**GENERAL NOTES**

1. **SURFACE TREATMENT:** As an option to Class 4 Floor Finish (Bridge Floor Grooving) per Section 400 a hand tined or heavy broomed finish may be permitted on the concrete portion of the riding surface. Sidewalk areas shall receive a broomed finish. The top surface of the concrete beneath the asphalt overlay shall be raked.

2. **CONDUIT:** If required, see Structures Plans for Conduit Details.

3. When a longitudinal construction joint is necessary or allowed by the Engineer, the transverse steel shall be extended as shown in the Longitudinal Construction Joint Detail.

4. The plan view for CASE 1 applies when the skew angle (Ø) = 0°.

5. The plan view for CASE 2 applies where the skew angle (Ø) is > 0°. The slab shown represents a skew to the right for an approach slab at begin bridge; approach slab at the end of bridge or a left skew shall be treated similarly.

6. Deformed WWR must meet the requirements of Specification Section 931.

7. Continue the asphalt pavement over the approach slab and match the friction course type used on the roadway.

8. Approach slabs shown in Plan View Cases 1 and 2 represent a typical approach slab with edge barriers and no sidewalks. Provide railings, parapets and raised sidewalks as detailed in the Contract Plans.

9. **PAYMENT:** Deformed WWR for the edge of Approach Slabs on retaining walls is not included in the estimated quantity for reinforcing steel and is considered incidental to the work. See Roadway Plans for Asphalt Overlay and Optional Base details and quantities.

**CROSS REFERENCES:**

For Section B-B, Longitudinal Construction Joint Detail and Approach Slab Details see Sheet 2.

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**STANDARD PLANS**

FY 2020-21

**APPROACH SLABS (30 FT.) (FLEXIBLE PAVEMENT APPROACHES)**
**GENERAL NOTES**

1. **SURFACE TREATMENT:** Apply a Class 4 Floor Finish (Grooved) to the riding surface from begin or end approach slab joint to begin or end bridge. See Bid Item Notes. Apply a broomed finish to sidewalk areas.

2. **CONDUIT:** If required, see Structures Plans for Conduit details.

3. When a longitudinal construction joint is necessary or allowed by the Engineer, the transverse steel shall be extended as shown in the Longitudinal Construction Joint Detail.

4. The plan view for CASE 1 applies when the skew angle \( \theta \) = 0°. Relevant details also apply to CASE 2.

5. The plan view for CASE 2 applies where the skew angle \( \theta \) is > 0°. The slab shown represents a skew to the right for an approach slab at begin bridge; approach slab at the end of bridge or a left skew shall be treated similarly. The shown reinforcement shall be utilized, and Dowels provided in accordance with Index 350-001 and 370-001.

6. Deformed WWR must meet the requirements of Specification Section 933.

7. **PROFILOGRAPH:** If profilograph requirements apply, planing as required. The permitted construction joint shown in the Longitudinal Construction Joint Detail and Approach Slab Details see Section A-A will facilitate the placement of the expansion joint.

8. Approach slabs shown in Plan View Cases 1 and 2 represent a typical approach slab with edge barriers and no sidewalks. Provide railings, parapets, traffic separators and sidewalks as detailed on the approach slab sheets.

9. **PAYMENT:** Deformed WWR for the edge of Approach Slabs on retaining walls is not included in the estimated quantity for reinforcing steel and is considered incidental to the work. See Roadway Plans for Optional Base details and quantities.

**GENERAL REFERENCES**

For Section B-B, Longitudinal Construction Joint Details see Sheet 2.

**APPRAOCH SLABS (30 FT.)**

**STANDARD PLANS**

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**SHEET**

1 of 2

**DESCRIPTION:**

FY 2020-21
NOTE: Bars C1 are required as shown when the 36" or 42" Single-Slope Traffic Railing, or the Traffic Railing/Noise Wall, are used at the edge of the Approach Slab.

NOTE: Bars C1 are required as shown when the 36" or 42" Single-Slope Traffic Railing, Pedestrian/Bicycle Railings, Traffic Separators and Sidewalks to match those on adjoining bridge.

Traffic Railing (Type varies, 36" Single-Slope shown)

Section B-B

STANDARD APPROACH SLAB

Approach Slab with Traffic Separator

Approach Slab with Median Traffic Railing

Approach Slab with Sidewalk

Approach Slab with Raised Sidewalk

Bridge Deck

Approach Slab

End Bent Wingwall

Top of Backwall

Bear or Girder

Approach Slab with Retaining Wall Details

View C-C at Begin or End Bridge (Beam Bridge Shown, Flat Slab Bridge Similar)

Approach Slab with Wingwall Details

View D-D at Begin or End Bridge (Beam Bridge Shown, Flat Slab Bridge Similar)

Longitudinal Construction Joint Detail

Coping Transition Detail for Retaining Walls with 2'-3" Coping Height (Railing Not Shown For Clarity)

Approach Slabs (30 ft.) (Rigid Pavement Approaches)

FY 2020-21

Standard Plans

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2 of 2
GENERAL NOTES:

LIVE LOAD: HL-93.

