FDOT FY 2020-21 Standard Plans

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

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

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

DISTRIBUTION OF EXEMPT PUBLIC DOCUMENTS:
It is the policy of the Department to protect the State Highway System's infrastructure by defining the responsibilities for disclosure and use of sensitive documents showing the structural elements used in the design and construction of Department structures. Section 119.07(3)(b), Florida Statute (F.S.), provides that these sensitive documents are exempt from Chapter 119, F.S., Florida's public records law. In accordance with Section 119.071(3)(b), F.S., the Department has adopted Procedure 050-020-026, Distribution of Exempt Public Documents Concerning Department Structures and Security System Plans, to define the method and responsibilities for disclosure and use of these sensitive documents.

Structure is defined in Section 334.03(2), 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 underclearings of abutments or spring lines of arches or extreme ends of openings for multiple boxes, and those other bridges subject to safety inspections under Section 335.074, F.S." A roadway is not otherwise a structure for the purposes of Procedure 050-020-026.

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

Entities or persons outside the Department requesting or receiving copies of any portion of plans or other documents considered Exempt Documents under Procedure 050-020-026 must complete and submit a request form (Form No. 050-020-26). The form also advises the requester that the entity or person receiving the documents shall maintain their exempt status. This procedure applies to all Department internal or contracted staff who have access to such Exempt Documents in their Department work. Refer to Procedure 050-020-026 for additional requirements.

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

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

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

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

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

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

Dear Mr. Christian:

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

Sincerely,

[Signature]

Derwood Sheppard, P.E.
State Standard Plans Engineer

For FHWA Florida Division Office use:

Approved for Use on Federal Aid Projects:

[Signature]

Bren George-Nwabugwu Sr. 10/28/19

For James Christian, P.E.
Division Administrator

www.fdot.gov
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO</td>
<td>American Association Of State Highway And Transportation Officials</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>Accel.</td>
<td>Acceleration</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
</tr>
<tr>
<td>ADA</td>
<td>Americans With Disabilities Act</td>
</tr>
<tr>
<td>ADT</td>
<td>Average Daily Traffic</td>
</tr>
<tr>
<td>AFAD</td>
<td>Automated Flagger Assistant Device</td>
</tr>
<tr>
<td>AESC</td>
<td>American Institute Of Steel Construction</td>
</tr>
<tr>
<td>AFSI</td>
<td>American Iron and Steel Institute</td>
</tr>
<tr>
<td>Alt.</td>
<td>Alternate</td>
</tr>
<tr>
<td>Alum.</td>
<td>Aluminum</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>ASD</td>
<td>Apparent Opening Size</td>
</tr>
<tr>
<td>APL</td>
<td>Approved Products List</td>
</tr>
<tr>
<td>App.</td>
<td>Approach</td>
</tr>
<tr>
<td>Approx.</td>
<td>Approximate</td>
</tr>
<tr>
<td>ARTBA</td>
<td>American Road &amp; Transportation Builders Association</td>
</tr>
<tr>
<td>Asph.</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Assem.</td>
<td>Assembly</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society For Testing And Materials</td>
</tr>
<tr>
<td>ATPB</td>
<td>Asphalt Treated Permeable Base</td>
</tr>
<tr>
<td>Auxil.</td>
<td>Auxiliary</td>
</tr>
<tr>
<td>AWG</td>
<td>American Wire Gauge</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
</tr>
<tr>
<td>B</td>
<td>Bottom</td>
</tr>
<tr>
<td>Brkwy.</td>
<td>Breakaway</td>
</tr>
<tr>
<td>b/w</td>
<td>Between</td>
</tr>
<tr>
<td>C</td>
<td>Center</td>
</tr>
<tr>
<td>C &amp; G</td>
<td>Curb And Gutter</td>
</tr>
<tr>
<td>C.C.</td>
<td>Crash Cushion</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed-Circuit Television</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CFRP</td>
<td>Carbon Fiber Reinforced Polymer</td>
</tr>
<tr>
<td>cfs, CFS</td>
<td>Cubic Feet Per Second</td>
</tr>
<tr>
<td>C.I.P.</td>
<td>Cast In Place</td>
</tr>
<tr>
<td>C.I.P. or C.I-P.</td>
<td>Cast In Place</td>
</tr>
<tr>
<td>CJP</td>
<td>Complete Joint Penetration</td>
</tr>
<tr>
<td>Cst.</td>
<td>Circuit</td>
</tr>
<tr>
<td>Ctr.</td>
<td>Center</td>
</tr>
<tr>
<td>Cl.</td>
<td>Clearance</td>
</tr>
<tr>
<td>CMP</td>
<td>Corrugated Metal Pipe</td>
</tr>
<tr>
<td>Con.</td>
<td>Connection</td>
</tr>
<tr>
<td>Conc.</td>
<td>Concrete</td>
</tr>
<tr>
<td>Const.</td>
<td>Construct or Construction</td>
</tr>
<tr>
<td>Cont.</td>
<td>Continuation or Continuous</td>
</tr>
<tr>
<td>Corr.</td>
<td>Corrugated</td>
</tr>
<tr>
<td>Cov.</td>
<td>Cover</td>
</tr>
<tr>
<td>CIP</td>
<td>Cast In Place</td>
</tr>
<tr>
<td>CP</td>
<td>Concrete Pipe</td>
</tr>
<tr>
<td>CSL</td>
<td>Cross-hole Sonic Logging</td>
</tr>
<tr>
<td>CTPB</td>
<td>Cement Treated Permeable Base</td>
</tr>
<tr>
<td>Ctr., Ctrs.</td>
<td>Center</td>
</tr>
<tr>
<td>Cu. ft.</td>
<td>Cubic Feet</td>
</tr>
<tr>
<td>Cu. Yd., Cu.</td>
<td>Cubic Yard</td>
</tr>
<tr>
<td>D</td>
<td>Depth, Distance or Diameter</td>
</tr>
<tr>
<td>Dia. or Ø</td>
<td>Diameter</td>
</tr>
<tr>
<td>Dbl.</td>
<td>Double</td>
</tr>
<tr>
<td>Decel.</td>
<td>Deceleration</td>
</tr>
<tr>
<td>Dim.</td>
<td>Dimension</td>
</tr>
<tr>
<td>Dist.</td>
<td>Distance</td>
</tr>
<tr>
<td>DHH</td>
<td>Domestic Mail Manual</td>
</tr>
<tr>
<td>DPI</td>
<td>Ditch Point Intersection</td>
</tr>
<tr>
<td>Dt</td>
<td>Ditch</td>
</tr>
<tr>
<td>Dte</td>
<td>District Traffic Operations Engineer</td>
</tr>
<tr>
<td>D.T.E.</td>
<td>District Traffic Operations Engineer</td>
</tr>
<tr>
<td>DMM</td>
<td>Domestic Mail Manual</td>
</tr>
<tr>
<td>DOP</td>
<td>Ditch Or Pavement</td>
</tr>
<tr>
<td>DPH</td>
<td>Ditch Or Pavement</td>
</tr>
<tr>
<td>DSC</td>
<td>Distribution System Controller</td>
</tr>
<tr>
<td>Drw. or Drw.</td>
<td>Draw</td>
</tr>
<tr>
<td>Eq.</td>
<td>Equation or Equal</td>
</tr>
<tr>
<td>Eqd.</td>
<td>Equiv. or Equal</td>
</tr>
<tr>
<td>E.P. or EOP</td>
<td>Edge Of Pavement</td>
</tr>
<tr>
<td>EA or Ea.</td>
<td>Each</td>
</tr>
<tr>
<td>Eq.</td>
<td>Equation</td>
</tr>
<tr>
<td>Eq.</td>
<td>Equation</td>
</tr>
<tr>
<td>Etc.</td>
<td>Etc.</td>
</tr>
<tr>
<td>ETP</td>
<td>Electronic Tough Pitch</td>
</tr>
<tr>
<td>ETP</td>
<td>Electronic Tough Pitch</td>
</tr>
<tr>
<td>Eq.</td>
<td>Equation</td>
</tr>
<tr>
<td>Eqd.</td>
<td>Equiv. or Equal</td>
</tr>
<tr>
<td>Eqd.</td>
<td>Equiv. or Equal</td>
</tr>
<tr>
<td>Eqt.</td>
<td>Equation</td>
</tr>
<tr>
<td>Ex.</td>
<td>Example</td>
</tr>
<tr>
<td>Ex.</td>
<td>Example</td>
</tr>
<tr>
<td>Ex.</td>
<td>Example</td>
</tr>
<tr>
<td>Exp.</td>
<td>Expansion</td>
</tr>
<tr>
<td>Exp.</td>
<td>Expansion</td>
</tr>
<tr>
<td>Ext.</td>
<td>Extension</td>
</tr>
<tr>
<td>Ext.</td>
<td>Extension</td>
</tr>
<tr>
<td>F</td>
<td>Ft.</td>
</tr>
<tr>
<td>FAC</td>
<td>Florida Administrative Code</td>
</tr>
<tr>
<td>FC</td>
<td>Friction Course</td>
</tr>
<tr>
<td>Fdn.</td>
<td>Foundation</td>
</tr>
<tr>
<td>F.L. or F.</td>
<td>Flow Line</td>
</tr>
<tr>
<td>F.I.</td>
<td>Florida</td>
</tr>
<tr>
<td>FDEP</td>
<td>Florida Department Of Environmental Protection</td>
</tr>
<tr>
<td>FDOT</td>
<td>Florida Department Of Transportation</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FL</td>
<td>Florida</td>
</tr>
<tr>
<td>FM</td>
<td>Florida</td>
</tr>
<tr>
<td>FL</td>
<td>Florida</td>
</tr>
<tr>
<td>Fl</td>
<td>Florida</td>
</tr>
<tr>
<td>Ft.</td>
<td>Foot</td>
</tr>
<tr>
<td>Ft.</td>
<td>Foot</td>
</tr>
<tr>
<td>FTR</td>
<td>Florida Traffic Plans</td>
</tr>
<tr>
<td>F.S.</td>
<td>Florida Statutes</td>
</tr>
<tr>
<td>F.S.</td>
<td>Florida Statutes</td>
</tr>
<tr>
<td>FTP</td>
<td>Florida Traffic Plans</td>
</tr>
<tr>
<td>G</td>
<td>Shear Modulus</td>
</tr>
<tr>
<td>g</td>
<td>Gram</td>
</tr>
<tr>
<td>Galv.</td>
<td>Galvanized</td>
</tr>
<tr>
<td>GFI</td>
<td>Ground Fault Interrupter</td>
</tr>
<tr>
<td>GFRP</td>
<td>Glass Fiber Reinforced Polymer</td>
</tr>
<tr>
<td>Grd.</td>
<td>Ground</td>
</tr>
<tr>
<td>H</td>
<td>Head</td>
</tr>
<tr>
<td>H.S.</td>
<td>High Strength</td>
</tr>
<tr>
<td>HDPE</td>
<td>High Density Polyethylene</td>
</tr>
<tr>
<td>Horiz.</td>
<td>Horizontal</td>
</tr>
<tr>
<td>HP</td>
<td>Horsepower or H.P.</td>
</tr>
<tr>
<td>HSHV</td>
<td>High Strength Horizontal Vertical</td>
</tr>
<tr>
<td>ID, I.D.</td>
<td>Inside Diameter or Identification</td>
</tr>
<tr>
<td>Inc.</td>
<td>Incorporated</td>
</tr>
<tr>
<td>Inv.</td>
<td>Invert</td>
</tr>
<tr>
<td>ITS</td>
<td>Intelligent Transportation Systems</td>
</tr>
<tr>
<td>k</td>
<td>kip</td>
</tr>
<tr>
<td>kip</td>
<td>1000 Pounds</td>
</tr>
<tr>
<td>ksi</td>
<td>Kips Per Square Inch</td>
</tr>
<tr>
<td>L</td>
<td>Length</td>
</tr>
<tr>
<td>L</td>
<td>Length</td>
</tr>
<tr>
<td>L.A.</td>
<td>Limited Access</td>
</tr>
<tr>
<td>Lbf</td>
<td>Pound force</td>
</tr>
<tr>
<td>LBR</td>
<td>Lime rock Bearing Ratio</td>
</tr>
<tr>
<td>LF</td>
<td>Linear Foot (Feet)</td>
</tr>
<tr>
<td>Lgh.</td>
<td>Length</td>
</tr>
<tr>
<td>Long.</td>
<td>Longitudinally or Longitudinal</td>
</tr>
<tr>
<td>LRFD</td>
<td>Load Resistance Factor Design</td>
</tr>
<tr>
<td>LRS</td>
<td>Low-Relaxation Strand</td>
</tr>
<tr>
<td>LS</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>LSD</td>
<td>Lump Sum per Day</td>
</tr>
<tr>
<td>Lt.</td>
<td>Left</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>M</td>
<td>Meter</td>
</tr>
<tr>
<td>m²</td>
<td>Meter Square</td>
</tr>
<tr>
<td>Mach.</td>
<td>Machine</td>
</tr>
<tr>
<td>MAS</td>
<td>Motorist Awareness System</td>
</tr>
<tr>
<td>HASH</td>
<td>Manual for Assessing Safety Hardware (AASHTO)</td>
</tr>
<tr>
<td>Max.</td>
<td>Maximum</td>
</tr>
<tr>
<td>M.E. or MSE.</td>
<td>Middle End Section</td>
</tr>
<tr>
<td>N.H.</td>
<td>Nautical or Nautical Height</td>
</tr>
<tr>
<td>NHW</td>
<td>Mean High Water</td>
</tr>
<tr>
<td>Wd.</td>
<td>Width</td>
</tr>
<tr>
<td>Mil or Ms.</td>
<td>One-Thousandth Of An Inch</td>
</tr>
<tr>
<td>Min.</td>
<td>Minimum or Minute</td>
</tr>
<tr>
<td>Misc.</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>M.L.W.</td>
<td>Mean Low Water</td>
</tr>
<tr>
<td>mm</td>
<td>Millimeter</td>
</tr>
<tr>
<td>Mod.</td>
<td>Modification</td>
</tr>
<tr>
<td>HOT</td>
<td>Maintenance Of Traffic</td>
</tr>
<tr>
<td>H.P.H. or H.P.H.</td>
<td>H.P.H. or H.P.H.</td>
</tr>
<tr>
<td>HUC/CD</td>
<td>Manual on Uniform Traffic Control Devices</td>
</tr>
<tr>
<td>N</td>
<td>Standard Penetration Number</td>
</tr>
<tr>
<td>NA or N/A</td>
<td>Not Available or Not Applicable</td>
</tr>
<tr>
<td>NC</td>
<td>Normal Crown</td>
</tr>
<tr>
<td>NCHRP</td>
<td>National Cooperative Highway Research Program</td>
</tr>
<tr>
<td>NDCBU</td>
<td>Neighborhood Delivery And Collection Box Unit</td>
</tr>
<tr>
<td>NERA</td>
<td>National Electrical Manufacturers Association</td>
</tr>
<tr>
<td>NW</td>
<td>Normal Water</td>
</tr>
<tr>
<td>No.</td>
<td>Number</td>
</tr>
<tr>
<td>Nom.</td>
<td>Nominal</td>
</tr>
<tr>
<td>N.P.S.</td>
<td>Nominal Pipe Size</td>
</tr>
<tr>
<td>NPT</td>
<td>National Pipe Thread</td>
</tr>
<tr>
<td>NS or N.S.</td>
<td>Near Side</td>
</tr>
<tr>
<td>N.S.</td>
<td>Near Side</td>
</tr>
<tr>
<td>R.S.</td>
<td>Non-Structural</td>
</tr>
<tr>
<td>NTS</td>
<td>Not To Scale</td>
</tr>
<tr>
<td>O.C.</td>
<td>On Center</td>
</tr>
<tr>
<td>O to O or O.O.</td>
<td>Out to Out</td>
</tr>
<tr>
<td>O.B.G.</td>
<td>Optional Base Group</td>
</tr>
<tr>
<td>G.D. or G.D.</td>
<td>Outside Diameter</td>
</tr>
<tr>
<td>Oz. or Dz.</td>
<td>Ounce</td>
</tr>
<tr>
<td>P</td>
<td>Pavement</td>
</tr>
<tr>
<td>P.B.R.</td>
<td>Pedestrian/Bicycle Railing</td>
</tr>
<tr>
<td>PC</td>
<td>Point Of Curvature</td>
</tr>
<tr>
<td>PCC</td>
<td>Plain Concrete</td>
</tr>
<tr>
<td>Pcf or P.C.F.</td>
<td>Pounds Per Cubic Foot</td>
</tr>
<tr>
<td>PCMS</td>
<td>Portable Changeable Message Sign</td>
</tr>
<tr>
<td>P.E. or PE</td>
<td>Professional Engineer</td>
</tr>
<tr>
<td>P.B. or PB</td>
<td>Pier Protection Barrier</td>
</tr>
<tr>
<td>P.P.P.</td>
<td>Polypropylene pipe</td>
</tr>
<tr>
<td>Prest.</td>
<td>Prestressed</td>
</tr>
<tr>
<td>P.R.S.</td>
<td>Portable Regulatory Sign</td>
</tr>
<tr>
<td>P.S.F.</td>
<td>Pounds Per Square Foot</td>
</tr>
<tr>
<td>P.S.I. or PSI</td>
<td>Pounds Per Square Inch</td>
</tr>
<tr>
<td>PT</td>
<td>Point of Tangency or Pressure Treated</td>
</tr>
<tr>
<td>P.T.F.E.</td>
<td>Polytetrafluoroethylene</td>
</tr>
<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
</tr>
<tr>
<td>Q</td>
<td>Quantity</td>
</tr>
<tr>
<td>R</td>
<td>Radius</td>
</tr>
<tr>
<td>R.H. or R.H.</td>
<td>Right Of Way</td>
</tr>
<tr>
<td>R.C.</td>
<td>Reverse Curve</td>
</tr>
<tr>
<td>R.C.P.</td>
<td>Reinforced Concrete Pipe</td>
</tr>
<tr>
<td>Rd. or Road</td>
<td>Road or Round</td>
</tr>
<tr>
<td>Rdwy.</td>
<td>Roadway</td>
</tr>
<tr>
<td>Rect.</td>
<td>Rectangular</td>
</tr>
<tr>
<td>Ref.</td>
<td>Reference</td>
</tr>
<tr>
<td>Rein.</td>
<td>Reinforced or Reinforcement</td>
</tr>
<tr>
<td>Req. or Reqd.</td>
<td>Required</td>
</tr>
<tr>
<td>R.G.S.</td>
<td>Rigid Galvanized Steel</td>
</tr>
<tr>
<td>R.R. or R.R.</td>
<td>Railroad</td>
</tr>
<tr>
<td>R.S.D.U.</td>
<td>Radar Speed Display Unit</td>
</tr>
<tr>
<td>R.U.</td>
<td>Rack Unit</td>
</tr>
<tr>
<td>R.X. or Rx.</td>
<td>Receive</td>
</tr>
<tr>
<td>S</td>
<td>Speed, Spacing or Second</td>
</tr>
<tr>
<td>Sch.</td>
<td>Schedule</td>
</tr>
<tr>
<td>S.H.B.R.</td>
<td>Special Height Bicycle Railing</td>
</tr>
<tr>
<td>S.H.W.</td>
<td>Seasonal High Water</td>
</tr>
<tr>
<td>S.I.P.</td>
<td>Stay In Place</td>
</tr>
<tr>
<td>S.P.</td>
<td>Superpave</td>
</tr>
<tr>
<td>S.Pa. or S.P.</td>
<td>Space(s)</td>
</tr>
<tr>
<td>Spec.</td>
<td>Specification</td>
</tr>
<tr>
<td>Sq.</td>
<td>Square</td>
</tr>
<tr>
<td>Sq. Ft., S.F.</td>
<td>Square Foot</td>
</tr>
<tr>
<td>S(q).</td>
<td>Square Inch</td>
</tr>
<tr>
<td>Sq. Yd., S.Y.</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Sr.</td>
<td>State Road</td>
</tr>
<tr>
<td>SS</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>S.Y.</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Str. or St.</td>
<td>Street</td>
</tr>
<tr>
<td>Std. or Std.</td>
<td>Standard</td>
</tr>
<tr>
<td>Stg. or St.</td>
<td>Strong</td>
</tr>
<tr>
<td>Stl. or St.</td>
<td>Steel</td>
</tr>
<tr>
<td>SW</td>
<td>Skewed Angle</td>
</tr>
<tr>
<td>Swl.</td>
<td>Sidewalk</td>
</tr>
<tr>
<td>T</td>
<td>Thickness, Tangent Distance or Time</td>
</tr>
<tr>
<td>T.A. or T.A.</td>
<td>Temperature And Humidity</td>
</tr>
<tr>
<td>T.A.G.</td>
<td>Tongue and Groove</td>
</tr>
<tr>
<td>T.C.P.</td>
<td>Traffic Control Plan(s)</td>
</tr>
<tr>
<td>T.C.Z.</td>
<td>Traffic Control Zone</td>
</tr>
<tr>
<td>Theoretical</td>
<td>Theoretical</td>
</tr>
<tr>
<td>Thw or Thw</td>
<td>Insulation (Flame Retardant, Moisture And Heat Resistant Thermoplastic)</td>
</tr>
<tr>
<td>Ton</td>
<td>Ton</td>
</tr>
<tr>
<td>Trans.</td>
<td>Transition or Transverse</td>
</tr>
<tr>
<td>T.T.C.</td>
<td>Temporary Traffic Control</td>
</tr>
<tr>
<td>T.V.S.S.</td>
<td>Transient Voltage Surge Suppression</td>
</tr>
<tr>
<td>T.Y.</td>
<td>Transit</td>
</tr>
<tr>
<td>TYP.</td>
<td>Typical</td>
</tr>
<tr>
<td>Ul</td>
<td>Underwriters Laboratories</td>
</tr>
<tr>
<td>U.P.S.</td>
<td>Uninterruptible Power Supply</td>
</tr>
<tr>
<td>U.S.P.S.</td>
<td>United States Postal Service</td>
</tr>
<tr>
<td>U.T.</td>
<td>Utilities</td>
</tr>
<tr>
<td>U.V.</td>
<td>Ultraviolet</td>
</tr>
<tr>
<td>V</td>
<td>Veh.</td>
</tr>
<tr>
<td>V.P. or V.P.</td>
<td>Vehicular</td>
</tr>
<tr>
<td>V.P.D. or V.P.D.</td>
<td>Vehicular Per Day</td>
</tr>
<tr>
<td>W</td>
<td>Width or Wide</td>
</tr>
<tr>
<td>W.T.</td>
<td>Weight</td>
</tr>
<tr>
<td>W.W.</td>
<td>Welded Wire Mesh</td>
</tr>
<tr>
<td>W.W.R.</td>
<td>Welded Wire Reinforcing</td>
</tr>
<tr>
<td>Y</td>
<td>Yard</td>
</tr>
<tr>
<td>Y.R.</td>
<td>Year</td>
</tr>
<tr>
<td>Design Standards Index</td>
<td>Standard Plans Index</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
</tr>
<tr>
<td>510</td>
<td>000-510</td>
</tr>
<tr>
<td>511</td>
<td>000-511</td>
</tr>
<tr>
<td>525</td>
<td>000-525</td>
</tr>
<tr>
<td><strong>General Construction Operations</strong></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>102-000</td>
</tr>
<tr>
<td>601/611</td>
<td>102-005</td>
</tr>
<tr>
<td>602/612</td>
<td>102-010</td>
</tr>
<tr>
<td>607/619</td>
<td>102-015</td>
</tr>
<tr>
<td>625</td>
<td>102-020</td>
</tr>
<tr>
<td>626</td>
<td>102-025</td>
</tr>
<tr>
<td>606</td>
<td>102-030</td>
</tr>
<tr>
<td>606</td>
<td>102-035</td>
</tr>
<tr>
<td>608</td>
<td>102-040</td>
</tr>
<tr>
<td>613</td>
<td>102-045</td>
</tr>
<tr>
<td>623</td>
<td>102-050</td>
</tr>
<tr>
<td>614</td>
<td>102-055</td>
</tr>
<tr>
<td>620/621/631</td>
<td>102-060</td>
</tr>
<tr>
<td>665</td>
<td>102-065</td>
</tr>
<tr>
<td>655</td>
<td>102-070</td>
</tr>
<tr>
<td>660</td>
<td>102-075</td>
</tr>
<tr>
<td>415</td>
<td>102-100</td>
</tr>
<tr>
<td>414</td>
<td>102-110</td>
</tr>
<tr>
<td>412</td>
<td>102-120</td>
</tr>
<tr>
<td><strong>Clearing Construction Site</strong></td>
<td></td>
</tr>
<tr>
<td>542</td>
<td>110-100</td>
</tr>
<tr>
<td>532</td>
<td>110-200</td>
</tr>
<tr>
<td><strong>Earthwork and Related Operations</strong></td>
<td></td>
</tr>
<tr>
<td>505</td>
<td>120-001</td>
</tr>
<tr>
<td>500</td>
<td>120-002</td>
</tr>
<tr>
<td>507</td>
<td>125-001</td>
</tr>
<tr>
<td>540</td>
<td>141-701</td>
</tr>
<tr>
<td>506</td>
<td>160-001</td>
</tr>
</tbody>
</table>

### Bituminous Treatments, Surface Courses and Concrete Pavement

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>515/516</td>
<td>330-001</td>
<td>Paved and Graded Driveways</td>
</tr>
<tr>
<td>305</td>
<td>350-001</td>
<td>Concrete Pavement Joints</td>
</tr>
<tr>
<td>308</td>
<td>353-001</td>
<td>Concrete Slab Replacement</td>
</tr>
<tr>
<td>306</td>
<td>370-001</td>
<td>Bridge Approach Expansion Joint</td>
</tr>
</tbody>
</table>

### Structures

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>6010</td>
<td>400-010</td>
<td>Cantilever Retaining Wall (C-I-P)</td>
</tr>
<tr>
<td>6011</td>
<td>400-011</td>
<td>Gravity Wall</td>
</tr>
<tr>
<td>521</td>
<td>400-021</td>
<td>Concrete Steps</td>
</tr>
</tbody>
</table>

### Inlets, Manholes and Junction Boxes

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>425-001</td>
<td>Supplementary Details for Manholes and Inlets</td>
</tr>
<tr>
<td>200</td>
<td>425-010</td>
<td>Structure Bottoms - Type J and P</td>
</tr>
<tr>
<td>210</td>
<td>425-020</td>
<td>Curb Inlet Tops - Types 1, 2, 3 and 4</td>
</tr>
<tr>
<td>211</td>
<td>425-021</td>
<td>Curb Inlet Tops - Types 5 and 6</td>
</tr>
<tr>
<td>212</td>
<td>425-022</td>
<td>Curb Inlet - Type 7</td>
</tr>
<tr>
<td>213</td>
<td>425-023</td>
<td>Curb Inlet - Type 8</td>
</tr>
<tr>
<td>214</td>
<td>425-024</td>
<td>Curb Inlet Top - Type 9</td>
</tr>
<tr>
<td>215</td>
<td>425-025</td>
<td>Curb Inlet Top - Type 10</td>
</tr>
<tr>
<td>217</td>
<td>425-030</td>
<td>Median Barrier Inlets Types 1 and 2</td>
</tr>
<tr>
<td>218</td>
<td>425-031</td>
<td>Adjacent Barrier Inlet</td>
</tr>
<tr>
<td>219</td>
<td>425-032</td>
<td>Curb and Gutter Barrier Inlet</td>
</tr>
<tr>
<td>220</td>
<td>425-040</td>
<td>Gutter Inlet - Type 5</td>
</tr>
<tr>
<td>221</td>
<td>425-041</td>
<td>Gutter Inlet - Type V</td>
</tr>
<tr>
<td>230</td>
<td>425-050</td>
<td>Ditch Bottom Inlet - Type A</td>
</tr>
<tr>
<td>231</td>
<td>425-051</td>
<td>Ditch Bottom Inlet - Type B</td>
</tr>
<tr>
<td>232</td>
<td>425-052</td>
<td>Ditch Bottom Inlets - Types C, D, E and H</td>
</tr>
<tr>
<td>233</td>
<td>425-053</td>
<td>Ditch Bottom Inlets - Types F and G</td>
</tr>
<tr>
<td>234</td>
<td>425-054</td>
<td>Ditch Bottom Inlet - Type J</td>
</tr>
<tr>
<td>235</td>
<td>425-055</td>
<td>Ditch Bottom Inlet - Type K</td>
</tr>
<tr>
<td>282</td>
<td>425-060</td>
<td>Back of Sidewalk Drainage</td>
</tr>
<tr>
<td>216</td>
<td>425-061</td>
<td>Closed Flume Inlet</td>
</tr>
<tr>
<td>240</td>
<td>425-070</td>
<td>Skimmer for Outlet Control Structures</td>
</tr>
<tr>
<td>307</td>
<td>425-080</td>
<td>Utility Conflicts thru Drainage Structures</td>
</tr>
<tr>
<td>293</td>
<td>425-090</td>
<td>Safety Modifications for Inlets In Box Culverts</td>
</tr>
</tbody>
</table>

### Pipe Culverts - End Treatments

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>280</td>
<td>430-001</td>
<td>Miscellaneous Drainage Details</td>
</tr>
<tr>
<td>260</td>
<td>430-010</td>
<td>U-Type Concrete Endwalls With Grates - 15' to 30' Pipe</td>
</tr>
<tr>
<td>Design Standards Index</td>
<td>Standard Plans Index</td>
<td>Index Title</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Pipe Culverts - End Treatments (Cont.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>261 430-011</td>
<td>U-Type Concrete Endwalls - Baffles and Grate Optional - 15” to 30” Pipe</td>
<td></td>
</tr>
<tr>
<td>264 430-012</td>
<td>U-Type Concrete Endwall - Energy Dissipator - 30” to 72” Pipe</td>
<td></td>
</tr>
<tr>
<td>270</td>
<td>Flared End Section</td>
<td></td>
</tr>
<tr>
<td>272 430-021</td>
<td>Cross Drain Mitered End Section</td>
<td></td>
</tr>
<tr>
<td>273 430-022</td>
<td>Side Drain Mitered End Section</td>
<td></td>
</tr>
<tr>
<td>250 430-030</td>
<td>Straight Concrete Endwalls - Single and Multiple Pipe</td>
<td></td>
</tr>
<tr>
<td>251 430-031</td>
<td>Straight Concrete Endwalls - Single and Double 60” Pipe</td>
<td></td>
</tr>
<tr>
<td>252 430-032</td>
<td>Straight Concrete Endwalls - Single and Double 66” Pipe</td>
<td></td>
</tr>
<tr>
<td>253 430-033</td>
<td>Straight Concrete Endwalls - Single and Double 72” Pipe</td>
<td></td>
</tr>
<tr>
<td>255 430-034</td>
<td>Straight Concrete Endwalls - Single 84” Pipe</td>
<td></td>
</tr>
<tr>
<td>266 430-040</td>
<td>Winged Concrete Endwalls</td>
<td></td>
</tr>
<tr>
<td>269 430-090</td>
<td>Safety Modifications for Endwalls</td>
<td></td>
</tr>
<tr>
<td>Structures - Miscellaneous Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>206 436-001</td>
<td>Trench Drain</td>
<td></td>
</tr>
<tr>
<td>286</td>
<td>Underdrain</td>
<td></td>
</tr>
<tr>
<td>245 443-002</td>
<td>Skimmers for French Drain Outlets</td>
<td></td>
</tr>
<tr>
<td>288</td>
<td>Deep Well Injection Box</td>
<td></td>
</tr>
<tr>
<td>287 444-T01</td>
<td>Deep Well Injection Box</td>
<td></td>
</tr>
<tr>
<td>Structures Foundations - Sheet Pile Wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6040 455-400</td>
<td>Precast Concrete Sheet Pile Wall (Conventional)</td>
<td></td>
</tr>
<tr>
<td>20440 455-440</td>
<td>Precast Concrete Sheet Pile Wall (FRP &amp; HSSS/GFRP)</td>
<td></td>
</tr>
<tr>
<td>Incidental Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17890 508-701</td>
<td>Traffic Control Devices for Movable Span Bridge Signals</td>
<td></td>
</tr>
<tr>
<td>17882 509-070</td>
<td>Railroad Grade Crossing Traffic Control Devices</td>
<td></td>
</tr>
<tr>
<td>17881 509-100</td>
<td>Advance Warning for R/R Crossing</td>
<td></td>
</tr>
<tr>
<td>Metal Pedestrian/Bicycle Railings, Guiderails and Handrails</td>
<td></td>
<td></td>
</tr>
<tr>
<td>852 515-052</td>
<td>Pedestrian/Bicycle Railing (Steel)</td>
<td></td>
</tr>
<tr>
<td>862 515-062</td>
<td>Pedestrian/Bicycle Railing (Aluminum)</td>
<td></td>
</tr>
<tr>
<td>870 515-070</td>
<td>Pipe Guiderail (Aluminum)</td>
<td></td>
</tr>
<tr>
<td>880 515-080</td>
<td>Pipe Guiderail (Steel)</td>
<td></td>
</tr>
<tr>
<td>Concrete Gutter, Curb Elements and Traffic Separator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 520-001</td>
<td>Curb and Gutter</td>
<td></td>
</tr>
<tr>
<td>284 520-005</td>
<td>Concrete Shoulder Gutter Spillway</td>
<td></td>
</tr>
<tr>
<td>283 520-010</td>
<td>Median Opening Flume</td>
<td></td>
</tr>
<tr>
<td>302 520-020</td>
<td>Traffic Separators</td>
<td></td>
</tr>
<tr>
<td>Concrete Barriers, Traffic Railings, and Parapets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>410</td>
<td>Concrete Barrier</td>
<td></td>
</tr>
<tr>
<td>411</td>
<td>Pier Protection Barrier</td>
<td></td>
</tr>
<tr>
<td>461</td>
<td>Opaque Visual Barrier</td>
<td></td>
</tr>
<tr>
<td>5210</td>
<td>Concrete Barrier/Noise Wall (8’-0”)</td>
<td></td>
</tr>
<tr>
<td>5211</td>
<td>Concrete Barrier/Noise Wall (14’-0”)</td>
<td></td>
</tr>
<tr>
<td>5212</td>
<td>Concrete Barrier/Noise Wall (8’-0”) Junction Slab</td>
<td></td>
</tr>
<tr>
<td>5213</td>
<td>Concrete Barrier/Noise Wall T-Shaped Spread Footing</td>
<td></td>
</tr>
<tr>
<td>5214</td>
<td>Concrete Barrier/Noise Wall L-Shaped Spread Footing</td>
<td></td>
</tr>
<tr>
<td>5215</td>
<td>Concrete Barrier/Noise Wall Trench Footing</td>
<td></td>
</tr>
<tr>
<td>5216-000</td>
<td>HSE Wall Coping (Precast or C-J-P)</td>
<td></td>
</tr>
<tr>
<td>5216-010</td>
<td>Concrete Barrier/Junction Slab - Wall Coping</td>
<td></td>
</tr>
<tr>
<td>5216-200</td>
<td>Concrete Barrier/Raised Sidewalk - Wall Coping</td>
<td></td>
</tr>
<tr>
<td>5216-630</td>
<td>Parapet with C-J-P Sidewalk - Wall Coping</td>
<td></td>
</tr>
<tr>
<td>5216-640</td>
<td>Drainage Inlet Openings in Junction Slab - Wall Coping</td>
<td></td>
</tr>
<tr>
<td>5216-650</td>
<td>Light Pole Pedestal - Wall Coping</td>
<td></td>
</tr>
<tr>
<td>Concrete Sidewalk and Driveways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>310</td>
<td>Concrete Sidewalk</td>
<td></td>
</tr>
<tr>
<td>304</td>
<td>Detectable Warnings and Sidewalk Curb Ramps</td>
<td></td>
</tr>
<tr>
<td>515</td>
<td>Concrete Flared Driveways</td>
<td></td>
</tr>
<tr>
<td>Ditch and Slope Pavement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>281</td>
<td>Ditch Pavement and Sodding</td>
<td></td>
</tr>
<tr>
<td>Noise and Perimeter Walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5200</td>
<td>Noise Walls (Precast)</td>
<td></td>
</tr>
<tr>
<td>5250</td>
<td>Perimeter Walls</td>
<td></td>
</tr>
<tr>
<td>Guardrail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>Guardrail</td>
<td></td>
</tr>
<tr>
<td>402</td>
<td>Guardrail Transitions and Connections for Existing Bridges</td>
<td></td>
</tr>
<tr>
<td>Crash Cushions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>430</td>
<td>Crash Cushion Transition Details</td>
<td></td>
</tr>
<tr>
<td>Rumble Strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>516</td>
<td>Raised Rumble Strips</td>
<td></td>
</tr>
<tr>
<td>518</td>
<td>Ground-In Rumble Strips</td>
<td></td>
</tr>
<tr>
<td>Retaining Wall Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6020</td>
<td>HSE Retaining Wall Systems - Permanent</td>
<td></td>
</tr>
<tr>
<td>6030</td>
<td>HSE Retaining Wall Systems - Temporary</td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801</td>
<td>Fence - Type A</td>
<td></td>
</tr>
<tr>
<td>802</td>
<td>Fence - Type B</td>
<td></td>
</tr>
<tr>
<td>803</td>
<td>Cantilever Slide Gate - Type B Fence</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>Fence Location</td>
<td></td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

**FY 2020-21 STANDARD PLANS FOR ROAD CONSTRUCTION**

## Performance Turf
- 104 570-001 Permanent Erosion Control
- 105 570-010 Shoulder Sodding and Turf on Existing Facilities

## Landscape
- 544 580-001 Landscape Installation
- N/A 591-001 Landscape Irrigation Sleeves

## Traffic Control Signals and Devices
- 17721 630-001 Conduit Installation Details
- 17727 634-001 Signal Cable and Span Wire Installation Details
- 17733 634-002 Aerial Interconnect
- 17700 635-001 Pull and Splice Boxes
- 17504 639-001 Service Point Details
- 17736 639-002 Electric Power Service
- 17175 641-010 Concrete Poles
- 18113 641-020 Concrete CCTV Pole
- 17723 649-010 Steel Strain Pole
- 18111 649-020 Steel CCTV Pole
- 17743 649-030 Standard Mast Arm Assemblies
- 17745 649-031 Mast Arm Assemblies
- 17764 653-001 Pedestrian Control Signal Installation Details
- 13862 654-001 Rectangular Rapid Flashing Beacon Assembly
- 17356 659-010 Span Wire Mounted Sign Details
- 18110 659-020 Camera Mounting Details
- 17781 660-001 Vehicle Loop Installation Details
- 17784 665-001 Pedestrian Detector Assembly Installation Details
- 17870 671-001 Standard Signal Operating Plans
- 17841 676-010 Cabinet Installation Details
- 17900 695-001 Traffic Monitoring Site

## Signing, Pavement Markings and Lighting
### Highway Signing
- 11860 700-010 Single Column Ground Signs
- 11861 700-011 Single Column Cantilever Ground Mounted Sign
- 11870 700-012 Single Post Bridge Mounted Sign Support
- 11871 700-013 Single Post Median Barrier Mounted Sign Support
- 11200 700-020 Multi-Column Ground Sign
- 11300 700-030 Wind and Hanger Beams for Overhead Signs
- 17505 700-031 External Lighting for Signs
- 11310 700-040 Cantilever Sign Structure
- 11320 700-041 Span Sign Structure

### Highway Lighting Systems
- 17352 706-001 Typical Placement of Raised Pavement Markers
- 17346 711-001 Pavement Markings
- 17347 711-002 Bicycle Markings
- 17345 711-003 Interchange Markings

### Railroad Crossing
- 560 830-T01 Railroad (Grade) Crossings
### Erosion Control and Water Quality

<table>
<thead>
<tr>
<th>Index Title</th>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Erosion Control</td>
<td>104 570-001</td>
<td></td>
</tr>
<tr>
<td>Shoulder Sodding and Turf on Existing Facilities</td>
<td>105 570-010</td>
<td></td>
</tr>
</tbody>
</table>

### Drainage (cont.)

<table>
<thead>
<tr>
<th>Index Title</th>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-Type Concrete Endwalls-Baffles and Grate Optional - 15&quot; to 30&quot; Pipe</td>
<td>261 430-011</td>
<td></td>
</tr>
<tr>
<td>U-Type Concrete Endwall-Energy Dissipator - 30&quot; to 72&quot; Pipe</td>
<td>264 430-012</td>
<td></td>
</tr>
<tr>
<td>Winged Concrete Endwalls - Single Round Pipe: Renamed: Winged Concrete Endwalls</td>
<td>266 430-040</td>
<td></td>
</tr>
<tr>
<td>Deleted U-Type Sand-Cement Endwalls</td>
<td>268 430-020</td>
<td></td>
</tr>
<tr>
<td>Flared End Section</td>
<td>270 430-021</td>
<td></td>
</tr>
<tr>
<td>Cross Drain Mitered End Section</td>
<td>272 430-022</td>
<td></td>
</tr>
<tr>
<td>Side Drain Mitered End Section</td>
<td>273 430-001</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Drainage Details</td>
<td>280</td>
<td></td>
</tr>
<tr>
<td>Ditch Pavement and Sodding</td>
<td>281 524-001</td>
<td></td>
</tr>
<tr>
<td>Back of Sidewalk Drainage</td>
<td>282 435-060</td>
<td></td>
</tr>
<tr>
<td>Median Opening Flume</td>
<td>283 520-010</td>
<td></td>
</tr>
<tr>
<td>Concrete Shoulder Gutter Spillway</td>
<td>284 520-005</td>
<td></td>
</tr>
<tr>
<td>French Drain</td>
<td>285 443-001</td>
<td></td>
</tr>
<tr>
<td>Underdrain</td>
<td>286 440-001</td>
<td></td>
</tr>
<tr>
<td>Concrete Pavement Subdrainage</td>
<td>287 446-001</td>
<td></td>
</tr>
<tr>
<td>Deep Well Injection Box</td>
<td>288 444-701</td>
<td></td>
</tr>
<tr>
<td>Concrete Box Culvert Details (LRFD)</td>
<td>289 400-289</td>
<td></td>
</tr>
<tr>
<td>Supplemental Details for Precast Concrete Box Culverts</td>
<td>291 400-291</td>
<td></td>
</tr>
<tr>
<td>Standard Precast Concrete Box Culverts</td>
<td>292 400-292</td>
<td></td>
</tr>
<tr>
<td>Safety Modifications for Inlets in Box Culverts</td>
<td>293 425-090</td>
<td></td>
</tr>
<tr>
<td>Safety Modifications for Endwalls</td>
<td>295 430-090</td>
<td></td>
</tr>
<tr>
<td>Curbs, Concrete Pavement and Sidewalks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn Lanes [*Content moved to the FDM]</td>
<td>301 Deleted*</td>
<td></td>
</tr>
<tr>
<td>Traffic Separators</td>
<td>302 520-020</td>
<td></td>
</tr>
<tr>
<td>Deleted Curb Return Profiles</td>
<td>303 443-002</td>
<td></td>
</tr>
<tr>
<td>Detectable Warnings and Sidewalk Curb Ramps</td>
<td>304 522-002</td>
<td></td>
</tr>
<tr>
<td>Concrete Pavement Joints</td>
<td>305 350-001</td>
<td></td>
</tr>
<tr>
<td>Bridge Approach Expansion Joint - Concrete Pavement: Renamed:</td>
<td>306 370-001</td>
<td></td>
</tr>
<tr>
<td>Bridge Approach Expansion Joint - Concrete Pavement with Special Select Soil Base</td>
<td>307 125-001</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Utility Details</td>
<td>308</td>
<td></td>
</tr>
<tr>
<td>NEW: Utility Conflicts thru Drainage Structures (Note: Index 307, Sheet 2 of 3)</td>
<td>309 353-001</td>
<td></td>
</tr>
<tr>
<td>Concrete Slab Replacement</td>
<td>310</td>
<td></td>
</tr>
<tr>
<td>Concrete Sidewalk</td>
<td>310 522-001</td>
<td></td>
</tr>
</tbody>
</table>

*Renamed:* Erosion Control, Adjacent Barrier Inlet, and Curb and Gutter.
<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Railings</td>
<td></td>
<td></td>
<td>General</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 536-001</td>
<td></td>
<td>Guardrail</td>
<td>500 120-002</td>
<td></td>
<td>Removal of Organic and Plastic Material (Renamed: Subsoil Excavation)</td>
</tr>
<tr>
<td>402 536-002</td>
<td></td>
<td>Guardrail Transitions and Connections for Existing Bridges</td>
<td>505 120-001</td>
<td></td>
<td>Embankment Utilization</td>
</tr>
<tr>
<td>404 521-404</td>
<td></td>
<td>Guardrail Transitions - Existing Post &amp; Beam Bridge Railings (Narrow &amp; Recessed Curbs)</td>
<td>506 160-001</td>
<td></td>
<td>Miscellaneous Earthwork Details</td>
</tr>
<tr>
<td>405 521-405</td>
<td></td>
<td>Guardrail Transitions - Existing Post &amp; Beam Bridge Railings (Wide Curbs)</td>
<td>510 000-510</td>
<td></td>
<td>Superelevation - Rural Highways, Urban Freeways and High Speed Urban Highways</td>
</tr>
<tr>
<td>410 521-001</td>
<td></td>
<td>Concrete Barrier</td>
<td>511 000-511</td>
<td></td>
<td>Superelevation - Urban Highways and Streets</td>
</tr>
<tr>
<td>411 521-002</td>
<td></td>
<td>Pier Protection Barrier</td>
<td>330-001 522-003</td>
<td></td>
<td>Turnouts</td>
</tr>
<tr>
<td>412 102-120</td>
<td></td>
<td>Low Profile Barrier</td>
<td>330-001 522-003</td>
<td></td>
<td>Turnouts - Resurfacing Projects</td>
</tr>
<tr>
<td>414 102-110</td>
<td></td>
<td>Type K Temporary Concrete Barrier System</td>
<td>517 546-001</td>
<td></td>
<td>Raised Rumble Strips</td>
</tr>
<tr>
<td>415 102-100</td>
<td></td>
<td>Temporary Concrete Barrier</td>
<td>518 546-010</td>
<td></td>
<td>Shoulder Rumble Strips</td>
</tr>
<tr>
<td>420 Deleted</td>
<td></td>
<td>Traffic Railing - (32&quot; F Shape)</td>
<td>521 400-021</td>
<td></td>
<td>Concrete Steps</td>
</tr>
<tr>
<td>421 Deleted</td>
<td></td>
<td>Traffic Railing - (Median 32&quot; F Shape)</td>
<td>525 000-525</td>
<td></td>
<td>Ramp Terminals</td>
</tr>
<tr>
<td>422 521-422</td>
<td></td>
<td>Traffic Railing - (42&quot; Vertical Shape)</td>
<td>526 Deleted*</td>
<td></td>
<td>Roadway Transitions [*Content moved to the FDM]</td>
</tr>
<tr>
<td>423 521-423</td>
<td></td>
<td>Traffic Railing - (32&quot; Vertical Shape)</td>
<td>527 Deleted*</td>
<td></td>
<td>Directional Median Opening [*Content moved to the FDM]</td>
</tr>
<tr>
<td>424 Deleted</td>
<td></td>
<td>Traffic Railing - (Corral Shape)</td>
<td>530 Deleted</td>
<td></td>
<td>Rest Area Pavillion</td>
</tr>
<tr>
<td>425 Deleted</td>
<td></td>
<td>Traffic Railing - (42&quot; F Shape)</td>
<td>532 110-200</td>
<td></td>
<td>Mailboxes</td>
</tr>
<tr>
<td>426 521-426</td>
<td></td>
<td>Traffic Railing - (Median 36&quot; Single-Slope)</td>
<td>535 Deleted</td>
<td></td>
<td>Tractor Crossing</td>
</tr>
<tr>
<td>427 521-427</td>
<td></td>
<td>Traffic Railing - (36&quot; Single-Slope)</td>
<td>540 141-T01</td>
<td></td>
<td>Settlement Plate</td>
</tr>
<tr>
<td>428 521-428</td>
<td></td>
<td>Traffic Railing - (42&quot; Single-Slope)</td>
<td>542 110-100</td>
<td></td>
<td>Tree Protection and Preservation</td>
</tr>
<tr>
<td>430 544-001</td>
<td></td>
<td>Crash Cushion Details</td>
<td>544 580-001</td>
<td></td>
<td>Landscape Installation</td>
</tr>
<tr>
<td>461 521-010</td>
<td></td>
<td>Opaque Visual Barrier</td>
<td>N/A 591-001</td>
<td></td>
<td>Landscape Irrigation Sleeves</td>
</tr>
<tr>
<td>470 460-470</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) General Note &amp; Details</td>
<td>546 Deleted*</td>
<td></td>
<td>Sight Distance at Intersections [*Content moved to the FDM]</td>
</tr>
<tr>
<td>471 460-471</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Narrow Curb</td>
<td>560 830-T01</td>
<td></td>
<td>Railroad Crossings</td>
</tr>
<tr>
<td>472 460-472</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Strong Curb Type 1</td>
<td>600 Deleted</td>
<td></td>
<td>General Information for Traffic Control Through Work Zones, New Index 102-000</td>
</tr>
<tr>
<td>473 460-473</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Strong Curb Type 2</td>
<td>601 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Work Outside Shoulder, New Index 102-005</td>
</tr>
<tr>
<td>474 460-474</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Intermediate Curb</td>
<td>602 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Work On Shoulder, New Index 102-010</td>
</tr>
<tr>
<td>475 460-475</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Curb Type 1</td>
<td>603 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Work Within The Travel Way, New Index 102-025</td>
</tr>
<tr>
<td>476 460-476</td>
<td></td>
<td>Traffic Railing - (Thrie-Beam Retrofit) Wide Curb Type 2</td>
<td>604 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Work in Intersection - See MUTCD.</td>
</tr>
<tr>
<td>477 460-477</td>
<td></td>
<td>Thrie-Beam Panel Retrofit (Concrete Handrail)</td>
<td>605 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Work Near Intersection - See MUTCD.</td>
</tr>
<tr>
<td>N/A 460-490</td>
<td></td>
<td>Traffic Railing - (Rectangular Tube Retrofit)</td>
<td>606 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Work The Travel Way - Signal Control, New Index 120-30 and 102-035</td>
</tr>
<tr>
<td>480 521-480</td>
<td></td>
<td>Traffic Railing - (Vertical Face Retrofit) General Note &amp; Details</td>
<td>607 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Mobile Operation, Work On Shoulder and Work Within the Travel Way, New Index 102-015</td>
</tr>
<tr>
<td>481 521-481</td>
<td></td>
<td>Traffic Railing - (Vertical Face Retrofit) Narrow Curb</td>
<td>608 Deleted</td>
<td></td>
<td>Two-Lane, Two-Way, Temporary Diversion Connection, New Index 102-040</td>
</tr>
<tr>
<td>482 521-482</td>
<td></td>
<td>Traffic Railing - (Vertical Face Retrofit) Wide Curb</td>
<td>611 Deleted</td>
<td></td>
<td>Multilane, Work Outside Shoulder, New Index 102-005</td>
</tr>
<tr>
<td>483 521-483</td>
<td></td>
<td>Traffic Railing - (Vertical Face Retrofit) Intermediate Curb</td>
<td>612 Deleted</td>
<td></td>
<td>Multilane, Work on Shoulder, New Index 102-010</td>
</tr>
<tr>
<td>484 521-484</td>
<td></td>
<td>Traffic Railing - (Vertical Face Retrofit) Spread Footing Approach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Standards Index</td>
<td>Standard Plans Index</td>
<td>Index Title</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Traffic Control Through Work Zones (Cont.)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>613 Deleted Multilane, Work Within Travel Way-Median or Outside Lane, New Index 102-045</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>614 Deleted Multilane, Work Within Travel Way-Center Lane - See Index 102-050 or MUTCD TA-38 for interior lane closures. See Index 102-055 for lane shifts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>615 Deleted Multilane, Work In Intersection - See MUTCD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>616 Deleted Multilane, Work Near Intersection-Median or Outside Lane - See MUTCD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>617 Deleted Multilane, Work In Intersection - Center Lane - See MUTCD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>618 Deleted Multilane, Work In Intersection - Two Lanes Closed-45mph or Less - See MUTCD.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>619 Deleted Multilane, Mobile Operations Work on Shoulder, Work Within Travel Way, New Index 102-015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>620 Deleted Multilane, Divided, Temporary Diversion Connection, New Index 102-060</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>621 Deleted Multilane Undivided, Temporary Diversion Connection, New Index 102-060</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>622 Deleted Multilane, Work Near Intersection - Temporary Diversion Connection 35mph or Less - See MUTCD or Index 102-060</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>623 Deleted Multilane, Work Within the Travel Way Double Lane Closure, New Index 102-050</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>625 Deleted Temporary Road Closure - 5 Minutes or Less, New Index 102-020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>628 Deleted Two Way Left Turn Lane Closure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>630 Deleted Crossover for Paving Train Operations, Rural</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>631 Deleted Temporary Crossover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>640 Deleted Converting Two-Lanes to Four-Lanes Divided, Rural</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>641 Deleted Converting Two-Lanes to Four-Lanes Divided, Urban</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>642 Deleted Transitions for Temporary Concrete Barrier Wall on Freeway Facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650 Deleted Two-Lane Two-Way, Rural Structure Replacement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>651 Deleted Multilane Divided, Maintenance and Construction, New Index 102-060</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>655 Deleted Traffic Pacing, New Index 102-070</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>660 Deleted Pedestrian Control for Closure of Sidewalks, New Index 102-075</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>665 Deleted Limited Access, Temporary Opening, New Index 102-065.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>667 Deleted Toll Plaza, Traffic Control Standards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>670 Deleted Motorist Awareness System - See Index 102-000 for MAS detail.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Fencing and Pedestrian Railings

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fencing and Pedestrian Railings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800 550-004 Fence Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>801 550-001 Fence - Type A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>802 550-002 Fence - Type B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>803 550-003 Cantilever Slide Gate - Type B Fence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>810 550-010 Bridge Fencing (Vertical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>811 550-011 Bridge Fencing (Curved Top)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>812 550-012 Bridge Fencing (Enclosed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>820 521-820 27” Concrete Parapet with Pedestrian/Bicycle Bullet Railing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Noise And Perimeter Wall Systems

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noise And Perimeter Wall Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5200 534-200 Precast Noise Walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5210 521-510 Traffic Railing/Noise Wall (8'-0&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5211 521-511 Traffic Railing/Noise Wall (14'-0&quot;)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5212 521-512 Traffic Railing/Noise Wall (8'-0&quot;) Junction Slab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5213 521-513 Traffic Railing/Noise Wall T-Shaped Spread Footing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5214 521-514 Traffic Railing/Noise Wall L-Shaped Spread Footing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5215 521-515 Traffic Railing/Noise Wall Trench Footing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5250 534-250 Perimeter Walls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wall Systems

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wall Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6010 400-010 C-I-P Cantilever Retaining Wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6011 400-011 Gravity Wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6020 548-020 Permanent MSE Retaining Wall Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6030 548-030 Temporary MSE Retaining Wall Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6040 455-400 Precast Concrete Sheet Pile Wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6100 521-600 MSE Wall Coping (Precast or C-I-P)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6110 521-610 Wall Coping With Traffic Railing/Junction Slab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6120 521-620 Wall Coping With Traffic Railing/Raised Sidewalk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6130 521-630 Wall Coping/Parapet with C-I-P Sidewalk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6200 521-650 Coping Mounted Light Pole Pedestal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6201 521-640 Junction Slab at Drainage Inlet Openings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Signing and Marking

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signing and Marking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11200 700-020 Multi-Column Ground Sign</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11300 700-030 Steel Overhead Sign Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11310 700-040 Cantilever Sign Structure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Signing and Marking (Cont.)

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11320</td>
<td>700-041</td>
<td>Span Sign Structure</td>
</tr>
<tr>
<td>11860</td>
<td>700-010</td>
<td>Single Column Ground Signs</td>
</tr>
<tr>
<td>11861</td>
<td>700-021</td>
<td>Single Column Cantilever Ground Mounted Sign</td>
</tr>
<tr>
<td>11862</td>
<td>700-120</td>
<td>Roadside Flashing Beacon Assembly</td>
</tr>
<tr>
<td>11862</td>
<td>654-001</td>
<td>Rectangular Rapid Flashing Beacon Assembly</td>
</tr>
<tr>
<td>11870</td>
<td>700-012</td>
<td>Single Post Bridge Mounted Sign Support</td>
</tr>
<tr>
<td>11871</td>
<td>700-013</td>
<td>Single Post Median Barrier Mounted Sign Support</td>
</tr>
<tr>
<td>13417</td>
<td>700-110</td>
<td>Mounting Exit Number Panels To Highway Signs</td>
</tr>
<tr>
<td>17302</td>
<td>700-101</td>
<td>Typical Sections For Placement of Single &amp; Multi-Column Signs</td>
</tr>
<tr>
<td>17328</td>
<td>700-108</td>
<td>Typical Signing for Truck Weigh &amp; Inspection Stations</td>
</tr>
<tr>
<td>17344</td>
<td>Deleted*</td>
<td>School Signs &amp; Markings [*Content moved to speed Zone Manual]</td>
</tr>
<tr>
<td>17345</td>
<td>711-003</td>
<td>Interchange Markings</td>
</tr>
<tr>
<td>17346</td>
<td>711-001</td>
<td>Pavement Markings</td>
</tr>
<tr>
<td>17347</td>
<td>711-002</td>
<td>Bicycle Markings</td>
</tr>
<tr>
<td>17349</td>
<td>700-109</td>
<td>Traffic Controls For Street Terminations</td>
</tr>
<tr>
<td>17350</td>
<td>700-104</td>
<td>Signing For Motorist Services</td>
</tr>
<tr>
<td>17351</td>
<td>700-105</td>
<td>Welcome Center Signing</td>
</tr>
<tr>
<td>17352</td>
<td>700-001</td>
<td>Typical Placement Of Reflective Pavement Markers</td>
</tr>
<tr>
<td>17354</td>
<td>Deleted*</td>
<td>Tourist Oriented Directional Signs [*Content moved to the FDM]</td>
</tr>
<tr>
<td>17355</td>
<td>700-102</td>
<td>Special Sign Details</td>
</tr>
<tr>
<td>17356</td>
<td>659-010</td>
<td>Span Wire Mounted Sign Details</td>
</tr>
<tr>
<td>17357</td>
<td>700-107</td>
<td>Bridge Weight Restrictions</td>
</tr>
<tr>
<td>17359</td>
<td>700-106</td>
<td>Rural Narrow Bridge Treatment</td>
</tr>
</tbody>
</table>

### Traffic Signal and Equipment (Cont.)

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11733</td>
<td>634-002</td>
<td>Aerial Interconnect</td>
</tr>
<tr>
<td>11736</td>
<td>639-002</td>
<td>Electrical Power Service</td>
</tr>
<tr>
<td>11743</td>
<td>649-030</td>
<td>Standard Mast Arm Assemblies</td>
</tr>
<tr>
<td>11745</td>
<td>649-031</td>
<td>Mast Arm Assemblies</td>
</tr>
<tr>
<td>11748</td>
<td>700-050</td>
<td>Free-Swinging Internally-Illuminated Street Sign Assemblies</td>
</tr>
<tr>
<td>11764</td>
<td>653-001</td>
<td>Pedestrian Control Signal Installation Details</td>
</tr>
<tr>
<td>11781</td>
<td>660-001</td>
<td>Vehicle Loop Installation Details</td>
</tr>
<tr>
<td>11784</td>
<td>665-001</td>
<td>Pedestrian Detector Assembly Installation Details</td>
</tr>
<tr>
<td>17841</td>
<td>676-010</td>
<td>Cabinet Installation Details</td>
</tr>
<tr>
<td>17870</td>
<td>671-001</td>
<td>Standard Signal Operating Plans</td>
</tr>
<tr>
<td>17881</td>
<td>509-100</td>
<td>Advance Warning For R/R Crossing</td>
</tr>
<tr>
<td>17882</td>
<td>509-070</td>
<td>Railroad Grade Crossing Traffic Control Devices</td>
</tr>
<tr>
<td>17890</td>
<td>508-701</td>
<td>Traffic Control Devices For Movable Span Bridge Signals</td>
</tr>
</tbody>
</table>

### Planning

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>17900</td>
<td>695-001</td>
<td>Traffic Monitoring Site</td>
</tr>
</tbody>
</table>

### Intelligent Transportation Systems (ITS)

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>18100</td>
<td>Deleted</td>
<td>CCTV Pole Placement</td>
</tr>
<tr>
<td>18101</td>
<td>Deleted*</td>
<td>Typical CCTV Site [*Combined with CCTV Indexes]</td>
</tr>
<tr>
<td>18102</td>
<td>Deleted*</td>
<td>Ground And Lightning Protection [*Combined with CCTV and DNS Indexes]</td>
</tr>
<tr>
<td>18104</td>
<td>Deleted*</td>
<td>Typical CCTV Cabinet Equipment Layout</td>
</tr>
<tr>
<td>18105</td>
<td>Deleted*</td>
<td>CCTV Block Diagram</td>
</tr>
<tr>
<td>18107</td>
<td>Deleted*</td>
<td>Ground Mounted CCTV Cabinet [*Combined with CCTV Indexes]</td>
</tr>
<tr>
<td>18108</td>
<td>Deleted*</td>
<td>Pole Mounted CCTV Cabinet [*Combined with CCTV Indexes]</td>
</tr>
<tr>
<td>18110</td>
<td>659-020</td>
<td>Camera Mounting Details</td>
</tr>
<tr>
<td>18111</td>
<td>649-020</td>
<td>Steel CCTV Pole</td>
</tr>
<tr>
<td>18113</td>
<td>641-020</td>
<td>Concrete CCTV Pole</td>
</tr>
<tr>
<td>18300</td>
<td>700-090</td>
<td>Dynamic Message Sign Walk-In</td>
</tr>
<tr>
<td>700-091</td>
<td>N/A</td>
<td>Catwalk Details</td>
</tr>
</tbody>
</table>

### Roadway Lighting

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>17500</td>
<td>715-001</td>
<td>Conventional Lighting</td>
</tr>
<tr>
<td>17502</td>
<td>715-010</td>
<td>High Mast Lighting</td>
</tr>
<tr>
<td>17504</td>
<td>639-001</td>
<td>Service Point Details</td>
</tr>
<tr>
<td>17505</td>
<td>700-031</td>
<td>External Lighting For Signs</td>
</tr>
<tr>
<td>17515</td>
<td>715-002</td>
<td>Standard Aluminum Lighting</td>
</tr>
</tbody>
</table>

### Traffic Signal and Equipment

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>17700</td>
<td>635-001</td>
<td>Pull &amp; Splice Box</td>
</tr>
<tr>
<td>17721</td>
<td>630-001</td>
<td>Conduit Installation Details</td>
</tr>
<tr>
<td>17723</td>
<td>649-010</td>
<td>Steel Strain Pole</td>
</tr>
<tr>
<td>17725</td>
<td>641-010</td>
<td>Concrete Poles</td>
</tr>
<tr>
<td>17727</td>
<td>634-001</td>
<td>Signal Cable &amp; Span Wire Installation Details</td>
</tr>
</tbody>
</table>

### Prestressed Concrete Beams

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>20010</td>
<td>450-010</td>
<td>Typical Florida-I Beam Details and Notes</td>
</tr>
<tr>
<td>20036</td>
<td>450-036</td>
<td>Florida-I 36 Beam - Standard Details</td>
</tr>
<tr>
<td>20045</td>
<td>450-045</td>
<td>Florida-I 45 Beam - Standard Details</td>
</tr>
<tr>
<td>20054</td>
<td>450-054</td>
<td>Florida-I 54 Beam - Standard Details</td>
</tr>
<tr>
<td>20063</td>
<td>450-063</td>
<td>Florida-I 63 Beam - Standard Details</td>
</tr>
<tr>
<td>20072</td>
<td>450-072</td>
<td>Florida-I 72 Beam - Standard Details</td>
</tr>
<tr>
<td>Design Standards Index</td>
<td>Standard Plans Index</td>
<td>Index Title</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Prestressed Concrete Beams (Cont.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20078</td>
<td>450-078</td>
<td>Florida-I 78 Beam - Standard Details</td>
</tr>
<tr>
<td>20084</td>
<td>450-084</td>
<td>Florida-I 84 Beam - Standard Details</td>
</tr>
<tr>
<td>20096</td>
<td>450-096</td>
<td>Florida-I 96 Beam - Standard Details</td>
</tr>
<tr>
<td>20120</td>
<td>450-120</td>
<td>AASHTO Type II Beam</td>
</tr>
<tr>
<td>20199</td>
<td>450-199</td>
<td>Build-Up &amp; Deflection Data For Prestressed I-Beams</td>
</tr>
<tr>
<td>20210</td>
<td>450-210</td>
<td>Typical Florida-U Beam Details and Notes</td>
</tr>
<tr>
<td>20248</td>
<td>450-248</td>
<td>Florida-U 48 Beam - Standard Details</td>
</tr>
<tr>
<td>20254</td>
<td>450-254</td>
<td>Florida-U 54 Beam - Standard Details</td>
</tr>
<tr>
<td>20263</td>
<td>450-263</td>
<td>Florida-U 63 Beam - Standard Details</td>
</tr>
<tr>
<td>20272</td>
<td>450-272</td>
<td>Florida-U 72 Beam - Standard Details</td>
</tr>
<tr>
<td>20299</td>
<td>450-299</td>
<td>Build-Up and Deflection Data For Florida-U Beams</td>
</tr>
<tr>
<td>Bridge Bearings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20502</td>
<td>450-502</td>
<td>Beveled Bearing Plate Details - Prestressed Florida-U Beams</td>
</tr>
<tr>
<td>20510</td>
<td>450-510</td>
<td>Composite Elastomeric Bearing Pads - Prestressed Florida-I &amp; AASHTO Type II Beams</td>
</tr>
<tr>
<td>20511</td>
<td>450-511</td>
<td>Bearing Plates (Type I) - Prestressed Florida-I &amp; AASHTO Type II Beams</td>
</tr>
<tr>
<td>20512</td>
<td>450-512</td>
<td>Bearing Plates (Type 2) - Prestressed Florida-I &amp; AASHTO Type II Beams</td>
</tr>
<tr>
<td>Square and Round Concrete Piles (With Carbon Steel)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20600</td>
<td>455-001</td>
<td>Notes and Details For Square Prestressed Concrete Piles</td>
</tr>
<tr>
<td>20601</td>
<td>455-002</td>
<td>Square Prestressed Concrete Pile Splices</td>
</tr>
<tr>
<td>20602</td>
<td>455-003</td>
<td>EDC Instrumentation For Square Prestressed Concrete Piles</td>
</tr>
<tr>
<td>20612</td>
<td>455-012</td>
<td>12&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20614</td>
<td>455-014</td>
<td>14&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20618</td>
<td>455-018</td>
<td>18&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20620</td>
<td>455-020</td>
<td>20&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20624</td>
<td>455-024</td>
<td>24&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20630</td>
<td>455-030</td>
<td>30&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20631</td>
<td>455-031</td>
<td>High Moment Capacity 30&quot; Square Prestressed Concrete Pile</td>
</tr>
<tr>
<td>20654</td>
<td>455-054</td>
<td>54&quot; Precast/Post- Tensioned Concrete Cylinder Pile</td>
</tr>
<tr>
<td>20660</td>
<td>455-060</td>
<td>60&quot; Prestressed Concrete Cylinder Pile</td>
</tr>
<tr>
<td>Approach Slabs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20900</td>
<td>400-090</td>
<td>Approach Slabs (Flexible Pavement Approaches)</td>
</tr>
<tr>
<td>20910</td>
<td>400-091</td>
<td>Approach Slabs (Rigid Pavement Approaches)</td>
</tr>
<tr>
<td>Bridge Expansion Joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21100</td>
<td>458-100</td>
<td>Strip Seal Expansion Joint</td>
</tr>
<tr>
<td>21110</td>
<td>458-110</td>
<td>Poured Joint With Backer Rod Expansion Joint System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Standards Index</th>
<th>Standard Plans Index</th>
<th>Index Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structures Access and Lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21200</td>
<td>521-660</td>
<td>Light Pole Pedestal</td>
</tr>
<tr>
<td>21210</td>
<td>630-010</td>
<td>Conduit Details</td>
</tr>
<tr>
<td>21220</td>
<td>510-001</td>
<td>Navigation Light System Details (Fixed Bridges)</td>
</tr>
<tr>
<td>21240</td>
<td>715-240</td>
<td>Maintenance Lighting For Box Girder</td>
</tr>
<tr>
<td>21250</td>
<td>460-250</td>
<td>Access Hatch Assembly For Steel Box Sections</td>
</tr>
<tr>
<td>21251</td>
<td>460-251</td>
<td>Access Hatch Assembly For Concrete Box Sections</td>
</tr>
<tr>
<td>21252</td>
<td>460-252</td>
<td>Access Door Assembly For Concrete Box Sections</td>
</tr>
<tr>
<td>Standard Bar Bending Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21300</td>
<td>415-001</td>
<td>Standard Bar Bending Details</td>
</tr>
<tr>
<td>Temporary Detour Bridges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21600</td>
<td>102-200</td>
<td>Temporary Detour Bridge General Notes and Details</td>
</tr>
<tr>
<td>21610</td>
<td>102-210</td>
<td>Temporary Detour Bridge Details - Timber Pile Foundations</td>
</tr>
<tr>
<td>21620</td>
<td>102-220</td>
<td>Temporary Detour Bridge Details - Steel H Pile Foundations</td>
</tr>
<tr>
<td>21630</td>
<td>102-230</td>
<td>Temporary Detour Bridge Details - Steel Pipe Pile Foundations</td>
</tr>
<tr>
<td>21640</td>
<td>102-240</td>
<td>Temporary Detour Bridge Thrie-Beam Guardrail</td>
</tr>
<tr>
<td>Post-Tensioning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21801</td>
<td>462-001</td>
<td>Post-Tensioning Vertical Profile</td>
</tr>
<tr>
<td>21802</td>
<td>462-002</td>
<td>Post-Tensioning Anchorage Protection</td>
</tr>
<tr>
<td>21803</td>
<td>462-003</td>
<td>Post-Tensioning Anchorage and Grouting Details</td>
</tr>
<tr>
<td>Fender System Details</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21930</td>
<td>471-030</td>
<td>Fender System - Prestressed Concrete Piles</td>
</tr>
<tr>
<td>Wall Systems (Corrosion Resistant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22440</td>
<td>455-440</td>
<td>Precast Concrete CFRP/GFRP &amp; HSS/GFRP Sheet Pile Wall</td>
</tr>
<tr>
<td>Square and Round Concrete Piles (Corrosion Resistant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22600</td>
<td>455-101</td>
<td>Notes and Details For Square CFRP &amp; SS Prestressed Concrete Piles</td>
</tr>
<tr>
<td>22601</td>
<td>455-102</td>
<td>Square CFRP and SS Prestressed Concrete Pile Splices</td>
</tr>
<tr>
<td>22612</td>
<td>453-112</td>
<td>12&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>22614</td>
<td>455-114</td>
<td>14&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>22618</td>
<td>455-118</td>
<td>18&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>22624</td>
<td>455-124</td>
<td>24&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>22630</td>
<td>455-130</td>
<td>30&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>22654</td>
<td>455-154</td>
<td>54&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>22660</td>
<td>455-160</td>
<td>60&quot; Square CFRP and SS Prestressed Concrete Pile</td>
</tr>
<tr>
<td>Standard Plans Index</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>102-000</td>
<td>New Index - Previously Index 102-600; Reorganized Index and Series; Added &quot;Temporary Traffic Control Tables&quot; detail.</td>
<td></td>
</tr>
<tr>
<td>102-005</td>
<td>New Index - Work Beyond the Shoulder.</td>
<td></td>
</tr>
<tr>
<td>102-010</td>
<td>New Index - Work on the Shoulder.</td>
<td></td>
</tr>
<tr>
<td>102-015</td>
<td>New Index - Mobile Operations.</td>
<td></td>
</tr>
<tr>
<td>102-020</td>
<td>New Index - Temporary Roadway Closure.</td>
<td></td>
</tr>
<tr>
<td>102-025</td>
<td>New Index - Two-Lane Roadway, Lane Closure Using Flagger.</td>
<td></td>
</tr>
<tr>
<td>102-030</td>
<td>New Index - Two-Lane Roadway, Lane Closure Using Temporary Traffic Signals.</td>
<td></td>
</tr>
<tr>
<td>102-035</td>
<td>New Index - Haul Road Crossing.</td>
<td></td>
</tr>
<tr>
<td>102-040</td>
<td>New Index - Two-Lane Roadway, Temporary Diversion.</td>
<td></td>
</tr>
<tr>
<td>102-045</td>
<td>New Index - Multilane Roadway, Single Lane Closure.</td>
<td></td>
</tr>
<tr>
<td>102-050</td>
<td>New Index - Multilane Roadway, Multiple Lane Closures.</td>
<td></td>
</tr>
<tr>
<td>102-055</td>
<td>New Index - Multilane Roadway, Lane Closure with Lane Shift.</td>
<td></td>
</tr>
<tr>
<td>102-060</td>
<td>New Index - Multilane Roadway, Temporary Diversion.</td>
<td></td>
</tr>
<tr>
<td>102-070</td>
<td>New Index - Traffic Pacing.</td>
<td></td>
</tr>
<tr>
<td>102-075</td>
<td>New Index - Work on the Sidewalk.</td>
<td></td>
</tr>
<tr>
<td>102-600</td>
<td>Deleted - Moved to New Index 102-000.</td>
<td></td>
</tr>
<tr>
<td>102-601</td>
<td>Deleted - Moved to New Index 102-005.</td>
<td></td>
</tr>
<tr>
<td>102-602</td>
<td>Deleted - Moved to New Index 102-010.</td>
<td></td>
</tr>
<tr>
<td>102-603</td>
<td>Deleted - Moved to New Index 102-025.</td>
<td></td>
</tr>
<tr>
<td>102-604</td>
<td>Deleted Index. See MUTCD for intersection TCC.</td>
<td></td>
</tr>
<tr>
<td>102-605</td>
<td>Deleted Index. See MUTCD for intersection TCC.</td>
<td></td>
</tr>
<tr>
<td>102-606</td>
<td>Deleted - Moved to New Index 120-030 and 102-035.</td>
<td></td>
</tr>
<tr>
<td>102-607</td>
<td>Deleted - Moved to New Index 102-015.</td>
<td></td>
</tr>
<tr>
<td>102-608</td>
<td>Deleted - Moved to New Index 102-040.</td>
<td></td>
</tr>
<tr>
<td>102-611</td>
<td>Deleted - Moved to New Index 102-005.</td>
<td></td>
</tr>
<tr>
<td>102-612</td>
<td>Deleted - Moved to New Index 102-010.</td>
<td></td>
</tr>
<tr>
<td>102-613</td>
<td>Deleted - Moved to New Index 102-045.</td>
<td></td>
</tr>
<tr>
<td>102-614</td>
<td>See index 102-050 or MUTCD TA-38 for interior lane closures. See Index 102-055 for lane shifts.</td>
<td></td>
</tr>
<tr>
<td>102-615</td>
<td>Deleted Index. See MUTCD for intersection TCC.</td>
<td></td>
</tr>
<tr>
<td>102-616</td>
<td>Deleted Index. See MUTCD for intersection TCC.</td>
<td></td>
</tr>
<tr>
<td>102-617</td>
<td>Deleted Index. See MUTCD for intersection TCC.</td>
<td></td>
</tr>
<tr>
<td>102-618</td>
<td>Deleted Index. See MUTCD for intersection TCC.</td>
<td></td>
</tr>
<tr>
<td>102-619</td>
<td>Deleted - Moved to New Index 102-015.</td>
<td></td>
</tr>
<tr>
<td>102-620</td>
<td>Deleted - Moved to New Index 102-060.</td>
<td></td>
</tr>
<tr>
<td>102-621</td>
<td>Deleted - Moved to New Index 102-060.</td>
<td></td>
</tr>
<tr>
<td>102-622</td>
<td>Deleted Index. See MUTCD TA-32 or Index 102-060.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-623</td>
<td>Deleted - Moved to New Index 102-050.</td>
</tr>
<tr>
<td>102-625</td>
<td>Deleted - Moved to New Index 102-020.</td>
</tr>
<tr>
<td>102-628</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-630</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-631</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-640</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-641</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-642</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-650</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-651</td>
<td>Deleted - Moved to New Index 102-060.</td>
</tr>
<tr>
<td>102-655</td>
<td>Deleted - Moved to New Index 102-070.</td>
</tr>
<tr>
<td>102-660</td>
<td>Deleted - Moved to New Index 102-075.</td>
</tr>
<tr>
<td>102-665</td>
<td>Deleted - Moved to New Index 102-065.</td>
</tr>
<tr>
<td>102-666</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-667</td>
<td>Deleted Index.</td>
</tr>
<tr>
<td>102-670</td>
<td>Deleted Index: See index 102-000 for MAS detail.</td>
</tr>
<tr>
<td>106-001</td>
<td>Changed Index Title to: “Median Stabilizing Details”.</td>
</tr>
<tr>
<td>350-001</td>
<td>Sheet 1: Clarified Note B.</td>
</tr>
<tr>
<td>370-001</td>
<td>Changed Index Title to: “Bridge Approach Expansion Joint Concrete Pavement With Special Select Soil Base”; Deleted Design Notes; Updated General Notes.</td>
</tr>
<tr>
<td>425-010</td>
<td>Sheet 1: Added a 4”-0” diameter option in ALTERNATE B SECTION B-B and ROUND RISER OPENING detail.</td>
</tr>
<tr>
<td>425-031</td>
<td>All Sheets: Changed Index Title to “Adjacent Barrier Inlet”. Sheet 1: Changed General Note 1 to include median barriers with usage; Updated section detail labels to include median barriers.</td>
</tr>
<tr>
<td>430-010</td>
<td>Reorganized Index: Added additional sheets; Moved Sodding quantities to index 570-001. Sheet 1: General Notes and Overview; Front Slope Transition at Endwall; Moved General Note 1 to the SPI; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only. Sheet 2: Dimensional and Reinforcing Details. Sheet 3: Type 1 and Type 2 Grate Details.</td>
</tr>
<tr>
<td>430-011</td>
<td>Reorganized Index; Added additional sheets. Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications Added General Note on quantities for estimating purposes only. Sheet 2: Endwalls for 1.2 Slopes with Baffles; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. Sheet 3: Endwalls for 1.2 Slopes Without Baffles and Bar Bending Diagram; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. Sheet 4: Endwalls with and Without Baffles for 1.3, 1.4, and 1.6 Slopes. Sheet 5: Steel Grate Option; Steel Grating Use Criteria Moved to SPI.</td>
</tr>
<tr>
<td>Standard Plans Index</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 430-012              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Dimensional Details.  
  Sheet 3: Reinforcing Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-020              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved payment information to Specifications; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Straight Flare and Optional Shape. |
| 430-021              | Reorganized Index; Moved payment information to Specifications.  
  Sheet 1: General Notes and Overview and Slope And Ditch Transitions. Design Notes to the Drainage Manual; Added General Note on Saddle Slope; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Combined details for Round and Elliptical Concrete Pipe; Added Section A-A “Pipe/Slab Fillet”; Added DETAIL “A”.  
  Sheet 3: Combined Tables of Quantities for Round and Elliptical Concrete Pipe.  
  Sheet 4: Combined Details for Arched and Round Corrugated Metal Pipe.  
  Sheet 5: Combined Tables of Quantities for Arched and Round Corrugated Metal Pipe.  
  Sheet 6: Moved Connection and Anchor Details. |
| 430-022              | Reorganized Index; Moved payment information to Specifications.  
  Sheet 1: General Notes and Overview and Slope And Ditch Transitions; Moved Design Notes to the SPI; Deleted information already in the Drainage Design Guide; Added General Note on Saddle Slope; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Combined details for Round and Elliptical Concrete Pipe; Added Section A-A “Pipe/Slab Fillet”; Added DETAIL “A”.  
  Sheet 4: Combined details for Arched and Round Corrugated Metal Pipe.  
  Sheet 5: Combined Tables of Quantities for Arched and Round Corrugated Metal Pipe.  
  Sheet 6: Moved Connection and Anchor Details.  
  Sheet 7: Moved Fastener and Grate Details. |
| 430-030              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and overall view; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Concrete Endwall Details; Added STA/Offset Location.  
  Sheet 3: Combined Quantities Tables; Elliptical Concrete and Elliptical/Arched Corrugated Metal Pipe tables.  
  Sheet 4: Moved Spacing for Multiple Pipes Details. |
| 430-031              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Single 60” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
  Sheet 3: Double 60” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
| 430-032              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Single 66” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
  Sheet 3: Double 66” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-033              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Single 72” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
  Sheet 3: Double 72” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars. |
| 430-034              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Deleted design information covered in the Design Manual; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Single 84” Endwall Details; Updated bar naming conventions to reflect Horizontal, Vertical, and Bent Bars.  
  Sheet 3: Endwall With U-Type Wings and Endwall With 45 Degree Wings. |
| 430-035              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved specification and payment information to Specifications; Added General Note on quantities for estimating purposes only.  
  Sheet 2: Endwalls for 1:4 and 1:6 Slopes; Split detail into Dimensional and Reinforcing Details.  
  Sheet 3: Steel Grate Details. |
| 430-036              | Reorganized Index; Added additional Sheet.  
  Sheet 2: Type I – Nonremovable Grate.  
  Sheet 3: Type II – Removable Grate. |
| 430-037              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Moved Design Notes to the SPI.  
  Sheet 2: Type I, II, and III Underdrains.  
  Sheet 3: Type IV, V, Underdrains and Cleanout. |
| 430-038              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Updated Notes.  
  Sheet 2: Typical Inspection Box Installation.  
  Sheet 3: Typical Urban, Slope, and Adjustment Installations. |
| 430-039              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
  Sheet 2: French Drain System.  
  Sheet 3: Concrete Slotted Pipe Options. |
| 430-040              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
  Sheet 2: Type I Skimmers.  
  Sheet 3: Type II Skimmers. |
| 430-041              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
  Sheet 2: Type I Skimmers.  
  Sheet 3: Type II Skimmers. |
| 430-042              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
  Sheet 2: French Drain System.  
  Sheet 3: Concrete Slotted Pipe Options. |
| 430-043              | Reorganized Index; Added additional Sheet.  
  Sheet 1: General Notes and Overview; Updated Notes; Removed Design Notes and moved to the SPI and Drainage Manual.  
  Sheet 2: Type I Skimmers.  
  Sheet 3: Type II Skimmers.  
  Sheet 4: Rehabilitation. |
### STANDARD PLANS
#### FY 2020-21 REVISIONS LOG

