical)

1. Spillway to be paid for as Shoulder Gutter, L.F.
2. If spillway empties into an unpaved ditch, the detail should be modified as necessary.
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.

Provide Smooth Section Match Existing Grade

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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.

Runoff

Limits 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.

Median Width As Indicated In Detail Plans

Runoff

Grade To Drain As Shown In The Plans Or As Adjusted By The Engineer During Construction

Prop. Part. (Breakover 0.02 Min. 0.05 Max.)

The Engineer During Construction

Prop. Median Part., Warp Surface If Necessary To Drain To Prop. Flumes

Runoff

Crown Line (Exist. Pavt.) Or Lane Line Of Superelevated Pavt. (Exist. Pavt. Or New 4-Lane Pavt.)

Portion Of New 4-Lane Pavt.
ROADWAY INSTALLATIONS - FLEXIBLE PAVEMENT

**TYPE I - CONCRETE TRAFFIC SEPARATOR**

**OPTION I**

**TYPE II - CONCRETE TRAFFIC SEPARATOR**

**OPTION II**

**TYPE IV - CONCRETE TRAFFIC SEPARATOR**

**OPTION I**

**OPTION II**

**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 12" 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.

MEDIAN CURB AND TRAFFIC SEPARATOR JUNCTURE DETAILS

(Option I Separator Shown; For Curb Details see Index 520-001)
Notes:

1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 5 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:

1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown, bars may be rotated to maintain clearance.

2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 5 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.
LONGITUDINAL SECTION (NOSE)

OPTION I

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

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 posttensioning steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-6" @ 7 equal spaces (continuous)

4. At the Contractor's option, a one-piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Traffic Separator (Typ.)

Poured Joint With Backer Rod Expansion Joint (See Expansion Joint Details)

Traffic Separator (Typ.)

Bar Spacing:

- 2'-0", 3'-0" or 4'-3" @ 1"-10" O.C. Max.
- 8'-0", 6'-0" or 8'-6" @ 1"-10" O.C. Max.

Pitch:

- 1/4" For 4' Separator
- 1/2" For 6' Separator
- 2" For 8'-6" Separator

Bar Spacing:

- Min. (Typ) 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 posttensioning steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-6" @ 7 equal spaces (continuous)

4. At the Contractor's option, a one-piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Traffic Separator (Typ.)

Poured Joint With Backer Rod Expansion Joint (See Expansion Joint Details)

Traffic Separator (Typ.)

Bar Spacing:

- 2'-0", 3'-0" or 4'-3" @ 1"-10" O.C. Max.
- 8'-0", 6'-0" or 8'-6" @ 1"-10" O.C. Max.

Pitch:

- 1/4" For 4' Separator
- 1/2" For 6' Separator
- 2" For 8'-6" Separator

Bar Spacing:

- Min. (Typ) 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 posttensioning steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-6" @ 7 equal spaces (continuous)

4. At the Contractor's option, a one-piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Traffic Separator (Typ.)

Poured Joint With Backer Rod Expansion Joint (See Expansion Joint Details)

Traffic Separator (Typ.)

Bar Spacing:

- 2'-0", 3'-0" or 4'-3" @ 1"-10" O.C. Max.
- 8'-0", 6'-0" or 8'-6" @ 1"-10" O.C. Max.

Pitch:

- 1/4" For 4' Separator
- 1/2" For 6' Separator
- 2" For 8'-6" Separator

Bar Spacing:

- Min. (Typ) 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 posttensioning steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-6" @ 7 equal spaces (continuous)

4. At the Contractor's option, a one-piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Traffic Separator (Typ.)

Poured Joint With Backer Rod Expansion Joint (See Expansion Joint Details)

Traffic Separator (Typ.)

Bar Spacing:

- 2'-0", 3'-0" or 4'-3" @ 1"-10" O.C. Max.
- 8'-0", 6'-0" or 8'-6" @ 1"-10" O.C. Max.

Pitch:

- 1/4" For 4' Separator
- 1/2" For 6' Separator
- 2" For 8'-6" Separator

Bar Spacing:

- Min. (Typ) 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 posttensioning steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-6" @ 7 equal spaces (continuous)

4. At the Contractor's option, a one-piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.
See Notes

LENGTH AS REQUIRED

1'-0" 8"

NOTE:
Length of Bars 4C is 2'-0" for 4'-0" Separator.
Length of Bars 4C is 4'-0" for 6'-0" Separator.
Length of Bars 4C is 4'-4" for 8'-6" Separator.

OPTION I

Length of Bars 4A is 2'-0" for 4'-0" Separator.
Length of Bars 4A is 4'-0" for 6'-0" Separator.
Length of Bars 4A is 8'-6" for 8'-6" Separator.

OPTION II

Bars 4A & 4E

LENGTH AS REQUIRED

1'-0" 8"

NOTE:
Length of Bars 4E is 2'-5" for 4'-0" Separator.
Length of Bars 4E is 4'-5" for 6'-0" Separator.
Length of Bars 4E is 8'-11" for 8'-6" Separator.

REINFORCING STEEL NOTES:
1. All dimensions are out to out.
2. The 8" vertical dimension shown for Bars 4B and 4D are based on a slab 8" thick or greater without a wearing surface. If slab thickness is less than 8", decrease this dimension by an amount equal to the difference in thickness. If a wearing surface is to be provided, increase this dimension by an amount equal to the wearing surface thickness.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

DRAINAGE JOINT DETAIL
(For 5" Opening Or Less)

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.

DOWEL DETAIL

CONCRETE:

ADHESIVE BONDING MATERIAL SYSTEM

REINFORCING STEEL:

(Dowels 3 x 4 - W5.0 x W6.7)

ALTERNATE REINFORCING STEEL DETAILS

(Welded Wire Reinforcement)

OPTIION A:
Use Welded Wire Reinforcement 3 x 4 - W5.0 x W6.7 as required by plans in place of Bars 4A and 4E. Bend the Welded Wire Reinforcement to the dimensions of Bar 4B shown in the Bending Diagram for Reinforcing Steel Option I.

OPTION B:
Use Welded Wire Reinforcement 3 x 4 - W5.0 x W6.7 as required by plans in place of Bars 4A and 4C shown in Reinforcing Steel Option II.

NOTE: Welded Wire Reinforcement to consist of smooth wire meeting the requirements of Specification 931.

ESTIMATED TRAFFIC SEPARATOR QUANTITIES:

CONCRETE:

Wear Surf.

Type & Size

Options

Wear Surf.

Type & Size

Options

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BRIDGE INSTALLATIONS - TYPE "E" AND "F" CURB

See Structures Plans, Superstructure Sheets for location(s) of drainage joints. Locations for drainage joints shall be limited to the constant width section of separator.
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 a constructive 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 WELODED WIRE REINFORCEMENT: With the approval of the Engineer, steel welded wire reinforcement in accordance with Specification 415 may be substituted for the steel bars shown herein. Place the welded wire in the same locations specified for the steel bars, and maintain the equivalent strength, cover, maximum spacing, and continuity requirements.

4. TOP FACE LONGITUDINAL REINFORCEMENT: Unless otherwise specified, the longitudinal reinforcement shown closest to the top face of the barrier has a minimum cover of 40", 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 foot.

6. CONSTRUCTION JOINTS: Install Construction Joints only as needed for discontinuous concrete casting or cold joints. Maintain continuity of all 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 Toll Grade-Separated Sections, see Sheet 3 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 1 & 13, install ⅜" 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 ¾" 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 barrier 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 sheering 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 delinators located 2" from the front face of the barrier and the reflective sheering facing traffic of the nearest approach.

17. TOLL SITES: Where called for in the Plans, substitute the steel reinforcing bars shown herein with GFRP reinforcing bars of the same size. Construct GFRP reinforcing bars in accordance with Specification 932, and use a 4½" inner diameter bar bend. Where required to fit pull boxes while maintaining bar spacing and concrete cover, trim GFRP bars as defined in the Plans.

At toll site locations, the use of Metal 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 connection into the first casting, the dowel may be cast-in-place for new concrete or placed into a 1½" x 13" (± 1⁄8") drilled hole for cured concrete. For drilled holes larger than 1½", 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 1½" NPS 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 1½" x 3½" (Min.) Shear Key shown. As a substitute for the Shear Key, the concrete footing's top surface may be raked to provide additional shear friction. Rake the fresh concrete surface so that about half of the surface area consists of approximately 45° depth longitudinal grooves, distributed evenly and approved by the Engineer.

5. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the ½" Dowelled Joint.

6. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with the 16'-0" End Segment for Guardrail shown herein.

7. **CRASH CUSHION CONNECTIONS:** Connect Crash Cushions per Index 544-001 in conjunction with the 3'-0" End Transition for Guardrail as shown herein.

8. **FREE ENDS:** When the barrier end does not terminate with a Traffic Railing Connection, Guardrail Connection, Crash Cushion Connection, or Sloped End Treatment as called for in the Plans, terminate in accordance with the Free End Reinforcing detail on Sheet 3.

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**SECTION A-A**

**38" HEIGHT MEDIAN BARRIER** (See Sheet 3 for Steel Reinforcing Details)

**DOWEL DETAILS**

**ELEVATION**

**PLAN**

**SECTION DOWEL PLACEMENT**

**DOWEL CONNECTIO**
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 2.

2. BAR BENDING DIAGRAMS: For additional information on Bars 4V1 and 4U1, see the details on Sheet 2.

3. PLAN VIEWS: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal steel locations, see the section views.

SECTION A-A
38" HEIGHT MEDIAN BARRIER
Concrete Mix = 0.20 cement
Steel Qty. = 11.8 LB/FT

VIEW B-B
REDUCED SECTION OF END TRANSITION FOR GUARDRAIL
(End of Barrier)

PLAN VIEW - 38" HEIGHT MEDIAN BARRIER
FREE END REINFORCING (See Note 3)

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION (See Note 3)

MEDIAN BARRIER - REINFORCING DETAILS

REVISION
01/01/18
DESCRIPTION:
FY 2019-20
STANDARD PLANS

CONCRETE BARRIER
INDEX
521-001
SHEET
3 of 26
NOTES:
1. GENERAL: Install the Grade-Separated sections where shown in the Plans and as required to accommodate vertical offsets in pavement of Height Y. Dowelled joints are not permitted within Grade-Separated sections.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect Short Grade-Separated sections and Tall Grade-Separated sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent section's longitudinal steel. Connect Short Grade-Separated sections and 30" Height Median Barrier sections of Sheet 2 using a 3Y 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 Transverse Joint locations. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

Longitudinal joints are permitted between the vertical limits shown and must remain level and at a consistent height per each continuous casting of concrete. Longitudinal joints may change elevations at Transverse joint locations. Field bending of bars is permitted at Longitudinal Joint locations.

Transverse joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:

i. The barrier length on both sides is at least 40 feet, where each segment has continuous steel reinforcement.

ii. The barrier's vertical steel spacing is reduced to 4" O.C. for a total of 12 spaces on both sides of the joint.

Grade separation heights of Y ≤ 9" are permitted on a limited basis using the Short 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.
38" Height Median Barrier
(See Sheet 2)

Barrier Height & Width Transition
Varies (15'-0" Min.)

Range of Project-Specific Reinforcing Not Shown (See Note 1)

BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 40" maximum cover from the top of the barrier.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, the 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.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, the 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.

PEDIMENT 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.

PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

NOTES:

1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 40" maximum cover from the top of the barrier.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, the bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

MEDIAN BARRIER - 56" HEIGHT SECTION
FOR BARRIER-MOUNTED SIGN
SUPPORT SHIELDING - SYMMETRICAL
**NOTES:**

1. **PROJECT-SPECIFIC REINFORCING:** For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. **BARRIER REINFORCING:** Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 40" maximum cover from the top of the barrier.

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, our bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. **PROJECT SPECIFIC PEDESTAL WIDTH & SETBACK:** The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. **PLAN VIEW:** Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

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**MEDIAN BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING - ASYMMETRICAL**

**CONCRETE BARRIER**

**FY 2019-20 STANDARD PLANS**

**DESCRIPTION:**

**INDEX**

**SHEET**
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 and 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. 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. 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 DUAL SIGN SUPPORT SHIELDING - MINIMUM WIDTH
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 on 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, 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.

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 on 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, 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.
Notes:

1. Section Views: See Sheet II for Section Views A-A through D-D and corresponding reinforcing steel details.

2. Pier: The round pier shown is an example only, and project-specific pier shapes may vary. For actual dimensions and requirements, see the Plans. The overall length and width of the split barrier system is governed by the project-specific pier dimensions, as defined in the Plans.

3. Multiple Piers: The parallel segment may be lengthened to accommodate multiple consecutive piers, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last piers, respectively.

Median Barrier - 44" Height
Split Section for Pier Shielding

CONCRETE BARRIER

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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.

MEDIAN BARRIER - 44" HEIGHT
SPLIT SECTION FOR PIER SHIELDING - DETAILS

CONCRETE BARRIER

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**SECTION A-A**

**BEGIN TRANSITION - OPTION 'A'**

**MATCH SINGLE-SLOPE 38" HEIGHT MEDIAN BARRIER**

ELEVATION

(Reverse Direction Similar by Opposite Hand)

**NOTES:**

1. **GENERAL:** Construct the Connection Segment as required per the Plans to connect existing F-Shape sections to Single-Slope Median 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 2.

3. **TRAFFIC RAILING CONNECTION:** For the Option 'B' connection, use 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.

**MEDIAN BARRIER - CONNECTION TO F-SHAPE**

**CONCRETE BARRIER**

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SECTION A-A
38" HEIGHT SHOULDER BARRIER
(See Sheet 14 for Reinforcing Steel Details)

3'-0"
1'-0"
2'-0"
3'-0"
3'-2"
2'-0" Min.
1'-0"

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.

For the dowel connection into the first casting, the dowel may be cast-in-place for new concrete or placed into a 1 1/2" x 13" drilled hole for cured concrete. For drilled holes larger than 1 1/2", 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 1/2" NPS Schedule 80 PVC pipe with a sealed cap, cast-in-place as shown.
4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 1 1/2" 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 3'-0" 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 SV2 and SU3 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 SU3, see the Bar Bending Diagrams on Sheet 26.

**SHOULDER BARRIER - REINFORCING DETAILS**

**PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION**

**LONGITUDINAL STEEL NOT SHOWN FOR CLARITY**

**SECTION A-A**

**38" HEIGHT SHOULDER BARRIER**

Concrete Qty. = 0.33 CY/FT
Steel Qty. = 50.9 LB/FT

**VIEW B-B**

**REDUCED SECTION OF END TRANSITION FOR GUARDRAIL**

(End of Barrier)
FRONT-FLUSH SECTION
(Where Required For Barrier Inlet Locations)
Concrete Qty. = 0.29 CF/FT
Steel Qty. = 46.6 LB/FT

TRENCH FOOTING SECTION
Concrete Qty. = 0.35 CF/FT
Steel Qty. = 46.2 LB/FT

SHOULDER BARRIER - SECTION OPTIONS

NOTES:
1. GENERAL: Install the differing Section Options as required per the Plans.
2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect differing Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections. Alternatively, a Doweled 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.
SHOULDER BARRIER - SECTION OPTIONS (CONTINUED)

44" HEIGHT SECTION
(For Use Adjacent to Rear-Flush
Section on Sheet 18)

Concrete Qty. = 0.34 CY/FT
Steel Qty. = 58.8 LB/FT

NOTE:
1. GENERAL: See the applicable notes on Sheet 15.

44" HEIGHT FRONT-FLUSH SECTION
(For Use Adjacent to Rear-Flush
Section on Sheet 18, as
Required for Barrier Inlets)

Concrete Qty. = 0.30 CY/FT
Steel Qty. = 52.6 LB/FT
SHOULDER BARRIER - 38" HEIGHT REAR-FLUSH SECTION FOR REDUCED SETBACK PIER SHIELDING
(Design Speed ≤ 45 MPH)

NOTE:
1. PRIOR: The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details requiring protection per the AASHTO LRF requirements. For piers requiring protection, see Index 521-002.
SHOULDER BARRIER - 44" HEIGHT REAR-FLUSH SECTION
FOR REDUCED SETBACK PIER SHIELDING

SECTION C-C
ABOVE-GROUND HAZARD EMBEDDED IN FOOTING

SECTION D-D
ABOVE-GROUND HAZARD EMBEDDED IN FOOTING & BARRIER

44" HEIGHT
REAR-FLUSH SECTION
WITH 3' WIDTH REDUCTION

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.

44" HEIGHT REAR-FLUSH SECTION WITH 3' WIDTH REDUCTION

FOR REDUCED SETBACK PIER SHIELDING

EXHIBIT PAGE 521-001

CONCRETE BARRIER

STANDARD PLANS

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SECTION A-A
BEGIN TRANSITION - OPTION 'A'
MATCH SINGLE-SLOPE
38" HEIGHT SHOULDER BARRIER

SECTION A-A
BEGIN TRANSITION - OPTION 'B'
MATCH SINGLE-SLOPE
36" HEIGHT TRAFFIC RAILING
(Bridge Applications)

SECTION B-B
INTERMEDIATE SECTION
OF LINEAR SECTION
MATCH 32" HEIGHT
F-SHAPE SECTION

NOTES:

1. GENERAL: Construct the Connection Segment as required per the Plans to connect existing F-Shape sections to Single-Slope 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. STIRRELP 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.
**CURB AND GUTTER BARRIER NOTES:**

1. **SECTION VIEWS:** For additional Views A-A and B-B, see Sheet 21.

2. **EXPANSION JOINTS:** Place 1⁄2" 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 1⁄2" Doweled Joints as defined on Sheet 13.

4. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 1⁄2" Doweled 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 NOTES:**

1. **GENERAL:** Place 24" 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 24" x 18" of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 6" bar spacing. If shifting the vertical bars, move the bars from the standard 6" spacing location to the closest end of the drainage slot and distributing additional vertical reinforcement evenly on each side of the Drainage Slot.

---

**CURB AND GUTTER BARRIER WITH DRAINAGE SLOT**

**SECTION A-A**

**Curb & Gutter Barrier Segment**

**ELEVATION**

**PLAN**

**ISOMETRIC VIEW**

**SECTION C-C**

**Curb & Gutter Barrier with Drainage Slot**

**DRAINAGE SLOT DETAILS**

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**CONCRETE BARRIER**

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**SHEET**

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SECTION A-A
CURB & GUTTER BARRIER

Concrete Qty. = 0.26 CY/FT
Steel Qty. = 41.2 LB/FT

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION
(Longitudinal Steel Not Shown for Clarity)

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 SV4 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 SV4, see the Bar Bending Diagrams on Sheet 20.
1. GENERAL: Install a Sloped End Treatment only where called for in the Plans, using either a 10'-0" length or 25'-0" length treatment as specified in the Plans. The 10'-0" length option is shown herein, while the 25'-0" length option requires additional trimmed Bars 5V2 & 5U4 at the same 9" longitudinal spacing.

2. BAR BENDING DIAGRAMS: For additional details on Bars 5V2 & 5U4, see the Bar Bending Diagrams on Sheet 26.
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
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 sections' 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.
WALL SHIELDING BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING

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" maximum cover from the top of the barrier.

For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans.

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.
BILL OF REINFORCING STEEL

<table>
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<tr>
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<th>SIZE</th>
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<tr>
<td>C2</td>
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<tr>
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</tr>
<tr>
<td>V2</td>
<td>5</td>
<td>6'-7&quot;</td>
</tr>
<tr>
<td>V3</td>
<td>6</td>
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</table>

NOTES:

1. Work with the Standard Bar Bending Details per Index 415-001.
2. All bar dimensions in the bending diagrams are out to out.
3. Use standard inner diameters for bar bending unless otherwise shown.

REINFORCING BAR BENDING DIAGRAMS

BAR 4U1

BAR 4U2

BAR 4V1

BAR 4C1

BAR 4V3

BAR 5U1

BAR 5U2

BAR 5V1

BAR 5V2

BAR 5C1

BAR 5C2

BAR 5U3

BAR 5U4

BAR 5V3

BAR 5V4
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**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 ½" 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 ½" V-Grooves while the concrete is still plastic, otherwise pre-form the joints when stationary forms are utilized.
NOTES:

1. GENERAL: The views shown herein are schematic only, showing example layouts for Pier Protection Barrier (PPB) footings and Crash Wall placement in relation to adjacent miscellaneous structures (including bridge piers, footings, drainage structures, etc.).

2. MINIMUM FOOTING LENGTH: The minimum length of a single footing option (i.e., Symmetrical Footing, Rear-Flush Footing, Front-Flush Footing) is 8'-0", measured longitudinally. See Sheet 6 for the footing option details.

3. FOOTING OVERLAP: When a Front-Flush Footing section connects to a Rear-Flush Footing section, a 4'-0" footing overlap is required as shown. In footing overlap segments, place all lateral steel reinforcement continuously for the entire width of the combined footing while maintaining the cover requirements per Sheet 6.

4. CONNECTING GUARDRAIL OR CONCRETE BARRIER: Connect the PPB to either Guardrail or Concrete Barrier as specified in the Plans. For additional Guardrail Details, see Sheet 3 and Index 536-001. For additional Concrete Barrier Details, see Sheet 3 and Index 521-001.
PIER PROTECTION BARRIER

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)

CONNECTION TO CONCRETE BARRIER

CONNECTION TO GUARDRAIL

STANDARD PLANS

FY 2019-20

DESCRIPTION:

REVISED 11/01/17

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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.

BARRIER DETAILS - CONNECTION TO CONCRETE BARRIER

1. FOOTING OPTIONS: See Sheet 6 for the supporting stem and footing 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 CF/FT (below gutter line)

Steel Qty. = 63.5 LB/FT (including Bars SU)

Concrete Qty. = 0.34 CY/FT (below gutter line)

**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 U 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).

**SECTION F-F**

**SYMMETRICAL FOOTING OPTION**

Concrete Qty. = 0.24 CF/FT (below gutter line)

Steel Qty. = 62.6 LB/FT (including Bars SU)

Concrete Qty. = 0.34 CY/FT (below gutter line)

**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 U 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).

**SECTION G-G**

**FRONT-FLUSH FOOTING OPTION**

Concrete Qty. = 0.24 CF/FT (below gutter line)

Steel Qty. = 63.5 LB/FT (including Bars SU)

Concrete Qty. = 0.34 CY/FT (below gutter line)

**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 U 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).
CRASH WALL DETAILS

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.
BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
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<tr>
<td>U</td>
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<tr>
<td>R</td>
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<td>5</td>
<td>Varies (Straight)</td>
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<td>5</td>
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<tr>
<td>E</td>
<td>5</td>
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<tr>
<td>S2, S3</td>
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<td>Varies (Straight)</td>
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</table>

NOTES:

1. Work with the Standard Bar Bending Details per Index 415-001.
2. All bar dimensions in the bending diagrams are out to out.

BAR BENDING DIAGRAMS
1. GENERAL: Construct Opaque Visual Barrier (OVB) in accordance with Specification 521, and use either cast in place or precast panels of cast OVB concrete monolithically with the Concrete Barrier or Traffic Railing. Use an ASTM D6980, Class 5, Type III Organic Felt bond 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. At cast in place embedment locations, longitudinally shift the dowel bars only as required to avoid reinforcing steel in the Concrete Barrier or Traffic Railing.

3. TRANSVERSE JOINTS: Place 3" 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 END TREATMENTS: Regardless of the traffic direction, place Sloped 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" (± 5/8") 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, bridge, 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 at a uniform distance of 6" (± 5/8") 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.

11. OPTIONAL WELDED 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, except 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)

NOTES:

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 'B' - 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 'A' - 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 'A' - The length of the OVB End 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' - The length of the OVB End Segment is governed by the length of linear width and height transition of the Concrete Barrier.

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 1/2" 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 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 (L-Shaped) or 521-515 (Trench).

**ELEVATION**
(INSIDE FACE OF CONCRETE BARRIER/NOISE WALL WITH T-SHAPED FOOTING SHOWN, (Other footings similar, Reinforcing steel not shown for clarity))

**PLAN**
(Reinforcing Steel not shown for clarity)

**REV 11/01/18**
**DESCRIPTION:**

**FY 2019-20**

**STANDARD PLANS**

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**SHEET**

**CONCRETE BARRIER/NOISE WALL (8'-0")**

**521-510**

2 of 5

**ELEVATION OF BARRIER/NOISE WALL REINFORCING STEEL AT OPEN JOINT**

(Bars S51 in Barrier not shown for clarity)
(Footing or Junction Slab Details not shown)

**ELEVATION OF BARRIER/NOISE WALL END TAPER (ADJACENT TO CONCRETE BARRIER SHOWN, GUARDRAIL ATTACHMENT SIMILAR SEE DETAIL "A", SHEET 5)**

(Bars S51 in Railing not shown for clarity)
(Footing or Junction Slab Details not shown)

**NOTES:**

* Field Cut Bars S51 & S55 to maintain clearance.
** Terminate ½ V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars S5V 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).
REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

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<tr>
<td>S1</td>
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<td>V (Wall)</td>
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<tr>
<td>V (Footing)</td>
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<td>7'-4½&quot;</td>
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(End Stirrup Bar 5V
To Be Field Cut
(Railing End Transition)

Stirrup Bar 5V

(Field Cut and Bend
for Railing End Transition)

BAR 5R1
BAR 5R2 &
BAR 5R3

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 5R shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars 5S1 may be continuous or spliced at the construction joints. Lap splices for Bars 5R, 5S1 and 5W 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.

(REFER TO SHEET 521-513 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 5R1 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)
**T-Shaped Spread Footing**

**Expansion Joint in footing (Typ.)**

**Shoulder or Roadway Pavement**

**See Detail "A" for Mortar Plug**

**T-Shaped Spread Footing**

**V-Groove in both faces and top of Concrete Barrier/Noise Wall**

**Open Joint (See Note 4)**

**V-Groove in both faces and top of Concrete Barrier/Noise Wall**

**Open Joint (See Note 4)**

**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.
   - A. Class II concrete for slightly aggressive environments.
   - B. Class IV concrete for moderately or extremely aggressive environments.

3. Construct bau Open Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. 3\(\frac{1}{2}\) Open Joint locations are to coincide with 3\(\frac{1}{2}\) Expansion Joints in footings.

4. Construct 1\(\frac{1}{2}\) V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 3\(\frac{1}{2}\) 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:
   - A. Index 521-513 - Concrete Barrier/Noise Wall T-Shaped Spread Footing,
   - B. Index 521-514 - Concrete Barrier/Noise Wall L-Shaped Spread Footing or
   - C. Index 521-515 - Concrete Barrier/Noise Wall Trench Footing.

**CONCRETE BARRIER/NOISE WALL (14'-0")**

**Plan (Reinforcing Steel not shown for clarity)**

(Reinforcing Steel shown, L-Shaped Spread Footing and Trench Footing Similar)

**CROSS REFERENCE:**

For Section A-A, Detail "A" and Estimated Quantities, see Sheet 3.

For Expansion Joint Detail in Footing, see Index 521-513, 521-514 or 521-515.

**1\(\frac{1}{2}\) Open Joint**

(Varies 50'-0" Minimum, 90'-0" Maximum) (See Note 4)

**30'-0" Maximum (See Note 5)**

**Spacing 3\(\frac{1}{2}\) Open Joint**

**Spacing 1\(\frac{1}{2}\) V-Groove**

**14'-0" Noise Wall End Taper**

(See Sheet 2 and Note 6). See Plans for location of End Taper.

**ELEVATION OF INSIDE FACE OF CONCRETE BARRIER/NOISE WALL**

(Reinforcing Steel not shown for clarity)

**1\(\frac{1}{2}\) Open Joint**

**3\(\frac{1}{2}\) Open Joint**

**1\(\frac{1}{2}\) V-Groove**

**1\(\frac{1}{2}\) V-Groove**

**3\(\frac{1}{2}\) Open Joint in Footing (Typ.)**

**T-Shaped Spread Footing**

**T-Shaped Spread Footing**

**Begin or End 8'-0" Concrete Barrier/Noise Wall or End Taper (See Note 6)**

**Begin or End 14'-0" Concrete Barrier/Noise Wall**

**Begin or End 8'-0" Concrete Barrier/Noise Wall continuing or End Taper on Approach Slab or Roadway (shown)**

**Begin or End 14'-0" Concrete Barrier/Noise Wall**

**Begin or End 8'-0" Traffic Railing/Noise Wall or End Taper (See Note 6 & 7)**

**Begin or End 8'-0" End Taper (See Note 6 & 7)**

**1:47:37 PM**

**11/01/18**

**REV 30/02/19**

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**521-511**

**1 of 3**
ELEVATION OF CONCRETE BARRIER/NOISE WALL REINFORCING STEEL

(Bars 5S1 in Railing not shown for clarity)

NOTES:
1. Field Cut Bars SR & 5S1 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. 3/8" Open Joint may be omitted when 8'-0" Railing/Noise Wall End Taper is adjacent to a 14'-0" Concrete Barrier/Noise Wall End Taper as shown on Sheet 1. See Index 521-510 for reinforcement details and spacing. Bars 5S2 are not required when 3/8" 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.

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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<td>5'-2½&quot;</td>
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<td>10'-10&quot;</td>
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<tr>
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<tr>
<td>S2</td>
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**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 SR may be continuous or spliced at construction joints. Lap splices for Bars SR, and S51 will be a minimum of 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>
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**NOTES:**
1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At $\frac{1}{4}$" Open Joints, plug the lower $\frac{1}{4}$" portion of the open joint by filling it with mortar in accordance with Specification Section 400.

**SECTION A-A**

**TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL**

---

**CONCRETE BARRIER/NOISE WALL (14'-0")**

**INDEX**

521-511

**SHEET**

3 of 3
**SECTION A-A**  
**SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL**  
(TYPE 1 Junction Slab Shown, TYPE 2 Similar)

### NOTES

1. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0').
2. Concrete will be in accordance with Specification Section 346.
   A. Use Class II concrete for slightly aggressive environments.
   B. Class IV concrete for moderately or extremely aggressive environments.
3. Construct 3/4" Expansion Joints and face of coping plumb, and either perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D6741. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant and between 9" to 45° from horizontal.
6. Construct 3/4" V-Grooves and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 3/4" Expansion Joints and/or Begin or End Junction Slab. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
8. Shoulder or Roadway Pavement or Fill is required on top of the junction slab for its entire length on the traffic side of the Barrier/Noise Wall. See Section B-B for details.
9. Actual location & width may vary depending on type of Retaining Wall used.
10. Field cut Bars 5A and 5B2 as required to maintain minimum cover for skewed Approach Slab.
11. Spacing shown is along the Gutter Line.
12. See Index 521-510 for Bars 5V and 2 - Bars 5S1. See Plans for Junction Slab shown, other Wall Types Similar.

### CROSS REFERENCE:
For Section B-B and Detail 'A', see Sheet 2.

### EXPANSION JOINT DETAIL**
Junction Slab expansion joints are required at 3/4 open joints in Concrete Barrier/Noise Wall.

