FY 2020-21 STANDARD PLANS
FOR ROAD CONSTRUCTION

Effective for Projects with Lettings in the Fiscal Year (FY) from
July 1, 2020 through June 30, 2021

State of Florida Department of Transportation
Office of Design
Mail Station 32
605 Suwannee Street
Tallahassee, Florida 32399-0450
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 expressly or implied by these standards that are covered by patent, copyright, or proprietary privilege is the sole responsibility of the user. Any infringement on the rights of the inventor, patentee, assignee or licensee shall be the sole responsibility of the user. For additional information refer to Subsection 7-3 of the FDOT Standard Specifications for Road and Bridge Construction.

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

Structure is defined in Section 334.032(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 the railings of abutments or spring lines of arches or extreme ends of openings for multiple boxes, and those other bridges subject to safety inspection under Section 335.074, F.S.” A roadway is not otherwise a structure for the purposes of Procedure 050-020-026.

Therefore, plans, blueprints, schematic drawings, and diagrams of structures owned by the Department are exempt from the public records provisions of Chapter 119, F.S. This exemption includes draft, preliminary, and final formats as described in Procedure 050-020-026 and includes paper, electronic, and other formats. The Department has provided for the limited release of such documents in Procedure 050-030-026.

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. 050-020-36). The form also advises the requestor that the entity or person receiving the documents shall maintain their exempt status. This procedure applies to all Department internal or contracted staff who have access to such Exempt Documents in their Department work. Refer to Procedure 050-020-026 for additional requirements.

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

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

The official version of the Standard Plans is the PDF version and can be found at:
http://www.fdot.gov/design/standardplans
October 24, 2019

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

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

Dear Mr. Christian:

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

Sincerely,

Derwood Sheppard, P.E.
State Standard Plans Engineer

For FHWA Florida Division Office use:

Approved for Use on Federal Aid Projects:

Bren George-Nwabugwu Sr. 10/28/19

For James Christian, P.E.
Division Administrator

www.fdot.gov
ABBREVIATIONS
FY 2020-21 STANDARD PLANS

Abbreviation

Meaning

----------------- A ----------------AASHTO
AC
Accel.

American Association Of State Highway And Transportation Officials
Alternating Current
Acceleration

ACI

American Concrete Institute

ADA

Americans With Disabilities Act

ADT

Average Daily Traffic

AFAD

Automated Flagger Assistance Device

AISC

American Institute Of Steel Construction

AISI

American Iron and Steel Institute

Abbreviation

Meaning

----------------- C ----------------CP
CSIP
CSL
CTPB
Ctr., Ctrs.

Shear Modulus

g

Gram

Cross-hole Sonic Logging
Cement Treated Permeable Base
Center

Grd.

----------------- D ----------------D
Dbl.
Decel.
Deg.

Depth, Distance or Diameter
Diameter

Dimension
Distance

Approximate

DMM

Domestic Mail Manual

Assem.

Assembly

ASTM

American Society For Testing And Materials

ATPB

Asphalt Treated Permeable Base

Auxil.

Auxiliary

AWG

American Wire Gauge

AWS

American Welding Society

----------------- B ----------------Bot.
Brkwy.
b/w

Bottom
Breakaway
Between

----------------- C ----------------CC, C to C
C & G
C.C.
CCTV
CFR
CFRP
cfs, CFS
CIP, C.I.P. or C-I-P

E.P. or EOP
EA or Ea.
EIA
El. or Elev.
Embed.
EPDM
Eq.
Equip.

Superelevation Rate
Edge Of Pavement
Each
Electronic Industries Alliance
Elevation
Embedment
Ethylene Propylene Diene Monomer
Equation or Equal
Equipment

Inv.

Invert

ITS

Intelligent Transportation Systems

----------------- J ----------------JCT
Jt.
k
kip
ksi
kVA
L

Example

LA

Exist.

Existing

lb or lbs.

Exp.

Expansion

lb/sy

Carbon Fiber Reinforced Polymer

Ext.

Extension

lbf

Cast In Place

Center Line
Clearance

FAC
FC
Fdn.
F.L. or ¥
Fl.

Florida Administrative Code
Friction Course

Kips Per Square Inch
Kilovolt Ampere

LBR
LF

Length
Limited Access
Pound(s)
Pounds Per Square Yard
Pound force
Lime rock Bearing Ratio
Linear Foot (Feet)
Length

Foundation

Long.

Longitudinally or Longitudinal

Flow Line

LRFD

Load Resistance Factor Design

Florida

Corrugated Metal Pipe

FDEP

Florida Department Of Environmental Protection

Con.

Connection

FDOT

Florida Department Of Transportation

Concrete

FHWA

Federal Highway Administration

Const.

Construct or Construction

FIB

Florida-I Beam

Cont.

Continuation or Continuous

F.S.

Florida Statutes

Corr.

Corrugated

FS

Far Side

Ft.

Foot or Feet

FTP

1000 Pounds

Lgth.

CMP

Cover

kip

----------------- L -----------------

Ex.

----------------- F -----------------

Junction
Joint

----------------- K -----------------

Code of Federal Regulations
Cubic Feet Per Second

Inch(es)
Interior

Electronic Tough Pitch

Circuit

Cov.

in.

Inside Diameter or Identification

Int.

ETP

Ckt.

Conc.

ID, I.D.

High Strength Horizontal Vertical
I -----------------

District Traffic Operations Engineer

Curb And Gutter
Closed-Circuit Television

HSHV
-----------------

Horsepower or H-Pile

Incorporated

Et Cetera (And So Forth)

Crash Cushion

HP

Inc.

etc.

Complete Joint Penetration

Cl.

Ditch Point Intersection

----------------- E ----------------e

High Strength

Ditch

Center to Center

CJP
¡

DTOE

Head

Horizontal

Dim.

Dt

Hd.
H.S., HS
Horiz.

Degree

Dist.
DPI

Ground

----------------- H -----------------

Deceleration

Approved Products List

Asphalt

Glass Fiber Reinforced Polymer

High Density Polyethylene

Approach
American Road & Transportation Builders Association

Galvanized
Ground Fault Interrupter

HDPE

APL

Asph.

Gauge or Gage

Double

App.
ARTBA

GFI
GFRP

Aluminum

Approx.

Ga.
Galv.

Cubic Yard

Alum.

American National Standards Institute

G

Cost Savings Initiative Proposal

Cubic Feet

Dia. or Ø

Apparent Opening Size

----------------- G -----------------

Concrete Pipe

Cu. Ft.

Alternate

AOS

Meaning

Cu. Yd., CY,

Alt.
ANSI

Abbreviation

Florida Traffic Plans

LRS
LS
LSD
Lt.

Low-Relaxation Strand
Lump Sum
Lump Sum per Day
Left


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<td>PSI</td>
<td>Pounds Per</td>
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<td>Display Unit</td>
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**ABBREVIATIONS**

**FY 2020-21 STANDARD PLANS**
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### General Construction Operations

#### Maintenance of Traffic

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<td>Reorganized Index; Moved payment information to Specifications. Sheet 1: General Notes and Overview and Ditch Transitions; Design Notes to the Drainage Manual; Added General Note on quantities for estimating purposes only. Sheet 2: Combined details for Round and Elliptical Concrete Pipe; Added Section A-A &quot;Pipe Slab Fillet&quot;; 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.</td>
<td></td>
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## FY 2020-21 REVISIONS LOG

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<tr>
<td>430-090</td>
<td>Reorganized Index; Added Additional Sheet.</td>
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<tr>
<td>436-001</td>
<td>Reorganized Index; Added Additional Sheet.</td>
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<tr>
<td>440-001</td>
<td>Reorganized Index; Added Additional Sheet.</td>
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<td>444-001</td>
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<td>448-001</td>
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<tr>
<td>450-001</td>
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<tr>
<td>450-010</td>
<td>Sheet 2: Removed INSERT DETAIL.</td>
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<tr>
<td>450-040</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
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<tr>
<td>450-054</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
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<tr>
<td>450-062</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
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<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
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<td>450-084</td>
<td>Sheet 1: Deleted Intermediate Diaphragm Inserts.</td>
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<td>450-096</td>
<td>Sheet 2: Deleted Intermediate Diaphragm Inserts.</td>
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<tr>
<td>450-120</td>
<td>Sheet 2: Deleted INSERT DETAIL.</td>
</tr>
<tr>
<td>455-440</td>
<td>Sheet 2: Changed bend diameter of GFRP strip/ins; Added new Note 5 and renumbered.</td>
</tr>
<tr>
<td>458-100</td>
<td>Changed Blastomeric Seal to Strip Seal throughout Index.</td>
</tr>
<tr>
<td>515-052</td>
<td>Sheet 8: Changed embedment depths and anchor lengths for Case I and Case 1b.</td>
</tr>
<tr>
<td>515-062</td>
<td>Sheet 9: Changed embedment depths and anchor lengths for Case I and Case 1b.</td>
</tr>
<tr>
<td>521-001</td>
<td>Sheets 15 &amp; 16: Changed &quot;Shoulder Barrier Inlet&quot; to &quot;Adjacent Barrier Inlet&quot; callouts.</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; (note, correction and Index name update).</td>
</tr>
<tr>
<td>521-040</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-045</td>
<td>Sheet 1: Changed Payment Note.</td>
</tr>
<tr>
<td>521-027</td>
<td>Sheets 1 – 4 Remerodered.</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>521-510</td>
<td>Sheet 1: Changed IY maximum spacing for 172 V-groove in consideration of 12 precast sections.</td>
</tr>
<tr>
<td>521-600</td>
<td>Sheet 1: Added organic felt bond breaker on surfaces of wall between C1-P coping to prevent cracking of the coping and wall.</td>
</tr>
<tr>
<td>521-610</td>
<td>Sheet 2: Added bond breaker between face of wall and C-1-P coping.</td>
</tr>
<tr>
<td>521-620</td>
<td>Sheet 3: Clarified Note referenced in Partial Plan View for Approach Slab.</td>
</tr>
<tr>
<td>521-660</td>
<td>Sheet 1: Corrected reference to Approach Slab Note in Partial Plan View; Changed maximum spacing of 3/4&quot; expansion joint.</td>
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<tr>
<td>522-002</td>
<td>Sheet 1: Changed 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>Sheet 1: 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.I.</td>
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<tr>
<td>536-001</td>
<td>All Sheets: Renumbered for additional Sheets 14 and 16.</td>
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Special Notes and Specifications:

- 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. |
- Sheet 2 & 3: Removed modified three beam from Note 8. |
- Sheet 5: Removed modified three beam details and Note 5; Added single-faced-to-double-faced guardrail connection detail. |
- Sheet 6: Removed modified three-beam section and post information from table. |
- Sheet 7: Removed flared approach terminal; Added note 6 "clear area requirement"; Added approach terminal callout at begin/end guardrail location; Added new information to Note 5 to allow substitution for miscellaneous asphalt pavement placed upstream of post 1. |
- Sheet 8: Renumbered Note 7 to Note 9 and deleted reference to flare; Added a new Note "clear area requirement"; Added approach terminal callout at begin/end guardrail location; Added new Note 8 to allow substitution for miscellaneous asphalt pavement placed upstream of post 1. |
- Sheet 9: Deleted trailing anchorage callout to being/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): Added full TL-2 Approach Transition Connection layout for both curb continuation options; show guardrail tapers. |
## STANDARD PLANS
### FY 2020-21 REVISIONS LOG

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<tr>
<td><strong>536-001</strong></td>
<td>Sheet 17: (Previously Sheet 15): Updated alignment curb dimensions for best fit; Changed &quot;Flat No Curb&quot; option to &quot;Flush Shoulder Option&quot;.  &lt;br&gt;SHEET 19: (Previously Sheet 17): Terminal updated from flared to parallel in Plan View; Added approach transition callout at begin/end guardrail location.&lt;br&gt;SHEET 20: (Previously Sheet 18): Added approach transition callout at begin/end guardrail location.&lt;br&gt;SHEET 21: (Previously Sheet 19): Updated terminal from flared to parallel in Plan View.&lt;br&gt;SHEET 23: (Previously Sheet 21): Updated Frangible Leave-out details to show steel post; Changed Note 1 to explain that only steel posts are permitted.</td>
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<tr>
<td><strong>536-002</strong></td>
<td>Sheet 1: Updated Note 2 to remove trailing end transition information; Reference Index 536-001 for new trailing end transition connection details on New Sheet 28.&lt;br&gt;SHEET 27: (NEW SHEET) Developed for Trailing End Transition Connections.</td>
</tr>
<tr>
<td><strong>544-001</strong></td>
<td>Sheet 1: Added callout notes to rigid barrier connection detail to include traffic railing and concrete barrier standards.&lt;br&gt;SHEET 3: (NEW SHEET) Added Three Beam retrofit connection detail; Short guardrail extension options from crash cushion to rigid barrier.</td>
</tr>
<tr>
<td><strong>570-001</strong></td>
<td>All Sheets: Renumbered for additional New Sheet.&lt;br&gt;SHEET 3: (NEW SHEET) Added sodding information from Index 524-001.</td>
</tr>
<tr>
<td><strong>580-001</strong></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>
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<tr>
<td><strong>591-001</strong></td>
<td>NEW INDEX - Previously Developmental Standard Plan D591-001.</td>
</tr>
<tr>
<td><strong>639-001</strong></td>
<td>Corrected TYPICAL DISTRIBUTION POINT SCHEMATIC DETAIL Callout and &quot;OFF&quot; position location.</td>
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<tr>
<td><strong>649-010</strong></td>
<td>Added Longitudinal Seam weld note 4H; Changed Note 4H to 4I.</td>
</tr>
<tr>
<td><strong>649-031</strong></td>
<td>Sheet 2: Change &quot;jam nut&quot; to anchor nut to match spec language.&lt;br&gt;SHEET 4: Clarified splice length (to match Sheet 3 splice).&lt;br&gt;SHEET 5: Clarified that the luminaire arms are galvanized steel.</td>
</tr>
<tr>
<td><strong>695-001</strong></td>
<td>Sheet 5: Changed the PVC Conduit or Non-Metallic Flexible Conduit from 1.5&quot; to 2&quot;.</td>
</tr>
<tr>
<td><strong>700-010</strong></td>
<td>All Sheets: Renumbered.&lt;br&gt;SHEET 6: Note 5: Clarified number of wind beams required.&lt;br&gt;SHEET 7: (NEW SHEET) - WIND BEAM CONNECTION FOR FLIP UP SIGN.</td>
</tr>
<tr>
<td><strong>700-041</strong></td>
<td>Sheet 1: Added information to Note 5B and Note 5C.</td>
</tr>
<tr>
<td><strong>700-090</strong></td>
<td>Deleted Catwalk Notes and references and added to New Index 700-091.</td>
</tr>
<tr>
<td><strong>700-091</strong></td>
<td>NEW INDEX - Catwalk Details.</td>
</tr>
<tr>
<td><strong>700-101</strong></td>
<td>Changed lateral offsets to more closely correspond with the MUTCD.</td>
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<tr>
<td><strong>700-104</strong></td>
<td>Note 4: Updated terminology for sign posts to match current naming.</td>
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<tr>
<td><strong>700-110</strong></td>
<td>Deleted 30 degree cut of Z mounting beams and added bolt diameters to drawing (See Index 700-030).</td>
</tr>
<tr>
<td><strong>706-001</strong></td>
<td>Changed striping limits in detail.</td>
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<tr>
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<tr>
<td><strong>711-001</strong></td>
<td>Sheet 1: Clarified &quot;Notes for Pavement Message&quot;.&lt;br&gt;SHEET 2: Changed &quot;Contrast Markings with Alternating Skip Pattern&quot; to &quot;10'-30' Skip Line with Shadow Markings&quot;. Added &quot;Dotted Line with Alternating Shadow Markings&quot; with detail. &lt;br&gt;SHEET 5 &amp; 6: Deleted the 6' Yellow marking from the nose of the Traffic Separator. &lt;br&gt;SHEET 8: Revised right turn lane details. &lt;br&gt;SHEET 11: Revised all details and notes.</td>
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<tr>
<td><strong>715-002</strong></td>
<td>Sheet 1: Changed Note 4C. &lt;br&gt;SHEET 2: Added 20' &amp; 22' mounting heights. &lt;br&gt;SHEET 3: Changed Strut weld size in ARM ELEVATION Detail. &lt;br&gt;SHEET 4: Added Pole P0.</td>
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<tr>
<td><strong>715-010</strong></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><strong>830-001</strong></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 &quot;shoulder pavement&quot; to &quot;asphalt pavement&quot; on the left half; Added &quot;or trail&quot; label to sidewalk on right half; Changed &quot;shoulder pavement&quot; on right to asphalt or concrete pavement to match adjacent surface.</td>
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### SUPERELEVATION TRANSITIONS - HIGH SPEED ROADWAYS

#### DESIGN SPEED, MPH

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<tr>
<td>6 Lane</td>
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<tr>
<td>8 Lane</td>
<td>1.150</td>
<td>1.170</td>
<td>1.190</td>
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</table>

#### NOTES:

1. These details apply to both paved and grassed shoulders. For median shoulders use 0.05 in lieu of 0.06.
2. **SHOULDER ON HIGH SIDE**: A shoulder slope of 0.06 downward from the edge of travel way will be maintained until a 0.07 break in slope at the pavement edge is reached due to superelevation of the pavement. As the pavement superelevation increases, the 0.07 break in slope will be maintained and the shoulder flattened until the shoulder slope reaches the minimum of 0.02 downward from the edge of travel way. Any further increases in pavement superelevation will necessitate sloping the inside half of the shoulder toward the travel way and the outer half outward; both at 0.02 for superelevations 0.06-0.09 and both at 0.03 for superelevation 0.10. For shoulders with paved widths 5 feet or less see Special Shoulder Break Over Details on Sheet 2 of 2.
3. **SHOULDER ON LOW SIDE**: Maintain 0.06 cross slope across shoulder until pavement cross slope reaches 0.06. For pavement cross slopes greater than 0.06, shoulder to have same slope as pavement. See **SHOULDER SLOPES ON SUPERELEVATION SECTION** (Sheet 2).

#### SUPERELEVATION TRANSITIONS...
8-LANE PAVEMENT WITH ONE LANE SLOPED TO MEDIAN

SECTION A-A
NORMAL CROWNED SECTION

SECTION B-B
SUPERELEVATION SECTION LT. & RT.

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

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

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

SECTION F-F
FULL SUPERELEVATION LT. & RT.

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.
GENERAL NOTES:
1. Obtain super-elevation by rotating the plane successively about the break points of the section until the plane has attained a slope equal to that required by the Plans. Should the rotation traverse the entire section and further super-elevation 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 on the outside of the curve only when the adjoining travel lanes require positive super-elevation.
2. When positive super-elevation 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 super-elevation transition.
4. The variable super-elevation 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 super-elevation in a similar manner.


ROADWAY SECTIONS HAVING LANE ARRANGEMENTS DIFFERENT FROM THOSE SHOWN, BUT COMPOSED OF A SERIES OF PLANES, ARE SUPER-ELEVATION IN A SIMILAR MANNER.

Obtain super-elevation by rotating the plane successively about the break points of the sections until the plane has attained a slope equal to that required by the Plans. Should the rotation traverse the entire section and further super-elevation be required, the remaining rotation of the plane shall be about the low edge of the inside travel lane. Crown is to be removed in the auxiliary lane to the outside of the curve only when the adjoining travel lanes require positive super-elevation.

When this section is used, super-elevation is established by rotating a tangent about the arc of the parabolic crown until the desired slope is attained (points A & B on sketch). The normal parabolic crown will be maintained outside the limits of the plane thus formed.

FOR LOW SPEED HIGHWAYS

TWO TRAVEL LANES EACH DIRECTION WITH MEDIAN AND AUXILIARY LANES

TWO TRAVEL LANES EACH DIRECTION WITH MEDIAN

TWO TRAVEL LANES EACH DIRECTION WITH AUXILIARY LANES

THREE TRAVEL LANES EACH DIRECTION WITH MEDIAN

UNDIVIDED FACILITIES

DIVIDED FACILITIES

PARABOLIC SECTION
**DESCRIPTION:**

**REVISED**

**STANDARD PLANS**

**FY 2020-21**

**SUPERELEVATION TRANSITIONS - LOW SPEED HIGHWAYS**

---

**PROFILE**

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<tr>
<td>Inside Median Edge Pavement</td>
<td>C</td>
</tr>
<tr>
<td>Construction</td>
<td>D</td>
</tr>
<tr>
<td>Outside Median Edge Pavement</td>
<td>E</td>
</tr>
<tr>
<td>Outside Lane Line</td>
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<tr>
<td>Outside Travel Lane</td>
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Inside And Outside Are Relative To Curve Center

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**TWO LANES EACH DIRECTION**

**PROFILE**

**LINE**

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<td>B</td>
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<td>Inside Median Edge Pavement</td>
<td>C</td>
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<td>Construction</td>
<td>D</td>
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<tr>
<td>Outside Median Edge Pavement</td>
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<td>Outside Lane Line</td>
<td>F</td>
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<tr>
<td>Outside Travel Lane</td>
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</tbody>
</table>

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

**PROFILE**

**LINE**

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<thead>
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<th>DESCRIPTION</th>
<th>INDEX</th>
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<td>B</td>
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<tr>
<td>Inside Median Edge Pavement</td>
<td>C</td>
</tr>
<tr>
<td>Construction</td>
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<tr>
<td>Outside Median Edge Pavement</td>
<td>E</td>
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<tr>
<td>Outside Lane Line</td>
<td>F</td>
</tr>
<tr>
<td>Outside Travel Lane</td>
<td>G</td>
</tr>
</tbody>
</table>

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

**Note:**

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

\[ \text{Shoulder Pavement} \]
SINGLE LANE RAMPS - ENTRANCE TERMINALS

**DESCRIPTION:**

**LAST REVISED:** 11/01/17

**INDEX SHEET**

**REVIEWED**

**FY 2020-21 STANDARD PLANS**

**RAMP TERMINALS**

**LEGEND:**

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

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

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

4. Remove all grass debris, loose dirt, and sand 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 other types of temporary barriers. See Index 102-120 for transitions between Type K Barrier and permanent bridge or traffic railing. Refer to the APL for additional information.

7. 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.

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

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

10. 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>
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<tr>
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<td>2 Min</td>
<td>2 Min*</td>
<td>3 Min</td>
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<tr>
<td>Free-standing</td>
<td>2 Min</td>
<td>4 Min</td>
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</table>

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

APPROACH SHOULDER BARRIER TRANSITION ON DIVIDED FACILITIES

MEDIAN BARRIER TRANSITION
DESCRIPTION:

DEPARTURE SHOULDER BARRIER TRANSITION ON UNDIVIDED FACILITIES

DEPARTURE (TRAILING) SHOULDER BARRIER TRANSITION ON DIVIDED FACILITIES
GENERAL NOTES:
1. Meet the requirements of Index 102-100.
2. For fabrication details see Sheets 15 thru 17.
3. HANDLING: Do not lift or move the Barrier Units by using Bars 6D that extend from the ends of the units. Approximate weight of one unit equals 2.7 tons.
4. CONNECTION PIN ASSEMBLY: Use steel for Connection Pin and Top Plate assemblies in accordance with ASTM A36 or ASTM A709 Grade 36. Nondestructive testing of welds is not required. At the Contractor's option, a 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 3/4" wooden block between ends of adjacent units. Install Connection Pin between adjacent Barrier Units as shown, then pull newly placed Barrier Unit away from adjacent Barrier Unit to remove slack between Connection Pin and Bars 6D (except as shown on Sheet 2). Do not use Barrier Units unconnected.
6. REUSE OF CONNECTION PINS AND STAKES: Connection pins and stakes may be reused if they have the structural integrity of new pins.
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 hot or cold patch asphalt material.
8. Type K Anchored to Free-Standing transitions: use the 3-3-2-1 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.

DETAIL OF CONNECTION BETWEEN BARRIER UNITS

CONNECTION PIN DETAIL

3-3-2-1 ANCHORAGE TRANSITION DETAIL

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

See Connection Pin Installation Note

Bar Unit
Unmarked End
Marked End

Top of Bridge Deck or Roadway Surface

Bars 6D (Typ.)

Bar Unit

Top Plate

Connection Pin

Top Plate Details

1/2" Ø hole for Anchor Bolt (at Contractor's option)

1/2" Ø hole for Anchor Bolt (at Contractor's option)

3/8" Ø hole for Anchor Bolt (at Contractor's option)

Free-Standing Barrier
Type K Barrier 3-3-2-1 Transition
Crash Cushion Or Additional Anchored Type K Units

1 Anchor
2 Anchors
3 Anchors
2 Anchors

FREE STANDING TYPE K BARRIER UNIT
NOTES FOR BOLTED INSTALLATIONS:

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

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

ANCHOR BOLTS, NUTS AND WASHERS: When using Adhesive-Bonded Anchor Bolts, use fully threaded rods in accordance with ASTM F 1554 Grade 36. Install Anchor Bolts for through bolting in accordance with ASTM A 307 or ASTM A 36. Install Nuts in accordance with ASTM A 563 or ASTM A 194. Install Flat Washers in accordance with ASTM F 436 and Plate Washers in accordance with ASTM A 36, or ASTM A 194 Grade 36.

Install three (3) Anchor Bolts per Barrier Unit on the traffic side of the Barrier Units as shown, except for Transition Installations. For the number and positions of Anchor Bolts required in Transition Installations see Sheets 8 and 9 and Index 102-100. Drilling through deck reinforcing steel to install Anchor Bolts is permitted. Unless otherwise shown in the Plans, at the Contractor’s option Barrier Units may be installed by through bolting (where geometrically possible) or by the use of Adhesive-Bonded Anchor Bolts. Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drains. Install Anchor Bolts and Nuts so that the maximum rotation beyond the face of the Barrier Units is 90°. Snug tighten the nuts on the Anchor Bolts. For through bolted installations, snug tighten the double Nuts on the underside of the deck against each other to minimize the potential for loosening.

Omit one (1) Anchor Bolt within a single Barrier Unit if a conflict exists between the Anchor Bolt location and a bridge deck expansion joint or drain. The adjacent Barrier Units must each be installed with the standard three (3) Anchor Bolts.

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

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

**Wrap threads with a single overlapping layer of PTFE tape to facilitate removal of anchors.**
NOTES FOR STAKED INSTALLATIONS:

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

STAKES: Provide steel for Stake assemblies in accordance with ASTM A 36 or ASTM A 309 Grade 36. Weld in accordance with the American Welding Society Structural Welding Code (Steel) AWS/AWS D1.1 (current edition). Welding metal are E60FX 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.

INSTALLATION:

1. For Bridge Decks only, use Keeper Pins that are 1/2" diameter, smooth steel bar in accordance with ASTM A 36 or ASTM A 309 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.

FREE-STANDING INSTALLATION:

NOTES FOR FREE-STANDING INSTALLATION:

1. For Bridge Decks only, use Keeper Pins that are 1/2" diameter, smooth steel bar in accordance with ASTM A 36 or ASTM A 309 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.
TYPICAL SECTION
ADJACENT TO RETAINING WALL WITH FLOWABLE FILL BACK-FILL

FLOWABLE FILL BACK-FILL ROADSIDE INSTALLATIONS

NOTES FOR SOIL BACK-FILLED ROADWAY INSTALLATIONS:

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

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

FLOWABLE FILL: Provide Excavatable Flowable Fill in accordance with Specification 121.
 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:
Dotted line indicates number and position of Bolts or Stakes.
Type K Temporary Concrete Barrier System

**Description:**

- 32" F of New Jersey Shape
- Median Traffic Railing
- 42" F Shape Traffic Railing
- Cross References:
  - See Sheet 10 for Section A-A, Section B-B and Section C-C.

**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)

**PARTIAL ELEVATION VIEW**

- 32" Florida Corral Traffic Railing (shown)
- Anchored Type K Barrier

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

- 32" Florida Corral Traffic Railing (shown)
- Anchored Type K Barrier

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

- Vertical Shape Traffic Railings (similar)
- Vertical End Taper required for 42" Vertical Shape Traffic Railing

**Approach Transition Splice Detail**

- For F and New Jersey Shape Traffic Railings and 8' & 14'
  Traffic Railing / Noise Walls

- Paved Surface
- (Type varies)

- Anchor Bolts or Stakes (shown)

- Raised Sidewalk

**Index Sheet 102-110**

**Revision:**

- 01/17

**Date:**

- 11/01/17

**Sheet:**

- 7 of 17

**Type:**

- FY 2020-21

**Standard Plans**

- Type K Temporary Concrete Barrier System
DESCRIPTION:

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

SHEET INDEX

REV 11/01/17

FY 2020-21
STANDARD PLANS

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PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

DRAWING NUMBER

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

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

Alignment of Type K Barrier Unit
with Traffic Railing at its end

Offset Block
Bolted to Guardrail

Paved Surface (Type varies)

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

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

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

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

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

(See Thrie-Beam Guardrail Positioning Detail, Sheet 10 and Notes for Thrie-Beam Guardrail Splice Installations, Sheet 1.)
TRAILING END SPLICE DETAIL

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

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

APPROACH TRANSITION SPLICE DETAIL

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

PARTIAL PLAN VIEW

PARTIAL ELEVATION VIEW

FREE-STANDING TYPE K BARRIER SHOWN; ANCHORED

BARREL SIMILAR. SEE PLANS FOR SPECIFIC REQUIREMENTS

BEGIN OR END APPROACH SLAB
(APPROXIMATE LOCATION)

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

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

OFFSET BLOCK BOLTED TO GUARDRAIL

* SEE THRIE-BEAM GUARDRAIL SPlice

DETAIL, SHEET 10 AND NOTES FOR THRIE-BEAM
GUARDRAIL SPlice INSTALLATIONS, SHEET 1.

END POST

RAILING

TRAFFIC RAILING

PAVED SURFACE

(TYPE VARIES)

BEGIN OR END APPROACH SLAB
(APPROXIMATE LOCATION)

FREE-STANDING TYPE K BARRIER SHOWN; ANCHORED

BARREL SIMILAR. SEE PLANS FOR SPECIFIC REQUIREMENTS

BEGIN OR END BRIDGE

ANCHOR BOLTS (SHOWN) OR STAKES;
PAVED SURFACE SIMILAR
SECTION A-A
32" F Shape Median Traffic Railing (shown), Median Concrete Barrier Wall (similar)

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

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

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

SECTION B-B
Adjacent to Shoulder Traffic Railings

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

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

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

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

**REVISION:** 11/01/17

**FY 2020-21 STANDARD PLANS**

**INDEX:** 102-110

**TYPE K TEMPORARY CONCRETE BARRIER SYSTEM**

**EDGE OF TRAVEL WAY**

**Hazard Shielded By Bolted Or Staked Units**

**First Full Type K Barrier Unit Before Drop-Off Or Hazard Shielded By Bolted Or Staked Units**

**See Index 102-100**

**Barrier Units (Typ.)**

**See Index 102-100 For Dimensions**

**Type K-Proprietary Barrier Transition Unit A or B (See APL)**

**Approach Transition From Free-Standing Proprietary Temporary Barriers To Anchored Type K Temporary Concrete Barriers**

**Approach And Trailing End Transitions From Free-Standing Type K Temporary Concrete Barriers To Free-Standing Proprietary Temporary Barriers**

**Trailing End Transition From Anchored Type K Temporary Concrete Barriers To Free-Standing Proprietary Temporary Barriers**

**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.
DESCRIPTION:

APPRAoch transition from free-standing proprietary temporary barriers to back-filled 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

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
NOTE:
When subjected to reverse direction hits, construct Transition Panels from Temporary Barrier to Crash Cushions. For additional details refer to the applicable crash cushion drawings on the APL.

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

UNIDIRECTIONAL - SEPARATED TRAFFIC

BIDIRECTIONAL - SEPARATED TRAFFIC

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

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

END TREATMENT WHEN SHIELDED BY A CRASH CUSHION

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

FABRICATION QUALIFICATIONS:
A. The Concrete Plant that meets the requirements:
   a. Specification 450 for prepressed concrete
   b. Specification 105 for precast.

CONCRETE:
A. Construct Barrier units with Class IV concrete in accordance with Specification 346.
B. Specification 346-10 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 2½" diameter pin must be used for the 180 degree bend test.
C. After steel reinforcing fabrication, hot dip galvanized in accordance with Specification 962 or coated with a cold galvanizing compound in accordance with Specification 962, all or part of Bars 6D.
D. At the Fabricator's option, the entire length of Bars 6D may be galvanized or coated.
E. The minimum limit of galvanizing or coating is shown in the Bending Diagrams.
F. Install Bars 6D within ½ of the plan dimensions.
G. Correct placement of Bars 6D is critical for proper fit up and performance of individual Barrier Units.
H. At the option of the Fabricator, Deformed Welded Wire Fabric in accordance with Specification 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 1½" 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. Finish the top and sides of the Barrier Units with a General Surface Finish.
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)
### ESTIMATED TEMPORARY CONCRETE BARRIER QUANTITIES

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<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>Concrete</td>
<td>CY</td>
<td>1.29</td>
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<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>218</td>
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The above quantities are for one Barrier Unit.

**SECTION THRU LIFT/DRAIN SLOT**

**ELEVATION VIEW**

**PLAN VIEW**

**ANCHOR BLOCKOUT DETAIL**

**SECTION D-D**

(Reinforcement not shown for clarity)

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

**LIFTING SLEEVE ASSEMBLY DETAIL (OPTIONAL)**

**CONCRETE BARRIER QUANTITIES**

<table>
<thead>
<tr>
<th>DESCRIPTION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2020-21 STANDARD PLANS</td>
</tr>
<tr>
<td>TYPE K TEMPORARY CONCRETE BARRIER SYSTEM</td>
</tr>
<tr>
<td>INDEX 102-110</td>
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<tr>
<td>SHEET 16 of 17</td>
</tr>
</tbody>
</table>
CONVENTIONAL REINFORCING STEEL DETAIL
WELDED WIRE REINFORCEMENT

ALTERNATE REINFORCING STEEL DETAIL
WELDED WIRE REINFORCEMENT

NO. 4 DRAIN BAR OVER DRAIN SLOTS
(CONVENTIONAL STEEL)

2 - No. 5 Bars
(Conventional Steel)

No. Drain Bar over drain slots (Conventional Steel), placed with D 19.7

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

CONFIGURATION ONE

CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
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<tbody>
<tr>
<td>A1</td>
<td>4</td>
<td>10</td>
<td>6'-3&quot;</td>
</tr>
<tr>
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<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>
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<tr>
<td>C</td>
<td>6</td>
<td>6</td>
<td>3'-1&quot;</td>
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<tr>
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<tr>
<td>D3</td>
<td>6</td>
<td>2</td>
<td>8'-6&quot;</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>4</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

NO. 4 DRAIN BAR OVER DRAIN SLOTS
(CONVENTIONAL STEEL)

2 - No. 5 Bars
(Conventional Steel)

No. 4 Drain Bar over drain slots (Conventional Steel), placed with D 19.7

NOTES:
Place 2 - No. 5 Bars (12'-3" long) tied to D 19.7 inside of bottom Welded Wire Reinforcement cage as shown.
Match D19.7 spacing to Bars 4A in the Elevation View, Sheet 15.
Field trim D19.7 to clear drain slot by 2".

CONFIGURATION TWO

NO. 4 TYPICAL BAR
(CONVENTIONAL STEEL)

2 - No. 5 Bars
(Conventional Steel)

D 6.3 (2 required)

No. 4 Drain Bar over drain slots (Conventional Steel), placed with D 19.7

NOTES:
Place 2 - No. 5 Bars (12'-3" long) tied to D 19.7 inside of bottom Welded Wire Reinforcement cage as shown.
Match D19.7 spacing to Bars 4A in the Elevation View, Sheet 15.
Field trim D19.7 to clear drain slot by 2".

STIRRUP BAR 4A1

STIRRUP BAR 4A2

TOP VIEW
BARS 6D1, 6D2 & 6D3

SIDE VIEW
BARS 6D1, 6D2 & 6D3

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

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

SECTION C-C
(Bars 6D not shown for clarity)

FY 2020-21
STANDARD PLANS

TYPE K TEMPORARY CONCRETE BARRIER SYSTEM

INDEX

102-110

LAST REVISION
01/01/17

DESCRIPTION:

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GENERAL NOTES

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

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

3. This legally mandated relationship is unique to federally funded University patents that Department contractors use on Contracts. Pursuant to federal law, the University may pursue royalties for a valid patent. Only those barrier units cast by producers licensed by the University Of Florida will be allowed for installation on the State Highway System in Florida. Barrier wall units shall conform to Specification 051 and shall be produced in Department-approved plants with quality control plans for precasting concrete barrier walls. Each barrier wall unit shall be permanently marked with an identification that is traceable to the manufacturer, the producing precast concrete plant and the date of production. This permanent identification mark will serve as certification that the unit has been manufactured in accordance with University of Florida drawings and specifications, and the approved quality control program.

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

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

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

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

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

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

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

DESCRIPTION:

LOW PROFILE BARRIER

FOR ROADSIDE SAFETY

Portable Temporary Low Profile Barrier

Traffic Face

Beveled Washer

CONCAVE CONNECTION

END VIEWS

Traffic Face

Beveled Washer

PARALLEL CONNECTION

Traffic Face

CONVEX CONNECTION

PLAN VIEWS OF CONNECTIONS

PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

Traffic Face

Traffic Face

Traffic Face

PLAN VIEW OF APPROACH END OFFSET

Work Zone Speed

LAT. OFFSET

SETBACK DISTANCE

45 MPH OR LESS

1'-6"

9"

LIMITATION OF USE: This installation technique can only be used on flexible or rigid pavement.

ASPHALT PAD: Where existing pavement is not present, construct a 2" Asphalt Pad using miscellaneous asphalt pavement in accordance with Specifications 339 with the exception that the use of a pre-emergent herbicide is not required. Payment for Asphalt Pad will be included in the cost of the barrier.

Notes:

Flexible or Rigid Pavement

Portable Temporary Low Profile Barrier For Roadside Safety

Approach Traffic

Edge Of Traffic Lane

Tangent Extension

Height To Bottom Of Type II Object Marker 1/2" I.D.
PORTABLE TEMPORARY LOW PROFILE BARRIER FOR ROADSIDE SAFETY

MAXIMUM CURVATURE ● MINIMUM RADIUS

CONVEX CURVATURE

CONCAVE CURVATURE

See Inset A

Inset A

See Inset B

Inset B

TRAFFIC SIDE

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

* Trailing End Flares Are Not Required When Barrier Located Outside The Clear Zone Of Opposing Traffic
Type I Object Marker To Be Installed When Trailing End Flare Falls Within The Clear Zone Of Opposing Traffic

**BARRIER OPENINGS AT DRIVEWAYS**

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

**LEGAL**

- Type I Object Marker

**BARRIER OPENINGS AT DRIVEWAYS**

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

**LEGEND**

- Type I Object Marker
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### GENERAL NOTES:

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

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

3. Except for emergencies, any road closure on State Highway System shall comply with Section 335.15, F.S.
DEFINITIONS

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

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

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

a. Travel Lane: The designated widths of roadway pavement marked to carry traffic through and to separate it from opposing traffic or occupying other traffic lanes.

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

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

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

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

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

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

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

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

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

OVERHEAD WORK
Work is only allowed over a traffic lane when one of the following options is used:

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

a. Work operation is located in a signalized intersection and limited to left or right turns, signs, lighting and utilities.

b. Work operations are 60 minutes or less.

c. Speed limit is 45 mph or less.

d. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.

e. Aerial lift equipment is placed directly above the work area to close the lane.

f. Traffic control devices are placed in advance of the vehicle/equipment closing the lane using a minimum 100 foot taper.

g. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.

OPTION 2 (OVERHEAD WORK ABOVE AN OPEN TRAFFIC LANE)
Overhead work above a open traffic lane is allowed if all of the following conditions are met:

a. Work operation is located on a utility pole, light pole, signal pole, or their appurtenances.

b. Work operations are 60 minutes or less.

c. Speed limit is 45 mph or less.

d. No encroachment by any part of the work activities and equipment within an area bounded by 2 feet outside of the edge of travel way and 18 feet high.

e. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.

f. Traffic operations are not encroached upon the travel way.

g. Aerial lift equipment is placed directly above the work area to close the lane.

h. Traffic control devices are placed in advance of the vehicle/equipment closing the lane using a minimum 100 foot taper.

i. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.

OPTION 3 (OVERHEAD WORK ADJACENT TO AN OPEN TRAFFIC LANE)
Overhead work adjacent to an open traffic lane is allowed if all of the following conditions are met:

a. Work operation is located on a utility pole, light pole, signal pole, or their appurtenances.

b. Work operation is 1 day or less.

c. Speed limit is 45 mph or less.

d. No encroachment by any part of the work activities and equipment within 2 feet from the edge of travel way to 18 feet high.

e. Aerial lift equipment in the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.

f. Traffic operations are not encroached upon the travel way.

g. Aerial lift equipment is placed directly above the work area to close the lane.

h. Traffic control devices are placed in advance of the vehicle/equipment closing the lane using a minimum 100 foot taper.

i. Volume or complexity of the roadway may dictate additional devices, signs, flagmen and/or a traffic control officer.

j. Adequate precautions are taken to prevent parts, tools, equipment and other objects from falling into open lanes of traffic.

k. Other Governmental Agencies, Rail facilities, or Codes may require a greater clearance. The greater clearance required prevails as the rule.

OPTION 4 (OVERHEAD WORK MAINTAINING TRAFFIC WITH NO ENCROACHMENT BELOW THE OVERHEAD WORK AREA)
Traffic shall be detoured, shifted, diverted or paced as to not encroach in the area of the overhead work operations in accordance with the appropriate index drawing or detailed in the plans. This option applies to, but not limited to, the following construction activities:

a. Beam, girder, segment, and bent/ender cap placement.

b. Form and falsework placement and removal.

c. Concrete placement.

d. Railing construction located at edge of deck.

e. Structure demolition.

OPTION 5 (CONDUCTOR/CABLE PULLING ABOVE AN OPEN TRAFFICE LANE)
Overhead cable and/or de-energized conductor installations initial pull to proper tension shall be done in accordance with the appropriate index or temporary traffic control plan.

Continuous pulling operations of a de-energized conductor shall be conducted as to not encroach by any part of the work activities, materials or equipment within the minimal vertical clearance above the travel way. The utility shall take precautions to ensure that pull ropes and conductors/cables are not at time fall below the minimum vertical clearance.

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

a. The temporary traffic control set up for the initial pulling of the pull rope across the roadway.

b. During pulling operations, advance warning consisting of no less than a Changeable Message Sign upstream of the work area with alternating messages, ‘Overhead Work Ahead’ and ‘Be Prepared To Stop’ followed by a traffic control officer and police vehicle with blue lights flashing during the pulling operation.

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

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

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

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

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

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

<table>
<thead>
<tr>
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<tr>
<td>WORK ZONE SPEED (MPH)</td>
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<tr>
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<tr>
<td>60-70</td>
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<tr>
<td>55</td>
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<tr>
<td>45-50</td>
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MINIMUM RADIUS FOR NORMAL CROWN

<table>
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<tr>
<th>WORK ZONE POSTED SPEED (MPH)</th>
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<tr>
<td>70</td>
<td>4000</td>
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<td>65</td>
<td>3733</td>
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<td>60</td>
<td>3400</td>
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<td>3184</td>
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<td>2514</td>
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<td>35</td>
<td>2304</td>
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<td>30</td>
<td>2100</td>
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SUPERELEVATION

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

OVERWEIGHT/OVERSIZE VEHICLES

Restrictions to Lane Widths, Heights or Load Capacity can greatly impact the movement of over dimensioned loads. The Contractor shall notify the Engineer who in turn shall notify the State Permits Office, phone no. (850) 410-3777, at least seven calendar days in advance of implementing a maintenance of traffic plan which will impact the flow of overweight/oversized vehicles. Information provided shall include (location, type of restriction (height, width and weight) and restriction time frames. When the roadway is restored to normal service the State Permits Office shall be notified immediately.

LANE WIDTHS

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

HIGH-VISIBILITY SAFETY APPAREL

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

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

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

FLASHERS: For daytime activities, Flaggers shall wear ANSI/ISEA Class 2 apparel. For nighttime activities, Flaggers shall wear ANSI/ISEA Class 3 apparel.

REGULATORY SPEEDS IN WORK ZONES

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

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

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

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

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

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

For additional information, refer to the FDOT Design Manual 240.
FLAGGER CONTROL
Where flaggers are used, a FLAGGER symbol or legend sign must replace the WORKERS symbol or legend sign.

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

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

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

Flashlight, lantern or other lighted signal that will display a red warning light shall be used at night-time, the STOP/SLOW paddle shall be retroreflectorized.

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

(A) A STAY IN YOUR LANE (W1-306) sign shall be added to the Advance Warning Sign sequence as the second most immediate sign from the work zone.

(B) Elevation Surveys: Cones may be used at the discretion of the Party Chief to protect the hoder and flagger(s). Cones, if used, may be placed at up to 50 intervals along the break line between the work zone.

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

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

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

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

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

INTERSECTING ROAD SIGNING
Signage for the control of traffic entering and leaving work zones by way of intersecting crossroads shall be adequate to make drivers aware of work zone conditions. When work operations exceed 60 minutes, place the ROAD WORK AHEAD sign on the side street entering the work zone.

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

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

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

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

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

1. All signs shall be post mounted when work operations exceed one day except for:
   a. Road closure signs mounted in accordance with the vendor drawing for the Type I Barricade shown on the APL.
   b. Pedestrian advanced warning or pedestrian regulatory signs mounted on signs in accordance with the vendor drawing shown on the APL.
   c. Median barrier mounted signs per Index 700-013.

2. Unless shielded with barrier or outside of the Clear Zone, signs mounted on temporary supports or barricades, and barricade/sign combination must be crashworthy in accordance with NCHRP 500 requirements and included on the Approved Products List (APL).

3. Use only approved systems listed on the Department's Approved Products List (APL).

4. Manufacturers seeking approval of U-Channel and steel square tube sign support assemblies for inclusion on the Approved Products List (APL) must submit a APL application, design calculations (for square tube only), and detailed drawings showing the product meets all the requirements of this Index.

5. Provide 3 lb/ft Steel U-Channel Posts with a minimum section modulus of 0.43 in³ for 80 ksi steel, a minimum section modulus of 0.37 in³ for 70 ksi steel, or a minimum section modulus of 0.34 in³ for 60 ksi steel.

6. Provide 4 lb/ft Steel U-Channel Posts with a minimum section modulus of 0.56 in³ for 60 ksi steel, or a minimum section modulus of 0.47 in³ for 70 ksi or 80 ksi steel.

7. U-channel posts shall conform with ASTM A 499, Grade 60, or ASTM A 576, Grade 1080 (with a minimum yield strength of 60 ksi). Square tube posts shall conform with ASTM A 653, Grade 50, or ASTM A 1013, Grade 50.

8. Sign attachment bolts, washers, nuts, and spacers shall conform with ASTM A307 or A 36.

9. For diamond warning signs with Supplement plaque (up to 5 ft in width), use 4 lb/ft posts for signs with a Clear Height of 10 ft or more.

10. Install U-channel type posts in accordance with the manufacturer's detail shown on the APL.

11. Post and foundation detail shown is for APL as shown on Sheet 6. Use 4 lb/ft U-channel sign post with a mounting height of 7' min. and 8' max. Attach sign panel using Z-bracket detail on Sheet 6.

12. Minimum foundation depth is 4.0' for 3 lb/ft sign panel using Z-bracket detail on Sheet 3.

13. Use 4 lb/ft posts for Clear Height up to 10' and 4 lb/ft posts for Clear Height up to 12'.

Notes for Table:

1. Use 3 lb/ft posts for Clear Height up to 10'
2. Use 4 lb/ft posts for Clear Height up to 12'
3. For both 3 lb/ft and 4 lb/ft base or sign posts installed in rock, a minimum cumulative depth of 2' of rock layer is required.
4. The soil plate as shown on the APL vendor drawing is not required for base posts or sign posts installed in existing rock (as defined in Note 3), asphalt roadway, shoulder pavement or soil under sidewalk.
**PROJECT INFORMATION SIGN DETAIL**

**50 MPH OR GREATER**
Use SIGN ATTACHMENT DETAIL (WITH Z-BRACKET).

**45 MPH OR LESS**
Use SIGN ATTACHMENT DETAIL (WITHOUT Z-BRACKET).

**PROJECT INFORMATION SIGN NOTES:**

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

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

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

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

- 4 lb/ft U-Channel Sign Post
- 3/8" Galvanized Steel Bolts with Nuts and Lock Washers.
- 3/8" Thick Aluminum
- Aluminum Z 1 13/16" x 1.09

**BRACKET DETAIL**

- 9'-2" Z-Bracket Wind Beam Length
- Aluminum Z 1 13/16" x 1.09
- 3/8" Galvanized Steel Bolts with Nuts and Lock Washers.

**PROJECT INFORMATION SIGN**

- 10'-0" x 3'-0"
- 8" Radii
- 4' and 6' series D Legend
- Blue Background and Border
- White Legend and Border

**CONTRACTOR**

1-XXX-XXX-XXXX

**SEASON YEAR**

1-XXX-XXX-XXXX

**PROJECT INFORMATION SIGN DETAIL**

- 5'-0" x 4'-6"
- 3" Radii
- 4' series D Legend and Border
- White Legend and Border
**MANHOLES/CROSSWALKS/JOINTS**

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

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

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

**REMOVING PAVEMENT MARKINGS**

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

**SIGNALS**

Existing traffic signal operations that require modification in order to carry out work zone traffic control shall be included in the TCP and be approved by the District Traffic Operations Engineer. Maintain all existing actuated or traffic responsive mode signal operations for main and side street movements for the duration of the Contract and require restoration of any loss of detection within 12 hours. The contractor shall select only detection technology listed on the Department's Approved Products List (APL) and approved by the Engineer to restore detection capabilities.

**ADVANCE WARNING ARROW BOARDS**

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

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

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

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

**CHANNELIZING DEVICES**

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

**PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)**

The PCMS can be used to:

1. Supplement standard signing in construction or maintenance work zones.
2. Reinforce static advance warning messages.
3. Provide motorists with updated guidance information.

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

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

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

**TRUCK/TRAILER-MOUNTED ATTENUATORS**

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

**CHANNELIZING DEVICE CONSISTENCY**

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

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

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

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

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

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

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

TRAVEL LANE TREATMENT FOR MILLING OR RESURFACING NOTES

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

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

3. If D is 15" or less, no treatment is required.

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

5. If the slope is steeper than 1:4 (not to be steeper than 1:1), the R4-1 and MOT-1-06 signs shall be used as a supplement to the W8-11; this condition should never exceed 3 miles in length.

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

PEDESTRIAN WAY DROP-OFF CONDITION NOTES

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

2. Protect any drop-off adjacent to a pedestrian way with pedestrian longitudinal channelizing devices, temporary barrier wall, or approved handrail.
### General Information for Traffic Control Through Work Zones

#### Channelizing Devices

1. **Temporary Lane Separators** shall be supplemented with any of the following approved fixed (surface mounted) channelizing devices: tubular markers, vertical panels, or opposing traffic lane divider panels. Opposing traffic lane divider panels (W6-4) shall only be used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation. Tubular Markers, Vertical Panels and Opposing Traffic Lane Divider panels shall not be intermixed within the limits where the temporary lane separator is used. The connection between the channelizing device and the temporary lane separator curb shall hold the channelizing device in a vertical position.

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

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

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

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

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

#### Device Spacing

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Max. Distance Between Devices (ft.)</th>
</tr>
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<tbody>
<tr>
<td>25</td>
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<td>30 to 45</td>
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</tbody>
</table>

### Placement of Business Entrance Signs and Channelizing Devices at Business Entrance

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

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

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

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

### Temporary Lane Separator

**Temporary Lane Separators** are often the case with resurfacing type projects. Signs are not required where there is minimal disruption to business driveways which is often the case with resurfacing type projects.
**CHANNELIZING DEVICE NOTES:**

1. The details shown on this sheet are for the following purposes:
   a. For ease of identification and guide to develop project specific Temporary Traffic Control Plans for workers within the work areas. APL drawings may be used as a reference.
   b. To provide information that supplements or supersedes that provided by the MUTCD, that are signed and sealed by the Contractor’s Engineer.

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

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

4. Ballast shall not be placed on top rails or any striped rails or higher than 1.7 above the driving surface.

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

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

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

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

9. Vehicular longitudinal channelizing devices shall not exceed 36" in height. For vehicular longitudinal channelizing devices (LCDs) less than 32" in height, the LCD shall be supplemented with approved fixed (surface mounted) channelizing devices (tubular markers, vertical panels, etc.) along the run of the LCD, at the ends, at 50' centers on tangents, and 20' centers on curves. The cost of the fixed supplemented channelizing devices shall be included in the cost of the LCD. LCDs less than 32" in height shall not be used for speeds greater than 45 mph.

10. For pedestrian longitudinal channelizing devices, the device shall have a minimum of 9' continuous detectable edging above the walkway. A gap not exceeding a height of 2" is allowed to facilitate drainage. The top surface of the device shall be a minimum height of 32" and have a 1/8" or less difference in any plane at all connection points between the devices to facilitate hand trailing. The bottom and the top surface of the device shall be in the same vertical plane. If pedestrian drop-off protection is required, the device shall have a footprint or offset of at least 2", otherwise the device must be at least 42" in height above the walkway and be anchored or ballasted to withstand a 200 lb lateral point load at the top of the device.

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

**TEMPORARY BARRIER NOTES:**

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

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

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

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

NOTES FOR RAISED PAVEMENT MARKERS:

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

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

2. No special signing is required.

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

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

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

SYMBOLS

Work Area

Lane Identification + Direction of Traffic

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS AND THEIR ACTIVITIES ARE BEHIND AN EXISTING BARRIER, MORE THAN 2' BEHIND THE CURB, OR 15' OR MORE FROM THE EDGE OF TRAVEL WAY.
GENERAL NOTES
1. When four or more work vehicles enter the through traffic lanes in a one hour period or less (excluding establishing and terminating the work area), the advanced FLAGGER sign shall be substituted for the WORKERS sign. For location of flaggers and FLAGGER signs, see Index 102-603.
2. SHOULDER WORK sign may be used as an alternate to the WORKER symbol sign only on the side where the shoulder work is being performed.
3. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TTC Indexes.
4. For general TCZ requirements and additional information, refer to Index 102-600.

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

CONDITIONS
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCroach THE AREA CLOSER Than 12' BUT Not CLOSER THAN 2' TO THE EDGE OF TRAVEL WAY.
GENERAL NOTES:

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

A. Railroad Crossings:
   a. If an active railroad crossing is located closer to the Work Area than the queue length plus 300 feet, extend the Buffer Space as shown on Sheet 2.
   b. If the queuing of vehicles on an active railroad crossing cannot be avoided, provide a uniformed traffic control officer or flagger at the highway-rail grade crossing to prevent vehicles from stopping within the grade crossing.
   c. The flaggers must be in sight of each other or in direct communication at all times.

2. Temporary Raised Rumble Strips:
   a. Use when both of the following conditions are met concurrently:
      - Existing Posted Speed is 55 mph or greater;
      - Speed limit is 45 mph or less.
   b. Use a consistent Strip color throughout the work zone.
   c. Reduce the posted speed when appropriate.

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

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

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

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

7. ROAD WORK AHEAD and the BE PREPARED TO STOP signs may be omitted if all of the following conditions are not met:
   A. Work operations are 60 minutes or less.
   B. Speed limit is 45 mph or less.
   C. There are no sight obstructions to vehicles approaching the work area for a distance equal to the Buffer Space shown in Table 1.
   D. Vehicles in the work area have high intensity, rotating, flashing, oscillating, or strobe lights operating.
   E. Volume and complexity of the roadway has been considered.
   F. If a railroad crossing is present, vehicles will not queue across rail tracks.
   G. AFADs are not in use.

8. See Index 102-603 for general TCZ requirements and additional information.

9. Automated Flagger Assistance Devices (AFADs) may be used in accordance with Specifications Section 102.990 and the APL vendor drawings.

SYMBOLS:
- Work Area
- Channelizing Device (See Index 102-603)
- Flagger
- Lane Identification + Direction of Traffic

**REVISION 01/01/17**

**DESCRIPTION:**

**STANDARD PLANS**

**FY 2020-21**

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

**INDEX**

102-603

1 of 3

**CONDITIONS**

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

**STANDARD PLANS**

**FY 2020-21**

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

**INDEX**

102-603

1 of 3

**CONDITIONS**

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH THE AREA BETWEEN THE CENTERLINE AND A LINE 2' OUTSIDE THE EDGE OF TRAVEL WAY.
SYMBOLS:
- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Flagger
- Lane Identification + Direction of Traffic

TEMPORARY RAISED RUMBLE STRIPS

(When Required See GENERAL NOTE 2)

REMOVABLE POLYMER STRIPING TAPE

RUMBLE STRIP SET OPTION - 1

MOLDED ENGINEERED POLYMER SET

RUMBLE STRIP SET OPTION - 2

TEMPORARY RAISED RUMBLE STRIPS

* May Be omitted if ROAD WORK AHEAD sign is installed upstream within the project limits.
TEMPORARY RAILROAD CROSSING BUFFER SPACE EXTENSION

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

SPECIAL CONDITIONS

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

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

**GENERAL NOTES**

1. The FLAGGER legend sign may be substituted for the symbol sign.

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

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

4. Flaggers shall be located where they can control more than one direction of traffic.

5. Maximum spacing between channelizing devices shall be not greater than 20'.

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

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

8. For unsignalized intersections, use Temporary Raised Rumble Strips in accordance with Index 102-603. Placement of Rumble Strips and additional signs should begin at FLAGGER sign location.

**DURATION NOTES**

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

**DISTANCE BETWEEN SIGNS**

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

**CONDITIONS**

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

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

**GENERAL NOTES**

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

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

3. If work area is confined to an outside auxiliary lane, the work area shall be barricaded and the FLAGGER signs replaced by ROAD WORK AHEAD signs. Flaggers are not required.

4. Flaggers shall be in sight of each other or in direct communication at all times.

5. The FLAGGER legend sign may be substituted for the symbol sign.

6. The maximum spacing between devices shall be no greater than 25'.

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

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

9. Use Temporary Raised Rumble Strips in accordance with Index 102-603. Placement of Rumble Strips and additional signs should begin at FLAGGER sign location.

**DURATION NOTES**

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

**CONDITIONS**

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

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF ONE TRAFFIC LANE, FOR WORK AREAS 200' OR MORE DOWNSTREAM FROM AN INTERSECTION FOR A PERIOD OF MORE THAN 60 MINUTES.
GENERAL NOTES
1. Use either portable signals or span wire signals and include two signal faces for each approach.

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

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

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

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

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

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

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

CONDITIONS
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES WILL ENCROACH ON ONE LANE OR MOMENTARILY ENCROACH ON BOTH LANES OF A TWO-LANE TWO-WAY ROADWAY AND TRAFFIC SIGNALS ARE NEEDED.
SINGLE LANE CLOSURE · ROADWAY AND BRIDGES ALL LENGTHS
MOMENTARY ROADWAY CLOSURE • HAUL ROUTE CROSSING
**WORK ON SHOULDER**

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

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

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

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

**SYMBOLS**

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

**GENERAL NOTES**

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

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

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

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

**CONDITIONS**

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

1. For speed sign applications, see Index 102-600.

2. Where the tangent distance (T) exceeds 600', spacing between cones or tubular markers may be increased to 50' or spacing between Type I or Type II barricades, vertical panels or drums may be increased to 100' within limits of the tangent, or post mounted delineators at 50' centers may be substituted for the barricades, vertical panels or drums.

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

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

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

6. If temporary structures are required on the diversion, traffic control will be in conformance with Index 105-650.

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

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

CONDITIONS

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

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

2. No special signing is required.

3. If the work operation requires that two or more work vehicles cross the offset zone in any one hour, traffic control is to be in accordance with Index 102-612.

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

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

6. When a side road intersects the highway within the work area, additional traffic control devices shall be placed in accordance with Index 102-612.

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

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

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

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

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

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

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

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

DURATION NOTES

1. Signs and channelizing devices may be omitted if all of the following conditions are met:

   a. Work operations are 60 minutes or less.

   b. Vehicles in the work area have high-intensity, rotating, flashing, oscillating, or strobe lights operating.

CONDITIONS

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

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

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

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

The same applies to undivided highways with the following exceptions:

a. Work shall be confined within one median lane.

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

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

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

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

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

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

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

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

DURATION NOTES

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

2. For work operations up to approximately 15 minutes, signs, channelizing devices, arrow board, and buffer space may be omitted if all of the following conditions are met:
   a. Speed limit is 45 mph or less.
   b. No sight obstructions to vehicles approaching the work area for a distance equal to the buffer space and the taper length combined.
   c. Volume and complexity of the roadway has been considered.
   d. The closed lane is occupied by a class 5 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GWVR) of 16,001 lb with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

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

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON THE LANE ADJACENT TO EITHER SHOULDER AND THE AREA 2 OUTSIDE THE EDGE OF TRAVEL WAY.
INTERMITTENT WORK STOPPAGE - LANE REOPENED TO TRAFFIC

UNEVEN PAVEMENT

Arrow Board Operation Discontinued And Arrow Board Shall Be Removed Or Relocated Outside The Clear Zone Or Be Shielded By A Barrier Or Crash Cushion

Median

Work Area

OPEN ROAD WORK

END ROAD WORK

Temporary Pavement Markings

Work Area

Area Temporarily Reopened To Traffic

500'

Temporary Pavement Markings

Placement Through Work Area And Devices Relocated Laterally 2' To 4' Outside Edge Of Travel Way.

UNEVEN LANE

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Hinged Or Overlay Shields

PRESENT

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Arrow Board Operation Discontinued And Arrow Board Shall Be Removed Or Relocated Outside The Clear Zone Or Be Shielded By A Barrier Or Crash Cushion

Median

Work Area

Area Temporarily Reopened To Traffic

500'

Temporary Pavement Markings

Placement Through Work Area And Devices Relocated Laterally 2' To 4' Outside Edge Of Travel Way.

UNEVEN PAVEMENT

INTERMITTENT WORK STOPPAGE - LANE REOPENED TO TRAFFIC

UNEVEN LANE

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Hinged Or Overlay Shields

PRESENT

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Arrow Board Operation Discontinued And Arrow Board Shall Be Removed Or Relocated Outside The Clear Zone Or Be Shielded By A Barrier Or Crash Cushion

Median

Work Area

Area Temporarily Reopened To Traffic

500'

Temporary Pavement Markings

Placement Through Work Area And Devices Relocated Laterally 2' To 4' Outside Edge Of Travel Way.

UNEVEN PAVEMENT

INTERMITTENT WORK STOPPAGE - LANE REOPENED TO TRAFFIC

UNEVEN LANE

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Hinged Or Overlay Shields

PRESENT

SPEEDING FINES DOUBLED WHEN WORKERS PRESENT

Arrow Board Operation Discontinued And Arrow Board Shall Be Removed Or Relocated Outside The Clear Zone Or Be Shielded By A Barrier Or Crash Cushion

Median

Work Area

Area Temporarily Reopened To Traffic

500'

Temporary Pavement Markings

Placement Through Work Area And Devices Relocated Laterally 2' To 4' Outside Edge Of Travel Way.
**CONDITION NOTES**

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

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

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

**GENERAL NOTES**

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

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

**DURATION NOTES**

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

**SYMBOLS**

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

**CONDITIONS**

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

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

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

Where:

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

**CONDITION NOTATION**

- Speeding fines doubled when workers present

**SYMBOLS**

- Work Area
- Channelizing Device (See Index 102-600)
CONDITION NOTES

1. See General Notes, Sheet 1.

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

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

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

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

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENCROACH ON ANY PORTION OF A CENTER LANE OF A MULTILANE HIGHWAY, AND TWO DRIVING LANES ARE MAINTAINED, AND, THE OUTSIDE SHOULDER PAVEMENT IS TEMPORARILY USED AS A TRAVEL LANE.

SYMBOLS

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

Table I

<table>
<thead>
<tr>
<th>EXISTING POSTED SPEED</th>
<th>PROPOSED WORK ZONE SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
<td>MPH</td>
</tr>
<tr>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>55</td>
<td>45</td>
</tr>
</tbody>
</table>

REMARKS

The 'Proposed Work Zone Speeds' are recommended speeds for the traffic control plan detailed below; however, where the Engineer deems other speeds are appropriate, the applicable speeds.

Table II

<table>
<thead>
<tr>
<th>Buffer Space and Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer Space</td>
</tr>
<tr>
<td>Dist.</td>
</tr>
<tr>
<td>(ft)</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>65</td>
</tr>
<tr>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Note 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table I Device Spacing</td>
</tr>
<tr>
<td>Max. Distance Between Devices (ft.)</td>
</tr>
<tr>
<td>Speed (mph)</td>
</tr>
<tr>
<td>Taper</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30 to 45</td>
</tr>
<tr>
<td>50 to 70</td>
</tr>
</tbody>
</table>

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

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

Where:

L = Length of taper in feet
W = Width of lateral transition in feet
S = Posted speed limit (mph)
**SYMBOLS**
- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Stop Bar
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic

**CONDITIONS**
WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ENTRAP TIONS ENCROACH ON THE PAVEMENT REQUIRING THE CLOSURE OF AT LEAST ONE MEDIAN TRAFFIC LANE.

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

**GENERAL NOTES**
1. The WORKERS legend sign may be substituted for the symbol sign.
2. When vehicles in a parking zone block the line of sight to TCZ signs, the signs shall be post mounted and located in accordance with Index 700-101.
3. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 102-660.
4. Dual signs are required for divided roadways.
5. Maximum spacing between barricades, vertical panels, cones, tubular markers and drums shall not be greater than 25.
6. Temporary signal phasing modifications are to be approved by the District Traffic Operations Engineer prior to the beginning of work.
7. For general TCZ requirements and additional information, refer to Index 102-600.

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A (ft.)</th>
<th>B (ft.)</th>
<th>C (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>175</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>560</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Table II**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L (ft.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>560</td>
<td></td>
</tr>
</tbody>
</table>

| Volume and complexity of the roadway has been considered. |
GENERAL NOTES

1. Work operations shall be confined to either one lane, or lane combinations as follows:
   a. Outside travel lane;
   b. Outside auxiliary lane;
   c. Outside travel lane and adjoining auxiliary lane;
   d. Inside travel lane ∇;
   e. Inside auxiliary lane ∇;
   f. Inside travel lane and adjoining auxiliary lane ∇.
   ∇ See Sheet 3

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

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

3. If the work space extends across a crosswalk, the crosswalk should be closed using the information in Index 702-660.

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

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

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

DURATION NOTES

1. For work operations up to approximately 15 minutes, signs, channelizing devices, and arrow board may be omitted if all of the following conditions are met:
   a. Speed limit is 45 mph or less.
   b. No sight obstructions to vehicles approaching the work area.
   c. Volume and complexity of the roadway has been considered.
   d. The closed lane is occupied by a class 5 or larger, medium duty truck(s) with a minimum gross weight vehicle rating (GWVR) of 16,001 lb with high-intensity, rotating, flashing, oscillating, or strobe lights mounted above the cab height and operating.

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

SYMBOLS

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚡️</td>
<td>Work Area</td>
</tr>
<tr>
<td>🚭</td>
<td>Work Zone Sign</td>
</tr>
<tr>
<td>🚭</td>
<td>Advance Warning Arrow Board</td>
</tr>
<tr>
<td>🚭</td>
<td>Type III Barricade</td>
</tr>
<tr>
<td>🚭</td>
<td>Channelizing Device (See Index 102-600)</td>
</tr>
<tr>
<td>⚡️</td>
<td>Lane Identification + Direction of Traffic</td>
</tr>
</tbody>
</table>
1. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right lane having significant right turning movements, then the right lane may be restricted to right turns only as shown in this detail.

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

### Table I

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Type I or Type II</th>
<th>Taper Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Cones or Tubular Markers</td>
<td>125</td>
</tr>
<tr>
<td>30</td>
<td>Barricades or Vertical Panels or Drums</td>
<td>180</td>
</tr>
<tr>
<td>35</td>
<td>Taper</td>
<td>245</td>
</tr>
<tr>
<td>40</td>
<td>Tangent</td>
<td>300</td>
</tr>
<tr>
<td>45</td>
<td>Taper</td>
<td>490</td>
</tr>
</tbody>
</table>

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

\[ L = \sqrt{\frac{WS^2}{S}} \]

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

### Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Taper Length - Merge (12' Lateral Transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>L (ft) Notes (Merge)</td>
</tr>
<tr>
<td>30</td>
<td>130</td>
</tr>
<tr>
<td>35</td>
<td>245</td>
</tr>
<tr>
<td>40</td>
<td>300</td>
</tr>
<tr>
<td>45</td>
<td>490</td>
</tr>
</tbody>
</table>

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

\[ L = \sqrt{\frac{WS^2}{S}} \]

- \( W \) = Width of lateral transition in feet
- \( S \) = Posted speed limit (mph)
**REVISED DESCRIPTION:**

**REVISION**

**STANDARD PLANS**

**FY 2020-21**

**MULTILANE, WORK NEAR INTERSECTION**

**MEDIAN OR OUTSIDE LANE**

---

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>45 mph</td>
<td>350</td>
<td>350</td>
<td>350</td>
</tr>
</tbody>
</table>

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

---

**Table I**

<table>
<thead>
<tr>
<th>Device Spacing - Taper Length</th>
<th>Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper Length = L</td>
<td>25</td>
</tr>
<tr>
<td>Taper Length = L</td>
<td>30 to 45</td>
</tr>
<tr>
<td>Taper Length = L</td>
<td>40</td>
</tr>
<tr>
<td>Taper Length = L</td>
<td>45</td>
</tr>
</tbody>
</table>

---

**Table II**

<table>
<thead>
<tr>
<th>Taper Length - Merge</th>
<th>Speed (mph)</th>
<th>L</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(12' Lateral Transition)</td>
<td>25</td>
<td>125</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>180</td>
<td>L = (S + W) / 60</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>245</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>340</td>
<td>L = (S + W) / 60</td>
</tr>
</tbody>
</table>

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

---

**Notes:**

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

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

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

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

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

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

**DURATION NOTES**

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

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

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

4. If the work area has high-intensity, rotating, flashing, oscillating, or strobe lights operating.

**CONDITIONS**

Where any vehicle, equipment, workers or their activities encroach on the pavement requiring the closure of the center lane near an intersection.