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>450-010</td>
<td>Sheet 2: Removed INSERT DETAIL.</td>
</tr>
<tr>
<td>450-036</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-045</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-054</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-063</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-072</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-084</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-096</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>450-120</td>
<td>Sheet 2: Deleted INSERT DETAIL.</td>
</tr>
<tr>
<td></td>
<td>Sheet 3: Deleted Intermediate Diaphragm Inserts.</td>
</tr>
<tr>
<td>455-440</td>
<td>Sheet 2: Changed bend diameter of GFRP stirrups; Added new Note 5 and renumbered Notes.</td>
</tr>
<tr>
<td>458-100</td>
<td>Changed Elastomeric Seal to Strip Seal throughout Index.</td>
</tr>
<tr>
<td>460-470</td>
<td>Sheet 1: Changed Barrier Delineator note.</td>
</tr>
<tr>
<td>515-052</td>
<td>Sheet 8: Changed embedment depths and anchor lengths for Case I and Case IIb.</td>
</tr>
<tr>
<td>515-062</td>
<td>Sheet 9: Changed embedment depths and anchor lengths for Case I and Case IIb.</td>
</tr>
<tr>
<td>521-001</td>
<td>Sheets 15 &amp; 16: Changed &quot;Shoulder Barrier Inlet&quot; to &quot;Adjacent Barrier Inlet&quot; callout.</td>
</tr>
<tr>
<td>521-002</td>
<td>Sheet 1: Updated Note 4 to refer to Index 425-031 for &quot;Adjacent Barrier Inlets&quot; (number correction and Index name update).</td>
</tr>
<tr>
<td>521-003</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-004</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-005</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-027</td>
<td>Sheets 1 - 4: Renumbered.</td>
</tr>
<tr>
<td>521-028</td>
<td>Sheet 5: (NEW SHEET) Drainage Slot Details.</td>
</tr>
<tr>
<td>521-038</td>
<td>Sheet 3: Added reference to drainage slot detail.</td>
</tr>
<tr>
<td>521-040</td>
<td>Sheet 3: Added transition from 42” on Bridge to 36” or 38” traffic railing on approaches.</td>
</tr>
<tr>
<td>521-048</td>
<td>Sheet 1: Removed Barrier Delineator Spacing table; Changed Barrier Delineator note to refer to specification 705 instead of table.</td>
</tr>
<tr>
<td>521-050</td>
<td>Sheet 1: Changed 10’ maximum spacing for 1/2” V-Groove in consideration of 12’ precast sections.</td>
</tr>
<tr>
<td>521-060</td>
<td>Sheet 1: Added organic felt band breaker on surfaces of wall between C-I-P coping to prevent cracking of the coping and wall.</td>
</tr>
<tr>
<td></td>
<td>Sheet 2: Added bond breakers between face of wall and C-I-P coping.</td>
</tr>
<tr>
<td>521-062</td>
<td>Sheet 1: Corrected Note referenced in Partial Plan View for Approach Slab.</td>
</tr>
<tr>
<td>521-063</td>
<td>Sheet 2: Clarified Note 4; Added Overbuild to Typical Section; Changed Title to End Transition Details.</td>
</tr>
<tr>
<td>521-064</td>
<td>Sheet 3: Changed Detail &quot;A&quot; to Details &quot;B&quot;; Clarified alternate construction joint for Detail &quot;B&quot;.</td>
</tr>
<tr>
<td>521-065</td>
<td>Sheet 1: Corrected reference to Approach Slab Note in Partial Plan View; Changed maximum spacing of 3/4” expansion joints.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>521-640</td>
<td>Added Note 7 and renumbered Notes; Locate Open Joints in Barrier &amp; Coping a minimum of 5'-0 from CL of Barrier Wall Inlet.</td>
</tr>
<tr>
<td>521-660</td>
<td>Sheets 1, 2 &amp; 4: Removed notes to slope concrete pedestal surface.</td>
</tr>
<tr>
<td>522-002</td>
<td>Deleted General Note 2 regarding parallel grade break; Renumbered General Notes based on the deletion of Note 2.</td>
</tr>
<tr>
<td>524-001</td>
<td>Removed Sodding information from Sheet 2 and Added to new Sheet 3 in Index 570-001.</td>
</tr>
<tr>
<td>534-200</td>
<td>Sheet 1: Changed Note 6.C.1.</td>
</tr>
</tbody>
</table>

All Sheets: Renumbered for additional Sheets 14 and 16. Sheet 1: Added Trailing End Transition Connection to Rigid Barrier to Table of Contents; Added Sheets 14 & 16 to TOC and renumbered; Removed flared approach terminal from TOC; Note 10, allow for single-reduced post spacing for connections to existing guardrail. Sheets 2 & 3: Removed modified thrie beam from Note 8. Sheet 5: Removed modified thrie beam details and Note 5; Added single-faced to double-faced guardrail connection detail. Sheet 6: Removed modified thrie-beam section and post information from table. Sheet 7: Changed approach terminal callout at begin/end guardrail location; Added new information to Note 9 to allow substitution for miscellaneous asphalt pavement placed upstream of post 1. Sheet 8: Renumbered Note 7 to Note 9 and deleted reference to flare; Added a new Note 6 "Clear Area Requirement"; Added approach terminal callout at begin/end guardrail location; Added new Note 8 to allow substitution for miscellaneous asphalt pavement placed upstream of post 1. Sheet 9: Added trailing anchorage callout to begin/end guardrail station location. Sheet 11 & 12: Added CRT End Treatment callout to Begin/End Guardrail Station location. Sheet 13: Changed default curb option shown to "Flush Shoulder Option", added TL-3 approach transition callout at begin/end GR. location. Sheet 14: (NEW SHEET): Added full TL-3 Approach Transition Connection layout for both curb continuation options, show guardrail tapers. Sheet 15: (Previously Sheet 14): Changed default curb option shown to "Flush Shoulder Option", added TL-2 approach transition callout at begin/end GR. Location. Sheet 16: (NEW SHEET): Full TL-2 Approach Transition Connection layout for both curb continuation options; Guardrail tapers. Sheet 17: (Previously Sheet 15): Updated alignment curb dimensions for best fit; Changed "Flat No Curb" option to "Flush Shoulder Option". Sheet 19: (Previously Sheet 17): Terminal updated from Flared to parallel in Plan View; Added approach transition callout at begin/end guardrail location. Sheet 20: (Previously Sheet 18): Added approach transition callout at begin/end guardrail location. Sheet 21: (Previously Sheet 19): Updated terminal from Flared to parallel in Plan View. Sheet 23: (Previously Sheet 21): Updated Flangeable Leave-out details to show steel post; Changed Note 1 to explain that only steel posts are permitted. Sheet 24: (Previously Sheet 22): Removed modified-thrie beam from Button-Head Bolt Length table. Sheet 28: (NEW SHEET) Developed for Trailing End Transition Connections.
<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>544-001</td>
<td>Sheet 1: Added callout notes to rigid barrier connection detail to include traffic railing and concrete barrier standards. Sheet 3: (NEW SHEET) Added Thrie Beam retrofit connection detail; Short guardrail extension options from crash cushion to rigid barrier.</td>
</tr>
<tr>
<td></td>
<td>Sheet 3: (NEW SHEET) Added Thrie Beam retrofit connection detail; Short guardrail extension options from crash cushion to rigid barrier.</td>
</tr>
<tr>
<td>570-001</td>
<td>All Sheets: Renumbered for additional New Sheet. Sheet 3: (NEW SHEET) Added sodding information from Index 524-001.</td>
</tr>
<tr>
<td>580-001</td>
<td>Updated bracing Detail, overall clarifications; Clarified that bracing is intended for plant establishment purposes only; Clarified on lumber grade; Clarified band strength.</td>
</tr>
<tr>
<td>591-001</td>
<td>NEW INDEX - Previously Developmental Standard Plan D591-001.</td>
</tr>
<tr>
<td>639-001</td>
<td>Corrected TYPICAL DISTRIBUTION POINT SCHEMATIC DETAIL Callout and “OFF” position location.</td>
</tr>
<tr>
<td>649-010</td>
<td>Added Longitudinal Seam weld note 4H; Changed Note 4H to 4I.</td>
</tr>
<tr>
<td>649-031</td>
<td>Sheet 2: Change “jam nut” to anchor nut to match spec language. Sheet 4: Clarified splice length (to match Sheet 3 splice). Sheet 5: Clarified that the luminaire arms are galvanized steel.</td>
</tr>
<tr>
<td>695-001</td>
<td>Sheet 5: Changed the PVC Conduit or Non-Metallic Flexible Conduit from 1.5” to 3”.</td>
</tr>
<tr>
<td>700-010</td>
<td>All Sheets: Renumbered. Sheet 6: Note 5: Clarified number of wind beams required. Sheet 7: (NEW SHEET) - WIND BEAM CONNECTION FOR FLIP UP SIGN.</td>
</tr>
<tr>
<td>700-041</td>
<td>Sheet 1: Added information to Note 5B and Note 5C.</td>
</tr>
<tr>
<td>700-090</td>
<td>Deleted Catwalk Notes and references and added to New Index 700-091.</td>
</tr>
<tr>
<td>700-091</td>
<td>NEW INDEX - Catwalk Details.</td>
</tr>
<tr>
<td>700-101</td>
<td>Changed lateral offsets to more closely correspond with the MUTCD.</td>
</tr>
<tr>
<td>700-104</td>
<td>Note 4: Updated terminology for sign posts to match current naming.</td>
</tr>
<tr>
<td>700-110</td>
<td>Deleted 30 degree cut of Z mounting beams and added bolt diameters to drawing (See Index 700-030).</td>
</tr>
<tr>
<td>706-001</td>
<td>Changed striping limits in detail.</td>
</tr>
<tr>
<td>715-002</td>
<td>Sheet 1: Changed Note 4C. Sheet 2: Added 20’ &amp; 22’ mounting heights. Sheet 3: Changed Strut weld size in ARM ELEVATION Detail. Sheet 4: Added Pole PG.</td>
</tr>
<tr>
<td></td>
<td>Sheet 3: Updated handhole ring and door dimensions to allow variation/increase in handhole size, increase distance from baseplate to bottom of handhole.</td>
</tr>
<tr>
<td></td>
<td>Sheet 2: Added a line indicating the curb continuing to the junction with the crossing; Remove the label about shoulder pavement in lieu of curb; Added a label for drop curb; Modified label “shoulder pavement” to “asphalt pavement” on the left half; Added “or trail” label to sidewalk on right half; Changed “shoulder pavement” on right to asphalt or concrete pavement to match adjacent surface.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>715-010</td>
<td>Sheet 3: Updated handhole ring and door dimensions to allow variation/increase in handhole size, increase distance from baseplate to bottom of handhole.</td>
</tr>
<tr>
<td>830-001</td>
<td>Sheet 2: Added a line indicating the curb continuing to the junction with the crossing; Remove the label about shoulder pavement in lieu of curb; Added a label for drop curb; Modified label “shoulder pavement” to “asphalt pavement” on the left half; Added “or trail” label to sidewalk on right half; Changed “shoulder pavement” on right to asphalt or concrete pavement to match adjacent surface.</td>
</tr>
</tbody>
</table>
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>45-50  55-60  65-70</td>
</tr>
<tr>
<td>6 Lane</td>
<td>1:180  1:200</td>
</tr>
<tr>
<td>8 Lane</td>
<td>1:150  1:170  1:190</td>
</tr>
</tbody>
</table>

CENTRAL  &  PROFILE GRADE

SUPERELEVATION TRANSITIONS - HIGH SPEED ROADWAYS

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 0.06 break in slope at the edge of pavement is reached due to superelevation of the pavement. As the pavement superelevation increases, the 0.06 break in slope will be maintained and the shoulder flattened until the shoulder slope reaches the minimum of 0.02 downward from the edge of travel way. Any further increase in pavement superelevation will necessitate sloping the inside half of the shoulder toward the travel way and the outside half outward, both at 0.06 for superelevations 0.06-0.09 and both at 0.03 for superelevation 0.10.
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
SUPERELEVATION TRANSITIONS - HIGH SPEED ROADWAYS

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.

A) 1P AND 1P FULL WIDTH SHOULders WITH 5 OR LESS PAVED WIDTHS,
B) 8 FULL WIDTH SHOULders WITH 4 OR LESS PAVED WIDTHs

SPECIAL SHOULDER BREAK OVER DETAILS

NORMAL CROWNED SECTION
SUPERELEVATION SECTION LT. & RT.
PLANE INCLINED SECTION LT.
PLANE INCLINED SECTION RT.
SUPERELEVATION TRANSITION LT. & RT.
FULL SUPERELEVATION LT. & RT.
8-LANE PAVEMENT WITH ONE LANE SLOPED TO MEDIAN
GENERAL NOTES:
1. Obtain Superelevation by rotating the plane successively about the break planes 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 in the outside of the curve only when the adjoining travel lanes require positive superelevation.
2. When positive superelevation is required, continue the slope of the pavement across the gutter on the high side.
3. Place short vertical curves at all angular profile breaks within the limits of the superelevation transition.
4. The variable superelevation transition length “L” has a minimum value of 30 feet for design speeds under 40 MPH and 75 feet for design speeds of 40 MPH or greater.
5. Roadway sections having lane arrangements different from those shown, but composed of a series of planes, are superelevation in a similar manner.

FOR LOW SPEED HIGHWAYS

SUPERELEVATION TRANSITION SECTIONS

LOW SPEED HIGHWAYS

TWO TRAVEL LANES EACH DIRECTION

TWO TRAVEL LANES EACH DIRECTION WITH MEDIAN

TWO TRAVEL LANES EACH DIRECTION WITH MEDIAN AND AUXILIARY LANES

THREE TRAVEL LANES EACH DIRECTION WITH MEDIAN

UNDIVIDED FACILITIES

DIVIDED FACILITIES

PARABOLIC SECTION
PROFILES FOR LOW SPEED HIGHWAYS

EXAMPLE SUPERELEVATION SECTIONS AND

PROFILE FOR TWO LANES EACH DIRECTION

PROFILE FOR TWO LANES EACH DIRECTION WITH MEDIAN AND AUXILIARY LANE

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

SUPERELEVATION TRANSITIONS - LOW SPEED HIGHWAYS

INDEX
000-511

2 of 2

REV 006 REV 11/01/18
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

SINGLE LANE RAMPS - EXIT TERMINALS

INDEX: 000-525

RAMP TERMINALS

1 of 5
### Table of Contents for Index 102-000

<table>
<thead>
<tr>
<th>Sheet No.</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Table of Contents</td>
</tr>
<tr>
<td>2</td>
<td>Temporary Traffic Control Tables</td>
</tr>
<tr>
<td>3</td>
<td>Miscellaneous Details</td>
</tr>
<tr>
<td>4</td>
<td>Post-mounted Work Zone Sign Supports</td>
</tr>
<tr>
<td>5</td>
<td>Project Information Signs</td>
</tr>
<tr>
<td>6</td>
<td>Work Zone Pavement Markings</td>
</tr>
<tr>
<td>7</td>
<td>Temporary Raised Roadside Strips</td>
</tr>
<tr>
<td>8</td>
<td>Temporary Traffic Control Devices</td>
</tr>
</tbody>
</table>

### Table of Contents for 102 Series

<table>
<thead>
<tr>
<th>Standard Plans Index</th>
<th>Index Title</th>
<th>Associated MUTCD Typical Application(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-000</td>
<td>Temporary Traffic Control General Information and Devices</td>
<td>N/A</td>
</tr>
<tr>
<td>102-025</td>
<td>Work Beyond the Shoulder</td>
<td>TA-3, TA-5, TA-6</td>
</tr>
<tr>
<td>102-010</td>
<td>Work on the Shoulder</td>
<td>TA-4, TA-6, TA-35</td>
</tr>
<tr>
<td>102-013</td>
<td>Mobile Operations</td>
<td>TA-18, TA-38</td>
</tr>
<tr>
<td>102-020</td>
<td>Temporary Roadway Closure</td>
<td>TA-13</td>
</tr>
<tr>
<td>102-025</td>
<td>Two-Lane Roadway, Lane Closure Using Flagger</td>
<td>TA-10</td>
</tr>
<tr>
<td>102-016</td>
<td>Two-Lane Roadway, Lane Closure Using Temporary Traffic Signals</td>
<td>TA-12</td>
</tr>
<tr>
<td>102-035</td>
<td>Mail Road Crossing</td>
<td>TA-14</td>
</tr>
<tr>
<td>102-040</td>
<td>Two-Lane Roadway, Temporary Diversion</td>
<td>TA-7</td>
</tr>
<tr>
<td>102-045</td>
<td>Multilane Roadway, Single Lane Closure</td>
<td>TA-33</td>
</tr>
<tr>
<td>102-050</td>
<td>Multilane Roadway, Multiple Lane Closure</td>
<td>TA-37</td>
</tr>
<tr>
<td>102-060</td>
<td>Multilane Roadway, Lane Closure with Lane Shift</td>
<td>TA-36</td>
</tr>
<tr>
<td>102-065</td>
<td>Multilane Roadway, Temporary Diversion</td>
<td>TA-29</td>
</tr>
<tr>
<td>102-070</td>
<td>Traffic Pacing</td>
<td>N/A</td>
</tr>
<tr>
<td>102-075</td>
<td>Traffic on the Sidewalk</td>
<td>TA-20, TA-29</td>
</tr>
<tr>
<td>102-100</td>
<td>Temporary Barrier</td>
<td>N/A</td>
</tr>
<tr>
<td>102-110</td>
<td>Type A Temporary Concrete Barrier System</td>
<td>N/A</td>
</tr>
<tr>
<td>102-120</td>
<td>Low Profile Barrier</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### General Notes:
1. Use this Index for all work zones.
2. See the Plans for Work Zone Speed.

### Clear Zone Widths for Work Zones

<table>
<thead>
<tr>
<th>Work Zone Speed (mph)</th>
<th>Min. Spacing (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 40</td>
<td>6 - 65</td>
</tr>
<tr>
<td>≥ 45</td>
<td>9 - 85</td>
</tr>
</tbody>
</table>

- Where \( W \) = width of offset in feet
- \( S \) = speed in mph

### Taper Length “L” (feet)

<table>
<thead>
<tr>
<th>Work Zone Speed (mph)</th>
<th>Min. Length (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 40</td>
<td>6</td>
</tr>
<tr>
<td>≥ 45</td>
<td>9</td>
</tr>
</tbody>
</table>

### Common Taper Lengths “L” (feet)

<table>
<thead>
<tr>
<th>Work Zone Speed (mph)</th>
<th>Width of Offset (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 40</td>
<td>6</td>
</tr>
<tr>
<td>≥ 45</td>
<td>9</td>
</tr>
</tbody>
</table>
- Where \( W \) = width of offset in feet
- \( S \) = speed in mph

### Buffer Length “U” (feet)

<table>
<thead>
<tr>
<th>Work Zone Speed (mph)</th>
<th>Length (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>155</td>
</tr>
<tr>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>35</td>
<td>250</td>
</tr>
<tr>
<td>40</td>
<td>305</td>
</tr>
<tr>
<td>45</td>
<td>360</td>
</tr>
<tr>
<td>50</td>
<td>425</td>
</tr>
<tr>
<td>55</td>
<td>495</td>
</tr>
<tr>
<td>60</td>
<td>570</td>
</tr>
<tr>
<td>65</td>
<td>645</td>
</tr>
<tr>
<td>70</td>
<td>730</td>
</tr>
</tbody>
</table>

### Work Zone Sign Distance “X”

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Min. Spacing (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>300</td>
<td>750</td>
</tr>
<tr>
<td>400</td>
<td>1,500</td>
</tr>
</tbody>
</table>

- Where using MUTCD Typical Application, use the above values for all MUTCD “A”, “B”, and “C” distances between signs.
**DROP-OFF NOTES:**
1. 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 inches 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 Details.

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

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

4. For Conditions 1 and 2 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.

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

---

**MILLING & RESURFACING NOTES:**
1. Whenever there is a difference in elevation between adjacent travel lanes, place "Uneven Lanes" signs (W8-11) at intervals of 0.5 miles or less.

2. If D is 1.5" or less, no drop-off treatment is required.

3. If the slope of the drop-off is greater than 1:4 (not to exceed 1:1), place a 6" white solid line on each side of the drop-off. Additionally, place "Stay In Your Lane" signs (MOT-1-06) as a supplement to the "Uneven Lanes" signs (W8-11). This condition may be used for distances of three miles or less.

---

**MANHOLE/CROSSWALK/JOINT DROP-OFF NOTES:**
1. Construct temporary asphalt apron for manholes extending 1" or more above the pedestrian way; a drop in elevation greater than 10" that is closer than 2' from the edge of the pedestrian way.

2. Construct temporary asphalt apron for all transverse joints that have a difference in elevation of 1" or more.

3. Remove aprons prior to constructing the next lift of asphalt.

---

**PEDESTRIAN WAY DROP-OFF NOTES:**
1. A pedestrian way drop-off is defined as either:
   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 1**

<table>
<thead>
<tr>
<th>Condition</th>
<th>D (inches)</th>
<th>C (feet)</th>
<th>Device Required</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt;3</td>
<td>2 - 12</td>
<td>Temporary Barrier</td>
<td>Do not show on plan.</td>
</tr>
<tr>
<td>2</td>
<td>&gt;3 to &lt;5</td>
<td>12 - C2</td>
<td>Channelizing Device</td>
<td>D &lt; 1.5&quot;</td>
</tr>
<tr>
<td>3</td>
<td>&gt;5</td>
<td>2 - C2</td>
<td>Temporary Barrier</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Removal of Bridge or Retaining Wall Barrier</td>
<td>Temporary Barrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Removal of portions of Bridge Deck</td>
<td>Temporary Barrier</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Do not show any Drop-off Conditions greater than 3 inches within two feet of the edge of traveled way.

---

**MILLING & RESURFACING LANE DROP-OFF TREATMENT DETAIL**

1. Construct temporary asphalt apron for all transverse joints that have a difference in elevation of 1" or more.

2. Construct temporary asphalt apron for manholes extending 1" or more above the pedestrian way; a drop in elevation greater than 10" that is closer than 2' from the edge of the pedestrian way.

3. Remove aprons prior to constructing the next lift of asphalt.

---

**MANHOLE/CROSSWALK/JOINT DROP-OFF TREATMENT DETAIL**

1. Construct temporary asphalt apron for all transverse joints that have a difference in elevation of 1" or more.

2. Construct temporary asphalt apron for manholes extending 1" or more above the pedestrian way; a drop in elevation greater than 10" that is closer than 2' from the edge of the pedestrian way.

3. Remove aprons prior to constructing the next lift of asphalt.

---

**Temporary Surface**

- 6" White
- Traffic Lane
- Channelizing Device
- Temporary Barrier
- Setback Distance

**DROP-OFFS**

---

**TEMPORARY TRAFFIC CONTROL**

**GENERAL INFORMATION AND DEVICES**

**FY 2020-21**

**STANDARD PLANS**

**INDEX**

**SHEET**

102-000 2 of 8
MISCELLANEOUS DETAILS

SYMBOLS:
- ■ Channelizing Device (See Sheet 8)
- ▲ Lane Identification and Direction of Traffic
- □ Work Zone Sign

NOTES:
1. Use this detail when work disrupts a business entrance for greater than one entire calendar day.
2. For single business entrances, place one 24"X36" business sign with the business name at each affected driveway entrance. Logos may be provided by the business owners. Alternatively, a sign with the message "Business Entrance" (see Index 700-102) may be used when approved by the Engineer.
3. When two or more businesses share a common driveway entrance, place a 24"X36" with the message "Business Entrance" (see Index 700-102) at the common driveway entrance.

TEMPORARY TRAFFIC CONTROL
GENERAL INFORMATION AND DEVICES

SYMBOLS:
- ■ Channelizing Device (See Sheet 8)
- ▲ Lane Identification and Direction of Traffic
- □ Work Zone Sign
GENERAL INFORMATION AND DEVICES
TEMPORARY TRAFFIC CONTROL
STANDARD PLANS
FY 2020-21
PROJECT INFORMATION SIGNS

NOTES:
1. Road designation should be the most common designation (i.e., I-Interstate, SR-State Road, or US).
2. Italic text on signs indicates variable information that is specific to the project.
3. See Sheet 4 for the Typical Foundation Details and the Sign Attachment Details.
4. Under "Questions or Comments", use the project website, or a telephone number for those projects without websites.

PROJECT INFORMATION SIGN DETAIL FOR WORK ZONE SPEED OF 50 MPH OR GREATER

PROJECT INFORMATION SIGN DETAIL FOR WORK ZONE SPEED OF 45 MPH OR LESS

BRACKET DETAIL

BRACKET DETAIL
NOTES:
1. Install RPMs as a supplement to:
   a. All lane lines
   b. Edge lines in transitions (e.g., merges, diversions, lane shifts)
   c. Edge lines of gore areas
2. Extend pavement marking and 5' RPM spacing by 100' in each direction for all transitions regardless of the line type.
3. Place RPMs in accordance with this detail and index 706-001.

SYMBOLS:
- Work Space
- Lane Identification and Direction of Traffic
TEMPORARY RAISED RUMBLE STRIP SETS

NOTE:
Use Temporary Raised Rumble Strips in accordance with the Plans and Specification 102.

REMovable POLYMER STRIPING TAPE

MOLDED ENGINEERED POLYMER MATERIAL
NOTE:
For pedestrian longitudinal channelizing device requirements, see Specification 990.
NOTES:
1. As determined by the Engineer, use a flagger, shoulder closure, or lane closure to accommodate a significant amount of work vehicle ingress and egress.

2. This Index may be applied to the medians of divided roadways.

SYMBOLS:
- Work Space

APPLIES TO TWO-LANE AND MULTILANE ROADWAYS
WORK ON THE SHOULDER

SYMBOLS:
- Work Zone Sign
- Road Work Ahead
- Speeding Fines Doubled When Workers Present
- End Road Work
- Channelizing Device

NOTES:
1. L = Taper Length
2. For incidental work (e.g., mowing or litter removal), only the Road Work Ahead sign is required.
3. As determined by the Engineer, use a flagger or lane closure to accommodate a significant amount of work vehicle ingress and egress.
4. For work less than two feet from the traveled way and work zone speed greater than 45 MPH, use a lane closure.
5. This Index may be applied to the medians of divided roadways.
6. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (G20-2) along with associated work zone sign distances may be omitted when the temporary condition is in place for 24 hours or less.
7. Temporary pavement markings may be omitted when the temporary condition is in place for 24 hours or less.

APPLIES TO TWO-LANE AND MULTILANE ROADWAYS
GENERAL NOTES:

1. 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.

2. For multilane roadways with curb and no paved shoulder, omit the shadow vehicle that would have been used on the paved shoulder. In such instances, the warning sign should be mounted on the shadow vehicle farthest from the work vehicle.

3. Minimize the longitudinal spacing between vehicles to deter road users from driving in between.

4. Use invented plan of the illustrations for work on left side of roadways.

5. Ensure that all vehicles in the mobile operation convey have functional two-way communication.

6. If the speed of the mobile operation exceeds the existing posted speed limit on limited access roadways and one half the existing posted speed limit on other roadways, the Engineer may delete requirements for shadow vehicles and attenuators. In such situations, mount arrow board and sign on the work vehicle.

SYMBOLS:

- Lane Identification and Direction of Traffic
- Truck/Trailer Mounted Attenuator (TMA)
- Work Vehicle With Warning Lights
- Shadow (S) Vehicle With Warning Lights And Arrow Board

APPLIES TO TWO-LANE AND MULTILANE ROADWAYS
**Truck/Trailer Mounted Attenuator (TMA)**

A Lane Identification and Direction of Traffic

**Symbols:**
- Lane Identification and Direction of Traffic
- Truck/Trailer Mounted Attenuator (TMA)
- Work Vehicle with Warning Lights
- Shadow (S) Vehicle with Warning Lights
- And Arrow Board

**Merger Arrow Board Message:**
- Merge

**Work in Traveled Way - Multilane Roadway, Single Lane Closure**

**Work in Traveled Way - Multilane Roadway, Double Lane Closure**

**Work in Traveled Way - Multilane Roadway, Triple Lane Closure**
NOTES:
1. $U =$ Buffer Length
   $X =$ Work Zone Sign Distance
   See Index 102-000 for "U" and "X" values.
2. Do not use this Index for limited access roadways.
3. Use this Index for temporary daytime road closures of 5 minutes or less.
4. Optionally, use "Flagger Ahead" sign with symbol (W20-7) instead of "Flagger Ahead" sign with text (W20-7A).

SYMBOLS:
- Work Space
- Work Zone Sign
- Lane Identification and Direction of Traffic
- Traffic Control Officer

APPLIES TO TWO-LANE AND MULTILANE ROADWAYS

WORK ZONE SIGN DISTANCE = $X$
BUFFER LENGTH = $U$
NOTES:

1. \( L = \text{Taper Length} \)
\( U = \text{Buffer Length} \)
\( X = \text{Work Zone Sign Distance} \)
See Index 102-000 for \( U, L, X \), and channelizing device spacing values.

2. Optionally, use "Flagger Ahead" sign with symbol (W20-7F) instead of "Flagger Ahead" sign with text (W20-7A).

3. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

4. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (G20-2), along with associated work zone sign distances, may be omitted when the work zone will be in place for 24 hours or less.

SYMBOLS:

- Work Space
- Channelizing Device (See Index 102-000)
- Work Zone Sign
- Lane Identification and Direction of Traffic
- Flagger

TWO-LANE ROADWAY, LANE CLOSURE USING FLAGGERS

INDEX:

102-025

1 of 1
GENERAL NOTES:

1. \[ L = \text{Taper Length} \]
   \[ U = \text{Buffer Length} \]
   \[ X = \text{Work Zone Sign Distance} \]
   See Index 102-000 for "L", "U", "X", and channelizing device spacing values.

2. Optionally, use "Signal Ahead" signs with symbols (W3-3) instead of "Signal Ahead" signs with text (W3-3A).

3. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

4. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (G20-2), along with associated work zone sign distances, may be omitted when the work zone will be in place for 24 hours or less.

5. For the maximum distance between temporary traffic signals, do not exceed the distance at which the temporary traffic signals can safely communicate. When the distance temporary traffic signals is greater than 0.25 miles, use a combination of a pilot vehicle and manually-controlled temporary traffic signals.

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

SYMBOLS:

- Work Space
- Channelizing Device (See Index 102-000)
- Lane Identification and Direction of Traffic
- Temporary Traffic Signal
- Work Zone Sign
- Flagger

SIDE ROAD INTERSECTING THE WORK ZONE
**Lane Identification and Direction of Traffic**

**Temporary Traffic Signal**

**Work Zone Sign**

**Flagger**

---

### NOTES:

1. **X** = Work Zone Sign Distance
   
   See Index 102-000 for "X" values.

2. Optionally, use "Signal Ahead" signs with symbols (W3-3) instead of "Signal Ahead" signs with text (W3-3A).

3. The "End Road Work" signs (G20-2) may be omitted when the work zone is in place for 24 hours or less.

4. Optionally, use temporary traffic signals for control of the haul road.

---

**SYMBOLS:**

- Lane Identification and Direction of Traffic
- Temporary Traffic Signal
- Work Zone Sign
- Flagger
NOTES:
1. \( L \) = Taper Length
   \( U \) = Buffer Length
   \( X \) = Work Zone Sign Distance
   \( R \) = Radius of Curve
   See Index 102-000 for \( L \), \( U \), \( X \), and channelizing device spacing values. See Plans for \( R \) values.

2. If the tangent distance "T" is less than 600', then, for each direction, use a "Double Reverse Curve" sign (W24-1) instead of the first "Reverse Curve" sign (W1-4) and omit the second "Reverse Curve" sign.

3. If the temporary paved shoulder matches the width of the existing paved shoulder, omit taper and channelizing devices from the paved shoulder.

SYMBOLS:
- **Work Space**
- **Channelizing Device (See Index 102-000)**
- **Work Zone Sign**
- **Lane Identification and Direction of Traffic**
- **Type III Barricade**
AHEAD
WORK
ROAD
PRESENT
WHEN   WORKERS
DOUBLED
SPEEDING   FINES
AHEAD
CLOSED
LANE
RIGHT
ROAD
WORK
END

NOTES:
1. L = Taper Length
   U = Buffer Length
   X = Work Zone Sign Distance
   See Index 102-000 for "L", "U", "X", and channelizing device spacing values.

2. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

3. If the paved shoulder is less than 4' in width, omit the taper and channelizing devices from the paved shoulder.

4. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (G20-2), along with associated work zone sign distances, may be omitted when the work zone will be in place for 24 hours or less.

5. Use inverted plan of the illustrations for work on left side of roadways.

6. Temporary pavement markings may be omitted when the temporary condition is in place for 24 hours or less.

SYMBOLS:
- Work Space
- Channelizing Device (See Index 102-000)
- Work Zone Sign
- Lane Identification and Direction of Traffic
- Arrow Board
NOTES:

1. \( L \) = Taper Length
\( U \) = Buffer Length
\( X \) = Work Zone Sign Distance
See Index 102-000 for \( L \), \( U \), \( X \), and channelizing device spacing values.

2. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

3. If the paved shoulder is less than 4' in width, omit taper and channelizing devices from the paved shoulder.

4. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (MOT-20-2), along with associated work zone sign distances, may be omitted when the work zone condition will be in place for 24 hours or less.

5. Use inverted plan of the illustrations for work on left side of roadways.

6. Temporary pavement markings may be omitted when the temporary condition is in place for 24 hours or less.
NOTES:
1. L = Taper Length
   U = Buffer Length
   X = Work Zone Sign Distance
   See Index 102-000 for "L", "U", "X", and channelizing device spacing values.

2. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

3. If the paved shoulder is less than 4' in width, omit taper and channelizing devices from the paved shoulder.

4. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (G20-2), along with associated work zone sign distances, may be omitted when the work zone will be in place for 24 hours or less.

5. Use inverted plan of the illustrations for work on left of roadways.

6. Temporary pavement markings may be omitted when the temporary condition is in place for 24 hours or less.
NOTES:

1. \( L = \) Taper Length 
   \( U = \) Buffer Length 
   \( X = \) Work Zone Sign Distance 
   See Index 102-000 for "L", "U", "X", and channelizing device spacing values.

2. If the tangent distance "T" is less than 600', then use "Double Reverse Curve" signs (W24-1A) instead of the first pair of "Reverse Curve" signs (W1-4B) and omit the second pair of "Reverse Curve" signs.

3. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

4. If the paved shoulder is less than 4' in width, omit taper and channelizing devices from the paved shoulder.

5. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (W20-2), along with associated work zone sign distances, may be omitted when the work zone will be in place for 24 hours or less.

6. Temporary pavement markings may be omitted when the temporary condition is in place for 24 hours or less.

SYMBOLS:
- Work Zone Sign
- Lane Identification and Direction of Traffic
- Arrow Board
REV IS ION
DESCRIPTION:
REV IS ION
LAST
STANDARD PLANS
FY 2020-21
MULTILANE ROADWAY, TEMPORARY DIVERSION
INDEX
102-060
1 of 2
TEMPORARY DIVERSION FOR ROADWAYS WITH WORK ZONE SPEED OF 45 MPH OR LESS

NOTES:
1. L = Taper Length
U = Buffer Length
X = Work Zone Sign Distance
R = Radius of Curve
See Index 102-000 for "L", "U", "X", channelizing device spacing values. See Plans for "R" values.

2. If the tangent distance "T" is less than 600', then use "Double Reverse Curve" signs (W24-1A) instead of the first pair of "Reverse Curve" signs (W1-4B) and omit the second pair of "Reverse Curve" signs.

3. If the paved shoulder is less than 4' in width, omit the taper and channelizing devices shown on the paved shoulder.

SYMBOLS:
- Work Space
- Channelizing Device (See Index 102-000)
- Work Zone Sign
- Lane Identification and Direction of Traffic
- Type III Barricade
**SYMBOLS:**
- Work Zone Sign
- Lane Identification and Direction of Traffic

**NOTES:**
1. $X =$ Work Zone Sign Distance  
   See Index 102-000 for "X" value.
2. Locate temporary openings in areas having adequate sight distance.
3. Do not locate temporary openings within 1.5 miles of interchanges, nor within 2000 feet of the acceleration-deceleration lanes at rest areas, median openings, other access openings, or other highway service areas.
4. Do not remove existing guardrail or barrier for temporary openings.
5. Use mitered end sections for any end sections within the clear zone.
6. Match cross slope of existing shoulder for widening.
7. Provide 2' of unpaved shoulder outside of the widening.

**LENGTH OF ACCESS LANES**

<table>
<thead>
<tr>
<th>Grade</th>
<th>$D_1$ (feet)</th>
<th>$D_2$ (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% or less</td>
<td>590</td>
<td>1540</td>
</tr>
<tr>
<td>3 to 4% Upgrade</td>
<td>530</td>
<td>2310</td>
</tr>
<tr>
<td>3 to 4% Downgrade</td>
<td>710</td>
<td>925</td>
</tr>
</tbody>
</table>

**LIMITED ACCESS TEMPORARY OPENING**

**REV 09/19**  
**DESCRIPTION:**
- **FY 2020-21**  
- **STANDARD PLANS**  
- **INDEX:** 102-065  
- **SHEET:** 1 of 1
NOTES:

1. P = Traffic Pacing Length
   For "P" value, see Traffic Pacing Length table or calculate using Formulas.
2. See the Plans for traffic pacing restrictions.
3. Do not exceed work duration of 30 minutes or traffic pacing length of 10 miles.
4. Coordinate with the traffic control officer supervisor to provide the correct number of traffic control officers for each traffic pacing operation.
5. Ensure that the necessary equipment is properly positioned for the work before requesting that the traffic control officer supervisor initiate the traffic pacing operation.
6. If workers or equipment are within the traveled way during the traffic pacing operation, use a truck- or trailer-mounted attenuator with portable changeable message sign to protect the work.
7. Maintain communications with all police vehicles throughout the traffic pacing.
8. Where feasible, do not pace traffic past the last available existing egress until the work has been completed.
9. When more than one traffic pacing operation is required in a calendar day, allow sufficient time between pacing operations to permit traffic to return to normal speed and flow.
10. For work durations of less than five minutes (e.g., moving large vehicles across the roadway), portable changeable message signs and truck-mounted attenuators are not required. Use traffic pacing length values from the five minute column of the table.

SYMBOLS:
- Work Space
- Lane Identification and Direction of Traffic
- Portable Changeable Message Sign (PCMS)
- Traffic Control Officer

TYPICAL PCMS DISPLAY:
One week prior to pacing operation:
Message 1: EXPECT DELAYS ON
Message 2: ROAD WORK TONIGHT
During day of pacing operation:
Message 1: SLOW TRAFFIC AHEAD
Message 2: BE PREPARED TO STOP

TRAFFIC PACING LENGTH "P"

<table>
<thead>
<tr>
<th>Work Zone Speed (mph)</th>
<th>Work Duration (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>55</td>
<td>5</td>
</tr>
<tr>
<td>60</td>
<td>5</td>
</tr>
<tr>
<td>65</td>
<td>5</td>
</tr>
<tr>
<td>70</td>
<td>5</td>
</tr>
<tr>
<td>75</td>
<td>5</td>
</tr>
<tr>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td>85</td>
<td>5</td>
</tr>
<tr>
<td>90</td>
<td>5</td>
</tr>
<tr>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>105</td>
<td>5</td>
</tr>
<tr>
<td>110</td>
<td>5</td>
</tr>
</tbody>
</table>

Notes: (1) All lengths in the above table are in miles.
(2) For work durations with no values shown above, calculate length using a reduced pacing speed, but not less than 20 mph.

FORMULAS:

For work duration of less than five minutes (e.g., moving large vehicles across the roadway), portable changeable message signs and truck-mounted attenuators are not required. Use traffic pacing length values from the five minute column of the table.
SYMBOLS:

- Work Zone Sign
- Lane Identification and Direction of Traffic
- Pedestrian Longitudinal Channelizing Device (LCD)

NOTES:

1. Cover or deactivate pedestrian traffic signal display(s) controlling closed crosswalks.

2. Place pedestrian LCDs across the full width of the closed sidewalk.

3. "Sidewalk Closed" signs (R9-XX) may be mounted on pedestrian LCDs in accordance with the manufacturer's instructions.

WORK ON THE SIDEWALK
NOTES:
1. $L = $ Faser Length
    $U = $ Buffer Length
    $X = $ Work Zone Sign Distance
    See Index 102-000 for "L", "U", "X", channelizing device spacing values.

2. Provide a 5' wide temporary pedestrian way with a maximum cross-slope of 0.03, except where space restrictions warrant a minimum width of 4'. Provide a 5' x 5' passing space for temporary pedestrian ways less than 5' in width at intervals not to exceed 200'.

3. When temporary pedestrian ways require curb ramps, meet the requirements of Index 522-002. Detectable warnings are not required for curb ramps diverting pedestrian traffic into a closed lane.

4. Use temporary raised rumble strips in accordance with the Plans. If temporary raised rumble strips are not used, omit "Rumble Strips Ahead" signs (MOT-18-10) and associated work zone sign distance. See Index 102-000 for temporary raised rumble strip details.

5. The "Speeding Fines Doubled When Workers Present" signs (MOT-13-06) and "End Road Work" signs (G20-2), along with associated work zone sign distances, may be omitted when the work zone will be in place for 24 hours or less.
**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)

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

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

4. Remove all grass debris, loose dirt, and sand from the pavement, bridge deck, or asphalt pad surface within the barrier footprint just prior to placement of the temporary barrier.

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

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

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

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

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

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

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

---

### 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>3' 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 SHOULDER BARRIER TRANSITION ON UNDIVIDED FACILITIES

DEPARTURE (TRAILING) SHOULDER BARRIER TRANSITION ON DIVIDED FACILITIES
GENERAL NOTES:
1. Meet the requirements of Index 102-100.
2. For fabrication details see Sheets 15 thru 17.
3. HANDLING: Do not lift or move the Barrier Units by using Bars 6D that extend from the ends of the units. Approximate weight of one unit equals 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 connected.
6. USE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.

7. REMOVAL OF BOLTS, STAKES AND KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification 930 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification 926. If a flexible pavement is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

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 SPLICE INSTALLATIONS:
1. THRIE-BEAM GUARDRAIL: Provide Thrie-Beam Guardrail for splices meeting the requirements of specification 967 and as follows: Two panels per splice (one panel per side of Class B (10 Gauge), or Four panels per splice (two nested panels per side) of Class A (12 Gauge). Use a 12-6" guardrail panel. Provide and install all other associated metallic guardrail components (Terminal Connectors, Shoulder Bolts, Hex Bolts and Nuts, Filler Plates, etc.) in accordance with Index 536-001. Install five Guardrail Anchor Bolts at each end of each splice in any of the standard seven anchor bolt holes in the Thrie-Beam Terminal Connector. If reinforcing steel is encountered when drilling holes for Guardrail Anchor Bolts in Type K Barrier Units, shift Thrie-Beam Terminal Connector so as to clear reinforcing steel within the given tolerances or select a different bolt hole to use. Do not drill or cut through reinforcing steel within Type K Barrier Units. Drilling or cutting through reinforcing steel within permanent concrete traffic railings is permitted.

2. GUARDRAIL OFFSET BLOCKS: Provide and install timber Offset Blocks meeting the requirements of Specification 967. Field trim Offset Blocks as required for proper fit. Utilize Offset Blocks as shown and required in order to prevent bending or kinking of Thrie-Beam Guardrail panels.

3. CONCRETE FOR FILLING TAPERED TRAFFIC RAILING TOES: Provide concrete for filling tapered toes of Traffic Railings as shown meeting the material requirements of Specification 346. Any Class, or a commercially available pre-bagged concrete mix (3000 psi minimum compressive strength). Sampling, testing, evaluation and certification of the concrete in accordance with Specification 346 is not required. Saturate with water the surfaces upon and against which the concrete fill will be placed prior to placing concrete. Place and finish concrete fill using forms or by hand methods to the general configurations shown so as to provide a smooth shape transition between the Type K Barrier and the adjacent traffic railing. A low slump is desirable if placing and finishing concrete by hand methods. Cure the concrete fill by application of a curing compound, or by covering with a wet tarp or burlap for a minimum of 24 hours. Completely remove the concrete fill upon relocation or removal of the Type K Temporary Concrete Barrier.

4. 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 connected.

5. 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.

6. 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 connected.

7. REMOVAL OF BOLTS, STAKES AND KEEPER PINS: Upon removal or relocation of Barrier Units, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain with Magnesium Ammonium Phosphate Concrete in accordance with Specification 930 or with an Epoxy Resin Compound, Type F or Q, in accordance with Specification 926. If a flexible pavement is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

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 SPLICE INSTALLATIONS:
1. THRIE-BEAM GUARDRAIL: Provide Thrie-Beam Guardrail for splices meeting the requirements of specification 967 and as follows: Two panels per splice (one panel per side of Class B (10 Gauge), or Four panels per splice (two nested panels per side) of Class A (12 Gauge). Use a 12-6" guardrail panel. Provide and install all other associated metallic guardrail components (Terminal Connectors, Shoulder Bolts, Hex Bolts and Nuts, Filler Plates, etc.) in accordance with Index 536-001. Install five Guardrail Anchor Bolts at each end of each splice in any of the standard seven anchor bolt holes in the Thrie-Beam Terminal Connector. If reinforcing steel is encountered when drilling holes for Guardrail Anchor Bolts in Type K Barrier Units, shift Thrie-Beam Terminal Connector so as to clear reinforcing steel within the given tolerances or select a different bolt hole to use. Do not drill or cut through reinforcing steel within Type K Barrier Units. Drilling or cutting through reinforcing steel within permanent concrete traffic railings is permitted.

2. GUARDRAIL OFFSET BLOCKS: Provide and install timber Offset Blocks meeting the requirements of Specification 967. Field trim Offset Blocks as required for proper fit. Utilize Offset Blocks as shown and required in order to prevent bending or kinking of Thrie-Beam Guardrail panels.

3. CONCRETE FOR FILLING TAPERED TRAFFIC RAILING TOES: Provide concrete for filling tapered toes of Traffic Railings as shown meeting the material requirements of Specification 346. Any Class, or a commercially available pre-bagged concrete mix (3000 psi minimum compressive strength). Sampling, testing, evaluation and certification of the concrete in accordance with Specification 346 is not required. Saturate with water the surfaces upon and against which the concrete fill will be placed prior to placing concrete. Place and finish concrete fill using forms or by hand methods to the general configurations shown so as to provide a smooth shape transition between the Type K Barrier and the adjacent traffic railing. A low slump is desirable if placing and finishing concrete by hand methods. Cure the concrete fill by application of a curing compound, or by covering with a wet tarp or burlap for a minimum of 24 hours. Completely remove the concrete fill upon relocation or removal of the Type K Temporary Concrete Barrier.
ADHESIVE-BONDING MATERIAL SYSTEMS: When using Adhesive Bonding Material Systems for Anchor Bolts, use Type HSHV in accordance with ASTM F 1554.

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

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

NOTES FOR BOLTED INSTALLATIONS:
- Bridge deck shown, approach slab or rigid pavement similar; installation adjacent to drop-off shown, median transition installation similar.
- When requested by the Engineer, remove the Demonstration Barrier Unit prior to testing the Anchor Bolts. Remove the test Anchor Bolts from the Demonstration Barrier Unit and test each Anchor Bolt with a 29,800 pound tensile proof load. Install and test additional demonstration Barrier Units in lieu of the production test requirements of Specification 416.
- Six (6) Adhesive-Bonded Anchor Bolts in the demonstration location(s), install a Demonstration Barrier Unit using the proposed production installation method, at a location approved by the Engineer.
- When installing Anchor Bolts, snug tighten the double Nuts on the underside of the deck against each other to minimize the potential for loosening.
- Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drains. Install Anchor Bolts and Nuts so that the maximum extension beyond the face of the Barrier Units is 1¼". Snug tighten the Nuts on the Anchor Bolts. For through bolted installations, number and positions of Anchor Bolts required in Transition Installations see Sheets B and C and Index 101-100. Drilling through deck reinforcing steel to install Anchor Bolts is permitted. Unless otherwise shown in the Plans, at the Contractor's option Barrier Units may be installed by through bolting (where geometrically possible) or by the use of Adhesive-Bonded Anchor Bolts. Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drains. Install Anchor Bolts and Nuts so that the maximum extension beyond the face of the Barrier Units is 1¼". Snug tighten the Nuts on the Anchor Bolts. For through bolted installations, number and positions of Anchor Bolts required in Transition Installations see Sheets B and C and Index 101-100. Drilling through deck reinforcing steel to install Anchor Bolts is permitted. Unless otherwise shown in the Plans, at the Contractor's option Barrier Units may be installed by through bolting (where geometrically possible) or by the use of Adhesive-Bonded Anchor Bolts. Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drains. Install Anchor Bolts and Nuts so that the maximum extension beyond the face of the Barrier Units is 1¼". Snug tighten the Nuts on the Anchor Bolts. For through bolted installations, number and positions of Anchor Bolts required in Transition Installations see Sheets B and C and Index 101-100. 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.

Anchor Bolts (Typ.) (Through Bolts shown, Adhesive-Bonded similar)

To accommodate movement at Expansion Joint, set Barrier Units with 3½" gap at locations shown.

ADHESIVE BONDING INSTALLATION

ANCHORED INSTALLATIONS - BOLTED

TREATMENT AT BRIDGE DECK EXPANSION JOINT SCHEMATIC
NOTES FOR STAKED INSTALLATIONS:

LIMITATION OF USE: This installation technique can only be used on flexible pavement or on 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 572 Grade 36. Weld in accordance with the American Welding Society Structural Welding Code (Steel) AWS/AMSE D1.1 (current edition). Welding metal are E60XX or E70XX. Nondestructive testing of welds is not required.

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

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

FREE-STANDING INSTALLATION:

1. For Bridge Decks only, use Keeper Pins that are 1/2" diameter, smooth steel bar in accordance with ASTM A572 Grade 36. As directed by the Engineer, in order to limit vibration induced translation of the Barrier Units, install one (1) Keeper Pin per Barrier Unit as shown.

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

3. Do not drill into or otherwise damage bridge deck expansion joints or drains.
NOTES FOR SOIL BACK-FILLED ROADWAY INSTALLATIONS:

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

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

**REVISION** 11/01/17

**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

**INDEX** 102-110

**SHEET** 5 of 17

**F Y 2020-21 STANDARD PLANS**

---

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

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

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

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

**REVISION**

**LAST REVISION**

**INDEX**

**SHEET**

**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

---

**PARTIAL PLAN VIEW AT MEDIAN 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)

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

---

**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)

Vertical End Taper required for 42" F Shape Traffic
Railing & 8’ & 14’ Traffic Railing / Noise Wall

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

---

**PARTIAL ELEVATION VIEW - FLORIDA CORRAL TRAFFIC RAILING**

32" Florida Corral Traffic Railing

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

---

**PARTIAL ELEVATION VIEW - VERTICAL SHAPE TRAFFIC RAILINGS**

32" Vertical Shape Traffic Railing (shown).

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

---

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

---

**APPROACH TRANSITION SPlice DETAIL**

FOR FLORIDA CORRAL AND VERTICAL
SHAPE TRAFFIC RAILINGS

---

**APPROACH TRANSITION SPlice DETAIL**

FOR FOR FLORIDA CORRAL AND VERTICAL
SHAPE TRAFFIC RAILINGS

---

**PARTIAL ELEVATION VIEW**

**MEDIAN TRAFFIC RAILING / NOISE WALLS (CONCRETE BARRIER WALL SIMILAR)**

---

**PARTIAL PLAN VIEW**

**FLORIDA CORRAL TRAFFIC RAILING**

---

**PARTIAL PLAN VIEW**

**VERTICAL SHAPE TRAFFIC RAILINGS**

---

**PARTIAL PLAN VIEW**

**FLORIDA CORRAL TRAFFIC RAILING**

---

**PARTIAL PLAN VIEW**

**VERTICAL SHAPE TRAFFIC RAILINGS**

---
10/29/2019

DESCRIPTION:

REVISION LAST

STANDARD PLANS FY 2020-21 SHEET INDEX

REV 0

11/01/17

102-110 8 of 17

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

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

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

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

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

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

PARTIAL PLAN VIEW

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

PARTIAL ELEVATION VIEW

TRAILING END SPLICE DETAIL
FOR F AND NEW JERSEY SHAPE TRAFFIC RAILINGS
AND 8' & 14' TRAFFIC RAILING / NOISE WALLS

TRAILING END SPLICE DETAIL
FOR FLORIDA CORRAL AND VERTICAL SHAPE TRAFFIC RAILINGS

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

1'-0" ± Limits of concrete fill

* Thrie-Beam Guardrail Splice

Limits of concrete fill

* Thrie-Beam Guardrail Splice

Limits of concrete fill

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

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

Offset Block bolted to guardrail

Offset Block bolted to guardrail

Paved Surface (Type varies)

Paved Surface (Type varies)

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

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

* Thrie-Beam Guardrail Splice

* Thrie-Beam Guardrail Splice

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

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

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

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

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

SECTION B-B
Adjacent to Shoulder Traffic Railings

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

SECTION C-C
32" F or New Jersey Shape Traffic Railing

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)
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

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

Type K-Proprietary Temporary Concrete Barrier Transitions

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**

**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

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

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

**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

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 API.

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

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

FABRICATION SPECIFICATIONS:
A. The Concrete Plant that meets the requirements:
   a. Specification 450 for prestressed concrete
   b. Specification 103 for precast.

CONCRETE:
A. Construct Barrier units with Class IV concrete in accordance with Specification 346.
B. Specification 346-1D is not applicable.
C. Barrier Units represented by concrete acceptance strength tests which fall below 5000 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. In the Fabricator's option, the entire length of Bars 6D may be galvanized or coated.
E. The minimum limit of galvanizing or coating is shown in the Bending Diagrams.
F. Install Bars 6D within 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 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 Specifications 480 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)
Revision Description:

Type K Temporary Concrete Barrier System

Estimated Temporary Concrete Barrier Quantities

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

The above quantities are for one Barrier Unit.

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

Section Thru Lift/Drain Slot

Lifting Sleeve Assembly Detail (Optional)

Anchor Blockout Detail

Plan View

Elevation View

Section D-D
(Reinforcement not shown for clarity)

* Measured from end of Barrier Unit to outside edge of Bars 6D.
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
NOTES:
Field trim D17.2 to clear drain slot by 2".
Match D17.2 spacing to Bars 4A in the Elevation View, Sheet 15.
Reinforcement cage as shown.
Place 2 ~ No. 5 Bars (12'-3" long) in bottom of Welded Wire

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NUMBER</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>4</td>
<td>10</td>
<td>6'-3&quot;</td>
</tr>
<tr>
<td>A2</td>
<td>4</td>
<td>2</td>
<td>5'-5&quot;</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>3</td>
<td>12'-3&quot; (Straight)</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>6</td>
<td>3'-1&quot;</td>
</tr>
<tr>
<td>D1</td>
<td>6</td>
<td>2</td>
<td>8'-4&quot;</td>
</tr>
<tr>
<td>D2</td>
<td>6</td>
<td>2</td>
<td>7'-6&quot;</td>
</tr>
<tr>
<td>D3</td>
<td>6</td>
<td>2</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>4</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

NOTE: Provide 1/2" Chamfer at top and bottom corners of Barrier.

SECTION A-A (SHOWN)
(SECTION B-B SIMILAR)

SECTION B-B SIMILAR

SECTION C-C
(Bars 6D not shown for clarity)
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 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 Specification 571 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 UF11052.

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

10. Setback distance shall be kept clear of any grass, construction debris, stockpiled materials, equipment, and objects.

BACKSIDE AND END PICTORIAL VIEWS

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

**T A B L E**

<table>
<thead>
<tr>
<th>WORK ZONE SPEED</th>
<th>LATTFAL OFFSET</th>
<th>SETBACK DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 MPH OR LESS</td>
<td>1&quot; MIN. 2&quot; PREFERED</td>
<td>9&quot;</td>
</tr>
</tbody>
</table>

**END VIEWS**

- **Traffic Face**
- **Flat Face Female End**
- **Beveled Face Male End**

**PLAN VIEWS OF CONNECTIONS**

- **Concave Connection**
- **Parallel Connection**
- **Convex Connection**

**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 399 with the exception that the use of a pre-emergent herbicide is not required. Payment for asphalt pad will be included in the cost of the barrier.

**PLAN VIEW OF APPROACH END OFFSET**

**CONSTRUCTION:**
- Beveled Washer
- Flat Face Female End
- Beveled Face Male End

**OFFSET OF STANDARD PLANS**

- **Index:** 102-120
- **Sheet:** 2 of 5
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

MAXIMUM CURVATURE ● MINIMUM RADIUS

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

CONCAVE CURVATURE

TRAFFIC SIDE

CONVEX CURVATURE

Inset A

SEE INSET A

Inset B

SEE INSET B

LOW PROFILE BARRIER
Flare Falls Within The Clear Zone Of Opposing Traffic

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

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

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

Edge Of Traveled Way

Driveway Width (w)

43

w+86 (Min.)

Work Area

Edge Of Traveled Way

Approach Traffic →

Edge Of Traveled Way

Driveway Width (w)

65

w+130 (Min.)

Work Area

* 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
**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.

---

**TREE PROTECTION BARRIER**

**TRUNK PROTECTION**

- **Tree Trunk**
- **Burlap Bands**
- **2' X 4' Nominal Boards**
- **Critical Root Zone**
- **Tree Pruning Trench**
- **Weather Resistant Sign**

**NOTES:**

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).

**TREES**

- **No Open Trenching Under The Critical Root Zone**
- **4' Minimum Depth**
- **4' Minimum Barrier Height**
- **Root Pruning Trench, As Required Per Construction Documents**
- **Maintain Existing Grade Within The Tree Protection Barrier**

**PLACE BURLAP BETWEEN TREE BOARDS AND THE TRUNK**

**HEAVY DUTY BURLAP (3 Minimum)**

**BURLAP**

- **6' Minimum Height Or To Lowest Branch**
- **2' X 4' Nominal Boards**
- **Form A Continuous Protective Barrier (Do Not Fasten Boards Into Tree)**

**CERTIFIED ARBORIST**

- **Pruning must be supervised by a Certified Arborist.**

**WEATHER RESISTANT SIGN**

- **Keep Out Tree Protection Area**
- **No Open Trenching Under The Critical Root Zone, See Note 1**

**ELEVATION**

- **Post (2' X 4' Nominal @ 4'-0" O.C. Typ.)**
- **Tree Protection Barrier**
- **Canopy**
- **Encourage**
- **Prune any portion of canopy that extends beyond barrier, unless pruning is required.**
- **Pruning must be supervised by a Certified Arborist.**

**SECTION A-A**

- **2' X 4' Nominal Boards**
- **Post (2' X 4' Nominal @ 4'-0" O.C. Typ.)**
- **Critical Root Zone**
- **Tree Trunk**

**ELEVATION**

- **Post (2' X 4' Nominal @ 4'-0" O.C. Typ.)**
- **Tree Protection Barrier**
- **Canopy**
- **Encourage**
- **Prune any portion of canopy that extends beyond barrier, unless pruning is required.**
- **Pruning must be supervised by a Certified Arborist.**

---

**STANDARD PLANS**

**TREE PROTECTION AND PRESERVATION**

**INDEX**

**FY 2020-21**

**REV 01/01/18**

**REVISION**

**DESCRIPTION:**

**REVISION**

**LAST REV 11/01/18**

**INDEX SHEET**

**110-100 1 of 1**
1. The location and construction of mailboxes shall conform to the rules and regulations of the United States Postal Service as modified by this Index.

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

3. 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 Domestic 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 patron’s 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 31 days after receipt of notice. 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 the Engineer.

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

4. Mailboxes shall be light sheet metal or plastic construction, in traditional style and only in Size 1 as prescribed by the Domestic Mail Manual of the U.S. Postal Service (DOMM). Mailbox production standards, lists of approved manufacturers and suppliers of mailboxes, design approval and guidance may be obtained by writing to the Rural Delivery Division, Delivery Service Department, Operations Group, USPS Headquarters, Washington, DC 20260.

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

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:

- 8" if shoulder width plus 8" is less than 12'.
- 10' for ADT over 10,000 vpd.
- 10' for ADT 100 to 10,000 vpd.
- 6' for ADT under 100 vpd.

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

6. 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 adjoins 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.

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

8. Lightweight newspaper receptacles may be mounted below the mailbox on the side of the support post in conformance with the USPS Domestic Mail Manual. The mailbox shall be responsible for newspaper receptacle installation and maintenance.

9. Wood and steel support posts for both single and double mailbox mountings shall be embedded into the ground. Concrete, brick, block, stone or other rigid foundation structures or encasement, either above or below the shoulder ground line, will not be permitted for mailboxes.

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

10. At driveway entrances mailboxes shall be placed on the far side of the driveway in the direction of the delivery route.

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

11. Mailbox support posts shall be in conformance with the material and dimensional requirements of Specification 952 and the treatment requirements of Specification 955.

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.

12. Mailboxes shall be paid for under the contract unit price for Mailboxes. Each. Payment shall be limited to one mailbox per patron address whether the mailbox is new, reused, salvaged, reset or relocated. Payment shall be per mailbox regardless of the number of mailboxes per support or grouping arrangement.

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

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

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

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

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

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

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

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

The above compensation shall include any work and cost incurred by the contractor for removal and disposal of existing mailboxes.
10/29/2019 8:14:41 AM

DESCRIPTION:

REV IS IO N

STANDARD PLANS FY 2020-21 SHEET

-Mailbox

11/01/17

MAILBOXES

REV IS IO N

INDEX

110-200

3 of 3

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. Details shown on this Index do not supersede the details shown in the Plans or Indexes 120-002 and 160-001.

2. Plastic (P) soils may be placed above the existing water level (at the time of construction) to within 4 feet of the proposed base. It should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for short distances.

3. High Plastic (H) soils excavated within the project limits may be used in embankment construction as indicated on this Index. High Plastic soils are not to be used for embankment construction when obtained from outside the project limits.

4. Select (S) soils having an average organic content of more than two and one-half (2.5) percent, or having an individual test value which exceeds four (4) percent, are not permitted in the subgrade portion of the roadbed. Select (S), Plastic (P), or High Plastic (H) soils having an average organic content of more than five (5) percent, or an organic content individual test result which exceeds seven (7) percent, are not permitted in the portion of embankment inside the control line, unless written authorization is provided by the District Geotechnical Engineer; these soils may be used for embankment construction outside the control line, unless restricted by the Plans or otherwise specified in the Plans, provided they can be compacted sufficiently to sustain a drivable surface for operational vehicles as approved by the Engineer. Determine average organic content from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Perform tests in accordance with AASHTO T 267 on the portion of a sample passing the No. 4 sieve.

5. Highly organic soils, composed primarily of partially decayed organic matter, often dark brown or black in color with an odor of decay, and sometimes fibrous, are designated as muck. Further, any stratum or stockpile of soil which contains pockets of highly organic material may be designated as Muck (M). Highly organic soils are not permitted within the subgrade or embankment portion of the roadbed.

NOTES:

1. All material in the shaded area is excess base to be removed.

2. There is no additional payment for removal of excess base material.

REMOVAL OF EXCESS BASE MATERIAL

GENERAL NOTES AND FLEXIBLE PAVEMENT
SYMBOL

S  Select  A-1, A-3, A-2-4 **
H  High Plastic  A-2-5, A-2-7, A-5 Or A-7 (ALL WITH LL > 50)
M  Muck  A-8

Classification listed left to right in order of preference.

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

* 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. A & S 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 12% passing the No. 200 U.S. Standard sieve.

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

RIGID PAVEMENT - SPECIAL SELECT SOIL OPTION
Whether or not Shoulder Gutter Is Used
Control Line Set By Normal Shoulder Point
Whether or Not Shoulder Gutter Is Used

Limit For Minimum Removal
Bottom Of Organic Material

Limit For Minimum Removal
Bottom Of Organic Material

Gutter Line

Back Of Proposed Or Future Sidewalk

WITH OVERBURDEN - HALF SECTION
CONSTRUCTION OF FLUSH SHOULDER ROADWAY

WITHOUT OVERBURDEN - HALF SECTION
CONSTRUCTION OF CURBED ROADWAY

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. Determine the average organic content from the test results from a minimum of three randomly selected samples from each stratum. Perform tests in accordance with AASHTO T267 on the portion of a sample passing the No. 4 sieve.
7. In areas of curbed roadway, where underdrain is to be constructed beneath the proposed pavement, the grade of the underdrain filter material will not extend above the bottom of the stabilized section of the subgrade. Gradation of the filter material must conform to Standard Specifications. The minimum grade of underdrain pipe is 0.2%.

GENERAL NOTES AND REMOVAL OF ORGANIC MATERIAL
DIVIDED FREeways, ArtERIALS, MAJOR COLLECTORS HAVING FLUsh MEDIANs, ON UNDIVIDED ArtERIALS AND MAJOR COLLECTORS

INTERSTATE FACILITIES, FReewayS, DivIDED ARTERIALS AND MAJOR COLLECTORS HAVING DEPRESSED MEDIANs

NOTES:
1. See Sheet 1 for the GENERAL NOTES.

2. When the typical cut details are applied to minor collectors and local facilities, the undercut may be reduced from 24" to 18".

3. Where frequency of median breaks indicates that it is impractical to leave plastic material in the median, the designer may elect to indicate total removal of this material. If during construction it becomes apparent, due to normal required construction procedures, that it is impractical to leave the plastic material in the median, total removal of this material shall be approved by the Engineer.

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

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

6. Cross slopes of 0.02 shown above are minimums. Follow the cross slope of the pavement to the extent possible.

CONSTRUCTION AND LOCATION OF UNDERDRAIN IN CURBED ROADWAY

(See Note 4)

REMOVAL OF PLASTIC MATERIAL

(See Note 3)

PREFERABLE REMOVAL

MINIMUM REMOVAL

SPECIAL REMOVAL DETAIL
NOTES:

Pavement Removal and Replacement

1. Pavement shall be mechanically sawed.
2. The replacement asphalt shall match the existing structural and friction courses for type and thickness in accordance with current FDOT asphalt mix specifications.
3. The new base materials shall be either of the same type and composition as the materials removed or of equal or greater structural adequacy.

Backfill Option

1. Compacted and Stabilized Fill
   A. Place backfill material in accordance with Specification 129.
   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 #1, 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 Specification 121, 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 pavement settlement.
3. All shoulder pavement, curb, curb and gutter, and their substructure disturbed by utility trench cut construction shall be restored in kind.
4. Method of construction must be approved by the Engineer.
5. Some pipe may require special granular backfill up to 8" above top of pipe. Geotextiles may be required to encapsulate the special granular material.

6. Where asphalt concrete overlays exist over full slab concrete pavement, the replacement pavement shall have an overlay constructed over the replacement slab. The overlay shall match the existing asphalt pavement thickness. The replacement friction course shall match the existing friction course, except structural course may be used in lieu of dense graded friction course.
7. The use of flowable fill to reduce the time traffic is taken off a facility is acceptable but must have prior approval by the Engineer. Flowable fill use is allowed only when properly engineered for pavement crossings, whether straight or diagonal, and shall not be installed for significant depths or lengths. The maximum length shall be fifty (50) feet and a maximum depth of six (6) feet unless supported by an engineering document prepared by a registered professional engineer that specializes in soils engineering. The engineering document shall address the evaluation of local groundwater flow interruption and settlement potential.
8. Excavatable flowable fill is to be used when the flowable fill option is selected.

TRENCH CUTS AND RESTORATIONS ACROSS ROADWAYS

INDEX

125-001

1 of 2
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 Transverse 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
DESCRIPTION:

REVISION

INDEX

SETTLEMENT PLATE

IMPLANTATION

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.
Connect to Paved Public Roads
Shoulder Width for Crossovers That
Stabilize 4" Back of Curb for Crossovers That
Connect to Paved Public Roads
Stabilize Full Width Under Traffic Separator

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".
7. Limits of Stabilization for Intermediate U-Turn Crossovers and, unless otherwise specified in the Plans, at paved and unpaved private roads and unpaved public roads.
DRIVEWAY ENTRANCES NOTES:

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

2. Stable material may be required for residential graded connecting facilities to private property as directed by the Engineer in accordance with Specification 102-8.

3. Stable material may be required for all side road connections. The size will be no less than 15' diameter or equivalent.

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.
### 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></td>
<td></td>
<td>Roadway*</td>
</tr>
<tr>
<td></td>
<td>Structural Bases</td>
<td>0.0, 0.2, 0.3</td>
</tr>
<tr>
<td>Structural</td>
<td>Asphalitic Concrete</td>
<td>0.25, 0.25</td>
</tr>
</tbody>
</table>

#### NOTES

1. Use same material for driveway structural course and roadway overbuild or structural course, except as approved by the Engineer for graded connections. Other Department-approved equivalent pavements may be used at the discretion of the Engineer.
2. Auxiliary lanes and their transition tapers shall be the same structure as the adjoining 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. Connections beyond the shoulder width are to be constructed as directed by the Engineer.
5. A structural course is required for flexible pavements where they are used for auxiliary lanes serving more than a single connection.
6. Use Class K5 concrete at least 6" thick for driveways paved with Portland Cement Concrete. Construct in accordance with Specifications 347, 350, and 522.

#### NEW DRIVEWAY

DRIVEWAY TYPES

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

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

<table>
<thead>
<tr>
<th>Drive Width (ft.)</th>
<th>Intersection</th>
<th>Normal</th>
<th>Skewed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type I</td>
<td>Type II</td>
<td>Type I</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>14</td>
<td>27</td>
<td>52</td>
<td>34</td>
</tr>
<tr>
<td>16</td>
<td>29</td>
<td>54</td>
<td>35</td>
</tr>
<tr>
<td>18</td>
<td>31</td>
<td>55</td>
<td>37</td>
</tr>
<tr>
<td>20</td>
<td>32</td>
<td>56</td>
<td>38</td>
</tr>
<tr>
<td>22</td>
<td>33</td>
<td>57</td>
<td>39</td>
</tr>
<tr>
<td>24</td>
<td>34</td>
<td>58</td>
<td>40</td>
</tr>
<tr>
<td>26</td>
<td>35</td>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td>28</td>
<td>36</td>
<td>61</td>
<td>43</td>
</tr>
<tr>
<td>30</td>
<td>38</td>
<td>63</td>
<td>45</td>
</tr>
<tr>
<td>32</td>
<td>39</td>
<td>64</td>
<td>47</td>
</tr>
<tr>
<td>34</td>
<td>41</td>
<td>65</td>
<td>48</td>
</tr>
<tr>
<td>36</td>
<td>42</td>
<td>66</td>
<td>49</td>
</tr>
<tr>
<td>38</td>
<td>43</td>
<td>67</td>
<td>50</td>
</tr>
<tr>
<td>40</td>
<td>44</td>
<td>68</td>
<td>52</td>
</tr>
<tr>
<td>42</td>
<td>45</td>
<td>69</td>
<td>53</td>
</tr>
<tr>
<td>44</td>
<td>46</td>
<td>71</td>
<td>55</td>
</tr>
<tr>
<td>46</td>
<td>47</td>
<td>72</td>
<td>57</td>
</tr>
<tr>
<td>48</td>
<td>48</td>
<td>74</td>
<td>59</td>
</tr>
<tr>
<td>50</td>
<td>51</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>52</td>
<td>52</td>
<td>76</td>
<td>61</td>
</tr>
<tr>
<td>54</td>
<td>53</td>
<td>77</td>
<td>62</td>
</tr>
</tbody>
</table>

**RESURFACING EXISTING DRIVEWAY**

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.
**CONCRETE PAVEMENT JOINTS**

**LONGITUDINAL JOINTS**

- **Transverse Joint**
- **Dowel Bars**
- **Tie Bars**

**TRANSVERSE JOINTS**

- **Butt Construction Joint**
  - Initial 1/8 Saw Cut Or 1/8 Max.
  - Formed Groove (Depth 1/4 to 3/16 D)

**DOWELS (LENGTH 18")**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Pavement Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>#8-5/8</td>
<td>1 3/4</td>
</tr>
<tr>
<td>#8-10</td>
<td>1 3/8</td>
</tr>
<tr>
<td>#8-11</td>
<td>1 1/16</td>
</tr>
</tbody>
</table>

**NOTES:**

1. For joint seal dimensions see Sheet 2.
2. For slabs poured simultaneously, tie bars may be inserted in the plastic concrete by means approved by the Engineer.
3. For longitudinal joints:
   - Tie bars are deformed #4 or #5 reinforcing steel bars meeting the requirements of Specification 931.
   - Provide a standard load transfer tied joint with #4 bars 29" in length at 24" spacing or #3 bars 30" in length at 30" spacing.
   - Transverse joints are to be spaced at a maximum of 15'. Dowels are required at all transverse joints unless otherwise noted in the plans.
4. Expansion joints to be placed at street intersections and other locations as indicated in the Plans. For bridge expansion joints, see Index 370-001.
5. Expansion joints to be placed at street intersections and other locations as indicated in the Plans.
6. Punch clean holes in preformed joint filler greater than bar diameter.
7. Coat and lubricate plain steel dowel bars in accordance with Specification 350.

**Dowel Bars Caps**

- **Metal**
  - Plain Steel Dowel Bar
  - Puncture and Push Down 1/4 on Both Sides

- **Plastic**
  - Plain Steel Dowel Bar
  - Bar Stop
  - Crimped

**Dowel Bar Layout**

- Bend up against end of pavement after forms are removed.
**CONCRETE-CONCRETE JOINTS**

**CONCRETE-ASPHALT SHOULDER JOINTS**

**JOINT SEAL DIMENSIONS**

FOR NEW AND REHABILITATION PROJECTS:

EITHER TAPE OR BACKER ROD BOND BREAKER REQUIRED;
SHOULDER MUST BE REPAIRED IF PROPER JOINT SHAPE CAN NOT BE ATTAINED.

**BACKER ROD BOND BREAKER**

<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>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>1</td>
<td>1/3</td>
<td>1/3</td>
<td>2/8</td>
<td>2/8</td>
</tr>
<tr>
<td>&gt;1</td>
<td>1/3</td>
<td>1/3</td>
<td>2/8</td>
<td>2/8</td>
</tr>
</tbody>
</table>

Unless otherwise indicated on the plans the joint width for new construction will be 1/4 for construction joints, 1/8 for all other joints.

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

**PLACING DEPTH**

- Saw Cut Or Formed Joint
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Backer Rod Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**FREQUENCY**

- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**MINIMUM JOINT DEPTH**

- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**JOINT WIDTH**

- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**JOINT DEPTH**

- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**PLACEMENT DEPTH**

- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**BACKER ROD BOND BREAKER**

<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>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>1/3</td>
<td>1/3</td>
<td>1/3</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>1</td>
<td>1/3</td>
<td>1/3</td>
<td>2/8</td>
<td>2/8</td>
</tr>
<tr>
<td>&gt;1</td>
<td>1/3</td>
<td>1/3</td>
<td>2/8</td>
<td>2/8</td>
</tr>
</tbody>
</table>

Unless otherwise indicated on the plans the joint width for new construction will be 1/4 for construction joints, 1/8 for all other joints.

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

**TAPER**

- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker
- Concrete Pavement Joint
- Asphalt Shoulder Pavement
- Joint Sealant Material To Be As Specified In The Plans
- Tape Bond Breaker

**JOINT SEAL DIMENSIONS**

FOR NEW PROJECTS

- PREFORMED ELASTOMERIC COMPRESSION SEAL

FOR REHABILITATION PROJECTS

- TAPE BOND BREAKER
Note: 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.

ALTERNATE KEYWAY AND HOOK BOLT

STEEL HOOK BOLT ASSEMBLY

ANCHOR BOLTS

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.

NOTES

1. Longitudinal joints will not be required for single lane pavement 14' or less in width. For entrance and exit ramp joint details, see Sheet 4.
2. Arrangement of longitudinal joints are to be as directed by the Engineer.
3. All manholes, meter boxes and other projections into the pavement shall be boxed-in with ½" preformed expansion joint material.

EXPANSION ASSEMBLY

Note: Proprietary contraction and expansion assemblies may be used. Products shall be introduced to the State Construction Office in accordance with section (C) of the Product Evaluation Procedure.
CONCRETE PAVEMENT JOINTS

INDEX
350-001

SHEET
4 of 4

DESCRIPTION:

REVISIO N
11/01/18

LAST
8:14:52 AM

STANDARD PLANS

FY 2020-21

REV

LONGITUDINAL JOINT

CONTRACTION JOINT (TYP.)

2-THRU LANES WITH SINGLE LANE ENTRANCE RAMP

TRANSITION FROM 13' TO 12' WIDE OVER 3 SLABS

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.
1. For Repair and Replacement Criteria see Sheet 2.

2. Full depth repairs consist of removing and replacing at least a portion of the existing slab to the bottom of the concrete.

3. Repair boundaries shall be sawed full-depth with diamond saw blades. On hot days, it may not be possible to make this cut without first making a wide pressure relief cut within the repair boundaries. A carbide-tipped wheel saw may be used for this purpose, but the wheel saw must not intrude on the adjacent lane, unless the lane is slated for repair. The wheel saw cuts produce a ragged edge that promotes excessive spalling along joints. Hence, if wheel saw cuts are made, diamond saw cuts must be made 18 in. outside the wheel saw cuts. To prevent damage to the base, the wheel saw must not be allowed to penetrate more than 0.5 in. into the base.

4. No additional base or subgrade material shall be added and all loose base or subgrade material shall be removed prior to placement of the new concrete slab. The concrete slab shall be placed to the full depth of the material removed. No additional compensation will be allowed for additional concrete required to bring proposed concrete slab up to finished grade.