### PLAN
JUNCTION SLAB ADJACENT TO SKewed APPROACH SLAB AND WITH BARRIER WALL INLET

1. **1'-4"** (TYPE 1)  
2. **6"** (TYPE 2)

**SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL**  
(TYPE 1 Junction Slab Shown, TYPE 2 Similar)

**INDEX**

**CONCRETE BARRIER/NOISE WALL (8'-0')**  
JUNCTION SLAB
**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.

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**BILL OF REINFORCING STEEL**

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<td>U2</td>
<td>S</td>
<td>17'-10&quot;</td>
<td>17'-10&quot;</td>
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**PARTIAL END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT**

(Showing Bars 5V and Bars 5S1)

**NOTES:** See Index 521-510, Detail "A" for details.

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**ESTIMATED JUNCTION SLAB QUANTITIES**

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<td>21.36 21.36</td>
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**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 2ৎ" side cover with adjusted Typical Section dimensions.

**CROSS REFERENCE:** For location of Section B-B, see Sheet 1.
**NOTES:**

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 V-Groove joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Construct V-Groove spacing and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between V-Groove 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. Place 8 ~ Bars (6 ~ 5B1 & 2 ~ 5S1) inside Stirrup Bars 5V2 as shown. (2 ~ 5S1 Bars included in 521-510 or 521-511 quantities)

10. Spacing shown is along the Gutter Line.

11. Work this Index with one or both of the following:
   - a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0")
   - b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0")

**SECTION A.A**

**SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET**
(Bars 5P, 5S and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

**EXPANSION JOINT DETAIL**
(Spread Footing expansion joints are required at 1'-0" open joints in Concrete Barrier/Noise Wall)
**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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</tr>
<tr>
<td>B</td>
<td>5</td>
<td>AS REQ'D.</td>
</tr>
<tr>
<td>U</td>
<td>5</td>
<td>11'-0&quot;</td>
</tr>
<tr>
<td>DOWEL</td>
<td></td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

**BARS 5A & 5B**

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**SECTION B-B**

**TYPICAL SECTION THRU SPREAD FOOTING**

(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

**NOTES:**

1. Match Cross Slope of Travel Lane or Shoulder.
2. See Sheet 1, Notes 8 & 9.

**ESTIMATED T-SHAPED SPREAD FOOTING QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>Concrete (Footings)</td>
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<tr>
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<td>25.90</td>
</tr>
<tr>
<td>ADDITIONAL Rein @ Expansion Joint</td>
<td>1B</td>
<td>31.38</td>
</tr>
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</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.
A – Bars 5F (Top of Slab) (Required only when Approach Slab is skewed)

Bars 5B

Skewed Approach Slab

Field Cut Bars 5U1 & 5B as required to maintain minimum cover for skewed approach slab (Typ.)

Plan - Option B
Spread Footing Adjacent to Skewed Approach Slab and with Barrier Wall Inlet

Option A Similar (Bars S1 Not Shown)

Expansion Joint Spacing - (50'-0" Min., 90'-0" Max.) (See Note 4)

V-Groove Spacing ~ 30'-0" Max. (See Note 5)

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 ½" V-Groove plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. Construct ½" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between ½" 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 and the full length of the spread footing (3'-0" minimum depth) on the traffic side of the spread footing for Option B. See Typical Sections on Sheets 2 and 3 for details.
8. Spacing shown is along the Gutter Line.
9. Work this Index with one or both of the following:
   a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0")
   b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0")

CROSS REFERENCE:
For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.
**TYPICAL SECTION THRU SPREAD FOOTING - OPTION A**
(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

**TYPICAL SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET - OPTION A**
(Reinforcing Steel not shown for clarity (See Note 3))

**NOTES:**
1. Match Cross Slope of Travel Lane or Shoulder
2. Place 10 ~ Bars (8 ~ Bars 5B and 2 ~ Bars 5S1) inside Bars 5U1 as shown, (2 ~ 5S1 Bars are included in 521-510 or 521-511 quantities)
3. For Reinforcing Steel spacing, see Typical Section Thru Spread Footing - Option A this Sheet
4. Provide 3" lip when optional construction joint is used.
TYPICAL SECTION THRU SPREAD FOOTING - OPTION 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.
**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 5S1 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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<tr>
<td>Additional Reinf. @ Expansion Joint</td>
<td>LB</td>
<td>48.06</td>
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</table>

* 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.

---

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>5</td>
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</tr>
<tr>
<td>F</td>
<td>5</td>
<td>5'-6&quot;</td>
</tr>
<tr>
<td>S3</td>
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<tr>
<td>S4</td>
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<tr>
<td>U1</td>
<td>5</td>
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<td>U2</td>
<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>

---

**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. 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.

---

**CONCRETE BARRIER/NOISE WALL**

**L-SHAPED SPREAD FOOTING**

---

**CONSTRUCTION DOCUMENTS**

**FY 2019-20 STANDARD PLANS**

**INDEX:** 521-514

**SHEET:** 4 of 4
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 II 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 A633 smooth round bar or GRFP smooth round bars 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. Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
6. Construct 1/2" V-Grooves plumb and provide 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. Spacing 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"

**ESTIMATED TRENCH FOOTING QUANTITIES**

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<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>21.36 21.36</td>
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**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

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<td>5</td>
<td>12'-7&quot;</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>DOWEL</td>
<td>1&quot; Ø Smooth Bar</td>
<td>2'-0&quot;</td>
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</table>

**PLAN**

(Bars SSI Not Shown)

**TYPICAL SECTION THRU TRENCH FOOTING**

(Bars SR and SSI in Concrete Barrier/Noise Wall not shown for clarity)
PRECAST COPING - PARTIAL ELEVATION VIEW

C-I-P COPING - PARTIAL ELEVATION VIEW

PRECAST AND C-I-P COPING NOTES:
1. Provide Class III 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

INDEX
521-600
1 of 2
1. Construct the expansion joints, V-Grooves and face of coping plumb.
2. Provide Class III concrete for slightly aggressive environments or Class IV for moderate or extremely aggressive environments.
3. 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.
4. Construct 3/8" Expansion Joints in junction slabs and C-I-P copings plumb and perpendicular or radial to the Gutter Line. Provide at 90'-0" minimum intervals as shown. Provide 3'x3' Mortar plugs in open joints at the base of Concrete Barriers to contain runoff.
5. Shear Keys in junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant and between 5" to 45" from horizontal.
6. Provide and Install Preformed Expansion Joint Filler in accordance with Specification Section 932.
7. Construct 3/8" V-Grooves in junction slabs and C-I-P copings at 30'-0" minimum intervals as shown. Space V-Grooves equally between 3/8" Expansion Joints and/or Begin or End Junction Slab. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier.
8. Shoulder or Roadway Paving is required on top of the joint slab for its entire length on the traffic side of the Concrete Barrier. See Typical Sections on Sheets 2 and 3 for details.
9. Spacing shown is along the Gutter Line.
10. For Precast Coping only, provide Dowel Bars 4D @ 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 build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
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)
PARTIAL END VIEW OF CONCRETE BARRIER END TRANSITION FOR GUARDRAIL ATTACHMENT

(Precast Coping Shown, C-I-P Coping Similar)

PLATE - RAILING END TRANSITION
(Showing Bars V and S)

PLAN - RAILING END TRANSITION
(Showing Bars V and S)

COPING

Details:

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 thickness at the edge of the slab as shown.
3. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade.
4. For Asphalt: Shoulder or Roadway Pavement will be SuperPave Structural asphalt. Variable thickness asphalt will be structural overbuild.
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 optimal 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.
### Bill of Reinforcing Steel

#### Typical Section Thru C-I-P Concrete Barrier with C-I-P Junction Slab and C-I-P Coping (Precast Coping Similar with C-I-P Buildup)

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 or 60'-0" for 42" Single-Slope.

### Estimated Quantities for C-I-P

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<td>21.36</td>
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Note: The above concrete quantities are based on a max. super-elevation of 6.25%.

### Reinforcing Steel Notes:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at expansion and open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B & 6S will be a minimum of 2'-2".
4. For Precast Copings only, lap splice Bars 5A with Bars SC. Lap splices will be a minimum of 2'-2".
5. The Contractor may use either full length Bars 5A or lap splice with Bars SC or Bars 5A for C-I-P Copings.
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-8".
7. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-8".
8. When approved by the Engineer, the Contractor may use deformed Welded Reinforcement (WWR) meeting the requirements of Specification Section R3.
9. Contractor may use a single #5 stirrup in lieu of two bars for 4P and 4V1.

### REINFORCING STEEL BENDING DIAGRAMS

#### Standard Plans

- **Reinforcing Steel Bending Diagrams**
- **Bill of Reinforcing Steel**
- **Reinforcing Steel Notes**

### Precautionary Notes:
- Shoulder or Roadway Pavement (Full depth asphalt or See Note 3)
- Slope Varies (See Note 1)
- Optional Shear Key @ (Typ.)
- Organic Felt Bond breaker (Typ.)
- Retaining Wall (Type Varies)
- 1" Ø Dowel Load Transfer Devices at expansion joints (Typ.)
- Bars 5A @ 6" sp. (Typ.)
- Bars 5F @ 6" sp. (Typ.)
- Bars 6S @ 6" sp. (Typ.)
- Construction Joint --
- Construction Joint Permitted
- Optional Keyway
- Optional Notch at Top of Coping
RAISED SIDEWALK NOTES:
1. When a 42" Vertical Shape is used with a precast coping, increase bars 4C to Bars 5A 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 ½" 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 952.
8. Construct ½" V-Grooves in raised sidewalk and C-I-P coping at 30'-0" maximum intervals as shown. Space V-Grooves equally between ½" 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 @ 3'-0" perpendicular and/or 30'-0" parallel to the Gutter Line. Provide at 90'-0" maximum intervals as shown.
11. Finish Sidewalks in accordance with Specification Section 952.
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)

PARTIAL ELEVATION VIEW
(Precast Coping & Raised Sidewalk Reinforcing Not Shown For Clarity)
(Precast Coping Shown, C-I-P Coping Shown)

VERTICAL SHAPE

PARTIAL PLAN VIEW
(Skewed Approach Slab Shown, Perpendicular Approach Slab Similar)
(Precast Coping Shown, C-I-P Coping Similar) (Concrete Barrier not shown for clarity)
Additional Rail required for Special Height Bicycle Railing

Pedestrian/Bicycle Railing

Bars SX @ 1'-0" sp. (Max.) (Alternate with Bars ST)

Bars ST @ 1'-0" sp. (Max.) (Alternate with Bars SX)

Additional Rail required for Special Height Bicycle Railing

DESCRIPTION:

Concrete Curb (See Note 2).

Additional Reinf. @ Expansion Joints (Steel Dowels)

CONCRETE BARRIER/RAISED SIDEWALK - WALL COPING

ESTIMATED QUANTITIES FOR PRECAST COPING

ITEM
Concrete (Precast Coping)
Concrete (C-I-P Raised Sidewalk)
Reinforcing Steel (Precast Coping) excluding Bars ST, SX and SS (Typ.)
Reinforcing Steel (C-I-P Raised Sidewalk) (Typ.)
Additional Reinf. @ Expansion Joints (Steel Dowels)

UNIT
CY/LF
CY/LF
LB/LF
LB/LF
LB

QUANTITY
0.095
0.232
23.90
13.50
32.04

NOTES:

1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Typ.) and height. See Roadway Plans and Index 520-001. 9'-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 20", fill gap with full depth Expanded Polystyrene to provide a maximum 20" air gap.
7. For Bullet Railings, see Index 515-821 and 515-822.
8. Beginning 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.

TYPICAL SECTION THRU PRECAST COPING WITH C-I-P RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS

(32" Vertical Shape Shown, 42" Vertical Shape Similar)

NOTE: See Sheet 4 for End Transition Elevation.
Concrete Reinforcing Steel (Typical) excluding Bars 5T, 5X and 5S (Typ.)

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**UNIT QUANTITIES FOR C-I-P COPING**

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<tr>
<td>Additional Rein. @ Expansion Joints (Steel Dowels)</td>
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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 5X at the railing end and proceed toward Retaining Wall to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars ST and 5X shall be made immediately adjacent to Begin or End Retaining Wall Cut, shift and rotate Bars ST and 5X as required to maintain cover in End Transition.

**ELEVATION END TRANSITION**

**END VIEW OF VERTICAL FACE END TRANSITION**

**TYPICAL SECTION THRU C-I-P COPING AND RAISED SIDEWALK AND RETAINING WALL AT EXPANSION JOINTS**

(42" Vertical Face Shown, 32" Vertical Face Similar)

**BUILDUP FOR STEPPED MSE WALL PANELS AND C-I-P COPING**

**42" VERTICAL SHAPE**

**PROJECT INDETIFICATION**

FY 2019-20

CONCRETE BARRIER/RAISED SIDEWALK WALL COPING

INDEX 521-620

SHEET 3 of 4
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

<table>
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<td>9'-1&quot;</td>
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<tr>
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<td>5</td>
<td>9'-6&quot;/11'-6&quot;</td>
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<td>C</td>
<td>4</td>
<td>5'-5&quot;</td>
<td>4'-5&quot;</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>4'-5&quot;</td>
<td>4'-5&quot;</td>
</tr>
<tr>
<td>X</td>
<td>5</td>
<td>5'-1&quot;</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

1" Ø Dowel Smooth Bar 2'-0" 2'-0"
32" 42"
7 5 7'-4" 9'-2"
X 5 5'-1" 6'-0"

FIELD CUT & DISCARD

VARIES (FIELD CUT TO)

BAR 5A

3'-9"

BAR 5L

1" Ø DOWEL

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are cut to cut.
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 7'-8".
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 5'-8", and reinforcing size must be increased to #5 bars (Bars 5C).
7. The Contractor may use deformed WWR when approved by the Engineer. WWR must meet the requirements of Specification Section 931.

* See Sheet 3 Note 3.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
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<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.095 0.145</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>23.38 18.33</td>
</tr>
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</table>

VERTICAL SHAPE

ESTIMATED CONCRETE BARRIER QUANTITIES

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<tr>
<th>ITEM</th>
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<th>QUANTITY</th>
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<tr>
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<td>CY/LF</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>23.38 18.33</td>
</tr>
</tbody>
</table>

END TRANSITION ELEVATION FOR 32" VERTICAL SHAPE (Guardrail Not Shown For Clarity)
**DETAIL “C”**

*PRECAST COPING*  
- **3⁄8” Open Joint**  
- **Spacing Bars 4P (3⁄8”)**  
- **1'-0” Spacing (Typ.)**  
- **See Note 4**

*PRECAST COPING (Showing Locations of 3⁄8” V-Grooves and 3⁄8” Preformed Expansion Joint Filler)*  
- **1⁄2” V-Groove (Typ.)**  
- **3⁄8” Preformed Expansion Joint Filler**

*PARTIAL PLAN VIEW*  
- **Approach Slab**  
- **Bars 5B2**  
- **2” Cover (See Note 3 & Detail “C”)**  
- **Bars 5A @ 1'-0” sp. (tied to Bars 5L (Typ.))**

*PARTIAL ELEVATION VIEW*  
- **10'-0” Typical Precast Coping & Concrete Parapet (5'-0” Min.)**  
- **Top of Precast Concrete Parapet**  
- **Top of Retaining Wall Panel (Typ.)**  
- **Top of C-I-P Buildup Concrete**  
- **10'-0” V-Groove Spacing**

**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 3⁄8” Expansion Joints in sidewalk and C-I-P coping plumb and either perpendicular or radial to the Gutter Line. Provide Expansion Joints at 30'-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 3⁄8” 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 build up 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)

**REVISION DESCRIPTION:**

**REV. 30/01/17**

**INDEX 521-630**
PLAN VIEW
(Junction Slab Shown, Raised Sidewalk Similar)
6'-10" (See Note 2)

SECTION A-A
SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL
(Junction Slab Shown, Raised Sidewalk Similar)

REINFORCING STEEL BENDING DIAGRAMS - DRAINAGE

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>REQ'D.</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
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<tbody>
<tr>
<td>S2</td>
<td>16</td>
<td>3</td>
<td>3'-7&quot;</td>
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<tr>
<td>U2</td>
<td>11</td>
<td>5</td>
<td>VARIES</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>5</td>
<td>12'-10&quot;</td>
</tr>
</tbody>
</table>

STIRRUP BAR 452

BAR 553
BAR 5U3
BAR 5U2

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.
5. Organic Felt bond breaker (Top) & Expanded Polystyrene shown hatched (ƀ" Side).
6. Locate 6 Expansion Joint in Junction Slab, Raised Sidewalk or Sidewalk, C-I-P Coping or Concrete Barrier or Parapet.

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 Sidewalks 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. See Index 521-610, 521-620 & 521-630 for Bars 4V1 or 5V1 and 5B1.
6. Locate 6 Barrier Wall Inlet a minimum of 10'-0" away from 6 Expansion Joints 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-Neck.
   Washers: ASTM F436 Type 1.
   Anchor Plate: ASTM A529 (Grade 36) or ASTM A36.
   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 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.

12. For Estimated Quantities, see Sheet 6.

13. Unless otherwise noted, Concrete Barrier (36' Single-Slope) is shown in all Views and Sections. The Pedestal details for other Concrete Barriers or pedestrian/bicycle railings are similar.

---

TABLE 1 DESIGN LIMITATION FOR ANCHOR BOLTS (1" Dia.)

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Arm Length (FT)</th>
<th>Base of Pole Height*</th>
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</thead>
<tbody>
<tr>
<td>120</td>
<td>ALL</td>
<td>75 75 75</td>
</tr>
<tr>
<td>140</td>
<td>ALL</td>
<td>75 75 75</td>
</tr>
<tr>
<td>160</td>
<td>8 &amp; 10</td>
<td>75 75 45**</td>
</tr>
<tr>
<td>160</td>
<td>12 &amp; 15</td>
<td>75 75 25**</td>
</tr>
</tbody>
</table>

* Above Natural Ground
** Use 1½" Ø Anchor bolts for wall heights greater than the height shown and less than 75'

---

PLAN VIEW
(Junction Slab reinforcing not shown for clarity)
(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)
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 sidewalk depth to 1'-6".
4. The minimum length of the Junction Slabs, raised sidewalks and sidewalks is 30'-0", measured along the Gutter Line.
5. Bars 4J are only required when pedestals are behind a 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 5B1, 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 521-620 (Vertical Shape), and Index 521-630 (Concrete Parapet).
ELEVATION VIEW (Junction Slab Reinforcing & Bars 4j not Shown for Clarity) (Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)

MINIMUM LIMITS OF C-I-P COPING

NOTES:
1. Field cut Bars 4M2 as required to maintain minimum cover.
2. Maximum clearance between leveling nut and top of pedestal will not exceed anchor bolt diameter.

REINFORCING STEEL BENDING DIAGRAMS - LIGHT POLE PEDESTAL

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

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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</thead>
<tbody>
<tr>
<td>Concrete (Pedestal)</td>
<td>CY</td>
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</tr>
<tr>
<td>Concrete (Thickened Junction Slab)</td>
<td>CY</td>
<td>1.222</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>324.09</td>
</tr>
</tbody>
</table>

(The quantities above are for one C-I-P Light Pole Pedestal. The concrete quantity for the thickened junction slab is based on a 5'-0" length, 9" increase in thickness and a 5" wide retaining wall panel. Adjust thickened concrete quantity as required.)

REVISION:

LAST REVISED: 11/01/17

DESCRIPTION:

REVISION

STANDARD PLANS

FY 2019-20

LIGHT POLE PEDESTAL - WALL COPING

INDEX 521-650

SHEET 3 of 3
GENERAL NOTES:

1. Construct sidewalks in accordance with Specification 522. Use 6" concrete for sidewalks and curb ramps located within curb returns (See Plan View). Install all other concrete with thickness as shown, unless otherwise detailed in the Plans.

2. Include detectable warnings on sidewalk curb ramps in accordance with Index 522-002.

3. For 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 12 mils.

5. Construct sidewalks with Edge Beam through the limits of any surface mounted Pedestrian/Bicycle Railing or Pipe Guardrail shown in the Plan(s). (See RAILING DETAIL)

PLAN

SIDEWALK WITH UTILITY STRIP

LEGEND:

- 4" Thick Sidewalk
- 6" Thick Sidewalk
- Utility Strip

OPEN JOINTS

SAWED JOINTS

LONGITUDINAL SECTION

LEGEND:

A- ½" 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 - ½" Dummy Joint, Tooled

C - ½" Formed Open Joints

D - ½" Saw Cut Joints, ½" Deep (within 96 hours) Max. 12" Centers

E - ½" Saw Cut Joints, 1½"-1½" Deep (within 12 hours) Max. 30" Centers

F - ½" Expansion Joint When Run of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.

G - Cold Joint With Bond Breaker, Tooled

SIDEWALK JOINTS

GENERAL NOTES AND CONCRETE SIDEWALK ON CURBED ROADWAYS

CONCRETE SIDEWALK

INDEX

FY 2019-20
STANDARD PLANS

522-001

1 of 2
**LEGEND:**

- A: 1/8" 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: 1/8" Dummy Joints, Tooled
- C: 1/8" Formed Open Joints
- D: 1/8" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 5' Centers
- E: 1/8" Saw Cut Joints, 1/4" Deep (within 12 hours) Max. 30' Centers
- F: 1/8" Expansion Joint When Run Of Sidewalk Exceeds 30'. Intermediate locations are left to the discretion of the Engineer.

**CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS**
GENERAL NOTES:

1. Cross Slopes and Grades:
   A. Sidewalk, ramp, and landing slopes (i.e. 0.02, 0.05, and 1:12) shown in this Index are maximums. With approval of the Engineer, 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. Ramp slopes are not required to exceed 15 feet in length.
   D. Joints permitted at the location of Slope Breaks. Otherwise locate joints in accordance with Index 522-001. No joints are permitted within the ramp portion of the Curb Ramp.

2. Grade Breaks:
   Grade breaks at the top and bottom of ramps must be parallel to each other and perpendicular to the direction of the ramp slope.

3. Curb, Curb and Gutter and/or Sidewalk:
   A. Refer to Index 522-001 for concrete thickness and sidewalk details.
   B. Remove any existing curb, 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.
SECTION A-A

NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet B.

SIDEWALK CURB RAMPS CR-A AND CR-B

REVISION 11/01/18 DESCRIPTION:

FY 2019-20 STANDARD PLANS

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX 522-002 SHEET 2 of 8

NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet B.
SECTION B-B

NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB
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)

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

DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS
NOTES:

1. Cross Slope of the median crossing not to exceed 0.02.

2. Running Slopes:
   A. Slopes ≤ 0.05: For roadway cross sections 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.

SECTION F-F
NOTES:
1. Where crosswalk markings are used, ramps must fall within the crosswalk limits. A clear space of 48" minimum is required at the bottom of the ramp within a marked crosswalk. If crosswalk markings are not present, a clear space of 48" minimum is required at the bottom of the ramp outside of active travel lanes.
2. Crosswalk widths and configurations vary; must conform to Index 711-001.
3. Flangeway Gap may be up to 3' for Freight-only Railways.

RAILROAD CROSSING
PLACEMENT OF SIDEWALK CURB RAMPS AT CURBED RETURNS (TYP.)

RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS

INDEX 522-002

FY 2019-20
STANDARD PLANS

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

LAST REVISION 01/01/17
DESCRIPTION:
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 18" 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 18" open joints @ 10 Centers and 12" expansion joints with preformed 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)

CONCRETE FLARED DRIVEWAY NOMENCLATURE

PLAN

ELEVATION

CONCRETE FLARED DRIVEWAYS

DESCRIPTION:

FY 2019-20

STANDARD PLANS

INDEX 522-003

1 of 4
**LEGEND:**

- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip

**SIDEWALK WITHOUT UTILITY STRIP**

**WITHOUT SIDEWALK OR UTILITY STRIP ≥ 10' WIDE**

**UTILITY STRIP < 10' WIDE**
SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE: 5' sidewalks shown.

SIDEWALK SECTIONS ON CURBED FACILITIES WITH SIDEWALKS

CONCRETE FLARED DRIVEWAYS

STANDARD PLANS

FY 2019-20

INDEX 522-003

Sheet 3 of 4

REVISED 11/01/18

DESCRIPTION: REVISED

11/01/18

STANDARD PLANS

FY 2019-20

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Sheet 3 of 4

REVISED 11/01/18

DESCRIPTION: REVISED

5' sidewalks shown.
**CONCRETE FLARED DRIVEWAYS**

**SIDEWALK WITHOUT UTILITY STRIP**

**SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE**

**SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE**

NOTE:
3' sidewalks shown.

---

**DESCRIPTION:**

**GENERAL APPLICATIONS**

**REVISION**

**STANDARD PLANS**

**FY 2019-20**

**INDEX**

**SHEET**

**522-003**

4 of 4
**Profile of Ditch Pavement**

**At Locations Other Than Junction With Lateral Ditch**

**Plan**

**Swaled Median (No Weep Holes)**

**Roadway Side Ditch**

**Typical Section**

**Weep Hole Arrangement**

**Alternate Ditch Pavement**

**Junction of Roadway Ditch and Lateral Ditch**

**Junction of R/W Ditch and Lateral Ditch**

**Section AA**

**Section Matting for Ditch**

**Standard Paved Ditch**

**Paved Ditch End Treatment**

**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' minimum intervals, or as directed by the Engineer. Construction joints may be autobonded (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.

3. A top bar joint filler shall be constructed at all inlets, endwalls, and at intervals of not more than 200'.

4. Toe walls are to be used with all ditch paving. Toe walls are not 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 858 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 to be paid for under contract unit price for Performance Turf, S.

---

**Table 1: Ditch Pavement**

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Dimensions</th>
<th>Payment Unit</th>
<th>Base of Estimate</th>
<th>Bitumen Filter Fabric</th>
<th>Bitumen Type</th>
<th>Bitumen Fiber Range</th>
<th>References &amp; Remarks</th>
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<td>Low-Grade</td>
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<td>Specification 528</td>
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<td>Miscellaneous</td>
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<td>Low-Moderate</td>
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<td>1'</td>
<td>Low-Grade</td>
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<td>Riprap</td>
<td>1' x 1'</td>
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<td>Moderate</td>
<td>2</td>
<td>Specification 530</td>
<td>Filter Fabric Required</td>
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**Section EE**

**Paved Ditch**

**Flow Line**

**Up (R Pivot)**

**Standard Paved Ditch**

**Pavement**

**Filter Fabric**

**Paved Ditch End Treatment**

**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' minimum intervals, or as directed by the Engineer. Construction joints may be autobonded (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.

3. A top bar joint filler shall be constructed at all inlets, endwalls, and at intervals of not more than 200'.

4. Toe walls are to be used with all ditch paving. Toe walls are not 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 858 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 to be paid for under contract unit price for Performance Turf, S.

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**Ditch Pavement and Sodding**

**Index**

**524-001**

1 of 2
BONDED OPTION

NAILED OPTION

Note: Either option may be used unless otherwise called for in the plans.

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>INDEX 430-030</th>
<th>INDEX 430-031</th>
<th>INDEX 430-040</th>
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| Toe Of Slope | Toe Of Slope | Toe Of Slope | Toe Of Slope |

Note: Sodding quantities for each endwall to be determined by the designer from this detail.

PIPE/CULVERT END TREATMENTS

DITCH PAVEMENT AND SODDING

INDEX 524-001

SHEET 2 of 2
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: +/- ¼"
   C. Plane of side mold: +/- 1/16"  
   D. Openings: +/- 1/32"  
   E. Out of Square: 1/8" per 6 ft., but not more than 3/8" total along any side  
   F. Warping: 1/16" per foot distance to nearest corner  
   G. Bowing: 1/240 panel dimension  
   H. Surface Smoothness for Type "A" Smooth Surface Texture Option: +/- 1/16"
Running Bond Block:
12" x (12", 14", 16" & 12") (1st course)
6" x (21", 10" & 23") (2nd course)
12" x (9", 10", 21" & 14") (3rd course)
6" x (16", 14" & 24") (4th course)

1:15 Min. Bevel
Ɓ
Mortar Joint
ƈ
Amplitude
4" o.c.
1" o.c.
Typ.
ƀ
Random 3/8 - 3/8 Gravel Texture

Type "A"
SMOOTH

Type "B"
ASHLAR STONE
3/8 Back Face
1/4 Front Face
Varies
3/8 to 7/8

Type "C"
SPLIT FACE RUNNING BOND BLOCK
3/8 Mortar Joint
3/8 Amplitude
8" x 16" Running Bond Block

Type "D"
FRACUTED GRANITE
3/8 Depth

Type "E"
WIRE-CUT BRICK
3/8 Depth
Mortar Joint
20" x 7/8 Running Bond Brick

Type "F"
CUT CORAL BLOCK (RUNNING BOND)
1/8 Mortar Joint
3/8 Amplitude
Running Bond Block:
12" x (12", 14", 16" & 12") (1st course)
6" x (21", 10" & 23") (2nd course)
12" x (9", 10", 21" & 14") (3rd course)
6" x (16", 14" & 24") (4th course)

Type "G"
VERTICAL FRACUTED FIN

Type "H"
TRAPEZOID VERTICAL FINS W/ FRACUTED FACE (COLORADO DRAG AGGREGATE)

Type "I"
GRANITE TEXTURE

NOTES:
1. Surfaces shall be formed, rolled, or pressed using form liners in accordance with the Plans and Specifications for Class 2 Surface Finish.
2. See Noise Wall Data Tables for project aesthetic requirements.
DESCRIPTION:

LAST REVISION: 07/01/14

Rev: 00

REVISED

REV 00

NOTE: 00

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SHEET 3 of 16

FORMED ROLLER

SECOND LAYER SURFACE FOR RECESS

GRAPHICS & TEXTURE DETAILS

HALF ELEVATION

(Front Face Post and Panel Texture Type "H" shown)

(Graphic Type SE-2 shown)

(Two stacked panels shown, three stacked panels similar)

TYPICAL FORMING DETAIL

(Front Face Panel Texture Type "H" shown)

(Back Face Panel Texture Type "D" shown)

(Post Forming Details Similar)

NOTES:

1. Submit specific form liner samples for approval by the Engineer.

2. Textures and graphics shown are for demonstration purposes only. See Noise Wall Data Tables in the plans for project specific texture and graphic requirements.
**DESCRIPTION:**

**REVISION:**

**LAST REVIEW:**

**INDEX:**

**SHEET:**
NOTE:
At the Contractor's option, Smooth or Deformed Wire Reinforcement may be used (equal area).

* Vertical Steel ~ #4 Bars @ 10" (As=0.24 in²/ft.) (Typ.)

** Horizontal Steel ~ #4 Bars @ 8" (As=0.30 in²/ft.) (Typ.)

TYPICAL PANEL ELEVATION
* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using tilt-tables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in²/ft.).

STANDARD PICK UP POINTS FOR PANELS
(Panels shall be rotated about long axis only)

### SECTION D-D
(Showing Flush Type Panel)

- See Detail "A"

### SECTION D-D
(Showing Recessed Type Panel)

- See Detail "B"

**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.

**TYPICAL PANEL DETAILS**
NOTE: The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2Δ°) between panels exceeds 7°.

NOTE: The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2Δ°) between panels exceeds 20°.

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)

* Hole Types A, B, C and D refer to distance from bottom of panel to center of opening. See Wall Control Drawings in the plans.

**SECTION F-F**

**GRATING DETAIL**

**SECTION G-G**

**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 1/2" Ø x 2" min. corrosion resistant (zinc/aluminum alloy or stainless steel) expansion anchors to connect grates to panels.