**SYMBOLS**

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

**DISTANCE BETWEEN SIGNS**

<table>
<thead>
<tr>
<th>Speed</th>
<th>Max. Distance Between Devices (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>200</td>
</tr>
<tr>
<td>45 mph or less</td>
<td>300</td>
</tr>
</tbody>
</table>

**Table I**

<table>
<thead>
<tr>
<th>Device Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max. Distance Between Devices (ft.)</strong></td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30 to 43</td>
</tr>
<tr>
<td>50</td>
</tr>
</tbody>
</table>

**Table II**

<table>
<thead>
<tr>
<th>Buffer Space and Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max. Distance Between Devices (ft.)</strong></td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
</tr>
<tr>
<td><strong>Buffer Space</strong></td>
</tr>
<tr>
<td><strong>Taper Length</strong></td>
</tr>
<tr>
<td><strong>L (ft.)</strong></td>
</tr>
</tbody>
</table>

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

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

Where:

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

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

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

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

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

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

**SYMBOLS**

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

**CONDITIONS**

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

**CONDITIONS**

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

**Table II**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Width of Lateral Transition (ft)</th>
<th>Notes (in feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>125</td>
<td>L = ( \frac{S^2}{W} )</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td>L = ( \frac{S^2}{W} )</td>
</tr>
<tr>
<td>35</td>
<td>245</td>
<td>L = ( \frac{S^2}{W} )</td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td>L = ( \frac{S^2}{W} )</td>
</tr>
<tr>
<td>45</td>
<td>340</td>
<td>L = ( \frac{S^2}{W} )</td>
</tr>
</tbody>
</table>

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

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

1. These illustrations are representative of general conditions.

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

3. Arrow boards shall not be obscured by equipment, supplies, signs, or the enclosure.

4. Vehicle-mounted signs shall be mounted with the bottom of the sign at a minimum height of 48 inches above the pavement. Vehicle-mounted changeable message signs may be used in lieu of truck mounted static signs. Changeable message signs shall flash alternately to read “Left or Right Lane” or “Two Left or Two Right Lanes,” “Closed Ahead,” and the arrow symbol. Arrow boards shall not be used with truck mounted changeable message signs. Sign legends shall be covered or turned from view when work is not in progress.

5. On freeway facilities (interstates, toll roads, and expressways), a traffic control officer is required for all nighttime non-emergency operations for work within the travel lane.

6. If the work vehicle speed exceeds the minimum legal speed limit on limited access facilities and one half the posted speed limit on other facilities, the Engineer may delete requirements for shadow vehicle and attenuator. The work vehicle will be required to have an arrow board and sign message.

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

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

9. Functional two-way communication is required between all vehicles in the mobile operation convoy.

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

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

WORK WITHIN TRAVEL WAY, CENTER LANE OR OUTSIDE CENTERLINE

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

MOVE/MERGE MODE

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

WORK WITHIN TRAVEL LANE
GENERAL NOTES
1. TWO-WAY TRAFFIC signals shall be repeated every ½ mile in each direction, throughout the tangent distance (T).

2. \[ l = \begin{cases} WS & \text{for speeds } \leq 45 \text{ mph} \\ WS/60 & \text{for speeds } > 45 \text{ mph} \end{cases} \]

Where:
- \(WS\) = Width of lateral transition in feet.
- \(l\) = Posted speed limit (mph).

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

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

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

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

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

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

SCHEME APPLICATIONS

Scheme 1: Restricted Construction Limits.

Scheme 2: Unrestricted Construction Limits and Light to Moderate Traffic.

Scheme 3: Unrestricted Construction Limits and Moderate to Heavy Traffic.

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

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

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

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

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

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

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

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

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

SYMBOLS

Work Area

Channelizing Device (See Index 102-600)

Type III Barricade

Work Zone Sign

Advance Warning Arrow Board

Lane Identification + Direction of Traffic

Table II

Taper Length - Merge (12' Lateral Transition)

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L (ft.)</th>
<th>Notes (Merge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>135</td>
<td>L=WS²/BT</td>
</tr>
<tr>
<td>30</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>243</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>660</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>780</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>840</td>
<td></td>
</tr>
</tbody>
</table>

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

L = Length of taper in feet
W = Width of lateral transition in feet
S = Paved speed limit (mph)

CONDITIONS

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

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

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

DURATION NOTE
Removable reflectorized pavement markings shall be used when closure time exceeds one daylight period.
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES AHEAD CLOSING RIGHT LANE 2/26/2020 12:58:59 PM

REVISIO N DESCRIPTION:

REV IS " " of STANDARD PLANS FY 2020-21 SHEET 11/01/17

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MULTILANE, WORK WITHIN THE TRAVEL WAY DOUBLE LANE CLOSURE

Table I

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Max. Distance Between Devices (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30 to 45</td>
<td>30</td>
</tr>
<tr>
<td>50 to 70</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Tubular Markers</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>50 to 70</td>
<td>50</td>
</tr>
</tbody>
</table>

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

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

Where:

L = length of taper in feet
W = Width of lateral transition in feet
S = Posted speed limit (mph)

Table II

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Buffer Space (ft.)</th>
<th>Taper Length (12' Lateral Transition)</th>
<th>Taper Length (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>155</td>
<td>125</td>
<td>250</td>
</tr>
<tr>
<td>30</td>
<td>200</td>
<td>180</td>
<td>360</td>
</tr>
<tr>
<td>35</td>
<td>250</td>
<td>245</td>
<td>490</td>
</tr>
<tr>
<td>40</td>
<td>300</td>
<td>320</td>
<td>640</td>
</tr>
<tr>
<td>45</td>
<td>350</td>
<td>480</td>
<td>1080</td>
</tr>
<tr>
<td>50</td>
<td>400</td>
<td>600</td>
<td>1320</td>
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<td>55</td>
<td>450</td>
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<td>60</td>
<td>500</td>
<td>720</td>
<td>1560</td>
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<tr>
<td>65</td>
<td>550</td>
<td>780</td>
<td>1640</td>
</tr>
<tr>
<td>70</td>
<td>600</td>
<td>840</td>
<td>1680</td>
</tr>
</tbody>
</table>

GENERAL NOTES

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

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

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

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

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

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

DURATION

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

CONDITIONS

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

SYMBOLS

<table>
<thead>
<tr>
<th>Work Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channelizing Device (See Index 102-600)</td>
</tr>
<tr>
<td>Work Zone Sign</td>
</tr>
<tr>
<td>Advance Warning Arrow Board</td>
</tr>
</tbody>
</table>

DESCRIPTION:

MULTILANE, WORK WITHIN THE TRAVEL WAY DOUBLE LANE CLOSURE
GENERAL NOTES

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

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

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

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

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

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

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

CONDITIONS

PLANNED CLOSURE NOT EXCEEDING 5 MINUTES.
SYMBOLS

- Work Area
- Channelizing Device (See Index 102-600)
- Work Zone Sign
- Work Vehicle With Rotating/Strobe Lights
- Shadow (S) Or Advance Warning (AW)
- Vehicle with Advance Warning Arrow Board and Sign Message
- Truck/Trailer Mounted Attenuator (TMA)

GENERAL NOTES

1. Work operations shall be confined to two way left turn lane, leaving the adjacent lanes open to traffic.
2. Advance Warning Vehicle will have an Advanced Warning Arrow Board in the Warning Mode.
3. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed in accordance with other applicable TCZ Indexes.
4. For general TCZ requirements and additional information, refer to Index 102-600.

CONDITIONS

WHERE ANY VEHICLE, EQUIPMENT, WORKERS OR THEIR ACTIVITIES ARE BEING CONDUCTED IN THE TWO WAY LEFT TURN LANE.
CROSSOVER FOR PAVING TRAIN
OPERATIONS, RURAL

**DESCRIPTION:**

**GENERAL NOTES**

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

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

3. **F** = Trailer Mounted and Actuated by Flagger Upon Approach Of The Work Vehicle

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

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

6. For Case II, Conditions A & B, when the median width is too narrow for trucks to make turns into Lane No. 2, Sign Nos. 1, 2, 3 and the Flagger Actuated Advance Warning Arrow Board shall be moved ahead to a crossover in advance of the 'RIGHT LANE CLOSED & MILE' sign. Project advance warning signs (not shown) shall be located in advance of the relocated Sign No. 3.

**CONDITIONS**

**CONDITION A**

WHEN THE PAVING TRAIN IS IN LANE 2 THE U-TURNING VEHICLE SHALL CAUTIOUSLY TURN INTO LANE 1 AND PROCEED IN LANE 1 TO THE FRONT OF THE TRAIN.

**CONDITION B**

WHEN THE PAVING TRAIN IS IN LANE 2 THE U-TURNING VEHICLE SHALL CAUTIOUSLY TURN INTO LANE 1 AND PROCEED IN LANE 1 TO THE FRONT OF THE PAVING TRAIN.

**CONDITION A & B**

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

**SYMBOLS**

- **Work Area**
- **Channelizing Device** (See Index 102-600)
- **Advance Warning Arrow Board** - Type C (48" x 96")
- **Advance Warning Arrow Board** - Type C (48" x 96")
- **Approach Of The Work Vehicle**
- **Lane Number**
- **Lane Identification + Direction of Traffic**

**CASE 1**

TRAFFIC TRANSITION AREA UPSTREAM FROM CROSSOVER

**PROJECT ADVANCE WARNING SIGNING**

These Signs Advance With Taper Transition

When This Sign Conflicts With ROAD WORK & MILE Sign, The ROAD WORK & MILE Sign Shall Be Temporarily Removed.

**CONDITIONS**

**CONCEPTUAL DESIGN**

**PROJECT ADVANCE WARNING SIGNING**

These Signs Advance With Taper Transition

When This Sign Conflicts With ROAD WORK & MILE Sign, The ROAD WORK & MILE Sign Shall Be Temporarily Removed.
CONDITION A

When this sign conflicts with ROAD WORK ½ MILE sign, the ROAD WORK ½ MILE sign shall be temporarily removed.

CONDITION B

When the paving train is in lane 2 the u-turning vehicle shall cautiously turn into lane 3 and proceed in lane 2 to the front of the train.

CONDITION A & B

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

TRAFFIC TRANSITION AREA DOWNSTREAM FROM CROSSED

CASE II

Note: See Sheet 1 for General Notes.
GENERAL NOTES

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

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

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

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

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

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

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

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

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

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

Maximum Spacing Between Cones And Tubular Markers Shall Be 25'

1. (Min.) = WS
2. S = Existing Posted Speed (MPH)

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

### LENGTH OF ACCESS LANES (Ft.)

<table>
<thead>
<tr>
<th>Grade</th>
<th>D_1</th>
<th>D_2</th>
</tr>
</thead>
<tbody>
<tr>
<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>

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

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

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

PHASE II

1. Remove existing pavement marking in areas of diversion and remark as shown, install warning devices and resign as shown. Traffic to be controlled in accordance with Index 102-601 or 102-602.

2. Route through traffic to temporary and existing pavement.

3. Construct transitions, excluding friction course.

SYMBOLS

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

LEGEND

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

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

Note: See Sheet 2 for General Notes.
ROAD CLOSED

SPEED LIMIT XX

NEXT X MILES
ROAD WORK

ROAD WORK

END

SPEED LIMIT XX

SPEED LIMIT XX

SPEED LIMIT XX

SPEED LIMIT XX

SPEED LIMIT XX

SPEED LIMIT XX

SPEED LIMIT XX

SPEED LIMIT XX

2 /26 /2020

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R E V I S I O N

DESCRIPTION:

REVISED

STANDARD PLANS

INDEX

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RETURN TO DOCUMENT

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11/01/17

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REVISED

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RETURN TO DOCUMENT

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

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

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

See Sheet 3 for General Notes.
PHASE II

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

2. Reroute through traffic to Phase I pavement.

3. Complete all Phase II construction, including the friction course. Side street traffic to be maintained. Through and cross traffic to be controlled in accordance with Indexes 102-604, 102-605, and 102-615. Channelizing devices shall be in conformance with Drop-Offs in Work Zones of Index 102-600. When work extends through an intersection, temporarily reroute cross traffic to other cross streets. When rerouting is not possible, provide one-lane access (minimum) for two-lane two-way cross streets and one-lane access (minimum) each direction for four-lane two-way cross streets, in accordance with Indexes 102-604, 102-605, and 102-615.

See Sheet 3 for General Notes.

SYMBOLS

- Channelizing Device (See Index 102-600)
- Type III Barricade
- Work Zone Sign
- Stop Bar

LEGEND

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

1. Sign and mark Phase II pavement in accordance with the Phase III diagram.
2. Reroute through traffic to Phase II pavement.
3. Construct friction course over Phase I pavement. Side street traffic to be maintained. Through and cross traffic to be controlled in accordance with Index 102-606, 102-605, or 102-615. When work extends through an intersection, temporarily reroute cross traffic to other cross streets. When rerouting is not possible, provide one-lane access (minimum) for two-lane two-way cross streets and one-lane across (minimum) each direction for four-lane two-way cross streets.

GENERAL NOTES

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

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

**TWO OR MORE LANES ONE WAY**

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

**TWO OR MORE LANES ONE WAY**

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

**SYMBOLS**

- Arrow: Direction of Traffic
- Channelizing Device (See Index 102-600)

**GENERAL NOTES**

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

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

GENERAL NOTES

1. All signing, pavement marking, and barricades necessary for maintenance of traffic shall conform to Index 102-600.
2. For speed sign applications, see Index 120-600.
3. For lane width requirements see Index 102-600. When one-way one-lane operations are necessary, a minimum width of 12' shall be maintained and traffic controlled in accordance with Index 102-603, 102-606, or 102-607. Minimum width for the diversion shoulders is 6'.
4. Method of attaching temporary guardrail to the diversion structure to be approved by the Engineer. Cost of temporary guardrail systems, including end anchorage assemblies, transitions and attachment to temporary structures, are to be included in the contract unit price for Guardrail (Temporary) LF.
5. Provisions approved by the Engineer shall be made for the removal of storm water from the roadway(s) during construction.
6. Only temporary crash cushions approved by the Department shall be used unless specified devices called for in the plans.
7. Where the temporary structure is not required, the diversion may be constructed in accordance with Index 102-608, unless otherwise stipulated in the plans.
8. For reflective raised pavement marker application, see Indexes 102-600 and 706-001.
9. For general TCZ requirements and additional information, refer to Index 102-600.
When Other Construction Or Maintenance Operations Occur Within 1 Mile, Signs To Be Omitted And Signing To Be Coordinated In Accordance With Index 102-600.

**NOTE:** Length of barrier needed for protection of work area and/or other hazards to be shown in the plans. For complimentary information on barrier and work area see Sheet 1. See Index 102-600 for clear zone requirements.

*Buffer Length (ft)*

<table>
<thead>
<tr>
<th>Construction Zone Speed (mph)</th>
<th>64' Median</th>
<th>88' Median</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>X</strong></td>
<td><strong>Z</strong></td>
</tr>
<tr>
<td>20</td>
<td>607</td>
<td>388</td>
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<td>45</td>
<td>562</td>
<td>352</td>
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<td>55</td>
<td>530</td>
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<td>60</td>
<td>521</td>
<td>321</td>
</tr>
<tr>
<td>70</td>
<td>512</td>
<td>312</td>
</tr>
</tbody>
</table>

*Minimum Radii for Normal Cross Slopes*

<table>
<thead>
<tr>
<th>Construction Zone Speed (mph)</th>
<th>Minimum Radii (ft)</th>
<th>Curves 1 &amp; 4</th>
<th>Curves 2 &amp; 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>22,918 (0° 15')</td>
<td>4,584 (1° 15')</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>22,918 (0° 15')</td>
<td>3,930 (1° 30')</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>22,918 (0° 15')</td>
<td>3,274 (1° 45')</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>11,450 (0° 30')</td>
<td>2,536 (1° 15')</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>11,450 (0° 30')</td>
<td>2,293 (1° 30')</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>200 (0° 15')</td>
<td>1,080 (1° 15')</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>200 (0° 15')</td>
<td>900 (1° 30')</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>200 (0° 15')</td>
<td>810 (1° 45')</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>200 (0° 15')</td>
<td>285 (2° 06')</td>
<td></td>
</tr>
</tbody>
</table>

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

**TYPICAL FOR 64' OR 88' MEDIAN (64' SHOWN)**

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

Traffic pacing is a traffic control technique to slow but not stop traffic to facilitate short duration work operations without an elaborate and difficult detour or diversion. Traffic Control Officers pace or slow the traffic to a speed that provides approximately 20-30 minutes to perform the work operation.

Traffic pacing is a traffic control technique to slow but not stop traffic to facilitate short duration work operations without an elaborate and difficult detour or diversion. Traffic Control Officers pace or slow the traffic to a speed that provides approximately 20-30 minutes to perform the work operation.

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Traffic pacing is a traffic control technique to slow but not stop traffic to facilitate short duration work operations without an elaborate and difficult detour or diversion. Traffic Control Officers pace or slow the traffic to a speed that provides approximately 20-30 minutes to perform the work operation.
STAGE ONE

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

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

STAGE TWO

1. Once the police vehicles are in place and the traffic control officer supervisor at the work area notifies all officers to begin the traffic pacing operation, the last three police vehicles shall clear the work area and immediately move to the right shoulder or crash truck(s) shall be moved from the travel lanes and the two pace setting police vehicles shall begin to slow to the pacing speed (20 mph is preferred, 10 mph minimum), for the duration of the traffic pacing operation.

STAGE THREE

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

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

STAGE FOUR

1. When the pace setting police vehicles are within approximately two miles of the work area they shall notify the mobile traffic control officer supervisor who will immediately inform the contractors on site supervisor of their location. Once the contractors on site supervisor has been notified of the pacing vehicles location, the contractor shall begin to clear the travel lanes of all equipment and debris in order to reopen all travel lanes.

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

GENERAL NOTES

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

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

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

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

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

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

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

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

The maximum allowed work duration is 1/2 hour (30 min).

The maximum practical pacing operation length is 10 miles.

S_r = Regulatory speed (mph)
S_p = Pacing speed (mph)
T_w = Work duration (min)
L = Total pacing distance in miles
L_p = distance paced vehicles must travel before the vehicles at regulatory speed have cleared the work zone
L_w = distance paced vehicles travel while work is performed
L_c = distance paced vehicles travel while work is performed
HV = Heavy Vehicle Factor
P_c = % Trucks
F_p = % Trucks

Hourly directional traffic volumes must be converted to pcphpl using the following:

pcphpl = (Hourly Directional Volume / 2 lanes (each direction)) x Heavy Vehicle Factor

S_p=20; pcphpl ≤ 1,750

<table>
<thead>
<tr>
<th>S_p</th>
<th>t_w (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.8</td>
</tr>
<tr>
<td>15</td>
<td>1.1</td>
</tr>
<tr>
<td>20</td>
<td>1.9</td>
</tr>
<tr>
<td>25</td>
<td>3.6</td>
</tr>
<tr>
<td>30</td>
<td>4.7</td>
</tr>
</tbody>
</table>

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

NOTES FOR TABLE:

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

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

pcphpl = (Hourly Directional Volume / 2 lanes (each direction)) x Heavy Vehicle Factor

* Calculation required, for additional guidance see FDOT Design Manual 242.
1. When encroaching work requires a sidewalk closure for 60 minutes or greater, provide an alternate pedestrian route.
2. For spacing of vehicular channelizing devices, see applicable vehicular temporary traffic control indexes.
3. Cover or deactivate pedestrian traffic signal display(s) controlling closed crosswalks.
4. For post mounted signs located near or adjacent to a sidewalk, maintain a minimum 2' clearance from the bottom of the sign panel to the surface of the sidewalk.
5. Provide a 5' wide temporary walkway, except where space restrictions warrant a minimum width of 4'. Provide a 5' x 5' passing space for temporary walkways less than 5' in width at intervals not to exceed 200'.
6. Provide a cross-slope with a maximum value of 0.02 for all temporary walkways.
7. Maintain temporary walkway surfaces and ramps that are stable, firm, slip-resistant, and free of any obstructions or hazards such as holes, debris, mud, construction equipment, and stored material.
8. Remove temporary walkways immediately after reopening of the sidewalk, unless otherwise noted in the plans.
9. Meet the requirements of Index 322-002 for temporary curb ramps.
10. Place pedestrian longitudinal channelizing device(s) across the full width of the closed sidewalk. For temporary walkways, similar to the Sidewalk Diversion, place LCDs to delineate both sides of the temporary walkway.
11. For sidewalk diversions, ensure that there is sufficient R/W for placement of temporary sidewalk and pedestrian longitudinal channelizing devices.

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

GENERAL NOTES:
- Crosswalk Closure and Pedestrian Detour
- Sidewalk Detour
- Sidewalk Diversion
GENERAL NOTES

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

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

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

4. Access openings shall not be constructed directly opposite temporary median crossovers or within 2000 ft. of temporary median crossovers.

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

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

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

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

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

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

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

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

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

- Work Area
- Work Zone Sign
- Advance Warning Arrow Board
- Lane Identification + Direction of Traffic
- Advance Warning Vehicle Equipped with
- Truck/Trailer Mounted Attenuator
- Portable Changeable (Variable) Message Sign
- PCMS Display A
- PCMS Display B
- PCMS Display C

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

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

GENERAL NOTES

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

Table I - Taper Length (L)

<table>
<thead>
<tr>
<th>Dedicated Lane Location</th>
<th>Number of Dedicated Lanes Closed</th>
<th>Number of Dedicated Lanes</th>
<th>Taper Length (Feet)</th>
<th>PCMS Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center</td>
<td></td>
<td>1</td>
<td>200</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>330</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>330</td>
<td>B</td>
</tr>
<tr>
<td>Inside***</td>
<td></td>
<td>2</td>
<td>350</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>350</td>
<td>C</td>
</tr>
</tbody>
</table>

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

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

See Table 1

Taper Length=L

See Table 1

Taper Length=L

Varies

Vehicle Equipped with Portable Changeable (Variable) Message Sign

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

MESSAGE 1: LANE(S) ONLY
MESSAGE 2: LEFT/RIGHT

When Workers Present, "Speeding Fines Doubled Through Toll Plaza"
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES

** If There is No Room in the Median for the PCMS, Then Locate it on the Outside of the Roadway only.

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

A truck/trailer mounted attenuator is required.

This Plan is for Lane Closures that exceed three hours.

Left Lane Closed Configuration.

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

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

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

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

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

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

4. A truck/trailer mounted attenuator is required.

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

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

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

GENERAL NOTES

SYMBOLS

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

PCMS DISPLAY

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

PCMS DISPLAYS

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

TWO OR MORE DEDICATED LANES CLOSED

CENTER OR RIGHT DEDICATED LANE CLOSED

INSIDE DEDICATED LANES

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

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

---

**OUTSIDE OPEN ROAD TOLLING LANS**

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

---

**GENERAL NOTES**

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

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

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

4. For planned lane closure, a portable changeable message sign shall be placed and shall display the message shown at a minimum of one week prior to closure. If planned lane closure is less than one week, place portable changeable message sign immediately using "prior to closure" messages.

5. A truck/trailer mounted attenuator is required.

6. Lane closure configurations applicable to 2 or 3 lane open road tolling plazas.

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

---

**TOLL PLAZA TRAFFIC CONTROL STANDARDS**
TOLL PLAZA TRAFFIC CONTROL STANDARDS

**PCMS DISPLAYS.**

**PCMS DISPLAY PRIOR TO CLOSURE**

Message 1: SUNPASS
Message 2: LANE
ONLY
OPEN
"DATE/EST"

**PCMS DISPLAY DURING CLOSURE**

Message 1: SUNPASS
ONLY
USE
LANE
CAUTION

**SYMBOLS**

- Work Area
- Work Zone Sign
- Lane Identification + Direction of Traffic
- Advance Warning Arrow Board
- Truck/Trailer Mounted Attenuator
- Portable Changeable (Variable) Message Sign

GENERAL NOTES

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

INSIDE OPEN ROAD TOLLING LANES

**REV ISIO N DESCRIPTION:**

pleado 2020-21 STANDARD PLANS

102-667 4 of 6

LAST REVISION 01/01/17
PRESENT WHEN WORKERS DOUBLED SPEEDING FINES AHEAD WORK PLAZA CLOSED LEFT LANE

EXHIBIT A
DEDICATED, CASH, OR MIXED-USE LANES IN CENTER - ONE LANE CLOSED
(This same plan can be used for any non-dedicated lane even if they are not in the center of the plaza)

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

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

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

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

3. A truck/trailer mounted attenuator is required.

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

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

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

MAINLINE PLAZAS & RAMP PLAZAS

SYMBOLS

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

EXHIBIT B
DEDICATED LANE INSIDE OR OUTSIDE - ONE LANE CLOSED
(Outside Lane Closure is a Mirror Image of this Exhibit)
GENERAL NOTES

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

SHORT-TERM CLOSURES

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

SYMBOLS

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

WORK DONE WITHIN TRAVEL LANE - ONE LANE CLOSED

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

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

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

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

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

5. See Index 102-400 for general TCZ requirements and additional information.

SYMBOLS:

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

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

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

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

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

5. See Index 102-400 for general TCZ requirements and additional information.

TYPICAL PCMS DISPLAY

With speed reduction:
Message 1: WORKERS PRESENT AHEAD
Message 2: SPEED REDUCED NEXT X MILES

Without speed reduction:
Message 1: WORKERS PRESENT AHEAD
Message 2: NEXT X MILES

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

Table I: Device Spacing

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

Table II: Buffer Space and Taper Length

<table>
<thead>
<tr>
<th>Posted Speed (mph)</th>
<th>Buffer Space</th>
<th>Taper Length (12' Lateral Transition)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dist. (ft.)</td>
<td>L (ft.)</td>
<td>Notes (Merge)</td>
</tr>
<tr>
<td>55</td>
<td>455</td>
<td>660</td>
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<td>720</td>
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<td>780</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>730</td>
<td>840</td>
<td></td>
</tr>
</tbody>
</table>

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

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

Where:

L = Length of taper in feet
W = Width of lateral transition in feet
S = Posted speed limit (mph)
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 height. 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

- **Critical Root Zone (See Plans For Barrier Alignment)**
- **2’ x 4’ Nominal Boards To Form A Continuous Protective Barrier (Do Not Fasten Boards Into Tree)**
- **Weather Resistant Sign (See Note 1)**
- **6’ Minimum Height Or To Lowest Branch**
- **Burlap Bands (3 Minimum)**
- **Burlap**
- **Fencing May Occur Outside Of The Critical Root Zone, See Note 1**
- **Bands**
- **Underground Utility**
- **Critical Root Zone, See Note 1**
- **Outside Of The Critical Root Zone**
- **No Open Trenching Under The Critical Root Zone Of The Tree**
- **Maintain Existing Grade Within The Tree Protection Barrier**
- **Critical Root Zone**
- **ELEVATION**
- **PLAN**
- **SECTION A-A**
- **PROTECTION BARRIER FOR TREE GROUPINGS**

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).
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 routes(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 21 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 patron.

Reuse of existing mailboxes by the contractor will not be a requirement under any construction project; however where an existing mailbox meets the design requirements of this index and is structurally and functionally sound, the postmaster may allow the contractor to use the existing mailbox in lieu of constructing a new mailbox. Any use of existing mailboxes must be approved by the Engineer.

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 (DMM).

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:

a. Shoulder width plus 8” to 12”.

b. 10’ for ADT over 10,000 vpd.
   6’ for ADT 100 to 10,000 vpd.
   4’ for ADT under 100 vpd.

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

Mailboxes on curved highways, roads, and streets shall be set with the face of the box between 6” and 12” behind the face of curb. If the sidewalk 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.

6. 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.

7. No more than two mailboxes may be mounted on a support unless the U.S. Postal Service establishes other height restrictions.

8. Lightweight newspaper receptacles may be mounted below the mailbox on the mail stop surface, unless the U.S. Postal Service establishes other height restrictions.

9. Wood and steel support posts for both single and double mailbox mountings shall be embedded no more than 24” into the ground.

Concrete, block, brick, stone or other rigid foundation structure or encasement, either above or below the shoulder ground line, will not be permitted for mailboxes on rural highways. On urban roads and streets where mailbox support posts are set within rigid pavement back of curb, the support posts shall be separated from the pavement by a minimum of 3” of expansion material.

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

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

11. Wood support posts shall be in conformance with the material and dimensional requirements of 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 cut to size 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.

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

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

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

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

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

GENERAL NOTES

STEEL SUPPORT POSTS

Steel support post 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 cut to size 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.

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

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MAILBOXES

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MAILBOXES

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DESCRIPTION:

LAST REVISION

01/01/17
DIVIDED ROADWAYS

GENERAL NOTES:
1. Roadway dimensions are representative. Subgrade dimensions and control lines are standard. The details shown on this Index do not supersede the details shown in the Plans or Indexes 120-002 and 160-001.
2. Plastic (P) soils may be placed above the existing water level (at the time of construction) to within 4 feet of the proposed base. It should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for short distances.
3. High Plastic (H) soils excavated within the project limits may be used in embankment construction as indicated on this Index. High Plastic soils are not to be used for embankment construction when obtained from outside the project limits.
4. Select (S) soils having an average organic content of more than two and one-half (2.5) percent, or having an individual test value which exceeds four (4) percent, are not permitted in the subgrade portion of the roadway. Select (S), Plastic (P), or High Plastic (H) soils having an average organic content of more than five (5) percent, or an organic content individual test result which exceeds seven (7) percent, are not permitted in the portion of embankment inside the control line, unless written authorization is provided by the District Geotechnical Engineer; these soils may be used for embankment construction outside the control line, unless restricted by the Plans or otherwise specified in the Plans, provided they can be compacted sufficiently to sustain a drivable surface for operational vehicles as approved by the Engineer. Determine average organic content from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Perform tests in accordance with AASHTO T 267 on the portion of a sample passing the No. 4 sieve. They may be used in the embankment above the water level existing at time of construction. They may be used in the subgrade portion of the roadway, unless restricted by the Plans or otherwise specified in the Plans, provided they can be compacted sufficiently to sustain a drivable surface for operational vehicles as approved by the Engineer. Determine average organic content from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Perform tests in accordance with AASHTO T 267 on the portion of a sample passing the No. 4 sieve.
5. Highly organic soils, composed primarily of partially decayed organic matter, often dark brown or black in color with an odor of decay, and sometimes fibrous, are designated as muck. Further, any stratum or stockpile of soil which contains pockets of highly organic material may be designated as Muck (M). Highly organic soils are not permitted within the subgrade or embankment portion of the roadway.

UNDIVIDED ROADWAY

SYMBOL | SOIL | CLASSIFICATION (AASHTO M 145)
-------|------|------------------------
S      | Select| A-1, A-3, A-2-4 **
H      | High Plastic| A-2-5, A-2-7, A-5 Or A-7 (ALL WITH LL > 50)
M      | Muck| A-8

Classification listed left to right in order of preference.

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

GENERAL NOTES AND FLEXIBLE PAVEMENT

REMOVAL OF EXCESS BASE MATERIAL

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.

GENERAL NOTES:
1. Roadway dimensions are representative. Subgrade dimensions and control lines are standard. The details shown on this Index do not supersede the details shown in the Plans or Indexes 120-002 and 160-001.
2. Plastic (P) soils may be placed above the existing water level (at the time of construction) to within 4 feet of the proposed base. It should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for short distances.
3. High Plastic (H) soils excavated within the project limits may be used in embankment construction as indicated on this Index. High Plastic soils are not to be used for embankment construction when obtained from outside the project limits.
4. Select (S) soils having an average organic content of more than two and one-half (2.5) percent, or having an individual test value which exceeds four (4) percent, are not permitted in the subgrade portion of the roadway. Select (S), Plastic (P), or High Plastic (H) soils having an average organic content of more than five (5) percent, or an organic content individual test result which exceeds seven (7) percent, are not permitted in the portion of embankment inside the control line, unless written authorization is provided by the District Geotechnical Engineer; these soils may be used for embankment construction outside the control line, unless restricted by the Plans or otherwise specified in the Plans, provided they can be compacted sufficiently to sustain a drivable surface for operational vehicles as approved by the Engineer. Determine average organic content from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Perform tests in accordance with AASHTO T 267 on the portion of a sample passing the No. 4 sieve.
5. Highly organic soils, composed primarily of partially decayed organic matter, often dark brown or black in color with an odor of decay, and sometimes fibrous, are designated as muck. Further, any stratum or stockpile of soil which contains pockets of highly organic material may be designated as Muck (M). Highly organic soils are not permitted within the subgrade or embankment portion of the roadway.

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NOTES:
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GENERAL NOTES:
1. Roadway dimensions are representative. Subgrade dimensions and control lines are standard. The details shown on this Index do not supersede the details shown in the Plans or Indexes 120-002 and 160-001.
2. Plastic (P) soils may be placed above the existing water level (at the time of construction) to within 4 feet of the proposed base. It should be placed uniformly in the lower portion of the embankment for some distance along the project rather than full depth for short distances.
3. High Plastic (H) soils excavated within the project limits may be used in embankment construction as indicated on this Index. High Plastic soils are not to be used for embankment construction when obtained from outside the project limits.
4. Select (S) soils having an average organic content of more than two and one-half (2.5) percent, or having an individual test value which exceeds four (4) percent, are not permitted in the subgrade portion of the roadway. Select (S), Plastic (P), or High Plastic (H) soils having an average organic content of more than five (5) percent, or an organic content individual test result which exceeds seven (7) percent, are not permitted in the portion of embankment inside the control line, unless written authorization is provided by the District Geotechnical Engineer; these soils may be used for embankment construction outside the control line, unless restricted by the Plans or otherwise specified in the Plans, provided they can be compacted sufficiently to sustain a drivable surface for operational vehicles as approved by the Engineer. Determine average organic content from the test results from a minimum of three randomly selected samples from each stratum or stockpile of a particular material. Perform tests in accordance with AASHTO T 267 on the portion of a sample passing the No. 4 sieve.
5. Highly organic soils, composed primarily of partially decayed organic matter, often dark brown or black in color with an odor of decay, and sometimes fibrous, are designated as muck. Further, any stratum or stockpile of soil which contains pockets of highly organic material may be designated as Muck (M). Highly organic soils are not permitted within the subgrade or embankment portion of the roadway.
**SYMBOL** | **SOIL** | **CLASSIFICATION (AASHTO M 145)**
--- | --- | ---
S | Select | A-1, A-3, A-2-4 **
H | High Plastic | A-2-5, A-2-7, A-5 Or A-7 (ALL WITH LL ≥ 50)
M | Muck | A-8

Classification listed left to right in order of preference.

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

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

* For cut sections this dimension may be reduced to 24"; see Index 120-002. For minor collectors and local facilities this dimension may be reduced to 18".
**SYMBOL**
- **S**: Select
- **S+**: Special Select
- **P**: Plastic
- **H**: High Plastic
- **M**: Muck

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

Classification listed left to right in order of preference.

*** 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.

** Muck material must be nonplastic and contain less than 15% passing the No. 200 U.S. Standard sieve.

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

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

*Remove overlying material and organic material within the limits shown and backfill in accordance with Index 120-001, unless approved otherwise by the District Geotechnical Engineer. The limits include full median width when applied to divided facilities with median widths up to 64'; when median width is greater than 64' and for bifurcated roadways the organic material removal limits will be set by a 1:2 control line complimentary to the outer roadway that will accommodate one future median lane on each roadway unless specified otherwise by the plans.
**Removal of Plastic Material**

**Notes:**
1. See Sheet 1 for the GENERAL NOTES.
2. When the typical cut details are applied to minor collectors and local facilities, the undercut may be reduced from 24" to 18".
3. Where frequency of median breaks indicates that it is impractical to leave plastic material in the median, the designer may elect to indicate total removal of this material. If during construction it becomes apparent, due to normal required construction procedures, that it is impractical to leave the plastic material in the median, total removal of this material shall be approved by the Engineer.
4. Refer to roadway cross sections to determine whether minimum or preferable removal is used.
5. Where the Preferable Removal method is shown in the plans and it is impossible to place the underdrain at the Outer Cut Limit due to conflict with storm drain trunk lines, remove to Inner Cut Limit and place underdrain at location shown for Minimum Removal. (See Special Removal Detail)
6. Cross slopes of 0.02 shown above are minimums. Follow the cross slope of the pavement to the extent possible.

**Construction and Location of Underdrain in Curbed Roadway**

(See Note 4)

**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**

**Description:**

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SHEET

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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 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 125.
   
   B. In Stage #1, construct compacted fill beneath the haunches of the pipe, using mechanical tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding.
   
   C. In Stage #2, construct compacted fill along the sides of the pipe and up to the bottom of the base, with the upper 12" receiving Type B Stabilization. In lieu of Type B Stabilization, the Contractor may construct using Optional Base Group 3.

2. **FLOWABLE FILL**
   
   A. If compaction cannot be achieved through normal mechanical methods then flowable fill may be used.
   
   B. Flowable fill is to be placed in accordance with 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.

**GENERAL NOTES**

1. The details provided in this Index apply to cases in which jack and bore or directional boring methods are not required by the Engineer.

2. Flowable fill shall not be placed directly over loose, or high plastic, or muck material (see Index 120-001) which will cause settlement due to fill weight. Where highly compressible material exists, the amount, shape and depth of flowable fill must be engineered to prevent pavement settlement.

3. These details do not apply to utility cuts longitudinal to the centerline of the roadway which may require the additional use of geotextiles, special bedding and backfill, or other special requirements.

4. Method of construction must be approved by the Engineer.

5. Some pipe may require special granular backfill up to 6" above top of pipe. Geotextiles may be required to encapsulate the special granular material.

**FLEXIBLE PAVEMENT CUTOFF**

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

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

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

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

**RIGID PAVEMENT CUTOFF**

TRENCH CUTS AND RESTORATIONS ACROSS ROADWAYS

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UTILITY ADJUSTMENTS THRU EXISTING PAVEMENT

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UTILITY ADJUSTMENTS THRU EXISTING PAVEMENT

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UTILITY ADJUSTMENTS THRU EXISTING PAVEMENT

REV 01/01/17
PARTIAL CUTS FOR RING AND COVER ADJUSTMENTS

NOTES
1. Cut-Lines must be straight and cleanly sawed.
2. See Sheet 1 for replacement pavement.
3. Adjust manholes prior to placing friction course when pavement resurfacing is occurring in the area adjacent to the manholes.
4. Align longitudinal Cut-Lines with pavement joint or center of traffic lane to avoid wheel path.
5. For rigid pavement, align Transverse Cut-Lines with nearest existing joint.
Timber Plate

Steel Plate

Installation

Notes:
1. Elevation of the top of each length of marker pipe shall be determined as soon as it is installed and also immediately before the next length of marker pipe is added.
2. Settlement plate locations shall be flagged and protected from construction vehicles and equipment. If settlement plates are disturbed, they shall be replaced in kind.
3. Oakum used to construct seal should not have a mesh covering (plastic or other synthetic material).
4. The settlement plates shall be paid for under the contract unit price for Settlement Plate Assembly, AS.
Connect to Paved Public Roads
Shoulder Width for Crossovers That
Stabilize Crossover Area Plus Normal
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.
1. See Plans for Driveway Width (W) and Return Radius (R).

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

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

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

5. Point of Connection:
   a. Construct paved driveways for all paved connecting facilities. The connecting point will be determined by the Engineer.
   b. Construct paved driveways for all business, commercial, industrial or high volume residential graded connecting facilities. Construct the connecting point 30'-0" from edge of travel way or at R/W line, whichever is less.
   c. Construct paved driveways for all side road connections. The R/W is the connecting point.
**DESCRIPTION:** REVISION OF STANDARD PLANS FY 2020-21 SHEET 11/01/18

**INDEX:** 330-001

**Paved and Graded Driveways**

**GENERAL NOTES:**
1. Driveways are to be constructed or resurfaced for low volume (single family, duplex, farm, etc.) residential connections as directed by the Engineer.
2. Driveways construction is not required for low volume residential connections where roadway shoulders are paved.
3. Match existing paved shoulder widths ± 4'. For all other shoulders conditions, construct at 5' wide.
4. Connections beyond the shoulder width are to be constructed as directed by the Engineer.
5. Construct Driveway Base in accordance with Specification 286.
6. Payment for structural course and friction course is to be included in roadway pavement pay item.

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

<table>
<thead>
<tr>
<th>Drive Width (ft.)</th>
<th>Interception Type I</th>
<th>Type II</th>
<th>Type I</th>
<th>Type II</th>
</tr>
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<tr>
<td>12</td>
<td>26</td>
<td>31</td>
<td>31</td>
<td>60</td>
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<tr>
<td>56</td>
<td>53</td>
<td>79</td>
<td>62</td>
<td>91</td>
</tr>
</tbody>
</table>

**MATERIAL TYPES AND THICKNESSES FOR PAVED CONNECTIONS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Materials</th>
<th>Minimum Thickness (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Structural</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>Asphaltic Concrete</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>Optional Base (See Specification 285)</td>
<td>0.66 G. 2</td>
</tr>
<tr>
<td></td>
<td>Roadway*</td>
<td>0.66 G. 3</td>
</tr>
</tbody>
</table>

* Travel way flares (bypass lanes), auxiliary lanes serving more than a single connection, and all median crossovers including their auxiliary lanes and/or transition tapers.

**NOTES**
1. Use same material for driveway structural course and roadway overbuild or structural course, except as approved by the Engineer for graded connections. Other Department-approved equivalent pavements may be used at the discretion of the Engineer.
2. Auxiliary lanes and their transition tapers shall be the same structure as the abutting travel way pavement thickness or any of the roadway structures tabulated above, whichever is thicker.
3. Use Class NS concrete at least 6" thick for driveways paved with Portland Cement Concrete. Construct in accordance with Specifications 347, 350, and 522.
4. A structural course is required for flexible pavements when they are used for auxiliary lanes serving more than a single connection.
5. Use Class KS concrete at least 6" thick for driveways paved with Portland Cement Concrete. Construct in accordance with Specifications 347, 350, and 522.
6. The Department may require other pavement criteria where local conditions warrant.
**NOTES:**

1. For joint seal dimensions see Sheet 2.

2. For slabs poured simultaneously, tie bars may be inserted in the plastic concrete by means approved by the Engineer.

3. For Longitudinal Joints:
   A. Tie bars are deformed #4 or #5 reinforcing steel bars meeting the requirements of Specification 931.
   B. Provide a standard load transfer tied joint with #4 bars 29" in length at 24" spacing or #3 bars 30" in length at 36" spacing.

4. Transverse joints are to be spaced at a maximum of 15'. Dowels are required at all transverse joints unless otherwise noted in the plans.

5. Expansion joints to be placed at street intersections and other locations as indicated in the Plans.
   For bridge expansion joints, see Index 370-001.

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

7. Coat and lubricate plain steel dowel bars in accordance with Specification 930.


---

**CONCRETE PAVEMENT JOINTS**

**METAL**

1. **Longitudinal Joint**
   - Tie Bars
   - Dowel Bars

2. **Transverse Joint**
   - Tie Bars
   - Dowel Bars

**PLASTIC**

1. **Expansion Joint**
   - Expansion Joint (See Note 6)
   - Initial 1/8" Saw Cut or 1/8" Max.
   - Formed Groove (Depth 1/4 to 1/2 D)

2. **Butt Construction Joint**
   - Butt Construction Joint
   - (Used At Discontinuance Of Work)

**Dowel Bars Caps**

**Dowel Bar Layout**

**Contraction Joints**

- **Vibro Case Method**
- **Sawed Method**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Minimum Bar Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>5/32&quot;</td>
<td>1/16&quot;</td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>3/32&quot;</td>
<td>1/16&quot;</td>
</tr>
</tbody>
</table>

**DOWELS (LENGTH 18")**

<table>
<thead>
<tr>
<th>Pavement Thickness</th>
<th>3&quot;</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
</tr>
</tbody>
</table>

1. **Lane-Tie Joint**: (See Note 2)
2. **Concrete Pavement Joints**
3. **Dowel Bars Composition**
4. **Dowel Bar Layout**
5. **Dowel Bars Caps**

---

**L/2**

- 12"
- 12"
- 12"
- 12"
- 12"
- 12"
- 12"
- 12"

---

**Revision Notes**

- **Revision 01/01/19**
- **F Y 2020-21**
- **Standard Plans**
- **Index 350-001**
**Concrete-Pavement Joints**

**Concrete-Concrete Joints**

**For New Projects**

**Preformed Elastomeric Compression Seal**

**For New and Rehabilitation Projects**

**Backer Rod Bond Breaker**

**Concrete-Asphalt Shoulder Joints**

**Joint Seal Dimensions**

**Concrete-Pavement Joints**

**Index**

**FY 2020-21 Standard Plans**

**Revision:** 01/01/17

**Description:**

---

**Concrete Pavement Joints**

**Index:** 350-001

**Sheet:** 2 of 4
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 \( \frac{1}{2} \)" preformed expansion joint material.

CONTRACTION ASSEMBLY

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.
**2-THRU LANES WITH SINGLE LANE ENTRANCE RAMP**

- **Contraction Joint (Typ.)**

**ENTRANCE TAPER WITH AUXILIARY LANE**

- **25:1 Taper**

**ENTRANCE RAMP WITH ADDED LANE**

- **Transition From 13' to 12' Wide Over 3 Slabs**

**EXIT TAPER WITH AUXILIARY LANE**

- **Transition From 13' to 12' Wide Over 3 Slabs**

**2-THRU LANES WITH SINGLE LANE EXIT RAMP**

- **Contraction Joint (Typ.)**

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

- **Note:** On single lane ramps, longitudinal joint to be constructed along centerline of ramp.

**JOINT LAYOUT AT ENTRANCE AND EXIT RAMP TERMINALS**

- Note: Transverse joint spacing should not exceed 15-ft or twenty-four times the slab thickness, whichever is less. If a lane exceeds 15-ft width, such as single lane ramps and weigh stations, longitudinal joint to be constructed in centerline of lane.
GENERAL NOTES

1. For Repair and Replacement Criteria see Sheet 2.

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

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

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

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

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

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

8. Install tie bars at longitudinal joints when two full adjacent or multiple replaced slabs.
<table>
<thead>
<tr>
<th>DISTRESS PATTERN</th>
<th>SEVERITY/DESCRIPTION</th>
<th>REPAIR METHOD</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CRACKING</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitudinal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>&lt;½” no faulting, spalling &lt;½” wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;½” width &lt;½”, spalling &gt;½” wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;½” width &gt;½”, &gt;½” faulting &gt;½”</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td>Transverse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>&lt;½” no faulting, spalling &lt;½” wide</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;½” width &lt;½”, spalling &gt;½” wide</td>
<td>Clean and Seal</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;½” width &gt;½”, &gt;½” faulting &gt;½”</td>
<td>Replace</td>
<td>Figure 10.3</td>
</tr>
<tr>
<td>Corner Breaks</td>
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<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
</tr>
<tr>
<td><strong>JOINT DEFICIENCIES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spall Nonwheel Path</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>spall width &lt;½”, &lt;½” slab depth, &lt;12” in length</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;½” &lt;spall width &lt;½”, &lt;½” slab depth, &lt;½” in length</td>
<td>None</td>
<td>Figure 10.2 and 10.5</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;½” &lt;spall width &gt;½” or length &gt;½”</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Spall Wheel Path</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>spall width &lt;½”, &lt;½” slab depth, &lt;½” in length</td>
<td>None</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;½” &lt;spall width &lt;½”, &lt;½” slab depth, &lt;12” in length</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
</tr>
<tr>
<td>Severe</td>
<td>&gt;½” &lt;spall width &gt;½” or length &gt;½”</td>
<td>Full Depth</td>
<td>Figure 10.4 and 10.5</td>
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<tr>
<td><strong>SURFACE DETERIORATION</strong></td>
<td></td>
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<tr>
<td>Pop Outs Nonwheel Path</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Light</td>
<td>Not deemed to be a traffic hazard</td>
<td>Keep under observation</td>
<td>Figure 10.2</td>
</tr>
<tr>
<td>Severe</td>
<td>Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Pop Outs Wheel Path</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>Deemed to be a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td>Severe</td>
<td>Flying debris deemed a traffic hazard</td>
<td>Full Depth</td>
<td>Figure 10.4</td>
</tr>
<tr>
<td><strong>MISCELLANEOUS DISTRESS</strong></td>
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</tr>
<tr>
<td>Faulting</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Light</td>
<td>Faulting &lt;4/32”</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>4 &lt;Faulting &lt;16/32”</td>
<td>Grind</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>Faulting &gt;16/32”</td>
<td>Grind</td>
<td></td>
</tr>
<tr>
<td>Lane To Shoulder Drop Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light</td>
<td>½” drop-off &lt;½”</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Moderate</td>
<td>&gt;½” drop-off &lt;3”</td>
<td>Build Up</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>drop-off &gt;3”</td>
<td>Build Up</td>
<td></td>
</tr>
<tr>
<td>Water Bleeding Or Pumping</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Seem 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>
<td></td>
</tr>
<tr>
<td>Blowups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
</tr>
</tbody>
</table>
Pavement with Special Select Soil Base

Bridge Approach Expansion Joint Concrete

Rigid Shoulder Pavement

Sodded Shoulder or Flexible Shoulder Pavement

Notes:
1. Immediately prior to placing the seal, thoroughly clean the joint of all foreign material. Immediately after the seal is placed, bend up the sheet metal strip against the pavement edge.
2. Use a minimum 16 gage steel, 12" wide sheet metal strip, Galvanized in accordance with ASTM A-526, Coating Designation G90.

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 shoulder pavements, measured at right angles to the centerline of the roadway. Payment for expansion joint is full compensation for joint construction, including reinforced concrete slab, sheet metal strip and compression seal, but, not including roadway pavement reconstruction associated with joint replacement or reconstruction. Expansion joint to be paid for under the contract unit price for Bridge Approach Expansion Joint, LF.

SECTION A-A

PLAN EXPANSION JOINT

For Joint Payment See General Note 4

Shear Variance (See Approach Slab details)

Reinforcing Steel

Joint Dimensions

Compression Seal Detail

Sheet Metal Strip Details

Compression Seal Detail

Option Seals

Joint Dimensions

Mark

Size

Spec. No.

Req'd

Length

Enum

5"

8"

10"

W Minus 8"

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.

* 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**

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**

3/4 V-Groove across top and down front face of wall at joint (Typ.). Extend V-Groove down back of wall to 0' min. below ground. (see V-Groove Detail)

**Stem Offset**

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

**Stem as constructed**

**Front Face of Wall**

**SECTION A-A**

**WALL JOINT DETAIL**

Wall Joint

(required at footing step)

- Wall Joint

- Wall Joint

- Wall Joint

(see 'Detail A')

**Junction Slab**

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

**TRAFFIC RAILING/JUNCTION SLAB DETAIL**

3" Ø PVC Drain Pipe. Slope down 1/2 from back to front of wall and extend 1/2 beyond both front face and back face of wall.

** 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.**

**V-Groove (Typ.)**

(see 'V-Groove Detail')

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.

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

**Top of Footing**

**V-Groove (Typ.)**

(see 'V-Groove Detail')

**SECTION A-A**

**EXPANSION JOINT DETAIL**

**Key to stop at top of footing and 6" from top of wall. Joint across footing and top of wall to be a straight line.**

**Stay-In-Place Plastic Preformed Bond Beakers are permitted to form joints.**
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.

Concrete for Gravity Wall shall be Class NS per Section 347. Concrete for Scheme 3 Junction Slab and Traffic Railing shall be Class II per Section 346, unless otherwise specified in the plans.

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

When required, for adjacent guiderail, see Index 515-070 or 515-080 as appropriate. For adjacent Type B fence see Index 350-002.

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

Provide a continuous 1" thick clean gravel or crushed rock drain for wall heights > 2'-0", and higher. Wrap drainage layer as shown, with Type D-3 geotextile fabric in accordance with Specification Section 985. Provide 2" Ø PVC drain pipe at 10 ft. max. spacing (when Drainage Layer is required). Locate or grade edge of Drain Pipe a minimum of 2'-0" from wall joints.

Cost of reinforcing steel, face texture, finish, joint seal, drain pipes, drainage layer, galvanized mesh and geotextile fabric to be included in the Contract Unit Price for Concrete Class NS, Gravity Wall. Cost of concrete for Junction Slab in Scheme 3, to be included in Contract Unit Price for Concrete Traffic Railing Barrier With Junction Slab. Adjacent railings or fences to be paid for separately.

<table>
<thead>
<tr>
<th>SCHEME</th>
<th>DESCRIPTION</th>
<th>LOCATION</th>
<th>PER LINEAR FOOT OF WALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(No Traffic Loading Effects &amp; Upper Slopes ≤ 1:1½)</td>
<td>C-I-P Concrete Gravity Wall</td>
<td>Class NS Concrete (CY)</td>
</tr>
<tr>
<td>2</td>
<td>(With Traffic Loading or Upper Slopes &gt; 1:1½)</td>
<td>1' 0&quot; Min. to SHW</td>
<td>0.08 (0.20°F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1'-0&quot; For Slopes ≤ 1:1½ 2'-0&quot; For Slopes &gt; 1:1½</td>
<td>0.14 (0.32°F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>0.22 (0.47°F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1'-6&quot; Cl. (Max.)</td>
<td>0.32 (0.65°F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>0.43 (0.85°F)</td>
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<tr>
<td></td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>0.60 (1.2°F)</td>
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</table>

<table>
<thead>
<tr>
<th>SCHEME</th>
<th>DESCRIPTION</th>
<th>LOCATION</th>
<th>REINFORCING STEEL</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>3 (3&quot;) No</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>3 (3&quot;) No</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>5 (5&quot;) Yes</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>6 (1&quot;) Yes</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1'-0&quot; Min. to SHW</td>
<td>7 (1&quot;) Yes</td>
</tr>
</tbody>
</table>

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

**Bill of Reinforcing Steel**

**Bar Bending Diagram**

**Notes:**
1. All bar dimensions are cut to out.
2. Lap Splices for Bars A must be a minimum of 1'-10".
NOTES:
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.
5. Pedestrian Railings: See indexes 515-052, 515-062, 515-070, 515-080 or Project Specific Design.
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)

HANDRAIL (Typ.)

CONCRETE STEPS

INDEX 400-021
1 of 1
**SUPPLEMENTARY DETAILS FOR MANHOLE AND INLETS**

**WEIGHT OF CASTINGS (lb)**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>2'-0&quot; Opening</th>
<th>3'-0&quot; Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>155</td>
<td>190</td>
</tr>
<tr>
<td>II</td>
<td>145</td>
<td>190</td>
</tr>
<tr>
<td>III</td>
<td>90</td>
<td>190</td>
</tr>
</tbody>
</table>

*Includes Type I Adjustable*

**NOTES (FRAMES, AND COVER)**

1. The standard cover is to be used for all frames Types I, II, III and the 2-piece cover and is the replacement cover for all previous frames with 18" deep seats (traffic type). The 185 lb. cover (non-traffic type), 1984 Roadway and Traffic Design Standards Index 201, is the replacement cover for existing frames with 10" deep seats. Installation of frame and cover is not permitted.

2. Use the 2'-0" cover, unless the 2-piece cover is called for. Do not use the 3'-0" cover where the depth exceeds 2", unless otherwise noted.

**DESIGNER NOTE:**

Consider using the 2-piece cover where depths exceed 5' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover on the Drainage Structure sheets in the plans.

**WEIGHT OF CASTINGS (lb)**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>2'-0&quot; Opening</th>
<th>3'-0&quot; Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>155</td>
<td>190</td>
</tr>
<tr>
<td>II</td>
<td>145</td>
<td>190</td>
</tr>
<tr>
<td>III</td>
<td>90</td>
<td>190</td>
</tr>
</tbody>
</table>

*Includes Type I Adjustable*
EYEBOLT AND CHAIN REQUIREMENTS

<table>
<thead>
<tr>
<th>Index</th>
<th>Inlet</th>
<th>Eye-</th>
<th>Length</th>
<th>Handling &amp; Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>425-030</td>
<td>1</td>
<td></td>
<td>8'0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-031</td>
<td>N/A</td>
<td>A</td>
<td>3'-8&quot;</td>
<td>Slide Or Side &amp; Spin</td>
</tr>
<tr>
<td>425-032</td>
<td>N/A</td>
<td>A</td>
<td>4'-0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-033</td>
<td>1</td>
<td></td>
<td>4'-0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-034</td>
<td>1</td>
<td></td>
<td>4'-0&quot;</td>
<td>Slide &amp; Spin</td>
</tr>
<tr>
<td>425-035</td>
<td></td>
<td>E</td>
<td>2</td>
<td>2 @ 4'-0&quot; Slide &amp; Spin</td>
</tr>
<tr>
<td>425-036</td>
<td></td>
<td>H</td>
<td>2</td>
<td>2 @ 2'-6&quot; Full Circ. Grade &amp; Slide &amp; Spin Single Pipe Grade</td>
</tr>
<tr>
<td>425-037</td>
<td></td>
<td></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>425-038</td>
<td></td>
<td></td>
<td>1</td>
<td>3'-8&quot;</td>
</tr>
<tr>
<td>425-039</td>
<td></td>
<td>D</td>
<td>2</td>
<td>2 @ 4'-0&quot; Lifting Loop</td>
</tr>
<tr>
<td>425-040</td>
<td></td>
<td></td>
<td>1</td>
<td>4'-0&quot;</td>
</tr>
</tbody>
</table>

EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS

Prior To Placing Base Material
Remove Riprap, Cement PVC Cap
On Lower Stub And Place Compacted Fill In Entrance.

Chain Connection To Grate
4" Min. Embedment For Adhesive Bonded
Grate Option

Jam Nut, Nut And Washer On Straight Bolt

Cold Shut, Cold Shut & 3"-Type Or Threaded
Straight Eyebolt (Thru-Bolted Or
Adhesive Bonded Anchor Installed
Per Specification Section 416 Using
Type HV Adhesive) Or Precaster GCP
Approved Connector

Half To Two-Thirds Wall Thickness

NOTE: When Alternate "I" grate is specified, the chain, bolt, nuts, washer and cold shut shall be galvanized in accordance with Section 425 of the Standard Specifications.

FILTER FABRIC WRAP ON GROUTED PIPING TO STRUCTURE JOINT

Brick Adjustment or Grade Ring Permitted (Min. 0°, Max. 27°)

Brick Adjustment or Grade Ring Permitted (Min. 0°, Max. 12°)

SECTION

Note: See Stab Designs index 425-010.

BRICK OR CONCRETE PRECAST CONCENTRIC CONE

MANHOLE TOPS

NOTES (TOPS)

1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C478 may be used for precast units; see General Note 3.

2. Manhole top Type 7 slabs may be of cast-in-place or precast construction. The optional key is for precast tops and is located downstream. Frame and slot openings are to be omitted when top is used over a junction box.

3. Manhole top Type 8 may be of cast-in-place or precast concrete construction or brick construction. For concrete construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric cone 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 rings. Frames can be adjusted a maximum 12" height with brick or precast concrete rings. Frames can be adjusted a maximum 12" height with brick or precast concrete rings.

6. Substitution of 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 substitution of manhole top Type 7 for Type 8.

DESIGN NOTES

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

SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS

INDEX 425-001 SHEET 2 of 5
**OPTIONAL CONSTRUCTION JOINTS**

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

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

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

4. 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 140 of the Specifications or by non-shrink grout, in accordance with Section 934 of the Specifications.

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 140 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.

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

- **Option 1:** Lap Splice: At Quarter Point (30 Bar Diameters Or Vertical Wire Spacing Plus 2" For WWR)
- **Option 2:** Lap Splice: Standard 90° Hooks At Corners (8" For #4, 10" For #6, 12" For #8)
- **Option 3:** Lap Splice: Corner Spliced Bar (30 Bar Diameters, But Not Less Than Two Vertical Wire Spacings Plus 2" For WWR)

**WALL REINFORCING SPLICE DETAILS**
### GENERAL NOTES

1. For square or rectangular precast drainage structures, use either deformed or smooth WWR meeting the requirements of Specification Section 931. WWR shall be continuous around the box and lap in accordance with Option 1 or 3 as shown in the Wall Reinforcing Splice Details.

2. Horizontal steel in the walls of rectangular structures shall be lap spliced in accordance with Option 1 or 3 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. Robar straight end embedment of peripheral reinforcement may be used in lieu of ACI standard hooks for top and bottom slabs except when hooks are specifically called for in the plans or standard drawings.

5. Concrete as specified in ASTM C478 (4000 psi) may be used in lieu of ACI standard hooks for top and bottom slabs except when hooks are specifically called for in the plans or standard drawings.

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

7. For pay items purposes, the height used to determine if a drainage structure is greater than 10 feet shall be computed using:

   \[ \text{Height} = \text{Elevation of top of manhole lid} \]

### EQUIVALENT REINFORCEMENT SUBSTITUTION

NOTES FOR PRECAST OPTIONS AND EQUIVALENT REINFORCEMENT SUBSTITUTION

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

2. When precast units are used in conjunction with All "B" Structure Bottoms, Index 425-010, the interdimensional 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 can be either deformed bar reinforcement or welded wire reinforcement. Bar reinforcement other than 60 ksi may be used, however only two grades are recognized; Grade 40 and Grade 60. Smooth welded wire reinforcement, will be recognized as having a design strength of 65 ksi and deformed welded wire reinforcement will be recognized as having a design strength of 70 ksi. The area of reinforcement required may be adjusted in accordance with the Equivalent Steel Area Table provided. For bars and spacings not given, the steel area required can be determined by the following equations:

   \[ \text{Max. Grade 40 Bar Spacing} = \frac{\text{Max. Grade 60 Bar Spacing}}{0.86} \]

   \[ \text{Max. Smooth Welded Wire Spacing} = \frac{\text{Max. Deformed Welded Wire Spacing}}{0.74} \]

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.

### EXAMPLE TABLE OF EQUIVALENT STEEL AREA

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Grade 60 Reinforcing Bar</th>
<th>Equivalent Grade 40 Reinforcing Bar</th>
<th>Equivalent 65 KS1 Smooth Welded Wire Reinforcement</th>
<th>Equivalent 70 KS1 Deformed Welded Wire Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Size &amp; Spacing</td>
<td>Bar Size &amp; Spacing</td>
<td>Steel Area (in²/ft)</td>
<td>Style Designation</td>
<td>Min. Steel Area (in²/ft)</td>
</tr>
<tr>
<td>A</td>
<td>#3 @ 60&quot; Cirs.</td>
<td>0.20</td>
<td>#3 @ 45&quot; Cirs.</td>
<td>0.30</td>
</tr>
<tr>
<td>B</td>
<td>#3 @ 50&quot; Cirs.</td>
<td>0.24</td>
<td>#3 @ 35&quot; Cirs.</td>
<td>0.36</td>
</tr>
<tr>
<td>Special 1</td>
<td>#3 @ 9&quot; Cirs.</td>
<td>0.267</td>
<td>#3 @ 12&quot; Cirs.</td>
<td>0.40</td>
</tr>
<tr>
<td>C</td>
<td>#3 @ 35&quot; Cirs.</td>
<td>0.37</td>
<td>#3 @ 45&quot; Cirs.</td>
<td>0.555</td>
</tr>
<tr>
<td>D</td>
<td>#4 @ 42&quot; Cirs.</td>
<td>0.53</td>
<td>#4 @ 55&quot; Cirs.</td>
<td>0.795</td>
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<tr>
<td>E</td>
<td>#4 @ 30&quot; Cirs.</td>
<td>0.73</td>
<td>#4 @ 35&quot; Cirs.</td>
<td>1.095</td>
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<tr>
<td>F</td>
<td>#5 @ 35&quot; Cirs.</td>
<td>1.06</td>
<td>#6 @ 42&quot; Cirs.</td>
<td>1.59</td>
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<tr>
<td>Special 2</td>
<td>#5 @ 50&quot; Cirs.</td>
<td>1.24</td>
<td>#7 @ 42&quot; Cirs.</td>
<td>1.86</td>
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<tr>
<td>G</td>
<td>#6 @ 35&quot; Cirs.</td>
<td>1.46</td>
<td>#7 @ 42&quot; Cirs.</td>
<td>2.19</td>
</tr>
</tbody>
</table>
PICTORIAL VIEW

NOTE:
1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.
2. $h_2$ may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.
3. For inlet segments at finish grade elevation substitute a #8 Bar for the top corner bar when 1'-0" ≤ $h_2$ < 2'-0".

RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER

$H_2$ = 1'-0" (See Notes 2 and 3 Below)

Dowel Construction Joint Or Monolithically Wall & Slabs

Provide 4 Extra #4 Bars (Continuous Around Corner Evenly Spaced. Tie To The Outside Of Vertical Wall Rein.

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

NOTE:
1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.
2. $h_2$ may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.
3. For inlet segments at finish grade elevation substitute a #8 Bar for the top corner bar when 1'-0" ≤ $h_2$ < 2'-0".

RECTANGULAR STRUCTURES

DETAILS FOR SKEWED PIPES IN RECTANGULAR STRUCTURES

SECTION AA

(Pipes Not Shown For Clarity)
### GENERAL NOTES

1. Standard structure bottoms 4'-0" diameter and smaller (Alt. A) and 3'-6" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type J. Risers are permitted for all structures. Round risers are designated Type A. Square 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 either reinforced cast-in-place or precast concrete units except that precast circular units may be furnished with walls in accordance with ASTM C474 (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 III 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 C474 (4000 psi) may be used in lieu of Class II concrete for precast items manufactured in accordance with Specifications Section 401.

5. All reinforcement shown is Grade 60 steel, deformed bar. Equivalent area Grade 40 steel or equivalent area smooth or deformed welded wire reinforcement in accordance with Specification Section 931 may be substituted according to Index 425-001, unless otherwise noted.

6. Alt. A or Alt. B structure bottoms may be used in conjunction with curb inlet tops Types 1, 2, 3, 4, 5, 6, 9, and 10, and any manhole or junction box unless otherwise shown in the Plans or other standard drawings. Alt. B structure bottoms may be used in conjunction with curb inlet Types 7 & 8, or any ditch bottom inlet unless otherwise shown in the Plans or other standard drawings.

7. Rectangular structures may be rotated as directed by the Engineer in order to facilitate connections between the structure walls and storm sewer pipes.

8. Except when 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 3'-6" diameter precast circular units manufactured under ASTM C474, keyed construction otherwise shown. Additional bars used to restrain hole formers for precast structures with grouted pipe connections, may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain cover. Exposed ends of reinforcing at precast pipe openings and grouted joints must be removed to 1" below the concrete cover. Exposed ends of reinforcing at precast pipe openings and grouted joints must be removed to 1" below the concrete surface and sealed with a Type F epoxy in accordance with Specification Section 926. Horizontal steel in rectangular structures shall be lapped a minimum of 30 bar diameters or by standard hooks at corners.

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

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

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

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

14. For manhole and junction box tops, for frames and covers, and, for supplementary details and notes see Index 425-001.

15. Type J structure bottoms must have a minimum 6'-0" wall height when possible, for maintenance access.
MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL

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

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MINIMUM WALL LENGTH (L) FOR NUMBER OF PARALLEL PIPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>3'-6&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>13'-0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>17'-6&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>22'-0&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>26'-6&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>33'-6&quot;</td>
</tr>
<tr>
<td>66&quot;</td>
<td>39'-6&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>45'-0&quot;</td>
</tr>
<tr>
<td>78&quot;</td>
<td>51'-0&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>57'-6&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 WITH MULTIPLE PIPE CONNECTIONS

STRUCTURE SIZES FOR PIPE CONNECTIONS

TABLE 3 - MINIMUM STRUCTURE SIZES FOR SINGLE PIPE CONNECTION PER SIDE

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>SINGLE PIPE</th>
<th>2 TO 4 PIPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>3'-6&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>8'-0&quot;</td>
<td>13'-0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>13'-0&quot;</td>
<td>17'-6&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>17'-6&quot;</td>
<td>22'-0&quot;</td>
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<td>42&quot;</td>
<td>22'-0&quot;</td>
<td>26'-6&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>26'-6&quot;</td>
<td>33'-6&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>33'-6&quot;</td>
<td>39'-6&quot;</td>
</tr>
<tr>
<td>66&quot;</td>
<td>39'-6&quot;</td>
<td>45'-0&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>45'-0&quot;</td>
<td>51'-0&quot;</td>
</tr>
<tr>
<td>78&quot;</td>
<td>51'-0&quot;</td>
<td>57'-6&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>57'-6&quot;</td>
<td>63'-6&quot;</td>
</tr>
</tbody>
</table>

TABLE 3 NOTES:
1. For Round Structures with variable angles between sides and variable pipe sizes, refer to the FDOT Storm Drain Handbook.
2. For 7'-0" Precast Square Structure Bottoms, 30" Pipes with similar invert elevations are not permitted in adjacent walls. Use 4'-0" Side Dimensions when 30" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
3. For 4'-0" Precast Square Structure Bottoms, 36" Pipes with similar invert elevations are not permitted in adjacent walls. Use 5'-0" Side Dimensions when 36" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
4. For 7'-0" Precast Square Structure Bottoms, 66" Pipes with similar invert elevations are not permitted in adjacent walls. Use 8'-0" Side Dimensions when 66" pipe openings are required on adjacent walls and the difference in flow lines is less than 4'-0".

TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

| WALL SPACING | MAXIMUM MAXIMUM MAXIMUM MAXIMUM |
|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|              | SKEW ANGLE                      | SKEW ANGLE                      | SKEW ANGLE                      | SKEW ANGLE                      |
|              | 6"                             | 18°                             | 17°                             | 16°                             |
| 4'-0"        | 17°                             | 16°                             | 15°                             | 14°                             |
| 5'-0"        | 17°                             | 16°                             | 15°                             | 14°                             |
| 6'-0"        | 17°                             | 16°                             | 15°                             | 14°                             |
| 8'-0"        | 17°                             | 16°                             | 15°                             | 14°                             |
| 9'-0"        | 17°                             | 16°                             | 15°                             | 14°                             |
| 10'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 10'-9"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 11'-8"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 12'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 12'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 13'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 13'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 14'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 14'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 15'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 15'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 16'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 16'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 17'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 17'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 18'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 18'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 19'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 19'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 20'-0"       | 17°                             | 16°                             | 15°                             | 14°                             |
| 20'-6"       | 17°                             | 16°                             | 15°                             | 14°                             |

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.

MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

PLAN VIEW

Provide Extra Reinforcing (Vertical Wall Reinforcement Not Shown For Clarity)

Provide Extra Reinforcing (See Note Section B-B)

MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL

PLAN VIEW

Typical Lap Splice (20 Bar Diameter For Deformed Wire Or Bar, But Not Less Than Vertical Wire Spacing Plus 2" For WWR Or 40 Bar Diameters For Smooth Wire)

Single Layer Horiz. Wall Reinf. (Vertical Wall Reinf. Not Shown For Clarity)

Masonry Seal for Precast Structures (Typ.)

Horiz. Wall Reinf. (Vert. Wall Reinf. Not Shown For Clarity)

Provide Extra Reinforcement (End Of Opening)

Provide Extra Reinforcement (Vert. Invert Elevations)

Individual Horizontal Wall Reinforcement Not Shown For Clarity

One Extra #4 Bar Each Side Of Opening (See Section A-A)

PRECAST ROUND STRUCTURES WITH MULTIPLE PIPE CONNECTIONS

STRUCTURE BOTTOMS TYPE J AND P

04/29/2019
SLAB DESIGNS - SQUARE AND RECTANGULAR STRUCTURES (TABLE 6)

<table>
<thead>
<tr>
<th>Size: 4' x Unlimited</th>
<th>Size: 6' x 8'</th>
<th>Size: 8' x 8'</th>
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<tr>
<td>≥0.5' &lt; 8'</td>
<td>≥0.5' &lt; 8'</td>
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</tr>
<tr>
<td>15' &lt; 25'</td>
<td>20' &lt; 34'</td>
<td>17' &lt; 25'</td>
</tr>
<tr>
<td>13' &lt; 20'</td>
<td>15' &lt; 19'</td>
<td>12' &lt; 17'</td>
</tr>
<tr>
<td>11' &lt; 16'</td>
<td>10' &lt; 15'</td>
<td>10' &lt; 14'</td>
</tr>
<tr>
<td>9' &lt; 12'</td>
<td>8' &lt; 11'</td>
<td>7' &lt; 9'</td>
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<tr>
<td>7' &lt; 7'</td>
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<td>5' &lt; 5'</td>
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<td>5.5' &lt; 3'</td>
<td>5.5' &lt; 3'</td>
</tr>
<tr>
<td>5' x 5'</td>
<td>5' x 5'</td>
<td>5' x 5'</td>
</tr>
<tr>
<td>4.5' x 4.5'</td>
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<td>4.5' x 4.5'</td>
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<tr>
<td>4' x 4'</td>
<td>4' x 4'</td>
<td>4' x 4'</td>
</tr>
<tr>
<td>3.5' x 3.5'</td>
<td>3.5' x 3.5'</td>
<td>3.5' x 3.5'</td>
</tr>
<tr>
<td>3' x 3'</td>
<td>3' x 3'</td>
<td>3' x 3'</td>
</tr>
<tr>
<td>2.5' x 2.5'</td>
<td>2.5' x 2.5'</td>
<td>2.5' x 2.5'</td>
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<td>2' x 2'</td>
<td>2' x 2'</td>
</tr>
<tr>
<td>1.5' x 1.5'</td>
<td>1.5' x 1.5'</td>
<td>1.5' x 1.5'</td>
</tr>
<tr>
<td>1' x 1'</td>
<td>1' x 1'</td>
<td>1' x 1'</td>
</tr>
<tr>
<td>0.5' x 0.5'</td>
<td>0.5' x 0.5'</td>
<td>0.5' x 0.5'</td>
</tr>
</tbody>
</table>

SLAB AND WALL DESIGN TABLE NOTES

1. Size is the inside dimensions of a structure.
2. Slab reinforcement is appropriate for top, intermediate, and bottom slabs.
3. Bottom Slabs for Precast 3'-6" x 3'-6" rectangular structures at 15' depth or less, may be 6" thick.
4. Slab depth is measured from finished grade to top of slab.
5. Wall depth is measured to the top of the bottom slab for boxes and to the intermediate slab for risers.
6. Wall height is the distance between top of lower slab to bottom of upper slab. Maximum wall height is 12' for wall lengths exceeding 5', or 10' for wall lengths exceeding 12.
7. Wall lengths exceeding 6'-0" require two layers of reinforcing (See Schedule B) with 7" of cover from the horizontal bars to the inside and outside faces for each layer.
8. Wall lengths exceeding the dimensions or depths shown in Table 6, or 12'-6" diameter may require a special design.
9. Wall thickness and reinforcing for rectangular structures is based on the longer wall length.
10. Reinforcing schedules with larger areas of steel may be substituted for schedules with smaller bar or wire spacing, except that Schedule B10 may not be substituted for Schedule D6. See Index 425-001 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.
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 d 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 III concrete, manufactured in plants which meet the requirements of Section 449 of the Specifications.

6. Corner fillets are required at inlet opening for precast units or C-I-P units used in conjunction with circular inlet bottoms or skewed rectangular inlet boxes. Finish top of fillets flush with drain inlet 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 the galvanized steel grate and frame must be used. Grates are to be gauged in accordance with the grating 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

Type E Or F Curb

Curb (See Note B)

To Be Paid For

Inlet Throat Transition

As Curb & Gutter

Inlet Throat Transition

(See Note 13)

Limits Of Inlet Construction (See Note 13)

Inlet Throat Transition

To Be Paid For

As Curb & Gutter

Type E Or F Curb

Gutter Transition

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STANDARD PLANS

CURB INLET TOPS TYPES 5 AND 6

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425-021
CAST IRON GRATE

STANDARD PLANS FY 2020-21

CURB INLET TOPS TYPES 5 AND 6

INDEX 425-021

Sheet 5 of 5

CROSS REFERENCES:
For Location Of Section GG and QQ
See Sheet 1.
GENERAL NOTES

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

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1½".

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

4. For supplementary details see Index 425-001.

5. All dimensions are for both Precast and Cast-In-Place Inlets unless otherwise shown.

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

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

1. This inlet is to be used only in Traffic Separators Types IV and V; or, in separators constructed with Curbs Types D and F and sidewalk paving, which cannot accommodate Inlets Types 1, 2, 3, 4, 5 or 6. Use of this inlet on the through traffic side of the separator should be avoided in medians constructed with Curbs Type D (Curb inlets Types 9 or 10 are recommended). Locate inlet outside of pedestrian way.

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

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with Alt. B 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 Alt. B 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.

All dimensions are for both precast and cast-in-place inlets unless otherwise shown.
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 3/16" minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

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

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

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

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible, right or left.
CURB INLET TOP TYPE 10

GENERAL NOTES

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

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

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

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

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

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

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

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

Efficiency Curve

- Approximate Debris Free Capacity (0.02 Pavement Cross Slope)
- Total Q (CFS)
- 80% % of Q (made of Q_total (%)
- 

SECTION AA (SEE NOTE 6 BELOW)

SECTION BB (SEE NOTE 6 BELOW)
MDN BARRIER INLETS TYPES 1 AND 2

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

PRECAST COLLAR REINFORCING DETAILS (TYPE 2)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

DESCRIPTION:

REVISED

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MEDIAN BARRIER INLETS TYPES 1 AND 2

425-030

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GENERAL NOTES:

1. Where 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 1/4" chamfer or tooled to 1/4" radius.

5. When Alternate G grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication. Field installation of the 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.

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.

INLET SECTIONS - EXAMPLE BARRIER TYPES

INLET WITH STRUCTURE BOTTOM

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

ADJACENT BARRIER INLET

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

SECTION B-B (Pipe Opening Not Shown)

TOP VIEW (WITHOUT GRATE)

TABLE 1: HORIZONTAL WALL REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>WALL DEPTH (IN.)</th>
<th>SCHEDULE</th>
<th>AREA (IN.²/FT.²)</th>
<th>MAX. SPACING (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5-10</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>10-15</td>
<td>A4</td>
<td>0.20</td>
<td>4&quot;</td>
</tr>
<tr>
<td>15-15</td>
<td>85.5</td>
<td>0.24</td>
<td>5'/6&quot;</td>
</tr>
</tbody>
</table>
**TRANVERSE SECTION THRU BACKWALL PLATE**

**INSET A**

- Option for Grout Stud
- Option for Anchor Bolt

**NOTES**

1. All reinforcing steel bars shown are #4 bars.
2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A325 or F1554 (Grade 56) galvanized fully threaded rod, adhesive bonded anchors installed in accordance with Specification Section 418. Bolts or rods shall be 6" long (4" min. embedment) with one heavy hex head nut (ASTM 194 or A563) and one flat washer (ASTM F436) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

**INSET B** (See Sheet 1, General Note 1)
GENERAL NOTES:
1. Where called for in the Plans, use this inlet in conjuction 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 ½" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier.

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

4. Apply a 32" chamfer or 32 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% electroforged cross bars and bearing bars as detailed on Sheet 3.

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

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

9. All dimensions are for both precast and cast-in-place (C-I-P) inlet unless otherwise indicated.

10. For all pipe sizes in areas of bicycle traffic, provide the extended crossbar or transverse. For larger pipe, use Alternate B bottoms, Index 425-020.

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

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

1. Where called for in the Plans, use this inlet in conjuction 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 ½" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier.

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

4. Apply a 32" chamfer or 32 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% electroforged cross bars and bearing bars as detailed on Sheet 3.

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

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

9. All dimensions are for both precast and cast-in-place (C-I-P) inlet unless otherwise indicated.

10. For all pipe sizes in areas of bicycle traffic, provide the extended crossbar or transverse. For larger pipe, use Alternate B bottoms, Index 425-020.

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

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

**Bar Bending Diagrams**

**Section D-D**
- INLET STRUCTURE
- (18" Dia. Pipe Opening Shown)

**Section E-E**
- (Pipe Opening Not Shown)
- (Barrier Reinforcing Steel Not Shown, See Sheet 1, Section C-C)

**Notes:**
1. For Bar Bending Diagrams of Bars 5V2 & 5U4, See Index 521-001. Bars 5V2M, 5U4M, & 5S may be field cut from Bars 5V2 & 5U4.
2. Install PVC drainage pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3 ~ 3/4" PVC pipes longitudinally spaced at 8", with the center pipe as near to the inlet centerline as practical without conflicting with the steel reinforcing.

**TABLE 1: Horizontal Wall Reinforcing Schedule**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA</th>
<th>MAX. SPACING</th>
<th>BARS</th>
<th>MWB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>6&quot; - 3&quot;</td>
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<td>12&quot;</td>
<td>4&quot;</td>
</tr>
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<td>3&quot; - 6&quot;</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>6&quot; - 10&quot;</td>
<td>6.5&quot; - 10&quot;</td>
<td>0.24</td>
<td>0.24</td>
<td>6½&quot;</td>
<td>5½&quot;</td>
</tr>
<tr>
<td>10&quot; - 15&quot;</td>
<td>6.5&quot; - 15&quot;</td>
<td>0.37</td>
<td>0.37</td>
<td>6½&quot;</td>
<td>6½&quot;</td>
</tr>
</tbody>
</table>

**Notes:**
- For Bar Bending Diagrams of Bars 5V2 & 5U4, See Index 521-001. Bars 5V2M, 5U4M, & 5S may be field cut from Bars 5V2 & 5U4.
- Install PVC drainage pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3 ~ 3/4" PVC pipes longitudinally spaced at 8", with the center pipe as near to the inlet centerline as practical without conflicting with the steel reinforcing.
DESCRIPTION:

1. For additional information on Bar 4B, see BAR BENDING DIAGRAMS (Sheet 2).
2. C-I-P Inlet Top Reinforcing Similar

NOTE:

BAR STUB

PLAN VIEW

CROSS BAR OPTIONS

OPTIONAL STEEL GRATES

RETICULINE GRATE

PICTORIAL VIEW OF INLET TOP

PRECAST INLET TOP REINFORCING DETAILS

CURB AND GUTTER BARRIER INLET

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1
**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 1½" minimum clearance around pipe.

3. All exposed edges and corners must be ¾” chamfer or rounded to 1½” radius.

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

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

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

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

CONCRETE APRON AT TERMINAL INLETS

SECTION BB
(Enlarged)

SECTION AA
(Enlarged)

Top View

Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter
CONCRETE APRON AT TERMINAL INLETS
ALTERNATIVE A STRUCTURE BOTTOM FOR INLET TYPE S

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot; Min. To 8'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
</tr>
<tr>
<td>5'-0&quot; Min. To 8'-0&quot; Max.</td>
<td>3'-3&quot; x 3'-10&quot;</td>
</tr>
</tbody>
</table>

5'-0" To 8'-0"

Centered Inlet

Structure Bottom

Section AA

Section BB

Top Slab With Centered Opening

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

Round Structure Bottom

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

2'-11" To 4'-0"

5'-0" Min. To 8'-0" Max. (Unless Otherwise Shown In The Plans)

TOP SLAB REINFORCING DIAGRAM

2 Way Reinforcement See Tables

#5 Hoop Bar

(Peripheral Reinforcement)

See Tables

#5 Hoop Bar

(2'-0" Min. Length)

#8 Bars

#4 Bars Each Corner

#4 Bar Each Corner

(2'-0" Min. Length)

2 Way Reinforcement See Tables

#8 Bars @ 5" Spacing

ALT. A STRUCTURE BOTTOM FOR INLET TYPE S

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE 2 WAY (2 WAYS)</th>
<th>SLAB</th>
<th>SLAB</th>
<th>REINFORCING</th>
<th>SCHEDULE (IN/FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.50</td>
<td>9½&quot;</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
<td>9½&quot;</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.27</td>
<td>9½&quot;</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.61</td>
<td>9½&quot;</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0.73</td>
<td>1&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1.35</td>
<td>1&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot;</td>
<td>9½&quot;</td>
<td>C</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>9½&quot;</td>
<td>D</td>
</tr>
<tr>
<td>7'-0&quot;</td>
<td>9½&quot;</td>
<td>E</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>9½&quot;</td>
<td>F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE: 5'-0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5&quot;&lt;30&quot;</td>
</tr>
<tr>
<td>30&quot;&lt;40&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE: 6'-0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5&quot;&lt;30&quot;</td>
</tr>
<tr>
<td>30&quot;&lt;40&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE: 8'-0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5&quot;&lt;30&quot;</td>
</tr>
<tr>
<td>30&quot;&lt;40&quot;</td>
</tr>
</tbody>
</table>

GUTTER INLET TYPE S

INDEX 425-040

3 of 3
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 "O" 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 "O."

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

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

6. For supplementary details see Index 425-003.

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</th>
<th>AREA</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPTH</td>
<td>(in²/ft.)</td>
<td>BARS</td>
</tr>
<tr>
<td>0'-5'</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>9'-9'</td>
<td>0.20</td>
<td>8&quot;</td>
</tr>
<tr>
<td>9'-12'</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>9'-15'</td>
<td>0.24</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

RECOMMENDED MAXIMUM PIPE SIZES

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet Inside Width</td>
<td>2'-11&quot; Or 3'-3&quot;</td>
</tr>
<tr>
<td>4&quot; Or 5&quot;</td>
<td>4&quot; Or 6&quot;</td>
</tr>
</tbody>
</table>

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

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.

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

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 "O."

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

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

For supplementary details see Index 425-003.

Inlet to be paid for under the contract unit price for Inlets (Gutter Type V), EA.
ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

**TOP SLAB OPENINGS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>MIN. OPENING SIZE</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot; To 8'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>2'-3&quot; x 3'-10&quot;</td>
</tr>
</tbody>
</table>

**TOP SLAB REINFORCING DIAGRAM**

- #4 Bar Each Corner (1'-0" Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement See Tables
- #8 Bars @ 5" Spacing
- 2" Cl.

**SECTION AA**

- Top Slab With Centered Opening
- Round Structure Bottom See Index 425-010 For Structure Bottom Details and Hole Reinforcement.
- 9" for 6'-0" Structure bottoms
- 11" for 8'-0" Structure bottoms

**SECTION BB**

- 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)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 9'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5' &lt; D</td>
<td>9&quot;</td>
<td>C</td>
</tr>
<tr>
<td>9&quot; &lt; D</td>
<td>9&quot;</td>
<td>D</td>
</tr>
<tr>
<td>SIZE: 6'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5' &lt; D</td>
<td>9&quot;</td>
<td>C</td>
</tr>
<tr>
<td>9&quot; &lt; D</td>
<td>9&quot;</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GRADE 66 (BAR) OR 45 KSI &amp; 70 KSI (WIRE FABRIC)</th>
<th>SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.30</td>
<td>A</td>
</tr>
<tr>
<td>0.29</td>
<td>B</td>
</tr>
<tr>
<td>0.28</td>
<td>C</td>
</tr>
<tr>
<td>0.27</td>
<td>D</td>
</tr>
<tr>
<td>0.26</td>
<td>E</td>
</tr>
<tr>
<td>0.25</td>
<td>F</td>
</tr>
<tr>
<td>0.24</td>
<td>G</td>
</tr>
</tbody>
</table>

**TOP SLAB REINFORCING SCHEDULE**

- #4 Bars Each Corner
- 2 Way Reinforcement See Tables
- #8 Bars @ 5" Spacing
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>

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

GENERAL NOTES

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

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Cut or bend bars out of way of pipe to clear pipe by 1½". See Index 425-001 for equivalent area of welded wire fabric.

3. All exposed edges and corners shall be ¾" chamfer or tooled to 1½" radius.

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

5. 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 (Dt Bot Type A), EA.

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10 - 15</td>
<td>M6</td>
<td>0.20</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

DITCH BOTTOM INLET TYPE A

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>#8 Bars</td>
<td>1.35</td>
</tr>
<tr>
<td>#5 Hoop Bar</td>
<td>1.35</td>
</tr>
<tr>
<td>#4 Bar Each Corner (2'-0&quot; Min. Length)</td>
<td>1.35</td>
</tr>
<tr>
<td>#5 Hoop Bar (Peripheral Reinforcement)</td>
<td>1.35</td>
</tr>
</tbody>
</table>

CENTERED OPENING

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>

DIMENSIONS

See Table For Opening - Centered

ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

SECTION AA

SECTION BB

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SIZE: 4'-0&quot;</th>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-1&quot; Or 2'-0&quot;</td>
<td>3'-1&quot;</td>
<td>9&quot;</td>
<td>C</td>
</tr>
<tr>
<td>4'-0&quot; Min. To 8'-0&quot; Max. (Unless Otherwise Shown In The Plans)</td>
<td>3'-1&quot;</td>
<td>9&quot;</td>
<td>C</td>
</tr>
<tr>
<td>8'-0&quot; For 4'-0&quot;/5'-0&quot;/6'-0&quot; Structure Bottoms</td>
<td>3'-1&quot;</td>
<td>9&quot;</td>
<td>C</td>
</tr>
</tbody>
</table>

DIMENSIONS

See Table For Opening - Centered
**SECTION EE**

**DITCH BLOCK**

**CONCRETE INLET PAVEMENT AND SODDING**

**RECOMMENDED MAXIMUM PIPE SIZES**

**INDEX 425-001**

- **SECTION AA**
  - HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

**INDEX 425-051**

- **SECTION BB**
  - STEEL GRATE

*See Sheet 2 of 3*
GENERAL NOTES

1. The general purpose of the inlet top designs are:
   a. For ditches, medians or other areas subject to heavy wheel loads. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. Inlet not suitable for bicycle traffic.
   b. Provide full grate and horizontal slot designs for new construction.
   c. Provide full grate and horizontal slot designs for replacing the vertical slot tops on existing Inlets Type B and Type X that are in locations subject to occasional pedestrian traffic.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for min 1 1/4" clearance around pipe.

3. All exposed edges and corners shall be 1/2" chamfer or 3/4" 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.
ALT. A STRUCTURE BOTTOM FOR INLET TYPE B

SECTION AA

Centered Opening:
See Table For Dimensions

SECTION BB

Centered Inlet

Structure Bottom

TOP SLAB OPENINGS

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

TOP SLAB REINFORCING DIAGRAM

#8 Bars @ 5" Spacing

#5 Hoop Bar (Peripheral Reinforcement)

#5 Bar Each Corner

(2'-0" Min. Length)

2 Way Reinforcement

See Tables

TOP SLAB REINFORCING SCHEDULE

GRADE 40 (SBM)
ON 65 KSI & 70 KSI (WIRE FABRIC)
in/ft.

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.37</td>
</tr>
<tr>
<td>D</td>
<td>0.53</td>
</tr>
<tr>
<td>E</td>
<td>0.73</td>
</tr>
<tr>
<td>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)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 6'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 &lt; 8&quot;</td>
<td>9/16&quot;</td>
<td>B</td>
</tr>
<tr>
<td>8&quot; &lt; 18&quot;</td>
<td>9/16&quot;</td>
<td>C</td>
</tr>
<tr>
<td>18&quot; &lt; 30&quot;</td>
<td>9/16&quot;</td>
<td>D</td>
</tr>
<tr>
<td>30&quot; &lt; 37&quot;</td>
<td>9/16&quot;</td>
<td>E</td>
</tr>
<tr>
<td>37&quot; - 40&quot;</td>
<td>9/16&quot;</td>
<td>G</td>
</tr>
<tr>
<td>SIZE: 8'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5 &lt; 9&quot;</td>
<td>11/16&quot;</td>
<td>C</td>
</tr>
<tr>
<td>9&quot; &lt; 15&quot;</td>
<td>11/16&quot;</td>
<td>D</td>
</tr>
<tr>
<td>15&quot; &lt; 23&quot;</td>
<td>11/16&quot;</td>
<td>E</td>
</tr>
<tr>
<td>23&quot; &lt; 33&quot;</td>
<td>11/16&quot;</td>
<td>F</td>
</tr>
<tr>
<td>33&quot; - 40&quot;</td>
<td>11/16&quot;</td>
<td>G</td>
</tr>
</tbody>
</table>

DIMENSIONS: See Table For Centered Opening

6'-0" Min. To 8'-0" Max

(Unless Otherwise Shown In The Plans)
**Schedules (Table 1)**

**Horizontal Wall Reinforcing Schedules (Table 2)**

**Horizontal Wall Reinforcing Schedules (Table 3)**

### Area

<table>
<thead>
<tr>
<th>Depth</th>
<th>Area (in²/ft)</th>
<th>Max Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-15</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
</tbody>
</table>

### Type C

Recommended Maximum Pipe Size:

- 2'-0" Wall - 18" Pipe
- 3'-1" Wall - 24" Pipe (18" where an 18" pipe enters a 2'-0" wall)

<table>
<thead>
<tr>
<th>Depth</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-0&quot;</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
<tr>
<td>0'-15</td>
<td>46</td>
<td>0.20</td>
<td>6&quot; 5&quot;</td>
</tr>
<tr>
<td>10'-15</td>
<td>44</td>
<td>0.20</td>
<td>4&quot; 3&quot;</td>
</tr>
<tr>
<td>10'-15</td>
<td>85.5</td>
<td>0.24</td>
<td>35/2 1&quot;</td>
</tr>
</tbody>
</table>

### Type D

Recommended Maximum Pipe Size:

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

<table>
<thead>
<tr>
<th>Depth</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-0&quot;</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
<tr>
<td>0'-5.5</td>
<td>46</td>
<td>0.20</td>
<td>6&quot; 5&quot;</td>
</tr>
<tr>
<td>5.5'-10'</td>
<td>85.5</td>
<td>0.24</td>
<td>6/2 5&quot;</td>
</tr>
<tr>
<td>10'-15</td>
<td>85.5</td>
<td>0.37</td>
<td>6/2 5&quot;</td>
</tr>
</tbody>
</table>

### Type E

Recommended Maximum Pipe Size:

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

- #4 Bars @ 12" Ctrs.

---

**Notes:**

- Wall Depth Varies
- Grate See Index 425-001
- Eyebolt See Index 425-001
- Eyebolts (Short Bars)

---

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

- Standard Plans FY 2020-21
- Index 425-052
HORIZONTAL WALL REINFORCING
SCHEDULES (TABLE 4)

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-6&quot;</td>
<td>D5.5</td>
<td>0.12</td>
<td>6&quot;</td>
</tr>
<tr>
<td>0'-9&quot;</td>
<td>C6.5</td>
<td>0.17</td>
<td>6&quot;</td>
</tr>
<tr>
<td>0'-12&quot;</td>
<td>B4.5</td>
<td>0.57</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

TYPE H (2 & 3-GRATE INLET)

Recommended Maximum Pipe Size:
3'-0" Wall - 24" Pipe
6'-7" Wall - 1-60" Pipe
Or 2-24" Pipe (5'-3"-5')

HORIZONTAL WALL REINFORCING
SCHEDULES (TABLE 5)

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

TYPE H (4-GRATE INLET)

Recommended Maximum Pipe Size:
3'-0" Wall - 24" Pipe
6'-7" Wall - 1-60" Pipe
Or 2-30" Pipe (5'-4"-3')

GENERAL NOTES
See Sheet 3 of 7.

FY 2020-21
STANDARD PLANS

DITCH BOTTOM INLET TYPES C, D, E AND H

INDEX
425-052

REVISION
01/01/17

DESCRIPTION:

REVISI ON
11/01/17

DATE
01/01/17

SHEET
2 of 7
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.

Traversable slots shall not be used in areas subject to occasional bicycle traffic. 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 occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

NOTE: Steel Grates Are Required On Inlets With Traversable Slots And On Inlets where Bicycle Traffic Is Anticipated.

GENERAL NOTES

1. These inlets are suitable for bicycle traffic and are to be used in ditches, medians and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. Inlets subject to minimal debris should be constructed without slots. Where debris is a problem inlets should be constructed with slots. Slot ed 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 Alternates G 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 ½" 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. Soldering to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, SY.

9. For supplementary details see Index 425-001.

10. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1/8" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.

STEEL GRATES

NOTE: Steel Grates Are Required On Inlets With Traversable Slots And On Inlets where Bicycle Traffic Is Anticipated.
FOR TRAVERSABLE SLOTS

PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Single Slot</th>
<th>Double Slot</th>
<th>Single Slot</th>
<th>Double Slot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SY</td>
<td>CY</td>
<td>SY</td>
<td>CY</td>
</tr>
<tr>
<td>C</td>
<td>4.82</td>
<td>0.77</td>
<td>6.16</td>
<td>0.83</td>
</tr>
<tr>
<td>D</td>
<td>3.99</td>
<td>0.91</td>
<td>7.70</td>
<td>1.10</td>
</tr>
<tr>
<td>E</td>
<td>3.88</td>
<td>0.91</td>
<td>7.37</td>
<td>1.08</td>
</tr>
</tbody>
</table>

Concrete Inlet Pavement (Hand Shape to Neat Lines)

TRAVERSABLE SLOTS

STANDARD PLANS

DITCH BOTTOM INLET TYPES C, D, E AND H

INDEX

425-052

4 of 7
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 right 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 and restoration of disturbed turf, and shall be paid for under the contract price for inlets (DT Bid/Type __) (Partial), each.

Sodding shall be paid for under the contract unit price for Performance Turf, SY. Ditch pavement shall be paid for separate from the inlet by pavement type(s) and unit(s) as called for in the plans.
ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>3'-1&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>5'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>GRADE 60 (BAR) OR 50 KSI (WIRE FABRIC)</th>
<th>SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>0.24</td>
</tr>
<tr>
<td>3</td>
<td>0.37</td>
</tr>
<tr>
<td>4</td>
<td>0.54</td>
</tr>
<tr>
<td>5</td>
<td>0.86</td>
</tr>
</tbody>
</table>

TOP SLAB WITH CENTERED OPENING

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 4'-0&quot;</td>
<td>95&quot;</td>
<td>2 #4 Bars Each Corner</td>
</tr>
<tr>
<td></td>
<td>95&quot;</td>
<td>#5 Hoop Bar Each Corner</td>
</tr>
<tr>
<td></td>
<td>95&quot;</td>
<td>#8 Bars @ 5&quot; Spacing</td>
</tr>
<tr>
<td>SIZE: 6'-0&quot;</td>
<td>95&quot;</td>
<td>2 #8 Bars each corner</td>
</tr>
<tr>
<td></td>
<td>95&quot;</td>
<td>#5 Hoop Bar Each Corner</td>
</tr>
<tr>
<td></td>
<td>95&quot;</td>
<td>#8 Bars @ 5&quot; Spacing</td>
</tr>
</tbody>
</table>

SECTION AA

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.
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" as shown in Index 425-031.

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

3. These inlets may be used with Alternate B structure bottoms, Index 425-030. The inlet and bottom combinations are to be paid for under the contract unit price for inlets (DT Bot) (Type F (or G)) (J Bot, Depth), Ea.

4. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/8" radius.

5. For special 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" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening as shown.

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

### Recommended Maximum Pipe Sizes

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot; (Type F)</td>
<td>18&quot;</td>
<td></td>
</tr>
<tr>
<td>4'-0&quot; (Type F)</td>
<td>30&quot;</td>
<td></td>
</tr>
<tr>
<td>4'-10&quot; / 5'-0&quot; (Type G)</td>
<td>42&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe sizes see Note 3.

### General Notes

1.  Cost of paving to be included in cost of inlet.

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

3.  Cost of paving to be included in cost of inlet.
**STANDARD PLANS**

**Fiscal Year (FY) 2020-21**

**DITCH BOTTOM INLET TYPES F AND G**

*Revision Information*
- **Date:** 11/01/17
- **Index:** 425-053
- **Sheet:** 2 of 2

*Description:*
- **Revision Information:**
  - **Date:** 11/01/17
  - **Index:** 425-053
  - **Sheet:** 2 of 2

*Overview:*
- The document provides details on ditch bottom inlet types F and G for FY 2020-21.
- It includes plan and section diagrams with annotations for construction and material specifications.

*Key Points:*
- Steel grate details with dimensions and reinforcement requirements.
- Optional haunch shape and construction joints information.
- Lifting loops and eyebolt locations.
- Table 2: Type G Inlet Specifications
  - **Type:** Type G
  - **Material:** Steel decking, weight 830 lbs.
  - **Main bars:** 5" x 1/4"
  - **Intermediate bars:** 1½" x 1/4"
  - **Reticuline bars:** 1½" x 1/4"

*dimensions and annotations noted in the diagrams.*
**INSET A (PRECAST OPTION)**

- Steel Grating, See Detail
- Horiz. Wall Reinforc. (See Table 1)
- Predominant Flow

**SECTION AA**

- #4 Bars @ 12" Ctrs.
- #4 Bars (Precast 6" Slab)

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

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' - 4'</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4' - 9'</td>
<td>A6</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>9' - 12'</td>
<td>A4</td>
<td>0.20</td>
<td>4&quot;</td>
</tr>
<tr>
<td>12' - 15'</td>
<td>B8</td>
<td>0.24</td>
<td>5'</td>
</tr>
</tbody>
</table>

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
<th>WALL DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-11&quot; or 3'-3&quot;</td>
<td>24&quot;</td>
<td>3'-10&quot;</td>
</tr>
<tr>
<td>3'-10&quot; or 4'-0&quot;</td>
<td>30&quot;</td>
<td>3'-10&quot;</td>
</tr>
</tbody>
</table>

**GENERAL NOTES**

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

2. All reinforcing Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1/8".

3. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/8 radius.

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

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

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

7. Cost of ditch paving to be included in cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.
Ditch Bottom Inlet Type J

**SECTION CC**
- Ditch Block (low side of inlet on continuous ditches)
- 4'-3" out to out
- 1'-6" equally spaced
- 9 main bars
- Main bars 5" x 1/2" (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.

**SECTION DD**
- Toe wall required (paved or unpaved ditches)
- 2 sod all around (total 9 SF)
- 2" sod all around
- Each end 16-5-3x3x3x3

**PAVEMENT & SODDING**
- "Preformed Joint Filler"
- 3" Conc. Ditch Pavt. (Total 9 SY)
- 2' Sod all around

**STEEL GRATING**
- 4-3" out to out
- 1'-5"
- 1'-5"
- 1'-5"
- 1'-5" each end
- Weld main bars to L (see detail below)
- Note: Two required per inlet
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 1/4 chamfer or rounded to 1/4 radius.

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

6. All reinforcing is Grade 60 with 7 1/2 min. cover unless otherwise noted. See Index 425-003 for equivalent area of varied wire reinforcing (WWR). Bars to be cut or bent for 1 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 A583 or A594 and washers shall be ASTM F436 or Type A plain washers. All nuts, bolts and washers shall be galvanized.
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.
   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 (Endwall), CY. Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.

<table>
<thead>
<tr>
<th>Pipe Size (in)</th>
<th>Concrete Class I (CY)</th>
<th>Sand-Cement Riprap (CY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4-9</td>
<td>2.3</td>
</tr>
<tr>
<td>18</td>
<td>5-7</td>
<td>2.6</td>
</tr>
<tr>
<td>24</td>
<td>6-9</td>
<td>3.3</td>
</tr>
</tbody>
</table>

SPECIAL CONCRETE ENDWALL
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").
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.

4. All reinforcement is ASTM A615/A615M Grade 60 steel, either smooth or deformed.

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

GENERAL NOTES

1. The finished grade and slope of the inlet top are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.

2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.

3. All steel shall have 2" minimum cover unless otherwise shown. Inlets can be either cast-in-place or precast concrete. Chamfer all exposed edges 90°.

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

5. Inlets to be paid for under the contract unit price for Inlets (Closed Flume) EA.
FLUME W/O SIDEWALK INLET (CLOSED FLUME) TYPE II
SINGLE BARREL FLUME DEPICTED
C

#5 Bars (Typ.)
Denotes Inside Layer
Of Reinforcing

#4 Bars, Top and
Bottom (Typ.)

#4 Bars

7'-0"

Center Wall
4-6"

4-6"

5'-0"

5'-0"

TOP VIEW

5'-0"

5'-0"

To Be Paid For
As Curb & Gutter

Limits Of Inlet Construction

Gutter Transition

Gutter Transition

SECTION CC

DOUBLE BARREL FLUME

INTERMEDIATE-WALL REINFORCING

NOTE: See Barrel Flume For Base Dimensions.

#4 Bar (Typ.)

2" Min. Cover

( Typ.)

7'-0"

17'-0"

Intermediate Wall
4-6"

4-6"

5'-0"

5'-0"

#4 Bars

TOP VIEW

5'-0"

5'-0"

To Be Paid For
As Curb & Gutter

Limits Of Inlet Construction

Gutter Transition

Gutter Transition

SECTION CC

QUADRUPLE BARREL FLUME

INTERMEDIATE-WALL REINFORCING

NOTE: See Barrel Flume For Base Dimensions.

#4 Bar (Typ.)

2" Min. Cover

( Typ.)

7'-0"

17'-0"

Intermediate Wall
4-6"

4-6"

5'-0"

5'-0"

#4 Bars

TOP VIEW

5'-0"

5'-0"

To Be Paid For
As Curb & Gutter

Limits Of Inlet Construction

Gutter Transition

Gutter Transition
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 not be less than 1 foot.

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

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

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

<table>
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</tr>
</tbody>
</table>

FLAT BAR

Holes For Expansion Anchors

TOP VIEW

Top Flange (Cut Away)

SIDE PANEL

END VIEW

Steel Sheet 0.1345” Thick (10 Gage)

1 /8” x 1 /2” (3 Slots)

SIDE VIEW

END VIEW (FRONT)

Steel Sheet 0.1345” Thick (10 Gage)

1 /8” Dia.

(6 Holes)

TOP VIEW

Front Panel Width Varies, See General Notes

FLAT BAR

1 /8” thick x 1 /2” wide

Front Panel

END VIEW

SKIMMER FOR OUTLET CONTROL STRUCTURES

INDEX

425-070

REVISION

2 of 2

DESCRIPTION:

REVISED

FDOT

LAST

STANDARD PLANS

FY 2020-21

REV 1/01/17

WSX

INDEX

SHEET

REV 11/01/17
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 C478, 4000 psi may be used in lieu of Class I concrete.
3. Maximum opening for pipe shall be the pipe OD plus 6". Mortar used to seal the pipe into the opening will be of such mix that shrinkage will not cause leakage into or out of the structure.
4. If the conflict structure is round or there are multiple inlet or outlet pipes, then the wall section should be reviewed for strength.
5. If during construction or the plans design process it is determined that a potable water supply line must pass through a storm drain structure, it must be in compliance with Chapter 42-555.314 (3) F.A.C. and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator for Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing excessive cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organization" on the menu to the right.

DESIGNER'S NOTES:
"Sumped" conflict manholes shall not be used unless the system is hydraulically designed to account for the headloss generated if the sump is completely blocked.
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

LONGITUDINAL SECTION

SECTION AA

SECTION BB

SAFETY MODIFICATIONS FOR INLET IN BOX CULVERTS

FY 2020-21
STANDARD PLANS

SAFETY MODIFICATIONS FOR INLET IN BOX CULVERTS

INDEX 425-090

SHEET 1 of 1

REVISED 11/01/17

DESCRIPTION:

REVISION

11/01/17

FOR INLET IN BOX CULVERTS
LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

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 = 10xDitch 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.

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<td>Pipe End Guard</td>
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<tr>
<td>6</td>
<td>Retaining Wall Concrete Gutter and Drains</td>
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LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

MISCELLANEOUS DRAINAGE DETAILS

FY 2020-21
STANDARD PLANS

INDEX
430-001

1 of 6
**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.

---

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

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter</th>
<th>Design Reinforcement in² per foot</th>
<th>Maximum Reinforcement in² per foot Under Tolerance</th>
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**NOTES:**

1. Filter Fabric Jacket is required on both type of joints.
2. Details shown before pull-up.

---

**ROUND AND ELLIPTICAL CONCRETE PIPE JOINT**
**FILTER FABRIC JACKET**

(For All Pipe Types - Concrete Elliptical Pipe Shown)

1. **Concrete Pipe**
   - Filter Fabric Jacket
   - Concrete Pipe
   - Joint

2. **Masonry Plug**
   - 8", Pipes to 60"
   - 12", Pipes 66" to 108"
   - 16", Pipes Above 108"

3. **Concrete Jacket**
   - Varies

**NOTES:**

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 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"; 16" for pipes 30" and larger.
6. 12" for pipes 14" x 23", 19" x 30", 24" for pipes 24" x 38", and larger.

**REVISION**

8-10/2019
DESCRIPTION:

RETURN

REVISIONS

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GUARD TABLE

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<th>Pipe Dia.</th>
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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.

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<th>Description</th>
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<tbody>
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<td>General Notes and Contents</td>
</tr>
<tr>
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<td>Dimensional and Reinforcing Details</td>
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<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>
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<td>48</td>
</tr>
<tr>
<td>1:6</td>
<td>18</td>
<td>48</td>
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</tr>
<tr>
<td>1:8</td>
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</tbody>
</table>

---

**FRONT SLOPE TRANSITION AT ENDWALL**
DIMENSIONAL AND REINFORCING DETAILS

DIMENSIONS AND QUANTITIES

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>A (ft.)</th>
<th>B (ft.)</th>
<th>Class I Conc. (CY)</th>
<th>Rein. Steel (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<td>24</td>
<td>9.27</td>
<td>10.27</td>
<td>2.03</td>
<td>129</td>
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</tbody>
</table>

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

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

FY 2020-21
STANDARD PLANS

INDEX
430-010
SHEET
2 of 3
**Table 3: Number of Grate Bars and Grates Required**

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>Type No. 1</th>
<th>Type No. 2</th>
<th>Type No. 1</th>
<th>Type No. 2</th>
<th>Total Grade Wt. (lbs)</th>
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</thead>
<tbody>
<tr>
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<td>0</td>
</tr>
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<td>2</td>
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<td>4</td>
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<td>0</td>
<td>101.08</td>
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<td>5</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>287.75</td>
</tr>
</tbody>
</table>

**Notes:**
1. Install grate bars evenly spaced across dimension D.
2. All bars and grate bars are ½" x 2".

**Type 1 and Type 2 Grate Details**

**Type 1**

**Type 2**

**U-Type Concrete Endwalls**

15" to 30" Pipes with Grates

**Details:**
- **End View**
- **Plan**
- **Elevation**
- **Top View**
- **Side View**
- **Section A-A**
**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 4x5.4 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 425-001 for opening and grouting details.

7. Quantities shown are for estimating purposes only.

---

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<th>Description</th>
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<td>2</td>
<td>Endwalls for 1:2 Slopes With Baffles</td>
</tr>
<tr>
<td>3</td>
<td>Endwalls for 1:2 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 ENDWALLS**

**STEEL GRATE OPTION**

**BAFFLE OPTION**

---

**FY 2020-21 STANDARD PLANS**

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

---

**INDEX**

**430-011**

**SHEET**

**1 of 5**
Pipe Diameter | Area (in.²) | Flow Rate (ft³/min) | Ht | W | Class 1 Concrete (cu. yd.) | Reinforcing Steel (lbs)
---|---|---|---|---|---|---
15" | 1.23 | 2 - 3 | 2.7 | 2.7 | 0.99 | 39
18" | 1.71 | 2 - 3 | 2.7 | 2.7 | 1.05 | 43
24" | 3.14 | 2 - 4 | 4 | 4 | 1.40 | 55
30" | 4.91 | 2 - 4 | 4 | 4 | 1.88 | 64

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

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

**REndoWalls FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM**

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

**REndoWalls FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM**

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

**REndoWalls FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM**

**LEGEND:**
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- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

**REndoWalls FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM**

**LEGEND:**
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- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

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**LEGEND:**
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- B = Bent Bars
- D = Dowels or Diagonal Bars

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**LEGEND:**
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- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

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

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- B = Bent Bars
- D = Dowels or Diagonal Bars

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**LEGEND:**
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- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

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

**REndoWalls FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM**

**LEGEND:**
- H = Horizontal Bars
- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars
NOTE:
1. Reinforcing similar to Sheets 2 and 3.
2. See Sheet 3 for Bar Bending Diagram.

REINFORCEMENT DETAILS
(Side Views and Backwall Sections Shown)

DIMENSIONAL DETAILS

DIMENSIONS AND QUANTITIES FOR BAFFLES

<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>X Baffle</th>
<th>Y Baffle</th>
<th>Rein. Steel</th>
<th>Concrete</th>
<th>CLASS I</th>
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<tbody>
<tr>
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<td>4&quot;</td>
<td>4&quot;</td>
<td>1-4 #4</td>
<td>1-4 #4</td>
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<tr>
<td>18&quot;</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>3- #4</td>
<td>1-4 #4</td>
<td>0.10</td>
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<td>5&quot;</td>
<td>5&quot;</td>
<td>4- #4</td>
<td>4- #4</td>
<td>16</td>
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DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL

<table>
<thead>
<tr>
<th>Rate Of Slope</th>
<th>Dia.</th>
<th>Area (Sq Ft)</th>
<th>L</th>
<th>Ht</th>
<th>W</th>
<th>Baffle Locations (When Required)</th>
<th>Class I</th>
<th>Rein. Steel</th>
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</thead>
<tbody>
<tr>
<td>1:3</td>
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<td>1.23</td>
<td>5&quot;</td>
<td>1-9</td>
<td>1-4 #4</td>
<td>1-4 #4</td>
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<td>6&quot;</td>
<td>2-6</td>
<td>2-4 #4</td>
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<td>9&quot;</td>
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<td>2-10</td>
<td>2-4 #4</td>
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<td>1.84</td>
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ENDWALLS WITH AND WITHOUT BAFFLES FOR 1:3, 1:4, AND 1:6 SLOPES

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

INDEX
430-011
GENERAL NOTES:
1. Use Class I concrete.
2. Chamfer all exposed edges 3/4".
3. See Index 550-002 for details of Type B fencing.
4. Quantities shown are for estimating purposes only.

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

U-TYPE CONCRETE ENDWALLS

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 B5 (cut and bend as required).
5. Bars V, V1, V2, V3, V4, V5, H, H1, H2, and H3 are straight bars.

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

**BENT BARS TABLE**

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<tr>
<th>Pipe</th>
<th>Size (No.)</th>
<th>Spacing (Ft.)</th>
<th>Size (No.)</th>
<th>Spacing (Ft.)</th>
<th>Size (No.)</th>
<th>Spacing (Ft.)</th>
<th>Size (No.)</th>
<th>Spacing (Ft.)</th>
<th>Size (No.)</th>
<th>Spacing (Ft.)</th>
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<tr>
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<td>B1</td>
<td>B2</td>
<td>B3</td>
<td>B4</td>
<td>B5</td>
<td>B6</td>
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<td>0-11</td>
<td>7</td>
<td>0-11</td>
<td>7</td>
<td>0-11</td>
</tr>
</tbody>
</table>

**NOTES:**
- Bars V1, V2, V3, V4, H, H1, H2, and H3 are straight bars.
- Bars B5 and B7 (N.S. and F.S.) equivalent in size to B6 (cut and bend as required).
- All Bars are size #4 unless otherwise noted.
- All bar dimensions are measured out to out.
- Install reinforcing steel with a minimum of 2" cover.

**REINFORCING DETAILS AND BENDING DIAGRAM**
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.

---

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

---

Pipe

FLARED END SECTION
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. When corrugated 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 5" 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 bevelling 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 \( \frac{1}{4} \) 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 24"x38" or smaller and 1.0 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 \( \frac{1}{4} \) 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.

---

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</tr>
</thead>
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<td>General Notes and Contents</td>
</tr>
<tr>
<td>2</td>
<td>Single and Multiple Concrete Pipe</td>
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<td>Concrete Pipe Dimensions and Quantities</td>
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<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>
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</table>

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SLOPE AND DITCH TRANSITIONS

CROSS DRAIN MITERED END SECTION

(Concrete Pipe Shown, Corrugated Metal Pipe Similar)
**DESCRIPTION:**

- **REVISION:** LAST
- **INDEX:** REVISION
- **STANDARD PLANS:** FY 2020-21
- **CROSS DRAIN MITERED END SECTION**
- **SINGLE AND MULTIPLE CONCRETE PIPE**

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

**SINGLE AND MULTIPLE CONCRETE PIPE DIMENSIONS AND QUANTITIES**

<table>
<thead>
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<th>Dia.</th>
<th>Rise</th>
<th>Slope</th>
<th>R/S</th>
<th>Span</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>M</th>
<th>N</th>
<th>3/4&quot; CONC. SLAB (CF) (See General Note 3)</th>
<th>3/4&quot; CONC. SLAB (CF) (See General Note 3)</th>
<th>3/4&quot; CONC. SLAB (CF) (See General Note 3)</th>
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- Dimensions permitted to allow use of 6" standard pipe lengths.
- Dimensions permitted to allow use of 12" standard pipe lengths.
## TABLE 2

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**Note:** This table is a condensed representation of the data provided in the document. For a comprehensive understanding, please refer to the full document. The table includes columns for Diameter (Dia. D), Rise, Span, X, A, B, C, E, F, G, M, N, My CONC. SLAB (CY), and 3°C CONC. SLAB (CY) for different configurations and spans. The data is used for calculating the dimensions and quantities of corrugated metal pipes. The table is part of a larger document that also includes descriptions and plans for various sections such as Cross Drain Mitered End Section and Standard Plans.
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.

CONCRETE PIPE CONNECTION DETAIL

DETAIL "C"

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.

BOLT Dia. |
1/8" |
3/16" |
1/4" |
1/2"
Pipe Dia. |
1 1/2" |
3/4" |
1 1/2" |
2 1/2"

CONCRETE PIPE CONNECTION AND CORRUGATED PIPE ANCHOR DETAILS

CROSS DRAIN MITERED END SECTION
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 26"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 1/4 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.

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<td>3</td>
<td>Concrete Pipe Dimensions and Quantities and Permissible Pavement Modifications</td>
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SIDEDRAIN MITERED END SECTION

(Congrue Pipe Shown, Corrugated Metal Pipe Similar)
**DESCRIPTION:**

**REVISION LAST**

**INDEX**

**F Y  2 0 2 0 - 2 1**

**STANDARD PLANS**

**S E I D E  D R A I N M I T E R E D E N D  S E C T I O N**

**S I N G L E A N D  M U L T I P L E  C O N C R E T E  P I P E**
### SINGLE AND MULTIPLE CONCRETE PIPE DIMENSIONS AND QUANTITIES

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#### PERMISSIBLE PAVEMENT MODIFICATION

- Dimensions permitted to allow use of 12" standard pipe lengths.
- Dimensions permitted to allow use of 12" standard pipe lengths.

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**Concrete Pipe Dimensions and Quantities and Permissible Pavement Modification**

**Side Drain Mitered End Section**

**Fy 2020-21 Standard Plans**

**Last Revision 01/01/19**

**Description:**

**Revision:**

**Index:**

**Sheet:**

---

**Notes:**

- 1:12 or Steeper

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**PERMISSIBLE PAVEMENT MODIFICATION**

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**INDEX**

**430-022**

**3 of 7**
**PLAN - SINGLE PIPE**

- Sod Area 2'-0" Min. (Typ) All Sides
- Construction Joint Permitted

**ELEVATION**

- 2'-0" Min. Sod
- See Section B-B

**SECTION B-B**

- Grate and Fasteners across crown
- Pipe/Slab Fillet: deepen concrete slab to form bridge across crown of pipe

**SIDE DRAIN MITERED END SECTION (Arched Pipe Similar)**

**PLAN - MULTIPLE PIPE**

- Concrete Slab, 3" Thick Reinforced With WWR 6x6-W1.4xW1.4
- Construction Joint Permitted

**DETAIL "B"**

- Concrete Slab
- Grates Spaced 14" c to c

**GENERAL NOTES**

- See Sheet 7
- Fill (Typ.)
- Anchor (Typ.)
- Slope Varies See Ditch Transition and Pavement Modification Details Sheets 1 and 3

**SINGLE AND MULTIPLE CORRUGATED METAL PIPE**

- FY 2020-21
- STANDARD PLANS
- SIDE DRAIN MITERED END SECTION
- INDEX 430-022
- SHEET 4 of 7
**SINGLE AND MULTIPLE CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES**

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**CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES**

**SIDE DRAIN MITERED END SECTION**

**INDEX**

**430-022**

**5 of 7**
**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.

**CONCRETE PIPE CONNECTION AND CORRUGATED PIPE ANCHOR DETAILS**
NOTES:
1. 3/4" x 3" bolts are standard for all grate fasteners, except when the contractor elects to use the slotted upper holes for the intermediate fasteners on multiple drain pipes, which will require bolt lengths in the Special Bolt Length Table.
2. 3/4" 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 24" or smaller.

CONCRETE PIPE

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MULTIPLE FASTENER UNIT DETAIL

* See Note 5

NOTE:
1. Install intermediate slot and fastener for multiple drain pipes only.

Options for top opening:
- 4 x 0.062" milled slot, 1" deep
- 2" diameter drilled hole
- 3/4" x 2" slot

Bottom opening: 1/2" x 2" slot.

GRADE DETAIL

For Single and Multiple Pipes

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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 1/8”.

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.

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STRAIGHT CONCRETE ENDMALL
NOTICE: Keyway and Dowels are required for optional construction joint.

OPTIONAL CONSTRUCTION JOINT

CONCRETE ENDWALL DETAILS

STRAIGHT CONCRETE ENDWALLS
SINGLE AND MULTIPLE PIPE
### ROUND CONCRETE AND CORRUGATED METAL PIPE

#### Dimensions

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#### Number of Pipe and Skew Angle of Pipe (α)

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#### Number of Pipe and Skew Angle of Pipe (β)

<table>
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<th>30°</th>
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<td>32.4</td>
<td>37.7</td>
<td>43.0</td>
<td>48.3</td>
</tr>
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#### Notes:
1. Dimension X is calculated as: X = 2 * SEC α
2. Select tabular quantities using skew values as follows:

- **Pipe Slope and Skew Angle of Pipe:**
  - 0° to 15°: 9.8
  - 15° to 30°: 11.3
  - 30° to 45°: 12.9
  - 45° to 60°: 14.6
  - 60° to 75°: 16.3
  - 75° to 90°: 18.0

---

### ELLIPTICAL CONCRETE AND CORRUGATED METAL PIPE ARCH

#### Dimensions

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>G</th>
<th>Y</th>
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#### Number of Pipe and Skew Angle of Pipe (β)

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<th>45°</th>
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</tbody>
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#### Notes:
1. Dimension X is calculated as: X = 2 * SEC α
2. Select tabular quantities using skew values as follows:

- **Pipe Slope and Skew Angle of Pipe:**
  - 0° to 15°: 9.8
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  - 45° to 60°: 14.6
  - 60° to 75°: 16.3
  - 75° to 90°: 18.0

---

### CONCRETE AND METAL PIPE TABLES

#### STRAIGHT CONCRETE ENDWALLS

**SINGLE AND MULTIPLE PIPE**

| Dia | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25|

#### STRAIGHT CONCRETE ENDWALLS

**SINGLE AND MULTIPLE PIPE**

| Dia | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25|

---

### INDEX

| FY 2020-21 STANDARD PLANS | 430-030 |

---

### DESCRIPTION

- **End Slope and Skew Angle of Pipe:**
  - 0° to 15°: 9.8
  - 15° to 30°: 11.3
  - 30° to 45°: 12.9
  - 45° to 60°: 14.6
  - 60° to 75°: 16.3
  - 75° to 90°: 18.0

---

**NOTES:**

1. Dimension X is calculated as: X = 2 * SEC α
2. Select tabular quantities using skew values as follows:

- **Pipe Slope and Skew Angle of Pipe:**
  - 0° to 15°: 9.8
  - 15° to 30°: 11.3
  - 30° to 45°: 12.9
  - 45° to 60°: 14.6
  - 60° to 75°: 16.3
  - 75° to 90°: 18.0

---

### SHEET 3 of 4
SPACING FOR MULTIPLE PIPES

LEGEND:

- α  Pipe Skew 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 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 60&quot; Pipe Endwall Details</td>
</tr>
<tr>
<td>3</td>
<td>Double 60&quot; Pipe Endwall Details</td>
</tr>
</tbody>
</table>
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

3. All bar dimensions are out to out.
2. Cut and bend B Bars as shown.

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

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD</th>
<th>LENGTH</th>
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<tr>
<td>H2</td>
<td>1'</td>
<td>2</td>
<td>4'-2&quot;</td>
</tr>
<tr>
<td>H3</td>
<td>1'</td>
<td>2</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>H4</td>
<td>1'</td>
<td>2</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>H5</td>
<td>1'</td>
<td>2</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>B1</td>
<td>4</td>
<td>2</td>
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<tr>
<td>B2</td>
<td>8</td>
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<td>B4</td>
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DOUBLE 60" PIPE ENDWALL DETAILS

DOUBLE 60" PIPE ESTIMATED QUANTITIES

<table>
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<th>ITEM</th>
<th>UNIT</th>
<th>CF</th>
<th>CUM</th>
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DOUBLE 60" PIPE ENDWALL DETAILS

HALF ELEVATION
(Showing Bars in Front Face of Wall)

SYMMETRICAL ABOUT ξ

PLAN
(Showing Bars In Footing)

STRAIGHT CONCRETE ENDWALLS
SINGLE AND DOUBLE 60" PIPE

REV IS IO N
8 :16 :40  A M

REV IS IO N
10 /29 /2019
GENERAL NOTES:
1. Use Class III 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>
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<td>Single 66&quot; Pipe Endwall Details</td>
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<td>3</td>
<td>Double 66&quot; Pipe Endwall Details</td>
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</tbody>
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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 = Doweled or Diagonal Bars

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>H1</td>
<td>6</td>
<td>9</td>
<td>42'-8&quot;</td>
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<tr>
<td>H2</td>
<td>6</td>
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ESTIMATED QUANTITIES

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<td>Cu. Yd.</td>
<td>1,406</td>
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DOUBLE 66° PIPE ENDEWALL DETAILS

HALF ELEVATION
(Showing Bars in Front Face of Wall)

HALF ELEVATION
(Showing Bars in Back Face of Wall)

SYMMETRICAL ABOUT E
GENERAL NOTES:

1. Use Class II concrete.

2. Reinfocing 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 3/4" unless otherwise shown.

5. Quantities shown are for estimating purposes only.

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<td>3</td>
<td>Double 72&quot; Pipe Endwall Details</td>
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STRAIGHT CONCRETE ENDWALLS 72" PIPE

SINGLE ENDOwall

DOUBLE ENDOwall

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

HALF ELEVATION
(Showing Bars in Front Face of Wall)

HALF ELEVATION
(Showing Bars in Back Face of Wall)

DOUBLE 72" PIPE ENDWALL DETAILS

STRAIGHT CONCRETE ENDWALLS
SINGLE AND DOUBLE 72" PIPE

REV 01/01/19

DESCRIPTION:
FY 2020-21
STANDARD PLANS

REV 11/01/19

BILLS OF MATERIALS

BILL OF REINFORCING STEEL

ESTIMATED QUANTITIES

NOTE:}
3. All bar dimensions are out to out.
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 1/8" unless otherwise shown.

5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:

<table>
<thead>
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<th>Sheet</th>
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<td>Single 84&quot; Pipe Endwall Details</td>
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</table>
**REV IS IO N DESCRIPTION:**

REV OF STANDARD PLANS FY 2020-21 SHEET INDEX

---

**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>Material</th>
<th>Unit</th>
<th>Requirement</th>
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<td>2.095</td>
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**BILL OF REINFORCING STEEL**

<table>
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<td>6'-0&quot;</td>
</tr>
<tr>
<td>H</td>
<td>2B</td>
<td>6</td>
<td>7'-10&quot;</td>
</tr>
<tr>
<td>H</td>
<td>3B</td>
<td>12</td>
<td>39'-8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>4B</td>
<td>26</td>
<td>10'-2&quot;</td>
</tr>
<tr>
<td>H</td>
<td>4B</td>
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<td>10'-2&quot;</td>
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<tr>
<td>H</td>
<td>5B</td>
<td>14</td>
<td>12'-4&quot;</td>
</tr>
<tr>
<td>B</td>
<td>5B</td>
<td>4</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

---

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

---

**DETAIL "A"**

(Concrete Pipe Optional Entrance)

---

**SECTION A-A**

(Rubar Not Shown)

---

**SECTION B-B**

(Typical Section)

---

**SECTION C-C**

---

**SINGLE 84" PIPE ENDWALL DETAILS**

---

**STRAIGHT CONCRETE ENDWALLS**

---

**FY 2020-21 STANDARD PLANS**

---

**INDEX SHEET 430-034 2 of 2**
GENERAL NOTES:
1. Use Class I concrete.
2. Chamfer all exposed edges and corners ½” unless otherwise shown.
3. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:

<table>
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<tr>
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</tr>
<tr>
<td>2</td>
<td>U-Type and 45° Endwalls</td>
</tr>
</tbody>
</table>

45° WING

U-TYPE

WINGED CONCRETE ENDWALLS
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 1½" 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.

SAFETY MODIFICATIONS FOR ENDWALLS

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<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>
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 6” 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.

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TRENCH DRAIN ASSEMBLY
TYPICAL LOCATIONS

(Round Channel Shown, Preformed Polyethylene Similar)

 WITHIN TYPE E CURB

 WITHIN TYPE F CURB

 WITHIN DROP CURB

 ADJACENT TO TRAFFIC SEPARATOR

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.

TYPE I - NONREMOVABLE GRATE

PREFORMED POLYETHYLENE CHANNEL

ROUND PIPE CHANNEL
NOTES:
1. Provide minimum 6" of concrete on this side of the drain.
2. 6" Minimum unless otherwise shown in Plans.
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 equivalencies:

   - 4" smooth interior equivalent to 5" corrugated interior
   - 5" smooth interior equivalent to 6" corrugated interior
   - 6" smooth interior equivalent to 8" corrugated interior
   - 8" smooth interior equivalent to 10" corrugated interior

2. Fine aggregate is quartz sand meeting the requirements of Specifications 902-4.

3. Coarse aggregate is gravel or stone meeting the requirements of Specifications 902-2 or 901-3. The gradation is in accordance with Specifications 901, Grades 4, 467, 5, 56 or 57 stone unless otherwise shown restricted in the plans.

4. Install Underdrain Type I, II, III and V 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 permeability of 0.7 /sec. and an AOS of #40 blue.

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 3". 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 90 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 446-001 for Eddrain Outlets.

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</table>
**DESCRIPTION:**

REVISION 10/29/2019

**STANDARD PLANS FY 2020-21**

**INDEX**

- Ditch or Basin Bottom
- Fine Aggregate
- Underdrain Pipe
- Coarse Aggregate
- Envelope Fabric Filter

**TYPE I, II, AND III**

- UNDERDRAIN

**TYPE I**

- 24" (Typ.)
- 9" (Min.)

**TYPE II**

- 24" (Typ.)
- 9" (Min.)

**TYPE III**

- 30" (Typ.)
- 18" (Typ.)

**UNDERDRAIN PIPE**

- Ditch or Basin Bottom
- Fine Aggregate
- Coarse Aggregate
GENERAL NOTES:

1. Install light duty cast iron cover and frame in accordance with Specifications 963.

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.

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<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.

**SECTION A-A** (Frame)

- Inspect Box Lid
- Stainless Steel or Brass Pin
- 1/2" Chamfer
- Opening (Typ.)

**SECTION B-B** (Lid)

- Lid
- Hinge
- Frame

**HINGE DETAIL**

- Lid
- Hinge
- Frame

**COVER REMOVAL**

- Lid
- Hinge
- Frame

**TYPICAL INSPECTION BOX INSTALLATION**

**ELEVATION**

- Inspection Box Lid
- Frame
- Concrete Apron
- Opening (Typ.)

**PLAN VIEW**

- Concrete Apron
- Hinge
- Lid
- Frame

**INSPECTION BOX DETAILS**

- Frame
- Concrete Apron
- Lid
- Hinge

**NOTE:**

- between underdrain pipe and inspection box.
- for required openings. Grout around opening to seal around hinge covers.
- 1. Cast or field cut 2 ~ 4" wide slots for hinges. Grout
- 2. One or more sides may have an opening, see Plans

---

**DESIGNATION:**

- FY 2020-21
- STANDARD PLANS

**INDEX:**

- UNDERDRAIN INSPECTION BOX

---

**REV:**

- 2 of 3
NOTES:
1. See Index 120-002 for Underdrain placement.
2. Curve the Underdrain to connect to the Inspection Box.
3. A maximum of 2 adjustment courses of brick is permitted.
GENERAL NOTES:

1. Install light duty cast iron cover and frame in accordance with Specifications 962.
2. Use Class 3 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.

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</tr>
<tr>
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</tbody>
</table>

FRENCH DRAIN ASSEMBLY
**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.

---

**SECTION A-A**

**PLAN**

- **Manhole or Inlet (Manhole With Sump Shown)**
- **Sump (See Notes 1 & 2)**
- **Filter Fabric Envelope**
- **Coupling Band**
- **Perforated Pipe**
- **No. 4 Coarse Aggregate**

**ELEVATION**

- **Metal or Plastic Pipe**
- **Concrete Pipe**
- **Filter Fabric Envelope**
- **1/4" Galvanized Hardware Cloth**

**FRENCH DRAIN SYSTEM**

- **French Drain (Round Pipe Shown)**

---

**DESCRIPTION:**

- **REVISION**
- **REV**
- **INDEX**

**FY 2020-21 STANDARD PLANS**

**INDEX**

**443-001**

**Sheet**

2 of 3
DESCRIPTION:

REVISION

LAST REVISION: 11/01/19

STANDARD PLANS

FY 2020-21

FRENCH DRAIN

INDEX: 443-001

SHEET: 3 of 3

CONCRETE SLOTTED PIPE OPTIONS

NOTES:

1. 2'-0" for 8'-0" joints of pipe
   2'-0" for 12'-0" joints of pipe

2. A curved cut is acceptable provided the control dimension is maintained.

### ROUND PIPE

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Slot Cut Opening (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;</td>
<td>12&quot; 14&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>12&quot; 14&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>16&quot; 18&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>18&quot; 18&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>22&quot; 24&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>22&quot; 24&quot;</td>
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<tr>
<td>48&quot;</td>
<td>22&quot; 24&quot;</td>
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<td>54&quot;</td>
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<tr>
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<tr>
<td>66&quot;</td>
<td>24&quot; 26&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>24&quot; 26&quot;</td>
</tr>
</tbody>
</table>

### ELLIPTICAL PIPE

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Slot Cut Opening (C)</th>
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</thead>
<tbody>
<tr>
<td>15&quot;x27&quot;</td>
<td>10&quot; 12&quot;</td>
</tr>
<tr>
<td>19&quot;x30&quot;</td>
<td>14&quot; 16&quot;</td>
</tr>
<tr>
<td>15&quot;x36&quot;</td>
<td>14&quot; 16&quot;</td>
</tr>
<tr>
<td>19&quot;x40&quot;</td>
<td>20&quot; 22&quot;</td>
</tr>
<tr>
<td>14&quot;x48&quot;</td>
<td>20&quot; 22&quot;</td>
</tr>
<tr>
<td>18&quot;x50&quot;</td>
<td>20&quot; 22&quot;</td>
</tr>
</tbody>
</table>

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**SECTION D-D**

**SIDE VIEW**

**Top View**

**SIDE VIEW**

**ISOMETRIC VIEW**

(Round Pipe Shown)

**OPTION A - ROUND PIPE**

**OPTION B - ROUND OR ELLIPTICAL PIPE**
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. Loss prevention device can use either stainless steel chain or riveted nylon strap.

5. Provide skimmer bodies (baffles) and cleanout pipe meeting Specification 943 for steel, 945 for aluminum or 948 for plastics.

6. Work this Index in accordance with Specification 425.

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<td>Type II Skimmers</td>
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NOTES:
1. Conform the backs of skimmers to the shape of the basin walls on which they are mounted.
2. "R" is the radius required for curved back skimmers. Applies to both skimmer types. See Plans.
3. Weld angles at all points of contact with skimmer.

<table>
<thead>
<tr>
<th>OUTLET PIPE</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
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<tbody>
<tr>
<td>18&quot;</td>
<td>12&quot;</td>
<td>6&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>18&quot;</td>
<td>12&quot;</td>
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<td>15&quot;</td>
<td>36&quot;</td>
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<tr>
<td>36&quot;</td>
<td>21&quot;</td>
<td>18&quot;</td>
<td>42&quot;</td>
</tr>
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See ANGLE DETAIL

PLAIN

SIDE ELEVATION

TC SCHEMATIC VIEW

ANGLE DETAIL
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.

TYPE II DETAILS

Outlet Pipe

Basin Wall

Neoprene Gasket

Flange

Skimmer

Outlet Pipe

Basin Wall

Neoprene Gasket

Flange

Skimmer

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.

SKIMMERS FOR FRENCH DRAIN OUTLETS

TYPE II SKIMMERS
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.

DETAILED APPLICATION:

SPECIAL MANHOLE STRUCTURE

DETAIL WITH OUTFALL

DESIGN NOTES:

1. Depth of casing varies, 60 min.

2. Depth of open hole, 10'-20'.

3. Actual size of the inflow and outflow chambers will be determined by the size of the pipes (Refer to Table 3 of Index 425-010). The width of the box shall be constant based on the largest pipe. The length is to be adjusted based on size and orientation of the pipes.
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 (10% 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 (0.1%) install the concrete pavement subdrainage on a minimum grade of one-tenth percent (0.1%).

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 drainerite.

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.

Sub 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 apron and bordering sod are not required for stubbed outlets, but replacement sodding will be required at trenches for pipes stubbed into paved ditches.

Install a single outlet apron for separate outlet pipes of concrete pavement subdrainage from opposite directions in sag vertical curves.

Install backfill consisting of cohesive soils around outlet pipes.

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.