5. Removal of the damaged concrete pavement shall be by lifting. Any good concrete pavement which is damaged during removal of damaged areas shall be removed and replaced by the contractor at his expense.

6. If the roadway contract includes grinding, then the slab replacement shall be performed first.

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

8. Install tie bars at longitudinal joints when two full adjacent or multiple replaced slabs.

FIGURE 10.1 - REPAIR METHOD: NONE OR CLEAN AND SEAL

Existing Transverse Joint

Crack

Existing Longitudinal Joint

Transverse Crack

Remainder

6'-0" (Min.)

6'-0" (Min.)

FIGURE 10.2 - REPAIR METHOD: NONE OR CLEAN AND SEAL

Existing Longitudinal Joint

Bond Breaker

(Along All Longitudinal and Transverse Joints)

Transverse Control Joint

12" (Typ.)

(10'-0" Max.)

Existing Transverse Joint

FIGURE 10.3 - FULL SLAB FULL DEPTH REPLACEMENT

Existing Longitudinal Joint

Epoxy Saw Overrun (Typ.)

1/2 L

Remainder

6'-0" (Min.)

FIGURE 10.4 - PARTIAL SLAB FULL DEPTH REPLACEMENT

Full-Depth Repair Area

New Dowel Bars (Equally Spaced Between Existing Dowel Bar Locations)

Epoxy Saw Overrun (Typical)

During Slab Replacement

Remainder

6'-0" (Min.)

6'-0" (Min.)

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

Existing Longitudinal Joint

New Dowel Bars (Equally Spaced Between Existing Dowel Bar Locations)

Epoxy Saw Overrun (Typ.)

6'-0" (Min.)

6'-0" (Min.)

FIGURE 10.6 - MULTIPLE SLAB FULL DEPTH REPLACEMENT

New Full Slab

12" (Typ.)

Tie Bar

Remainder

6'-0" (Min.)

6'-0" (Min.)

3'-0" (Min.)

3'-0" (Min.)

3'-0" (Min.)

3'-0" (Min.)

FIGURE 10.7 - MULTIPLE SLAB FULL DEPTH REPLACEMENT

GENERAL NOTES
<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;8°, no faulting, spalling &lt;3/8&quot; wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Moderate: 8°-15° width &lt;3&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;3&quot;, spalling &gt;3 faulting &gt;8°</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td>Transverse</td>
<td>Light: &lt;8°, no faulting, spalling &lt;3/8&quot; wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td></td>
<td>Moderate: 8°-15° width &lt;3&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;3&quot;, spalling &gt;3 faulting &gt;8°</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</td>
<td>Cracking patterns that divide the slab into three or more segments.</td>
<td>Full Depth</td>
<td>Figure 10.3 and 10.4</td>
</tr>
<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;1/8&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: 1/8&quot; &lt;spall width &lt; 1&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;1/2&quot;, &gt; ½ slab depth, &gt;12&quot; in length</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;1/8&quot;, &lt; than 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: 1/8&quot; &lt;spall width &lt; 1&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;1/2&quot;, &gt; ½ slab depth, &gt;12&quot; in length</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>Small pieces of surface pavement broken loose, normally ranging from 1 to 4 in. diameter and 1/8 to 2 in. in depth.</td>
<td>Keep under observation</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td>Light</td>
<td>Not deemed to be a traffic hazard</td>
<td>None</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Pop Outs Wheel Path</td>
<td>Small pieces of surface pavement broken loose, normally &gt;3&quot; diameter and 2&quot; in depth.</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Light</td>
<td>Deemed to be a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td><strong>MISCELLANEOUS DISTRESS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faulting</td>
<td>Elevation differences across joints or cracks.</td>
<td>None</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Light</td>
<td>Faulting &lt;4/32&quot;</td>
<td>None</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Moderate</td>
<td>4/32&quot;&lt;faulting &lt;16/32&quot;</td>
<td>Grind</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Faulting &gt;16/32&quot;</td>
<td>Grind</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Lane To Shoulder Drop Off</td>
<td>Spall width &lt;1&quot;</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Light</td>
<td>spall width &lt;1&quot;</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Moderate</td>
<td>1&quot; &lt;drop-off &lt;3&quot;</td>
<td>Build Up</td>
<td>N/A</td>
</tr>
<tr>
<td>Severe</td>
<td>drop-off &gt;3&quot;</td>
<td>Build Up</td>
<td>N/A</td>
</tr>
<tr>
<td>Water Bleeding Or Pumping</td>
<td>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>
**DESCRIPTION:**

Revision of Standard Plans FY 2020-21

**INDEX:** 370-001

**SHEET:** 1 of 1

**GENERAL NOTES:**

1. For asphalt base, use four expansion joints per index 350-001.

2. The centerline of roadway and the centerline of bridge do not necessarily coincide. Determine the centerline of the roadway pavement prior to the placement of the expansion joint.

3. For information on other types of concrete pavement joints see Index 350-001.

4. Pay quantity for expansion joint is the length of joint to be constructed across the roadway and adjacent shoulders. Measured at right angles to the centerline of the roadway. Payment for expansion joint is full compensation for joint construction, including reinforced concrete subbase, 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.

**REINFORCING STEEL**

- Mark
- Size
- Spec.
- No. Req'd
- Length

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Spec.</th>
<th>No. Req'd</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>5</td>
<td>81.6</td>
<td>4</td>
<td>4.6</td>
</tr>
</tbody>
</table>

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

**SECTION AA**

**SHEET METAL STRIP DETAILS**

**COMPRESSION SEAL DETAIL**

**JOIN Dimensions**

**OPTIONAL SEALS**

NOTE:

Thoroughly coat all contacting surfaces between the compression seal and concrete with a lubricant-adhesive.
NOTES

TRAFFIC RAILINGS OR PARAPETS:
If there is a Traffic Railing or Parapet on the wall, align Wall Joints with V-Grooves, and Wall Expansion Joints with Barrier Open Joints.

FOUNDATION:
Prepare the soil below the footing in accordance with the requirements for spread footings in Specification Section 455.

REINFORCING STEEL BENDING DIAGRAMS

<table>
<thead>
<tr>
<th>Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'-0&quot; lap splice (Typ)</td>
</tr>
</tbody>
</table>

BARS GI

BARS J & K

NOTE:
All bar dimensions are out-to-out

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

Wall joint spacing 25 ft. maximum and 5' minimum. At minimum, every fourth wall joint to be an expansion joint. See Plans for actual wall joint spacing and expansion joint location.

**Ground Line**

See 'Detail A'

45° (Typ.)

Front Face of Wall

Vertical Line

Stem Offset = Height (Ft.) / 16

Stem as constructed

Stem Offset (for H < 20 Ft.)

**TRAFFIC RAILING/JUNCTION SLAB DETAIL**

(36° Single-Slope shown, other Traffic Railings similar)

**Top of CIP Wall**

**Top of Coping**

**Height (in.)**

**Junction Slab**

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

See Typical Backfill Detail

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

**V-GROOVE DETAIL**

At Contractor's option, Surface Treatments may terminate 9" below ground line

See 'Detail A'

**STEM OFFSET VALUES**

(for H < 20 Ft.)

**SECTION A-A WALL JOINT DETAIL**

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

See Roadway Plans for drainage requirement

Limits of Excavation

Drain shall be continuous 1.5' x 1.5' clean, broken stone or gravel, graded and placed to allow free drainage. Place Type D-3 (see Specification Section 985) geotextile fabric, 1'-0" wide and full height of fill, to the back of 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.

**FINAL GROUNDLINE**

Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with ½" openings

**TYPICAL BACKFILL DETAIL**

**SECTION A-A EXPANSION JOINT DETAIL**

Attach Type D-5 (see Specification Section 985) Geotextile fabric, 1'-0" wide and full height of fill, to the back of wall with an adhesive approved by the Engineer.

* Wall Joint

** Wall Joint**

** Wall Joint**

** Top of Footing**

(by footing step)

**Top of Footing**

**Top of CIP Wall**

**Top of Coping**

**Height (in.)**

**Junction Slab**

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

See Typical Backfill Detail

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

**V-GROOVE DETAIL**

At Contractor's option, Surface Treatments may terminate 9" below ground line

See 'Detail A'

**STEM OFFSET VALUES**

(for H < 20 Ft.)

**SECTION A-A WALL JOINT DETAIL**

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

See Roadway Plans for drainage requirement

Limits of Excavation

Drain shall be continuous 1.5' x 1.5' clean, broken stone or gravel, graded and placed to allow free drainage. Place Type D-3 (see Specification Section 985) geotextile fabric, 1'-0" wide and full height of fill, to the back of 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.

**FINAL GROUNDLINE**

Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with ½" openings

**TYPICAL BACKFILL DETAIL**

**SECTION A-A EXPANSION JOINT DETAIL**

Attach Type D-5 (see Specification Section 985) Geotextile fabric, 1'-0" wide and full height of fill, to the back of wall with an adhesive approved by the Engineer.

* Wall Joint

** Wall Joint**

** Wall Joint**

** Top of Footing**

(by footing step)

**Top of Footing**

**Top of CIP Wall**

**Top of Coping**

**Height (in.)**

**Junction Slab**

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

See Typical Backfill Detail

Traffic Railing (Index 521-610, 36° Single-Slope shown, see Plans for Traffic Railing Type)
**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 Walls shall be Class NS per Section 347. Concrete for Scheme 3 Junction Slab and Traffic Railing shall be Class II per Section 348, unless otherwise specified in the plans.

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

4. When required, for adjacent guardrail, 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 top of wall.

6. Provide a continuous 1" clean gravel or crushed rock drain for wall heights > 2' high. Wrap drainage layer as shown, with Type D-3 geotextile fabric in accordance with Specification Section 985. Provide 8" galvanized mesh with 1/2" 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 adjust edge of Drain Pipe a minimum of 2'-0" from wall joints.

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

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

**PER LINEAR FOOT OF WALL**

<table>
<thead>
<tr>
<th>HEIGHT (FT.)</th>
<th>SCHEME 1</th>
<th>SCHEME 2</th>
<th>SCHEME 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'</td>
<td>0.08</td>
<td>0.11</td>
<td>0.03</td>
</tr>
<tr>
<td>2'</td>
<td>0.14</td>
<td>0.20</td>
<td>0.09</td>
</tr>
<tr>
<td>3'</td>
<td>0.22</td>
<td>0.33</td>
<td>0.29</td>
</tr>
<tr>
<td>4'</td>
<td>0.32</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>5'</td>
<td>0.43</td>
<td>0.50</td>
<td>0.60</td>
</tr>
</tbody>
</table>

**WEIGHT HOLES & DRAIN NOOD.**

**DESCRIPTION:**

- Bars B @ 1'-6" Ctrs. (Max.)
- Bars A @ 1'-0" Ctrs. (Max.)

**SCHEME 1**

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

- 1'-0" Min. to SHW
- Slopes up to Max. 1:1½

**SCHEME 2**

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

- 1'-0" Min. to SHW
- 1" For Slopes ≤ 1:1½
- 2' For Slopes > 1:1½

**SCHEME 3**

(With Traffic Railing)

- 1'-0" For Wall Height ≤ 2'-0"
- 2'-0" For Wall Height > 2'-0"

**BAR A**

- 4" x 4" As Reqd. (29'-8" Max.)

**BAR B**

- As Reqd. (29'-8" Max.)

**BILL OF REINFORCING STEEL**

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

**BILL OF REINFORCING STEEL**

**MARK**

| 0    | 4    |

**SIZE**

| 4    | As Reqd. |

**LENGTH**

| 4    | As Reqd. |

**BIL OF REINFORCING STEEL**

**MARK**

| 0    | 4    |

**SIZE**

| 4    | As Reqd. |

**LENGTH**

| 4    | As Reqd. |
**DESCRIPTION:**

**REVISION**

**STANDARD PLANS**

**FY 2020-21**

**CONCRETE STEPS**

**INDEX**

**REVISED**

**11/01/17**

**1 of 1**

---

**STAIR TREAD AND RISER DETAILS**

*The greatest riser height within the flight of steps shall not exceed the smallest by more than 1/2.*

**NOTE:** Provide a maximum of 12 risers between landings.

---

**NOTE:**

1. Do not use this Index for suspended (structural) steps or stairways.
2. Construct steps in accordance with Specification 522.
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)
**DESCRIPTION:**

FAA FY 2020-21

**STANDARD PLANS**

**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**WEIGHT OF CASTINGS (lb)**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>2' Opening</th>
<th>3' Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td></td>
</tr>
</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 1/2" deep seats (traffic type). The 185 lb cover (nontraffic type), 1984 Roadway and Traffic Design Standards Index 201, is the replacement cover for existing frames with 1/2" deep seats. Installation of frame with 1/2" 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 8' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover in the Drainage Structure sheets in the plans.
Base Material At Stub Opening Shall Be Removed To Permit Adhesive Bonded Covering Of Opening With Structural Course Material. When Alternate "G" grate is specified, the chain, bolt, nuts, washer and cold shuts 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.

**EYEBOLT AND CHAIN REQUIREMENTS**

<table>
<thead>
<tr>
<th>Index</th>
<th>Type</th>
<th>Eye-Bolts</th>
<th>Length Of Chain</th>
<th>Handling &amp; Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>425-026</td>
<td>A</td>
<td>1</td>
<td>8'-0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>B</td>
<td>1</td>
<td>4'-0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>C</td>
<td>1</td>
<td>2'-6&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>D</td>
<td>1</td>
<td>2'-4&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>E</td>
<td>2</td>
<td>2'-4&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>F</td>
<td>2</td>
<td>2'-4&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>G</td>
<td>2</td>
<td>2'-4&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-026</td>
<td>H</td>
<td>2</td>
<td>2'-4&quot;</td>
<td>Center Grate (Single) 1&quot;</td>
</tr>
<tr>
<td>425-026</td>
<td>I</td>
<td>1</td>
<td>4'-0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
</tbody>
</table>

**EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS**

- Bevel Cut Upper Stub To Match Forming For Apron Face
- Cap Grating Or Plugging Of Upper Stub Not Required (Visi-able For Pipe Wall)
- Base Material & Stub Opening Shall Be Removed To Permit Covering Of Opening With Structural Course Material

**PIPE TO STRUCTURE JOINT**

- To Be Placed In Approximate Center Of Opening
- Filter Fabric Wrap
- Grout Seal or Integral Cast
- Note: Cost of pipe, fittings and sandbagging to be included in the contract unit price for inlets.

**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**MANHOLE TOPS**

1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C495 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 precast construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric key can be used.

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

5. Frames can be adjusted a maximum 12" height with brick or precast concrete construction. For concrete construction, the frames can be adjusted a maximum 12" with brick or precast concrete 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.

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.

**SECTION**

**NOTES (TOPS)**

1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C495 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 precast construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric key can be used.

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

5. Frames can be adjusted a maximum 12" height with brick or precast concrete construction. For concrete construction, the frames can be adjusted a maximum 12" with brick or precast concrete 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.

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 7 should be specified in the plans when depths shown above can be maintained.

2. Manhole top Type 8 slabs may be of cast-in-place or precast concrete construction. For concrete construction, the frames can be adjusted a maximum 12" height with brick or precast concrete 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. Substitution of manhole top Type 8 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.

4. 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.

**FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT**

- Grout (3:1 Sand-Cement Mixture Or Any Class (4'))
- Filter Fabric
- Pipe Wall
- Structure Wall
- Mortar Per Specification Section 425
- Brick Masonry Or Any Class Concrete Required For Gaps Greater Than 2'"
**SEPARATE RISER SEGMENTS WITH CONSTRUCTION JOINTS OTHER THAN DOWEL OPTION**

**WALL JOINTS**

1. One or more types of joints may be used in a single structure, except brick wall structure. Brick wall construction is permitted in circular units only.

2. All grouted joints are to have a maximum thickness of 1".

3. Keyways are to be a minimum of 1/2" deep.

4. Joint dowels are to be #4 bars, 12" long with a minimum of 6 bars per joint approximately evenly spaced for circular structures or at maximum 12" spacing for rectangular structures. Bars may be either Adhesive Bonded Dowels in accordance with Specification Section 416, or placed approximately 6" into fresh concrete leaving the remainder to extend into the secondary cast. Welded wire reinforcement may be substituted for the dowel bar in accordance with the equivalent steel area table 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.

---

**MINIMUM DIMENSIONS FOR BOX AND RISER SEGMENTS**

**COMPARATIVE SIDE VIEWS**

**REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS**

**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 AASHTO M259 shall apply.

4. Bar size and spacing of peripheral reinforcement may be used in lieu of ACI standard hooks for top and bottom slabs except when hooks are specifically called for in the plans or standard drawings.

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

6. Precast opening for pipe shall be the pipe OD plus 6" (± 2" tolerance). Mortar used to seal the pipe into the opening will be of a mix that will not cause leakage into or out of the structure. Dry-pack mortar may be used in lieu of brick and mortar construction to seal openings less than 2" wide.

7. Fiber-reinforced concrete may be substituted for conventional steel reinforcement in accordance with the Structures Design Guidelines. Shop drawings corresponding to an approved fiber-reinforced concrete mix design must be submitted for approval to the State Drainage Engineer.

---

**EXAMPLE TABLE OF EQUIVALENT STEEL AREA**

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 60</th>
<th>REINFORCING BAR</th>
<th>EQUIVALENT GRADE 40</th>
<th>REINFORCING BAR</th>
<th>EQUIVALENT 65 KSI SMOOTH WIRE REINFORCEMENT</th>
<th>EQUIVALENT 70 KSI DEFORMED WIRE REINFORCEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar Size &amp; Spacing</td>
<td></td>
<td>Steel Area (in²/ft)</td>
<td>Min. Steel Area (in²/ft)</td>
<td>Style Designation</td>
<td>Min. Steel Area (in²/ft)</td>
<td>Style Designation</td>
</tr>
<tr>
<td>A</td>
<td>#3 @ 60° Cts.</td>
<td>0.20</td>
<td>#3 @ 60° Cts.</td>
<td>0.30</td>
<td>3&quot; x 8&quot; x 0.066</td>
<td>6&quot; x 11.1 x 0.111</td>
</tr>
<tr>
<td>B</td>
<td>#3 @ 60° Cts.</td>
<td>0.24</td>
<td>#3 @ 60° Cts.</td>
<td>0.36</td>
<td>3&quot; x 8&quot; x 0.065</td>
<td>6&quot; x 11.1 x 0.111</td>
</tr>
<tr>
<td>Special 1</td>
<td>#3 @ 90° Cts.</td>
<td>0.267</td>
<td>#3 @ 90° Cts.</td>
<td>0.40</td>
<td>3&quot; x 8&quot; x 0.062</td>
<td>6&quot; x 8.6 x 0.08</td>
</tr>
<tr>
<td>C</td>
<td>#3 @ 30° Cts.</td>
<td>0.37</td>
<td>#3 @ 30° Cts.</td>
<td>0.555</td>
<td>3&quot; x 8&quot; x 0.065</td>
<td>6&quot; x 11.1 x 0.111</td>
</tr>
<tr>
<td>D</td>
<td>#3 @ 60° Cts.</td>
<td>0.53</td>
<td>#3 @ 60° Cts.</td>
<td>0.795</td>
<td>3&quot; x 8&quot; x 0.065</td>
<td>6&quot; x 11.1 x 0.111</td>
</tr>
<tr>
<td>E</td>
<td>#3 @ 90° Cts.</td>
<td>0.73</td>
<td>#3 @ 90° Cts.</td>
<td>1.095</td>
<td>3&quot; x 8&quot; x 0.062</td>
<td>6&quot; x 8.6 x 0.08</td>
</tr>
<tr>
<td>F</td>
<td>#3 @ 60° Cts.</td>
<td>1.06</td>
<td>#3 @ 60° Cts.</td>
<td>1.59</td>
<td>3&quot; x 8&quot; x 0.066</td>
<td>6&quot; x 11.1 x 0.111</td>
</tr>
<tr>
<td>Special 2</td>
<td>#3 @ 60° Cts.</td>
<td>1.24</td>
<td>#3 @ 60° Cts.</td>
<td>1.86</td>
<td>3&quot; x 8&quot; x 0.066</td>
<td>6&quot; x 8.6 x 0.08</td>
</tr>
<tr>
<td>G</td>
<td>#3 @ 90° Cts.</td>
<td>1.66</td>
<td>#3 @ 90° Cts.</td>
<td>2.19</td>
<td>3&quot; x 8&quot; x 0.066</td>
<td>6&quot; x 8.6 x 0.08</td>
</tr>
</tbody>
</table>

**NOTES FOR PRECAST OPTIONS AND EQUIVALENT REINFORCEMENT SUBSTITUTION**

1. Details for optional precast inlet construction up to depths of 15' are shown on the inlet indexes.

2. When precast units are used in conjunction with All "B" Structure Bottoms, Index 425-010, the internal dimensions of an All "B" Bottom can be adjusted to reflect these inlet interior dimensions.

3. Concrete which meets the requirements of ASTM C478 or Class IV must be used for precast structures constructed with 6" wall or slab thickness.

4. Reinforcement other than 60 ksi may be used, however only two grades are recognized; Grade 40 and Grade 60. Smooth welded wire reinforcement, will be recognized as having a design strength of 65 ksi and deformed wire reinforcement will be recognized as having a design strength of 70 ksi. The area of reinforcement required may be adjusted in accordance with the Equivalent Steel Area Table provided. For bars and spacings not given, the area required can be determined by the following equations:

   - Grade 40 Steel Area = A 60 = 65 x A 65
   - Smooth Welded Wire Reinforcement Steel Area = A 65 = 65 x A 65
   - Deformed Welded Wire Reinforcement Steel Area = A 70 = 65 x A 70

5. Fiber-reinforced concrete may be substituted for conventional steel reinforcement in accordance with the Structures Design Guidelines. Shop drawings corresponding to an approved fiber-reinforced concrete mix design must be submitted for approval to the State Drainage Engineer.

---

**INDEX**

**425-001**

4 of 5
DESIGNER NOTE: Use only when round structures are not practical, engineer of record approval required.

PICTORIAL VIEW

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

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

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

RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER

SECTION AA

DETAILS FOR SKEWED PIPES IN RECTANGULAR STRUCTURES

PLAN VIEW FOR SKEWS \( \leq 45° \) (Not Centered)

PLAN VIEW FOR SKEWS \( > 45° \) (Not Centered)
**TOP SLAB REINFORCING STEEL DIAGRAM** (ALTERNATE A)

**TOP SLAB REINFORCING STEEL DIAGRAM** (ALTERNATE B)

**ROUND RISER OPENING**

**SQUARE OPENING WITH CORNER FILLETS**

**SECTION A-A** (ALTERNATE A)

**SECTION B-B** (ALTERNATE B)

**SPECIAL TOP SLAB***

**TYPICAL SLAB TO WALL DETAILS** FOR PRECAST STRUCTURES
### ROUND STRUCTURE BOTTOMS (ALTERNATE A) & ROUND RISERS – TABLE 1

<table>
<thead>
<tr>
<th>Structure/Riser Diameter (ft)</th>
<th>Cast-In-Place Items</th>
<th>Precast Items</th>
<th>Class II Concrete</th>
<th>ASTM C478</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class III Concrete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>t1</td>
<td>t2</td>
<td>A</td>
</tr>
<tr>
<td>P 3'-0&quot;</td>
<td>6</td>
<td>8</td>
<td>0.20</td>
<td>6</td>
</tr>
<tr>
<td>J 5'-0&quot;</td>
<td>-</td>
<td>8</td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td>J 6'-0&quot;</td>
<td>-</td>
<td>8</td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td>J 7'-0&quot;</td>
<td>-</td>
<td>8</td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td>J 8'-0&quot;</td>
<td>-</td>
<td>8</td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td>J 10'-0&quot;</td>
<td>10</td>
<td>0.40##</td>
<td>10</td>
<td>0.40##</td>
</tr>
<tr>
<td>J 12'-0&quot;</td>
<td>10</td>
<td>0.40##</td>
<td>12</td>
<td>0.40##</td>
</tr>
</tbody>
</table>

**GENERAL NOTES**

1. Standard structure bottoms 4'-0" diameter and smaller (Alt. A) and 3'-0" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type 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 thickness and reinforcement are for both reinforced cast-in-place or precast concrete units except that precast circular units may be furnished with walls in accordance with ASTM C478 (see modified wall thicknesses in Table 1).

4. Top and bottom slab thickness and reinforcement are for precast and cast-in-place construction. All concrete shall be of Class II concrete, 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 Specifications 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 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'-6" 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 grouted pipe connection, may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain grouted pipe connections, may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain grouted pipe connection, may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain grouted pipe connection, may be left flush with the hole surface.

10. The corner filllets shown are necessary for rectangular structures used with circular risers and inlet throats and when used on skew with rectangular risers, inlet throats, and inlet throats. Filllets 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.

**TABLE 1 NOTES:**

- **#**Provide 0.20 sq. in./ft. at each face, 12" max. bar spacing.
- **##**Adjusted minimum wall thickness.
- **###**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 grouted pipe connections, may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain grouted pipe connections, may be left flush with the hole surface.

**TABLE 2 NOTES:**

See Table 8 for Reinforcing Schedule.
TABLE 3 - MINIMUM STRUCTURE SIZES FOR SINGLE PIPE CONNECTION PER SIDE

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>RECTANGULAR</th>
<th>ROUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (D)</td>
<td>Side Dimension (L)</td>
<td>Diameter (D)</td>
</tr>
<tr>
<td>18&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-0&quot;</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>3'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>3'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>3'-0&quot;</td>
<td>10'-0&quot;</td>
</tr>
<tr>
<td>54&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
</tbody>
</table>

TABLE 3 NOTES:
1. For Round Structures sizes with variable angles between sides and variable pipe sizes, refer to the FDOT Storm Drain Handbook.
2. For rectangular structures, refer to the FDOT Storm Drain Handbook.
3. These values are based on 2" clearance for precast structures.

TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>WALL THICKNESS</th>
<th>MAXIMUM SKEW ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;</td>
<td>18&quot;</td>
<td>17°</td>
</tr>
<tr>
<td>10&quot;</td>
<td>20&quot;</td>
<td>17°</td>
</tr>
<tr>
<td>12&quot;</td>
<td>24&quot;</td>
<td>14°</td>
</tr>
<tr>
<td>14&quot;</td>
<td>30&quot;</td>
<td>13°</td>
</tr>
<tr>
<td>16&quot;</td>
<td>40&quot;</td>
<td>12°</td>
</tr>
<tr>
<td>18&quot;</td>
<td>48&quot;</td>
<td>12°</td>
</tr>
</tbody>
</table>

TABLE 5 NOTES:
These values are based on 2" clearance for precast structures. Larger skews are possible for Cast-In-Place Structures or elliptical pipe openings when approved by the Engineer.

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

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>PIPE SPACING</th>
<th>MINIMUM WALL LENGTH (L) FOR NUMBER OF PARALLEL PIPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (D)</td>
<td>(In.)</td>
<td>(Feet)</td>
</tr>
<tr>
<td>18&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>2'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-0&quot;</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>3'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>3'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>3'-0&quot;</td>
<td>10'-0&quot;</td>
</tr>
<tr>
<td>54&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>3'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
</tbody>
</table>

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

MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL PLAN VIEW

PRECAST ROUND STRUCTURES WITH MULTIPLE PIPE CONNECTIONS
### SLAB DESIGNS - SQUARE AND RECTANGULAR STRUCTURES (TABLE 6)

**Table 6**: Slab designs for square and rectangular structures.

<table>
<thead>
<tr>
<th>Size (ft x ft)</th>
<th>Slab Design 1</th>
<th>Slab Design 2</th>
<th>Slab Design 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 x 8</td>
<td>C6.5</td>
<td>C6.5</td>
<td>C6.5</td>
</tr>
<tr>
<td>9 x 9</td>
<td>C6.5</td>
<td>C6.5</td>
<td>C6.5</td>
</tr>
<tr>
<td>10 x 10</td>
<td>C6.5</td>
<td>C6.5</td>
<td>C6.5</td>
</tr>
<tr>
<td>11 x 11</td>
<td>C6.5</td>
<td>C6.5</td>
<td>C6.5</td>
</tr>
<tr>
<td>12 x 12</td>
<td>C6.5</td>
<td>C6.5</td>
<td>C6.5</td>
</tr>
</tbody>
</table>

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

**Table 7**: Slab designs for round structures.

<table>
<thead>
<tr>
<th>Size (ft)</th>
<th>Slab Design 1</th>
<th>Slab Design 2</th>
<th>Slab Design 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>B5.5</td>
<td>B5.5</td>
<td>B5.5</td>
</tr>
<tr>
<td>3</td>
<td>D4.5</td>
<td>D4.5</td>
<td>D4.5</td>
</tr>
<tr>
<td>4</td>
<td>E3</td>
<td>E3</td>
<td>E3</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 the top of the slab for boxes and to the top of the intermediate slab for risers.
5. Wall height is the distance between the top of lower slab to the bottom of upper slab. Maximum wall height is 12' for wall lengths exceeding 3', and 14' for wall lengths exceeding 12'.

---

**Note**: Slabs 8" thick except as noted; reinforcing parallel to short way and long way.
### WALL DESIGNS - RECTANGULAR STRUCTURES (TABLE 8)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<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: 3'-6&quot; &amp; RISERS</td>
<td>SIZE: 3'-6&quot; &amp; RISERS</td>
<td>SIZE: 3'-6&quot; &amp; RISERS</td>
</tr>
<tr>
<td>10' - 14'</td>
<td>6.5'</td>
<td>6.5'</td>
<td>6.5'</td>
</tr>
<tr>
<td>10' - 14'</td>
<td>6.5'</td>
<td>6.5'</td>
<td>6.5'</td>
</tr>
<tr>
<td>20' - 28'</td>
<td>13.5'</td>
<td>13.5'</td>
<td>13.5'</td>
</tr>
<tr>
<td>20' - 28'</td>
<td>13.5'</td>
<td>13.5'</td>
<td>13.5'</td>
</tr>
<tr>
<td>SIZE: 4'-6&quot;</td>
<td>SIZE: 4'-6&quot;</td>
<td>SIZE: 4'-6&quot;</td>
<td>SIZE: 4'-6&quot;</td>
</tr>
<tr>
<td>10' - 14'</td>
<td>6.5'</td>
<td>6.5'</td>
<td>6.5'</td>
</tr>
<tr>
<td>10' - 14'</td>
<td>6.5'</td>
<td>6.5'</td>
<td>6.5'</td>
</tr>
<tr>
<td>20' - 28'</td>
<td>13.5'</td>
<td>13.5'</td>
<td>13.5'</td>
</tr>
<tr>
<td>20' - 28'</td>
<td>13.5'</td>
<td>13.5'</td>
<td>13.5'</td>
</tr>
</tbody>
</table>

### WALL THICKNESS

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
<td>Outside</td>
</tr>
<tr>
<td>20' - 40'</td>
<td>23'</td>
<td>23'</td>
<td>23'</td>
</tr>
<tr>
<td>20' - 40'</td>
<td>23'</td>
<td>23'</td>
<td>23'</td>
</tr>
<tr>
<td>28' - 40'</td>
<td>26'</td>
<td>26'</td>
<td>26'</td>
</tr>
<tr>
<td>28' - 40'</td>
<td>26'</td>
<td>26'</td>
<td>26'</td>
</tr>
</tbody>
</table>

### WALL DEPTH SCHEDULE

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
<th>WALL DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside</td>
<td>Outside</td>
<td>Inside</td>
<td>Outside</td>
</tr>
<tr>
<td>10' - 14'</td>
<td>6.5'</td>
<td>6.5'</td>
<td>6.5'</td>
</tr>
<tr>
<td>10' - 14'</td>
<td>6.5'</td>
<td>6.5'</td>
<td>6.5'</td>
</tr>
<tr>
<td>20' - 28'</td>
<td>13.5'</td>
<td>13.5'</td>
<td>13.5'</td>
</tr>
<tr>
<td>20' - 28'</td>
<td>13.5'</td>
<td>13.5'</td>
<td>13.5'</td>
</tr>
</tbody>
</table>

### REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>GRADE 60 AREA (in.²/ft)</th>
<th>GRADE 60 AREA (in.²/ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWR EQUIV. AREA*</td>
<td>WWR EQUIV. AREA*</td>
</tr>
<tr>
<td>65 KSI (450 MPa)</td>
<td>70 KSI (480 MPa)</td>
</tr>
<tr>
<td>A12</td>
<td>A6</td>
</tr>
<tr>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>B10</td>
<td>B6</td>
</tr>
<tr>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>C6.5</td>
<td>C6.5</td>
</tr>
<tr>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>D7</td>
<td>D7</td>
</tr>
<tr>
<td>0.53</td>
<td>0.53</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>D4.5</td>
<td>D4.5</td>
</tr>
<tr>
<td>0.53</td>
<td>0.53</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>E3</td>
<td>E3</td>
</tr>
<tr>
<td>0.73</td>
<td>0.73</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>E5</td>
<td>E5</td>
</tr>
<tr>
<td>1.06</td>
<td>1.06</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>F3.5</td>
<td>F3.5</td>
</tr>
<tr>
<td>1.06</td>
<td>1.06</td>
</tr>
<tr>
<td>3.5</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>G5</td>
<td>G5</td>
</tr>
<tr>
<td>1.45</td>
<td>1.45</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>H6</td>
<td>H6</td>
</tr>
<tr>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*Equivalent Area Welded Wire Reinforcing may be substituted in accordance with Index 425-001.

### WALL REINFORCING SPLICE DETAILS (ALTERNATE B)

#### Option 1) Lap Splice:
At Quarter Point (30 Bar Diameter Or Vertical Wire Spacing Plus 2" For WWR)

#### Option 2) Lap Splice:
With Standard 40 Hooks At Corners (8 For #4, 10 For #5, 12 For #6)

#### Option 3) Lap Splice:
Corner Spliced Bar (30 Bar Diameter, But Not Less Than Two Vertical Wire Spacing Plus 2" For WWR)
Inlet Or Riser
For C-I-P Inlets
6" Ø Concrete Post
Corner Fillets (See Note 6)
5'-9" (Tied to Bars 4A)
Bar 4E @ 5" Bottom
Bars 4B @ 5" Bottom
Bars 4H @ 5" Sp.
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.

GENERAL NOTES
1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. For inlets constructed on a curve, refer to the plans to determine the radius, and modify the inlet details accordingly. Bend steel when necessary.
3. All reinforcing steel to be Grade 60 bars with 1½" minimum cover unless otherwise shown, see Sheet 4 for equivalent area Welded Wire Reinforcement details.
4. Inlet tops shall be either cast-in-place or precast concrete. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer.
5. Concrete meeting the requirements of ASTM C478 (4,000 psi) may be used in lieu of Class II concrete for precast units, manufactured in plants which meet the requirements of Section 448 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 border 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.

GENERAL NOTES
1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. For inlets constructed on a curve, refer to the plans to determine the radius, and modify the inlet details accordingly. Bend steel when necessary.
3. All reinforcing steel to be Grade 60 bars with 1½" minimum cover unless otherwise shown, see Sheet 4 for equivalent area Welded Wire Reinforcement details.
4. Inlet tops shall be either cast-in-place or precast concrete. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer.
5. Concrete meeting the requirements of ASTM C478 (4,000 psi) may be used in lieu of Class II concrete for precast units, manufactured in plants which meet the requirements of Section 448 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 border 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.
GENERAL NOTES

1. This inlet is used in Traffic Separators Types I and II, or, in separators constructed with Curbs Types A, B and E and sidewalk paving which cannot accommodate inlets Types 1, 2, 3, 4, 5, or 6. Use of this inlet on through traffic side of the separator is not permitted in medians with Curbs Types A and B. Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 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.

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.

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

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

For supplementary details see Index 425-001.
GENERAL NOTES

1. This inlet is to be used only in Traffic Separators Types IV and V; or, in separators constructed with Curbs Types D and F and sidewalk paving, which cannot accommodate Inlets Types 1, 2, 3, 4, 5 or 6. Use of this inlet on the through traffic side of the separator should be avoided in medians constructed with Curbs Type D (Curbs 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 10".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, Inlets with All 8 bottoms, Index 425-010 are recommended. Locate inlet outside of pedestrian way.

4. For supplemental details and notes see Index 425-001.

5. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, Inlets with All 8 bottoms, Index 425-010 are recommended. Locate inlet outside of pedestrian way.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 8). Each.

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>AREA (in²/ft.)</th>
<th>MAX SPACING (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>1/4</td>
<td>14</td>
</tr>
<tr>
<td>2-4</td>
<td>1/2</td>
<td>12</td>
</tr>
<tr>
<td>4-6</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>6-10</td>
<td>1.5</td>
<td>8</td>
</tr>
<tr>
<td>10-15</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>15-20</td>
<td>2.5</td>
<td>4</td>
</tr>
<tr>
<td>20-30</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>30-50</td>
<td>3.5</td>
<td>1</td>
</tr>
</tbody>
</table>

Modified to standard plans for FHWA FY 2020-21 Standard Plans.
**LONGITUDINAL SECTION**

**FRAME AND GRATE**

**TRANSVERSE SECTION**

**TOP VIEW**

**SECTION BB** (SEE NOTE 6 BELOW)

**SECTION AA** (SEE NOTE 6 BELOW)

**TOP SLABS**

**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 threaded Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

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

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

4. All steel in slab tops shall have 1/2" minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

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

6. When used on a structure with dimensions larger than those detailed above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 24" x 36". The "Special Top Slab" on Index 425-010 is not permitted.

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

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible, right or left.
This inlet is primarily intended for locations with light flows where right of way does not permit the use of throated Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

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

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

4. All steel in slab tops shall have 15° minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

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

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

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

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

1. Whole called for in the Plans, use this inlet in conjunction with median or shoulder barrier per Index 521-001 or a barrier with junction slab and wall coping per Index 521-610. The inlet is suitable for bicycle and occasional pedestrian traffic, with roller bar installation (see INSET B), but should not be placed in a designated pedestrian travel way.

2. Inlets located in embankments constructed with earth anchored retaining wall shall be designed with minimum depths to reduce adverse impact on the anchorage system. Runs of pipe parallel to and near anchored wall shall be avoided wherever practical. Special coordination must be exercised during the design and construction of storm water systems within anchored wall systems.

3. Inlet bottoms and/or tops may be either precast or cast-in-place. Whether cast as a single unit or as multiple segments, and whether precast or cast-in-place, the upper 2'-3" of the inlet shall be reinforced in accordance with sections CC, DD, and EE.

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

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

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

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

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

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

10. Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.
GENERAL NOTES:

1. Where called for in the Plans, use this inlet in conjunction with Curb and Gutter Barrier per Index 521-001. Construct Barrier segments shown herein in accordance with requirements of Index 521-001, including connections to adjacent barrier segments using the Doweled Joint.

2. Reinforcing shown is grade 60 steel bars. For the equivalent area of welded wire reinforcement for the inlet, see Index 425-001. Reinforcing shall have 2" minimum cover unless otherwise shown. Trim or bend bars to provide 1/8" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier.

For Bar Bending Details of Bars 5L425 & 5S04, 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 1/2" chamfer or 1/2" radius to all exposed concrete edges.

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

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

7. When Alternate E 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 bar grade elevation, minus either the flow line elevation of the longest 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.

10. For inlets placed in areas of bicycle traffic, provide the extended crossbar or extended grate is to be hot-dip galvanized after fabrication.

For Alternates B bottoms, Index 425-032.

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

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

**Section A-A**

**Transition Barrier**

Begin Cross-Slope Transition (Align with Curb and Gutter Barrier, See Index 521-001)

**Section B-B**

**Transition Barrier**

End Cross-Slope Transition (Align with Inlet Structure)

**Section C-C**

**Barrier Over Inlet Structure**

(Throat Fully Transitioned)

**Barrier Sections**
**SECTION DD**

- Precast 6"
- Gap 1'-0" (Pipe Opening Shown)
- 9" PIPE SIZE

**SECTION AA**

- Inlet 8"
- Precast 1'
- Precast 6"
- Inset 8"

**SECTION BB**

(CAST-IN-PLACE INLET SHOWN, PRECAST INLET SIMILAR)
- #4 Bars @ 12" Ctrs.
- #4 Bars @ 12" Ctrs. (8" Slab)

**SECTION CC**

- Gutter Transition 9" (C-I-P)
- Gutter Transition 9'-0"

**DETAIL**

- Detail of Bar Stub

**SHOULDER GUTTER TRANSITION**

- To Be Paid For As Inlet
- To Be Paid For As Shoulder Gutter
- Center of Box
- Stake/offset Location
- Back Of Inlet

**SECTION FF**

- Top Views

**SECTION EE**

- Steel Grate

**GENERAL NOTES**

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

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for 1/8" radius.

3. All exposed edges and corners must be 3/4" chamfer or rounded to 1/4" radius.

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

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

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

7. Inlets to be paid for under the contract unit price for inlets (Gutter Type S). A cost of concrete apron at terminal inlets to be included in the cost of the inlet.

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-10&quot; or 3'-0&quot;</td>
<td>24&quot;</td>
</tr>
</tbody>
</table>

**Note:** Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail 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>
<th>.BARS</th>
<th>.WWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>A12</td>
<td>0.20</td>
<td>2'</td>
<td>4</td>
<td>1&quot;</td>
</tr>
<tr>
<td>5'-9&quot;</td>
<td>425-001</td>
<td>0.20</td>
<td>2'</td>
<td>4</td>
<td>1&quot;</td>
</tr>
<tr>
<td>9'-12&quot;</td>
<td>425-001</td>
<td>0.20</td>
<td>2'</td>
<td>4</td>
<td>1&quot;</td>
</tr>
<tr>
<td>9'-15&quot;</td>
<td>425-001</td>
<td>0.20</td>
<td>2'</td>
<td>4</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

**TOP VIEWS**

**INLET WITH STRUCTURE BOTTOM**

**NOTE:** Alt. B Structure Bottom Only. See Index 425-010.

For structure bottom details and hole reinforcement.

**INLET TYPE S**

**FY 2020-21 STANDARD PLANS**

**GUTTER INLET TYPE S**

**INDEX**

**425-040**

**1 of 3**
Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter

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

**TOP SLAB OPENINGS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8'-0&quot; to 10'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>3'-3&quot; x 3'-10&quot;</td>
</tr>
</tbody>
</table>

**TOP SLAB REINFORCING DIAGRAM**

- Centered Opening
- Round Structure Bottom (Centered Opening - See Index 425-020 For Structure Bottom Details and Hole Reinforcement)
- #8 Bars @ 5" Spacing
- 2 Way Reinforcement See Tables

**TOP SLAB WITH CENTERED OPENING**

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 5'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5&quot;&lt;30&quot;</td>
<td>9/16&quot;</td>
<td>C</td>
</tr>
<tr>
<td>30'-40'</td>
<td>9/16&quot;</td>
<td>D</td>
</tr>
<tr>
<td>SIZE: 6'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5&quot;&lt;30&quot;</td>
<td>9/16&quot;</td>
<td>B</td>
</tr>
<tr>
<td>30'-40'</td>
<td>9/16&quot;</td>
<td>C</td>
</tr>
<tr>
<td>SIZE: 8'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5&quot;&lt;30&quot;</td>
<td>11/16&quot;</td>
<td>C</td>
</tr>
<tr>
<td>30'-40'</td>
<td>11/16&quot;</td>
<td>D</td>
</tr>
</tbody>
</table>

**GUTTER INLET TYPE S**

- Centered Inlet
- Structure Bottom
- 2 Way Reinforcement See Tables

**TOP SLAB REINFORCING SCHEDULE**

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>OR 65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.27</td>
</tr>
<tr>
<td>D</td>
<td>0.31</td>
</tr>
<tr>
<td>E</td>
<td>0.33</td>
</tr>
<tr>
<td>F</td>
<td>0.36</td>
</tr>
<tr>
<td>G</td>
<td>1.35</td>
</tr>
</tbody>
</table>
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 1/2".

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

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

6. For supplementary details see Index 425-001.

7. Inlet to be paid for under the contract unit price for Inlets (Gutter Type V), EA

HORIZONTAL WALL REINFORCING
SCHEDULE (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' - 5'</td>
<td>A12</td>
</tr>
<tr>
<td>5' - 9'</td>
<td>A6</td>
</tr>
<tr>
<td>9' - 12'</td>
<td>A4</td>
</tr>
<tr>
<td>12' - 15'</td>
<td>B5.5</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 below detail above and Index 425-010.
Alt. A Structure Bottom for Inlet Type V
NOTE: All B Structure Bottom Only. See Index 425-010 for Structure Bottom Details and Hole Reinforcement.

INLET WITH STRUCTURE BOTTOM

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 1/2". See Index 425-001 for equivalent area of welded wire fabric.

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

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

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

6. For supplemental details see Index 425-001.

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

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

DETOURED INFILTRATION AREA

1/4" Preformed Joint Filler

Pipe Size

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>3'-1&quot;</td>
<td>18&quot; Where An 18&quot; pipe Enters A 2'-0&quot; Wall</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.

RECOMMENDED MAXIMUM PIPE SIZES

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>3'-1&quot;</td>
<td>18&quot; Where An 18&quot; pipe Enters A 2'-0&quot; Wall</td>
</tr>
</tbody>
</table>

Pipe Size

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>3'-1&quot;</td>
<td>18&quot; Where An 18&quot; pipe Enters A 2'-0&quot; Wall</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.

SECTION DD

Ditch Bottom (Paved Or Unpaved Ditches)

Flow

Ditch Block (Low Side Of Inlet On Continuous Ditches)

SIDE SLOPE

Center Of Box

Eyebolt (See Index 425-001)

2' 3" Conc. Ditch Pavt.

Pipe Opening Shown)

PLAN

SECTION CC

SECTION AA

(Pipe Opening Shown)

SECTION BB

(Pipe Opening Not Shown)
ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; To 8'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Top Slab with Centered Opening

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

Centered Structure Bottom (2'-0" Min. Length)

#4 Bar Each Corner

#5 Hoop Bar (Peripheral Reinforcement)

TOP SLAB REINFORCING DIAGRAM

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 60 (BAR) OR 65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.26</td>
</tr>
<tr>
<td>B</td>
<td>0.38</td>
</tr>
<tr>
<td>C</td>
<td>0.53</td>
</tr>
<tr>
<td>D</td>
<td>0.73</td>
</tr>
<tr>
<td>E</td>
<td>1.05</td>
</tr>
<tr>
<td>F</td>
<td>1.55</td>
</tr>
</tbody>
</table>

Top Slab with Centered Opening

SIZE: 4'-0"

SIZE: 5'-0"

SIZE: 6'-0"

SIZE: 8'-0"

ALT. A STRUCTURE BOTTOM FOR INLET TYPE A
**Section EE**

**Ditch Block**

**Concrete Inlet Paving and Sodding**

**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>30&quot;</td>
</tr>
</tbody>
</table>

*Note: Recommended sizes are for concrete pipe. Sizes for other types of pipes must be verified for fit in accordance with Index 425-001. For larger pipe see bottom details above and Index 425-010.*
1. The general purpose of the inlet top designs are:
   a. For ditches, medians or other areas subject to heavy wheel loads. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. Inlet not suitable for bicycle traffic.
   b. Provide full grade and horizontal slot designs for new construction.
   c. Provide full grade and horizontal slot designs for replacing the vertical slot tops on existing Inlets Type B and Type X that are in locations subject to occasional pedestrian traffic.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for min. 1/2" clearance around pipe.

3. All exposed edges and corners shall be 1/2" chamfered or tooled to 1/4" 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 traversable tops on new inlet boxes shall be included in the contract unit price for Inlets (DT BOT) (Type B), EA., and shall include the cost for surrounding concrete inlet pavement. Existing Inlets Type B and Inlets Type X that are converted to traversable inlet tops shall be paid for under the contract unit price for Inlets (DT BOT) (Type B) (Partial), EA. Unit price and payment shall be full compensation for inlet conversion and shall include the removal of any existing concrete inlet pavement; the removal and stockpiling or disposal of sufficient material from the existing inlet box to facilitate construction of the required inlet top; construction of the required inlet conversion; backfill construction; construction of concrete inlet pavement; reusing, supplementing, transferring or replacing grates as required by plans or as directed by the Engineer; any required earthwork for ditch restoration within 30' of the inlet, and, restoration of disturbed turf.

6. Ditch pavement shall be paid for, separate from the inlet and concrete inlet pavement, by pavement types and units as called for in the plans.

7. sod will be paid for under the contract unit price for Performance Turf, SY.

8. For supplementary details see Index 425-001.

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

**DESIGN NOTES**

1. The type of top (single or double slots) depends on the approach ditch configuration and the hydraulic requirements of the site. The designer will stipulate in the plans the type of top to be constructed at each individual inlet location.

2. On existing inlets, conversion 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 to support storm water detention, details for ditch modifications and underdrains shall be shown in the plans.

**MAINTENANCE NOTES**

1. Traversable inlet tops that are constructed by maintenance contract or by maintenance forces may reuse the existing grates that are determined by the Maintenance Engineer to be functionally sound, and their reuse is so directed by the Maintenance Engineer. Existing grates approved for reuse and new grates may be mixed, matched or replaced as directed by the Maintenance Engineer.
Top Slab Reinforcing Diagram

**Section AA**

- Top Slab Openings
  - **Diameter** | **Opening Size**
  - MIN | MAX
  - 6'-0" to 8'-0" | 7'-8" x 4'-2" to 7'-10" x 4'-2"

- Top Slab Reinforcing Diagram
  - #5 Hoop Bar (Peripheral Reinforcement)
  - #5 Bar Each Corner (2'-0" Min. Length)
  - 2 Way Reinforcement
    - See Tables

**Section BB**

- Centered Opening
- Top Slab with Bottom Details and Hole Reinforcement

**Top Slab Reinforcing Schedule**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Grade 60 (Bar) on 65 ksi &amp; 70 ksi (Wire Fabric)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.27</td>
</tr>
<tr>
<td>D</td>
<td>0.53</td>
</tr>
<tr>
<td>E</td>
<td>0.73</td>
</tr>
<tr>
<td>F</td>
<td>1.06</td>
</tr>
<tr>
<td>G</td>
<td>1.45</td>
</tr>
</tbody>
</table>

**Top Slab with Centered Opening**

<table>
<thead>
<tr>
<th>Slab Depth</th>
<th>Slab Thickness</th>
<th>Reinforcing (2 Ways) Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 &lt; B</td>
<td>9/16</td>
<td>B</td>
</tr>
<tr>
<td>B &lt; 18&quot;</td>
<td>9/16</td>
<td>C</td>
</tr>
<tr>
<td>18&quot; &lt; 30&quot;</td>
<td>9/16</td>
<td>D</td>
</tr>
<tr>
<td>30&quot; &lt; 37&quot;</td>
<td>9/16</td>
<td>E</td>
</tr>
<tr>
<td>37&quot; - 40&quot;</td>
<td>9/16</td>
<td>G</td>
</tr>
</tbody>
</table>

**Size: 8'-0"**

<table>
<thead>
<tr>
<th>Width (in.)</th>
<th>Slab Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-8&quot;</td>
<td>11/2&quot;</td>
</tr>
<tr>
<td>3'-10&quot;</td>
<td>11/2&quot;</td>
</tr>
</tbody>
</table>

**Plan Dimensions**

- Precast Centered Inlet Structure Bottom
- Top Slab with Centered Opening
- Round Structure Bottom
  - See Index 425-010 For Structure Bottom Details and Hole Reinforcement

**Top Slab with Centered Opening**

- #5 Hoop Bar
- #5 Bars Each Corner
- 2 Way Reinforcement
  - See Tables
- #8 Bars @ 5' Spacing
**HORIZONTAL WALL REINFORCING 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' 8'</td>
</tr>
</tbody>
</table>

**TYPE C**

Recommended Maximum Pipe Size:

- 2'-0" Wall - 18" Pipe
- 3'-0" Wall - 24" Pipe

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 2)**

<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'-6'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>6'-10'</td>
<td>A6</td>
<td>0.20</td>
<td>6' 5'</td>
</tr>
<tr>
<td>10'-15'</td>
<td>C6.5</td>
<td>0.24</td>
<td>10' 5'</td>
</tr>
</tbody>
</table>

**TYPE D**

Recommended Maximum Pipe Size:

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

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 3)**

<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'-6'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>6'-10'</td>
<td>A4</td>
<td>0.20</td>
<td>4' 3'</td>
</tr>
<tr>
<td>10'-13'</td>
<td>C6.3</td>
<td>0.27</td>
<td>8' 5'</td>
</tr>
</tbody>
</table>

**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' 8'</td>
</tr>
</tbody>
</table>

**TYPE C**

Recommended Maximum Pipe Size:

- 2'-0" Wall - 18" Pipe
- 3'-0" Wall - 24" Pipe
horizontally aligned

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 2)**

<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'-6'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>6'-10'</td>
<td>A6</td>
<td>0.20</td>
<td>6' 5'</td>
</tr>
<tr>
<td>10'-15'</td>
<td>C6.5</td>
<td>0.24</td>
<td>10' 5'</td>
</tr>
</tbody>
</table>

**TYPE D**

Recommended Maximum Pipe Size:

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

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 3)**

<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'-6'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>6'-10'</td>
<td>A4</td>
<td>0.20</td>
<td>4' 3'</td>
</tr>
<tr>
<td>10'-13'</td>
<td>C6.3</td>
<td>0.27</td>
<td>8' 5'</td>
</tr>
</tbody>
</table>

**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' 8'</td>
</tr>
</tbody>
</table>

**TYPE C**

Recommended Maximum Pipe Size:

- 2'-0" Wall - 18" Pipe
- 3'-0" Wall - 24" Pipe
horizontally aligned

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 2)**

<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'-6'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>6'-10'</td>
<td>A6</td>
<td>0.20</td>
<td>6' 5'</td>
</tr>
<tr>
<td>10'-15'</td>
<td>C6.5</td>
<td>0.24</td>
<td>10' 5'</td>
</tr>
</tbody>
</table>

**TYPE D**

Recommended Maximum Pipe Size:

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

**HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 3)**

<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'-6'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>6'-10'</td>
<td>A4</td>
<td>0.20</td>
<td>4' 3'</td>
</tr>
<tr>
<td>10'-13'</td>
<td>C6.3</td>
<td>0.27</td>
<td>8' 5'</td>
</tr>
</tbody>
</table>

**TYPE E**

Recommended Maximum Pipe Size:

- 3'-0" Wall - 24" Pipe
- 4'-0" Wall - 36" Pipe
HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 4)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
<th>WWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-5'</td>
<td>B3.5</td>
<td>0.24</td>
<td>5/6'</td>
<td>2'</td>
</tr>
<tr>
<td>5'-7'</td>
<td>C6.5</td>
<td>0.37</td>
<td>6/10'</td>
<td>6'</td>
</tr>
<tr>
<td>7'-10'</td>
<td>D4.5</td>
<td>0.53</td>
<td>4/6'</td>
<td>4'</td>
</tr>
</tbody>
</table>

TYPE H (2 & 3-GRATE INLET)

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

GENERAL NOTES

See Sheet 3 of 7.

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 5)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
<th>WWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-0&quot;</td>
<td>C3.5</td>
<td>0.37</td>
<td>3/6'</td>
<td>3'</td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td>D4.5</td>
<td>0.53</td>
<td>4/6'</td>
<td>4'</td>
</tr>
</tbody>
</table>

TYPE H (4-GRATE INLET)

Recommended Maximum Pipe Size:
- 3'-0" Wall - 24" Pipe
- 8'-9" Wall - 1-30" Pipe
Or 2-30" Pipe (S=4'-3")

GENERAL NOTES

See Sheet 3 of 7.
1. These inlets are suitable for bicycle traffic and are to be used in ditches, medians and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to any heavy wheel loads. These inlets may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. Inlets subject to minimal debris should be constructed without slots. 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 ½” chamfer or tooled to ¼” radius.

6. Concrete inlet pavement to be used on inlets without slots and inlets with non-traversable slots only when called for in the plans; but required on all traversable slot inlets. Cost to be included in contract unit price for inlets.

7. Traversable slots constructed in existing inlets shall be paid for as inlets partial. For conversion work and method of payment see TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS.

8. Sodding to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, 5t.

9. For supplementary details see Index 425-001.

10. All reinforcing is Grade 60 bars with 2” min. cover unless otherwise noted. Bars to be cut or bent for 1½” clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.
## FOR TRAVERSABLE SLOTS

### PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Pavement</th>
<th>Single Slot</th>
<th>Double Slot</th>
<th>Single Slot</th>
<th>Double Slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>SY</td>
<td>4.85</td>
<td>0.77</td>
<td>4.16</td>
<td>0.83</td>
</tr>
<tr>
<td>D</td>
<td>SY</td>
<td>5.99</td>
<td>0.91</td>
<td>7.70</td>
<td>1.10</td>
</tr>
<tr>
<td>E</td>
<td>SY</td>
<td>5.88</td>
<td>0.91</td>
<td>7.37</td>
<td>1.08</td>
</tr>
</tbody>
</table>

### TRAVERSABLE SLOTS

- **PLAN VIEW**
- **SECTION AA**
- **SECTION BB**
- **SECTION CC**

**Concrete Inlet Pavement**
- Hand Shape to Neat Lines

**Flow**
- Ditch Width

**Ditch Bottom Inlet Types C, D, E and H**

**Concrete Inlet Pavement**
- Hand Shape to Neat Lines

**Flow**
- Ditch Width

**Ditch Bottom Inlet Types C, D, E and H**

**Concrete Inlet Pavement**
- Hand Shape to Neat Lines

**Flow**
- Ditch Width
DITCH BLOCK FOR INLETS WITH OR WITHOUT SLOTS

PAVEMENT AND SODDING QUANTITIES

<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>4.87</td>
<td>0.83</td>
</tr>
<tr>
<td>D</td>
<td>5.99</td>
<td>1.01</td>
</tr>
<tr>
<td>E</td>
<td>5.86</td>
<td>0.99</td>
</tr>
</tbody>
</table>

NOTE: For plan view and additional details see Sheet 4 of 7.

TRAVERSABLE SLOTS FOR EXISTING INLETS
### DESIGN NOTES FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

1. The general purpose of these conversions is to remove the hazard of the protruding inlet top, while not creating a hazard by depressing the top too deeply.

2. The corrective procedure depends on the approach ditch grade and hydraulic requirements of the site. The selection of the appropriate case depends on the relationship between inlet top and ditch elevation, and, on the vertical clearance between the top of the uppermost pipe(s) and the grate. The purpose for the Case 1 conversion is to add the traversable slot to an existing inlet where top removal, change in grade elevation and ditch transitions are not required. Case 2 will normally be applicable to ditches with 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 whether ditch reconstruction is required more than 35 feet beyond any traversable slot side and shall include separate pay items in the plans to cover the cost for that portion of required ditch reconstruction exceeding the 35 foot limit. The designer shall also determine whether ditch pavement is required for ditch restoration within the 35 foot limit and include that pavement under a pay item separate from the inlets partial.

When the detention ditch concept is to be used with Case 3, the designer shall stipulate Case 3 (Detention) in the plans.

The designer shall determine whether light soil or other conditions at each individual inlet indicates the need for underdrain in Case 3 conversions and shall call for Underdrain, Type I in the plans.

### METHOD OF PAYMENT FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

1. Existing inlets converted to traversable slot tops under Cases 1, 2 and 3 shall be paid for as inlets partial, each. Case shall not be included in the pay item description.

2. All ditch reconstruction work within 35 feet of each traversable slot conversion, whether required by these details or as a direct result of the conversion, shall be included as a part of the partial cost. Reconstruction work shall include excavation and removal of surplus materials or borrow materials in place, grading, compaction, shaping and restoration of disturbed turf. Sodding, ditch pavement and underdrain are not included as part of the inlet partial cost and are to be paid for separately.

3. Concrete inlet pavement and sodding shall be paid in accordance with the sections on this detail and with the Plan on Sheet 4 and Sections AA, BB and CC (as Case 1) and tabular quantities on Sheet 5.

4. Unit price and payment shall constitute full compensation for inlet conversion (including concrete inlet paving and replacement grate(s)), ditch reconstruction, restoration of disturbed turf, and shall be paid under the contract price for inlets (DT Bot) (Type __) (Partial), each.

Sodding shall be paid for under the contract unit price for Performance Turf, SY. Ditch pavement shall be paid for separately from the inlet partial costs and billed as called for in the plans.
ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D AND E

**SECTION AA**

**TOP VIEW**

**TOP SLAB OPENINGS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>2' x 3'</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>2' x 3'</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>2' x 3'</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**TOP SLAB REINFORCING DIAGRAM**

- #4 Bar Each Corner (2'-0" Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement See Tables

**TOP SLAB REINFORCING SCHEDULE**

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 60 (BAR)</th>
<th>GRADE 50 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
<td>60 KSI</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
<td>50 KSI</td>
</tr>
<tr>
<td>C</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**TOP SLAB WITH CENTERED OPENING**

- #5 Hoop Bar Each Corner
- #8 Bars @ 5" Spacing
- See Tables 2 Way Reinforcement and Hole Reinforcement.

**SECTION BB**

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

**PIPE OPENING SCHEMATIC**

See Index 425-010 for structure bottom details and hole reinforcement.
2. Cost of paving to be included in cost of inlet.

Notes:
1. Pavement and/or sod to be used only where called for in the plans.

PAVEMENT AND SODDING

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) (I Bot, Depth), Ea.

4. All exposed edges and corners shall be ½" chamfer or tooled to ½" 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 one #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.

2. Cost of paving to be included in cost of inlet.
Ditch Bottom Inlet Types F and G

**TYPE G INLET (TABLE 2)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' - 3'</td>
<td>A12</td>
<td>0.20</td>
<td>12'</td>
</tr>
<tr>
<td>4' - 7'</td>
<td>A6</td>
<td>0.20</td>
<td>6'</td>
</tr>
<tr>
<td>7' - 10'</td>
<td>B5.5</td>
<td>0.24</td>
<td>10'</td>
</tr>
<tr>
<td>10' - 15'</td>
<td>C6.5</td>
<td>0.37</td>
<td>15'</td>
</tr>
</tbody>
</table>

**STEEL GRATE**

5" Steel Decking, Weight 930 Lbs. Main Bars 5" x 1/8"
Intermediate Bars 1/2" x 1/8". Reticuline Bars 1/8" x 1/8".

**TYPE G**
This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

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

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

4. When alternate C grate is specified in plans the grate is to be hot dip galvanized after fabrication.

5. For supplemental details, see Index 425-001.

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

7. Cost of ditch paving to be included in cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.
DESCRIPTION:

DITCH BOTTOM INLET TYPE J

SECTION CC

- Ditch Bottom
- Toe Wall Required (Paved or Unpaved Ditches)
- 6" Side Slope
- Ditch Block (Low Side of Inlet on Continuous Ditches)
- 1:30
- 1:20
- 1'-6"
- 1'-5"
- 4'-3" Out To Out
- 4" x 3" x 3/4" Each End
- Weld Main Bars To 4
- (See Detail Below)
- Details: Two Required Per Inlet

SECTION DD

- Ditch Block
- Side Slope
- Main Bars 5" x 1/4" (Notched For Cross Bars)
- Cross Bars 1/2" x 1/2" (Continuously Welded At Main Bar Notches)
- Main Bars and Cross Bars Flush on Top
- Note: Two Required Per Inlet

PAVEMENT & SODDING

- 1' 6"
- 1' 5"
- 1' 5"
- 1' 5"
- 4' 3" Out To Out

STEEL GRATING

- V60 Preformed Joint Filler
- 2 Sod All Around (Total 9 SY)
- 3" Conc. Ditch Pavt.

INDEX

425-054

11/01/17

REVOCATION

REVISON

STANDARD PLANS

FY 2020-21

4 of 2

10/29/2019

8:15:58 AM
**GENERAL NOTES**

1. This inlet is to be used 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 1⁄2 chamfer or tooled to 1⁄2 radius.

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

6. All reinforcing is Grade 60 with 2” min. cover unless otherwise noted. See Index 42-001 for equivalent area of welded wire reinforcing (WWR). Bars to be cut or bent for 1/2” clearance around pipe opening. Bend top and corner bars to clear anchor holes.

7. Channel section C 3x6 at 14” max. bar spacing may be used as an alternate for the C 4x5.4 channel at 15” bar spacing.

8. Channels and bars for grate shall be ASTM A242/A242M, A572/A572M or A588/A588M, Grade 50 steel, and galvanized in accordance with Specification 975.

9. Fence enclosure shall be Fence Type B (Index 550-002). All posts to be set in concrete. A minimum of 10 posts required. Corner and approach side posts to be 3” nominal diameter.

10. Cost of ditch paving, anti-vortex wall, grate, concrete, reinforcing steel and fence enclosure to be included in the cost of inlet. Inlet to be paid for under the contract unit price for Inlets (DT Bot) (Type K). Each.

11. Anchor bolts shall be ASTM F1554 Grade 36 fully threaded headless bolts, installed in accordance with Specification 416 and 937. Nuts shall be ASTM A563 or A594 and washers shall be ASTM F336 or Type A plain washers. All nuts, bolts and washers shall be galvanized.

**SECTION BB**

**INLET LENGTHS (L) GREATER THAN OR EQUAL TO 9’ (DOUBLE LAYER WALL REINFORCING)**

**SECTION AA**

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

**INDEX**

425-055

1 of 2
INLET TYPE C (MODIFIED)

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

Notes:
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.
3. 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>C</th>
<th>Concrete Class I (CY)</th>
<th>Sand-Cement Riprap (CY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4'-9&quot;</td>
<td>2.3</td>
<td>1.1</td>
</tr>
<tr>
<td>18</td>
<td>5'-3&quot;</td>
<td>2.6</td>
<td>1.3</td>
</tr>
<tr>
<td>24</td>
<td>6'-3&quot;</td>
<td>3.3</td>
<td>1.8</td>
</tr>
</tbody>
</table>
YARD DRAIN ITEM INCLUDES:

1. 15" x 15" x 12" Concrete or PVC Tee & long.
2. Grate diameter = 14-½" 
   Thickness = 2-½"
   Flow area = 45 sq in min.
   Light Duty Cast Iron, see Specification Section 962.
3. 12" pipe as necessary.
4. 0.04 Cubic yards concrete for slab.

YARD DRAINS

Notes:
1. Yard drains to be located outside the R/W. Drainage area should not exceed 750 SF (grate flow 0.1 Cfs).
2. Yard drains may be constructed at the option of the property owner as shown on the plans.
3. Cost of plugs and collars to be included in the cost for 15" pipe. For collar and plug details see index 430-001.
4. Yard drains to be paid for under the contract unit price for Yard Drains, EA.

SHALLOW DITCHES

Notes:
1. To be constructed at locations as directed by the Engineer.
2. Either cast iron pipe or PVC rigid conduit, U.L. listed for direct sunlight exposure, Schedule 40, may be used.
3. Pipe and Mitered End to be paid for under the contract unit price for either Cast Iron Soil Pipe (Standard) (4"), or PVC Pipe For Back Of Sidewalk Drainage (4"), ID.
**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 1/2'.

4. All reinforcement is ASTM A615/A615M Grade 60 steel, either smooth or deformed. Equivalent area grade 40 steel or 65 ksi welded wire fabric may be substituted.

5. Inlets to be paid for under the contract unit price for Inlets (Closed Flume) EA.
ENDWALL

SECTION AA

SECTION BB

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

*Bricks to Dissipate Energy:
When Called For In Plans,
Bricks To Be Included In
The Cost Of The Inlet.

The Middle Of Slab To Be Included In The
Cost Of The 4" Thick Slab And The 6"x6"
W2.5xW2.5 Min. Welded Wire Reinforcement In
The Width Of Sod To Be Included In The
Cost Of The Inlet.

#4 Steel Tie Bar

Curb & Gutter Type "F"

Sod For Flumes Without Sidewalk

2" Typ E.P.

4" Thick Concrete Slab
GENERAL NOTES

1. This skimmer is intended for use on Type C, D, or E Ditch Bottom Inlets that are used as outlet control structures of stormwater management facilities.

2. The side panels are dimensionally symmetric, therefore they may be used on either side of the structure.

3. Two (2) skimmers may be constructed on one structure provided they are on opposite ends.

4. The width of the front panel (dimension W) shall be the same as the outside dimension across the front of the structure.

5. The front panel, side panels, and flat bars are to be hot dip galvanized after fabrication.

6. The location of the reinforcing steel in these structures must conform to the applicable standards to avoid conflict with the expansion anchors used to attach the skimmer.

7. Grates to be used on the inlets unless otherwise specified in the plans.

8. A skimmer consists of two (2) side panels, one front panel, two (2) flat bars, and accessory hardware. The cost of skimmers is to be included in the cost of the inlet.

DESIGN NOTES

1. The designer must specify, in the plans, the skimmer height (dimension H) and the sides where the weir slots and skimmers are located. The skimmer height must be one of the dimensions shown in the table on Sheet 2. The skimmer should not be used on structure sides with outside dimensions greater than 6’-4”.

2. To minimize hydraulic losses across the skimmer, the flow area under the skimmer should be three times larger than the flow area of the weir slot. The distance between the pond bottom at the structure and the skimmer shall be not less than 1 foot.

3. The configuration of skimmers may be subject to regulatory requirements. The designer should coordinate the outlet control structure details with the permitting agencies.

4. Where this skimmer is used, the designer should reference this index with the outlet control structure details. Where a different skimmer design is needed, the designer should provide skimmer details in the plans.

5. The designer shall evaluate if a grate is needed for safety reasons. Where a grate is not needed for safety reasons and is not desirable for hydraulic or other reasons, the designer may omit the grate by stating so in the outlet control structure details.

6. The designer must show the configuration of the weir slots in the outlet control structure details.
**DIMENSIONS**

<table>
<thead>
<tr>
<th>Skimmer Height as Specified in the Plans</th>
<th>Bolt Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>D</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>inches</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>3(\frac{3}{8})</td>
</tr>
<tr>
<td>14</td>
<td>3(\frac{3}{8})</td>
</tr>
<tr>
<td>16</td>
<td>3(\frac{3}{8})</td>
</tr>
<tr>
<td>18</td>
<td>3(\frac{3}{8})</td>
</tr>
<tr>
<td>20</td>
<td>4(\frac{3}{8})</td>
</tr>
<tr>
<td>22</td>
<td>4(\frac{3}{8})</td>
</tr>
<tr>
<td>24</td>
<td>4(\frac{3}{8})</td>
</tr>
<tr>
<td>26</td>
<td>4(\frac{3}{8})</td>
</tr>
<tr>
<td>28</td>
<td>4(\frac{3}{8})</td>
</tr>
<tr>
<td>30</td>
<td>5(\frac{3}{8})</td>
</tr>
<tr>
<td>32</td>
<td>5(\frac{3}{8})</td>
</tr>
<tr>
<td>34</td>
<td>5(\frac{3}{8})</td>
</tr>
<tr>
<td>36</td>
<td>6(\frac{3}{8})</td>
</tr>
<tr>
<td>38</td>
<td>6(\frac{3}{8})</td>
</tr>
<tr>
<td>40</td>
<td>6(\frac{3}{8})</td>
</tr>
</tbody>
</table>

**TOP VIEW**

**SIDE VIEW**

**END VIEW**

**SIDE PANEL**

**FRONT PANEL**

**END VIEW (FRONT)**

**END VIEW**

**SIDE VIEW**

**FRONT VIEW**

**TOP VIEW**
NOTES:
1. These details are for construction field expediency to resolve utility conflicts that cannot be remedied by relocation. For conflicts determined during design, use the construction shop drawings for structure details.
2. Concrete used in conflict structures shall be as specified in ASTM C476. 4000 psi may be used in lieu of Class I concrete.
3. Maximum opening for pipe shall be the pipe OD plus 6". Mortar used to seal the pipe into the opening will be of such mix that shrinkage will not cause leakage into or out of the structure.
4. If the conflict structure is round or there are multiple inlet or outlet pipes, then the wall section should be reviewed for strength.
5. If during construction or the plans design process it is determined that a potable water supply line must pass though a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C. and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts:

www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organization" on the menu to the right.

DESIGNER'S NOTES:
"Sump" conflict manholes shall not be used unless the system is hydraulically designed to account for the headloss generated if the sump is completely blocked.

"Organizer" on the menu to the right.
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

LONGITUDINAL SECTION

SECTION AA

SECTION BB

SAFETY MODIFICATIONS
FOR INLET IN BOX CULVERTS
NOTES:
1. Fill or excavate variable slopes during normal grading operations.
2. Minimum distance as required to comply with safety criteria.
3. Use Larger Value Of Either:
   L=10xH (No Maximum)
   L=10x(Ditch Offset (Maximum L=100) 
4. Slope to normal slope if possible. Slope not to be steeper than 1:2. See side elevation (extended) below if 1:2 slope must go beyond toe of normal slope.
5. 1:2 slope if necessary to go beyond normal toe of slope and maintain ditch width by moving out back slope.

---

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limits of Variable Front Slopes at Drainage Structures</td>
</tr>
<tr>
<td>2</td>
<td>Round and Elliptical Concrete Pipe Joints</td>
</tr>
<tr>
<td>3</td>
<td>Filter Fabric Jacket, Concrete Jacket, and Pipe Plug</td>
</tr>
<tr>
<td>4</td>
<td>Concrete Collars</td>
</tr>
<tr>
<td>5</td>
<td>Pipe End Guard</td>
</tr>
<tr>
<td>6</td>
<td>Retaining Wall Concrete Gutter and Drains</td>
</tr>
</tbody>
</table>

LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

MISCELLANEOUS DRAINAGE DETAILS

INDEX: 430-001

FY 2020-21
STANDARD PLANS

SHEET 1 of 6
Rubber Gasket - Round or Profile (Round Shown)
Shoulder Point (See Note 2)

SCHEDULE OF BELL REINFORCEMENT
Classes II, III, IV, V: Wall A, B, C

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter</th>
<th>Design Bell Reinforcement</th>
<th>Maximum Reinforcement Under Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in²/ft</td>
<td>in²/ft</td>
</tr>
<tr>
<td>15&quot;</td>
<td>0.07</td>
<td>0.010</td>
</tr>
<tr>
<td>18&quot;</td>
<td>0.09</td>
<td>0.010</td>
</tr>
<tr>
<td>24&quot;</td>
<td>0.16</td>
<td>0.010</td>
</tr>
<tr>
<td>30&quot;</td>
<td>0.14</td>
<td>0.010</td>
</tr>
<tr>
<td>42&quot;</td>
<td>0.16</td>
<td>0.010</td>
</tr>
<tr>
<td>48&quot;</td>
<td>0.20</td>
<td>0.020</td>
</tr>
<tr>
<td>54&quot;</td>
<td>0.22</td>
<td>0.012</td>
</tr>
<tr>
<td>60&quot;</td>
<td>0.33</td>
<td>0.015</td>
</tr>
<tr>
<td>66&quot;</td>
<td>0.26</td>
<td>0.015</td>
</tr>
<tr>
<td>72&quot;</td>
<td>0.28</td>
<td>0.015</td>
</tr>
<tr>
<td>78&quot;</td>
<td>0.31</td>
<td>0.016</td>
</tr>
<tr>
<td>84&quot;</td>
<td>0.33</td>
<td>0.016</td>
</tr>
<tr>
<td>90&quot;</td>
<td>0.30</td>
<td>0.020</td>
</tr>
<tr>
<td>96&quot;</td>
<td>0.37</td>
<td>0.025</td>
</tr>
<tr>
<td>102&quot;</td>
<td>0.40</td>
<td>0.024</td>
</tr>
<tr>
<td>108&quot;</td>
<td>0.42</td>
<td>0.025</td>
</tr>
</tbody>
</table>

NOTES:
1. Allowable Tolerance for the last full wrap of reinforcing when using single elliptical cage.
2. Extend the last full wrap of reinforcing to the shoulder point and meet ASTM C-76 requirements.
3. All circumferential steel located above this line and within the 1.75 L is defined as bell reinforcement.

ROUND CONCRETE PIPE JOINT DETAIL

ELLIPtical CONCRETE PIPE JOINT DETAIL

MISCELLANEOUS DRAINAGE DETAILS

INDEX 430-001

SHEET 2 of 6
DESCRIPTION:

REVISION

1. Alternate connection must be approved by the Engineer.
2. Install securing device in accordance with Specification 985.
3. Any wire mesh arrangement which provides 0.126 square inches of steel area per linear foot both ways may be used, provided the wires are spaced a minimum of 2" and/or a maximum of 6" on centers.
4. Do not use a concrete jacket to join dissimilar metal pipes.
5. 12" for pipes 15" through 24"; 24" for pipes 30" and larger.
6. 12" for pipes 14" x 23" through 19" x 30"; 24" for pipes 24" x 38" and larger.
NOTES:

1. The collar may be formed by any method approved by the Engineer.
2. Install &x16; dowels in adhesive bond material.
3. Stub Pipes maximum diameter: 1/4 of a round main line pipe diameter, or 1/4 of the height of elliptical main line pipes.
4. Opening by Pipe Manufacturer.
5. Install riser reinforcement using #5 Bars @ 18" centers vertically and 6" centers horizontally. Bend pipe steel to riser.
6. Reinforced concrete top required when inlet: manhole or junction box riser is less than 4 feet in diameter, or when 3'-6", alt. 24" inlet, manhole or junction box riser is used; or when rectangular inlet is used.
7. See Index 425-001 for optional construction joints.
DESCRIPTION:

REVISION LAST
Of STANDARD PLANS FY 2020-21

SHEET INDEX

GUARD TABLE

NOTES:
1. Construct guards only at locations specifically called for in Plans.
GENERAL NOTES:

1. Use Class I concrete.

2. Reinforcing steel: All bars are size #4. Spacing 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. Endwall may be cast in place or precast concrete. Construct precast units to dimensions shown, or as shown in approved shop drawings. Use Index 425-001 for opening and grouting details.

4. Quantities shown are for estimating purposes only.

---

**TABLE OF CONTENTS:**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Dimensional and Reinforcing Details</td>
</tr>
<tr>
<td>3</td>
<td>Type 1 and Type 2 Grate Details</td>
</tr>
</tbody>
</table>

---

**U-TYPE CONCRETE ENDWALLS 15" TO 30" PIPES WITH GRATES**

(24" Pipe Shown)

---

**TABLE 1**

<table>
<thead>
<tr>
<th>Slope</th>
<th>Pipe Dia.</th>
<th>Offset (Ft.)</th>
<th>L (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:4</td>
<td>15&quot;</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>1:6</td>
<td>18&quot;</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>1:8</td>
<td>24&quot;</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>1:10</td>
<td>30&quot;</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

---

**FRONT SLOPE TRANSITION AT ENDWALL**
**LEGEND:**
- **H** = Horizontal Bars
- **V** = Vertical Bars
- **B** = Bent Bars
- **D** = Dowels or Diagonal Bars

**DIMENSIONAL AND QTYs**

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>A (Ft)</th>
<th>B (Ft)</th>
<th>C (CY)</th>
<th>D (Class I Conc.)</th>
<th>E (Reinf. Steel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope: 1/4</td>
<td>15'</td>
<td>2.38</td>
<td>0.85</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>18'</td>
<td>6.67</td>
<td>1.975</td>
<td>1.45</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>21'</td>
<td>6.67</td>
<td>1.975</td>
<td>1.45</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>10.81</td>
<td>1.975</td>
<td>2.53</td>
<td>129</td>
<td></td>
</tr>
</tbody>
</table>
See DETAIL "A"

**NOTES:**
1. Install grate bars evenly spaced across dimension D.
2. All bars and grate bars are \( \frac{1}{2''} \times 2'' \).