3. Blockout textured concrete surface for a strip 2" wide around drainage hole to enable secure attachment of the drainage grate.

**DRAINAGE HOLE DETAILS**
NOTES:
1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
NOTE:
1. For Pile Length Tables, see Sheets 15 and 16.

STANDARD POST PLACEMENT IN AUGER CAST PILE
(H-Post Shown, 45° Corner Posts Similar)

LOW CLEARANCE OPTION

POST PLACEMENT & PILE REINFORCING STEEL DETAILS

10 - #9 Bars (Typ.), See Section P-P
45° POST NOTES:
1. Reference Sheets 8 & 9 for location of Sections.
   Space Bars P7 as shown for Bars P1.
   Space Bars P8 as shown for Bars P2.
2. Match texture thickness with appropriate Panel face.
3. For Post Reinforcing, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.
REV ISIO N

DESCRIPTION:

1 0 /3 0 /2 0 1 8
1 :5 1 :4 2  P M

#4 Bars (Typ.)

 Bars A (Typ.)

 Bars B (Typ.)

 Bars P5 (Pairs)

 Bars P4 (Typ.)

 Bars A (Typ.)

 Bars B (Typ.)

 Bars P5 (Pairs)

 Bars P4 (Typ.)

 Bars A (Typ.)

 Bars B (Typ.)

 Bars P5 (Pairs)

 Bars P4 (Typ.)

 Bars A (Typ.)

 Bars B (Typ.)

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 Bars P5 (Pairs)
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".

SECTION T-T
C-I-P COLLAR

SECTION U-U

90° CORNER TYPICAL POST PLACEMENT DETAILS
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".
### TABLE 2A - TABLE OF POST REINFORCING STEEL

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### TABLE 3A - TABLE OF POST REINFORCING STEEL

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### TABLE 3B - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 170 MPH</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
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<tr>
<td></td>
<td>BARS A</td>
<td>BARS B D BARS E</td>
<td>BARS A</td>
<td>BARS B D BARS E</td>
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<td>SIZE</td>
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<td>22'-9&quot;</td>
<td>23'-0&quot;</td>
<td>22'-9&quot;</td>
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</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 are restricted to those required for geometric needs only.
3. Post spacing is measured from centerline to centerline of foundation element. This Index, posts and foundation elements have been designed for 20 ft. spacings. Use post spacings 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.

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 W 1.2 (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 962. 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 1 T-180. Perform soil density tests at 100 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 8-2A 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 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 C1329
D. Grout: Type S, coarse grout.
E. Aggregate for Grout: Meet the requirements of ASTM C404 or Specification Section 901 size 08 or 09.
F. Use W 1.7 (9mm) galvanized ladder reinforcing spaced at 16" vertically. Provide special accessories for corners, intersections, etc. Joint reinforcing shall be continuous except it shall not pass through vertical masonry control joints. Lap joint reinforcing a minimum of 6".

MASONRY OPTION 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 are restricted to those required for geometric needs only.
3. Post spacing is measured from centerline to centerline of foundation element. This Index, posts and foundation elements have been designed for 20 ft. spacings. Use post spacings 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.

PERIMETER WALLS

GENERAL WALL ELEVATION
(Precast Option with Single Height Panel Shown, Others Similar)
DRAINAGE DETAILS

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.
ELEVATION STEP AT TOP OF WALL

(Precast Panel Cap not Shown)

3" (Typ.)

Bottom Panel

Post & Pile

Top Panel

Post Spacing (S)

5/4

(20'-0" Max.)

Precast Post Cap (Typ.)

(See Sheet 2)

Top of wall elevation

See Detail "A"

Bearing Pad

Bearing Pad

Fill with Non-Shrink Grout

Typical Post

Typical Post

SECTION D-D

SECTION E-E

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°.

DETAIL "A"

(Back Face Chamfer Shown Front Face Chamfer Similar)

ELEVATION STEP AT BOTTOM OF WALL

(Auger Cast Pile (Typ.)

(1'-4" Max.)

Top Panel

Auger Cast Pile (Typ.)

Top Panel

Typical Post

Typical Post

Fill with Non-Shrink Grout

Typical Post

Typical Post

Typical Plan

* Nominal embedment (not including tolerances)
**TYPICAL PANEL ELEVATION**

*In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using lift-cables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in.²/ft.).*

**Panel Height (H):**
- 0.207 H
- 0.586 H
- 0.207 H

**Panel Length (L):**
- 0.207 L
- 0.586 L
- 0.207 L

**Texture Front Face**

**Pick up points**

**Notes:**
- At the Contractor's option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).
- Vertical Steel - #4 Bars @ 10" (As=0.24 in.²/ft.) (Typ.)
- Horizontal Steel - #4 Bars @ 7/8" (As=0.32 in.²/ft.) (Typ.)

**DETAIL "B" - TOP-INSTALLED** *(Typ. Both Ends)*

**DETAIL "B" - SIDE-INSTALLED** *(Typ. Both Ends)*

**SECTION F-F**

**SECTION G-G**

**STANDARD PICK UP POINTS FOR PANELS** *(Panels shall be rotated about long axis only)*
**TYPICAL POST SECTION**
(H Section)

**SECTION H-H**
(H Section - Above Collar)

- Roadway face of wall
- Front Face Post Texture (Formed)

<table>
<thead>
<tr>
<th>Post &amp; Wall (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'-4&quot;</td>
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</table>

Bar Length = 2'-30"

Bar Length = 9'-0"

All bar dimensions in bending diagrams are out-to-out.
All bars not shown in the bending diagrams are straight.

**LOW CLEARANCE OPTION**

- See Shop Drawing for Post Lengths.

**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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<td>#3</td>
<td>#4</td>
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<tr>
<td>150</td>
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<td>#3</td>
<td>#3</td>
<td>#4</td>
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<tr>
<td>170</td>
<td>15'-6&quot;</td>
<td>#3</td>
<td>#3</td>
<td>#4</td>
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</table>

**SECTION I-I**
(Precast Collar)

**SECTION H-H**
(for Low Clearance Option)

**BAR BENDING DETAILS**

**SECTION J-J**

PRECAST OPTION - STANDARD POST DETAILS
STANDARD POST PLACEMENT IN AUGER CAST PILE
(Standard Post Shown, 45° and 90° Corner Posts Similar)

Notes:
1. For Reinforcing Steel Sizes and Pile Lengths, see Table 1, Sheet 6.
2. For Corner Posts, see Sheet 8.
3. For Typical Post Section Dimensions, see Sheet 6.
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 POST FOR 90° CORNERS

Bar Length = 2'-3½"

BAR P3
(90° Corner)
Bar Length = 3'-3½"

BAR P6
(90° Corner)
Bar Length = 4'-2"

BAR P4
(45° Corner)
Bar Length = 2'-3½"

BAR P5
(45° Corner)
Bar Length = 4'-6½"

All bar dimensions in bending diagrams are out-to-out.
All bars not shown in the bending diagrams are straight.

SPECIAL POSTS FOR 45° CORNERS

PRECAST OPTION - SPECIAL CORNER POSTS

ELEVATION VIEW
(Low Clearance Shown)

SECTION I-I
(See Note 3)

ELEVATION VIEW

SECTION H-H

SECTION I-I
(See Note 3)

SPECIAL POSTS FOR 90° CORNERS

PRECAST OPTION - SPECIAL CORNER POSTS

PERIMETER WALLS

STANDARD PLANS

FY 2019-20

INDEX

SHEET

534-250

8 of 10
Notes:
1. End vertical reinforcing bars 13⁄4" from top of bond beam blocks and horizontal bars 13⁄4" from edge of control joints.
2. Do not continue horizontal #4 bond beam reinforcing through control joint.
3. Use stainless steel joint stabilizing anchors spaced at 16" vertically at all control joints. Install per manufacturer's instructions.
4. Seal Control Joints with backer rod and Type "A" silicone sealant (top and both sides).
5. See Sheet 10 for Bar placement details.
6. For Pilaster Cap Details, see Sheet 2.
REINFORCING AT PILASTER WITH EXPANSION JOINT
(Step Shown, without Step Similar)
(T-Footing Shown, Trench Footing Similar)

Notes:
1. For location of Sections K-K and L-L see Sheet 9.
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.
<table>
<thead>
<tr>
<th>SHEET</th>
<th>CONTENTS</th>
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<tbody>
<tr>
<td>1</td>
<td>General Notes:</td>
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<tr>
<td></td>
<td>Index Contents</td>
</tr>
<tr>
<td>2</td>
<td>General, TL-3 Guardrail - Installed Plan and Elevation</td>
</tr>
<tr>
<td>3</td>
<td>Low-Speed, TL-2 Guardrail - Installed Plan and Elevation</td>
</tr>
<tr>
<td>4</td>
<td>W-Beam and Thrie-Beam Panel Details</td>
</tr>
<tr>
<td>5</td>
<td>Post and Offset Block Details</td>
</tr>
<tr>
<td>6</td>
<td>Guardrail Sections - Heights and Adjacent Slopes</td>
</tr>
<tr>
<td>7</td>
<td>End Treatment - Approach Terminal Geometry, Parallel and Flared</td>
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<tr>
<td>8</td>
<td>End Treatment - Approach Terminal Geometry, Curbed and Double Faced</td>
</tr>
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<td>9</td>
<td>End Treatment - Trailing Anchorages</td>
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<td>10</td>
<td>End Treatment - Component Details</td>
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<td>11</td>
<td>End Treatment - Controlled Release Terminal (CRT) System</td>
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<td>Layout for CRT System - Side Roads and Crossways</td>
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<td>13</td>
<td>Approach Transition Connection to Rigid Barrier - General, TL-3</td>
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<tr>
<td>14</td>
<td>Approach Transition Connection to Rigid Barrier - Low-Speed, TL-2</td>
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<td>Approach Transition Connection to Rigid Barrier - Details</td>
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<td>16</td>
<td>Approach Transition Connection to Rigid Barrier - Double Faced Guardrail</td>
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<td>17</td>
<td>Layout to Rigid Barrier - Approach Ends</td>
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<tr>
<td>18</td>
<td>Layout to Rigid Barrier - Approach Ends with Double Faced Guardrail</td>
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<td>19</td>
<td>Tub Rail Details</td>
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<td>20</td>
<td>Pedestrian Safety Treatment - Pipe Rail</td>
</tr>
<tr>
<td>21</td>
<td>Modified Mount - Special Steel Post for Concrete Structure Mount:</td>
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<td></td>
<td>Modified Mount - Encased Post for Shallow Mount:</td>
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<tr>
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<td>Modified Mount - Fragible Leave-Out for Concrete Surface Mount</td>
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<tr>
<td>22</td>
<td>Barrier Deterritorial - Post Mounted:</td>
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<td>Clear Space - Reduced Post Spacing for Hazards:</td>
</tr>
<tr>
<td></td>
<td>3/8&quot; Button-Head Bolt System</td>
</tr>
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</table>

**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 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 1/2 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 551. Place washers under nuts.

6. **MISCELLANEOUS ASPHALT PAVEMENT:** Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ±1" depth and in accordance with Specification 339.

7. **ADJACENT SIDEWALKS & SHARED USE PATHS:** When guardrail posts are placed within 4'-0" of a sidewalk or shared use path, use timber posts or use steel posts only if treated with Pipe Rail as shown on Sheet 20.

   When timber posts are used, one of the following safety treatments is required for the bolts(s) protruding from the back face of the posts:
   
a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification 562.

   b. Use post bolts 15" in length and countersink the washer and nut between 1/2" and 1 1/2" deep into the back face of the post.

   c. Use 15" post bolts with sleeve nuts and washers.

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. 2" 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 Low-Speed 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 1/2 of the panel’s post bolt slots at the approach/trailing ends).
GENERAL GUARDRAIL
INSTALLED ELEVATION

INSTALLATION SECTION

NOTES:
1. GENERAL: Install the General Guardrail configuration where indicated in the plans. This may include tapered segments if called for in the plans.

2. MIDSPAN PANEL LAP SPlice: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

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).
LOW-SPEED GUARDRAIL

INSTALLED ELEVATION

INSTALLED PLAN

LOW-SPEED GUARDRAIL

NOTES:

1. GENERAL: Install the Low-Speed Guardrail configuration where indicated in the plans. Low-Speed Guardrail may include tapered segments if called for in the plans.

Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 9'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" post spacing to meet the nominal Begin/End Guardrail Sta. required.

Where a differing guardrail configuration is required for constructability beyond the options shown in this Index or the Plans, obtain approval from the Engineer prior to installation.

2. MIDSPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

Lap the Panels with the Splice Ridge oriented downstream of the final Direction of Traffic in the nearest traffic lane. For reverse lane conditions, orient the Splice Ridge downstream of the lane direction with the highest traffic volume. Orienting Lap Splices for Temporary Traffic Control phasing is not required.

3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the following Index Sheets, APL Drawings, or the plans.


5. POST & OFFSET BLOCK DETAILS: See Sheet 5.

6. GUARDRAIL SECTIONS: For Sections showing typical mounting heights, grading, and lateral offsets in relation to adjacent roadway features, see Sheet 6.

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalk, roadway features, see Sheet 6.

8. RESTRICTIONS: Low-Speed Guardrail segments are not permitted for use with items including, but not limited to, Double Face W-Beam, Modified Thrie-Beam, Deep Posts at Slope Breaks, Pipe Rail, and/or Rub Rail.
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 where specified in the Plans, use the Deep Post 'L' for slope break conditions as shown on Steel 6.

2. **OFFSET BLOCKS:** For each panel type, install the corresponding offset block type as shown. For General, 1'-3' (Single Faced) Approach Transitions only, use the 1'-0" Thrie-Beam Block (See Steel 12).

3. **BOLT HOLES:** Bolt Holes shown in posts within this index may be substituted with 3/8" Bolt Holes.

4. **DOUBLE FACED GUARDRAIL:** Orient Post Bolts with the Steel Block as shown to prevent Block rotation. Use steel 3/8" Bolt Holes shown in posts within 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 where specified in the Plans, use the Deep Post 'L' for slope break conditions as shown on Steel 6.

5. **MODIFIED THRIE-BEAM SYSTEM:** 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 3/8" Type 256 nails with ASTM A153 hot-dip galvanization. For steel posts, drive the nail through the unused flange Bolt Hole and bend the nail so its head contacts the flange.

7. **MATERIALS:** Use Timber and steel posts and offset blocks in accordance with Specification 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.

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**POST AND OFFSET BLOCK DETAILS**

**INDEX:** 536-001

**SHEET:** 5 of 22
GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS

GUARDRAIL SECTIONS - CURB & GUTTER

GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS

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 by the plans.

2. TYPICAL GRADING & PAVEMENT PLACEMENT DETAIL: Construct features as depicted except where superceded by specific Guardrail Sections or the plans. Place the Slope Break a Minimum of 2' behind the post. For Deep Posts, the slope break may be placed at the Edges of Guardrail as shown in the plans.

3. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callout. For offset changes, transition 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.

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.

5. ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

GUARDRAIL SECTIONS - SHOULDER GUTTER

5. ADJACENT TO SHOULDER GUTTER: 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.
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.

2. GENERAL GUARDRAIL: General Guardrail typically includes Panels, Posts, and Frangible Leave-Outs, are not permitted within the Approach Terminal segment unless otherwise called for 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 DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 536. 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.

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.


Projected Face of General Guardrail

APPENDIX TERMINAL ASSEMBLY
'PARALLEL' SEGMENT - PLAN VIEW

Edge of 2" Misc. Asphalt Pavt. (See Note 2)
Front Slope Break

APPENDIX TERMINAL ASSEMBLY
'FLARED' SEGMENT - PLAN VIEW

Edge of 2" Misc. Asphalt Pavt. (See Note 2)
Front Slope Break

SECTION AT POST (1)
WITH UNPAVED SHOULDER

SECTION AT POST (1)
WITH FULLY PAVED SHOULDER

SECTION AT POST (1)
WITH SHOULDER GUTTER

END TREATMENT - APPROACH TERMINAL GEOMETRY PARALLEL AND FLARED

APPENDIX TERMINAL ASSEMBLY
'PARALLEL' SEGMENT - PLAN VIEW

APPENDIX TERMINAL ASSEMBLY
'FLARED' SEGMENT - PLAN VIEW

SECTION AT POST (1)
WITH UNPAVED SHOULDER

SECTION AT POST (1)
WITH FULLY PAVED SHOULDER

SECTION AT POST (1)
WITH SHOULDER GUTTER

APPENDIX TERMINAL ASSEMBLY
'PARALLEL' SEGMENT - PLAN VIEW

APPENDIX TERMINAL ASSEMBLY
'FLARED' SEGMENT - PLAN VIEW

SECTION AT POST (1)
WITH UNPAVED SHOULDER

SECTION AT POST (1)
WITH FULLY PAVED SHOULDER

SECTION AT POST (1)
WITH SHOULDER GUTTER

END TREATMENT - APPROACH TERMINAL GEOMETRY PARALLEL AND FLARED

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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 general guardrail away 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'-0" 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 (See Sheet 6). For Double Faced Segments, the End Treatment Height 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 ALI 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 536.

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 Specification Section 967. End Units are referred to as "End or Buffer Sections" in AASHTO M180. Lap the Flared End Unit behind the W-Beam; lap the Rounded and Buffered End Units over the face of the W-Beam.

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 sheeting to the approach face of the End Unit in accordance with Specification Sections 336 and 967.
NOTES:

1. INSTALLATION: Use components as shown on Sheets 9 & 11.

2. MATERIALS: Use steel plates, channels, and Cable Assemblies in accordance with Specification 967.

3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2 3/8" Hex Head Bolt (Typ) into the Foundation Plate Edge (Three Sides) respectively. Two Hex Nuts may be used for the Hex Jam Nut System.

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 may be substituted with a single bolt hole located at the tube centerline.
**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 for a minimum 2’ behind the posts, and maintain a slope not steeper than 1:2 beyond 2’ 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 \( \frac{3}{8} \) 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 within the CRT radius using the General configuration of \( \frac{3}{8} \) Button-Head Bolts (8 reqd. per splice).

7. **GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans. The layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required. For existing bridge connection options, see indexes 536-002, 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. 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 toe as shown. See Sheet 15 for the required offset of the connecting 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 536-002, 521-404, and 521-405.

5. OFFSET BLOCKS: For Thrie-Beam post locations within the Length of Approach Transition segment, use the Timber Offset Blocks with 1'-6" height shown on Sheet 5. For the midspan of the Three-Beam Transition Panel and for all other W-Beam locations shown herein, use the W-Beam Offset Blocks with 1'-6" height.

6. 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 calculations in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length 'LA'.

7. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Terminal, Low Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

APPRAOCH TRANSITION CONNECTION TO RIGID BARRIER - GENERAL, TL-3
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. The required offset of the connecting adjacent guardrail is shown in the plans. The Layouts given on Sheet 17 provide basic schemes for connections to adjacent guardrail, where a taper to a differing guardrail offset may be required. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

   For existing bridge connection options, see Indexes 536-000, 521-404, and 521-405.

2. SECTION VIEWS & DETAILS: For cross sections and details including the barrier mounting hardware, turn 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. The transition may require a different shape depending on the End Transition option indicated in the plans (Either a Shoulder Gutter Option, Raised Curb Option or Flat No Curb Option). See Sheet 15 for curb shape details.

4. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-001, and Traffic Railing, Indexes 521-420 thru 521-426, for details.

5. OFFSET: The required offset difference between the Face of Guardrail and Rigid 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.
DESCRIPTION:

Alignment Curb

2. END TRANSITION OF CURB OPTION: Install one of the three End Transition types shown per Section E-E as indicated by the plans.
3. GRADING BEHIND POSTS: Place Slope Break a Min. 2'-0" behind the post, per Sheet 6.
4. MATERIALS & CONSTRUCTION: Construct the concrete Aligning Curb and Curb transition in accordance with Specification 967.

APPENDIX TRANSITION CONNECTION - DETAILS

CURB TRANSITION ISOMETRIC VIEWS

NOTES:

2. END TRANSITION OF CURB OPTION: Install one of the three End Transition types shown per Section E-E as indicated by the plans.
3. GRADING BEHIND POSTS: Place Slope Break a Min. 2'-0" behind the post, per Sheet 6.
4. MATERIALS & CONSTRUCTION: Construct the concrete Aligning Curb and Curb transition in accordance with Specification 967.

CURB TYPICAL SECTIONS

SECTION B-B
BEGIN ALIGNMENT CURB
(Mate to Rigid Barrier)

SECTION C-C
ALIGNMENT CURB
(Intermediate)

SECTION D-D
BEGIN TRANSITION
(End Alignment Curb)

SECTION E-E
END TRANSITION
SHOULDER GUTTER OPTION

SECTION E-E
END TRANSITION
RAISED CURB OPTION

SECTION E-E
END TRANSITION
FLAT NO CURB OPTION

RAISED CURB OPTION

FLAT NO CURB OPTION

CURB TYPICAL SECTIONS

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TL-3 DOUBLE FACED APPROACH TRANSITION
INSTALLED ELEVATION

TL-3 DOUBLE FACED APPROACH TRANSITION
INSTALLED PLAN

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.

2. THRIE-BEAM TERMINAL CONNECTOR: See Sheet 15 for Details. The installed bolt's threaded portion is not permitted to extend beyond 3/8 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 if the required offset of the guardrail shown herein it indicated in the plans.

APPROACH TRANSITION CONNECTION TO RIGID BARRIER WITH DOUBLE FACED GUARDRAIL

LAST REVISION 01/01/17
DESCRIPTION: FY 2019-20 STANDARD PLANS
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**Shoulder Line**

**DESCRIPTION:**

**Bridge Break**

**Slope Guard**

**H**

**Rigid Barrier**

**Offset Block**

**Std. Post & Offset Block**

**CROSSOVER GUARDRAIL FOR MEDIAN SHOULDERS ONLY**

**TYPE A APPROACH TO RIGID BARRIER - PLAN VIEW**

**MEDIAN OR OUTSIDE SHOULDERS**

(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)

**TYPE B APPROACH TO RIGID BARRIER - PLAN VIEW**

**CROSSOVER GUARDRAIL FOR MEDIAN SHOULDERS ONLY**

**DUAL BRIDGE APPROACH CONFIGURATION**

(Mirror Horiz. 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.
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.

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.

LAYOUT TO RIGID BARRIER - APPROACH ENDS WITH DOUBLE FACED GUARDRAIL
1. GENERAL: Install Rub Rail where called for in the plans. Position as shown on Sheet 6 unless otherwise shown in the plans. Install the backs of Rub Rail panels flush against Standard Posts. Either of the Channel Section or Bent-Plate Panel Rub Rail options may be used (consistent type per project). Where Double Sided Rub Rail is called for, thread the Button-Head Bolt through the Post Bolt Hole(s) and the panels on either side, and tighten the nut against the face of the panel farthest from adjacent traffic lanes. Trim the bolt's threaded portion in accordance with Note 4 on Sheet 5.

2. MOUNTING HEIGHT: Mount to the Standard Post's Rub Rail Bolt Hole as defined on Sheet 5.

3. MATERIALS: Use steel components in accordance with Specification 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.
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), Approach Transition (LT), and Approach Transition (CT) 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.
1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, steps, piers, footings, or other underground obstructions, an Encased Post may be installed. When the post location conflicts with the structure, a Special Steel Post may be installed. When the post location conflict results in post(s) conflicting with the structure, the structure must be adjusted or excavated. When the post location conflict results in post(s) conflicting with a concrete structure, 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, the Steel Base Plate is not located entirely on the structure at least 3" from the Edge of Concrete, the longitudinal post location may be altered by up to 1'-6" (Quarter Span) from the original required spacing location to prevent the Edge Conflict. With the post location adjusted, use a Std. Post mounted in soil (Option 1) or a Special Steel Post with its Base Plate mounted entirely on the structure (Option 2). Maintain the original required spacing locations upstream and downstream of the structure.

3. BASE PLATE MOUNT: Install Special Steel Posts as shown using steel Adhesive-Bonded Anchor Bolts in accordance with Specifications 536. Use 3/8" Hex-Head Bolts for structures less than 8' deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 3/8" Post Bolt Slots(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 Slot(s) requirements of Specification 536. 

5. MATERIALS: Use steel base plates in accordance with Specification 536.

### SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT

**NOTES:**

1. INSTALLATION: When the construction of Guardrail at the required post spacing results in post(s) conflicting with underground utilities or other underground obstructions, an Encased Post may be installed. When the post location conflict results in post(s) conflicting with the structure, a Special Steel Post may be installed. When the post location conflict results in post(s) conflicting with a concrete structure, 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. REDUCED-LENGTH STANDARD POST: Use a Standard Post with reduced length such that the Panel Height 'H' is maintained while the post bottom terminates 3" from the bottom of the Concrete Foundation. Typically, the Post Length 'L' is 4'-7" for W-Beam Guardrail.

3. FOUNDATION: Use non-reinforced Class NS Concrete material in accordance with Specification 347. After casting the concrete, ensure the surrounding soil material is compacted and tamped to provide full passive resistance.

4. LIMIT: Encased Posts are not permitted for consecutive posts unless otherwise shown in the plans.

### INSTALLED PLAN EXAMPLE (Curb Inlet Top Type 2 Shown)

**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 Flangable Leave-Out around the post base as shown. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

   For the required 1'-6" x 1'-0" Leave-Out, smooth-cut the existing concrete surface or form-up the square shape when an application has new surrounding concrete. Ensure Flangable Fill surface is smooth and even with the adjacent concrete surface.

2. MATERIALS: Use Non-Excavatable Flangable Fill in accordance with Specification 121, not to exceed 150 psi.

### 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 Flangable Leave-Out around the post base as shown. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

   For the required 1'-6" x 1'-0" Leave-Out, smooth-cut the existing concrete surface or form-up the square shape when an application has new surrounding concrete. Ensure Flangable Fill surface is smooth and even with the adjacent concrete surface.

2. MATERIALS: Use Non-Excavatable Flangable 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 and 705, and with the manufacturer's design as approved on the APL.

2. MATERIALS: Use materials of the size and type defined for Barrier Delineators in Specifications 993.

3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane's edge line.

4. MOUNT LOCATIONS: Mount Barrier Delineators as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:
   - S1 = 25' - 1 Space
   - S2 = 50' - 1 Space
   - S3 = 75' - 1 Space
   - S4 = 100' - 1 Space for the Remaining Run
   
   Additionally, place a Barrier Delineator on Post (2) of the Trailing Anchorage 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. BUTTON-HEAD BOLT SYSTEM

   - **Application(s):**
     - Steel Post Mount - Single Faced Guardrail
     - Timber Post Mount - Single Faced Guardrail
     - Steel or Timber Post Mount - Double Faced Guardrail
     - Modified Three-Beam Panel / Terminal Connector Splice

   - **Length 'L':** Full Length

   - **Min. Thread Length:**
     - Panel Splice: 16" (one bolt per panel)
     - Steel Post Mount - Single Faced Guardrail: 25" (one bolt thru both post flanges may be replaced with two 10" Length bolts)
NOTES FOR GUARDRAIL TRANSITIONS CONNECTING TO TRAFFIC RAILING RETROFITS ON EXISTING BRIDGES

1. The transition detail shown on this sheet shows (a) the standard post spacings within the typical thrie-beam approach transitions connecting to existing bridges with retrofitted traffic railings, and (b) depict the typical alignments of the approach transitions.

2. The curb and gutter flare shown on this sheet is typical of flares that are to be constructed when approach slab curbs extend to the beginning of the slab, and where other treatment to curb blunt ends are not in place.

3. The special steel post for roadway thrie-beam transitions detailed on this sheet is specific to all transition applications on this index that require one or more steel posts.

The special steel post and base plate assembly shall be fabricated in accordance with Specification 967.

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.

4. Anchor studs and nuts shall be hot-dip zinc coated in accordance with the Specifications. After the nuts have been snug tightened, the anchor stud threads shall be single punch distorted immediately above the top nuts to prevent loosening of the nuts. Distorted threads shall be coated with a galvanizing compound in accordance with the Specifications.

Adhesive bonding material systems for anchors shall comply with Specification 937 and be installed in accordance with Specification 416.4. Rested beam extensions and points for terminal connector attachments will vary for traffic railing barrier vertical face retrofits. The plan views for the vertical face retrofit barriers show the primary configurations for each particular scheme. The associated pictorial views show the variations.

5. For installing thrie-beam terminal connector to traffic railing vertical face retrofits, see notes on Sheets 35 through 18 and the Flag notation on Sheet 26.

6. Payment for connections to traffic railing vertical face retrofits are to be made under the contract unit price for Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate and bolts, nuts and washers.
GUARDRAIL LENGTH (FT.)

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<td>182.5</td>
<td>38</td>
<td>212.5</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>&lt; 1500</td>
<td>24</td>
<td>143.75</td>
<td>24</td>
<td>143.75</td>
<td>24</td>
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<tr>
<td>45-55</td>
<td>≥ 1500</td>
<td>34</td>
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<td>38</td>
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<td>45-55</td>
<td>&lt; 1500</td>
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<td>143.75</td>
<td>24</td>
<td>143.75</td>
<td>24</td>
<td>143.75</td>
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<tr>
<td>45-55</td>
<td>20' Urban w/o Curv</td>
<td>18</td>
<td>92.5</td>
<td>36</td>
<td>106.5</td>
<td>18</td>
<td>92.5</td>
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</table>

Note: Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and on the length of advancement needed for flared end anchorages. The lengths may be adjusted for connection location, shoulder treatment, auxiliary lanes, parallel end anchorage, skewed crossings, and other hazards present.

APPROACH SLAB TREATMENTS FOR BRIDGES WITH CONCRETE TRAFFIC RAILING

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN WIDE MEDIANs WITH FLUSH SHOULDERS
DESCRIPTION:

REVISED

STANDARD PLANS

REVISI0N

11/01/18

CONNECTIONS FOR EXISTING BRIDGES

FA40

LAST

REVISION

11/01/18

INDEX

536-002

SAMPLE PLANS

1.5

50

45

1.15

1.10

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

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M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  1 0 ' B R I D G E  S H O U L D E R S

M E D I A N S  W I T H  6 ' B R I D G E  S H O U L D E R S
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
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 460-473 & 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

SEE INDEX 460-474 - SCHEME 3
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

Traffic Railing (Thrie-Beam Retrofit)

Key Post (Q Post Bolt)

Existing Railing and Pedestrian Rail,

Pictorial View

SEE INDEX 460-471 - SCHEME 1

SEE INDEX 460-471 - SCHEME 2

SEE INDEX 460-471 - SCHEME 3

Nest W-Beam

Nest W-Beam

Nest W-Beam

Nest W-Beam

PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

Traffic Railing (Thrie-Beam Retrofit)

Key Post (Q Post Bolt)

Existing Railing and Pedestrian Rail,

Pictorial View

SEE INDEX 460-471 - SCHEME 1

SEE INDEX 460-471 - SCHEME 2

SEE INDEX 460-471 - SCHEME 3

Nest W-Beam

Nest W-Beam

Nest W-Beam

Nest W-Beam

PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 1

Any Detached Or Integral Sidewalk Removed

Transition Block In Absence Of Curb

Key Post Reference Line

Integral Approach Side Wall With Curb
Remove Portion of Curb As Required For Post Placement.