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<td>3</td>
<td>Rehabilitation</td>
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<td>4</td>
<td>New Construction</td>
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</table>

DRAINCRETE SUBDRAINAGE
1. Install 6" thick Class NS concrete 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 grassed ditches, 0.5" std. for paved ditches (less is acceptable to provide minimum 0.1% outlet pipe slope).
**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.
NOTES:

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. Confining 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: 150pcf
Module of Elasticity: Based on the use of Florida limestone concrete

REINFORCING STEEL
ASTM A416 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:
  - Type "A": Minimum compressive strength f'ci ≥ 4000 psi required.
  - Types "B1", "B2", "C1" & "C2": 0.0 psi tension with 1.5 times pile self weight

ENVIRONMENT:
The pile designs are applicable to all environments.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:

Type "A"
Pick-up of pile may be either a single point pick-up or a two point pick-up as shown below.

Types "B1", "B2", "C1" & "C2"
Two point pick-up for lifting out of forms & two point support for storage & transportation.
Single point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1/2" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 1/2". No changes shall be made to the tongues or grooves.

CROSS REFERENCES:
For Dimensions L and X see Sheet Pile Wall Data Table in Structures Plans.
TYPICAL PILE

SPACING for
Bars S

STARTER PILE

TOTAL # OF
STRANDS

INITIAL (JACKING)
FORCE (kips)

<table>
<thead>
<tr>
<th>WALL</th>
</tr>
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<tbody>
<tr>
<td>10 in.</td>
</tr>
<tr>
<td>12 in.</td>
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</table>

<table>
<thead>
<tr>
<th>STRAND DIA.</th>
<th>MAXIMUM</th>
<th>n</th>
<th>D (in.)</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>28-0'</td>
<td>6</td>
<td>3/8</td>
<td>14</td>
</tr>
<tr>
<td>0.6</td>
<td>27-0'</td>
<td>4</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>0.5</td>
<td>31-0'</td>
<td>7</td>
<td>3/8</td>
<td>16</td>
</tr>
<tr>
<td>0.6</td>
<td>30-0'</td>
<td>5</td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
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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 Site Pile Data Table in Structures Plans.

CASCO CONCRETE SHEET PILE WALL
CONVENTIONAL

BAR BENDING DIAGRAMS

NOTES:
1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are #5 and Bars S are #4.
4. At the Contractor’s option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
5. The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 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 Site Pile Data Table in Structures Plans.
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.
1. All bar dimensions are out-to-out.
2. Bars A are #8 and Bars S are #4.
3. This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
4. If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
5. If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

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

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

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

For 10" Pile
For 12" Pile

SECTION C-C (T=10" or 12")

SECTION D-D (T=10")

SECTION D-D (T=12")

STIRRUP DIMENSIONS

<table>
<thead>
<tr>
<th>T (in.)</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>S1: 7&quot;</td>
<td>S2: 3&quot;</td>
<td>S3: 3&quot;</td>
</tr>
<tr>
<td></td>
<td>S4: 3½&quot;</td>
<td>S5: 3½&quot;</td>
<td>S6: 3½&quot;</td>
</tr>
<tr>
<td>12</td>
<td>S1: 9&quot;</td>
<td>S2: 9&quot;</td>
<td>S3: 9&quot;</td>
</tr>
<tr>
<td></td>
<td>S4: 6½&quot;</td>
<td>S5: 6½&quot;</td>
<td>S6: 6½&quot;</td>
</tr>
</tbody>
</table>

BAR BENDING DIAGRAMS

STIRRUPS S

BARS A

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>3½</td>
<td>4½</td>
</tr>
<tr>
<td>Z (in.)</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: All bar dimensions are out-to-out.
CROSS REFERENCES:
For Dimensions L and X see Sheet Pile Wall Data Table in Structures Plans.

DETAIL "A" (Section Taken Above Dimension X)
(Cap and Anchoring System Not Shown)
NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Pile View.

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

NOTE:  Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Pile View.

DESCRIPTION:
This Index includes details for six types of piles with two thicknesses. Type "A" is prestressed concrete construction with CFRP or HSSS strands. Types "B1", "B2", "C1" and "C2" piles (corner piles) are reinforced concrete construction. Manufacture, cure and install Sheet Piles in accordance with the requirements of the contract documents.

MATERIALS:  (for materials not listed refer to the Specifications)
CONCRETE
Class: V (Special)
Unit weight: 145 pcf
Modulus of Elasticity: Based on the use of Florida limerock aggregate concrete

REINFORCING BARS
Glass Fiber Reinforced Polymer (GFRP) bars meeting the requirements of Specification Section 932.

PRESTRESSING STRAND
Stainless Steel: Prestressing steel shall be seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
Carbon FRP: Prestressing strand shall be CFRP strand, meeting the requirements of Specification Section 933.

DESIGN PARAMETERS:
Type "A"
Concrete Compressive Strength at release of prestressing: 4000 psi minimum
Uniform compression after prestressing losses: 700 psi minimum
Pick-up, Storage and Transportation: 450 psi tension with 1.5 times pile self weight for single-point pick-up at f'c ≥ 6000 psi
Types "B1", "B2", "C1" & "C2"
Pick-up, Storage and Transportation: Minimum compressive strength f'c ≥ 4000 psi required for two-point pick-up; f'c ≥ 6000 psi for single-point pick-up.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:
Two-point pick-up for lifting out of forms & two-point support for storage & transportation. Single-point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5½". No changes shall be made to the tongues or grooves.
### TYPICAL PILE

- **Strand Material**: CFRP/GFRP, HSSS/GFRP
- **Wall Thickness**: 11" (Typ.)
- **Spaced at 1'-0" Maximum**
- **Bars A**: 2
- **Prestressed Strands**: Spaced at 6 sp. @ 4"
- **Pick-up Strand(s)**: Spaced at 3'/2" Maximum

### STARter PILE

<table>
<thead>
<tr>
<th>Strand Material</th>
<th>Wall Thickness</th>
<th>STRAND DIA. (in.)</th>
<th>MAXIMUM L *</th>
<th>n</th>
<th>D (in.)</th>
<th>TOTAL # OF STRANDS</th>
<th>Initial (Jacking) FORCE (Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFRP Strand</td>
<td>T=10 in.</td>
<td>0.49 (12.5mm)</td>
<td>26'-0&quot;</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td>T=12 in.</td>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3½</td>
<td>8</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6 (15.2mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3½</td>
<td>12</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.49 (12.5mm)</td>
<td>31'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>12</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 (12.7mm)</td>
<td>31'-0&quot;</td>
<td>5</td>
<td>3½</td>
<td>12</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6 (15.2mm)</td>
<td>31'-0&quot;</td>
<td>3</td>
<td>3½</td>
<td>8</td>
<td>42.7</td>
</tr>
<tr>
<td>HSSS Strand</td>
<td>T=10 in.</td>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>5</td>
<td>2½</td>
<td>12</td>
<td>25.7</td>
</tr>
<tr>
<td></td>
<td>T=12 in.</td>
<td>0.6 (15.2mm)</td>
<td>32'-0&quot;</td>
<td>6</td>
<td>3½</td>
<td>14</td>
<td>25.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 (12.7mm)</td>
<td>32'-0&quot;</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>36.5</td>
</tr>
</tbody>
</table>

* Based on lifting using single point pick-up.

### SHEET PILE DIMENSIONS

- **Stranded at 1'-0" Maximum**
- **Spacing for Bars S**
- **Spaced at 6 sp. @ 4"**
- **Pick-up Strand(s)**: Spaced at 3'/2" Maximum

### NOTES:

1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are cut-to-out.
3. Bars A are GFRP & S or HSSS/GFRP & S and may be a single closed bar (hoop) with equivalent area and tensile strength.
4. 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.
5. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

---

**COVER**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER L**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER B**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER C**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER T**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER D**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER E**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER T**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER D**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**OVER E**

**Bars A**

**Bars S1**

**Bars S2**

**Bars A**

**Bars S3**

**Bars S4**

**Bars S5**

**Bars S6**

**Bars S7**

---

**BAR BENDING DIAGRAMS**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

---

**DETAIL "D"**

**DETAIL "E"**

**TYPE "A" STANDARD SECTION**
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>
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<tbody>
<tr>
<td>30°</td>
<td>S1</td>
<td>1</td>
<td>1/2</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1</td>
<td>1/2</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
</tr>
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</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>1</td>
<td>1/2</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>1</td>
<td>1/2</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
<td>5/8</td>
<td>3/4</td>
</tr>
</tbody>
</table>

BAR BENDING DIAGRAMS

NOTES:
1. This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
2. The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-to-out.
4. Bars A are GFRP #8 and Bars S are GFRP #4.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60° only.
6. Bars S are fabricated as a 2 piece stirrup with a minimum lap length of Ø, as shown in Bar Bending Diagrams, or a single closed bar (hoop) when approved by the Engineer.
7. If Type "B1" or "B2" pile is used as a Starter Pile show 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 Ø see Sheet Pile Data Table in Structures Plans.

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

INDEX
455-440

3 of 4
**Note:** All Bar dimensions are out-to-out.

1. All bar dimensions are out-to-out.
2. Bars A are GFRP #8 and Bars S are GFRP #4.
3. This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
4. If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
5. At the Contractor’s option Bars S may be fabricated as a 2 piece or 3 piece bar with a minimum lap length of 8”, as shown in Bar Bending Diagrams, or as a single closed bar (hoop) when approved by the Engineer.
6. If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
7. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

---

**STIRRUP DIMENSIONS**

<table>
<thead>
<tr>
<th>Bar</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S2</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>S4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>S5</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

---

**STIRRUPS S**

(2 - Piece)

<table>
<thead>
<tr>
<th>Bar</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

**STIRRUPS S**

(3 - Piece)

<table>
<thead>
<tr>
<th>Bar</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S4</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S5</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

---

**SHEET PILE DIMENSIONS**

<table>
<thead>
<tr>
<th>Y (in.)</th>
<th>3&quot;</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (in.)</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

---

**BAR BENDING DIAGRAMS**

**Notes:** All Bar dimensions are out-to-out.
NOTES:

1. A bypass switch shall be installed to override each timing interval in case of a malfunction.
2. "STOP HERE ON RED" is omitted in Type I operation and "TRAFFIC SIGNALS" are omitted in Type II operation.
3. The time between beginning of flashing yellow on "Drawbridge Ahead" sign and the clearance of traffic signal to red, or beginning of flashing red should not be less than the travel time of a passenger car, from the sign location to the stop line, traveling at the 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 5 seconds.
10. Requirements on gate installation are contained in Section 2 of the "Manual on Uniform Traffic Control Devices".
11. In accordance with Traffic Engineering Manual (Task Force 750-000-005) Section 2, "SLIPPERY WHEN WET SIGNS shall be placed in advance of all MOVABLE and NONMOVABLE STEEL DECK BRIDGES."

* Field conditions may require adjustment of this standard distance.

<table>
<thead>
<tr>
<th>SIGNALS &amp; SIGNS</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP HERE ON RED (Type I only)</td>
<td>Variable Time Bridge Open</td>
</tr>
<tr>
<td>TRAFFIC SIGNALS (Type I only)</td>
<td>Variable Time Bridge Open</td>
</tr>
<tr>
<td>ENTRANCE GATES</td>
<td>Variable Time Bridge Open</td>
</tr>
<tr>
<td>EXIT GATES</td>
<td>Variable Time Bridge Open</td>
</tr>
</tbody>
</table>

SEQUENCE CHART

<table>
<thead>
<tr>
<th>SIGNAL SWITCH</th>
<th>FLASHING BEACON</th>
<th>DRAWBRIDGE AHEAD SIGN (See Note 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLANK</td>
<td>FF</td>
<td>FF</td>
</tr>
<tr>
<td>STOP HERE ON RED (Type II only)</td>
<td>Variable Time</td>
<td></td>
</tr>
<tr>
<td>TRAFFIC SIGNALS (Type II only)</td>
<td>Variable Time</td>
<td></td>
</tr>
<tr>
<td>ENTRANCE GATES</td>
<td>Variable Time</td>
<td></td>
</tr>
<tr>
<td>EXIT GATES</td>
<td>Variable Time</td>
<td></td>
</tr>
</tbody>
</table>

LEGEND:
- TRAFFIC SIGNALS: Mast Arm Mounted (Off Bridge)
- DRAWBIDGE SIGN: Monotube Support Mounted (On Bridge)
- DRAWBIDGE AHEAD SIGN WITH YELLOW FLASHING BEACON: Ground Mounted
- STOP HERE ON RED SIGN WITH YELLOW FLASHING BEACONS
- ENTRANCE GATE
- EXIT GATE
- 24" THERMOPLASTIC STOP BAR

REFERENCES:
- Variable Time
- 10/29/2019 8:17:35 AM
- REVISION OF STANDARD PLANS FY 2020-21
- SHEET INDEX 11/01/17
- MOVABLE SPAN BRIDGE SIGNALS
- TRAFFIC CONTROL DEVICES FOR MOVABLE SPAN BRIDGE SIGNALS
- INDEX 508-T01
FIGURE - A
MONOTUBE SUPPORT MOUNTING

FIGURE - B
SIGN PANEL MOUNTING ASSEMBLY

FIGURE - C
Signal Head Mounting Assembly

FIGURE - D

FIGURE - E

FIGURE - F

FIGURE - G

* 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 1 OPERATION, AS SHOWN ON PREVIOUS SHEET
MONOTUBE SUPPORT MOUNTING

NOTES:
1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only when gate arm is in the lower position or in the process of being lowered. The number of lights shall vary accordingly to length of the gate arm.
2. Alternating 16" pattern of fully reflectorized red and white stripes.

GATE & ARM DETAIL

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Edge Of Travelway

ROADWAY

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

GATE & ARM DETAIL

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

GATE & ARM DETAIL

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

GATE & ARM DETAIL

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

GATE & ARM DETAIL

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

GATE & ARM DETAIL

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

GATE & ARM DETAIL

ROADWAY

Dowel Position

Counterweights

2" Steel Railing

Roadway

MONOTUBE SUPPORT MOUNTING TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET

BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND

11/01/17 MOVABLE SPAN BRIDGE SIGNALS

TYPICAL LAMP PLACEMENT
NOTES:
1. The location of flashing warning devices and stop lines shall be established based on future (or present) installation of gate with appropriate track clearances.
2. Where plans call for railroad traffic control devices to be installed in curbed medians, the minimum median width shall be 12'-6".
3. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk. 0 to 8' - Locate device outside sidewalk. Over 8' - 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 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.
DO NOT STOP ON TRACKS

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.

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Distance &quot;A&quot; (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>400</td>
</tr>
<tr>
<td>55</td>
<td>375</td>
</tr>
<tr>
<td>50</td>
<td>350</td>
</tr>
<tr>
<td>45</td>
<td>325</td>
</tr>
<tr>
<td>40</td>
<td>300</td>
</tr>
<tr>
<td>35</td>
<td>275</td>
</tr>
<tr>
<td>30</td>
<td>250</td>
</tr>
</tbody>
</table>

RELATIVE LOCATION OF CROSSING TRAFFIC CONTROL DEVICES

RAILROAD CROSSING AT TWO-LANE ROADWAY

RAILROAD CROSSING AT MULTILANE ROADWAY

RAILROAD CROSSING PAVEMENT MESSAGE

Pavement Message White

Area = 89 S.F.

6'-0"

8'-0"

6'-0"

10'-0"

12'-0"

12'-0"

8'-0"

4' (Typ.)

16'

45'

250'

325'

400'

100'

125'

175'

250'

325'

400'

60'

55'

50'

45'

40'

35'

30'

25'

20'

15'

10'

5'

3'

2'

1'

0'

URBAN

Speed Design

(A)

Distance (ft)

(mph)

Notes:

- Area = 89 S.F.
- Pavement Message White
- 6'-0" and 8'-0" letters and strokes
- Rail Grade Crossing Sign
- 20' area
- 10' area
- 50' area
- 6'-0" stroke width
- 8'-0" stroke height
- 6'-0" height
- 8'-0" height
- 6'-0" height
- 8'-0" height
- 10'-0" height
- 12'-0" height
- 24" White
- 6" Dbl Yellow
- Gate When Present.
- Or 8' From & Parallel To Edge Of Travel Way
- Stop Bar Perpendicular
- To Edge Of Travel Way
- Or 8' From & Parallel To Gate When Present.
RAILROAD GATE ARM LIGHT SPACING

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>Dimension &quot;A&quot;</th>
<th>Dimension &quot;B&quot;</th>
<th>Dimension &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Ft.</td>
<td>6&quot;</td>
<td>36&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>16-17 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>28&quot;</td>
<td>41&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>36&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>36&quot;</td>
<td>8&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>29-32 Ft.</td>
<td>36&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>33-35 Ft.</td>
<td>36&quot;</td>
<td>9&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>10&quot;</td>
<td>10&quot;</td>
</tr>
</tbody>
</table>


MEDIAN SIGNAL GATES FOR
MULTILANE UNDIVIDED URBAN SECTIONS
(THREE OR MORE DRIVING LANES IN ONE DIRECTION, 45 MPH OR LESS)
FUNCTIONAL BLOCK DIAGRAM

LOCATION OF THE ADVANCE WARNING SIGN

SPEED (mph) | DISTANCE (ft) |
--- | --- |
Min. | 50 |
30 | 75 |
40 | 125 |
50 | 250 |
55 | 325 |

NOTE:
- ADVANCE WARNING Sign Location May Be Adjusted To Fit Field Condition
- Power Service Pull Boxes 200' Nominal Spacing

TYPICAL PLAN

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.
**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>Post &quot;A&quot;</td>
<td>HSS 2½ x 1½ x ½</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Post &quot;B&quot;</td>
<td>HSS 2½ x 1½ x ½</td>
<td>2.50&quot; x 1.50&quot;</td>
<td>0.188&quot;</td>
</tr>
<tr>
<td>Top Rail</td>
<td>2½&quot; NPS (Sch. 16)</td>
<td>2.875&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>HSS 3.000 x 0.120</td>
<td>3.000&quot;</td>
<td>0.120&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>HSS 2.500 x 0.123</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Intermediate &amp; Bottom Rail</td>
<td>HSS 2 x 2 x ½</td>
<td>2.00&quot; x 2.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Int. &amp; Bottom Rail Post Connection Sleeve</td>
<td>HSS 1.500 x 0.123</td>
<td>1.500&quot;</td>
<td>0.120&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>HSS 1.500 x 0.123</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>½ x 3&quot; Round Bar</td>
<td>1.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>½ x 3&quot; Round Bar</td>
<td>1.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>Varies (See Details)</td>
<td>Varies</td>
<td>Varies</td>
</tr>
</tbody>
</table>

### TABLE 1 NOTES:

1. 0.125" wall thickness permitted for rails with post spacings less than 5'-8", except that Post Connection Sleeve must be 1½" NPS (Sch. 40).

### 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:
   - 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.
   - Structural Tube: ASTM A500 Grade A, B, C, or D or ASTM A501
   - Steel Plate: ASTM A36 or ASTM A509 Grade 36
   - U-Channels and filler plates: ASTM A36 or ASTM A1011 (Grade 36).
   - Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   - Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   - Hex Head Bolts: ASTM A307
     1. ½" diameter single bolt option, Grade 36
     2. ½" four bolt option, Grade 55
   - Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   - Hex Nuts: ASTM A563
   - Flat Washers: ASTM F436
   - Plate Washers: ASTM A36 or ASTM A706 Grade 36
   - Shims: ASTM B909 Alloy 6061
   - Bearing Pads: ½" Plain, Fabric Reinforced or Fabric Laminated pads that meet the requirements of Specification Section 932 for Ancillary Structures.

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 6½" for standard installations and 3½" when a 4" sphere requirement is indicated in the Data Tables.

5. Maximum spacing between expansion joints is 40'-0". Locate an Expansion Joint between the posts on either side of the Deck Expansion Joint.

6. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "X".

7. Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.

8. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.

9. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.

10. 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.
Ramp Requirements

- For slopes greater than 3%:
  - Max. ramp slope = 8.33%
  - Max. ramp cross-slope = 2.0%

Landings Requirements

- Max. landing slope = 2%
- Max. landing cross-slope = 3%

Railings on Grades Steeper Than 5%

(Type 1 - Picket Railing Shown, Other Types Similar)

- Post Spacing: 3'-9"
- Top Rail: 5'-0" (Max.) - Type "B" Post Only
- End Hoop: 6'-0" Min. - 1'-6" Max.

Expanded Elevation at Corners

See Detail "B", Sheet 4

Typical Railing Details & Railings on Grades 0% to 5%

(Typ. - Picket Railing Shown, Other Types Similar)

- Post Spacing: 3'-9"
- Top Rail: 5'-0" (Max.) - Type "A" Post Only
- See Detail "A", Sheet 1

Notes:

- Non-continuous corners are permitted when handrails are not required.

Foundation Expansion Joint

- SHBR
- 48" ~ SHBR

Rail Expansion Joint (Typ.)

- Top of Intermediate Rail

See "Typical Railing Details" for post, rail & picket or infill panel details

Intermediate Landing

- 6'-0" Min.

Bottom Landing

- 5'-0" Min.

Top of Sidewalk

- 0'-Min. 1'-Max.

Intermediate Rail

- SHBR
- 48" ~ SHBR

Top of Sidewalk

- 0'-Min. 1'-Max.

For slopes greater than 5%:

- 30'-0" Max. for Slopes ≥ 6.25%
- 40'-0" Max. for Slopes ≤ 6.25%

Railings on Grades Steeper Than 5%

(Type 1 - Picket Railing Shown, Other Types Similar)
**SECTION A-A**  (Top Rail Connection)

**SECTION B-B**  (Handrail Connection)

**SECTION C-C**  (Intermediate Rail Connection)

**SECTION D-D**  (Bottom Rail Connection - Single Anchor Bolt Shown)

**SECTION G-G**  BASE PLATE DETAILS

**DETAIL "A" - RAIL CONNECTIONS**  (Pickets/panels and 4-Bolt Anchorage Not Shown for Clarity)

**NOTES:**
1. Base Plate A (Ramps) - Bolts normally use 1/2" Ø Holes for Single Anchor Bolts with Flat Washers for slopes ≤ 8.33%.
2. Base Plate B (Stairs - Bolts plumb) use 1/2" Ø Holes for Single Anchor Bolts with Beveled Plate and Washers for slopes ≤ 8.33% or ≤ 15% use 3/8" x 1/2" Slotted Holes with Leveling Channel for slopes > 15%.
3. * Ɓ" Ø x Ƃ" Pan Head Stainless Steel (Type 316 or 18-8 Alloy) Set Screws. Screws must be set flush against the outside face of rails & posts and underside of handrails. 1/2" plug welds may be substituted for the Set Screws. Do not provide Set Screws for Rails at free end of Expansion Joints.
4. ** Embedded length may be 4" for plug welded connection.

**DETAIL "B" - EXPANSION JOINT (FIELD SPLICE SLIP JOINT SIMILAR)**

**VIEW F-F**  INTERMEDIATE OR BOTTOM RAIL - STEEL SLEEVE DETAIL (Bottom Side Shown)

**CROSS REFERENCE:**  For location of Details "A", See Sheet 2.

**INDEX**

**FY 2020-21**

**PEDESTRIAN/BICYCLE RAILING (STEEL)**

**INDEX**

**SHEET**  4 of 8
**TYPE 1 - PICKET INFILL PANEL**

*Picket Spacing of 6" centers is based on a 5/8" Bar for standard applications. When shown in the Contract Plans a 4" picket spacing may be required. See Note 4 (Sheet 1).*

**PICKET NOTES:**
- Equal Clear Openings at Posts 2 5/8" Min. - 5 3/16" Max. (Typ.)
- 5" Nominal Opening

**SECTION A-A**

**TYPE 2 - CHAIN-LINK (Continuous Infill Panel)**

- Ties @ 1'-0" center (Post and End Rail)
- Ties @ 2'-0" center (Intermediate & Bottom Rail)

**TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>ASTM</th>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A 392</td>
<td>Zinc-Coated Steel - No. 9 gage (coated wire diameter), Class 2 Coating</td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
<td>A 491</td>
<td>Aluminum-Coated Steel - No. 9 gage (coated wire diameter)</td>
</tr>
<tr>
<td>Polyvinyl Chloride (PVC) Coated Steel - No. 9 gage Zinc-Coated Wire (metallic-coated core wire diameter)</td>
<td>F 668</td>
<td>See Plans for specified color of PVC</td>
</tr>
<tr>
<td>Tie Wires</td>
<td>F 626</td>
<td>Zinc-Coated Steel Wire - No. 9 gage with coating to match Chain-Link Fence Fabric</td>
</tr>
<tr>
<td>Tension Bars</td>
<td>F 626</td>
<td>1/4&quot; (Min. thickness) x 3/8&quot; (Min. width) x 2'-3&quot; (Min. height) Steel 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'-6" minimum increments is permitted.
TYPE 3 - SUNSHINE INFILL PANEL

*Arc, Rays and Sun Segment may be formed in a single panel from ½ steel plate pattern cut with laser or plasma CNC, welded to a 1x1½ Angle Border or the ½x½ Channel Border shown.

TYPE 4 - BROADWAY INFILL PANEL

NOTES:

1. See Plans for Infill Panel Option required.
### SECTION A-A

- **PERFORATED PANEL**: Inside Face of Rail, Channel 2"x2"x3/16”, Perforated Panel (0.04" Min.)
- **Filler Strip**: 3/8"x5/8" (Typ.)

### SECTION C-C

- **PANEL/SPICE CONNECTION**: Panel Mullion, Rail Expansion Joint
- **DETAIL "5A"**: PANEL/RAIL CONNECTION (Top Shown, Bottom Similar)
- **DETAIL "5B"**: PANEL END CONNECTION (Expansion Joint Shown, Sides Similar)

### NOTES:

1. See Plans for Infill Panel Type required.

### DESCRIPTION:

- **TYPE 5 - PERFORATED INFILL PANEL**
- **Seal welding mitered corners is permitted.**

### REVISION

- LAST REVISED: 11/01/16
- STANDARD PLANS: PEDESTRIAN/BICYCLE RAILING (STEEL)
- INDEX: 515-052
**Bolts & Post**

**Edge Shim (8" long x 3\(\frac{1}{4}\)" wide x thickness as reqd.)**

1-\(\frac{1}{2}\)\(\frac{1}{2}\)" (Min.) wide bed of Adhesive Bonding Material

**TYPICAL SECTION ON CONCRETE SIDEWALK**

**CASE 1**

- 1 -\(\frac{1}{2}\)\(\frac{1}{2}\) C-I-P Hex Head Anchor Bolt, or 1 -\(\frac{3}{8}\)\(\frac{1}{2}\) Anchor Bolt with hex nut & washer.
- Place Anchor Bolt perpendicular to base of Sidewalk for Grades ≤ 8.33% (Ramps) with flat washer.
- Place anchor bolts plumb for Grades > 8.33% (Stairs) with flat washer & beveled washer, or leveling channel.

**REINFORCED CONCRETE STRUCTURE**

**MINIMUM 2 ~ #4 BAR @ 1'-0" (Max.) SPACING FOR CASE II a**

**TYPICAL SECTION ON RETAINING WALL**

**Case II**

- Post & Anchor Bolts
- Washers or Leveling Channel
- Optional 4-Bolt Anchorage (shown dashed)

**Base Plate**

- \(\frac{7}{8}\)" Thick Bearing Pad (Typ.)

**Details**

- **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)

**ANCHOR BOLT TABLE**

<table>
<thead>
<tr>
<th>CASE</th>
<th>STRUCTURE TYPE</th>
<th>DIMENSIONS</th>
<th>ANCHOR LENGTH</th>
<th>ANCHOR SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Unreinforced Concrete</td>
<td>6&quot;</td>
<td>1(\frac{1}{2})&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>II a</td>
<td>Reinforced Concrete</td>
<td>4&quot;</td>
<td>1(\frac{1}{2})&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>II b</td>
<td>Gravity Wall</td>
<td>6(\frac{1}{2})&quot;</td>
<td>9&quot;</td>
<td>10(\frac{1}{2})&quot;</td>
</tr>
<tr>
<td>III</td>
<td>Step Cheekwall</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
</tr>
</tbody>
</table>

**TYPICAL SECTION ON STEPS & STAIRS**

**CASE III**

- Optional 4-Bolt Anchorage (shown dashed)
- Minimum #4 Bar (Typ.)

**MINIMUM 2 - #4 BARS IN TOP OF STRUCTURE FOR CASE II, III & IV**

**MINIMUM #4 BARS @ 1'-0" (Max.) SPACING FOR CASE II a**

**TYPICAL SECTION FOR 4-BOLT ANCHORAGE**

**CASE IV**

- Optional 4-Bolt Anchorage (shown dashed)
- \(\frac{3}{4}\) Thick Bearing Pad (Typ.)

**NOTE**

**When required, measured from top of sidewalk.**
### TABLE 1 - RAILING MEMBERS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>ALLOY(1)</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posts (Type &quot;A&quot; &amp; &quot;B&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1½&quot; x 2¾&quot; x 0.125</td>
<td>1.50&quot; x 2.50&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Posts (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion 1½&quot; x 2¾&quot; x 0.125</td>
<td>3.00&quot; x 2.00&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Plate (Type &quot;C&quot;)</td>
<td>6061-T6</td>
<td>Extrusion (See Details)</td>
<td>2½&quot; x 1½&quot;</td>
<td>Varies</td>
</tr>
<tr>
<td>Top Rail</td>
<td>6061-T6</td>
<td>2½&quot; NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3¼&quot; Round Top Cap Rail</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>End Hoops</td>
<td>6063-T5</td>
<td>2½&quot; NPS (Sch. 10)</td>
<td>2.875&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3½&quot; OD x 0.125 Wall</td>
<td>3.000&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Top Rail Joint/Splice Sleeves</td>
<td>6061-T6</td>
<td>2.50&quot; OD x 0.125 Wall</td>
<td>2.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td></td>
<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>6061-T6</td>
<td>1.50&quot; OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Inc. &amp; Bottom Rail Post Connection Sleeve</td>
<td>6063-T5</td>
<td>1.50&quot; OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>6063-T5</td>
<td>1&quot; NPS (Sch. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1½&quot; OD x 0.125 Wall</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>6063-T6</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.500&quot;</td>
<td>0.185&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>6063-T6</td>
<td>1½&quot; Round Bar</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Pickets (Type 1 Infill Panel)</td>
<td>6061-T6</td>
<td>1½&quot; Round Bar</td>
<td>1.500&quot;</td>
<td>0.125&quot;</td>
</tr>
<tr>
<td>Infill Panel Members (Types 2 - 5)</td>
<td>6063-T5</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 515-061 Bridge Bicycle/Pedestrian Railing (Aluminum).
3. Materials:
   a. Structural Extrusions, Tube, Pipe and Bars: Table 1 and ASTM B221 or ASTM B429
   b. Top, bottom and intermediate rail corner bends with maximum 4'-0" post spacing may be Alloy 6063-T6
   c. Base Plates and Rail Caps: ASTM B209 Alloy 6061-T6
   d. Perforated panels (Type 5) Alloy 3003-H14
   e. Stainless steel (SS) screws: Type 316 or 18-8 Alloy
   f. Aluminum screws: Alloy 2024-T3 or 7075-T73
   g. Galvanized Steel Fasteners: coated in accordance with Specification Section 962.
   h. Hex Head Bolts: ASTM A307
   i. 1½" diameter single bolt option, Grade 36
   j. 1½" diameter single bolt option, Grade 55
   k. Adhesive Anchors: ASTM F1554 fully threaded rods, Grade 55
   l. Hex Nuts: ASTM A356
   m. Flat Washers: ASTM F136
   n. Plate Washers: ASTM A36 or ASTM A476 Grade 36
   o. Shims: ASTM B209 Alloy 6061 or 6063
   p. Bearing Pads: Provide ½" thick Plain, Fabric Reinforced or Fabric Laminated Bearing Pads meeting the requirements of Specification Section 932 for Ancillary Structures.
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 ½" for standard installations and ¼" when a 4" sphere requirement is indicated in the Data Tables.
5. Locate railing expansion joints between the posts on either side of the deck expansion joint. Maximum spacing between expansion joints is 25'-0".
6. Field splices are similar to the Expansion Joint Detail and may be approved by the Engineer to facilitate handling; but the top rail must be continuous across a minimum of two posts.
7. For intermediate and bottom horizontal rails, the screwed joints shown may be substituted with alternate joints shown in detail "B", Sheet 4, or detail "F", Sheet 9.
8. Make corners and changes in tangential longitudinal alignment with a 9" bend radius or terminate adjoining sections with mitered end sections when handrails are not required.
9. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner but not at the corner apex.
10. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
11. Handrails are required and must be continuous at landings for:
   a. Grades Steeper than 5%,
   b. Three or more steps
12. Installation: Cutting of reinforcing steel is permitted for post installed anchors.

### CROSS REFERENCES:

- Detail "A", Sheet 4
- Detail "B", Sheet 4
- Detail "K", Sheet 3

### INDEX

- PEDESTRIAN/BICYCLE RAILING (ALUMINUM)

### LAST REVISION

- FY 2020-21
- PEDESTRIAN/BIKE RAILING (ALUMINUM)

### SHEET

- 1 of 9
5'-0" Min. ~ 1" Max. ~ 1-1/2" NPS Sch. 40 Post

40'-0" Max. for Slopes ≤ 6.25%
30'-0" Max. for Slopes > 6.25%

30'-0" Max. for Slopes > 6.25%
40'-0" Max. for Slopes ≤ 6.25%

Handrail required for ramps (Handrail continuous at landings between runs)
Handrail = 1-1/2" NPS Sch. 40

Equal Clear Openings at Posts
2-7/8" Min. ~ 5-1/2" Max. (Typ.)

48" SHBR
42" PBR

ELEVATION
(Showing Outside Face of Railing with Type "A" Posts)

Typical Railing Details & Railings on Grades 0% to 5%
(Type 1 - Picket Railing Shown, Other Types Similar)

Notes:
* Keyed construction joints in Index 400-011 Gravity Wall are not considered to be expansion joints.
** Contraction joints (Tooled or Saw Cut) in sidewalks do not require a 6" minimum offset.

Notes:
Non-continuous corners are permitted when handrails are not required.

TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%

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%
Section A-A (Top Rail Connection)

Section B-B (Handrail Connection)

Section C-C (Intermediate Rail Connection)

Section D-D (Bottom Rail Connection - Single Anchor Bolt Shown)

Section G-G - Base Plate Details

Detail "A" - Rail Connections (Showing Inside Face of Railing)

Detail "B" - Expansion Joint (Field Splice Slip Joint Similar)

View F-F

Square Rails - Intermediate or Bottom Rail (Bottom Rail Shown at Expansion Joint Shown)

Intermediate or Bottom Rail - Aluminum Sleeve Detail (Bottom Side Shown)

Detail "K" on Sheet 3)
**SECTION A-A**

**See Detail "1A"**

**See Detail "1B"**

---

**SECTION A-A**

**DETAIL "1A"**

*(Top of Picket Connection)*

**DETAIL "1B"**

*(Bottom of Picket Connection)*

---

**TIE WIRE NOTES:**

- Ties @ 1'-0" center (Post and End Rail)
- Ties @ 2'-0" center (Intermediate & Bottom Rail)

---

**TABLE 2 - CHAIN-LINK PANEL COMPONENT MATERIALS**

<table>
<thead>
<tr>
<th>COMPONENT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPONENT</strong></td>
</tr>
<tr>
<td>Chain-Link Fence Fabric (2&quot; mesh with twisted bottom and knuckled top selvage)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></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.

---

**DESCRIPTION:**

**REVISED:**

**INDEX:**

**FY 2020-21 STANDARD PLANS**

**PEDESTRIAN/BICYCLE RAILING (ALUMINUM)**

**REVISION**

**SHEET**

515-062 6 of 9
SECTION A-A

Panel Mullion

SECTION C-C

Inside Face of Rail

Channel 2½ x 2½ x ½

Perforated Panel (0.04" Min.)

리를

ﺐ” x ” Filler Strip

Perforated Panel (0.04" Min.)

Inside Face of Post

DETAIL "5A"

Panel/Rail Connection

(Top Shown, Bottom Similar)

DETAIL "5B"

Panel End Connection

(Expansion Joint Shown, Sides Similar)

Seal welding mitered corners is permitted

TYPE 5 - PERFORATED INFILL PANEL

3'-0" Max. (Panel Width)

3'-0" Max. (Panel Width)

REPEATING PATTERN DETAIL
FOR PERFORATED PANEL

Panel Mullion

#10 x ½" Pan Head Screws @ 2'-0" sp.

#10 x ½" Pan Head Screws @ 1'-0" sp.

10 /29 /2019
NOTES:
1. Shop Drawings are required.
3. Materials:
   A. Pan Head Set Screws: Aluminum Alloy 2024-T4 or 7075-T73 or Stainless Steel (SS) Type 316 or 18-8 Alloy.
   C. Structural Pipe Tube and Bars: ASTM B221 or ASTM B429, Alloy 6061-T6.
   D. End Rails 90° bends and corner bends with a maximum 4 foot spacing: Alloy 6061-T5 is permitted.

<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 (Schr. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rails</td>
<td>2&quot; NPS (Schr. 40)</td>
<td>2.375&quot;</td>
<td>0.154&quot;</td>
</tr>
<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Schr. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Schr. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrail</td>
<td>1½&quot; NPS (Schr. 40)</td>
<td>1.315&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrail Support Bar</td>
<td>1&quot; Ø Round Bar</td>
<td>1.000&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

E.Galvanized Steel Fasteners:
   a. Hex Head Bolts: ASTM A 327 Type 1 or ASTM F1554 Grade 36.
   b. Adhesive Anchors: ASTM F1554 Grade 36 fully threaded rods.
   d. Flat Washers: ASTM F436.
   e. Sheet Metal Washers: ASTM A563.
   f. Stainless Steel (SS) Type 316 or 18-8 Alloy.

F. Aluminum Shims: ASTM B209, Alloy 6061.
G. Bearing Pads: Phenolic, Fabric Reinforced, or Fabric Laminated meeting requirements of Specifications S15 & 932.

4. Fabrication:
   A. Place expansion joints at a maximum of 30’ spacing.
   B. Field splices are similar to the expansion joint detail and may be approved by the Engineer to facilitate handling, but top rail must be continuous across a minimum of two posts.
   C. Continuity field splice (Detail "E"): only use to make the railing continuous for unforeseen field adjustments.
   D. Corners and changes in tangential longitudinal alignment may be made continuous with a 9” bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   E. For curved longitudinal alignments, shape 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.
   g. Cutting of reinforcing steel is permitted for post installed anchor bolts.
PIPE GUIDERAIL (ALUMINUM)
**GUIDERAIL ON STEPS & STAIRS**

**DESCRIPTION:**

- **Railing Continuation Beyond Steps**
  - (Bottom shown, Top similar)

- **Handrail Termination**
  - See Detail "A" (Typ.)

- **Concrete Sidewalk**
  - To extend 6" min. behind railing

- **Handrail**
  - Continuous at landings

- **Handrail and Cheekwall**
  - See "Typical Railing Details", Sheet 2 for post & rail details

- **Step Details**
  - See Index 400-021 for Step Details

**ELEVATION**

- **At Grade Steps**
  - Aluminum Handrail required for three or more steps (Handrail and cheekwall continuous at landings)

- **Length of Landing**
  - 5' Min.

- **Handrail Continuous**
  - 6'-0" Max. on Steps

- **Handrail Termination**
  - See Detail "A" (Typ.)

**PIPE GUARD RAIL (ALUMINUM)**

**INDEX**

515-070

**REVISION**

11/01/17

**FY 2020-21**

STANDARD PLANS
NOTES:

1. Shop Drawings are required, refer to Specification 515.

2. **Materials:**
   - A. Pan Head Set Screws: Stainless Steel (SS) Type 316 or 18-8 Alloy.
   - B. Base Plates and Cap Plates: ASTM A36 or ASTM A500 Grade B or D or ASTM A501 for Structural Tube.
   - 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>
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<tbody>
<tr>
<td>Posts</td>
<td>2&quot; NPS (Sch. 40)</td>
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<td>Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
<td>3.500&quot;</td>
<td>0.134&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>1.375&quot;</td>
<td>0.133&quot;</td>
</tr>
<tr>
<td>Handrails</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
</tr>
<tr>
<td>Handrail Support Rail</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:
     - but top rail must be continuous across a minimum of two posts.
   - C. Continuity field splice (Detail "E") only use to make the railing continuous for unforeseen field adjustments
   - D. Continuity in tangential longitudinal alignment may be made continuous with a 90° bend radius or terminated at adjoining sections with a standard end hoop when handrails are not required.
   - E. For curved longitudinal alignments, shop bend the top and bottom rails and handrails to match the alignment radius.
   - F. For changes in tangential longitudinal alignment greater than 45°, position posts a maximum of 2'-0" each side of the corner, not at the corner apex.

4. **Handrails are required and must be continuous at landings for:**
   - A. Grades Steeper than 5%.
   - B. Three or more steps.

5. Cutting of reinforcing steel is permitted for adhesive anchor bolt installations.
PIPE GUIDERAIL (STEEL)

**TYPICAL RAILING DETAILS & RAILINGS ON GRADES 0% TO 5%**

**RAILINGS ON GRADES STEEPER THAN 5% TO 8.33%**

**RAMP REQUIREMENTS**
- For slopes greater than 5%:
  - Max. ramp slope = 8.33%
  - Max. ramp cross-slope = 2.0%

**LANDING REQUIREMENTS**
- Max. landing slope = 2%
- Max. landing cross-slope = 2%

**NOTES:**
- NPS = Nominal Pipe Size
- Keyed construction joints in Index 400-011 Gravity Structures Expansion Joints
- Not considered to be expansion joints.

**STRUCTURES EXPANSION JOINTS NOTE:**
- Keyed construction joints in Index 400-011 Gravity Structures Expansion Joints
- Not considered to be expansion joints.

**CROSS REFERENCE:**
- For Details "C", "D" and "E", see Sheet 4.
Handrail Continuation
See Detail "A" (Typ.)

Steel Handrail required for three or more steps (handrail and cheekwalls continuous at landings)

Handrail Termination
See Detail "A" (Typ.)

Concrete sidewalk to extend 6" min. behind Handrail

5'-0" Min. for one run of steps

6'-0" Max. on Steps

Varies - Equal to one tread length

6'-0" Max. for post & rail details

See "Typical Railing Details", Sheet 2 for post & rail details

0'-0" Min.

2'-10"

1'-6"±

2'-10"

3'-6"

9" Min. Wide cheekwall both sides

Length of Landing 5' Min.

2'-10"

3'-6"

9" Min. Wide cheekwall both sides

See Index 400-021 or Contract Plans for Step Details

Handrail Continuous
See Detail "A" (Typ.)

3'-6"

2' Min. (Typ.)

2"

6'-0" Max. on Steps

Varies - Equal spacing

Length of Landing

2'-10"

2" Min. (Typ.)

6'-0" Max. on Steps

Varies - Equal spacing

2'-10"

2" Min. (Typ.)

Handrail Continuation
See Detail "A" (Typ.)

ALTERNATE END TREATMENT

GUIDERAIL ON STEPS & STAIRS

REVIEW
11/01/17

STANDARD PLANS

FY 2020-21

INDEX 515-080

PIPE GUIDERAIL (STEEL)

3 of 5
**DESCRIPTION:**

REVISED SHEET

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515-080 4

PIPE GUIDERAIL (STEEL)

CROSS REFERENCE:
For locations of Details "C", "D" and "E", see Sheet 2.

FIELD SPLICE

DETAIL "E" - CONTINUITY FIELD SPlice

DETAIL "D" - EXPANSION JOINT (FIELD SPlice SLIP JOINT SIMILAR)

DETAIL "B" - RAIL AND HANDRAIL (Showing Sloped Condition For Ramps with 2~Bolt Anchorage)

For locations of Details "C", "D" and "E", see Sheet 2.
DESCRIPTION:
REVISION
LAST of STANDARD PLANS FY 2020-21 SHEET
INDEX
515-080 5 of 5

TYPICAL SECTION ON CONCRETE SIDEWALK

TYPICAL SECTION ON GRAVITY WALL
(Other Retaining Walls Similar)

TYPICAL SECTION ON STEPS & STAIRS

OPTIONAL SIDEWALK ANCHORAGE DETAIL

SIDEWALK ANCHORAGE DETAIL
OPTION 2 & 3

NOTES:
**2 ~ 2" Ø x 8" or 4 ~ 4" 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.
**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**

Note: For use adjacent to concrete or flexible pavement, concrete shown. Expansion joint, preformed joint filler and joint seal are required between curbs and concrete pavement only, see Sheet 2.

**CONCRETE CURB AND GUTTER**

**CONCRETE CURB**

**TRAFFIC BEARING SECTION FOR USE IN ROUNDABOUT CENTRAL ISLAND CONSTRUCTION TYPE RA**

**DESCRIPTION:**

**REV IS ION**

**LAST REVISION 01/01/17**

**INDEX**

**FY 2020-21 STANDARD PLANS**

**CURB AND GUTTER**

**520-001 1 of 2**
CURB AND GUTTER ENDINGS

CURB AND GUTTER TYPES E & F

GENERAL NOTES

1. For curb, gutter & curb & gutter provide 1/8” - 1/2 contraction joints at 10’ centers (max.) Contraction joints adjacent to concrete pavement on tangents and flat curves are to match the pavement joints, with intermediate joints not to exceed 10’ centers. Curb, gutter & 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’.
1. Spillway to be paid for as Shoulder Gutter, L.F.

2. If spillway empties into an unpaved ditch, the detail should be modified as necessary.

DETAIL OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER
(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPRACTICAL)
Provide Approximately A Minimum Of 0.20% Grade On Gutter, Slightly Warping The Surface Of The Median Pavement If Necessary. Within Limits Of The Median Curb Or Curb And Gutter. Construct A Drainage Flume Or Flumes At The Point Or Points Of Low Grade. See Details.

GRADE TO DRAIN AS SHOWN IN THE PLANS OR AS ADJUSTED BY THE ENGINEER DURING CONSTRUCTION.

PROVIDE SMOOTH SECTION.

MATCH EXISTING GRADE.

SLOPE TO APPRX. MATCH THAT OF ADJOINING PAVT. (BREAKOVER 0.02 MIN., 0.05 MAX.)

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.

GENERAL NOTES

1. These details are to apply to projects which provide for the conversion of 2-lane sections to 4-lane divided highway sections and for superelevated sections of new 4-lane divided highways. Layout above is illustration only. Cost of flumes to be included in the contract price for Curb or Curb and Gutter. See 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.
LONGITUDINAL SECTION (NOSE)

OPTION I

TRANSVERSE SECTION

LONGITUDINAL SECTION (NOSE)

OPTION II

TRANSVERSE SECTION

REINFORCING STEEL

(Bridge Deck Shown, Approach Slab Similar)

Notes:

1. Treatment of separators on straight bridges shown. For additional notes and treatment of separators on skewed bridges, see Sheet 2.

2. Option II is not permitted on bridge decks with prestressing steel.

3. Bar Spacing:
   - For 8'-6" Separator
     - 6'-0" @ 5 equal spaces (continuous)
   - For 6' Separator
     - 8'-6" @ 5 equal spaces (continuous)
   - For 4' Separator
     - 10'-6" @ 7 equal spaces (continuous)

4. At the Contractor's option, a one piece bar may be substituted for Bars 4B and 4E.

5. Field bend and cut rebar as required to maintain cover.

Details:

- Expansion joint assembly
  - See expansion joint details

- Poured joint with backer rod expansion joint
  - See expansion joint details

Traffic separator (typ.)

Bridge deck or approach slab

Bars 4A (See Note 5)

Bars 4B (Typ.)

Bars 4C (Typ.)

Bars 4D (Typ.)

Bars 4A (See Note 3)

Bars 4E @ 1'-0" O.C. Max. (Typ.)

Bars 4B @ 1'-0" O.C. Max. (Typ.)

Bars 4C @ 1'-0" O.C. Max. (Typ.)

Dowel (See DOWEL DETAIL, Sheet 5)

Details:

- Field bend and cut rebar as required to maintain cover.

Bridge installations - Type "F" Curb

Traffic Separators

FY 2020-21

Standard Plans

Index 520-020

Sheet 4 of 5
**DESCRIPTION:**

**REINFORCING STEEL NOTES:**
1. All dimensions are out to out.

2. The 8" vertical dimension shown for Bars 4B and 4D are based on a slab 8½" thick or greater without a wearing surface. If slab thickness is less than 8½", decrease this dimension by an amount equal to the difference in thickness. If a wearing surface is to be provided, increase this dimension by an amount equal to the wearing surface thickness.

---

**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

---

**DRAINAGE JOINT DETAIL**

(For 5" Opening Or Less)

---

**REINFORCING STEEL 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.

---

**ALTERNATE REINFORCING STEEL DETAILS**

(Welded Wire Reinforcement)

---

**ESTIMATED TRAFFIC SEPARATOR QUANTITIES:**

**CONCRETE:**

<table>
<thead>
<tr>
<th>WIDTH</th>
<th>COMMON WEIGHT</th>
<th>TYPE I</th>
<th>TYPE II</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>0.056 CY per Ft.</td>
<td>0.072 CY per Ft.</td>
<td></td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>0.089 CY per Ft.</td>
<td>0.112 CY per Ft.</td>
<td></td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>0.133 CY per Ft.</td>
<td>0.164 CY per Ft.</td>
<td></td>
</tr>
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</table>

**NOSE:**

<table>
<thead>
<tr>
<th>TYPE I</th>
<th>TYPE II</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>0.080 CY</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>0.227 CY</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>0.538 CY</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL:**

(All quantities are based on an 8½" slab)

---

**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.

---

**BRIEF 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 exposed surfaces, apply a Class 3 surface finish in accordance with Specification 400.

2. STEEL BAR REINFORCEMENT: Where required to maintain continuity, provide lap splices of at least 18 inches for No. 4 bars and 20 inches for No. 5 bars, unless otherwise shown herein (including shorter splices as provided by the default bar bending diagrams).

The default reinforcing details shown herein, including bar shapes and lap splice positions, are intended to show required steel locations and provide for a constructible design. However, with the approval of the Engineer, alternate steel configurations may be used in the same locations shown herein, given that the equivalent strength-reinforcing is provided and the cover, maximum spacing, and continuity requirements are maintained.

3. OPTIONAL WELDED WIRE REINFORCEMENT: With the approval of the Engineer, steel welded wire reinforcement in accordance with Specification 415 may be substituted for the steel bars shown herein. Place the welded wire in the same locations specified for the steel bars, and maintain the equivalent strength, cover, maximum spacing, and continuity requirements.

GENERAL NOTES (CONTINUED):

4. TOP FACE LONGITUDINAL REINFORCEMENT: Unless otherwise specified, the longitudinal reinforcement shown closest to the top face of the barrier has a maximum cover of 4½; measured from the top face of the barrier.

5. MINIMUM BARRIER LENGTH: Unless otherwise shown in the Plans, the minimum Concrete Barrier length is 40 feet.

6. CONSTRUCTION JOINTS: Install Construction 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 Toll Grade-Separated Sections, see Sheet 3 for additional Transverse Joint requirements.

Longitudinal Joints are only permitted where indicated in the following details and notes, with a vertical position tolerance of ±1 1/2" from the locations shown.

7. DOWELED JOINTS: As shown in the Dowel Details on Sheets 2 & 13, install ⅞" Doweled Joint for Concrete Barrier connections to Pier Protection Barrier and Traffic Railings. Doweled Joints are also required for expansion mitigation in Median Barrier as defined per Sheets 2 & 5. Doweled Joints are not permitted within Grade-Separated Median Barrier.

8. CRACK CONTROL V-GROOVES: At 20-foot intervals, place ⅜" deep V-grooves that run vertically and/or transversely in the front, top, and back faces of barriers. The V-grooves can be either molded or scored while the concrete is still plastic.

9. SUBGRADE: Compact the top 12 inches of the subgrade to at least 98% of the maximum density determined by FM 1-1-180, Method D.

10. FOOTING BOTTOM CONCRETE COVER: At the bottom of barrier footings shown throughout this Index, up to 2 inches of additional concrete cover is permitted beyond what is shown herein to accommodate soil grade irregularities.

11. FINISH GRADE ELEVATION: At the barrier face location, the finish grade pavement has a vertical position tolerance of ±1½" from the locations shown herein, relative to the barrier elevation. Maintain visually smooth and even pavement at the barrier face, per the approval of the Engineer.

12. DRAINAGE INLETS: Where called for in the Plans, install corresponding inlets per Indexes 425-030 thru 425-032.


15. BARRIER END MARKERS: For all free ends of concrete barriers that are not shielded with an end treatment or connection to another barrier or traffic railing type, install a Type 3 Object Marker on the end face per Specification 705.

16. BARRIER DELINATORS: Install Barrier Delinators in accordance with Specification 705. For median barriers, mount the delinator 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 2½" from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.

17. TILL SITES: Where called for in the Plans, substitute the steel reinforcing bars shown herein with GFRP reinforcing bars of the same size. Construct GFRP reinforcing bars in accordance with Specification 932, and use a 4½" inner diameter 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 till 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.
**DESCRIPTION:**

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**CONCRETE BARRIER**

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**NOTES:**

1. **BARRIER RUN SEGMENT:** Within the Barrier Run Segment, either the 38" Height Median Barrier or the differing Median Barrier sections shown throughout the Index may be placed as required per the Plans.

2. **SECTION VIEWS:** For additional Views A-A and B-B, see Sheet 3.

3. **DOWELED JOINTS:** See the General Notes on Sheet 1 for usage of joint types. Space Doweled Joints at 100-foot maximum intervals. Place steel reinforcing with a longitudinal 3" cover adjacent to the joint faces in the barrier. Use ASTM A36 smooth round bars with hot-dip galvanization.

4. **OPTIONAL LONGITUDINAL JOINT:** When a longitudinal joint is placed above the footing, use the Optional Doweled Joint shown. As a substitute for the Shear Key, the concrete footing's top surface may be raked to provide additional shear friction. Rake the fresh concrete surface so that about half of the surface area consists of approximately 4" depth longitudinal grooves, distributed evenly.

5. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 3/8" Dowelled Joint.

6. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with the 38" Height Median Barrier only as shown herein.

7. **CRASH CUSHION CONNECTIONS:** Connect Crash Cushions per Index 544-001 in conjunction with the 38" Height Median Barrier only 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.
PLAN VIEW - 38" HEIGHT MEDIAN BARRIER
FREE END REINFORCING (See Note 3)

NOTE:
1. GENERAL: Work with the Plan and Elevation Views on Sheet 2.
2. BAR BENDING DIAGRAMS: For additional information on Bars 4V1 and 4U1, see the details on Sheet 2.
3. PLAN VIEWS: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal steel locations, see the section views.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION (See Note 3)

SECTION A-A
38" HEIGHT MEDIAN BARRIER
Concrete Mix = 0.20 Cubic
Steel Qty. = 11.8 LB/FT

VIEW B-B
REDUCED SECTION OF END TRANSITION FOR GUARDRAIL (End of Barrier)

CONCRETE BARRIER
DESCRIPTION:
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CONCRETE BARRIER

NOTES:
1. GENERAL: Install Sloped End Treatment only where called for in the plans.
2. JOINTS: Construction or Doweled Joints are not permitted within the Sloped End Treatment segment.

3'-2" Height Median Barrier

8'-0" Min.

3'-0"

2'-0"

38" Height Median Barrier

SEE SHEET 2

3'-9" (±3"

No. 4 Bars (or Cut Bars 4V1) & Bars 4U1 @ 18" Sp.

Bars 4U1 @ 18" Sp. Max.

No. 4 Bars @ 10" Sp. Max.

Bars 4U1 @ 18" Sp. Max.

NOTES:
1. GENERAL: Install Sloped End Treatment only where called for in the plans.
2. JOINTS: Construction or Doweled Joints are not permitted within the Sloped End Treatment segment.
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.

3. PROJECT-SPECIFIC PEDESTAL WIDTH & SETBACK: The pedestal width is governed by the size requirements of the overhead sign support, as detailed in the Plans. Likewise, the setback distance from the sign support base to the barrier face is governed by the anchor bolt cover requirements, as defined per the Plans. The minimum pedestal width is 2'-0", where a complete removal of the gutter line taper is permitted.

4. PLAN VIEW: Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

MEDIAN BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING - SYMMETRICAL
NOTES:

1. PROJECT-SPECIFIC REINFORCING: For footing and barrier reinforcing required in the overhead sign support, see the project-specific design in the Plans.

2. BARRIER REINFORCING: Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 40" maximum cover from the top of the barrier.

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.

BEGIN TRANSITION   SECTION A-A

SYMMETRICAL ABOUT Axis

END TRANSITION   SECTION C-C

SYMMETRICAL ABOUT Axis

MEDIAN BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING - ASYMMETRICAL
**NOTES:**

1. **PROJECT-SPECIFIC DESIGN:** For the base plate, anchor bolts, foundation design, and additional reinforcing required for the barrier, see the project-specific design in the Plans.

2. **BARRIER REINFORCING:** Maintain the 38" Height Median Barrier's longitudinal steel reinforcing continuously through the barrier height transition and pedestal. Provide the Additional No. 4 Bars and taper as required to maintain a 4" maximum cover from the top of the barrier.

   For the vertical and transverse reinforcement requirements shown in Sections A-A through C-C, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

3. **PLAN VIEW:** Only top and bottom longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

**MEDIAN BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED DUAL SIGN SUPPORT SHIELDING - MINIMUM WIDTH**
**DESCRIPTION:**

**REVISION**

**LAST REVIEW** 01/01/18

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**NOTES:**

1. **OVERHEAD SIGN SUPPORT:** The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements. The overall length and width of the barrier's taper and parallel segments is governed by the overhead sign support dimensions as defined in the Plans.

2. **MULTIPLE SIGN SUPPORTS:** The parallel segment may be lengthened to accommodate multiple sign supports, with the approach and trailing tapers located 1 foot, measured longitudinally, upstream and downstream from the first and last sign support bases, respectively.

3. **PLAN VIEW:** Only outermost longitudinal reinforcing is shown for clarity. For all longitudinal reinforcing locations, see the Section Views.

4. **STIRRUP BARS:** For the vertical and transverse reinforcement requirements shown in Sections A-A and B-B, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

5. **CONCRETE OR FLOWABLE FILL:** Use Class NC Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.

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**SECTION C-C**

**38" HEIGHT SPLIT SECTION (OPPOSITE SIDE SIMILAR BY OPPOSITE HAND)**

**PLAN VIEW**

**SYMPARIAL (AT BEGIN SPLIT SECTIONS)**

**SECTION A-A**

**SECTION B-B**

**OVERHEAD SIGN SUPPORT:**

- Overhead sign support shown is an example only; see the Plans for project-specific dimensions and requirements.
- The overhead sign support is an example only; see the Plans for project-specific dimensions and requirements.

- **MEAN BARRIER - 38" HEIGHT SPLIT SECTION**

**FOR STAND-ALONE SIGN SUPPORT SHIELDING**

**FLOWABLE FILL:** Use Class NC Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.
**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.

**MEDIAN BARRIER - 44" HEIGHT**

**SPLIT SECTION FOR PIER SHIELDING**
NOTES:

1. GENERAL: Work with the Plan and Elevation views on Sheet 10.

2. LONGITUDINAL REINFORCING CONTINUITY: Maintain all longitudinal steel reinforcing shown in Section C-C continuously into Section D-D (spliced where required). The additional longitudinal reinforcing shown in Section D-D does not require continuity into Section C-C, and it starts 3" from the construction joint or edge of concrete per the details on Sheet 10.

3. STIRRUP BARS: For the vertical and transverse reinforcement requirement shown, bar bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

MEDIAN BARRIER - 44" HEIGHT
SPLIT SECTION FOR PIER SHIELDING - DETAILS
**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"Ø x 1"Ø x 24" (±3/8") drilled hole for cured concrete. For drilled holes larger than 1½"Ø, 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"Ø Schedule 80 PVC pipe with a sealed cap, cast-in-place as shown.

4. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the 1/2" Doweled Joint.

5. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001.

6. **CRASH CUSHION CONNECTIONS:** Connect Crash Cushions per Index 544-001 in conjunction with the 3'-0" End Transition for Guardrail as shown herein.

7. **FREE ENDS:** When the barrier end does not terminate with a Traffic Railing Connection, Guardrail Connection, or Crash Cushion Connection as called for in the Plans, terminate in accordance with the Free End Reinforcing Note on Sheet 14.
NOTES:

1. GENERAL: Work with the Plan and Elevation Views on Sheet 13. The Section Option footings shown on Sheet 15 may be substituted where called for in the Plans.

2. FREE END REINFORCING: Where shown in the Plans, terminate the 38" height Barrier section with a transverse vertical end face. Reduce the spacing of Bars SV2 and SV3 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 SV3, see the Bar Bending Diagrams on Sheet 26.

PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION (Longitudinal Steel Not Shown for Clarity)
NOTES:

1. GENERAL: Install the differing Section Options as required per the Plans.

2. CONNECTIONS BETWEEN DIFFERENT SECTIONS: Connect differing Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections. Alternatively, a Doweled Joint may be used as shown on Sheet 13.

3. FLUSH RETAINING SECTION COMBINATION: Where Barrier Joints are required in retaining segments, install the Flush Section, except replace the 1'-0" General Heel with the 2'-0" Extended Heel as shown in the Retaining Section. Use longer lateral reinforcing bars of 2-1/2" length to maintain the cover shown.
NOTE:
1. GENERAL: See the applicable Notes on Sheet 15.

SHOULDER BARRIER - SECTION OPTIONS (CONTINUED)
Transition Line Gutter

<table>
<thead>
<tr>
<th>2'-6&quot;</th>
<th>2'-6&quot;</th>
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<tbody>
<tr>
<td>Top &amp; Sides</td>
<td>(Stem &amp; Barrier Top &amp; Sides)</td>
</tr>
</tbody>
</table>

| 4 | 3 |
| 7 | 4 |
| 1 | 7 |

| 6 " | & Bottom | (Footin Top 2'-0"
|-------|----------|

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<tr>
<th>2'-0&quot;</th>
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<td>3&quot; Cover</td>
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<table>
<thead>
<tr>
<th>Sp. Max.</th>
<th>No. 4 Bars @ 8&quot; Sp. Max. (Typ.)</th>
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<tbody>
<tr>
<td>Bars S12 @ 8&quot; Sp. Max. (Typ.)</td>
<td>No. 5 Bars @ 8&quot; Sp.</td>
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<tr>
<th>Gutter Line</th>
<th>Toe of Footing</th>
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<table>
<thead>
<tr>
<th>Optional Long Joints</th>
<th>2&quot; Cover</th>
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</thead>
<tbody>
<tr>
<td>Bars S13 @ 8&quot; Sp. (Field Cut as Reqs.)</td>
<td>No. 5 Bars @ 8&quot; Sp.</td>
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</tbody>
</table>

### 44" HEIGHT REAR-FLUSH SECTION

**ABOVE-GROUND HAZARD EMBEDDED IN FOOTING**

**SECTION C-C**

**PLAN - ROUND PIERS EXAMPLE (SQUARE PIERS SIMILAR)**

**ELEVATION - ROUND PIERS EXAMPLE (SQUARE PIERS SIMILAR)**

**NOTE:**

1. PIERS: The piers shown herein are example shapes only; see the Plans for the project-specific dimensions. The details shown herein are only for use when piers do not require protection per the AASHTO LRFD requirements. For piers requiring protection, see Index 521-002.

### SHOULDER BARRIER - 44" HEIGHT REAR-FLUSH SECTION FOR REDUCED SETBACK PIER SHIELDING

**CONCRETE BARRIER**

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521-002
SECTION A-A
BEGIN TRANSITION - OPTION 'A'
MATCH SINGLE-SLOPE
36" HEIGHT SHOULDER BARRIER

SECTION A-A
BEGIN TRANSITION - OPTION 'B'
MATCH SINGLE-SLOPE
36" HEIGHT TRAFFIC RAILING
(Bridge Applications)

SECTION B-B
INTERMEDIATE SECTION
OF LINEAR SECTION
2'-8" HEIGHT SHOULDER BARRIER

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. STIRRRUP BARS: For the vertical and transverse reinforcement requirements shown, bending diagrams are not provided due to varying section dimensions. Use any combination of spliced reinforcing steel to position the reinforcement with the same cover, spacing, continuity, and equivalent strength shown herein, as approved by the Engineer.

SHOULDER BARRIER - CONNECTION TO F-SHAPE

ELEVATION

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FAA
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10/29/19
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**SECTION A-A CURB & GUTTER BARRIER**

1. **GENERAL:** Place 20" x 18" Drainage Slots at locations and/or spacing called for in the Plans.

2. **STEEL REINFORCEMENT CONFLICT:** When the Drainage Slot encounters a conflict with reinforcing steel, shift or cut the reinforcing steel to provide 29\(\frac{1}{2}\) to 3\(\frac{1}{2}\) of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 8" bar spacing. If shifting the vertical bars, move the bars from the standard 8" spacing location to the closest end of the drainage slot (distributing 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 \(\frac{1}{2}\) Doweled Joints as defined on Sheet 13.

4. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the \(\frac{1}{2}\) Doweled Joint per Sheet 13.

5. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 526-001 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 16" with transverse expansion joints through the barrier and footing spaced at 100-foot maximum intervals. On both sides of each joint, use the Free End Reinforcing bar spacing per Sheet 21.

3. **DOWELED JOINTS:** See the General Notes on Sheet 1 for usage of joint types. Where required, install \(\frac{1}{2}\) Doweled Joints as defined on Sheet 13.

4. **TRAFFIC RAILING CONNECTIONS:** Align the barrier and Traffic Railing faces and connect with the \(\frac{1}{2}\) Doweled Joint per Sheet 13.

5. **GUARDRAIL CONNECTIONS:** Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001 in conjunction with 3'-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.

**DRAINAGE SLOT DETAILS**

**DRAINAGE SLOT NOTES:**

1. **GENERAL:** Place 20" x 18" Drainage Slots at locations and/or spacing called for in the Plans.

2. **STEEL REINFORCEMENT CONFLICT:** When the Drainage Slot encounters a conflict with reinforcing steel, shift or cut the reinforcing steel to provide 29\(\frac{1}{2}\) to 3\(\frac{1}{2}\) of concrete cover for the reinforcing around the Drainage Slot. If cutting the vertical bars, maintain 8" bar spacing. If shifting the vertical bars, move the bars from the standard 8" spacing location to the closest end of the drainage slot (distributing additional vertical reinforcement evenly on each side of the Drainage Slot).

**CURB AND GUTTER BARRIER**

**CONCRETE BARRIER**

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**NOTES:**

1. **GENERAL:** Work with the Plan and Elevation Views on Sheet 20.
2. **FREE END REINFORCING:** Where shown in the Plans, terminate the 38" Curb & Gutter Barrier section with a transverse vertical end face. Reduce the spacing of Bars 5V2 and 5U4 to 6" for S Spaces, placed with 3" cover from the barrier's end face.
3. **BAR BENDING DIAGRAMS:** For additional details for bars 5V2 and 5U4, see the Bar Bending Diagrams on Sheet 20.

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**PLAN VIEW - END SEGMENT FOR GUARDRAIL CONNECTION**

*(Longitudinal Steel Not Shown for Clarity)*

**CURB AND GUTTER BARRIER - REINFORCING DETAILS**
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:

Plan - Curb and Gutter Barrier

SHOWING SLOPED END TREATMENT
(Approach and Trailing End Similar by Opposite Hand; See Sections for All Longitudinal Steel Locations)

CURB AND GUTTER BARRIER - SLOPED END TREATMENT

ELEVATION - CURB AND GUTTER BARRIER

SHOWING SLOPED END TREATMENT
(Approach and Trailing End Similar by Opposite Hand)
NOTES:

1. TAPER SEGMENTS AND OFFSET SEGMENT: The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. OVERHEAD SIGN SUPPORT: The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. CONNECTION TO SHOULDER BARRIER SECTIONS: Connect to Shoulder Barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent sections longitudinal steel.

4. FREE ENDS: Where shown in the Plans, terminate the Single-Faced Section with a transverse and face. Place a stirrup bar with a 3" cover from the end face. Place longitudinal bars with a 3" cover from the end face.

5. CONCRETE OR FLOWABLE FILL: Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 121.

WALL SHIELDING BARRIER - 38'-0" HEIGHT SECTION - APPROACH & TRAILING TRANSITION

SECTION A-A 38'-0" 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

PLAN
(See Section A-A for Barrier Reinforcing)
1. **TAPER SEGMENTS AND OFFSET SEGMENT:** The plan view shown is an example only, showing general geometry for the taper segments and offset segment. For the actual segment lengths and corresponding taper rates required, see the barrier placement information in the Plans.

2. **OVERHEAD SIGN SUPPORT:** The overhead sign support shown is an example only; see the Plans for the project-specific dimensions and requirements if applicable.

3. **CONNECTIONS TO DIFFERENT CONCRETE BARRIER SECTIONS:** Connect to aligning barrier sections using a continuous pour or Transverse Joint, where longitudinal steel that aligns within the adjacent section is maintained continuously between sections or has a full lap splice with the adjacent section's longitudinal steel.

4. **FREE ENDS:** Where shown in the Plans, terminate the Single-Faced Section with a transverse end face. Place a stirrup bar with a 3" cover from the end face. Place longitudinal bars with a 3" cover from the end face.

5. **GUARDRAIL CONNECTIONS:** Within the Shoulder Barrier Segment for Guardrail, install Shoulder Barrier as shown per Sheet 3, including the corresponding End Transition for Guardrail. Connect Guardrail using the Transition Connections to Rigid Barrier per Index 536-001.

6. **CONCRETE OR FLOWABLE FILL:** Use Class NS Concrete in accordance with Specification 347 or Non-Excavatable Flowable Fill in accordance with Specification 123. Use only concrete fill behind the Shoulder Barrier Segment; do not use flowable fill at this location.