**TABLE 3**

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>Grate Bars Req'd</th>
<th>Grate Wt. (lbs)</th>
<th>Grate Req'd</th>
<th>Total Grate Wt. (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15''</td>
<td>0</td>
<td>53.55</td>
<td>0</td>
<td>53.55</td>
</tr>
<tr>
<td>18''</td>
<td>0</td>
<td>53.55</td>
<td>0</td>
<td>53.55</td>
</tr>
<tr>
<td>24''</td>
<td>0</td>
<td>53.55</td>
<td>0</td>
<td>53.55</td>
</tr>
<tr>
<td>30''</td>
<td>0</td>
<td>53.55</td>
<td>0</td>
<td>53.55</td>
</tr>
</tbody>
</table>

---

**PIPE SIZE RANGE:**
15' to 30'' pipes with grates

**U-TYPE CONCRETE ENDWALLS**

**DESCRIPTION:**
Revision of Standard Plans FY 2020-21

**INDEX SHEET:**
430-010 3 of 3
GENERAL NOTES:
1. Use Class I concrete
2. Construct Baffles only when called for in Plans.
3. See Sheet 5 when steel grating is required on endwall.
4. All reinforcing #4 bars with 2" clearance except as noted.
5. Channel section C 3x6 may be substituted for C 4x5.6 channel.
6. Endwall may be cast in place or precast concrete. Construct precast units to dimensions shown, or as shown in approved shop drawings. Submit requests for shop drawing approvals to the Engineer. Use Index 425-003 for opening and grouting details.
7. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Endwalls for 1:2 Slopes With Baffles</td>
</tr>
<tr>
<td>3</td>
<td>Endwalls for 1:1 Slopes Without Baffles and Bending Bar Diagram</td>
</tr>
<tr>
<td>4</td>
<td>Endwalls for 1:3, 1:4, and 1:6 Slopes</td>
</tr>
<tr>
<td>5</td>
<td>Steel Grate Option</td>
</tr>
</tbody>
</table>

U-TYPE CONCRETE ENGWALLS

STEEL GRATE OPTION

BAFFLE OPTION
ENDWALLS FOR 1:2 SLOPES WITH BAFFLES

DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;</td>
<td>1.23</td>
<td>2'-3&quot;</td>
<td>3'-10&quot;</td>
<td>3'-10&quot;</td>
<td>1'-3&quot;</td>
<td>2'-9&quot;</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>3 #4</td>
<td>1 #4</td>
<td>1.61</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18&quot;</td>
<td>1.77</td>
<td>2'-5&quot;</td>
<td>3'-10&quot;</td>
<td>3'-10&quot;</td>
<td>1'-6&quot;</td>
<td>2'-9&quot;</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
<td>4 #4</td>
<td>2 #4</td>
<td>1.89</td>
<td>86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24&quot;</td>
<td>3.16</td>
<td>2'-8&quot;</td>
<td>4'-4&quot;</td>
<td>4'-4&quot;</td>
<td>2'-9&quot;</td>
<td>3'-0&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>6&quot;</td>
<td>4 #4</td>
<td>3 #4</td>
<td>2.52</td>
<td>108</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30&quot;</td>
<td>4.91</td>
<td>2'-11&quot;</td>
<td>6'-12&quot;</td>
<td>6'-12&quot;</td>
<td>2'-9&quot;</td>
<td>3'-0&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
<td>8&quot;</td>
<td>4 #4</td>
<td>4 #4</td>
<td>3.34</td>
<td>131</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ENDWALLS FOR 1:2 SLOPES WITH BAFFLES

REINFORCING DETAILS

NOTE:
See Sheet 3 for Bar Bending Diagram.

LEGEND:
H = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars
LEGEND:

- H = Horizontal Bars
- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

ENDWALLS FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>Area &amp; Ply</th>
<th>L</th>
<th>Ht</th>
<th>W</th>
<th>Class 1 Conc. Cu. Yd.</th>
<th>Rein/Steel Lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;</td>
<td>1.23</td>
<td>3'-3&quot;</td>
<td>1'-7 1/2&quot;</td>
<td>3'-7&quot;</td>
<td>0.89</td>
<td>39</td>
</tr>
<tr>
<td>18&quot;</td>
<td>1.77</td>
<td>3'-9&quot;</td>
<td>1'-10 1/2&quot;</td>
<td>3'-10&quot;</td>
<td>1.05</td>
<td>63</td>
</tr>
<tr>
<td>24&quot;</td>
<td>3.14</td>
<td>4'-3&quot;</td>
<td>2'-4 1/2&quot;</td>
<td>4'-4&quot;</td>
<td>1.40</td>
<td>55</td>
</tr>
<tr>
<td>36&quot;</td>
<td>4.91</td>
<td>5'-9&quot;</td>
<td>2'-10 1/2&quot;</td>
<td>4'-10&quot;</td>
<td>1.88</td>
<td>64</td>
</tr>
</tbody>
</table>

DIMENSIONAL DETAILS

REINFORCING DETAILS

ENDWALLS WITHOUT BAFFLES

BENDING DIAGRAM
NOTE:
1. Reinforcing similar to Sheets 2 and 3.
2. See Sheet 3 for Bar Bending Diagram.
GENERAL NOTES:
1. Use Class I concrete.
2. Chamfer all exposed edges 1/4".
3. See Index 550-002 for details of Type B fencing.
4. Quantities shown are for estimating purposes only.

Table of Contents:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Dimensional Details</td>
</tr>
<tr>
<td>3</td>
<td>Reinforcing Details and Bending Diagram</td>
</tr>
</tbody>
</table>

ENERGY DISSIPATOR 30" TO 72" PIPE
NOTES:
1. All bar dimensions are measured out to out.
2. All Bars are size #4 unless otherwise noted.
3. Install reinforcing steel with a minimum of 2" cover.
4. Bars B6 and B7 (N.S. and F.S.) equivalent in size to B1 (cut and bend as required)
5. Bars V4, V6, V8, V10, V12, H1, H2, and H3 are straight bars.

LEGEND:
H = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars

<table>
<thead>
<tr>
<th>Pipe</th>
<th>B. 1</th>
<th>Size (No.)</th>
<th>Spacing (Ft.-In.)</th>
<th>B. 2</th>
<th>Size (No.)</th>
<th>Spacing (Ft.-In.)</th>
<th>B. 3</th>
<th>Size (No.)</th>
<th>Spacing (Ft.-In.)</th>
<th>B. 4</th>
<th>Size (No.)</th>
<th>Spacing (Ft.-In.)</th>
<th>B. 5</th>
<th>Size (No.)</th>
<th>Spacing (Ft.-In.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>95°</td>
<td>1</td>
<td>0-11</td>
<td>1-1</td>
<td>1</td>
<td>0-11</td>
<td>1-1</td>
<td>1</td>
<td>0-11</td>
<td>1-1</td>
<td>1</td>
<td>0-11</td>
<td>1-1</td>
<td>1</td>
<td>0-11</td>
<td>1-1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0-10</td>
<td>1-1</td>
<td>2</td>
<td>0-10</td>
<td>1-1</td>
<td>2</td>
<td>0-10</td>
<td>1-1</td>
<td>2</td>
<td>0-10</td>
<td>1-1</td>
<td>2</td>
<td>0-10</td>
<td>1-1</td>
</tr>
</tbody>
</table>

1. All bar dimensions are measured out to out.
2. All Bars are size #4 unless otherwise noted.
3. Install reinforcing steel with a minimum of 2" cover.
4. Bars B6 and B7 (N.S. and F.S.) equivalent in size to B1 (cut and bend as required)
5. Bars V4, V6, V8, V10, V12, H1, H2, and H3 are straight bars.
GENERAL NOTES:

1. Provide flared end sections meeting the requirements of ASTM C76 with the exception that dimensions and reinforcement meet the criteria in the table on sheet 2. Circumferential reinforcement may consist of either one cage or two cages of steel. Use concrete compressive strength of 4000 psi.

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 manufacturer of the flared end sections must certify the compatibility of joint designs.
   b. Joints sealed with preformed plastic gaskets. Use gaskets that meet the requirements Specification 942-2 of the Standard Specifications and the minimum sizes for gaskets as specified for equivalent sizes of elliptical pipe.
   c. Reinforced concrete jackets, as detailed on sheet 2. When non-coated corrugated metal pipe is called for in the Plans, use bituminous coated pipe in the jacketed area as specified on Index 430-001. Construct concrete jacket as specified in Index 430-001.
3. Toe walls are to be cast-in-place using Class I Concrete.
4. On skewed pipe culverts place the flared end sections in line with the pipe culvert. Warp the side slopes as required to fit the flared end sections.
5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Straight Flare and Optional Shape Details</td>
</tr>
</tbody>
</table>

FLARED END SECTION
<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>T</th>
<th>Reinforc. as in. Per Foot</th>
<th>Bell or Spigot</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>R 1</th>
<th>R 2</th>
<th>FLAT</th>
<th>P</th>
<th>Sta./Offset Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2</td>
<td>0.93</td>
<td>10&quot;</td>
<td>4</td>
<td>2-0&quot;</td>
<td>4-0&quot;</td>
<td>8-0&quot;</td>
<td>2-0&quot;</td>
<td>18%</td>
<td>10%</td>
<td>9</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>16</td>
<td>5/8</td>
<td>0.93</td>
<td>9&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>20%</td>
<td>12%</td>
<td>9</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>18</td>
<td>1&quot;</td>
<td>0.93</td>
<td>9&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>20%</td>
<td>12%</td>
<td>8</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>0.93</td>
<td>8&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>20%</td>
<td>12%</td>
<td>8</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>0.93</td>
<td>8&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>20%</td>
<td>12%</td>
<td>8</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>27</td>
<td>3/4</td>
<td>0.93</td>
<td>7/8&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>15%</td>
<td>10%</td>
<td>8</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>30</td>
<td>3/4</td>
<td>0.93</td>
<td>7/8&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>15%</td>
<td>10%</td>
<td>8</td>
<td>3/4</td>
<td>12</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>0.93</td>
<td>7/8&quot;</td>
<td>4</td>
<td>2-3</td>
<td>4-3</td>
<td>8-3</td>
<td>2-3</td>
<td>15%</td>
<td>10%</td>
<td>8</td>
<td>3/4</td>
<td>12</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Use a wire mesh with 0.126 square inches of steel area per linear foot both directions. Use 2" minimum wire and spaced 2" minimum.
2. Concrete pipe shown, other pipe material similar.

**DESCRIPTION:**
- Flat
- Pipe Dia. + 1"

**INDEX**
- 430-020
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), steel reinforced polyethylene pipe (SRPE), and polypropylene pipe (PP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE, PVC, SRPE, or PP pipe, with metal pipe. When used in conjunction with a concrete mitered end sections, construct concrete jacket in accordance with Index 430-001.

3. Class NS concrete cast-in-place reinforced slabs are required for all sizes of cross drain pipes. Construct slabs at 6" thick, unless P thickness is called for in the Plans.

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. 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.

7. Saddle Slope:

- 1:4 Miter - Slope to 1/4 of pipe for round pipes less than or equal to 18" diameter and 1:1 for round pipes greater than or equal to 24" diameter.
- Slope to the major axis for elliptical pipes 24"x36" or smaller and 1:2 for pipes 29"x45" or larger.
- Slope to the span line for pipe arch 28"x20" or smaller and 1:2 for pipe arch 33"x24" or larger.

- 1:2 Miter - Slope to 1/2 of pipe for round pipes less than or equal to 18" diameter and 1:1 for round pipes greater than or equal to 24" diameter.
- Slope to the major axis for elliptical pipes 29"x45" or smaller and 1:1 for pipes 34"x53" or larger.
- Slope 1:1 for all pipe arch sizes.

8. Quantities shown are for estimating purposes only.

---

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single and Multiple Concrete Pipe</td>
</tr>
<tr>
<td>3</td>
<td>Concrete Pipe Dimensions and Quantities</td>
</tr>
<tr>
<td>4</td>
<td>Single and Multiple Corrugated Metal Pipe</td>
</tr>
<tr>
<td>5</td>
<td>Corrugated Metal Pipe Dimensions and Quantities</td>
</tr>
<tr>
<td>6</td>
<td>Concrete Pipe Connections and Corrugated Metal Pipe (CMP) Anchor Detail</td>
</tr>
</tbody>
</table>

---

SLOPE AND DITCH TRANSITIONS
Plan - Single Pipe

Plan - Multiple Pipe

Elevation

Round Concrete Pipe

(Semi-Elliptical Pipe Similar)

NOTE: See Table 1 on Sheet 3 for Dimensions and Quantities.

Revised:
11/01/19

Last Revision:
11/01/19

Description:
FY 2020-21

Standard Plans

Cross Drain Mitered End Section

Index
430-021

Sheet
2 of 6
<table>
<thead>
<tr>
<th>Slope</th>
<th>Elliptical Concrete Pipe</th>
<th>Round Concrete Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ø</td>
<td>Slip</td>
</tr>
<tr>
<td>60°</td>
<td>5.77</td>
<td>5.59</td>
</tr>
<tr>
<td>54°</td>
<td>3.95</td>
<td>3.34</td>
</tr>
<tr>
<td>58°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>53°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>29°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>34°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>38°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>45°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>91°</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>10'-8&quot;</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>8'-11&quot;</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>9'-11&quot;</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>4'-3&quot;</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>7'-0&quot;</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>3.39'</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>3.39'</td>
<td>3.39</td>
<td>2.87</td>
</tr>
<tr>
<td>2.87'</td>
<td>2.87</td>
<td>2.43</td>
</tr>
<tr>
<td>2.43'</td>
<td>2.43</td>
<td>1.97</td>
</tr>
<tr>
<td>1.97'</td>
<td>1.97</td>
<td>3.59</td>
</tr>
<tr>
<td>3.59'</td>
<td>3.59</td>
<td>6</td>
</tr>
<tr>
<td>6'</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7.18'</td>
<td>7.18'</td>
<td>23.68'</td>
</tr>
<tr>
<td>25.35'</td>
<td>25.35'</td>
<td>14.18'</td>
</tr>
<tr>
<td>17.27'</td>
<td>17.27'</td>
<td>11.04'</td>
</tr>
<tr>
<td>25'</td>
<td>25'</td>
<td>21'</td>
</tr>
<tr>
<td>21'</td>
<td>21'</td>
<td>15'</td>
</tr>
<tr>
<td>15'</td>
<td>15'</td>
<td>10'</td>
</tr>
<tr>
<td>7'</td>
<td>7'</td>
<td>4.28'</td>
</tr>
<tr>
<td>3.95'</td>
<td>3.95'</td>
<td>2.37'</td>
</tr>
<tr>
<td>2.37'</td>
<td>2.37'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
<tr>
<td>4.59'</td>
<td>4.59'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
<tr>
<td>4.59'</td>
<td>4.59'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
<tr>
<td>4.59'</td>
<td>4.59'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
<tr>
<td>4.59'</td>
<td>4.59'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
<tr>
<td>4.59'</td>
<td>4.59'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
<tr>
<td>4.59'</td>
<td>4.59'</td>
<td>3.57'</td>
</tr>
<tr>
<td>3.57'</td>
<td>3.57'</td>
<td>4.59'</td>
</tr>
</tbody>
</table>
PLAN - SINGLE PIPE

PLAN - MULTIPLE PIPE

ELEVATION

SECTION B-B

DETAIL "B"

ARCHED CORRUGATED METAL PIPE

(Round Pipe Similar)

NOTE: See Table 2 on Sheet 5 for Dimensions and Quantities.
## TABLE 2
### SINGLE AND MULTIPLE CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES

<table>
<thead>
<tr>
<th>Dia. D</th>
<th>Rise R</th>
<th>Span S</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>M</th>
<th>N</th>
<th>MY CONC. SLAB (CY)</th>
<th>3Y CONC. SLAB (CY)</th>
<th>SIDDING (FY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10&quot;</td>
<td>2&quot;</td>
<td>2.5</td>
<td>1.66</td>
<td>1.16</td>
<td>1.5</td>
<td>1.22</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>3&quot;</td>
<td>2.5</td>
<td>1.76</td>
<td>1.26</td>
<td>1.5</td>
<td>1.35</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>4&quot;</td>
<td>2.5</td>
<td>1.87</td>
<td>1.36</td>
<td>1.5</td>
<td>1.46</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>5&quot;</td>
<td>2.5</td>
<td>1.98</td>
<td>1.46</td>
<td>1.5</td>
<td>1.58</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>6&quot;</td>
<td>2.5</td>
<td>2.09</td>
<td>1.56</td>
<td>1.5</td>
<td>1.70</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>7&quot;</td>
<td>2.5</td>
<td>2.20</td>
<td>1.66</td>
<td>1.5</td>
<td>1.82</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>8&quot;</td>
<td>2.5</td>
<td>2.30</td>
<td>1.76</td>
<td>1.5</td>
<td>1.94</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>9&quot;</td>
<td>2.5</td>
<td>2.40</td>
<td>1.86</td>
<td>1.5</td>
<td>2.06</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>10&quot;</td>
<td>10&quot;</td>
<td>2.5</td>
<td>2.50</td>
<td>1.96</td>
<td>1.5</td>
<td>2.18</td>
<td>1.95</td>
<td>4.33</td>
<td>4.02</td>
<td>9.50</td>
<td>12.08</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>1/4 Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td>2&quot;</td>
<td>2.5</td>
<td>2.99</td>
<td>2.59</td>
<td>2.5</td>
<td>2.71</td>
<td>3.19</td>
<td>6.38</td>
<td>6.06</td>
<td>12.79</td>
<td>17.13</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>6&quot;</td>
<td>3&quot;</td>
<td>2.5</td>
<td>3.19</td>
<td>3.29</td>
<td>2.5</td>
<td>2.91</td>
<td>3.19</td>
<td>6.38</td>
<td>6.06</td>
<td>12.79</td>
<td>17.13</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>6&quot;</td>
<td>4&quot;</td>
<td>2.5</td>
<td>3.39</td>
<td>3.99</td>
<td>2.5</td>
<td>3.51</td>
<td>3.19</td>
<td>6.38</td>
<td>6.06</td>
<td>12.79</td>
<td>17.13</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>6&quot;</td>
<td>5&quot;</td>
<td>2.5</td>
<td>3.59</td>
<td>4.69</td>
<td>2.5</td>
<td>4.11</td>
<td>3.19</td>
<td>6.38</td>
<td>6.06</td>
<td>12.79</td>
<td>17.13</td>
<td>1.04</td>
<td>0.95</td>
</tr>
<tr>
<td>6&quot;</td>
<td>6&quot;</td>
<td>2.5</td>
<td>3.79</td>
<td>5.39</td>
<td>2.5</td>
<td>4.71</td>
<td>3.19</td>
<td>6.38</td>
<td>6.06</td>
<td>12.79</td>
<td>17.13</td>
<td>1.04</td>
<td>0.95</td>
</tr>
</tbody>
</table>

**Note:** All values are approximate and subject to minor variations based on specific material and construction tolerances.
CONCRETE PIPE CONNECTION AND CORRUGATED PIPE ANCHOR DETAILS

TONGUE AND GROOVE CONNECTOR DETAIL

BELL AND SPIGOT CONNECTOR DETAIL

STEEL BAR

NOTES:
1. Use galvanized steel for all bars, bolts, nuts, and washers.
2. Two connectors required per joint, located 60° right and left of bottom center of pipe.
3. Bolt holes in pipe shell are to be drilled.

CONCRETE PIPE CONNECTION DETAIL DETAIl "C"

CROSS DRAIN MITERED END SECTION

REVISION DESCRIPTION:

FY 2020-21 STANDARD PLANS

INDEX SHEET 6 of 6

NOTES:
1. Anchors required for CMP only.
2. Use galvanized steel for all anchors, nuts, and washers.
3. Bend anchor where required to center in concrete slab.
4. Repair damaged surfaces after bending.
5. Space anchors a distance equal to four (4) corrugations.
6. Place the anchors in the outside crest of corrugation.
7. Place flat washers on inside wall of pipe.
8. Drill or punch holes in the mitered end pipe; burning not permitted.
9. A 6" x 1/2" bolt substitution is permitted.

BOLT SIZES

<table>
<thead>
<tr>
<th>Bolt Dia</th>
<th>Pipe Dia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot;</td>
<td>15/32&quot; to 3/8&quot;</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>42 to 72&quot;</td>
</tr>
</tbody>
</table>
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), steel reinforced polyethylene pipe (SRPE), and polypropylene pipe (PP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE, PVC, SRPE, or PVC pipe. When used in conjunction with a concrete mitered end sections, construct concrete jacket in accordance with Index 430-001.

3. Use class NS concrete cast-in-place reinforced slabs for all cross drain pipes.

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. 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. Saddle Slope:
   - 1:4 Miter - Slope to 1/4 of pipe for round pipes less than or equal to 18" diameter and 1:1 for round pipes greater than or equal to 24" diameter.
   - Slope to the major axis for elliptical pipes 20"x38" or smaller and 1:2 for pipes 29"x45" or larger.
   - Slope to the span line for pipe arch 28"x20" or smaller and 1:2 for pipe arch 35"x24" or larger.
   - 1:2 Miter - Slope to 1/2 of pipe for round pipes less than or equal to 18/diameter and 1:2 for round pipes greater than or equal to 24" diameter.
   - Slope to the major axis for elliptical pipes 29"x45" or smaller and 1:1 for pipes 34"x53" or larger.
   - Slope 1:1 for all pipe arch sizes.

8. Quantities shown are for estimating purposes only.

---

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single and Multiple Concrete Pipe</td>
</tr>
<tr>
<td>3</td>
<td>Concrete Pipe Dimensions and Quantities</td>
</tr>
<tr>
<td></td>
<td>and Permissible Pavement Modifications</td>
</tr>
<tr>
<td>4</td>
<td>Single and Multiple Corrugated Metal Pipe</td>
</tr>
<tr>
<td>5</td>
<td>Corrugated Metal Dimensions and Quantities</td>
</tr>
<tr>
<td>6</td>
<td>Concrete Pipe Connection and Corrugated Metal</td>
</tr>
<tr>
<td></td>
<td>Pipe Anchor Details</td>
</tr>
<tr>
<td>7</td>
<td>Fastener Unit and Grate Details</td>
</tr>
</tbody>
</table>

---

DITCH TRANSITION

SIDE DRAIN MITERED END SECTION

(Concrete Pipe Shown, Corrugated Metal Pipe Similar)
PLAN - SINGLE PIPE

- Concrete Slab, 3" Thick Reinforced
- Grates and Fasteners (See Sheet 1)

PLAN - MULTIPLE PIPE

- Concrete Slab, 3" Thick Reinforced
- Grates and Fasteners

SIDE DRAIN MITERED END SECTION

- Saddle Slope (See General Note 7)
- Grates Spaced 1'-0" c to c

ROUND CONCRETE PIPE

(Elliptical Pipe Similar)

SINGLE AND MULTIPLE CONCRETE PIPE

GENERAL NOTE 7)

Saddle Slope (See General Note 7)
<table>
<thead>
<tr>
<th>Dia.</th>
<th>Rise</th>
<th>Span</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>Single Pipe</th>
<th>Double Pipe</th>
<th>Triple Pipe</th>
<th>Quad Pipe</th>
<th>N</th>
<th>STANDARD WEIGHT PIPE</th>
<th>EXTRA STRONG PIPE</th>
<th>STANDARD PRECAST</th>
<th>EXTRA STRONG PRECAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>5&quot;</td>
<td>-1/2</td>
<td>12</td>
<td>5.0</td>
<td>4.9</td>
<td>4.8</td>
<td>4.7</td>
<td>1.1</td>
<td>1.0</td>
<td>0.9</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>6&quot;</td>
<td>-1/4</td>
<td>18</td>
<td>7.0</td>
<td>6.9</td>
<td>6.8</td>
<td>6.7</td>
<td>1.5</td>
<td>1.4</td>
<td>1.3</td>
<td>1.2</td>
<td>1.1</td>
<td>1.0</td>
<td>0.9</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>7&quot;</td>
<td>-1/8</td>
<td>24</td>
<td>9.0</td>
<td>8.9</td>
<td>8.8</td>
<td>8.7</td>
<td>2.0</td>
<td>1.9</td>
<td>1.8</td>
<td>1.7</td>
<td>1.6</td>
<td>1.5</td>
<td>1.4</td>
<td>1.3</td>
<td>1.2</td>
<td>1.1</td>
</tr>
<tr>
<td>8&quot;</td>
<td>-1/16</td>
<td>30</td>
<td>11.0</td>
<td>10.9</td>
<td>10.8</td>
<td>10.7</td>
<td>2.6</td>
<td>2.5</td>
<td>2.4</td>
<td>2.3</td>
<td>2.2</td>
<td>2.1</td>
<td>2.0</td>
<td>1.9</td>
<td>1.8</td>
<td>1.7</td>
</tr>
</tbody>
</table>

**PERMISSIBLE PAVEMENT MODIFICATION**

**CONCRETE PIPE DIMENSIONS AND QUANTITIES**

**SIDE DRAIN MITERED END SECTION**

**INDEX**

**SHEET 3 of 7**
**SIDE DRAIN MITERED END SECTION**

**SINGLE AND MULTIPLE CORRUGATED METAL PIPE**

**PLAN - SINGLE PIPE**

- **Concrete Slab, 3" Thick Reinforced With WWR** 6x6-W14xW14
- **Sta./Offset Location**
- **Construction Joint Permitted**
- **Pipe/Slab Fillet (Typ.)**
- **Anchor (Typ.)**
- **Fillet (Typ.)**
- **Concrete Slab, 3" Thick Reinforced With WWR 6x6-W14xW14**

**PLAN - MULTIPLE PIPE**

- **Concrete Slab, 3" Thick Reinforced With WWR 6x6-W14xW14**
- **Sta./Offset Location**
- **Construction Joint Permitted**
- **Pipe/Slab Fillet: Deepen Concrete Slab to Form Bridge**
- **Across Crown of Pipe**
- **Anchor (Typ.)**
- **Pipes/Slab Fillet**
- **Concrete Slab**
- **Grates Spaced 14" c to c**

**ELEVATION**

- **SIDE DRAIN MITERED END SECTION**
- **SIDE DITCH GRADE**
- **Pipes/Slab Fillet**
- **Concrete Slab**
- **Anchor**
- **(Pipe/Slab Fillet)**

**GENERAL NOTES**

1. **2'-0" Min. Sod**
2. **Slope Varies**
3. **See Ditch Transition and Pavement Modification Details Sheets 1 and 3**
4. **See Section B-B**
5. **Corrugated Metal Pipe**
6. **Anchor (Typ.)**
7. **Saddle Slope (See General Note 7)**

**DETAIL "B"**

- **Concrete Slab, 3" Thick Reinforced With WWR 6x6-W14xW14**
- **Pipes/Slab Fillet**
- **Concrete Slab**
- **Grates Spaced 14" c to c**
- **Anchor (Typ.)**

**INDEX**

- **SIDE DRAIN MITERED END SECTION**
- **SINGLE AND MULTIPLE CORRUGATED METAL PIPE**
- **PLAN - SINGLE PIPE**
- **PLAN - MULTIPLE PIPE**
- **ELEVATION**
- **DETAIL "B"**

**REVISION**

- **11/01/19**
- **REV 3**
- **REV 4**

**DESCRIPTION:**

- **SIDE DRAIN MITERED END SECTION**
- **SINGLE AND MULTIPLE CORRUGATED METAL PIPE**
- **PLAN - SINGLE PIPE**
- **PLAN - MULTIPLE PIPE**
- **ELEVATION**
- **DETAIL "B"**
## SINGLE AND MULTIPLE CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES

<table>
<thead>
<tr>
<th>Dia</th>
<th>Rise</th>
<th>Side</th>
<th>Span</th>
<th>X</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>Single Pipe</th>
<th>Double Pipe</th>
<th>Triple Pipe</th>
<th>Quad Pipe</th>
<th>N</th>
<th>STANDARD WEIGHT PIPE</th>
<th>EXTRA STRONG PIPE</th>
<th>J CONCAVE SLAB (CP)</th>
<th>SADDLING (STY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.60</td>
<td>0.38</td>
<td>0.25</td>
<td>25</td>
<td>0.72</td>
<td>0.12</td>
<td>0.07</td>
<td>0.02</td>
<td>0.05</td>
<td>0.07</td>
<td>0.10</td>
<td>1.29</td>
<td>2.87</td>
<td>4.77</td>
<td>1.125</td>
<td>11/20</td>
<td>7.78</td>
<td>1.54</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.72</td>
<td>0.36</td>
<td>0.25</td>
<td>25</td>
<td>0.86</td>
<td>0.19</td>
<td>0.14</td>
<td>0.08</td>
<td>0.11</td>
<td>0.14</td>
<td>0.17</td>
<td>3.35</td>
<td>7.09</td>
<td>12.86</td>
<td>3.09</td>
<td>13/14</td>
<td>8.64</td>
<td>1.70</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.86</td>
<td>0.36</td>
<td>0.25</td>
<td>25</td>
<td>1.00</td>
<td>0.26</td>
<td>0.21</td>
<td>0.14</td>
<td>0.18</td>
<td>0.22</td>
<td>0.25</td>
<td>5.10</td>
<td>11.62</td>
<td>20.34</td>
<td>5.10</td>
<td>14/15</td>
<td>9.50</td>
<td>1.99</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1.00</td>
<td>0.33</td>
<td>0.25</td>
<td>25</td>
<td>1.14</td>
<td>0.34</td>
<td>0.29</td>
<td>0.23</td>
<td>0.30</td>
<td>0.35</td>
<td>0.39</td>
<td>7.60</td>
<td>16.38</td>
<td>31.28</td>
<td>7.60</td>
<td>15/16</td>
<td>10.36</td>
<td>2.31</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1.14</td>
<td>0.30</td>
<td>0.25</td>
<td>25</td>
<td>1.29</td>
<td>0.42</td>
<td>0.38</td>
<td>0.30</td>
<td>0.40</td>
<td>0.46</td>
<td>0.50</td>
<td>10.09</td>
<td>22.70</td>
<td>44.75</td>
<td>10.09</td>
<td>16/17</td>
<td>11.22</td>
<td>2.65</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- The table provides dimensions and quantities for single and multiple corrugated metal pipes.
- The dimensions are in inches and are listed for different pipe diameters (4 to 8 inches).
- The quantities are provided for single and multiple pipes, including standard and extra strong weights.
- The table also includes standard and extra strong weights for different pipe diameters and spans.

---

**COPPER PIPE DIMENSIONS AND QUANTITIES**

**SIDE DRAIN MITERED END SECTION**

**INDEX**

**REVISION**

**DESCRIPTION:**

**FY 2020-21**

**STANDARD PLANS**

**INDEX**

**SHEET** 5 of 7
**DESCRIPTION:**

**LAST REVIEW:** 01/01/19

**FY 2020-21 STANDARD PLANS**

**INDEX SHEET 430-022**

**SIDE DRAIN MITERED END SECTION**

**CONCRETE PIPE CONNECTION AND CORRUGATED PIPE ANCHOR DETAILS**

**TONGUE AND GROOVE CONNECTOR DETAIL**

**BELL AND SPIGOT CONNECTOR DETAIL**

**STEEL BAR**

**NOTES:**

1. Use galvanized steel for all bars, bolts, nuts, and washers.

2. Two connectors required per joint, located 60° right and left of bottom center of pipe.

3. Bolt holes in pipe shell are to be drilled.

4. Repair damaged surfaces after bending.

5. Space anchors a distance equal to four (4) corrugations.

6. Place the anchors in the outside crest of corrugation.

7. Place flat washers on inside wall of pipe.

8. Drill or punch holes in the mitered end pipe; burning not permitted.

9. A 6" x 1/2" bolt substitution is permitted.

**CONCRETE PIPE CONNECTION DETAIL**

**DETAIL "C"**

**CORRUGATED METAL PIPE (CMP) ANCHOR DETAIL**

**DETAIL "D"**
NOTES:
1. 1/8" x 3" bolts are standard for all grate fasteners. Except when the contractor elects to use the slotted upper holes for the intermediate fasteners on multiple drain pipes, which will require bolt lengths in the Special Bolt Length Table.
2. 1/8" galvanized bolt hex head bolt shown, either hex head or square head bolt may be used. Use only hex nuts.
3. Make the specified weld 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.
4. Omit on trailing downstream ends on divided roadways.
5. Use grates only when called for in the plans on round pipes 24" or less in diameter, arch pipes 28" x 20" or smaller, and elliptical pipes 18" x 20" or smaller.

CONCRETE PIPE

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>Drain Size</th>
<th>s</th>
<th>n</th>
<th>L</th>
<th>La</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>15&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
</tbody>
</table>

CORRUGATED METAL PIPE

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>Drain Size</th>
<th>s</th>
<th>n</th>
<th>L</th>
<th>La</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>15&quot;</td>
<td>2&quot;-10&quot;</td>
<td>1</td>
<td>2</td>
<td>1&quot;-8&quot;</td>
<td>7&quot;</td>
</tr>
</tbody>
</table>

MULTIPLE FASTENER UNIT DETAIL

FOR SINGLE AND MULTIPLE PIPES

NOTE:
1. Install intermediate slot and fastener for multiple drain pipes only.

Options for top opening:
- 4" of 8" mill head cut, 1" deep
- 2" diameter drilled hole
- 1/32" x 2" slot

Bottom opening: 1/32" x 2" slot.
GENERAL NOTES:
1. Use Class I concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. (Additional reinforcement necessary for handling precast units will be determined by the Contractor or the supplier).
4. Chamfer all exposed edges and corners to ¾".
5. 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.
6. On outfall ditches with side slopes flatter than 1:1.5 provide 20' transitions from the endwall to the flatter side slopes, right of way permitting.
7. Construct front slope and ditch transitions in accordance with Index 430-001.
8. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:
<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Concrete Endwall Details</td>
</tr>
<tr>
<td>3</td>
<td>Concrete and Metal Pipe Tables</td>
</tr>
<tr>
<td>4</td>
<td>Spacing For Multiple Pipes</td>
</tr>
</tbody>
</table>

STRAIGHT CONCRETE ENDCASE
DESCRIPTION:

LAST REVISED: FY 2020-21

STANDARD PLANS

STRAIGHT CONCRETE ENDWALLS
SINGLE AND MULTIPLE PIPE

INDEX 430-030

SHEET 2 of 4

CONCRETE ENDWALL DETAILS

NOTE: Keyway and Dowels are required for optional construction joint.

(Optional Construction Joint (See DETAIL "A")

STRAIGHT CONCRETE ENDWALLS
SINGLE AND MULTIPLE PIPE
ROUND CONCRETE AND CORRUGATED METAL PIPE

DOUBLE ROUNDED

Class 1

Dimensions

Table of Number of Pipes and Pipe Angle of Pipe

<table>
<thead>
<tr>
<th>Dia (in)</th>
<th>No. of Pipes</th>
<th>Single</th>
<th>Double</th>
<th>Quadruple</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2 1/2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3 1/6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4 1/2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

CONCRETE AND METAL PIPE TABLES

ELLIPSOIDAL CONCRETE AND CORRUGATED METAL PIPE

Table of Number of Pipes and Pipe Angle of Pipe

<table>
<thead>
<tr>
<th>Dia (in)</th>
<th>No. of Pipes</th>
<th>Single</th>
<th>Double</th>
<th>Quadruple</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2 1/2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3 1/6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4 1/2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTES:
1. Diameter X is calculated as: X = 5°SEC a.
2. Select tabular quantities using skew values as follows:
   0° to 5°
   5° to 10°
   10° to 15°
   15° to 20°
   20° to 25°
   25° to 30°
   30° to 35°
   35° to 40°
   40° to 45°

INDEX 430-030 3 of 4
SPACING FOR MULTIPLE PIPES

STRAIGHT CONCRETE ENDWALLS
SINGLE AND MULTIPLE PIPE

LEGEND:

a  Pipe Slope Angle
S  Center to Center between pipes
X  Center to Center along front of Headwall

NORMAL PIPE

SKewed PIPE
(Multiple Pipe Shown, Single Pipe Similar)
GENERAL NOTES:

1. Use Class 31 concrete.

2. Reinforcing steel is either Grade 40 or 60.

3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.

4. Chamfer all exposed edges and corners 3/8" unless otherwise shown.

5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single 60&quot; Pipe Endwall Details</td>
</tr>
<tr>
<td>3</td>
<td>Double 60&quot; Pipe Endwall Details</td>
</tr>
</tbody>
</table>

STRAIGHT CONCRETE ENDWALLS 60" PIPE

SINGLE ENDWALL

DOUBLE ENDWALL

STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 60" PIPE

FY 2020-21 STANDARD PLANS

INDEX 430-031

1 of 3
NOTES:
1. 2" clearance on all reinforcement, unless otherwise shown.
2. Cut and bend B, Bars as shown.
3. All bar dimensions are out to out.

LEGEND:
H = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars

DOUBLE 60° PIPE ESTIMATED QUANTITIES

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>4</td>
<td>1</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>P2</td>
<td>4</td>
<td>4</td>
<td>4'-2&quot;</td>
</tr>
<tr>
<td>P3</td>
<td>4</td>
<td>4</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>P4</td>
<td>4</td>
<td>2</td>
<td>4'-2&quot;</td>
</tr>
<tr>
<td>P5</td>
<td>4</td>
<td>4</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>F4</td>
<td>4</td>
<td>4</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>F3</td>
<td>4</td>
<td>29</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>F2</td>
<td>8</td>
<td>8</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td>F1</td>
<td>4</td>
<td>4</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>D1</td>
<td>4</td>
<td>16</td>
<td>7'-0&quot;</td>
</tr>
</tbody>
</table>

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SIZE</th>
<th>NO. REQD</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMP</td>
<td>20</td>
<td>4</td>
<td>4'-2&quot;</td>
</tr>
<tr>
<td>RCP</td>
<td>4</td>
<td>4</td>
<td>13'-9&quot;</td>
</tr>
<tr>
<td>UNIT</td>
<td>7'</td>
<td>7'-6&quot;</td>
<td></td>
</tr>
<tr>
<td>CMP</td>
<td>29</td>
<td>12'-6&quot;</td>
<td></td>
</tr>
<tr>
<td>UNIT</td>
<td>13.8</td>
<td>13.7</td>
<td></td>
</tr>
<tr>
<td>Lb.</td>
<td>824</td>
<td>824</td>
<td></td>
</tr>
<tr>
<td>Cu. Yd.</td>
<td>824</td>
<td>824</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
3. All bar dimensions are out to out.
2. Cut and bend B, Bars as shown.
1. 2" clearance on all reinforcement, unless otherwise shown.

DOUBLE 60° PIPE ENDWALL DETAILS

LEGEND:
D = Dowels or Diagonal Bars
B = Bent Bars
V = Vertical Bars
H = Horizontal Bars

STRAIGHT CONCRETE ENDCWALLS
SINGLE AND DOUBLE 60° PIPE

INDEX 430-031
SHEET 3 of 3
**GENERAL NOTES:**

1. Use Class 31 concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.
4. Chamfer all exposed edges and corners $\frac{3}{8}$" unless otherwise shown.
5. Quantities shown are for estimating purposes only.

**TABLE OF CONTENTS:**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single 66&quot; Pipe Endwall Details</td>
</tr>
<tr>
<td>3</td>
<td>Double 66&quot; Pipe Endwall Details</td>
</tr>
</tbody>
</table>

---

STRAIGHT CONCRETE ENDWALLS 66" PIPE

SINGLE ENDWALL

DOUBLE ENDWALL

---

STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 66" PIPE
NOTES:
1. 2" Clearance on all reinforcement, unless otherwise shown.
2. Cut and bend B Bars as shown.
3. All bar dimensions are out to out.

LEGEND:
H = Horizontal Bars  B = Bent Bars
V = Vertical Bars  D = Dowels or Diagonal Bars

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>S/L</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>4</td>
<td>5</td>
<td>5'-3&quot;</td>
</tr>
<tr>
<td>H2</td>
<td>5</td>
<td>4</td>
<td>9'-11&quot;</td>
</tr>
<tr>
<td>B1</td>
<td>5</td>
<td>24</td>
<td>9'-11&quot;</td>
</tr>
<tr>
<td>B2</td>
<td>4</td>
<td>8</td>
<td>7'-8&quot;</td>
</tr>
<tr>
<td>B3</td>
<td>4</td>
<td>4</td>
<td>7'-8&quot;</td>
</tr>
</tbody>
</table>

SINGLE 66" PIPE ENDWALL

ESTIMATED QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>EST. QTY</th>
<th>13.3</th>
<th>13.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Lb.</td>
<td>1,170</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMP</td>
<td>Cu. Yd.</td>
<td>1,170</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BENDING DIAGRAM

SECTION C-C

SINGLE 66" PIPE ENDWALL DETAILS

STRAIGHT CONCRETE ENDWALLS
SINGLE AND DOUBLE 66" PIPE
NOTES:
1. 2" clearance on all reinforcement, unless otherwise shown.
2. Cut and bend B Bars as shown.
3. All bar dimensions are out to out.

LEGEND:
H = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars

PLAN
(Showing Bars in Footing)

HALF ELEVATION
(Showing Bars in Front Face of Wall)

HALF ELEVATION
(Showing Bars in Back Face of Wall)

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>6</td>
<td>4</td>
<td>4'-11&quot;</td>
</tr>
<tr>
<td>V</td>
<td>6</td>
<td>5</td>
<td>9'-11&quot;</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>8</td>
<td>42'-8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>8</td>
<td>42'-8&quot;</td>
</tr>
</tbody>
</table>

DOUBLE 66" PIPE ENDWALL DETAILS

STRAIGHT CONCRETE ENDWALLS
SINGLE AND DOUBLE 66" PIPE

REVISION: 06/01/19
INDEX: 430-032
SHEET: 3 of 3
GENERAL NOTES:

1. Use Class II concrete.

2. Reinforcing steel is either Grade 40 or 60.

3. Endwalls may be cast-in-place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.

4. Chamfer all exposed edges and corners 90° unless otherwise shown.

5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single 72&quot; Pipe Endwall Details</td>
</tr>
<tr>
<td>3</td>
<td>Double 72&quot; Pipe Endwall Details</td>
</tr>
</tbody>
</table>

STRAIGHT CONCRETE ENDWALLS 72" PIPE
NOTES:
1. 2" clearance on all reinforcement, unless otherwise shown.
2. Cut and bend B Bars as shown.
3. All bar dimensions are out to out.

LEGEND:
M = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars

STATEMENT:
REVISIIO N
of
STANDARD PLANS
FY 2020-21
SHEET
INDEX

PLAN
(Showing Bars in Footing)

HALF ELEVATION
(Showing Bars in Front Face of Wall)

HALF ELEVATION
(Showing Bars in Back Face of Wall)

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>No. Req'd</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>5</td>
<td>9</td>
<td>43'-8&quot;</td>
</tr>
<tr>
<td>N2</td>
<td>4</td>
<td>8</td>
<td>B '@ 10&quot;</td>
</tr>
<tr>
<td>N3</td>
<td>3</td>
<td>2</td>
<td>B '@ 8&quot;</td>
</tr>
<tr>
<td>N4</td>
<td>4</td>
<td>8</td>
<td>B '@ 10&quot;</td>
</tr>
<tr>
<td>N5</td>
<td>4</td>
<td>8</td>
<td>7'-0&quot;</td>
</tr>
</tbody>
</table>

DOUBLE 72" PIPE ENDWALL DETAILS

SHEET 2
See Sheet 2

SYMMETRICAL ABOUT Q
See Note 2

STRAIGHT CONCRETE ENDWALLS
SINGLE AND DOUBLE 72" PIPE

INDEX 3 of 3
430-033
GENERAL NOTES:

1. Use Class 31 concrete.

2. Reinforcing steel is either Grade 40 or 60.

3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.

4. Chamfer all exposed edges and corners ¼" unless otherwise shown.

5. Quantities shown are for estimating purposes only.

---

**TABLE OF CONTENTS:**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single 84&quot; Pipe Endwall Details</td>
</tr>
</tbody>
</table>

---

STRAIGHT CONCRETE ENDWALL SINGLE 84" PIPE
NOTES:
1. 2" clearance on all reinforcement, unless otherwise shown.
2. Cut and/or bend B2 Bars as shown.
3. All bar dimensions are out to out.
4. Install a 1/4" V-Groove at the top, front and back.

SINGLE 84" PIPE ENDWALL
ESTIMATED QUANTITIES

<table>
<thead>
<tr>
<th>Item</th>
<th>No. REQD.</th>
<th>LENGTH</th>
<th>BILL OF REINFORCING STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEGEND:
H = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars

SECTION C-C
SINGLE 84" PIPE ENDWALL DETAILS
GENERAL NOTES:
1. Use Class I concrete.
2. Chamfer all exposed edges and corners 1/8" unless otherwise shown.
3. Quantities shown are for estimating purposes only.

**TABLE OF CONTENTS:**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>U-Type and 45° Endwalls</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. Use Class I concrete.
2. Chamfer all exposed edges and corners 1/8" unless otherwise shown.
3. Quantities shown are for estimating purposes only.
GENERAL NOTES:

1. Use Class I Concrete.

2. Channel section C3 x 6.0 may be substituted for the C4 x 5.4 channel.

3. All steel reinforcing bars are #4 with 2" cover except as noted.
   Spacing shown are center to center. Lap bars 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.

4. Drill 1" holes 8' deep with a rotary drill in existing endwall for
   dowel bars. Thoroughly clean holes prior to installing Adhesive-Bonded
   Dowels.

5. Quantities shown are for estimating purposes only.

6. For supplemental details, see Index 425-001.

---

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Endwalls for 1:4 and 1:6 Slopes</td>
</tr>
<tr>
<td>3</td>
<td>Steel Grate</td>
</tr>
</tbody>
</table>

SAFETY MODIFICATIONS FOR ENDWALLS
U-ENDWALL DIMENSIONS AND QUANTITIES

<table>
<thead>
<tr>
<th>Slope</th>
<th>Pipe Dia.</th>
<th>G</th>
<th>M</th>
<th>Ht</th>
<th>R</th>
<th>P</th>
<th>Class 1 Concrete-CY</th>
<th>Reinforcing Steel-lbs</th>
<th>Sed SY</th>
</tr>
</thead>
</table>
| 1:6   | 2'-0"     | 2'-0" | 2'-0" | 1'-0" | 2'-0" | 2'-0" | 1'-6" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 2'-0" | 1'
### TABLE 2
**Grate Dimensions and Quantities**

<table>
<thead>
<tr>
<th>Slope</th>
<th>Dia.</th>
<th>Channels @ 5.4 lbs/LF</th>
<th>Bars @ 2.8 lbs/LF (2 ea.)</th>
<th>Angles @ 3.2 lbs/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:8</td>
<td>12</td>
<td>2-0°</td>
<td>139</td>
<td>27.5</td>
</tr>
<tr>
<td>1:8</td>
<td>16</td>
<td>2-0°</td>
<td>188</td>
<td>32.7</td>
</tr>
<tr>
<td>2:8</td>
<td>15</td>
<td>3-3/4°</td>
<td>209</td>
<td>40.3</td>
</tr>
<tr>
<td>2:8</td>
<td>20</td>
<td>3-3/4°</td>
<td>372</td>
<td>58.3</td>
</tr>
<tr>
<td>1:4</td>
<td>7</td>
<td>2-0°</td>
<td>83</td>
<td>16.3</td>
</tr>
<tr>
<td>1:4</td>
<td>9</td>
<td>2-0°</td>
<td>107</td>
<td>16.3</td>
</tr>
<tr>
<td>2:4</td>
<td>9</td>
<td>2-0°</td>
<td>163</td>
<td>16.3</td>
</tr>
<tr>
<td>3:4</td>
<td>11</td>
<td>2-0°</td>
<td>227</td>
<td>16.3</td>
</tr>
</tbody>
</table>

**Concrete Slab Dimensions:**
- Base Width: 15' 6"
- Base Length: 25' 0"
- Wall Height: 5' 0"
- Wall Thickness: 8"

**Steel Grate Mounting**
- Channel Steel: C4 x 5.4
- Anchor Bolts: 3/8" x 6" Galv.
- Bolt Grade: 70 M-4

**Additional Details:**
- Anchor Bolts at 4 ea.
- Channels spaced @ 1'-0" c. to c.
- Bars @ 3'-3" c. to c.
- Slope: 1:6

**Safety Modifications for Endwalls**
- Existing Hookup and Endwall (To Remain)
- Anchor Bolt Detail: "B"

---

**Grate Dimensions and Quantities Table**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>Channels @ 5.4 lbs/LF</th>
<th>Bars @ 2.8 lbs/LF (2 ea.)</th>
<th>Angles @ 3.2 lbs/LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2-0°</td>
<td>139</td>
<td>27.5</td>
</tr>
<tr>
<td>16</td>
<td>2-0°</td>
<td>188</td>
<td>32.7</td>
</tr>
<tr>
<td>15</td>
<td>3-3/4°</td>
<td>209</td>
<td>40.3</td>
</tr>
<tr>
<td>20</td>
<td>3-3/4°</td>
<td>372</td>
<td>58.3</td>
</tr>
<tr>
<td>7</td>
<td>2-0°</td>
<td>83</td>
<td>16.3</td>
</tr>
<tr>
<td>9</td>
<td>2-0°</td>
<td>107</td>
<td>16.3</td>
</tr>
<tr>
<td>9</td>
<td>2-0°</td>
<td>163</td>
<td>16.3</td>
</tr>
<tr>
<td>11</td>
<td>2-0°</td>
<td>227</td>
<td>16.3</td>
</tr>
</tbody>
</table>
GENERAL NOTES:
1. Install outlet pipes and preformed channel inverts with a slope of 0.6% or steeper toward the outlet regardless of the surface slope, unless shown different in the Plans.

2. Stub trench drain directly into drainage structures or install outlet pipes to connect trench drain to drainage structures.

3. Provide a cleanout port compatible with the manufactured system for Type I drains at the upstream end and at intervals of 50 feet maximum. Provide a cleanout port with an opening of 8” to 10” wide (transverse to the trench drain length) and 18” to 24” long. Form curbs or separators around the cleanout when cleanouts are placed adjacent to raised curb or separator. Install the cleanout with a removable load resistant cover or grate.

4. Excavate trench to allow for a minimum of 6” of concrete to be placed under and alongside the trench drain channel system. Install concrete backfill in accordance with Specification 347. Install concrete backfill extending a minimum of 6” past the end of the drain opening at the end of all Type I or II units.

5. Install transverse bars spaced 4” to 6” on center for Type I Trench Drain.

---

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Type I - Nonremovable Grate</td>
</tr>
<tr>
<td>3</td>
<td>Type II - Removable Grate</td>
</tr>
</tbody>
</table>

---
NOTES:
1. Opening for fixed height grates. Opening at the pipe can be 3'.
2. The Round Pipe Channel is 15' in diameter, unless otherwise shown in the Plans.
3. Provide a minimum 6' concrete on this side of the drain.
4. Install grates on preformed polyethylene channel at driveways.

TYPICAL LOCATIONS
(Round Channel Shown, Preformed Polyethylene Similar)

WITHIN TYPE E CURB
WITHIN TYPE F CURB
WITHIN DROP CURB
ADJACENT TO TRAFFIC SEPARATOR

TYPE I - NONREMOVABLE GRATE

FY 2020-21
STANDARD PLANS
TRENCH DRAIN

INDEX 436-001
SHEET 2 of 3
DESCRIPTION:

REVISION LAST OF STANDARD PLANS FY 2020-21

SHEET INDEX

PREFORMED CHANNEL WITH REMOVABLE GRATE

NOTES:

1. Provide minimum 6" of concrete on this side of the drain.

2. 4" Minimum unless otherwise shown in Plans.

TYPICAL LOCATIONS

WITHIN DROP CURB

WITHIN VALLEY GUTTER

TRENCH DRAIN

TYPE II - REMOVABLE GRATE

INDEX 436-001

SHEET 3 of 3
GENERAL NOTES:

1. Install underdrain pipe that is either 4" smooth or 5" corrugated tubing unless otherwise shown in the Plans. The size to be furnished will be based on the nominal internal diameter of a pipe with a smooth interior wall. Except when prohibited by the Plans, the special provisions or this standard, pipe with a corrugated interior wall may be provided based on the following size equivalency:

4" smooth interior equivalent to 5" corrugated interior
5" smooth interior equivalent to 8" corrugated interior
6" smooth interior equivalent to 8" corrugated interior
8" smooth interior equivalent to 10" corrugated interior

2. Fine aggregate is quartz sand meeting the requirements of Specifications 902-4.

3. Coarse aggregate is gravel or stone meeting the requirements of Specification 902-2 or 901-3. The gradation is in accordance with Specifications 901, Grades 4, 467, 5, 50 or 57 stone unless otherwise shown restricted in the Plans.

4. Install Underdrain Type I, II, and III in accordance with Specification 440.

5. Install filter fabric Type D-3 in accordance with Specifications 985. The internal filter fabric of Type V underdrain has a permittivity of 0.7/sec and an AOS of #40 kN/m.

6. When Type I is used, use a filter fabric sock in accordance with Specification 948.

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. Install filter fabric joints with a overlap a minimum of 1'. Install the internal filter fabric of Type V underdrain with an overlap into the coarse aggregate or the fine aggregate a minimum of 1'.

9. Use nonperforated pipes for underdrain outlet and make all bends using 3/4 (85 deg) elbows. Construct 90 deg. bends with two 45 deg. elbows separated by at least 1' of straight pipe. Outlet pipes stubbed into inlets or other drainage structures must be a minimum 6' above the structure flow line. Install concrete aprons, hardware cloth, and sod for outlet pipes discharging to grassed areas as shown in Index 666-001 for Edgedrain Outlets.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Type I, II, and III Underdrains</td>
</tr>
<tr>
<td>3</td>
<td>Type Va, Vb, and Cleanout</td>
</tr>
</tbody>
</table>

UNDERDRAIN TYPE I, II, AND III ASSEMBLY

(Type II Shown, Others Similar)
DESCRIPTION:

REVISION LAST
OF STANDARD PLANS FY 2020-21

SHEET INDEX

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)

(Design)
GENERAL NOTES:

1. Install light duty cast iron cover and frame in accordance with Specifications 962.

2. Use Class J concrete. Use No. 3 bars (Grade 60) on 8" centers both ways, sides and bottom.

3. Furnish covers with pick holes. Do not use fitted lifts or handles.

4. Manhole Type P Alternate A, Index 425-010, Type I Frame and Cover, Index 425-001, may be used in lieu of the box detailed in this Index.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Typical Inspection Box Installation</td>
</tr>
<tr>
<td>3</td>
<td>Typical Urban, Slope, and Top Adjustment Installations</td>
</tr>
</tbody>
</table>
**NOTES:**

1. Cast or field cut 2 – 4" wide slots for hinges. Grout around hinge covers.

2. One or more sides may have an opening, see Plans for required openings. Grout around opening to seal between underdrain pipe and inspection box.

**TYPICAL INSPECTION BOX INSTALLATION**

**SECTION A-A (Frame)**

**SECTION B-B (Lid)**

**COVER REMOVAL**

**HINGE DETAIL**

**INSPECTION BOX DETAILS**

**Hinge Details** (See Note 1)

**CENTER OF BOX Sta./Offset Location**

**PLAN VIEW**

**PLAN**

**ELEVATION** (FRONT VIEW)

**ELEVATION** (SIDE VIEW)

**INSPECTION BOX DETAILS**

**TYPICAL INSPECTION BOX INSTALLATION**

**NOTES:**

1. Cast or field cut 2 – 4" wide slots for hinges. Grout around hinge covers.

2. One or more sides may have an opening, see Plans for required openings. Grout around opening to seal between underdrain pipe and inspection box.

**TYPICAL INSPECTION BOX INSTALLATION**

**SECTION A-A (Frame)**

**SECTION B-B (Lid)**

**COVER REMOVAL**

**HINGE DETAIL**

**INSPECTION BOX DETAILS**

**Hinge Details** (See Note 1)

**CENTER OF BOX Sta./Offset Location**

**PLAN VIEW**

**PLAN**

**ELEVATION** (FRONT VIEW)

**ELEVATION** (SIDE VIEW)

**INSPECTION BOX DETAILS**

**TYPICAL INSPECTION BOX INSTALLATION**

**NOTES:**

1. Cast or field cut 2 – 4" wide slots for hinges. Grout around hinge covers.

2. One or more sides may have an opening, see Plans for required openings. Grout around opening to seal between underdrain pipe and inspection box.
DESCRIPTION:

REVISION OF STANDARD PLANS FY 2020-21

Sheet Index (Side View)

Installation on Slope

Concrete Apron

Pipe Outlet

Underdrain

Slope 1:12

Elevation

Concrete Apron

Inspection Box

TYPICAL URBAN INSTALLATION

Curb and Gutter

Grout

Concrete Apron

Inspection Box

Underdrain (Secondary Location) (See Note 1)

Underdrain (Preferred Location) (See Note 1)

Varies

TYPICAL URBAN, SLOPE, AND TOP ADJUSTMENT INSTALLATIONS

NOTES:

1. See Index 121-002 for Underdrain placement.
2. Curve the Underdrain to connect to the Inspection Box.
3. A maximum of 2 adjustment courses of brick is permitted.

Concrete Apron

Underdrain

Inspection Box

Top Frame

Brick (Typ.) (See Note 3)
GENERAL NOTES:

1. Install light duty cast iron cover and frame in accordance with Specifications 962.

2. Use Class J concrete. Use No. 3 bars (Grade 60) on 8" centers both ways, sides and bottom.

3. Furnish covers with pick holes. Do not use fitted lifts or handles.

4. Manhole Type P Alternate A, Index 425-010, Type I Frame and Cover, Index 425-001, may be used in lieu of the box detailed in this Index.

<table>
<thead>
<tr>
<th>TABLE OF CONTENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>
NOTES:
2. For additional sump bottom information see Index 425-001.
3. Construct weep holes only where called for in the Plans.
4. Only cast and ductile iron sanitary sewer, or cast iron, ductile and steel water mains will be allowed to pass directly through French drain (without sleeve).
5. Use only steel, cast or ductile iron sleeves.
6. No slots or perforations.

11/01/19

10/29/19
**CONCRETE SLOTTED PIPE OPTIONS**

**OPTION A - ROUND PIPE**

**OPTION B - ROUND OR ELLIPTICAL PIPE**

### ROUND PIPE

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Slot Cut Min.</th>
<th>Opening (C) Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;</td>
<td></td>
<td>12&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td></td>
<td>14&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td></td>
<td>16&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td></td>
<td>18&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td></td>
<td>22&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td></td>
<td>24&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td></td>
<td>26&quot;</td>
</tr>
<tr>
<td>54&quot;</td>
<td></td>
<td>26&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td></td>
<td>26&quot;</td>
</tr>
<tr>
<td>66&quot;</td>
<td></td>
<td>26&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td></td>
<td>26&quot;</td>
</tr>
</tbody>
</table>

### ELLIPTICAL PIPE

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Slot Cut Min.</th>
<th>Opening (C) Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>14&quot;x22&quot;</td>
<td></td>
<td>10&quot;</td>
</tr>
<tr>
<td>16&quot;x30&quot;</td>
<td></td>
<td>14&quot;</td>
</tr>
<tr>
<td>18&quot;x36&quot;</td>
<td></td>
<td>16&quot;</td>
</tr>
<tr>
<td>20&quot;x40&quot;</td>
<td></td>
<td>18&quot;</td>
</tr>
<tr>
<td>20&quot;x53&quot;</td>
<td></td>
<td>20&quot;</td>
</tr>
<tr>
<td>20&quot;x57&quot;</td>
<td></td>
<td>20&quot;</td>
</tr>
</tbody>
</table>

### NOTES:
1. Slot-Cut for 8'-0" joints of pipe
2. A curved cut is acceptable provided the control dimension is maintained.

---

**DETAILED INFORMATION**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**SECTION D-D**

---

**DESCRIPTION:**

**REVISION**

**FRENCH DRAIN**

**INDEX**

**CONTRACT DOCUMENTS**

**REVISED**

**FISCAL YEAR**

**STANDARD PLANS**

**REVISED**

**DATE**

**FISCAL YEAR**

**STANDARD PLANS**

**REVISED**

**DATE**

---

**LAST REVISION:**

**DESCRIPTION:**

**FY 2020-21**

**INDEX**

**SHEET:**

3 of 3
GENERAL NOTES:

1. The French Drain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin.

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

3. Provide skimmer baffles, cleanout pipe and angles constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrile butadiene styrene. Provide hot-dip galvanized steel components, unless stainless.

4. Use Mounting hardware, hinges and latches made of stainless steel.

5. Provide skimmer bodies (baffles) and clean-out pipe meeting Specification 943 for steel, 945 for aluminum or 948 for plastic.

6. Work this Index in accordance with Specification 425.

---

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Type I Skimmers</td>
</tr>
<tr>
<td>3</td>
<td>Type II Skimmers</td>
</tr>
</tbody>
</table>

---

SKIMMERS FOR FRENCH DRAIN OUTLETS
NOTES:
1. Conform the backs of skimmers to the shape of the basin walls on which they are mounted.
2. "R" is the radii required for curved back skimmers. Applies to both skimmer types. See Plans.
3. Weld Angles at all points of contact with skimmer.

---

**DIMENSION TABLE**

<table>
<thead>
<tr>
<th>OUTLET PIPE</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>12&quot;</td>
<td>23&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>18&quot;</td>
<td>28&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>21&quot;</td>
<td>48&quot;</td>
<td>42&quot;</td>
</tr>
</tbody>
</table>

---

**SIDE ELEVATION**

- Basin Wall
- Outlet Pipe
- Neoprene Gasket
- Cleanout Pipe
- Skimmer

**PLAN**

- Basin Wall
- Outlet Pipe
- Neoprene Gasket
- Cleanout Pipe
- Skimmer

**SIDE ELEVATION**

- Basin Wall
- Outlet Pipe
- Neoprene Gasket
- Cleanout Pipe
- Skimmer

**SCHEMATIC VIEW**

- 1'-0" I.D.
- Lid Hinge
- Latch Pin
- Lid
- Cleanout Pipe
- Skimmer Wall

**SIDE ELEVATION**

- Lid Hinge
- Latch Pin
- Lid
- Cleanout Pipe
- Skimmer Wall

**ANGLE DETAIL**

- Lid Hinge
- Latch Pin
- Lid
- Cleanout Pipe
- Skimmer Wall

**TYPE I DETAILS**

- Limits of Skimmer on Circular Basin Wall
- Circular Basin Wall
- Flat Basin Wall

---

**TYPE I SKIMMERS**

FY 2020-21

SKIMMERS FOR FRENCH DRAIN OUTLETS

INDEX

443-002

2 of 3
NOTE:
1. Install a gasket for the cleanout with either a threaded screw-in lid or a lid secured by four stainless steel quick-release latches.
DESCRIPTION:

REVISION 11/01/17

SPECIAL MANHOLE STRUCTURE

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.

24" STEEL WELL GRATE

Heavy duty "bee hive" grate

Openings: 1-½" maximum

For 24" well, outer diameter = 29"

Steel grate to be installed over 24" deep well.

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

Note: Deep well encased and open lengths as specified in plans. Contractor is to verify design capacity.
GENERAL NOTES:

1. Do not leave trench greater than 2' in depth overnight. Barricade trenches at all times.

2. Construct concrete pavement subdrainage adjacent to the low edge of the roadway pavement and under travel lanes, auxiliary pavement and shoulders, as called for in the plans. Extend the concrete pavement subdrainage 50' beyond and begin 50' before the flat point (100' overlap) when the low edge shifts between outside and inside edges of pavement. Place concrete pavement subdrainage on the low side of ramps for crossroad terminals.

3. Install concrete pavement subdrainage on a grade parallel with the edge of pavement profile, except on profiles flatter than one-tenth percent (0.10%) install the concrete pavement subdrainage on a minimum grade of one-tenth percent (0.10%).

4. Remove adhering base material and soil from the vertical face of the concrete immediately prior to placing the filter fabric.

5. Submit a procedure for holding the filter fabric in position on the vertical face of the trench for approval by the Engineer prior to placing draincrete.

6. Cap the upper end of each separate run of the concrete pavement subdrainage pipe.

7. Install outlet pipes at 500' maximum intervals. Use elbows or 1/8 bends to connect the outlet pipe to the concrete pavement subdrain pipe. Use elbows or bends of the same material as the outlet pipe.

Stump outlet pipes into existing inlets or into existing ditch pavements at an elevation 6' above the inlet flowline or ditch bottom when directed by the Engineer. Concrete aprons and bordering sod are not required for stubbed outlets, but replacement sodding will be required at trenches for pipes stubbed into paved ditches. Place concrete pavement subdrainage on the low side of ramps for crossroad terminals.

8. Replace existing paved shoulder removed for the construction of outlet pipes with Type SP asphaltic concrete at the rate of 500 LB per SY.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Edgedrain and Outlet</td>
</tr>
<tr>
<td>3</td>
<td>New Construction</td>
</tr>
<tr>
<td>4</td>
<td>Rehabilitation</td>
</tr>
</tbody>
</table>
NOTES:

1. Install 4" thick Class NS concrete, 0.19 cubic yard for 1:4 slopes and 0.25 cubic yard for 1:6 slopes.

2. Install perimeter sod, 4.7 square feet for 1:4 slopes and 5.5 square feet for 1:6 slopes.

3. 1.25' std. for grazed ditches; 0.5' std. for paved ditches (less is acceptable to provide minimum 0.1% outlet pipe slope).

1:4 SLOPE

1:6 SLOPE

SECTION A-A

EDGEDRAIN OUTLET

PLANT

ELEVATIONS

CONCRETE PAVEMENT SUBDRAINAGE
**NOTES:**

1. The edgdrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. 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.

3. Install the filter fabric in accordance with Specification 514.

4. Install only noncorrugated or smooth lined corrugated pipe.

5. At the Contractor's option this area may be constructed of Optional Base material (Specification 285) or special stabilized subbase.

---

**CONCRETE SHOULDERS AND AUXILIARY PAVEMENT**

**CONCRETE PAVEMENT SUBDRAINAGE**

**ASPHALT SHOULDER**

**ASPHALT BASE**

**NEW CONSTRUCTION**

**STANDARD PLANS**

**FY 2020-21**
**NOTES:**

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. Confine the construction of draincrete edgedrain to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

3. Install the filter fabric in accordance with Specification 514.

4. Install only noncorrugated or smooth lined corrugated pipe.

5. Install Filter Fabric 2' below bottom of pavement for cement stabilized, soil cement and econcrete subbases and 2' above bottom of pavement for other subbases.
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 limerock 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'ci ≥ 4000 psi required.

ENVIRONMENT:
The pile designs are applicable to all environments.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:

Type "A"
Pick-up of pile may be either a single point pick-up or a two point pick-up as shown below.

Types "B1", "B2", "C1" & "C2"
Two point pick-up for lifting out of forms & two point support for storage & transportation.
Single point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1/4" 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.

CROSS REFERENCES:
For Dimensions L and X see Sheet Pile Wall Data Table in Structures Plans.

DETAIL "A"
(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.

DETAIL "A"
(Section Taken Below Dimension X)

PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS

NOTE:  Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Plan View.
**TYPICAL PILE**

- Spaced at 1'-0" Maximum
- 6 sp. @ 4" / 3" Spacing for Bars S

**STARTER PILE**

<table>
<thead>
<tr>
<th>WALL THICKNESS</th>
<th>STRAND DIA.</th>
<th>MAXIMUM</th>
<th>n</th>
<th>D (in.)</th>
<th>TOTAL # OF STRANDS</th>
<th>INITIAL (JACKING) FORCE (Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T=10 in.</td>
<td>0.5</td>
<td>28'-0&quot;</td>
<td>6</td>
<td>3½</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>0.6</td>
<td>27'-0&quot;</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>T=12 in.</td>
<td>0.5</td>
<td>31'-0&quot;</td>
<td>7</td>
<td>2½</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>0.6</td>
<td>30'-0&quot;</td>
<td>5</td>
<td>4</td>
<td>12</td>
<td>44</td>
</tr>
</tbody>
</table>

**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.

**PILE SHEET DIMENSIONS**

<table>
<thead>
<tr>
<th>DIMENSION A</th>
<th>S1</th>
<th>11 1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>S7</td>
<td>1'-9 1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>8&quot;</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>1'-10 1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>S6</td>
<td>1'-12&quot;</td>
<td></td>
</tr>
<tr>
<td>S7</td>
<td>1'-12&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**DIMENSION B**

T=10 in. 4"  
T=12 in. 6"
NOTES:
1. This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
2. The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-to-out.
4. Bars A are #8 and Bars 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 tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3 & S4 in shop drawings.
8. If tongue must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.
10. For Dimensions C over 3" see Detail “D.”
11. Slope is to this point. Slope only on tongue side.

STIRRUP DIMENSIONS (T = 10")

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
<th>R8</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
</tbody>
</table>

STIRRUP DIMENSIONS (T = 12")

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
<th>R8</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
<tr>
<td></td>
<td>S4</td>
<td>1½</td>
<td>8/5</td>
<td>7/6</td>
<td>6/7</td>
<td>5/8</td>
<td>4/9</td>
<td>3/10</td>
<td>2/11</td>
</tr>
</tbody>
</table>

SHEET PILE DIMENSIONS

<table>
<thead>
<tr>
<th>T (in)</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø (in)</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
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.

**BAR BENDING DIAGRAMS**

**STIRRUPS S**

**STIRRUP DIMENSIONS**

<table>
<thead>
<tr>
<th>B</th>
<th>T (in.)</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>7 3/4</td>
<td>7 3/4</td>
<td>7 3/4</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td></td>
</tr>
<tr>
<td>S5</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td>9 1/2</td>
<td></td>
</tr>
</tbody>
</table>

**SHEET PILE DIMENSIONS**

<table>
<thead>
<tr>
<th>T (in.)</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y (in.)</td>
<td>3 1/2</td>
<td>4 1/2</td>
</tr>
<tr>
<td>Z (in.)</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

**NOTES:**

- **SECTION C-C (T=10" or 12")**
- **SECTION D-D (T=10")**
- **SECTION D-D (T=12")**

**Type "C1" and "C2" - Right Angle Corner Pile**
PRECAST CONCRETE SHEET PILE WALL
(CFRP/GFRP and HSSS/GFRP)

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: Minimum compressive strength f'c ≥ 6000 psi
for single-point pick-up at f'c ≥ 6000 psi

Types "B1", "B2", "C1" & "C2"
Pick-up, Storage and Transportation: Minimum compressive strength f'c = 4000 psi required for two-point pick-up;
f'c ≥ 6000 psi for single-point pick-up.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:
Two-point pick-up for lifting out of forms & two-point support for storage & transportation.
Single-point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to ƀ" to
allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5ƀ". No changes shall be made
to the tongues or grooves.

DETAIL "A"
(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.

DETAIL "A"
(Cap and Anchoring System Not Shown)
(Section Taken Below Dimension X)

NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead.
See Bulkhead plans for actual Plan View.
TYPICAL PILE

STARTER PILE

**Filler 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 10" thick Sheet Piles, Bars S may be tilted to achieve contact with strands or provide supplemental GFRP Bars to offset Bars S from strands and maintain 2" Nominal cover.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

**Sheet pile dimensions:**

<table>
<thead>
<tr>
<th>Section</th>
<th>2′-6&quot; (in.)</th>
<th>1′-0&quot; (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1′-9&quot;</td>
<td>31'-0&quot;</td>
</tr>
<tr>
<td>B</td>
<td>1′-9&quot;</td>
<td>31'-0&quot;</td>
</tr>
<tr>
<td>C</td>
<td>1′-9&quot;</td>
<td>31'-0&quot;</td>
</tr>
</tbody>
</table>

**Angle dimensions:**

<table>
<thead>
<tr>
<th>DIMENSION A</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
</tr>
<tr>
<td>S7</td>
</tr>
<tr>
<td>S3</td>
</tr>
<tr>
<td>S4</td>
</tr>
<tr>
<td>S5</td>
</tr>
<tr>
<td>S6</td>
</tr>
<tr>
<td>S7</td>
</tr>
</tbody>
</table>

**Dimensions B**

<table>
<thead>
<tr>
<th>T-10 in.</th>
<th>6′</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-12 in.</td>
<td>6′</td>
</tr>
</tbody>
</table>

**Bar bending diagrams**

**Dimension A**

**Dimension B**

**Notes:**
- Bars S are GFRP #4 and may be a single closed bar (hoop) with equivalent area and tensile strength.
- For Dimensions L and X see Sheet Pile Data Table in Structures Plans.
- Bars A are GFRP #5
- Bars S may be tilted to achieve contact with strands or provide supplemental GFRP Bars to offset Bars S from strands and maintain 2" Nominal cover.

**TYPICAL PILE**

<table>
<thead>
<tr>
<th>STRAND DIA.</th>
<th>MAXIMUM L *</th>
<th>D (in.)</th>
<th>TOTAL # OF STRANDS</th>
<th>Initial (Jacking) FORCE (Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.49 (12.5mm)</td>
<td>26'-0&quot;</td>
<td>4</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3½</td>
<td>8</td>
</tr>
<tr>
<td>0.6 (15.2mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3½</td>
<td>8</td>
</tr>
<tr>
<td>0.49 (12.5mm)</td>
<td>31'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>12</td>
</tr>
<tr>
<td>0.5 (12.7mm)</td>
<td>31'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>12</td>
</tr>
<tr>
<td>0.6 (15.2mm)</td>
<td>31'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>8</td>
</tr>
<tr>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>12</td>
</tr>
<tr>
<td>0.6 (15.2mm)</td>
<td>27'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>8</td>
</tr>
<tr>
<td>0.5 (12.7mm)</td>
<td>32'-0&quot;</td>
<td>6</td>
<td>3½</td>
<td>14</td>
</tr>
<tr>
<td>0.6 (15.2mm)</td>
<td>32'-0&quot;</td>
<td>4</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

**Alternate symmetrical strand patterns:**
- (1) 4 sp. @ 2" & 1 sp. @ 8" *(Typical Tongue)*
- (2) 2 sp. @ 4" & 1 sp. @ 8" *(Typical Tongue)*
- (3) 4 sp. @ 2" & 2 sp. @ 4" *(Typical Tongue)*

* Based on lifting using single point pick-up.
11° Slope is to this point

Slope on only tongue side

Bars S3
Bars S4

VIEW C-C

10 /29 /2019

DESCRIPTION:

11" Slope is to 1'-1

1'-0"

1'-2"

1'-0"

2'-2"

FY 2020-21

INDEX

455-440

3 of 4
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 side.
7. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

** 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".

** This A4 bar ends here if T=12".
NOTES:

1. A bypass switch shall be installed to override each timing interval in case of a malfunction.

2. "STOP HERE ON RED" is omitted in Type I operation and "TRAFFIC SIGNALS" are omitted in Type II operation.

3. The time between beginning of flashing yellow on "Drawbridge Ahead" sign and the clearance of traffic signal to red, or beginning of flashing red, should be less than the travel time of a passenger car, from the sign location to the stop line, traveling at the 85th 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 85th percentile approach speed from having continuous view of at least one signal indication for approximately 10 seconds.

10. Requirements on gate installation are contained in Section 4I of the "Manual on Uniform Traffic Control Devices".

11. In accordance with Traffic Engineering Manual (Topic Number 750-000-005) Section 2, "SLIPPERY WHEN WET" shall be placed in advance of all MOVABLE and NONMOVABLE STEEL DECK BRIDGES.*

* Field conditions may require adjustment of this standard distance.

SEQUENCE CHART

<table>
<thead>
<tr>
<th>Normal Operation</th>
<th>Variable Time</th>
<th>25 Sec. Min.</th>
<th>Variable Time</th>
<th>Variable Time</th>
<th>Variable Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time</td>
<td></td>
<td>Bridge Open</td>
<td>(See Note 3)</td>
<td>(See Note 3)</td>
</tr>
<tr>
<td></td>
<td>(See Note 3)</td>
<td>(See Note 4)</td>
<td>(See Note 6)</td>
<td>(See Note 5)</td>
<td></td>
</tr>
</tbody>
</table>

LEGEND:

1. TRAFFIC SIGNALS

2. DRAWBRIDGE SIGN

3. DRAWBRIDGE AHEAD SIGN WITH YELLOW FLASHING BEACON

4. STOP HERE ON RED SIGN WITH YELLOW FLASHING BEACONS

5. ENTRANCE GATE

6. EXIT GATE

7. 24" THERMOPLASTIC STOP BAR

8. DRAWBRIDGE AHEAD SIGN

9. DRAWBRIDGE SIGN

10. SIGNAL SWITCH

11. FLASHING BEACON

12. GATES

13. STOP HERE ON RED SIGN

14. TRANSITION (TYPE II only)

15. DRAWBRIDGE OPERATOR IS "ON CALL"
FIGURE - A
MONOTUBE SUPPORT MOUNTING

FIGURE - B
SIGN PANEL MOUNTING ASSEMBLY

FIGURE - C

FIGURE - D

FIGURE - E

FIGURE - F

FIGURE - G

DRAW BRIDGE AHEAD

Varnished Cabinet Location When Required

4" O.D. Aluminum pedestal, 0.188 Wall Thickness, Alloy 6061-T6

FTP-84-09

Pulling Elbow

4" Slip Fit Collar

Bridge Mounting Details Not Shown

* Measured from the bottom of the sign to the near edge of the pavement. Horizontal distance between edge of the pavement and inside edge of sign will vary with condition at job site.
BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND
TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET
MONOTUBE SUPPORT MOUNTING

NOTES:

1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only when gate arm is in the lower position or in the process of being lowered. The number of lights shall vary accordingly to length of the gate arm.

2. Alternating 16" pattern of fully reflectorized red and white stripes.
NOTES:

1. The location of flashing warning devices and stop lines shall be established based on future (or present) installation of gate with appropriate track clearances.

2. Where plans call for railroad traffic control devices to be installed in curbed medians, the minimum median width shall be 12'-6".

3. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk, 0 to 6' - Locate device 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.
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.
**MEDIAN SIGNAL GATES FOR**

**MULTIPLE UNDIVIDED URBAN SECTIONS**

(THREE OR MORE DRIVING LANE IN ONE DIRECTION, 45 MPH OR LESS)

**RAILROAD GATE ARM LIGHT SPACING**

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>&quot;A&quot;</th>
<th>Specified Length Of Gate Arm</th>
<th>&quot;B&quot;</th>
<th>Specified Length Of Gate Arm</th>
<th>&quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Ft.</td>
<td>6&quot;</td>
<td>10 Ft.</td>
<td>36&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>15 Ft.</td>
<td>36&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>16-17 Ft.</td>
<td>24&quot;</td>
<td>10 Ft.</td>
<td>36&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>24&quot;</td>
<td>18&quot;</td>
<td>45&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>30&quot;</td>
<td>18&quot;</td>
<td>45&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>30&quot;</td>
<td>24-28 Ft.</td>
<td>5&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>29-32 Ft.</td>
<td>36&quot;</td>
<td>39&quot;</td>
<td>6&quot;</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>32-36 Ft.</td>
<td>36&quot;</td>
<td>32-36 Ft.</td>
<td>7&quot;</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>36&quot;</td>
<td>35-37 Ft.</td>
<td>9&quot;</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>38 And Over</td>
<td>10&quot;</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**


[Diagram of railroad grade crossing and signal gates]

**MEDIAN SECTION AT SIGNAL GATES**

[Diagram of median section at signal gates]

**RAILROAD GRADE CROSSING**

**TRAFFIC CONTROL DEVICES**

**STANDARD PLANS**

**FY 2020-21**

**INDEX**

**SHEET**

**LAST REVISION**

**DESCRIPTION:**

**509-070**

**4 of 4**
REVIEW
DESCRIPTION:

REVISED

11/01/17

INDEX

11/01/17

1 of 1

FUNCTIONAL BLOCK DIAGRAM

LOCATION OF THE
ADVANCE WARNING
SIGN

SPEED

DISTANCE

(MPH)
(FT)

Min.

30

50

40

125

50

250

55

325

NOTE:

The Distance Is Measured Along Right Edge Of Pavement
From RR Stop Bar To Sign Advance Warning Sign.

PASSIVE STATE

(TRAIN CIRCUIT NOT ACTUATED)

ACTIVE STATE

(TRAIN CIRCUIT ACTUATED)

NOTE:

1. "STOP AHEAD" is standard and preferred sign message. Another message may be approved when appropriate for specific situations.

NOTE:

Conduit and cable from the normally closed relay of RR controller cabinet to the junction box shall be furnish & installed by RR.

ROW.

Installed At RR
Junction Box

Flasher

Control Circuit

1. Pull Box

Crushed Rock

1" PVC Conduit

S t a t i o n a r y  B a c k g r o u n d  T o
F o r m  A  P a r t i o n  O f  ' S T O P
AHEAD' Sign In Open Mode.