Any Detached Or Integral Sidewalk Removed

Transition Block In Absence Of Curb

Key Post Reference Line

Integral Approach Side Wall With Curb
Remove Portion of Curb As Required For Post Placement.

Any Detached Or Integral Sidewalk Removed

Transition Block In Absence Of Curb

Key Post Reference Line

Integral Approach Side Wall With Curb
Remove Portion of Curb As Required For Post Placement.

Any Detached Or Integral Sidewalk Removed

Transition Block In Absence Of Curb

Key Post Reference Line

Integral Approach Side Wall With Curb
Remove Portion of Curb As Required For Post Placement.

Any Detached Or Integral Sidewalk Removed

Transition Block In Absence Of Curb

Key Post Reference Line

Integral Approach Side Wall With Curb
Remove Portion of Curb As Required For Post Placement.

Any Detached Or Integral Sidewalk Removed

Transition Block In Absence Of Curb

Key Post Reference Line

Integral Approach Side Wall With Curb
Remove Portion of Curb As Required For Post Placement.
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

PICTORIAL VIEWS

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEMES 5 & 6
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

See Index 460-474 - Scheme 3

See Index 460-474 - Scheme 2

See Index 460-474 - Scheme 1

PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR
BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
*21" x 12" x 5/8" Three-Beam Terminal Connector Plate (Back-Up Plate), And 9/16" x 12" Long HS Hex Bolts And Nuts (5 Req'd.) With 21G OD Plain Round Washers Under Heads And Nuts

SEE INDEX 460-481 - SCHEME 1

SEE INDEX 521-481 - SCHEME 2

SEE INDEX 521-481 - SCHEME 3

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

FY 2019-20
STANDARD PLANS

INDEX 536-002
SHEET 15 of 27
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 3/4" x 12" x 16" Thrie-Beam Connector Plate (Back-Up Plate), and 3/4" x 12" Long
N5 Hex Bolts And Nuts (5 Req'd) with 29c 50 Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 2 1/2" x 12" x 1/8" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 7/8" x 12" Long NS Hex Bolts And Nuts (5 Req'd) With 2 1/2" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:

* 21" x 12" x 3/8" Three-Beam Terminal Connector Plate (Back-Up Plate), And 3/8" MS Hex Bolts And Nuts (12" Long For Scheme 1 And Length To Fit For Schemes 2 And 3/5 Req.) With 21/2" OD Plain Round Washers Under Heads And Nuts
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERITCAL FACE RETROFIT)
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 (3'-1") Post Hole Location On Bridge
(1' Min. From End Of Bridge). Use 7/16" HS Hex Bolts And Nuts With 2 1/2" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts As First Standard (7-1/2") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use 3/8" HS Hex Bolts And Nuts
With 2" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

- Traffic Railing (Vertical Face Retrofit) Constructed
- Key Post
- End of Terminal Connector Identified in Plans by Station Location
- Nested Three-Beam

PICTORIAL VIEW
SEE INDEX 521-483 - SCHEME 3

* Post Bolts at First Standard (3'-1") Post Hole Location On Bridge (7' Min. From End of Bridge). Use 1/2 HS Hex Bolts and Nuts With 2/ig OD Plain Round Washers Under Heads And Nuts

PICTORIAL VIEW
SEE INDEX 521-483 - SCHEME 3

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

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TRAILING END GUARDRAIL AND ANCHORAGE IN ABSENCE OF OTHER HAZARDS

TRAILING END GUARDRAIL AND ANCHORAGE WHEN OTHER HAZARDS PRESENT

GUARDRAIL TRAILING END ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)
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 1/8" x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/8" 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 Cladding Assemblies.

2. When retrofitting guardrail to existing wing post or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Anchorages 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
GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 564 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 3 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.

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.

CONCRETE BARRIER APPLICATION

PERMANENT CRASH CUSHION APPLICATIONS

GUARDRAIL APPLICATION

CRASH CUSHION DETAILS

INDEX

PERMANENT CRASH CUSHION APPLICATIONS

CRASH CUSHION DETAILS

INDEX

PERMANENT CRASH CUSHION APPLICATIONS

GUARDRAIL APPLICATION

CRASH CUSHION DETAILS

INDEX
PLAN VIEW

ELEVATION VIEW

NOTE:
Work this Sheet with the details and General Notes on Sheet 1.
### TABLE 1 - BRAKING ZONE

<table>
<thead>
<tr>
<th>Speed</th>
<th>Z' (Feet)</th>
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<tr>
<td>30</td>
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</tr>
<tr>
<td>35</td>
<td>200</td>
</tr>
<tr>
<td>40</td>
<td>250</td>
</tr>
<tr>
<td>45</td>
<td>300</td>
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<tr>
<td>50</td>
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<tr>
<td>55</td>
<td>410</td>
</tr>
<tr>
<td>60</td>
<td>470</td>
</tr>
<tr>
<td>65</td>
<td>550</td>
</tr>
</tbody>
</table>

### NOTES:

1. Construct permanent raised rumble strips where shown in the Plans and in accordance with Specification 546.

2. Preformed Thermoplastic Set:
   - Use multiple applications to achieve desired thickness.
   - Use color white.

---

**SPACING OF RAISED RUMBLE STRIP SETS AT INTERSECTIONS**

(Preformed Thermoplastic Set Shown, Others Similar)

**OPTION P1 - ASPHALT SET**

**OPTION P2 - PREFORMED THERMOPLASTIC SET**

**OPTIONAL MATERIALS DETAILS**

* C = 0' For Roadways With Paved Shoulders
  * C = 1.5' For Roadways Without Paved Shoulders

---

**PERMANENT RAISED RUMBLE STRIPS**

**DETAIL "A"**
SHORT-TERM RAISED RUMBLE STRIPS

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 Preformed Thermoplastic and Removable Polymer Striping Tape Sets.

OPTIONAL MATERIALS DETAILS
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 deceleration lane taper.
   D. On outside shoulders of exit ramp terminals, terminate rumble strips at the start of the acceleration 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>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>3 (±1/2)</td>
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</tbody>
</table>

RUMBLE STRIP ARRAY DETAILS

CENTER TO CENTER

CONTINUOUS ARRAY

SKIP ARRAY

CONTINUOUS ARRAY
Rumble Strip Placement Types

**TYPE "A1"**
- 6" Pavement Marking

**TYPE "B1"**
- 6" White

**TYPE "C1"**
- 6" White

**TYPE "D1" - PASSING**
- 6" Double Yellow

**TYPE "D1" - NO PASSING**
- 6" Yellow

**EDGE LINE RUMBLE STRIP PLACEMENT TYPES**

- Center to Center: 12'-6" (±6") Gap

**CENTERLINE RUMBLE STRIP PLACEMENT TYPES**

- Continuous Grinding

**SKIP ARRAY**
- Outside Shoulder Edge Lines

**CONTINUOUS ARRAY**
- Centerlines and Inside Shoulder Edge Lines

**RUMBLE STRIP DEPTH TABLE**

<table>
<thead>
<tr>
<th>Location</th>
<th>Depth from Surface (In.)</th>
</tr>
</thead>
<tbody>
<tr>
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**NOTE:**
See the plans for the Placement Type to be used.

**GROUND-IN RUMBLE STRIPS**

**INDEX**

546-010

**SHEET**

2 of 3
NOTE:
See the Plans for the Placement Type to be used.
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 strips/mesh may be skewed (15°) maximum to avoid the post locations if authorized by the Engineer. No cutting of soil reinforcement is allowed unless shown on Shop Drawings and approved by the Engineer. Any damage done to the soil reinforcement due to installation of the guardrail will be repaired by the Contractor at the Contractor's expense. Repair method will be approved by the Engineer.
7. If existing or future structures, 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 will notify the Engineer to determine what course of action shall be taken.
8. The Contractor is responsible for gradually displacing upper/layers of soil reinforcement downward (15° maximum from horizontal) to avoid cutting 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.
9. For concrete panel surface treatment, see Wall Control Drawings. Extend surface treatment a minimum of 6" below final ground line.
10. Drive piles located within the soil volume prior to construction of the retaining wall, unless a method to protect the structure, acceptable to both the Engineer and Wall Company, is proposed and approved in writing. The portion of piles or drilled shafts extensions within the soil volume will be wrapped with polyethylene sheeting in accordance with Specification Section 459.
11. A structural extension of the connection of the retaining wall to soil reinforcement will be used whenever necessary to avoid cutting or excessive skewing (greater than 15°) of the soil reinforcement around obstructions (i.e., piles, pipes, manholes, drop inlets, etc.).
12. Steps in leveling pads will occur at MSE Wall panel interfaces. Panels will not cantilever more than 2" past the end of the upper tier leveling pad.
13. The top of the leveling pad or footing will be 2'-0" minimum below final ground line.
14. Top of leveling pad elevations shown in the Wall Control Drawings are maximum elevations. The constructed leveling pad elevations may be deeper based on the panel layout shown in the shop drawings.
15. The height of panels in the bottom course of MSE Walls must not be less than half the height of a standard panel.
16. Work this Index with Index 521-600 thru 521-650.

SHOP 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 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 resistances, minimum wall embedment and anticipated long term and differential settlements.
4. If existing or future structures, pipes, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor must notify the Engineer to determine what course of action should be taken.
5. The Contractor is responsible for gradually deflecting upper layer(s) of soil reinforcement downward (15° maximum from horizontal) to avoid coating soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.

GENERAL NOTES AND DETAILS
1. This fence to be provided generally in rural areas. For supplemental information see Specifications 550.

2. Fabric shall be woven wire, either galvanized steel, meeting the requirements of ASTM A120, No. 9 Grade 60, Design Number 1047-4-9, with Class 3 zinc coating; No. 12 ½ Grade 173, Design Number 1047-8-12 ½, with a 10 ½ gage top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A361, No. 9 Farm, Design Number 1047-4-9, with a minimum coating weight of 0.40 oz./ft.². For additional information see payment note below.

3. Fence shall be installed with wire to private property except on horizontal curves greater than 3° the fence shall be installed so as to pull against all posts.

4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor must use either 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 approach post assemblies, but exclusive of gate widths. One post of only one optional material will be permitted between corner and pull post assemblies. Within individual corner and end post assemblies only one optional material will be permitted.

5. Fasteners used shall meet the material requirements of Specification 960. Timber line posts are to be minimum 4” diameter. Timber corner, pull, approach and end posts are to be minimum 5” diameter. Timber braces are to be minimum 1 1/2” diameter.

6. Connections between timber posts and braces to be provided by dowels as shown in fastener details.

7. Wire to be wrapped and tied, as shown in the splice details, at the following locations:
   (a) At end posts, (b) Corner post, including the assemblies at vertical breaks of 15° or more and (c) Pull posts where the wire is not spliced and pulled through the assembly, see General Note 18.

8. The woven wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.

9. Posts to be set by driving or digging. If by digging, the posts shall be set at the center of the hole and the soil tamped securely on all sides.

10. Longer posts than those indicated above may be required by the plans or for deeper installations.

11. Concrete bases for angular steel posts (pull, corner, end and approach) shall be Class NS in accordance with Specification 960. Materials for Class NS concrete may be proportioned by volume and/or by weight.

12. Pull post assemblies shall be installed at approximately 330’ centers except that this maximum interval may be reduced by the Engineer on curvatures where the radius is less than 300’.

13. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 15° or more.

14. A maximum length of 1320’ of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by clipping sleeves only. Pulls through a corner post assembly will not be permitted.

15. Unless otherwise called for in the plans, gate widths shall be commercially available metal swing gates assembled and installed in accordance with the manufacturer’s specifications as approved by the Engineer. Chain link swing gates, in accordance with index 550-002 may be substituted for metal swing gates as approved by the Engineer. Gate size is full opening width; whether single leaf or double leaves. Payment for gates shall include the gate, single or double, all necessary hardware for installation and any additional length and/or size for posts at the corners. Gates shall be paid for under the contract unit price for Fence Gates, EA.

16. Pull post assemblies shall be installed at approximately 330’ centers except that this maximum interval may be reduced by the Engineer on curvatures where the radius is less than 300’.

17. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 15° or more.

18. The woven wire shall be attached to steel and concrete posts by a minimum of four tie wires. The single tie wires shall be applied to the top, bottom and three intermittent line wires. The ends of each tie wire shall have a minimum of two tight turns. The line wire. Tie wires shall be steel wire not less than 1/8” diameter, zinc coating Class 3, soft temper, in accordance with ASTM A461.

19. Steel Barbed Wire shall be either of the following types:
   Type I: This type shall conform to the requirements of ASTM A121, with two strands of 10 gauge wire; four-point barbs, wire size 14 gauge, twisted around both line wires; and, Class 3 coating, Design No. 12-4-3.2R, Type 1B. This type shall conform to the requirements of ASTM A121 with two strands of 12 gauge high tensile wire; four point barbs, wire size 16 gauge twisted around both line wires; and, Class 3 coating, Design No. 12-4-3.2R.

20. Plastic Barbed Wire shall be fabricated of two strands of 0.101-inch diameter four-point barbs spaced at approximately 3/4” and at a maximum spacing of 6’. The wire for the strands and for the barbs shall be of ASTM A230 Alloy 502-503 R or equal.

21. All posts, braces, tension wires, fabric, tie wires, Class NS concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, EA. Fencing shall be inclusive of the lengths of pull, end and corner post assemblies, but exclusive of gate widths.
FENCING PROPOSAL

FENCE TYPE A

DESCRIPTION:

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

REV REVIEW

STANDARD PLANS

FY 2019-20

INDEX

SHEET

550-001

2 of 3

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

LINE POST

GROUN D L I N E

B R A C E

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

W R I T E N O T E

S E E G E N E R A L

N O T E 2

H U N M O R T E N S I O N

C O N C R E T E B A S E F O R

A N G U L A R S T E E L P O S T

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

FENCE TYPE A

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

LINE POST

GROUN D L I N E

B R A C E

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

W R I T E N O T E

S E E G E N E R A L

N O T E 2

H U N M O R T E N S I O N

C O N C R E T E B A S E F O R

A N G U L A R S T E E L P O S T

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

FENCE TYPE A

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

LINE POST

GROUN D L I N E

B R A C E

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

W R I T E N O T E

S E E G E N E R A L

N O T E 2

H U N M O R T E N S I O N

C O N C R E T E B A S E F O R

A N G U L A R S T E E L P O S T

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

FENCE TYPE A

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

LINE POST

GROUN D L I N E

B R A C E

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

W R I T E N O T E

S E E G E N E R A L

N O T E 2

H U N M O R T E N S I O N

C O N C R E T E B A S E F O R

A N G U L A R S T E E L P O S T

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

FENCE TYPE A

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

LINE POST

GROUN D L I N E

B R A C E

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

W R I T E N O T E

S E E G E N E R A L

N O T E 2

H U N M O R T E N S I O N

C O N C R E T E B A S E F O R

A N G U L A R S T E E L P O S T

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

FENCE TYPE A

LINE POST

PULL POST

LINE POST

LINE POST

LINE POST

APPROACH POST

CORNER OR END POST

LINE POST

GROUN D L I N E

B R A C E

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

T W I S T E D S O F T T E M P E R, G A L V A N I Z E D

W R I T E N O T E

S E E G E N E R A L

N O T E 2

H U N M O R T E N S I O N

C O N C R E T E B A S E F O R

A N G U L A R S T E E L P O S T

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

DESIGN NOTE

This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
BRACE AND POST

BRACE TO BRACE ON LINE

BRACE TO BRACE AT CORNER

FASTENER FOR CONCRETE POST AND BRACES

FASTENER FOR TIMBER POST AND BRACE

ALTERNATE CONCRETE POSTS AND BRACES

**SPICES**

Each horizontal wire to be wrapped around corner, end and pull posts and tied to same wire. See General Notes 5 and 17. Timber post illustrated. These methods also apply to steel and concrete post illustrations.
GENERAL NOTES

1. This fence to be used generally in urban areas.

2. For supplemental information refer to Specification 550.

3. Chain link fabric, post, truss rods, tension wires; tie wires, strainer bars, gates and all miscellaneous fittings and hardware shall meet the requirements of AASHO and ASTM signify current reference.

4. Fence Component Options:
   A. Line post options:
      1. Galvanized steel pipe, Schedule 40- 1 1/2" nominal dia., zinc galvanized at the rate of 1.8 oz./ft²:
         ASTM A53 Table 2 (Grade A or B); ASTM F1083, and AASHTO M111.
      2. Aluminum coated steel pipe, Schedule 40- 1" nominal dia., coated at the rate 0.40 oz./ft²:
         ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
   B. Corner, end, and pull post options:
      1. Galvanized steel pipe, Schedule 40- 1 1/2" nominal dia., zinc galvanized at the rate of 1.8 oz./ft²:
         ASTM A53 Table 2, ASTM F1083, and AASHTO M111.
      2. Aluminum coated steel pipe, Schedule 40- 1" nominal dia., coated at the rate 0.40 oz./ft²:
         ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
   C. Rail options:
      1. Galvanized steel pipe, Schedule 40- 1 1/2" 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 A53 steel, X 2 Tables Schedule 40, 1 1/2" nominal dia.,
         coated at the rate 0.40 oz./ft²:
         ASTM A53 Table 2 (Grade A or B), ASTM F1083, and AASHTO M111.
      3. Aluminum alloy pipe- 1 1/2" nominal dia., ASTM B211, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
      4. Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A653/A653M, or
         undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV
         (Alternative Design); fence industry 1 1/2" OD; 2" NPS, 1 1/16" dec. equiv., 0.130" min. wall
         thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations
         of Table 2, ASTM F1043.
   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. 7 gage (coated wire diameter), coated at
         the rate of 1.8 oz./ft²: ASTM F1043 metric equivalent internal coating Types A, B, C or
         D and external coating Types A, B, or C; the chromate conversion coating of external
         Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a
         thickness of 0.003" min. Internal and external coatings are not restricted to the combinations
         of Table 2, ASTM F1043.
      2. AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated
         at the rate of 0.40 oz./ft².:
         ASTM A569/A569M, A653/A653M or
         undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV,
         or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV
         (Alternative Design); fence industry 2" OD, 1 1/4" NPS, 1.90" dec. equiv., 0.120" min. wall
         thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations
         of Table 2, ASTM F1043.
      3. AASHTO M181 Type III - Polyvinyl Chloride (PVC) Coated Steel; No. 9 gage (coated core
         wire diameter), core wire-zinc coated steel, PVC coating: ASTM F1043 metric equivalent internal
         coating Types A, B, C or D and external coating Types A, B, or C (tubular bar); the chromate
         conversion coating of external Type B shall have a thickness of 15µg/in². min. and the polymer
         film topcoat shall have a thickness of 0.003" min. Internal and external coatings are not restricted
         to the combinations of Table 2, ASTM F1043.
      4. AASHTO M181 Type IV - Polyvinyl Chloride (PVC) Coated Steel; No. 9 gage (coated core
         wire diameter), core wire-zinc coated steel, PVC coating: ASTM F1043 metric equivalent internal
         coating Types A, B, C or D and external coating Types A, B, or C; the chromate conversion coating
         of external Type B shall have a thickness of 15µg/in². min. and the polymer film topcoat shall have a
         thickness of 0.003" min. Internal and external coatings are not restricted to the combinations
         of Table 2, ASTM F1043.
      5. AASHTO M181 Type V - Other Coated Steel, No. 9 gage (coated wire diameter), coated at
         the rate of 0.40 oz./ft².:
         ASTM A569/A569M, A653/A653M or
         undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV,
         or undepleted stock of discontinued A446/A446M base materials; ASTM F669 Group IV
         (Alternative Design); fence industry 2" OD, 1 1/4" NPS, 1.90" dec. equiv., 0.120" min. wall
         thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations
         of Table 2, ASTM F1043.
      6. AASHTO M181 Type VI - Concrete: ASTM C150, Plain Concrete, No. 7 gage (coated wire
         diameter), coated at the rate of 0.40 oz./ft².:
         ASTM A500, Grade B (Grade C or Grade D), ASTM A615, Grade 40, or Grade 60,
         ASTM A992, Grade 50, or Grade 60.
      7. AASHTO M181 Type VII - Other: Any material, No. 7 gage (coated wire diameter), coated at
         the rate of 0.40 oz./ft².:
         ASTM A500, Grade B (Grade C or Grade D), ASTM A615, Grade 40, or Grade 60,
         ASTM A992, Grade 50, or Grade 60.

E. Tension wire options:
   1. Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².:
      AASHTO M181.
   2. Steel wire with a diameter of 0.1875" or larger conforming to the requirements of
      ASTM A653, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
      AASHTO M181.
   3. Aluminum coated steel wire No. 7 gage coated at the rate of 0.24 oz./ft².:
      AASHTO M181.

F. Tie wire and hog ring options:
   1. Steel wire No. 7 gage zinc galvanized at the rate of 1.2 oz./ft².:
      (Alternative Design): fence industry 1 1/2" OD, 1 1/4" NPS, 1.90" dec. equiv., 0.120" min. wall
      thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations
      of Table 2, ASTM F1043.
   2. Aluminum wire with a diameter of 0.1875" or larger conforming to the requirements of
      ASTM A653, Alloy 5056 Temper H38, or, Alclad Alloy 5056 Temper H192.
      (Alternative Design): fence industry 1 1/2" OD, 1 1/4" NPS, 1.90" dec. equiv., 0.120" min. wall
      thickness of 0.0003" min.; internal and external coatings are not restricted to the combinations
      of Table 2, ASTM F1043.
### GENERAL NOTES CONTINUED

5. Unless a specific material is called for in the plans the Contractor may elect to use either a single type of material or a combination of material types from the component options listed in note 4. Combinations of optional materials are restricted as follows:
   (a) Only one fabric optional material will be permitted between corner and/or end post assemblies.
   (b) Only one line post optional material will be permitted between corner and/or end post assemblies.
   (c) Pull post assemblies shall be optional materials identical to 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 347.1 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.
   Line post installed in accordance with Section 3.8 shall be 9'-6" long.
   (c) Post mounted on concrete structure or solid rock shall be mounted in accordance with the base plate detail "Fence Mounting On Concrete Endwalls and Retaining Wall", Sheet 3; or, by embedment in accordance with ASTM F567 Subsection 5.5.

   End, pull and corner post assemblies shall be in concrete as detailed above for all soil conditions other than solid rock. Post within assemblies that are located on concrete structures or solid rock shall be set by base plate or by embedment as prescribed under (b) above for line post.

   Line and assembly posts for 6' fence which must be lengthened due to a variation in the normal ground clearance, shall be set an additional 3' in depth for each 3' of additional ground clearance.

8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that this maximum interval may be reduced by the Engineer on curves where the curve is greater than 3°.

9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical breaks over 15° as determined by the Engineer.

10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall be used unless the plans specifically identify locations for twisted selvage fabrics.

11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates meeting the material requirements described and as approved by the Engineer. Payment shall include the gates, single or double, all necessary hardware for installation and any additional length and/or 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>
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<th>TYPE IV VINYL COATED FABRIC</th>
<th>PVC Thickness Range</th>
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<tr>
<td>Specified Diameter Core Wire</td>
<td>Minimum Weight Of Zinc Coating</td>
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### DESIGN NOTE

This index details fencing that is constructed with chain link fabric (ex) in height and with specific ground clearance. For fencing of different height or installation details, the fence shall be fully detailed in the contract plans.
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):
   a. Expansion bolts not permitted.
   b. Headed bolts, U-Bolts or Cluster Plates.
   c. Anchors shall be headless anchor bolts set in drilled holes with an Adhesive Material System in accordance with Specifications 416 and 937; drilled holes shall be larger in diameter than the anchor bolt.

   Post to be plumbed by grout shim under base plate.

   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.

   Post to be plumbed by grout shim under base plate.

   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.

   Post to be plumbed by grout shim under base plate.

   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.
GENERAL NOTES

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

Gate components shall meet or exceed the protective coatings specified on Index 550-002.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36, or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002 that are tolerant of welding (low burn back), and a protective coating applied to the weld and damged 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 weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

CANTILEVER SLIDE GATE TYPE B FENCE
**FENCING TERMINALS AT BRIDGE ENDS**

*Roadway*

1. **Approach Slab**
2. **Bridge**
3. **Shoulder Line**
4. **Tee Of Slope**
5. **Natural Ground**
6. **Proposed Fence**
7. **LA R/W Line**
8. **Gutter Transition**
9. **3 Strands Barbed Wire**
10. **Embedment**
11. **Anchor Eyebolt Or Studs And Eyenuts**

**Note:** When height of headwall is 4' or less (strange pipe 36" or less), the fence shall not be tied to the headwall, but shall span the lateral ditch.

**FENCING DETAIL AT CULVERT**

*(For Heights Of Headwalls 4' Or Less.)*

- **Plan**
- **Elevation**
- **Pictorial View**

**FENCING TERMINALS AT BOX CULVERTS**

*(For Heights Of Headwall Greater Than 4')*

- **Locate Fence Along Slope Where Top Of Fence Approx. Equals Tops Of Headwall.**
- **Terminate Fence Where Culvert End Bent. Set Post At Edge Of Slope Pavement.**
- **Construct Flush Against Footing**

**Plan**

- **Locate Fence Along Slope Where Top Of Fence Approx. Equals Fence Height.**
- **Fence Locations At Cross Drains With Excavated Outfall Ditches Or As Shown In Plans.**
- **Note:** When height of headwall is 4' or less (strange pipe 36" or less), the fence shall not be tied to the headwall, but shall span the lateral ditch.
NOTE: LA R/W along the crossroad will extend a minimum 200' beyond the end of the acceleration or deceleration ramp. For interchange quadrants having a 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.

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.

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.

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT RURAL INTERCHANGES

FENCING TERMINALS AT URBAN INTERCHANGES

FENCING TERMINALS AT RETAINING WALLS
**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.

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**SEEDING ZONES**

Zone 1

Zone 2

---

**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>Goldenthread Tickseed (Coreopsis basalis)</td>
<td>10</td>
</tr>
<tr>
<td>Variegated Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
</tr>
<tr>
<td>Goldfeder 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 enneaphylla)</td>
<td>6</td>
</tr>
<tr>
<td>Variegated 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 Point

Shoulder Pavement

In Absence of Shoulder Pavement on Existing Divided Roadways, Construct Shoulder Pavement Same As Above

Sodding (Overlapped) See Table Below For Application

Use 5' Shoulder Pavement And 32" Sod Strip When Negative Grade Intersects Positive Grade And Algebraic Difference In Roadway Grades Is 2% Or Greater; When Algebraic Difference In Roadway Grades Is Between 1% & 2% Use 32" Sod Strip Only

Sod To Toe Of Front Slope When Algebraic Difference In Roadway Grades Exceeds 4% (Both Sides)

Low Point Of Sag

CRITERIA FOR PAVING SHOULDER ON DIVIDED AND UNDIVIDED FACILITIES

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Degree Of Curve</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>7° or Greater</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>5° or Greater</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>4° or Greater</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>3° or Greater</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>2° or Greater</td>
<td></td>
</tr>
</tbody>
</table>

Note:
- Shoulder Pavement is required on all curves meeting the criteria tabulated. For curves not meeting the criteria, shoulders are to be paved where erosion of the shoulder is evident or anticipated.

SHOULDER AND SLOPE TREATMENT FOR SUPERELEVATED ROADWAYS

TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING

NOTES

1. These treatments are applicable to new construction, reconstruction and RRR projects. Project requirements for shoulder pavement and sodding that exceed the limits of this standard 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.
**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 root ball 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 shrubs, or solidly around ground cover. Never pile mulch against the tree trunk.

7. Install guying 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 finish 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.
GENERAL NOTES:
1. Install conduit in accordance with Specification 630.

7. 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. Street Surface

6. Pull Box (See Index 635-001)

7. Conduit

8. Pull Box (See Index 635-001)

9. Pull Box (See Index 635-001)

GENERAL NOTES:

1. Install conduit in accordance with Specification 630.

7. 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. Street Surface

6. Pull Box (See Index 635-001)

7. Conduit

8. Pull Box (See Index 635-001)

9. Pull Box (See Index 635-001)

GENERAL NOTES:

1. Install conduit in accordance with Specification 630.

7. 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. Street Surface

6. Pull Box (See Index 635-001)

7. Conduit

8. Pull Box (See Index 635-001)

9. Pull Box (See Index 635-001)
**REVISION DESCRIPTION:**

**REVISION LAST STANDARD PLANS OF FY 2019-20 SHEET INDEX**

- **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 utilities. If vertical clearance cannot be maintained, conduit is to be routed under pipe maintaining 1'-0" minimum vertical clearance.

**CONDUIT INSTALLATION DETAILS**

**INDEX 630-001 SHEET 2 of 4**
NOTES:
1. Pavement Removal: The removal and replacement of the additional pavement width (i.e., 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.
Conduit Installation Details

**Placing Conduits Across Existing Drainage Piping or Utilities**

- **Below Existing** - Depth 2'-6" or Less
  - Conduit installation is guided by a depth of less than 2'-6". Ensure that the new conduit is not encased in concrete and is installed at a depth of less than 2'-6".

- **Above Existing** - Depth 2'-6" or Less
  - When 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".

- **Above Existing** - Depth 2'-6" or Greater
  - Placement under the railroad.

**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".
2. Place 3" Warning Tape when new conduit is installed at a depth of 1'-0" or greater, and the new conduit is not encased in concrete.

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**SECTION A-A**
**SIGNAL ATTACHMENT**

**NOTES:**

1. Use only span wire mounting assemblies listed on the APL. For specific details and requirements, see the vendor drawings on the APL.

2. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.

3. Lashing wire should normally be used for distances of 12' or greater.

4. Use only stainless steel hardware on all signal attachments.

5. Note for eyebolt will require field reaming for 1" & 1½" 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 2–12" drain holes in the bottom of the installed signals.

9. Method of framing corner Strain Poles angles 10° to 120°.
NOTES:
1. Meet all grounding requirements of Specification 620.
2. If accessible, ground the messenger wire of the interconnect cables in 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 ½" 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.
NOTES:
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 contractor's responsibility to provide a complete service assembly as per the plans and service specifications.

2. The service installation shall meet the requirements of the national electric code and applicable local codes.

3. Shop drawings are not required for service equipment, unless noted in the plans.

4. A Pull Box is required at each service point, see Index 635-001.
PHOTO ELECTRIC CONTROLLER DETAIL

Keyed Notes:
2. Service Feeder in Rigid Galvanized Steel Conduit.
3. Meter Socket by Contractor
4. Service Main Disconnect.
6. Concrete Riser Pole.
7. Weatherhead
8. Electrical Panel. Number and Rating of Branch Circuit Breakers shall be as indicated on Distribution Point Description on Lighting Plan Sheets.
10. #6 Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.
11. Fused Control Power Transformer 0.5 KVA, Single Phase, 480V Primary, 120V Secondary (Part of Lighting Contactor, Shown Outside for Clarity).
12. Lightning Arrester Mounted on Outside of Enclosure.
13. Lighting Control Panel Main Breaker.
14. 2 Pole Electrical Lighting Contactor.
15. Insert Automatic Selector Switch (Part of Lighting Contactor, Shown Outside for Clarity).
16. Concrete Pad.
17. Underground Feeder Conduit.
18. Mount on Riser Pole.
19. Ground BUS.