**WALL SHIELDING BARRIER - 38" HEIGHT SECTION - GUARDRAIL CONNECTION**

**PLAN (See Section A-A for Barrier Reinforcing)**

**NOTES:**

- Use only concrete fill behind the Shoulder Barrier Segment; do not use flowable fill at this location.
- Use only concrete fill behind the Shoulder Barrier Segment; do not use flowable fill at this location.
- Use only concrete fill behind the Shoulder Barrier Segment; do not use flowable fill at this location.
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 1/2" 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 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.

WALL SHIELDING BARRIER - 56" HEIGHT SECTION FOR BARRIER-MOUNTED SIGN SUPPORT SHIELDING
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.

BILL OF REINFORCING STEEL

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BARS 4U1

BAR 4U2

BAR 4V1

BAR 4V3

BAR 5U3

BAR 5U4

BAR 5V2

BAR 5V3

BAR 5C2

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 I-T 180, Method D.

4. DRAINAGE INLETS: See Index 425-031 for Adjacent Barrier Inlets, and isolate these structures from Pier Protection Barriers and Footings with 1" Preformed Joint Filler.

5. BARRIER END MARKERS: For all free ends of barriers that are not connected to guardrail or concrete barrier, install a Type 3 Object Marker on the end face per Specification 705.

6. BARRIER DELINEATORS: Install Barrier Delineators in accordance with Specification 705. Mount the delineators on the top face of the barrier, with the roadway side of the delineator located 2" from the front face of the barrier and the reflective sheeting facing traffic of the nearest approach.

7. CRACK CONTROL: Provide ½ depth crack control V-Grooves at 15' to 30' spacing. Locate V-Grooves above any joint or discontinuity in the barrier footing. Align V-Grooves perpendicular to the longitudinal axis of the Pier Protection Barrier and make continuous across the top surface and both side faces. For slip formed barriers, score ½ V-Grooves while the concrete is still plastic, otherwise pre-form the joints when stationary forms are utilized.
EXAMPLE LAYOUTS - FOOTING PLACEMENT AND CONNECTIONS

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)

PLAN
(Footing Not Shown,
See Sheet 6 for Options)

CONNECTION TO
CONCRETE BARRIER

CONNECTION TO
GUARDRAIL

(Per the Plans)

(Per the Plans)

(Footing Details)

(Footing Details)
NOTES:

1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Sheets 2 & 3 for additional plan and elevation details.

2. FOOTING OPTIONS: See Sheet 6 for footing and stem details.

BARRIER DETAILS - CONNECTION TO CONCRETE 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.

   Footing Options: See Sheet 6 for supporting stem and footing details.

2. FußEbE OPTIONS: See Sheet 6 for additional footing and stem details.

   BARRIER DETAILS - CONNECTION TO CONCRETE 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.

      Footing Options: See Sheet 6 for supporting stem and footing details.
NOTES:

1. GENERAL: Construct either the 56" PPB or the 44" PPB height as called for in the Plans. See Sheets 2 & 3 for additional plan and elevation details.
2. FOOTING OPTIONS: See Sheet 6 for footing details.

FINISH GRADE, GUTTER LINE, & LONGITUDINAL JOINT

FINISH GRADE

GUTTER LINE

LONGITUDINAL JOINT

STANDARD PLANS

FY 2020-21

PIER PROTECTION BARRIER

INDEX

521-002

5 of 8
SECTION E-E
REAR-FLUSH FOOTING OPTION
Concrete Qty. = 0.34 CY/FT (Below Gutter Line)
Steel Qty. = 63.5 LB/FT (Including Bars SU)

SECTION F-F
SYMMETRICAL FOOTING OPTION
Concrete Qty. = 0.34 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.

   Work with the supported 44" PPB and 56" PPB as shown on Sheets 3, 4, & 5.

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).

BARRIER FOOTING OPTIONS
PIER PROTECTION BARRIER

CRASH WALL DETAILS

CONCRETE QTY. = 0.82 CY/FT (44" Crash Wall) or 0.93 CY/FT (56" Crash Wall)
Steel QTY. = 71.8 LB/FT (44" Crash Wall) or 76.0 LB/FT (56" Crash Wall)

NOTES:

1. GENERAL: Only where called for in the Plans, install the Crash Wall as a supplement for PPB. If applicable, see the Plans for the corresponding Station and Offset required.
   For additional layout details, see Sheets 2 & 3.

2. CRASH WALL HEIGHT: Install the Crash Wall at a height which matches the adjacent PPB (either 44" or 56")

3. SCHEMATIC VIEWS: Only partial reinforcing is shown in the Schematic Views to establish a trend while keeping clarity. For all reinforcing steel locations and spacing requirements, see Section H-H.

4. GUARDRAIL CONNECTIONS: To facilitate guardrail connections, shift the Crash Wall 3 feet from the end of the PPB as shown on Sheets 2 & 3.

5. OPTIONAL SLIP FORMING SUPPORT: The 1'-0" depth spread footing may be extended by 3' laterally beyond the face of the wall to provide support for a subsequent slip forming operation above. Do not adjust the steel reinforcement location for the additional concrete.

For additional layout details, see Sheets 2 & 3.
### Bill of Reinforcing Steel

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<td>S2, S3</td>
<td>5</td>
<td>Varies (Straight)</td>
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### 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

- **Bars 5V**
- **Bars 5U**
- **Bars 5R**
- **Bars 5F1**
- **Bars 5L**
- **Bars 5E**
1. GENERAL: Construct Opaque Visual Barrier (OVB) in accordance with Specification 521, and use either cast in place or prestressed panels. Cast OVB concrete monolithically with the Concrete Barrier or Traffic Railing; use an ASTM D6800, Class 5, Type III, Organic Fiber bend breaker as needed.

2. Dowel Bar Connection: For the embedment in Concrete Barrier or Traffic Railing concrete, dowel bars must be either cast in place for new concrete or grouted in place for existing concrete. Embed the dowel bars to the corresponding depths shown, and use the bar lengths provided in the Dowel Bar Length Table. At grouted embedment locations, drill $\frac{3}{8}$" holes to a depth of 6%\(^2\). Use only approved non-shrink grout on the APL. Drilling through existing reinforcing steel is permitted.

3. Transverse Joints: Place 3" Transverse Joints with a maximum spacing of 50'-0" and a minimum spacing of 20'-0". Use a consistent spacing where practical, without violating the above spacing requirements, place Transverse Joints matching the location and width of open joints in the supporting Concrete Barrier or Traffic Railing.

4. Sloped End Treatments: Regardless of the traffic direction, place Sloped End Treatments on all exposed ends of OVB, excluding leave-outs for barrier-mounted signs and light poles. See Note 7 below.

5. Barrier-Mounted Signs and Light Poles: Where signs and barrier-mounted light pole structures conflict with placement of OVB, end and restart the OVB with a transverse vertical face located a longitudinal distance of 3" (0.5) from the base of the structure. Follow the same reinforcing scheme and concrete cover requirement for the Transverse Joint shown herein. See Note 7 below.

6. Large Barrier-Mounted Sign Supports: See Sheet 2 for details. See Note 7 below.

7. Leave-Outs: OVB leave-outs are longitudinal gaps in OVB segments required to accommodate barrier-mounted signs and light pole placement. Leave-outs up to 15 feet in length are included in OVB length measurement.

8. Asymmetrical Concrete Barrier Sections: When mounting on top of an asymmetrical Concrete Barrier section (not shown), align the centerline of the OVB with the centerline of the top face of the Concrete Barrier section.

9. Split Concrete Barrier Sections: For split Concrete Barrier sections that run separately (for vertical structures, bridges, etc.), OVB is only required on top of one of the Concrete Barrier sections. Place OVB on top of the Concrete Barrier section with the highest elevation. Longitudinally overlapping OVB runs are permitted, where called for in the Plans, which are designated with overlapping Begin and End Station OVB callouts.

10. Vertical Reinforcement: Place vertical No. 3 bars with the spacing shown, except that No. 3 bars at the dowel bar locations may be shifted longitudinally or eliminated to the satisfaction of the contractor.

11. Optional Welded Wire Reinforcement: With the approval of the Engineer, the No. 3 bars shown herein may be replaced with welded wire reinforcement in accordance with Specification 41S, use welded wire reinforcement of equal or greater strength than the bars being replaced, maintain the same cover requirements with equivalent or smaller spacing.

12. Variable Height Concrete Barriers: See Sheet 2 for details.

13. Concrete Barrier and Traffic Railing Transitions Between Differing Sections: Transition the OVB section using a method similar to the OVB Linear Transition shown in Elevation View 'B' on Sheet 2, except adjust the longitudinal length of the transition as required.

GENERAL NOTES:

- Dowel Bar Spacing
- 6'-0" Sloped End Treatment (Linear Transition) (See Note 4)
- 1'-0" Transverse Joint (See Note 3)
- 3'-0" Transverse Joint (See Note 10)
- 6'-0" Sloped End Treatment (Typ.) (See Note 2)
- 2'-11" ± No. 4 Dowel Bar (Trim As Req'd.) (See Note 2)
- 2'-11" ± No. 4 Dowel Bar (Trim As Req'd.) (See Note 2)
- 3'-0" Max. (Adjacent to Open Joint)
- 3'-0" Max. (Adjacent to Open Joint)
- 2'-4" Single-Slope Concrete Barrier (Typ.) (See Note 2)
- 2'-4" Single-Slope Traffic Railing (Typ.) (See Note 2)
ELEVATION VIEW ‘A’ - OVB END SEGMENT AT CONCRETE BARRIER
HEIGHT TRANSITION FROM 38" HEIGHT TO 56" SECTION
(REVERSE DIRECTION SIMILAR BY OPPOSITE HAND)

1. LATERAL DIMENSIONS: Maintain the OVB section width and lateral placement as defined on Sheet 1.

2. DOWEL BAR LENGTHS & CONNECTIONS: For the differing OVB section heights, trim or adjust the dowel bar lengths as required to meet the clearances shown while maintaining the dowel bar connection requirements of Sheet 1.

   Elevation View ‘A’ - For the two dowel bars closest to the OVB end location, use full dowel bar lengths and bend as shown to maintain clearances. Overlapping dowel bars may deviate from the later centerline as required.

3. DOWEL BAR SPACING:

   Elevation View ‘B’ - The dowel locations shown in this detail are examples only, and may shift to maintain the spacing pattern that is governed by adjacent OVB. Maintain the dowel bar spacing scheme as defined on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.

4. SEGMENT LENGTHS:

   Elevation View ‘A’ - The length of the reduced-section OVB segment is governed by the length of linear width and height transition of the Concrete Barrier.

   Elevation View ‘B’ - The length of the reduced-section OVB segment is governed by the length of Concrete Barrier with 44” Height Section.

5. VERTICAL REINFORCING: For the differing OVB section heights, trim or adjust the vertical No. 3 Bar lengths as required to meet the clearances shown.

   Elevation View ‘A’ - For the two dowel bars closest to the OVB end location, use full dowel bar lengths and bend as shown to maintain clearances. Overlapping dowel bars may deviate from the later centerline as required.

6. TRANSVERSE JOINTS:

   Follow the requirements of Sheet 1.

   Elevation View ‘A’ - Do not place Transverse Joints within the End Segment.

   Elevation View ‘B’ - Maintain the Transverse Joint spacing scheme as defined on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.

NOTES:

1. LATERAL DIMENSIONS: Maintain the OVB section width and lateral placement as defined on Sheet 1.

2. DOWEL BAR LENGTHS & CONNECTIONS: For the differing OVB section heights, trim or adjust the dowel bar lengths as required to meet the clearances shown while maintaining the dowel bar connection requirements of Sheet 1.

   Elevation View ‘A’ - For the two dowel bars closest to the OVB end location, use full dowel bar lengths and bend as shown to maintain clearances. Overlapping dowel bars may deviate from the lateral centerline as required.

3. DOWEL BAR SPACING:

   Elevation View ‘B’ - The dowel locations shown in this detail are examples only, and may shift to maintain the spacing pattern that is governed by adjacent OVB. Maintain the dowel bar spacing scheme as defined on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.

4. SEGMENT LENGTHS:

   Elevation View ‘A’ - The length of the reduced-section OVB segment is governed by the length of linear width and height transition of the Concrete Barrier.

   Elevation View ‘B’ - The length of the reduced-section OVB segment is governed by the length of Concrete Barrier with 44” Height Section.

5. VERTICAL REINFORCING: For the differing OVB section heights, trim or adjust the vertical No. 3 Bar lengths as required to meet the clearances shown.

6. TRANSVERSE JOINTS:

   Follow the requirements of Sheet 1.

   Elevation View ‘A’ - Do not place Transverse Joints within the End Segment.

   Elevation View ‘B’ - Maintain the Transverse Joint spacing scheme as defined on Sheet 1; place dowel bars within the OVB Linear Bottom Transition as required.
**NOTES:**
1. Work this Index with Indexes S21-512 through S21-515.
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 S21-512.
- For Footing mounted Barrier/Noise Wall Details see Index 521-513 (T-Shaped), 521-514 (L-Shaped) or 521-515 (Trench).

**PLAN**
(Reinforcing Steel not shown for clarity)

**ELEVATION**
(INSIDE FACE OF CONCRETE BARRIER/NOISE WALL WITH T-SHAPED FOOTING SHOWN, (Other footings similar, Reinforcing steel not shown for clarity)
ELEVATION OF BARRIER/NOISE WALL REINFORCING STEEL AT OPEN JOINT
(Bars S51 in Barrier not shown for clarity)
(Footing or Junction Slab Details not shown)

ELEVATION OF BARRIER/NOISE WALL END TAPER (ADJACENT TO CONCRETE BARRIER
SHOWN, GUARDRAIL ATTACHMENT SIMILAR SEE DETAIL "A", SHEET 5)
(Bars S51 in Railing not shown for clarity)
(Footing or Junction Slab Details not shown)

NOTES:
* Field Cut Bars S5R & S51 to maintain clearance.
** Terminate ½” V-groove at Construction Joint & cast Top of Railing with End Taper.
*** Bar spacing shown for Bars S5 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

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(The above quantities are based on the Concrete Barrier/Noise wall typical section, excluding junction slab or footing)

BILL OF REINFORCING STEEL

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<td>V (T-Footings)</td>
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REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints 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.
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)

CROSS REFERENCE:
For location of Detail "A" see Sheet 1.
For location of Section C-C see Sheet 1.
For View B-B see Sheet 3.
**CONCRETE BARRIER/NOISE WALL (14'-0")**

**PLAN** (Reinforcing Steel not shown for clarity)

(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 $\frac{3}{8}$ Open Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown. $\frac{3}{8}$ Open Joint locations are to coincide with $\frac{3}{8}$ Expansion Joints in footings.

4. Construct $\frac{1}{2}$ V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between $\frac{3}{8}$ Open Joints and/or Begin or End Concrete Barrier/Noise Wall.

5. 14'-0" Noise Wall End Taper is required when adjacent to an 8'-0" Concrete Barrier/Noise Wall and may be used when an 8'-0" Concrete Barrier/Noise Wall End Taper is provided (see Index 521-510 for details). See Roadway Plans for Concrete Barrier/Noise Wall End Treatment.

6. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0") and one or more of the following:
   - A. Index 521-513 - Concrete Barrier/Noise Wall T-Shaped Spread Footing,
   - B. Index 521-514 - Concrete Barriers/Noise Wall L-Shaped Spread Footing or
   - C. Index 521-515 - Concrete Barrier/Noise Wall Trench Footing.

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**ELEVATION OF INSIDE FACE OF CONCRETE BARRIER/NOISE WALL**

(T-Shaped Spread Footing Shown, L-Shaped Spread Footing and Trench Footing Similar)

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**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.

**LAST REVISION:** 01/01/18

**STANDARD PLANS**

**FY 2020-21**

**INDEX**: 521-511

**SHEET**: 1 of 3
NOTES:
1. Field Cut Bars 5R & 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. ½ 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 ½ Open Joint is omitted.
4. Bar spacing shown is along the Gutter Line.
**SECTION A-A**  
**TYPICAL SECTION THRU CONCRETE BARRIER/NOISE WALL**

- **Bars SR3** (Typ.)
- **Bars SS1 (Typ.)**
- **Bars SS2** (Typ.)
- **Bars SS1** at each side of open joints, shown as *(*) (Typ.)
- **2" Cover**
- **2" Cover**
- **3" V-Groove**
- **Top of Footing (Const. Joint Required)**
- **Footage Reinforcement (See Note 1)**
- **Footage Reinforcement**
- **Footage**
- **Mortar Plug**

**NOTES:**
1. See Index 521-513, 521-514 or 521-515 for footing reinforcement.
2. At 32" 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>
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<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 SS1 & SS2**

**ESTIMATED CONCRETE BARRIER/NOISE WALL QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
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<tbody>
<tr>
<td>Concrete (Concrete Barrier)</td>
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<td>0.107</td>
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<tr>
<td>Concrete (Noise Wall, excluding any thickening)</td>
<td>CY/FT</td>
<td>0.293</td>
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<tr>
<td>Reinforcing Steel (Railing/Noise Wall)</td>
<td>LB/FT</td>
<td>100.31</td>
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<tr>
<td>Additional Rein. @ Open Joint (Railing/Noise Wall)</td>
<td>BT</td>
<td>397.38</td>
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**REINFORCING STEEL NOTES:**
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars SR may be continuous or spliced at construction joints. Lap splices for Bars SR, and SS1 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.

**CROSS REFERENCE:**
For locations of Section A-A and Detail "A", see Sheet 1.
SECTION A-A
SECTION THRU JUNCTION SLAB, BARRIER WALL INLET AND RETAINING WALL (TYPE 1 Junction Slab Shown, TYPE 2 Similar)

NOTES
1. Work this Index with Index 521-510 - Concrete Barrier/Noise Wall (8'-0'), as needed.
2. Concrete will be in accordance with Specification Section 346.
3. Construct 3/8" Expansion joints and face of coping plumb, and either perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.
4. Dowel Load Transfer Devices will be hot-dip galvanized ASTM A36 smooth round bars or GFRP smooth round bars with a minimum shear strength of 22 ksi in accordance with ASTM D471. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Load Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant and between 1 in 10 in horizontal.
6. Construct 3/8" V-Grooves in accordance with 30'-0" maximum intervals as shown. Space V-Grooves equally between Expansion Joints and/or Begin or End Junction Slab. V-Groove locations are to coincide with Expansion Joints.
7. Provide Organic Felt bond breaker on top and Expanded Polystyrene (3/16" thick) on sides of retaining wall.
8. Shoulder or Roadway Pavement or Fill is required on top of the junction slab for its entire length on the traffic side of the Barrier/Noise Wall. See Section B-B for details.
9. Actual location & width vary depending on type of Retaining Wall used.
10. Field cut Bars 5A and 5B2 as required to maintain minimum cover for joint reinforcing.
11. Spacing shown is along the Gutter Line.

CROSS REFERENCE:
For Section B-B and Detail "A", see Sheet 2.

CONCRETE BARRIER/NOISE WALL (8'-0')
JUNCTION SLAB

INDEX
521-512
1 of 2

STANDARD PLANS
FY 2020-21

LAST REVISION
01/01/18
DESCRIPTION:

REVISED

11/01/18

11/01/18

11/01/18
**BILL OF REINFORCING STEEL**

**REINFORCING STEEL BENDING DIAGRAMS**

**REINFORCING STEEL NOTES:**

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. The Contractor may use Deformed WWR when approved by the Engineer. Deformed WWR must meet the requirements of Specification Section 931.

**ESTIMATED JUNCTION SLAB QUANTITIES**

**ITEM** | **UNIT** | **TYPE 1** | **TYPE 2**
--- | --- | --- | ---
Concrete (Junction Slab) | LF/FT | 21.72 | 34.85
Reinforcing Steel (Typical) | LB/FT | 0.208 | 0.305
Additional Rein @ Expansion Joint | LB | 21.36 | 21.36

**NOTES:**

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. Actual width varies depending on type of Retaining Wall used.
4. See Index 521-510 for Bars 5V and Bars 5S1.
5. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade.
7. If slip forming is used, submit shop drawings for approval showing Expansion Joint support details and 2½" side cover with adjusted Typical Section dimensions.

**SECTION B-B**

**TYPICAL SECTION THRU JUNCTION SLAB AND RETAINING WALL**

**CROSS REFERENCE:**

For location of Section B-B, see Sheet 1.
**Notes:**

1. Construct the Spread Footing level transversely and plumb vertically; do not construct the spread footing perpendicular to the roadway surface.

2. Concrete will be in accordance with Specification Section 346. 
   - A. Class II concrete for slightly aggressive environments.
   - B. Class IV concrete for moderately or extremely aggressive environments.

3. Dowel Load Transfer Devices will be ASTM A 36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.

4. Construct 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 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 B = Bars (6 = 5B1 & 2 = 5S1) Inside Stirrup Bars 5V2 as shown. (2 = 5S1 Bars included in 521-510 or 521-511 quantities)

10. Spacing shown is along the Gutter Line.

11. Work this Index with one or both of the following:
   - a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0")
   - b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0")

**CROSS REFERENCE:**
For Section B-B and Detail "A", see Sheet 2.

**PLAN**

**SECTION A-A**

**SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET**

(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)
REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>LENGTH</th>
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<tbody>
<tr>
<td>A</td>
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<td>6'-8&quot;</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>AS REGD.</td>
</tr>
<tr>
<td>v</td>
<td>5</td>
<td>17'-0&quot;</td>
</tr>
</tbody>
</table>

**DOWEL** 1" Ø Smooth Bar 2'-0"

**BARS 5A & 5B**

REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer.
   WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

**REINFORCING STEEL QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DETAIL</th>
<th>QUANTITY</th>
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</thead>
<tbody>
<tr>
<td>Bars 5V2 (See Note 2)</td>
<td>2½ V-Groove</td>
<td>2' 2¼&quot;</td>
</tr>
<tr>
<td>Bars 5S1 (See Note 2)</td>
<td>3½ Preformed Expansion Joint Filler</td>
<td>18' 6&quot;</td>
</tr>
</tbody>
</table>

SECTION B-B

TYPICAL SECTION THRU SPREAD FOOTING

(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:

1. Match Cross Slope of Travel Lane or Shoulder.
2. See Sheet 1, Notes 8 & 9.

**ESTIMATED T-SHAPED SPREAD FOOTING QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
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</thead>
<tbody>
<tr>
<td>Concrete (Footings)</td>
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<tr>
<td>Reinforcing Steel (Typical)</td>
<td>LB/FT</td>
<td>25.90</td>
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<tr>
<td>Additional Rein: @ Expansion Joint</td>
<td>1B</td>
<td>31.38</td>
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</table>

Note: The reinforcing steel quantity includes the difference between Index 521-510 or 521-511 and Bars 5V shown. Bars 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE:

For location of Section B-B, see Sheet 1.
PLAN - OPTION B
SPREAD FOOTING ADJACENT TO SKEWED APPROACH SLAB AND WITH BARRIER WALL INLET
(Option A Similar) (Bars S1 Not Shown)

NOTES:

1. Construct the Spread Footing level transversely; do not construct the spread footing perpendicular to the roadway surface.

2. Concrete will be in accordance with Specification Section 346:
   a. Class II concrete for slightly aggressive environments.
   b. Class IV concrete for moderately or extremely aggressive environments.

3. Dowel Load Transfer Devices will be ASTM A 36 smooth round bar and hot-dip galvanized in accordance with Specification Section 962. Install Dowel Load Transfer Devices in accordance with Specification Section 350.

4. Construct 2" Expansion Joints plumb and perpendicular or radial to Gutter Line. Provide at 90'-0" maximum intervals as shown.

5. Construct 1/2" V-Grooves plumb and provide at 30'-0" maximum intervals as shown. Space V-Grooves equally between 1/2" Expansion Joints and/or Begin or End Spread Footing. V-Groove locations are to coincide with V-Groove locations in the Concrete Barrier/Noise Wall.

6. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 932.

7. Shoulder or Roadway Pavement and Fill is required on the traffic side of the spread footing for Option A. Fill is required for a distance of 4'-0" on the backside of the spread footing and the full length of the spread footing (3'-0" minimum depth) on the traffic side of the spread footing for Option B. See Typical Sections on Sheets 2 and 3 for details.

8. Spacing shown is along the Gutter Line.

9. Work this Index with one or both of the following:
   a. Index 521-510 - Concrete Barrier/Noise Wall (8'-0")
   b. Index 521-511 - Concrete Barrier/Noise Wall (14'-0").

CROSS REFERENCE:
For Detail "A", see Sheet 3.
For Section A-A and Estimated Quantities, see Sheet 4.
**TYPICAL SECTION THRU SPREAD FOOTING - OPTION B**
(Bars SP, SR and SS1 in Concrete Barrier/Noise Wall not shown for clarity)

**NOTES:**
1. Match Cross Slope of Travel Lane or Shoulder.
2. Place 10 ~ Bars (8 ~ Bars SB and 2 ~ Bars SS1) inside Bars SS1 as shown.
3. Provide 3" lip when optional construction joint is used.

**EXPANSION JOINT DETAIL**
(Spread Footing expansion joints are required at 1/2" open joints in Concrete Barrier/Noise Wall)
SECTION A-A
TYPICAL SECTION THRU SPREAD FOOTING AND BARRIER WALL INLET - OPTION B
(Bars 5P, 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)

NOTES:
1. Place 8 ~ Bars 5B and 2 Bars S1 inside Bars 5U1 as shown.
2. For Reinforcing Steel spacing, see Typical Section Thru Spread Footing - Option B on Sheet 3.
3. Provide 3" lip when optional construction joint is used.

REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

<table>
<thead>
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<th>MARK</th>
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<tr>
<td>F</td>
<td>5</td>
<td>5'-6&quot;</td>
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<tr>
<td>S3</td>
<td>5</td>
<td>3'-7&quot;</td>
</tr>
<tr>
<td>S4</td>
<td>5</td>
<td>3'-10&quot;</td>
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<tr>
<td>U1</td>
<td>5</td>
<td>8'-2&quot;</td>
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<tr>
<td>U2</td>
<td>5</td>
<td>17'-10&quot;</td>
</tr>
<tr>
<td>U3</td>
<td>5</td>
<td>12'-10&quot;</td>
</tr>
</tbody>
</table>

1" Ø DOWEL

6'-8"

1" Cover (Top & Sides)
2" Cover (Bottom)
4" Cover (Bottom)

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B will be a minimum of 2'-2".
4. Lap splices Bars 5T and 5V with 5U1 will be a minimum of 2'-2".
5. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of Deformed wire meeting the requirements of Specification Section 931.

ESTIMATED L-SHAPED SPREAD FOOTING QUANTITIES

<table>
<thead>
<tr>
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<td>LB/FT</td>
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<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>48.06</td>
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* Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

CROSS REFERENCE: For location of Section A-A, see Sheet 1.
1. Construct the Trench Footing plumb, do not construct the Trench Footing perpendicular to the roadway surface.
2. Concrete will be in accordance with Specification Section 346.
   a. Class II concrete for slightly aggressive environments.
   b. Class VI concrete for moderately or extremely aggressive environments.
3. Shear Keys in footing 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 the transverse vertical plane.
4. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Construct 2" 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 2" Expansion Joints and/or Begin or End Trench Footing. V-Groove locations are to coincide with V-Groove locations shown. Space V-Grooves equally between Expansion Joints.
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 (14'-0'').
   b. Index 521-511 - Concrete Barrier/Noise Wall (8'-0'').

**CONCRETE BARRIER/NOISE WALL**

**REINFORCING STEEL BENDING DIAGRAMS**

**BILL OF REINFORCING STEEL**

**NOTES**

- Construct the Trench Footing plumb, do not construct the Trench Footing perpendicular to the roadway surface.
- Concrete will be in accordance with Specification Section 346.
- Lap splices for Bars 5B will be a minimum of 2'-2".
- All reinforcing steel at the open joints will have a 2" minimum cover.
- All bar dimensions in the bending diagrams are out to out.

**REINFORCING STEEL NOTES:**

- Spacing Bars 5B @ 6" (Lap with Bars 5T as shown)
- Bars 5V @ 6" sp. (lap with Bars 5T as shown)
- V-Groove Spacing ~ 30'-0" Max. (See Note 6)
- 2" Min. Cover @ Expansion Joint Filler

**ESTIMATED TRENCH FOOTING QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Reinforcing Steel (Typical)</td>
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<td>38.76 49.19</td>
</tr>
<tr>
<td>Additional Rein. @ Expansion Joint</td>
<td>LB</td>
<td>21.36 21.36</td>
</tr>
</tbody>
</table>

**PLAN**

- Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.
- Bars 5V and 5S1 are included in Index 521-510 or 521-511 quantities.

**DETAIL "A"**

(Showing locations of 1/2" V-Grooves and 3/4" Preformed Expansion Joint Filler)

- Expansion Joint (See Detail this sheet)
- 1/2" V-Groove Transfer Devices (See Typical Section and Note 3)

**EXPANSION JOINT DETAIL**

- (Trench Footing expansion joints are required at 1/2" open joints in Concrete Barrier/Noise Wall)
- Top of Trench Footing
- Bottom of Trench Footing
- 1/2" Preformed Expansion Joint Filler

**TYPICAL SECTION THRU TRENCH FOOTING**

(Bars 5R and 5S1 in Concrete Barrier/Noise Wall not shown for clarity)
PRECAST AND C-I-P COPING NOTES:
1. Provide Class II concrete for slightly aggressive environments
   or Class IV for moderately or extremely aggressive environments.
2. Dowel Bars 4D extend 11" above the top of retaining wall panel. Field cut as necessary to maintain 2" minimum
   cover. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
3. Payment for Dowel Bars 4D, Buildup Concrete and Coping will be made under Retaining Wall System (Permanent).

PRECAST COPING - PARTIAL ELEVATION VIEW

SECTION A-A
C-I-P COPING

SECTION B-B
PRECAST COPING
REINFORCING STEEL BENDING DIAGRAMS - PRECAST AND C-I-P COPINGS

REINFORCING STEEL NOTES:
1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at the open joints will have a 2" minimum cover.
3. Bars 4A may be continuous or spliced at the construction joints. Lap splices for Bars 4A will be a minimum of 1'-8".
4. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.
5. S = Slightly Aggressive
   M = Moderately Aggressive
   E = Extremely Aggressive

Field bend Bars 4A to maintain minimum cover for Extremely Aggressive Environments

Field cut as required to maintain 2" minimum cover

Top of Retaining Wall End Panel

Top of Coping

Edge of C-I-P Coping Enclosure

Edge of Retaining Wall End Panel

C-I-P COPING ENCLOSURE DETAIL

C-HAMMER (Typ.)

1'-8" Min. Cover (Top & Sides)

3" Min. Cover (Typ.)

3" Min. Overlap

Leveling Pad for MSE Wall Shown

MSE WALL COPING (PRECAST OR C-I-P)

Note: When precast coping units do not fit the entire length of the retaining wall, use this similar C-I-P coping for short portions between precast coping units. This C-I-P coping may also be used for vertical copings.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
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<td>AS REQ'D.</td>
<td>AS REQ'D.</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>AS REQ'D.</td>
<td>AS REQ'D.</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 4U3 @ 1'-6" Max. sp. (Typ.)

Bars 4B (Horizontal) (Field cut as required to maintain minimum cover)

Bars 4B (Horizontal) (Field cut as required to maintain minimum cover for Extremely Aggressive Environments)

Bars 4B (Horizontal)

C-I-P COPING USED WITH PRECAST COPING

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.

LENGTH

E

S or M

** For Slightly and Moderately Aggressive environments

** For Extremely Aggressive environments
1. Construct the expansion joints, V-Grooves and face of coping plumb.

2. Provide Class III concrete for slightly aggressive environments or Class IV for moderate or extremely aggressive environments.

3. Dowel Load Transfer Devices will be hot-dip galvanized ASTM 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. Construct 3/4" Expansion Joints in junction slabs and C-I-P copings plumb and perpendicularly or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown. Provide 3"x3" Mortar plugs in open joints at the base of Concrete Barriers to contain runoff.

5. Shear Keys in junction slabs 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 3/4" V-Grooves in junction slabs and C-I-P copings plumb and perpendicularly or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown. Approach Slab V-Grooves 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.

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.

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)
**CONCRETE BARRIER/JUNCTION SLAB**

**WALL COPING**

**CONCRETE BARRIER/JUNCTION SLAB**

**WALL COPING**

**SINGLE-SLOPE CONCRETE BARRIERS**

**TYPICAL SECTION THRU PRECAST 36" SINGLE-SLOPE CONCRETE BARRIER AND COPING WITH C-I-P JUNCTION SLAB**

**NOTES:**

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary Junction Slab slope based on roadway cross slope to maintain a minimum 6" asphalt depth at the edge of the slab as shown.
3. For Rigid Pavement (Concrete), Junction Slab may be thickened to match finished grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the edge of the slab.
4. See Roadway Plans for asphalt shoulder, roadway pavement and overbuild.
5. Minimum length of Junction Slab between expansion joints is 30'-0".
6. At the Contractor's option, mechanical couplers may be used to splice reinforcing. Provide mechanical couplers in accordance with Specification Section 415. Mechanical couplers shall develop 125% of the bar yield strength.
7. Contractor to maintain stability of precast coping/Concrete Barrier prior to junction slab completion. In the Shop Drawings, show reinforcement for optional extension required for stability, shipping and handling. Maintain 2" minimum concrete cover.
8. When the air gap between the precast coping extension and retaining wall exceeds 2' & 2", fill gap with full depth Expanded Polystyrene to provide a maximum 2" air gap.
9. Angle varies ~ 0° min., 25° max.

**DETAIL "A"**

(Showing Locations of 1/2" V-Grooves and 1/2" Preformed Expansion Joint Filler)

**PRECAST COPING**

**C-I-P COPING**

**PARTIAL END VIEW OF CONCRETE BARRIER END TRANSITION FOR GUARDRAIL ATTACHMENT**

(Precast Coping Shown, C-I-P Coping Similar)
### REINFORCING STEEL BENDING DIAGRAMS

#### BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
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<tr>
<td></td>
<td></td>
<td>(36&quot;)</td>
</tr>
<tr>
<td>A</td>
<td>5</td>
<td>5'-3&quot;</td>
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<tr>
<td>B1</td>
<td>5</td>
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<tr>
<td>B2</td>
<td>5</td>
<td>AS REQD.</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>4'-10&quot;</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>4'-10&quot;</td>
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<tr>
<td>L</td>
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<td>S</td>
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<tr>
<td>S</td>
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<td>V1</td>
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<tr>
<td>V1</td>
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#### REINFORCING STEEL NOTES:

1. All bar dimensions in the bending diagrams are out to out.
2. All reinforcing steel at expansion and open joints will have a 2" minimum cover.
3. Lap splices for Bars 5B & 5E will be a minimum of 2'-2".
4. For Precast Copings only, lap splice Bars 5A with Bars SC. Lap splices will be a minimum of 2'-2".
5. The Contractor may use either full length Bars 5A or lap splice with Bars SC at Bars 5A for C-I-P Copings.
6. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 1'-5".
7. Dimension shown is for lap splice option. For mechanical coupler option, this dimension is 4'-8".
8. When approved by the Engineer, the Contractor may use deformed Welded Wire Reinforcement (WWR) meeting the requirements of Specification Section 931.
9. Contractor may use a single #5 stirrup in lieu of two bars for 4P and 4V1.

#### ESTIMATED QUANTITIES FOR C-I-P

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY (36&quot;)</th>
<th>QUANTITY (42&quot;)</th>
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<tr>
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<td>0.420</td>
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<tr>
<td>Reinforcing Steel (Typical) (excludes Bars SC &amp; 5F)</td>
<td>LB/LF</td>
<td>62.45</td>
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<tr>
<td>Additional Rein @ Expansion Joint (Steel Dowels)</td>
<td>LB</td>
<td>21.36</td>
<td>21.36</td>
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(These above concrete quantities are based on a max. super-elevation of 6.25%)

### CONCRETE BARRIER/JUNCTION SLAB - WALL COPING

**Typical Section thru C-I-P Concrete Barrier with C-I-P Junction Slab and C-I-P Coping (Precast Coping Similar with C-I-P Buildup)**

1. Match Cross Slope of Travel Lane or Shoulder.
2. Vary the Junction Slab slope based on the roadway cross slope to maintain a minimum 4" asphalt depth at the edge of the slab.
3. For rigid Pavement (Concrete), Junction Slab may be thinned to match finish grade. Vary the Junction Slab slope to maintain a minimum 1'-6" thickness at the inside edge of the slab.
4. Minimum length of Junction Slab between expansion joints is 30'-0" for 36" Single-Slope or 60'-0" for 42" Single-Slope.
5. Contractor to maintain stability of precast coping prior to junction slab completion. In the Shop Drawings, show reinforcement for optional extension required for stability, shipping and handling. Maintain 2" minimum concrete cover.
6. If slip forming is used, submit shop drawings for approval showing 2" side cover with the Typical Section dimensions adjusted.

### BUILDUP FOR STEPPED MSE WALL PANELS and C-I-P COPINGS

 attent Board Construction Joint Permitted

### LAST REVISION
01/10/19

### FY 2020-21

### STANDARD PLANS

521-610
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 1 ½" OD Dowel with a minimum shear strength of 22 kips in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Construct ½" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown.
6. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant or vary as required to maintain minimum cover to the top of the MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 522.
8. Spacing shown is along the Gutter Line.
9. Dowel Bars 4D (Typ.) are permitted to form joints.
10. For Precast Coping only, provide Dowel Bars 4D @ 1'-0" sp. and extend 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. Finish Sidewalks in accordance with Specification Section 522.
12. The following Indexes contain details of the Retaining wall at approach slabs:
   Index 400-090 – Approach Slabs (Flexible Pavement Approaches)
   Index 400-091 – Approach Slabs (Rigid Pavement Approaches)

** STAY-IN-PLACE Plastic Preformed Bond Breakers are permitted to form joints.

EXPANSION JOINT DETAIL
(Raised Sidewalk expansion joints are to coincide with ½" 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 1 ½" OD Dowel with a minimum shear strength of 22 kips in accordance with ASTM D7617. Install Dowel Load Transfer Devices in accordance with Specification Section 350.
5. Construct ½" Expansion Joints in raised sidewalk and C-I-P copings perpendicular or radial to the Gutter Line. Provide at 90'-0" maximum intervals as shown.
6. Shear Keys in Junction Slab are required when GFRP bars are used for Dowel Transfer Devices and are optional with steel dowel bars. Tongue Slope on Shear Key must be constant or vary as required to maintain minimum cover to the top of the MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
7. Provide and install Preformed Expansion Joint Filler in accordance with Specification Section 522.
8. Spacing shown is along the Gutter Line.
9. Dowel Bars 4D (Typ.) are permitted to form joints.
10. For Precast Coping only, provide Dowel Bars 4D @ 1'-0" sp. and extend 9" above the top of MSE wall panels. Field cut as necessary to maintain 2" minimum cover to the top of the build-up concrete. See Wall Company Drawings for number and spacing of Dowel Bars 4D.
11. Finish Sidewalks in accordance with Specification Section 522.
12. The following Indexes contain details of the Retaining wall at approach slabs:
   Index 400-090 – Approach Slabs (Flexible Pavement Approaches)
   Index 400-091 – Approach Slabs (Rigid Pavement Approaches)

** STAY-IN-PLACE Plastic Preformed Bond Breakers are permitted to form joints.
END VIEW OF 32" VERTICAL SHAPE END TRANSITION FOR GUARDRAIL ATTACHMENT
(Showing Bars 5S, Bars ST and Bars SX)  
(Precast Coping Shown, C-I-P Coping Similar)  

NOTE: See Sheet 4 for End Transition Elevation.

**ESTIMATED QUANTITIES FOR PRECAST COPING**

<table>
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<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>Concrete (Precast Coping)</td>
<td>CY/LF</td>
<td>0.995</td>
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<tr>
<td>Concrete (C-I-P Raised Sidewalk)</td>
<td>CY/LF</td>
<td>0.232</td>
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<td>Reinforcing Steel (Precast Coping) excluding</td>
<td>LB/LF</td>
<td>23.90</td>
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<tr>
<td>Bars ST, 5X and 5S (Typ.)</td>
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<td></td>
</tr>
<tr>
<td>Reinforcing Steel (C-I-P Raised Sidewalk)</td>
<td>LB/LF</td>
<td>13.50</td>
</tr>
<tr>
<td>(Typ.)</td>
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<tr>
<td>Additional Reinf. @ Expansion Joints (Steel Dowsels)</td>
<td>LB</td>
<td>32.04</td>
</tr>
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</table>

The above quantities are based on a Type D Concrete Cure (See Note 2).

**NOTES:**
1. Actual width varies depending on type of Retaining Wall used.
2. Match roadway curb shape (Type) and height. See Roadway Plans and Index 520-001. 5'-11" dimension is based on a 32" Vertical Shape with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
3. Trim end of Bars ST and SX to clear construction joint for 42" Vertical Shape.
4. At the Contractor's option, mechanical couplers may be used to splice reinforcing. Complete details, including reinforcement lengths are required in the Shop Drawings. Mechanical couplers shall develop 125% of the bar yield strength.
5. Contractor to maintain stability of precast coping prior to junction slab completion.
6. When the air gap between the precast coping extension and retaining wall exceeds 2½", fill gap with full depth Expanded Polystyrene to provide a maximum 2½" air gap.
7. For Bullet Railings, see Index 515-021 and 515-022.
8. Begin placing Railing Bars ST and SX at the railing end and proceed toward Retaining Wall to avoid conflict with guardrail bolt holes. If required, adjustments to the bar spacing for Bars ST and SX shall be made immediately adjacent to Begin or End Bridge Cut, shift and rotate Bars ST and SX as required to maintain cover in End Transition.
TYPICAL SECTION THRU C-I-P COPING AND RAISED SIDEWALK
AND RETAINING WALL AT EXPANSION JOINTS
(42" Vertical Face Shown, 32" Vertical Face Similar)

NOTES:
1. Match roadway curb shape (type) and height. See Roadway Plans and Index 520-001. 6'-6" dimension is based on a 42" Vertical Shape with a Type D curb adjacent to a 6'-0" wide sidewalk. Adjust this dimension as required for other curb types or transitions at Begin or End Retaining Wall.
2. If slip forming is used, submit shop drawings for approval showing 3" side cover with the Typical Section dimensions adjusted.
3. Begin placing Railing Bars 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.

The above concrete quantities are based on a Type D Concrete Curb on a level Retaining Wall (See Note 1).

ESTIMATED QUANTITIES FOR C-I-P COPING

<table>
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<tr>
<th>ITEM</th>
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<tr>
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<tr>
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<td>35.38</td>
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<td>Additional Rein. @ Expansion Joints (Steel Shown)</td>
<td>LB</td>
<td>32.04</td>
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The above concrete quantities are based on a Type D Concrete Curb on a level Retaining Wall (See Note 1).
Concrete Reinforcing Steel

**BILL OF REINFORCING STEEL**

<table>
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<tr>
<th>MARK</th>
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<th>LENGTH</th>
<th>PRECAST COPING / RAILING</th>
<th>C-I-P COPING</th>
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<td>5'-11&quot;</td>
<td>9'-1&quot;</td>
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</tr>
<tr>
<td>B1</td>
<td>5</td>
<td>9'-6/11'-6&quot;</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>5</td>
<td>9'-6/11'-6&quot;</td>
<td>AS REGD.</td>
<td>IS REGD.</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>5'-5&quot;</td>
<td>5'-6&quot;</td>
<td></td>
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<td>F</td>
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</tr>
<tr>
<td>L</td>
<td>5</td>
<td>4'-5&quot;</td>
<td>4'-6&quot;</td>
<td></td>
</tr>
<tr>
<td>1&quot; Ø Dowel Smooth Bar</td>
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<td>2'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>5</td>
<td>7'-4&quot;</td>
<td>9'-2&quot;</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>5</td>
<td>5'-1&quot;</td>
<td>6'-0&quot;</td>
<td></td>
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**CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS**

- Precast Coping ~ 4'-1" (See Note 5)
- Precast Concrete Barrier/Coping ~ 11'-4"

**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 & 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 5'-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 QUANTITIES**

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<th>ITEM</th>
<th>UNIT</th>
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<tr>
<td>Reinforcing Steel</td>
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<td>23.38</td>
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**VERTICAL SHAPE**

**END TRANSITION ELEVATION FOR 32" VERTICAL SHAPE**
(Guardrail Not Shown For Clarity)

**CONCRETE BARRIER/RAISED SIDEWALK - WALL COPING**
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 1/4" 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 521-820 - Pedestrian/Bicycle
   Railing, or Index 521-825 - 42" Concrete Pedestrian/ Bicycle Railing.
9. Finish Sidewalks in accordance with Specifications Section 522.
10. The following Indexes contain details of the intersection of the retaining
    wall at approach slabs:
    Index 400-090 - Approach Slabs (Flexible Pavement Approaches)
    Index 400-091 - Approach Slabs (Rigid Pavement Approaches)
LIGHT POLE PEDESTAL NOTES:

1. ANCHOR BOLTS:
   Anchor Bolt design is based on the standard roadway aluminum light pole
   configurations shown on Index F15-002 with top of pedestal 75' or less
   above ground or H/LW.
   Anchor Bolt Diameter: See Table 1

2. MATERIALS:
   Anchor Bolts: ASTM F1554 Grade 55.
   Nuts: ASTM A563 Grade A, Heavy-Hex.
   Washers: ASTM F436 Type 1.
   Coating: Galvanize all nuts, bolts, washers, and plates in accordance with ASTM F2329.

3. The Contractor is responsible for ensuring the anchor bolt design is compatible with the light
   pole base plate. Modifications to the anchor bolt design shown must be signed and sealed by the
   Contractor's Specialty Engineer and submitted to the Engineer for approval prior to construction.

4. Install Anchor Bolts plumb.

5. For conduit, EJB and expansion/deflection fitting details, see Utility Conduit
   Detail Drawings.

6. The cost of anchor bolts, nuts, washers and anchor plates will be included in the Bid Price for
   Light Poles. Include the cost of all labor, concrete and reinforcing steel required for construction
   of the pedestals, and miscellaneous hardware required for the completion of the electrical
   system in the Bid Price for either the Concrete Barrier or Concrete Parapet that the pedestal
   is behind.

7. Field cut Bars 4M2 as required to maintain clearance.

8. Slip Forming Method of construction requires the Engineer’s approval within the limits shown.

9. Reinforcing shown for light pole pedestals is in addition to typical reinforcing for Junction
   Slabs and Raised Sidewalks.

10. Work this Index with the following as appropriate:
    Index 521-512
    Index 521-610
    Index 521-620
    Index 521-630

11. Pedestal may be precast in one section with Coping. Minimum Precast Coping section length is
    10 ft. or 12 ft for combination Precast Concrete Barrier and Coping section.

12. For Estimated Quantities, see Sheet 3.

13. Unless otherwise noted, Concrete Barrier (36” Single-Slope) is shown in all Views and Sections. The
    Pedestal details for other Concrete Barriers or pedestrian/bicycle railings are similar.

---

**TABLE 1 DESIGN LIMITATION FOR ANCHOR BOLTS (1” Dia.)**

<table>
<thead>
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<th>Wind Speed (MPH)</th>
<th>Arm Length (FT)</th>
<th>BASE OF POLE HEIGHT</th>
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<td>75, 75, 75</td>
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<tr>
<td>140</td>
<td>ALL</td>
<td>75, 75, 75</td>
</tr>
<tr>
<td>160</td>
<td>8 &amp; 10</td>
<td>75, 75, 45**</td>
</tr>
<tr>
<td>160</td>
<td>12 &amp; 15</td>
<td>75, 75, 25**</td>
</tr>
</tbody>
</table>

* Above Natural Ground
* (use 1½” @ Anchor bolts for wall heights greater than the height shown and less than 75’.

---

**PLAN VIEW**

(Junction Slab reinforcing not shown for clarity)
(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)
NOTES:
1. Provide Concrete Class to match adjacent coping.
2. For junction slabs, increase the 1'-0" depth dimension to 1'-9".
3. For Parapet with sidewalk see Index 521-630, but increase sidewalk depth to 1'-6".
4. The minimum length of the Junction Slab(s), raised sidewalks and sidewalks is 30'-0", measured along the Gutter Line.
5. Bars 4H 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 4V, 5H1 and SB, or Index 521-510 for Bars 5V and SB1.
9. Work with Index 521-512 (Concrete Barrier/Noise Wall), Index 521-610 (Vertical Shape), and Index 521-630 (Concrete Parapet).
**Reinforcing Steel Notes:**

1. All bar dimensions in the bending diagrams are out to out.
2. Lap splices for Bars 4G1, 4G2, 4G3, 4G4 & 4G5 will be a minimum of 1'-4".
3. The Contractor may use Welded Wire Reinforcement (WWR) when approved by the Engineer. WWR must consist of deformed wire meeting the requirements of Specification Section 931.

**Estimated Quantities**

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>QUANTITY</th>
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<tbody>
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<td>CY</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>334.09</td>
</tr>
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(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.)

**Bill of Reinforcing Steel**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
</tr>
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<td>4</td>
<td>4'-6&quot;</td>
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<td>G2</td>
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<td>4'-6&quot;</td>
</tr>
<tr>
<td>G1</td>
<td>4</td>
<td>16</td>
<td>5'-8&quot;</td>
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<td>G4</td>
<td>4</td>
<td>6</td>
<td>8'-10&quot;</td>
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<td>G5</td>
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<td>3'-8&quot;</td>
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**REINFORCING STEEL BENDING DIAGRAMS - LIGHT POLE PEDESTAL**

**Detail "A"**

- Reinforcing Steel
- Concrete (Thickened Junction Slab)
- Concrete (Pedestal)
- Optional Notch for Index 521-610 (Typ.)
- 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
- Minimum Limits of C-I-P Coping

**Elevation View**

(Junction Slab Reinforcing & Bars 4j not shown for Clarity)

(Junction Slab Shown, Raised Sidewalk or Sidewalk Similar)

**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 10 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- 1/2" Expansion Joints (Preformed Joint Filler) between the sidewalk and; driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).
- B- 1/6" Dummy Joints, Tooled
- C- 1/4" Formed Open Joints
- D- 1/2" Saw Cut Joints, 1/6" Deep (within 96 hours) Max. 3' Centers
- E- 1/4" Saw Cut Joints, 1/3" Deep (within 12 hours) Max. 30 Centers (Joints) Required When Length Exceeds 30' 
- F- 1/2" Expansion Joint When Run of Sidewalk Exceeds 120'. Intermediate locations when called for in the plans or at locations as directed by the Engineer.
- G- Cold Joint With Bond Breaker, Tooled

SIDEWALK JOINTS

LONGITUDINAL SECTION

LEGEND:
- 4" Thick Sidewalk
- 6" Thick Sidewalk
- Utility Strip

OPEN JOINTS

SAWED JOINTS

PLAN

SIDEWALK WITH UTILITY STRIP

SIDEWALK WITHOUT UTILITY STRIP

RAILING DETAIL

SECTION A-A

SECTION B-B

GENERAL NOTES AND CONCRETE SIDEWALK ON CURBED ROADWAYS

CONCRETE SIDEWALK

INDEX 522-001

1 of 2

FY 2020-21
STANDARD PLANS
LONGITUDINAL SECTION

LEGEND:
A- 1/4" Expansion Joint (Preformed Joint Filler) between the sidewalk and driveways, sidewalk-intersections, and all other fixed objects (e.g. drainage inlets and utility poles).
B- 1/8" Dummy Joint, Tooled
C- 1/4" Formed Open Joints
D- 1/8" Saw Cut Joints, 1/2" Deep (within 96 hours) Max. 5' Centers
E- 1/8" Saw Cut Joints, 1/4" Deep (within 12 hours) Max. 30' Centers
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.

SIDEWALK JOINTS

CONCRETE SIDEWALK ON FLUSH SHOULDER ROADWAYS
GENERAL NOTES:

1. Cross Slopes and Grades:
   A. Sidewalk, ramp, and landing slopes (i.e. 0.02, 0.05, and 1:12) shown in this Index are maximums. With approval of the Engineer, 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.
   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.

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 705.
   C. There shall be no more than 4 non-compliant domes in any one square foot.
   D. Non-compliant domes shall not be adjacent to other non-compliant domes.
   E. Surfaces shall not deviate more than 0.10" from a true plane.
NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet B.
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**
SIDEWALK CURB RAMPS CR-D, CR-E, CR-F & CR-G

OPTION A

OPTION B

OPTION A

OPTION B

OPTION A

OPTION B

DESCRIPTION:

REVISION

REVISION

REVISION

REVISION

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REVISION
LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS

(See CR-F, CR-G & CR-K Respectively For Detectable Warning Details/Options)

Transition Slope 1:12
Pavement Relief (If Needed)
(See Section C-C)

ISOMETRIC VIEW
(CR-C Shown, Other Similar)

NOTE: Remove Elevated Pavement By Spading And Rolling, Smooth Milling, or Grinding.

SECTION C-C

PAVEMENT RELIEF DETAILS

CURB RAMPS WITHOUT SIDEWALKS AND FLUSH SHOULDER SIDEWALKS

DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS
NOTES:
1. Where crosswalk markings are used, ramps must fall within the crosswalk limits. A clear space of 48" minimum is required at the bottom of the ramp within a marked crosswalk. If crosswalk markings are not present, a clear space of 48" minimum is required at the bottom of the ramp outside of active travel lanes.
2. Crosswalk widths and configurations vary; must conform to Index 711-001.
3. Flangeway Gap may be up to 3" for Freight-only Railways.

RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS

PLACEMENT OF SIDEWALK CURB RAMPS AT CURBED RETURNS (TYP.)
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 1/8 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 1/8 open joints @ 10 Centers and 1/8 expansion joints with preformed joint filler every 5th joint.

7. Construct driveways (6" thick concrete) to a uniform width (W) to the R/W line or the extent shown in the Plans.

8. Width of Sidewalk Thru Driveway is 4'-0" minimum. Match sidewalk width when shown in Plans or when utility strip width is equal to or greater than the depth of the Driveway Apron.

9. Alpha-Numeric Identification:
   Concrete flared driveway Alpha-Numeric Identifications (e.g. G4) are provided for reference purposes in the Plans.

---

LEGEND:

- Sidewalk
- Flared Driveway (6" Thick Concrete)
- Sidewalk Thru Driveway (6" Thick Concrete)
- Utility Strip
- Gy Grade of Apron
- Gd Grade of Driveway (Per Plans)

---

CONCRETE FLARED DRIVEWAY NOMENCLATURE

---

PLAN

ELEVATION

CONCRETE FLARED DRIVEWAYS

INDEX

FY 2020-21
STANDARD PLANS
10'-0" 8'-0" 7'-0" 6'-0" 5'-0" 4'-0" 3'-0" 2'-0" 1'-0"

SIDEWALK WITHOUT UTILITY STRIP
SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE
SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE:
5' sidewalks shown.
SIDEWALK WITHOUT UTILITY STRIP

SIDEWALK WITH UTILITY STRIP ON 0.02 SLOPE

SIDEWALK WITH UTILITY STRIP ON 0.04 SLOPE

NOTE:
3' sidewalks shown.
TYPICAL SECTION

PLAN

WAILED MEDIAN
(No Weep Holes)

SECTION AA

PROFILE OF DITCH PAVEMENT

AT LOCATIONS OTHER THAN JUNCTION WITH LATERAL DITCH

TYPICAL SECTION

TABLE 1: DITCH PAVEMENT

<table>
<thead>
<tr>
<th>Pavement Type</th>
<th>Dimensions</th>
<th>Payment Unit</th>
<th>Basis of Estimate</th>
<th>Filter Fabric Type</th>
<th>Variance Range</th>
<th>References &amp; Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>2% 12' x 2'</td>
<td>YD</td>
<td>ST</td>
<td>D-4</td>
<td>Low-Mod</td>
<td>Specification 54</td>
</tr>
<tr>
<td>Miscellaneous Asphalt</td>
<td>2' 12' x 2'</td>
<td>YD</td>
<td>ST</td>
<td>Low-Moderate</td>
<td>Specification 333</td>
<td></td>
</tr>
<tr>
<td>Wrip (Sand-Cement)</td>
<td>2' 12' x 6'</td>
<td>YD</td>
<td>CT</td>
<td>Low-Moderate</td>
<td>Specification 530, Grooving of joints required</td>
<td></td>
</tr>
<tr>
<td>Riprap (Ditch Gravel)</td>
<td>2' 12' x 2'</td>
<td>TN</td>
<td>TN</td>
<td>D-2</td>
<td>Moderate-High</td>
<td>Specification 530</td>
</tr>
</tbody>
</table>

PAVED DITCH END TREATMENT

GENERAL NOTES

1. Type of ditch pavement shall be as shown on plans.
2. In concrete ditch pavement, contraction joints are to be spaced at 2' minimum intervals, or at the direction of the Engineer. Contraction joints may be below and adjacent to drainage structures. Expansion joints with 1/4 preformed joint filler shall be constructed at all angles, endwalls, and edgewise between the aggregate and the ditch pavement. A toewall is required under all ditch filter fabric or underlapping the pavement filter fabric or adjacent to drainage structures. No open joints will be permitted in concrete ditch pavement.
3. Type of ditch pavement shall normally be located downstream of DIP or on platter grades where there is a decrease in ditch velocity.
4. Toewalls are to be used with all ditch paving. A toewall is not required adjacent to drainage structures.
5. A section of pavement shall be constructed at angles of not more than 60 degrees.
6. For junction of R/W ditch spillway and lateral ditch, sides of paving to be 1' high minimum.
7. Filter fabric is required under all ditch pavement, with the exception of miscellaneous asphalt, regardless of the pavement thickness. Place the filter fabric below the pavement for the entire length and width of the pavement. See Specification 985 for fabric requirements and application.
8. When weep holes are used, the aggregate is to form a mat continuous with the pavement filter fabric or underlapping the pavement filter fabric, if present.
9. If ditch pavement requires reinforcement, it shall be detailed in the plans.
10. Cost of plastic filter fabric to be included in the contract unit price for ditch pavement.
11. Sodding to be paid for under contract unit price for Performance Turf, SY.

INDEX

FY 2020-21 STANDARDS

DITCH PAVEMENT AND SODDING

REVISION: 01/10/19

DESCRIPTION:

Ditch Pavement and Sodding
BONDED OPTION

NAILLED OPTION

Note: Either option may be used unless otherwise called for in the plans.

FILTER FABRIC PLACEMENT AT CONCRETE STRUCTURE
10. 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 \(\frac{1}{2}\)" 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 \(\frac{1}{2}\)"
         b. 20' Post Spacing and Wall Height < 17 feet: 4" x 4" x \(\frac{1}{2}\)"
         c. 20' Post Spacing and Wall Height ≥ 17 feet: 4" x 5" x \(\frac{1}{2}\)"
   B. At panel bearing points between stacked panels, use Plain or Fiber Reinforced Bearing Pads.

1. Work this Index with the Noise Wall Data Tables and Wall Control Drawings in the Plans.
   A. Prestressed concrete posts with equivalent strength resistance may be substituted for conventionally reinforced precast posts shown in this Index when approved as part of a Producer's Quality Control Plan.
   B. Producer shop drawings for prestressed concrete post designs must be approved by the State Structures Design Office prior to inclusion in the Quality Control Plan.

2. Construct Noise Walls in accordance with the requirements of Specification Section 534, and Augers Cast Piles in accordance with Specification Section 455.

3. Field verify the location of all overhead and underground services shown in the Wall Control Drawings.

4. Wall Height is the nominal height of the walls above finished grade. The Wall Embedment Depth for design is 1'-0". The actual embedment depth may vary by plus or minus \(\frac{1}{2}\)" 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: +/- \(\frac{1}{2}\)"
   B. Thickness: +/- \(\frac{1}{2}\)" per panel
   C. Plane of side mold: +/- 1/16" panel
   D. Openings: +/- \(\frac{1}{2}\)" panel
   E. Out of Square: 1/16" 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" panel
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"  
PEA GRAVEL

Type "G"  
VERTICAL FRACUTED FIN

Type "H"  
TRAPEZOID VERTICAL FINS W/ FRACUTED FACE (COLORADO DRAG AGGREGATE)

Type "I"  
CUT CORAL BLOCK (RUNNING BOND)

NOTES:
1. Surfaces shall be formed, rolled, or pressed using form liners in accordance with the Plans and Specifications for Class 3 Surface Finish.
2. See Noise Wall Data Tables for project aesthetic requirements.
DESCRIPTION:

REVISION LAST of STANDARD PLANS FY 2020-21

INDEX NOISE WALLS - (PRECAST)

TYPICAL FORMING DETAIL

(Front Face Panel Texture Type "H" shown)
(Back Face Panel Texture Type "D" shown)
(Post Forming Details Similar)

NOTES:

1. Submit specific form liner samples for approval by the Engineer.
2. Textures and graphics shown are for demonstration purposes only. See Noise Wall Data Tables in the plans for project specific texture and graphic requirements.

GRAPHICS & TEXTURE DETAILS

HALF ELEVATION

(Front Face Post and Panel Texture Type "H" shown)
(Graphic Type SE-2 shown)
(Two stacked panels shown, three stacked panels similar)
TYPICAL 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.).

TYPICAL PANEL DETAILS

* Vertical Steel ~ #4 Bars @ 1" (As=0.24 in.²/ft.) (Typ.)
* Horizontal Steel ~ #4 Bars @ 8" (As=0.30 in.²/ft.) (Typ.)

STANDARD PICK UP POINTS FOR PANELS
( Panels shall be rotated about long axis only)

Notes:
1. See Sheet 3 for allowable methods of applying textures.
2. See plans for panel type and aesthetic requirements.
3. For equal post spacing, side-installed panel length will be shorter than top-installed panel length.

SECTION D-D
(Showing Flush Type Panel)

SECTION D-D
(Showing Recessed Type Panel)
NOTE:
The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (2Δ°) between panels exceeds 7°.

NOTE:
The shop drawings shall include specific pivoting details of panel ends at locations where the deflection angle (20°) 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.

DRAINAGE HOLES DETAILS

BAR BENDING DETAILS (#3 Bars)

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 1/4" 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.

GRADE TO DRAIN INTO GRATE.

DRAINAGE HOLES DETAILS

REVISION
11/01/17
**STANDARD POST REINFORCEMENT**

(Standard Post Shown, 45° Corner Posts Similar)

**LOW CLEARANCE OPTION**

* Extend Post 3' above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".

**STANDARD POST DETAILS**

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.

---

**TEXTURE (FORMED)**

- **Front Face of Wall**
- **Roadway Face of Wall**
- **Post**
- **Post (Typ.)**

---

**SECTION K.K**

(Collar Section)

---

**SECTION H-H**

---

**SECTION J-J**

---

**SECTION L-L**

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**NOTES:**

1. For Post Reinforcing see Sheets 15 and 16.
2. For Pile Lengths Tables see Sheets 15 and 16.
**Noise Walls - (Precast)**

**Description:**
- **Revision:** FY 2020-21
- **Standard Plans:** Noise Walls - (Precast)

**Sheet Index:**
- **No.1107:** Standard Plans FY 2020-21
- **Sheet No. 9**

**Illustrations:**
- **Section N-N:** Typical Post, Low Clearance Option
- **Section M-M:** Post Placement & Pile Reinforcing Steel Details

**Details:**
- **Post Placement & Pile Reinforcing Steel Details:**
  - 30° Ø Auger Cast Pile
  - Bars P3 (Typ.)
  - 10 - #9 Bars (Typ.), See Section P-P
  - Post, Pile & Wall

**Notes:**
- 1. For Pile Length Tables, see Sheets 15 and 16.

**Specifications:**
- Finished Grade
- Precast Post
- Top of Precast Collar, Elev. A
- Top of Auger Cast Pile
- Bottom of Auger Cast Pile

**Dimensions:**
- Pile Length (See Note 1)
- Post & Pile Cover
- 4" Minimum

**Additional Notes:**
- 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".
Bars P3
around Bar P3
spaced equally
10 - #9 Bars

4" Cover
Cast Pile
36" Ø Auger

67.5°

22.5°

45°

1" Cover
(when required)

67.5°

2" Cover
(Typ.)

Bars A (Typ.)
Bars P7 (Pairs)
(See Note 1)

Texture
(when required)

Bars B (Typ.)
Bars P8
(See Note 1)

1/2 Chamfer (Typ.)

Bars D
Bars E

1/2 Chamfer (Typ.)

Bars P7 (Pairs)
(See Note 1)

1 1/4" Cover
(Typ.)

1/2 Radius (Typ.)

Bars A (Typ.)
Bars B (Typ.)

1/2 Chamfer (Typ.)

Bars P7 (Pairs)
(See Note 1)

1/2 Chamfer (Typ.)

Bars P8
(See Note 1)

1 1/4" Cover
(Typ.)

45° POST NOTES:
1. Reference Sheets 8 & 9 for location of Sections.
   Space Bars P7 as shown for Bars P1.
   Space Bars P8 as shown for Bars P2.
2. Match texture thickness with appropriate Panel face.
3. For Post Reinforcing, see sheets 15 & 16.
4. For Pile Length Tables, see sheets 15 & 16.
**DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2020-21 SHEET INDEX**

**NOISE WALLS - (PRECAST)**

**SECTION S-S**

* Top of Wall

**SECTION R-R**

**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".

**90° CORNER POST REINFORCEMENT**

(Post Surface Features Not Shown For Clarity)

**90° CORNER POST DETAILS**

1. For Post Reinforcing, see Sheets 15 and 16.
2. For Pile Length Tables, see Sheets 15 and 16.
3. Reduce typical panel length or adjust pile spacing at each 90° Corner Post.
4. Match texture thickness with appropriate Panel Face.
NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel finish top of Collar to allow placement of Bearing Pads.

* Extend Post 2" above top of high side wall panel when post caps are shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL".
NOTES:
1. For Pile Length Tables, see Sheets 15 and 16.
2. Trowel Finish top of auger cast pile to allow placement of Bearing Pads.
   * Extend Post 2" above top of high side wall panel when post caps shown in plans. See Sheet 4, "ELEVATION STEP AT TOP OF WALL."
**TABLE 1A - TABLE OF POST REINFORCING STEEL**

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>WIND SPEED = 130 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10'-0&quot; POST SPACING</td>
<td>20'-0&quot; POST SPACING</td>
</tr>
<tr>
<td></td>
<td>SIZE</td>
<td>DIM 'A'</td>
</tr>
<tr>
<td>12</td>
<td>#4</td>
<td>7'-11&quot;</td>
</tr>
<tr>
<td>13</td>
<td>#4</td>
<td>10'-11&quot;</td>
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<tr>
<td>14</td>
<td>#4</td>
<td>13'-25&quot;</td>
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<td>#5</td>
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<td>#6</td>
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<td>21</td>
<td>#6</td>
<td>34'-0&quot;</td>
</tr>
<tr>
<td>22</td>
<td>#6</td>
<td>37'-0&quot;</td>
</tr>
</tbody>
</table>

**TABLE 1B - PILE LENGTHS (Feet) - WIND SPEED = 130 MPH**

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SOIL 1</td>
<td>SOIL 2</td>
</tr>
<tr>
<td>30'0&quot;</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>30'6&quot;</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>36'0&quot;</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>36'6&quot;</td>
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<td>15</td>
</tr>
<tr>
<td>42'0&quot;</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>42'6&quot;</td>
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<td>19</td>
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<tr>
<td>48'0&quot;</td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>

**TABLE 1C - PILE DEPTH & REINFORCING SUMMARY**

1. Bars D and Bars E are for 45° Corner Posts only.
2. See Contract Plans for project wind speed.
4. Soil 2 = Medium Dense Granular Soil, N = 10 to 40.
### TABLE 2A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SIZE</td>
<td>DIM (')</td>
<td>SIZE</td>
</tr>
<tr>
<td>WITHOUT CAP</td>
<td>BARS A</td>
<td></td>
<td>BARS B</td>
</tr>
<tr>
<td>12</td>
<td>#5</td>
<td>9'-11&quot;</td>
<td>#6</td>
</tr>
<tr>
<td>13</td>
<td>#4</td>
<td>10'-8&quot;</td>
<td>#7</td>
</tr>
<tr>
<td>14</td>
<td>#5</td>
<td>10'-8&quot;</td>
<td>#7</td>
</tr>
<tr>
<td>15</td>
<td>#5</td>
<td>10'-8&quot;</td>
<td>#7</td>
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<tr>
<td>16</td>
<td>#5</td>
<td>11'-8&quot;</td>
<td>#6</td>
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<tr>
<td>17</td>
<td>#5</td>
<td>11'-8&quot;</td>
<td>#6</td>
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<tr>
<td>18</td>
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<td>14'-4&quot;</td>
<td>#7</td>
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<td>#6</td>
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<td>21</td>
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<td>18'-2&quot;</td>
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<td>22</td>
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<td>18'-2&quot;</td>
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<tr>
<td></td>
<td>WITH CAP</td>
<td></td>
<td>BARS D</td>
</tr>
<tr>
<td></td>
<td>BARS E</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BARS F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 2B - PILE LENGTHS (Feet) - WIND SPEED = 150 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>SOIL 1</th>
<th>SOIL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30'</td>
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<tr>
<td></td>
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<tr>
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<td>36'</td>
</tr>
<tr>
<td></td>
<td>30'</td>
<td>36'</td>
</tr>
</tbody>
</table>

### TABLE 3A - TABLE OF POST REINFORCING STEEL

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>POST LENGTHS</th>
<th>10'-0&quot; POST SPACING</th>
<th>20'-0&quot; POST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SIZE</td>
<td>DIM (')</td>
<td>SIZE</td>
</tr>
<tr>
<td>WITHOUT CAP</td>
<td>BARS A</td>
<td></td>
<td>BARS B</td>
</tr>
<tr>
<td>12</td>
<td>#5</td>
<td>9'-11&quot;</td>
<td>#6</td>
</tr>
<tr>
<td>13</td>
<td>#4</td>
<td>10'-8&quot;</td>
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<td>14</td>
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<tr>
<td>16</td>
<td>#5</td>
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<td>11'-8&quot;</td>
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<td>#6</td>
<td>14'-4&quot;</td>
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<td>#6</td>
<td>14'-4&quot;</td>
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<tr>
<td></td>
<td>WITH CAP</td>
<td></td>
<td>BARS D</td>
</tr>
<tr>
<td></td>
<td>BARS E</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BARS F</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### TABLE 3B - PILE LENGTHS (Feet) - WIND SPEED = 170 MPH

<table>
<thead>
<tr>
<th>NOMINAL WALL HEIGHT (Feet)</th>
<th>SOIL 1</th>
<th>SOIL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30'</td>
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<tr>
<td></td>
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<td></td>
<td>30'</td>
<td>36'</td>
</tr>
<tr>
<td></td>
<td>30'</td>
<td>36'</td>
</tr>
<tr>
<td></td>
<td>30'</td>
<td>36'</td>
</tr>
</tbody>
</table>

### TABLE NOTE:
1. Bars D and Bars E are for 49' Corner Posts only.
2. See Contract Plans for project wind speed.
   Soil 2 = Medium Dense Granular Soil, N = 10 to 40.