Stationary Background
To Form A Portion Of
Distance Message When
"STOP AHEAD" Sign Is
In Closed Mode.

Folding Sign Control System
(Closed).

Grade At Edge Of Travel Way

18" Shoulder

Sho ulder

From RR Stop Bar To Sign Advance Warning Sign.

The Distance Is Measured Along Right Edge Of Pavement
From RR Stop Bar To Sign Advance Warning Sign.

From Railroad Controller Cabinet (Normally Closed Relay).
TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post &quot;A&quot;</td>
<td>HSS 2½ x 1½ x ½</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS 2½ x 1½ x ½</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>HSS 3.00 x 0.120</td>
<td>3.00&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>HSS 3.00 x 0.120</td>
<td>3.00&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 2.500 x 0.125</td>
<td>2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>HSS 2 x 2 x 1/8&quot;</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>HSS 1.500 x 0.125</td>
<td>1.500&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1&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>3½ Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>3½ Ø Round Bar</td>
<td>0.750&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

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 A36 for bars.
   B. Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A510
   C. Steel Plate: ASTM A36 or ASTM A309 Grade 36
   D. U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
   E. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   F. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
4. Fabricate pickets and vertical panel elements parallel to the posts; except Type 2, 3 and 5 panel infills may be fabricated parallel to the longitudinal grade. Maintain a maximum clear opening of 3½" for standard installations and 2½" when a 4" sphere requirement is indicated in the Data Tables.
5. Maximum spacing between expansion joints is 40'-0". Locate an Expansion Joint between the posts on either side of the Deck Expansion Joint.
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For Intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "K".
8. Make corners and changes in tangential longitudinal alignment with a 90° bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
9. For changes in tangential alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius. Handrails are required and must be continuous at landings for:
    A. Grades Steeper than 5%.
    B. Three or more steps.
11. Installation: Cutting of reinforcing steel is permitted for post installed anchors.
Handrail required for ramps (Handrail continuous at landings between runs)

Handrail ~ 1-1/2" NPS Sch. 40 Post

30'-0" Max. for Slopes > 6.25%
40'-0" Max. for Slopes ≤ 6.25%

For slopes greater than 5%:
Max. ramp slope = 8.33%
Max. ramp cross-slope = 2.0%

Max. landing slope = 2%
Max. landing cross slope = 3%

Note: Non-continuous corners are permitted when handrails are not required.
RAILINGS ON STEPS & STAIRS

RAIL TERMINATION DETAILS

VIEW J-J
DETAIL "J" - ELEVATION VIEW
TOP RAIL TERMINATION

DETAIL "K" - ELEVATION VIEW
BOTTOM RAIL CONNECTION
(Intermediate Rail Similar)

RAIL TERMINATION DETAILS

DETAIL "L" - PLAN VIEW
HANDRAIL TERMINATION

DETAIL "K" - ELEVATION VIEW
BOTTOM RAIL CONNECTION
(Intermediate Rail Similar)

ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

DESCRIPTION:

FY 2020-21
STANDARD PLANS

PEDESTRIAN/BICYCLE RAILING (STEEL)

INDEX 515-052

5/1/16

3 of 8

REV. 8:17:44 AM

10/29/2019

REV.

8:17:44 AM
SECTION A-A

PICKET NOTES:
* Picket Spacing of 6" centers is based on a 3/16" Ø Bar for standard applications. When shown in the Contract Plans a 6" picket spacing may be required. See Note 4 (Sheet 1).

TYPE 1 - PICKET INFILL PANEL

DETAIL "1A"
(Top of Picket Connection)

DETAIL "1B"
(Bottom of Picket Connection)

SECTION A-A

TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
</tr>
<tr>
<td>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.

NOTES:
1. See Plans for Infill Panel option required.
TYPE 3 - SUNSHINE INFILL PANEL

* Arc, Rays and Sun Segment may be formed in a single panel from 1/2" steel plate pattern cut with laser or plasma CNC, welded to a 1x1x1/8 Angle Border or the 1x1x1/8 Channel Border shown.

NOTES:
1. See Plans for Infill Panel Option required.
NOTES:

1. See Plans for Infill Panel Type required.

SECTION A-A

SECTION C-C

REPEATING PATTERN DETAIL FOR PERFORATED PANEL

DETAIL "5A" PANEL/RAIL CONNECTION
(Top Shown, Bottom Similar)

DETAIL "5B" PANEL END CONNECTION
(Expansion Joint Shown, Sides Similar)
**TYPICAL SECTION ON CONCRETE SIDEWALK**  
(Case I)

**TYPICAL SECTION ON RETAINING WALL**  
(Case II)

**TYPICAL SECTION ON STEPS & STAIRS**  
(Case III)

**TYPICAL SECTION FOR 4-BOLT ANCHORAGE**  
(Case IV)

**ANCHOR BOLT TABLE**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>1-2&quot;</td>
</tr>
<tr>
<td>IIa</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>IIb</td>
<td>Gravity Wall Index 400-011</td>
<td>4½&quot;</td>
<td>3½&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>4½&quot;</td>
<td>4½&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>Varies</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

**DETAIL "D" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION)**  
(Used in lieu of Beveled Shim Plates)

**DETAIL "C"**  
(Cast-In-Place Anchor Bolts shown, Adhesive Anchors similar)

**REVISION LAST OF STANDARD PLANS FY 2020-21**

**PEDESTRIAN/BICYCLE RAILING (STEEL)**

**INDEX SHEET**

**11/01/19**

**10/29/2019 8:17:53 AM**

**DESCRIPTION:**

**REV**
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>Extrusion 1½x2½x0.125</td>
<td>1.50 x 2.50</td>
<td>0.125</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>Extrusion (See Details)</td>
<td>2½ x 3&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>2½ NPS (Sch. 10)</td>
<td>1.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td></td>
<td>3 Round Top Cap Rail</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td></td>
<td>3½ NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td></td>
<td>3.00 OD x 0.125 Wall</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>Extrusion (See Details)</td>
<td>2.500&quot; x 2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>2.50 OD x 0.125 Wall</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td></td>
<td>Top Cap Rail Inner Sleeve</td>
<td>2.800&quot;</td>
<td>0.090&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>Extrusion (See Details)</td>
<td>2.000&quot; x 2.000&quot;</td>
<td>0.250&quot;</td>
</tr>
<tr>
<td></td>
<td>1.50 OD x 0.125 Wall (Typ.)</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td></td>
<td>1½ OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1½ OD NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.185&quot;</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>½ Round Bar</td>
<td>0.750&quot;</td>
<td>NA</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies</td>
<td>Varies</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° of post spacing may be Alloy 6063-T6
   c. Fat Plates and Rail Caps: ASTM B209 Alloy 6061-T6
   d. Perforated panels (Typ.) S5 3003-M14
   e. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   f. Aluminum screws: Alloy 2024-T4 or 7075-T73
   g. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   h. Hex Head Bolts: ASTM A 307
   1. 1½" diameter single bolt option, Grade 36
   2. 1½" diameter four bolt option, Grade 55
   j. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   k. Hex Nuts: ASTM A3563
   l. Flat Washers: ASTM F436
   m. Plate Washers: ASTM A36 or ASTM A076, Grade 36
   n. Shims: ASTM B209 Alloy 6061, or 6063
   o. Bearing Pads: Provide ½" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.

### 3" ROUND TOP CAP RAIL

**ALTERNATE TOP RAIL SECTION**

**PEDESTRIAN/BICYCLE RAILING (ALUMINUM)**

**INDEX** 515-062

**SHEET** 1 of 9
**Detailed Railing Requirements**

**Handrail Required for Ramps**
- Handrail continuous at landings between runs
- Minimum 1" width
- NPS Schedule 40 Post

**Maximum Railing Heights**
- 30'-0" Max. for Slopes > 6.25%
- 40'-0" Max. for Slopes ≤ 6.25%

**Foundation Expansion Joint**
- See Detail “B”, Sheet 4

**Rail Expansion Joints**
- To be located in panels above structure expansion joints (35'-0" maximum spacing)

**Railings on Grades Steeper Than 5%**

**Ramp Requirements**
- For slopes greater than 5%:
  - Max. ramp slope = 8.33%
  - Max. ramp cross-slope = 2.0%
- Top of Intermediate Rail
- 3'-0" Min. ~ 1" Max.
- Top Landing
- 5'-0" Min.

**Landing Requirements**
- Max. landing slope = 2%
- Max. landing cross slope = 3%
- See Plans for continuation or termination limits of railing

**Railing Details & Railings on Grades 0% to 5%**

**Typical Railing Details & Railings on Grades 0% to 5%**

**Expanded Elevation at Corners**

**Detail for Non-Continuous Railing at Corners**

**Notes:**
- Non-continuous corners are permitted when handrails are not required.
- See Plans for continuation or termination limits of railing.

**Identification:**
- PEDESTRIAN/BICYCLE RAILING (ALUMINUM)
- FY 2020-21
- STANDARD PLANS
- 07/01/15
- 2 of 9

**Revision:**
- 10/29/2019
- 8:17:56 AM

**Index:**
- 515-062
RAIL TERMINATION DETAILS

RAILING CONTINUATION BEYOND STEPS OR STAIRS
(Bottom shown, Top similar)

DETAIL "L" - PLAN VIEW
HANDRAIL TERMINATION

See "Typical Railing Details", Sheet 2 for post, rail & picket details.

RAIL TERMINATION DETAILS

ALTERNATE HANDRAIL END TREATMENT OR MOUNTING LOCATION FOR SLOPED WALLS

LEVELING CHANNEL
(Typ.) See Detail, Sheet 4

Not considered an expansion joint for railing fabrication (Typ.)
BASE PLATE DETAILS FOR TYPE "C" POST
(Screws Not Shown For Clarity)

COUNTERSUNK HOLES
for 3/8" Ø x 1" Min. Self-Tapping Screws (Typ.)

COUNTERSUNK HOLES
for 3/8" Ø x 1½" Self-Tapping Screws (Typ.)

COUNTERSUNK HOLES
for 3/8" Ø x 1" Min. Set Screws (Typ.)

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.

Optional intermittent weld in-lieu of Self-Tapping screws between posts.
**SECTION A-A**

**See Detail "1A"**

**See Detail "1B"**

---

**TYPE 1 - PICKET INFILL PANEL**

* Picket Spacing of 6" centers is based on a 3/8" Ø Bar for standard applications.

When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).

---

**SECTION A-A**

---

**TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
</tr>
<tr>
<td>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>
</tbody>
</table>

**CHAIN-LINK PANEL NOTE:**

Chain-Link Fence Fabric shall be continuous along limits of railing.

Splicing of Chain-Link panels using Tension Bars at 20'-0" minimum increments is permitted.

---

**NOTES:**

1. See Plans for Infill Panel option required.
**NOTES:**
1. See Plans for Infill Panel Option required.

---

**TYPE 3 - SUNSHINE INFILL PANEL**

* Arc, Rays and Sun Segment may be formed in a single panel from 3/8 in. thick (ASTM B209 Alloy 6061-T6 or T651) pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the 3x3½ Channel Border shown.

---

**TYPE 4 - BROADWAY INFILL PANEL**

---

**DESCRIPTION:**

NOTICE: 8:29:2019
TYPE 5 - PERFORATED INFILL PANEL

SECTION A-A

 Inside Face of Rail

 Channel ½"x½"x½"

 Perforated Panel (0.04" Min.)

 See Detail "5A"

 Perforated Panel (0.04" Min.)

 SELECTION C-C

 Panel Mullion

 2'-0" (Panel Height)

 Perforated Panel (0.04" Min.)

 #10 x ½" Pan Head Screws @ 2'-0" sp.

 ½"x½" Filler Strip (Typ.)

 Inside Face of Post

 Perforated Panel (0.04" Min.)

 #10 x ½" Pan Head Screws @ 1'-0" sp.

 ½"x½" Filler Strip (Typ.)

 Opening Joint

 Expansion Joint

 DETAIL "5A"
 PANEL/RAIL CONNECTION
 (Top Shown, Bottom Similar)

 DETAIL "5B"
 PANEL END CONNECTION
 (Expansion Joint Shown, Sides Similar)

 REPEATING PATTERN DETAIL FOR PERFORATED PANEL

 Seal welding mitered corners is permitted

 3'-0" Max. (Panel Width)

 3'-0" Max. (Panel Width)

 PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

 FY 2020-21
 STANDARD PLANS

 PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

 INDEX
 515-062
 SHEET
 8 of 9

 LAST REVISION 8/1/16
 DESCRIPTION:

 REVISED 11/01/16

 REVISED 10/29/19

 REVISION

 STANDARD PLANS

 PEDESTRIAN/BICYCLE RAILING (ALUMINUM)
DETAIL "D" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION) (Used in lieu of Beveled Shim Plates)

DETAIL "C" (Cast-in-Place Anchor Bolts shown, Adhesive Anchors similar)

TYPICAL SECTION ON CONCRETE SIDEWALK (Case I)

TYPICAL SECTION ON RETAINING WALL (Case II)

ANCHOR BOLT TABLE

CASE | STRUCTURE TYPE | DIMENSIONS | ANCHOR LENGTH | ANCHOR SIZE
--- | --- | --- | --- | ---
I | Unreinforced Concrete | Edge Dist. 6" | Edge Dist. 1"-2" | "C" Embedment 6" | C.I.P Hex Head Bolt 10" Short | Adhesive Anchor 8" | 1/2" Ø
IIa | Reinforced Concrete | 4" | 4" | 9" | 10" | 11" | 5/8" Ø
Iib | Gravity Wall Index 400-011 | 4½" | 7/8" @ top | 9" | 10½" | 11" | 5/8" Ø
III | Step Cheekwall | 4½" | 4½" | 9" | 10½" | 11" | 5/8" Ø
IV | Varies | 5" | 5" | 5" | 6½" | 7" | 3/4" Ø

** When required; measured from top of sidewalk (Typ.)

FAUX BEARING PAD

MINIMUM 2 ~ #4 Bars in Top of Structure for Case IIa, III & IV

MINIMUM #4 Bars @ 1'-0" (Max) spacing for Case IIa

INSIDE FACE OF CONCRETE Structure or Sidewalk

(See Concrete Structure Plans for actual dimensions and reinforcing details)

EDGE SHIM (8" long x 1/2" thick as Read)

FULL SIZE SHIM PLATES when required for height adjustment

1/2" (Min.) wide bed of Adhesive Bonding Material

TYPICAL SECTION ON STEPS & STAIRS (Case III)

TYPICAL SECTION FOR 4-BOLT ANCHORAGE (Case IV)
NOTES:
1. Shop Drawings are required.
2. Work with Specification 515.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T4 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM B209, Alloy 6061-T6
   C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6
   D. End Rails 90° bends and corner bends with a maximum 4 foot spacing; Alloy 6061-T6 is permitted.

RAILING MEMBER DIMENSIONS TABLE

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts</td>
<td>2&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>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½&quot; NPS (Sch 40)</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1½&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

E. Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A 307 Type 1 or ASTM F1554 Grade 36
   b. Adhesive Anchors: ASTM F1554 Grade 36 Fully threaded rods
   c. Hex Nuts: ASTM A563
   d. Flat Washers: ASTM F436
   e. Aluminum Shims: ASTM B209, Alloy 6061

F. Aluminum Shims: ASTM B209, Alloy 6061
G. Bearing Pads: Phenolic Reinforced, or Fabric laminated meeting requirements of Specifications S15 & 932.

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. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner, not at the corner apex.
   G. Handrails are required and must be continuous at landings for:
      a. Grades Steeper than 5%.
      b. Three or more steps.

6. Cutting of reinforcing steel is permitted for post-installed anchor bolts.
PIPE GUIDERAIL (ALUMINUM)

ELEVATION

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

RAMP REQUIREMENTS

For slopes greater than 5%:
Max. landing slope = 8.33%
Max. landing cross-slope = 2.0%

LANDING REQUIREMENTS

Max. ramp slope = 6.25%
Max. ramp cross-slope = 2.0%
Max. landing slope = 2%
Max. landing cross-slope = 2%

RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.

NOTES:
NPS = Nominal Pipe Size
STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity Rail are not considered to be expansion joints.

RAINING ON GRADES STEEPER THAN 5% TO 8.33%

RAMP REQUIREMENTS

For slopes greater than 5%:
Max. landing slope = 8.33%
Max. landing cross-slope = 2.0%

LANDING REQUIREMENTS

Max. ramp slope = 6.25%
Max. ramp cross-slope = 2.0%
Max. landing slope = 2%
Max. landing cross-slope = 2%
GUIDERAIL ON STEPS & STAIRS

RALING CONTINUATION BEYOND STEPS
(Bottom shown, Top similar)

Concrete sidewalk to extend 6" min. behind 8 railing

See "Typical Railing Details", Sheet 3 for post & rail details

Handrail Required for three or more steps (Handrail and cheekwalls continuous at landings)

See "Typical Railing Details", Sheet 2 for post & rail details

Handrail Termination, see Details "A" (Typ.)

Handrail Continuous

Variies = Equal spacing

6'-0" Max. on Steps

At Landing

Handrail

Equal to one tread length

Length of Landing 5' Min.

Top Landing

9" Min. Wide cheekwall both sides

See Index 400-021 or Contract Plans for Step Details

Bottom of cheekwall

9" Min. Wide cheekwall both sides

Length of Landing

ELEVATION
(At-Grade Steps)

6'-0" Max. for one run of steps

6'-0" Min. for one run of steps

9" Min. (Typ.)

2" Min. (Typ.)

(At-Grade Steps)

Guidesrail on Steps & Stairs

Handrail Termination, see Details "A" (Typ.)

ALTERNATE END TREATMENT

GUIDERAIL ON STEPS & STAIRS

PIPE GUIDERAIL (ALUMINUM)
DESCRIPTION:

PIPE GUIDERAIL (ALUMINUM)

REV 01-17

STANDARD PLANS

FY 2020-21

INDEX

515-070

4 of 5

PIPE GUIDERAIL (ALUMINUM)

SECTIONS B-B
(Handrail Connection)

SECTIONS C-C
BASE PLATE DETAIL
(2-Bolt Anchorage)

BASE PLATE DETAIL
(4-Bolt Anchorage)

BASE PLATE DETAIL
(2-Bolt Anchorage)

BASE PLATE DETAIL
(4-Bolt Anchorage)

PLATE WASHER DETAIL

ALTERNATE BASE PLATE DETAIL
(Recommended for Steep Slopes)

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 GUIDERAIL (ALUMINUM)

**DESCRIPTION:**

REVISION

LAST REVISED

STANDARD PLANS

FY 2020-21

PIPE GUIDERAIL & Anchor Bolts

Optional 4-Bolt Anchorage (Shown Dashed)

4" Sidewalk with Thickened Edge

Slope 2% Max. (away from drop-off)

TYPICAL SECTION ON GRAVITY WALL

(Other Retaining Walls Similar)

TYPICAL SECTION ON STEPS & STAIRS

SIDEWALK ANCHORAGE DETAIL

OPTION 1

SIDEWALK ANCHORAGE DETAIL

OPTION 2 & 3

DETAIL "F" (OPTIONAL SHIMMING DETAIL FOR CROSS SLOPE CORRECTION)

(Used in lieu of Beveled Shim Plates)

NOTES:

** 2 - 6" Ø Anchor Bolts (**)

Steel Anchorage

2 or 4 ~ Bolt Steel Anchorage

NOTES:

** 2 ~ 6" Ø Anchor Bolts (**)

Steel Anchorage

2 or 4 ~ Bolt Steel Anchorage

NOTES:

3½" Core Drilled Hole (10% t)

Core hole in accordance with Specification 916

3½" Core Drilled Hole (10% t)

Core hole in accordance with Specification 916

Seal base of hole (Option 2) prior to epoxy filling to prevent leakage

Seal base of hole (Option 2 & 3) prior to epoxy filling to prevent leakage

** 6" Foundation embedment permitted (Option 3)

** The minimum embedment for Adhesive Anchors is 6" for 2-Bolt Anchorage or 6" for 4-Bolt Anchorage.

** Galvanized Steel Bolts (As Shown) (C-I-P); Galvanized U-Bolts Permitted (C-I-P); Galvanized Adhesive Anchors Permitted

** Permitted (C-I-P); Galvanized Adhesive Anchors Permitted
NOTES:
1. Shop Drawings are required, refer to Specification 515.
2. Materials:
   A. Pan Head Set Screws: Stainless Steel (316) Type 316 or 18-8 Alloy.
   B. Base Plates and Cap Plates: ASTM A36 or ASTM A709 Grade 36.
   C. Pipe Rails and Posts: ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C, or D or ASTM A501 for structural tube.
   Handrail Support Bars: ASTM A36

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>3&quot; NPS (Sch. 40)</td>
<td>1.125&quot;</td>
<td>0.123&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 F436
   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.
   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 changes in 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.
   C. Place expansion joints at a maximum of 30'-0" spacing.

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.
STRUCTURES EXPANSION JOINTS NOTE:
* Keyed construction joints in Index 400-011 Gravity
Wall are not considered to be expansion joints.

CROSS REFERENCE:
For Details "C", "D" and "E", see Sheet 4.
Pipe Guide rail (Steel)

Handrail Continuation
See Detail "A" (Typ.)

Steel Handrail required for three or more steps
(Handrail and cheekwalls continuous at landings)

Handrail Termination
See Index 400-021 or Contract Plans for Step Details

See "Typical Railing Details", Sheet 2 for post & rail details

Concrete sidewalk to extend 6" min. behind rail

Railing continuation beyond steps
(Bottom shown, Top similar)

Handrail

See "Typical Railing Details", Sheet 2 for post & rail details

Handrail Termination
See Index 400-021 or Contract Plans for Step Details
TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL (Other Retaining Walls Similar)

OPTIONAL SIDEWALK ANCHORAGE DETAIL

SIDEWALK ANCHORAGE DETAIL OPTION 2 & 3

NOTES:

*2 ~ 2" Ø x 8" or 4 ~ 3" 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.
**CONCRETE CURB AND GUTTER**

**SECTION AA**

**SECTION BB**

**SECTION CC**

**VALLEY GUTTER**

* When used on high side of roadways, the cross slope of the gutter shall match the cross slope of the adjacent pavement. The thickness of the lip shall be 6", unless otherwise shown on plans.

* 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.

**DROP CURB**

**SHOULDER GUTTER**

**CONCRETE CURB**

**CONCRETE CURB AND GUTTER**

**DESCRIPTION:**

**REV ISIO N**

**INDEX**

**CURB AND GUTTER**

**FA 2020-21**

**STANDARD PLANS**

**INDEX**

**SHEET**

**FA 2020-21**

**STANDARD PLANS**

**INDEX**

**SHEET**
CURB & GUTTER TYPES E & F

SHOULDER GUTTER

Depth Of Sawcut 2 1/2 Min.

3/16' Max

0' Min.

TYPE E

Sawcuts should be avoided within valley gutter and within curb and gutter endings.

CONTRACTION JOINT IN CURB

TYPE A

CONTRACTION JOINT IN CURB AND GUTTER

TYPE B

CONTRACTION JOINT IN CURB AND TYPE A CURB ADJACENT TO FLEXIBLE PAVEMENT

CONCRETE BUMPER GUARD

ASPHALTIC CONCRETE CURB

GENERAL NOTES

1. For curb, gutter & curb & gutter provide系列产品 - 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'.
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.

1. These details are to apply to projects which provide for the conversion of 2-lane sections to 4-lane divided highway sections and for superelevated sections of new 4-lane divided highways. Layout above is illustration only. Cost of flumes to be included in the contract price for Curb or Curb and Gutter. Sed to be paid for under the contract unit price for Performance Turf, SF.

2. Flumes to be located in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

SECTION AA

SECTION BB

(May Drain From Any Point Designated In the Plans Or As Adjusted By The Engineer During Construction)
ROADWAY INSTALLATIONS - FLEXIBLE PAVEMENT

**TYPE I - CONCRETE TRAFFIC SEPARATOR**

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 6" 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.

**OPTION I**

**OPTION II**

**TYPE IV - CONCRETE TRAFFIC SEPARATOR**

**OPTION I**

**OPTION II**

**MEDIAN CURB AND TRAFFIC SEPARATOR JUNCTURE DETAILS**

(Option I Separator Shown, For Curb Details see Index 520-001)
1. Traffic Separator transverse reinforcement adjacent to deck expansion joints shall be field adjusted to maintain clearance and spacing. Bars shall be field cut as shown. Bars may be rotated to maintain clearance.

2. Traffic Separator ends at deck expansion joints shall follow the deck joint limits. Drainage joints and V-grooves shall be placed perpendicular or radial to the E of the Traffic Separator. See Structures Plans, Superstructure and Approach Slab Sheets for details.


4. Option II is not permitted on bridge decks with prestressing steel.

5. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

7. Field bend and cut 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" @ 3 equal spaces (continuous)
   - 6'-0" @ 5 equal spaces (continuous)
   - 8'-0" @ 7 equal spaces (continuous)

6. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

7. Field bend and cut rebar as required to maintain cover.
Notes:

1. Treatment of separators on straight bridges shown.
   For additional notes and treatment of separators on skewed bridges, see Sheet 2.

2. Option II is not permitted on bridge decks with prestressing steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 3 equal spaces (continuous)
   - 8'-6" @ 3 equal spaces (continuous)

4. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Traffic Separator (Typ.)

Notes:

1. Treatment of separators on straight bridges shown.
   For additional notes and treatment of separators on skewed bridges, see Sheet 2.

2. Option II is not permitted on bridge decks with prestressing steel.

3. Bar Spacing:
   - 4'-0" @ 3 equal spaces (continuous)
   - 6'-0" @ 3 equal spaces (continuous)
   - 8'-6" @ 3 equal spaces (continuous)

4. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Traffic Separator (Typ.)
REINFORCING STEEL NOTES:

1. All dimensions are out to out.

2. The 8” vertical dimension shown for Bars 4B and 4D are based on a slab 8½” thick or greater without a wearing surface. If slab thickness is less than 8½”, decrease this dimension by an amount equal to the difference in thickness. If a wearing surface is to be provided, increase this dimension by an amount equal to the wearing surface thickness.

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

DRAINAGE JOINT DETAIL
(For 5” Opening Or Less)

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

ALTERNATE REINFORCING STEEL DETAILS
(Welded Reinforcement Wire)

NOTE:
Length of Bars 4C is 8'-6" for 8'-6" Separator.
Length of Bars 4C is 6'-0" for 6'-0" Separator.
Length of Bars 4C is 4'-0" for 4'-0" Separator.

NOTE:
Length of Bars 4D is 6'-10½" for 8'-6" Separator.
Length of Bars 4D is 6-3½" for 6'-0" Separator.
Length of Bars 4D is 6-3½" for 8'-6" Separator.

SPLICE DETAIL
(Between WWR 3 x 4 - W5.0 x W6.7 Sections)

OPTION A: 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 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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Concrete Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>0.026 CY per Ft.</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>0.029 CY per Ft.</td>
</tr>
<tr>
<td>8'-6&quot;</td>
<td>0.040 CY per Ft.</td>
</tr>
</tbody>
</table>

Nose:

<table>
<thead>
<tr>
<th>Type</th>
<th>Nose Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>0.003 CY</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>0.008 CY</td>
</tr>
<tr>
<td>8'-6&quot;</td>
<td>0.013 CY</td>
</tr>
</tbody>
</table>

REINFORCING STEEL:

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>0.090 CY</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>0.237 CY</td>
</tr>
<tr>
<td>8'-6&quot;</td>
<td>0.536 CY</td>
</tr>
</tbody>
</table>

Manufactured by the manufacturer's requirements.

Dowel Notes:
1. Shift Dowel Holes to clear if existing reinforcement is encountered.
2. Provide and install 3 x 4 - W5.0 x W6.7 as required by plans in place of Bars 4B shown in the Bending Diagram for Reinforcing Steel Option I.

Dowel Detail

BRIDGE INSTALLATIONS - TYPE "E" AND "F" CURB
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 exterior surfaces, apply a Class III surface finish in accordance with Specification 400.

2. **STEEL BAR REINFORCEMENT:** Where required to maintain continuity, provide lap splices of at least 18 inches for No. 4 bars and 20 inches for No. 5 bars, unless otherwise shown herein (including shorter splices as provided by the default bar bending diagrams).

   The default reinforcing details shown herein, including bar shapes and lap splice positions, are intended to show required steel locations and provide for a constructible design. However, with the approval of the Engineer, alternate steel configurations may be used in the same locations shown herein, given that the equivalent strength reinforcing is provided and the cover, maximum spacing, and continuity requirements are maintained.

3. **OPTIONAL WELDED WIRE REINFORCEMENT:** With the approval of the Engineer, steel welded wire reinforcement in accordance with Specification 415 may be substituted for the steel bars shown herein. Place the welded wire in the same locations specified for the steel bars, and maintain the equivalent strength, cover, maximum spacing, and continuity requirements.

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 4 inches, measured from the top face of the barrier.

5. **MINIMUM BARRIER LENGTH:** Unless otherwise shown in the Plans, the minimum Concrete Barrier length is 40 feet.

6. **CONSTRUCTION JOINTS:** Install Construction Joints only as needed for discontinuous concrete casting or cold joints. Maintain continuity of steel reinforcement across Construction Joints. Construction joints are classified herein as Transverse Joints or Longitudinal Joints.

   Transverse Joints are permitted at 20-foot or greater intervals along the barrier. For Tall 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 ± 3/4 inch from the locations shown.

7. **DOWELED JOINTS:** As shown in the Dowel Details on Sheets 2 & 13, install 1/4” Doweled Joints for Concrete Barrier connections to Pier Protection Barrier and Traffic Railings. Doweled Joints are also required for expansion mitigation in Median Barriers as defined per Sheets 2 & 6. Doweled Joints are not permitted within Grade-Separated Median Barrier.

8. **CRACK CONTROL V-GROOVES:** At 20-foot intervals, place 1/8” 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-T 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 ± 1/4 inch 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.

13. **LIGHT POLE MOUNTING:** Where called for in the Plans, install aluminum light poles per Index 715-002.

14. **OPAL VISUAL BARRIER:** Where called for in the Plans, install Opal Visual Barrier per Index 521-010.

15. **BARRIER END MARKERS:** For all free ends of concrete barriers that are not shielded with an end treatment or connection to another barrier or traffic railing type, install a Type 3 Object Marker on the end face per Specification 705.

16. **BARRIER DELINATORS:** Install barrier delinators in accordance with Specification 705. For median barriers, mount the delinators on the top of the barrier, at the centerline of barrier, with reflective sheeting facing traffic on both approaches. For shoulder barriers and split sections, mount the delinators on the top of the barrier, with the roadway side of the delinators located 2 feet from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.

17. **TOLL SITES:** Where called for in the Plans, substitute the steel reinforcing bars shown herein with GFRP reinforcing bars of the same size. Construct GFRP reinforcing bars in accordance with Specification 932, and use a 45-degree inner diameter for bar bends. 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 Median Barriers on outside shoulders is permitted where called for in the Plans. Shoulder Pavement shown herein may be substituted with material for an alternate usage where defined in the Plans.

**GENERAL NOTES (CONTINUED):**
**DESCRIPTION:**

**REVISION**

**LAST REVISED:** 31/01/18

**FY 2020-21 STANDARD PLANS**

**CONCRETE BARRIER**

**INDEX:** 521-001

**SHEET:** 2 of 26

---

**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 faces 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" x 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 3/4" Dowelled Joint (Reversing Direction Similar to Opposite Hand) in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

   For the dowel connection into the second casting, a 1½" x 3½" x 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.

5. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 3/4" Dowelled Joint.

6. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 336-001 in conjunction with the 16'-0" End Segment for Guardrail shown herein.

7. **CRASH CUSHION CONNECTIONS:** Connect Crash Cushions per Index 344-001 in conjunction with the 16'-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.

---

**SECTION A-A**

38" HEIGHT MEDIAN BARRIER (See Sheet 3 for Steel Reinforcing Details)

---

**SECTION DOWEL PLACEMENT**

---

**ELEVATION DOWEL BAR & PVC CONNECTION**

---

**DOWEL DETAILS**

---

**PLAN**

---

**ELEVATION**

---

**SECTION**

---

**NOTES:**

---

**CONCRETE BARRIER**

---

**INDEX:** 521-001

---

**SHEET:** 2 of 26
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.

NOTES: 

PLAN VIEW - 38" HEIGHT MEDIAN BARRIER 
FREE END REINFORCING (See Note 3)

PLAN VIEW - END SEGMENT FOR 
GUARDRAIL CONNECTION (See Note 3)

SECTION A-A 
38" HEIGHT 
MEDIAN BARRIER 
Concrete DRY = 0.28 cuf/lfy
Steel A3 = 11.8 LBD/ft

VIEW B-B 
REDUCED SECTION 
OF END TRANSITION 
FOR GUARDRAIL 
(End of Barrier)

MEDIAN BARRIER - REINFORCING DETAILS

REVISION 3/1/18
DESCRIPTION:
FY 2020-21
STANDARD PLANS
INDEX
CONCRETE BARRIER
521-001
3 of 26
**DESCRIPTION:**

REVISION

**LAST REVISION:**

**INDEX:**

**CONCRETE BARRIER**

**SLOPED END TREATMENT (Linear Transition)**

**FY 2020-21 STANDARD PLANS**

**REV IS IO N**

1. GENERAL: Install Sloped End Treatment only where called for in the plans.

2. JOINTS: Construction or Doweled Joints are not permitted within the Sloped End Treatment segment.

**NOTES:**

**PLAN - SLOPED END TREATMENT**

(Only Top & Bottom Longitudinal Bars Shown for Clarity, See Section Views for All Longitudinal Steel Locations)

**SECTION C-C**

BEGIN TRANSITION REINFORCING
(Height Varies Linearly per Elevation View)

**SECTION D-D**

INTERMEDIATE TRANSITION REINFORCING
(Height Varies Linearly per Elevation View)

**VIEW E-E**

END TRANSITION

**ELEVATION - SLOPED END TREATMENT**

**FINISH GRADE**

**3'-2"**

**SHOULDER**

**CONCRETE BARRIER**

**521-001**

**Sheets:**

4 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 Tall Height Median Barrier sections of Sheet 2 using a 5' Dowelled Joint.

3. **SHORT GRADE-SEPARATED SECTIONS:** Bars 4C1 and the two uppermost longitudinal bars may be omitted for segments where Y \( \leq 2' \).

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 at Longitudinal Joint locations. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

   Longitudinal joints are permitted between the vertical limits shown, and must remain level and at a consistent height per each continuous casting of concrete. Longitudinal joints may change elevations at Transverse Joint locations. Field bending of bars is permitted at Longitudinal Joint locations.

   Transverse joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:
   - The barrier length on both sides is at least 40 feet, where each segment has continuous steel reinforcement.
   - The barrier's vertical steel spacing is reduced to 4" O.C. for a total of 12 spaces on both sides of the joint.

   Transverse joints between Tall Grade-Separated Sections do not require continuous steel across the joint if the following conditions are met:
   - The barrier length on both sides is at least 40 feet, where each segment has continuous steel reinforcement.
   - 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 \( \leq 9" \) are permitted on a limited basis using the Tall Grade-Separated section, this is to accommodate cases where maintaining the spread footing through lower height segments is more practical than changing to the Short Grade-Separated section.
**DESCRIPTION:**

**REVISION**

**LAST OF STANDARD PLANS FY 2020-21**

**SECTION B-B**

**ELEVATION**

- **No. 4 Bars**
- **Additional No. 4 Bars**
- **1" M in.**
- **" Cover (Typ.)**

**SECTION D-D**

- **Pedestal Width**
- **Setback**
- **Overhead Sign Support**
- **Anchor Bolts**
- **Support Shielding - Symmetrical**
- **For Barrier-Mounted Sign**

**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 46" maximum cover from the top of the barrier.

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, our bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. **PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK:** The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. **PLAN VIEW:** Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

**MEDIAN BARREER - 56" HEIGHT SECTION**

**CONCRETE BARRIER**

**INDEX**

**521-001**

**6 of 26**
1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 4'0" maximum cover from the top of the barrier.

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 in 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.

NOTES:

1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required for the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 4'0" maximum cover from the top of the barrier.

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 in 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.
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. See any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. 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外科 sign support dimensions as defined in the Plans.

2. **MULTIPLE SIGN SUPPORTS:** The parallel segment may be lengthened to accommodate multiple sign supports, with the approach and trailing tapers located 1 foot measured longitudinally, upstream and downstream from the first and last sign support bases, respectively.

3. **PLAN VIEW:** Only outermost longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

4. **STIRrup BARS:** For the vertical and transverse reinforcement requirements shown in Sections A-A, 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.

---

**SECTION A-A**

**TRANSITION SECTION**

(At Begin Split Sections)

**SECTION B-B**

**38” HEIGHT SPLIT SECTION**

(Opposite Side Similar by Opposite Hand)

**SECTION C-C**

**Overhead Sign Support Shielding**
MEDIAN BARRIER - 44" HEIGHT
SPLIT SECTION FOR PIER SHIELDING

NOTES:

1. SECTION VIEWS: See Sheet 11 for Section Views A-A through D-D and corresponding reinforcing steel details.

2. PIER: The round pier shown is an example only, and project-specific pier shapes may vary. For actual dimensions and requirements, see the Plans. The overall length and width of the split barrier system is governed by the project-specific pier dimensions, as defined in the Plans.

3. MULTIPLE PIERS: The parallel segment may be lengthened to accommodate multiple consecutive piers, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last piers, respectively.
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

521-001
11 of 26
SECTION A-A
38" HEIGHT SHOULDER BARRIER
(See Sheet 14 for
Reinforcing Steel Details)

NOTES:
1. BARRIER RUN SEGMENT: Either the 38" Height Shoulder Barrier or the differing Shoulder Barrier sections shown throughout the Index may be placed within this segment as required per the Plans.
2. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 14.
3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Place steel reinforcing with a longitudinal 3" cover adjacent to the joint face in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

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" 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. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the ½" 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 placed with 3” cover from the barrier's end face.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION

(Longitudinal Steel Not Shown for Clarity)
**FRONT-FLUSH SECTION** (Where Required For Barrier Inlet Locations)

Concrete Qty. = 0.26 CY/FT
Steel Qty. = 46.6 LB/FT

**RETAILING SECTION**

Concrete Qty. = 0.36 CY/FT
Steel Qty. = 55.3 LB/FT

**TRENCH FOOTING SECTION**

Concrete Qty. = 0.35 CY/FT
Steel Qty. = 46.2 LB/FT

**NOTES:**

1. **GENERAL:** Install the differing Section Options as required per the Plans.
2. **CONNECTIONS BETWEEN DIFFERENT SECTIONS:** Connect differing Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections. Alternatively, a Doweled Joint may be used as shown on Sheet 13.
3. **FLUSH RETAINING SECTION COMBINATION:** Where Barrier Joints are required in retainer 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**

- **Adjacent Barrier Inlet Structure per Index 425-031**
- **Pavement Shoulder**
- **Gutter Line**
- **Inlet Structure**
- **Adjacent Barrier**
- **Foot of Barrier**
- **Top of Barrier**
- **Steel Qty.**
- **Concrete Qty.**

**GENERAL SECTION**

- **Steel Qty.**
- **Concrete Qty.**

**FRONT-FLUSH SECTION - PLAN VIEW**

(Not Applicable for Trench Footing Sections)
44" HEIGHT SECTION
(For Use Adjacent to Rear-Flush Section on Sheet 18)
Concrete Qty. = 0.34 CY/FT
Steel Qty. = 56.8 LB/FT

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

NOTE:
1. GENERAL: See the applicable Notes on Sheet 15.
SHOULDER BARRIER - 38" HEIGHT REAR-FLUSH SECTION
FOR REDUCED SETBACK PIER SHIELDING
(DESIGN SPEED ≤ 45 MPH)

NOTE:
1. PIERS: The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details requiring protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.

PLAN - ROUND PIER EXAMPLE
REAR-FLUSH SECTION
(See Section View for All Longitudinal Steel Locations)

PLAN - SQUARE PIER EXAMPLE
REAR-FLUSH SECTION
(See Section View for All Longitudinal Steel Locations)

SECTION A-A
ABOVE-GROUND HAZARD
EMBEDDED IN FOOTING

SECTION B-B
ABOVE-GROUND HAZARD
EMBEDDED IN FOOTING & BARRIER

38" HEIGHT
REAR-FLUSH SECTION
WITH 3" WIDTH REDUCTION

38" HEIGHT
REAR-FLUSH SECTION
WITH 3" WIDTH REDUCTION
(See Note 1)

38" Height Rear-Flush Section
(See Note 1)

38" Height Rear-Flush Section with 3" Width Reduction
(See Note 1)

1. PRECAST: The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details requiring protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.
**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.
**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 TRANSITION

**SECTION C-C**
END TRANSITION
MATCH 32" HEIGHT
F-SHAPE SECTION

**NOTES:**
1. **GENERAL:** Construct the Connection Segment as required per the Plans to connect existing
F-Shape sections to Single-Slope Shoulder Barrier or Traffic Railing sections. Construct Option 'A' or 'B' as required to match the heights of the connecting sections.

2. **DOWELED JOINT:** Install Dowel Bars per the Dowel Details on Sheet 13.

3. **TRAFFIC RAILING CONNECTION:** For the Option 'B' connection, use a Doweled Joint per Sheet 13 and the additional Free End Reinforcing with reduced bar spacing per Sheet 14.

4. **STIRRUP BARS:** For the vertical and transverse reinforcement requirements shown, bar
bending diagrams are not provided due to varying section dimensions. Use any combination of
spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.
DRAINAGE SLOT NOTES:

1. GENERAL: Place 2' x 18' Drainage Slots at locations and/or spacing called for in the Plans.

2. STEEL REINFORCEMENT CONFLICT: When the Drainage Slot encounters a conflict with reinforcing steel, shift or cut the reinforcing steel to provide 2' x 18' of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 8" bar spacing. If shifting the vertical bars, move the bars from the standard 8" spacing location to the closest end of the drainage slot and distribute additional vertical reinforcement evenly on each side of the Drainage Slot.

3. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install 3/4" Doweled Joints as defined on Sheet 13.

4. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 3/4" 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'-0" End Transition for Guardrail as shown herein.

6. FREE ENDS: When the barrier end does not terminate with a Traffic Railing connection or Guardrail connection as called for in the Plans, terminate the barrier in accordance with the Free End Reinforcing Note on Sheet 21.

CURB AND GUTTER BARRIER NOTES:

1. SECTION VIEWS: For additional Views A-A and B-B, see Sheet 21.

2. EXPANSION JOINTS: Place 1'-0" 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. EXPANSION JOINTS: Place 2'-0" wide 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.

4. DOWELED JOINTS: See the General Notes on Sheet 1 for usage of joint types. Where required, install 3/4" Doweled Joints as defined on Sheet 13.

5. TRAFFIC RAILING CONNECTIONS: Align the barrier and Traffic Railing faces and connect with the 3/4" Doweled Joint per Sheet 13.

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.
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 26.

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 S54 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 S54, see the Bar Bending Diagrams on Sheet 26.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION
(Longitudinal Steel Not Shown for Clarity)
1. GENERAL: Install a Sloped End Treatment only where called for in the Plans, using either a 10'-0" length or 25'-0" length treatment as specified in the Plans. The 10'-0" length option is shown herein, while the 25'-0" length option requires additional trimmed Bars 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:

CURB AND GUTTER BARRIER - SLOPED END TREATMENT

PLAN - CURB AND GUTTER BARRIER SHOWING SLOPED END TREATMENT (Approach and Trailing End Similar by Opposite Hand; See Sections for All Longitudinal Steel Locations)
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 sections' longitudinal steel.

4. FREE ENDS: Where shown in the Plans, terminate the Single-Faced Section with a lap splice with the adjacent section's longitudinal steel.

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

DETAILED SPECIFICATION:

PLAN
(See Section A-A for Barrier Reinforcing)

SECTION A-A
38" HEIGHT
SINGLE-FACED SECTION
(Reverse Side Similar by Opposite Hand)

SECTION B-B
FLUSH SEGMENT

SECTION C-C
OFFSET SEGMENT

SECTION D-D
OVERHEAD SIGN SUPPORT

...
REVISION DESCRIPTION:

REVISION LAST OF STANDARD PLANS FY 2020-21 SHEET INDEX

Support Base Plate
Overhead Sign Support Pedestal
Overhead Sign

Gutter Line

Concrete Fill

Full Height of Retaining Wall,
Against Face of Joint Filler
“Preformed 2 1

GUARDRAIL CONNECTION
38” HEIGHT SECTION - WALL SHIELDING BARRIER - 38” HEIGHT SECTION - GUARDRAIL CONNECTION

SECTION A-A 38” HEIGHT SINGLE-FACED SECTION (Reverse Side Similar by Opposite Hand)

SECTION B-B FLUSH SEGMENT

SECTION C-C OFFSET SEGMENT

SECTION D-D OVERHEAD SIGN SUPPORT

SECTION E-E SHOULDER BARRIER SEGMENT FOR GUARDRAIL

SECTION F-F CONCRETE FILL END FACE

NOTES:

1. TAPER SEGMENTS AND OFFSET SEGMENT: The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. CONNECTIONS TO DIFFERENT CONCRETE BARRIER SECTIONS: Connect to aligning barrier sections using a continuous pour or Transverse joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent 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 Segment 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 6. Use only concrete fill behind the Shoulder Barrier Segment; do not use flowable fill at this location.

WALL SHIELDING BARRIER - 38” HEIGHT SECTION - GUARDRAIL CONNECTION

FY 2020-21 STANDARD PLANS

CONCRETE BARRIER

INDEX 521-001 SHEET 24 of 26

LAST REVISION 01/01/18

DESCRIPTION:
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 raper 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.

6. ADJUSTABLE TAPER RATE: 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.
**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>4</td>
<td>3'-8&quot;</td>
</tr>
<tr>
<td>C2</td>
<td>5</td>
<td>3'-0&quot;</td>
</tr>
<tr>
<td>U1</td>
<td>4</td>
<td>5'-3&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>4</td>
<td>7'-8&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>5</td>
<td>9'-7&quot;</td>
</tr>
<tr>
<td>U4</td>
<td>5</td>
<td>5'-9&quot;</td>
</tr>
<tr>
<td>V1</td>
<td>4</td>
<td>6'-4&quot;</td>
</tr>
<tr>
<td>V2</td>
<td>5</td>
<td>6'-3&quot;</td>
</tr>
<tr>
<td>V3</td>
<td>4</td>
<td>5'-30&quot;</td>
</tr>
</tbody>
</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**
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 INFILTRATION: See Index 425-031 for Adjacent Barrier Infills, 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.). The actual PPB footing placement depends on the project-specific configuration of adjacent structures and obstacles. For project-specific locations of PPB and adjacent features, see the Plans.

2. MINIMUM FOOTING LENGTH: The minimum length of a single footing option (i.e., Symmetrical Footing, Rear-Flush Footing, Front-Flush Footing), is 8'-0", measured longitudinally. See Sheet 6 for the footing option details.

3. FOOTING OVERLAP: When a Front-Flush Footing section connects to a Rear-Flush Footing section, a 4'-0" footing overlap is required as shown. In footing overlap segments, place all lateral steel reinforcement continuously for the entire width of the combined footing while maintaining the cover requirements per Sheet 6.

4. CONNECTING GUARDRAIL OR CONCRETE BARRIER: Connect the PPB to either Guardrail or Concrete Barrier as specified in the Plans. For additional Guardrail Details, see Sheet 3 and Index 536-001. For additional Concrete Barrier Details, see Sheet 3 and Index 521-001.
ELEVATION - 44" PPB
(See Sheet 4)

ELEVATION - 56" PPB
(See Sheet 4)

ELEVATION - 44" PPB
(See Sheet 5)

ELEVATION - 56" PPB
(See Sheet 5)

CONNECTION TO CONCRETE BARRIER

CONNECTION TO GUARDRAIL

PIER PROTECTION BARRIER
1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Sheets 2 & 3 for additional plan and elevation details.

2. FOOTING OPTIONS: See Sheet 6 for footing and stem details.

NOTES:

BARRIER DETAILS - CONNECTION TO CONCRETE BARRIER
SECTION E-E
REAR-FLUSH FOOTING OPTION
Concrete Qty. = 0.84 CY/FT (Below Gutter Line)  
Steel Qty. = 63.5 LB/FT (Including Bars SU)

SECTION F-F
SYMMETRICAL FOOTING OPTION
Concrete Qty. = 0.84 CY/FT (Below Gutter Line)  
Steel Qty. = 62.6 LB/FT (Including Bars SU)

NOTES:
1. GENERAL: Install the footing options per project-specific requirements, as defined on Sheet 2 and specified per the Plans.

2. OPTIONAL SLIP FORMING SUPPORT: The 1'-0" depth spread footing may be extended by 2" laterally beyond the face of the stem to provide support for a subsequent slip forming operation above. Do not adjust the steel reinforcement location for the additional concrete.

3. GUARDRAIL CONNECTION TAPERED TOE: For tapering the barrier as shown on Sheet 5, View D-D, bend Bars 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).
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.

**CRASH WALL DETAILS**

Concrete Qty. = 0.82 CY/FT (44" Crash Wall) or 0.83 CY/FT (56" Crash Wall)

Steel Qty. = 71.8 LB/FT (44" Crash Wall) or 76.0 LB/FT (56" Crash Wall)

**NOTES:**

- 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>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>5</td>
<td>7'-5&quot;</td>
</tr>
<tr>
<td>U</td>
<td>5</td>
<td>8'-3&quot;</td>
</tr>
<tr>
<td>R</td>
<td>5</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>F1</td>
<td>5</td>
<td>13'-9&quot;</td>
</tr>
<tr>
<td>F2</td>
<td>5</td>
<td>Varies (Straight)</td>
</tr>
<tr>
<td>L</td>
<td>5</td>
<td>6'-0&quot; / 7'-9&quot;</td>
</tr>
<tr>
<td>F2</td>
<td>5</td>
<td>9'-9&quot;</td>
</tr>
<tr>
<td>SL</td>
<td>8</td>
<td>Varies (Straight)</td>
</tr>
<tr>
<td>S2, S3</td>
<td>5</td>
<td>Varies (Straight)</td>
</tr>
</tbody>
</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**
GENERAL NOTES:

1. GENERAL: Construct Opaque Visual Barrier (OVB) in accordance with Specification 521, and use either cast in place or precast panels with OVB concrete monolithically with the Concrete Barrier or Traffic Railing. Use an ASTM D6380, Class 5, Type III Organic Felt bend breaker as needed.

2. DOWEL BAR CONNECTION: For the embedment in Concrete Barrier or Traffic Railing concrete, dowel bars must be either cast in place or precast in place. Embed the dowel bars to the corresponding depths shown, and use the bar lengths provided in the Dowel Bar Length Table.

3. TRANSVERSE JOINTS: Place Transverse Joints with a maximum spacing of 50'-0" and a minimum spacing of 1'-0" at grouted embedment locations. Drill %" holes to a depth of 6%". Use only approved non-shrink grout on the APL through existing reinforcing steel is permitted. 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 pole placement. See Note 7 below.

5. BARRIER-MOUNTED SIGNS AND LIGHT POLES: Where signs and barrier-mounted light poles conflict with placement of OVB, end and restart the OVB with a transverse vertical face located a longitudinal distance of 3%" 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 1 for details. See Note 7 below.

7. LEAVE-OUTS: OVB leave-outs are longitudinal gaps in OVB segments required to accommodate barrier-mounted signs and light pole placement. Leave-outs up to 15 feet in length are included in OVB length measurement.

8. ASYMMETRICAL CONCRETE BARRIER SECTIONS: When mounting on top of an asymmetrical Concrete Barrier section (not shown), align the centerline of the OVB with the centerline of the top face of the Concrete Barrier section.

9. SPLIT CONCRETE BARRIER SECTIONS: For split Concrete Barrier sections that run separately (for vertical structures, bridges, etc.), OVB is only required on top of one of the Concrete Barrier sections. Place OVB on top of the Concrete Barrier section with the highest elevation. Longitudinally overlapping OVB runs are permitted where called for in the Plans, which are designated as overlapping Begin and End Station OVB Callouts.

10. VERTICAL REINFORCING: Place vertical No. 3 bars with the spacing shown, except that No. 3 bars at the dowel bar locations may be shifted longitudinally or they may be omitted at the option of the contractor.

11. OPTIONAL MELTED 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 413. 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 1 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 - OPAQUE VISUAL BARRIER

SECTION VIEW - OPAQUE VISUAL BARRIER FOR MEDIAN SINGLE-SLOPE CONCRETE BARRIER OR TRAFFIC RAILING

SECTION VIEW - OPAQUE VISUAL BARRIER FOR MEDIAN F-SHAPE CONCRETE BARRIER OR TRAFFIC RAILING

INDEX

OPAQUE VISUAL BARRIER

FY 2020-21 STANDARD PLANS

521-010

1 of 2
**DESCRIPTION:**

**REVISED**: STD PLS FY 2020-21

**INDEX**: 521-010

**SHEET**: 2 of 2

**FAA**: Opaque Visual Barrier

**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 dowels 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 'W': The length of the reduced-section OVB segment is governed by the length of linear width and height transition of the Concrete Barrier.

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.

6. TRANSVERSE JOINTS:

   - Follow the requirements of Sheet 1.

   - Elevation View 'A': Do not place Transverse Joints within the End Segment.

   - Elevation View 'W': 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 and Detail "A" see Sheet 5.
For Wall mounted Barrier/Noise Wall Details see Index 521-512.
For Footing mounted Barrier/Noise Wall Details see Index 521-513 (T-Shaped), 521-514 (L-Shaped) or 521-515 (Trench).
ELEVATION OF BARRIER/NOISE WALL REINFORCING STEEL AT OPEN JOINT
(Bars 5S1 in Barrier not shown for clarity)
(Footing or Junction Slab Details not shown)

NOTES:
* Field Cut Bars 5R & 5S1 to maintain clearance.
** Terminate 3/4" V-groove at construction joint & cast top of railing with End Taper.
*** Bar spacing shown for Bars 5V only applies when Single-Slope Concrete Barrier continues. For transition to guardrail see Sheet 5.
Work Traffic/ Railing noise Wall reinforcing with Index 521-512 (Junction Slab) or Index 521-513 through 521-515 (T, L or Trench Footings).
**ESTIMATED TRAFFIC RAILING/NOISE WALL QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Railing)</td>
<td>CY/LF</td>
<td>0.107</td>
</tr>
<tr>
<td>Concrete (Noise Wall)</td>
<td>CY/LF</td>
<td>0.136</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/LF</td>
<td>69.36</td>
</tr>
<tr>
<td>Additional Reinf. @ Open Joint</td>
<td>LB</td>
<td>226.95</td>
</tr>
</tbody>
</table>

(The above quantities are based on the Concrete Barrier/Noise wall typical section, excluding junction slab or footing)

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>5</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>5'-2½&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>4'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>As Req.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>V (Wall)</td>
<td>5</td>
<td>6'-6½&quot;</td>
</tr>
<tr>
<td>V (T-Footings)</td>
<td>5</td>
<td>7'-4½&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints shall have a 2" minimum cover.
3. Bars 5R shall be one continuous or lap spliced bar. No mechanical couplers are permitted.
4. Bars 5S1 may be continuous or spliced at the construction joints. Lap splices for Bars 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.

**CROSS REFERENCE:**

See Index 521-512 for Junction Slab Details and Indexes 521-513 thru 521-515 for additional footing details.
### Plan - Railing End Transition
(Showing Bars 5R and Bars 5S1)
(Bars 5V not shown for Clarity)

### Section C-C
THRU NOISE WALL END TAPER

### Detail "A" Notes:
1. Begin placing Railing Bars 5V at the railing end and proceed toward the guardrail (thrie beam) terminal connector to ensure placement of guardrail bolt holes. Pair Bars 5R with Bars 5V as shown. Clearance of Bars 5R & 5V to guardrail bolt holes shall be checked to prevent cutting of bars if bolt holes are to be drilled. Shift bars locally where conflicts occur.
2. For Guardrail connection details see Index 536-001.
3. Omit Railing End Transition if a Single-Slope Concrete Barrier/Barrier continues beyond the End Taper. See the Plan Sheets.
4. Field cut Bars 5R2 to maintain cover. Field cut Bars 5V and lap as necessary to maintain cover; field cut & bend Bars 5R1 front leg (more plumb) to maintain cover and tie to S1 Bars. (See Sheet 1 Notes 1 and 2)

### Plan - Railing End Transition
(Showing Bars 5V and Bars 5S1)
(Bars 5R not shown for Clarity)
T-Shaped Spread Footing

Shoulder or Roadway Pavement

See Detail "A" for Mortar Plug

T-Shaped Spread Footing

1/2" V-Groove in both faces and top of Concrete Barrier/Noise Wall (See Note 5)

1/2" Open Joint

ELEVATION OF INSIDE FACE OF CONCRETE BARRIER/NOISE WALL

(T-Shaped Spread Footing Shown, L-Shaped Spread Footing and Trench Footing Similar)

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 1/2" Open Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. 1/2" Open Joint locations are to coincide with 1/2" Expansion Joints in footings.

4. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 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.

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.
ELEVATION OF CONCRETE BARRIER/NOISE WALL REINFORCING STEEL
(Bars 5S1 in Railing not shown for clarity)

NOTES:
1. Field Cut Bars S8 & 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/" 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/" Open Joint is omitted.
4. Bar spacing shown is along the Gutter Line.

ELEVATION OF CONCRETE BARRIER/NOISE WALL END TAPER
(Bars 5S1 in Railing not shown for clarity)
CROSS REFERENCE:
For locations of Section A-A and Detail “A”, see Sheet 1.

TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL

SECTION A-A

NOTES:
1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 1/2" Open Joints, plug the lower 2" portion of the open joint by filling it with mortar in accordance with Specification Section 400.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>5</td>
<td>5'-2&quot;</td>
</tr>
<tr>
<td>R2</td>
<td>5</td>
<td>5'-25&quot;</td>
</tr>
<tr>
<td>R3</td>
<td>5</td>
<td>10'-10&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>5</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>S2</td>
<td>5</td>
<td>7'-3&quot;</td>
</tr>
</tbody>
</table>

BARS S51 & S52

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars SR may be continuous or spliced at construction joints. Lap splices for Bars SR, and S51 will be a minimum of 2'-2".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

ESTIMATED CONCRETE BARRIER/NOISE WALL QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Concrete Barrier)</td>
<td>CF/FT</td>
<td>0.107</td>
</tr>
<tr>
<td>Concrete (Noise Wall, excluding any thickening)</td>
<td>CF/FT</td>
<td>0.283</td>
</tr>
<tr>
<td>Reinforcing Steel (Railing/Noise Wall)</td>
<td>LB/FT</td>
<td>100.31</td>
</tr>
<tr>
<td>Additional Rein. @ Open Joint (Railing/Noise Wall)</td>
<td></td>
<td>397.38</td>
</tr>
</tbody>
</table>

CROSS REFERENCE:
For locations of Section A-A and Detail “A”, see Sheet 1.
PLAN

JUNCTION SLAB ADJACENT TO SKewed APPROACH SLAB AND WITH BARRIER WALL INLET

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 III concrete for slightly aggressive environments.
B. Class IV concrete for moderately or extremely aggressive environments.
3. 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° in 40" from horizontal.
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 D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Expansion Joints are required to clear Barrier Wall Inlet. V-Groove locations in the Barrier/Noise Wall are permitted to form joints.
6. Construct 1/2 V-Grooves and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints.
7. 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° in 40" from horizontal.
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 vary depending on type of Retaining Wall used.
10. Field cut Bars 5A and 5B2 as required to maintain minimum cover for Approach Slab.
11. Spacing shown is along the Gutter Line.
12. Spacing shown is along the Gutter Line.

NOTES

SECTION A-A

SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL
(TYPE 1 Junction Slab Shown, TYPE 2 Similar)

CROSS REFERENCE:
For Section B-B and Detail "A", see Sheet 2.
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 III concrete for slightly aggressive environments.
   B. Class IV concrete for moderately or extremely aggressive environments.

3. Dowel Load Transfer Devices will be ASTM A 36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.

4. Construct 1" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1" Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.

6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

7. FILL REQUIREMENTS: Shoulder or Roadway Pavement or Fill is required on top (1'-0" minimum depth) for the entire length of the spread footing on both sides of the Barrier/Noise Wall. See Section B-B for details.

8. See Index 521-510 for Bars 5V2.

9. 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").
### 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>
<td>5</td>
<td>6'-8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>AS REQ'D.</td>
</tr>
<tr>
<td>U</td>
<td>5</td>
<td>1'-0&quot;</td>
</tr>
</tbody>
</table>

**DOWEL** 1" Ø Smooth Bar 2'-0"

**BARS 5A & 5B**

2'-0"

1" Ø DOWEL

**BAR 5U**

### 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.

### ESTIMATED T-SHAPED SPREAD FOOTING QUANTITIES

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Footings)</td>
<td>CT/FT</td>
<td>0.312</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>25.90</td>
</tr>
<tr>
<td>ADDITIONAL REIN. @ EXP. JOINT</td>
<td>LB</td>
<td>31.38</td>
</tr>
</tbody>
</table>

Note: The reinforcing steel quantity includes the difference between index 521-510 or 521-511 and Bars 5V shown. Bars SS1 are included in Index 521-510 or 521-511 quantities.

### PARTIAL END VIEW OF RAILING END TRANSITION FOR GUARDRAIL ATTACHMENT

(showing bars 5V2, and bars 5B inside of stirrup bars 5V2)

NOTE: See index 521-510, detail "A" for details.

### SECTION B-B

**TYPICAL SECTION THRU SPREAD FOOTING**

(Bars 5R and SS1 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.

### CONCRETE BARRIER/NOISE WALL

**T-SHAPED SPREAD FOOTING**

**INDEX** 521-513

**SHEET** 2 of 2

**FY 2020-21**

**STANDARD PLANS**

**REVISED** 01/11/19

**DESCRIPTION:**

**REVISED** 10/29/19

**DESCRIPTION:**

**REVISION** 8:19:17 A.M.
SPREAD FOOTING ADJACENT TO SKewed APPROACH SLAB AND WITH BARRIER WALL INLET 
(Option A Similar) (Bars SI Not Shown)

NOTES:

1. Construct the Spread Footing level transversely; do not construct the spread footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
   a. Class II concrete for slightly aggressive environments.
   b. Class IV concrete for moderately or extremely aggressive environments.
3. Dowel Load Transfer Devices will be ASTM A 36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
4. Construct 3⁄8" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
5. Construct 1⁄2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 3⁄8" 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 a distance of 4'-0" and the full length of the spread footing (3'-0" minimum depth) on the backside of the spread footing for Option A. Fill is required for a distance of 4'-0" on the backside of the spread footing and the full length of the spread footing (3'-0" minimum depth) on the traffic side of the spread footing for Option B. See Typical Sections on Sheets 2 and 3 for details.
8. Spacing shown is along the Gutter Line.
9. Work this Index with one or both of the following:
   a. Index S21-510 - Concrete Barrier/Noise Wall (8'-0")
   b. Index S21-511 - Concrete Barrier/Noise Wall (14'-0').

CROSS REFERENCE:
For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.
DESCRIPTION:

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.
DETAILS:

### 18.06 Concrete Footing

- Additional Reinforcement @ Expansion Joint
- Concrete (Footing)

### Cross Reference:
For location of Section A-A, see Sheet 1.

### Optional 3" Lip
(See Note 3)

### Bars 5S4 @ 6" sp.
Optional Construction Joint (See Note 3)

### Bars 5U1 @ 6" sp.

### 3" Slope Varies

### Gutter Line
Top of Spread Footing (Const. Joint Required)

### 14'-0" or 8'-0" Concrete Barrier/Noise Wall
Bars 5S1

### Slope Varies

### Project 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Footings)</td>
<td>CY/FT</td>
<td>0.398</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>68.84</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>48.06</td>
</tr>
</tbody>
</table>

* Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

### Rebar Bending Diagrams

### Bill of Reinforcing Steel

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>5</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>5'-6&quot;</td>
</tr>
<tr>
<td>S3</td>
<td>5</td>
<td>3'-7&quot;</td>
</tr>
<tr>
<td>S4</td>
<td>5</td>
<td>2'-10&quot;</td>
</tr>
<tr>
<td>U1</td>
<td>5</td>
<td>8'-2&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>5</td>
<td>13'-10&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>5</td>
<td>12'-10&quot;</td>
</tr>
</tbody>
</table>

### Dowel:
1" Ø Smooth Bar 2'-0"

### Section Notes:
- All bar dimensions in the bending diagrams are out to out.
- All reinforcing steel at the open joints will have a 2" minimum cover.
- Lap splices for Bars 5B will be a minimum of 2'-2".
- Lap splices Bars 5T and 5V with 5U1 will be a minimum of 2'-2".
- 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

### Cross Reference:
For location of Section A-A, see Sheet 1.
**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>B</td>
<td>5</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>12'-6&quot;</td>
</tr>
<tr>
<td>DOWEL</td>
<td>1&quot; Ø Smooth Bar</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

**NOTES**

1. Construct the Trench Footing plumb, do not construct the Trench Footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A572 Grade 50 round bar or GRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D7617.
4. Shear keys in footing are required when GRP 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 the transverse vertical plane.
5. Construct 3/8" 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. Space V-Grooves equally between 3/8" Expansion Joints and/or Begin or End Trench Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Fill is required a distance of 4'-0" on both sides for the entire depth of the trench footing. See Typical Section for details.
8. Match Cross Slope of travel lane or shoulder.
9. 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').

**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>B</td>
<td>5</td>
<td>AS REQ.</td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>12'-6&quot;</td>
</tr>
<tr>
<td>DOWEL</td>
<td>1&quot; Ø Smooth Bar</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

**NOTES**

1. Construct the Trench Footing plumb, do not construct the Trench Footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A572 Grade 50 round bar or GRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D7617.
4. Shear keys in footing are required when GRP 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 the transverse vertical plane.
5. Construct 3/8" 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. Space V-Grooves equally between 3/8" Expansion Joints and/or Begin or End Trench Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Fill is required a distance of 4'-0" on both sides for the entire depth of the trench footing. See Typical Section for details.
8. Match Cross Slope of travel lane or shoulder.
9. 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**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Footing</td>
<td>CY/FT</td>
<td>0.446</td>
</tr>
<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>39.76</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>27.36</td>
</tr>
</tbody>
</table>

**PLAN**

(Bars 5S Not Shown)

**DETAIL "A"**

(Showing Locations of 1/2" V-Grooves and 3/8" Preformed Expansion Joint Filler)

**DESCRIPTION:**

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.
3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A572 Grade 50 round bar or GRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D7617.
4. Shear keys in footing are required when GRP 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 the transverse vertical plane.
5. Construct 3/8" 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. Space V-Grooves equally between 3/8" Expansion Joints and/or Begin or End Trench Footing. V-Groove locations are to coincide with V-Groove locations in the Barrier/Noise Wall.
7. Fill is required a distance of 4'-0" on both sides for the entire depth of the trench footing. See Typical Section for details.
8. Match Cross Slope of travel lane or shoulder.
9. 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').

**TYPICAL SECTION THRU TRENCH FOOTING**

(Bars 5S and 5S1 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 II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
2. Dowel Bars 4D extend 11" above the top of retaining wall panel. Field cut as necessary to maintain 2" minimum cover. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
3. Payment for Dowel Bars 4D, Buildup Concrete and Coping will be made under Retaining Wall System (Permanent).

Organic Felt Bond Breaker

Dowel Bars 4D (Typ.) (See Note 2)

Varies (1'-3" Max., 2" Min.)

2" Min. Cover (Typ.)

Drainage Ditch when required (See Wall Control Drawings for details)

Retaining Wall Panel (See Wall Company Drawings for Details)

Dim. A

Panel width + 6'

Dim. B

Panel width + 1'-0" Min.

2" Chamfer (Typ.)

Varies (1'-3" Max., 2" Min.)

2" Cover Min.

3/8" Std. (1/2" Min. - 25/32" Max.)

C-I-P Buildup Concrete (1'-1" Max.)

Provide 3/8" x 3/8" preservative treated timber blocking @ 2' Max. Spacing for gaps > 1'

Dowel Bars 4D (See Note 2)

C-I-P COPING - PARTIAL ELEVATION VIEW

SECTION A-A

SECTION B-B

PRECAST COPING

RETAINING WALL COPING (PRECAST OR C-I-P)

REV 11/01/19

10 /30 /2019

3:08 :34 P M

REV

INDEX

MSE WALL COPING (PRECAST OR C-I-P)

STANDARD PLANS

FY 2020-21

521-600

1 of 2
REINFORCING STEEL BENDING DIAGRAMS - PRECAST AND C-I-P COPINGS

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**S** = Slightly Aggressive
**M** = Moderately Aggressive
**E** = Extremely Aggressive

BARS 4A & 4B
Dowel Bar 4D
Bar 4U1
Bar 4U2
Bar 4U3

C-I-P COPING USED WITH PRECAST COPING

Note: When precast coping units do not fill the entire length of the retaining wall, use this similar C-I-P coping for short portions between precast coping units. This C-I-P coping may also be used for vertical copings.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH (L)</th>
<th>LENGTH (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>AS REQD.</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>AS REQD.</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>U1</td>
<td>4</td>
<td>Panel width + 4&quot;</td>
<td>Panel width + 4&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>4</td>
<td>Dim. B - 4&quot;</td>
<td>Dim. B - 4&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>Dim. C - 4&quot;</td>
<td>Dim. C - 6&quot;</td>
</tr>
</tbody>
</table>

Bars 4A (follows slope of C-I-P Coping Enclosure)

Bars 4B (Horizontal) (Field cut as required to maintain minimum cover)

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments

Top of C-I-P Coping Enclosure

Top of Retaining Wall End Panel

3" Min. Cover (Typ.)

3" Min. Cover (Typ.)

2" Chamfer (Typ.)

3" Min. Cover (Typ.)

For Slightly and Moderately Aggressive environments

For Extremely Aggressive environments

C-I-P COPING ENCLOSURE DETAIL

LEVELING PAD FOR MSE WALL Shown

Ground Line

Expanded Polystyrene (3")

Drainage Ditch when required (See Wall Control Drawings for details)

Organic Felt Bond Breaker

Dowel Bars 4D

(See Note 2, Sheet 1)

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**S** = Slightly Aggressive
**M** = Moderately Aggressive
**E** = Extremely Aggressive

BARS 4A & 4B
Dowel Bar 4D
Bar 4U1
Bar 4U2
Bar 4U3

C-I-P COPING USED WITH PRECAST COPING

Note: When precast coping units do not fill the entire length of the retaining wall, use this similar C-I-P coping for short portions between precast coping units. This C-I-P coping may also be used for vertical copings.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH (L)</th>
<th>LENGTH (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>AS REQD.</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>AS REQD.</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>U1</td>
<td>4</td>
<td>Panel width + 4&quot;</td>
<td>Panel width + 4&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>4</td>
<td>Dim. B - 4&quot;</td>
<td>Dim. B - 4&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>Dim. C - 4&quot;</td>
<td>Dim. C - 6&quot;</td>
</tr>
</tbody>
</table>

Bars 4A (follows slope of C-I-P Coping Enclosure)

Bars 4B (Horizontal) (Field cut as required to maintain minimum cover)

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments

Top of C-I-P Coping Enclosure

Top of Retaining Wall End Panel

3" Min. Cover (Typ.)

3" Min. Cover (Typ.)

2" Chamfer (Typ.)

3" Min. Cover (Typ.)

For Slightly and Moderately Aggressive environments

For Extremely Aggressive environments

C-I-P COPING ENCLOSURE DETAIL

LEVELING PAD FOR MSE WALL Shown

Ground Line

Expanded Polystyrene (3")

Drainage Ditch when required (See Wall Control Drawings for details)

Organic Felt Bond Breaker

Dowel Bars 4D

(See Note 2, Sheet 1)

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**S** = Slightly Aggressive
**M** = Moderately Aggressive
**E** = Extremely Aggressive

BARS 4A & 4B
Dowel Bar 4D
Bar 4U1
Bar 4U2
Bar 4U3

C-I-P COPING USED WITH PRECAST COPING

Note: When precast coping units do not fill the entire length of the retaining wall, use this similar C-I-P coping for short portions between precast coping units. This C-I-P coping may also be used for vertical copings.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH (L)</th>
<th>LENGTH (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>AS REQD.</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>AS REQD.</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>U1</td>
<td>4</td>
<td>Panel width + 4&quot;</td>
<td>Panel width + 4&quot;</td>
</tr>
<tr>
<td>U2</td>
<td>4</td>
<td>Dim. B - 4&quot;</td>
<td>Dim. B - 4&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>4</td>
<td>Dim. C - 4&quot;</td>
<td>Dim. C - 6&quot;</td>
</tr>
</tbody>
</table>

Bars 4A (follows slope of C-I-P Coping Enclosure)

Bars 4B (Horizontal) (Field cut as required to maintain minimum cover)

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments

Top of C-I-P Coping Enclosure

Top of Retaining Wall End Panel

3" Min. Cover (Typ.)

3" Min. Cover (Typ.)

2" Chamfer (Typ.)

3" Min. Cover (Typ.)

For Slightly and Moderately Aggressive environments

For Extremely Aggressive environments

C-I-P COPING ENCLOSURE DETAIL

LEVELING PAD FOR MSE WALL Shown

Ground Line

Expanded Polystyrene (3")

Drainage Ditch when required (See Wall Control Drawings for details)

Organic Felt Bond Breaker

Dowel Bars 4D

(See Note 2, Sheet 1)
1. Construct the expansion joints, V-Grooves and face of coping plumb.

2. Provide Class II 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 A36 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. Dowel Load Transfer Devices in junction slabs and C-I-P copings plumb and perpendicular or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown. Provide 3 ½" x 4' P-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" maximum intervals as shown. Approach Slab - 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 Pavement is required on top of the junction 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 embedded 1'-0" and extended 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the buildup concrete. See Wall Company 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)

CROSS REFERENCE: For Detail "A", see Sheet 2.

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)

SINGLE SLOPE CONCRETE BARRIERS
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 and 60'-0" for 42" Single-Slope.
5. Contractor to maintain stability of precast coping prior to junction slab completion. In the case of 6.25% superelevation, the Typical Section dimensions adjusted.
6. 1'-0" @ 1'-0" sp. is required between expansion joints (Typ).
7. Minimum 1'-6" thickness at the side edge of the slab.
8. Minimum length of expansion joints is 30'-0" for 36" Single-Slope or 60'-0" for 42" Single-Slope.
9. Contractor to maintain stability of precast coping prior to junction slab completion. In the case of 6.25% superelevation, the Typical Section dimensions adjusted.

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)

- Precast Coping
- C-I-P Coping

REINFORCING STEEL NOTES:
1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary the Junction Slab slope based on the roadway cross slope to maintain a minimum 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 case of 6.25% superelevation, the Typical Section dimensions adjusted.
6. Minimum 1'-6" thickness at the side edge of the slab.
7. Minimum length of expansion joints is 30'-0" for 36" Single-Slope or 60'-0" for 42" Single-Slope.
8. Contractors may use deformed steel bars or Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 93.1.
9. Contractors may use a single #5 stirrup in lieu of two bars for 4P and 4V1.

ESTIMATED QUANTITIES FOR C-I-P

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY (36&quot;)</th>
<th>QUANTITY (42&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>CY/LF</td>
<td>0.376</td>
<td>0.420</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB/LF</td>
<td>62.45</td>
<td>82.17</td>
</tr>
<tr>
<td>Additional Rein @</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expansion Joint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LB</td>
<td>21.36</td>
<td>21.36</td>
</tr>
</tbody>
</table>

The above quantities are based on a max. superstructure of 6.25%.
EXPANSION JOINT DETAIL

(Raised Sidewalk expansion joints are to coincide with 2" open joints in Concrete Barrier)

** Stay-In-Place Plastic Preformed Bond Breakers are permitted to form joints.**

RAISED SIDEWALK NOTES:
1. When a 42" Vertical Shape is used with a precast coping, increase Bars 4C to Bars 5C or provide Bars 4C @ 4" spacing within 6'-0" of Expansion Joints.
2. Construct the expansion joints, V-Grooves and face of coping plumb.
3. Provide Class II concrete for slightly aggressive environments or Class IV for moderately or extremely aggressive environments.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A 36 smooth round bar, or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D7615. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Construct 2" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 60"-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 and between 5" to 45" from horizontal.
7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
8. Construct 2" V-Grooves in raised sidewalk and C-I-P coping at 30'-0" maximum intervals as shown. Space V-Grooves equally between 2" Expansion Joints and/or Begin or End Raised Sidewalk V-Groove Locations are to coincide with V-Groove locations in the Concrete Barrier.
9. Spacing shown is along the Gutter Line.
10. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. Finish Sidewalks in accordance with Specification Section 322.
12. The following indexes contain details of the intersection of the retaining wall at approach slabs:
   - Index 400-090 - Approach Slabs (Flexible pavement approaches)
   - Index 400-091 - Approach Slabs (Rigid pavement approaches)

CROSS REFERENCE: For Detail "B", see Sheet 4.
**END VIEW OF 32" VERTICAL SHAPE END TRANSITION FOR GUARDRAIL ATTACHMENT**

*(Showing Bars 5S, Bars 5T and Bars 5X)*

(Precast Coping Shown, C-I-P Coping Similar)

**NOTE:** See Sheet 4 for End Transition Elevation.

---

**ESTIMATED QUANTITIES FOR PRECAST COPING**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (Precasting)</td>
<td>CY/LF</td>
<td>0.095</td>
</tr>
<tr>
<td>Concrete (C-I-P Raised Sidewalk)</td>
<td>CY/LF</td>
<td>0.232</td>
</tr>
<tr>
<td>Reinforcing Steel (Precasting) excluding Bars ST, 5S and 5X (Typ.)</td>
<td>LB/LF</td>
<td>23.90</td>
</tr>
<tr>
<td>Reinforcing Steel (C-I-P Raised Sidewalk) (Typ.)</td>
<td>LB/LF</td>
<td>13.50</td>
</tr>
<tr>
<td>Additional Reinf. @ Expansion Joints (Steel Dowels)</td>
<td>LB</td>
<td>32.04</td>
</tr>
</tbody>
</table>

The above concrete quantities are based on a Type D Concrete Curb (See Note 2).

---

**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)*

**NOTES:**

1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape 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 5X to clear construction joint for 42" Vertical Shape.
4. Trim end of Bars ST and 5X to clear construction joint for 32" Vertical Shape.
5. Contractor to maintain stability of precast coping prior to expansion joint completion.
6. Trim end of Bars ST and 5X to clear construction joint for 42" Vertical Shape.
7. For Bullet Railings, see Index 515-021 and 515-022.
8. When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polyethylene to provide a maximum 2½" air gap.

**FY 2020-21 STANDARD PLANS**

**INDEX 521-620**

**SHEET 2 of 4**

---

**DESCRIPTION:**

- Additional Rail required for Special Height Bicycle Rail (see note 2).
- Concrete Curb (see note 2).
- The above concrete quantities are based on a Type D Concrete Curb (see note 2).

---

**REVISED 03/01/18**

---

**INDEX 521-620**

**SHEET 2 of 4**

---

**DESCRIPTION:**

- Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
- Trim end of Bars ST and 5X to clear construction joint for 42" Vertical Shape.
- Trim end of Bars ST and 5X to clear construction joint for 32" Vertical Shape.
- Contractor to maintain stability of precast coping prior to expansion joint completion.
- Trim end of Bars ST and 5X to clear construction joint for 42" Vertical Shape.
- For Bullet Railings, see Index 515-021 and 515-022.
- When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polyethylene to provide a maximum 2½" air gap.