Cut a 2" hole in the side of the Lighting Control Panel enclosure for the operation and mounting of the Photo Electric controller. Use mastic and a clear silicone sealant to cover hole. Install Photo Electric Controller.

PHOTO ELECTRIC CONTROLLER DETAIL

ONE LINE DIAGRAM DISTRIBUTION POINT

TYPICAL DISTRIBUTION POINT SCHEMATIC DETAIL

RISER DIAGRAM - TYPICAL DISTRIBUTION POINT
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.

FIGURE A
AERIAL FEED (NO METER USED)

FIGURE B
AERIAL FEED (METER USED)

FIGURE C
UNDERGROUND FEED (NO METER USED)

FIGURE D
TYPE "B" UNDERGROUND FEED (METER USED)

FIGURE E
UNDERGROUND CABINET MOUNTED (METER USED)
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 inch per face.
   B. Prestressed Taper: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
   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-IIB (36 Ft.) ELEVATION**
(Strands Not Shown)

**PEDESTAL POLE P-IIC (12 Ft.) ELEVATION**
(Strands Not Shown)

**NOTES:**
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance of 4 Ft. (for P-IIA & P-IIC) or 10 Ft. (for P-IIB) from the Tip End.
- * Dimension may vary from 2⅛" to 3½" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2".
SPIRAL REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

Pole Height Dim. H
Depth Dim. D
Pole Length Dim. L

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 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".

POLE TYPE P-III

POLE ELEVATION
(Strands and Reinforcing Not Shown)
**CONCRETE POLES**

**DESCRIPTION:**

- **SPIRAL REINFORCING ELEVATION**
  - (Strands, Holes, and Fixtures Not Shown)
  - **POLE ELEVATION**
    - (Strands and Reinforcing Not Shown)
    - **STRAND LEGEND**
    - **TIP END SECTION (TOP)**
      - (For Dormant Strand Locations See Section A-A)
      - **SECTION A-A**
        - (Typical Square Section)

**NOTES:**

- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 20% L from the Tip End.
- *Dimension may vary from 3" to 4¼" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2½".*

**STRAIN POLE TYPE P-IV**
Concrete Poles

**Spiral Reinforcing Elevation**
(STRANDS, HOLES, AND FIXTURES NOT SHOWN)

**POLE ELEVATION**
(STRANDS AND REINFORCING NOT SHOWN)

**STRAND LEGEND**
- Prestressed Strand
- Dormant Strand

**NOTES:**
Strands shown are continuous from Tip End to Butt End.
Elevation view scale is exaggerated vertically for clarity.
For final erection, tilt pole upright with single point attachment located a distance 12.5% L from the Tip End.
*Dimension may vary from 3/4" to 4" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 4".*
**CONCRETE POLES**

**SPRING REINFORCING ELEVATION**

(Strands, Holes, and Fixtures Not Shown)

Pole Length Dim. L

Support Locations (Horizontal Pole)

\[ \text{Pole Length Dim. L} \geq \frac{2.5}{L} \]

**POLE ELEVATION**

(Strands and Reinforcing Not Shown)

**STRAND LEGEND**

- **Prestressed Strand**
  - 0.5 in. – 31 kips Before Transfer (12 Strands Total)

- **Dormant Strand**
  - 0.5 in. (6 Strands Total) One 24” Splice Allowed Per Strand

**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 10% L from the Tip End.

\* Dimension may vary from 3½” to 5” to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½”.

**STRAIN POLE TYPE P-VIII**
GENERAL NOTES:
1. Work this Index with Specifications 641.
2. This Index is considered fully detailed and no shop drawings are necessary. Submit Shop Drawings for minor modifications not detailed in the Plans.
3. Install pole plumb.
4. Provide either round or 12-sided Poles.
5. See Index 635-001 for additional details for Pull Boxes.
6. Materials:
   A. Pole: Use Class VI concrete with 6 ksi minimum strength at transfer.
   B. Prestressing Strands: ASTM A416, Grade 270 low relaxation.
   C. Reinforcing Steel: ASTM A615, Grade 60.
   D. Spiral Reinforcing: ASTM A193, Cold-Drawn
   E. Bolts: ASTM F1554, Grade 55
   F. Washers: ASTM F436
   G. Steel plates and Pole Cap: ASTM A325 or ASTM A709, Grade 50
   H. Galvanization bolts, nuts and washers: ASTM F2329

7. Pole Fabrication:
   A. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
   B. For spiral reinforcing, one turn is required for spiral splices and two turns are required at the top and bottom of poles.
   C. For Reinforcing Steel, lap splice to consist of a 3'-0" lap length at each splice. No more than two opposite 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 1' minimum cover.
   F. Provide handleless and coupler cover plates made of non-corrosive materials. Attach cover plate 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:
      - 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. Ensure that all electronic equipment power is protected and conditioned with SPDs.
   E. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   F. Install the pole mounted cabinet with the hinges next to the pole.
   G. 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
   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".

9. Lowering Device Installation:
   A. Place the lowering cable that moves within the pole in an interior conduit to prevent it from tangling or interfering with any electrical wire that is in the pole. Ensure that any electrical wire within the pole is routed securely and free from slack.
   B. Mount lowering arm perpendicular to the roadway or as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
   C. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, paring slots, etc.) with lowering device manufacturer.
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 or equal to N_y: ASTM A1011 Grade 50, 55, 60 or 65
  b. Greater than or equal to N_y: ASTM A572 Grade 50, 55, 60 or 65
B. Steel Plates: ASTM A36
C. Bolt Steel: ASTM A36
D. Bolts, Nuts and Washers:
  a. High Strength Bolts, ASTM F3125, Grade A252, Type 1
  b. Nuts, ASTM A193 Grade D Heavy-Hex
  c. Washers: ASTM F436 Type 1, one under turned element
F. Anchor Bolts, Nuts and Washers:
  a. Anchor Bolts: ASTM F1554 Grade 55
  b. Nuts, ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
  c. Plate Washers: ASTM A193 (2 per bolt). Split-lock washers and self-locking nuts are not permitted
H. Handhole Frame: ASTM A412 or ASTM A936, Grade 36
D. Handhole Cover: ASTM A412 or ASTM A936, Grade 36
E. Identification Tag: (Submit details for approval.)
F. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65
G. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
L. Reinforcing Steel: Specification 415

4. Fabrication:
A. Pole Taper: Change diameter at a rate of 0.14 inches per foot, round or 12-sided (Min.)
B. Upright splices are not permitted. Transverse welds are only permitted at the base.
C. Provide bolt hole diameters as follows:
  a. Bolts (except Anchor Bolts): Bolt diameter plus 3\times\phi_y, prior to galvanizing.
  b. Anchor Bolts: Bolt diameter plus 3\times\phi_y, maximum.
D. Locate handhole 180° from 2" wire entrance pipe.
E. Identification Tag: (Submit details for approval.)
  a. Try 4 (Max.) aluminum identification tag
  b. Locate on the inside of the pole and visible from the handhole.
  c. Secure to pole with \phi_y diameter stainless steel rivets or screws.
  d. Include the following information on the ID Tag:
     1. Financial Project ID
     2. Pole Type
     3. Pole Height
     4. Manufacturer's Name
     5. Ty of Steel
     6. Base Wall Thickness
F. Provide a 2" or 4" hook at the top of the pole for signal wiring support (See Sheet 3).
G. Perform all welding in accordance with Specification 460-6.
H. Hot Dip Galvanize after fabrication.

5. Coatings:
A. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F439
B. All other steel items including plate washers: ASTM A36

6. Construction:
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.

---

ELEVATION AND NOTES

SECTION 6

STRAIN POLE ASSEMBLY

STANDARD PLANS

FY 2019-20

DESCRIPTION:

INDEX 649-010

SHEET 1 of 3
STEEL STRAIN POLE DATA TABLE

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>POLE</th>
<th>BASE CONNECTION</th>
<th>SHAFT</th>
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NOTE:
1. Double Nuts: Bottom nut may be half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.
**NOTES:**

1. Clamps have been sized for Design Table Loads shown in the Clamp Thickness Table, and a Maximum Pole Diameter at the Clamp location of 2'-7". Use one clamp per cable.

2. Install a properly sized Weather Head, fastened securely to the standard pipe for each pole location. At locations other than the wire entrance, the Weather Head Face is to be left closed to outside atmosphere. Wire entrance installed per Index 634-001.

3. Any combination of Option 'a' or 'b' may be used provided both lifting and wiring is accommodated.

---

**CLAMP THICKNESS TABLE**

<table>
<thead>
<tr>
<th>Cable Diameter (in)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in)</th>
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<tr>
<td>1/2</td>
<td>28</td>
<td>7/8</td>
</tr>
<tr>
<td>5/8</td>
<td>31.6</td>
<td>7/8</td>
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<td>3/4</td>
<td>31.6</td>
<td>7/8</td>
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**HANDHOLE**

<table>
<thead>
<tr>
<th>Handhole Frame</th>
<th>(Thru Handhole)</th>
<th>31 Gage Handhole Cover</th>
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<td>4' x 4'</td>
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**WIRE ENTRANCE DETAIL**

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<th>Handhole Cover Clip</th>
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<tbody>
<tr>
<td>Tack Welded Cover</td>
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</table>

**SECTION C-C**

**CUT-AWAY (Option 'a')**

- 3/4" Stainless Steel Hex Head Screw (Typ.)
- 2" Wire Cap & Lifting Bar
- Nuts and Washers (Typ.)
- 3/16" Bolt With Double Nut And Washer (Typ.)
- 3/16" Bolt With Double Nut And Washer (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- 3/4" Thick (Min.)
- "C" Hook For Wiring And Lifting, 3/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**CUT-AWAY (Option 'b')**

- 3/4" Stainless Steel Hex Head Screw (Typ.)
- 2" Wire Cap & Lifting Bar
- Nuts and Washers (Typ.)
- 3/16" Bolt With Double Nut And Washer (Typ.)
- 3/16" Bolt With Double Nut And Washer (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- 3/4" Thick (Min.)
- "C" Hook For Wiring And Lifting, 3/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**PLAN**

- 1/2" Bolt With Double Nut And Washer (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- 3/4" Thick (Min.)
- "C" Hook For Wiring And Lifting, 3/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**ELEVATION**

- 1/2" Bolt With Double Nut And Washer (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- 3/4" Thick (Min.)
- "C" Hook For Wiring And Lifting, 3/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**FACTORING**

- 1/2" Bolt With Double Nut And Washer (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- 3/4" Thick (Min.)
- "C" Hook For Wiring And Lifting, 3/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**ATTACHMENT DETAILS**

- 1/2" Bolt With Double Nut And Washer (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- 3/4" Thick (Min.)
- "C" Hook For Wiring And Lifting, 3/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**STANDARD PLANS**

- FY 2019-20
- Steel Strain Pole
- Standard Plans

---

**REV 01/01/17**

**DESCRIPTION:**

- Steel Strain Pole
- Standard Plans

---

**INDEX SHEET**

- 649-010 3 of 3
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.

3. Materials:
   a. Pole: ASTM A1011 Grade 50, 55, 60 or 65 (less than 1½") or ASTM A572 Grade 50, 60 or 65 (greater than or equal to 1½") or ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield).
   b. Steel Plates and Pole Cap: ASTM A36 or ASTM A709 Grade 50.
   c. Weld Metal: E70XX.
   d. Bolts: ASTM F3125, Grade A325, Type 1.
   f. Washers: 1/2".
   g. Anchor Bolts: ASTM F1554 Grade 55 with ASTM A563 Grade A heavy hex nuts and ASTM A36 plate washers.
   h. Handhole Frame: ASTM A109 Grade 36 or ASTM A36.
   i. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65.
   j. Stainless Steel Screws: AISI Type 316.

4. Fabrication:
   a. Specifying Section 460-6.4 and

5. 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.

6. Cabinet Installation:
   a. Splice fiber optic cables in cabinet to terminating 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. Epoxy coated equipment cabinet is bonded to CCTV pole grounding system.
   f. Install the pole mounted cabinet with the hinges next to the pole.
   g. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking stands, etc.) with lowering device manufacturer.

7. Lowering Device Installation:
   a. Place the lowering cable that moves within the pole in an interior conduit to the camera to prevent it from tangling or interfering with any electrical wire that is in the pole. Ensure that any electrical wire within the pole is routed securely and free from slack.
   b. Mount lowering device perpendicular to the roadway as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
   c. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking stands, etc.) with lowering device manufacturer.

LAST REVISION 01/01/18
DESCRIPTION: FY 2019-20 STANDARD PLANS

INDEX 649-020
SHEET 1 of 6

STEEL CCTV POLE ASSEMBLY
**SHAFT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter</th>
<th>Shaft Length</th>
<th>Longitudinal Reinforcement</th>
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<tr>
<td>60</td>
<td>6'-0&quot;</td>
<td>14'-0&quot;</td>
<td>(16) #11</td>
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<tr>
<td>65</td>
<td>6'-0&quot;</td>
<td>13'-0&quot;</td>
<td>(16) #11</td>
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<tr>
<td>70</td>
<td>5'-0&quot;</td>
<td>14'-0&quot;</td>
<td>(18) #11</td>
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**ADDITIONAL BURIAL DEPTH DUE TO GROUND SLOPE**

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
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</thead>
<tbody>
<tr>
<td>1:5</td>
<td>7'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>1:4</td>
<td>7'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>7'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>1:2</td>
<td>7'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
</tbody>
</table>

**FOUNDATION NOTES:**

1. Shaft Length is based on 1'-0" height above the finished grade.
2. Shaft Design Table values are based on level ground (Flatter than 1:15). For foundation within slopes 1:2 and greater, increase the foundation depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

**BASE PLATE AND ANCHOR BOLT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Diameter (in.)</th>
<th>Base Plate Thickness (in.)</th>
<th>Anchor Bolt Diameter (in.)</th>
<th>Anchor Bolt Embedment (in.)</th>
<th>Minimum Anchor Bolt Projection (in.)</th>
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NOTE:
To secure the cover plate, install a steel chain from the cover to the pole or by mounting the cover with hinges and installing a padlock tab.
### ARM AND BASE PLATE

<table>
<thead>
<tr>
<th>Arm ID</th>
<th>Arm</th>
<th>Arm Extension</th>
<th>Total Arm Length (ft)</th>
<th>PASE/PA (ft)</th>
<th>FCS/FC (in)</th>
<th>FS/FS (in)</th>
<th>PM/PM (in)</th>
<th>MT (in)</th>
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### POLE, BASE PLATE AND ARM CONNECTION

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<th>P=Poleno</th>
<th>S=SingleArm</th>
<th>D=DoubleArm</th>
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<thead>
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### LUMINAIRE AND CONNECTION

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GENERAL NOTES:

1. Shop Drawings. This index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

2. Prior to Fabrication: Verify the installed foundation elevation will result in the required signal elevation and adjust the Pole height as needed.

3. Details for Signal and Sign locations, Signal Head attachment, Sign attachment, Pedestrian Head attachment, and Foundation Conduit are not shown for simplicity.

4. Materials:
   a. Poles, Mast Arms and Backing Rings
      - Less than 5/8” ASTM A1011 Grade 50, 55, 60 or 65
      - Greater than or equal to 5/8” ASTM A52 Grade 50, 55, 60 or 65
      - 5/8” ASTM A595 Grade A (35 ksi yield) or Grade B (40 ksi yield)
   b. Steel Plates: ASTM A36
   c. Weld Metals: E70XX
   d. Bolts, Nuts and Washers:
      - High Strength Hex Head Bolts: ASTM F3172, Grade A49, Type 3
      - Nuts: ASTM A563 DH High-Hex
      - Washers: ASTM F436 Type 1, one under turned element
   e. Anchor Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F1354 Grade 55
      - Nuts: ASTM A563 Grade A (Max. 6 per anchor bolt)
      - Plate Washers: ASTM A576 (2 per bolt)
   f. Threaded Bars/Studs: ASTM A193 or ASTM A307
   g. Handhole Frame: ASTM A1070 or ASTM A333, Grade 36
   h. Handhole Cover: ASTM A1011 Grade 50, 55, 60, 65
   i. Aluminum Pole Caps and Nut Covers: ASTM B26 (209-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:
      - Specification Section 460-6.4 and
      - AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaries, and Traffic Signals Section 14.4
   b. Poles and Mast Arms:
      - Round or 12-sided (Min.)
      - Taper pole diameter at 0.14 inches per foot
      - Upright poles must be a single section.
      - Arms may be either one or two sections. See Sheet 4 for permitted.
   c. Arms may be either one or two sections. See Sheet 4 for permitted.
   d. Fabricate longitudinal seam welds with 60 percent minimum penetration in fusion welds except:
      - Use a full-penetration groove weld within 6 inches of the circumferential weld-to-plate connection.
      - 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.
   e. Locate longitudinal seams weld along the:
      - Lower quadrant of the arm.
      - Same side of the pole as the arm connections.
   f. Provide a 24” or 30” hook at the top of the pole for signal wiring support (See Sheet 6).
   g. Face handholes perpendicular from arm on single arm poles, 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” or 1” 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:
      - 1/2” or less in diameter.
   k. Bolt diameters plus 1/2” (Max).

6. Coatings:
   a. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F2329
   b. All other steel items including plate washers ASTM A123

7. 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 grout pad with drain between top of foundation and bottom of baseplate 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 1/2” or less in diameter.

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<td>Luminaries Arm and Connection Details</td>
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ELEVATION AND NOTES

MAST ARM ASSEMBLY

Single Arm Shown, Double Arm Similar (Luminaries Arm Not Shown)
**MAST ARM ASSEMBLY**

**RELEASE THROUGH MAST ARM ASSEMBLY**

**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.

**PLAN**

- **#5 Tie Bars & Spans @ #**
- **Double Nut (Typ.)**
- **#5 Tie Bars**
- **#5 Tie Bars** Remaining Spans @ #

**ELEVATION**

- **#8 # #8 Bars Equally Spaced**

**SECTION A-A**

- **Plan**
- **Elevation**

**DETAIL 'A'**

- **Foundation and Base Plate Details**

**DESCRIPTION:**

- **Foundation and Base Plate Details**

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- **649-031**

**REV. SHEET**

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**LAST REV.**

- **11/01/18**

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**MAST ARM ASSEMBLIES**
DOUBLE ARM CONNECTION & SPLICE DETAILS

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 (see Note 3) for the seam location at the bottom side of the Arm.
4. 'UF' measured counter clockwise from the First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

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 (see Note 3) for the seam location at the bottom side of the Arm.
4. 'UF' measured counter clockwise from the First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.
**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 \( \frac{1}{2} \) in. thick bent 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**

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**Section I-I**

---

**Detail ‘G’**

---

**Luminaire Connection Elevation**

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**Luminaire Arm and Connection Details**

---

**Luminaire Orientation**

---

**Luminaire Elevation**

---

**Luminaire Assembly**

---

**Notes:**

- Luminaire type and luminaire length may be found in the Lighting Plans.
- Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.
- The fabricator may substitute a \( \frac{1}{2} \) in. thick bent plate with the same flange width, height, and length as the MC 10x33.6 Channel section.
- 'LL' measure counter clockwise from First Mast Arm.
**NOTES:**

1. Handhole covers may be omitted when Terminal Compartment is provided.

2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required 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 lifters and wiring is accommodated.

**MAST ARM ASSEMBLY**

**COVER**

- 11 Gage Mast Arm Handhole Cover (See Note 1)
- 5/8" OD x 1/2" Wall Thick Std. Mast Arm Handhole Frame
- 1/2" Ø Hole (Typ.)
- Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

**FRAME**

- 11 Gage Mast Arm Handhole Cover
- Tack Weld Cover Clip (Typ.)
- Handhole Frame
- Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

**SECTION J-J**

- Partial Penetration Weld

**SECTION K-K**

- Full Penetration Weld

**HANDHOLE**

- 11 Gage Handhole Cover (Thru Handhole)
- 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)

**POLE TOP**

- 1/4" Min. Thick
- 1/8" Min. Bolt
- Stainless Steel Hex Head Screw (Typ.)
- Cast Aluminum Pole Cap Plate
- 1/4" Min. Thick

**POLE TOP DETAILS**

- 1/2" Ø Hole (Typ.)
- Stainless Steel Hex Head Screw (Typ.)
- C Hook For Wiring And Lifting, 1/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

**COVER**

- Full Penetration Weld

**FRAME**

- Partial Penetration Weld (Typ.)
- Center Of Pole, Pole Cap And Lifting Bar
- Lifting Bar
- Nut

- Pole Cap Plate

**SECTION J-J**

- Partial Penetration Weld (Typ.)
- Pole Wall
- Tack Weld Cover Clip (Typ.)

**SECTION K-K**

- Full Penetration Weld
- Pole Wall
- Handhole Frame
- 1/2" Ø Stainless Steel Hex Head Screw (Typ.)

- 1/2" Ø Stainless Steel Hex Head Screw (Thru Handhole)
- 1/2" Ø Stainless Steel Hex Head Screw (Typ.)

- Partial Penetration Weld (Typ.)
- Tack Weld Cover Clip
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. Install grommets or bushings in each hole.
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 ~ 5/8 x 18" Anchor Bolts With Double Nuts. (ASTM F1554 Grade 55)
9. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.
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 665-003.
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 646 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:
- 3 " Vari (If Installed) and Controller
- Transformer Base and Foundation (See Detail "B"
- Solar Battery Compartment (If Installed) and Controller
- Rectangular Rapid Flashing Beacon
- W16-7P Sign
- W11-2 Sign (See Note 5)
- See DETAIL "A"
- 7 '-0 " W11-2 Sign (See Note 5)
- See DETAIL "B"
- For Conventionally-Powered Applications
- Pole Non-Fused Watertight Breakaway Electrical Connectors
- U.L. Approved Ground Rod
- To Power Service Point
- Circuit Conductors in Schedule 40 PVC Conduit. Circuit Conductors and Conduit Size as Shown in Plans.
- 1 1/4" Diameter 20' Long Copper Clad with Approved Ground Connection (At all Pull Boxes)
- Concrete Apron (Typ.)
- Conduit. Circuit Conductors
- Finished Grade
- Crushed Stone For Drainage.
- 12" Bed of Pearock or Size as Shown in Plans.
- #6 TW Green Ground Wire
- Pull Box
- Strain Relief Fitting
- #6 TW Green Ground Wire
- Concrete Apron (Typ.)
- Connection (At all Pull Boxes)
- Strain Relief Fitting
- Finished Grade
- Approach Traffic
- Pole Wiring and Footing Detail
- DETAIL "A"
- DETAIL "B"
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.

TYPICAL INSTALLATIONS FOR SIGN PANEL(S) MOUNTED ON SPAN WIRE

SIGN MOUNTING DETAIL

OPPOSING SIGN MOUNTING DETAIL

TYPICAL INSTALLATIONS FOR SIGN PANEL(S) MOUNTED ON SPAN WIRE

SPAN WIRE MOUNTED SIGN DETAILS

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659-010

SHEET
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 1¾" diameter PVC conduit.
8. All communication and power cables must be neatly bundled and secured.
10. Use a Camera Lowering Device listed on the Approved Product List (APL).

CAMERA LOWERING DEVICE DETAIL

CAMERA MOUNTING WITH LOWERING DEVICE
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.

Pole Plate With Stainless Steel Band
(Or Method Approved By Engineer)

Camera Mounting Details

SECTION AA

CAMERA MOUNTING WITH FIXED BRACKET

REVISIO N
DESCRIPTION:

REV 1
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SHEET 2 of 2
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 third enclosure over the exposed end of the shielded cable. An alternate is to use 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 through the curb at the point which the required saw-cut depth is obtained just prior to cutting the top inside edge of the curb. As an alternate, a larger diameter enclosure that will accommodate all of the conductors and the exposed end of the shielded cable may be used.
2. Install the conduit at least 6" into the asphalt pavement and approximately 2" below the top of the roadway surface. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the engineer.
3. The departure angle of the conduit from the roadway is between 30° to 45°.
4. Fill the hole with loop sealant to the level of the curb surface.
5. Ensure the conduit fits snug within the drilled hole.
6. Use a nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

ELEVATION

INSTALLATION WITHOUT CURB & GUTTER

ALTERNATIVE 1

INSTALLATION WITH CURB & GUTTER

ALTERNATIVE 2

TWISTED PAIR AND LOOP LEAD-IN INSTALLATION
LOOP TYPES, EXPANSION JOINTS, AND DETAILS

LOOP TYPES

TYPES A, B, C, D, E, F, G

NOTES:
1. The number of "Turns" indicated at the specified point on the loop refers to the number of passes of loop wires which are placed in the saw-cut forming the complete loop.
2. Loop types or details not drawn to scale.
3. Loop Types are centered in a single lane except Type 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.

VERTICAL SECTION

CONCRETE PAVEMENT EXPANSION JOINTS

VEHICLE LOOP INSTALLATION DETAILS
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.
Vehicle movements & signal head number assignments are not directionally oriented but shall maintain their relative orientation about the intersection (i.e., movements 7 and 4 are always to the right of movements 1 and 6 etc.).

**LEGEND**

1 Vehicle Movement Number
2 Pedestrian Movement Number
3 Timing Function Number
4 Phase Number
5 Green Arrow (Left or Right)
6 Red Arrow
7 Yellow Arrow

**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
3 Timing Function Number
4 Phase Number
5 Green Arrow (Left or Right)
6 Red Arrow
7 Yellow Arrow

**SIGNAL CLEARANCE TABLE**

(Blank Indicates No Clearance Required)

<table>
<thead>
<tr>
<th>FROM</th>
<th>R</th>
<th>G</th>
<th>WALK</th>
<th>DONT WALK</th>
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</table>

**SIGNAL INDICATIONS**

WALK
DONT WALK
Flash
DONT WALK

**DESCRIPTION:**

10/24/18 3:46:05 PM

**REVISION:**

11/01/17

**STANDARD SIGNAL OPERATING PLANS**

**STANDARD PLANS**

**INDEX**

671-001

1 of 2
NOTES:
1. 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.

1. Service Slab: slope 2" to 1" 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 pullbox. 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.

POLE MOUNTED CONTROLLER CABINET

INTERCONNECT JUNCTION BOX

NEW CONTROLLER CABINET

EXISTING CONTROLLER CABINET

GROUND MOUNTED CONTROLLER CABINET

PEDESTAL MOUNTED CABINET

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_Generator Power for Signalized Intersection
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).

**CABINET LAYOUT DETAILS (Four Lanes or Less)**

**NOTES:**

- Fabricate bracket out of 1/8" - ½ 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 receptacles with mounting brackets
   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).

NOTES:

CABINET LAYOUT DETAILS (Five to Eight Lanes)
NOTES:
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 capable of up to eight lanes of inputs and a single equipment cable with split ends to fit two J1 receptacles. (Reference Sheet 2 detail)
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 loop wire in the bottom of the slot. Inductive loops are 6'x6'. Place the IMSA 51-7 copper wire 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 twists per foot. Leads that are within 150' of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances over 150', #14 IMSA 50-2 shielded lead-in cable must be spliced to the loop wire twisted pair at the first pull box to which the loop wire is pulled.
4. Marking will consist of two rounds of contrasting colored tape, one color for the lane number and the second color for the lead loop location in the lane. The first band closest to the cabinet will represent the lane number, one round of tape and a second round of a contrasting colored tape for the lead loop in the lane. The trailing loop would not have a second contrasting colored band of tape.
5. See Index 635-001 for pull box and apron details.
6. All splices will be performed using splice kits designed for direct burial. Splice kits will include screw on wire connectors and a housing with sufficient sealant to fully encapsulate the spliced connections. Taped splices are not permitted.
7. Use a chalk line or string and paint to layout the position of the sensor and lead-in cable slots. Ensure saw cuts do not deviate more than 0.5 inches from the chalk line. Use a single blade or ganged blade saw wide enough to cut the 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 loop wire in the bottom of the slot. Inductive loops are 6'x6'. Place the IMSA 51-7 copper wire 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.
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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 #10 AWG stranded copper wire for Solar Panel Array installations.
4. Solar panel should be installed facing due south with angle of tilt equal to the sum of the following equation. The Latitude of the panel's location, multiplied by 0.76, plus 3.1 degrees. Equation expressed as \[(LAT) \times 0.76 + 3.1°\]
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"
   d. 4'-0" Weather Head
   e. 4" Weather Head
   f. Flexible Conduit
   g. Bare Copper Wire
   h. No. 4 AWG Solid Copper

SOLAR POWER POLE
WITH POLE MOUNTED CABINET
(To 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.
Centroid
5

6

NORTH

Size

'A'
n

'X'
n x 'A'
n

'Y'
n x 'A'
n

(in.�)

(in.�)

(in.�)

-4,252.5

2,362.5

315

+4,252.5

2,362.5

15+1+12 = 28

576

-7,776

16,128

15+1+12 = 28

436

5,886

12,208

a x h

Local
'Y
n'

Global
'X
n '

Global
'Y
n '

(in. x in.)

(in.)

(in.)

1

21 x 15

7.5

-10.5-1.5-1.5 = -13.5

7.5

2

21 x 15

7.5

10.5+1.5+1.5 = 13.5

7.5

3

24 x 24

12

-12-1.5 = -13.5

4

24 x 24

12

12+1.5 = 13.5

EAST

3

4
'
D'

Centroid of Sign Cluster
COUNTY

2

'
C'

'
H'

Bottom of Sign Cluster
1

315

'
B'

SHEET
Edge of Pavement Elevation
24 x 12

5

Groundline Elevation

24 x 12

6

-12-1.5 = -13.5

6

12+1.5 = 13.5

6

15+1+24+1+6 = 47

15+1+24+1+6 = 47
TOTALS

Σ ('A ')
n

'X' =
c

= 2,218 in.� = 15.4 ft.�
Σ ( 'X' x 'A' )
n
n

Σ ('X ' x 'A ') = -1,890 in.� = -1.09 ft.�
n
n

= -0.1 ft.

Σ 'A'
n

'Y' =
c

Σ ( 'Y' x 'A' )
n
n
Σ 'A'
n

Σ ('Y ' x 'A ')
n
n

288

-3,888

13,536

288

3,888

13,536

2,218

-1,890

60,133

= 60,133 in.� = 34.8 ft.�

CONTENTS

1

General Notes and Design Example

2

Design Example - Centroid

3

Column and Foundation Tables

4

Slip Base and Foundation Details

5

Driven Post and Soil Plate Detail

6

Wind Beam Connection

7, 8 & 9

Frequently Used Sign Clusters

= 2.26 ft.

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.

Calculated:

X'= -0.1 ft., 'Y'
c =
c

'D' 2.26 ft.

GENERAL NOTES:
'H' = 'B' + 'C' + 'D' = 10.26 ft. ==>

Σ ('A ')
n

USE 11 ft.

= 15.4 ft.�

==> USE 16 ft.�

1. Shop Drawings:
This Index is considered fully detailed. Submit Shop Drawings only for
minor modifications not detailed in the Plans.
2. Aluminum Sign, Wind Beams and Column (Post) Materials:

STEP 3:Refer to the Aluminum Column (Post) Selection Tables and find the intersection point. See Sheet 3.