CONSTRUCTION LOADING: It is the construction Contractor’s responsibility to provide for supporting construction loads that exceed AASHTO HL-93, and any construction load applied prior to 2 feet of compacted fill placed above the top slab.

SURFACE FINISH: All concrete surfaces shall receive a general surface finish.

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of B.

REINFORCING STEEL: See the “Box Culvert Data Tables” in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.
WINGWALL NOTES:
1. Align construction joint perpendicular to wingwall.
2. In the vicinity of the construction joint, field bend reinforcement as necessary to maintain minimum reinforcement cover.
3. For constant height wingwalls, variable length Bars 403, 405 & 408 are not required, and as such the limits of Bars 401 & 407 extend the full length of the wingwall, and the limits of Bars 402 & 404 extend to the full height of the wingwall.
PARTIAL PLAN TOP SLAB
(Left Side, Left Skew)

SINGLE BARREL BOX CULVERT
(Skewed Culvert With Parallel Wingwalls Shown)

PARTIAL PLAN BOTTOM SLAB
(Right Side, Right Skew)

NOTES:
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail "C" (Sheet 5).

CENTRAL OF TRAFFIC LANES

Depth of Fill (do not use upper or lower points in normal or super-elevated roadway sections unless so directed by the Structures Design Office).

LONGITUDINAL SECTION THRU CULVERT
(Transverse Top & Bottom Slab Reinforcing Not Shown For Clarity)
NOTES:
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail C (Sheet 5).
NOTES:
1. For small angles, the Contractor may elect to fill the area between the box and the wingwall footing with unreinforced concrete. For wingwall skew angles less than 90 degrees, field bend wingwall reinforcement as necessary while maintaining cover. No additional payment will be made for this work.
2. Location of Construction Joint determined by WP at theoretical intersection of:
   - Soil side face of Headwall and outside face of Box Exterior Wall, for SW≤90°;
   - Outside face of Wingwall and outside face of Box Exterior Wall, for SW>90°.
3. Provide 6" chamfer when angle 'A' is greater than 45°. Maintain minimum wall thickness. Field adjust reinforcing to maintain cover.
4. Wingwall Skew Angles (SW) are measured from the adjacent box exterior wall to the wingwall.
5. Turn or extend Wingwall Cutoff Wall as necessary to meet Box Cutoff Wall.
6. Provide additional reinforcement in the top of the top slab below traffic railings to ensure a minimum area of 0.80 sq. in./ft. transverse reinforcing.
OUTSIDE WALLS OF BOXES

SECTION A-A

- Cut back Existing Walls, Top Slab & Bottom Slab
- 2'-0" Min. Width
- Wrap Filter Fabric Around Construction Joint (2'-0" Min. Width)

SECTION C-C

- Proposed Side Slope
- Existing Side Slope
- Existing Wingwall
- Transition

OUTSIDE WALLS OF BOXES

SECTION B-B

STRAIGHT WINGWALL

- Longitudinal Reinforcing Steel to be Extended into Culvert Extension (See Note 3)
- Cut back Existing Walls, Top Slab & Bottom Slab to Beginning of Radius (2'-0" Min.)

FLARED WINGWALL

- Longitudinal Reinforcing Steel to be Extended into Culvert Extension (See Note 3)
- Existing Box Culvert
- Box Culvert Extension

DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION

OUTSIDE WALLS OF BOXES

INTERIOR DOUBLE WALLS OF BOXES

SECTION C-C

- 2'-0" Straight Transition
- 2'-0" Tapered Transition
- Transition (See Detail "M")

INTERIOR SINGLE WALLS OF BOXES

- 2'-0" Straight Transition
- 2'-0" Tapered Transition
- Transition (See Detail "L")

DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS

- Wrap Filter Fabric Around Construction Joint (2'-0" Min. Width)
- Existing Slab or Wall Thickness
- 3" Min. Cl.

TYPE I CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS

(CUT BACK EXISTING CONCRETE)

NOTES:
1. The Box Culvert Data Tables and Reinforcing Bar List do not include the additional quantities needed for dowel connections or transitions from double walls of existing concrete box culverts; the cost for additional reinforcement and the thickened concrete wall in the transitional area shall be included in the costs for concrete and steel in the culvert extension.
2. Cost for removal and disposal of material from existing headwalls, wingwalls and box, and cost of cleaning, straightening and extending or doweling longitudinal reinforcing steel shall be included in the cost for concrete and steel of the culvert extension.
3. Remove existing concrete while avoiding damage to existing reinforcement. Clean and straighten existing reinforcement, lap and tie onto extension reinforcement.
4. Dowel in #4 Bars @ 1'-0" max. spacing into wall/slab when there is a single mat of existing reinforcing steel, otherwise splice 1'-6" as shown for inside reinforcement. Use an Adhesive Bonding Material System in accordance with Specifications Section 416 & 937.
5. Provide additional transverse bars for top and bottom slab, parallel and full width of any skewed joint connection when shown in the Plans.
6. See Box Culvert Data Table notes in Plans for Connection Types allowed.
Concrete Box Culvert

Filter Fabric (both sides)

2'-0" 1'-0"

Coarse Aggregate

Bottom of Base

Use Extra Base When This Dimension is Less Than 12"

The cost of furnishing and installing extra friable base material shall be included in the cost of the Box Culvert.