PILE DEPTH & REINFORCING SUMMARY

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>INDEX</th>
<th>SHEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2020-21 STANDARD PLANS</td>
<td>534-200</td>
<td>16 of 16</td>
</tr>
</tbody>
</table>
GENERAL NOTES:
1. Construct Perimeter Walls in accordance with Specification Section 534.
2. Choice of either Precast Option or Masonry Option is at the discretion of the Contractor.
3. Contractor must also select the desired foundation type. Modifications to this Index is restricted to those required for geometric needs only.
4. Post spacing is measured from centerline to centerline of foundation element. For this index, posts and foundation elements have been designed for 20 ft. spacings. Use post spacing less than 20 feet only at changes in horizontal alignment, wall terminations or to accommodate steep grades.
5. See "Perimeter Wall Data Tables" in the plans for project requirements.
6. Field verify the locations of all overhead and underground utilities shown in the Wall Control Drawings.

MASONRY OPTION NOTES (CONT.)
D. Fully Grout all cells with horizontal or vertical reinforcing bars.
E. Use reinforcing bar positioners to maintain vertical and horizontal bar placement.
F. Fully grout first three courses of the wall.
G. Joint Reinforcement, use W 1.2 (9mm) galvanized ladder reinforcing spaced at 16" vertically. Provide special accessories for corners, intersections, etc. Joint reinforcing shall be continuous except it shall not pass through vertical masonry control joints. Lap joint reinforcing a minimum of 6".
H. Construct expansion joints in the foundation at 90 foot maximum intervals, and directly below a wall control joint.
I. Dowel Load Transfer Devices will be ASTM A 36 smooth round bars hot-dip galvanized in accordance with Specification Section 980. Install Dowel Load Transfer Devices in accordance with Specification Section 200.
J. For spread footings, use a walk-behind compactor of at least 600 lbs. in weight. Obtain a minimum density of 95% of the maximum dry density as determined by FM 1 T-180. Perform soil density tests at 100 foot intervals.
K. Protect walls during construction from soil, grout or mortar stains. Clean wall as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
L. Use soap and potable water to clean walls. If stain removal is necessary, use a cleaning method indicated in NCMA TEK 8-2A applicable to the type of stain on the exposed surface.
M. During construction, cover tops of walls, with waterproof sheeting at the end of each day's work, or when construction is not in progress. Extend sheeting a minimum of 2 feet down each side and secure in place.
N. Fully grout all cells with horizontal or vertical reinforcing bars.
O. Fill all gap in the top and side-installed panels are allowed. After panel is centered between posts, grout between panel ends and posts.

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 pointed 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.

GENERAL WALL ELEVATION
(Precast Option with Single Height Panel Shown, Others Similar)
**TYPE "C" CAP DETAILS**

**PLAN VIEW**

*Corner Cap

**VIEW A-A**

*Corner Cap

**SECTION B-B**

**TYPE "B" CAP DETAILS**

**SECTION B-B**

**TYPE "A" CAP DETAILS**

**PICTORIAL VIEW**

*Precast Option only
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 OPTION - TYPICAL DETAILS**

**TYPICAL ELEVATION**

(Front Face Shown, Textured Finish not Shown for Clarity)

**PIVOTING JOINT DETAILS**

NOTE: Shop Drawings shall include specific pivoting joint details of panel ends at locations where the deflection angle (2°) between panels exceeds 20°.

**SECTION D-D**

**SECTION E-E**

**ELEVATION STEP AT BOTTOM OF WALL**

(Precast Panel Cap not Shown)

**TYPICAL PLAN**

* Nominal embedment (not including tolerances)
Typical Panel Elevation

* In lieu of utilizing the standard pick up points below, panels may be cast vertically or cast horizontally then lifted upright using lift cables prior to lifting from form. In this case, pick points must be placed in the top of panels only and transported maintaining the vertical orientation. If these criteria are met, the vertical steel may be reduced to #4 bars @ 1'-3" (As=0.16 in²/ft).
LOW CLEARANCE OPTION

NOTES:
1. See Shop Drawing for Post Lengths.

TYPICAL POST

STANDARD POST REINFORCEMENT

SECTION H-H
(H Section - Above Collar)

SECTION I-I
(Precast Collar)

SECTION J-J
(Typical)

SECTION I-I
(for Low Clearance Option)

TABLE 1

<table>
<thead>
<tr>
<th>Wind Speed (MPH)</th>
<th>Pile Length</th>
<th>Bars A</th>
<th>Bars P1 thru P6</th>
<th>Bars S1</th>
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</thead>
<tbody>
<tr>
<td>130</td>
<td>12'-0&quot;</td>
<td>#3</td>
<td>#3</td>
<td>#4</td>
</tr>
<tr>
<td>150</td>
<td>13'-6&quot;</td>
<td>#3</td>
<td>#3</td>
<td>#4</td>
</tr>
<tr>
<td>170</td>
<td>15'-0&quot;</td>
<td>#3</td>
<td>#3</td>
<td>#4</td>
</tr>
</tbody>
</table>

BAR BENDING DETAILS

BAR P1
Bar Length = 2'-30"

BAR P2
Bar Length = 9'-0"

All bar dimensions in bending diagrams are out-to-out.
All bars not shown in the bending diagrams are straight.

PERIMETER WALLS

PRECAST OPTION - STANDARD POST DETAILS

INDEX
534-250

SYRESON

STANDARD PLANS

REVISION
6 of 10

DESCRIPTION:

REV 11/01/17

REV 01/29/20

REV 10/29/19

I. See Shop Drawing for Post Lengths.
STANDARD POST PLACEMENT IN AUGER CAST PILE  
(Standard Post Shown, 45° and 90° Corner Posts Similar)
Table 2

<table>
<thead>
<tr>
<th>Wind Speed Category</th>
<th>Masonry Walls (8x8x16)</th>
<th>Foundations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bars V1</td>
<td>3/8 Spacing</td>
</tr>
<tr>
<td>110</td>
<td>#5</td>
<td>2-3</td>
</tr>
<tr>
<td>170</td>
<td>#5</td>
<td>3-3</td>
</tr>
</tbody>
</table>

Notes:
1. End vertical reinforcing bars 1½" from top of bond beam blocks and horizontal bars 1⅛" 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 16 for Bar placement details.
6. For Pilaster Cap Details, see Sheet 2.

All bar dimensions in bending diagram are out to out. All bars not shown in the bending diagrams are straight.
Notes:
1. For location of Sections K-K and L-L see Sheet 9.
2. Provide and install ½" Preformed Expansion Joints with 1" Ø Dowel Load Transfer Devices at 90' Max. as shown. See Sections L-L for placement details.
3. For reinforcing sizes and spacings, see Table 2, Sheet 9.
4. Pairs F1, V1 are required in the wall cells on both sides of pilasters, plus a pair in each pilaster cell. Space wall reinforcing per Table 2, Sheet 9.

SECTION K-K
TYPICAL WALL SECTION
WITH T-FOOTING

SECTION L-L
PILASTER SECTION
WITH T-FOOTING

SECTION K-K
TYPICAL WALL SECTION
WITH TRENCH FOOTING

SECTION L-L
TYPICAL PILASTER SECTION
WITH TRENCH FOOTING

EXPANSION JOINT DETAILS

REINFORCING AT PILASTER WITH EXPANSION JOINT
(Step Shown, without Step Similar)
(T-Footing Shown, Trench Footing Similar)
<table>
<thead>
<tr>
<th>SHEET</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Notes; Index Contents</td>
</tr>
<tr>
<td>2</td>
<td>General, TL-3 Guardrail - Installed Plan and Elevation</td>
</tr>
<tr>
<td>3</td>
<td>Low-Speed, TL-2 Guardrail - Installed Plan and Elevation</td>
</tr>
<tr>
<td>4</td>
<td>W-Beam and Thrie-Beam Panel Details</td>
</tr>
<tr>
<td>5</td>
<td>Post and Offset Block Details</td>
</tr>
<tr>
<td>6</td>
<td>Guardrail Sections - Heights and Adjacent Slopes</td>
</tr>
<tr>
<td>7</td>
<td>End Treatment - Approach Terminal Geometry, Parallel</td>
</tr>
<tr>
<td>8</td>
<td>End Treatment - Approach Terminal Geometry, Curbed and Double Faced</td>
</tr>
<tr>
<td>9</td>
<td>End Treatment - Trailing Anchorages</td>
</tr>
<tr>
<td>10</td>
<td>End Treatment - Component Details</td>
</tr>
<tr>
<td>11</td>
<td>End Treatment - Controlled Release Terminal (CRT) System</td>
</tr>
<tr>
<td>12</td>
<td>Layout for CRT System - Side Roads and Driveways</td>
</tr>
<tr>
<td>13</td>
<td>Approach Transition Connection to Rigid Barrier - General, TL-3</td>
</tr>
<tr>
<td>14</td>
<td>Approach Transition Connection to Rigid Barrier - General, TL-3 - Guardrail Sections</td>
</tr>
<tr>
<td>15</td>
<td>Approach Transition Connection to Rigid Barrier - Low-Speed, TL-2</td>
</tr>
<tr>
<td>16</td>
<td>Approach Transition Connection to Rigid Barrier - Low-Speed, TL-2 - Guardrail Sections</td>
</tr>
<tr>
<td>17</td>
<td>Approach Transition Connection to Rigid Barrier - Details</td>
</tr>
<tr>
<td>18</td>
<td>Approach Transition Connection to Rigid Barrier - Double Faced Guardrail</td>
</tr>
<tr>
<td>19</td>
<td>Layout to Rigid Barrier - Approach Ends</td>
</tr>
<tr>
<td>20</td>
<td>Layout to Rigid Barrier - Approach Ends with Double Faced Guardrail</td>
</tr>
<tr>
<td>21</td>
<td>Railing Details</td>
</tr>
<tr>
<td>22</td>
<td>Pedestrian Safety Treatment - Pipe Rail</td>
</tr>
<tr>
<td>23</td>
<td>Modified Mount - Special Steel Post for Concrete Structure Mount; Modified Mount - Encased Post for Shallow Mount; Modified Mount - Frangible Leave-Out for Concrete Surface Mount</td>
</tr>
<tr>
<td>24</td>
<td>Barrier Delineators - Post Mounted; Clear Space - Reduced Post Spacing for Hazards; 1/2&quot; Button-Head Bolt System</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. **INSTALLATION:** Construct guardrail in accordance with Specification 536.

   This Index, along with the plans and the manufacturers' drawings on the Approved Products List (APL), is sufficiently detailed for installation of General Guardrail, Low-Speed Guardrail, End Treatment assemblies, and their connecting options shown herein. This Index provides requirements for shop drawing submittals unless otherwise specified in the plans.

2. **COMPATIBILITY:** The General Guardrail in this Index is based on the Midwest Guardrail System (MGS) design, with an approximate height of 31" at the top of the Panel (2'-1" mounting height at vertical 6" 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 shown 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 ± 1/2" depth and in accordance with Specification 339.

7. **ADJACENT SIDEWALKS & SHARED USE PATHS:** When guardrail posts are placed within 4'-0" of a sidewalk or shared use path, use timber posts, or use steel posts only if treated with Pipe Rail as shown on Sheet 22.

   When timber posts are used, one of the following safety treatments is required for the bolts protruding from the back face of the post:
   - a. After tightening the nut, trim the protruding post bolt flush with the nut and galvanize per Specification 562.
   - b. Use post bolts 15" in length and counterbore the washer and nut between 1" and 1.5" deep into the back face of the post.
   - c. Use 15" post bolts with sleeve nuts and washers.

   When End Treatment posts are within 4'-0" of a sidewalk or shared path use, steel posts are not permitted within the End Treatment segment. Terminate the Pipe Rail outside of End Treatment segments, as noted per Sheet 22.

8. **NESTED W-BEAM:** Where called for in the plans, install two W-Beam Panels mounted flush per location, securing all panels with Button-Head Bolts threaded through aligned slots and holes. 2" Button-Head Bolts are permitted for panel splice locations.

9. **CONNECTION TO RIGID BARRIER:** The connections to Rigid Barrier in this Index only apply to newly constructed bridge Traffic Railings and Concrete Barrier or where the complete Approach Transition Connection to Rigid Barrier shown herein can be installed without conflicting with existing Traffic Railings, structures, or approach slabs.

   For connecting guardrail to existing bridge Traffic Railings, see Indexes 536-002, 521-404, and 521-405.

10. **CONNECTION TO EXISTING GUARDRAIL:** Where a transition to existing guardrail at 27" height is required, linearly transition the new guardrail height over a distance ranging from 25'-0" to 31'-3". Height transitions must occur outside of End Treatment and Approach Transition segments.

   Provide an immediate transition to the required midspan panel splice using the available panel options on Sheet 4 (9'-4") or 15'-7") panel. Alternatively, this transition to midspan panel splice may be achieved by installing a single reduced post spacing of 3'-1" within the new guardrail, immediately adjacent to the connection location.

11. **PLANS CALLOUTS:** Begin/End Station labels are shown throughout this Index as they correspond to the station and offset callouts specified in the plans.

   In the plans, begin/End Guardrail Station refers to the General TL-3 Guardrail Pay Item, and it may be abbreviated as Begin/End GR. Station. Where the Low-Speed TL-2 Guardrail Pay Item is specifically required, the callout in the plans will then specify Begin/End TL-2 GR. Station.

12. **QUANTITY MEASUREMENT:** Measure guardrail and corresponding components as defined in Specification 536. The Guardrail length is measured along the centerline of installed Panels, between the points labeled Begin/End Guardrail Station shown on the following Index Sheets and defined in the plans (typically measured from the 6" of the panel's post bolt slots at the approach/trailing ends).
GENERAL GUARDRAIL

NOTES:

1. GENERAL: Install the General Guardrail configuration where indicated in the plans. This may include tapered segments if called for in the plans.

Use 12'-6" or longer W-Beam Panels. A single 6'-3" Panel may be used at the end of the run if the required Begin/End Guardrail Sta. requirements are met.

Where a differing guardrail configuration is required for constructability beyond the options shown in this Index (e.g. Double Faced W-Beam, Deep Posts at transitions), or other segment types are defined in 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. Omitting 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 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
**INSTALLED SECTION**

**LOW-SPEED GUARDRAIL**

**INSTALLED ELEVATION**

**INSTALLED PLAN**

**NOTES:**

1. **GENERAL:** Install the Low-Speed Guardrail configuration where indicated in the plans. Low-Speed Guardrail may include tapered segments if called for in the plans.

   Use 12'-6" or 25'-0" W-Beam Panels for normal spans, and use 9'-4" Panels for end connections to adjoining segments as shown. A single 6'-3" Panel may be used at the end of the Low-Speed Guardrail run along with a single reduced 6'-3" post spacing to meet the nominal Begin/End Guardrail Sta. required.

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.

4. **W-BEAM PANEL DETAILS:** See Sheet 4.

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 Face W-Beam, Deep Posts at Slope Breaks, Raised Curb, Pipe Rail, and/or Rub Rail.
NOTES:

1. STANDARD POSTS: Where Standard Posts are called for in this Index, use either a Timber Post or Steel Post at the length "L", shown for Standard Posts. Use a single post material type consistently per each run of guardrail. Only where specified in the Plans, use the Steel 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 3/4" 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 3/8" 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 16d Type 16d nails with ASTM A516 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
GUARDRAIL TYPES - MOUNTING HEIGHTS & POST DEPTHS

GUARDRAIL SECTIONS - CURB & GUTTER

GUARDRAIL SECTIONS - SHOULders

GUARDRAIL SECTIONS - TYPICAL

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>3'-10&quot;</td>
<td>2'-6&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>Double Faced W-Beam</td>
<td>3'-10&quot;</td>
<td>2'-6&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>Thrie-Beam</td>
<td>3'-10&quot;</td>
<td>2'-6&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>Timber Deep Post</td>
<td>4'-10&quot;</td>
<td>See Above</td>
<td>7'-0&quot;</td>
</tr>
<tr>
<td>Steel Deep Post</td>
<td>6'-4&quot;</td>
<td>See Above</td>
<td>9'-0&quot;</td>
</tr>
</tbody>
</table>

NOTES:

1. GUARDRAIL SECTIONS: Construct Sections as indicated in the plans. The details shown herein depict W-Beam guardrail, but are applicable to the other defined Guardrail Types placed at the corresponding height. *Use components per Sheets 4 & 5. Steel and timber post types are interchangeable unless otherwise defined. The 1:10 Max. cross slope shows the maximum slope permitted for proper guardrail function, but project-specific cross slope requirements are governed by the plans.

2. TYPICAL GRADING & PAVEMENT PLACEMENT DETAIL: Construct as shown in the plans. Deep Posts are only permitted where post spacing is 6'-6" or less.

3. SLOPE BREAK CONDITION: Install Deep Posts only where called for in the plans. Deep Posts are only permitted where post spacing is 4'-3" or less.

4. LATERAL OFFSETS: The Lateral Offsets shown are governed by the station and offset callouts for Face of Guardrail, as shown in the plans.

5. ADJACENT TO CURB: Place the Face of Guardrail consistently offset either flush with the Face of Curb or 5" behind the Face of Curb, as indicated by the plans station and offset callouts. For offset changes, transition the Face of Guardrail as shown in the plans.

GUARDRAIL SECTIONS

INDEX

FAA - 2020-21

STANDARD PLANS

GUARDRAIL

INDEX

536-001

SHEET

6 of 24
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 proprietary 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 spacings as shown on Sheet 2, including parallel and tapered segments. Approach Transitions, Low Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

3. APPROACH TERMINAL TEST LEVEL: Install either a Test Level 3 (TL-3) or Test Level 2 (TL-2) Approach Terminal as specified in the plans. TL-3 Approach Terminals may substitute for TL-2 Approach Terminals unless the substitution is specifically prohibited in the plans. TL-2 Approach Terminals may not substitute for TL-3 installations.

4. IMPACT HEAD END 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.

The 2" Misc. Asphalt Pavement shown upstream of Post (1) may be substituted with a different pavement type where called for in the plans.

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 dunes, 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 guardrail away from the roadway where shown to place the inside edge of the Impact Head at 90° behind the face of the guardrail. Where additional lateral offset is required to fit the Approach Terminal Assembly hardware, such as a soil plate, place the impact head as close to the curb as the hardware allows, not to exceed 2'-0" from the face of curb.

4. GUARDRAIL HEIGHT TAPER: For Curbed Segments, the connecting General Guardrail Mounting Height, "H", is typically measured from the top of gutter (see Sheet 6) and reduced in accordance with Specification 536. Impact Head End 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'-6", starting where indicated herein.

5. DOUBLE FACED SEGMENT: Connect to Double Faced General Guardrail use consistent Posts and Offset Block types as specified in the APL 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.

6. IMPACT HEAD END DELINEATOR: Apply Yellow Retroreflective Sheeting to the nose of the End Terminal, typically measured from the Lip of Gutter (See Sheet 6) connecting General Guardrail Mounting Height, "H", is measured from the Misc. Asphalt Pavt. (See Section A-A). Linearly taper the difference in Mounting Height over a minimum length of 25'-0".

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.


APPENDIX TERMINAL GEOMETRY
CURBED AND DOUBLE FACED
NOTES:

1. COMPONENT DETAILS: For additional component details, see Sheet 10.

2. END UNITS: Use materials for end units as defined in Specifications Section 967. END UNITS are referred to as "End or Buffer Sections" in AASHTO M180. Lap the Flared End Unit behind the W-Beam; lap the Rounded and Buffered End Units over the face of the W-Beam.

3. FOUNDATIONS: Install Steel Tubes by either of the following methods:
   a. Drive the Tube using a dummy timber post to prevent damage to the Breakaway Post.
   b. Excavate, backfill, and compact material to provide full passive soil resistance to the surface of the Tube.

4. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.

5. SIDEWALK REQUIREMENTS: When sidewalks are located adjacent to the End Treatment, install a Rounded End Unit (Flared End Unit not permitted for this case).

6. END DELINERATOR: Mount retroreflective sheeting to the approach face of the End Unit in accordance with Specification Sections 536 and 967.
NOTES:

1. INSTALLATION: Use components as shown on Sheets 9 & 11.
2. MATERIALS: Use steel plates, channels, and Cable Assemblies in accordance with Specification 967.
   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 2½" Type 8d nails with ASTM A53 hot-dip galvanization.
4. CABLE ANCHOR PLATE ASSEMBLY INSTALLATION: Mount to the pre-fabricated Cable Anchor Plate Bolt Holes in the W-Beam Panel, as shown on Sheet 6. These panel holes are only permitted for this Cable Anchor Plate Assembly application.
5. SOIL PLATE BOLT HOLES: For Trailing Anchorage installations as shown on Sheet 9, the two bolt holes may be substituted with a single bolt hole located at the tube centerline.
4. PARTIAL CABLE ASSEMBLY: The Partial Cable Assembly is similar to the Cable Assembly defined on Sheet 10, except with a 9'-0" total length and the Swage Fitting and Cable Stud omitted from one end. Feed the Cable Stud through the Cable Stud Hole of the Transverse Cable Stud Mount as shown, and secure it with the Hex Jam Nut System as defined on Sheet 10.

5. SPECIAL END SHOE MOUNT: Punch a 5/8" hole in the W-Beam Panel as needed to secure the Special End Shoe with the 5/8" Hex-Head Bolt. Galvanize hole per Specification 562.

6. FOUNDATIONS: Install Steel Tubes with attached Soil Plates by either of the following methods:
   a. Excavate, backfill, and compact material to provide full passive soil resistance to all surfaces of the tube and soil plate.
   b. Drive the steel tube and soil plate as a single unit using a dummy timber post to prevent damage to the breakaway post.

7. END DELINERATOR: Mount retroreflective sheeting to the approach face of the Buffer End Unit in accordance with Specifications 536 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 5/8" Button-Head Bolt only at the location shown).

6. SHOP-BENT PANELS: Install Shop-Bent panel(s) where indicated using 12'-0" or 25'-0" W-Beam Panels. Splice at post locations within the CRT radius using the General configuration of 5/8" Button-Head Bolts (8 reqd. per splice).

7. GENERAL GUARDRAIL: General Guardrail typically includes Panels and Post Spacing as shown on Sheet 2, including parallel and tapered segments. Approach Transitions, Low-Speed Guardrail, or Reduced Post Spacing Guardrail segments may be substituted for the General Guardrail shown herein if indicated in the plans.
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. See Sheet 14 for additional curb options and Sheet 17 for curb shape details.

5. RIGID BARRIER END TRANSITION: Taper the Rigid Barrier toe as shown. See Sheet 19 for 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 Thrie-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 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'.

8. 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.
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 plans. For example, layouts showing the Approach Transition fit among other guardrail segments, see Sheet 19.

For existing bridge connection options, see Indexes 536-002, 521-404, and 521-405.

2. SECTION VIEWS & DETAILS: For cross sections and details, including the barrier mounting hardware, curb transition, adjacent grading, and installation dimensions, see Sheet 17.

3. GUARDRAIL TAPER: The connecting guardrail may require a different lateral offset if shown in the plans. 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, and Traffic Railing, Indexes 521-422 and 521-428, 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 callout. A consistent guardrail offset deviation of up to 4 inches outside of the Rigid Barrier Shoulder Line is permitted over the length "L".

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.

APPROACH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2
DESCRIPTION:

REVISED

STANDARD PLANS

FY 2020-21

REVISION

INDEX

YEAR

536-001

10/29/2019

ADJACENT TO CURB

ADJACENT TO SHOULDER GUTTER

ADJACENT TO CURB

ADJACENT TO SHOULDER GUTTER

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.

APPRAOCH TRANSITION CONNECTION TO RIGID BARRIER - LOW-SPEED, TL-2 CURB CONNECTIONS
**DESCRIPTION:**
Flattened Section

**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 Alignment Curb and Curb transition in accordance with Specification 520. Use steel Plates and Thrie-Beam Terminal Connectors in accordance with Specification 967.

**CURB TRANSITION ISOMETRIC VIEWS**

**APPROACH TRANSITION CONNECTION - DETAILS**
**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))

**SECTION H-H**
BRIDGE ABUTMENT SLOPE GUARD
(Between Bridges)

**NOTES:**

- **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.

- **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.

- **LENGTH OF APPROACH TRANSITION (LA):** Install the applicable Approach Transition as shown per Sheets 13 thru 16, where called for in the plans.

- **LENGTH OF END TREATMENT (LE):** Install the Approach Terminal End Treatment as shown on Sheet 7 or 8, where called for in the plans. Use the corresponding APL drawings for construction details.

- **CROSSOVER GUARDRAIL (FOR TYPE B APPROACH):** Install the Crossover Segment tapering linearly from the Begin Taper Sta. and offset to the End Taper Sta. and offset as specified in the plans.

- **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.

- **END TREATMENT OPTIONS (FOR TYPE B & C APPROACH):** For Double faced applications, use either a Double Faced Approach Terminal Assembly per Sheet 8 or a Crash Cushion per Index 544-001. For either option, meet the 1:10 adjacent grading requirements for Approach Terminals as shown on Sheet 8.

- **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.

- **INSTALL A FLARED END UNIT** where shown, as defined on Sheet 9.
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. THRIE-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. 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. THRIE-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 Holes 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.

NOTES:

Direction of Traffic
1. GENERAL: Install General Pipe Rail where indicated in the plans or when existing sidewalks or shared use paths are located less than 4'-0" from the back of Steel Posts as shown on Sheet 6.

2. PIPE RAIL END SEGMENTS: Place End Segments on both ends of General Pipe Rail runs, with End Fixtures mounted to Terminal Posts located outside of Approach Terminal Assembly (LT), Trailing Anchorage Assembly (LT), and Approach Transition (LA) segments.

3. MATERIALS: Use steel brackets, fixtures, and pipes in accordance with Specification 967.

4. RAIL SPLICES: Install Rail Splices to join pieces of 2" NPS Pipe Rail into a continuous system. Place splices as needed, at a spacing of 18'-0" or greater. Orient the head of bolt on the top of the pipe.
**SPECIAL STEEL POST FOR CONCRETE STRUCTURE MOUNT**

**NOTES:**

1. **INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, inlets, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Instance shown where in plans and/or as-needed, in accordance with Specification 536.

2. **REDUCED-LENGTH STANDARD POST:** Use a Standard Post with reduced length such that the Panel Height ‘H’ is maintained while the post bottom terminates ‘F’ from the bottom of the Concrete Foundation. Typically, the Post Length ‘L’ is 6'-7" for W-Beam Guardrail.

3. **FOUNDATION:** Use non-reinforced Class NS Concrete material in accordance with Specification 347. After casting the concrete, ensure the surrounding soil material is 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**

**NOTES:**

1. **INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, inlets, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Instal where shown in the plans and/or as-needed, in accordance with Specification 536.

2. **REDUCED-LENGTH STANDARD POST:** Use a Standard Post with reduced length such that the Panel Height ‘H’ is maintained while the post bottom terminates ‘F’ from the bottom of the Concrete Foundation. Typically, the Post Length ‘L’ is 6'-7" for W-Beam Guardrail.

3. **FOUNDATION:** Use non-reinforced Class NS Concrete material in accordance with Specification 347. After casting the concrete, ensure the surrounding soil material is completely backfilled and tamped to provide full passive resistance.

4. **LIMIT:** Encased Posts are not permitted for more than 3 consecutive posts.

**FRANGIBLE LEAVE-OUT FOR CONCRETE SURFACE MOUNT**

**NOTES:**

1. **INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) placed within a concrete structure (typically a sidewalk), use a frangible leave-out around the post base as shown. Install where shown in the plans and/or as-needed, in accordance with Specification 536.

2. **MATERIALS:** Use non-extractable Flowable Fill in accordance with Specification 321, not to exceed 150 psi.

**GENERAL POST SPACING**

- **Base Plate & Structure Edge Conflict (See Note 2)**
- **Additional Offset Block(s) (3 Blocks Max.)**
- **Special Steel Post**
- **Steel Section**
- **Steel Base Plate**
- **Top of Concrete Structure**
- **Steel Post & Offset Block**
- **Steel Base Plate (12"x12"x4")**

**GENERAL POST SPACING**

- **Base Plate & Structure Edge Conflict (See Note 2)**
- **Additional Offset Block(s) (3 Blocks Max.)**
- **Special Steel Post**
- **Steel Section**
- **Steel Base Plate**
- **Top of Concrete Structure**
- **Steel Post & Offset Block**
- **Steel Base Plate (12"x12"x4")**

**ENCASED POST FOR SHALLOW MOUNT**

**NOTES:**

1. **INSTALLATION:** When the construction of Guardrail at the required post spacing results in post(s) located atop culverts, inlets, or similar concrete structures, a Special Steel Post may be substituted for a Standard Post. Instal where shown in the plans and/or as-needed, in accordance with Specification 536.

2. **REDUCED-LENGTH STANDARD POST:** Use a Standard Post with reduced length such that the Panel Height ‘H’ is maintained while the post bottom terminates ‘F’ from the bottom of the Concrete Foundation. Typically, the Post Length ‘L’ is 6'-7" for W-Beam Guardrail.

3. **FOUNDATION:** Use non-reinforced Class NS Concrete material in accordance with Specification 347. After casting the concrete, ensure the surrounding soil material is completely backfilled and tamped to provide full passive resistance.

4. **LIMIT:** Encased Posts are not permitted for more than 3 consecutive posts.
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 AAD.

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 edge line.

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:

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 = 25'</td>
<td>1 Space</td>
</tr>
<tr>
<td>S2 = 50'</td>
<td>1 Space</td>
</tr>
<tr>
<td>S3 = 75'</td>
<td>1 Space</td>
</tr>
<tr>
<td>S4 = 100'</td>
<td>1 Space</td>
</tr>
</tbody>
</table>

5. MEDIAN GUARDRAIL: Install retroreflective sheeting on both sides of the barrier delineator for Guardrail on medians.

6. LOW-SPEED GUARDRAIL: For Low-Speed Guardrail (12'-6" post spacing), the Reduced Spacing pattern requires a 6'-3" space between the 12'-6" and 3'-1" spaces.

7. PANEL SPLICES: Midspan Panel Splices are not required in Transition and Reduced Post Spacing segments. However, they are required for General segments. To show midspan splices in General segments, use one midspan general panel length (9'-6" or 10'-7") or add an additional Transition spaced panel where required.

8. PANEL POST BOLT SLOTS: For Quarter Spacing configurations, punch additional 3/8" x 2" Post Bolt Slots in the panels only where required for mounting and in accordance with Specification 596.

DETAIL ‘S’ - QUARTER SPACING ELEVATION
(AS READ PER THE PLANS)

REDUCED POST SPACING FOR HAZARDS

BUTTON-HEAD BOLT SYSTEM

Application(s):

<table>
<thead>
<tr>
<th>Description</th>
<th>Length ‘L’</th>
<th>Min. Thread Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Splice</td>
<td>11&quot;</td>
<td>Full Length</td>
</tr>
<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>21&quot;</td>
<td>#</td>
</tr>
</tbody>
</table>

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 19" length bolts (one bolt per panel flange).

3. Use bolts listed in Table 2 in corresponding locations shown in this Index.
GUARDRAIL TRANSITION ALIGNMENTS FOR BRIDGE THRIE-BEAM AND VERTICAL FACE TRAFFIC RAILING RETROFIT

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. 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.

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 guardrail detail 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.

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.

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.

LONGITUDINAL LOCATION OF TRANSITION BLOCKS AND CURB END FLARES WILL VARY WITH SCHEME TYPE

PARTIAL PLAN VIEWS

SPECIAL STEEL POST FOR ROADWAY THRIE-BEAM TRANSITIONS TO BRIDGE TRAFFIC RAILING RETROFITS

10 Gage Thrie-Beam Or Thrie-Beam Terminal Connector

Traffic Railing (Thrie-Beam Or Vertical Face Retrofit)

APPROACH SLAB WITHOUT CURB

6 Posts Spaced @ 1'-6" 3'-1½" 3'-1½" 3'-1½" 6'-3" 125° R: 1:10 Taper Rate 187° R: 1:15 Taper Rate

APPROACH SLAB WITH CURB

Longitudinal Location Of Transition Blocks And Curb End Flares Will Vary With Scheme Type

PICTORIAL

CURB TYPE F FLARE WHEN END OF EXISTING APPROACH SLAB CURB EXPOSED

TOP VIEW

SIDE VIEW

11" Ø 10 x 10 Galvanized Adhesive-Bonded Anchor Studs (8 Req'd.), Hex Nuts (8 Req'd.) & Standard Washers (4 Req'd.)

Adjusting Nuts

2" Ø Recess

Anchor Hole

Remove Any Asphalt To Set Base Plate Flush With Slab

11" Ø Bolt Holes

125° R: 1:10 Taper Rate

187° R: 1:15 Taper Rate

NOTES FOR GUARDRAIL TRANSITIONS CONNECTING TO TRAFFIC RAILING RETROFITS ON EXISTING BRIDGES

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. 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.

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3. The special steel post for roadway thrie-beam transitions detailed on this sheet is specific to all transition applications on this index that require one or more steel posts.

4. 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.

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.
GUARDRAIL APPLICATIONS FOR BRIDGES WITH FULL WIDTH SHOULDERS AND SAFETY SHAPE TRAFFIC RAILING BARRIER EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

UNDIVIDED ROADWAY - DETAIL H

GUARDRAIL APPLICATIONS FOR BRIDGES WITH LESS THAN FULL WIDTH SHOULDERS AND CONCRETE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

UNDIVIDED ROADWAY - DETAIL S

DIVIDED ROADWAY - DETAIL I

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES

INDEX 536-002
### GUARDRAIL LENGTHS

**Design Speeds (mph)**

<table>
<thead>
<tr>
<th>ADT</th>
<th>35-40</th>
<th>45-50</th>
<th>60-70</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1500</td>
<td>36</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>1500-2250</td>
<td>38</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>2250-3000</td>
<td>38</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>3000-3500</td>
<td>38</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>3500-4000</td>
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<td>40</td>
<td>40</td>
</tr>
<tr>
<td>≥ 4000</td>
<td>38</td>
<td>40</td>
<td>40</td>
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</tbody>
</table>

**Notes:**

- Guardrail Lengths are based on minimum median widths and 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 underslope and bridge end hazards.

**Approach Slab**

<table>
<thead>
<tr>
<th>Panel Width (ft.)</th>
<th>6' Bridge Shoulder</th>
<th>10' Bridge Shoulder</th>
</tr>
</thead>
<tbody>
<tr>
<td>8'</td>
<td>168.75</td>
<td>212.5</td>
</tr>
<tr>
<td>10'</td>
<td>181.25</td>
<td>237.5</td>
</tr>
<tr>
<td>12'</td>
<td>193.75</td>
<td>287.5</td>
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</table>

**Approach Terminal**

<table>
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**Flared End Section**

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<tr>
<th>Panel Width (ft.)</th>
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<td>287.5</td>
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</table>

** Guardslash Transition**

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</table>

**Guardrail Transition**

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<tr>
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<td>193.75</td>
<td>287.5</td>
</tr>
</tbody>
</table>
Note: The guardrail configurations shown apply only to parallel or near parallel bridges with open medians.

The lengths shown in this table are based on standard widths for roadway and bridge median shoulders. Length requirements for both standard width and narrow bridge shoulders and end anchorage end shielding requirements shall be determined on a site specific basis. The number of panels may be reduced when installing a crash cushion more than 2.5’ in width; see * below.

*Number shown is the minimum number of panels plus a W-Thrie beam transition panel; single faced guardrail must have a length of five (5) or more panels.

**APPROACH GUARDRAIL 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)
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PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEXES 460-473 & 460-476 - SCHEMES 5 & 6
PARTIAL PLAN VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (THRIE-BEAM RETROFIT)

SEE INDEX 460-471 - SCHEME 1

SEE INDEX 460-471 - SCHEME 2

SEE INDEX 460-471 - SCHEME 3

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 INDEX 460-472, 460-473, 460-475 & 460-476 - SCHEMES 3 & 4
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
"21" x 12" x 1\4" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 1\4" x 12" Long HS Hex Bolts And Nuts (5 Req'd.) With 21G 00 Plain Round Washers Under Heads And Nuts

SEE INDEX 460-481 - SCHEME 1

SEE INDEX 521-481 - SCHEME 2

SEE INDEX 521-481 - SCHEME 3

REVISION DESCRIPTION: REVISION LAST STANDARD PLANS FY 2020-21 GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES INDEX SHEET 536-002 15 of 28
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

Note:
* 2½" x 12" x 12" Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 3½" x 12" Long
  1¼" 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)

**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**

Note:
* 21" x 12" x 1/8 Thrie-Beam Terminal Connector Plate (Back-Up Plate), And 3/8" x 12" Long
* NS Hex Bolts And Nuts (5 Reqs.) With 2½" OD Plain Round Washers Under Heads And Nuts
PARTIAL PLAN VIEWS OF TRAFFIC RAILING (VERTICAL FACE RETROFIT)

Note:
* 21" x 12" x ½" Thrie-Beam Terminal Connector Plate (Wash-Up Plate), And 7/8" HS Hex Bolts And Nuts (12" Long) For Scheme 1 And Length To Fit For Schemes 2 And 3 (5 Req) With 2" OD Plain Round Washers Under Heads And Nuts

SEE INDEX 521-483 - SCHEME 1

SEE INDEX 521-483 - SCHEME 2

SEE INDEX 521-483 - SCHEME 3

GUARDRAIL TRANSITIONS AND CONNECTIONS FOR EXISTING BRIDGES
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge
(7' Min. From End Of Bridge). Use 1/8" NS Hex Bolts And Nuts
With 25° LD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS
AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING
(VERTICAL FACE RETROFIT)

* Post Bolts At First Standard (3'-1") Post Hole Location On Bridge
  (7" Min. From End Of Bridge). Use ¾" HS Hex Bolts And Nuts
With 2½" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS
FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(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 3/8 HS Hex Bolts And Nuts
With 2½" OD Plain Round Washers Under Heads And Nuts
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)

* Post Bolts At First Standard (7'-1\(\frac{1}{2}\)') Post Hole Location On Bridge (12" Min. From End Of Bridge). Use 2\(\frac{3}{4}\)" HS Hex Bolts And Nuts With 2\(\frac{1}{4}\)" OD Plain Round Washers Under Heads And Nuts.
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)
(INDEX 521-482 SHOWN, INDEX 521-405 SIMILAR)
PICTORIAL VIEWS OF GUARDRAIL APPROACH TRANSITIONS AND CONNECTIONS FOR BRIDGE TRAFFIC RAILING (VERTICAL FACE RETROFIT)

- Post Bolts At First Standard (7'-15") Post Hole Location On Bridge (7" Min. From End Of Bridge). Use 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") Post Hole Location On Bridge
(7' Min. From End Of Bridge). Use 1/2" MS Hex Bolts And Nuts
With 2" OD 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

TRAILING END GUARDRAIL AND ANCHORAGE FOR BRIDGE TRAFFIC RAILING (THRIE BEAM RETROFITS)
NOTES FOR GUARDRAIL TRANSITIONS TO SAFETY SHAPE TRAFFIC RAILINGS ON EXISTING BRIDGES

1. When the guardrail attachment overlays the Bridge Number, Bridge Name or Date on the traffic railing, provide an aluminum sign panel with the obscured information. Attach the sign panel to the face of the traffic railing adjacent to the Three-Beam Terminal Connector with 1/8 x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/8" thick and meet the requirements of Specification 700 with a white background and 3" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail 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

PLAN

- Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

G UARDRAIL APPROACH SLAB

MIS. ASPHALT PAVT.

RECESS

27

(c)

(d)

APPROACH SLAB

(b)

(e)

CONNECTIONS FOR EXISTING BRIDGES

(SHEET 28)

Exist. Shoulder Gutter

(f)

(c)

Bridge Wing Post

(b)

(a)

Guardrail Splice Bolt

(f)

(e)

(g)

(h)

(i)

(j)

(k)

(l)

(m)

(n)

(o)

(p)

(q)

(r)

(s)

(t)

(u)

(v)

(w)

(x)

(y)

(z)

See The Plans For Required Offset (Shoulder Gutter Shown)

SHAFT BOLT

J HOLE

NUT

BOLT

Splice Locations: Three-Beam - 12 Guardrail Splice Bolts And Recessed Nuts

W-Beam - 4 Guardrail Splice Bolts And Recessed Nuts

Use Of Schemes II And III Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

ALUMINUM SIGN PANEL

W/ 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.

20½" x 12½" Three-Beam Terminal Connector Plate (Back-Up Plate), And 2½" x 18" Long 115° Long With 3½" Min. Thread

Length For Bridge Safety Shape Railing) H5 Hex Bolts And Nuts (5 Req'd.) With 2½" OD Plain Round Washers Under Heads And Nuts. (When Attaching Guardrail To Existing Wing Posts Or Bridge Rails, Care Should Be Exercised To Avoid Damaging Conducts And Their Utilities That May Be Routed Through Wing Posts Or Bridge Rails. When Conducts And Their Utilities Are Encountered, At Least Five H5 Hex Bolts Shall Be Installed In Any Of The Seven Holes Provided In The Three-Beam Terminal Connector.)

Approach Post

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DESCRIPTION:
GUARDRAIL TRANSITIONS TO EXISTING FLAT SLAB, PRESTRESSED BEAM AND GIRDER BRIDGES

**SCHEME I**

Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

GUARDRAIL TRANSITION TO EXISTING FLAT SLAB BRIDGES

Use Of Scheme I Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

**SCHEME II**

GUARDRAIL TRAILING END TRANSITION CONNECTIONS FOR EXISTING FLAT SLAB, PRESTRESSED BEAM AND GIRDER BRIDGES WITH SAFETY SHAPE TRAFFIC RAILING EXTENDING LESS THAN FULL APPROACH SLAB LENGTH

**SCHEME III**

Use Of Schemes II and III Shall Be Determined In Accordance With The Standard Plans Instructions (SPI 536-002).

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 Thrie-Beam Terminal Connector with 1/8" x 1" long concrete screws or expansion anchors at each corner, as approved by the Engineer. The sign panel shall be a minimum 1/8" thick and meet the requirements of Specification 700 with a white background and 3" tall black letters and sized appropriately to contain the information required. The cost of the sign panel shall be included in the cost of the Guardrail Bridge Anchor Assembly.

2. When retrofitting thrie-beam guardrail to existing wing posts or existing bridge safety shape traffic railing, attachment construction to be paid for under the contract unit price for Guardrail Bridge Anchor Assembly, EA., and shall be full compensation for bolt hole construction, terminal connector, terminal connector plate(s) and bolts, nuts and washers.

**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"

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 slip extending beyond parapet type traffic railing termini.

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PERMANENT CRASH CUSHION APPLICATIONS

GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 544 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'-3" post spacing, except that Post (10) will remain where shown herein if it is located at a guardrail begin or end taper station callout per the Plans. This 21'-10" segment must also remain parallel to the roadway.

5. LENGTH OF END TREATMENT: For Crash Cushions, the Length of End Treatment includes all proprietary elements of the design as shown in the APL drawing, including the manufacturer's transition of guardrail if applicable.

The actual length of End Treatment varies per Crash Cushion type, but an estimated Length of End Treatment is generally shown in the Plans to provide sufficient space for the Contractor's option of differing Crash Cushion types.

6. LENGTH RESTRICTION: In the "Summary of Permanent Crash Cushions" table, if a value is provided in the Length Restriction column, then select a Crash Cushion from the APL which has a Length of End Treatment less than or equal to the value shown. If the table instead shows not applicable (N/A), then Crash Cushion selection is unrestricted regarding length.

7. CRASH CUSHION STATION: The Crash Cushion Station point shown herein corresponds to the station provided in the "Summary of Permanent Crash Cushions" table in the Plans.

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.

CONCRETE BARRIER APPLICATION

GENERAL NOTES:

1. GENERAL: Work this Index in accordance with Specification 544 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'-3" post spacing, except that Post (10) will remain where shown herein if it is located at a guardrail begin or end taper station callout per the Plans. This 21'-10" segment must also remain parallel to the roadway.

5. LENGTH OF END TREATMENT: For Crash Cushions, the Length of End Treatment includes all proprietary elements of the design as shown in the APL drawing, including the manufacturer's transition of guardrail if applicable.

The actual length of End Treatment varies per Crash Cushion type, but an estimated Length of End Treatment is generally shown in the Plans to provide sufficient space for the Contractor's option of differing Crash Cushion types.

6. LENGTH RESTRICTION: In the "Summary of Permanent Crash Cushions" table, if a value is provided in the Length Restriction column, then select a Crash Cushion from the APL which has a Length of End Treatment less than or equal to the value shown. If the table instead shows not applicable (N/A), then Crash Cushion selection is unrestricted regarding length.

7. CRASH CUSHION STATION: The Crash Cushion Station point shown herein corresponds to the station provided in the "Summary of Permanent Crash Cushions" table in the Plans.
Standard Guardrail Transition

**PLAN VIEW**

- Crash Cushion Sta. (See General Note 2)
- Begin/End Guardrail Sta. (if Post)
- Length of End Treatment (See General Note 3)
- 0'-10" (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
- Thrie-Beam Offset Block (Typ.)
- 12'-6" Thrie-Beam Panel (Nested)
- 6'-3" Thrie-Beam Transition Panel
- W-Beam Panels
- Finished Grade

**ELEVATION VIEW**

- Crash Cushion Sta. (See General Note 2)
- Begin/End Guardrail Sta. (if Post)
- Manufacturer's Transition (See General Note 3)
- 4 Spaces @ 1'-6¾" CC
- 5 Spaces @ 3'-1½" CC
- Thrie-Beam Offset Block (Typ.)
- 12'-6" Thrie-Beam Panel (Nested)
- 6'-3" Thrie-Beam Transition Panel
- W-Beam Panels
- Finished Grade

**NOTE:**

Work this Sheet with the details and General Notes on Sheet 1.
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.

NOTES:

ELEVATION - CONNECTION TO CONCRETE TRAFFIC RAILING (See Note 2)

ELEVATION - CONNECTION TO THRIE-BEAM RETROFIT (See Note 3)
PLAN

SPACING OF RAISED RUMBLE STRIP SETS AT INTERSECTIONS
(Preformed Thermoplastic Set Shown. Others Similar)

TABLE 1 - BRAKING ZONE

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>L' (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 30</td>
<td>150</td>
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<tr>
<td>35</td>
<td>200</td>
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<tr>
<td>40</td>
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<td>55</td>
<td>410</td>
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<tr>
<td>60</td>
<td>470</td>
</tr>
<tr>
<td>65</td>
<td>550</td>
</tr>
</tbody>
</table>

NOTES:
1. Construct permanent raised rumble strips where shown in the Plans and in accordance with Specification 546.
2. Preformed Thermoplastic Set:
a. Use multiple applications to achieve desired 1/2" thickness.
b. Use color white.

OPTION P1 - ASPHALT SET

OPTION P2 - PREFORMED THERMOPLASTIC SET

OPTIONAL MATERIALS DETAILS

PERMANENT RAISED RUMBLE STRIPS

RAISED RUMBLE STRIPS

DESCRIPTION:

REVISON
04/23/19

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546-001

SHEET
1 of 2
**SHORT-TERM RAISED RUMBLE STRIPS**

**DESCRIPTION:**

**OPTION ST1 - ASPHALT SET**

- 5'-0" (6 Strips)
- 1'-0" (4 Strips)

**OPTION ST2 - PREFORMED THERMOPLASTIC SET**

- 15'-0" (4 Strips)
- 5'-0" (Typ.)

**OPTION ST3 - REMOVABLE POLYMER STRIPING TAPE SET**

- 15'-0" (4 Strips)
- 5'-0" (Typ.)

**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. On either side of median crossover openings, terminate rumble strips within 400 feet.
EDGE LINE RUMBLE STRIP PLACEMENT TYPES

- TYPE "A1" (Plan View)
- TYPE "B1" (Plan View)
- TYPE "C1" (Plan View)

CENTERLINE RUMBLE STRIP PLACEMENT TYPES

- TYPE "D1" - PASSING (Plan View)
- TYPE "D1" - NO PASSING (Plan View)

RUMBLE STRIP DEPTH TABLE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DEPTH FROM SURFACE (IN.)</th>
</tr>
</thead>
<tbody>
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<td>C</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>2 (±1&quot;)</td>
</tr>
</tbody>
</table>

RUMBLE STRIP ARRAY DETAILS

- SKIP ARRAY (Outside Shoulder Edge Lines)
- CONTINUOUS ARRAY (Centerlines and Inside Shoulder Edge Lines)

NOTE:
See the Plans for the Placement Type to be used.
Rumble Strip Details

Rumble Strip Depth Table

<table>
<thead>
<tr>
<th>Location</th>
<th>Depth from Surface (In.)</th>
</tr>
</thead>
<tbody>
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<td>E</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>1/4</td>
</tr>
<tr>
<td>G</td>
<td>3/8</td>
</tr>
<tr>
<td>H</td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>2</td>
</tr>
</tbody>
</table>

Continuous Grinding

Edge Line Rumble Strip Placement Types

CENTERLINE Rumble Strip Placement Types

Skip Array

(centerlines and inside shoulder edge lines)

Continuous Array

Ground-In Rumble Strips

Sinusoidal for arterials and collectors

NOTE:

See the plans for the placement type to be used.

Revised 04/04/18

Description:

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Standard Plans

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NOTES

DESIGN CRITERIA:
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and Chapter 3 of the FDOT Structures Design Guidelines.

SOIL PARAMETERS:
1. See Wall Control Drawings for soil characteristics of foundation material to be used in the design of the wall system.
2. The Contractor will provide soil design parameters for backfill material based on the actual soil characteristics utilized at the site.

MATERIALS:
1. See Specification Section 548 for material requirements.

CONSTRUCTION:
1. Walls will be constructed in accordance with Specification Section 548 and the Wall Company's instructions.
2. For location and alignment of retaining walls, see Wall Control Drawings.
3. If required, locate manholes and drop inlets as shown on wall elevations.
4. Refer to Wall Control Drawings of individual walls for minimum reinforcement strip/mesh length, factored bearing resistance's, minimum wall embedment and anticipated long term and differential settlements.
5. The Contractor is responsible for controlling water during storm events as needed during construction.
6. It is the Contractor's responsibility to determine the location of any guardrail posts behind retaining wall panels. Prior to placement of the top layer of soil reinforcement, individual reinforcing strip/mesh may be skewed (10° maximum) to avoid the post locations if authorized by the Engineer. 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 (10° maximum from horizontal) to avoid cutting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway super-elevation and/or soil mixing are anticipated.
9. For concrete facing panel surface treatment, see Wall Control Drawings. Extend surface treatment a minimum of 6" below final ground line.
10. Drive piles located within the soil volume prior to construction of the retaining wall unless a method to protect the structure, acceptable to both the Engineer and Wall Company, is proposed and approved in writing. The Contractor will notify the Engineer to determine what course of action shall be taken.
11. A structural extension of the connection of the retaining wall panel to soil reinforcement will be used whenever necessary to avoid cutting or excessive skewing (greater than 15°) of the soil reinforcement around obstructions (i.e., piles, pipes, manholes, drop inlets, etc.).
12. Skewing (greater than 15°) of the soil reinforcement around obstructions (i.e., piles, pipes, manholes, drop inlets, etc.).
13. The top of leveling pad or footing will be 2'-0" minimum below final ground line.
14. Extend surface treatment a minimum of 6" below final ground line.
15. The height of panels in the bottom course of MSE Walls must not be less than half the height of a standard panel.
16. Work this Index with Index 521-600 thru 521-650.

SHOP DRAWINGS:  See Specification Section 548 for shop drawing requirements.
NOTES

DESIGN CRITERIA:
1. Design is based on the assumption that the material contained within the reinforced soil volume, methods of construction and quality of prefabricated materials are in accordance with Specification Section 548 and FDOT Structures Design Guidelines Section 3.13.2.
2. It is the responsibility of the Engineer to determine that the factored bearing pressure shown for the wall does not exceed the factored bearing resistance of the foundation for that specific wall location.
3. The Wall Company is responsible for internal stability of the wall. External stability design, including foundation 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 layers of soil reinforcement downward (15° maximum from horizontal) to avoid lifting soil reinforcement and conflicts with paving and subgrade preparation. The Contractor's attention is directed especially to situations where roadway superelevation and/or soil mixing are anticipated.
1. This fence to be provided generally in rural areas. For supplemental information see Specifications 550.

2. Fabric shall be woven wire, either galvanized steel, meeting the requirements of ASTM A120, No. 8 Grade 60, Design Number 1047-6-9, with a Class 3 zinc coating, or Class 3 zinc coating, or aluminum coated steel, meeting the requirements of ASTM A584, No. 9 Farm, Design Number 1047-6-9, with a minimum coating weight of 0.04 oz./ft.

For additional information see payment note below.

3. Fence shall be installed with wire to private property except on horizontal curves greater than 3° the fence shall be installed so as to pull against all posts.

4. Posts may be either timber, steel, recycled plastic or concrete. Unless a specific post material is called for in the plans, the Contractor 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 Specification 350. Line posts of one material may be used with corner, pull and end post assemblies of a different material. One post of only one material shall be permitted between corner and pull post assemblies. Within individual corner and end post assemblies only one material will be permitted.

5. Perimeter posts shall meet the material requirements of Specification 966. 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 ½” minimum length, for approach, corner and pull posts ½” 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 support 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., together with necessary hardware and wire clamps and meeting the following requirements:

(A) Line posts: 8’ long, 1.33 lbs./ft.; roll formed studding, anchor plate attached, ASTM A702 (18 in²).

(B) Approach posts: 25’ ½” x 2 ½” angles, 8’ long; fabricated for attaching brace; with necessary hardware, clamps, etc.

(C) Pull, end and corner posts: 25’ ½” x 2 ½” angles, 8’ long; fabricated for attaching brace; with necessary hardware, clamps, etc.

(D) Braces: 2 ½” x 2 ½” angles with necessary hardware and fabricated for attaching to post.

(E) The pull, corner, approach and end posts are to be set in concrete as per detail. Also see General Note 15.

7. Recycled plastic posts shall meet the following material requirements: "Post shall have a minimum section of 1 ½” C.S. 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 954 for timber post. A maximum length of 1320’ of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

8. The Contractor, at his option, may use any suitable precast or prestressed concrete posts; however, approval by the Engineer, or posts not shown on this index, will be required prior to construction of the fence. Precast concrete posts shall be Class I concrete. Prestressed posts 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 wire tie 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 A465.

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 1/2” gauge wire; four-point barbs, wire size 14 gauge, twisted around all line wires; and, Class 3 coating, Design No. 12-4-3-15G.

Type IIA: This type same as Type I except the two strands 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 1/2” gauge high tensile wire; four-point barbs, wire size 18 ½ gauge twisted around both line wires; and Class 3 coating. Design No. 12-4-3-15G.

12. The woven wire shall be stretched only until one-half the tension curl has been pulled out of the line wires.

13. 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 NS in accordance with Specification 347. Materials for Class NS concrete may be proportioned by volume and/or by weight.

16. Pull post assemblies shall be installed at approximately 30° centers except that this maximum interval may be reduced by the Engineer on curves where the radius is less than 30°.

17. Corner post assemblies are to be installed at all horizontal and vertical breaks in fence of 15° or more.

18. A maximum length of 1320’ of wire may be installed as a unit. For pulls through a pull post assembly the fabric shall be spliced by crimping sleeves only. Pulls through a corner post assembly will not be permitted.

19. 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 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.

20. 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 NS concrete, and all miscellaneous fittings and hardware to be included in the cost for Fencing, SI. Fencing shall be inclusive of the lengths of pull, end and corner post assemblies, but exclusive of gate widths.
This index details fencing that is constructed with farm fabric 46" (47" nominal) in height and with specific ground clearance and specific barbed wire spacings. For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.

DESIGN NOTE

CONCRETE BASE FOR ANGULAR STEEL POST

FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(REFER TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

PRIVATE PROPERTY

6' OR AS INDICATED IN PLANS

WIRE FABRIC

POST

(Pull, Corner, End And Approach Posts)

CONCRETE BASE FOR ANGULAR STEEL POST

FENCE TYPE A

FY 2020-21

STANDARD PLANS

INDEX

550-001

2 of 3
GENERAL NOTES

C. Rail options:
(1) Galvanized steel pipe, Schedule 40 - 1½" nominal dia., zinc galvanized at the rate of 1.8 oz./ft².: ASTM A53 Table X 2, ASTM F1083, and AASHTO M111.
(2) Aluminum coated steel pipe, ASTM A53 steel, S 2 Tables Schedule 40, 1½" nominal dia., 1.660" OD, coated at the rate 0.40 oz./ft².: AASHTO M111.
(3) Aluminum alloy pipe: 1½” nominal dia.: ASTM F221 or B221, Alloy 6063, T6.
(4) Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A653/A653M, A633/A633M, or undeveloped steel pipe, ASTM F1083, and AASHTO M111.
(5) Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A653/A653M, A633/A633M, or undeveloped steel pipe, ASTM F1083, and AASHTO M111.
(6) Resistance welded steel pipe, 50,000 psi min. yield strength ASTM A653/A653M, A633/A633M, or undeveloped steel pipe, ASTM F1083, and AASHTO M111.
(7) Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A653/A653M, A633/A633M, or undeveloped steel pipe, ASTM F1083, and AASHTO M111.

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) (4) Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A653/A653M, A633/A633M, or undeveloped steel pipe, ASTM F1083, and AASHTO M111. 5 Per Bar Equally Spaced ≤ (15")
(2) (4) Resistance welded steel pipe, 30,000 psi min. yield strength ASTM A653/A653M, A633/A633M, or undeveloped steel pipe, ASTM F1083, and AASHTO M111.

E. Tension wire options:
(1) Steel wire No. 7 gage, zinc galvanized at the rate of 1.2 oz./ft².: AASHTO M181.
(2) Steel wire with a diameter of 0.1875", larger conforming to the requirements of ASTM F669, Grade 1110, or, AlumiAlloy 1110, Grade 1110.
(3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.40 oz./ft².: AASHTO M181.

F. Tie wire and hog ring options:
(1) Steel wire No. 8 gage, zinc galvanized at the rate of 1.20 oz./ft².: AASHTO M181.
(2) Steel wire with a diameter of 0.1875", larger conforming to the requirements of ASTM F669, Grade 1110, or, AlumiAlloy 1110, Grade 1110.
(3) Aluminum coated steel wire No. 7 gage coated at the rate of 0.40 oz./ft².: AASHTO M181.
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 methods:
   (a) In accordance with special details and/or as specifically described in the Contract Plans and Specifications.
   (b) In accordance with ASTM F567 Subsections 5.4 through 5.10 as approved by the Engineer.
   (c) Post mounted on concrete structure or solid rock shall be mounted in accordance with the base plate detail "Fence Mounting On Concrete Endwalls And Retaining Wall", Sheet 3; or, by embedment in accordance with ASTM F567 Subsection 5.5.

   End, pull and corner post assemblies shall be in concrete as detailed above for all soil conditions other than solid rock. Post within assemblies that are located on concrete structures or solid rock shall be set by base plate or by embedment as prescribed under (b) above for line post.

   Line and assembly posts for 6' fence which must be lengthened due to a variation in the normal ground clearance, shall be set an additional 3' in depth for each 3' of additional ground clearance.

8. Pull post shall be used at breaks in vertical grades of 15° or more, or at approximately 350' centers except that this maximum interval may be reduced by the Engineer on curves where the curve is greater than 3°.

9. Corner post are to be installed at all horizontal breaks in fence at 15° or more and as required at vertical breaks over 15° as determined by the Engineer.

10. When fence has an installed top of fabric height less than 6' knuckled top and bottom selvages shall be used unless the plans specifically identify locations for twisted selvage fabrics.

11. Unless sliding gates or special gates are called for in the plans, all gates shall be chain link swing gates meeting the material requirements described and as approved by the Engineer. Payment shall include the gates, hinge, roller, and all necessary hardware for installation and any additional length and/or wire for posts at the opening. Gates shall be paid for under the contract unit price for Fence Gates, EA.

12. For construction purposes corner post assemblies shall consist of one corner post, two braces, two truss rods, and all necessary fittings and hardware as detailed. End post assemblies shall consist of one end post, one brace, one truss rod and all necessary fittings and hardware as detailed.

13. In areas where there are physical constraints outside the right-of-way which restricts the fence construction, the fabric may be installed on the inside of the posts.

<table>
<thead>
<tr>
<th>TYPE IV VINYL COATED FABRIC</th>
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<tr>
<td><strong>ASSHTO M181 Table 4 Redefined As Follows</strong></td>
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<table>
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<tr>
<th>Specified Diameter</th>
<th>Minimum Weight Of Zinc Coating</th>
<th>PVC Thickness Range</th>
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<td>in.</td>
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<td>0.148</td>
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<tr>
<td>0.375</td>
<td>9.52</td>
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**DESIGN NOTE**

This index details fencing that is constructed with chain link fabric 6' (nominal) in height and with specific ground clearance.

For fencing of different height or installation details, the fence shall be fully detailed in the Contract plans.
FENCE POSITION AT LOCATIONS WITHOUT FRONTAGE ROADS

(FERRY TO DETAIL PLANS FOR FENCE POSITION AT LOCATIONS WITH FRONTAGE ROADS)

NOTES

Attachments to be used only when called for in the plans.
Attachments to extend in direction of restraint, unless otherwise called for in plans, direction of restraint will be as follows:
(a) Outward on limited access right of way line.
(b) Outward on controlled access right of way line.
(c) Outward from utilities and hazardous facilities located within highway right of way.
(d) Outward from lateral ditches, culverts, retention basins, canals, borrow areas and similar support facilities.
(e) Housed 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.

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):
   - Headed Bolts, U-Bolts or Cluster Plates.
   - Anchors (Galvanized Steel):
     - Per Sec. 416 and 937: Headed Bolts, U-Bolts or Cluster Plates.
     - Adhesive Anchors, 6" Min. Embedment (Refer to Footnotes) and anchor bolts set in drilled holes with an Adhesive Material System in accordance with Specifications 416 and 937: Drilled holes shall be ½" larger in diameter than the anchor bolt.
   - Expansion Bolts Not Permitted.

FENCE MOUNTING ON CONCRETE ENDWALL AND RETAINING WALLS

FOUR ANCHOR PLATE OPTION

TWO ANCHOR PLATE OPTION

STEEL ALUMINUM

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<th>Area (Sq. In.)</th>
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<th>724</th>
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<tbody>
<tr>
<td>Weight (lbs/ft)</td>
<td>2.72 ± 5% (Galv.)</td>
<td>0.91 ± 5%</td>
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<tr>
<td>Tensile Strength (psi Min.)</td>
<td>60,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Yielding Point (psi Min.)</td>
<td>48,000</td>
<td>23,000</td>
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</table>

A ½" x 1½" H-BEAM LINE POST

TOP VIEW

1. ½" Dia. Hole for ½" Anchors, Nuts and Washers (2 Req'd)
2. Fence Wall
3. Post
4. Fence And Wall

EXPANSION BOLTS NOT PERMITTED

2.72 ± 5% (Galv.)

NOTES

Fence To Be Mounted On Retainer Side Unless Otherwise Called For In Plans (See Notes)
**GENERAL NOTES**

1. Extruded, rolled or formed components that provide equal strength and stability may be used in lieu of the pipe components shown; and, internal rollers may be used in lieu of the external roller units shown.

2. Steel gate frame shall be fabricated prior to galvanizing, except that truss rods may be fabricated following frame galvanizing provided surfaces damaged during welding are galvanized in accordance with Section 24 of AASHTO M36, or, fabricated from pipe components with protective coating meeting the requirements of Index 550-002 that are galvanized in accordance with Specification 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-987. 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.
**DESCRIPTION:**

**STANDARD PLANS**

**FY 2020-21**

**REVISION**

**LAST OF STANDARD PLANS**

**INDEX 11/01/17**

**SHEET**

**550-004 1 of 2**

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**FENCING TERMINALS AT BRIDGE ENDS**

*(ROADWAY)*

- **Fence Location**
  - Locate fence along slope where top of fence approx. equals tops of headwall.
  - Terminate fence where culvert drag height approx. equals fence height.
  - Construct flush against footing.
  - Fence locations at cross drains with excavated outfall ditches or as shown in plans.

- **Fence Height**
  - Top of fence approx. equals locate fence along slope.
  - Wing height approx. equals.
  - Terminate fence where culvert tops of headwall.

- **Fencing Terminals at Bridge Ends**
  - Fencing terminals at box culverts (for heights of headwalls greater than 4').
  - Fencing detail at culvert (for heights of headwalls 4' or less).

- **Fence Location**
  - Note: When height of headwall is 4' or less (drainage pipe 36' or less) the fence shall not be tied to the headwall, but shall span the lateral ditch.

---

**PICTORIAL VIEW**

**PLAN**

- Plan view of bridge and approach slab.
- Shaft pavement.
- Natural ground.
- Shoulder line.
- Top of slope.
- Proposed fence.
- LA R/W line.

**ELEVATION**

- Elevation of fence and proposed fence along shoulder line.
- Top of fence approx. equals locate fence along slope.
- Wing height approx. equals.
- Terminate fence where culvert tops of headwall.

---

**FENCING TERMINALS AT BOX CULVERTS**

*(For Heights Of Headwall Greater Than 4')*

- Shaft pavement.
- Toe of slope.
- Proposed fence.
- LA R/W line.

**ELEVATION**

- Elevation view of fence and proposed fence along toe of slope.
- Top of fence approx. equals locate fence along slope.
- Wing height approx. equals.
- Terminate fence where culvert tops of headwall.

---

**FENCING TERMINALS AT STREAM CROSSING**

*(For Heights Of Headwalls 4' Or Less.)*

- Shaft pavement.
- Approach slab.
- Gutter transition.
- Shoulder line.
- Top of slope.
- Proposed fence.
- LA R/W line.

**ELEVATION**

- Elevation view of fence and proposed fence along shoulder line.
- Top of fence approx. equals locate fence along slope.
- Wing height approx. equals.
- Terminate fence where culvert tops of headwall.

---

**PICTORIAL VIEW**

**PLAN**

- Plan view of bridge and approach slab.
- Shaft pavement.
- Natural ground.
- Shoulder line.
- Top of slope.
- Proposed fence.
- LA R/W line.
FENCING TERMINALS AT RURAL INTERCHANGES

FENCING TERMINALS AT URBAN INTERCHANGES

FENCING TERMINALS AT RETAINING WALLS

NOTE: LA R/W along the crossroad will extend a minimum of 300' beyond the end of the acceleration or deceleration roadway. The radius point of the ramp return will be establishing the end for both sides of the roadway. In the absence of a taper the radius point of the ramp return will be used with the above criteria.

For interchange quadrants having no ramp the LA R/W will extend along the crossroad to a point opposite the limit of LA R/W established by the ramp taper or radius point as noted above.

Note A - The indicated distance shall be sufficient to provide satisfactory sight distance for the traffic from the ramp.

Note B - The indicated distance shall be identical to the above noted dimension, if practical.
DIVIDED NARROW MEDIAN WITH OR WITHOUT CURBED MEDIAN

DIVIDED WIDE MEDIAN WITH OR WITHOUT CURBED MEDIAN

UNDIVIDED FLUSH SHOULDER

UNDIVIDED CURBED

DIVIDED CURBED

WILDFLOWER SEEDING RATES

<table>
<thead>
<tr>
<th>Common Name (Botanical Name)</th>
<th>lbs/ac</th>
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<tbody>
<tr>
<td>#1 Group</td>
<td></td>
</tr>
<tr>
<td>Black-Eyed Susan (Rudbeckia hirta)</td>
<td>2</td>
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<tr>
<td>Lance Leaf Tickseed (Coreopsis lanceolata)</td>
<td>10</td>
</tr>
<tr>
<td>Goldmoss Tickseed (Coreopsis baicalis)</td>
<td>10</td>
</tr>
<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
</tr>
<tr>
<td>Softhair Coreflower (Rudbeckia mollis)</td>
<td>2</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
</tr>
<tr>
<td>#2 Group</td>
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<tr>
<td>Annual Phlox (Phlox drummondii)</td>
<td>10</td>
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<tr>
<td>Moss Verbena (Verbena 'Louisiana')</td>
<td>6</td>
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<tr>
<td>Leavenworth's Tickseed (Coreopsis leavenworthii)</td>
<td>10</td>
</tr>
<tr>
<td>Fire Wheel (Gaillardia pulchella)</td>
<td>10</td>
</tr>
<tr>
<td>Crimson Clover (Trifolium incarnatum)</td>
<td>15</td>
</tr>
</tbody>
</table>

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.