A. Aluminum Plates: ASTM B209, Alloy 6061-T6
B. Aluminum Bars and Extruded Shapes: ASTM B221, Alloy 6061-T6
C. Aluminum Structural Shapes: ASTM B308 Alloy 6061-T6

ALUMINUM COLUMN (POST) SELECTION TABLE

D. Cast Aluminum: ASTM B26 Alloy A356-T6

'H' (FT)

TO TAL PANEL AREA (SF)

8 ft

9 ft 10 ft 11 ft 12 ft 13 ft 14 ft 15 ft 16 ft 17 ft 18 ft 19 ft 20 ft

For 'H' = 11 ft.,

Area = 16 ft.�

E. Aluminum Weld Material: ER 5556 or 5356

3 sf

2

2.5

2.5

2.5

3

3

3

3

3.5

3.5

3.5

3.5

3.5

4 sf

2.5

2.5

3

3

3

3

3.5

3.5

3.5

3.5

3.5

3.5

3.5

5 sf

2.5

3

3

3

3.5

3.5

3.5

3.5

3.5

3.5

3.5

4

4

6 sf

3

3

3.5

3.5

3.5

3.5

3.5

3.5

3.5

3.5

4

4

4

7 sf

3

3.5

3.5

3.5

3.5

3.5

3.5

3.5

4

4

4

4

4

8 sf

3.5

3.5

3.5

3.5

3.5

3.5

3.5

4

4

4

4

4

4

column labeled "11 FT". For the example the

9 sf

3.5

3.5

3.5

3.5

3.5

3.5

4

4

4

4

4

4

4

intersection value is "4" (4" OD).

10 sf

3.5

3.5

3.5

3.5

3.5

4

4

4

4

4

4

4.5

4.5

11 sf

3.5

3.5

3.5

3.5

4

4

4

4

4

4

4.5

4.5

4.5

12 sf

3.5

3.5

3.5

4

4

4

4

4

4

4

4.5

4.5

4.5

13 sf

3.5

3.5

4

4

4

4

4

4

4

4.5

4.5

4.5

5

14 sf

3.5

3.5

4

4

4

4

4

4

4.5

4.5

4.5

5

5

15 sf

3.5

4

4

4

4

4

4

4.5

4.5

4.5

5

5

5

16 sf

3.5

4

4

4

4

4

4

4.5

4.5

5

5

5

6

17 sf

4

4

4

4

4

4

4.5

4.5

4.5

5

5

6

6

18 sf

4

4

4

4

4

4.5

4.5

4.5

5

5

5

6

6

19 sf

4

4

4

4

4

4.5

4.5

4.5

5

5

6

6

6

20 sf

4

4

4

4

4.5

4.5

4.5

5

5

5

6

6

6

21 sf

4

4

4

4

4.5

4.5

5

5

5

6

6

6

6

22 sf

4

4

4

4.5

4.5

4.5

5

5

6

6

6

6

6

E. Galvanized Washers: ASTM F436

23 sf

4

4

4

4.5

4.5

5

5

5

6

6

6

6

6

F. Galvanized Bolts (Sleeve): ASTM A307 with Galvanized Hex Nuts and Washers

24 sf

4

4

4.5

4.5

4.5

5

5

6

6

6

6

6

6

25 sf

4

4

4.5

4.5

5

5

5

6

6

6

6

6

8

26 sf

4

4.5

4.5

4.5

5

5

5

6

6

6

6

8

8

A. Aluminum Fasteners: Anodic coating (0.0002 inches min.) and chromate sealed

27 sf

4

4.5

4.5

4.5

5

5

6

6

6

6

6

8

8

B. High Strength Steel Bolts Nuts and Washers: ASTM F2329

28 sf

4

4.5

4.5

5

5

5

6

6

6

6

6

8

8

C. All other steel items (excluding stainless steel): Hot-dip Galvanize - ASTM A123

29 sf

4.5

4.5

4.5

5

5

6

6

6

6

6

8

8

8

D. Repair damaged galvanizing in accordance with Specification 562

30 sf

4.5

4.5

5

5

5

6

6

6

6

6

8

8

8

- Refer to the Aluminum Column (Post) Selection
Table, from Sheet 3 and shown here for reference.

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

- To determine the required post size, find the

C. Aluminum Washers: ASTM B221, Alloy 7075-T6

intersection of the row labeled "16 SF" and the
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 SH1
- In the Column (Post) and Foundation Table, the value
"4" shows the design requires a 4.0" diameter and
1 "
4

B. Stainless Steel Nuts: ASTM F594

thick Aluminum Column (Post) and a 2.0' diameter

and 3.5' deep Concrete Foundation and 3.0' Stub.

5. Sign Column (Post) Bolts, Nuts and Washers:
A. Galvanized U-Bolt (Column): ASTM A449 or ASTM A193 B7 according to
ASTM F2329 with double nuts.
B . Aluminum Bolts (Sleeve): ASTM F468, Alloy 6061-T6 or 2024-T4 with
Hex Nuts F467 6061-T6 or 6262-T9 and Washers B221, Alclad 2024-T4
C. Galvanized High Strength Hex Head Bolts (Base Bolts): ASTM F3125,
Grade A325, Type 1
D. Galvanized Hex Nuts: ASTM A563 Grade DH

6. Coatings:

2:
59:
19 PM

7. BREAKAWAY SUPPORTS REQUIREMENTS: Install non-frangible aluminum column (post)
1
2")

(larger than 3

STEP 4:For sign assemblies with signs oriented in two directions, only the sign with the

10/30/2018

with breakaway supports as shown on Sheet 4. Signs shielded by

barrier wall or guardrail do not require breakaway support.

largest area should be analyzed to determine the Column (Post) requirements.

GUIDE TO USE THIS INDEX

LAST
REVISION

11/01/18

REVISIO N

GENERAL NOTES AND DESIGN EXAMPLE
DESCRIPTION:

FY 2019-20
STANDARD PLANS

INDEX

SHEET

SINGLE COLUMN GROUND SIGNS
700-010

1of 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

\[ X_C = \frac{\sum \left( X_i \cdot A_i \right)}{\sum A_i} \]

\[ Y_C = \frac{\sum \left( Y_i \cdot A_i \right)}{\sum A_i} \]

- \( X_C \) = Centroid horizontal location of sign or cluster from Aluminum Column (Post)
- \( Y_C \) = Centroid height of sign or cluster from bottom of sign cluster
- \( X_{n} \) = Individual sign horizontal location from Aluminum Column (Post)
- \( Y_{n} \) = Individual sign centroid height from bottom of sign cluster

- \( A \) = Individual sign area
- \( h \) = Individual sign height
- \( a \) = Individual sign width
- \( h' \) = Height of sign or cluster centroid from groundline
**Concrete (Class I)**

- **10 ft**
  - **3.5 ft**
  - **17 ft**
  - **3.5 ft**

**5 ft**

- **4.5 ft**

**SHEET 3.5 ft**

- **14 ft**

**DESCRIPTION:**

- **20 ft**
  - **4.5 ft**
  - **3.5 ft**
  - **3.5 ft**
  - **4.5 ft**

- **3.5 ft**
  - **16 ft**
  - **4.5 ft**
  - **3.5 ft**
  - **3.5 ft**
  - **4.5 ft**
  - **4.5 ft**

- **2.5 ft**
  - **17 ft**
  - **3.5 ft**
  - **3.5 ft**
  - **4.5 ft**
  - **4.5 ft**
  - **4.5 ft**

- **2.5 ft**
  - **15 ft**
  - **3.5 ft**
  - **3.5 ft**
  - **4.5 ft**
  - **4.5 ft**
  - **4.5 ft**

- **5 ft**
  - **19 ft**
  - **3.5 ft**
  - **3.5 ft**
  - **4.5 ft**
  - **4.5 ft**
  - **4.5 ft**

- **3.5 ft**
  - **21 sf**
  - **3.5 ft**
  - **3.5 ft**
  - **4.5 ft**
  - **4.5 ft**
  - **4.5 ft**

**REVISION**

- **10/30/18**

**TOTAL PANEL AREA (SF)**

- **20 sf**
  - **19 sf**
  - **18 sf**
  - **17 sf**
  - **16 sf**
  - **15 sf**
  - **14 sf**
  - **13 sf**
  - **12 sf**
  - **11 sf**
  - **10 sf**
  - **9 sf**
  - **8 sf**
  - **7 sf**
  - **6 sf**
  - **5 sf**
  - **4 sf**
  - **3 sf**

**ALUMINUM COLUMN (POST) SELECTION TABLE (O.D. in.)**

<table>
<thead>
<tr>
<th>Outside Diameter (in)</th>
<th>Wall THK. (in)</th>
<th>Embedment Depth (ft)</th>
<th>Concrete (Class I)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>12 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
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<tr>
<td><strong>15 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
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<td><strong>16 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>17 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>20 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>21 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>22 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>23 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>24 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>25 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>26 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>27 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>28 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>29 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>30 ft</strong></td>
<td><strong>3.5 ft</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COLUMN AND FOUNDATION TABLES**

- **FOUNDATION TABLE**
  - **Column (Post) Scale**
  - **Driven Post Without Soil Plate**
  - **Foundation Alternatives**
  - **Embedment Depth (ft)**
  - **Concrete (Class I)**

- **INSTALLING FRANGIBLE COLUMN SUPPORTS:**
  - Columns (posts) 3'-0" O.D. and less are considered frangible and may be installed either by driving the post or setting the posts in preformed holes. Backfill preformed holes with suitable material tamped in layers not thicker than 6" (to provide adequate compaction) or filled with flowable fill or bagged concrete.

- **OFFSET SIGN**
  - **Sign**
  - **Aluminum Column (Post)"**

**NOTE:**

1. For offset sign placement see Index 700-101.
2. For signs with widths greater than 4" see Index 700-011.
3. Offset signs with driven posts require a soil plate.

**STANDARD PLANS**

- **FY 2019-20**

**INDEX**

- **700-010**

**SHEET**

- **3 of 9**
**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 3/8" 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.
      2. Assemble top base plate to bottom Base Plate using Base Bolts (high strength) with 3 washers per bolt. (See Detail ‘A’):
         a. Place one washer on each Base Bolt between the bottom Base Plate and the Base Bolt head.
         b. Place the first 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.
      3. Orient the Bolt Keeper Plates in the Direction of Traffic.
      4. Tighten Bolt Bolts as follows:
         1. 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).
         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. Space the shims evenly around the perimeter of the column (1 between each bolt hole. 4 total). Use shims that are 1" shorter than the height of the sleeve.
Optional Slotted Holes

**DETAIL "B"**

**ALUMINUM SOIL PLATE DETAIL**

(Frangible Post In Crossovers, Medians & Sidewalks)

**DRIVEN POST AND SOIL PLATE DETAIL**

3½ O.D. Max.
Aluminum Column (Post)

**PLAN**

Concrete Sidewalk, Median, Etc.

**ELEVATION**

1½ Ø Bolt Holes
(See DETAIL "B")

Washers as required

Hole Spacing to match U-Bolts

2" Thick Grout Seal

1½ Ø Bolt Holes
(See DETAIL "B")

Washers as required

Hole Spacing to match U-Bolts

2" Thick Grout Seal
WIND BEAM CONNECTIONS DETAILS

NOTES:
1. 1/2" 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 sheeting.
3. Slots up to 2" long are allowed in wind beams to accommodate U-Bolts for varying Column (Post) diameters.
4. Wind beams may be oriented in either direction.
5. For rectangular signs greater than 66" 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 the Sign.

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

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>30x15</td>
<td>3.13 SF</td>
<td>3.13 SF</td>
<td>2.51 Ft.</td>
</tr>
<tr>
<td>45x36</td>
<td>8.99 SF</td>
<td>8.99 SF</td>
<td>2.58 Ft.</td>
</tr>
<tr>
<td>24x12</td>
<td>2.00 SF</td>
<td>2.00 SF</td>
<td>2.28 Ft.</td>
</tr>
<tr>
<td>24x24</td>
<td>3.20 SF</td>
<td>3.20 SF</td>
<td>1.77 Ft.</td>
</tr>
<tr>
<td>21x15</td>
<td>2.19 SF</td>
<td>2.19 SF</td>
<td>2.18 Ft.</td>
</tr>
<tr>
<td>30x15</td>
<td>3.13 SF</td>
<td>3.13 SF</td>
<td>2.51 Ft.</td>
</tr>
<tr>
<td>30x24</td>
<td>3.99 SF</td>
<td>8.18 SF</td>
<td>2.33 Ft.</td>
</tr>
<tr>
<td>21x15</td>
<td>2.19 SF</td>
<td>2.19 SF</td>
<td>2.18 Ft.</td>
</tr>
<tr>
<td>30x15</td>
<td>3.13 SF</td>
<td>3.13 SF</td>
<td>2.51 Ft.</td>
</tr>
<tr>
<td>30x24</td>
<td>3.99 SF</td>
<td>9.31 SF</td>
<td>2.35 Ft.</td>
</tr>
<tr>
<td>21x15</td>
<td>2.19 SF</td>
<td>2.19 SF</td>
<td>2.18 Ft.</td>
</tr>
<tr>
<td>30x20</td>
<td>4.69 SF</td>
<td>6.69 SF</td>
<td>2.38 Ft.</td>
</tr>
<tr>
<td>24x12</td>
<td>2.00 SF</td>
<td>2.00 SF</td>
<td>2.28 Ft.</td>
</tr>
<tr>
<td>30x18</td>
<td>3.75 SF</td>
<td>3.75 SF</td>
<td>2.28 Ft.</td>
</tr>
<tr>
<td>36x26</td>
<td>6.75 SF</td>
<td>6.75 SF</td>
<td>2.19 Ft.</td>
</tr>
<tr>
<td>30x18</td>
<td>3.75 SF</td>
<td>3.75 SF</td>
<td>2.28 Ft.</td>
</tr>
<tr>
<td>30x30</td>
<td>4.69 SF</td>
<td>4.69 SF</td>
<td>1.77 Ft.</td>
</tr>
<tr>
<td>24x12</td>
<td>2.00 SF</td>
<td>2.00 SF</td>
<td>1.61 Ft.</td>
</tr>
<tr>
<td>30x18</td>
<td>3.75 SF</td>
<td>3.75 SF</td>
<td>2.28 Ft.</td>
</tr>
<tr>
<td>36x36</td>
<td>6.75 SF</td>
<td>6.75 SF</td>
<td>2.19 Ft.</td>
</tr>
<tr>
<td>30x18</td>
<td>3.75 SF</td>
<td>3.75 SF</td>
<td>2.28 Ft.</td>
</tr>
</tbody>
</table>

### Index

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>30x30</td>
<td>6.25 SF</td>
<td>6.25 SF</td>
<td>2.31 Ft.</td>
</tr>
<tr>
<td>24x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>2.06 Ft.</td>
</tr>
<tr>
<td>36x36</td>
<td>9.00 SF</td>
<td>9.00 SF</td>
<td>2.48 Ft.</td>
</tr>
<tr>
<td>30x24</td>
<td>5.00 SF</td>
<td>5.00 SF</td>
<td>2.48 Ft.</td>
</tr>
</tbody>
</table>

### Description

**Last Revision:** 01/01/17

**Revision:**

FY 2019-20

STANDARD PLANS

SINGLE COLUMN GROUND SIGNS

INDEX

700-010

Sheet 9 of 9
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 × 2 1/8 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 Diameter x Thickness</th>
<th>Sleeve Size Diameter x Thickness</th>
<th>U-bolt Diameter Base Bolt Diameter x Length</th>
<th>Torque lbs.in Base Plate Thickness</th>
<th>Footing Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; x 5'-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 0.5&quot;)</td>
<td>1/2' W x 3/8&quot;</td>
<td>75 ± 44</td>
<td>1&quot;</td>
</tr>
<tr>
<td>4'-0&quot; x 6'-0&quot;</td>
<td>4 NPS Schedule 80 (4.5&quot; x 0.337&quot;)</td>
<td>6 NPS Schedule 80 (6.625&quot; x 0.432&quot;)</td>
<td>3/4' W x 1/4&quot;</td>
<td>445 ± 75</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>6 NPS Schedule 80 (6.625&quot; x 0.432&quot;)</td>
<td>3/4' W x 1/4&quot;</td>
<td>445 ± 75</td>
<td>1 1/2&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>6 NPS Schedule 80 (6.625&quot; x 0.432&quot;)</td>
<td>3/4' W x 1/4&quot;</td>
<td>445 ± 75</td>
<td>1 1/2&quot;</td>
</tr>
</tbody>
</table>

TYPICAL SECTION

SIGN DETAIL

VIEW A-A

SECTION B-B

SECTION C-C
NOTES:
1. Work with index 700-010.
2. Shop Drawings: Not required.

3. Materials:
A. Steel Pipe: ASTM A36 or ASTM A500 Grade 36
B. Steel Pipe (Support Post): ASTM A501 Schedule 40
C. Aluminum Pipe: ASTM B429 Alloy 6061-T6
D. Galvanized U-Bolts, Nuts and Plate Washer
  a. U-Bolts: ASTM A449
  b. Hex Nuts: ASTM A 563 Lock Nuts
  c. Plate Washer: ASTM A 36 or ASTM A500 Grade 36 or 50
E. Galvanized anchor bolts, nuts and washers:
   a. Anchor Rod: ASTM F1354 Grade 55 fully threaded (for Adhesive Anchors)
   b. Anchor Bolt: ASTM F1354 Grade 55 Grade A Hex
   c. Nuts: ASTM A563 Heavy Hex Locking
   d. Washers: ASTM F136
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 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 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-1-P Embedded Anchors
   c. Do not drill into existing conduit
D. Temporary Signs on Permanent Traffic Railings: Same asPermanent except Field testing of anchors is not required
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 F136
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

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.

SIGN LIMITATIONS TABLE

<table>
<thead>
<tr>
<th>MAX. SIGN AREA (SF)</th>
<th>MAX. SIGN CENTROID HEIGHT (DIM. A + DIM. C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></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.

700-012
1 of 3
**NOTES:**

1. **Existing Traffic Railings:**
   - A. Locate existing conduit prior to drilling and adjust placement of base plate as necessary to avoid damaging existing conduit. Base plate must be flush with back of traffic railing. Maintain a minimum cover of 2" from face of traffic railing to tip of Adhesive anchor.
   - B. For concrete parapets less than 10" thick, through bolt 1 1/2" Heavy Hex Head Bolts without coupler threads free of concrete. 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 countersinking depth and diameter of 1/2".

2. **New Traffic Railings:**
   - A. Optional Couplers are shown for slipforming; keep Anchor coupler threads free of concrete.
   - B. For concrete parapets less than 10" thick, through bolt 1 1/2" 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 countersinking depth and diameter of 1/2".

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.

---

**2. New Traffic Railings:**

- A. Optional Couplers are shown for slipforming; keep Anchor coupler threads free of concrete.
- B. For concrete parapets less than 10" thick, through bolt 1 1/2" 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 countersinking depth and diameter of 1/2".
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>≤ 24</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>135 ≤ Sign ≤ 20</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

Permanent Signs

DIRECTION OF TRAFFIC

PARALLEL TO DIRECTION OF TRAFFIC

INDEX 700-013

ELEVATION

Concrete Barrier

1/2" Saw Cut Groove In Barrier

Steel Pipe (Support Post): ASTM A53 Grade B Schedule 40
U-Bolts: ASTM A449
Concrete Barrier

NOTES:
1. Work with Index 700-010.
2. Shop Drawings: Not required.
3. Materials:
   A. Steel Plate: ASTM A36 or ASTM A572 Grade 50
   B. U-Bolts, Nuts and Plate Washer
   C. Galvanized Anchor Bolts, Nuts and Washers
   1. Anchor Bolt: ASTM F1554 Grade 55 Fully Threaded (for Adhesive Anchors)
   2. Anchor Rod: ASTM A363 Grade 50 Grade A Hex
   3. Washers: ASTM A325
   4. Epoxy coating 1/16" thick minimum
   5. Extend coating 2 inches beyond edge of cut anchor rods
   6. Coat anchors with Type F-1 epoxy to prevent corrosion
   7. Cut anchor rods flush with the top of the railing
   8. Field testing of anchors is not required
   9. Do not drill into existing reinforcing

4. Coating:
   A. U-Bolts, Threaded Rods, Nuts and Washers: ASTM F2329
   B. Other Steel: ASTM A123

5. Fabrication:
   A. Weld: Specification 460-0.06
   B. Hot dip galvanize after fabrication

6. Construction:
   A. Locate Sign Supports a minimum of 5 feet from an open joint or transition (sign stationing may be adjusted to accommodate this requirement)
   B. Anchor Rods must be flush with top of railing
   C. Anchors in Traffic Railings:
      a. Install Adhesive Anchors in accordance with Specification 416 except perform field testing on one anchor per sign support location
      b. Use templates and cut anchors as necessary to maintain correct placement of C-T-P Embedded Anchors
   D. Install Sign Supports at the midpoint along the length of a single segment
   E. Anchors in Traffic Railings:
      a. Install Sign Supports at the midpoint along the length of a single segment
      b. Coat anchors with Type F-1 epoxy to prevent corrosion
      c. Do not drill into existing reinforcing

7. Removal of Temporary Signs on Permanently Installed Railings:
   A. Cut anchor rods flush with the top of the railing
   B. Coat anchors with Type F-1 epoxy to prevent corrosion
   C. Field testing of anchors is not required

8. Payment:
   Include the cost of all materials and labor in the cost of the single post sign assembly.
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 2 - BASE PLATE TYPE AND ANCHOR ROD SIZING**

<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>B</td>
<td>1&quot;</td>
</tr>
<tr>
<td>521-001</td>
<td>Cantilever or L-Wall</td>
<td>A</td>
<td>1&quot;</td>
</tr>
<tr>
<td>102-110 &amp; 102-100</td>
<td>Temporary Signs</td>
<td>C</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Use a staggered pattern for all temporary barriers.
**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 16 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 B222, 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 A709, Grade 36
      b. Steel Weld Metal: F132
      c. Shims: Brass ASTM B86 or Galvanized Steel
      d. 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
      e. Stainless Steel Bolts, Nuts and Washers Alloy Group 2, Condition A, may be substituted for the Aluminum bolts as follows:
         a. Bolts: ASTM F593, CW1 or SN1
         b. Nuts: ASTM F594
         c. Washers: ASTM B221, Alloy 6061-T6 or Alloy 6351-T5
   C. High Strength (H.S.) Steel Bolts, Nuts and Washers:
      a. Galvanized Hex Head Bolts: ASTM F3320, Grade A325, Type 1
      b. Galvanized Nuts: ASTM A 563 Hex, Grade DH
      c. Galvanized Washers: ASTM F436
   D. Stainless Steel Bolts, Nuts and Washers:
      a. Bolts: ASTM F1562, Grade A325, Type 1
      b. Nuts: ASTM F594, Grade A325
      c. Washers: ASTM B221, Alloy 2024-T4
   E. Hot dip galvanize after fabrication; Remove all drips, runs or beads on base plate within washer contact areas (Including saw cuts)
   F. Reinforcing Bars or Welded Wire Reinforcement (WWR): Specification 415
   G. Treat damaged galvanizing in accordance with Specification 562

4. Coatings:
   A. Aluminum Fasteners: Anodic coating (0.0002 inches min.) and chromate sealed
   B. Galvanize High Strength Steel Bolts Nuts and Washers: ASTM F3320
   C. Galvanize all other steel items (excluding stainless steel): Hot-dip ASTM A123
   D. Galvanize all other aluminum items: Hot-dip ASTM F1562
   E. Hot dip galvanize after fabrication. Remove all drips, runs or beads on base plate within washer contact areas (Including saw cuts)

5. Fabrication:
   A. All Base Connections and Stub Column materials are steel unless otherwise specified.
   B. Drill or sub-punch and ream holes in Fuse Plates and Hinge Plates
   C. Weld Base Plate to Post & Stub or if using the Alternate Connection Detail weld Base Plate and Stiffeners to Post and Stub (Sheet 2)
   D. Hot dip galvanize after fabrication. Remove all drips, runs or beads on base plate within washer contact areas (Including saw cuts)

6. Construction:
   A. Install the Sign Structure foundation in accordance with Specification 455. Orient Stub Post according to direction of traffic (Sheet 2)
   B. Install all high strength bolts except Base bolts in accordance with Specification 700.
   C. Assemble Post to Stub with Base Bolts and three flat washers per bolt (See Base Connection Details, Sheet 2) Tighten Base Bolts in accordance with Instructions Notes on Sheet 2.
MULTI-COLUMN SIGN ASSEMBLY

FOUNDATION NOTES:
The Contractor may use Welded Wire Reinforcement (WWR) for foundation reinforcing.

At the Contractors option, the #4 tie bars at 12" o.c. may be replaced by 10x33' diameter @ 1/4" pitch, with three flat turns at the top and one flat turn at the bottom in accordance with Specification 415.

INSTRUCTIONS:
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.

2. H.S. Base Bolt L2 Tightening Instructions:
   A. Tighten Base Bolts to the maximum possible with a 12" wrench and torque to the maximum possible.
   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 galing/ temp.

   ALTERNATIVE BASE CONNECTION DATA

   ALTERNATIVE BASE CONNECTION

   FOUNDATION AND BASE CONNECTION DETAILS

   SHEET: 700-020  2 of 3
GENERAL NOTES:
1. Use this Index with Index 700-040 and 700-041.
2. The number and location of the Panel Splices are determined by the sign face supplier.
3. Spacing of Vertical Hangers:
   A. Two Vertical Hangers = 11.0% L
   B. Spacing of vertical hangers may be varied slightly as necessary to clear the truss struts and diagonals at panel points.
4. Spacing of Wind Beams:
   A. Two Wind Beams = 21.0% D
   B. Spacing of vertical hangers may be varied slightly as necessary to clear the truss struts and diagonals at panel points.
5. Shop Drawings:
   A. Required for Sign Panels deeper than 10'-0" with a horizontal panel splice.
   B. Splice must be located in between interior Zee Supports and only allowed on signs greater than 10'-0".
6. Materials:
   A. Aluminum:
      a. Bars, and Extruded Shapes: ASTM B221, Alloy 6061-T6 or Alloy 6351-T5
      b. Structural Shapes: ASTM B6061, Alloy 6061-T6
      c. Flat, Wide and Tubular Shapes: ASTM F469, ASTM F468, Alloy 6061-T6 or Alloy 6062-T9
      d. Washers: ASTM B222, A499, Alloy 6061-T6
   B. Steel:
      a. U-Bolts: ASTM A449 or ASTM A193 B7
      b. Nuts: ASTM A563, 2 per leg
      c. Washers: ASTM F436, Alloy 6062-79
   C. Coatings:
      a. Aluminum Coatings: AASHTO M288, (Fluoropolymer)
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
   D. Wind Speed by county: see Index 715-010.
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. The Guide Sign Worksheet indicates the sign luminaire used for basis of design.
The contractor may propose a different luminaire by submitting photometric
calculations for each lighted sign for review by the Engineer.

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 loop 2' of lighting circuit
   conductors in the pull box for connection by the signing contractor.
4. Signing contractor furnishes and installs the luminaires, NEMA 3R
   enclosure, 30 amp breaker, conduit, conductors and all other electrical
   equipment necessary for connection to the lighting circuit.

Roadway Lighting not included in contract:
1. Signing plans include the pay item numbers to furnish and install conduit,
   conductors, ground rods, pull boxes and service point equipment.
2. Signing plans indicate the location of the service point equipment and
   circuit runs.
3. Signing contractor provides all electrical equipment necessary for
   connection of the sign lights.
NOTES

1. Install hanger pipe to each vertical beam crossed with a 3/8" 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. + 5" (Min.)

SECTION A-A

PLATE 'A'

- 2 1/2" Pipe Cap
- 2 9/16" Steel Pipe
- 2 1/8" Pipe Coupling
- 2 7/8" Pipe Tee
- 2 3/4" Pipe Cap

SECTION B-B

PLATE 'B'

- 6"x9/16" U-Bolt With Washers And Double Nuts (2 Bolts Req'd)
- 6"x9/16" U-Bolt With Washers And Double Nuts (2 Bolts Req'd)
- 6"x9/16" U-Bolt With Washers And Double Nuts (2 Bolts Req'd)

PLATE 'A'

- 1/4" Bolt On 5" Ø Bolt Circles
- 3/8" Ø Hole On 5" Ø Bolt Circles
- 3/8" Ø Hole Thru 3" Sleeve
- 3/8" Ø Hole Thru 3" Sleeve

PLATE 'A'

- 2 1/2" Pipe Cap
- 2 3/4" Pipe Cap
- 2 1/2" Pipe Cap
- 2 1/2" Pipe Cap

LUMINAIRE SUPPORT STRUCTURE

- Varies By Luminare Type
- 9" Of Luminare
- 2 1/2" To 1 1/2" Reducing Coupling
- 2 1/2" To 1 1/2" Reducing Coupling

DETAIL 'A'

(Luminare Support Structure)

DETAIL 'B'

(Hanger Pipe Connection)
NOTES:

1. Work this Index in conjunction with CANTILEVER SIGN STRUCTURE DATA TABLES in the Plans and Index 700-020.

2. Handholes are required at pole base for DNS Structures. Refer to Index 700-095 for Handhole Details.

3. Shop Drawings are required.

   Obtain Shop Drawing approval prior to fabrication. Include the following:
   A. Upright Pipe height ('A') and Foundation elevations. Verify dimension in the field prior to submittal to ensure minimum vertical clearances of the sign panel over the roadway.
   B. Height of the foundation above adjacent ground.
   C. Anchor bolt orientation with respect to centerline of truss and the direction of traffic.
   D. Chord Splices
   E. Handholes at pole base (when required).

4. Materials:

   A. Sign Structure:
      a. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield of ASTM A606, Grade B (Wiki).
      b. Steel Angles and Structural Plates and Bars: ASTM A709 Grade 36.
      c. Wood Material: ET63X.
   B. Bolts, Nuts and Washers:
      a. High Strength Bolts: ASTM F3125, Grade A325 Type 1.
      b. Nuts: ASTM A893 Grade DH Heavy-Five.
      c. Washers: ASTM F436 Type 1, one under turned element.
   C. Anchor Bolts, Nuts and Washers
      a. Anchor Bolts: ASTM F7538 Grade 55.
      b. Nuts: ASTM A893 Grade A Heavy-Five (5 per bolt).
      c. Plate Washers: ASTM A36 (2 per bolt).
   D. Concrete:
      a. Spread Footing Concrete: Class IV.
      b. Drilled Shaft concrete: Class IV ( Drill Shaft).

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 TABLE: Minimum splice spacing is two truss panel lengths apart.
   C. Upright Splices: Not Allowed.
   D. Structural bolt hole diameters: Bolt diameter plus 1/16"
   E. Anchor bolt hole diameters: Bolt diameter plus 3/8"
   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 corrective action if necessary, prior to shipment.
   H. Disassemble, as necessary, and secure components for shipment.

6. Coatings:

   A. Bolts, Nuts and Washers: ASTM F3389
   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-B.
NOTES:
1. Construction joint allowed, roughen surface to 3/8 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 Structural Grout Pad does not provide adequate clearance for accessibility considerations.
6. Wrap fillet weld around the stiffener termination on the tube wall.
CANTILEVER ASSEMBLY

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 '1C' hex head bolts.
   B. Back: Install '1B' hex head bolts.
4. Gusset Plates (Typ.)
5. 'F' OD + 2" For An Odd Numbers Of Bolts Per Row
   3/4" For An Even Numbers Of Bolts Per Row
6. 'TB' OR 'TC' Gusset Plates (Typ.)
CANTILEVER ASSEMBLY

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.
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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.