Friable Base Material

Concrete Box Culvert

FRIABLE BASE

PLAN

INLET TYPE A GRATE

NOTES:
1. Cost of Steel Grating to be included in cost of Box Culvert.
2. All reinforcing shall be 2" clear for Slightly and Moderately Aggressive Environments, and 3" clear for Extremely Aggressive Environments.

INLET IN TOP OF BOX CULVERT

Location of Number

20' or more

(Bridge Culverts)

The number is to be placed in the center of the top surface of all bridge culvert headwalls. For Bridge Number see Plan-Profile sheet(s).

TOP VIEW OF HEADWALL

BRIDGE CULVERT NUMBER LOCATION

INLET TYPE B GRATE

PLAN

SECTION THRU RECESSED V-GROOVE TO FORM INSCRIBED FIGURES

Black Plastic Figures 3" in height as approved by the Engineer may be used in lieu of numbers formed by 3/8" V-Grooves. V-Grooves shall be formed by preformed figures.

ASPHALTIC BASE

NOTE: Extra base is required when cross box culverts are located on facilities subject to high speed traffic (>45 mph) or high traffic volumes (>1600 ADT) and the cover is within the range specified in the notation above.

EXTRA BASE FOR BOX CULVERTS CROSSING UNDER FLEXIBLE PAVEMENT

The cost of furnishing and installing extra friable base material shall be included in the cost of the Box Culvert.
Direction of Bottom Section Placement

**Bottom Slab**

*Provide WWR or extend reinforcing into tongue (See Section A-A)*

Joint Sealant

3" Min.

3" Min. (Typ.)

3" Min. (Typ.)

3" Min.

3" Min. (8° to 15° bevel)

**Direction of Flow**

Provide WWR or extend reinforcing into tongue
(See Section A-A)

Joint Sealant

**3" Min. Tongue length**

(8° to 15° bevel)

**1" Min. cover**

inside at joint

**1" Min. cover**

inside at joint

**3" Min. Tongue length**

(8° to 15° bevel)

**1" Min. cover**

inside at joint

**1" Min. cover**

inside at joint

3" Min. Tongue length

(8° to 15° bevel)

**1" Min. cover**

inside at joint

**1" Min. cover**

inside at joint

**SECTIONS A-A**

(2" Cover - Thin Wall Detail)

**NOTE:**

Bottom Slab Joints in Type B Boxes may be single tongue & groove joints as shown in Section A-A when the Top Slab Joints are oriented as shown in Schematic "A".

**SECTIONS A-A**

(2" Cover - Thick Wall Detail)

**ALTERNATE BOTTOM SLAB TRANSVERSE JOINT TYPICAL SECTION**

(DOUBLE-SIDED TONGUE & GROOVE JOINT)

(All reinforcing not shown for clarity)

**NOTE:**

Bottom Slab Joints in Type B Boxes may be single tongue & groove joints as shown in Section A-A when the Top Slab Joints are oriented as shown in Schematic "A".

**SCHEMATIC "A"**

TYPE B BOX SECTION PLACEMENT

FOR SINGLE TONGUE & GROOVE JOINTS

**PRECAST SEGMENT TO SEGMENT TONGUE & GROOVE TRANSVERSE JOINTS**

**TWO-PIECE PRECAST SEGMENT ADDITIONAL JOINT DETAILS (TYPE B BOX)**
New Precast Box Culvert

Filter Fabric wrapped around construction joint

Outside Face of Wall/Slab

Longitudinal reinforcing
Mechanical couplers or 2'-0" extension of precast box reinforcing

Equivalent reinforcing to C-I-P design shown in plans

Cast-In-Place (C-I-P) Transition
4'-0" (Typ.)

Splice

Existing Box Culvert to remain

C-I-P End Section
(As per Plans)

Precast Box Culvert

Face of Precast End Segment

Face of Wingwall or Headwall

Precast Box Culvert

Cutoff wall reinforcing (Typ.)

Circumferential bottom slab reinforcing

Longitudinal bottom slab reinforcing

Bottom slab C-I-P reinforcing or extension of precast reinforcing

Cutoff wall reinforcing (Typ.)