LEGEND

- Wildflower Group #1
- Wildflower Group #2
- Turf (To Limit of Construction)
- Turf (To Limit of Construction)
- Selective Clearing And Grubbing
- Limits Of Construction
- Turf

SEEDING ZONES

Zone I

Zone II

Note: Wildflower seeding rates are for restoring impacted wildflower areas.
SHOULDER AND SLOPE TREATMENT FOR SUPERRELATIVE ROADWAYS

CRITERIA FOR PAVING SHOULDER ON DIVIDED AND UNDIVIDED FACILITIES

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Degree Of Curve</th>
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<td>30</td>
<td>7° or Greater</td>
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<tr>
<td>40</td>
<td>6° or Greater</td>
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<td>50</td>
<td>5° or Greater</td>
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<td>60</td>
<td>4° or Greater</td>
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<tr>
<td>70</td>
<td>3° or Greater</td>
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<tr>
<td>80</td>
<td>2° or Greater</td>
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</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 SUPERRELATIVE ROADWAYS

TRANSVERSE SECTION

Longitudinal Section

OVERLAPPED SOD FLUME

SHOULDER AND SLOPE TREATMENT IN SAG VERTICAL CURVES

TREATMENTS FOR PROTECTION FROM CONCENTRATED ROADWAY RUNOFF EROSION AND SHOULDER RAVELING

NOTES

1. These treatments are applicable to new construction, reconstruction and RRR projects. Project requirements for shoulder pavement and sodding that exceed the limits of this standard take precedence.

2. For sodding adjacent to ditches and at headwalls, see Index 524-001.

3. All front slopes steeper than 1:3 are to be sodded.
INDEX 430-010

INDEX 430-011

INDEX 430-020

INDEX 430-030

INDEX 430-031 Through 430-034

INDEX 430-040

TABLE 2: SOD QUANTITIES (SY)

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>1.4</th>
<th>1.2</th>
<th>1.3</th>
<th>1.4</th>
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<th>1.2</th>
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</table>

Note: See Plans for sodding quantities for each endwall to be determined by the designer from this detail.

SOD PLACEMENT AT PIPE/CULVERT END TREATMENTS

PERMANENT EROSION CONTROL
**TREATMENT I**

**CRITERIA FOR USING TREATMENT I**

- Project:
  - Resurfacing, widening and resurfacing or construction of shoulder pavement
  - Is rural or is urban without curb and gutter
  - Resurfacing build-up is less than 3"

- Shoulder Option 1:
  - Width called for in the plans (shoulder width plus 2' min.)
  - Drop-off (1' Min., 1' Max.)
  - Sod (avg. depth 1½"
  - Drop-off (avg. depth 1½")
  - Excavated turf and topsoil
  - Sod (avg. depth 1½"
  - Excavated turf and topsoil
  - Turf

**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. Excess material to be uniformly distributed over the shoulder.

2. **Treatment II:**
   - A. Borrow must meet the requirements for a "Select" material in accordance with Index 120-001 and Specification 120.
   - B. Borrow may be used in lieu of excavated turf and topsoil when economically feasible. There will be no additional payment for substituting borrow for excavated turf and topsoil.

3. **Special attention is to be directed at achieving the required Drop-Off at the edge of pavement, within the dimension range shown.**

4. **Activities such as clearing, grading, and excavating that will disturb one or more acres of land require coverage under the Generic Permit for Stormwater Discharge from Large and Small Construction Activities from the Florida Department of Environmental Protection, and implementation of appropriate pollution prevention measures to minimize erosion and sedimentation and properly manage stormwater.**

5. **Turf Establishment:**
   - A. Wildflowers destroyed by shoulder sodding and turf operations are to be reestablished under the seeding rates prescribed for permanent wildflower #2 Group shown by table on Index 570-001.
   - B. Establish turf in accordance with Specification 570.

**TREATMENT II**

**CRITERIA FOR USING TREATMENT II**

- Project:
  - Resurfacing or construction of shoulder pavement
  - Is rural or is urban without curb and gutter
  - Resurfacing build-up is 3" or more

- Shoulder Option 2:
  - Width called for in the plans (shoulder width plus 2' min.)
  - Drop-off (1½" Min., 1½" Max.)
  - Sod (avg. depth 1½"
  - Excavated turf and topsoil
  - Turf

**A SIMILAR TREATMENT MAY BE USED FOR PROJECTS THAT REQUIRE SHOULDER WIDENING. DETAILS ARE TO BE SHOWN IN THE PLANS.**
## UNDER 2½" CALIPER TREE PLANTING

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, slope or steeper.

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 the trunk. 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 ground cover. Never pile soil on top of rootball.

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.

## 2½" TO 6" CALIPER TREE PLANTING

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, slope or steeper.

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 the trunk. 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 guying systems specified or approved by the Engineer may be used in lieu of the tree bracing and guying methods detailed on the plans.

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.

## UNDER 4" CALIPER TREE PLANTING WITH UNDERGROUND BRACING

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, slope or steeper.

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 the trunk. 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 guying systems specified or approved by the Engineer may be used in lieu of the tree bracing and guying methods detailed on the plans.

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 Sleeve 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.

2. When installing conduit under sidewalk by open trench, replace the entire sidewalk slab.

3. Trench not to be open more than 250' at a time when construction area is subject to vehicular or pedestrian traffic.

4. Sawcut asphalt at the edges of the trench to leave neat lines.

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**ELEVATION**

---

**Curb and Gutter**

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**Conduit Installation Details**

**FY 2020-21**

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**Standard Plans**

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**CONDUIT INSTALLATION DETAILS**

---

**INDEX**

---

**SHEET**

---
VERTICAL CLEARANCE NOTE:
Maintain 1'-0" minimum vertical clearance when crossing over pipe and utilities. If minimum vertical clearance cannot be maintained, conduit is to be routed under pipe maintaining 1'-0" minimum vertical clearance.
PLACEMENT NOT EXPOSED
TO VEHICULAR TRAFFIC

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.

PLACEMENT UNDER NEW ROADWAY
PRIOR TO INSTALLATION OF
BASE AND PAVEMENT

PLACEMENT UNDER EXISTING PAVEMENT
NOT ADJACENT TO GUTTER

PLACEMENT UNDER EXISTING PAVEMENT
ADJACENT TO GUTTER

CONDUIT INSTALLATION DETAILS
**DESCRIPTION:**

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.

**NOTES:**

- **BELOW EXISTING**
  - 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.

- **ABOVE EXISTING - DEPTH 2'-6" OR GREATER**
  - 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.

- **ABOVE EXISTING - DEPTH 2'-6" OR LESS**
  - 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.

**SECTION A-A**

**PLACEMENT ACROSS EXISTING DRAINAGE PIPES OR UTILITIES**

**PLACEMENT UNDER RAILROAD**
**DESCRIPTION:**

1. Use only span wire mounting assemblies listed on the APL. For specific details and requirements, see the vendor drawings on the APL.

2. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.

3. Lashing wire should normally be used for distances of 12' or greater.

4. Use only stainless steel hardware on all signal attachments.

5. Note for eyebolt will require field reaming for 1" & 1½" eyebolts.

6. Meet all grounding requirements of Specification 620.

7. The load face of pole is to be perpendicular to the resultant load.

8. Field drill 2-½" drain holes in the bottom of the installed signals.

9. Method of framing corner Strain Poles angles 10° to 120°.

**NOTES:**

- Drain holes in the bottom of the installed signals.
- Field Drill 2½" (See Note 8)
- The load face of pole is to be perpendicular to the resultant load.
- Field Drill 2½" drain holes in the bottom of the installed signals.
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 3/4" 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 N5 concrete. Slope the apron away from the box.
3. Where multiple pull boxes are placed side by side, maintain at least 8" between the pull boxes.
4. Rectangular boxes shown, others similar.
GENERAL NOTES:
1. It shall be the contractors responsibility to provide a complete service assembly as per the plans and service specifications.
2. The service installation shall meet the requirements of the national electric code and applicable local codes.
3. Shop drawings are not required for service equipment, unless noted in the plans.
4. A Pull Box is required at each service point, see Index 635-001.

SERVICE POINT DETAILS

Concrete Pole, Prestressed Type P-II, 36' Long

Concrete Pole, Prestressed Type P-II, 12' Long

1. It shall be the contractors responsibility to provide a complete service assembly as per the plans and service specifications.
2. The service installation shall meet the requirements of the national electric code and applicable local codes.
3. Shop drawings are not required for service equipment, unless noted in the plans.
4. A Pull Box is required at each service point, see Index 635-001.
Keyed Notes:
2. Service Feeder in Rigid Galvanized Steel Conduit.
3. Meter Socket by Contractor.
4. Service Main Disconnect.
6. Concrete Riser Pole.
7. Weatherhead.
8. Electrical Panel. Number and Rating of Branch Circuit Breakers shall be as Indicated on Distribution Point Description on Lighting Plan Sheets.
10. #6 Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.
11. Fusible Control Power Transformer 0.5 KVA, Single Phase, 480V Primary, 120V Secondary (Part of Lighting Contactor, Shown Outside for Clarity).
12. Lightning Arrester Mounted on Outside of Enclosure.
13. Concrete Pad.
15. Ground BUS.
17. 120V Photoelectric cell, 1800VA with 2000V Peak Surge Protection.
19. Service Main Disconnect.
20. Bond the Service Neutral to Ground at Service Main Disconnect.
21. 2 Pole Electrical Lighting Contactor.
22. NEMA 4X SST Ground Mounted Storage Cabinet with Two Shelves. Only Required for High Mast Lighting Systems.

PHOTOELECTRIC CONTROLLER DETAIL

Cut a 2" hole in the side of the Lighting Control Panel enclosure for the operation and mounting of the Photo Electric controller. Use interlock and a clear silicone sealant to cover hole. Install Photo Electric Controller.
[Diagram Aerial Feed, No Meter Used]

[Diagram Aerial Feed, Meter Used]

[Diagram Underground Feed, No Meter Used]

[Diagram Type "B" Underground Feed, Meter Used]

[Diagram Underground Cabinet Mounted, Meter Used]

**NOTES:**

1. The lightning arrester can be located on the side or bottom of the service disconnect enclosure at the Contractor's option.
2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.
3. Bond all elements together to form an Intersection Grounding Network in accordance with Specification 620. The bond wire shall be run in conduit with the Electrical Service Wire or Signal Cable.
4. Meet all grounding requirements of Specification 620.
5. The Service Disconnect shall be lockable by padlock and four keys provided to the maintaining agency. The door shall have a minimum of three hinges and be lockable. No screws to be used to attach door.
6. The Service Disconnect shall be NEMA 3R or better.
GENERAL NOTES:

1. Work these Index drawings with the Strain Pole Schedule in the Plans.
2. Shop Drawings: This Index is considered fully detailed and no shop drawings are necessary.
3. Submit shop drawings for minor modifications not detailed in the plans.
4. Fabrization:
   a. Pole Taper for pole width, strands, reinforcing and void: 0.081 inch per face.
   b. Prestress Super-T wire.
   c. Spiral reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
5. 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.
6. Tie ground wires to the interior of reinforcing steel to prevent displacement during concreting operations.
7. Provide cover plates and screws for hand hole and couplers. Attach cover plates to the poles using lead anchors or embedded threaded inserts.
8. Provide aluminum identification tags on the poles with the following information:
   a. Financial Project ID.
   b. Pole Manufacturer.
   c. Standard Pole Type Number
   d. Pole Length (L)
9. Support locations are for strand release, storage, lifting and transport. Keep BF oriented downward until final erection.
10. Pick-up and support locations shown may vary within a tolerance of ±3".
11. Tether Wire: When required, field-drill the eyebolt hole prior to installation.

Materials:

A. Concrete: Class V Special or Class VI
B. Prestress Strands & Spiral Reinforcing: Specification 641
C. Hand and coupler cover plates: Non-corrosive material
D. Screws: Round headed, chrome plated non-corrosive material

FINANCIAL PROJECT ID:

- Specification 641
- Prestress Strands & Spiral Reinforcing: Class V Special or Class VI
- Concrete: 1" minimum
- Pole Taper: 0.081 in/ft per face
- Spiral reinforcing: 0.5" to assist with removal from forms
- Front Face (FF) and Back Face (BF) section areas
- Tether Wire: Field-drill eyebolt hole prior to installation

Concrete Cover: 1" minimum
Pole Taper for pole width, strands, reinforcing and void: 0.081 inch per face.
Spiral reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
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.
Tie ground wires to the interior of reinforcing steel to prevent displacement during concreting operations.
Provide cover plates and screws for hand hole and couplers. Attach cover plates to the poles using lead anchors or embedded threaded inserts.
Provide aluminum identification tags on the poles with the following information:
Financial Project ID:
Pole manufacturer:
Standard Pole Type Number
Pole Length (L)
Support locations are for strand release, storage, lifting and transport. Keep BF oriented downward until final erection.
Pick-up and support locations shown may vary within a tolerance of ±3".
Tether Wire: When required, field-drill the eyebolt hole prior to installation.
SERVICE AND PEDESTAL POLE TYPE P-II

CONCRETE POLES

DESCRIPTION: REVISED

SERVICE POLE P-II A (12 Ft.) & P-II B (36 Ft.) ELEVATION
(Strands Not Shown)

PEDESTAL POLE P-II C (12 Ft.) ELEVATION
(Strands Not Shown)

NOTES:

- Strand locations 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 2 1/4" to 3 1/2" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2".

SERVICE POLE P-II A (12 Ft.) & P-II B (36 Ft.) ELEVATION
(Strands Not Shown)
SPIRAL REINFORCING ELEVATION
(STRANDS, HOLES, AND FIXTURES NOT SHOWN)

POLE ELEVATION
(STRANDS AND REINFORCING NOT SHOWN)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 33.3% L from Tip End.
- Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optional stepped (PVC) void.

POLE TYPE P-III

CONCRETE POLES
SPiral REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

POLE ELEVATION
(Strands and Reinforcing Not Shown)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 12.5% L from the Tip End.
- * Dimension may vary from 3ƀ" to 4Ƃ" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 4".
**DESCRIPTION:**

**REVISION**

**LAST REVISION:**

**INDEX:**

**FY 2020-21 STANDARD PLANS**

**CONCRETE POLES**

**SHEET INDEX:**

**POLE ELEVATION**

(Strands and Reinforcing Not Shown)

**POLE ELEVATION**

(Strands and Reinforcing Not Shown)

**POLE ELEVATION**

(Strands and Reinforcing Not Shown)

**SPIRAL REINFORCING ELEVATION**

(Strands, Holes, and Fixtures Not Shown)

**NOTES:**

Strands shown are continuous from Tip End to Butt End.

Elevation view scale is exaggerated vertically for clarity.

For final erection, tilt pole upright with single point attachment located a distance 10% L from the Tip End.

* Dimension may vary from 3½" to 5" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½".

**STRAIN POLE TYPE P-VIII**
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 A193B Cold-Drawn
   E. Bolts: ASTM F1554, Grade 55
   F. Washers: ASTM F1554
   G. Steel plates and Pole Cap: ASTM A325 or ASTM A709, Grade 50
   H. Galvanization Bolts, nuts and washers: ASTM F239
   I. All other steel: ASTM A123
7. Pole Fabrication:
   A. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
   B. For spiral reinforcing, one turn is required for spiral splices and two turns are required at the top and bottom of poles.
   C. For reinforcing steel, lap splice to consist of a 2'-0" lap length at each splice, no more than two opposing rebars to be spliced at the same cross section. Stagger lap splices as needed.
   D. Provided a Class 3 surface finish in accordance with Specification 400:
   E. Provide a 1'-0" minimum cover.
   F. Provide handhole and coupler cover plates made of non-corrosive materials. Attach cover plates to poles using lead anchors or threaded inserts embedded in the poles in conjunction with round headed chrome plated screws.
   G. Provide identification markings on the poles where indicated on the following sheets. Include the following information using inset numerals with 1" height or as approved in the Producers' Quality Control Program:
   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 preterminator patch panel.
   B. Furnish and install Surge Protection Devices (SPDs) on all cabling in cabinet.
   C. Furnish and install secondary SPDs protection on outlets for equipment in cabinet.
   D. Ensure that all electrical equipment power is protected and conditioned with SPDs.
   E. Furnish and install Surge Protection Devices (SPDs) on all cabling in cabinet.
   F. Ensure that equipment cabinets are bonded to CCTV pole grounding system.
   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:
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 slabs, etc.) with lowering device manufacturer.
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 alternative, embed 4½" Ø x 18" stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate at 4½" 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 10': ASTM A1011 Grade 50, 55, 60 or 65
      b. Greater than or equal to 10': ASTM A325 Grade 50, 55, 60 or 65
      c. ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield)
   B. Steel Plates: ASTM A36
   C. Bolt Metal: E701X
   D. Bolts, Nuts and Washers:
      a. High Strength Bolts: ASTM F3125, Grade A125, Type 1
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      c. Plate Washers: ASTM A563 (1 per bolt), Split-lock washers and self-locking nuts are not permitted
   F. Handhole Frame:
      a. Handhole Cover: ASTM A361 Grade A, 55, 60 or 65
      b. Aluminum Pole Caps and Nut Covers: ASTM B26 (319-F)
      c. Threaded Bars/Studs: ASTM A36 or ASTM A307
   G. Concrete:
      a. Concrete Class IV (Drilled Shaft) for all environmental classifications.
   H. 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:
      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 1/8" diameter stainless steel rivets or screws.
   F. Locate the following information on the ID Tag:
      1. Financial Project ID
      2. Pole Type
      3. Pole Height
      4. Manufacturer's Name
      5. FY of Steel
      6. Base Wall Thickness
   G. Reinforcement:
      a. high strength bolts: ASTM F3125, Grade A325, Type 1
      b. Nuts: ASTM A563 Grade DH Heavy-Hex
      c. Washers: ASTM F436 Type 1, one under turned element
   H. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      c. Plate Washers: ASTM A563 (1 per bolt), Split-lock washers and self-locking nuts are not permitted
   I. Connection:
      b. Anchor Bolts: Bolt diameter plus 1/2" maximum.
   J. Concrete:
      a. Concrete Class IV (Drilled Shaft) for all environmental classifications.
   K. Reinforcing Steel: Specification 415

5. Coatings:
   A. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F3129
   B. All other steel items including plate washers: ASTM A123

6. Construction:
   A. Foundation: Specification 445, 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.
POLE ASSEMBLY

NOTES:
1. Clamps have been sized for Design Capacity Loads shown in the Clamp Thickness Table, and a Maximum Pole Diameter at the clamp location of 2'-7". Use one clamp per cable.
2. Install a properly sized Weather Head, fastened securely to the standard pipe for each pole location. At locations other than the wire entrance location, 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.

<table>
<thead>
<tr>
<th>Clamp Thickness Table</th>
<th>Cable Diameter (in)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in)</th>
</tr>
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<td></td>
<td>2&quot;</td>
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<td>25</td>
<td>3/8</td>
</tr>
</tbody>
</table>

CUT-AWAY

(a) Hook for Wiring, 1/8" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

CAPTENARY AND MESSENGER WIRE CLAMPS

POLE TOP

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.

Materials:

- A. Pole: ASTM A1011 Grade 50, 55, 60 or 65 (less than 12") or ASTM A572 Grade 50, 60 or 65 (greater than or equal to 12") or ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield).
- B. Steel Plates and Pole Cap: ASTM A690 or ASTM A709 Grade 50.
- C. Weld Metal: E70XX.
- D. Bolts: ASTM F3125, Grade A325, Type 1.
- Nuts: ASTM A563.
- Washers: ASTM F914.
- E. Anchor Bolts: ASTM F1554 Grade 55 with ASTM A563 Grade A heavy hex nuts and ASTM A36 plate washers.
- F. Handhole Frame: ASTM A109 Grade 36 or ASTM A36.
- G. Handhole Cover: ASTM A1011 Grade 50, 60 or 65.
- H. Stainless Steel Screws: AISI Type 316.
- I. Reinforcing Steel: ASTM A615 Grade 60.
- J. Galvanization: Bolts, nuts and washers: ASTM F2329 All other steel including plate washer: ASTM A123
- K. Concrete: Class IV (Drilled Shaft) for all environment classifications.

Fabrication:

- A. Welding:
  - a. Specification 460-6.4 and
- B. Poles:
  - a. Round or 16-sided (Min.)
  - b. Taper pole diameter at 0.14 inches per foot
  - c. Fabricate Pole longitudinal seam welds (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
    - 2. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of one and one-half times the inside diameter of the female section plus 6 inches.
  - d. Pole shaft may be either one or two sections (with telescopic field splice)
  - e. Circumferentially welded pole shafts and laminated pole shafts are not permitted
  - f. 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
  - g. Pole shaft may be either one or two sections (with telescopic field splice)
  - h. Exempt Anchor Bolts, bolt hole diameters are bolt diameter plus 1/8 and anchor bolt holes are bolt diameter plus 1/2 (Max) prior to galvanizing.
- C. Identification Tag:
  - a. 2" x 4" (Max.) aluminum tag
  - b. Locate on the inside of the pole and visible from the handhole
  - c. Secure with 1/4" diameter stainless steel rivets or screws
  - d. Include the following information on the ID Tag:
    - 1. Financial Project ID
    - 2. Pole Type
    - 3. Pole Height
    - 4. Manufacturers’ Name
    - 5. Yield Strength (Fy of Steel)
    - 6. Base Wall Thickness
  - e. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus 1/8 and anchor bolt holes are bolt diameter plus 1/2 (Max) prior to galvanizing.

6. Pole Installation:

- A. Do not install additional wire access holes (not shown in this Index) with a diameter that exceeds 1/2" in diameter.
- B. Install Anchor Bolts in accordance with Specification 649-5
- C. Cable Supports: Electrical Cable Guides and Eyebolts
  - a. Locate top and bottom cable guides within the pole aligned with each other.
  - b. Location one cable guide 2" below the handhole.
  - c. Position lower cable guide 1" directly below the top of the tenon.
  - d. Position Park Stands 2" below the top of the handhole.

7. Cabinet Installation:

- A. Splice fiber optic cables in cabinet to preterminer patch panel.
- B. Furnish and install Surge Protection Devices (SPDs) on all cabling in cabinet.
- C. Furnish and install secondary SPDs protection on outlets for equipment in cabinet.
- D. Ensure that all electronic equipment power is protected and conditioned with SPDs.
- E. Install the pole mounted cabinet with the hinges next to the pole.
- F. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
- G. Sizes and types of conduits and inner ducts for network communications between the pullbox and cabinet are stated in the Contract Documents.
- H. Install public welfare equipment cabinet parallel to the roadway or as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
- I. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking stands, etc.) with lowering device manufacturer.

7. Lowering Device Installation:

- A. Place the lowering cable that moves within the pole in an interior conduit to 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 the lowering device perpendicular to the roadway or as shown in the plans. Position Giant Type CCTV Camera
- C. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking stands, etc.) with lowering device manufacturer.
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"

ASSEMBLY

FOUNDATION

ELEVATION

PLAN

PLAN

ELEVATION

BASE PLATE

DATA SCREEN (See Spec. 649)

Foundation

FINISHED GRADE

Section on Sheet 2.

4. Work these details with Data for clarity.

3. Conduit and CSL Tubes not shown for each bolt.

2. Double Nuts: Bottom nut may be half-height (jam nut). Provide individual nut covers (not shown) for each bolt.

1. Shaft Length is based on 1'-0" height above the finished grade.

NOTES:
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:

STEEL CCTV POLE

FY 2020-21

STANDARD PLANS

REV 649-020

INDEX

SHEET 5 of 6
### Arm and Base Plate

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GENERAL NOTES:
1. Shop Drawings. This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.
2. Prior to Fabrication: Verify the installed foundation elevation will result in the required signal elevation and adjust the Pole height as needed.
3. Details for Signal and Sign locations, Signal Head attachment, Sign attachment, Pedestrian hand attachment, and Foundation Conduit are not shown for simplicity.

4. Materials:
   A. Poles, Mast Arms and Backing Rings
      - Less than "1/4" ASTM A1011 Grade 50, 55, 60 or 65
      - Greater than or equal to "1/4" ASTM A52 Grade 50, 55, 60 or 65
      - ASTM A595 Grade A (55 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 F1554 Grade 55
      - Nuts: ASTM A563 Grade A Heavy-Hex
      - Washers: ASTM F436 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F1154 Grade 55
      - Nuts: ASTM A36 Grade A Heavy-Hex
      - Washers: A36 Heavy-Hex (2 per bolt)
   F. Threaded Bars/Studs: ASTM A36 or ASTM A307
   G. Handhole Frame: ASTM A1090 or ASTM A468, Grade 36
   H. Handhole Cover: ASTM A511 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 460-8-A and
      - AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaries, and Traffic Signals Section 14.4
   B. Poles and Mast Arms:
      - Round or 12-sided (Min.)
      - Taper pole diameter at 0.14 inches per foot
      - Upright poles must be a single section. 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 splice detail
   C. Fabricate longitudinal seam welds with 60 percent minimum penetration or fusion welds except:
      1. Use a full-penetration groove weld within 6 inches of the circumferential hub-to-plate connection.
      2. Use full-penetration groove welds on the female end of longitudinal welds (i.e., shod type) field splices for a minimum length of one and one-half times the inside diameter of the female section plus 6 inches.
      3. Locate longitudinal welds along the:
         - Lower quadrant of the arm.
         - Same side of the pole as the arm connections.
      4. 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.
      5. Provide a "7 x 4" hole at the top of the pole for signal wiring support (See Sheet 6)
      i. First and Second arm camber angle = 2
      ii. Bolt holes diameter as follows:
         - 1/4" diameter plus (Max).
   D. Coatings:
      - Bolt diameter plus 1/2" (Max.)
   E. Anchor Bolts: Bolt diameter plus 1/2" (Max.)

6. Coatings:
   A. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F2329
   B. All other steel items including plate washers ASTM A123

7. Construction:
   A. Foundation: Specification 455 Drilled Shaft, except that payment is included in the cost of the Mast Arm.
   B. Install Pole vertically.
   C. Place structural grout pad with drain between top of foundation and bottom of baseplate in accordance with Specification 649-7.
   D. Attach Sign Panels and Signals centered on the elevation of the Mast Arm.
   E. Wire Access holes are 1/4" or less in diameter.

MATERIALS: Baseplate in accordance with Specification 649-7.

GENERAL NOTES:
1. Constructed to project specifications.
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 hand attachment, and Foundation Conduit are not shown for simplicity.

4. Materials:
   A. Poles, Mast Arms and Backing Rings
      - Less than "1/4" ASTM A1011 Grade 50, 55, 60 or 65
      - Greater than or equal to "1/4" ASTM A52 Grade 50, 55, 60 or 65
      - ASTM A595 Grade A (55 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 F1554 Grade 55
      - Nuts: ASTM A563 Grade A Heavy-Hex
      - Washers: ASTM F436 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F1154 Grade 55
      - Nuts: ASTM A36 Grade A Heavy-Hex
      - Washers: A36 Heavy-Hex (2 per bolt)
   F. Threaded Bars/Studs: ASTM A36 or ASTM A307
   G. Handhole Frame: ASTM A1090 or ASTM A468, Grade 36
   H. Handhole Cover: ASTM A511 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

ELEVATION AND NOTES
1. Provide 7" x 4" hole at the top of the pole for signal wiring support (See Sheet 6).
2. First and Second arm camber angle = 2
3. Bolt holes diameter as follows:
   - 1/4" diameter plus (Max.)
4. Anchor Bolts: Bolt diameter plus 1/2" (Max.)

MATERIALS: Baseplate in accordance with Specification 649-7.

GENERAL NOTES:
1. Constructed to project specifications.
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 hand attachment, and Foundation Conduit are not shown for simplicity.

4. Materials:
   A. Poles, Mast Arms and Backing Rings
      - Less than "1/4" ASTM A1011 Grade 50, 55, 60 or 65
      - Greater than or equal to "1/4" ASTM A52 Grade 50, 55, 60 or 65
      - ASTM A595 Grade A (55 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 F1554 Grade 55
      - Nuts: ASTM A563 Grade A Heavy-Hex
      - Washers: ASTM F436 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F1154 Grade 55
      - Nuts: ASTM A36 Grade A Heavy-Hex
      - Washers: A36 Heavy-Hex (2 per bolt)
   F. Threaded Bars/Studs: ASTM A36 or ASTM A307
   G. Handhole Frame: ASTM A1090 or ASTM A468, Grade 36
   H. Handhole Cover: ASTM A511 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

ELEVATION AND NOTES
1. Provide 7" x 4" hole at the top of the pole for signal wiring support (See Sheet 6).
2. First and Second arm camber angle = 2
3. Bolt holes diameter as follows:
   - 1/4" diameter plus (Max.)
4. Anchor Bolts: Bolt diameter plus 1/2" (Max.)

MATERIALS: Baseplate in accordance with Specification 649-7.
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 for each bolt.

PLAN

SECTION A-A

JOINT WELD DETAIL

DETAIL 'A'

FOUN DB ORN AND BASE PLATE DETAILS
**Description:**

- **Mast Arm Assembly**
- **Arm Splice**
- **Arm Connection**
- **Pole Connection Plate**
- **'FT'**
- **Bottom Plates**
- **Typ. Top and Base Plate**
- **Mast Arm Extension**
- **'F'**
- **'FL'**
- **Connection Bolt**
- **1/2" Ø Threaded Bar/Stud With Self Locking Nut**
- **Six 'FP' Ø Connection Bolts (May Vary For Special Design)**
- **Center of Pole**
- **Face of Arm Base Plate at 4' Arm**
- **4" Ø Wiring Hole (Typ.)**
- **Pole Connection Plate**
- **Four 'FP' Ø Connection Bolt**
- **Center of Pole**
- **Six 'FP' Ø Connection Bolts**
- **Wall Thickness**
- **Seam Weld (Typ.)**
- **Splice = 3'-0" (Nominal) (2'-0" Min.)**
- **Splice = 3'-0" (Nominal) (2'-0" Min.)**
- **10/29/2019 8:22:30 AM**
- **REVISION**
- **LAST REV.**
- **STANDARD PLANS**
- **FY 2020-21**
- **INDEX**
- **649-031**
- **3 of 6**

**Note:**

1. Install the 'Slip joint' splice with a tight fit and no change in the Mast taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly and the seam weld is in the proper location (seam located at the bottom side of the Arm).

**Detail 'B':**

- Mast Arm Extension Base Plate
- Pole Connection Plate
- 'FP' Ø Connection Bolt
- Top Top and Bottom Plates (Top Conn. Plate Similar)
- Bottom Connection Plate

**Detail 'C':**

- Mast Arm Extension Base Plate
- Pole Connection Plate
- 'FP' Ø Connection Bolt
- Edge of Mast Arm Extension
- Top Top and Bottom Plates (Top Conn. Plate Similar)

**Section B-B:**

- Mast Arm Extension
- Pole Connection Plate
- Center Of Pole
- 4" Ø Wiring Hole (Typ.)
- 'FP' Ø Connection Bolt

**Section C-C:**

- Mast Arm Extension
- Pole Connection Plate
- Edge of Top Connection Plate
- Opening

**Section D-D:**

- Mast Arm Extension Base Plate
- Pole Connection Plate
- 'FP' Ø Connection Bolt
- Inside Radius Measured Flat To Flat
- Seam Weld (Typ.)
- Inside Bend Radius 'FD', 'FH', 'UC'
- Base Diameters 'FB', 'FF', 'UC'

**SINGLE ARM CONNECTIONS & SPLICE DETAILS**
DESCRIPTION:

MAST ARM ASSEMBLY

SECTION E-E

SECTION F-F

SECTION G-G

NOTE:

1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.

2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.

3. Match mark the Arm and Connection Plates to ensure proper assembly and the seam weld is in the proper location (seam located at the bottom side of the Arm).

4. "UF" measured counter clockwise from 4° First Mast Arm Extension.

5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

DOUBLE ARM CONNECTIONS & SPLICE DETAILS

FA 2020-21
STANDARD PLANS

MAST ARM ASSEMBLIES

INDEX

649-031
4 of 6
Mast Arm Assemblies

**NOTES:**
1. Galvanized steel luminaire type and luminaire length may be found in the Lighting Plans.
2. Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.
3. The fabricator may substitute a 1/2" thick flat plate with the same flange width, height, and length as the MC 10x33.6 Channel section.
4. 'L' measure counter clockwise from First Mast Arm.

---

**DESCRIPTION:**

**FY 2020-21 STANDARD PLANS**

**INDEX**

**SHEET** 649-031 5 of 6
**NOTES:**

1. Handhole covers may be omitted when Terminal Compartment is provided.
2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required for locations.
3. Terminal Compartment Frame Height 2'-0" minimum to 2'-4" maximum. Align bottom of Terminal Compartment a minimum of 1" below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.

---

**MAST ARM ASSEMBLY**

- **COVER**
  - 11 Gage Mast Arm Handhole Cover
  - 3/8" Ø Hole (Typ.)
  - Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

- **FRAME**
  - 5½" OD x 1½" Wall Thick Std. Mast Arm Handhole Frame

- **SECTION J-J**
  - Partial Penetration Weld
  - Mast Arm Handhole Frame
  - 11 Gage Handhole Cover
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

- **SECTION K-K** (Thru Handhole)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Handhole Cover
  - Full Penetration Weld

- **SECTION K-K** (Terminal Compartment)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**POLE TOP**

- **ISO VIEW (Option 'a')**
  - Pole Cap Plate
  - Lifting Bar
  - Center Of Pole, Pole Cap And Lifting Bar

- **TOP VIEW (Option 'a')**
  - Pole Cap Plate
  - 1/2" Overhang (Min.)
  - Lifting Bar
  - Center Of Pole, Pole Cap And Lifting Bar

- **CUT-AWAY (Option 'a')**
  - Stainless Steel Screw (Typ.)
  - Polished Cast Aluminum Pole Cap Plate
  - 1/8" Min. Thick.
  - 3/4" Hook For Wiring.

**HANDHOLE AND POLE TOP DETAILS**

- **COVER**
  - 11 Gage Handhole Cover
  - 3/8" Ø Hole (Typ.)
  - Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

- **SECTION J-J**
  - Partial Penetration Weld
  - Mast Arm Handhole Frame
  - 11 Gage Handhole Cover
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

- **SECTION K-K** (Thru Handhole)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Handhole Cover
  - Full Penetration Weld

- **SECTION K-K** (Terminal Compartment)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**COVER**

- 11 Gage Handhole Cover (See Note 1)
- 3/8" Ø Hole (Typ.)
- Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

---

**FRAME**

- 5½" OD x 1½" Wall Thick Std. Mast Arm Handhole Frame

---

**SECTION J-J**

- Partial Penetration Weld
- Mast Arm Handhole Frame
- 11 Gage Handhole Cover
- 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**SECTION K-K** (Thru Handhole)

- Partial Penetration Weld (Typ.)
- 11 Gage Handhole Cover
- Full Penetration Weld

---

**SECTION K-K** (Terminal Compartment)

- Partial Penetration Weld (Typ.)
- 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)
- 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**HANDHOLE AND POLE TOP DETAILS**

- **COVER**
  - 11 Gage Handhole Cover
  - 3/8" Ø Hole (Typ.)
  - Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

- **SECTION J-J**
  - Partial Penetration Weld
  - Mast Arm Handhole Frame
  - 11 Gage Handhole Cover
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

- **SECTION K-K** (Thru Handhole)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Handhole Cover
  - Full Penetration Weld

- **SECTION K-K** (Terminal Compartment)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**POLE TOP**

- **ISO VIEW (Option 'a')**
  - Pole Cap Plate
  - Lifting Bar
  - Center Of Pole, Pole Cap And Lifting Bar

- **TOP VIEW (Option 'a')**
  - Pole Cap Plate
  - 1/2" Overhang (Min.)
  - Lifting Bar
  - Center Of Pole, Pole Cap And Lifting Bar

- **CUT-AWAY (Option 'a')**
  - Stainless Steel Screw (Typ.)
  - Polished Cast Aluminum Pole Cap Plate
  - 1/8" Min. Thick.
  - 3/4" Hook For Wiring.

---

**COVER**

- 11 Gage Handhole Cover
- 3/8" Ø Hole (Typ.)
- Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

---

**FRAME**

- 5½" OD x 1½" Wall Thick Std. Mast Arm Handhole Frame

---

**SECTION J-J**

- Partial Penetration Weld
- Mast Arm Handhole Frame
- 11 Gage Handhole Cover
- 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**SECTION K-K** (Thru Handhole)

- Partial Penetration Weld (Typ.)
- 11 Gage Handhole Cover
- Full Penetration Weld

---

**SECTION K-K** (Terminal Compartment)

- Partial Penetration Weld (Typ.)
- 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)
- 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**HANDHOLE AND POLE TOP DETAILS**

- **COVER**
  - 11 Gage Handhole Cover
  - 3/8" Ø Hole (Typ.)
  - Threaded Hole For 1/2" Ø Hex Head Screw (Typ.)

- **SECTION J-J**
  - Partial Penetration Weld
  - Mast Arm Handhole Frame
  - 11 Gage Handhole Cover
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

- **SECTION K-K** (Thru Handhole)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Handhole Cover
  - Full Penetration Weld

- **SECTION K-K** (Terminal Compartment)
  - Partial Penetration Weld (Typ.)
  - 11 Gage Waterproof Terminal Compartment. Cover Installed With Waterproof Gasket. (See Note 2 And 3)
  - 3/8" Ø Stainless Steel Hex Head Screw (Typ.)

---

**POLE TOP**

- **ISO VIEW (Option 'a')**
  - Pole Cap Plate
  - Lifting Bar
  - Center Of Pole, Pole Cap And Lifting Bar

- **TOP VIEW (Option 'a')**
  - Pole Cap Plate
  - 1/2" Overhang (Min.)
  - Lifting Bar
  - Center Of Pole, Pole Cap And Lifting Bar

- **CUT-AWAY (Option 'a')**
  - Stainless Steel Screw (Typ.)
  - Polished Cast Aluminum Pole Cap Plate
  - 1/8" Min. Thick.
  - 3/4" Hook For Wiring.
NOTES:
1. As an option, pedestrian signals may be installed on concrete poles and pedestals using lead anchors.
2. Repair drilled or punched holes in galvanized steel poles or pedestals in accordance with Specification 562.
4. See APL for Department-approved Pedestrian Signal Assemblies and hardware.
5. Construct footing with Class I Concrete, footing may be Cast-In-Place (CIP) or Precast.
6. For Steel Strain Poles see Index 649-010.
7. For Prestressed Concrete Poles see Index 641-010.
8. Install 4 ~ \( \frac{5}{8} \times 36' \) Anchor Bolts With Double Nuts. (ASTM F1554 Grade 55)
9. Meet the requirements of Specification 646 for aluminum poles and transformer bases.
NOTES:
1. A transformer base is required for both conventionally-powered and solar-powered applications (conventional power shown).
2. Install the RRB in pairs, one on either side of approach traffic.
3. Install controller on the backside of post from approach traffic.
4. Install a 30" x 30" W11-2 sign on two-lane roadways and a 36" x 36" W11-2 sign for multiple lane roadways.
5. Install push button and R10-25 sign in accordance with Index 665-003.
6. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.
7. Meet the requirements of 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 removable transformer base.
10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.
11. For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.

3. Install controller on the backside of post from approach traffic.

6. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

11. For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.
NOTES:

1. Materials:
   A. Sign panels, wind beams and associated hardware: See Index 700-020
   B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL
   C. Wire and associated hardware requirements: See Specification 634

2. Type B and C Attachments:
   A. Extend wind beams to within 6" of the sign edge.
   B. Number of sign hangers required based on sign width:
      a. Sign depth < 3'-6": One
      b. 3'-6" ≤ sign width ≤ 7'-0": Two
   C. Number of wind beams required based on sign width:
      a. Sign depth < 3'-6": One
      b. 3'-6" ≤ sign depth < 7'-0": Two

3. Type D Attachments:
   Maximum sign width = 7'-0"

4. Align the bottom edges of signs to approximately the same elevation.

5. Use a minimum of 2 bolts with a minimum spacing of 2" for overlapped connection of the adjustable hangers.

DESCRIPTION:

A. Extend wind beams to within 6" of the sign edge.
B. Number of sign hangers required based on sign width:
   a. Sign depth < 3'-6": One
   b. 3'-6" ≤ sign width ≤ 7'-0": Two
C. Number of wind beams required based on sign depth:
   a. Sign depth < 3'-6": One
   b. 3'-6" ≤ sign depth < 7'-0": Two

TYPICAL INSTALLATIONS FOR SIGN PANEL(S) MOUNTED ON SPAN WIRE

1. Materials:
   A. Sign panels, wind beams and associated hardware: See Index 634-001
   B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL
   C. Wire and associated hardware requirements: See Specification 634

2. Type B and C Attachments:
   A. Extend wind beams to within 6" of the sign edge.
   B. Number of sign hangers required based on sign width:
      a. Sign depth < 3'-6": One
      b. 3'-6" ≤ sign width ≤ 7'-0": Two
   C. Number of wind beams required based on sign width:
      a. Sign depth < 3'-6": One
      b. 3'-6" ≤ sign depth < 7'-0": Two

3. Type D Attachments:
   Maximum sign width = 7'-0"

4. Align the bottom edges of signs to approximately the same elevation.

5. Use a minimum of 2 bolts with a minimum spacing of 2" for overlapped connection of the adjustable hangers.
GENERAL NOTES:

1. Lowering device to be shipped ready for pole attachment to include 100 ft. of composite power and signal cable prewired to lowering device at the factory.

2. The lowering device manufacturer shall supply both a portable lowering tool with a manual hand crank and a half-inch chuck variable-speed reversible industrial-duty electric drill that matches the winch’s manufacturer-recommended revolutions per minute. One lowering tool per every 10 lowering devices is required.

3. The lowering device manufacturer shall provide an on-site installation inspection and operator instruction and certification. This ensures the product is assembled correctly and that all necessary persons are trained in the proper, safe operation of the system. Before erecting the first pole the contractor must contact the lowering device supplier and schedule a manufacturer’s representative to be on-site.


5. Camera to be mounted to camera junction box and stabilizing weight via 1½ Standard NPT Pipe Thread.

6. Use air terminal extension when the pole top junction box is wider than top of pole.

7. The stainless steel device lowering cable shall be installed inside the pole within a 1½ diameter PVC conduit.

8. All communication and power cables must be neatly bundled and secured.


10. See Index 641-020 for concrete pole details and Index 649-020 for steel pole details.
GENERAL NOTES:

1. Verify the pole type, the dimensions of the pole at the 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.
Twisted Pair or Loop Lead-In in Saw-Cut
Flexible Conduit
PVC Coated
30"
Flexible Conduit
PVC Coated
30"

Twisted Pair or Loop Lead-In in Saw-Cut
Rigid Conduit
Connector
Gutter
Roadway Pavement
Slot (See General Note 8)
PVC Coated Flexible Conduit
To Pullbox or Cabinet

ELEVATION
INSTALLATION WITHOUT CURB & GUTTER

INSTALLATION WITH CURB & GUTTER

Twisted Pair or Loop Lead-In in Saw-Cut
Intermediate Pullbox
PVC Coated Flexible Conduit
To Pullbox or Cabinet

Twisted Pair or Loop Lead-In in Saw-Cut
Intermediate Pullbox
PVC Coated Flexible Conduit
To Pullbox or Cabinet

Twisted Pair or Loop Lead-In in Saw-Cut
Rigid Conduit
Connector
Gutter

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. Insure the conduit fits snug within the drilled hole.
2. Install a section of flexible conduit at least 6" into the hole from the back side of the curb but not within 2" of the top of the hole.
3. Fill the top of the hole with loop sealant to the level of the curb surface.
4. Use nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

ALTERNATIVE 1

ALTERNATIVE 2

NOTES:
1. Cut a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.
2. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.
3. Alternative installations may be approved by the State Traffic Operations Engineer.
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.

NOTE: Loop conductors must follow saw-cut to bottom forming slack section at joint.
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.
SOP 11

SOP 12

SOP 13

SOP 14

SOP 15

SOP 16

SOP 17

SOP 18

SOP 19

From Normal Operation (Dwell) To Normal Operation (Dwell)

From Normal Operation (Track Clearance) To Normal Operation (Track Clearance)

From Normal Operation (Dwell) To Normal Operation (Dwell)

From Normal Operation (Track Clearance) To Normal Operation (Track Clearance)

HIGH VOLUME

LOW VOLUME
DESCRIPTION:

REVISION LAST

11/01/17

TRAFFIC MONITORING SITE

695-001

1 of 7

CABINET LAYOUT DETAILS (Four Lanes or Less)

1. Traffic monitoring site cabinet includes:
   A. One adjustable Shelf; (equipped as shown)
   B. One backplane assembly; (equipped as shown)
   C. One J1 receptacle with mounting bracket;
   D. One J1 equipment cable 5 ft. long (Reference Sheet 4); and
   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 \( \frac{3}{16} \) - \( \frac{1}{16} \) 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.

J1 MOUNTING BRACKET
NOTES:
1. The contractor is responsible for contacting the EMS Manager in the Transportation Statistics Office for lane number information and verification.
2. The equipment cable can accommodate up to four lanes of inductive loop and piezo sensor inputs. (Reference Sheet 1 for cabinet layout)
3. For more than four lanes and up to eight lanes of inputs, the following options are available:
   A. Second Vehicle Speed/Class. Unit and separate equipment cable connecting to a second J1 receptacle, or
   B. Single Vehicle Speed/Class. Unit capable of up to eight lanes of inputs and a single equipment cable with split ends to fit two J1 receptacles. (Reference Sheet 2 detail)
4. Numbers in parenthesis in the pinout chart identify lane numbers when a second backplane for lanes 5 through 8 is required.
5. Cable Ends must be fabricated to fit the vehicle Speed/Classification Unit.
TYPICAL FOR UP TO 4 LANES OF SENSOR LEADS PULLED TO ONE SIDE OF THE ROADWAY

ROADWAYS WITH PAVED SHOULDERS

1. Install axle sensors and loops associated with axle sensors after placement of the friction course.
2. Cut a 3½ deep slot for the Inductive loops. Loop slots will be cut wide enough to allow unforced placement of the wire into the bottom of the slot. Four turns of #14 AWG place the IMSA 51-7 copper wire in the slot. Place short pieces of backer rod (2” to 3” in length) every 18” to 24” to hold the loop wire in the bottom of the slot.
3. Twist loop leads at the rate of 8 to 16 twists per foot. Loops that are within 150’ of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances over 150’, #14 IMSA 50-2 shielded loop in cable must be spliced to the loop wire twisted pair at the first pull box to which the loop wire is pulled.
4. Marking will consist of two rounds of contrasting colored tape, one color for the lane number and the second color for the lead loop location in the lane. The first band closest to the cabinet will represent the lane number, one round of tape and a second round of a contrasting colored tape for the lead loop in the lane. The trailing loop would not have a second contrasting colored band of tape.
5. See Index 635-001 for pull box and apron details.
6. All splices will be performed using splice kits designed for direct burial. Splice kits will include screw on wire connectors and a meshing with a sufficient sealant to fully encapsulate the spliced connections. Tape splices are not permitted.
7. Use a chalk line or string and paint to layout the position of the sensor and lead-in cable slots. Ensure saw cuts do not deviate more than 0.5 inches from the chalk line. Use a single blade or ganged blade saw wide enough to cut the axle sensor slot at full width in a single pass. Cutting two slots and chipping out roadway material between them is not allowed.
8. All sensor slots and any cuts in the roadway will be thoroughly blown out to ensure there is no dust or debris prior to installation of sensors or leads.
9. Install Exit Windows at least 2’ apart.

NOTES:

Flexible Conduit
Or Non-Metallic
3" Ø PVC Conduit

Curb & Gutter ROADWAYS

Lane Layout for TMS Inductive Loop and Axle Sensor

Traffic Monitoring Site

Index 695-001

Sheet 5 of 7
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. Red insulation is THHN or THWN for positive 12 volts wiring. Black insulation is THHN or THWN for negative 12 volts wiring. Green insulation is THHN or THWN for ground bonding of the solar panel frame to the pole and earth.

4. Solar panel should be installed facing due south with angle of tilt equal to the sum of the following equation: The Latitude of the panel’s location, multiplied by 0.76, plus 3.1 degrees. Equation expressed as (LAT)(0.76)+(3.1°)

5. Encase all wiring from the weather head to the solar panel in outdoor flexible conduit.

6. Concrete Base Requirements:
   a. 4' poles: 2'-0" X 2'-0" wide, a depth of 2'-0"
   b. 12', 15' or 20' poles: 3'-0" X 3'-0" wide, a depth of 3'-0"
   c. 30' or 35' poles: 3'-0" X 3'-0" wide, a depth of 4'-0"

SOLAR POWER POLE
WITH POLE MOUNTED CABINET
(Portable Traffic Monitoring Sites)
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, Wind Beams and Column (Post) Materials:
   A. Aluminum Plates: ASTM B209, Alloy 6061-T6
   B. Aluminum Bars and Extruded Shapes: ASTM B221, Alloy 6061-T6
   C. Aluminum Structural Shapes: ASTM B308 Alloy 6061-T6
   D. Cast Aluminum: ASTM B288, 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. Aluminum Hex Nuts: ASTM F467 Alloy 6061-T6 or 6262-T9
   C. Aluminum Washers: ASTM B221, Alloy 7075-T6

4. Stainless Steel Bolts, Nuts and Washers may be used in lieu of the Aluminum button head and flat head bolts as follows:
   A. Stainless Steel Bolts: ASTM F 593 Alloy 20, Condition A, CWI or SM1
   B. Stainless Steel Nuts: ASTM F 594
   C. Stainless Steel Washers: ASTM F 596
   D. Stainless Steel Hex Nuts: ASTM F 597
   E. Stainless Steel Washers: ASTM F 598

5. Sign Column (Post) Bolts, Nuts and Washers:
   A. Galvanized U-Bolt (Column) ASTM A449 or ASTM A193 B7 according to ASTM D1232 with double nuts
   B. Aluminum Bolts (Sliece): ASTM F468, Alloy 6061-T6 or 2024-T4 with Hex Nuts F467 6061-T6 or 6262-T9 and Washers B221, Alclad 2024-T4
   C. Galvanized High Strength Hex Head Bolts (Bsw/Boots): ASTM F3153, Grade 55/55, Type 1
   D. Galvanized Hex Nuts: ASTM A563 Grade DH
   E. Galvanized Washers: ASTM F 596
   F. Galvanized Bolts (Sliece): ASTM A307 with Galvanized Hex Nuts and Washers

6. Coatings:
   A. Aluminum Fasteners: Anodic coating (0.0002 inches min.) and chromate sealed
   B. High Strength Steel Bolts Nuts and Washers: ASTM F3329
   C. All other steel items (excluding stainless steel) Hot dip Galvanized - ASTM A123

7. BREAKAWAY SUPPORT REQUIREMENTS: Install non-fragile aluminum column (post) (larger than 35") with breakaway supports as shown on Sheet 4. Signs shielded by barrier wall or guardrail do not require breakaway support.
**CALCULATION OF SIGN CLUSTER CENTROID**

Let:

- $A_n$ = Area of individual sign
- $b_n$ = Height of the edge of pavement from the mounting elevation
- $C_n$ = Height of the centroid of the sign or cluster from the edge of pavement elevation
- $a_n$ = Individual sign height
- $h_n$ = Individual sign width
- $Y_n$ = Height of sign or cluster centroid from groundline
- $X_n$ = Individual sign width
- $Y_{C_n}$ = Centroid horizontal location of sign or cluster from $C_n$ Aluminum Column (Post)
- $Y_{C_n}$ = Centroid height of sign or cluster from bottom of sign cluster
- $Y_{n}$ = Individual sign centroid horizontal location from $C_n$ Aluminum Column (Post)
- $Y_{n}$ = Individual sign centroid height from bottom of sign cluster

**NOTES:**

1. For 'B' & 'C' see Index 700-101 and Roadway Plans.
2. Do not exceed an area of 30 SF or a width of 60 inches for a sign or a sign cluster, including rotated sign panels.
3. Vertical sign spacing (1" shown on Sign Cluster detail) also applies to rotated signs.
### ALUMINUM COLUMN (POST) SELECTION TABLE (O.D. in.)

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<th>Diameter (in)</th>
<th>3 ft</th>
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### TOTAL PANEL AREA (SF)

- 30 sf
- 29 sf
- 28 sf
- 27 sf
- 26 sf
- 25 sf
- 24 sf
- 23 sf
- 22 sf
- 21 sf
- 20 sf
- 19 sf
- 18 sf
- 17 sf
- 16 sf
- 15 sf
- 14 sf
- 13 sf
- 12 sf
- 11 sf
- 10 sf
- 9 sf
- 8 sf
- 7 sf
- 6 sf
- 5 sf
- 4 sf
- 3 sf

### FOUNDATION TABLE

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<th>Embedment Depth (ft)</th>
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<td></td>
<td>4.0</td>
<td>3.0</td>
<td>2.5</td>
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### 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.

### STANDARD PLANS

- **4'-0" (Max.)**
- **6'-3" (Min.)**

### SINGLE COLUMN GROUND SIGNS

**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.
SLIP BASE AND FOUNDATION DETAILS

STUB/SLEEVE & BASE PLATE DETAILS

1. Foundation Notes for Slip Base:
   A. Place Stub into concrete foundation given in the FOUNDATION TABLE using Class I Concrete.
   B. Slip Base Fabrication Notes:
      A. The difference between the O.D. of the post and I.D. of the Sleeve must be ≤ 0.5".
      B. Either a Welded Stub or Bolted Stub/Sleeve Base may be used in Slip Base.
      C. For cast base plates bolted to foundation stubs, use a foundation stub the same size as the sign column.

2. Slip Base Assembly Instructions:
   A. Assemble the Slip Base as follows:
      1. Insert Post into Sleeve and connect using 2 – 1/2" diameter Sleeve Bolts. (See Detail 'A')
      2. Assemble top base plate to bottom Base Plate using Base Bolts (High strength) with 3 washers per bolt. (See Detail 'A')
      3. Slip-Base Assembly Instructions:
         1. Tighten Base Bolts to the maximum possible with a 12" or 15" wrench (this will bed the washers and shims and clear the bolt threads).
         2. Loosen each Base Bolt one turn.
         3. Under the supervision of the Engineer, use a calibrated wrench to tighten bolts to the torque prescribed in the SLIP BASE DETAILS Table. Over tightened Base Bolts are not permitted.
         4. Distress bolt threads at the junction with nuts to prevent loosening. Repair damaged galvanizing.
         5. Tighten all base bolts using a 2 - 1/2" diameter Sleeve Bolt. (See Detail 'A')
      B. Orient the Bolt Keeper Plates in the Direction of Traffic.
      C. For cast base plates bolted to foundation stubs, use a foundation stub the same size as the sign column.

3. SLIP BASE DETAILS

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<tr>
<th>Column (Post) Size</th>
<th>Sleeve (Max) Thickness</th>
<th>Sleeve Height</th>
<th>Post Height</th>
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<th>Base Bolt Dia</th>
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<td>1/2</td>
<td>3/8</td>
<td>345</td>
<td>1/2</td>
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**SLIP BASE AND FOUNDATION DETAILS**

(Non-Frangible Column, Typ.)

**SLIP BASE AND FOUNDATION DETAIL IN CONCRETE**

(Non-Frangible Column In Crossovers, Medians & Sidewalks)
Optional Slotted Holes

DETAIL "B"

ALUMINUM SOIL PLATE DETAIL

DRIVEN POST DETAIL

(Single Frangible Post In Crossovers, Medians & Sidewalks)
WIND BEAM CONNECTIONS DETAILS

1. Use stainless steel hex head bolts with nylon washer under head and washer under nut may be used in lieu of 3/8" 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 § Sign. Install two wind beams on signs with heights greater than 12' and less than or equal to 66'.
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. Stowed 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. Stake bolts, wing nuts, and washers in the bottom corner of the sign when in the deployed (up) position.
### SINGLE COLUMN GROUND SIGNS

**FY 2020-21 STANDARD PLANS**

**INDEX 700-010**

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### Single Column Ground Signs

**REVISION**: 01/01/19  
**DESCRIPTION**:  
**SHEET**: 10/29/19 8:23:09 AM  
**INDEX**: 11/01/19  
**Standard Plans**: FY 2020-21  

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GENERAL NOTES:
1. Refer to Index 700-010 for additional notes, assembly of base connection and material specifications not given in this Index.
3. Place galvanized steel shims between the Sleeve and Post to obtain a tight fit between the Post and Sleeve.
4. Wind Beam and Vertical Brace: Use wind beam and vertical brace size that is suitable for the sign size.
5. Provide 2 ~ 0.0149" Thick (28 gauge) and 2 ~ 0.0329" Thick (21 gauge) Brass Shims Per Post. Used brass shims to plumb the post.
6. Use nylon washers under the button bolt heads to protect sign sheeting. Use aluminum washers under nut.

COLUMN SELECTION AND FOOTING SIZE TABLE

<table>
<thead>
<tr>
<th>Sign Size</th>
<th>Column Size Diameter x Thickness</th>
<th>Sleeve Size Diameter x Thickness</th>
<th>U-bolt Diameter</th>
<th>Base Bolt Diameter x Length</th>
<th>Torque lbs.</th>
<th>Base Plate Thickness</th>
<th>Footing Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; x 5'-0&quot;</td>
<td>4 NPS Schedule 80 (4.50&quot; x 0.337&quot;)</td>
<td>5 NPS Schedule 120 (5.562&quot; x 0.5&quot;)</td>
<td>1/4&quot;</td>
<td>3/8&quot; x 3/4&quot;</td>
<td>270</td>
<td>1&quot;</td>
<td>6'-0&quot;</td>
</tr>
<tr>
<td>4'-0&quot; x 6'-0&quot;</td>
<td>4 NPS Schedule 80 (4.50&quot; x 0.337&quot;)</td>
<td>6 NPS Schedule 80 (5.562&quot; x 0.432&quot;)</td>
<td>1/4&quot;</td>
<td>3/8&quot; x 3/4&quot;</td>
<td>445</td>
<td>1½&quot;</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

TYPICAL SECTION

SIGN DETAIL

VIEW A-A

SECTION B-B

SECTION C-C
NOTES:
1. Work with index 700-010.
2. Shop Drawings: Not required.

3. Materials:
   A. Steel Pipe: ASTM A36 or ASTM A706 Grade 36
   B. Steel Pipe (Support Post): ASTM A500 Schedule 40
   C. Aluminum Pipe: ASTM B429 Alloy 6063 T6
   D. Galvanized U-Bolts, Nuts and Plate Washers
      a. U-Bolts: ASTM A449
      b. Hex Nuts: ASTM A 563 Lock Nuts
      c. Plate Washers: 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 A 563
   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 F2329
   B. Other Steel: ASTM A123

5. Fabrication:
   A. Weld: Specification 460-6.4
   B. Hot dip galvanize after fabrication

6. Construction:
   A. Locate Sign Support a minimum of 5 feet from an open joint or transition (sign Stationing may be adjusted to accommodate this requirement).
   B. Base plate must be flush 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-3 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 SUPPORT ASSEMBLY

- **Dimension A**: Distance from centerline of the Support Post to the bottom of the sign or sign cluster.
- **Dimension C**: Vertical distance from the bottom of the sign or sign cluster to the centroid of the sign or sign cluster.

### SIGN 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>

A. Cut anchor rods flush with the top of the traffic railing
B. Coat anchors with Type F-3 epoxy to prevent corrosion
   a. Extend coating 2 inches beyond edge of cut anchor rods
   b. Epoxy coating 1/16" thick minimum

- **Base Plate**: End Plate
- **Support Post**: 5" NPS Schedule 40 Steel Pipe
- **Bridge Deck**
NOTES:

1. Existing Traffic Railings:
   A. Locate existing conduit prior to drilling and adjust placement of base plate as necessary to avoid damaging existing conduit. Base plate must be flush with back of traffic railing. Maintain a minimum cover 2' from face of traffic railing to tip of Adhesive anchor.
   B. For concrete parapets less than 1½ thick, through bolt ⅝ Heavy Hex Head Bolts with Nuts and Washers in lieu of Adhesive Bonded Anchors. Bolt heads shall not protrude more than 1½ beyond traffic face of railing.
   C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersinking depth and diameter of 2' 1/8.

2. New Traffic Railings:
   A. Optional Couplers are shown for slip forming; keep Anchor Bolt coupler threads free of concrete.
   B. For concrete parapets less than 10" thick, through bolt Adhesive Anchor.
   C. For through bolting, countersink the nut and washer so that the bolt and nut does not extend beyond the face of the traffic railing. Do not exceed a countersinking depth and diameter of 2' 1/8.
   D. Bridge Deck shown, Approach Slab and Retaining Wall are similar.

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.
NOTES:
1. Work with Index 700-010.
2. Shop Drawings: Not required.
3. Materials:
   A. Steel Plate: ASTM A36 or ASTM A572 Grade 50
   B. Steel Pipe (Support Post): ASTM A53 Grade B Schedule 40
   C. Galvanized U-Bolts, Nuts and Plate Washer
      a. U-Bolts, ASTM A449
      b. Hex Nuts, ASTM A 563 Lock Nuts
   D. Galvanized Anchor Bolts, Nuts and Washers:
      a. Anchor Rod: ASTM F1554 Grade 55 Fully threaded (for Adhesive Anchors)
      b. Anchor Rod: ASTM F1554 Grade 55 Grade A Hex
   E. Nuts: ASTM A563 Heavy Hex Locking
   F. Anchor Bolt Bonding Material: Specification 937 Type IV Adhesive
   G. Snap-In Post Cap: UV and weather-resistant glass-filled polyester cap
4. Coating:
   A. U-Bolts, Threaded Rods, Nuts and Washers: ASTM F2329
   B. Other Steel: ASTM A123
5. Fabrication:
   A. Weld, Specification 460-6.4
   B. Hot dip galvanize after fabrication
6. Construction:
   A. Locate Sign Support a minimum of 5 feet from an open joint or transition (sign stationing may be adjusted to accommodate this requirement)
   B. Base plate must be flush with top of Railing
   C. Anchors in Traffic Railings:
      a. Install Adhesive Anchors in accordance with Specification 416 except perform field testing on one anchor per sign support location
      b. Use template and cut 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.
   F. Cost of all materials and labor in the cost of the single post sign assembly.
7. TABLE 1 - SIGN PANEL AND POST SIZING
   
<table>
<thead>
<tr>
<th>Temporary Signs</th>
<th>Max. Sign Area (SF)</th>
<th>Post (IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2A</td>
<td>30</td>
</tr>
<tr>
<td>Permanent Signs</td>
<td>135 ≤ Sign Area &lt; 20</td>
<td>35</td>
</tr>
</tbody>
</table>
8. Payment:
   Include the cost of all materials and labor in the cost of the single post sign assembly.

PARALLEL TO DIRECTION OF TRAFFIC

PERPENDICULAR TO DIRECTION OF TRAFFIC

(Sign Panel See Index 700-010)

Concrete Barrier

Concrete Barrier
### TABLE 2 - BASE PLATE TYPE AND ANCHOR ROD SIZING

<table>
<thead>
<tr>
<th>Index</th>
<th>Type/Application</th>
<th>Base Plate Type</th>
<th>Anchor Rod Ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>521-001</td>
<td>Full Wall</td>
<td>B</td>
<td>1&quot;</td>
</tr>
<tr>
<td>521-001</td>
<td>Cantilever or L-Wall</td>
<td>A</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

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.

#### BASE PLATE TYPE A
(Linear Anchor Rod Pattern)

#### BASE PLATE TYPE B
(Staggered Anchor Rod Pattern)

#### BASE PLATE TYPE C
(Staggered Anchor Rod Pattern)

**NOTES:**
- 2. Use a staggered pattern for all temporary barriers.
**GENERAL NOTES:**

1. Verify Column lengths in the field prior to fabrication.
2. Shop drawings:
   - A. Sign Support Shop drawings are not required when fabricated in accordance with this Index and support columns do not exceed the length shown in the plans by more than 2'-0".
   - B. Sign Panels: Horizontal panel splices are allowed at interior wind beams for sign panels with a depth (>D) greater than 10 feet. Shop drawings required for horizontal panel splice details.
   - C. When shop drawings are required, obtain approval prior to fabrication.

3. **Materials:**
   - A. Sign Panel Mounting Materials:
     - a. Aluminum Bars, and Extruded Shapes: ASTM B221, Alloy 6061-T6 or Alloy 6351-T5
     - b. Aluminum Structural Shapes: ASTM B308, Alloy 6061-T6
   - B. Sign Support Structure Materials:
     - a. Steel Plates and Structural Shapes: ASTM A36 or ASTM A572, Grade 50
     - b. Steel Weld Metal: F185
     - c. Shims: 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 F467, 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 SN1
     - b. Nuts: ASTM F594
     - c. Washers: ASTM F436
   - E. High Strength (H.S.) Steel Bolts, Nuts and Washers:
     - a. Galvanized Hex Head Bolts: ASTM F3125, Grade A325, Type 1
     - b. Galvanized Nuts: ASTM A563 Hex, Grade DH
     - c. Galvanized Washers: ASTM F436
   - F. Concrete: Class C 1
   - G. Reinforcing Bars or Welded Wire Reinforcement (WWR): Specification 475

4. **Coatings:**
   - A. Aluminum Fasteners: Anodic coating (0.0002 inches min.) and chromate sealed
   - B. Galvanize High Strength Steel Bolts Nuts and Washers: ASTM F2329
   - C. Galvanize all other steel items (excluding stainless steel): Hot-dip ASTM A123
   - D. Treat damaged galvanizing in accordance with Specification 562

5. **Fabrication:**
   - A. All Base Connections and Stub Column materials are steel unless otherwise specified.
   - B. Drill or sub-punch and ream holes in Fuse Plates and Hinge Plates
   - C. Weld Base Plate to Post & Stub or if using the Alternate Connection Detail weld Base Plate and stiffeners to Post and Stub (Sheet 2)
   - D. Hot dip galvanize after fabrication. Remove all drips, runs or beads on base plate within washer contact areas (Including saw cuts)

6. **Construction:**
   - A. Install the Sign Structure foundation in accordance with Specification 455. Orient Stub Post according to direction of traffic (Sheet 2)
   - B. Tighten all high strength bolts except Base Bolts in accordance with Specification 700.
   - C. Assemble Post to Stub with Base Bolts and three flat washers per bolt (See Base Connection Details, Sheet 2) Tighten Base Bolts in accordance with Instructions Notes on Sheet 2.
MULTI-COLUMN GROUND SIGN

FOUNDER NOTES:
The Contractor may use Welded Wire Reinforcement (WWR) for foundation reinforcing.

At the Contractor's option, the #4 tie bars at 12" O.C. may be replaced by D10 Spiral Wire @ 6" pitch, with three flat turns at the top and one flat turn at the bottom in accordance with Foundation reinforcing.

The Contractor may use Welded Wire Reinforcement (WWR) for 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 the top base plate section and place the third washer between the top base plate and the nut.
   B. Shim as required to plumb column. Provide 2-0.0149" thick (28 gauge) and 3-0.032" thick (31 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 gaskets.
   E. Shim as required to plumb column. Provide 2-0.0149" thick (28 gauge) and 3-0.032" thick (31 gauge) shims per column.
   F. H.S. Base Bolt Width X 3 Washers & Hex Bolt on each base bolt. See Table for Bolt Dia. & Torque. See Assembly of Base Instructions.

ALTERNATE BASE CONNECTION DATA

<table>
<thead>
<tr>
<th>Sheet Section</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>w2</th>
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<tbody>
<tr>
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<td>1/8</td>
<td>1/8</td>
<td>1/8</td>
<td>1/8</td>
<td>3/16</td>
<td>3/16</td>
<td>3/16</td>
<td>3/16</td>
</tr>
<tr>
<td>M 8x14</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>1/4</td>
<td>5/32</td>
<td>5/32</td>
<td>5/32</td>
<td>5/32</td>
</tr>
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<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>11/64</td>
<td>11/64</td>
<td>11/64</td>
<td>11/64</td>
</tr>
<tr>
<td>M 12x18</td>
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<td>7/16</td>
<td>7/16</td>
<td>7/16</td>
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<td>7/16</td>
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</tr>
</tbody>
</table>

* Designations (Nominal Depth in inches) x (weight in pounds per linear foot)
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

4. Spacing of Wind Beams:
   A. Six Wind Beams = 21.0% D
   B. Splice must be located in between interior Zee Supports and only allowed on signs greater than 10'-0".