Bolt Size | Distance EA | Distance EB
--- | --- | ---
1 1/2" | 43/8 | 2 1/2"
1" | 31/8 | 1 1/2"
9/16" | 15/32 | 7/32"
9/32" | 25/64 | 19/64"
1/8" | 19/64 | 15/64"
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

CANTILEVER ASSEMBLY

SPLICE CONNECTION 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.
4. Obtain Shop Drawing approval prior to fabrication. Include the following:
A. Upright Pipe height ("C" & "B") and foundation elevations: Verify minimum vertical clearances of the sign panel over the roadway.
B. Height of the foundation above adjacent ground surface.
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, X60, 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 A325, Type 1
      b. Nuts: ASTM A563 Grade A Heavy-Hex
      c. Washers: ASTM F686, Type 1, one under turned element
   C. Anchor Bolt, Nut and Washers:
      a. Anchor Bolts: Grade 55
      b. Nuts: ASTM A563, Grade DH Heavy-Hex (5 per bolt)
      c. Washers: ASTM A36 Grade 6 (1 per bolt)
   D. Concrete: Class IV (Drilled Shaft)
   E. Reinforcing Steel: Specification 415
5. Fabrication:
   A. Welding: Specification 460-6.4
   B. Chord Splices: Minimum splice spacing is three truss panel lengths apart and three truss panel lengths from the uprights.
   C. Upright splice: Not allowed
   D. Structural bolt hole diameters: Bolt diameter plus \( t \times \frac{3}{4} \)
   E. Anchor bolt hole diameters: Bolt diameter plus \( t \times \frac{3}{4} \)
   F. Hot Dip Galvanize after fabrication
   G. Shop assemble the entire structure after galvanizing to validate/document alignment and clearance for bolted connections as well as control 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 F1554
   B. All other steel, including Plate Washers, hot dip galvanize: ASTM A500, Grade B (Min.)
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. Handholes at pole base (when required)
   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).
5. The drilled shaft is terminated on the tube wall (Typ).
6. Wraps fillet weld around the stiffener. Above finished grade.
7. The shaft length is based on 2'-0" height from top elevation of the drill shaft to the finished grade, unless specified otherwise in the plans.
8. See Traffic Plans for elevation at top of Foundation.
NOTES:

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" Ø.
3. Right Upright Truss connection shown, Left Upright Truss connection similar.

SPAN SIGN ASSEMBLY

SPAN SIGN STRUCTURE

UPRIGHT-TRUSS CONNECTION DETAIL

SECTION A-A

FRONT ELEVATION

SIDE ELEVATION

DETAIL "C"
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.

<table>
<thead>
<tr>
<th>Bolt Diameter (in.)</th>
<th>Distance (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/8</td>
<td>4 1/2</td>
</tr>
<tr>
<td>1</td>
<td>3 1/2</td>
</tr>
<tr>
<td>1 1/8</td>
<td>2 1/2</td>
</tr>
</tbody>
</table>

HEAD BOLTS:

- (Typ.) 3/8 x 2" Head Bolt
- (Typ.) 3/8 x 4 1/2"

BACK SIDE SIGN MOUNTING:

- 3/8" Ø U-Bolt With Double Nuts And Washers (Typ.)

FRONT ELEVATION

SIDE ELEVATION

SPAN SIGN STRUCTURE

DETAIL 'D'

DETAIL 'E'

DETAIL 'F'

DETAIL 'G'

DETAIL 'H'

DETAIL 'I'

DETAIL 'J'

DETAIL 'K'

DETAIL 'L'

TRUSS

DETAIL 'O'

DETAIL 'P'

DETAIL 'Q'

DETAIL 'R'

DETAIL 'S'

DETAIL 'T'

DETAIL 'U'

DETAIL 'V'

DETAIL 'W'

DETAIL 'X'

DETAIL 'Y'

DETAIL 'Z'

SPAN SIGN STRUCTURE

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SPAN SIGN ASSEMBLY

SPICE CONNECTION DETAIL

1. Only 6 bolts are shown in detail for clarity.

(One Half Each End Of Splice)

TRUSS PLUG DETAIL

THICK NEOPRENE

SECTION D-D

ALTERNATE SPICE CONNECTION DETAIL

UPRIGHT CAP DETAIL
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.

NOTES:
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 4 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. U-Bolts: ASTM A449 or A193 B7
      d. Steel Bolts, Nuts, and Washers:
         1. High Strength Bolts: ASTM F1315, Grade A325, Type 1
         2. Nuts: ASTM F363
         3. Washers: ASTM F463 (Flat Washer)
   B. Coatings:
      a. All nuts, bolts and washers ASTM F2329
      b. All other steel items ASTM A123
      c. Bolt Hole Diameters: Bolt plus \( \frac{3}{4} \)" 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 enclosure. Field locate holes to allow vertical hanger placement 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 truss.
   F. Connect grounding conductors to the steel framework that has been cleaned to base metal by use of bonding plates having contact area of not less than 8 square inches or by welding or brazing. Drilling and tapping the steel structure to accept a threaded connector is also an acceptable method.
   G. If steel framework is to be drilled and tapped to accept threaded connector, the threaded connector shall be galvanized and have at least 3 threads fully engaged and secured with a jam nut to the steel framework.
   H. Bends in the conduit must be greater than the minimum bending radius for the cable contained in the conduit.
   I. Completely encase all data, fiber optic and power cables for the DMS within the sign structure or in conduit.
   J. 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

DYNAMIC MESSAGE SIGN WALK-IN

INDEX
700-090

DEPARTMENT
R E V I S I O N  D E S C R I P T I O N
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NOTE: Actual number and direction of travel lanes varies.
**Dynamic Message Sign Grounding and Conduit Details**

**Ground Mounted Cabinet**
- Air Terminal (Typ.)
- Dynamic Message Sign (DMS) (See DETAIL "A")
- Handrail
- Post
- Catwalk
- Fiber Optic Pull Box (See DETAIL "B")

**Ground Rod A**
- Primary Ground Rod Assembly (See DETAIL "C")
- Transition Conduit Outside of Foundation (Typ.)
- 3'-0" Max.
- 40'-0" (Typ.)

**Ground Rod B**
- As Required

**Ground Rod C**
- As Required

**Ground Rod D**
- As Required

**Concrete Slab**

**Steel Ground Rod (Typ.)**
- "Ø 20' Copper-Clad"

**Pole Mounted Cabinet**
- Air Terminal (Typ.)
- Dynamic Message Sign (DMS)
- Handrail
- Post
- Grating
- Bottom Truss Chord
- Span or Cantilever (See DETAIL "E")

**2" PVC Conduit with #3 AWG Tin-Plated Bare Solid Copper Ground Wire Bonded to DMS Structure and Ground Rod With Exothermic Weld**

**Electrical Service and Communications Conduits For Electrical Service and Communications**
- 1'-6" Min.
- 110 Copper (Class II) Surface Mount The Cabinet

**Power Conduit (2" PVC)**
- 2'-0" to 4'-0"

**Fiber Optic Pull Box (See DETAIL "B")**

**Foundation (Typ.)**
- Outside Of Transition Conduit (As Shown On Plans)

**Contact Area Per NFPA 780-4.16.3**
- Base of 8 Square-Inches Minimum

**DYNAMIC MESSAGE SIGN WALK-IN**

**POLE MOUNTED CABINET**

**REVISION**

**DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2019-20 SHEET INDEX 3 of 5**

**REVISI ON DESCRIPTION:**

**INDEX 700-090**
**Detail "B"**

- **Primary Ground Rod**
- #2 AWG Tin-Plated Bare Solid Copper Wire To Ground Mounted Cabinet
- Exothermic Weld (Typ.)

**Detail "C"**

- 20' Radius Each "Sphere Of Influence"
- Ground Rod C
- Primary Ground Rod A
- #2 AWG (Typical)

**Ground Rod Array Detail**

**Detail "D"**

- **Primary Ground Rod B**
- #2 AWG (Typical)
- Ground Rod D

**Grounding Conduit**

**Finished Grade**

**Pull Box**

**Ground Rod**

**Grounding Conduit**

**Detail "E"**

- 11 Gage Handhole Cover
- 3/16" Hole (Typ.)
- 4" Ø Stainless Steel Hex Head Screw (Typ.)
- (Thru Handhole)
- 3/8" Partial Penetration Weld (Typ.)
- Tack Welded Cover Clip (Typ.)
- Thru Hole For 3/8" Ø Hex Head Screw (Typ.)
Zee Beam Aluminum Zee 4½x3½x3.57 (Typ.)
Horizontal Member Attached To The Internal Framework And Included With The DMS Sign

Vertical Hanger Galvanized W6x9 (Typ.)
Hanger @ 5'-0" (Max.) Spacing

2-½" Ø U-Bolts With Double Nuts and Washers

Field Drill Holes And Provide 2-½" Ø Bolts With Nuts and Washers

DMS Sign Enclosure
Vertical Hanger
Truss Chord
Zee Beam

Back Face Of DMS Sign Enclosure

HANGER LOCATION DETAIL

SECTION B-B

SECTION C-C

SECTION D-D

DYNAMIC MESSAGE SIGN END VIEW

DYNAMIC MESSAGE SIGN WALK-IN
**TYPICAL SECTIONS FOR PLACEMENT OF SINGLE AND MULTI-COLUMN SIGN**

**CASE I**  
Use On Mainline Freeways And Express Way Systems

**CASE II**  
Use On All Rural, Freeways And Expressway Ramps

**CASE III**  
Use On All Roads With Signs Mounted Behind Sidewalk

**CASE IV**  
Use On All Rural, Freeway And Express Systems

**CASE V**  
Use In Business Or Residential Areas Only

**CASE VI**  
Use On All Roadway With Signs Behind Guardrail

**CASE VII**  
Use On All Rural, Freeway And Express Systems

**CASE VIII**  
Use On Island Or Curbed Median

**CASE IX**  
Use On Interstate Marker

**CASE X**  
Use On Interstate Exit Ramps

---

**GENERAL NOTES:**

1. Single-Column Signs Shown, Multi-Column Signs Similar. These typical sections serve as a guide for locating the traffic signs required under various roadside conditions. For size and details of sign construction and footing, refer to the appropriate Index and Plans.

2. Verify the length of sign supports in the field prior to fabrication.

3. Install ground signs at an angle of 1 to 4 degrees away from the traffic flow (see illustrations). Install shoulder mounted signs rotated counterclockwise and median mounted signs rotated clockwise. Install signs on a curve as noted above from the perpendicular to the motorist line of sight.

4. The setback for Stop and Yield signs may be reduced to 3 minimum from the edge of the traveled way if required for visibility in business or residential sections with no curb and speeds of 30 MPH or less.

5. The mounting heights are measured from the bottom of the sign panel to a horizontal line extended from the edge of the traveled way or from the ground surface at the back of the 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)

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.

---

**NOTE:**  
If median width does not allow standard offset from both roadway, center sign in median.
NOTES:
1. Florida marker shall have Black Legend with White Background.
2. Stroke width of State Outline shall be 1/8" for Guide Sign.
4. 1/8" Border

GUIDE SIGN USE

FTP-17-06 - FLORIDA ROUTE MARKER

FTP-18-06 - COUNTY ROUTE MARKER (MI-6)

INDEX

700-102

SPECIAL SIGN DETAILS

1. Series D Legend.
2. Color: Yellow Legend and Border on Blue Background.
3. When used on a guide sign, marker must be overlaid on a rectangular Yellow Background as shown in chart.
4. When two or more County Route Markers are mounted together, use the dimensions of the largest marker for all other markers.

NOTES:
1. Stroke width of State Outline shall be 1".
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" Radius

INDEPENDENT USE OTHER THAN FREEWAY

NOTES:
1. Series D Legend.
2. Color: Yellow Legend and Border on Blue Background.
3. When used on a guide sign, marker must be overlaid on a rectangular Yellow Background as shown in chart.
4. When two or more County Route Markers are mounted together, use the dimensions of the largest marker for all other markers.

INDEPENDENT USE FOR FREEWAY

NOTES:
1. Stroke width of State Outline shall be 1".
2. 25° Radii

DIMENSIONS

Rectangular Yellow Background Dimensions (See Note 3)

4 DIGIT POST MOUNTED:
25 1/2" x 24" 10 7/8" 6" 6" 8 5/8" 3 1/4" 5 1/2"

4 DIGIT OVERHEAD:
21 1/2" x 24" 6 7/8" 3 1/4" 12 6" 6" 6 7/8" 5 1/2" 4 7/8"

3 DIGIT OVERHEAD:
25 1/2" x 24" 7 1/2" 3 1/4" 12 6" 6" 12 6" 5 1/2" 4 7/8" 48 1/8"

4 DIGIT OVERHEAD:
29 1/2" x 24" 9" 3 1/4" 12 6" 6" 12 6" 5 1/2" 4 7/8" 52 5/8"
SPECIAL SIGN DETAILS

FTP-19-06
1' X 1'-6"
4" Radii 1/8" Border
Top 4" Series D
Bottom 2" Series C
White Background
Green Legend and Border

FTP-20-06
1' X 1'-6"
2" Radii 1/8" Border
2" Series C Legend
Color Background
Legend and Border
Top 2" Bottom 3/4"
Blue White Black

FTP-21-06
1' X 6"
2" Radii 1/8" Border
1.5" Series C Legend
Color Background
Legend and Border
Top 2" Bottom 3/4"
Blue White Black

FTP-22-06
1' X 6"
1" Radii 1/8" Border
1" Series C Legend
White Background
Black Legend and Border

FTP-23-06
2' X 2"
1.5" Radii 1/8" Border
Blue Background
White Legend and Border

FTP-24-06
2' X 2"
1.5" Radii 1/8" Border
Blue Background
White Legend and Border

INTERNATIONAL SYMBOL OF ACCESS FOR HEARING LOSS

INTERNATIONAL TDD SYMBOL

REV 01/01/17

DESCRIPTION:
FY 2019-20 STANDARD PLANS

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SHEET 4 of 11

REVISED 11/01/17
### Special Sign Details

#### FTP-25-06
- **Panel Style:** FTP-25-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-26-06
- **Panel Style:** FTP-26-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-29-06
- **Panel Style:** FTP-29-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-31-06
- **Panel Style:** FTP-31-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-32-06
- **Panel Style:** FTP-32-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-33-06
- **Panel Style:** FTP-33-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-34-06
- **Panel Style:** FTP-34-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-35-06
- **Panel Style:** FTP-35-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-36-06
- **Panel Style:** FTP-36-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-37-06
- **Panel Style:** FTP-37-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-38-06
- **Panel Style:** FTP-38-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

#### FTP-39-06
- **Panel Style:** FTP-39-06.ssi
- **Construct Panels:** 36|24|18
- **Levels:** GSCOLORFILL | GSBWFILL | GSOUTLINE

### Description

- **Revision Last Date:** 11/01/18
- **Index:** 700-102

---

**One - Stop Career Center**

**Speeding Fines Doubled**

**School Zone**

**Speeding Fines Doubled**

---

(continued)
LEFT TURN
YIELD ON
FLASHING
YELLOW
ARROW

STAY
IN YOUR
LANE

LITTER
PICK UP
AHEAD

TRUCKS
ENTERING
HIGHWAY

TRUCKS
ENTERING
HIGHWAY

MERGE
RIGHT ON
FLASHING
ARROW

LIGHTED
WORK
ZONE
AHEAD

STATE
PRISONERS
WORKING

BUSINESS
ENTRANCE

PEDESTRIAN
WALKWAY

SPEEDING FINES
DOUBLED
WHEN WORKERS
PRESENT

FTP-85-13
3 x 2'-6"
1.875" Radii 1/8" Border

MOT-1-06
4 x 6'
2" Radii 1/8" Border

MOT-1-06
3.5" Series C Legend
White Background
Black Legend and Border

MOT-4-06
4 x 6'
2" Radii 1/8" Border

MOT-4-06
6" Series C Legend
Orange Background
Black Legend and Border

MOT-5-06
4 x 6'
2" Radii 1/8" Border

MOT-5-06
6" Series C Legend
Orange Background
Black Legend and Border

MOT-6-06
5 x 6'
2" Radii 1/8" Border

MOT-7-06
5 x 5'
2" Radii 1/8" Border

MOT-7-06
6" Series D Legend
Orange Background
Black Legend and Border

MOT-8-06
5 x 5'
2" Radii 1/8" Border

MOT-8-06
6" Series D Legend
Orange Background
Black Legend and Border

MOT-9-06
6" Series D Legend
Orange Background
Black Legend and Border

MOT-10-06
4 x 6'
2" Radii 1/8" Border

MOT-11-06
3 x 2'
2" Radii 1/8" Border

MOT-11-06
6" Series B Legend
Blue Background
White Legend and Border

MOT-12R-06
2 x 3'
2" Radii 1/8" Border

MOT-12L-06
For Diversion to the left

MOT-12L-06
6" Series C Legend
White Background
Black Legend and Border

MOT-13-06
Freeway Sign
6 x 4'
6" Radii 1/8" Border

F DOT STANDARD PLANS FY 2019-20

SPECIAL SIGN DETAILS

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100-102
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LAST
7/1/18
DESCRIPTION:
REV
00
REV
00
INDEX
REV
00
FY 2019-20
STANDARD PLANS
**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.

   * The phone symbol shall not be shown whenever any Gas, Food, Lodging or Camping symbol appears.

2. Symbols shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

3. All motorist service signs to have White Legend and Border with Blue Background.

4. For mounting details see Index 700-020 for Type "A" breakaway or Index 700-010 for Type "C" Frangibility.

**Note:**

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"

**Approximate Position Of Second Motorist Service Sign**

Details "B" or "C" for Interchanges With Two Exit Ramps

**Sign to be installed at beginning of deceleration lane.**

Proposed Guide Sign

**Proposed Supplemental Guide Sign**

See Detail "B" or Detail "C"

**NOTE**

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.

The mounting height of the advance sign panel or existing guide sign panel shall be increased, where necessary, to provide 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

**DETAIL "D"**

(1 To 3 Symbols)

**DETAIL "A"**

(1 To 3 Symbols)

**DETAIL "B"**

(4 Symbols)

**DETAIL "C"**

(4 Symbols)
FOR LIMITED ACCESS HIGHWAYS

STATE OF FLORIDA
WELCOME CENTER
1 MILE
SIGN FTP-10-06

STATE OF FLORIDA
WELCOME CENTER
↑
SIGN FTP-11-06

STATE OF FLORIDA
OFFICIAL
WELCOME CENTER
↑
SIGN FTP-12-06

WELCOME CENTER
SIGN FTP-13-06

Tourist Information Center
NEXT RIGHT
SIGN FTP-14-06

Note: Roadway not drawn to scale.
Distances shown are adequate for driver communication but may be altered slightly if conditions require.

Notes:
1. Signs and sign structures shall be erected in accordance with the details shown on Index 700-000.
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: 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 halfway between normal guide signs).
STATE OF FLORIDA
WELCOME CENTER
1 MILE

STATE OF FLORIDA
OFFICIAL
WELCOME CENTER

1/2 MILE
SIGN FTP-15B-06
SIGN FTP-15C-06

SIGN FTP-15A-06
SIGN FTP-12-06

FTP-15A-06
FTP-15B-06
FTP-15C-06
FTP-12-06
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

WELCOME CENTER SIGNING

FTP-15A-06
FTP-15B-06
FTP-15C-06
FTP-12-06

50' Maximum For Rural Conditions
80' 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.

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<th>Shoulder Width</th>
<th>No. of RPM's</th>
<th>Spacing</th>
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<td>2</td>
<td>2</td>
<td>16&quot;</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13&quot;</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>19&quot;</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>16.67&quot;</td>
</tr>
</tbody>
</table>
1. See Standard Highway Signs for sign R12-5 and W16-3a details.
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. 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.
WEIGH STATION SIGNING

4 - LANE DIVIDED INSTALLATION

WEIGH STATION 1 MILE
DB-1
ALL TRUCKS ENTER WEIGH STATION
FTP-1-06
WEIGH STATION NEXT RIGHT
FTP-3-06
ALL TRUCKS
FTP-83-08
WEIGH STATION
DB-3

Note:
Signs DB-3 to be placed at or near the theoretical gore.

1500' Min.
1890'
1890'

MEDIAN INSTALLATION

WEIGH STATION 1 MILE
DB-1
ALL TRUCKS ENTER WEIGH STATION
FTP-1-06
WEIGH STATION NEXT LEFT
FTP-3-06
ALL TRUCKS
FTP-83-08
WEIGH STATION
DB-3

WEIGH STATION SIGNING

FY 2019-20
STANDARD PLANS

TYPICAL SIGNING FOR TRUCK WEIGH AND INSPECTION STATIONS

INDEX
700-108

1 of 2

REV 1 -2

DEPARTMENT OF TRANSPORTATION UNIVERSITY OF DELAWARE DEPARTMENT OF TRANSPORTATION UNIVERSITY OF DELAWARE

DESCRIPTION:
REV ISIO N

11/01/17

W4-1

2 - LANE INSTALLATION

WEIGH STATION 1 MILE
DB-1
ALL TRUCKS ENTER WEIGH STATION
FTP 2-06
WEIGH STATION 1000 FT
FTP-3-06
WEIGH STATION
DB-3

W4-1

2640'
1640'
700'
300'

300'
2500'
1500'
700'
2640'
2500'
1500'
700'
2640'
1640'
700'
300'

1890'
1890'

DB-3
WEIGH STATION NEXT LEFT
FTP-1-06
ALL TRUCKS ENTER WEIGH STATION
FTP-3-06
WEIGH STATION
DB-3

1500' Min.
1890'
1890'

1260'
2500'
1500'

TRAFFIC CONTROLS FOR STREET TERMINATIONS

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.

3. See Index 711-001 for pavement markings.

TYPE 4 OBJECT MARKER PLACEMENT

OBJECT MARKER DETAIL

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 B209 Alloy 6061-T6
   C. Extruded Shapes: ASTM B211 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.

1'-0" Max
58% "L"

Exit Number Panel
(3/16" Thick Min.)

Bolt Exit Sign to Zee at 1'-0" Max. Spacing
Zee 1.75 x 1.75 x 1.08

Bolt Vertical Hanger to Horizontal Wind Beam

Overhead Sign

Exit Number Panel

Vertical Hanger or Column

Overhead Sign (See Index 700-030)
Multi-Column Ground Sign (See Index 700-020)
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 700-010 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 flashing beacon 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 'B' NOTES:

1. Install a separate pole for mounting the solar panel, controller and batteries for all flashing beacon assemblies with solar panels, controllers and batteries weighing more than 170 lbs.

2. Install the auxiliary pole as close to the right of way boundary as possible.

3. Install the auxiliary pole so that the height is the same as the column for the beacon 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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<td>Roadside Sign Assembly-5</td>
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<td>8</td>
<td>Roadside Sign Assembly-6</td>
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<tr>
<td>9</td>
<td>Overhead Sign Assembly</td>
</tr>
</tbody>
</table>
CONDUIT, WIRING, AND FOUNDATION DETAILS

DETAIL "A"

Transformer Base
Nominal 4" (Sch. 40) Aluminum

Strain Relief Fitting
Concrete Apron (Typ.)

#6 Ground Wire

Grounding Lug

12" Bed of Pearock or Crushed Stone For Drainage.

To Power Service or Auxiliary Pole

U.L. Approved Ground Rod
1/2" Diameter 20' Long Copper Clad with Approved Ground Connection (At all Pull Boxes)

DETAIL "B"

Transformer Base
Nominal 4" (Sch. 40) Aluminum

Strain Relief Fitting

#6 Ground Wire

Grounding Lug

Conduit for Future Use

Cap Conduit

Nominal 4" (Sch. 40) Aluminum

#6 Ground Wire

Grounding Lug

1'-0"

Footage Depth

1'-0"

Nominal 4" (Sch. 40) Aluminum

Strain Relief Fitting

Concrete Apron (Typ.)

#6 Ground Wire

Grounding Lug

12" Bed of Pearock or Crushed Stone For Drainage.

To Power Service or Auxiliary Pole

U.L. Approved Ground Rod
1/2" Diameter 20' Long Copper Clad with Approved Ground Connection (At all Pull Boxes)
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 B2 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 19' high numerals for posted speeds greater than 45 mph.
**GENERAL NOTES:**

1. Offset all RPMs 1” from solid longitudinal lines unless otherwise noted or shown.

2. Spacing may be reduced for sharp curves if required.

3. For placement of RPMs on ramps, see Index 711-003.

4. Make the traffic face of the RPM the same color as the pavement marking that it is supplementing.

**LEGEND:**

- B/C = Back of Curb
- EOP = Edge of Pavement
- RPM = Raised Pavement Marker
- W/R = White/Red RPM
- Y/Y = Yellow/Yellow RPM
- W/R = White/Red RPM
- MD/Y = Multidirectional Yellow RPM
- ALTERNATING SKIP LINE
- MULTILANE

**DESCRIPTION:**

- Offset all RPMs 1” from solid longitudinal lines unless otherwise noted or shown.
- Spacing may be reduced for sharp curves if required.
- For placement of RPMs on ramps, see Index 711-003.
- Make the traffic face of the RPM the same color as the pavement marking that it is supplementing.
RAISED PAVEMENT MARKERS

**TYPICAL PLACEMENT OF RAISED PAVEMENT MARKERS**

**RPM PLACEMENT AT INTERSECTIONS**

- **W/R RPMs (Typ.)**
- **Y/Y RPMs (Typ.)**
- Install RPMs At 20' Center To Center

**RPM PLACEMENT AT TRAFFIC CHANNELIZATION AT GORE**

(Traffic Flows In Same Direction)

- **18" Yellow**
- **6" Yellow**
- **6" White**

**LEGEND:**

- B/C = BACK OF CURB
- EOP = EDGE OF PAVEMENT
- RPM = RAISED PAVEMENT MARKER
- W/R = WHITE/RED RPM
- Y/Y = YELLOW/YELLOW RPM
- Y/R = YELLOW/RED RPM
- M/D/Y = MONO-DIRECTIONAL YELLOW RPM

**NOTE:**

- 1. Center the Raised Pavement Markers between chevrons and crosshatching.

**RPM PLACEMENT AT TRAFFIC SEPARATION**

(Traffic Flows In Opposite Direction)

- **6" Yellow**
- **18" Yellow**
- **6" Double Yellow**

**LEGEND:**

- B/C = BACK OF CURB
- EOP = EDGE OF PAVEMENT
- RPM = RAISED PAVEMENT MARKER
- W/R = WHITE/RED RPM
- Y/Y = YELLOW/YELLOW RPM
- Y/R = YELLOW/RED RPM
- M/D/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.

**RPM PLACEMENT AT ROADSIDE CROSSHATCHING**

- **W/R RPMs (Typ.)**
- **6" White**
- **18" White**

**LEGEND:**

- B/C = BACK OF CURB
- EOP = EDGE OF PAVEMENT
- RPM = RAISED PAVEMENT MARKER
- W/R = WHITE/RED RPM
- Y/Y = YELLOW/YELLOW RPM
- Y/R = YELLOW/RED RPM
- M/D/Y = MONO-DIRECTIONAL YELLOW RPM

**NOTE:**

- 1. Center the Raised Pavement Markers between chevrons and crosshatching.
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.

LEGEND:

B/C = BACK OF CURB
ESP = EDGE OF PAVEMENT
RPM = RAISED PAVEMENT MARKER
W/R = WHITE/RED RPM
Y/R = YELLOW/RED RPM
Y/Y = YELLOW/YELLOW RPM
W/Y = WHITE/YELLOW RPM
MD/Y = MONO-DIRECTIONAL YELLOW RPM

POSTED SPEED LIMIT (F) FEET

<table>
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<tr>
<th>SPEED LIMIT</th>
<th>(F) FEET</th>
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<tr>
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<tr>
<td>30 - 40</td>
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<td>45 - 50</td>
<td>30</td>
</tr>
<tr>
<td>50 OR MORE</td>
<td>40</td>
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</table>
**RPM PLACEMENT AT ISLANDS**

(When called for in the Plans)

**NOTES:**
1. For Type "E" Curb install RPMs along the pavement edge marking using the same spacing shown.

2. Orient traffic faces of RPMs in median radii to be parallel to direction of travel lanes.

**RPM PLACEMENT AT TRAFFIC SEPARATORS**

(When called for in the Plans)

**LEGEND:**
- B/C = BACK OF CURB
- EOP = EDGE OF PAVEMENT
- RPM = RAISED PAVEMENT MARKER
- W/R = WHITE/RED RPM
- Y/Y = YELLOW/YELLOW RPM
- Y/R = YELLOW/RED RPM
- MD/W = MONO-DIRECTIONAL WHITE RPM
- MD/Y = MONO-DIRECTIONAL YELLOW RPM

---

**POSTED SPEED LIMIT**

<table>
<thead>
<tr>
<th>MPH</th>
<th>FEET</th>
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<td>45</td>
<td>30</td>
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<tr>
<td>50 OR MORE</td>
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</tbody>
</table>

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**DETAIL "G"**

**DETAIL "J"**

**DETAIL "K"**
RPM PLACEMENT FOR CROSSES ON LIMITED ACCESS ROADWAYS

1500'-0" Yellow RPMs Spaced at 500'-0" Intervals Approaching Crossover (Typ. Each Side)

See DETAIL "L"

DETAIL "L"
**NOTES FOR PAVEMENT MESSAGES:**

1. When an arrow and a pavement message are used together, locate the arrow a distance of 5" (12.7cm) 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.

### PAVEMENT MESSAGE SPACING TABLE

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Distance &quot;S&quot; (feet)</th>
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<tbody>
<tr>
<td>25</td>
<td>36</td>
</tr>
<tr>
<td>30 - 35</td>
<td>42</td>
</tr>
<tr>
<td>40 - 45</td>
<td>72</td>
</tr>
<tr>
<td>45 - 50</td>
<td>88</td>
</tr>
</tbody>
</table>

### PAVEMENT MESSAGE AND ARROW DETAILS

- **Wrong-Way Arrow**: 24 S.F.
- **Turn and Through Lane-Use Arrow**: 29 S.F.
- **U Turn Lane-Use Arrow**: 27 S.F.
- **Through Lane-Use Arrow**: 12 S.F.
- **Turn Lane-Use Arrow (Left Turn Shield - Right Turn Similar)**: 17 S.F.
- **Roundabout Approach Arrow**: 19 S.F.
- **Preferential Lane Symbol**: 13 S.F.
### PAVEMENT MARKING LINES

- **Solid Edge Line or Lane Line**
- **Solid Channelizing Line**
- **Two-Lane Passing Prohibited Lines**
- **Double Solid Lines**
- **12' Solid Pedestrian Crosswalk Line**
- **24' Solid Stop Line**
- **2'-4' Dotted Guide Line**
- **6'-10' Dotted Extension Line**
- **3'-9' Dotted Interchange Line**
- **3'-9' Dotted Lane Drop Line**
- **10'-30' Skip Line**
- **Double Solid Lines**
- **12" Solid Pedestrian Crosswalk Line**
- **24" Solid Stop Line**
- **2'-4' Dotted Guide Line**
- **2'-4' Dotted Extension Line**
- **6'-10' Dotted Extension Line**
- **3'-9' Dotted Interchange Line**
- **3'-9' Dotted Lane Drop Line**
- **10'-30' Skip Line**

### CONTRAST MARKINGS WITH ALTERNATING SKIP PATTERN

(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.)