(See C-I-P design in plans)

H lc w  +  6 " (Index 400-289) *

Circumferential bottom slab reinforcing

Longitudinal bottom slab reinforcing

Thickness of C-I-P bottom slab in plans (Tb)

Mechanical couplers or 1'-6" Min. bar extension (Full length bar extension or adhesive bonded dowel bars with 1'-0" embedment permitted)

6" x 6" Chamber

2" x 2" Chamber (Typ.)

Headwall reinforcing (Same as C-I-P in plans)

Line with Filter Fabric with 1'-0" overlap (Min.)

Circumferential top slab reinforcing

Longitudinal top slab reinforcing

Top slab C-I-P reinforcing or extension of precast reinforcing

Face of C-I-P Wingwall/Headwall

Field bend & trim bottom bar extension as shown to maintain cover

H lh w  (Index 400-289)

6" x 6" Chamfer

8" Min.

3 1/2" Max. Joint

(Non-Shrink Grout or Joint Sealant)

1'-0" Min.

(Filter Fabric)

1 1/2" Min.

Key

Varies**

(4" Min.)

Bend bottom reinforcing as required to maintain cover at joint

Type D-3 Filter Fabric (full length of horizontal joint)

1" Min. -

Cl.

1 1/2" Max. Joint

(Non-Shrink Grout or Joint Sealant)

1'-0" Min.

(Filter Fabric)

Typ. Cover

4 1/2" Min.

#4 Stirrups @ 1'-0" Max. spacing

6" Min.

2" Min.

2" Cl. (Typ. @ joint)

Bend bottom reinforcing as required to maintain cover at joint

Type D-3 Filter Fabric (full length of horizontal joint)

Type D-3 Filter Fabric (full length of horizontal joint)

Mechanical couplers or 2'-0" extension of precast box reinforcing

Equivalent reinforcing to C-I-P design shown in plans

Mechanical couplers or 2'-0" extension of precast box reinforcing

Longitudinal reinforcing

Filter Fabric wrapped around construction joint

Outside Face of Wall/Slab

Inside Face of Wall/Slab

Cutoff wall reinforcing (Typ.)

Extension of bottom steel (Provide)

Top Slab

SECTION B-B

Top Slab to Wall Joint (Keyed Joint)

** Provide adequate width to satisfy shear strength requirements at joint

SECTION B-B

Top Slab to Wall Joint (Haugched Joint)

TYPE B BOX LONGITUDINAL JOINTS

SECTION C-C

C-I-P HEADWALL DETAILS AND CONNECTION TO PRECAST BOX

SECTION D-D

C-I-P TOE SLAB & CUTOFF WALL DETAILS AND CONNECTION TO PRECAST BOX

* Provide additional 6" depth of cutoff wall at no additional cost.

SECTION E-E

EXTERIOR WALL/SLAB TRANSITION DETAIL FOR PRECAST EXTENSION

(Type I Connection shown, Type II Connection similar)

Section of Existing Box Culvert to be removed and replaced, for Type I Connection.

SEE INDEX 400-289 FOR C-I-P Transition details

Livingston 4/09/18

410/14/2019

REV

REV

DESCRIPTION:

REVISION

LAST Revision

STANDARD PLANS

FY 2020-21

PRECAST CONCRETE BOX CULVERTS - SUPPLEMENTAL DETAILS

INDEX

SHEET

400-291

3 of 5
PIPE BLOCKOUT NOTES:
1. Cut box culvert reinforcement as required to maintain 2" cover.
2. For Precast Sections construct opening a minimum of 1'-6" away from any box to box joint, except opening may be a minimum of 1'-3" away from joint when at least 2'-0" of clearance to the box to box joint is provided on the opposite side of the pipe opening.
3. Pipe blockout diameter to be 6" greater than pipe outside diameter.
4. See Drainage Plans for size, placement, and invert elevation.

PIPE BLOCKOUT DETAILS:
- Embedded End (1'-0" Min.)
- Mechanical or adhesive bonded dowel or inside longitudinal bar extension with 90° hook (Typ.)
- Field cut vertical bars to maintain clearance

#4 BAR END CAP ANCHOR BAR BEND DIAGRAM

SECTION H-H
(Showing additional blockout reinforcing only)

Provide 50% of vertical reinforcing cut by blockout on each side of pipe at each face (Typ.)

VIEW G-G
(Headwall, Toe Slab and Cutoff Wall Reinforcing not shown for clarity)

C-1-P END CAP DETAILS AND CONNECTION TO PRECAST BOX
**DIFFERENTIAL SETTLEMENT COUNTERMEASURES FOR PRECAST BOX CULVERTS**

**VIEW J-J**

**ESTIMATED LINK SLAB QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class II or IV Concrete (Culvert)</td>
<td>CY/SF</td>
<td>0.0216</td>
</tr>
<tr>
<td>Reinforcing Steel (Roadway)</td>
<td>Lb./SF</td>
<td>1.32</td>
</tr>
</tbody>
</table>

**NOTE:** Estimated quantities are based on the plan area of precast box slabs, and are provided for information only. No additional payment will be made for Link Slabs where these are required for the precast box culverts.