**NOTES:**

1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape 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 5X to clear construction joint for 42" Vertical Shape.
4. Trim end of Bars ST and 5X to clear construction joint for 42" Vertical Shape.
5. Contractor to maintain stability of precast coping prior to expansion joint completion.
6. Trim end of Bars ST and 5X to clear construction joint for 42" Vertical Shape.
7. For Bullet Railings, see Index 515-021 and 515-022.
8. Begin placing Railing Bars ST and 5X at the railing end and proceed toward Retaining Wall to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars ST and 5X shall be made immediately adjacent to Begin or End Bridge Cut, shift and rotate Bars ST and 5X as required to maintain cover in End Transition.
Concrete Reinforcing Steel (Typical) excluding Bars 5T, 5X and 5S (Typ.):

<table>
<thead>
<tr>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY/LF</td>
<td>35.38</td>
</tr>
<tr>
<td>LB/LF</td>
<td>32.04</td>
</tr>
</tbody>
</table>

Estimated Quantities for C-I-P Coping

**Notes:**
1. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 8'-0" 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 5T 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 5T and 5X shall be made immediately adjacent to Begin or End Retaining Wall. Cut, shift and rotate Bars 5T and 5X as required to maintain cover in End Transition.
### BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>UNIT</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>LB/LF</td>
<td>2'-0&quot;</td>
</tr>
<tr>
<td>B1</td>
<td>5</td>
<td>LB/LF</td>
<td>1'-10&quot;</td>
</tr>
<tr>
<td>B2</td>
<td>4</td>
<td>LB/LF</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>LB/LF</td>
<td>4'-5&quot;</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>LB/LF</td>
<td>4'-5&quot;</td>
</tr>
<tr>
<td>E</td>
<td>7</td>
<td>LB/LF</td>
<td>9'-2&quot;</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>LB/LF</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>G</td>
<td>5</td>
<td>LB/LF</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>H</td>
<td>5</td>
<td>LB/LF</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

<table>
<thead>
<tr>
<th>STIRRUP BAR 5T</th>
<th>STIRRUP BAR 5X</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Be Field Cut (7 of each required per Railing End Transition)</td>
<td>To Be Field Cut (7 of each required per Railing End Transition)</td>
</tr>
</tbody>
</table>

**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.

### BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>0.095</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>23.38</td>
</tr>
</tbody>
</table>
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 1/2" Expansion Joints in sidewalk and C-I-P coping plumb and either perpendicular or radial to the Gutter Line. Provide Expansion Joints at 90'-0" maximum intervals as shown.
3. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.
4. Construct 1/2" V-Grooves in sidewalk and C-I-P coping. Space V-Grooves at 30'-0" maximum intervals equally spaced between 1/2" Expansion Joints and/or Begin or End Sidewalk. For C-I-P Coping only, V-Groove locations are to coincide with V-Groove locations in the Concrete Parapet.
5. Spacing shown is along the gutter line.
6. For Precast Coping only, provide Dowel Bars 4D embedded 1'-0" and extend 11" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the buildup concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
7. Work this Index with Index 521-001 - Concrete Barrier Wall.
8. For C-I-P Coping only, work this Index with Index 521-020 - Pedestrian/Bicycle Railing, or Index 521-025 - 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)

(Showing Locations of 1/2" V-Grooves and 1/2" Preformed Expansion Joint Filler)
**PLAN VIEW**
(Junction Slab Shown, Raised Sidewalk Similar)

- **Bars 5U2**: @ 6" sp.
- **Bars 5B2**: Field Cut as required to clear Barrier Wall Inlet (Typ.)
- **Bars 5S3**: @ 6" sp.
- **Bars 4V1 or 5V1**: (Typ.)
- **Bars 5A (Top)**: (Typ.)
- **Bars 5L (Bottom)**: (Typ.)
- **Bars 5C (Top)**: (Typ.)
- **Bars 5B1**: (See Note 4)
- **Bars 4S2**: @ 6" sp.
- **Bars 5U2**: @ 6" sp.
- **Bars 5B1**: (Typ.)
- **Bars 4V1 or 5V1**: (See Note 4)
- **1" Preformed Expansion Joint Filler (Typ. all Sides)**
- **Coping**
- **Gutter Line**
- **Shoulder or Roadway Pavement**
- **Riding Surface**
- **Compacted Sand**
- **Construction Joint**

**SECTION A-A**
SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL
(Junction Slab Shown, Raised Sidewalk Similar)

- **Gutter Line**
- **Bars S53 (Bottom)**
- **Bars S51 (Top)**
- **Bars S51 (Typ.)**
- **Bars S53 (Rotate as required to clear junction slab reinforcing)**
- **Bars S52**: @ 6" sp.
- **C-1-P Concrete Barrier (36" Single-Slope shown, 42" Single-Slope similar)**
- **3'-0" (See Note 2)**
- **4'-0"**
- **4" Cover**
- **6'-0" (See Note 1)**

**NOTES:**
1. Spacing shown is along the Gutter Line. Spacing shown is for C-1-P Junction Slab. For C-1-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-1-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 S51.
5. Organic Felt bond breaker (Top) & Expanded Polystyrene shown hatched (Ț" Side).
6. Locate \( \frac{1}{2} \)" Barrier Wall Inlet a minimum of 10'-0" away from \( \frac{1}{2} \)" Expansion Joints in Junctions Slab, Raised Sidewalk or Sidewalk, C-1-P Coping and Traffic Railing or Concrete Parapet.
7. Locate open joints in Barrier Wall and Coping a minimum of 5'-0" from the centerline of the Barrier Wall Inlet.
8. Work this Index with the following as appropriate:
   - Index 521-610
   - Index 521-620
   - Index 521-630

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>REQD</th>
<th>SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2</td>
<td>16</td>
<td>4&quot;</td>
<td>3'-7&quot;</td>
</tr>
<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>

**REINFORCING STEEL BENDING DIAGRAMS - DRAINAGE**

**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.

**INDEX:**
- 521-640

**DESCRIPTION:**
FY 2020-21
STANDARD PLANS
DRAINAGE INLET OPENINGS IN JUNCTION SLAB - WALL COPING
TYPICAL SECTION AT LIGHT POLE PEDESTAL
(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar) (36° Single-Slope Concrete Barrier shown, other railings similar)

NOTES:
1. Provide Concrete Class to match adjacent coping.
2. For junction slabs, increase the 1'-0" depth dimension to 1'-9".
3. For Parapet with sidewalk see Index 521-630, but increase sidewalk depth to 1'-6".
4. The minimum length of the Junction Slabs, raised sidewalks and sidewalks is 30'-0".
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 5B, or Index 521-512 for Bars 5V and 5B1.
9. Work with Index 521-610 (Concrete Barrier/Noise Wall), Index 521-612 (Single-Slope), Index 521-620 (Vertical Shape), and Index 521-630 (Concrete Parapet).
**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>4</td>
<td>16</td>
<td>9-10&quot;</td>
</tr>
<tr>
<td>G2</td>
<td>4</td>
<td>4</td>
<td>9-10&quot;</td>
</tr>
<tr>
<td>G3</td>
<td>4</td>
<td>6</td>
<td>8-15&quot;</td>
</tr>
<tr>
<td>G4</td>
<td>4</td>
<td>4</td>
<td>7-8&quot;</td>
</tr>
<tr>
<td>G5</td>
<td>4</td>
<td>2</td>
<td>2-18&quot;</td>
</tr>
<tr>
<td>H1</td>
<td>4</td>
<td>3</td>
<td>9-8&quot;</td>
</tr>
<tr>
<td>M1</td>
<td>5</td>
<td>8</td>
<td>5-10&quot;</td>
</tr>
<tr>
<td>M2</td>
<td>4</td>
<td>10</td>
<td>3-8&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL BENDING DIAGRAMS - LIGHT POLE PEDESTAL**

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.

**REINFORCING STEEL 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.
3. 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.

**ELEVATION VIEW**

(Junction Slab Reinforcing & Bars 4J not shown for Clarity) (Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)

**DETAIL "A"**

- **Top of Concrete Barrier**
- **Bottom of Pedestal**
- **Bottom of Thickened Junction Slab**
- **Varies (Transition to 1'-9" Thick Junction Slab) Junction Slab**
- **Minimum Limits of C-I-P Coping**
- **Top of Recess & Bottom of Junction Slab**
- **Bottom of Pedestal**
- **Bottom of Thickened Junction Slab**
- **Varies (Transition to 1'-9" Thick Junction Slab) Junction Slab**
- **2" Ø Conduit**
- **Light Pole Base Plate (Level)**
- **Slope Pedestal Surface Longitudinally with Profile Grade**
- **Wire Screen**
- **Anchor Bolts**
- **Leveling Nut**
- **Optional Notch for Index 521-610 (Typ.)**
- **2" Ø Conduit**

**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.
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 Guiderail shown in the plans. (See RAILING DETAIL)

LEGEND:
A- ½" Expansion Joints (Preformed Joint Filler) between the sidewalk and adjacent driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).
B- ⅛" Dummy Joints, Tooled
C- ⅛" Formed Open Joints
D- ½ Saw Cut Joints, ½" Deep (within 96 hours) Max. 5' Centers
E- ½ Saw Cut Joints, ½" Deep (within 12 hours) Max. 20 Centers (Joint) Required When Length Exceeds 30'
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

OPEN JOINTS

SAWED JOINTS

LONGITUDINAL SECTION

LEGEND:
4" Thick Sidewalk
6" Thick Sidewalk
Utility Strip

PLAN

SIDEWALK WITH UTILITY STRIP

SIDEWALK WITHOUT UTILITY STRIP

SECTION A-A

SECTION B-B

RAILING DETAIL

GENERAL NOTES AND CONCRETE SIDEWALK ON CURBED ROADWAYS
**Description:**

**Legend:**

- **A:** 1/2" Expansion Joints (Preformed Joint Filler) between the sidewalk and driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).
- **B:** Dummy Joints, Tooled.
- **C:** Formed Open Joints.
- **D:** 1/8" Saw Cut Joints, 1/4" Deep (within 96 hours) Max. 5" Centers.
- **E:** 1/8" Saw Cut Joints, 1/2" Deep (within 12 hours) Max. 5" Centers. Joints Required When Length Exceeds 30'.
- **F:** 1/4" Expansion Joint When Run Of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.

**Longitudinal Section**

**Discontinuous Sidewalk**

**Continuous Sidewalk**

**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. 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.

3. 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.

4. 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.

5. Detectable Warnings - Acceptance Criteria:
   A. Color and texture shall be complete and uniform.
   B. 96% of individual truncated domes shall be in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 703.
   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.
DESCRIPTION:
SIDEWALK CURB RAMPS CR-A AND CR-B

NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet B.

CR-A

CR-B

SECTION A-A

SIDEWALK CURB RAMPS CR-A AND CR-B

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX

FY 2020-21

STANDARD PLANS

522-002

2 of 8
CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS

NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.

SECTION B-B

SIDEWALK CURB OPTIONS

SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB

NOTE:

4'-0" (shown)

For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.
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

DETECTABLE WARNING ON FLUSH SHOULDERT NEW SIDEWALKS

CURB RAMPS WITHOUT SIDEWALKS AND FLUSH SHOULDER SIDEWALKS

DESCRIPTION:

FY 2020-21

STANDARD PLANS

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX

522-002

SHEET

6 of 8
NOTES:
1. Cross Slope of the median crossing not to exceed 0.02.
2. Running Slopes:
   A. Slopes ≤ 0.05: For roadway cross sections were the Edge of Pavement elevation is the same for both directions of traffic, the median crossing running slopes (0.02 Typ.) should meet at the centerline of the median. For roadway cross sections with variable Edge of Pavement elevations, or to accommodate other construction in the median, the slopes may intersect off the centerline of the median.
   B. Slopes > 0.05: Provide a median refuge area (landing, 0.02 slope) for crossings with running slopes > 0.05. The refuge area must extend the full width of the crossing and have a minimum length of 5 feet.
3. On existing facilities, remove and reconstruct curb transition for raised sidewalk with ramp.
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.

Rail Car Width

Flangeway Gap (2½" Max.) (See Note 3)

Collection of Nearest Rail

Gate

2'-0" Detectable Warnings

4'-0" Min. Full Height Curb

2'-0" Detectable Warnings

Crosswalk

Ray Car Width

Flangeway Gap (2½" Max.)

4'-0" Min. Full Height Curb

2'-0" Detectable Warnings

Crosswalk

2'-0" Detectable Warnings

Crosswalk

Flangeway Gap

2'-0" Detectable Warnings

Crosswalk

RADIAL SIDEWALK RAMPS

3'-0" Curb Transition From Full to Zero Height

Full Height Curb, 2'-0" Min.

2'-0" Detectable Warnings

Utility Strip

Crosswalk

Crosswalk

Crosswalk

Crosswalk

Crosswalk

PLACEMENT OF SIDEWALK CURB RAMPS AT CURBED RETURNS (TYP.)

RAILROAD CROSSING

RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS

INDEX 522-002

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

STANDARD PLANS

FY 2020-21

LAST REVISION 01/01/17

8 of 8 SHEET
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 0.03 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 0.03 open joints @ 10' Centers and 0.03 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.
**SIDEWALK WITHOUT UTILITY STRIP**

**WITHOUT SIDEWALK OR UTILITY STRIP ≥ 10' WIDE**

**UTILITY STRIP < 10' WIDE**

**LEGEND:**
- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip

**DESCRIPTION:**

- **REV ISIO N**
  - Last Revision: 11/01/18
  - Standard Plans: FY 2020-21
  - Index: 522-003

**CONCRETE FLARED DRIVEWAYS**

- Match Driveway Flare
- Sidewalk Thru Driveway (6" Thick Concrete)
- Sidewalk Flare
- Sidewalk Without Utility Strip
- Utility Strip

**DIMENSIONS:**

- 6'-0" Min.
- 4'-0" Min.
- 3'-0" Min.
- 7'-0" Max.
- 10'-0" Max.
- ˂10'

**NOTES:**

- Drop Curb
- Grade and Depth Per Plans
- Sidewalk Flare Option A
- Sidewalk Flare Option B
- Match Driveway Flare
- Varies (See Sheets 3 & 4)
SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE:
5' sidewalks shown.
CONCRETE FLARED DRIVEWAYS

SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE:
5' sidewalks shown.
Standard Paved Ditch

**Typical Section**

**Sheet 1**

**Roadway Ditch**

1:6

**0.04**

**3'**

**b**

**0.5'**

**9.2'**

20.67'

**10 /29 /2019**

Grade

11/01/19

Revision

Ditch

the same elevation and should be used to locate the paved section. For use only where side slopes are 1:4 or flatter. Point "A" and "B" are to be

Riprap (Sand-Cement)

4' Ditch Bottom Width

5' Ditch Bottom Width

6' Median Swale

Miscellaneous Asphalt

1:4 Front Slopes & Back Slope

S

Arc Length

AT LOCATIONS OTHER THAN JUNCTION WITH LATERAL DITCH

SECTION AA

PROFILE OF DITCH PAVEMENT

AT LOCATIONS OTHER THAN JUNCTION WITH LATERAL DITCH

Typical Section

<table>
<thead>
<tr>
<th>TABLE I: DITCH PAVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Type</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Concrete</td>
</tr>
<tr>
<td>Miscellaneous Asphalt</td>
</tr>
<tr>
<td>Mape (Sand-Cement)</td>
</tr>
<tr>
<td>Kiprap (Ditch Linings)</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. Type of ditch pavement shall be as shown on plans.

2. In concrete ditch pavement, contraction joints are to be spaced at 25' maximum intervals, or as directed by the Engineer. Construction joints may be either concrete (construction joints) or tooled. No open joints will be permitted in concrete ditch pavement.

3. Lateral ditch pavement shall be constructed at at inlets, endwalls, and at intervals of not more than 200'.

4. Sodding or specified sediment traps shall be used with all ditch paving. A toewall is not required adjacent to drainage structures.

5. Sodding to be paid for under contract unit price for Sod or "Ditch Pavt."

6. Filter fabric is required under all ditch pavement, except for miscellaneous asphalt, regardless of the pavement thickness. Place the filter fabric directly beneath the pavement for the entire length and width of the pavement. See Specification 985 for fabric requirements and application.

7. Weep hole spacing may be spaced at 25' maximum intervals, or as directed by the Engineer. Construction joints may be either concrete (construction joints) or tooled. No open joints will be permitted in concrete ditch pavement.

8. When weep holes with aggregate are used, place filter fabric between the aggregate and the ditch pavement. Filter fabric is required under all ditch pavement, except for miscellaneous asphalt, regardless of the pavement thickness. Place the filter fabric directly beneath the pavement for the entire length and width of the pavement. See Specification 985 for fabric requirements and application.
Note: Either option may be used unless otherwise called for in the plans.

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE
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 back face of the wall. Recessed panels may be installed from the back or front 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: +/- ¼" 
   B. Thickness: +/- ⅛"
   C. Plane of side mold: +/- 1/16"
   D. Openings: +/- ⅛"
   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
Mortar Joint

Amplitude
4" o.c.
1" o.c.
Typ.

Random 3" - 3½" Gravel Texture

Type "A" SMOOTH

Type "B" ASHLAR STONE

Type "C" SPLIT FACE RUNNING BOND BLOCK

Type "D" FRACUTED GRANITE

Type "E" WIRE-CUT BRICK

Type "F" CUT CORAL BLOCK (RUNNING BOND)

Type "G" VERTICAL FRACTURED FIN

Type "H" TRAPEZOID VERTICAL FINS W/ FRACTURED FACE (COLORADO DRAG AGGREGATE)

Type "I" PEA GRAVEL

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.

TEXTURE OPTIONS
DESCRIPTION:

修订

最近修订日期：
2020-21

标准计划

噪音墙 - (预浇筑)

第3版

图形及纹理细节

注释：

1. 提交特定的模具衬膜样品供工程师批准。
2. 显示的纹理和图形仅为示例，用于说明用途。具体纹理和图形需求，请参阅计划中的噪音墙数据表。
**DESCRIPTION:**

**REVISION:**

**LAST REVIEW:**

**STANDARD PLANS:**

**NOISE WALLS - (PRECAST)**

**INDEX:**

**FY 2020-21**

**SHEET:** 4 of 16

---

**TYPICAL ELEVATION**

- **Top Panel**
- **Bottom Panel**
- **Post (Typ.)**
- **Auger Cast Pile (Typ.)**
- **Neoprene Pad**

**SECTION A-A**

**WITH POST CAP**

- **Top of post**
- **Top Panel**

**SECTION B-B**

**WITHOUT POST CAP**

**ELEVATION STEP AT TOP OF WALL**

**ELEVATION STEP AT BOTTOM OF WALL**

**PLAN**

- **Post Spacing (S)**
- **Post & Pile**
- **Fill with Non-Shrink Grout**
- **Auger Cast Pile**

**TYPICAL DETAILS**

- **Precast Cap (Type "B")**
- **Step**
- **Bearing Pads (Typ.)**

---

**Notes:**

- See the plans for required post spacings (S).
- See Sheet 1, Note 10.
**TYPICAL PANEL ELEVATION**

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then tilted upright using tilt-tables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 Bars @ 1'-3" (As=0.16 in.²/ft.).

**STANDARD PICK UP POINTS FOR PANELS**

(Panels shall be rotated about long axis only)

**DESIGNATION:**
- Vertical Steel ~ #4 Bars @ 10" (As=0.24 in.²/ft.) (Typ.)
- Horizontal Steel ~ #4 Bars @ 8" (As=0.30 in.²/ft.) (Typ.)

**NOTES:**
1. See Sheet 3 for allowable methods of applying textures.
2. See plans for panel type and aesthetic requirements.
3. For equal post spacing, side-installed panel length will be shorter than top-installed Panel length.
NOTE:
The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle ($2\Delta^\circ$) between panels exceeds 7°.

NOTE:
The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle ($2\Delta^\circ$) 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.

**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.

**BAR BENDING DETAILS (#3 Bars)**

**DRAINAGE HOLE DETAILS**
**STANDARD POST REINFORCEMENT**

(Standard Post Shown, 45° Corner Posts Similar)

**TYPICAL POST**

*Low Clearance Option*

*Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

**STANDARD POST DETAILS**

NOTES:

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
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. For Post Reinforcing, see sheets 15 & 16.
3. For Pile Length Tables, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.

45° POST NOTES:

1. Reference Sheets 8 & 9 for location of Sections. Space Bars P7 as shown for Bars P1. Space Bars P8 as shown for Bars P2.
2. Match texture thickness with appropriate Panel face. For Post Reinforcing, see sheets 15 & 16.
3. For Pile Length Tables, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.

45° POST DETAILS

45° POST PLACEMENT IN AUGER CAST PILE

45° CORNER POST DETAILS

DESCRIPTION:

FY 2020-21
STANDARD PLANS

REVISION

INDEX

NOISE WALLS - (PRECAST)

REV ISIO N

10 of 16

SHEET
DESCRIPTION:

REVISION LAST SHEET INDEX

NOISE WALLS - (PRECAST)

11/01/16

534-200

11 of 16
NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel finish top of Collar to allow placement of Bearing Pads.
   * Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".
DESCRIPTION:

REVISION of STANDARD PLANS FY 2020-21

INDEX NOISE WALLS - (PRECAST)

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".
PLAN VIEW
(Type "A" Cap Shown, Type "B" & "C" Caps Similar)

VIEW A-A SHOWN, VIEW B-B SIMILAR
(Type "A" Cap Shown, Type "B" & "C" Caps Similar)

CAP PLACEMENT DETAIL
(Type "B" Cap Shown, Type "A" & "C" Caps Similar)

SECTION C-C
TYPE "A" CAP DETAILS

SECTION C-C
TYPE "B" CAP DETAILS

SECTION C-C
TYPE "C" CAP DETAILS

PRECAST POST CAPITAL

NOISE WALLS - (PRECAST)
# TABLE 2A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 150 MPH</th>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 150 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WITHOUT CAP</td>
<td>WITH CAP</td>
<td></td>
<td>WITHOUT CAP</td>
<td>WITH CAP</td>
</tr>
<tr>
<td>12</td>
<td>13-0'</td>
<td>12-0'</td>
<td>13-0'</td>
<td>12-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>14-0'</td>
<td>13-0'</td>
<td>14-0'</td>
<td>14-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>15-0'</td>
<td>14-0'</td>
<td>15-0'</td>
<td>15-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>16-0'</td>
<td>15-0'</td>
<td>16-0'</td>
<td>16-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>17-0'</td>
<td>16-0'</td>
<td>17-0'</td>
<td>17-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>18-0'</td>
<td>17-0'</td>
<td>18-0'</td>
<td>18-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>19-0'</td>
<td>18-0'</td>
<td>19-0'</td>
<td>19-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>20-0'</td>
<td>19-0'</td>
<td>20-0'</td>
<td>20-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>21-0'</td>
<td>20-0'</td>
<td>21-0'</td>
<td>21-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>22-0'</td>
<td>21-0'</td>
<td>22-0'</td>
<td>22-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>23-0'</td>
<td>22-0'</td>
<td>23-0'</td>
<td>23-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
</tbody>
</table>

**Table Note:**
1. Bars D and Bars E are for 40' Corner Posts only.
2. See Contract Plans for project wind speed.
   Soil 2 = Medium Dense Granular Soil, N = 10 to 40.

---

# TABLE 3A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 170 MPH</th>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 170 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WITHOUT CAP</td>
<td>WITH CAP</td>
<td></td>
<td>WITHOUT CAP</td>
<td>WITH CAP</td>
</tr>
<tr>
<td>12</td>
<td>13-0'</td>
<td>12-0'</td>
<td>13-0'</td>
<td>12-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>14-0'</td>
<td>13-0'</td>
<td>14-0'</td>
<td>14-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>15-0'</td>
<td>14-0'</td>
<td>15-0'</td>
<td>15-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>16-0'</td>
<td>15-0'</td>
<td>16-0'</td>
<td>16-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>17-0'</td>
<td>16-0'</td>
<td>17-0'</td>
<td>17-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>18-0'</td>
<td>17-0'</td>
<td>18-0'</td>
<td>18-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>19-0'</td>
<td>18-0'</td>
<td>19-0'</td>
<td>19-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>20-0'</td>
<td>19-0'</td>
<td>20-0'</td>
<td>20-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>21-0'</td>
<td>20-0'</td>
<td>21-0'</td>
<td>21-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>22-0'</td>
<td>21-0'</td>
<td>22-0'</td>
<td>22-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>23-0'</td>
<td>22-0'</td>
<td>23-0'</td>
<td>23-0'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#5</td>
<td>#8</td>
<td></td>
<td>#8</td>
<td></td>
</tr>
</tbody>
</table>

**Table Note:**
1. Bars D and Bars E are for 40' Corner Posts only.
2. See Contract Plans for project wind speed.
   Soil 2 = Medium Dense Granular Soil, N = 10 to 40.
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 design 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. For 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 slope changes.
4. See "Perimeter Wall Data Tables" in the plans for project requirements.
5. Field verify the locations of all overhead and underground utilities shown in the Wall Control Drawings.

PRECAST OPTION NOTES:

6. WALL NOTES:
   A. Walls may consist of either a single height panel or two stacked panels. Minimum panel height is 4'-0".
   B. Only when reduced overhead clearance between posts prohibits installation of panels from the top, side-installed panels are allowed. Altered panel is centered between posts, grout between panel ends and posts.

7. CONCRETE AND GROUT:
   A. Cast-in-Place and Precast Concrete: Class IV
   B. Grout for Auger Cast Piling: Minimum 28 Day Strength = 5000 psi
   C. Minimum Compressive Strength for Form Removal and Handling of Posts and Precast Spread Footings:
      i. 2,500 psi for horizontally cast post, panels and precast spread footings.
      ii. 2,006 psi for vertically cast panels or when lift-up form tables are used for horizontally cast panels.

8. REINFORCING STEEL:
   A. Concrete Cover: 1" unless otherwise noted.
   B. Grout for Auger Cast Piling: Minimum 28 Day Strength = 5000 psi
   C. Minimum Compressive Strength for Form Removal and Handling of Posts and Precast Spread Footings:
      i. 2,500 psi for horizontally cast post, panels and precast spread footings.
      ii. 2,066 psi for vertically cast panels or when lift-up form tables are used for horizontally cast panels.

9. BEARING PADS:
   A. Bearing Pads for Collar or Pedestal Bearing Points and between stacked panels may be either Plain or Fiber Reinforced Neoprene Pads, in accordance with Specification Section 932 for ancillary structures.
   B. Only when reduced overhead clearance between posts prohibits installation of panels from the top, side-installed panels are allowed. Altered panel is centered between posts, grout between panel ends and posts.

10. CASTING TOLERANCES:
    A. Overall Height & Width: +/- 1/8" (max.)
    B. Thickness: +/- 1/32" (max.)
    C. Plane of side mold: +/- 1/16" (max.)
    D. Openings: +/- 1/32" (max.)
    E. Out of Square: 1/8" per 6 ft, but not more than 3/4" total along any side
    F. Warping: 1 per foot distance to nearest corner
    G. Sloping: 1/240 panel dimension

11. PILING:
    A. Construct Auger Cast Piling in accordance with the Plans and Specification Section 455.

MASONRY OPTION NOTES:

12. WALL NOTES:
    A. Inspect construction in accordance with the International Building Code (IBC) Section 17.
    B. Construct masonry walls with 8x8x16 block using a running bond pattern and concave coated joints.
    C. Make all elevation changes (steps) in footing and top of wall using full height blocks. Make top of wall steps at pilasters exclusively. Footing steps may be made between pilasters as necessary to maintain minimum soil cover.
    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 230.
    J. For spread footings, use a wall behind the column at least 600 lbs. in weight. Obtain a minimum density of 95% of the maximum dry density as determined by FM T-1780. 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 tooing joints.
    L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TECH 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 of a minimum of 2 feet down each side and secure in place.
    N. Comply with Hot Weather Requirements in ACI 530.1.

13. MATERIALS:
    A. Concrete Masonry Units (CMU): Provide normal weight blocks.
    B. Cast-In-Place Concrete: Class II for slightly to moderate aggressive environments or Class IV for extremely aggressive environments.
    C. Mortar: Type S meeting requirements of ASTM C1329
    D. Grout: Type S; coarse grout.
    E. Aggregate for Grout: Meet the requirements of ASTM C404 or Specification Section 901 size 8 or 89.

14. STORAGE OF MATERIALS:
    A. Store CMU's on elevated platforms, under cover, and in a dry location.
    B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp or exceeded the manufacturers shelf life.
    C. Store masonry accessories and reinforcing to prevent corrosion and accumulation of dirt and oil.
    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 230.
    J. For spread footings, use a wall behind the column at least 600 lbs. in weight. Obtain a minimum density of 95% of the maximum dry density as determined by FM T-1780. 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 tooing joints.
    L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TECH 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 of a minimum of 2 feet down each side and secure in place.
    N. Comply with Hot Weather Requirements in ACI 530.1.
Typical Cap

4" x 4"

1'-9"

1'-5"

1" Recess

4"

4"

2" Cover

No. 4 Bars

2 sp. @ 10" (Typical Cap)

Precast Cap (center cap about post/pilaster)

Precast Post

Top of post

Top of Wall

Wall

Set cap on 1/2" Mortar Bed (ASTM C 1329, Type S)

Cyprus Option only

Precast Post Cap (center cap about post/pilaster)

Top of post

Top of Wall

Wall

Precast Cap (center cap about post/pilaster)

Precast Post

Top of post

Top of Wall

Wall

2'-1" x 2'-5"

Typical Cap

*Corner Cap

1" Typical Cap

1'-11"

1'-15"

Typical Cap

1" *Corner Cap

1" Recess

1'-5"

1'-9"

Typical Cap

1" Corner Cap

No. 4 Bars

2" Cover

Precast Cap (center cap about post/pilaster)

Precast Cap (center cap about post/pilaster)
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)

Detail "A"
(Back Face Chamfer Shown
Front Face Chamfer Similar)

NOTE: Shop Drawings shall include specific pivoting point details of panel ends at locations where the deflection angle (2°) between panels exceeds 20°.

PIVOTING JOINT DETAILS

ELEVATION STEP AT BOTTOM OF WALL
(Auger Cast Pile (Typ.))

Typical Elevation
(Front Face Shown, Textured Finish not Shown for Clarity)

SECTION D-D

SECTION E-E

Typical Plan

Nominal embedment (not including tolerances)

PERIMETER WALLS

PRECAST OPTION - TYPICAL DETAILS

REVISED
11/01/17

LAST
REVISED
10/29/19

DESCRIPTION:

REV

STANDARD PLANS

INDEX

FY 2020-21

SHEET

INDEX

534-250

4 of 10
At the Contractor's option, Smooth or Deformed Welded Wire Reinforcement may be used (equal area).

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.)

* Vertical Steel - #4 Bars @ 10" (As=0.24 in.²/ft.) (Typ.)

Horizontal Steel - #4 Bars @ 7/2" (As=0.32 in.²/ft.) (Typ.)

NOTE:

Pick up points

Panel Height (H)

Panel Length (L)

0.207 L

0.586 L

0.207 H

0.586 H

Texture

Front Face

Pattern

SECTION F-F

Pick up points

1/2" Chamfer (Typ.)

DETAIL "B" - TOP-INSTALLED

(Typ. Both Ends)

DETAIL "B" - SIDE-INSTALLED

(Typ. Both Ends)

SECTION G-G

REINFORCING MAT

R = 1/2"

4" Rebar

FORMED TEXTURE

Front Face

Texture

Front Face

PANEL HEIGHT (H)

Panel Length (L) (19'-2" Max.)

STANDARD PICK UP POINTS FOR PANELS

(Panels shall be rotated about long axis only)
LOW CLEARANCE OPTION

NOTES:
1. See Shop Drawing for Post Lengths.
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

SECTION H-H

SPECIAL POSTS FOR 45° CORNERS

SECTION I-I

ELEVATION VIEW
(See Note 3)

BAR BENDING DETAILS

PRECAST OPTION - SPECIAL CORNER POSTS
### Table 2

<table>
<thead>
<tr>
<th>Wind Speed Category</th>
<th>Masonry Walls (8x8x16)</th>
<th>Foundations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#5</td>
<td>2-8</td>
</tr>
</tbody>
</table>

### Notes:
1. End vertical reinforcing bars 1½" from top of bond beam blocks and horizontal bars 1½" from edge of control joints.
2. Do not continue horizontal #4 bond beam reinforcing through control joint.
3. Use stainless steel joint stabilizing anchors spaced at 16" vertically at all control joints. Install per manufacturer’s instructions.
4. Seal Control Joints with backer rod and Type "A" silicone sealant (top and both sides).
5. See Sheet 10 for Bar placement details.
6. For Pilaster Cap details, see Sheet 2.

---

**NOTES:**
- All bar dimensions in bending diagram are out to out.
- All bars not shown in the bending diagrams are straight.

---

**MASONRY OPTION**
- Precast Post Cap (Typ.)
- (See Sheet 2)

**SHEET 10**
- Table 2
- Masonry Walls (8x8x16)
- Foundations

**FACTOR OF SAFETY:**
- Top of Bond Beam
- Mortar Cap

**SECTION M-M**
- Pilaster Reinforcing and Wall Control Joint Detail

**BAR BENDING DETAIL**
- Bar F1
- Length = 5'-2"

---

**DESIGN:**
- FY 2020-21
- Standard Plans

---

**AS BUILT:**
- 30/09/19
- 8:20:23 AM
- Revision

---

**INDEX:**
- 534-250
- 9 of 10
GENERAL NOTES:

1. INSTALLATION: Construct guardrail in accordance with Specification 536.

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 ½ 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.

3. STANDARD COMPONENTS: Standard guardrail components, including posts, panels, and bolt systems, are based on the Task Force 13 Publication: Guide to Roadside Hardware Components (http://tf13.org/Guides/componentGuide/).

4. BUTTON-HEAD BOLTS: Install Button-Head Bolts where indicated using bolts, nuts, and washers as defined on Sheet 24. 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 567. Place washers under nuts.

6. MISCELLANEOUS ASPHALT PAVEMENT: Install Miscellaneous Asphalt Pavement where indicated with a tolerance of ± 0.5" with conflicting with existing Traffic Railings, structures, or approach slabs.

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 22. When timber posts are used, one of the following safety treatments is required for the bolt(s) protruding from the face of the post:
   a. After tightening the nut, trim the protruding post bolt flush with the nut and gandelier per Specification 562.
   b. Use post bolts 15" in length and countersink the washer and nut between 1" and 1½" deep into the back face of the post.
   c. Use 1½" post bolts with sleeve nuts and washers.

8. 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 ½ 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.

9. END TREATMENT: The End Treatment shown herein can be installed as needed at station markings. Provide an immediate transition to the required midspan panel splice using the available panel options on Sheet 4 (9'-4" or 19'-7") panel). Alternatively, this transition to midspan panel splice may be achieved by installing a single reduced post spacing of 3'-1½" within the new guardrail, immediately adjacent to the connection location.

10. APPROACH TRANSITION CONNECTION TO RIGID BARRIER: The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and include connections to Rigid Barrier shown herein to be installed without conflicting with existing Traffic Railings, structures, or approach slabs.

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.

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 ½ of the panel’s post bolt slots at the approach/trailing ends).
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 23 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, Deep Posts at Slope Breaks, Pipe Rail, Rub Rail, or Reduced Post Spacing for Hazards).

GENERAL, TL-3 GUArdrail DETAILS
LOW-SPEED GUARDRAIL DETAILS

1. GENERAL: Install the Low-Speed Guardrail configuration where indicated in the plans. Low-Speed Guardrail may include tapered segments if called for in the plans.

Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 8'-40" 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 Mia required.

Where a differing guardrail configuration is required for constructability beyond the options shown in this Index or the Plans, obtain approval from the Engineer prior to installation.

2. MIDSPAN PANEL LAP SPLICE: For proper structural function, place all Lap Splices at midspan unless otherwise indicated.

Lap the Panels with the Splice Ridge oriented downstream of the final Direction of Traffic in the nearest traffic lane. For reverse lane conditions, orient the Splice Ridge downstream of the lane direction with the highest traffic volume. Orienting Lap Splices for Temporary Traffic Control phasing is not required.

3. CONNECTION DETAILS: Connections to End Treatments, Approach Transitions, or other segment types are defined in the following Index Sheets, APL Drawings, or the Plans.


5. POST & OFFSET BLOCK DETAILS: See Sheet 5.

6. GUARDRAIL SECTIONS: For Sections showing typical mounting heights, grading, and lateral offsets in relation to adjacent roadway Features, see Sheet 6.

7. MODIFIED MOUNTS: Where concrete structures, concrete sidewalk, or shallow depth conditions are encountered, see Sheet 23 for additional post mounting options.

8. RESTRICTIONS: Low-Speed Guardrail segments are not permitted for use with items including, but not limited to, Double Faced W-Beam, Deep Posts at Slope Breaks, Raised Curb, Pipe Rail, and/or Rub Rail.

LOW-SPEED, TL-2 GUARDRAIL DETAILS

INDEX 536-001

SHEET 3 of 24
NOTES:

1. STANDARD POSTS: Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the length 7" 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 Sheet 6.

2. OFFSET BLOCKS: For each Panel type, install the corresponding Offset Block type as shown. For General, TL-3 (Single Faced) Approach Transitions only, use the 1'-6" Thrie-Beam Block (See Sheet 13).

3. BOLT HOLES: 3/8" Bolt Holes shown in posts within this Index may be substituted with 7/8" Bolt holes.

4. DOUBLE FACED GUARDRAIL: Orient Post Bolts with the Button-Head located on the side nearest the traffic lane. The bolt’s threaded portion is not permitted to extend beyond 3/16" from the face of the tightened nut; trim the threaded portion as needed and galvanize in accordance with Specification 562.

5. BLOCK STOP-NAIL: Drive one nail per Standard Offset Block as shown to prevent Block rotation. Use steel 3/4" Type 16d nails with ASTM A153 hot-dip galvanization. For steel posts, drive the nail through the unused Flange Bolt Hole and bend the nail so its head contacts the Flange.

6. 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.

POST AND OFFSET BLOCK DETAILS

INDEX

536-001

5 of 24
GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS

GUARDRAIL SECTIONS - TYPICAL

GUARDRAIL SECTIONS - CURB & GUTTER

GUARDRAIL SECTIONS - SHOULDERS

GUARDRAIL HEIGHT SUMMARY TABLE:

<table>
<thead>
<tr>
<th>Type</th>
<th>Min. Depth</th>
<th>Mounting Height</th>
<th>Post Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-Beam</td>
<td>0&quot;-10&quot;</td>
<td>0&quot;-10&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Thrie-Beam</td>
<td>0&quot;-10&quot;</td>
<td>0&quot;-10&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Timber Post</td>
<td>0&quot;-10&quot;</td>
<td>0&quot;-10&quot;</td>
<td>6'-6&quot;</td>
</tr>
<tr>
<td>Steel Post</td>
<td>0&quot;-10&quot;</td>
<td>0&quot;-10&quot;</td>
<td>6'-6&quot;</td>
</tr>
</tbody>
</table>

NOTES:
1. GUARDRAIL SECTIONS: Construct Sections as indicated in the plans. The details shown herein depict W-Beam guardrail, but are applicable to the other defined Guardrail Types placed at the corresponding height. 'N' Use components per Sheets 4 to 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. GUARDRAIL SECTIONS - PAVEMENT DETAIL: Construct features as work with other Sections as Regrd.
3. GUARDRAIL SECTIONS - SHOULDER: Place the Slope Break a Maximum of 2' behind the Post. For Deep Posts, the Slope Break may be placed at the Post with the 2" Miscellaneous Asphalt Pavement omitted.
4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts for Face of Guardrail, as shown in the plans.
5. ADJ. 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.

FY 2020-21
STANDARD PLANS

GUARDRAIL

INDEX 536-001

SHEET 6 of 24

LAST REVISION 01/01/19

DESCRIPTION:

SLOPE BREAK CONDITION

GUARDRAIL SECTIONS

TIMBER DEEP POST

STEEL DEEP POST

GUARDRAIL SECTIONS

FULLY PAVED SHOULDER

SHOULDER GUTTER

DOUBLE FACED GUARDRAIL

(Shown In Median)

INDEX 536-001

SHEET 6 of 24

LAST REVISION 01/01/19

DESCRIPTION:

SLOPE BREAK CONDITION

GUARDRAIL SECTIONS

TIMBER DEEP POST

STEEL DEEP POST

GUARDRAIL SECTIONS

FULLY PAVED SHOULDER

SHOULDER GUTTER

DOUBLE FACED GUARDRAIL

(Shown In Median)

INDEX 536-001

SHEET 6 of 24

LAST REVISION 01/01/19

DESCRIPTION:

SLOPE BREAK CONDITION

GUARDRAIL SECTIONS

TIMBER DEEP POST

STEEL DEEP POST

GUARDRAIL SECTIONS

FULLY PAVED SHOULDER

SHOULDER GUTTER

DOUBLE FACED GUARDRAIL

(Shown In Median)
NOTES:

1. INSTALLATION: Locate Approach Terminals where called for in the plans, with the Post (1) placed at the Begin/End Guardrail Station indicated in the plans.

The Plan Views shown herein are schematic only, showing basic geometry for Approach Terminals listed on the APL. The proposed Length of End Treatment 'LE' includes the proprietary portion of various Approach Terminals and provides for more consistent planning of assembly installations across the differing Approach Terminal types. Forward-entering style Approach Terminals may vary from the planned lengths shown by up to 3'-0".

Construct Approach Terminals as shown in the APL and in accordance with the manufacturer's unique drawing details, procedures, and specifications. Install posts in accordance with the manufacturer's drawings. The Special Posts on Sheet 23, including Special Steel Posts, Encased Posts, and Frangible Leave-Outs, are not permitted within the Approach Terminal segment unless otherwise called for in the plans.

Align panel lap splices in accordance with the manufacturer's drawings, regardless of the direction of traffic. Install adjacent grading, gutters, and/or curbing as shown herein.

2. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Splice Location as shown herein. Approach Transitions, Low Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

3. APPROACH TERMINAL TEST LEVEL: Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not substitute for TL-3 installations.

4. IMPACT HEAD END DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal in accordance with Specification 536.

5. 2" MISCELLANEOUS ASPHALT PAVEMENT: The Plan View depicts 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.

6. CLEAR AREA REQUIREMENT: Do not place any permanent aboveground installations within the areas shown with 1:10 maximum grading. For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.

7. CURBED AND DOUBLE FACED GUARDRAIL SEGMENTS: See Sheet 8.
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 9'-0" to 10'-0".

3. TAPER LENGTH: For Curbed Segments, taper the curbed way 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 lip of gutter (Sheet 6 Appendix "B-B", Curb Transition) or from the outside of the Type E curb limits, transition the curb shape linearly, over a nominal distance ranging 5'-0" to 10'-0". The approach terminal assembly "H" is measured from the Misc. Asphalt Pavt. (See Section A-A); linearly taper the difference in Mounting Height over a minimum length of 12'-0", starting where indicated herein.

5. DOUBLE FACED SEGMENT: Connect to Double Faced General Guardrail using consistent Posts and Offset Block types as specified in the AP. Drawings over the entire length of End Treatment, "LE". Posts and Offset Blocks in the adjoining General Guardrail segment may be different from those inside of the "LE". A change in post type between timber and steel is permitted, immediately outside of the "LE" segment. Maintain the 1:10 maximum grading as shown in Section B-B throughout segment "LE". Where required, transition to differing adjacent grades linearly, over a minimum longitudinal length of 25'-0".

6. IMPACT HEAD END DEFINITION: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal Assembly in accordance with Specification 538.

7. CLEAR AREA REQUIREMENT: Do not place any permanent aboveground Installations within the areas shown with 1:10 maximum grading. For the finished condition, keep this area free of all aboveground obstructions, including dense vegetation and trees.

8. 2" MISCELLANEOUS ASPHALT PAVEMENT: The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the Plans.


END TREATMENT - APPROACH TERMINAL GEOMETRY CURBED AND DOUBLE FACED
NOTES:

1. INSTALLATION: Use components as shown on Sheets 9 & 11.

2. MATERIALS: Use steel plates, channels, and Cable Assemblies in accordance with Specification M67.

   Use Short Timber Breakaway Posts and Steel Tube Foundations in accordance with Specification 536.

   Use Hex Nuts, Hex Jam Nuts, and Washers in accordance with the AASHTO-AGC-ARTBA Guide to
   Standardized Barrier Hardware with English unit equivalents of components FNX24a and FWC24a,
   respectively. Two Hex Nuts may be used for the Hex Jam Nut System.

3. PLATE STOP-NAILS: To prevent rotation of the Bearing Plate, drive steel 2\(\frac{3}{8}\) Hex Head
   Bolts (Thru W-Beam Pre-fabricated Holes) (8 Reqd.)

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 6. These panel holes are only permitted for this
   Cable Anchor Plate Assembly application.

5. SOIL PLATE BOLT HOLES: For Trailing Anchorages installations as shown on Sheet 9, the two bolt
   holes may be substituted with a single bolt hole located at the tube centerline.
3. MATERIALS: Use steel End Shoes, Plates, Tubes, and pipes in accordance with Specification 967.

4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end. 

5. SPECIAL END SHOE MOUNT: Punch a 5/8" hole in the W-Beam Panel as needed to secure the Special End Shoe with the 5/8" Hex-Head Bolt. Galvanize hole per Specification 562.

6. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the tube and soil plate.
   b. Drive the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.

7. END DELINER: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 538 and 967.
**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 $\frac{1}{4}$" 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 $\frac{1}{4}$" Button-Head Bolts (8 reqd. per splice).

7. **GENERAL GUARDRAIL:** General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plans. For example, Layouts showing the Approach Transition fit among other guardrail segments, see Sheet 19.

2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.

3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. At the location shown herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E, but this transition may require a different shape depending on the End Transition option shown in the plans. Either a Shoulder Gutter Option, Raised Curb Option, or Flush Shoulder Option. See Sheet 14 for additional curb options and Sheet 13 for curb shape details.

5. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Sheet 14 for additional curb options and Sheet 13 for curb shape details.

6. 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'-0" height.

7. 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'.

8. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Terminations, 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. GENERAL: See the applicable notes and details on Sheet 13.

2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.

3. ELEVATION VIEW: For post and panel installation details within "LA", see the elevation view on Sheet 13. The curb details will differ depending on curb option required.
NOTES:

1. INSTALLATION: Construct the Approach Transition segment where indicated in the plan. For example, Layouts showing the Approach Transition fit among other guardrail segments, see Sheet 19.

For existing bridge connection options, see Indexes 536-000, 536-004, and 536-403.

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. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. At the location indicated herein, taper the guardrail to the connecting guardrail offset. If the adjacent guardrail segment has the same offset as the Approach Transition segment, then no taper is required.

4. END TRANSITION OF CURB OPTIONS: The Plan and Elevation views depict an example Curb Transition to Flush Shoulder from Section D-D to E-E. But this transition may require a different shape depending on the End Transition option shown in the plans (Either a Shoulder Gutter Option, Raised Curb Option, or Flush Shoulder Option). See Sheet 16 for additional curb options and Sheet 17 for curb shape details.

5. Rigid Barrier End Transition: Taper the Rigid Barrier toe as shown. See Concrete Barrier, Index 521-001, for details.

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 callouts in the plans. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length ‘LA’.

7. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Terminals, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
TL-2 APPROACH TRANSITION WITH 'SHOULDER GUTTER' CONNECTION - PLAN VIEW

TL-2 APPROACH TRANSITION WITH 'TYPE F CURB' CONNECTION - PLAN VIEW

NOTES:
1. GENERAL: See the applicable notes and details on Sheet 15.
2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.
3. ELEVATION VIEW: For post and panel installation details within 'LA', see the elevation view on Sheet 15. The curb details will differ depending on curb option required.
DESCRIPTION:

FLUSH SHOULDER OPTION

BEGIN ALIGNMENT CURB

(Intermediate)

SECTION F-F

END TRANSITION

SHOULDER GUTTER OPTION

SECTION E-E

END TRANSITION

RAISED CURB OPTION

SECTION G-G

END TRANSITION

CURB Transition Isometric Views

NOTES:

1. PLAN AND ELEVATION VIEWS: Work with Sheets 13 thru 16.

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 520. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specification 967.

APPROACH TRANSITION CONNECTION - DETAILS

CURB TYPICAL SECTIONS

INDEX

SHEET
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. The layout given on Sheet 30 provides a basic scheme for connections to adjacent guardrails where a taper in a differencing guardrail offset may be required. If the adjacent guardrail has the same offset as the Approach Transition segment, then no taper is required.

2. THRIE-BEAM TERMINAL CONNECTOR: See Sheet 17 for Details. The installed bolt’s threaded portion is not permitted to extend beyond 3/4” from the face of the nut. Trim the threaded portion as needed and galvanize in accordance with Specification 982.

3. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parapet and tapered segments. End Treatments 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 WITH DOUBLE FACED GUARDRAIL
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 Vert. for Opposite Direction)

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 applicable Approach Transition as shown per Sheets 13 thru 16, where 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. CROSSEOVER 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 B.
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.

LAYOUT TO RIGID BARRIER - APPROACH ENDS
INDEX 536-001
9 of 24

FORİMÈRỊN G 10/01/2019
FY 2020-21
STANDARD PLANS
GUARDRAIL

APL240601_01F-06.png
NOTES:

1. See the applicable Notes on Sheet 19.

TYPE C APPROACH TO RIGID BARRIER - DOUBLE FACED GUARDRAIL
PLAN VIEW - MEDIAN SHOULDERS ONLY
(Mirror Horiz. and Vert. for Opposite Direction and/or Side of Road)

NOTES:

1. See the applicable Notes on Sheet 19.

TYPE D TRAILING CONNECTION FROM RIGID BARRIER
PLAN VIEW - MEDIAN OR OUTSIDE SHOULDER
(Mirror Horiz. and/or Vert. for Opposite Direction and/or Side of Road)

NOTES:

1. See the applicable Notes on Sheet 19.

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 17.

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.
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), Trailing Anchor/Assembly Assembly (LT), and Approach Transition (C5) segments.

3. **MATERIALS**: Use steel brackets, fixtures, and pipes in accordance with Specification 967.

4. **RAIL SPLICES**: Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.

---

**NOTES:**

- General Pipe Rail
- Mount Bracket
- Steel Post Flange
- Steel Plate
- Bolt Hole
- Hex-Head Bolt
- Pipe Rail
- End Fixture
- Pipe Rail Gap
- Splice & Splice Pipe
- Steel Post

**PEDESTRIAN SAFETY TREATMENT - PIPE RAIL**

**GENERAL PIPE RAIL SECTION**

**PIPE RAIL INSTALLED ELEVATION**

**PIPE RAIL INSTALLED PLAN**

**ELEVATION SECTION**

**END FIXTURE DETAIL**

**RAIL SPLICE DETAIL**

**MOUNT SECTION DETAIL**

**MOUNT ELEVATION DETAIL**

**MOUNT ISOMETRIC CUT-AWAY**

**MOUNT BRACKET DETAIL**

**END AT STEEL POST OPTION**

**END AT TIMBER POST OPTION**

**PIPE RAIL INSTALLED PLAN**

**ELEVATION**

**SECTION**

**PLAN**

---

**INDEX**

**SHEET**

536-001 22 of 24

**GUIDRAL**

**FY 2020-21 STANDARD PLANS**

**REV ISIO N**

11/01/19

**DESCRIPTION:**

**REV ISIO N**

11/01/19

**LAST REV ISIO N**

01/01/19
NOTES:

1. INSTALLATION: When the construction of GUARDRAIL at the required post spacing results in posts located atop culverts, bents, pier footings, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

2. EDGE CONFLICT: When a required post location causes an Edge Conflict with the structure, where the Steel Base Plate is not located entirely on the structure at least 3" from the Edge of Concrete, the longitudinal post location may be altered by up to 1'-6" (Quarter Span) from the original required spacing location to prevent the Edge Conflict. With the post location adjusted, use a Std. Post mounted on soil (Option 1) or a Special Steel Post with its Base Plate mounted entirely on the structure (Option 2). Maintain the original required spacing locations upstream and downstream of the structure.

3. BASE PLATE MOUNT: Install Special Steel Posts as shown using Steel Adhesive-Bonded Anchor Bolts in accordance with Specification 536. Use Type Hex-Head Bolts for structures less than 9" deep as defined in the Specification.

4. PANEL MOUNT TO ADJUSTED POST: Punch additional 3/8" Bolt Slots in the W-Beam or Thrie-Beam Panel only where needed to mount the panel to a post in an adjusted location. Meet the Panel Post Bolt Slots requirements of Specification 536.

5. MATERIALS: Use steel plate bases 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 posts conflicting with underground utilities or other underground obstructions, an Encased Post may be used where a 2'-0" depth will avoid the conflict. 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 specified in the GUARDRAIL specification is satisfied while the post bottom terminates 3' from the bottom of the Concrete Foundation. Typically, the Post Length 1’-6" 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 completely backfilled and tamped to provide full passive resistance.

4. LIMIT: Encased Posts are not permitted for more than 3 consecutive posts.

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 posts placed within a concrete surface (typically a sidewalk), use a Frangible Leave-Off around the post base as shown. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

2. MATERIALS: Use Non-Excavatable Flowable Fill in accordance with Specification 521, not to exceed 150 psi.

FY 2020-21
STANDARD PLANS

INDEX
536-001 23 of 24

GUARDRAIL
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 Specification 993.

3. COLOR: Use either white or yellow retroreflective sheeting to match the color of the nearest lane’s edgeline.

4. MOUNT LOCATIONS: Mount Barrier Delineators atop posts as shown, starting with Post (3) of Approach Terminals and incrementally increasing spacing towards the downstream direction. Install the Barrier Delineators at the following spacing:

   - S1 = 25' / 1 Space
   - S2 = 50' / 1 Space
   - S3 = 75' / 1 Space
   - S4 = 100' for the Remaining Run

   Additionally, place a Barrier Delineator on Post (2) of the Trailing Anchorage or on the post nearest the Rigid Barrier.

5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

BARRIER DELINEATORS

NOTES:

1. INSTALLATION: Work these details with the plans, where Stationing for Begin/End Half Spacing and Begin/End Quarter Spacing are indicated if required.

   Where the Begin/End Stations indicated in the plans do not correspond exactly to post locations in construction, extend the Reduced Post Spacing segment to the nearest post(s) before the Begin Station and/or after the End Station called for.

2. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing Segments unless they are required for General configurations. To show midspan splices in general segments, use one of: (a) General panel length (9'-4" or 10'-7") or an additional Transition spaced post where required.

3. LOW-SPEED GUARDRAIL: For Reduced Post Spacing with Low-Speed Guardrail (12'-6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 15'-7" spaces.

4. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional ¾" x ¼" Post Bolt Slots in the panels only where required for mounting and in accordance with Specification 598.

REDUCED POST SPACING FOR HAZARDS

BUTTON-HEAD BOLT SYSTEM

NOTES:

1. Use nuts, bolts, and washers in accordance with Specification 967.

2. For Steel Posts with Double Faced Guardrail, the single 25' length bolt (one bolt thru both post flanges) may be replaced with two 10' Length bolts (one bolt per panel flange).

3. Use bolts listed in Table 2 in corresponding locations shown in this Index.

S1/8" BUTTON-HEAD BOLT SYSTEM

BUTTON-HEAD BOLT LENGTHS:

<table>
<thead>
<tr>
<th>Application(s):</th>
<th>Length 'L'</th>
<th>Min. Thread Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Post Mount - Single Faced Guardrail</td>
<td>10&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Timber Post Mount - Single Faced Guardrail</td>
<td>18&quot;</td>
<td>#</td>
</tr>
<tr>
<td>Steel or Timber Post Mount - Double Faced Guardrail</td>
<td>22&quot;</td>
<td>#</td>
</tr>
</tbody>
</table>

LENGTH 'L':

<table>
<thead>
<tr>
<th>Option</th>
<th>Length 'L'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 Shown</td>
<td>16&quot;</td>
</tr>
<tr>
<td>Option 2</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

LOW-SPEED GUARDRAIL:

For Reduced Post Spacing with Low-Speed Guardrail (12'-6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 15'-7" spaces.
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. Nested beam extensions and points for terminal connector attachments will vary for traffic railing barrier vertical face retrofits. The plan views for the vertical face retrofit barriers show the primary configurations for each particular scheme. The associated pictorial views show the variations.

5. For installing thrie-beam terminal connector to traffic railing vertical face retrofits, see notations on Sheets 15 through 18 and the Flag notation on Sheet 26.

6. Payment for connections to traffic railing vertical face retrofits are to be made under the contract unit price for Bridge Anchorage Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate and bolts, nuts and washers.

GENERAL NOTES

1. This index provides guardrail transition details for approach and trailing end guardrail connections to existing bridges, including details for connecting to traffic railing retrofits and safety shape barriers on existing bridges. Sheets 1 through 26 apply to bridges with retrofitted traffic railings (Sheet 26 shows the trailing end guardrail connections). Sheets 27 and 28 apply to bridges with safety shape traffic railing, and they provide approach and trailing end transition connection details for guardrail. Construct these guardrail transitions and connections where called for in the plans.

2. For miscellaneous guardrail components and construction details that are not provided in this index, refer to Index 536-001.

GUARDRAIL TRANSITION ALIGNMENTS FOR BRIDGE THRIE-BEAM AND VERTICAL FACE TRAFFIC RAILING RETROFIT

SPECIAL STEEL POST FOR ROADWAY THRIE-BEAM TRANSITIONS TO BRIDGE TRAFFIC RAILING RETROFITS

Pictorial

Top View

Side View

Approach Slab Without Curb

Approach Slab With Curb

Longitudinal Location Of Transition Blocks And Curb End Flares Will Vary With Scheme Type

Partial Plan Views

GuARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES
UNDIVIDED ROADWAY - DETAIL H

GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

DIVIDED ROADWAY - DETAIL I

STANDARD PANELS SET TO RADIALS ADJOINING BRIDGES

UNDIVIDED ROADWAY - DETAIL S

GUARDRAIL APPLICATIONS FOR BRIDGES WITH LESS THAN FULL WIDTH SHOULDERS AND CONCRETE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH
### GUARDRAIL LENGTH (FT.)

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Projected ADT</th>
<th>6' &amp; 10 Shoulder, SLAB (FT.)</th>
<th>6 &amp; 12 HDwy, SHDL. (FT.)</th>
<th>10 &amp; 12 HDwy, SHDL. (FT.)</th>
<th>Guardrail Length</th>
<th>Min. Width</th>
<th>Guardrail Length</th>
<th>Min. Width</th>
<th>Guardrail Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-40</td>
<td>≥ 1500</td>
<td>36</td>
<td>10</td>
<td>54</td>
<td>312.5</td>
<td>6'</td>
<td>287.5</td>
<td>48</td>
<td>237.5</td>
</tr>
<tr>
<td>35-40</td>
<td>&lt; 1500</td>
<td>36</td>
<td>10</td>
<td>54</td>
<td>312.5</td>
<td>6'</td>
<td>287.5</td>
<td>48</td>
<td>237.5</td>
</tr>
<tr>
<td>35-40</td>
<td>&lt; 1500</td>
<td>24</td>
<td>8</td>
<td>21.5</td>
<td>212.5</td>
<td>6'</td>
<td>212.5</td>
<td>44</td>
<td>162.5</td>
</tr>
<tr>
<td>45-50</td>
<td>≥ 1500</td>
<td>30</td>
<td>10</td>
<td>18.5</td>
<td>212.5</td>
<td>10'</td>
<td>287.5</td>
<td>48</td>
<td>237.5</td>
</tr>
<tr>
<td>45-50</td>
<td>&lt; 1500</td>
<td>30</td>
<td>10</td>
<td>18.5</td>
<td>212.5</td>
<td>10'</td>
<td>287.5</td>
<td>48</td>
<td>237.5</td>
</tr>
</tbody>
</table>

**Notes:**
- Lengths are based on minimum median widths and on standard clear zone widths for travel lanes on tangent roadways, and the length of advancement needed for flared end anchorage assemblies to shield normal transverse underside and bridge end hazards.
- Lengths may need to be adjusted for correct location on wing post or bridge traffic railing barrier, auxiliary lanes, curved roadways, parallel end anchorage assemblies, skewed crossings and other hazards present.
- For Guardrail Lengths See Table Below

### GUARDRAIL LENGTHS

<table>
<thead>
<tr>
<th>Median Width (Ft.)</th>
<th>1:10 TAPER RATE</th>
<th>1:15 TAPER RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6' Bridge Shoulder</td>
<td>10' Bridge Shoulder</td>
</tr>
<tr>
<td>Panels (No.)</td>
<td>Length (FT)</td>
<td>Panels (No.)</td>
</tr>
<tr>
<td>32</td>
<td>7.5</td>
<td>6</td>
</tr>
<tr>
<td>34</td>
<td>8.5</td>
<td>6</td>
</tr>
<tr>
<td>38</td>
<td>10.5</td>
<td>6</td>
</tr>
<tr>
<td>40</td>
<td>10.5</td>
<td>8</td>
</tr>
<tr>
<td>42</td>
<td>12.5</td>
<td>8</td>
</tr>
<tr>
<td>44</td>
<td>12.5</td>
<td>10</td>
</tr>
<tr>
<td>46</td>
<td>12.5</td>
<td>12</td>
</tr>
<tr>
<td>48</td>
<td>14.5</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**
- Lengths shown on this table are typical for roadways with standard width shoulders and a relocated connection to the existing wing post. Length requirements shall be determined on a site specific basis for both standard width and narrow bridge shoulders and for end anchorage or end shielding use.

### GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

**Approach Guardrail Treatments for Bridges with Concrete Traffic Railing Extending Less Than Full Approach Slab Length in Wide Medians with Flush Shoulders**

**When End Terminal Cannot Be Located Outside of Opposing Roadway Clear Zone**

**When End Terminal Is Outside of Opposing Roadway Clear Zone**

**Approach Guardrail Treatments for Bridges with Concrete Traffic Railing Extending Less Than Full Approach Slab Length in Wide Medians with Flush Shoulders**
MEDIANs WITH 10’ BRIDGE SHOULders

<table>
<thead>
<tr>
<th>MEDIAN</th>
<th>6’ BRIDGE SHOULDERS</th>
<th>10’ BRIDGE SHOULDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIDTH (ft.)</td>
<td>10: TAPER RATE</td>
<td>115: TAPER RATE</td>
</tr>
<tr>
<td>10'</td>
<td>1:10</td>
<td>230.75</td>
</tr>
<tr>
<td>12'</td>
<td>1:10</td>
<td>253.25</td>
</tr>
<tr>
<td>14'</td>
<td>1:10</td>
<td>275.75</td>
</tr>
<tr>
<td>16'</td>
<td>1:10</td>
<td>298.25</td>
</tr>
<tr>
<td>18'</td>
<td>1:10</td>
<td>320.75</td>
</tr>
</tbody>
</table>

Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

APPoACH GUIDRAIL TREATMENTS FOR BRIDGES WITH CONCRETE TRAFFIC RAILING

EXTENDING LESS THAN FULL APPROACH SLAB LENGTH IN NARROW MEDIANs WITH FLUSH SHOULDERS
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
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEX 460-474 - SCHEME 1

SEE INDEX 460-474 - SCHEME 2

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET

SEE INDEX 460-474 - SCHEME 3

FACE OF RAIL OFFSET
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 1

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 3

Key Post Reference Line
Any Detached or Integral Sidewalk Removed
Integral Approach Side with Curb
Remove Portion of Curb as Required for Post Placement.

Traffic Railing (Thrie-Beam Retros)
1-40
X Post Bolts
Nested Thrie-Beam

See Indexes 460-472, 460-473, 460-475 & 460-476 - SCHEME 2

SEE INDEXES 460-472, 460-473, 460-475 & 460-476 - SCHEME 3

PICTORIAL VIEWS

ROADWAY GUARDRAIL TRANSITION

TWIN-BEAM OR W-BEAM TRAFFIC RAILING

SEEN EXESES 460-472, 460-473, 460-475 & 460-476 - SCHEME 1

SEEN EXESES 460-472, 460-473, 460-475 & 460-476 - SCHEME 2

SEEN EXESES 460-472, 460-473, 460-475 & 460-476 - SCHEME 3
Traffic Railing (Thrie-Beam Retrofit)

On Bridge Structure Blocks control Post located flush with back of rail for all schemes.

Intermediate Post may be required see Index 460-472, 460-473, 460-475 & 460-476 for alternate spacing.

Traffic Railing (Thrie Beam Retrofit)

Key Post

On Bridge Structure Blocks control Post located flush with back of rail for all schemes.

Intermediate Post may be required see Index 460-472, 460-473, 460-475 & 460-476 for alternate spacing.

See Indexes 460-472, 460-473, 460-475 & 460-476. Schemes 5 & 6

PICTORIAL VIEWS

TRAFFIC RAILING (THRIE-BEAM RETROFIT)

TRANSITIONS AND CONNECTIONS FOR BRIDGE

GUARDRAIL APPROACH

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 VIEW

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)
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
* 21\(\times\) 12\(\times\) ½" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 9/16\(\times\) 12" Long HS Hex Bolts And Nuts (5 Req'd.) With 2½" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 2½" x 12" x 16" Three-Beam Terminal Connector Plate (Back-Up Plate), And ¾" x 12" Long
  HS Hex Bolts And Nuts (5 Req'd.) With 2" 5/16 Plain Round Washers Under Heads And Nuts

SEE INDEX 521-405 OR 521-482 - SCHEME 2

SEE INDEX 521-405 OR 521-482 - SCHEME 3
**PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)**

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

*Note:*

- 2½" x 12" x 10" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And ¾" x 12" Long NS Hex Bolts And Nuts (5 Req'd) With 2½" OD Plain Round Washers Under Heads And Nuts

SEE INDEX 521-405 OR 521-482 - SCHEME 1

SEE INDEX 521-405 OR 521-482 - SCHEME 4

SEE INDEX 521-405 OR 521-482 - SCHEME 5

**DESCRIPTION:**

REVISED

CLAIMED

REVISION

01/09/19

INDEX

536-002

FY 2020-21

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

STANDARD PLANS

17 of 28
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" HS 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 (VERTICAL FACE RETROFIT)

PICTORIAL VIEW
SEE INDEX 521-481 - SCHEME 1

PICTORIAL VIEW
SEE INDEX 521-481 - SCHEME 2

PICTORIAL VIEW
SEE INDEX 521-481 - SCHEME 2

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use 3/8" NS Hex Bolts And Nuts
With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

- Wing Post 5'-0" Min. In Length That Meets the Design Criteria For Structural Stability. Refer To The Standard Plan Instructions (SP 536-002)
- \( \frac{3}{8} \)" OD Plain Round Washers Under Heads And Nuts
- \( \frac{7}{8} \)" Hex Bolts
- Traffic Railing (Vertical Face Retrofit) & Guardrail Transition

*参照图例，图示详细展示了桥梁交通护栏的连接方式。
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
(7" Min. From End Of Bridge). Use 1/8" Hex Bolts And Nuts
With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

* Post Bolts At First Standard (8'-15") Post Hole Location On Bridge (1'-6" Min. From End Of Bridge). Use 7/8" H15 Hex Bolts And Nuts With 2-5/8" OD Plain Round Washers Under Heads And Nuts.

See INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

**PICTORIAL VIEW**

See INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

See INDEX 521-405 OR 521-482 - SCHEMES 3 & 4

FOR BRIDGE TRAFFIC RAILING (VERTICAL 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)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

* Post Bolts As First Standard (7'-15") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use 1/2" HS Hex Bolts And Nuts With 3/4" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts At First Standard (3'-1/2") Post Hole Location On Bridge
(7" Min. From End Of Bridge). Use 1/4" HS Hex Bolts And Nuts
With 2ig 0D Plain Round Washers Under Heads And Nuts.
TRAILING END GUARDRAIL AND ANCHORAGE IN ABSENCE OF OTHER HAZARDS

TRAILING END GUARDRAIL AND ANCHORAGE WHEN OTHER HAZARDS PRESENT

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

REVIEW

DESCRIPTION:

REVISION

LAST

OF

STANDARD PLANS

FY 2020-21

STANDARD PLANS

INDEX

536-002

26 OF 28
GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

APPROACH POSTS AND SPECIAL OFFSET BLOCKS

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 16d galvanized nails, see "Nail For Prevention Of Offset Block".

NOTATION – Index 536-001. The nested rails shall not be bolted to the blocks and posts at posts (a), (c) and (e). The details shown are for approach slabs with internal edge dike extending beyond parapet type traffic railing termini.

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 770 with a white background and 7" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail Bridge Anchorage Assembly.

2. When retrofitting three-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Bridge Anchorage Assembly, EA, and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.

GUARDRAIL APPROACH TRANSITION CONNECTIONS FOR EXISTING FLAT SLAB, PRESTRESSED BEAM AND GIRDER BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

Use Of Schemes I And III Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).
GUARDRAIL TRANSITIONS TO EXISTING FLAT SLAB BRIDGES

SCHEME I

Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

GUARDRAIL TRANSITIONS TO EXISTING PRESTRESSED BEAM OR GIRDER BRIDGES

SCHEME II

Use Of Schemes II And III Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

TRAILING END POSTS AND SPECIAL OFFSET BLOCKS

Block assemblies for special offsets can be made up of one special block plus one standard size block or of three standard size blocks field dressed to approximately equal size, with the pieces secured for relative position by 16d galvanized nails, see '16d NAIL FOR PREVENTION OF OFFSET BLOCK.

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 0.02" thick and meet the requirements of Specification 700 with a white background and 3" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail Bridge Anchorage Assembly.

2. When retrofitting three-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Bridge Anchorage Assembly, EA, and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.
GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 564 and the "Summary of Permanent Crash Cushions" table in the Plans. Where applicable, use Guardrail components and panel lap splices in accordance with Index 536-003.

2. TRANSITION PANEL: Where crash cushions are placed between two-way traffic or adjacent to two-way two-lane traffic, place a Transition Panel from the Concrete Barrier to the Crash Cushion on the downstream side of the barrier end (as shown). Follow the requirements of the APL drawing.

3. MANUFACTURER'S TRANSITION: Construct the proprietary guardrail transition only if shown in the applicable APL drawing. See Note 4 below.

4. STANDARD GUARDRAIL TRANSITION: If the APL drawing does not provide a guardrail transition to w-beam guardrail, construct the Standard Guardrail Transition segment from three-beam to w-beam as shown per Sheet 2. This 21'-10" segment must remain parallel to the roadway.

If the APL drawing does provide a guardrail transition to w-beam guardrail, replace the Standard Guardrail Transition segment with a w-beam guardrail segment at 6'-6" post spacing, except that Post (10) will remain where shown herein if it is located at a guardrail begin or end taper station callout per the Plans. This 21'-10" segment must also remain parallel to the roadway.

5. LENGTH OF END TREATMENT: For Crash Cushions, the Length of End Treatment includes all proprietary elements of the design as shown in the APL drawing, including the manufacturer's transition of guardrail if applicable.

The actual length of End Treatment varies per Crash Cushion type, but an estimated length of End Treatment is generally shown in the Plans to provide sufficient space for the Contractor's option of differing Crash Cushion types.

6. LENGTH RESTRICTION: In the "Summary of Permanent Crash Cushions" table, if a value is provided in the Length Restriction column, then select a Crash Cushion from the APL which has a Length of End Treatment less than or equal to the value shown. If the table instead shows not applicable (N/A), then Crash Cushion selection is unrestricted regarding length.

7. CRASH CUSHION STATION: The Crash Cushion Station point shown herein corresponds to the station provided in the "Summary of Permanent Crash Cushions" table in the Plans.

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.
PERMANENT CRASH CUSHION

PLAN VIEW

CRASH CUSHION STA. (See General Note 7) 
Begin/End Guardrail STA. (Q Post) 

Panel Lap Splice (Typ.) 
(Lap in Direction of Adjacent Traffic) 

21'-10") Standard Guardrail Transition (Parallel to Roadway) 
(If Applicable, See General Note 4) 

Manufacturer's Transition 
(If Applicable, See General Note 3) 

4 Spaces @ 1'-6¾" CC 
5 Spaces @ 3'-1½" CC 

ELEVATION VIEW

PERMANENT CRASH CUSHION

12'-6" Thrie-Beam Panel (Nested) 
6'-3" Thrie-Beam Transition Panel 
W-Beam Panels 

NOTE: 
Work this Sheet with the details and General Notes on Sheet 1.

STANDARD GUARDRAIL TRANSITION

CRASH CUSHION DETAILS
**NOTES:**

1. **GENERAL:** Work this Sheet with the details and General Notes on Sheet 1.

   Install short guardrail extension only where called for in the plans, using the project-specific length specified.

   Short guardrail extensions are typically used where adding length to a barrier system is warranted, but a full Approach Transition Connection to Rigid Barrier will not fit.

2. **CONNECTION TO CONCRETE TRAFFIC RAILING:** See Index 536-001 for connection details to rigid barrier, including the Thrie-Beam Terminal Connector and Alignment Curb details. Install the Alignment Curb section with no curb transition, and extend the curb to the crash cushion as shown. The crash cushion must laterally extend beyond the above-ground portion of the alignment curb to shield its end face from approaching traffic.

3. **CONNECTION TO THRIE-BEAM RETROFIT:** Provide Thrie-beam Retrofit guardrail connection splice, curb, and Transition Block per Index 536-002 and the applicable Index 460-470 series.

**ADDITIONAL BRIDGE CONNECTION OPTIONS**

**SHORT GUARDRAIL EXTENSIONS**

**ELEVATION - CONNECTION TO CONCRETE TRAFFIC RAILING (See Note 2)**

**ELEVATION - CONNECTION TO THRIE-BEAM RETROFIT (See Note 3)**
Braking Zone

75'
125'
200'
400' Alert/Reaction Zone

See DETAIL "A"

TABLE 1 - BRAKING ZONE

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>1' (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>35</td>
<td>200</td>
</tr>
<tr>
<td>40</td>
<td>250</td>
</tr>
<tr>
<td>45</td>
<td>300</td>
</tr>
<tr>
<td>50</td>
<td>350</td>
</tr>
<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>

NOTE 2

Plan 1 - Asphalt Set

- Use specification 546.
- Use color white.

Plan 2 - Preformed Thermoplastic Set

- Use multiple applications to achieve desired 1/8" thickness.
- Use color white.

NOTES:

1. Construct permanent raised rumble strips where shown in the Plans and in accordance with Specification 546.
2. Preformed Thermoplastic Set:
   - Use color white.
SHORT-TERM RAISED RUMBLE STRIPS

DESCRIPTION:

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 within 50 feet of the centerline of the overhead gantry.
   D. On outside shoulders of exit ramp terminals, terminate rumble strips at the point of the physical gore and resume at the end of the acceleration lane taper.
   E. On approaches to bridges, terminate rumble strips at the approach slab joint.
   F. On either side of median crossover openings, terminate rumble strips within 400 feet.

4. Use the continuous array on both inside and outside shoulders 2,000 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.

5. 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.
Rumble Strip (Typ.)
6" Double Yellow

Rumble Strip (Typ.)
6" Pavement Marking

Rumble Strip (Typ.)
6" White

Rumble Strip (Typ.)
8" Traffic Lane Buffered Bike Lane

NOTE:
See the Plans for the Placement Type to be used.

EDGE LINE RUMBLE STRIP PLACEMENT TYPES

CENTERLINE RUMBLE STRIP PLACEMENT TYPES

RUMBLE STRIP DETAILS

RUMBLE STRIP ARRAY DETAILS

GROUND-IN RUMBLE STRIPS

CYLINDRICAL FOR ARTERIALS AND COLLECTORS
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 drawings.
4. Refer to Wall Control Drawings of individual walls for minimum reinforcement strip/mesh length, factored bearing resistance's, minimum wall embedment and anticipated long term and differential settlements.
5. The Contractor is responsible for controlling water during storm events as needed during construction.
6. It is the Contractor's responsibility to determine the location of any guardrail posts behind retaining wall panels. Prior to placement of the top layer of soil reinforcement, individual reinforcing strip/mesh may be skewed (15°) to avoid the post locations if authorized by the Engineer. No cutting of soil reinforcement is allowed unless shown on Shop Drawings and approved by the Engineer. Any damage done to the soil reinforcement due to installation of the guardrail will be repaired by the Contractor at the Contractor's expense. Repair method will be approved by the Engineer.
7. If existing or future structures, piles, foundations or guardrail posts within the reinforced soil volume interfere with the normal placement of soil reinforcement and specific directions have not been provided on the plans, the Contractor will notify the Engineer to determine what course of action shall be taken.
8. The Contractor is responsible for gradually displacing upper layer(s) of soil reinforcement downward (15° maximum from horizontal) to avoid cutting soil reinforcement and conflicts with paving and subgrade preparation.
9. The Contractor's attention is directed especially to situations where roadway super-elevation and/or soil mixing are anticipated.

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.
11. The top of the leveling pad or footing will be 2'-0' minimum below final ground line.
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 lower 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.

GENERAL NOTES AND DETAILS

FDOT MSE RETAINING WALL CLASSIFICATION TABLE

<table>
<thead>
<tr>
<th>Applicable FDOT Wall Type</th>
<th>Durability Requirements (Carbon-Steel Reinforcing)</th>
<th>Durability Requirements (FRP Reinforcing)</th>
<th>Soil Reinforcement</th>
<th>Other Allowable FDOT Wall Types</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concrete Cover (in.)</td>
<td>Concrete Cover (in.)</td>
<td>Concrete Cover (in.)</td>
<td>2A</td>
</tr>
<tr>
<td></td>
<td>Concrete Class for Panels</td>
<td>Concrete Class for Panels</td>
<td>Concrete Class for Panels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pozzolan Additions*</td>
<td>Pozzolan Additions*</td>
<td>Pozzolan Additions*</td>
<td></td>
</tr>
<tr>
<td>Type 2A</td>
<td>2</td>
<td>1.5</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>Type 2B</td>
<td>2</td>
<td>1.5</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Type 2C</td>
<td>3</td>
<td>1.5</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Type 2D</td>
<td>2</td>
<td>2</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Type 2E</td>
<td>2</td>
<td>2</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>Type 2F</td>
<td>3</td>
<td>2</td>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

* See Data Table in Contract Plans.
** Silica fume, metakaolin or ultrafine fly ash.

10'-0" Min. C-I-P Coping, 12'-0" Min. Precast Coping/Concrete Barrier

See Plans

ELEVATION VIEW OF COPING HEIGHT TRANSITION

TYPICAL MSE RETAINING WALL SECTION
WITH A CONCRETE BARRIER
(Showing Limits of the Reinforced Soil Volume)
**DESIGN CRITERIA:**
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and FDOT Structures Design Guidelines Section 3.13.2.
2. It is the responsibility of the Engineer to determine that the factored bearing pressure shown for the wall does not exceed the factored bearing resistance of the foundation for that specific wall location.
3. The Wall Company is responsible for internal stability of the wall. External stability design, including foundation and slope stability, is the responsibility of the Engineer.
4. If present, consider in design and analysis and locate manholes and drop inlets as shown on wall elevations.

**SOIL PARAMETERS:**
1. See wall control drawings for soil characteristics of foundation material to be used in the design of the wall system. The Contractor must provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site. Provide the values of unit weight, cohesion and internal friction angle in the Shop Drawings.

**MATERIALS:**
1. Provide soil reinforcement in accordance with Specification Section 548.
2. For additional material notes, see Wall Company General Notes.

**CONSTRUCTION:**
1. Walls must be constructed in accordance with Specification Section 548 and the Wall Company’s instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length, factored bearing 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 cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor’s attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.

**DESIGN CRITERIA:**
1. See wall control drawings for soil characteristics of foundation material to be used in the design of the wall system. The Contractor must provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site. Provide the values of unit weight, cohesion and internal friction angle in the Shop Drawings.

**MATERIALS:**
1. Provide soil reinforcement in accordance with Specification Section 548.
2. For additional material notes, see Wall Company General Notes.

**CONSTRUCTION:**
1. Walls must be constructed in accordance with Specification Section 548 and the Wall Company’s instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. Refer to Plan and Elevation sheets of individual walls for minimum reinforcement strip/mesh length, factored bearing 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 cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor’s attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.
1. The fence to be provided generally in rural areas. For supplemental information see Specifications 550.
2. Fabrics shall be woven wire, electro-galvanized steel, meeting the requirements of ASTM A216, No. 9 Grade 60, Design Number 1047-6-9, with Class 3 zinc coating; No. 12 1/2 Grade 13, Design Number 1047-12-13, with a 0.125 gage top and bottom wire and with Class 3 zinc coating; or aluminum coated steel, meeting the requirements of ASTM A89, No. 9 Farm, Design Number 1047-8-9, with a minimum coating weight of 0.04 oz./ft.