### YIELD LINES
Curb and Gutter

Flush Shoulder

Striping for Buffered Bike Lane

Striping with Shoulder or Non-Buffered Bike Lane

Striping with No Shoulder or Bike Lane

Notes:
1. Lane widths (X) may not be same for each lane in the section.
2. For placement of RPMs, see Index 706-001.
NOTES:
1. Lane widths (X) may not be same for each lane in the section.
2. For placement of Express Lane markers and associated RPMs, see the plans.
3. For placement of RPMs, see Index 706-001.
4. For placement of Express Lane markers and associated RPMs, see the plans.

BUFFERED EXPRESS LANE STRIPING

INTERSECTION APPROACH STRIPING WITH TURN
LANES AND BUFFERED BIKE LANE KEY HOLE

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS
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.
**TWO WAY LEFT TURN LANE**

(With Single Lane Left Turn Channelization)

**SCHEME ONE**

- Use Stop Line At Signalized Intersection Only
- 6" White
- 6" Double Yellow
- 6" Yellow
- 6" White
- 24" White
- 25'
- 50'
- 75'
- 50'

**SCHEME TWO**

- 6" White
- 6" Yellow
- 18" Yellow
- 6" Yellow
- 10'
- 25'
- 30'
- 8
- 8

300' Max. Intervals Between Double Arrows

For use in congested urban areas where storage length between intersections is limited and a permanent point of transition from the two-way turning lane to the exclusive turning lane can not be determined.

**TWO WAY LEFT TURN LANE DROP AND ISLAND DETAILS**

LEFT TURN LANE DROP IS MIRROR IMAGE

RIGHT TURN LANE DROP AND ISLAND DETAILS

TRAFFIC CHANNELIZATION AT GORE

**DETAIL "C"**

- 10' White
- 10'
- 25'
- 50'

300' Max. Intervals Between Double Arrows

For use in rural & suburban areas where an adequate storage lane length can be specifically determined.

**PAVEMENT MARKINGS**

FY 2019-20

STANDARD PLANS

INDEX

711-001

SHEET

8 of 13
### Left Roadway Centered on Existing Roadway

**Design Speeds Are Greater Than 50 mph**

White Delineators Shall Be Used Throughout The Transition Where Design Speeds Are Greater Than 50 mph.

**NOTE:**

- Make pavement markings yellow for left roadway centered on existing roadway. Right roadway centered on existing roadway is similar with white pavement markings.

### Schemes for Transition - 2 Lane / 4 Lane Roadway

**DESIGN SPEEDS:**

<table>
<thead>
<tr>
<th>MPH</th>
<th>Feet/1000</th>
<th>Feet/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>500</td>
<td>5000</td>
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<td>50</td>
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<td>5500</td>
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<td>55</td>
<td>595</td>
<td>5950</td>
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<tr>
<td>60</td>
<td>640</td>
<td>6400</td>
</tr>
</tbody>
</table>

**Length L (FT.)**

- 30 or Less: 30
- 40 or More: 40

**S = L/W**

**B = 80°**

- 45° Minimum

- Median Or Island

### Right Roadway Centered on Existing Roadway

**NOTE:**

- See Sheet 1 for “S” value.
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 **

Stop Bar (If Required)

- ** 6" White
- ** 6" White
- ** 6" White
- ** 6" White
- ** 6" White
- ** 12" White
- ** 6" Pavement Marking
- ** 6" Pavement Marking
- ** 12" White
- ** 6" Pavement Marking
- ** 6" Pavement Marking

** SINGLE LEFT TURNS **

Queue Length is measured from the median nose radial point or, when a stop bar is required, from the stop bar.

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
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<th>Brake To Stop Distance</th>
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** TURN LANE MARKINGS **

** TURN LANE MARKINGS - CURBED AND UNCURED MEDIANS **

** URBAN CONDITIONS **

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<th>Design Speed (mph)</th>
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** TURN LANE MARKINGS - RURAL CONDITIONS **

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<th>Design Speed (mph)</th>
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** ARROW SPACING **

NOTES:

1. This index also applies to right turn lanes.
2. Make pavement marking yellow for left-turn lanes and white for right-turn lanes.
3. See Sheet 1 for "S" value.

** TURN LANE MARKINGS **

** TURN LANE MARKINGS - CURBED AND UNCURED MEDIANS **

** URBAN CONDITIONS **

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
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** TURN LANE MARKINGS - RURAL CONDITIONS **

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</tbody>
</table>
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.
5. Mount FTP-22-06 sign below the FTP-21-06 sign.

FOR ACCESSIBLE MARKINGS - SEE ABOVE

"DIMENSIONS"

<table>
<thead>
<tr>
<th>Angle</th>
<th>45°</th>
<th>60°</th>
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<td>5'-9&quot;</td>
<td>6&quot; White (Typ.)</td>
<td>5'-9&quot;</td>
</tr>
<tr>
<td>7'-0&quot;</td>
<td>22&quot;</td>
<td>7'-0&quot;</td>
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</tbody>
</table>

FORWARD-IN PARKING

REVERSE-IN PARKING

Use of pavement symbol in accessible parking spaces is optional, when used the symbol shall be 3' or 5' high and white in color.
NOTES:
1. All grids are 4" x 4".
2. Pavement Marking Should Not Extend Into Opposing Lane.

SCHOOL PAVEMENT MARKING

33 S.F.

SCHOOL

NOTES:
1. All grids are 4" x 4".
2. Pavement Marking Should Not Extend Into Opposing Lane.

SCHOOL PAVEMENT MARKING

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2. Pavement Marking Should Not Extend Into Opposing Lane.
APPROACH TO INTERSECTIONS DETAILS

BUFFERED BIKE LANES

FAR SIDE OF INTERSECTION DETAIL

EOP

Center of Solid Line and Dotted Line

Radius Curb Return or Stop Line

Shared Lane 150'

Lane Width

BICYCLE MARKINGS

FY 2019-20
STANDARD PLANS

INDEX
711-002

REVISION
01/01/17

DESCRIPTION:

LAST

REVISED

7 of 2
1. All bicycle markings and pavement messages shall be White.
2. All bicycle markings shall be preformed thermoplastic.
3. All grids are 4" x 4".

---

**STANDARD PAVEMENT MARKING MESSAGE LAYOUTS**

**Shared Lane Marking (SLM)**

**Helmeted Bicyclist Symbol**

**Bike Lane Arrow**

**Railroad Crossing**

(For Shared Use Path Only)
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.

DETAIL "A"
INTERCHANGE MARKINGS

TYPICAL MARKINGS AT DUAL LANE EXITS

TYPICAL LANE DROP MARKINGS AT EXIT RAMPS

PARALLEL ACCELERATION AND DECELERATION LANE
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 at 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
1. This Index shows layouts for 1, 2, and 3 lane configurations.

2. The lane markings 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".
1. 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 to tighten strain relief fittings or cable clamps at both ends of conduit to prevent cable from slipping.

2. Provide cable length to prevent cable from slipping.
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 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.
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 12'' 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 shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi. The pull box shown is 12'' x 24''; others approved under Specification 635 may be used.

Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.

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.
GENERAL NOTES:

1. Poles are designed to support the following:
   a. Luminaire Effective Projected Area (LEPA) ≤ 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 B221, Alloy 319-T6
   d. Steel Bearing Plates: ASTM A709 or ASTM A36 Grade 36
   e. Aluminum Weld Material: ER 4043
   g. Bolts, Nuts and Washers:
      - For Standard Light Pole: ASTM F1358, Grade A355, Type 1
      - For Median Barrier Mounted Light Pole: ASTM F1358, Grade A355, Type 1
      - Nuts: ASTM F593, Grade A
      - Washers: ASTM A36 or ASTM A207
   i. Stainless Steel Fasteners: ASTM F593, Alloy Group 2, Condition A, CW1 or SH1
   j. Concrete: ASTM C39
   k. Nut Covers: ASTM B26, Alloy 319-F
   l. Reinforcing Steel: ASTM A709 or ASTM A36 Grade 36
   m. Anchor Bolts: ASTM F1554 Grade 55
   n. Foundation: Specification 455
   o. Bars, Plates, Stiffeners and Backer Ring: ASTM B221, Alloy 6063-T6 or 6061-T6
   p. Plates, Caps and Covers: ASTM B26, Alloy 319-F
   q. Cast Steel Bearing Plate: ASTM A709
   r. Washer: ASTM A36
   s. Anchor Bolts, Nuts, and Washers:
      - Anchor Bolts: ASTM F1554 Grade A
      - Nuts: ASTM A563 Grade A
      - Washers: ASTM A207, Gr. 5
   t. Transformer and Frangible Base Materials:
      - Transformer Base: ASTM B26
      - Frangible Base: ASTM B26
   u. Weld Material:
      - Aluminum Weld Material: ER 4043
      - Steel Bearing Plate: ASTM A709 or ASTM A36 Grade 36
   v. Zinc: ASTM A795
   w. Concrete: ASTM C39
   x. Reinforcing Steel: ASTM A709 or ASTM A36 Grade 36
   y. Anchor Bolts: ASTM F1554 Grade 55
   z. Foundation: Specification 455

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. All welds shall be continuous and polished smooth.
   c. Weld all seams continuously and grind smooth.
   d. Weld all seams continuously and grind smooth.
   e. Weld all seams continuously and grind smooth.

5. Coatings/Finish:
   a. Pole and Arm Finish: 50 grit satin rubbed.
   b. Galvanize Steel Bolts, Screws, Nuts and Washers: ASTM A123
   c. Hot Dip Galvanize EJB and other steel items including poles and plate washers: ASTM A123
   d. Hot Dip Galvanize EJB and other steel items including poles and plate washers: ASTM A123
   e. Hot Dip Galvanize EJB and other steel items including poles and plate washers: ASTM A123

6. Construction:
   a. Foundation: Specification 455, 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 Frangible Base Design are capable of providing the required capacity.
      - Certify that the Clamp, Frangible Transformer Base, and Frangible Base Design are capable of providing the required capacity.
      - Certify that the Clamp, Frangible Transformer Base, and Frangible Base Design are capable of providing the required capacity.
   c. 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
   b. 140 MPH
   c. 160 MPH
   d. 180 MPH
   e. 200 MPH
   f. 220 MPH

8. Fabrication:
   a. Fabrication:
      - For Standard Light Pole:
      - For Median Barrier Mounted Light Pole:

9. Wind Speed by County:
   a. 120 MPH
   b. 140 MPH
   c. 160 MPH
   d. 180 MPH
   e. 200 MPH
   f. 220 MPH
STANDARD ROADWAY ALUMINUM LIGHT POLE W/ARM

STANDARD ROADWAY ALUMINUM LIGHT POLE W/TOP MOUNT

MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE ON CYLINDRICAL FOUNDATION

MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE ON SPREAD FOOTING FOUNDATION

ELEVATIONS
Sturdy Aluminum Light Pole Details:

- **Fixture Arm Length**: 8', 10', 12', or 15'
  - 3 x (Fixture Arm Length - 3'-0") / 4

- **Strut**: 16" O.D. x 0.125 (Min.)

- **Upper Arm Tube**: Horizontal - See Arm Section Above
  - **4" O.D. Pipe Beyond This Point**: See Arm Tube Extrusion Note

- **Lower Arm Tube**: Horizontal - See Arm Section Above
  - **Provide 1/2" Holes (Min.) in Underside of Arm Tubes 1/2" From the Base Weld**

- **Vibration Damper Elevation**
  - **2" Ø Tapped Hole**
  - **ASTM D2287 PVC Type 65500**

- **Vinyl Cap Details**
  - **2" Ø x 2" Long (Typ.)**
  - **ASTM A36 Hot Rolled Rod 1/2" long**

- **Arm Tube Extrusions Notes**:
  - The arm fabrication 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 1/8" nominal and within the Aluminum Association tolerances.

- The outside diameter about the minor axis should be held at 2\(\frac{5}{8}\) at the upper and lower arms.

---

**F千年铝照明**

**FY 2019-20**

**INDEX**: 715-002 **Sheet**: 3 of 8

**REVISION**

**DESCRIPTION**: **STANDARD PLANS**
**ARM-POLE TABLE**

<table>
<thead>
<tr>
<th>Assembly Height (ft)</th>
<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></td>
<td>8, 10, 12, 15</td>
<td>9</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>35</td>
<td>A1-P1</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A1-P1</td>
</tr>
<tr>
<td>40</td>
<td>A1-P2</td>
<td>A2-P1</td>
<td>A1-P2</td>
<td>A2-P2</td>
</tr>
<tr>
<td>45</td>
<td>A1-P3</td>
<td>A1-P3</td>
<td>A2-P2</td>
<td>A2-P2</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>A1-P3</td>
<td>A2-P2</td>
<td>A2-P2</td>
</tr>
</tbody>
</table>

**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>Pole 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>0.126</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>P2</td>
<td>0.250</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>P3</td>
<td>0.313</td>
<td>3/8</td>
<td>3/8</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 tolerances.

**TOP MOUNT POLE TABLE**

<table>
<thead>
<tr>
<th>Assembly Height (ft)</th>
<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></td>
<td>8, 10, 12, 15</td>
<td>9</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>35</td>
<td>Pole P1</td>
<td>Pole P1</td>
<td>Pole P1</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Pole P2</td>
<td>Pole P2</td>
<td>Pole P2</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td>Pole P2</td>
<td>Pole P2</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>Pole P2</td>
<td>Pole P2</td>
<td></td>
</tr>
</tbody>
</table>

**Pole and Base Details for Roadway Aluminum Light Pole**

**Foundation Notes:**
1. Depths shown are for slopes flatter than 1:4; for slopes 1:2 or flatter, and 2'-6" to foundation depths shown.
2. Foundation Tie Bars: #4 Tie Bars @ 12" centers (max.) or D10 (max. #10) spiral @ 6" pitch, 3 flat turns top and 1 flat turn bottom.

**POLE BASE ELEVATION**

**SECTION C-C**

**TOP MOUNT TENON**

**TOP VIEW TRANSFORMER BASE**

**BOTTOM VIEW TRANSFORMER BASE**

**FOUNDATION**

**General Notes on Sheet 1**

- Transformer Base. See Note
- Cast Aluminum Pressure Mounted Nut Cover - Bolted Attachment Optional
- Cast Aluminum Transient/Breakaway Transformer Base. See General Notes on Sheet 1
- Anchor Bolt and Washer as Required by Approved Breakaway Transformer Base Manufacture (Typ.)

**Notes on Sheet 1**

- 1" Chamfer
- 3'-6" Ø Min.
- 3'-0" Ø Max.
- #6 AWG Bare Ground Wire Cast-In or Place in Conduit
- Double Nuts (Typ.)
- 8-#7 Bars Equally Spaced
- Foundation: Depth = Foundation Note 1
- Foundation Depth = Foundation Note 2
- For Best Foundation Note 4
- Minimum Embedment
- 8-#7 Bars Equally Spaced
- Each Way
- Anchor Bolt, See Note in Pole Base Elevation
- Arm
- Pole
- Arm
- Pole
- Arm
- Pole
- Tenon

**Foundation Notes:**
1. Depths shown are for slopes flatter than 1:4; for slopes 1:2 or flatter, and 2'-6" to foundation depths shown.
2. Foundation Tie Bars: #4 Tie Bars @ 12" centers (max.) or D10 (max. #10) spiral @ 6" pitch, 3 flat turns top and 1 flat turn bottom.

**Description:**

- Standard Aluminum Lighting
- FY 2019-20
- Standard Plans
- 715-002
- 4 of 8
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**

1/2" R (Typ.)

1/2" x 120° Bond as shown (2 required)

1 1/2" Anchor Bolt threaded 8" min. top and bottom

1/2" Plate Washer

1/2" Plate Washer

Base Plate

Leveling Nut

Galv. Coupler permitted (Typ.)

Full Penetration Weld

Full Penetration Weld

Full penetration weld w/ 1/4" x 1/4" fillet reinforcing

4.31/4" x 16" Bolt Dia. (Max.)

7/8" Min.

Top of Traffic Railing

NOTE:
with the minimum Aluminum Association thicknesses.

Provide individual nut covers (not shown) for each bolt.

NOTE:
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.
**Plan**

- **2'-9"** Spacing Bars 5V & 5W1
- **20'-0" Min.**

**Elevation**

- **Symmetrical about Light Pole**
- **Roadway Concrete Barrier**
- **Optional Const. Jt.** (See Note 2)

**End View**

- **Spread Footing Details for Median Barrier Mounted Aluminum Light Pole**

**Index 521-001**

- **Median Barrier**
- **FRONT VIEW**
- **VIEW A-A**

**Embedded Junction Box Details**

- **4" Cover** (Bottom)

**NOTES:**

1. For Bearing Plate and Base Plate Details, see Sheet 5.
2. For connections to adjacent Median Barrier, use the Doweled Joint detail per Index 521-001. Alternatively, a continuous concrete pour or a construction joint may be substituted; these alternatives require the Median Barrier's longitudinal steel to lap a minimum of 2'-0" with the longitudinal steel shown herein.
BARRIER MOUNTED ALUMINUM LIGHT POLE

**Cylindrical Foundation Details for Median Barrier**

- **Foundation Table**
  - Wind Speed (MPH)
  - Design Height (FT)
  - Foundation Depth (FT)
  - 120
  - 40
  - 9
  - 140
  - 40
  - 9
  - 160
  - 40
  - 9

**PLAN**
- Provides dowel bars @ construction joint
- Optional constr. Jt. (See Note 2)

**VIEW B-B**
- Anchor Bolts and Barrier Longitudinal Steel & Stirrups Not Shown

**SECTION C-C**
- End View

**NOTES:**
1. For Bearing Plate and Base Plate Details, see Sheet 5.
2. For connections to adjacent Median Barrier, use the Dowelled joint detail per Index 521-001. Alternatively, a continuous concrete pour or a construction joint may be substituted; these alternatives require the Median Barrier's longitudinal steel to lap a minimum of 2'-0" with the Barrier's longitudinal steel to lap.

**Foundation Table**

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Design Height (FT)</th>
<th>Foundation Depth (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>40</td>
<td>9</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**

- **Foundation Table**
  - #4 Bars (Typ.)
  - #5 Bars, 6'-10" long (Typ.)
  - 1" Chamfer
  - Max. (Typ.) Bars 5V @ 8" Sp.

**Details:**

- **Anchor Bolts**
  - #5 Bars, 6'-10" long (Typ.)
  - 1" Ø Anchor Bolts

- **Bearing Plate**
  - #7 Bars

- **2" Ø Conduit**
  - #5 Bars, 6'-10" long (Typ.)
  - Construction Joint (Typ.)

- **Bearing Plate**
  - #7 Bar & Arm

**Notes:**

- Provide dowel bars @ construction joint.
- Equally Spaced 8 - #7 Bars

**Dimensions:**

- 1'-0" x 1'-3" x 6" (Typ.)
- 1'-3" x 1'-6" x 6" (Typ.)
- 2'-6" Ø Anchor Bolts

- Cast-in-Place or Precast
- Class I Concrete may be used with "Flowable Fill" Backfill

**Description:**

- Embedded Junction Box (EJB)
- Embedded Junction Box (EJB) 1'-0" x 1'-3" x 6" (Typ.)
- Embedded Junction Box (EJB) See Detail 'A'

**Additional Details:**

- Median Barrier (Index 521-001)
- Optional Con. Jt. (See Note 2)
- See Sheet 5 for Details
- See Roadway Plans

**Construction Joint:**

- Optional

**Tie Bars:**

- **#4 Tie Bars @ 12" centers (max.) or 2" Cover & Stirrups Not Shown**
- 2" Cover (Typ.)

**Grounding Rod:**

- 1" Ø x 20'

**Anchor Bolts:**

- D10 (or W10) spiral @ 6" pitch, 3 flat turns top and 1 flat turn bottom.

**FINISHED LEVELS:**

- Bearing Plate
- Base Plate
- Optional Con. Jt. (See Note 2)

**Elevation:**

- 2'-0" Ø Anchor Bolts
- 1'-0" x 1'-3" x 6" (Typ.)
- 1'-3" x 1'-6" x 6" (Typ.)

**Plan: (Reinforcing Steel not Shown)**

- Provide dowel bars @ construction joint

**Notes:**

- Reinforcing Steel not Shown
- Median Barrier (Index 521-001)
- Median Barrier (Index 521-001) See Detail 'A'

**Coordinating Plans:**

- Sheet 5
- Sheet 6
**REVISION DESCRIPTION:**

**STANDARD PLANS**

**REVISION LAST OF STANDARD PLANS FY 2019-20 SHEET INDEX**

- **Bars 5S (Typ.)**
  - Bearing Plate
  - 2" Ø Conduit
  - 4 ~ 1" Ø Anchor Bolts
  - 1" Ø Conduit

- **Bars 5R (Typ.)**
  - Base Plate
  - Optional Const. Joint
  - Embedded Junction Box
  - Optional Splice (see Note 3)

- **Bars 5W (Typ.)**
  - 8" x 1'-6" x 8" (Max.) Embedded Junction Box "B" (Note 3)
  - 1" Conduit
  - Min. 5' from open joint

**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 details of adjacent Traffic Railing (Median 36° Single-Slope) and for angles ‘A’ and ‘B’.

**ELEVATION**

(Reinforcing steel not shown)

- **Bars 5R and 5W @ 1'-0"**
- **Bars 5R and 5W @ 8"**
- **Bars 5R and 5W @ 1'-0"**

**SECTION D-D**

(Longitudinal and transverse deck reinforcing steel not shown)

- **1" Ø Conduit**
- **Supplemental #5 Bars**
- **Optional Const. Joint**
- **Supplemental #5 Bar**
- **See Detail 'A' Sheet 5**
- **4 ~ 1/2" Ø Anchor Bolts**

**DETAILED FOR TRAFFIC RAILING (MEDIAN 36° SINGLE-SLOPE) MOUNTED ALUMINUM LIGHT POLE**

**INDEX**

715-002

**SHEET**

8 of 8
HIGHMAST LIGHTING NOTES:

1. Poles are designed to support the following:
   a. One (1) cylindrical head assembly with a maximum effective projected area of 6 sf and 140 lbs (Max.)
   b. Eight (8) cylindrical luminaires with a maximum effective projected area of 1.5 sf and 77 lbs each.

2. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

3. High Mast Structure Materials:
   a. Poles and Backing Rings:
      i. Less than 70$: ASTM A1011 Grade 50, 55, 60 or 65
      ii. Greater than or equal to 70$: ASTM A572 Grade 50, 55, 60 or 65
   b. THICKNESS: A36
   c. ASTM A595 Grade A (35 ksi yield) or Grade B (60 ksi yield)
   d. Sheet Materials: ASTM A606 or ASTM A36
   e. Pole Caps: ASTM A1011 Grade 50, 55, 60, or 65 or ASTM B209
   f. Bolt Material: C102
   g. Stainless Steel Screws: A571 316
   h. 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 Washers: ASTM A36 (4 per anchor bolt)
      iv. Nut Covers: ASTM B36 (319-F)
   i. Concrete: Class IV (Drilled Shaft)
   j. Reinforcing Steel: Specification 413

4. Fabrication:
   a. Welding:
      i. Specification Section 460-6.4 and
      ii. AASHTO LRFD 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
      vi. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection and
         vii. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field
   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. Secure 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: Name
         d. Total Length (Ft of Steel)
         e. Base Rail Thickness
      v. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus 1/16" and anchor bolts holes are
         bolt diameter plus 1/4" (Max) prior to galvanizing
      vi. Hot Dip Galvanize after Fabrication
   d. Coating:
      i. Galvanize Anchor Bolts, Nuts and Washers: ASTM F2329
      ii. Hot Dip Galvanize all other steel items including plate washers: ASTM A123
   e. Construction:
      i. Foundation: Specification 455 Drilled Shaft, except that payment is included in the cost of the Structure.
      ii. After Installation: Place wire screen between top of foundation and bottom of baseplate in accordance with
         Specification 649-6
   f. Wind Speed by County:
      i. 130 MPH
         A. Alachua, Baker, Bradford, Calhoun, Clay, Columbia, DISIN, Dade, Gadsden, Glades, Hosp, Hamilton, Jackson,
      ii. 150 MPH
         A. Bay, Citrus, De Soto, Flagler, Franklin, Glades, Gulf, Hardee, Hendry, Hernando, Highlands, Hillsborough,
            Holmes, Jackson, Lee, Levy, Manatee, Marion, Grady, Okeechobee, Orange, Osceola, Pasco, Pinellas, Polk, Santa
            Rosa, Seminole, St. Johns, Sumter, Volusia, Walton and Washington Counties.
      iii. 170 MPH
         A. Broward, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach,
            Sarasota and St. Lucie Counties.
1. At all pull boxes and pole bases, ends of conduit shall be sealed in accordance with Section 630 of the Standard Specifications For Road And Bridge Construction.
2. Slabs to be placed around all Poles and Pull Boxes.
3. For Pull Boxes between Poles refer to Index 715-001.

NOTES:

1/0 AWG stranded Cu bare ground wire connected to grounding lug inside pole.

Minimum of (6) 1/2" x 20' approved ground rods.

12" bed of pea rock or crushed stone for drainage.

UL approved ground rod diameter 20' long copper clad with approved ground connection.

Schedule 40 PVC conduit. Circuit conductors and conduit size as shown in plans (Typical).

Schedule 40 PVC conduit, Circuit conductors and conduit size as shown in plans (Typical).
The contractor's attention is directed to those plan sheets detailing the mounting of luminaires at the pole top. Particular attention is directed to alignment of luminaire light distributions. Special attention must be exercised in the physical alignment of these luminaries 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.

The 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.

**HIGH MAST POLE WIRING DIAGRAM**

- **600 Volt rated Pole Cable.**
  - Size of conductors to be determined by luminaire load.

- **2" Slip-fitter Assembly**
  - Equally spaced around ring

- **Power Cable Terminator**
  - 600 Volt rated Circuit Breaker Cable. Size of conductors to be determined by luminaire load.

- **Luminaire support ring**

- **Pole Cable**

- **Lift cables (2 minimum)**

- **Power Cable Terminator**
  - 600 Volt rated Pole Cable. Size of conductors to be determined by luminaire load.

- **Lift cable sheaves**

- **Equipment Ground Conductor**

- **#6 Bonding Ground**

- **480V Phase to Phase**

- **Conduit**

- **4/0 Ground**

- **#6 Bonding Ground**

- **Grounding Array**

- **Lift cables (2 minimum)**

- **Remote control switch**

- **Step-down transformer provided with 120V. grounded receptacle for electric drill & receptacle for supply cable.**

- **Remote control switch**

- **Supply cable receptacle**

**SCHEMATIC OF REMOTE AUXILIARY POWER UNIT**

- **Covered receptacle to power luminaires when in the lowered position with Male Inlet.**

- **Luminaire support ring**

- **2" Slip-fitter Assembly**
  - Equally spaced around ring

- **Pole Cable**

- **Lift cable sheaves**

- **Pole cable & sheaves.**

- **Head plate**

- **Lift cables (2 minimum)**

- **Power Cable Terminator**
  - 600 Volt rated Circuit Breaker Cable. Size of conductors to be determined by luminaire load.

- **Ground to Winch Support Plate**

- **Circuit Panel Breaker**

- **Conduit**

- **480V Phase to Phase**

- **Grounding Array**

- **#6 Bonding Ground**

- **4/0 Ground**

- **Ground to Winch Support Plate**

- **Circuit Panel Breaker**

- **Conduit**

- **Grounding Array**

- **#6 Bonding Ground**

- **4/0 Ground**

- **Ground to Winch Support Plate**

**LOWERING DETAILS**

- **Circuit Breaker Cable with Female Plug**
  - 25' minimum remote control cable (see schematic)

- **Hand hole**

- **Winch**

- **Positive drive reversible winch**

- **Female Plug**

- **Supply cable receptacle**

- **Remote control switch**

- **Step-down transformer provided with 120V. grounded receptacle for electric drill & receptacle for supply cable.**

- **Remote control switch**

- **Supply cable receptacle**

**HIGHER MAST LIGHTING**

- **600 Volt rated Pole Cable.**
  - Size of conductors to be determined by luminaire load.

- **2" Slip-fitter Assembly**
  - Equally spaced around ring

- **Pole Cable**

- **Lift cable sheaves**

- **Pole cable & sheaves.**

- **Head plate**

- **Lift cables (2 minimum)**

- **Power Cable Terminator**
  - 600 Volt rated Circuit Breaker Cable. Size of conductors to be determined by luminaire load.

- **Ground to Winch Support Plate**

- **Circuit Panel Breaker**

- **Conduit**

- **480V Phase to Phase**

- **Grounding Array**

- **#6 Bonding Ground**

- **4/0 Ground**

- **Ground to Winch Support Plate**

- **Circuit Panel Breaker**

- **Conduit**

- **Grounding Array**

- **#6 Bonding Ground**

- **4/0 Ground**

- **Ground to Winch Support Plate**

**SCHEMATIC OF REMOTE AUXILIARY POWER UNIT**

- **Covered receptacle to power luminaires when in the lowered position with Male Inlet.**

- **Luminaire support ring**

- **2" Slip-fitter Assembly**
  - Equally spaced around ring

- **Pole Cable**

- **Lift cable sheaves**

- **Pole cable & sheaves.**

- **Head plate**

- **Lift cables (2 minimum)**

- **Power Cable Terminator**
  - 600 Volt rated Circuit Breaker Cable. Size of conductors to be determined by luminaire load.

- **Ground to Winch Support Plate**

- **Circuit Panel Breaker**

- **Conduit**

- **480V Phase to Phase**

- **Grounding Array**

- **#6 Bonding Ground**

- **4/0 Ground**

- **Ground to Winch Support Plate**

- **Circuit Panel Breaker**

- **Conduit**

- **Grounding Array**

- **#6 Bonding Ground**

- **4/0 Ground**

- **Ground to Winch Support Plate**
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 12' 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.

SLAB DIMENSIONS

5' 10'-0"

10'-0"

Varies

Varies

Typ.

S

8'

5'

SHAFT LOCATION

PULL BOX LOCATION

SECTION C-C

6' SELECT MATERIAL

½ Expansion Joint (Sealed)

SLAB DETAILS

SLAB DETAILS

REVISION
01/01/17

DESCRIPTION:

FY 2019-20
STANDARD PLANS

HIGH MAST LIGHTING

INDEX
715-010

SHEET
6 of 6
### 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.

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### 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>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.
TYPICAL CROSSING MATERIAL REPLACEMENT AT RR CROSSINGS

VERTICAL ROADWAY ALIGNMENT THROUGH A RAILROAD CROSSING

To prevent low-clearance vehicles from becoming caught on the tracks, the crossing surface should be at the same grade 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 superlevation 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 superlevated, or a roadway approach section that is not level, will necessitate a site specific analysis for rail clearances.

SECTION VIEW

HALF PLAN
ROADWAYS WITH FLUSH SHOULDERS

RAILROAD (GRADE) CROSSING

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REV 03/01/17

DESCRIPTION:

REV 03/01/17

FOOT

STANDARD PLANS

FY 2019-20

LAST REVISION 03/01/17