**NOTE:**
1. Link Slab required when joint openings from differential settlement exceed \( \frac{1}{2}'' \) as determined in Link Slab Note 1.

**DESIGN NOTE:**
1. All bar dimensions are out to out.
2. Lap splice length for Bars 4M is 1'-4" minimum.

**SCHEMATIC LONGITUDINAL SECTION (NEW CONSTRUCTION)**

**SCHEMATIC LONGITUDINAL SECTION (WIDENING)**
GENERAL NOTES:
1. These precast designs may be substituted for cast-in-place box culverts designed to AASHTO LRFD Bridge Design Specifications, 4th Edition. Designs are based on the design criteria shown in FDOT Structures Design Guidelines.
2. Loading: ML - #3 & any fill heights between the minimum & maximum shown.
3. Only one design of precast box culvert is to be used for any installation.
4. Reinforcing steel must consist of smooth or deformed welded wire reinforcement (WWR) meeting the requirements of Specification Section 931. Longitudinal reinforcement may consist of reinforcing bars meeting the requirements of Specification Section 931. Minimum cover must be 2" for slightly or moderately aggressive environments or 3" for extremely aggressive environments, unless otherwise shown. The spacing of circumferential wires must not be less than 2", nor more than 4". The spacing of longitudinal wires or bars must not be more than 8".
5. As9 longitudinal wires must have a minimum cross-sectional area of 40% of the circumferential wires, but not less than a #25 or D4.0 for WWR, or #3 bars for deformed bars.
6. Welding of reinforcement must be limited to the locations shown in ASTM C1577 and in accordance with ANSI/AWS D1.4 "Structural Welding Code - Reinforcing Steel".
7. For alternate reinforcing configurations Options 2 and 3 shown in Detail "P" and "B" (Sheet 1). As3 may be extended to the middle of either slab and lap spliced with As4 and As8. As4 may be lap spliced at any location or connected to As2 or As3 at corners by welding.
8. Haunch dimensions may vary between the minimum and maximum dimensions shown in the Design Tables but only one haunch dimension must be used within the full length of the box culvert installation.

FOR OPTION 2 & 3 REINFORCING CONFIGURATIONS

NOTES: 1. See Sheet 1 for Reinforcing Details and dimension locations.
9. Submittal of redesign calculations are not required for any increase to the slab and/or wall thickness when the minimum reinforcement areas shown in the Design Tables are provided.
10. For Design Earth Cover greater than 10 feet, the Contractor may interplate the required areas of reinforcement and slab or wall thickness. Interpolated areas of reinforcement, slab or wall thickness must be approved by the Engineer.
11. Minimum length of precast box segments is 4 feet and maximum length is 16 feet.
12. See Index 400-291 for connections to wingwalls, headwalls and other general details.

TABLE 1A - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R) (Tf) (Tw)</td>
<td>(Tt) (Tb) (H)</td>
<td></td>
<td>A1  A2  A3  A4  A5  A6  A7  A8  A9</td>
<td></td>
</tr>
<tr>
<td>3 x 3</td>
<td>7 7 7 10</td>
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<td>0.33 - &lt;2 0.17 0.29 0.21 0.17 0.17 0.17</td>
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<tr>
<td>4 x 3</td>
<td>7 7 7 10</td>
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<td>0.33 - &lt;2 0.19 0.38 0.26 0.17 0.17 0.17</td>
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</tr>
<tr>
<td>4 x 4</td>
<td>7 7 7 10</td>
<td></td>
<td>0.33 - &lt;2 0.19 0.41 0.28 0.17 0.21 0.17 0.17 0.17 0.17</td>
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</table>

TABLE 1B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R) (Tf) (Tw)</td>
<td>(Tt) (Tb) (H)</td>
<td></td>
<td>A1  A2  A3  A4  A5  A6  A7  A8  A9</td>
<td></td>
</tr>
<tr>
<td>3 x 3</td>
<td>8 8 8 10</td>
<td></td>
<td>0.33 - &lt;2 0.20 0.26 0.32 0.20 0.20 0.20 0.20</td>
<td></td>
</tr>
<tr>
<td>4 x 3</td>
<td>8 8 8 10</td>
<td></td>
<td>0.33 - &lt;2 0.20 0.31 0.22 0.20 0.20 0.20 0.20</td>
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</tr>
<tr>
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<td>8 8 8 10</td>
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NOTE: 1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 14 for WWR Bending Diagram.
### TABLE 2A - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 5' & 6' SPANS