For further information see page note below.

3. Fence shall be wired with line 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 may elect to use either a single material or a combination of timber, steel, recycled plastic or concrete materials, but must comply with the electrical grounding requirements in Section 550. Line posts of one material may be used with corner, pull and end post assemblies or a different material. Line posts of only one optional material and pull post assemblies of only one optional material will be permitted between corner and end post assemblies. Within individual corner and end post assemblies only one optional material will be permitted.

5. Post and post assemblies shall meet the material requirements of Specification 996. Timber line posts are to be minimum 4” diameter. Timber corner, pull, approach and end posts are to be a minimum 5” diameter. Timber braces are to be minimum 4” diameter. (A) Staples for line posts to be 1½” minimum length, for approach, corner and pull posts 1¾” minimum length. At approach, corner and pull posts, staple every line wire. At line posts, staple every line wire in top half and alternate line wires in bottom half. Staples shall be driven diagonally across the line wire with the points in separate grains. (B) Connections between timber posts and braces to be provided by dowels as shown in fastener details. (C) 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.

6. Steel posts and braces shall be standard steel posts, galvanized at the rate of 2 oz./ft. (1/2), together with necessary hardware and wire clamps and meeting the following requirements: (A) Line posts: 8 long, 1.15 lbs./ft.; roll forming studwall, anchor plate attached, ASTM A202 (18 in.). (B) Approach posts: 2½”x2½”x¾” angles, 8 long; fabricated for attaching brace with necessary hardware, clamps, etc. (C) Pull, end and corner posts: 2½”x3½”x¾” angles, 8 long; fabricated for attaching brace with necessary hardware, clamps, etc. (D) Braces: 2½”x2½” angles with necessary hardware and fabricated for attaching to post. (E) The pull, corner, approach and end posts are to be set in concrete as per detail. (Also see General Note 19).

7. Recycled plastic posts shall meet the following material requirements: line posts shall have a minimum section of 2” square. Plastic posts shall not be used as corner, pull, end or approach posts unless such use is specifically detailed in the plans. The straightness of the post shall comply with Specification 994 for timber post. All plastic posts shall meet the requirements of the latest edition of the Southern Pine Inspection Burau’s Standard Grading Rules for Southern Pine lumber for No. 25R Stress Rated Grade Timber. Plastic posts can be set by either digging and tamp backfill or by driving into full depth preformed holes 12” to 10” smaller than cross section of post. Staples for fabric and barbed wire connection to plastic line posts shall be the same size, count and location as that for timber posts.

8. The Contractor, at his option, may use any suitable precast or prestressed concrete posts; however, approval by the Engineer of posts not shown on this line will be required prior to construction of the fence. Individual corner, pull, approach and end post assemblies shall be Class I concrete. Prestressed post shall be Class I1 concrete. Lengths of concrete post to be as indicated for timber posts.

9. Aluminum post, braces and accessory framing hardware shall not be used unless the plans specifically detail their application or the Engineer specifically approves their incorporation in fence construction or repair. Aluminum framed gates are permitted as described in General Note 19.

10. The woven wire shall be attached to steel and concrete posts by a minimum of four tie wires. The single wire ties 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; around the line wire. Tie wires shall be steel wire not less than 0.120” diameter, zinc coating Class 3, soft temper, in accordance with ASTM A461.

11. Steel Barbed Wire may be either of the following types:
   - Type I: This type shall conform to the requirements of ASTM A121, with two strands of 1½” gage wire; four-point barbs, wire size 14 gauge twisted around both line wires; and, Class 3 coating. Design No. 12-4-5-14.
   - Type IIA: This type same as Type I except the two strand wires are twisted in alternating directions between consecutive barbs.
   - Type IIB: This type shall conform to the requirements of ASTM A121 with two strands of 1½” gage high tensile wire; four-point barbs, wire size 18½ gauge twisted around both line wires; and Class 3 coating. Design No. 12-4-5-16R.

   Aluminum Barbed Wire shall be fabricated from strands of 0.110-inch wire with 0.08-inch diameter four-point barbs spaced at approximately 3½”, and at a maximum spacing of 6”. The wire for the strands and for the bars shall be of ASTM A411-Alloy 3003-H26 or equal.

   - Type I: The barbed wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.
   - Type IIA: The barbed wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.
   - Type IIB: The barbed wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.

   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.

14. Longer posts than those indicated above may be required by the plans or for deeper installations.

15. Concrete bases for angular steel posts (pull, corner, end and approach) shall be Class III or Class IV in accordance with Specification 497. Materials for Class KS concrete may be proportioned by volume and/or by weight.

16. Pull post assemblies shall be installed at approximately 300’ centers except that this maximum interval may be reduced by the Engineer on curves where the radius is less than 3’. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 15° or more.

17. A maximum length of 1320’ of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spaced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

18. Unless otherwise called for in the plans, gates shall be commercially available metal swing gates assembled and installed in accordance with the manufacturer’s specifications as approved by the Engineer. Chain link swing gates in accordance with Index 550-002 may be substituted for metal swing gates as approved by the Engineer. Gate size is full opening width whether single leaf or double leaves. Payment for gates shall include the gate, single or double, all necessary hardware for installation and any additional length and/or size for posts at the corners. Gates shall be paid for under the contract unit price for Fence Gates, EA.

19. For construction purposes, assemblies are defined as follows: End post assemblies shall consist of: one end post, one approach post, two braces, four diagonal tension wires and all necessary fittings and hardware. Pull post assemblies shall consist of: one pull post, two braces, four diagonal tension wires and necessary fittings and hardware. Corner post assemblies shall consist of: one corner post, two approach posts. Four braces, eight diagonal tension wires and all necessary fittings and hardware.

21. All posts, braces, tension wires, fabric, tie wires, Class KS concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, LF. Fencing shall be inclusive of the lengths of pull, end, and corner post assemblies, but exclusive of gate widths.
FENCE TYPE A

DESCRIPTION:

This index details fencing that is constructed with farm fabric (48" x 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 POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

CONCRETE BASE FOR ANGULAR STEEL POST

(The pull, corner, end, and approach posts)

DESIGN NOTE

This index details fencing that is constructed with farm fabric (48" x 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.

Note: Timber post illustrated.
FASTENER FOR CONCRETE POST AND BRACES

FASTENER FOR TIMBER POST AND BRACE

ALTERNATE CONCRETE POSTS AND BRACES

END AND PULL POSTS

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

C. Rail options:
   (1) Galvanized steel pipe. Schedule 40, 1 1/2" nominal dia., zinc galvanized at the rate of 1.0 oz/ft².
       ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
   (2) Aluminum coated steel pipe, ASTM A53 steel, 1 1/2" Schedule 40, 1 1/2" nominal dia.,
       1.66 oz/ft²; coated at the rate of 0.40 oz/ft²; AASHTO M111.
   (3) Aluminum alloy pipe: 1 1/4" nominal dia. ASTM B221 or B221, Alloy 6060-T6.
       (Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A569/A569M,
        ASTM F669/A669 or undereated stock of discontinued A446/A446M base materials; ASTM F669 Group IV
        (Alternative Design): fabric industry 1 1/4" OD, 1.000" NPS, 1.66 oz/ft², equally coated. 0.170" min. wall
        thickness, and min. wt. 1.836 lb./ft.; with 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/ft²; and the polymer film topical shall have a thickness of 0.0003" min.  
       Internal and external coatings are not restricted to the combinations of Table 2, ASTM F1043.
   (4) High strength steel pipe, ASTM A569/A569M and Detail.
   (5) Cold rolled steel pipe, Schedule 40, 1 1/2" nominal dia., 0.120" min. wall.
       AASHTO M111 and Detail.

D. Chain link fabric options (2" mesh with twisted and barbed selvage top and bottom for all options
   except as described in Note 10):
   (1) AASHTO M181 Type I - Galvanized Steel. No. 8 gauge (coated wire diameter), coated at
       the rate of 1.0 oz/ft². (M181 Class D 2 1/2 oz/ft², modified to 1.0 oz/ft²).
   (2) AASHTO M181 Type II - Aluminum Coated Steel. No. 8 gauge (coated wire diameter), coated
       at the rate of 0.4 oz/ft².
   (3) AASHTO M181 Type IV - Polycrystalline (PVC) Coated Steel. No. 8 gauge (coated wire
data), coated at the rate of 0.4 oz/ft².

E. Tension wire options:
   (1) Steel wire No. 7 gauge zinc galvanized at the rate of 1.2 oz/ft². AASHTO M181.
   (2) Steel alloy wire with a diameter of 0.163" or larger conforming to the requirements of
       ASTM F611, Alloy 5056 Temper H38 or, Alclad Alloy 5056 Temper H192.
   (3) Aluminum coated steel wire No. 7 gauge coated at the rate of 0.6 oz/ft². AASHTO M181.

F. Tie wire and hog ring options:
   (1) Steel wire No. 8 gauge zinc galvanized at the rate of 1.2 oz/ft².
   (2) Steel alloy wire with a diameter of 0.1443" or larger conforming to the requirements of
       ASTM F611, Alloy 5056 Temper H38 or, Alclad Alloy 5056 Temper H192.
   (3) Aluminum coated steel wire No. 8 gauge coated at the rate of 0.4 oz/ft².
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 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 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 method:
(a) In accordance with special details and/or as specifically described in the Contract Plans and Specifications.
(b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer.
(c) Post mounted on concrete structure or solid rock shall be mortised 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 approved by the Engineer. Payment shall include the gates, trolley, rail, 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.

---

**TYPE IV VINYL COATED FABRIC**

<table>
<thead>
<tr>
<th>ASHTEO M181 Table 4 Redefined As Follows</th>
<th>PVC Thickness Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified Diameter Of Metallic Coated Core Wire</td>
<td>Minimum Weight Of Zinc Coating</td>
</tr>
<tr>
<td>in.</td>
<td>oz./ft²</td>
</tr>
<tr>
<td>0.148</td>
<td>3.77</td>
</tr>
<tr>
<td>0.30</td>
<td>9.10</td>
</tr>
</tbody>
</table>

**DESIGN NOTE**

This index details fencing that is constructed with chain link fabric 6' (nominal) in height and with specific ground clearance.

For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

TOP VIEW
FOUR ANCHOR PLATE OPTION

TOP VIEW
TWO ANCHOR PLATE OPTION

BARB WIRE ATTACHMENT

BASE PLATE AND ANCHOR NOTES:

1. Base plate identical for line, pull, end and corner posts and shall be considered an integral part of the respective posts for basis of payment.

2. Post to be plumbed by grout shim under base plate.

3. Anchors (Galvanized Steel):
   - 12" Cast In Place, 100" Embedment: Headed Bolts, U-Bolts or Cluster Plates.

Steel 1/8" x 5/8" (ASTM A36) Galvanized or Aluminum 1/8" x 5/8" Alloy 6063-T6

1/8" Dia Hole For 5/8" Anchors, Nuts And Washers (2 Req'd)

Steel 1/8" (ASTM A36) Galvanized or Aluminum 1/8" x 5/8" Alloy 6063-T6

Fence To Be Mounted On

NOTES

Attachments to be used only when called for in the plans.
Attachments to extend in direction of restraint, unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from utilities and hazardous facilities located within highway right of way.
(d) Outward from lateral ditches, canals, retention basins, canals, borrow areas and similar support facilities.
(e) Hauled on pedestrian ways.
The cap-arm shall be designed to provide a drive fit over the top of posts and to exclude moisture in posts with tubular sections.
**GENERAL NOTES**

1. Extruded, rolled, or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

Gate components shall meet or exceed the protective coatings specified on Index 550-002.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36, or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002.

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 and/or by weight.

5. Cost of all gate components shall be included in the contract unit price for Sliding Fence Gate (Cantilever), EA.

---

**TYPICAL FRAME - 24 Opening**

**TYPICAL FRAME - 12, 16 & 20 Opening**
1. Fencing Terminals at Bridge Ends (Roadway)

- The fence should be located along the slope where the shoulder line varies, as directed by the engineer.
- The fence should be constructed flush against the footing.
- Fence locations at cross drains shall not be tied to the headwall but shall span the lateral ditch.
- Fence terminations at bridge ends shall not be tied to the headwall, but shall span the lateral ditch.

2. Fencing Terminals at Box Culverts

- For heights of headwalls greater than 4', the fence shall be located along the slope where the shoulder line varies, as directed by the engineer.
- The fence shall be 6' high and 3' min.
- The fence shall be constructed flush against the footing.

3. Fencing Detail at Culvert (For Heights of Headwalls 4' or Less)

- Note: When height of headwall is 4' or less, the fence shall not be tied to the headwall but shall span the lateral ditch.
FENCING TERMINALS AT RURAL INTERCHANGES

APPLIES TO BRIDGE OVER CROSSROAD AND CROSSROAD OVER FREEWAY (BRIDGE OVER CROSSROAD SHOWN)

FENCING TERMINALS AT URBAN INTERCHANGES

NOTE: LA R/W along the crossroad will extend a minimum 200' beyond the end of the acceleration or deceleration 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 RETAINING WALLS

NOTE: LA R/W along the crossroad will extend a minimum 200' beyond the end of the acceleration or deceleration 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.
**WILDFLOWER SEEDING RATES**

<table>
<thead>
<tr>
<th>Common Name (Botanical Name)</th>
<th>#1 Group</th>
<th>#2 Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black-Eyed Susan (Rudbeckia hirta)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Lance Leaf Tickseed (Coreopsis lanceolata)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Goldmound Tickseed (Coreopsis goldenrockii)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Soft chciał Coneflower (Rudbeckia mollis)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Annual Phlox (Phlox drummondii)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Moss Verbena (Verbena cneorum)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Wildflower seeding rates are for restoring impacted wildflower areas.

**GENERAL NOTES**

1. All turf establishment shall be performed meeting the requirements of Specification 570.

2. Activities such as clearing, grading, and excavating that will disturb one or more acres of land require coverage under the Generic Permit for Stormwater Discharge from Large and Small Construction Activities from the Florida Department of Environmental Protection, and implementation of appropriate pollution prevention measures to minimize erosion and sedimentation and properly manage stormwater.

3. Confirm compatibility of wildflower with Seeding Zones.

**SEEDING ZONES**

- Zone I
- Zone II

**LEGEND**

- Wildflower Group #1
- Wildflower Group #2
- Turf (To Limit of Construction)
- Turf
- Selective Cleaning And Grubbing
- Limits Of Construction
- Turf
- Wildflower Group #1
- Wildflower Group #2
- Turf (To Limit of Construction)
- Turf
- Selective Cleaning And Grubbing
- Limits Of Construction
- Turf
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.


<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Degree Of Curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>7° Or Greater</td>
</tr>
<tr>
<td>40</td>
<td>6° Or Greater</td>
</tr>
<tr>
<td>50</td>
<td>5° Or Greater</td>
</tr>
<tr>
<td>60</td>
<td>4° Or Greater</td>
</tr>
<tr>
<td>70</td>
<td>3° Or Greater</td>
</tr>
<tr>
<td>80</td>
<td>2° Or Greater</td>
</tr>
<tr>
<td>90</td>
<td>1° Or Greater</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

TRANSVERSE SECTION

OVERLAPPED SOD FLUME

SHOULDER AND SLOPE TREATMENT IN SAG VERTICAL CURVES

TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING
**INDEX 430-010**

- **INDEX 430-011**

- **INDEX 430-030**

- **INDEX 430-031 Through 430-034**

### SOD PLACEMENT AT PIPE/CULVERT END TREATMENTS

**SOD QUANTITIES (SY)**

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>1.4</th>
<th>1.5</th>
<th>1.6</th>
<th>1.7</th>
<th>1.8</th>
<th>1.9</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLOPE</td>
<td>ALL</td>
<td>SLOPE</td>
<td>SLOPE</td>
<td>SLOPE</td>
<td>SLOPE</td>
<td>SLOPE</td>
<td>SLOPE</td>
</tr>
<tr>
<td>1:2</td>
<td>10</td>
<td></td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>1:3</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>1:4</td>
<td>17</td>
<td>19</td>
<td>21</td>
<td>23</td>
<td>25</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>1:5</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:6</td>
<td>15</td>
<td>17</td>
<td>21</td>
<td>25</td>
<td>31</td>
<td>37</td>
<td>43</td>
</tr>
<tr>
<td>1:7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- See Plans for sodding quantities for each endwall to be determined by the designer from its detail.
- Toe of Slope

**INDEX 430-040**

**U-TYPE**

**INDEX 570-001**

**PERMANENT EROSION CONTROL**

**INDEX 570-001 SHEET 3 of 3**
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 to 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 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.
   C. Special attention is to be directed at achieving the required Drop-Off at the edge of pavement, with the dimension range shown.
   D. 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.
   E. 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.

SHOULDER SODDING AND TURF ON EXISTING FACILITIES

TREATMENT I

1. Edge of Any Existing Or New Pavement

2. Drop-Off (1" Min., 1" Max.)

3. Less Than 3" Overlay

4. Transverse Joints

5. Backfill (Excavated Turf And Topsoil)

6. Sod (Avg. Depth 1")

7. (Depending on asphalt overlay depth may require trenching or borrow under sod to attain the 1" drop at the edge of pavement.)

8. Shot of Pavement

9. Plan View

10. Pattern Detail

SHOULDER OPTION 1

1. Drop-Off (1" Min., 1" Max.)

2. Width Called For In The Plans (Shoulder Width Plus 2 Min.)

3. Turf

4. Salvaged Turf And Topsoil

5. Excavated Turf And Topsoil (Cap For Drainage)

6. Mix To Depth Indicated In Specifications Or Plans

TREATMENT II

1. Drop-Off (1" Min., 1" Max.)

2. Width Called For In The Plans (Shoulder Width Plus 2 Min.)

3. Turf

4. Salvaged Turf And Topsoil

5. Excavated Turf And Topsoil (Cap For Drainage)

6. Mix To Depth Indicated In Specifications Or Plans

SHOULDER OPTION 2

1. Drop-Off (1" Min., 1" Max.)

2. Width Called For In The Plans (Shoulder Width Plus 2 Min.)

3. Turf

4. Borrow

5. Mix To Depth Indicated In Specifications Or Plans

A SIMILAR TREATMENT MAY BE USED FOR PROJECTS THAT REQUIRE SHOULDER WIDENING. DETAILS ARE TO BE SHOWN IN THE PLANS.
1. Staking guidelines are based on standard horticultural requirements and are provided for plant establishment purposes only. Details not intended to apply when bracing is intended to address safety considerations. When bracing for safety, refer to Designer generated signed and sealed details. These guidelines are not intended to apply when the tree or palm is within falling distance of a roadway, pedestrian or bicycle route, under extreme wind loads, non-standard soil properties, slopes shown are Vertical:Horizontal.

2. All dimensions 6" and less are exaggerated for illustrative purposes only. Dimensions shown for wood materials are nominal. Slopes shown are Vertical:Horizontal.

3. Remove plant containers prior to planting. Remove a minimum of the top 1/3 of burlap, fabric, or wire mesh for plants not grown in containers.

4. Allow no more than 1" of soil to cover the uppermost root on all trees. Set the top of rootball 1"-2" above finish grade after setting and set plumb to the horizon.

5. 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. Contact the Engineer prior to planting if existing soils contain excessive sand, clay, or other material not conducive to proper plant growth.

6. Construct soil rings at the outer edge of the planting pit with a height of 3" and gently sloping sides unless a permanent, subsurface or drip irrigation system is provided. Do not pile soil on top of rootball.

7. Construct a 3" deep layer of mulch placed 2" off the edge of the trunk flare, around the base of shrub, or solidly around ground cover. Never pile mulch against the tree trunk.

8. Install guying with minimum 1" wide nylon or polypropylene straps with a minimum 600 lb. break strength. Check straps monthly and adjust as required to eliminate girdling of tree. Locate all wood stakes beyond the edge of soil ring in existing soil and embed a minimum of 18" below finished grade unless otherwise specified. Alternate tree bracing and guy systems specified or approved by the Engineer may be used in lieu of the tree bracing and guy systems detailed on the HDB.

9. 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.

10. Use 2" x 2" minimum wood stakes unless otherwise shown in the Plans or directed by the Engineer. Use wood meeting #2 Common or better in accordance with the Standard Grading Rules for Southern Pine.

11. Drive stakes into existing, undisturbed soil. Localized compaction may be provided to prevent displacement of the stakes for previously disturbed existing soils that do not provide sufficient stability.
NOTES:
1. Work this Index with Specification 591.
2. Install Sleeves with the minimum depth measured from the top of the Irrigation Sleeve as shown in the Plans or specified in Index 630-001.
3. When installing Irrigation Sleeves in a median crossover, place sleeves along the centerline.
4. Irrigation Sleeves for Electrical Control Wire and Irrigation Pipe must be no further than 12" apart.
5. Install Utility Strip Breaks only when shown in the Plans.
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.

4. Sawcut asphalt at the edges of the trench to leave neat lines.
**DESCRIPTION:**

**REVISION 10/29/2019**

**LAST REVISION 11/01/18**

**STANDARD PLANS**

**FY 2020-21**

**CONDUIT INSTALLATION DETAILS**

**INDEX 630-001**

**SHEET 2 of 4**

---

**PLACEMENT WITHIN THE UTILITY STRIP**

- Sidewalk
- Conduit(s)
- Backfill
- Undisturbed Material
- Finished Grade
- Drainage Pipe and/or Utilities Beneath Roadway

**PLACEMENT UNDER SIDEWALK**

- Sidewalk
- Conduit(s)
- Backfill
- Undisturbed Material
- Finished Grade
- Drainage Pipe and/or Utilities Beneath Roadway

**PLACEMENT BEHIND GUARDRAIL**

- Edge of Travelled Way or Paved Shoulder
- Finished Grade
- Conduit(s)
- Backfill
- Undisturbed Material
- See Vertical Clearance Note
- Drainage Pipe and/or Utilities Beneath Roadway

**PLACEMENT IN FRONT OF GUARDRAIL**

- Edge of Travelled Way or Paved Shoulder
- Finished Grade
- Conduit(s)
- Backfill
- Undisturbed Material
- See Vertical Clearance Note
- Drainage Pipe and/or Utilities Beneath Roadway

**VERTICAL CLEARANCE NOTE:**

Maintain 1'-0" minimum vertical clearance when crossing over pipe and or utilities. If minimum vertical clearance cannot be maintained, conduit is to be routed under pipe maintaining 1'-0" minimum vertical clearance.

---
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.
**REVISION DESCRIPTION:**

**LAST REVISION:** 11/01/18

**STANDARD PLANS**

**FY 2020-21**

**CONDUIT INSTALLATION DETAILS**

**INDEX:** 630-001

**SHEET:** 4 of 4

---

**PLACEMENT ACROSS EXISTING DRAINAGE PIPES OR UTILITIES**

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'-6" or greater, and the new conduit is not encased in concrete.

---

**PLACEMENT UNDER 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'-6" or greater, and the new conduit is not encased in concrete.

---

**PLAN**

**SECTION A-A**

**INDEX 635-001**
**DESCRIPTION:**

**REVISION**

**LAST REVISION**

**INDEX**

**STANDARD PLANS**

**SHEET**

**FY 2020-21**

**SIGNAL CABLE AND SPAN WIRE INSTALLATION DETAILS**

**INDEX 634-001**

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" & 1 1/2" 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°.

10. Drain holes in the bottom of the installed signals.

11. 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 to the copper ground wire of the pole or to the external wire extending down the pole.

3. When utilizing the external ground wire, install a piece of 1/2" conduit extending up 8' from the finish grade to protect the ground wire connecting the messenger wire to the ground rod.

4. Use either locking cable ties or lashing wire, placed no further than 12" apart. Except at the point of cable drop or terminations, place one (1) at the point where the cables separate from the messenger wire and place another at a maximum distance of 4' from that tie.

5. When installing Figure 8 interconnect cable, only use locking cable ties.

6. Lashing wire should normally be used for distances of 12' or greater.
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.
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. 2" Copper Clad Ground Rod, 40' Long.
11. #6 Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.
12. Fused Control Power Transformer 0.5 KVA, Single Phase, 480V Primary, 120V Secondary (Part of Lighting Contactor, Shown Outside for Clarity).
13. Lightning Arrester Mounted on Outside of Enclosure.
15. 2 Pole Electrical Lighting Contactor.
16. 120V Photoelectric cell, 1800VA with 2000V Peak Surge Protection.
17. Hand-off Automatic Selector Switch (Part of Lighting Contactor, Shown Outside for Clarity).
18. Concrete Pad.
20. Mount on Riser Pole.
21. Ground BUS.
22. NEMA 4X SST Ground Mounted Storage Cabinet with Two Shelves. Only Required for High Mast Lighting Systems.

Cut a 2" hole in the side of the Lighting Control Panel enclosure for the operation and mounting of the Photo Electric controller. Use Waterproof and a clear silicone sealant to cover hole, install Photo Electric Controller.

Side or Back of Enclosure
**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.

---

**DESCRIPTION:**

**REVISION**

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

**FY 2020-21 STANDARD PLANS**

**ELECTRIC POWER SERVICE**

**INDEX**

**639-002 1 of 1**
GENERAL NOTES:

1. Work these Index drawings with the Strain Pole Schedule in the Plans.
2. Shop Drawings: This Index is considered fully detailed and no shop drawings are necessary.
3. Submit shop drawings for minor modifications not detailed in the plans.
4. Fabrication:
   a. Tie ground wires to the interior of reinforcing steel to prevent displacement during concreting operations.
   b. Concrete Taper for pole width, strands, reinforcing and void: 0.081 in/ft per face.
   c. Concrete Cover: 1" minimum
   d. Spiral Reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
   e. 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.
   f. Polish 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:
      1. Financial Project ID.
      2. Pole Manufacturer
      3. Standard Pole Type Number
      4. Pole Length (L)
5. Support locations are for strand release, storage, lifting and transport. Keep BF oriented downward until final erection.
6. Pick-up and support locations shown may vary within a tolerance of ±3\°.
7. Two point attachment: provide an eye bolt hole for the messenger wire.
8. Tether Wire: When required, field-drill the eyebolt hole prior to installation.
SERVICE POLE P-II A (12 Ft.) & P-II B (36 Ft.) ELEVATION
(>Trands Not Shown)

PEDESTAL POLE P-I IC (12 Ft.) ELEVATION
(>Trands Not Shown)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance of 4 Ft. (for P-II A & P-II C) or 10 Ft. (for P-II B) from the Tip End.
- * Dimension may vary from 2½" to 3½" to accommodate smaller radius of distance of 4 Ft. (for P-II A & P-II C) or 10 Ft. (for P-II B) from the Tip End.
- The void diameter shall not be less than 2".

SERVICE AND PEDESTAL POLE TYPE P-II
**DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2020-21**

**INDEX**

**POLE ELEVATION** (Strands and Reinforcing Not Shown)

**POLE TYPE P-III**

**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 ELEVATION** (Strands and Reinforcing Not Shown)

**STANDARD PLANS**

**CONCRETE POLES**
**SPiral Reinforcing Elevation**

(Strands, Holes, and Fixtures Not Shown)

- **Front Face (Roadway)**
- **Back Face (Roadway)**
- **Identification Markings**
- **2½" Galv. Nipple (On ¡)**
- **2¼" Hole** (Two-Wire System Only)
- **48" No. 6 Bare Copper Ground Wire**
- **6" Pitch**
- **1½" Min.** (Typ.)
- **Circular Void**
- **2¼" Chamfer (Typ.)**
- **2½" Galv. Nipple (On ¡)**
- **¾" Hole**
- **2¼" Hole (Two-Wire System Only)**
- **Pole Length Dim. L**
- **Pole Height Dim. H**
- **Depth Dim. D**

**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".*

**Strand Legend**
- Prestressed Strand
  - 0.5 in. = 31 kips
  - Transfer (8 strands total)
- Dormant Strand
  - 0.5 in. (5 strands total)
  - One 24" Splice Allowed Per Strand

**Typical Square Section**

**POLE ELEVATION**

(Strands and Reinforcing Not Shown)

**Spiral Reinforcing Elevation**

(Strands, Holes, and Fixtures Not Shown)

- **4½ Turns @ 2¼ Pitch**
- **¾" Hole**
- **2½" Galv. Nipple (On ¡)**
- **2¼" Hole** (Two-Wire System Only)
- **48" No. 6 Bare Copper Ground Wire**
- **6" Pitch**
- **1½" Min.** (Typ.)
- **Circular Void**
- **2½" Galv. Nipple (On ¡)**
- **¾" Hole**
- **2¼" Hole (Two-Wire System Only)**
- **Pole Length Dim. L**
- **Pole Height Dim. H**
- **Depth Dim. D**

**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".*

**Typical Square Section**

**Strain Pole Type P-IV**

**Concrete Poles**

**FY 2020-21 Standard Plans**

**Index**

**Sheet 641-010 4 of 8**
Spiral Reinforcing Elevation
(Strands, Holes, and Fixtures Not Shown)

Pole Elevation
(Strands and Reinforcement Not Shown)

Notes:
- Strands shown are continuous from Tip End to Butt End.
- Splice locations and size shown are typical, not applicable to all installations.
- Final erection elevation shown is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 12.5% L from the Tip End.
- Dimension may vary from 3½” to 4½” to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 4”.

Strand Legend
- Prestressed Strand - 0.5 in. ~ 31 kips per strand
- Prestressed Strand - 0.5 in. ~ 31 kips per strand (minimum 8 strands total) 0.5 in. 3¼” Splice Allowed Per Strand
- Dormant Strand - 0.5 in. 3¼” Splice Allowed Per Strand

Tip End Section (Top)
(For Dormant Strand Locations, See Section A-A)

Section A-A
(Typical Square Section)
**Spiral Reinforcing Elevation**

(Strands, Holes, and Fixtures Not Shown)

- **24" Galv. Nipple (On Q)**
- **24" No. 6 Bare Copper Ground Wire**
- **3/4" Hole (Two-Wire System Only)**

**Identification Markings**

- **Front Face (Roadway)**
- **Back Face**

**Support Locations**

- **Min. 3' of Concrete**

**Pole Height Dim.**

**Pole Length Dim.**

**Notes:**

- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 10% L from Tip End.
- Dimension may vary from 3' to 4½' to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½".

**Strand Legend**

- Prestressed Strand
- Dormant Strand

**TIP END SECTION (TOP)**

(For Dormant Strand Locations, See Section A-A)

**SECTION A-A**

(Typical Square Section)
GENERAL NOTES:
1. Work this Index with Specification 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 A1054 Cold Drawn.
   E. Bolts: ASTM F1554, Grade 55.
   F. Washers: ASTM F436.
   G. Steel plates and Pole Cap: ASTM A38 or ASTM A709, Grade 50.
   H. Ground Rods: ASTM F2399.
   I. All other steel: ASTM A123.
7. Pole Fabrication:
   A. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
   B. For spiral reinforcing, one turn is required for spiral splices and two turns are required at the top and bottom of poles.
   C. For reinforcing steel, lap splices to consist of a 3'-0" lap length at each splice. No more than two opposing rebars to be spliced at the same cross section. Stagger lap splices as needed.
   D. Provide a Class 3 surface finish in accordance with Specification 400.
   E. Provide a 1" minimum cover.
   F. Provide handleless and coupler cover plates made of non-corrosive materials. Attach cover plates to poles using lead anchors or threaded inserts embedded in the poles in conjunction with round headed chrome plated screws.
   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 concreting operations.
   1. Storage, handling and erection locations shown may vary within ± 3".
8. Cabinet Installation:
   A. Splice fiber optic cables in cabinet to preterminated 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. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   G. Sizes and types of conduits and innerducts for network communications between the pullbox and cabinet are stated in the Contract Documents.
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, parking slots, etc.) with lowering device manufacturer.
NOTES:
1. Install all handhole and opening covers prior to shipping.

2. Install {1/2} "Ø x 5" long stud with hex nut in insert before shipment.

3. As an alternate, embed 6-1/2 "Ø x 18" Stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate at 4-1/2 x 1½ Stainless steel bolts.

4. Handhole frame may be Cast Aluminum 356.2.

1. Install all handhole and opening covers prior to shipping.

2. Install ½" Ø x 5" long stud with hex nut in insert before shipment.

3. As an alternate, embed 6-1/2 "Ø x 18" Stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate at 4-1/2 x 1½ Stainless steel bolts.

4. Handhole frame may be Cast Aluminum 356.2.

NOTES:
1. Install all handhole and opening covers prior to shipping.

2. Install ½" Ø x 5" long stud with hex nut in insert before shipment.

3. As an alternate, embed 6-1/2 "Ø x 18" Stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate at 4-1/2 x 1½ Stainless steel bolts.

4. Handhole frame may be Cast Aluminum 356.2.
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 60 ksi: ASTM A1011 Grade A, B or C
      b. Greater than or equal to 60 ksi: ASTM A572 Grade 50, 55, 60 or 65
   B. Steel Plates: ASTM A36
   C. Steel Pipe: ASTM A252 Grade A, B or C
   D. Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F936 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F936 Type 1, one under turned element
   F. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65
   G. Handhole Cover: ASTM A651 Grade 44 or 50
   H. Steel Plates: ASTM A36
   I. Stainless Steel Screws: AISI Type 316
   J. Threaded Bars/Studs: ASTM A36 or ASTM A307
   K. 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:
      b. Anchor Bolts: Bolt diameter plus 1/2", maximum.
   D. Locate handhole 180° from 2" wire entrance pipe.
   E. Identification Tag: (Submit details for approval.)
      a. 2" x 4" (Min.) aluminum identification tag.
      b. Locate on the inside of the pole and visible from the handhole.
      c. Secure to pole with 2" x 4" (Max.) aluminum identification tag.
   F. Anchor Bolts: Bolt diameter plus 1/2", maximum.
   G. Secure to pole with 2" x 4" (Max.) aluminum identification tag.
   H. Fabricate longitudinal seam welds in pole with 60 percent minimum penetration or fusion welds, except within 6" of the base plate connection use full-penetration groove welds.
   I. Perform all welding in accordance with Specification 460-6.

5. Coatings:
   A. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F2329
   B. All other steel items including base washers: ASTM A123

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 base plate in accordance with Specification 649-6.

7. Elevation and Notes:
   A. Pole Top (See Sheet 3)
   B. Pole (See Sheet 3)
   C. Clamp (Typ.) (See Sheet 3)
   D. Messenger Wire (See Sheet 3)
   E. Clamp Spacing Based on Sags for Longest Span (See Signalization Plans)
   F. Top of Finished Grade (Make Drilled Shaft 1'-0" (Min.) above the finished grade. Include the following information on the ID Tag:
      a. 2" x 4" (Max.) aluminum identification tag.
      b. Locate on the inside of the pole and visible from the handhole.
      c. Secure to pole with 2" x 4" (Max.) aluminum identification tag.
   G. Fabricate longitudinal seam welds in pole with 60 percent minimum penetration or fusion welds, except within 6" of the base plate connection use full-penetration groove welds.
   H. Perform all welding in accordance with Specification 460-6.
POLE ASSEMBLY

NOTES:
1. Clamps have been sized for Design Table Loads shown in the clamp thickness table, and a maximum pole diameter at each clamp location of 2'-1". Use one clamp per cable.
2. Install a properly sized weather head, fastened securely to the standard pipe for each pole location. At locations other than the wire entrance, the weather head face is to be left closed to outside atmosphere. Wire entrance installed per Index 634-001.
3. Any combination of Option 'a' or 'b' may be used provided both lifting and wiring is accommodated.

CLAMP THICKNESS TABLE

<table>
<thead>
<tr>
<th>Cable Diameter (in.)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>20</td>
<td>3/8</td>
</tr>
<tr>
<td>5/16</td>
<td>25</td>
<td>7/8</td>
</tr>
<tr>
<td>3/4</td>
<td>32</td>
<td>3/4</td>
</tr>
<tr>
<td>7/8</td>
<td>35</td>
<td>3/2</td>
</tr>
</tbody>
</table>

WEATHER HEAD

A 2" NPS, Sch. 40 Pipe 2'6" long, ASTM A500 Grade B Steel Clamp, ASTM A490 Grade 50 (See Table For Thickness). Steel Clamp, ASTM A490 Grade 50 (See Table For Thickness).

STANDARD PLANS

FY 2020-21

STEEL STRAIN POLE

ATTACHMENT DETAILS
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 $\frac{1}{2}$") or ASTM A572 Grade 50, 60 or 65 (greater than or equal to $\frac{1}{2}$") 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.
   e. Nuts: ASTM A490.
   f. Washers: ASTM F-436.
   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.
   k. Reinforcing Steel: ASTM A615 Grade 60.
   l. Galvanization: Bolts, nuts and washers: ASTM F3329 All other steel including plate washer: ASTM A123.
   m. Concrete: Class IV (Drilled Shaft) for all environment classifications.
4. Fabrication:
   b. Poles:
      a. Round or 16-sided (Min.)
      b. Taper pole diameter at 0.14 inches per foot
      c. Fabricate Pole longitudinal seam welds (2 maximum) with 60 percent minimum penetration or fusion welds except as follows:
         1. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection and
         2. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of one and one-half times the diameter of the female section plus 6 inches.
      d. Pole shaft may be either one or two sections (with telescopic field splices).
   c. Furnish and install Surge Protection Devices (SPDs) on all cabling in cabinet.
   d. Install the pole mounted cabinet with the hinges next to the pole.
   e. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   f. Ensure that all electronic equipment power is protected and conditioned with SPDs.
   g. Fabricate Pole longitudinal seam welds with 60 percent minimum penetration or fusion welds except as follows:
      1. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection and
      2. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of one and one-half times the diameter of the female section plus 6 inches.
   h. Pole Top (See Sheet 5).
5. Pole Installation:
   a. Do not install additional wire access holes (not shown in this Index) with a diameter that exceeds $\frac{1}{2}$" in diameter.
   b. Install Anchor Bolts in accordance with Specification 649-5.
   c. Cable Supports: Electrical Cable Guides and Eyebolts.
      a. Locate cap and bottom cable guides within the pole aligned with each other.
      b. Position one cable guide 2" below the handhole.
      c. Position other cable guide 1" directly below the top of the tenon.
      d. Position Park Stands 2" below the top of the handhole.
      e. Include the following information on the ID Tag:
         1. Financial Project ID
         2. Pole Type
         3. Pole Height
         4. Manufacturers' Name
         5. Yield Strength (Fy of Steel)
         6. Base Wall Thickness
      f. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus $\frac{1}{2}$" and anchor bolt holes are bolt diameter plus $\frac{1}{2}$" (Max) prior to galvanizing.
   d. Pole Top (See Sheet 5).
6. Cabinet Installation:
   a. Locate the intermediate pole between the handhole and the top of the handhole.
   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. Design and types of conduits and inner ducts for network communications between the pullbox and cabinet are stated in the Contract Documents.
7. Lowering Device Installation:
   a. Lowering Device Shown
   b. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking stands, etc.) with lowering device manufacturer.
SHAFT DESIGN TABLE

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter</th>
<th>Shaft Length</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>6'-0&quot;</td>
<td>11'-0&quot;</td>
<td>(14) #11</td>
</tr>
<tr>
<td>55</td>
<td>6'-0&quot;</td>
<td>12'-0&quot;</td>
<td>(16) #11</td>
</tr>
<tr>
<td>60</td>
<td>6'-0&quot;</td>
<td>13'-0&quot;</td>
<td>(18) #11</td>
</tr>
<tr>
<td>65</td>
<td>6'-0&quot;</td>
<td>14'-0&quot;</td>
<td>(18) #11</td>
</tr>
<tr>
<td>70</td>
<td>7'-0&quot;</td>
<td>14'-0&quot;</td>
<td>(18) #11</td>
</tr>
</tbody>
</table>

ADDITIONAL SHAFT DEPTH DUE TO GROUND SLOPE

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1:4</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1:2</td>
<td>9'-0&quot;</td>
<td>9'-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 Shaft Length is based on level ground (flatter than 1:5). Increase the shaft depth in accordance with the Additional Shaft Depth Due To Ground Slope table for foundations with slopes 1:5 and steeper. Use the higher value for slope or diameter values that fall between those shown on the table.

BASE PLATE AND ANCHOR BOLT DESIGN TABLE

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Diameter (in.)</th>
<th>Base Plate Thickness (in.)</th>
<th>Anchor Bolt Diameter (in.)</th>
<th>Anchor Bolt Embedment (in.)</th>
<th>Minimum Anchor Bolt Projection (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>27</td>
<td>0.25</td>
<td>4.5</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>55</td>
<td>28</td>
<td>0.25</td>
<td>4.5</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>60</td>
<td>29</td>
<td>0.25</td>
<td>4.5</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>65</td>
<td>30</td>
<td>0.25</td>
<td>4.5</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>70</td>
<td>40</td>
<td>2.5</td>
<td>33</td>
<td>30</td>
<td>38</td>
</tr>
</tbody>
</table>

POLE DESIGN TABLE

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Section 1 (Top)</th>
<th>Section 2 (Bottom)</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>30'-0&quot;</td>
<td>30'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>35'-0&quot;</td>
<td>35'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>38'-0&quot;</td>
<td>38'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>40'-0&quot;</td>
<td>40'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

SHAFT DEPTH DUE TO GROUND SLOPE

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1:4</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1:2</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
</tbody>
</table>

Pole and Foundation Details Same as "Camera Lowering Device" Detail

Air Terminal (See Sheet 6)
Camera Lowering Device
Dome Type CCTV Camera
Pole and Foundation
Concrete
ELEVATION

STANDARD PLANS
FY 2020-21
STEEL CCTV POLE
INDEX 649-020
SHEET 2 of 6
DESCRIPTION:

NOTES:
1. Shaft Length is based on 1'-0" height above the finished grade.
2. Double Nuts: Bottom nut may be half-height (jam nut). Provide individual nut covers (not shown) for each bolt.
3. Conduit and CSL Tubes not shown for clarity.
4. Refer to Shaft Design Table on Sheet 2.

SECTION A-A

SECTION B-B

JOINT WELD DETAIL

DETAIL "A"
NOTE:
To secure the cover plate, install a steel chain from the cover to the pole or by mounting the cover with hinges and install a pad lock tab.
DESCRIPTION:

ASSEMBLY

POLE TOP PLATE

POLE TOP DETAIL

ELEVATION

CAP PLATE DETAIL

PLAN VIEW

POLE TOP PLATE

CAP PLATE DETAIL

PLAN VIEW

ELEVATION

LOWERING DEVICE TENON

ELEVATION

TENON COVER

TENON CAP

STANDARD PLANS

STEEL CCTV POLE

REV 1

649-020

5 of 6
# Standard Mast Arm Assemblies

## ARM AND BASE PLATE

<table>
<thead>
<tr>
<th>Arm ID</th>
<th>Arm X-Arm Length (ft)</th>
<th>Total Arm Length (ft)</th>
<th>Arm</th>
<th>Arm Extension</th>
<th>Base Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A50/5</td>
<td>30.13 0.250</td>
<td>30.13 0.250</td>
<td>22 25 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A50/6</td>
<td>30.12 0.250</td>
<td>30.12 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A60/5</td>
<td>30.12 0.250</td>
<td>30.12 0.250</td>
<td>22 27 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A60/6</td>
<td>30.13 0.250</td>
<td>30.13 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A70/5</td>
<td>30.12 0.250</td>
<td>30.12 0.250</td>
<td>22 29 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A70/6</td>
<td>30.13 0.250</td>
<td>30.13 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A80/5</td>
<td>30.13 0.250</td>
<td>30.13 0.250</td>
<td>30 36 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A80/6</td>
<td>30.14 0.250</td>
<td>30.14 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A85/5</td>
<td>30.14 0.250</td>
<td>30.14 0.250</td>
<td>30 36 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A85/6</td>
<td>30.15 0.250</td>
<td>30.15 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A90/5</td>
<td>30.14 0.250</td>
<td>30.14 0.250</td>
<td>30 36 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A90/6</td>
<td>30.15 0.250</td>
<td>30.15 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A95/5</td>
<td>30.15 0.250</td>
<td>30.15 0.250</td>
<td>30 36 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A95/6</td>
<td>30.16 0.250</td>
<td>30.16 0.250</td>
<td>30 36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## POLE, BASE PLATE AND ARM CONNECTION

<table>
<thead>
<tr>
<th>Pole ID</th>
<th>P+Index</th>
<th>S+SingleArm</th>
<th>D+DoubleArm</th>
<th>Luminaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>A50/5</td>
<td>16</td>
<td>0.375</td>
<td>37.5</td>
<td>16</td>
</tr>
<tr>
<td>A50/6</td>
<td>18</td>
<td>0.375</td>
<td>37.5</td>
<td>18</td>
</tr>
<tr>
<td>A60/5</td>
<td>20</td>
<td>0.375</td>
<td>37.5</td>
<td>20</td>
</tr>
<tr>
<td>A60/6</td>
<td>22</td>
<td>0.375</td>
<td>37.5</td>
<td>22</td>
</tr>
<tr>
<td>A70/5</td>
<td>24</td>
<td>0.375</td>
<td>37.5</td>
<td>24</td>
</tr>
<tr>
<td>A70/6</td>
<td>26</td>
<td>0.375</td>
<td>37.5</td>
<td>26</td>
</tr>
<tr>
<td>A80/5</td>
<td>28</td>
<td>0.375</td>
<td>37.5</td>
<td>28</td>
</tr>
<tr>
<td>A80/6</td>
<td>30</td>
<td>0.375</td>
<td>37.5</td>
<td>30</td>
</tr>
<tr>
<td>A85/5</td>
<td>32</td>
<td>0.375</td>
<td>37.5</td>
<td>32</td>
</tr>
<tr>
<td>A85/6</td>
<td>34</td>
<td>0.375</td>
<td>37.5</td>
<td>34</td>
</tr>
<tr>
<td>A90/5</td>
<td>36</td>
<td>0.375</td>
<td>37.5</td>
<td>36</td>
</tr>
<tr>
<td>A90/6</td>
<td>38</td>
<td>0.375</td>
<td>37.5</td>
<td>38</td>
</tr>
<tr>
<td>A95/5</td>
<td>40</td>
<td>0.375</td>
<td>37.5</td>
<td>40</td>
</tr>
<tr>
<td>A95/6</td>
<td>42</td>
<td>0.375</td>
<td>37.5</td>
<td>42</td>
</tr>
</tbody>
</table>

## LUMINAIRE AND CONNECTION

<table>
<thead>
<tr>
<th>LA (ft)</th>
<th>LB (ft)</th>
<th>LC (ft)</th>
<th>LD (ft)</th>
<th>LE (ft)</th>
<th>LF (ft)</th>
<th>LG (ft)</th>
<th>LH (ft)</th>
<th>LJ (ft)</th>
<th>LL (ft)</th>
<th>US (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>10</td>
<td>3</td>
<td>0.125</td>
<td>0.5</td>
<td>0.5</td>
<td>0.75</td>
<td>0.25</td>
<td>0.25</td>
<td>0</td>
<td>37.5</td>
</tr>
</tbody>
</table>

## Drilled Shaft

<table>
<thead>
<tr>
<th>Drilled Shaft ID</th>
<th>DA (ft)</th>
<th>DR (ft)</th>
<th>RA</th>
<th>RR</th>
<th>RC</th>
<th>RD (in)</th>
<th>RE (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D5/32/3.0</td>
<td>20.5</td>
<td>5.0</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>D5/32/4.0</td>
<td>25.0</td>
<td>6.25</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>D5/32/5.0</td>
<td>30.0</td>
<td>7.5</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

## Notes:
1. Work this Index with Index 649-031.
GENERAL NOTES:

1. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

2. Prior to Fabrication: Verify the installed foundation elevation will result in the required signal elevation and adjust the Pole height as needed.

3. Details for Signal and Sign locations, Signal Head attachment, Sign attachment, Pedestrian head attachment, and Foundation Conduit are not shown for simplicity.

4. Materials:
   a. Poles, Mast Arms and Backing Rings
      - Less than ¾"; ASTM A1011 Grade 50, 55, 60 or 65
      - Greater than or equal to ¾"; ASTM A52 Grade 50, 55, 60 or 65
      - ASTM A535 Grade A (35 ksi) yield or Grade B (60 ksi) yield
   b. Steel Plates: ASTM A36
   c. Weld Metal: E70XX
   d. Bolts, Nuts and Washers:
      - High Strength Hex Head Bolts: ASTM F3125, Grade A325, Type 1
      - Nuts: ASTM A563 DH Heavy-Hex
      - Washers: ASTM F436 Type 1, one under turned element
   e. Anchor Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F1554 Grade 55
      - Nuts: ASTM A535 Grade A Headless (1½ per anchor bolt)
      - Plate Washers: ASTM A36 (2 per bolt)
   f. Threaded Bars/Studs: ASTM A307
   g. Handhole Frame: ASTM A1070 or ASTM A36, Grade 36
   h. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65
   i. Aluminum Pole Caps and Nut Covers: ASTM B26 (319-F)
   j. Stainless Steel Screws: AISI Type 316
   k. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
   l. Reinforcing Steel: Specification 415

5. Fabrication:
   a. Welding:
      - Specification 460-4.4 and
      - AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals Section 14.4.4
   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. For arms and upright poles, circumferential welds and laminated sections are not permitted.
      - Arms may be either one or two sections. See Sheet 4 for telescopic spliced section.
   c. Fabricate longitudinal seam welds with 60 percent minimum penetration or fusion welds except:
      - Use a full-penetration groove weld within 6 inches of the circumferential tube-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.
   d. Locate longitudinal seams weld along the:
      - Lower quadrant of the arms.
      - Same side of the pole as the arm connections.
      - Face handhole 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.
   e. Provide a 2'-0" to 4'-0" secure to pole by 1/4" stainless steel rivets or screws. Fabricators to provide details for approval. Identification Tag located on inside of pole visible from handhole, or on outside of pole inside Terminal Compartment. Tag to be stamped with the following information:
      - Standard Design
        - Financial Project ID
        - Manufacturer's Name
        - Pole Base (F  of Steel)
        - Arm (F  of Steel)
        - Wall Thickness (in.)
      - Special Design
        - Financial Project ID
        - Manufacturer’s Name
        - Pole Base (F  of Steel)
        - Arm (F  of Steel)
        - Wall Thickness (in.)
      - Stainless Steel Set Screws
      - Ventilated Mast Arm Cap With (3) Stainless Steel Set Screws
   f. Locate longitudinal seam welds 16" prior to visible from handhole, or on outside of pole inside Terminal Compartment. Tag to be stamped with the following information:
   g. Other:
      - AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals Section 14.4.4
      - Material:
        - Polishing or rounded edges as specified on shop drawings.
        - Equipment and Tooling:
          - Use a portable impact wrench to properly fasten the bolts, nuts, and washers.

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 grade 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.

ELEVATION AND NOTES:

Table of Contents:

<table>
<thead>
<tr>
<th>SHEET</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mast Arm Assembly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHEET</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Foundation and Base Plate Details</td>
</tr>
<tr>
<td>3</td>
<td>Mast Arm Connection and Splice Details</td>
</tr>
<tr>
<td>4</td>
<td>Luminare Arm and Connection Details</td>
</tr>
<tr>
<td>5</td>
<td>Mast Arm Assembly</td>
</tr>
</tbody>
</table>

LAST REVISION 01/01/18

FY 2020-21

STANDARD PLANS

MAST ARM ASSEMBLIES

INDEX 649-031

1 of 6
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 anchor 'jam' nut. Provide individual nut covers (not shown) for each bolt.

10/29/2019

Mast Arm Assembly

Foundation

Base Plate and Anchors

Foundation (Drilled Shaft)

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 anchor 'jam' nut. Provide individual nut covers (not shown) for each bolt.

10/29/2019

Mast Arm Assembly

Foundation

Base Plate and Anchors

Foundation (Drilled Shaft)

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 anchor 'jam' nut. Provide individual nut covers (not shown) for each bolt.
DESCRIPTION:

MAST ARM ASSEMBLY

EXTENSION

ARM SPlice

DETAIL 'B'

SECTION B-B

DETAIL 'C'

SECTION C-C

SECTION D-D

SINGLE ARM CONNECTION

SINGLE 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 (seam located at the bottom side of the Arm).

FACED OF ARM BASE PLATE AT J ARM

Mast Arm Extension

First Arm Camber Angle

Face of Pole Connection Plate at J Pole

Mast Arm Extension

Face of Pole Connection Plate at J Pole

° ø Wiring Hole (Typ.) Pole and Conn. Plate

° ø Connection Bolt

See DETAIL 'B'

Center Of Pole

Center of Arm or Pole

Wall Thickness

Inside Radius Measured Flat To Flat

Inside Bend Radius

5 Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.

Splice = 3'-0" (Nominal) (2'-0" Min.)

Five Times Wall Thickness or 1 Inch

Min.

Seam Weld (Typ.)

Dia. ø Wall Thickness

See Note 3

Nol.
**DESCRIPTION:**

1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly and the seam weld is in the proper location (seam located at the bottom side of the Arm).
4. "UF" measured counter clockwise from $\xi$ First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.
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'-4' maximum. Align bottom of Terminal Compartment a minimum of 1' below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.

1. Handhole covers may be omitted when Terminal Compartment is provided.
2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required and for locations.
3. Terminal Compartment Frame Height 2'-0' minimum to 2'-4' maximum. Align bottom of Terminal Compartment a minimum of 1' below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.
NOTES:
1. As an option, pedestrian signals may be installed on concrete poles and pedestals using lead anchors (two bolts same size per hub) in lieu of the stainless steel bands.
2. Repair drilled or punched holes in galvanized steel poles or pedestals in accordance with Specification 562. Install grommets or bushings in each hole.
4. For Steel Strain Poles see Index 649-010.
5. For Prestressed Concrete Poles see Index 641-010.
6. For Steel Strain Poles see Index 649-010.
7. For Prestressed Concrete Poles see Index 641-010.
8. Use 6-#5 Bars Equally Spaced – 5-#4 Tie Bars Equally Spaced.
9. Meet the requirements of Specification 646 for aluminum poles and transformer bases.

NEW CONSTRUCTION
(See Note 7)

EXISTING CONSTRUCTION

CONCRETE POLE MOUNTED SIGNAL

STRAIN POLE MOUNTED SIGNAL

PEDESTAL MOUNTED SIGNAL
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.
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 Specification 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 frangible transformer base.
10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.

NOTES:
- A transformer base is required for both conventionally-powered and solar-powered applications.
- Install the RRFB in pairs, one on either side of approach traffic.
- Install controller on the backside of post from approach traffic.
- Install a 39" X 39" W11-2 sign on two-lane roadways and a 36" X 39" W11-2 sign for multiple lane roadways.
- Install push button and R10-25 sign in accordance with Index 665-003.
- Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

REFERENCES:
- See DETAIL "A" for Conventional-Powered Applications.
- See DETAIL "B" for solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.
- For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.
- Nominal 4" (Sch. 40) Aluminum
- Back to Back Signs Shown for Clarity of Installation. Refer to Plans for Where Back to Back is Required.
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:
      1. Sign width < 4'-0": One
      2. 4'-0" ≤ sign width ≤ 7'-0": Two
   C. Number of wind beams required based on sign depth:
      1. Sign depth < 3'-6": One
      2. 3'-6" ≤ Sign depth ≤ 7'-0": Two

3. Type D Attachments:
   Maximum sign width = 3'-0"

4. Align the bottom edges of signs to approximately the same elevation.

5. Use a minimum of 2 bolts with a minimum spacing of 2" for overlapped connection of the adjustable hangers.

DESCRIPTION:

1. Materials:
   - Sign panels, wind beams and associated hardware: See Index 700-020
   - Sign adjustable hangers, wire rope clamps and associated hardware: See APL
   - Wire and additional hardware requirements: See Specification 634

2. Type B and C Attachments:
   - Extend wind beams to within 6" of the sign edge.
   - Number of sign hangers required based on sign width:
     1. Sign width < 4'-0": One
     2. 4'-0" ≤ sign width ≤ 7'-0": Two
   - Number of wind beams required based on sign depth:
     1. Sign depth < 3'-6": One
     2. 3'-6" ≤ Sign depth ≤ 7'-0": Two

3. Type D Attachments:
   - Maximum sign width = 3'-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

SPAN WIRE MOUNTED SIGN DETAILS

INDEX 659-010

1 of 1
GENERAL NOTES:

1. Lowering device to be shipped ready for pole attachment to include 100 ft. of composite power and signal cable prewired to lowering device at the factory.

2. The lowering device manufacturer shall supply both a portable lowering tool with a manual hand crank and a half-inch chuck variable-speed reversible industrial-duty electric drill that matches the winch's manufacturer-recommended revolutions per minute. One lowering tool per every 10 lowering devices is required.

3. The lowering device manufacturer shall provide an on-site installation inspection and operator instruction and certification. This ensures the product is assembled correctly and that all necessary persons are trained in the proper, safe operation of the system. Before erecting the first pole the contractor must contact the lowering device supplier and schedule a manufacturer's representative to be on-site.


5. Camera to be mounted to camera junction box and stabilizing weight via 1½" Standard NPT Pipe Thread.

6. Use air terminal extension when the pole top junction box is wider than top of pole.

7. The stainless steel device lowering cable shall be installed inside the pole within a 1½" diameter PVC conduit.

8. All communication and power cables must be neatly bundled and secured.


10. See Index 641-020 for concrete pole details and Index 649-020 for steel pole details.

For Power, Data And Video
TVSS Surge Protection
Strain Relief Fitting
Assembly And Junction Box)
(Between Lower Contact
Sealing Gasket
Double Support Arms
Guide Pin
Unit Cover
Connector Socket
Disconnect Unit
ETP Alloy 110 Copper
Air Terminal Class II
Pole Top Junction Box
Camera Mounting Bracket And Dome Flange
Dome Type CCTV Camera (TYP)
3-Way Tracking Guide And Support
Camera Connectors
Camera Junction Box
Sealing Gasket Ring
CCTV Lowering Cable
Guide Wire
Pulley
Pole Filter
Divided Channel Arm
U-Bolt
Clamps
Pole Details On Separate Drawing
Pole Details
Conduit To Be Bolted Here
Cable Stop Block
Interior Conduit
Ground Rod Base Mount To Side Of Pole
Lower Contact
Disconnect Unit Cover
Unit Fitter
Disconnector
Socket
Connector
EPDM O-Ring Seal
Pole Top Junction Box
Double Support Arms
Strain Relief Fitting
TVSS Surge Protection
For Power, Data And Video
GENERAL NOTES:

1. Verify the pole type, the dimensions of the pole at the point 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.
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 the enclosure over the end of each conductor and place a third enclosure over the exposed end of the shielded cable. As an alternate, a larger diameter enclosure that will accommodate both the splices of the conductors and the exposed end of the shielded cable may be used.

7. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.

8. Alternative installations may be approved by the 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. 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 both the splices of the conductors and the exposed end of the shielded cable may be used.

2. Install a molded bushing (nonmetallic) on the roadway surface.

3. Place the top of the rigid conduit approximately 2" below the top of the roadway surface.

4. Use nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

5. Use a nonmetallic material to prevent excessive loop sealant from entering the rigid conduit.

6. Splice Connections in pull boxes with UL listed, watertight, insulated enclosures. Place one enclosure over the end of each conductor and place a third enclosure over the exposed end of the shielded cable. As an alternate, a larger diameter enclosure that will accommodate both the splices of the conductors and the exposed end of the shielded cable may be used.

7. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.

8. Alternative installations may be approved by the Operations Engineer.

NOTES:

1. Cut a slot in the edge of the roadway of sufficient size and depth to slightly place the end of the flexible conduit.

2. Install the conduit at least 6" into the roadway pavement and approximately 2" below the top of the final surface.

3. The departure angle of the conduit from the roadway is between 30° to 45°.

4. Fill the top of the flexible conduit to the level of the curb surface.

5. Use nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

6. Splice Connections in pull boxes with UL listed, watertight, insulated enclosures. Place one enclosure over the end of each conductor and place a third enclosure over the exposed end of the shielded cable. As an alternate, a larger diameter enclosure that will accommodate both the splices of the conductors and the exposed end of the shielded cable may be used.

7. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.

8. Alternative installations may be approved by the 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. 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 both the splices of the conductors and the exposed end of the shielded cable may be used.

2. Install a molded bushing (nonmetallic) on the roadway surface.

3. Place the top of the rigid conduit approximately 2" below the top of the roadway surface.

4. Use nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

5. Use a nonmetallic material to prevent excessive loop sealant from entering the rigid conduit.
**NOTES:**

1. The number of "Turns" indicated at the specified point on the loop refers to the number of passes of loop wires which are placed in the saw-cut forming the complete loop.

2. Loop types or details not drawn to scale.

3. Loop Types are centered in a single lane except Type E which is centered on two lanes.

4. The number of individual loops in the Type G loop may vary up to a maximum of four (4).

5. Lead-in may be connected to either end of loop.

6. 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.

---

**LOOP TYPES, EXPANSION JOINTS, AND DETAILS**

---

**LOOP TYPES**

**TYPE A**

**TYPE B**

**TYPE C**

**TYPE D**

**TYPE E**

**TYPE F**

**TYPE G**

**CONCRETE PAVEMENT EXPANSION JOINTS**

**.loop Types, Expansion Joints, and 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, or as shown in the Plans.

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.
**POLE MOUNTED**

- **Cabinet**
- **Pole Plate With Steel Bands or Anchors & Bolts**
- **2½ Ø Field Drilled**
- **Pulling Elbow Type LB**
- **Optional Conduit**
- **Lag Bolts (Typ.)**
- **Conduit (Rigid)**
- **Grounding Rod (As Required)**
- **Conduit**
- **Conduit Lag Bolts (Typ.)**

**NOTES:**
1. If cabinet mounting requires relocation of hole in concrete pole, fill existing hole with concrete or cover with a noncorrosive cover plate.
2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.

**PEDESTAL MOUNTED**

- **Cabinet**
- **Service Slab**
- **Drilled**
- **" Ø Field**
- **2" Min.**
- **2'-6" Max.**

**NOTES:**
1. Service Slab: slope ½" 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.

**NEW CONTROLLER CABINET**

**EXISTING CONTROLLER CABINET**

- **Transfer Switch**
- **Cabinet**
- **Conduit**
- **Conduit**
- **Conduit**
- **Grounding Rod (As Required)**

**NOTES:**
1. Retrofit existing controller cabinets in accordance with Specification 678.

**GROUND MOUNTED**

- **Cabinet**
- **Junction Box**
- **Conduit**
- **Conduit**
- **Grounding Rod (As Required)**

**NOTES:**

**SIDE ELEVATION**

- **Cabinet**
- **Conduit**
- **Conduit**
- **Conduit**
- **Conduit**
- **Grounding Rod (As Required)**
DESCRIPTION:

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).

NOTES:

1. Traffic monitoring site cabinet includes:
   A. One adjustable Shelf; (equipped as shown)
   B. One backplane assembly; (equipped as shown)
   C. One J1 receptacle with mounting bracket;
   D. One J1 equipment cable 5 ft. long (Reference Sheet 4);
   E. All Associated wiring and wiring harnesses.

2. Basic backplane assembly consists of:
   A. Two inductive loop terminal strips;
   B. One piece sensor terminal strip;
   C. One battery terminal strip;
   D. One solar panel terminal strip.

3. The contractor is responsible for contacting the TMS Manager at the Transportation Statistics Office for lane number information and verification.

4. Speed/Classification Unit and Modem furnished separately.

5. Cable ends must be fabricated to fit the vehicle speed/classification unit (Reference Sheet 4).

NOTE:
Fabricate bracket out of 1/8" - 1/4" inch thick aluminum. Dimensions may vary depending on the manufacturer of the J1 receptacle being furnished. The cabinet manufacturer will construct the mounting bracket to fit the receptacle.

CABINET LAYOUT DETAILS (Four Lanes or Less)
CABINET LAYOUT DETAILS (Five to Eight Lanes)

**NOTES:**

1. Traffic monitoring site cabinet includes:
   - A. One adjustable shelf; (equipped as shown)
   - B. Two backplane assembly; (equipped as shown)
   - C. Two J1 receptacle with mounting bracket.
   - D. One J1 equipment cable 5 ft. long (Reference Sheet 4).
   - E. All associated wiring and wiring harness.

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:
1. Reference Sheet 1 or 2, Note 2 for items to be included with backplane.
2. All terminal strip contacts are on 3/4" centers (Clinch 142 Series or equal). Use insulated fork wire terminations.
3. The contractor is responsible for contacting the TMS Manager in the Transportation Statics Office for lane number information and verification.
<table>
<thead>
<tr>
<th>J1 RECEPCTACLE PINOUT</th>
<th>J1 EQUIPMENT CABLE PLUG</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 Recessed Male Pins</td>
<td>26 Female Pin Slots</td>
</tr>
<tr>
<td>A Loop 1a (5a) yellow</td>
<td>A Loop 1a (5a)</td>
</tr>
<tr>
<td>B Loop 1a (5a) purple</td>
<td>B Loop 1a (5a)</td>
</tr>
<tr>
<td>C Loop 1b (5b) gray</td>
<td>C Loop 1b (5b)</td>
</tr>
<tr>
<td>D Loop 1b (5b) pink</td>
<td>D Loop 1b (5b)</td>
</tr>
<tr>
<td>E Loop 2a (6a) brown</td>
<td>E Loop 2a (6a)</td>
</tr>
<tr>
<td>F Loop 2a (6a) blue</td>
<td>F Loop 2a (6a)</td>
</tr>
<tr>
<td>G Loop 25 (6b) orange</td>
<td>G Loop 25 (6b)</td>
</tr>
<tr>
<td>H Loop 25 (6b) tan</td>
<td>H Loop 25 (6b)</td>
</tr>
<tr>
<td>I Loop 3a (7a) white</td>
<td>I Loop 3a (7a)</td>
</tr>
<tr>
<td>J Loop 3a (7a) green</td>
<td>J Loop 3a (7a)</td>
</tr>
<tr>
<td>K Loop 3b (7b) red</td>
<td>K Loop 3b (7b)</td>
</tr>
<tr>
<td>L Loop 3b (7b) black</td>
<td>L Loop 3b (7b)</td>
</tr>
<tr>
<td>M Gnd</td>
<td>M Gnd</td>
</tr>
<tr>
<td>N Loop 4a (8a) w/yellow</td>
<td>N Loop 4a (8a)</td>
</tr>
<tr>
<td>O Loop 4a (8a) w/purple</td>
<td>O Loop 4a (8a)</td>
</tr>
<tr>
<td>P Loop 4b (8b) w/grey</td>
<td>P Loop 4b (8b)</td>
</tr>
<tr>
<td>Q Loop 4b (8b) w/brown</td>
<td>Q Loop 4b (8b)</td>
</tr>
<tr>
<td>R Piezo 1 (5) (+) w/blue</td>
<td>R Piezo 1 (5) (+)</td>
</tr>
<tr>
<td>S Piezo 1 (5) sh w/orange</td>
<td>S Piezo 1 (5) sh</td>
</tr>
<tr>
<td>T Piezo 2 (6) (+) w/green</td>
<td>T Piezo 2 (6) (+)</td>
</tr>
<tr>
<td>U Piezo 2 (6) sh w/red</td>
<td>U Piezo 2 (6) sh</td>
</tr>
<tr>
<td>V Piezo 3 (7) (+) w/black</td>
<td>V Piezo 3 (7) (+)</td>
</tr>
<tr>
<td>W Piezo 3 (7) sh w/red/blk</td>
<td>W Piezo 3 (7) sh</td>
</tr>
<tr>
<td>X Piezo 4 (8) (+) red/green</td>
<td>X Piezo 4 (8) (+)</td>
</tr>
<tr>
<td>Y Piezo 4 (8) sh red/green</td>
<td>Y Piezo 4 (8) sh</td>
</tr>
<tr>
<td>Z Gnd red/black</td>
<td>Z Gnd red/black</td>
</tr>
</tbody>
</table>

**NOTES:**

1. The contractor is responsible for contacting the TMS 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:
   - **OPTION A**
     - Second Vehicle Speed/Class. Unit and separate equipment cable connecting to a second J1 receptacle; or
     - Single Vehicle Speed/Class. Unit capable of up to eight lanes of inputs and a single equipment cable with split ends to fit two J1 receptacles. (Reference Sheet 2 details)

4. Numbers in parenthesis in the pinout chart identify lane numbers when a second backplane for lanes 5 through 8 is required.

5. Cable Ends must be fabricated to fit the vehicle Speed/Classification Unit.
Roadways with Paved Shoulders:

1. Install axle sensors and loops associated with axle sensors after placement of the friction course.
2. Cut a 3½ inch slot for the inductive loops. Loop slots will be cut wide enough to allow unforced placement of the wire in the bottom of the slot. Four turns of #14 AWG place the MSA 35-1 copper wire in the slot. Place short pieces of backer rod (2 to 3 inches) in length every 18 to 24 inches to hold the loop wire in the bottom of the slot.
3. Twist loop leads at the rate of 8 to 16 turns per foot. Loops that are within 150 feet of the cabinet, extend the twisted pair loop lead directly to the cabinet: For distances over 150 feet, #14 MSA 35-2 shielded loop in cable must be spliced to the loop wire twisted pair at the first pull box to which the loop wire is pulled.
4. Marking will consist of two rounds of contrasting color tape, one color for the lane number and the second color for the lead loop location in the lane. The first band closest to the cabinet will represent the lane number, one color for the lane and two rounds will be lane 2, etc. The lead loop in lane 1 would have one round of tape and a second round of a contrasting colored tape for the lead loop in 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 feet apart.

TYPICAL FOR UP TO 4 LANES OF SENSOR LEADS PULLED TO ONE SIDE OF THE ROADWAY

Lane Layout for TMS Inductive Loop and Axle Sensor

NOTES:
1. Install axle sensors and loops associated with axle sensors after placement of the friction course.
2. Cut a 3½ inch slot for the inductive loops. Loop slots will be cut wide enough to allow unforced placement of the wire in the bottom of the slot. Four turns of #14 AWG place the MSA 35-1 copper wire in the slot. Place short pieces of backer rod (2 to 3 inches in length) every 18 to 24 inches to hold the loop wire in the bottom of the slot.
3. Twist loop leads at the rate of 8 to 16 turns per foot. Loops that are within 150 feet of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances over 150 feet, #14 MSA 35-2 shielded loop in cable must be spliced to the loop wire twisted pair at the first pull box to which the loop wire is pulled.
4. Marking will consist of two rounds of contrasting color tape, one color for the lane number and the second color for the lead loop location in the lane. The first band closest to the cabinet will represent the lane number, one color for the lane and two rounds will be lane 2, etc. The lead loop in lane 1 would have one round of tape and a second round of a contrasting colored tape for the lead loop in 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 feet 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)X(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': 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"

2. Place pole in accordance with the Standard Specification 125.4 and 125.8.2. Above grade.

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)X(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': 3'-0" X 3'-0" wide, a depth of 3'-0"

c. 30' or 35': 3'-0" X 3'-0" wide, a depth of 4'-0"
**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.

<table>
<thead>
<tr>
<th>Size x h</th>
<th>Local</th>
<th>Global</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STEP 2:** Determine the height $H'$ from groundline to the centroid of the individual sign or sign cluster.

Assume: $B' = 11$ ft., $C' = 2$ ft. 
Calculated: $X = 2.26$ ft.

**STEP 3:** Refer to the Aluminum Column (Post) Selection Tables and find the intersection point. See Sheet 3.

**STEP 4:** For sign assemblies with signs oriented in two directions, only the sign with the largest area should be analyzed to determine the Column (Post) requirements.

---

**GUIDE TO USE THIS INDEX**

**GENERAL NOTES AND DESIGN EXAMPLE**

**INDEX**

**SHEET 700-010**

**GENERAL NOTES:***

1. Shop Drawings: This Index is considered fully detailed. Submit Shop Drawings only for minor modifications not detailed in the Plans.

2. **Aluminum Sign, Wire Beams, and Column (Post) Materials:**
   - A. Aluminum Plates: ASTM B209, Alloy 6061-T6
   - B. Aluminum Bars and Extruded Shapes: ASTM B213, Alloy 6061-T6
   - C. Aluminum Structural Shapes: ASTM B308 Alloy 6061-T6
   - D. Cast Aluminum: ASTM B26 Alloy A356-T6
   - E. Aluminum Weld Material: ER 5556 or 5356

3. **Sign Mounting Bolts, Nuts and Washers:**
   - A. Aluminum Button Head and Flat Head Bolts: ASTM F468 Alloy 2024-T4
   - B. Stainless Steel Bolts, Nuts and Washers: ASTM A490 or ASTM A193 B7, according to ASTM F1329 with double nuts
   - C. Galvanized Washers: ASTM A368 Grade OH

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 2024-T4
   - B. Stainless Steel Washers: ASTM A368

5. **Sign Column (Post) Bolts, Nuts and Washers:**
   - A. Galvanized U-Bolt (Column) ASTM A449 or ASTM A193 B7 according to ASTM F1329
   - B. Aluminum Bolts (Sleeves): ASTM F468, Alloy 6061-T6 or 6063-0 and Washers B213
   - C. Aluminum Washers: ASTM A368

6. **Coatings:**
   - A. Aluminum Fasteners: Anodic coating (0.002 inches min.) and chromate sealed
   - B. High Strength Steel Bolts Nuts and Washers: ASTM F339
   - C. All other steel items (excluding stainless steel): Hot-dip Galvanized - ASTM A123
   - D. Repair damaged galvanizing in accordance with Specification 363

7. **BREAKAWAY SUPPORT REQUIREMENTS:**
   - Install non-frangible aluminum column (post) (larger than 3") with breakaway supports as shown on Sheet 4. Signs shielded by barrier wall or guardrail do not require breakaway support.
**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**

\[ Y_C = \frac{\sum (X_i \times Y_i)}{\sum Y_i} \]

\[ Y_H = \text{Height of sign or cluster centroid from groundline} \]

\[ Y_N = \text{Height of sign or cluster centroid from bottom of sign cluster} \]

\[ Y_{Cn} = \text{Individual sign centroid height from bottom of sign cluster} \]

\[ Y_{Hn} = \text{Individual sign centroid horizontal location from \(\Omega\) Aluminum Column (Post)} \]

\[ X = \text{Individual sign width} \]

\[ X_C = \text{Centroid horizontal location of sign or cluster from \(\Omega\) Aluminum Column (Post)} \]

\[ X_H = \text{Height of the edge of pavement from the mounting elevation} \]

\[ X_N = \text{Height of the bottom of the sign or cluster from the edge of pavement elevation} \]

\[ a = \text{Individual sign height} \]

\[ a/2 = \text{Area of individual sign} \]

\[ b = \text{Height of the centroid of the sign or cluster from the bottom of the sign or cluster} \]

\[ c = \text{Height of the centroid of the sign or cluster from the edge of pavement elevation} \]

**TYPICAL SECTION**

**SIGN CLUSTER**

**TYPICAL SECTION**

**DIAMOND**

**RECTANGLE**

**STOP**

**RAILROAD**

**SCHOOL**

**SHIELD**

**COUNTY**
**ALUMINUM COLUMN (POST) SELECTION TABLE (O.D. in.)**

<table>
<thead>
<tr>
<th>'H' (FT)</th>
<th>8 ft</th>
<th>9 ft</th>
<th>10 ft</th>
<th>11 ft</th>
<th>12 ft</th>
<th>13 ft</th>
<th>14 ft</th>
<th>15 ft</th>
<th>16 ft</th>
<th>17 ft</th>
<th>18 ft</th>
<th>19 ft</th>
<th>20 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 ft</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>4 ft</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>5 ft</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>6 ft</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>7 ft</td>
<td>3</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>8 ft</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**TOTAL PANEL AREA (SF)**

**FOUNDATION TABLE**

<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>Embedment Depth (ft)</th>
<th>Concrete (Class I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Diameter (in)</td>
<td>Wall Thk. (in)</td>
<td>Expand. Length (ft)</td>
</tr>
<tr>
<td>2.0</td>
<td>1/4</td>
<td>4.5</td>
</tr>
<tr>
<td>2.5</td>
<td>1/4</td>
<td>5.0</td>
</tr>
<tr>
<td>3.0</td>
<td>1/4</td>
<td>6.0</td>
</tr>
<tr>
<td>3.5</td>
<td>1/4</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**INSTALLING FRANGIBLE COLUMN SUPPORTS:**

Columns (posts) 3” 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**

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.

**NOTE:**

INDEX 700-101

SINGLE COLUMN GROUND SIGNS
BOLTED STUB/SLEEVE BASE

**DESCRIPTION:**
- Footing Depth 3" (Typ.)
- Sleeves Size Or Larger
- Stub Size Equals Min. 1" (Typ.)
- See Detail 'A'

**NOTES:**
- 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 bolts, use a foundation stub the same size as the sign column (Post).

**SLIP BASE DETAILS**
- Column (Plate) Size
  - Diameter
  - Wall Thickness
  - Sleeve Height
  - Roof Plate Torque
  - Column (Plate) Size
    - 4" 4" 6" 6" 6" 6" 6" 8"
    - 4" 4" 4" 4" 4" 4" 4" 4"
    - 4" 4" 4" 4" 4" 4" 4" 4"
    - 4" 4" 4" 4" 4" 4" 4" 4"
    - 4" 4" 4" 4" 4" 4" 4" 4"
    - 4" 4" 4" 4" 4" 4" 4" 4"
    - 4" 4" 4" 4" 4" 4" 4" 4"
    - 4" 4" 4" 4" 4" 4" 4" 4"

**SLIP BASE AND FOUNDATION DETAILS**
- (Non-Frangible Column, Typ.)
- (Non-Frangible Column In Crossovers, Medians & Sidewalks)
Optional Slotted Holes

DETAIL "B"

ALUMINUM SOIL PLATE DETAIL

DRIVEN POST AND SOIL PLATE DETAIL

(Single Column Ground Signs)
WIND BEAM CONNECTIONS DETAILS

WIND BEAM CONNECTION

SINGLE SIGN DETAIL

VIEW A-A

BACK-TO-BACK SIGN DETAIL

NOTES:

1. 7/8" 8 stainless steel hex head bolts with nylon washer under head and washer under nut may be used in lieu of 1/2" aluminum button or flat head bolts.

2. Use nylon washers (provided by the sheeting supplier) under the 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 signs greater than 66" in height, install a third wind beam evenly spaced between the top and bottom wind beams. For signs up to 12" in height, use only one wind beam at single sign. Install two wind beams on signs with heights greater than 12" and less than or equal to 66".

DESCRIPTION:

REV. 01/01/19

FDO:
STD PLANS

FY 2020-21

SINGLE COLUMN GROUND SIGNS

INDEX

700-010

6 of 10
**NOTES:**

1. Install sign in the undeployed (down) position.

2. Provide a continuous stainless steel hinge with minimum 0.060" leaf thickness, 2" open width and 0.120" pin diameter. Stake the hinge at both ends to prevent pin movement.

3. Store 1 or 2 pcs of U-Bolt sized specifically for column (post) diameter with double nuts. Stowed on Wind Beam and displaced while deploying the sign.