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 B821, Alloy 6061-T6
      c. Flat Head and Hex Head Machine Bolts: ASTM F468, Alloy 2024-T4
      d. Flat Head and Hex Head Machine Bolts: ASTM F468, Alloy 2024-T4
      e. Washers: ASTM B221, Alloy 2024-T4
   B. Steel:
      a. U-Bolts: ASTM A449 or ASTM A193 B7
      b. Nuts: ASTM A563, 2 per leg
      c. Washers: ASTM F436, (Flat Washers)
   C. coatings:
      a. Aluminum Bolts, Nuts and Washers: Anodic 0.0092 inches thick and chrome sealed.
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Wind Speed by county: see Index 715-010.

WIND AND HANGER BEAMS FOR OVERHEAD SIGNS

STATE OF FLORIDA
WELCOME CENTER

FRONT ELEVATION

ELEVATION

PLAN VIEW

SIDE ELEVATION

TYPICAL SIGN FOR OVERHEAD TRUSSES

WIND BEAM TABLE (2.33) x 3' x 2.33)

<table>
<thead>
<tr>
<th>Number of Horizontal Wind Beams Based on Sign Depth (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Beams</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>11.0%</td>
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</table>

HANGER TABLE (1.6 x 4.69 or 2.3 x 3.5 x 6.19)

<table>
<thead>
<tr>
<th>Number of Vertical Hanger Beams Based on Wind Speed and Sign Length (L)</th>
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<tbody>
<tr>
<td>2 Hangers</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>21.0%</td>
</tr>
</tbody>
</table>

NOTE: For Monroe County designs, use 170 mph values but with Z 5 x 3.5 x 6.19 vertical hanger beams only.

WIND BEAM (Typ.)

Sign Panels Butt Together

Panel Splice (See DETAIL "A" & Note 2)

Hanger Table (See DETAIL "B")

*Panel Splice (See DETAIL "A" & Note 2)

Alum. Backing Strip

Sign Face

Veritical Hanger (Typ.)

Wind Beam (See DETAIL "B")

Vertical Hanger (Typ.)

Wind Beam (Typ.)

Sign (Typ.) 1/4" Thick

Wind Beam (Typ.)

Panel Splice (See DETAIL "A" & Note 2)

Bolt Wind Beam to Vertical Hanger

Washers & Nuts (Use Nylon Washers Under the Hex Head Bolts to Protect Sign Sheeting)

Flat Head Machine Bolt With Lock Nut

Steel U-Bolt With Washers & Nuts

See Table For Number

Sign (Typ.) 1/4" Thick

Vertical Hanger Equally Spaced (See Note 3)

Four Wind Beams = 7.0% L

Wind Beams Equally Spaced (See Note 3)

Four Wind Beams = 7.0% L

Wind Speed by county: see Index 715-010.

3. Spacing of Vertical Hangers:
   A. Two Vertical Hangers = 21.0% L
   B. Six Vertical Hangers = 7.0% L

4. Spacing of Wind Beams:
   A. Two Wind Beams = 21.0% D
   B. Six Wind Beams = 7.0% D

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 B821, Alloy 6061-T6
      c. Flat Head and Hex Head Machine Bolts: ASTM F468, Alloy 2024-T4
      d. Flat Head and Hex Head Machine Bolts: ASTM F468, Alloy 2024-T4
      e. Washers: ASTM B221, Alloy 2024-T4
   B. Steel:
      a. U-Bolts: ASTM A449 or ASTM A193 B7
      b. Nuts: ASTM A563, 2 per leg
      c. Washers: ASTM F436, (Flat Washers)
   C. Coatings:
      a. Aluminum Bolts, Nuts and Washers: Anodic 0.0092 inches thick and chrome sealed.
      b. Galvanized Steel Bolts, Nuts and Washers: ASTM F2329
      c. Wind Speed by county: see Index 715-010.
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 lights in the lighting plans.

3. Lighting contractor installs pull box and loop 2' of lighting circuit conductors in the pull box for connection by the signing contractor.

4. Signing contractor furnishes and installs the luminaires, NEMA 3R enclosure, 30 amp breaker, conduit, conductors and all other electrical equipment necessary for connection to the lighting circuit.

Roadway Lighting not included in contract:

1. Signing plans include the pay item numbers to furnish and install conduit, conductors, ground rods, pull boxes and service point equipment.

2. Signing plans indicate the location of the service point equipment and circuit runs.

3. Signing contractor provides all electrical equipment necessary for connection of the sign lights.
NOTES:
1. 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 700-050 for Handhole Details.
3. Shop Drawings are required: Obtain Shop Drawing approval prior to fabrication. Include the following:
   - Upright Pipe height ('A') and Foundation elevations. Verify dimension in the field prior to submittal to ensure minimum vertical clearances of the sign panel over the roadway.
   - Height of the foundation above adjacent ground.
   - Anchor bolt orientation with respect to centerline of truss and the direction of traffic.
   - Upright Splices
   - Handholes at pole base (when required).
4. Materials:
   - Sign Structure
     - Upright and Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield
     - Steel Angles and Structural Plates and Bars: ASTM A36 Grade 36
     - Weld Material: E70XX
   - Bolts, Nuts and Washers
     - High Strength Bolts: ASTM F3125, Grade A325 Type 1
     - Nuts: ASTM A563 Grade DH Heavy-Hex
     - Washers: ASTM F436 Type 1, one on turned element
   - Anchor Bolts, Nuts and Washers
     - Anchor Bolts: ASTM F1554 Grade 55
     - Nuts: ASTM A563 Grade A Heavy-Five (1 per bolt)
     - Plate Washers, ASTM A36 (2 per bolt)
   - Concrete
     - Spaced Footing Concrete: Class IV
   - Reinforcing Steel: Specification 315
5. Fabrication:
   - Welding: Specification 460-6.4
   - 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.
   - Upright Splices: Not allowed.
   - Structural bolt hole diameters: Bolt diameter plus 1/8", or ASTM A500, Grade B (Min.)
   - Anchor bolt hole diameters: Bolt diameter plus 1/8".
   - Hot Dip Galvanize after fabrication.
6. Coatings:
   - Bolts, Nuts and Washers: ASTM F3329
   - All other steel, including Plate Washers, hot dip galvanize: ASTM A123
7. Construction:
   - Construct foundation in accordance with Specification 455, except payment is included in the cost of the structure.
   - Prior to erection, record the as-built anchor locations and submit to the Engineer.
   - Place backfill above spread footings prior to installation of the sign panels. Do not remove or reduce backfill without prior approval of the Engineer.
   - Tighten nuts and bolts in accordance with Specification 700.
   - Handholes are not permitted.
   - Install Aluminum Sign Panels as shown in the Plans.
   - Place structural grout pad with drain between top of foundation and bottom of baseplate in accordance with Specification 649-7.

DESCRIPTION:
FY 2020-21
STANDARD PLANS
CANTILEVER SIGN STRUCTURE
INDEX 700-040
SHEET 1 of 5
NOTES:
1. Construction joint allowed, roughen surface to 1/2" 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 grade, unless specified otherwise in the plans.
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 'TC' hex head bolts.
   B. Back: Install 'TB' hex head bolts.
TRUSS NOTES:
1. Out-of-plane members are not shown for clarity.
2. Wrap fillet weld around plate termination on the tube wall.
3. Chord Splices not shown.

Bolt Size | Ea | Eb
|-------|-----|-----|
| 1\(\frac{1}{2}\)"  | 4\(\frac{3}{4}\)"  | 2\(\frac{3}{4}\)"
| 1"    | 3\(\frac{3}{4}\)"  | 1\(\frac{3}{4}\)"
| 5/8"  | 2  | 1\(\frac{1}{2}\)"
| 3/4"  | 2\(\frac{1}{4}\)"  | 1"    

Truss Web Angles (Typ.)

See Upright-Truss Connection Detail (Sheet 3)
CANTILEVER ASSEMBLY

SPICE CONNECTION NOTES:
1. Only 6 bolts are shown in detail for clarity. (One Half Each Side Of Splice)
2. Splices are not permitted for trusses less than or equal to 40', Splice optional for trusses greater than 40'.

TRUSS PLUG DETAIL

UPRIGHT CAP DETAIL
NOTES:
1. Work this Index in conjunction with SPAN SIGN STRUCTURE DATA TABLES in the Plans and Index 700-020.
2. Handholes at the pole base are required for OMS 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 clearance of structures.
   B. Height of the Foundation above adjacent ground.
   C. Anchor bolt orientation with respect to centerline of truss and 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 PS12, 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 F436, Type 1, one under turned element
   C. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolt, Nut and Washer: ASTM A490 Grade 56
      b. Nuts: ASTM A563 Grade A Heavy-Hex (5 per bolt)
      c. Pla Washers: ASTM A193 (per bolt)
   D. Concrete: Class IV (Drilled Shaft)
   E. Reinforcing Steel: Specification 415
5. Fabrication:
   A. Welding: Specification 460-6.4
   B. Chord Splices: Minimum splice spacing is three truss panel lengths apart and three (3) truss panel lengths from the uprights when panel lengths are 10'-0" or less.
   C. Upright splice: Not allowed unless the upright exceeds available mill lengths (35' - 40').
   D. Structural bolt hole diameters: Bolt diameter plus 1.6".
   E. Anchor bolt hole diameters: Bolt diameter plus 1.6".
   F. Hot Dip Galvanize after fabrication.
   G. Shop assemble the entire structure after galvanizing to validate/document alignment and clearances of the sign panel over the roadway.
   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 A500, Grade B (Min.)
7. Construction:
   A. Construct foundation in accordance with Specification 455 Drilled Shaft, except payment is included in the cost of the structure.
   B. Prior to erection, record the as-built anchor locations and submit to the Engineer.
   C. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
   D. Tighten nuts and bolts in accordance with Specification 700.
   E. Reinforcing Steel: Specification 415
   F. After installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification 649-6.
NOTES:
1. See Traffic Plans for elevation at top of Foundation.
2. Install Drilled Shaft with a 2'-0" minimum from top elevation of the drill shaft to the finished grade, unless specified otherwise in the plans.
3. The shaft length is based on 2'-0" height above finished grade.
4. Wrap fillet weld around the stiffener termination on the tube wall (Typ).

1. See Traffic Plans for elevation at top of Foundation.
2. Install Drilled Shaft with a 2'-0" minimum from top elevation of the drill shaft to the finished grade, unless specified otherwise in the plans.
3. The shaft length is based on 2'-0" height above finished grade.
4. Wrap fillet weld around the stiffener termination on the tube wall (Typ).
**SPAN SIGN ASSEMBLY**

**UPRIGHT-TRUSS CONNECTION DETAIL**

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.

**NOTES:**
SPAN SIGN ASSEMBLY

NOTES:
1. Out-of-plane members are not shown for clarity.
2. Back truss chord and attached angles are not shown for clarity.
3. Wrap fillet weld around plate termination on the tube wall.

<table>
<thead>
<tr>
<th>Bolt Diameter (in.)</th>
<th>Distance (in.)</th>
<th>EA</th>
<th>EB</th>
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<tr>
<td>1/8</td>
<td>7/32</td>
<td>7/32</td>
<td>7/32</td>
<td>7/32</td>
</tr>
</tbody>
</table>

FRONT ELEVATION

SIDE ELEVATION

TRUSS

DET AIL "D"

DET AIL "E"

DET A IL "F"

BACK-SIDE SIGN MOUNTING

DET A IL "G"

DET A IL "H"

DET A IL "I"

DET A IL "J"

DET A IL "K"

DET A IL "L"
DESCRIPTION:

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 submittal of structural calculations and Shop Drawings that have been prepared by and sealed by the Specialty Engineer.

NOTES:
GENERAL NOTES:

1. Work this Index with Specification 700.

2. Furnish and install the Dynamic Message Sign (DMS), sign structure in accordance with Index 700-040 or 700-041. Locate foundations at locations shown in the Plans.

3. Shop Drawings are required.
   a. Include the DMS 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 Guides: ASTM A464, Grade 36
      iii. D-Bolts: ASTM A480 or A325 B7
      iv. Steel Bolts, Nuts, and Washers:
         1. High Strength Bolts: ASTM F3125, Grade A325, Type I
         2. Nuts: ASTM F562
         3. Washers: ASTM A463 (Flat Washer)
   b. Coatings:
      i. All nuts, bolts and washers ASTM F2239
      ii. All other steel items ASTM A123
      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 shown on the Plans with no conflicts with gusset or splice plates.
   e. Locate threaded couplings on sign side of upright above the sign truss.
   f. Connect grounding conductors to the steel framework that has been cleaned to base metal by use of bonding plates having contact area of not less than 8 square inches or by welding or brazing. Drilling and tapping the steel structure to accept a threaded connector is also an acceptable method.
   g. If steel frameworks is to be drilled and tapped to accept threaded connector, the threaded connector shall be galvanized and have at least 3 threads fully engaged and secured with a jam nut to the steel framework.
   h. Bends in the conduit must be greater than the minimum bending radius for the cable contained in the conduit.
   i. Completely encase all data, fiber optic and power cables for the DMS within the sign structure or in conduit.
   j. Permanently stamp/mark foundation to indicate conduit locations.
   k. Transition conduit in foundation to indicate underground conduit with appropriate reducer outside the limits of the foundation.

DYNAMIC MESSAGE SIGN ASSEMBLY
NOTE: Actual number and direction of travel lanes varies.

CANTILEVER STRUCTURE PLAN VIEW

SPAN STRUCTURE PLAN VIEW

CANTILEVER STRUCTURE ELEVATION VIEW

SPAN STRUCTURE ELEVATION VIEW

DYNAMIC MESSAGE SIGN WALK-IN

DYNAMIC MESSAGE SIGN GENERAL LAYOUT
Primary Ground Rod

#2 AWG Tin-Plated Bare Solid Copper Wire to Ground Mounted Cabinet
Exothermic Weld (Typ.)

Primary Ground Rod

DETAIL "B"

#2 AWG Tin-Plated Bare Solid Copper Wire to Ground Mounted Cabinet
Exothermic Weld (Typ.)

#2 AWG Tin-Plated Bare Solid Copper Wire Continuous to the Base of the DMS Structure

Ground Rod B, C and D as Required (Connections may be Combined)

DETAIL "C"

20' Radius Each "Sphere of Influence"

Ground Rod C

#2 AWG

Primary Ground Rod A

90° (Typical)

Ground Rod B

Sign Structure Foundation

GROUND ROD ARRAY DETAIL

DETAIL "D"

#2 AWG

TYPICAL (20' Rods, 40' Spacing)

DETIAL "E"

DYNAMIC MESSAGE SIGN WALK-IN

10 Gage Handhole Cover

1 1/8" Hole (Typ.)

Exothermic Weld (Typ.)

Tack Welded Cover Clip (Typ.)

Threaded Hole for 1/2" Ø Hex Head Screw (Typ.)

Full Penetration Weld

Cover Clip

Typical

Pole

Partial Penetration Weld (Typ.)

Tack Weld Cover Clip

1 1/8" Stainless Steel Hex Head Screw (Typ.)

1/2" Handhold Frame

(Thru Handhole)

SECTION A-A

INDEX

700-090

4 of 5
DESCRIPTION:

Last Revision of Standard Plans FY 2020-21

Sheet Index

2" Threaded Couplings

SECTION B-B

Dynamic Message Sign Walk-In

SECTION C-C

SECTION D-D

Dynamic Message Sign End View

Hanger Location Detail

Vertical Hanger Spacing 5'-0" (Max.)

Quantity and Spacing of the Members will be Dictated by Locations of Truss Connection Plates, Splices, and 2'-0" (Max.) Spacing.

(Cantilever Sign Structure Shown, Span Sign Structure Similar)

Vertical Hanger Galvanized W6x9 (Typ.)

Hanger @ 5'-0" (Max.) Spacing

2-½" Ø U-Bolts With Double Nuts and Washers

Provide 2-½" Ø Bolts

Field Drill Holes And

Back Face of DMS Sign Enclosure

Horizontal Member Attached to the Internal Framework and Included with the DMS Sign

Top Truss Chord

2-½" Ø U-Bolts With Nuts and Washers

DMS Sign Enclosure

2-½" Ø U-Bolts With Nuts and Washers

Zee Beam Aluminum Zee Beam 4⅝x3⅝x3⅝ (Typ.)

Vertical Hanger Galvanized W6x9 (Typ.)

Hanger @ 5'-0" (Max.) Spacing

2-½" Ø U-Bolts

Zee Beam 4⅝x3⅝x3⅝ (Typ.)

Vertical Hanger Galvanized W6x9 (Typ.)

Hanger @ 5'-0" (Max.) Spacing

2-½" Ø U-Bolts

Zee Beam 4⅝x3⅝x3⅝ (Typ.)

Zee Beam Aluminum Zee Beam

DMS Sign Enclosure

Back Face of DMS Sign Enclosure

Horizontal Member Attached to the Internal Framework and Included with the DMS Sign

Top Truss Chord

2-½" Ø U-Bolts With Nuts and Washers

Provide 2-½" Ø Bolts

Field Drill Holes And

Back Face of DMS Sign Enclosure

Horizontal Member Attached to the Internal Framework and Included with the DMS Sign

Top Truss Chord

2-½" Ø U-Bolts With Nuts and Washers

Provide 2-½" Ø Bolts

Field Drill Holes And

Back Face of DMS Sign Enclosure
## 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. Catwalk 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 5’.

4. Maximum spacing of Catwalk hanger supports is 5'-0". Cantilever ends of grating is 8’.

5. Galvanized steel catwalk grating meeting the requirements of Specification 504-2.3. Must support a 90 psf load and have a 2½' 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 gauge coated wire diameter, coated at the rate of 1.8 oz/ft² (M181 Class D 2.0 oz/ft², modified to 1.8 oz/ft²).
   - B. AASHTO M181 Type II - Aluminum Coated Steel, No. 9 gauge (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.

11. Coatings/Galvanizing:
    - Hot dip galvanize support frame after fabrication and galvanize non-stainless steel fasteners in accordance with Specification 962.

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<th>Description</th>
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<td>1</td>
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</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>

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### CATWALK ASSEMBLY

(Cantilever Shown, Span Similar)
NOTES:

1. See manufacturer details for walkway planks and bolting criteria.
2. Fasten securely. See grating manufacturer details.

GENERAL ASSEMBLY AND FIXED BASE DETAILS
GENERAL NOTES:

1. Single-Column Signs Shown, Multi-Column Signs similar. These typical sections serve as a guide for locating the traffic signs required under various roadside conditions. For size and details of sign construction and footing, refer to the appropriate Index and Plans.

2. Verify the length of sign supports in the Field prior to fabrication.

3. Install ground signs at an angle of 1 to 4 degrees away from the traffic flow (see illustration). Install shoulder mounted signs rotated counterclockwise and median mounted signs rotated clockwise. Install signs on a curve as noted above from the perpendicular to the motorist line of sight.

4. The setback for Stop and Yield signs may be reduced to 3 minimum from the edge of traveled way if required for visibility in business or residential sections with no curb and speeds of 30 MPH or less.

5. The mounting heights are measured from the bottom of the sign panel to a horizontal line extended from the edge of traveled way or from the ground surface at the back of curb. If the standard heights cannot be met, the minimum heights are as follows:

   - Limited Access Roadways – 7'
   - Arterial and Collector Roadways:
     - 5’ - Rural
     - 7’ - Urban (including residential with parking and/or pedestrian activity)

   - For a secondary sign is mounted below the major sign, mount the major sign so that the bottom of the sign is at least 8’ above the edge of the traveled way and the secondary sign at least 3’ above the edge of the traveled way.

6. Do not install sign supports in the bottom of ditches.

7. Install sign supports so they do not reduce the accessible width of sidewalks or shared use paths to less than 4’ clear width.

8. For more information refer to Section 2H of the MUTCD.

CASE I

Use on Limited Access Roadways

Edge of Traveled Way

Edge of Mainline

Paved Shoulder

NOTE:
If median width does not allow standard offset from both roadway, center sign in median.

CASE II

Use on Arterial and Collector Roadways, and Limited Access Ramps

Edge of Ramp

Face of Curb

Curb & Gutter

Traveled Way

CASE III

Use on Arterial and Collector Roadways

Face of Curb

Curb & Gutter

Traveled Way

R/W Line

Sign Face

Angle From Center Of Roadway

CASE IV

Use on Limited Access Roadways

Edge of Mainline

Traveled Way

CASE V

Use in Business or Residential Areas Only

Face of Curb

Curb & Gutter

Traveled Way

CASE VI

Use on Roadways With Signs Behind Guardrail

Face of Curb

Guardrail

5’-0” Std.

CASE VII

REST AREA AND EXIT GORE SIGNS

Use on Limited Access Roadways

CASE VIII

Use on Island or Curbed Median

Face of Curb

Curb or Island

Traveled Way

CASE IX

MILE POST MARKER

Use on Limited Access Roadways

Harbor

6’-0” Min.

CASE X

WRONG WAY SIGNS

Use on Interstate Exit Ramps

NOTE:
For more information refer to Section 2H of the MUTCD.

CASE XI

Use on Limited Access Roadways

Edge of Mainline

Traveled Way

NOTE:
If median width does not allow standard offset from both roadway, center sign in median.

CASE XII

Use on Arterial and Collector Roadways, and Limited Access Ramps

Edge of Ramp

Face of Curb

Curb & Gutter

Traveled Way

CASE XIII

Use on Arterial and Collector Roadways

Face of Curb

Curb & Gutter

Traveled Way

R/W Line

Sign Face

Angle From Center Of Roadway

CASE XIV

Use on Limited Access Roadways

Edge of Mainline

Traveled Way

CASE XV

Use in Business or Residential Areas Only

Face of Curb

Curb & Gutter

Traveled Way

CASE XVI

Use on Roadways With Signs Behind Guardrail

Face of Curb

Guardrail

5’-0” Std.

CASE XVII

REST AREA AND EXIT GORE SIGNS

Use on Limited Access Roadways

CASE XVIII

Use on Island or Curbed Median

Face of Curb

Curb or Island

Traveled Way

CASE XIX

MILE POST MARKER

Use on Limited Access Roadways

Harbor

6’-0” Min.

CASE XX

WRONG WAY SIGNS

Use on Interstate Exit Ramps

NOTE:
For more information refer to Section 2H of the MUTCD.

CASE XXI

Use on Limited Access Roadways

Edge of Mainline

Traveled Way

NOTE:
If median width does not allow standard offset from both roadway, center sign in median.

CASE XXII

Use on Arterial and Collector Roadways, and Limited Access Ramps

Edge of Ramp

Face of Curb

Curb & Gutter

Traveled Way

CASE XXIII

Use on Arterial and Collector Roadways

Face of Curb

Curb & Gutter

Traveled Way

R/W Line

Sign Face

Angle From Center Of Roadway

CASE XXIV

Use on Limited Access Roadways

Edge of Mainline

Traveled Way

CASE XXV

Use in Business or Residential Areas Only

Face of Curb

Curb & Gutter

Traveled Way

CASE XXVI

Use on Roadways With Signs Behind Guardrail

Face of Curb

Guardrail

5’-0” Std.

CASE XXVII

REST AREA AND EXIT GORE SIGNS

Use on Limited Access Roadways

CASE XXVIII

Use on Island or Curbed Median

Face of Curb

Curb or Island

Traveled Way

CASE XXIX

MILE POST MARKER

Use on Limited Access Roadways

Harbor

6’-0” Min.

CASE XXX

WRONG WAY SIGNS

Use on Interstate Exit Ramps

NOTE:
For more information refer to Section 2H of the MUTCD.
NOTES:
1. Stroke width of State Outline shall be 1".
2. 2½" 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. Stroke width of State Outline shall be 1".
2. The 24" X 24" panel shall only be used for a 3 digit route when the panel is to be used on a sign cluster with other 24" X 24" panels.
3. 1½" Radii

GUIDE SIGN USE

FTP-17-06 - FLORIDA ROUTE MARKER

FTP-18-06 - COUNTY ROUTE MARKER (MI-6)
SAFETY BELT
CHILD RESTRAINT
USE REQUIRED
BY LAW

BUCKLE UP
IT'S THE LAW

WEIGHT LIMIT
RESTRICTION AHEAD

FLORIDA LITTER LAW
$100 MIN FINE FOR LITTERING

ADOPT-A-HIGHWAY
A Partnership For
Litter-Free Florida Highways

FLORIDA HIGHWAY
PATROL
DIAL * FHP
(347)

SAFETY BELT
CHILD RESTRAINT
USE REQUIRED
BY LAW

BUCKLE UP
IT'S THE LAW

WEIGHT LIMIT
RESTRICTION AHEAD

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ADOPT-A-HIGHWAY
A Partnership For
Litter-Free Florida Highways

FLORIDA HIGHWAY
PATROL
DIAL * FHP
(347)
**Note:**

Two assemblies are required: one for each side of the ramp, showing those services in each particular direction from the ramp terminal.

Ramp mounted signs shall be installed to avoid conflict with existing signs and in no case should they be placed within 100' of another sign.

**One Post Service Signs See Detail "D"**

**Approximate Position Of Second Motorist Service Sign (Details "B" Or "C") For Interchanges With Two Exit Ramps**

**Sign to be installed at beginning of deceleration lane.**

**Proposed Guide Sign**

**Proposed Supplemental Guide Sign**

**See Detail "B" Or Detail "C"**

**DETAIL "D"**

**NOTE**

When approved for attachment to the advance guide sign, up to 3 services may be used for an exit. The symbol signs shall be suspended from the guide sign panel or existing wind beams. Symbol signs are not to be connected to existing sign posts.

The mounting height of the advance guide sign shall be increased, where necessary, to provide 8' between the level of the pavement edge and the bottom of the guide sign, prior to mounting the supplementary panel.

**GENERAL NOTES**

1. Only those services meeting criteria established by the Department and approved by the State Traffic Operations Engineer for each interchange shall be shown. Symbol signs for motorist services shall always appear in the following order: reading from left to right and top to bottom: Gas, Food, Lodging, Phone *, Hospital, Camping.

* The phone symbol shall not be shown whenever any Gas, Food, Lodging or Camping symbol appears.

2. Symbols shall appear consecutively on the sign with no positions left blank or reserved for intermediate symbols not currently approved for a particular interchange.

3. All motorist service signs to have White Legend and Border with Blue Background.

4. For mounting details see Index 700-010 for Single-column Ground Signs or Index 700-020 for Multi-column Ground Signs.

**DETAIL "A"**

(1 To 3 Symbols)

**DETAIL "B"**

(4 Symbols)

**DETAIL "C"**

(4 To 6 Symbols)
**Welcome Center Signing**

For Limited Access Highways

**Tourist Information Center**

Next Right

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. Sign FTP-10-06, 11-06, 12-06 shall be located at 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).

Note: Roadway not drawn to scale. Distances shown are adequate for driver communication but may be altered slightly if conditions require.

For Limited Access Highways
DESCRIPTION:

STATE OF FLORIDA
WELCOME CENTER
1 MILE

STATE OF FLORIDA
OFFICIAL
WELCOME CENTER

SIGN FTP-15A-06
SIGN FTP-15B-06
SIGN FTP-15C-06
SIGN FTP-12-06

FTP-15A-06
FTP-15B-06
FTP-15C-06
FTP-12-06

2,240' 2,240' 800'

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-B-06 should be used depending on speed, roadside development & geometric conditions.

FOR PRIMARY HIGHWAYS

WELCOME CENTER SIGNING

INDEX
700-105
SHEET
2 of 2
NOTES:

1. Roadways with Two-Way Traffic:
   No passing zone should be extended 1570' in advance of narrow bridge.

2. If the bridge or the approach is on a curve, delineators shall be installed for a distance of 1570' in advance of narrow bridge on the outside portion of the roadway. Spacing shall be 100' between delineators.
   Delineators are to be placed not less than 2' or not more than 8' outside the outer edge of pavement.

3. Object markers and delineators on both sides of roadway shall face traffic approaching bridge.

4. The ON-3R & ON-3L object markers shall be installed 4' above the roadway edge. The panels may be post mounted at the bridges.
WEIGHT LIMIT 8T 16T 12T

WEIGHT LIMIT 8T 16T 12T

WEIGHT LIMIT 8T 16T 12T

WEIGHT LIMIT 8T 16T 12T

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.
4 - LANE DIVIDED INSTALLATION

WEIGH STATION 1 MILE
D8-1
FTP-1-06

All Trucks
Enter
WEIGH STATION
D8-2
FTP-3-06

All Trucks
WEIGH STATION
NEXT RIGHT
FTP-3-06

WEIGH STATION
FTP-83-08

ALL TRUCKS
WEIGH STATION
D8-3

WEIGH STATION
1000 FT
FTP-3-06

ALL TRUCKS
WEIGH STATION
NEXT LEFT
FTP-1-06

WEIGH STATION
1 MILE
D8-1

Note:
Sign D8-3 to be placed at or near the theoretical gore.

MEDIAN INSTALLATION

WEIGH STATION 1 MILE
D8-1
FTP-1-06

All Trucks
Enter
WEIGH STATION
D8-2
FTP-3-06

All Trucks
WEIGH STATION
NEXT LEFT
FTP-3-06

WEIGH STATION
FTP-83-08

ALL TRUCKS
WEIGH STATION
D8-3

WEIGH STATION
1000 FT
FTP-3-06

ALL TRUCKS
WEIGH STATION
NEXT LEFT
FTP-1-06

WEIGH STATION
1 MILE
D8-1

1500' Min.
1890'
1890'

TYPICAL SIGNING FOR TRUCK WEIGH AND INSPECTION STATIONS

WEIGH STATION SIGNING
DESCRIPTION:

REVISION

LAST OF STANDARD PLANS FY 2020-21

INSPECTION STATION SIGNING

TYPICAL SIGNING FOR TRUCK WEIGH AND INSPECTION STATIONS

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FY 2020-21
STANDARD PLANS
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 731-001 for pavement markings.

TYPE 1 OBJECT MARKER PLACEMENT

TYPE 4 OBJECT MARKER PLACEMENT

OBJECT MARKER DETAIL

TRAFFIC CONTROLS FOR STREET TERMINATIONS
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.

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SIDE ELEVATION

BACK ELEVATION

EXIT NUMBER PANELS TO SIGNS
POWER CONFIGURATION ‘A’
CONVENTIONALLY-POWERED
(Type A1 Shown)

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 ‘A’ Identification shown above and Numerical Identification shown on Sheet 3 thru 8.
2. Install sign panel and wind beam in accordance with Index 700-010 and Specification 700.
3. Route all conductors through the sign column with a bushing or rubber grommet to protect conductors.
4. Orient the sign to face South for maximum exposure to sunlight.
5. The controller and the solar batteries may be located in the same compartment.

POWER CONFIGURATION ‘B’
SOLAR-POWERED
(Type B1 Shown)

POWER CONFIGURATION ‘B’ NOTES:
1. Install a separate pole for mounting the solar panel, controller and solar 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 maximum exposure to sunlight.
5. The controller and the solar batteries may be located in the same compartment.

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<td>10</td>
<td>Overhead Sign Assembly</td>
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CONDUIT, WIRING, AND FOUNDATION DETAILS

DETAIL "A"

Nominal 4" (Sch. 40) Aluminum
Transformer Base
#6 Ground Wire
Grounding Lug
2'-0" Anchor Bolts
Concrete Apron (Typ.)

Strain Relief Fitting

Circuit Conductors in Schedule 40 PVC Conduit
Conductors and Conduit Spec as Shown in Plans (Typical)

12" Bed of Pearock or Crushed Stone For Drainage.

CONDUIT, WIRING, AND FOUNDATION DETAILS

DETAIL "B"

Nominal 4" (Sch. 40) Aluminum
Transformer Base
#6 Ground Wire
Grounding Lug
2'-0" Anchor Bolts

Concrete Apron (Typ.)

Strain Relief Fitting

Circuit Conductors in Schedule 40 PVC Conduit
Conductors and Conduit Spec as Shown in Plans (Typical)

12" Bed of Pearock or Crushed Stone For Drainage.

CONDUIT, WIRING, AND FOUNDATION DETAILS
NOTE:
Type A1 Assembly (conventionally-powered) is shown. Type B1 Assemblies (solar-powered) similar.
SCHOOL SPEED LIMIT
20 OR 15
WHEN FLASHING

12" Yellow Flashing Beacon

55-1 (24" x 48") Sign

FFP-38-06 (24" x 30") Sign

Nominal 4" (Sch. 40) Aluminum

To Pull Box

Beacon Controller

NOTE:
Type A2 Assembly (conventionally-powered) is shown.
Type B3 Assemblies (solar-powered) similar.
NOTES:

1. Type A3 Assembly (conventionally-powered) is shown. Type B3 Assemblies (solar-powered) similar.

2. Use electronic speed feedback sign with 18" high numerals for posted speed of 45 mph or less, and 16" high numerals for posted speeds greater than 45 mph.

See Index 700-101
**NOTE:**

Type A4 Assembly (conventionally-powered) is shown. Type B4 Assemblies (solar-powered) similar.
NOTES:
1. Type A5 Assembly (conventionally-powered) is shown.
Type B5 Assemblies (solar-powered) similar.

2. Use electronic speed feedback sign with 15" high numerals for posted speeds of 45 mph or less,
and 18" high numerals for posted speeds greater than 45 mph.
NOTES:
1. Type A6 Assembly (conventionally-powered) is shown. Type B6 Assemblies (Solar-powered) similar.

2. Use electronic speed feedback sign with 15” high numerals for posted speed of 45 mph or less, and 19” high numerals for posted speeds greater than 45 mph.
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.
**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 111-003.
4. Make the traffic face of the RPM the same color as the pavement marking that it is supplementing.

**LEGEND:**

- B/C = BACK OF CURB
- EOP = EDGE OF PAVEMENT
- RPM = RAISED PAVEMENT MARKER
- W/R = WHITE/RED RPM
- Y/Y = YELLOW/YELLOW RPM
- W/Y = WHITE/YELLOW RPM
- MD/Y = MONO-DIRECTIONAL YELLOW RPM

**TYPICAL PLACEMENT OF RAISED PAVEMENT MARKERS**

<table>
<thead>
<tr>
<th>RPM Type</th>
<th>Width</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>10' - 20'</td>
</tr>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>20' - 30'</td>
</tr>
<tr>
<td>MD/Y RPMs</td>
<td>6&quot; Yellow</td>
<td>10' - 20'</td>
</tr>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>20' - 30'</td>
</tr>
<tr>
<td>W/R RPMs</td>
<td>6&quot; White</td>
<td>10' - 20'</td>
</tr>
<tr>
<td>W/R RPMs</td>
<td>6&quot; White</td>
<td>20' - 30'</td>
</tr>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>10' - 20'</td>
</tr>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>20' - 30'</td>
</tr>
<tr>
<td>W/R RPMs</td>
<td>6&quot; White</td>
<td>10' - 20'</td>
</tr>
<tr>
<td>W/R RPMs</td>
<td>6&quot; White</td>
<td>20' - 30'</td>
</tr>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>10' - 20'</td>
</tr>
<tr>
<td>Y/Y RPMs (Typ.)</td>
<td>6&quot; Yellow</td>
<td>20' - 30'</td>
</tr>
</tbody>
</table>

**LEGEND:**

- ALTERNATING SKIP LINE
- SKIP LINE
- DOUBLE SOLID LINE
- MULTILANE
YELLOW RPM

MD/Y = MONO-DIRECTIONAL

Y/R = YELLOW/RED RPM

Y/Y = YELLOW/YELLOW RPM

W/R = WHITE/RED RPM

RPM = RAISED PAVEMENT MARKER

EOP = EDGE OF PAVEMENT

B/C = BACK OF CURB

LEGEND:

B/C = BACK OF CURB

EOP = EDGE OF PAVEMENT

RPM = RAISED PAVEMENT MARKER

W/R = WHITE/RED RPM

Y/Y = YELLOW/YELLOW RPM

Y/R = YELLOW/RED RPM

MD/Y = MONO-DIRECTIONAL YELLOW RPM

REVISION

DESCRIPTION:

REVISION

LAST

STANDARD PLANS

FY 2020-21

TYPICAL PLACEMENT OF RAISED PAVEMENT MARKERS

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SHEET

2 of 6
The image contains a diagram of RPM placement details for median openings and curb installations. The text includes notes on RPM placement at median openings, typical placement of raised pavement markers, and specific details for different types of curbs and medians.

**NOTES:**

1. For Type "C" Curb, install RPMs along the pavement edge marking using the same spacing shown.

2. Orient traffic faces of RPMs in curb median radii to be parallel to direction of travel lanes.

**LEGEND:**

- B/C = Back of Curb
- EOP = Edge of Pavement
- RPM = Raised Pavement Marker
- W/R = White/Red RPM
- Y/R = Yellow/Red RPM
- Y/Y = Yellow/Yellow RPM
- Y/R = Yellow/Red RPM
- MD/Y = Mono-Directional Yellow RPM

**POSTED SPEED LIMIT**

- 20 OR LESS: 10
- 25 OR LESS: 20
- 30 OR LESS: 30
- 40 OR MORE: 40

**DESCRIPTION:**

RPM PLACEMENT AT MEDIAN OPENINGS

(When called for in the Plans)
RPM PLACEMENT AT ISLANDS
(When called for in the Plans)

NOTES:
1. For Type "E" Curb install RPMs along the pavement edge marking using the same spacing shown.
2. Orient traffic faces of RPMs in median radii to be parallel to direction of travel lanes.

RPM PLACEMENT AT TRAFFIC SEPARATORS
(When called for in the Plans)

LEGEND:
B/C = BACK OF CURB
EOP = EDGE OF PAVEMENT
RPM = RAISED PAVEMENT MARKER
W/R = WHITE/RED RPM
Y/Y = YELLOW/YELLOW RPM
W/R = WHITE/RED RPM
MD/W = MONO-DIRECTIONAL WHITE RPM
MD/Y = MONO-DIRECTIONAL YELLOW RPM

POSTED SPEED LIMIT RPM

<table>
<thead>
<tr>
<th>MPH</th>
<th>FEET</th>
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<tr>
<td>30 OR LESS</td>
<td>10</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>50 OR MORE</td>
<td>60</td>
</tr>
</tbody>
</table>

For Illustrative Purpose Only

For Illustrative Purpose Only

For Illustrative Purpose Only
1500'-0" Yellow RPMs Spaced at 500'-0" Intervals Approaching Crossover (Typ. Each Side)

See DETAIL "L"

RPM PLACEMENT FOR CROSSEOVERS ON LIMITED ACCESS ROADWAYS

DETAIL "L"
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.
CURB AND GUTTER

BLACK ARROW

FLUSH SHOULDER

X = LANE WIDTH (FT.)
Y = BUFFERED BIKE LANE WIDTH (FT.)

STRIPING FOR BUFFERED BIKE LANE

STRIPING WITH SHOULDER OR NON-BUFFERED BIKE LANE

X = LANE WIDTH (FT.)
Y = PAVED SHOULDER / BIKE LANE

NOTES:
1. Lane widths (X) may not be same for each lane in the section.
2. For placement of RPMs, see Index 706-003.

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

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PAVEMENT MARKINGS
INTRODUCTION

BUFFERED EXPRESS LANE STRIPING

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 RPMs, see Index 710-001.

3. For placement of Express Lane markers and associated RPMs, see the Plans.

BUFFERED EXPRESS LANE STRIPING

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS
DESCRIPTION:

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS

CURB AND GUTTER SHOWN

PAVEMENT MARKINGS
FLUSH SHOULDER SHOWN

PLACEMENT OF LONGITUDINAL PAVEMENT MARKINGS
DESCRIPTION:

PAVEMENT MARKINGS AND DELINEATORS FOR MEDIAN Crossover

NOTE:
1. Apply yellow reflective paint to the noses of curbed medians, traffic separators, and raised islands. When applying yellow reflective paint in conjunction with Raised Pavement Markers, see Index 706-001.
2. Use yellow retro-reflective sheeting on both sides of the delineator. Install the post so that the top is 4' above the grade at the edge of the pavement.
3. Extend double yellow centerlines 100' back from intersection on all approaches or 50' for unmarked cross roads.

PAVEMENT MARKINGS FOR INTERSECTIONS WITH MAJOR AND MINOR ROADS
TWO WAY LEFT TURN LANE
(With Single Lane Left Turn Channelization)

NOTE:
See Sheet 1 for "S" value.

TRAFFIC CHANNELIZATION AT GORE

NOTE:
See Sheet 1 for "S" value.
DESCRIPTION:

REVISED SHEET INDEX

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PAVEMENT MARKINGS

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NOTE: See Sheet 1 for "S" value.

NOTE: Make pavement markings yellow for left roadway centered on existing roadway. Right roadway centered on existing roadway is similar with white pavement markings.

DETAIL "D"

18" Pavement Marking

(See Note)

6" Pavement Marking

(See Note)

NOTE: See Sheet 1 for "S" value.

DETAIL "E"

MARKINGS FOR TRAFFIC SEPARATION

LEFT ROADWAY CENTERED ON EXISTING ROADWAY

RIGHT ROADWAY CENTERED ON EXISTING ROADWAY

SCHEMES FOR TRANSITION - 2 LANE / 4 LANE ROADWAY
**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.

---

**STANDARD CROSSWALK DETAILS**

- Width: 12" White
- Lane line

---

**SPECIAL EMPHASIS CROSSWALK DETAILS**

- Width: 24" White (Typ.)
- 4'-0" Min. (When Stop Line Present)
- Lane line
- Longitudinal Markings (Typ.)
**Queue Length**

**Queue Length** is measured from the median nose radial point or, when a stop bar is required, from the stop bar.

### Single Left Turns

- **Queue Length**: Measured from the stop bar location.
- **6" Pavement Marking (See Note 2)**
- **15' Begins Lane Line**
- **25'**
- **Stop Bar (If Required)**

### Double Left Turns

- **Queue Length**: Measured from the stop bar location.
- **6" Pavement Marking (See Note 2)**
- **15' Begins Lane Line**
- **25'**
- **Stop Bar (If Required)**

### Arrow Spacing

- **1 Arrow**: Length less than 125'
- **2 Arrows**: Varies 125' to 225'
- **3 Arrows**: Greater than 225' (See Note 4)

### 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 Lane Markings

- **Through Lane Becomes Exclusive Left Turn**
- **Through Lane Becomes Optional Left Turn**

### ARROW SPACING

- **6" White**
- **15'**
- **25'**

### Notes on Arrow Spacing

- **NOTE**: 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.
**Pavement Marking for Parking**

**Face of Curb**

- 3-6" White Diagonal
- Equally Spaced Per Aisle

**Sidewalk**

- 3-6" White (Typ)
- 6" White

**Curb Ramp**

- 6" White
- BLUE
- WHITE

**Sign FTP-21-06**

- And FTP-22-06

**FORWARD-IN PARKING**

- 4'-4" (Typ)
- 4" (Typ)
- 2.7 S.F.

**REVERSE-IN PARKING**

- 4'-4" (Typ)
- 4" (Typ)
- 4.53 S.F.

**TYPICAL**

**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.
NOTES:
1. All grids are 4" x 4".
2. Pavement Marking Should Not Extend Into Opposing Lane.

SCHOOL PAVEMENT MARKING

MARKINGS FOR SCHOOL ZONES

SINGLE-LANE APPROACH

TWO-LANE APPROACH

MULTI-LANE APPROACH

(Three or More)
NOTES:
1. All bicycle markings and pavement messages shall be White.
2. All bicycle markings shall be preformed thermoplastic.
3. All grids are 4" x 4".

---

**STANDARD PAVEMENT MARKING MESSAGE LAYOUTS**

- **Shared Lane Marking (SLM)**
  - 8.1 S.F.
- **Helmeted Bicyclist Symbol**
  - 6.3 S.F.
- **Bike Lane Arrow**
  - 4.2 S.F.
- **Railroad Crossing**
  - (For Shared Use Path Only)
  - 9.0 S.F.

**BICYCLE MARKINGS**

- **FY 2020-21 STANDARD PLANS**

**INDEX**

- 711-002

**SHEET**

- 1 of 2
APPROACH TO INTERSECTIONS DETAILS

BUFFERED BIKE LANES

**FAR SIDE OF INTERSECTION DETAIL**

- **6" White Solid Line**
- **6" White Solid Line**
- **5' Min. From Curb Radius Return**
- **Lane Width**
- **Shared Lane 150'**

**SIDEWALK**
- **Center of Solid Line and Dotted Line**

**REVISION**
- **10/29/2019**
- **8:24:43 AM**

**DESCRIPTION:**
- **REVISION LAST of STANDARD PLANS FY 2020-21 SHEET INDEX**
- **BICYCLE MARKINGS 11/01/17 711-002 2**

**EOP**
- **Line**
- **Dotted 2'-4'**
- **Radius Curb Return or Stop Line**
- **8" 8" 8"**

**LANE TRAVEL**
- **SIDEWALK CURB AND GUTTER**

**APPROACH TO INTERSECTIONS DETAILS**

**BUFFERED BIKE LANES**
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.

DESCRIPTION:

SINGLE LANE RAMPS - EXIT TERMINALS

INTERCHANGE MARKINGS

STANDARD PLANS
INTERCHANGE MARKINGS

TAPER - TYPE ENTRANCE

PARALLEL - TYPE ENTRANCE

Shoulder Gutter
Paved Shoulder

Paved Shoulder

Paved Shoulder

Paved Shoulder

Paved Shoulder

6" Yellow

6" White (10'-30')

6" White

6" White

6" White

6" White

6" White

12" White

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

White/Red Raised Pavement Markers

Maintain Full Ramp Width (15' Typ.)

Maintain Full Ramp Width (15' Typ.)

Maintain Full Ramp Width (15' Typ.)

Maintain Full Ramp Width (15' Typ.)

Maintain Full Ramp Width (15' Typ.)

Maintain Full Ramp Width (15' Typ.)
DESCRIPTION:

parallel acceleration and deceleration lane

Typical Markings at Dual Lane Exits

Typical Lane Drop Markings at Exit Ramps

INTERCHANGE MARKINGS

Fy 2020-21
standard plans

index

sheet

711-003
NOTES:

1. Place the Wrong Way Arrow at the physical gore or 100'-0" from the theoretical gore.

2. Post delineators spaced at 40' on curves of the entrance and exit of ramps. The spacing on the tangent portion of the ramp section is 300'-0". All delineators are to be setback 4' from shoulder break. Post delineators should not be discontinued in sections with guardrail.
NOTES:

1. Place the Wrong Way Arrow at the end of the physical gore or 100'-0 ± from the end of theoretical gore.

2. Post delineators spaced at 40' on curves of the entrance and exit of ramps. The spacing on the tangent portion of the ramp section is 300'-0. All delineators are to be setback 4' from shoulder break.

Post delineators should not be discontinued in sections with guardrail.
**NOTE:**
Do not place wrong way arrows in between consecutive directional arrows.

**TYPICAL PARTIAL CLOVERLEAF/TRUMPET EXIT RAMP**

<table>
<thead>
<tr>
<th>Description</th>
<th>Index 711-003</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTERCHANGE MARKINGS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FY 2020-21 STANDARD PLANS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>INTERCHANGE MARKINGS</strong></td>
<td>6 of 7</td>
</tr>
</tbody>
</table>
INTERCHANGE MARKINGS

NOTES:
1. This Index shows layouts for 1, 2, and 3 lanes regardless of the number of lines of
   information.
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

LAST of STANDARD PLANS

STANDARD PLANS

FY 2020-21

CONVENTIONAL LIGHTING

INDEX

715-001

Pole

Luminaire

Breakaway Fuseholders

Strain Relief Fitting (See Note 2)

PVC Conduit

Pull box

Surge Protective Device (SPD)

Equipment Ground Conductor

Breakaway Fuseholders on Neutral side with solid copper slug (Line To Neutral Service). Slugs to be same size as 10 Amp fuse.

Pole Ground Conductor

Breakaway Fuseholders on 480V side with a 10 Amp slow blow fuse for line to line service both lines to be fused.

Ground rod

Breakaway Fuseholders with solid copper slugs. Slugs to be same size as 10 Amp fuse.

WIRING DIAGRAM

90° diameter 20' long copper clad with approved ground connection (At all pull boxes)

Access Panel

#6 Solid Copper Ground Wire (Bare)

Surge Protective Device (SPD)

#6 TW Green Bonding Ground

Length of Bracket Arm

Pull Box (See Metal Pole Wiring Detail)

Metal Pole Detail

Metal pole detail

Metal pole wiring detail

PVC conduit with Type TC Cable

Metal pole detail

WIRING DETAILS

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.

3. Circuit conductors in schedule 40 PVC conduit. Circuit conductors and conduit size as shown in plans. (Typical)

4. U.L. approved Ground Rod 9" diameter 20' long copper clad with approved ground connection (At all pull boxes)

5. Ground Wire (Bare)

6. 12" bed of Pearrock or crushed stone for drainage

7. Equipment Ground Conductor

8. Breakaway Fuseholders

9. Gound Wire

10. Strain Relief Fitting (See Note 2)

11. Strain Relief Fitting (See Note 2)

12. Strain Relief Fitting (See Note 2)

13. Strain Relief Fitting (See Note 2)

14. Strain Relief Fitting (See Note 2)
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
NOTES:

1. Use compacted select material in accordance with Index 120-001.
2. Concrete shall be Class NS with a minimum strength at 28 days of f'c=2.5 ksi.
3. Outside edge of slab shall be cast against formwork.
4. The pull box shown is 13' x 24'; others approved under Specification 635 may be used.
5. Slabs to be placed around all Poles and Pull Boxes. In urban areas or where space is limited slab dimensions may be adjusted as shown in the plans.
6. Concrete for slabs around poles and pull boxes shall be included in the price of pole or pull box.
7. The expansion joint shall consist of ½" of closed-cell polyethylene foam expansion material. The top ½" of expansion material shall be removed after pouring the slab and sealed with an APL approved Type A sealant meeting the requirements of Specification 932.

Concrete 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. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A563 Grade A Heavy-Hex
      c. Washer: ASTM F436 Type 1
   h. Plate Bearing: ASTM A36
   i. Stainless Steel Fasteners: ASTM F593 Alloy Group 2, Condition A, CW1 or SH1
   j. Nut Covers: ASTM B26 (319-F)
   k. Concrete: Class 1
   l. Refrigerining Steel: Specification 415
4. Fabrication:
   a. Weld Arm and Pole (Alloy 6063) in the 14 tonmper 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" D.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" on the oblong and 6" round respectively to simplify fabrication.
   e. Provide 2, 2", or 3" hole at top of pole for electrical wires.
   f. Provide notches in the pole to accommodate the height of S, J, and C hooks at the top of the pole for non median barriers/Traffic Railings with a vibration damper.
   g. Perform all welding in accordance with AWS D1.2.
   h. Embedded Junction Box (EJB): Install EJBs per Note 4 and in accordance with Specification 635, as shown on the following Sheets.
   i. Fabricate all watertight covers with neoprene gasket and secure cover with galvanized screws.
   j. Finish Median Barrier Mounted Aluminum Light Poles: the manufacturer must demonstrate the ability to produce a crack free pole, the manufacturer’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 and 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 5/16" 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.
   k. 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 1/2" diameter stainless steel rivets or screws.
   l. Include the following information on the ID Tag:
      1. Financial Project ID
      2. Pole Height
      3. Manufacturer’s Name
At the pole connections, provide arm tube extrusions with dimensions as shown, uniformly transition elliptical sections to a cylindrical section at the arm connection.

The fabricator may substitute elliptical cross sections other than those tabulated, provided the section properties about the vertical axis and the area of the section equal or exceed that of the required section, and provide minimum wall thickness of \( \frac{3}{8} \) nominal and within the Aluminum Association tolerances.

The outside diameter about the minor axis should be held at \( 2\frac{1}{8} \) from the Base Weld. Provide \( \frac{3}{8} \) Stainless Steel Bolts with Hex Nuts and a Split Lockwasher each side of Pole where shown.
**BASE PLATE DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE**

**NOTE:**
1. For locations of Bearing Plates, Base Plates and Detail "A" see Sheets 6 & 7.
2. Double Nuts: The bottom hex nut may be substituted by a half-height "jam" nut.
3. Provide individual nut covers (not shown) for each bolt.
4. Pole wall thicknesses shown are nominal and shall be within the Aluminum Association Tolerances. Thicker walls are permitted and tapered walls may be used in accordance with the minimum Aluminum Association thicknesses.

**DESCRIPTION:**
- **REVISION**
- **LAST REVIEW**
- **FAA FACILITY IDENTIFICATION**
- **INDEX**
- **SHEET**

**STIFFENER PLATE DETAIL**
- Stiffener Plate
- Base Plate
- Light Pole
- Bend as shown

**BASE PLATE PLAN**
- Base Plate
- Light Pole
- Full Penetration Weld

**BASE PLATE ELEVATION**
- Base Plate
- Outer Wall
- Full Penetration Weld

**BEARING PLATE PLAN**
- 1½" Ø Hole (Typ.)

**BEARING PLATE ELEVATION**
- 1½" Ø Anchor Bolt
- Threaded 8" min.
- Top and bottom

**BASE PLATE DETAILS**
- Beaming Plate Plan
- Beaming Plate Elevation
- "A" Base Plate Plan
- "A" Base Plate Elevation

**STANDARD PLANS**
- **FY 2020-21**
- **STANDARD ALUMINUM LIGHTING**
- **INDEX**
- **SHEET**
**PLAN**

**ELEVATION**

**END VIEW**

**SPREAD FOOTING DETAILS FOR MEDIAN BARRIER MOUNTED ALUMINUM LIGHT POLE**

**EMBEDDED JUNCTION BOX DETAILS**

**STANDARD PLANS**

FY 2020-21

STANDARD ALUMINUM LIGHTING

INDEX 715-002 6 of 8

**NOTES:**

1. For Bearing Plate and Base Plate details, see Sheet 5.

2. For connections to adjacent Median Barrier, use the Dowelled Joint detail per Index 521-001. Alternatively, a continuous concrete pour or a continuous construction joint may be substituted; these alternatives require the Median Barrier’s longitudinal steel to lap a minimum of 2'-0" with the longitudinal steel shown herein.
**SECTION C-C**

**NOTES:**

1. For Bearing Plate and Base Plate Details, see Sheet 5.

2. For connections to adjacent Median Barrier, use the Dowelled Joint detail per Index 521-001. Alternatively, a continuous concrete pour or a construction joint may be substituted; these alternatives require the Median Barrier's longitudinal steel to lap a minimum of 2'-0" with the alternative shown herein.

**PLAN**

(Reinforcing steel not shown).

Provide dowel bars @ construction joint.

**ELEVATION**

- #4 Tie Bars @ 12" centers (max.) or #10 (or W10) spliced @ 6" pitch. 2 flat turns top and 1 flat turn bottom.

**SECTION B-B**

(Anchor Bolts and Barrier Longitudinal Steel & Stirrups Not Shown)

- #7 Bars

**VIEW B-B**

(Anchor Bolts and Base Plate)

- Optional Const. Jt. (See Note 2)

- Optional Construction Joint (Typ.) (See Note 2)

- See Detail 'A'

**FOUNDATION TABLE**

<table>
<thead>
<tr>
<th>WIND SPEED (MPH)</th>
<th>DESIGN MOUNTING HEIGHT (FT)</th>
<th>FOUNDATION DEPTH (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>140</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>160</td>
<td>40</td>
<td>9</td>
</tr>
</tbody>
</table>

**FY 2020-21 STANDARD PLANS**

**STANDARD ALUMINUM LIGHTING**

**INDEX**

715-002

**SHEET**

7 of 8
**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.

---

**Optional Const. Joint**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Optional Splice (see Note 3)**

---

**Min. 5' from Φ open joint**

---

**EJB "B"**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Supplemental #5 Bar**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Shift horizontally to avoid Anchor Bolts**

---

**Symmetrical about Φ Light Pole**

---

**Optional Const. Joint**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**1" Conduit**

---

**Optional Const. Joint**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Supplemental #5 Bar**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Shift horizontally to avoid Anchor Bolts**

---

**Symmetrical about Φ Light Pole**

---

**Optional Const. Joint**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Supplemental #5 Bar**

(Reinforcing steel and 2" Ø Conduit not shown)

---

**Shift horizontally to avoid Anchor Bolts**

---

**Symmetrical about Φ Light Pole**

---

**Optional Const. Joint**

(Reinforcing steel and 2" Ø Conduit not shown)
HIGHMAST LIGHTING NOTES:

1. Poles are designed to support the following:
   a. One (1) cylindrical head assembly with a maximum effective projected area of 6 sf and 180 lbs (Max.)
   b. Eight (8) cylindrical luminaires with a maximum effective projected area of 1.5 sf and 71 lbs each.

2. Shop Drawings: This Index is considered fully detailed; only submit shop drawings for minor modifications not detailed in the Plans.

3. High Mast Structure Materials:
   a. Poles and Backing Rings:
      i. Less than 10': ASTM A1011 Grade 50, 55, 60 or 65
      ii. Greater than or equal to 10': ASTM 4672 Grade 50, 55, 60 or 65
   b. ASTM A955 Grade A (55 ksi yield) or Grade B (60 ksi yield)
   c. Pole Caps: ASTM A1011 Grade 50, 55, 60, or 65 or ASTM B209
   d. Bolt Washers: C15500
   e. Stainless Steel Screws: AISI 316
   f. Anchor Bolts, Nuts and Washers:
      i. Bolt: ASTM F1554 Grade 55
      ii. Nut: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      iii. Plate Washer: ASTM A36 (4 per anchor bolt)
   g. Nut Covers: ASTM B56 (319-F)
   h. Concrete: Class IV (Drilled Shaft)
   i. Reinforcing Steel: Specification 415

4. Fabrication:
   a. Welding:
      i. Specification Section 460-6.4 and
      ii. AASHTO LRFD Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals Section 14.4.4
   b. Poles:
      i. Round or 16-sided (Min.)
      ii. Taper pole diameter at 0.14 inches per foot
      iii. Pole shaft may be up to three sections using telescopic field splices
      iv. Use full-penetration groove welds (2 maximum) within 6 inches of the circumferential tube-to-plate connection and use full-penetration groove welds on the female and section of telescopic (i.e., slip type) field splices for a minimum length of 42 inches.
   c. Identification Tag: (Submit details for approval)
      i. 2" x 4" (Max.) aluminum tag
      ii. Locate on the inside of the pole and visible from the handhole
   d. Manufacturer’s Name
   e. 2" (Max.) long screws
   f. Base Wall Thickness
   g. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus 1/16" and anchor bolts holes are bolt diameter plus 3/16" and anchor bolts holes are 60 percent minimum penetration or fusion welds except as follows:
   h. Include the following information on the ID Tag:
      i. Financial Project ID
      ii. Pole Type
      iii. Pole Height
      iv. Manufacturer’s Name
      v. Taper Length (Ft of Steel)
      vi. Base Roll Thickness
      vii. Excerpt for Anchor Bolts

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
      i. Brevard, Broward, Charlotte, Collier, Escambia, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, Sarasota and St. Lucie Counties.
### POLE DESIGN TABLE

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Wall Thickness (in.)</th>
<th>Minimum Splice Length (in.)</th>
<th>Base Dia. (in.)</th>
<th>Wall Thickness (in.)</th>
<th>Minimum Splice Length (in.)</th>
<th>Base Dia. (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td>80</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>11</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.174</td>
<td>2'-0&quot;</td>
<td>10</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>12</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>17</td>
</tr>
<tr>
<td>150 mph</td>
<td>80</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>11</td>
<td>0.313</td>
<td>2'-0&quot;</td>
<td>16</td>
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<tr>
<td></td>
<td>100</td>
<td>0.174</td>
<td>2'-0&quot;</td>
<td>10</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>15</td>
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<tr>
<td></td>
<td>120</td>
<td>0.250</td>
<td>2'-0&quot;</td>
<td>16</td>
<td>0.250</td>
<td>3'-0&quot;</td>
<td>21</td>
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<tr>
<td>170 mph</td>
<td>80</td>
<td>0.250</td>
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<td>11</td>
<td>0.313</td>
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<tr>
<td></td>
<td>100</td>
<td>0.174</td>
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<td>0.250</td>
<td>2'-0&quot;</td>
<td>15</td>
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<tr>
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<td>120</td>
<td>0.250</td>
<td>3'-0&quot;</td>
<td>18</td>
<td>0.313</td>
<td>3'-0&quot;</td>
<td>23</td>
</tr>
</tbody>
</table>

### BASE PLATE AND BOLTS DESIGN TABLE

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Diameter (in.)</th>
<th>Base Plate Thickness (in.)</th>
<th>Bolt Circle (in.)</th>
<th>No. Bolts</th>
<th>Bolt Diameter (in.)</th>
<th>Bolt Embedment (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td>80</td>
<td>3.000</td>
<td>2.000</td>
<td>8</td>
<td>1.75</td>
<td>3.000</td>
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<td>3.000</td>
<td>2.000</td>
<td>8</td>
<td>1.75</td>
<td>3.000</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>3.000</td>
<td>3.000</td>
<td>8</td>
<td>2.00</td>
<td>3.000</td>
<td>48</td>
</tr>
<tr>
<td>150 mph</td>
<td>80</td>
<td>3.000</td>
<td>2.000</td>
<td>8</td>
<td>1.75</td>
<td>3.000</td>
<td>43</td>
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<td></td>
<td>100</td>
<td>3.000</td>
<td>2.000</td>
<td>8</td>
<td>1.75</td>
<td>3.000</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>3.000</td>
<td>3.000</td>
<td>8</td>
<td>2.00</td>
<td>3.000</td>
<td>47</td>
</tr>
<tr>
<td>170 mph</td>
<td>80</td>
<td>3.000</td>
<td>2.000</td>
<td>8</td>
<td>1.75</td>
<td>3.000</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>3.000</td>
<td>2.000</td>
<td>8</td>
<td>2.00</td>
<td>3.000</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>3.000</td>
<td>3.750</td>
<td>10</td>
<td>2.25</td>
<td>3.000</td>
<td>58</td>
</tr>
</tbody>
</table>

### SHAFT DESIGN TABLE

<table>
<thead>
<tr>
<th>Design Wind Speed</th>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter (in.)</th>
<th>Shaft Length (ft)</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 mph</td>
<td>80</td>
<td>4'-0&quot;</td>
<td>17'-0&quot;</td>
<td>14- #11</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4'-6&quot;</td>
<td>16'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>18'-0&quot;</td>
<td>18- #11</td>
</tr>
<tr>
<td>150 mph</td>
<td>80</td>
<td>4'-0&quot;</td>
<td>17'-0&quot;</td>
<td>14- #11</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4'-6&quot;</td>
<td>16'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>18'-0&quot;</td>
<td>18- #11</td>
</tr>
<tr>
<td>170 mph</td>
<td>80</td>
<td>4'-0&quot;</td>
<td>17'-0&quot;</td>
<td>14- #11</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4'-6&quot;</td>
<td>17'-0&quot;</td>
<td>16- #11</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>5'-0&quot;</td>
<td>19'-0&quot;</td>
<td>18- #11</td>
</tr>
</tbody>
</table>

**NOTE:**
- Shaft Design Table Shaft Length is based on level ground (flatter than 1:5).
- Increase the shaft depth in accordance with the Additional Shaft Depth Due to Ground Slope values shown on the table.

### ADDITIONAL SHAFT DEPTH DUE TO GROUND SLOPE

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3</td>
<td>3'-0&quot;</td>
<td>4'-0&quot;</td>
</tr>
<tr>
<td>1/4</td>
<td>4'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>1/2</td>
<td>5'-0&quot;</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

---

**ELEVATION**

**POLE DESIGN TABLES**
SECTION A-A

FOUNDATION PLAN
(Anchor Bolts and Conduits Not Shown)

SECTION B-B
(Conduits Not Shown)

SECTION C-C

SECTION E-E

BASE PLATE AND ANCHORAGE ELEVATION
(Conduits Not Shown)

POLE FOUNDATION

HIGH MAST LIGHTING

STANDARD PLANS

FY 2020-21

INDEX
715-010

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For Pull Boxes between Poles refer to Index 715-001.

1. Slabs to be placed around all Poles and Pull Boxes.
2. Conduit ends shall be sealed in accordance with Specification 630.
3. At all pull boxes and pole bases, ends of conduit shall be accommmodate 2-4/0 and 2-#6 conductors for grounding.

NOTES:
1. At all pull boxes and pole bases, ends of conduit shall be sealed in accordance with Specification 630.
2. Slabs to be placed around all Poles and Pull Boxes.
3. For Pull Boxes between Poles refer to Index 715-001.

WIRING DETAILS
The contractor's attention is directed to those plan sheets detailing the mounting of luminaires at the pole top. Particular attention is directed to alignment of luminaire light distributions. Special attention must be exercised in the physical alignment of these luminaires to ensure that the approved photometric layout is physically produced at each lighting standard in the field. A marking shall be placed on the external face of the refractor to allow visual inspection of alignment. The marking shall correspond to the 0° axis of the refractor.

- **Luminaire support ring**
- **Cover**
- **2" slip fitter Assembly**
- **Lift cables & sheaves**
- **Pole cable & sheaves**
- **Lift cable sheaves**
- **Power Cable Terminator**
- **600 Volt rated Pole Cable**. Size of conductors to be determined by luminaire load.
- **Luminaires**
- **Male Inlet**
- **Male Plug**
- **Circuit Breaker Cable with Female Plug**
- **Pole Cable**
- **Winch cable**
- **Winch**
- **Winch lock nuts**
- **Hand hole**
- **Base plate**
- **Cover**
- **Lift cables (2 minimum)**
- **Luminaire support ring**
- **2" Slip/Fitter Assembly**
- **Power Cable**
- **Circuit Breaker Cable**
- **Female Plug with Female Plug**
- **Circuit Breaker Cable**
- **25' minimum remote control cable** (see schematic)
- **25' minimum supply cable receptacle**
- **Remote control switch**
- **Remote control switch**
- **Supply cable receptacle**
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 10' 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 1/2" of closed-cell polyethylene foam expansion material. The top 1/2" of expansion material shall be removed after pouring the slab and sealed with an APL approved Type A sealant meeting the requirements of Specification 932.
**CROSSING SURFACES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Concrete</td>
</tr>
<tr>
<td>R</td>
<td>Rubber</td>
</tr>
<tr>
<td>RA</td>
<td>Rubber/Asphalt</td>
</tr>
<tr>
<td>TA</td>
<td>Timber/Asphalt</td>
</tr>
</tbody>
</table>

**STOP ZONE FOR RUBBER CROSSING**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Zone Length (Distance From Stop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 Or Less</td>
<td>250'</td>
</tr>
<tr>
<td>50 - 55</td>
<td>350'</td>
</tr>
<tr>
<td>60 - 65</td>
<td>500'</td>
</tr>
<tr>
<td>70</td>
<td>600'</td>
</tr>
</tbody>
</table>

Notes:
1. Type R Crossings are NOT to be used for multiple track crossings within zones for an existing or scheduled future vehicular stop. Zone lengths are charted above.
2. Single track Type R Crossings within the zones on the chart may be used unless engineering or safety considerations dictate otherwise.

**GENERAL NOTES**

1. The Railroad Company will furnish and install all track bed (ballast), crossties, rails, crossing surface panels and accessory components. All pavement material, including that through the crossing, will be furnished and installed by the Department or its Contractor, unless negotiated otherwise.

2. When a railroad grade crossing is located within the limits of a highway construction project, a transition pavement will be maintained at the approaches of the crossing to reduce vehicular impacts to the crossing. The transition pavement will be maintained as appropriate to protect the crossing from low clearance vehicles and vehicular impacts until the construction project is completed and the final highway surface is constructed.

3. The Central Rail Office will maintain a list of currently used Railroad Crossing Products and will periodically distribute the current list to the District Offices as the list is updated.

4. The Railroad Company shall submit engineering drawings for the proposed crossing surface type to the Construction Project Engineer and/or the District Rail Office for concurrence along with the list of Railroad Crossing Products. The approved engineering drawings of the proposed 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.
TYPICAL CROSSING MATERIAL REPLACEMENT AT RR CROSSINGS

VERTICAL ROADWAY ALIGNMENT THROUGH A RAILROAD CROSSING

To prevent low-clearance vehicles from becoming caught on the tracks, the crossing surface should be at the same grade as the top of the rails for a distance of 2 feet outside the rails. The surface of the highway should also not be more than 3 inches higher or lower than the top of the nearest rail at a point 30 feet from the rail unless track super-elevation 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 super-elevated, 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

Department Participation

50' Max

50' Min

50' Min.

(Except Area Occupied By Crossing Surfacing Material):
a. To Shoulder Line For Outside Shoulders Less Than 8' Wide.
b. To 8' Maximum Width For Outside Shoulders 8' Or Wider (Regardless Of Approach Shoulder Pavement Width).c. For Median Shoulders.

"Where the existing shoulder is substandard for the facility type, the shoulder width is to be widened to accommodate crossing shoulder pavement.

Crossing Shoulder Pavement

* Pavement

Overbuild

Ballast

Type SP Asphalt (500 lb/SY)

RR Crossing Varies

(1" to 4.5")

(1" to 4.5")

Crossing Shoulder Pavement

(Except Area Occupied By Crossing Surfacing Material):

a. To Shoulder Line For Outside Shoulders Less Than 8' Wide.
b. To 8' Maximum Width For Outside Shoulders 8' Or Wider (Regardless Of Approach Shoulder Pavement Width).c. For Median Shoulders.

* Where the existing shoulder is substandard for the facility type, the shoulder width is to be widened to accommodate crossing shoulder pavement.

3 Curb Transition

Drop Curb

Concrete Curb And Gutter

Utility Strip

Asphalt

RR Crossing Varies

(1" to 4.5")

(1" to 4.5")

Crossing Shoulder Pavement

(Except Area Occupied By Crossing Surfacing Material):

a. To Shoulder Line For Outside Shoulders Less Than 8' Wide.
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