<table>
<thead>
<tr>
<th>SPAN (S) (Ft)</th>
<th>TOP SLAB (in.)</th>
<th>BOT SLAB (in.)</th>
<th>SIDE WALL THICKNESS (in.)</th>
<th>MAUWNCH (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./ft)</th>
<th>ART LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 3</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
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<tr>
<td>5' x 4</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
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<tr>
<td>5' x 5</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 6</td>
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<td>0.31 - 0.08</td>
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<tr>
<td>6' x 3</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 4</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
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<tr>
<td>6' x 5</td>
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<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
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<tr>
<td>6' x 6</td>
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<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
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### LAST SLAB

<table>
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<th>SPAN (S) (Ft)</th>
<th>TOP SLAB (in.)</th>
<th>BOT SLAB (in.)</th>
<th>SIDE WALL THICKNESS (in.)</th>
<th>MAUWNCH (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./ft)</th>
<th>ART LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 3</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 5</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 6</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 3</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 5</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 6</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
</tbody>
</table>

### TABLE 2B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 5' & 6' SPANS

<table>
<thead>
<tr>
<th>SPAN (S) (Ft)</th>
<th>TOP SLAB (in.)</th>
<th>BOT SLAB (in.)</th>
<th>SIDE WALL THICKNESS (in.)</th>
<th>MAUWNCH (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./ft)</th>
<th>ART LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 3</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 4</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 5</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>5' x 6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 3</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 4</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 5</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
<tr>
<td>6' x 6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>0.33 - &lt;2</td>
<td>0.31 - 0.08</td>
</tr>
</tbody>
</table>
### TABLE 3 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 7' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER (sq. in./Ft.)</th>
<th>REINFORCEMENT AREAS</th>
<th>AS1 EXT. LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T x 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8' x 8</td>
<td></td>
<td>4</td>
<td>0.33 - 2</td>
<td>-</td>
</tr>
<tr>
<td>7' x 10</td>
<td></td>
<td>3</td>
<td>0.37 - 0.58</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>5' x 12</td>
<td></td>
<td>2</td>
<td>0.37 - 0.58</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>4' x 15</td>
<td></td>
<td>2</td>
<td>0.36 - 0.60</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>3' x 20</td>
<td></td>
<td>3</td>
<td>0.37 - 0.58</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>2' x 25</td>
<td></td>
<td>2</td>
<td>0.36 - 0.60</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>1' x 30</td>
<td></td>
<td>3</td>
<td>0.36 - 0.60</td>
<td>0.20 - 0.22</td>
</tr>
</tbody>
</table>

### TABLE 4 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 8' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER (sq. in./Ft.)</th>
<th>REINFORCEMENT AREAS</th>
<th>AS1 EXT. LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T x 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8' x 8</td>
<td></td>
<td>4</td>
<td>0.33 - 2</td>
<td>-</td>
</tr>
<tr>
<td>7' x 10</td>
<td></td>
<td>3</td>
<td>0.37 - 0.58</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>5' x 12</td>
<td></td>
<td>2</td>
<td>0.37 - 0.58</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>4' x 15</td>
<td></td>
<td>2</td>
<td>0.36 - 0.60</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>3' x 20</td>
<td></td>
<td>3</td>
<td>0.37 - 0.58</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>2' x 25</td>
<td></td>
<td>2</td>
<td>0.36 - 0.60</td>
<td>0.20 - 0.22</td>
</tr>
<tr>
<td>1' x 30</td>
<td></td>
<td>3</td>
<td>0.36 - 0.60</td>
<td>0.20 - 0.22</td>
</tr>
</tbody>
</table>

NOTES:
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
### TABLE 5 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 9' SPANS

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SLAB / WALL THICKNESS</th>
<th>BASE LENGTH</th>
<th>TOP SLAB DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2' - &lt;3'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 to 12</td>
<td>30'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 to 18</td>
<td>30'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 to 30</td>
<td>30'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30'</td>
<td>30'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.00 - &lt;5.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.00 - &lt;7.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.50 - &lt;10.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10.00 - &lt;15.00</td>
</tr>
</tbody>
</table>

### TABLE 6 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 10' SPANS

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SLAB / WALL THICKNESS</th>
<th>BASE LENGTH</th>
<th>TOP SLAB DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2' - &lt;3'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.00 - &lt;5.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.00 - &lt;7.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.50 - &lt;10.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10.00 - &lt;15.00</td>
</tr>
</tbody>
</table>

**NOTES:**
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
### TABLE 7 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 12' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN</th>
<th>EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11' x 4</td>
<td>11 11 11</td>
<td>4</td>
<td>0.33 - &lt;7</td>
<td>0.51 0.57 0.44 0.27 0.27 0.45 0.48</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>2</td>
<td>0.33 - &lt;7</td>
<td>0.51 0.57 0.44 0.27 0.27 0.45 0.48</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 10</td>
<td>0.47 0.50 0.50 0.14</td>
<td>-   -   -   -</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>0.59 0.58 0.58 0.14</td>
<td>-   -   -   -</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>0.77 0.77 0.77 0.14</td>
<td>-   -   -   -</td>
<td>55</td>
</tr>
<tr>
<td>11.5 11.5 11</td>
<td>8 to</td>
<td>30 40</td>
<td>0.92 0.95 0.91 0.14</td>
<td>-   -   -   -</td>
<td>55</td>
</tr>
<tr>
<td>13 13 13</td>
<td>12</td>
<td>30 40</td>
<td>0.94 1.09 1.06 0.14</td>
<td>-   -   -   -</td>
<td>55</td>
</tr>
<tr>
<td>13.5 13.5 11</td>
<td>8 to</td>
<td>30 40</td>
<td>0.95 1.05 1.01 0.14</td>
<td>-   -   -   -</td>
<td>55</td>
</tr>
</tbody>
</table>