4. Bolts, Wingnuts, and washers at the bottom corners of the sign hold the sign panels closed when in the undeployed (down) position. Store bolts, wingnuts, and washers in the bottom corner of the sign when in the deployed (up) position.
<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>24x24</td>
<td>3.31 SF</td>
<td>3.31 SF</td>
<td>1.71 ft.</td>
</tr>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>30x30</td>
<td>5.18 SF</td>
<td>5.18 SF</td>
<td>2.10 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>30x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>36x36</td>
<td>7.46 SF</td>
<td>7.46 SF</td>
<td>2.10 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>48x48</td>
<td>13.25 SF</td>
<td>13.25 SF</td>
<td>2.25 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>24x24</td>
<td>3.31 SF</td>
<td>3.31 SF</td>
<td>1.71 ft.</td>
</tr>
<tr>
<td>24x18</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>30x30</td>
<td>5.18 SF</td>
<td>5.18 SF</td>
<td>2.18 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>30x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>24x24</td>
<td>4.00 SF</td>
<td>4.00 SF</td>
<td>2.10 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x36</td>
<td>7.46 SF</td>
<td>7.46 SF</td>
<td>2.10 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>30x24</td>
<td>5.50 SF</td>
<td>5.50 SF</td>
<td>2.55 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x36</td>
<td>7.46 SF</td>
<td>7.46 SF</td>
<td>2.10 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>30x24</td>
<td>5.50 SF</td>
<td>5.50 SF</td>
<td>2.55 ft.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>Area</th>
<th>Total Area</th>
<th>Centroid</th>
</tr>
</thead>
<tbody>
<tr>
<td>36x12</td>
<td>3.00 SF</td>
<td>3.00 SF</td>
<td>1.75 ft.</td>
</tr>
<tr>
<td>30x24</td>
<td>5.50 SF</td>
<td>5.50 SF</td>
<td>2.55 ft.</td>
</tr>
<tr>
<td>Size</td>
<td>Area</td>
<td>Total Area</td>
<td>Centroid</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>30x15</td>
<td>3.13 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45x36</td>
<td>8.99 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21x15</td>
<td>2.19 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x24</td>
<td>3.99 SF</td>
<td>8.18 SF</td>
<td>2.31 Ft.</td>
</tr>
<tr>
<td>21x15</td>
<td>2.19 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x15</td>
<td>3.13 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x24</td>
<td>3.99 SF</td>
<td>9.31 SF</td>
<td>2.55 Ft.</td>
</tr>
<tr>
<td>21x15</td>
<td>2.19 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x20</td>
<td>4.69 SF</td>
<td>6.69 SF</td>
<td>1.63 Ft.</td>
</tr>
<tr>
<td>24x12</td>
<td>2.00 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x30</td>
<td>4.69 SF</td>
<td>8.44 SF</td>
<td>1.77 Ft.</td>
</tr>
<tr>
<td>30x18</td>
<td>3.75 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36x26</td>
<td>6.75 SF</td>
<td>10.50 SF</td>
<td>2.06 Ft.</td>
</tr>
<tr>
<td>30x18</td>
<td>3.75 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x30</td>
<td>6.25 SF</td>
<td>10.25 SF</td>
<td>2.34 Ft.</td>
</tr>
<tr>
<td>24x24</td>
<td>4.00 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36x36</td>
<td>9.00 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30x24</td>
<td>5.00 SF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24x3 36</td>
<td>3.13 SF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GENERAL NOTES:
1. Refer to Index 100-010 for additional notes, assembly of base connection and material specifications not given in this Index.
3. Place galvanized steel shims between the Sleeve and Post to obtain a tight fit between the Post and Sleeve.
4. Wind Beam and Vertical Brace: Aluminum Z 3 x 2\(\frac{3}{16}\) x 3.38. Install Vertical Brace on 7'-0" to 8'-0" signs only.
5. Provide 2 - 0.0149" Thick (28 gauge) and 2 - 0.0329" Thick (21 gauge) Brass Shims Per Post. Used brass shims to plumb the post.
6. Use nylon washers under the button bolt heads to protect sign sheeting. Use aluminum washers under nut.

<table>
<thead>
<tr>
<th>COLUMN SELECTION AND FOOTING SIZE TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign Size</td>
</tr>
<tr>
<td>Height x Length</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>4'-0&quot; x 5'-0&quot;</td>
</tr>
<tr>
<td>4'-0&quot; x 6'-0&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ground Mounted Sign</th>
<th>Single Column Cantilever</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign Size</td>
<td>Column Size</td>
</tr>
<tr>
<td>Diameter x Thickness</td>
<td>Diameter x Thickness</td>
</tr>
<tr>
<td>4'-0&quot; x 5'-0&quot;</td>
<td>4 NPS Schedule 80 (4.5&quot; x 0.337&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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Footing Size</th>
<th>Footings Size</th>
<th>Footing Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'-0&quot;</td>
<td>4500 lbs/in</td>
<td>270 Y. 45</td>
</tr>
<tr>
<td>7'-0&quot;</td>
<td>7500 lbs/in</td>
<td>1&quot;</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>7500 lbs/in</td>
<td>1-1/2&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sept 29, 2019</th>
<th>2:23 PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>R E V I S I O N</td>
<td>109</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>700-011</td>
</tr>
<tr>
<td>FY 2020-21 STANDARD PLANS</td>
<td>1 of 2</td>
</tr>
<tr>
<td>SINGLE COLUMN CANTILEVER</td>
<td>GROUND MOUNTED SIGN</td>
</tr>
<tr>
<td>SIGN DETAIL</td>
<td>VIEW A-A</td>
</tr>
<tr>
<td>SECTION B-B</td>
<td>SECTION C-C</td>
</tr>
</tbody>
</table>
NOTES:
1. Work with index 700-010.
2. Shop Drawings: Not required.

3. Materials:
A. Steel Pipe: ASTM A36 or ASTM A500 Grade 36
B. Steel Pipe (Support Post): ASTM A500 Schedule 40
C. Aluminum Pipe: ASTM 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 F1554 Grade 55 fully threaded (for Adhesive Anchors)
   b. Anchor Bolts: ASTM F1554 Grade 55 Grade A Hex
   c. Nuts: ASTM A563 Heavy Hex Locking
   d. Washers: ASTM F436
F. Adhesive Anchor Bonding Material: Specification 931 Type HV 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 F21329
B. Other Steel: ASTM A123

5. Fabrication:
A. Weld: Specification 660-6.4
B. Hot dip galvanize after Fabrication

6. Construction:
A. Locate Sign Support a minimum of 5 feet from an open joint or transition (sign stationing may be adjusted to accommodate this requirement).
B. Base plate must be flush with back of Traffic Railing
C. Anchors in Traffic Railings:
   a. Install Adhesive Anchors in accordance with Specification 416 except perform field test on one anchor per sign support location.
   b. Use templates and tie anchors as necessary to maintain correct placement of C-I-P Embedded Anchors
   c. Do not drill into existing conduit
D. Temporary Signs on Permanent Traffic Railings: Same as permanent except field testing of anchors is not required
7. Removal of Temporary Signs on Permanent Traffic Railings:
A. Cut anchor rods flush with the top of the traffic railing
B. Coat anchors with Type F-1 epoxy to prevent corrosion
   a. Extend coating 2 inches beyond edge of cut anchor rods
   b. Epoxy coating 1/16" thick minimum
8. Payment:
Include the cost of all materials and labor in the cost of the single post sign assembly.

---

**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>25</td>
<td>9'-7&quot;</td>
</tr>
</tbody>
</table>

Dimension A = Distance from centerline of the Support Post to the bottom of the sign or sign cluster.
Dimension C = Vertical distance from the bottom of the sign or sign cluster to the centroid of the sign or sign cluster.
NOTES:

1. Existing Traffic Railings:
   A. Locate existing conduit prior to drilling and adjust placement of base plate as necessary to avoid damaging existing conduit. Base plate must be flush with back of traffic railing. Maintain a minimum cover of 2\" from face of traffic railing to tip of Adhesive anchor.
   B. For concrete parapets less than 1/2" thick, through bolt 1/4\" Heavy Hex Head Bolts with Nuts and Washers in lieu of Adhesive Bonded Anchors. Bolt heads shall not protrude more than 1/8\" beyond traffic face of railing.
   C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersink depth and diameter of 2\".

2. New Traffic Railings:
   A. Optional Couplers are shown for slipforming, keep Anchor Bolt coupler threads free of concrete.
   B. For concrete parapets less than 10\" thick, through bolt Adhesive Anchor.
   C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersink depth and diameter of 2\".

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.

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 1/2\" thick, through bolt 1/4\" Heavy Hex Head Bolts with Nuts and Washers in lieu of Adhesive Bonded Anchors. Bolt heads shall not protrude more than 1/8\" beyond traffic face of railing.

C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersink depth and diameter of 2\".

D. For concrete parapets less than 10\" thick, through bolt Adhesive Anchor.

E. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersink depth and diameter of 2\".

F. 36\° Single-Slope Traffic Railing shown, other Traffic Railings and Parapets are similar.

G. Bridge Deck shown, Approach Slab and Retaining Wall are similar.
SIGN SUPPORT ASSEMBLY

SIGN SUPPORT WELDMENT DETAIL

BASE PLATE

U-BOLT PLATE WASHER

END PLATE

DESCRIPTION:

FY 2020-21
STANDARD PLANS

SINGLE POST BRIDGE MOUNTED SIGN SUPPORT

INDEX

700-012

3 of 3
NOTES:

1. Work with Index 700-010.
2. Shop Drawings: Not required.
3. Coating:
   - A. U-Bolts, Threaded Rods, Nuts and Washers: ASTM F2329
   - B. Other Steel: ASTM A123
4. Fabrication:
   - A. Hot dip galvanize after fabrication
5. 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. Align the Sign Support, parallel to the edge of the travel way
   - 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 tie anchors as necessary to maintain correct placement of C-I-P Embedded Anchors
     - C. Do not drill into existing reinforcing
   - D. Temporary Signs on Permanent Traffic Railings, same as permanent except field testing of anchors is not required
   - E. Temporary Signs on Temporary Railings/Barriers:
     - a. Install Sign Supports at the midpoint along the length of a single segment
     - b. Avoid drilling through existing reinforcement, use of metal detector not required
     - c. Field testing of anchors is not required
   - F. Removal of Temporary Signs on Permanent Traffic Railings:
     - a. Cut anchor rods flush with the top of the railing
     - b. Coat anchors with Type F-1 epoxy to prevent corrosion
     - c. Extend coating 2 inches beyond edge of cut anchor rods
     - d. Epoxy coating 1/16" thick minimum
   - G. Snap-In Post Cap: UV and weather-resistant glass-filled polyester cap

TABLE 1 - SIGN PANEL AND POST SIZING

<table>
<thead>
<tr>
<th>Temporary Signs</th>
<th>Max. Sign Area (SF)</th>
<th>Post (NPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≥ 24</td>
<td>≥ 30</td>
</tr>
<tr>
<td>Permanent Signs</td>
<td>≥ 135 &lt; Sign ≤ 20</td>
<td>≥ 35</td>
</tr>
</tbody>
</table>

Payment:
Include the cost of all materials and labor in the cost of the single post sign assembly.
NOTES:
1. Place anchor rods in a staggered or linear pattern as necessary to avoid reinforcing.
2. Use a staggered pattern for all temporary barriers.

| TABLE 2 - BASE PLATE TYPE AND ANCHOR ROD SIZING |
|---|---|---|
| Index | Type/Application | Base Plate Type | Anchor Rod Ø |
| 521-001 | Full Wall | B | 1" |
| 521-001 | Cantilever or L-Wall | A | |
| All listed above Plus 102-110 & 102-100 | Temporary Signs | C | |

**DESCRIPTION:**

**REVISED DATE:** 01/01/17

**INDEX:** 700-013

**SHEET:** 2 of 2

**FY 2020-21 STANDARD PLANS**

**SINGLE POST MEDIAN BARRIER MOUNTED SIGN SUPPORT**
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 B221, Alloy 6061-T6 or Alloy 6351-T5
      b. Aluminum Structural Shapes: ASTM B308, Alloy 6061-T6
   B. Sign Support Structure Materials:
      a. Steel Plates and Structural Shapes: ASTM A36 or ASTM A572, Grade 50
      b. Steel Weld Metal: E70XX
      c. Sheers: Brass ASTM B68 or Galvanized Steel
   C. Aluminum Bolts, Nuts and Washers:
      a. Flat Head and Button Head Bolts: ASTM F 468, Alloy 2024-T4
      b. Hex Nuts: ASTM F487, 2024-T4
      c. Washers: ASTM B221, Alloy 2024-T4
   D. Stainless Steel Bolts, Nuts and Washers Alloy Group 2, Condition A, may be substituted for the aluminum bolts as follows:
      a. Bolts: ASTM F593, CW1 or SH1
      b. Nuts: ASTM F594
   E. High Strength (H.S.) Steel Bolts, Nuts and Washers:
      a. Galvanized Hex Head Bolts: ASTM F332, Grade A325, Type 1
      b. Galvanized Nuts: ASTM A563 Hex, Grade DH
      c. Galvanized Washers: ASTM F436
   F. Concrete: Class 1
   G. Reinforcing Bars or Welded Wire Reinforcement (WWR): Specification 475
4. Coatings:
   A. Aluminum Fasteners:
      a. Anodic coating (0.0002 inches min.) and chromate sealed
   B. Galvanize High Strength Steel Bolts Nuts and Washers: ASTM F332
   C. Galvanize all other steel items (excluding stainless steel) Hot-dip ASTM A123
   D. Treat damaged galvanizing in accordance with Specification 562
5. Fabrication:
   A. All Base Connections and Stub Column materials are steel unless otherwise specified.
   B. Drill or sub-punch and ream holes in Fuse Plates and Hinge Plates
   C. Weld Base Plate to Post & Stub or if using the Alternate Connection Detail weld Base Plate and Stiffeners to Post and Stub (Sheet 2)
   D. Hot dip galvanize after fabrication. Remove all drips, runs or beads on base plate within washer contact areas (including saw cuts)
6. Construction:
   A. Install the Sign Structure foundation in accordance with Specification 455. Orient Stub Post according to direction of traffic (Sheet 2)
   B. Tighten all high strength bolts except Base Bolts in accordance with Specification 700.
   C. Assemble Post to Stub with Base Bolts and three flat washers per bolt (See Base Connection Details, Sheet 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 reinforcement.

At the Contractor's option, the #4 tie bars at 12' o.c. may be replaced by #10 Spiral wire @ 8' pitch, with three flat turns at the top and one flat turn at the bottom in accordance with Foundation reinforcing.

### INSTRUCTIONS NOTES:

1. **Assembly of Base Instructions:**
   - A. Place one washer on each Base Bolt between the Bottom Base Plate and the head of high strength Base Bolt. Place the next washer between the Bottom Base Plate and the Bolt Keeper Plate, and add the Top Base Plate section and place the third washer between the Top Base Plate and the Nut.
   - B. Shim as required to plumb column. Provide 2-0.0149" thick (28 gauge) and 2-0.0329" thick (21 gauge) shims per column.

2. **H.S. Base Bolt L, Tightening Instructions:**
   - A. Tighten Base Bolts to the maximum possible with a 12" wrench (See Foundation Notes).
   - 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 galling.

---

**ALTERNATIVE BASE CONNECTION DATA**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Cover (Typ.)</th>
<th>#4 Bars @ 12&quot; Centers</th>
<th>Bars V (See Foundation Notes)</th>
<th>Top Cover (Typ.)</th>
<th>Washer (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5&quot;</td>
<td>D</td>
<td>2</td>
<td>1/2&quot;</td>
<td>1/8&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
<td>F</td>
<td>3</td>
<td>1/2&quot;</td>
<td>1/8&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>3.5&quot;</td>
<td>E</td>
<td>4</td>
<td>1/2&quot;</td>
<td>1/8&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>A</td>
<td>5</td>
<td>1/2&quot;</td>
<td>1/8&quot;</td>
<td>1/4&quot;</td>
</tr>
</tbody>
</table>

---

**BASE PLATE DETAIL**

- **Plate Thickness:** 0.0149" (28 gauge)
- **Specifications:**
  - 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 add the Top Base Plate section and place the third washer between the Top Base Plate and the Nut.
  - B. Shim as required to plumb column. Provide 2-0.0149" thick (28 gauge) and 2-0.0329" thick (21 gauge) shims per column.
  - 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 galling.

---

**SHIM DETAIL**

- **Note 1B:**
  - 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 add the Top Base Plate section and place the third washer between the Top Base Plate and the Nut.
  - B. Shim as required to plumb column. Provide 2-0.0149" thick (28 gauge) and 2-0.0329" thick (21 gauge) shims per column.
  - 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 galling.
STATE OF FLORIDA
WELCOME CENTER

FRONT ELEVATION

PLAN VIEW

B. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
A. Aluminum Bolts, Nuts and Washers: Anodic

SIDE ELEVATION

SIGN PANEL SPlice

WIND AND HANGER BEAMS FOR OVERHEAD SIGNS

GENERAL NOTES
1. Work 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 = 21.0% L
   B. Spacing of vertical hangers may be varied slightly as necessary to clear the truss struts and diagonals at panel points
   3. Spacing of Vertical Hangers:
      A. Two Vertical Hanger = 21.0% L
      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 B 221, Alloy 6061-T6 or Alloy 6351-T5
      b. Structural Shapes: ASTM B515, Alloy 6061-T6
      c. Flat Head and Hex Head Machine Bolts: ASTM F468, Alloy 2024-T4
      d. Hex Nuts:  ASTM F467, Alloy 6061-T6 or Alloy 6262-T9
      e. Washers: ASTM B221, Alclad 2024-T4
   B. Steel:
      a. U-Bolts: ASTM A449 or ASTM A193 B7
      b. Nuts: ASTM A563, 2 per leg
      c. Flat Head and Hex Head Machine Bolts: ASTM F468, Alloy 2024-T4
      d. Hex Nuts:  ASTM F467, Alloy 6061-T6 or Alloy 6262-T9
      e. Washers: ASTM B221, Alclad 2024-T4
   C. Steel:
      a. 0.2-Bolts: ASTM A499 or ASTM A193 B7
      b. Nuts: ASTM A563, 2 per leg
      c. Washers: ASTM F436, (Flat Washers)
   D. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   E. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   F. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   G. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   H. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   I. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   J. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   K. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   L. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   M. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   N. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   O. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   P. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   Q. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   R. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   S. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   T. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   U. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   V. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   W. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   X. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   Y. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
   Z. Steel:
      a. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Washers: ASTM A563, (Flat Washers)
PLACEMENT OF SIGN LIGHTS

1. This Index details a bottom luminaire support structure. For signs requiring top luminaire support structures, the detail can be reversed.

2. Luminaire spacing and arm length is shown on Guide Sign Worksheet.

3. 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 lighting 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. Work this Index in conjunction with CANTILEVER SIGN STRUCTURE DATA TABLES in the Plans and Index 700-030.
2. Handholes are required at pole base for DNS Structures. Refer to Index 700-090 for Handhole Details.

3. Shop Drawings are required.
   - Obtain Shop Drawing approval prior to fabrication. Include the following:
     a. Upright Pipe height (F1) 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 centersline of truss and the direction of traffic.
     d. Chord Splices
     e. Handholes at pole base (when required).

4. Materials:
   - a. Sign Structure
      - Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A333, Grade B (When)
      - Steel Angles and Structural Plates and Bars: ASTM A369 Grade 36
      - Weld Material: E70SH
   - b. Bolts, Nuts, and Washers
      - High Strength Bolts: ASTM F3125, Grade 55 Type 1
      - Nuts: ASTM A563 Grade DH Heavy-Hex
      - Washers: ASTM F436 Type 1, one under turned element
   - c. Anchor Bolts, Nuts, and Washers
      - Anchor Bolts: ASTM F1554 Grade 55
      - Nuts: ASTM A563 Grade A Heavy-Five (5 per bolt)
      - Plate Washers, ASTM A36 (2 per bolt)
   - d. Concrete
      - Spreading Footing Concrete: Class IV
      - Drilled Shaft Concrete: Class IV (Drilled Shaft)
   - e. Reinforcing Steel: Specification 415

5. Fabrication:
   - a. Welding: Specification 460 6.4
   - b. Chord Splices: "SD" Panel from upright is the closest panel in which a chord splice may be used. See Plans for CANTILEVER SIGN STRUCTURE DATA 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 1/8"
   - 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 remedial action, if necessary, prior to shipment.
   - h. Disassemble, as necessary, and secure components for shipment.

6. Coatings:
   - a. Bolts, Nuts, and Washers: ASTM F2329
   - b. All other steel, including Plate Washers, hot dip galvanize: ASTM A123

7. Construction:
   - a. Construct Foundation in accordance with Specification 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. Spies anchor bolts are not permitted.
   - f. Install Aluminum Sign Panels as shown in the Plans.
   - g. Place structural grout pad with drain between top of foundation and bottom of baseplate in accordance with Specification 649-7.

8. Final Upright Position
   - Obtain Shop Drawing approval prior to fabrication. Include the following:
   - Anchor bolt orientation with respect to centersline of truss and the direction of traffic.
   - Chord Splices
   - Handholes at pole base (when required).

- Upright-Structure Connection
- Base Plate Connection
- Back Rake Top of Pipe 'F' before Truss installation by using selected Bolt at Base Plate
- Upright Truss Connection
- Truss Web Angles (Typ.)

ISOMETRIC VIEW

CAMBER DIAGRAM

CANTILEVER SIGN ASSEMBLY
NOTES:
1. Construction joint allowed, roughen surface to 1/4" minimum amplitude prior to pour.
2. See Traffic Plans for elevation at top of Foundation.
3. Install Drilled Shaft with a 2'-0" minimum from top elevation of the drilled 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.
NOTE:
1. Wrap fillet weld around the stiffener termination on the tube wall.
2. Truss Chord Bolts:
   A. Top and Bottom: Install \( 'C' \) hex head bolts.
   B. Back: Install \( 'TB' \) hex head bolts.

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)
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.
CANTILEVER ASSEMBLY

SPLICE CONNECTION NOTES:
1. Only 6 bolts are shown in detail for clarity. (One Half Each Side Of Splice)
2. Splices are not permitted for trusses less than or equal to 40’, Splice optional for trusses greater than 40’.

TRUSS PLUG DETAIL

UPRIGHT CAP DETAIL

SPLICE CONNECTION DETAIL
NOTES:
1. Work this Index in conjunction with SPAN SIGN STRUCTURE DATA TABLES in the Plans and Index 700-029.
2. Handholes at the pole base are required for DMS Structures. Refer to Index 700-090 for Handhole Details.

3. Shop Drawings are required.

   Obtain Shop Drawing approval prior to fabrication. Include the following:
   A. Upright Pipe height ('C' & 'B') and foundation elevations: Verify vertical alignment.
   B. Upright assembly in accordance with structural guidelines.
   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 PSL2, 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 F3123, Grade A325, Type 1
      b. Nuts: ASTM A563 Grade A Heavy-Hex
      c. Washers: ASTM A496, Type 1, one under turned element
      d. Anchor Bolt, Nut, and Washers: ASTM A325, Grade 56
      e. Nuts: ASTM A563 Grade A Heavy-Hex (5 per bolt)
      f. Plate Washers: ASTM A193 (3 per bolt)
   C. Concrete:
      a. Concrete: Class IV (Drilled Shaft)
   D. Reinforcing Steel:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436, Type 1, one under turned element
   E. Welding:
      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 when panel lengths are 10'-0" or less.
      c. Structural bolt hole diameters: Bolt diameter plus 0.166".
      d. Anchor bolt hole diameters: Bolt diameter plus 0.166".
      e. Structural bolt hole diameters: 0.166".
      f. Hot Dip Galvanize after fabrication.
   F. Shop assembled:
      a. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A500, Grade B (Min).
      b. Steel Angles and Plates: ASTM A709 grade 36
      c. Weld Material: E70XX
   G. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts, Nuts and Washers: ASTM A193 (3 per bolt)
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436, Type 1, one under turned element
   H. Special: Material to be used to provide the required parabolic camber (see Camber Diagram).
   I. Handholes at pole base (when required).

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 when panel lengths are 10'-0" or less.
   C. Structural bolt hole diameters: Bolt diameter plus 0.166".
   D. Anchor bolt hole diameters: Bolt diameter plus 0.166".
   E. Structural bolt hole diameters: 0.166".
   F. Hot Dip Galvanize after fabrication.
   G. Shop assembled:
      a. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A500, Grade B (Min).
      b. Steel Angles and Plates: ASTM A709 grade 36
      c. Weld Material: E70XX
   H. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts, Nuts and Washers: ASTM A193 (3 per bolt)
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436, Type 1, one under turned element
   I. Special: Material to be used to provide the required parabolic camber (see Camber Diagram).
   J. Handholes at pole base (when required).

6. Coatings:

   A. Anchors, Nuts, and Washers: ASTM F2329
   B. All other steel, including Plate Washers, hot dip galvanize: ASTM A123

7. Construction:

   A. Construct foundation in accordance with Specification 455 Drilled Shaft, except payment is included in the cost of the structure.
   B. Prior to erection, record the as-built anchor locations and submit to the Engineer.
   C. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
   D. Tighten nuts and bolts in accordance with Specification 700.
   E. Install Aluminum Sign Panels as shown in the Plans.
   F. After installation, place wire screen between top of Foundation and bottom of Baseplate in accordance with Specification 649-6.

8. Foundation:

   A. Foundation:
      a. Construct foundation in accordance with Specification 455 Drilled Shaft, except payment is included in the cost of the structure.
      b. Prior to erection, record the as-built anchor locations and submit to the Engineer.
      c. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
      d. Tighten nuts and bolts in accordance with Specification 700.
      e. Install Aluminum Sign Panels as shown in the Plans.
      f. After installation, place wire screen between top of Foundation and bottom of Baseplate in accordance with Specification 649-6.
   B. Upright pipe height ('C' & 'B') and foundation elevations: Verify vertical alignment.
   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).

9. Materials:

   A. Sign Structure:
      a. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 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 F3123, Grade A325, Type 1
      b. Nuts: ASTM A563 Grade A Heavy-Hex
      c. Washers: ASTM A496, Type 1, one under turned element
      d. Anchor Bolt, Nut, and Washers: ASTM A325, Grade 56
      e. Nuts: ASTM A563 Grade A Heavy-Hex (5 per bolt)
      f. Plate Washers: ASTM A193 (3 per bolt)
   C. Concrete:
      a. Concrete: Class IV (Drilled Shaft)
   D. Reinforcing Steel:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436, Type 1, one under turned element
   E. Welding:
      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 when panel lengths are 10'-0" or less.
      c. Structural bolt hole diameters: Bolt diameter plus 0.166".
      d. Anchor bolt hole diameters: Bolt diameter plus 0.166".
      e. Structural bolt hole diameters: 0.166".
      f. Hot Dip Galvanize after fabrication.
   G. Shop assembled:
      a. Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A500, Grade B (Min).
      b. Steel Angles and Plates: ASTM A709 grade 36
      c. Weld Material: E70XX
   H. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts, Nuts and Washers: ASTM A193 (3 per bolt)
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436, Type 1, one under turned element
   I. Special: Material to be used to provide the required parabolic camber (see Camber Diagram).
   J. Handholes at pole base (when required).
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.).
SPAN SIGN ASSEMBLY

Upright-Truss Connection

TOP TRUSS CHORD

Bottom Similar

Gusset Plates (Typ.)

LEFT UPRIGHT

RIGHT UPRIGHT

SPAN SIGN STRUCTURE

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

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</th>
<th>Distance (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>3/4</td>
</tr>
<tr>
<td>1</td>
<td>3/4</td>
</tr>
<tr>
<td>1 1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>1 1/2</td>
<td>1 1/2</td>
</tr>
</tbody>
</table>

- TRUSS
- FRONT ELEVATION
- SIDE ELEVATION
- BACK-SIDE SIGN MOUNTING

DETAIL 'D'

DETAIL 'E'

DETAIL 'F'

DETAIL 'G'

DETAIL 'H'

DETAIL 'I'

DETAIL 'J'

DETAIL 'K'

DETAIL 'L'
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 Specification 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 submission of structural calculations and Shop Drawings that have been prepared by and sealed by the Specialty Engineer.

OPTION 1

OPTION 2

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 connection.
   b. Do not start fabrication until the shop drawings are approved.
4. If required, install guardrail at location shown in the Plans and in
   accordance with Index 536-001.
5. Materials:
   a. Sign Mounting Components:
      i. Aluminum Structural Shapes: ASTM B308, Alloy 6061-T6
      ii. Vertical Brackets: ASTM A604, Grade 36
      iii. D-Bolts: ASTM A490 or A193 B7
      iv. Steel Bolts, Nuts, and Washers:
          1. High Strength Bolts: ASTM F3125, Grade 325, Type 1
          2. Nuts: ASTM F2329
          3. Washers: ASTM F463 (Flat Washer)
   b. Coatings:
      i. All nuts, bolts and washers ASTM F2329
      ii. All other steel items ASTM A413
      iii. Bolt hole Diameters: Bolt plus 1/8" before galvanizing
6. 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
      of connection. Drilling and tapping the steel structure
      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
      of connection.
   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.
CANTILEVER STRUCTURE PLAN VIEW

SPAN STRUCTURE PLAN VIEW

CANTILEVER STRUCTURE ELEVATION VIEW

SPAN STRUCTURE ELEVATION VIEW

DYNAMIC MESSAGE SIGN GENERAL LAYOUT

NOTE: Actual number and direction of travel lanes varies.

DYNAMIC MESSAGE SIGN WALK-IN

FAAulent: 2020-21
STANDARD PLANS

INDEX
700-090
2 of 5
**DESCRIPTION:**

**REVISION**

**LAST**

**STANDARD PLANS**

**INDEX**

**SHEET**
...
GENERAL NOTES:

1. Work this Index with Specification 700.
2. Shop Drawings are required:
   A. Provide length as shown in the Plans
   B. Design in accordance with AISC, AASHTO, and OSHA requirements
   C. Do not start fabrication until the shop drawings are approved
3. Cantilever hangers must be positioned to avoid conflicts with the sign structure truss and gusset plates. Place walkway close to the sign with a maximum open distance from walkway grate to DNS sign of 1/8".
4. Maximum spacing of Catwalk hanger supports is 3'-0". Cantilever ends of grating is 8'.
5. Galvanized steel catwalk grating meeting the requirements of Specification 504-23. Must support a 90 psf load and have a 3/8" minimum toe kick. Attach grating in accordance with the manufacturer's instructions using stainless steel or galvanized fasteners.
7. Chain link fabric options (2" mesh with knuckled selvage top and bottom for all options):
   A. AASHTO M181 Type I - Zinc Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 1.8 oz./ft². (M181 Class D modified to 1.8 oz./ft²).
   B. AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gage (coated wire diameter), coated at the rate of 0.40 oz./ft².
8. Install 2" NPS (SCH. 40) guiderail and posts: ASTM A53 Grade B for standard weight pipe.
9. Welding:
   E70XX
10. Materials:
   A. Steel Plates: ASTM A 36 or A709 Grade 36.
   B. W. Sections: ASTM A572 Grade 36 or 50.
   C. Steel Pipe railings or Structural tubing: Specification 962
   D. High Strength Bolts, Nuts and Washers: Specification 962
   E. U-Bolts, nuts and washers: Specification 962
11. Coatings/Galvanizing:
   Hot dip galvanize support frame after fabrication and galvanize non-stainless steel fasteners in accordance with Specification 962.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Content</td>
</tr>
<tr>
<td>2</td>
<td>General Assembly and Fixed Base Details</td>
</tr>
<tr>
<td>3</td>
<td>Walkway Support Details</td>
</tr>
</tbody>
</table>

CATWALK ASSEMBLY
(Cantilever Shown, Span Similar)
NOTES:
1. See manufacturer details for walkway planks and bolting criteria.
2. Fasten securely. See grating manufacturer details.
**DESCRIPTION:**

**REVISION**

**STANDARD PLANS**

**FY 2020-21**

**CATWALK DETAILS**

**INDEX**

**700-091**

**3 of 3**
GENERAL NOTES:

1. Single-Column Signs Shown. Multi-Column Signs similar. These typical sections serve as a guide for locating the traffic signs required under various roadside conditions. For size and details of sign construction and footing refer to the appropriate Index and Plans.

2. Verify the length of sign supports in the field prior to fabrication.

3. Install ground signs at an angle of 1 to 4 degrees away from the traffic flow (use illustration). Install shoulder mounted signs rotated clockwise and median mounted signs rotated counterclockwise. 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 5 minimum from the edge of traveled way if required for visibility in business or residential sections with no curb and speeds of 30 MPH or less.

5. The mounting heights are measured from the bottom of the sign panel to a horizontal line extended from the edge of traveled way or from the ground surface at the back of curb. If the standard heights cannot be met, the minimum heights are as follows:

   - Limited Access Roadways: 7'
   - Arterial and Collector Roadways: 5' - Rural
   - 7' - 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' clear width.

8. Use of Guides Shown. Multi-Column Guides similar.

9. For more information refer to Section 2H of the MUTCD.
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 in a sign cluster with other 24" x 24" panels.
3. 15° Radii
4. When two or more County Route Markers are mounted together, use the dimensions of the largest marker for all other markers.

NOTES:
1. Florida marker must have black Legend with White Background.
2. Stroke width of State Outline shall be 1/8" for Guide Sign.
4. 1/8" Border

INDEX
700-102
3 of 11
SAFETY BELT
CHILD RESTRAINT
USE REQUIRED
BY LAW

BUCKLE UP
IT'S THE LAW

WEIGHT LIMIT
RESTRICTION AHEAD

SPECIAL SIGN DETAILS

INDEX

700-102

6 of 11
No obstruction to text or symbols from holes or bolts. Sign mounting holes can be punched or field drilled with no obstruction to text or symbols from holes or bolts.


For letter size signs manual, see standard highway signs manual, sign R10-3b for letter size spacing and symbol sizes.

Black Legend and Border
White Background
Series B Legend
4" Radii Border
3' x 3'
3'-6" X 2'-6"
GENERAL NOTES

1. Only those services meeting criteria established by the Department and approved by the State Traffic Operations Engineer for each interchange shall be shown. Symbol signs for motorist services shall always appear in the following order reading from left to right and top to bottom: Gas, Food, Lodging, Phone *, Hospital, Camping.

2. The phone symbol shall not be shown whenever any Gas, Food, Lodging or Camping symbol appears.

3. Symbol signs shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

4. All motorist service signs to have White Legend and Border with Blue Background.

5. For mounting details see Index 700-010 for Single-column Ground Signs or Index 700-020 for Multi-column Ground Signs.

** 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.

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"
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.

FTP-10-06

4,480'

FTP-11-06

800'

FTP-12-06

FTP-13-06

FTP-12-06

FOR LIMITED ACCESS HIGHWAYS

1. Signs and sign structures shall be erected in accordance with the details shown on Index 700-030.

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 half-way between normal guide signs).
NOTES:
1. Signs and sign structures shall be erected in accordance with the details shown on Index 700-020.
2. Sign FTP-12-06 shall be located on the Welcome Center grounds in proximity to the building and as far from the Main Line Roadway as possible (2 signs back to back).
3. All legend to be Series E.
4. One sign FTP-15A-06 or FTP-06 should be used depending on speed, roadside development & geometric conditions.
DESCRIPTION:

ONE-WAY TRAFFIC

- For Paved Shoulders
  - 6" White @ 45°
  - Every 50'
  - For 1570'

- 18" White
  - For Paved Shoulders
  - Solid

- 6" Solid White
  - For Slab Approach

- Type 2 Object Markers
  - Installed Behind Guardrail
  - Minimum of 3

TWO-WAY TRAFFIC

- 6" Solid White
  - For Slab Approach

- Type 2 Object Markers
  - Installed Behind Guardrail

- 4 Spaces @ 50'

- 6" Double Yellow

- 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 2370' 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 ON-3R & ON-3L object markers shall be installed 4' above the roadway edge. The panels may be post mounted at the bridges.

<table>
<thead>
<tr>
<th>Shoulder Width</th>
<th>No. of RPM's</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>18'</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13'</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>16.67'</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SIGN LOCATIONS TYPICAL

2. Location of Sign 3 may require some field adjustment.
3. The Cross Road is the last detour to route around the restricted bridge.
4. Location of Sign 2 should be established from the Cross Road
   the following approximate distances: Interstate-1 Mile Non- Interstate-1/2 Mile.
5. See Index 700-102 for sign details.
DESCRIPTION:

REVISED

STANDARD PLANS

FY 2020-21

TYPICAL SIGNING FOR TRUCK WEIGH
AND INSPECTION STATIONS

WEIGH STATION SIGNING
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 1 OBJECT MARKER PLACEMENT

TYPE 4 OBJECT MARKER PLACEMENT

OBJECT MARKER DETAIL
NOTES:
1. Work with Indexes 700-020 and 700-030.
2. Materials (Aluminum):
   A. Sheets and Plates: ASTM B209 Alloy 6061-T6
   B. Standard Structural Shapes: ASTM B308 Alloy 6061-T6
   C. Extruded Shapes: ASTM B221 Alloy 6061-T6
   D. For Bolts, Nuts, and Washers requirements see Index 700-020 or 700-030.
3. Fabrication:
   A. See sign layout sheet for dimension "L" and sign face details in the Plans.
   B. Round all sign corners.
4. For right exits, install the Exit Numbering Panel to the top right side of the Highway Sign.
5. For left exits, install the Exit Numbering Panel to the top left side of the Highway Sign.

DESCRIPTION:
STANDARD PLANS
FY 2020-21
MOUNTING EXIT NUMBER PANELS TO SIGNS
INDEX 700-110
SHEET 1 of 1
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 'Alph' Identification shown above and Numerical Identification shown on Sheet 3 thru 8.

2. Install sign panel and wind beam in accordance with Index 700-030 and Specification 700.

3. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

4. Meet the requirements of Specification 646 for aluminum poles and transformer bases.

5. Install a concrete slab around all roadside assemblies on slopes 6:1 or greater. The minimum slab dimension is 4'-0" by 5'-0".

6. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.

POWER CONFIGURATION 'A'
CONVENTIONALLY-POWERED
(Type A1 Shown)

POWER CONFIGURATION 'B'
SOLAR-POWERED
(Type B1 Shown)

POWER CONFIGURATION 'B' NOTES:

1. Install a separate pole for mounting the solar panel, controller and batteries for all roadside assemblies with solar panels, controllers and batteries weighing more than 170 lbs.

2. Install the auxiliary pole as close to the right of way boundary as possible.

3. Install the auxiliary pole so that the height is the same as the column for the roadside assembly.

4. Orient solar panel to face South for optimal exposure to sunlight.

5. The controller and the solar batteries may be located in the same compartment.

TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Conduit, Wiring, and Foundation Details</td>
</tr>
<tr>
<td>3</td>
<td>Roadside Sign Assembly-1</td>
</tr>
<tr>
<td>4</td>
<td>Roadside Sign Assembly-2</td>
</tr>
<tr>
<td>5</td>
<td>Roadside Sign Assembly-3</td>
</tr>
<tr>
<td>6</td>
<td>Roadside Sign Assembly-4</td>
</tr>
<tr>
<td>7</td>
<td>Roadside Sign Assembly-5</td>
</tr>
<tr>
<td>8</td>
<td>Roadside Sign Assembly-6</td>
</tr>
<tr>
<td>9</td>
<td>Roadside Sign Assembly-7</td>
</tr>
<tr>
<td>10</td>
<td>Overhead Sign Assembly</td>
</tr>
</tbody>
</table>
**CONDUIT, WIRING, AND FOUNDATION DETAILS**

**DETAIL "A"**
- Transformer Base
- #6 Ground Wire
- Concrete Apron (Typ.)
- #6 Ground Wire
- Pull Box
- Cap Conduit
- Stripe Relief Fitting
- Circuit Conductors
- Strain Relief Fitting
- Grounding Lug
- 1-8" X 18" Anchor Bolts
- #6 Ground Wire
- U.L. Approved Ground Rod
- 12" Bed of Pearock or Crushed Stone For Drainage.
- To Power Service or Auxiliary Pole
- Nominal 4" (Sch. 40) Aluminum
- Strain Relief Fitting
- Conduit for Future Use
- 2'-0" Dia.

**DETAIL "B"**
- Transformer Base
- #6 Ground Wire
- Grounding Lug
- 1/2" X 18" Anchor Bolts
- #6 Ground Wire
- U.L. Approved Ground Rod
- 12" Bed of Pearock or Crushed Stone For Drainage.
- To Power Service or Auxiliary Pole
- Nominal 4" (Sch. 40) Aluminum
- Strain Relief Fitting
- Conduit for Future Use
- 2'-0"

**DESCRIPTION:** REVISION LAST of STANDARD PLANS FY 2020-21 SHEET INDEX
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.
Nominal 4" (Sch. 40) Aluminum

NOTE:
LIMIT
SCHOOL
FLASHING
WHEN
20

Beacon Controller

12" Yellow Flashing Beacon

SCHOOL
SPEED
LIMIT
20
OR 15
WHEN
FLASHING

SPEEDING
FINES
DOUBLED

FTF-38-06 (24" X 30") Sign

Nominal 4" (Sch. 40) Aluminum

To Pull Box

To Pull Box

10/29/2019
8:24:13 AM

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.
ENHANCED HIGHWAY SIGNING ASSEMBLIES

NOTE:
Type A4 Assembly (conventionally-powered) is shown. Type B4 Assemblies (solar-powered) similar.
SCHOOL SPEED LIMIT

20
OR 15

YOUR SPEED

Electronic Speed Feedback Sign

Nominal 4" (Sch. 40) Aluminum

TO Pull Box

S-5-1 (24" x 48") Highlighted Sign

SCHOOL

FLASHING

Highlighted Sign Controller

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 Assembly (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 A7 Assembly (Conventionally-Powered) is shown. Type B7 Assemblies (Solar-Powered) Similar.
2. Install cameras, point-to-point microwave link, microwave detectors, and antennas in accordance with the manufacturer's instructions.
**LEGEND:**
- **B/C = BACK OF CURB**
- **EOP = EDGE OF PAVEMENT**
- **RPM = RAISED PAVEMENT MARKER**
- **W/R = WHITE/RED RPM**
- **Y/Y = YELLOW/YELLOW RPM**
- **MD/Y = MONO-DIRECTIONAL YELLOW RPM**

**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.

**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.**
RPM PLACEMENT AT INTERSECTIONS

RPM PLACEMENT AT TRAFFIC CHANNELIZATION AT GORE
(Traffic Flows In Same Direction)

RPM PLACEMENT AT TRAFFIC SEPARATION
(Traffic Flows In Opposite Direction)

NOTE:
1. Center the Raised Pavement Markers between chevrons and crosshatching.

LEGEND:
B/C = BACK OF CURB
EDP = EDGE OF PAVEMENT
RPM = RAISED PAVEMENT MARKER
W/R = WHITE/RED RPM
Y/Y = YELLOW/YELLOW RPM
Y/R = YELLOW/RED RPM
ND/R = MONO-DIRECTIONAL YELLOW RPM

Right side of the roadway shown. For the left side of roadway, the pavement marking is yellow and oriented opposite hand.
NOTES:

1. For Type "E" Curb, install RPMs along the pavement edge marking using the same spacing shown.

2. Orient traffic faces of RPMs in curb median radius to be parallel to direction of travel lanes.
RPM PLACEMENT AT ISLANDS
(When called for in the Plans)

NOTES:
1. For Type "E" Curb install RPMs along the pavement edge marking using the same spacing shown.
2. Orient traffic faces of RPMs in median radii to be parallel to direction of travel lanes.

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
Y/R = YELLOW/RED RPM
MD/Y = MONO-DIRECTIONAL YELLOW RPM
MD/W = MONO-DIRECTIONAL WHITE RPM

RPM PLACEMENT AT TRAFFIC SEPARATORS
(When called for in the Plans)
RPM PLACEMENT FOR CROSSEOVERS ON LIMITED ACCESS ROADWAYS

3 Yellow RPMs
See DETAIL "L"

2 Yellow RPMs

1 Yellow RPM

6" Yellow Edge Line

Edge of Traveled Way

DETAIL "L"
NOTES FOR PAVEMENT MESSAGES:

1. When an arrow or another pavement message is used with a pavement message, maintain a minimum distance of "S" between items, measured from the base of each item. 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.

PAVEMENT MESSAGE SPACING TABLE

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Distance &quot;S&quot; (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 25</td>
<td>10 ± 5</td>
</tr>
<tr>
<td>25 - 35</td>
<td>20 ± 5</td>
</tr>
<tr>
<td>40 - 45</td>
<td>30 ± 5</td>
</tr>
<tr>
<td>50 - 60</td>
<td>40 ± 5</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>50 ± 5</td>
</tr>
</tbody>
</table>

GENERAL NOTE:

1. See Index 509-070 for pavement markings at railroad crossings.
PAVEMENT MARKING LINES

10'-30' SKIP LINE WITH SHADOW MARKINGS

DOTTED LINE WITH ALTERNATING SHADOW MARKINGS
(3'-9' Dotted Line Shown, Other Dotted Lines Similar)

YIELD LINES

Yield Lines consist of five, 18" X 27" white triangles which face traffic. Equally space triangles within traffic lane. When a bike lane is present, add one additional triangle in the center of the bike lane.
DESCRIPTION:

1. Lane widths (X) may not be same for each lane in the section.
2. For placement of RPMs, see Index 706-001.
INTERSECTION APPROACH STRIPING WITH TURN
LANES AND BUFFERED BIKE LANE KEY HOLE

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.
PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

CURB AND GUTTER SHOWN
PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

DESCRIPTION:

FLUSH SHOULDER SHOWN

PAVEMENT MARKINGS

INDEX 711-001 SHEET 6 of 13

LAST REVISION 11/01/19

FY 2020-21 STANDARD PLANS
PAVEMENT MARKINGS AND DELINEATORS FOR MEDIAN CROSSLING

**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.
DESCRIPTION:

1. **STANDARD PLANS**
   - **FY 2020-21**
   - **PAVEMENT MARKINGS**

**REV IS IO N**

**INDEX**

**SHEET**

**NOTE:**
- See Sheet 1 for "S" value.
- See DETAIL "C" for specific details.

**SCHEME ONE**

- Use Stop Line At Signalized Intersection Only
- 6" White
- 6" Double Yellow
- 6" White
- 6" Yellow

**SCHEME TWO**

- 25'
- 12'
- 8'
- 8'
- 8'

**TWO WAY LEFT TURN LANE**

(With Single Lane Left Turn Channelization)

**RIGHT TURN LANE DROP AND ISLAND DETAILS**

- LEFT TURN LANE DROP IS MIRROR IMAGE

**RIGHT TURN LANE DROP AND ISLAND DETAILS**

- See DETAIL "C" for specific details.

**TRAFFIC CHANNELIZATION AT GORE**

**NOTE:**
- See Sheet 1 for "S" value.

**300' Max. Intervals Between Double Arrows**

- For use in congested urban areas where available storage length between intersections is limited and a permanent point of transition from the two-way turning lane to the exclusive turning lane can not be determined.

- For use in rural & suburban areas where an adequate storage lane length can be specifically determined.
LEFT ROADWAY CENTERED ON EXISTING ROADWAY

RIGHT ROADWAY CENTERED ON EXISTING ROADWAY

SCHEMES FOR TRANSITION - 2 LANE / 4 LANE ROADWAY

NOTE: Make pavement markings yellow for left roadway centered on existing roadway. Right roadway centered on existing roadway is similar with white pavement markings.

NOTE: See Sheet 1 for "S" value.
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** is measured from the median nose radial point or, when a stop bar is required, from the stop bar.

**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.
4. Space arrows evenly between the first and last arrow with a minimum spacing of "S" between arrows.
5. For turn lanes greater than 225' in length, use a minimum of three arrows. Use additional arrows in accordance with the Plans or as directed by the Engineer. Space arrows evenly throughout the available length with a minimum spacing of "S" between arrows.

**Turn Lanes - Curbed and Uncurbed Medians**

**Urban Conditions**

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Clearance Distance</th>
<th>Brake To Stop Distance</th>
<th>Total Dekel. Distance</th>
<th>Stop Bar Distance</th>
<th>Total Dekel. Distance</th>
<th>Clearance Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>90'</td>
<td>70'</td>
<td>150'</td>
<td>120'</td>
<td>185'</td>
<td>240'</td>
</tr>
<tr>
<td>40</td>
<td>100'</td>
<td>75'</td>
<td>180'</td>
<td>200'</td>
<td>285'</td>
<td>270'</td>
</tr>
<tr>
<td>50</td>
<td>125'</td>
<td>70'</td>
<td>190'</td>
<td>220'</td>
<td>285'</td>
<td>300'</td>
</tr>
<tr>
<td>55</td>
<td>140'</td>
<td>75'</td>
<td>200'</td>
<td>250'</td>
<td>305'</td>
<td>320'</td>
</tr>
<tr>
<td>60</td>
<td>175'</td>
<td>80'</td>
<td>225'</td>
<td>300'</td>
<td>340'</td>
<td>360'</td>
</tr>
</tbody>
</table>

**Rural Conditions**

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Clearance Distance</th>
<th>Brake To Stop Distance</th>
<th>Total Dekel. Distance</th>
<th>Stop Bar Distance</th>
<th>Total Dekel. Distance</th>
<th>Clearance Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>175'</td>
<td>80'</td>
<td>225'</td>
<td>300'</td>
<td>340'</td>
<td>360'</td>
</tr>
<tr>
<td>70</td>
<td>200'</td>
<td>85'</td>
<td>250'</td>
<td>350'</td>
<td>380'</td>
<td>400'</td>
</tr>
<tr>
<td>80</td>
<td>230'</td>
<td>90'</td>
<td>280'</td>
<td>400'</td>
<td>420'</td>
<td>440'</td>
</tr>
<tr>
<td>90</td>
<td>260'</td>
<td>95'</td>
<td>310'</td>
<td>450'</td>
<td>470'</td>
<td>490'</td>
</tr>
<tr>
<td>100</td>
<td>290'</td>
<td>100'</td>
<td>340'</td>
<td>500'</td>
<td>520'</td>
<td>540'</td>
</tr>
<tr>
<td>110</td>
<td>320'</td>
<td>105'</td>
<td>370'</td>
<td>550'</td>
<td>570'</td>
<td>590'</td>
</tr>
<tr>
<td>120</td>
<td>350'</td>
<td>110'</td>
<td>400'</td>
<td>600'</td>
<td>620'</td>
<td>640'</td>
</tr>
</tbody>
</table>

**Arrow Spacing**

1 Arrow

2 Arrows

3 Arrows

**Notes:**

1. When installing lane lines for turn lanes, use the dimensions in the Plans, or use the above values for turn lanes not dimensioned in the Plans.

2. Use a minimum of three arrows. Use additional arrows in accordance with the Plans or as directed by the Engineer. Space arrows evenly throughout the available length with a minimum spacing of "S" between arrows.

3. See Sheet 1 for "S" value.
FOR ACCESSIBLE MARKINGS - SEE ABOVE

FORWARD-IN PARKING

REVERSE-IN PARKING

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, not public sidewalk curb ramp locations. For ramp locations refer to plans.
4. Tint blue pavement markings to match color 15180 of Federal Standards 595a.
5. Mount FTP-22-06 sign below the FTP-21-06 sign.
6. Use of the pavement symbol in accessible parking spaces is optional. When pavement symbol is used, the symbol is either 3'-0" or 5'-0" high and white in color.

PAVEMENT MARKING FOR PARKING
NOTES:
1. All grids are 4" x 4".
2. Pavement Marking Should Not Extend Into Opposing Lane.
3. Center School Pavement Marking In lane.
NOTES:
1. All bicycle markings and pavement messages shall be White.
2. All bicycle markings shall be preformed thermoplastic.
3. All grids are 4" x 4".

---

STANDARD PAVEMENT MARKING MESSAGE LAYOUTS

---
**APPROACH TO INTERSECTIONS DETAILS**

**BUFFERED BIKE LANE STRIPING**
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.
INTERCHANGE MARKINGS

TYPICAL MARKINGS AT DUAL LANE EXITS

TYPICAL LANE DROP MARKINGS AT EXIT RAMPS

PARALLEL ACCELERATION AND DECELERATION LANE

DESCRIPTION:

REVISED 3/1/17

LAST REVISED 3/1/17

INDEX 711-003

SHEET 3 of 7
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.
DESCRIPTION:

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 the entrance and exit of ramps. The spacing on the tangent portion of the ramp section is 300'-0". All delineators are to be setback 4' from shoulder break.

Post delineators should not be discontinued in sections with guardrail.
NOTE:
Do not place wrong way arrows in between consecutive directional arrows.

TYPICAL PARTIAL CLOVERLEAF/TRUMPET EXIT RAMP
**EXIT RAMP WITHOUT AUXILIARY LANE**

- 2 Lanes
- Grids are 4" x 4".
- The message consists of white letters and numbers with black contrasting material.
- The "EXIT NUMBER" position remains the same distance from the beginning of taper regardless of the number of lines of information.
- All grids are 4" x 4".

**EXIT RAMP WITH AUXILIARY LANE**

- 3 Lanes
- Grids are 4" x 4".
- The message consists of white letters and numbers with black contrasting material.
- The "EXIT NUMBER" position remains the same distance from the beginning of taper regardless of the number of lines of information.
- All grids are 4" x 4".

**NOTES:**
1. This Index shows layouts for 1, 2, and 3 digit numbers and letters.
2. The message consists 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".
DESCRIPTION:

REVISION OF STANDARD PLANS FY 2020-21 SHEET INDEX 11/01/17

CONVENTIONAL LIGHTING

NOTES:

1. Barrier wall or bridge mounted poles: The wiring shall be in accordance with Specification 992.

2. Provide cable length to remove fuseholders from transformer base, pole base or pullbox for maintenance. Remove slack from the luminaire cable to provide tension on the fuseholders if the pole breaks away. Pull excess cable into pull box tighten strain relief fittings or cable clamps at both ends of conduit to prevent cable from slipping.

PDF Review Revision 01/01/17

WIRING DIAGRAM

WIRING DETAILS

METAL POLE WIRING DETAIL

METAL POLE DETAIL

Luminaire

Luminaire Cable

Breakaway Fuseholders

Strain Relief Fitting
(See Note 2)

PVC Conduit

PVC Conduit

Pull box

Strain Relief Fitting
(See Note 2)

Equipment Ground Conductor

Pole Ground Conductor

Ground Rod

Access Panel

Breakaway Fuseholders

Surge Protective Device (SPD)

Breakaway Fuseholders on Neutral side with solid copper slug (Line To Neutral Service). Slugs to be same size as 10 Amp fuse.

Breakaway Fuseholder on 480V side with a 10 Amp slow blow fuse for line to line service both lines to be fused.

Breakaway Fuseholders with solid copper slugs. Slugs to be same size as 10 Amp fuse.

12' bed of Pea Rock or crushed stone for drainage

12' of solid copper ground wire clad with approved ground connection (At all pull boxes)

#6 Solid Copper Ground Wire

Grounding Lug

#6 TW Green Bonding Ground Wire

1 1/2" PVC Conduit with Type TC Cable

#6 Solid Copper Ground Wire (Bare)

1" PVC Conduit with #6 Solid Copper Ground Wire (Bare)

U.L. approved Ground Rod 5/8" diameter 20' long copper clad with approved ground connection (At all pull boxes)

Length of Bracket Arm unless otherwise noted on plans

Pole setback 20'

Pole Wire Detail

Metal Pole Wire Detail

Pull Box (See Metal Pole Wire Detail)

Edge of traveled pavement or face of curb.

12' bed of Pea Rock or crushed stone for drainage.
NOTES:

1. Use compacted select material in accordance with Index 120-001.
2. Concrete shall be Class N5 with a minimum strength at 28 days of f’c=2.5 ksi.
3. Outside edge of slab shall be cast against formwork.
4. The pull box shown is 13” x 24”; others approved under Specification 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.

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 13" x 24"; others approved under Specification 635 may be used.
5. Slabs to be placed around all Poles and Pull Boxes. In urban areas or where space is limited slab dimensions may be adjusted as shown in the plans.
6. Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.
7. The expansion joint shall consist of ½" of closed-cell polyethylene foam expansion material. The top ½" of expansion material shall be removed after pouring the slab and sealed with an APL approved Type A sealant meeting the requirements of Specification 932.

Slab Dimensions

For Pole and Pull Box Locations

Slab Details

Section B-B

Shaft Location

Pull Box Location

Select Material

SLAB DIMENSIONS

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi. Use compacted select material in accordance with Index 120-001. Outside edge of slab shall be cast against formwork. The pull box shown is 13" x 24"; others approved under Specification 635 may be used. 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. 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 (EPA): 1.55 SF
   b. Weight: 75 lb.

2. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not included in the Plans.

3. Materials:
   a. Pole, Pole Connection Extrusions and Arm Extrusions: ASTM B221, Alloy 6063-T6 or Alloy 6061-T6
   b. Bars, Plates, Stiffeners and Backer Ring: ASTM B221, Alloy 6063-T6
   c. Caps and Covers: ASTM B-26, Alloy 319-F
   d. Steel Bearing Plate: ASTM A709 or ASTM A36 Grade 36
   e. Aluminum Weld Material: ER 4043
   g. Bolts, Nuts and Washers:
      a. Shoe Base Bolts: ASTM F3135, Grade A325, Type 1
      b. Nuts: ASTM A490 Grade UN Heavy-Hex
      c. Anchor Bolts: ASTM F3135 Grade 55
      d. Nuts: ASTM A563 Grade A Heavy-Hex
      e. Pipe Nipple: ASTM A27
   h. Stainless Steel Fasteners: ASTM F593 Alloy Group 2, Condition A, CW1 or S11
   i. Nut Covers: ASTM B26, Alloy 319-F
   j. Concrete: Class I
   k. Reinforcing Steel: Specification 415
   l. Embedded Junction Box (EJB): Install EJBs per Note 4 and in accordance with Specification 635, as shown on the following Sheets.

4. Fabrication:
   a. Weld Arm and Pole (Alloy 6063) in the 14 temper using 4043 filler. Age the Arm and Pole artificially to the T6 temper after welding.
   b. Transverse welds are only allowed at the base.
   c. Roadway Light Pole Taper: Taper as required to provide a round top O.D. of 6" and a base O.D. of 8" for 20' and 25' mounting heights and 10" O.D. for poles with 30' to 50' mounting heights. Portions of the pole near the base shoe and at the arm connections may be held constant to simplify fabrication.
   d. Median Barrier Mounted Light Pole Taper: Taper as required to provide a 6" O.D. round top with an 11" x 7" O.D. oblong base. Portions of the pole near the base and at the arm connections may be held constant at 11" x 7" od and 6" round respectively to simplify fabrication.
   e. Provide 2", 2.5", or 3" hoop at top of pole for electrical wires.
   f. Hot Dip Galvanize after Fabrication.
   g. Perform all welding in accordance with AWS D1.2.
   h. Embedding Junction Box (EJB):
      a. Weld all seams continuously and grind smooth.
      b. Hot Dip Galvanize after Fabrication.
      c. Provide a watertight cover with neoprene gasket and secure cover with galvanized screws.
   i. Median Barrier Mounted Aluminum Light Poles, the fabricator must demonstrate the ability to produce a crack free pole. The fabricator's Department-approved QC Plan must contain the following information prior to fabrication:
      a. Tests demonstrating a pole with a 1/2" wall thickness achieves ultimate moment capacity of 36 kip-ft in the strong axis and 30 kip-ft in the weak axis.
      b. Tests demonstrating a pole with a 1/8" wall thickness achieves an ultimate moment capacity of 44 kip-ft in the strong axis and 37 kip-ft in the weak axis.
      c. Test results showing the pole does not buckle at the shape transition area under the ultimate moment capacity loads.
      d. Complete details and calculations for the reinforced 4" x 6" (Min) handhole located 1'-6" above the base plate.
   j. Identification Tag: Submit details for approval:
      a. 2" x 4" (Max) Aluminum identification tag.
      b. Locate on the inside of the transformer base and visible from the door opening.
      c. Secure to transformer base with 5/16" diameter stainless steel rivets or screws.
   k. Include the following information on the ID Tag:
      1. Financial Project ID
      2. Pole height
      3. Manufacturer's Name

5. Coatings/Finish:
   a. Pole and Arm Finish: 50 grit satin rubbed.
   b. Galvanized Steel Bolts, Screws, Nuts and Washers: ASTM F1554 Grade 55
   c. Hot Dip Galvanize EIB and other steel items including poles and plate washers: ASTM A123

6. Construction:
   a. Foundation: Specification 435, except payment for the foundation is included in the cost of the pole.
   b. Frangible Base, Base Shoe, and Clamp:
      a. Certify that the Clamp, Frangible Transformer Base, and Base Shoe Design are capable of providing the required capacity.
      b. Certify the Base conforms to the current FHWA required AASHTO Frangibility Requirements, tested under NCHRP Report 350 Guidelines (e.g. Akron Foundry TB1-17).
      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:

120 MPH

140 MPH

160 MPH
Brevard, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota and St. Lucie Counties.
### ARM-POLE TABLE

<table>
<thead>
<tr>
<th>Wind Speed and Arm Lengths (ft)</th>
<th>120 mph</th>
<th>140 mph</th>
<th>160 mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
</tr>
<tr>
<td>15</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
</tr>
<tr>
<td>15</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
</tr>
<tr>
<td>15</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
</tr>
<tr>
<td>15</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
</tr>
</tbody>
</table>

### ARM POLE NOTES:
1. See ARM SECTION detail on Sheet 3 for all A1 and A2 Values.
2. See Pole Table for all P1, P2, and P3 values.
4. For 20' and 25' assembly heights use only 8' or 10' arm A1 with P0.

### 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>P0</td>
<td>0.126</td>
<td>1/8</td>
<td>1/8</td>
</tr>
<tr>
<td>P1</td>
<td>0.156</td>
<td>1/4</td>
<td>1/4</td>
</tr>
<tr>
<td>P2</td>
<td>0.200</td>
<td>1/4</td>
<td>1/4</td>
</tr>
<tr>
<td>P3</td>
<td>0.313</td>
<td>1/4</td>
<td>1/4</td>
</tr>
</tbody>
</table>

### FOUNDATION 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>20</td>
<td>Pole P0</td>
<td>Pole P0</td>
<td>Pole P0</td>
<td>Pole P0</td>
</tr>
<tr>
<td>25</td>
<td>Pole P0</td>
<td>Pole P0</td>
<td>Pole P0</td>
<td>Pole P0</td>
</tr>
<tr>
<td>30</td>
<td>Pole P1</td>
<td>Pole P1</td>
<td>Pole P1</td>
<td>Pole P1</td>
</tr>
<tr>
<td>35</td>
<td>Pole P2</td>
<td>Pole P2</td>
<td>Pole P2</td>
<td>Pole P2</td>
</tr>
<tr>
<td>45</td>
<td>Pole P2</td>
<td>Pole P2</td>
<td>Pole P2</td>
<td>Pole P2</td>
</tr>
</tbody>
</table>

### POLE AND BASE DETAILS FOR ROADWAY ALUMINUM LIGHT POLE

- **FOUNDATION NOTES:**
  1. Depths shown are for slopes equal to or flatter than 1:6. For slopes steeper than 1:4 and equal to or flatter than 1:2 add 2'-6" to foundation depths shown.
  2. Foundation Tie Bars: #4 Tie Bars @ 12" Centers (max.) or #10 (max. #12) Spiral @ 6" Pitch. 3 Flat turn top and 1 Flat turn bottom.

- **POLE BASE ELEVATION:**
  - Cast Aluminum Base Shoe (See General Notes on Sheet 1)
  - Shoe Base Bolt with Nut and Washer
  - Anchor Bolt and Washer as Required by Approved Breakaway Transformer Base Manufacture (Typ.)

- **BASE TENON:**
  - Cast Aluminum Pressure Mounted Nut Cover - Bolted Attachment Optional

- **TOP MOUNT TENON:**
  - Cast Aluminum Base Shoe (See Pole Table)
  - Shoe Base Bolt with Nut and Washer

- **FOOTING:**
  - Cast-in-Place or Precast Class I Concrete may be used in accordance with the minimum Aluminum Association tolerances.
  - Thicker walls are permitted and tapered walls may be used in accordance with the Aluminum Association tolerances.

### ARM-POLAR 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>20</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
<td>A4-P1</td>
</tr>
<tr>
<td>25</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
<td>A4-P1</td>
</tr>
<tr>
<td>30</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
<td>A4-P1</td>
</tr>
<tr>
<td>35</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
<td>A4-P1</td>
</tr>
<tr>
<td>40</td>
<td>A1-P1</td>
<td>A2-P1</td>
<td>A3-P1</td>
<td>A4-P1</td>
</tr>
</tbody>
</table>

### ARMS TABLE

- **ARM SECTION detail on Sheet 3:**
  - A1-P1
  - A2-P1
  - A3-P1

- **TOP MOUNT POLE TABLE FOR STANDARD ALUMINUM LIGHT POLES WITH TOP MOUNT:**
  - Cast-in-Place or Precast Class I Concrete may be used in accordance with the minimum Aluminum Association tolerances.

### NOTES AND REMARKS:
- **REVISED: 10/29/19**
- **INDEX: 715-002**
- **F-FOOT:**
  - Foundation Tie Bars: #4 Tie Bars @ 12" Centers (max.) or #10 (max. #12) Spiral @ 6" Pitch. 3 Flat turn top and 1 Flat turn bottom.

- **SECTION C-C:**
  - Cast Aluminum Base Shoe (See Pole Table)
  - Shoe Base Bolt with Nut and Washer

- **VIEW B-B:**
  - Cast Aluminum Base Shoe (See Pole Table)
  - Shoe Base Bolt with Nut and Washer

- **TRANSFORMER BASE:**
  - Cast Aluminum Pressure Mounted Nut Cover - Bolted Attachment Optional

- **POLE TABLE:**
  - Cast Aluminum Base Shoe (See General Notes on Sheet 1)
  - Shoe Base Bolt with Nut and Washer

- **FOUNDATION TABLE:**
  - Cast-in-Place or Precast Class I Concrete may be used in accordance with the minimum Aluminum Association tolerances.
  - Thicker walls are permitted and tapered walls may be used in accordance with the Aluminum Association tolerances.
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.

STIFFENER PLATE DETAIL

BASE PLATE PLAN

BASE PLATE ELEVATION

BEARING PLATE ELEVATION

BEARING PLATE PLAN

BASE PLATE DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE
PLAN

5'-6"  10'-0"

20'-0" Min.

2 Sp. @ 16" ±

2 Sp. @ 16" ±

Spacing Bars 5V & 5W1

REINFORCING STEEL (NOT SHOWN)

Bars 5W1

(See Note 2)

 Bars 5V

† Sp. @ 8" ±

3" Cover (Top and sides)

3" Cover (Bottom)

EMBEDDED JUNCTION BOX DETAILS

ANCHOR BOLTS

BASE PLATE

Bars 5V

Bars 5W1

Construction Joint (Typ.)

See Roadway Plans

JOINT (Typ.)

See Roadway Plans

Bearing Plate

END VIEW

SPREAD FOOTING DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE

NOTES:

1. For Bearing Plate and Base Plate Details, see Sheet 5.

2. For connections to adjacent Median Barrier, use the Doweled Joint detail 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 3'-0" with the longitudinal steel shown herein.
**DESCRIPTION:**

Last Revision of Standard Plans FY 2020-21

**REVISION** 10/29/19

**INDEX** 715-002

---

**NOTES:**

1. For Base Plate Details, Bearing Plate Details, and Detail 'A', see Sheet 5.
2. See Index 521-426 for details of adjacent Traffic Railing (Median 36" Single-Slope) and for angles 'A' and 'B'.
3. See Index 630-010 for conduit, EJB, and supplemental reinforcing details.

---

**ELEVATION**

(Longitudinal and transverse deck reinforcing steel not shown)

**PLAN**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**SECTION D-D**

(Longitudinal and transverse deck reinforcing steel not shown)

---

**DETAILS FOR TRAFFIC RAILING (MIDIAN 36" SINGLE-SLOPE) MOUNTED ALUMINUM LIGHT POLE**

---

**STANDARD ALUMINUM LIGHTING**

---

**LAST REVISION** 10/29/2019

**DESCRIPTION:**

---

**INDEX** 715-002

**SHEET** 8 of 8
HIGH MAST LIGHTING NOTES:

1. Poles are designed to support the following:
   A. One (1) cylindrical head assembly with a maximum effective projected area of 5 sf and 340 lbs (Max.)
   B. Eight (8) cylindrical luminaires with a maximum effective projected area of 1.5 sf and 71 lbs each.

2. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

3. High Mast Structure Materials:
   A. Poles and Backing Rings:
      a. Less than 7.5": ASTM A1011 Grade 50, 55, 60 or 65
      b. Greater than or equal to 7.5": ASTM 4072 Grade 50, 55, 60 or 65
      c. ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield)
   B. Sheet Pile:
      a. AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
      b. Secured with 1/8" diameter stainless steel rivets or screws.
   C. Identification Tag:
      a. 2" x 4" (Max.) aluminum tag
      b. Located on the inside of the pole and visible from the handhole
      c. Secure with 1/8" diameter stainless steel rivets or screws.
      d. Include the following information on the ID Tag:
         i. Project ID
         ii. pole type, pole height, pole diameter
         iii. Splices for a minimum length of 42 inches.
   D. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus 1/16" and anchor bolts holes are 6.
   E. Base Wall Thickness: 5.
   F. Yield Strength (Fy of Steel): 4.
   G. Manufacturers’ Name: 3.
   H. Pole Type: 2.
   I. Financial Project ID: 1.
   J. Hot Dip Galvanize After Fabrication
   K. Galvanize Anchor Bolts, Nuts and Washers: ASTM F2329
   L. Hot Dip Galvanize all other steel items including plate washers: ASTM A123

4. Fabrication:
   A. Welding:
      a. Specified Section 660-6-4 and 660-6-5.
      b. AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
      c. Specification Section 14.4.4.
   B. Poles:
      a. Round or 16-sided (Min)
      b. Larger pole diameters at 0.14 inches per foot
      c. Pole shaft may be up to three sections (using telescopic field splices)
      d. Circumferentially welded pole shafts are not permitted.
   C. Identification Tag: (Submit details for approval)
      a. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection and use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of 42 inches.
      b. Secure with 1/8" diameter stainless steel rivets or screws.
      c. Include the following information on the ID Tag:
   D. Cylindrical luminaires:
      b. Place wire screen between top of foundation and bottom of baseplate in accordance with AASHTO LRFD Specification 649-6.
   E. Hot Dip Galvanize After Fabrication

5. Coating:
   A. Galvanize Anchor Bolts, Nuts and Washers: ASTM F2329
   B. Hot Dip Galvanize all other steel items including plate washers: ASTM A123

6. Construction:
   A. Foundation: Specification 455 Drilled Shaft, except that payment is included in the cost of the Structure.
   B. After Installation: Place wire screen between top of foundation and bottom of baseplate in accordance with Specification 649-6.

7. Wind Speed by County:
   A. 130 MPH
   B. 150 MPH
   C. 170 MPH
      1. Broward, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota and St. Lucie Counties.

STANDARD POLE DESIGN NOTES

11/01/18

INDEX
715-010
1 of 6
**POLE DESIGN TABLE**

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>SECTION 1 (TOP)</th>
<th>SECTION 2</th>
<th>SECTION 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pole Overall Height (ft)</td>
<td>Base Dia (in.)</td>
<td>Minimum Splice Length (in.)</td>
</tr>
<tr>
<td>130 mph</td>
<td></td>
<td>80</td>
<td>41'-0&quot;</td>
<td>0.250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>23'-0&quot;</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>41'-0&quot;</td>
<td>0.250</td>
</tr>
<tr>
<td>150 mph</td>
<td></td>
<td>80</td>
<td>41'-0&quot;</td>
<td>0.250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>23'-0&quot;</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>41'-0&quot;</td>
<td>0.250</td>
</tr>
<tr>
<td>170 mph</td>
<td></td>
<td>80</td>
<td>40'-0&quot;</td>
<td>0.250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>23'-0&quot;</td>
<td>0.179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>41'-0&quot;</td>
<td>0.250</td>
</tr>
</tbody>
</table>

* Diameter Measured Flat to Flat

**BASE PLATE AND BOLTS DESIGN TABLE**

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Diameter (in.)</th>
<th>Wall Thickness (in.)</th>
<th>No. of Bolts</th>
<th>Bolt Diameter (in.)</th>
<th>Bolt Embedment (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td></td>
<td>80</td>
<td>30.0</td>
<td>2'-0&quot;</td>
<td>1.75</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>34.0</td>
<td>3.000</td>
<td>2'-0&quot;</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>38.0</td>
<td>3.000</td>
<td>2'-0&quot;</td>
<td>2.00</td>
</tr>
<tr>
<td>150 mph</td>
<td></td>
<td>80</td>
<td>30.0</td>
<td>2'-0&quot;</td>
<td>1.75</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>36.0</td>
<td>3.000</td>
<td>2'-0&quot;</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>44.0</td>
<td>3.000</td>
<td>2'-0&quot;</td>
<td>2.25</td>
</tr>
<tr>
<td>170 mph</td>
<td></td>
<td>80</td>
<td>32.0</td>
<td>3.000</td>
<td>2'-0&quot;</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>37.0</td>
<td>3.000</td>
<td>2'-0&quot;</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>46.0</td>
<td>3.000</td>
<td>3'-0&quot;</td>
<td>2.25</td>
</tr>
</tbody>
</table>

**SHAFT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter</th>
<th>Shaft Length</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td></td>
<td>80</td>
<td>4'-0&quot;</td>
<td>17'-0&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>4'-0&quot;</td>
<td>14'-0&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>4'-0&quot;</td>
<td>16'-0&quot;</td>
</tr>
<tr>
<td>150 mph</td>
<td></td>
<td>80</td>
<td>4'-0&quot;</td>
<td>17'-0&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>5'-0&quot;</td>
<td>18'-0&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>17'-0&quot;</td>
</tr>
<tr>
<td>170 mph</td>
<td></td>
<td>80</td>
<td>4'-0&quot;</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>5'-0&quot;</td>
<td>18'-0&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>20'-0&quot;</td>
</tr>
</tbody>
</table>

**ADDITIONAL SHAFT DEPTH DUE TO GROUND SLOPE**

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:5</td>
<td>3'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>1:4</td>
<td>4'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>5'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>1:2</td>
<td>7'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

* Diameter Measured Flat to Flat
For Pull Boxes between Poles refer to Index 715-001.

1. Slabs to be placed around all Poles and Pull Boxes.
2. Conductors for grounding.
3. Circuit Breaker Panel Box with Surge Arrester mounted to Top of Circuit Breaker Panel Box for easy access. Service entrance fittings shall be used on all conductors entering Circuit Breaker Panel Box.

NOTES:
1. At all pull boxes and pole bases, ends of conduit shall be sealed in accordance with Specification 630.
2. Minimum of (6) ⅜ x 20' approved ground rods.
3. Interrod distances must be a minimum of 10'
4. Slabs to be placed around all Poles and Pull Boxes.
5. For Pull Boxes between Poles refer to Index 715-001.
The contractor's attention is directed to those plan sheets detailing the mounting of luminaires at the pole top. Particular attention is directed to alignment of luminaire light distributions. Special attention must be exercised in the physical alignment of these luminaires to ensure that the approved photometric layout is physically produced at each lighting standard in the field. A marking shall be placed on the external face of the refractor to allow visual inspection of alignment. The marking shall correspond to the 0° axis of the refractor.

### Luminaire Support Ring
- **Male Inlet**
- **600 Volt rated Pole Cable**
- **Size of conductors to be determined by luminaire load.**
- **Lift cables**
- **Luminaire support ring**
- **2" Slip-fitter Assembly**

### Pole Cable Termination
- **Positive drive reversible winch**
- **600 Volt rated Circuit Breaker Cable.**
- **Size of conductors to be determined by luminaire load.**
- **Winch cable**
- **Covered receptacle to power luminaires when in the lowered position with Male Inlet.**

### Remote Control Switch
- **Remote control switch**
- **Supply cable receptacle**
- **Step-down transformer provided with 320% grounded receptacle for electric drill & receptacle for supply cable.**
- **25' minimum remote control cable same as Pole Cable.**

### Grounding Conductor
- **4/0 Bonding Ground**
- **Grounding Array**
- **#6 Bonding Ground**
- **480V Phase to Phase**
- **Conduit**
- **Equipment Ground Conductor**
- **20' Ground Rod**
- **To Luminaire**
- **Circuit Panel Breaker**

### Lowering Details
- **A surge protector shall be located in the pole with the circuit breaker.**
- **A surge protector shall be mounted at the front near hand hole for easy access.**
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 15" 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.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.

Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
Use compacted select material in accordance with Index 120-001.
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.
**CROSSING SURFACES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Concrete</td>
</tr>
<tr>
<td>R</td>
<td>Rubber</td>
</tr>
<tr>
<td>RA</td>
<td>Rubber/Asphalt</td>
</tr>
<tr>
<td>TA</td>
<td>Timber/Asphalt</td>
</tr>
</tbody>
</table>

**STOP ZONE FOR RUBBER CROSSING**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Zone Length (Distance From Stop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 or Less</td>
<td>25'</td>
</tr>
<tr>
<td>50 - 55</td>
<td>35'</td>
</tr>
<tr>
<td>60 - 65</td>
<td>50'</td>
</tr>
<tr>
<td>70</td>
<td>60'</td>
</tr>
</tbody>
</table>

**GENERAL NOTES**

1. The Railroad Company will furnish and install all track bed (ballast), crossties, rails, crossing surface panels and accessory components. All pavement material, including that through the crossing, will be furnished and installed by the Department or its Contractor, unless negotiated otherwise.

2. When a railroad grade crossing is located within the limits of a highway construction project, a transition pavement will be maintained at the approaches of the crossing to reduce vehicular impacts to the crossing. The transition pavement will be maintained as appropriate to protect the crossing from low clearance vehicles and vehicular impacts until the construction project is completed and the final highway surface is constructed.

3. The Central Rail Office will maintain a list of currently used Railroad Crossing Products and will periodically distribute the current list to the District Offices as the list is updated.

4. The Railroad Company shall submit engineering drawings for the proposed crossing surface type to the Construction Project Engineer and/or the District Rail Office for concurrence along with the list of Railroad Crossing Products. The approved engineering drawings of the crossing surface type shall be made a part of the installation agreement.

5. Sidewalks shall be constructed through the crossing between approach sidewalks of the crossing. Sidewalks shall be constructed with appropriate material to allow unobstructed travel through the crossing in accordance with ADA requirements.

6. Install pavement in accordance with the Specifications.

7. The Department will participate in crossing work that requires adjustments to rail outside of the crossing, no more than 50 feet from the edge of the travel way.

Notes:

1. Type R Crossings are NOT to be used for multiple track crossings within zones for an existing or scheduled future vehicular stop. Zone lengths are charted above.

2. Single track Type R Crossings within the zones on the chart may be used unless engineering or safety considerations dictate otherwise.
Crossing Shoulder Pavement
(Except Area Occupied By Crossing Surfacing Material):
a. To Shoulder Line For Outside Shoulders Less Than 8' Wide.
b. To 8' Maximum Width For Outside Shoulders 8' Or Wider
      (Regardless Of Approach Shoulder Pavement Width).
c. 4 For Median Shoulders

* Where the existing shoulder is substandard for the facility type, the shoulder width is to be widened to accommodate crossing shoulder pavement.

Pavement
Beveled Edge (1:4 Slope)
Shoulder Pavement
Edge Of Travel Way

Railroad Signal, Gate
Or Signal And Gate
Varies (2 Min.)

See ‘Crossing Shoulder Pavement’ Above

50' Min.
With Or Without Signal,
Gate Or Signal And Gate

Vary
(Width Varies)

HALF PLAN
ROADWAYS WITH FLUSH SHOULDERS

RR Crossing Varies
(Full Depth Asphalt/Rubber Shown)
Varies
(1' To 4.5')

FRICITION COURSE
Cap Or Expansion
Material (When Required
By Crossing Type)

Overbuild
Type SP Asphalt (500 lb/SY)

Filter Fabric (Optional
With RR Company)

SECTION VIEW

TYPICAL CROSSING MATERIAL REPLACEMENT AT RR CROSSINGS

VERTICAL ROADWAY ALIGNMENT THROUGH A RAILROAD CROSSING

3' Curb Transition
Drop Curb
Concrete Curb And Gutter

Utility Strip
Asphalt

Concrete Curb And Gutter

12'

30'

30'

12'

HALF PLAN
CURBED ROADWAYS

To prevent low-clearance vehicles from becoming caught on the tracks, the crossing surface should be at the same
plane as the top of the rails for a distance of 2 feet outside the rails. The surface of the highway should also not
be more than 3 inches higher or lower than the top of the nearest rail at a point 30 feet from the rail unless track
superelvation 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 superelvated, or a roadway approach section that
is not level, will necessitate a site specific analysis for rail clearances.

Note: For location of railroad signals, gates or signals and gates see
Index 509-070

For location of railroad signals,
gates or signals and gates see
Index 509-070

Department Participation
50' Max

12'

30'

12'

30'

V = 50'

Grade

3'

2'

H1

Level

H2

Level

Crossing

3'

2'

Grade

3'

2'

H1

Level

H2

Level

Crossing

3'

2'

Grade

3'

2'

H1

Level

H2

Level

Crossing