### TABLE 8 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 12' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN</th>
<th>EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12' x 4</td>
<td>12 12 12</td>
<td>4</td>
<td>0.33 - &lt;7</td>
<td>0.52 0.57 0.45 0.29 0.29 0.47 0.49</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>12 12 12</td>
<td>2</td>
<td>0.33 - &lt;7</td>
<td>0.52 0.57 0.45 0.29 0.29 0.47 0.49</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 10</td>
<td>0.50 0.52 0.52 0.15</td>
<td>-   -   -   -</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>0.63 0.61 0.59 0.25</td>
<td>-   -   -   -</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>0.82 0.81 0.77 0.15</td>
<td>-   -   -   -</td>
<td>59</td>
</tr>
<tr>
<td>12.5 12.5 12</td>
<td>8 to</td>
<td>25 30</td>
<td>0.99 0.99 0.95 0.15</td>
<td>-   -   -   -</td>
<td>59</td>
</tr>
<tr>
<td>14 14 14</td>
<td>12</td>
<td>30 40</td>
<td>1.01 1.01 1.11 0.15</td>
<td>-   -   -   -</td>
<td>59</td>
</tr>
</tbody>
</table>

### NOTES:
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
### TABLE 9A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>Span X Rise (Ft.)</th>
<th>Slab / Wall Thickness</th>
<th>Design Earth Cover Above Top Slab</th>
<th>Reinforcement Areas (sq. in./Ft.)</th>
<th>As1 Ext. Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3' x 3' 9 9 9</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.22</td>
<td>-</td>
</tr>
<tr>
<td>3' x 3' 10 10 10</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
<tr>
<td>3' x 4' 9 9 9</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
<tr>
<td>3' x 4' 10 10 10</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
</tbody>
</table>

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.

### TABLE 9B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>Span X Rise (Ft.)</th>
<th>Slab / Wall Thickness</th>
<th>Design Earth Cover Above Top Slab</th>
<th>Reinforcement Areas (sq. in./Ft.)</th>
<th>As1 Ext. Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3' x 3' 9 9 9</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
<tr>
<td>3' x 3' 10 10 10</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
<tr>
<td>3' x 4' 9 9 9</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
<tr>
<td>3' x 4' 10 10 10</td>
<td>0.33 - &lt;2</td>
<td>4</td>
<td>0.24</td>
<td>-</td>
</tr>
</tbody>
</table>

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### TABLE 10A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 5' & 6' SPANS

<table>
<thead>
<tr>
<th>SPAN (FT)</th>
<th>TOP SLAB / WALL THICKNESS</th>
<th>REINFORCEMENT AREAS (sq. in./FT)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 5'</td>
<td>4</td>
<td>0.27 0.47 0.67 0.87 1.07 1.27</td>
<td>A61 A62 A63 A64 A65 A66</td>
</tr>
<tr>
<td>5' x 6'</td>
<td>4</td>
<td>0.27 0.47 0.67 0.87 1.07 1.27</td>
<td>A61 A62 A63 A64 A65 A66</td>
</tr>
</tbody>
</table>

### TABLE 10B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 5' & 6' SPANS

<table>
<thead>
<tr>
<th>SPAN (FT)</th>
<th>TOP SLAB / WALL THICKNESS</th>
<th>REINFORCEMENT AREAS (sq. in./FT)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 5'</td>
<td>4</td>
<td>0.27 0.47 0.67 0.87 1.07 1.27</td>
<td>A61 A62 A63 A64 A65 A66</td>
</tr>
<tr>
<td>5' x 6'</td>
<td>4</td>
<td>0.27 0.47 0.67 0.87 1.07 1.27</td>
<td>A61 A62 A63 A64 A65 A66</td>
</tr>
</tbody>
</table>

---

**Note:**
- See General Note 5
- Side Haunch = 4 in.
- Earth Cover = 0.33' - <2'
- Design Span x Rise = 38' x 38' or 45' x 45'
- See Table 10C for additional designs.
### TABLE 11A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (ft)</th>
<th>SLAB x WALL THICKNESS (in.)</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB (sq. in./ft)</th>
<th>REINFORCEMENT AREAS (sq. in./ft)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7' x 4</td>
<td>10</td>
<td>0.37 x &lt;2</td>
<td>0.33 x 0.39 x 0.44 x 0.44 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2 x &lt;2</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 5</td>
<td>10</td>
<td>3 x &lt;5</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 6</td>
<td>10</td>
<td>4 x &lt;6</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 7</td>
<td>10</td>
<td>5 x &lt;7</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 8</td>
<td>10</td>
<td>6 x &lt;8</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 9</td>
<td>10</td>
<td>7 x &lt;9</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
</tbody>
</table>

### TABLE 11B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (ft)</th>
<th>SLAB x WALL THICKNESS (in.)</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB (sq. in./ft)</th>
<th>REINFORCEMENT AREAS (sq. in./ft)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7' x 4</td>
<td>10</td>
<td>0.37 x &lt;2</td>
<td>0.33 x 0.39 x 0.44 x 0.44 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2 x &lt;2</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 5</td>
<td>10</td>
<td>3 x &lt;5</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 6</td>
<td>10</td>
<td>4 x &lt;6</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 7</td>
<td>10</td>
<td>5 x &lt;7</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 8</td>
<td>10</td>
<td>6 x &lt;8</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
<tr>
<td>7' x 9</td>
<td>10</td>
<td>7 x &lt;9</td>
<td>0.33 x 0.59 x 0.28 x 0.32 x 0.24 x 0.24 x 0.24 x 0.33</td>
<td>-</td>
</tr>
</tbody>
</table>

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT. LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOP (ft)</td>
<td>BGT (Tb) (in.)</td>
<td>MAU (Tb) (in.)</td>
<td>MAU (in.)</td>
<td>AS1</td>
</tr>
<tr>
<td>8' x 4</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.48</td>
<td>0.49</td>
<td>0.52</td>
<td>0.11</td>
</tr>
<tr>
<td>5 - 10</td>
<td>0.52</td>
<td>0.48</td>
<td>0.49</td>
<td>0.11</td>
</tr>
<tr>
<td>10</td>
<td>0.75</td>
<td>0.72</td>
<td>0.71</td>
<td>0.11</td>
</tr>
<tr>
<td>20</td>
<td>1.00</td>
<td>0.98</td>
<td>0.97</td>
<td>0.11</td>
</tr>
<tr>
<td>9.5</td>
<td>9.5</td>
<td>9</td>
<td>8</td>
<td>8' x 3</td>
</tr>
<tr>
<td>10</td>
<td>10.5</td>
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<td>12</td>
<td>1.31</td>
</tr>
<tr>
<td>8' x 5</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.51</td>
<td>0.69</td>
<td>0.66</td>
<td>0.11</td>
</tr>
<tr>
<td>5 - 10</td>
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<td>0.51</td>
<td>0.53</td>
<td>0.11</td>
</tr>
<tr>
<td>10</td>
<td>0.74</td>
<td>0.77</td>
<td>0.78</td>
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<td>1.05</td>
<td>1.05</td>
<td>0.11</td>
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<td>9.5</td>
<td>9</td>
<td>8</td>
<td>8' x 4</td>
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<tr>
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<td>1.26</td>
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<tr>
<td>8' x 6</td>
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<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.47</td>
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<tr>
<td>5 - 10</td>
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<td>0.55</td>
<td>0.58</td>
<td>0.11</td>
</tr>
<tr>
<td>10</td>
<td>0.74</td>
<td>0.87</td>
<td>0.85</td>
<td>0.11</td>
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<tr>
<td>20</td>
<td>0.97</td>
<td>1.12</td>
<td>1.13</td>
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<td>9.5</td>
<td>9</td>
<td>8</td>
<td>8' x 5</td>
</tr>
<tr>
<td>10</td>
<td>10.5</td>
<td>9</td>
<td>12</td>
<td>1.26</td>
</tr>
<tr>
<td>8' x 7</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.52</td>
<td>0.74</td>
<td>0.67</td>
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</tr>
<tr>
<td>5 - 10</td>
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<td>0.64</td>
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<td>1.19</td>
<td>1.21</td>
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<td>9.5</td>
<td>9</td>
<td>8</td>
<td>8' x 6</td>
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<tr>
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<td>1.31</td>
</tr>
<tr>
<td>8' x 8</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.55</td>
<td>0.77</td>
<td>0.76</td>
<td>0.13</td>
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<tr>
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<td>0.87</td>
<td>0.96</td>
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<td>8</td>
<td>8' x 7</td>
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<tr>
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<td>10.5</td>
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<td>12</td>
<td>1.41</td>
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</tbody>
</table>

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### TABLE 13A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9' x 5'</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9' x 6'</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>9' x 7'</td>
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<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9' x 8'</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### TABLE 13B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft.)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EARTH COVER ABOVE SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9' x 5'</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9' x 6'</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9' x 7'</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9' x 8'</td>
<td>10</td>
<td>10</td>
<td>10</td>
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</tr>
</tbody>
</table>

**NOTES:**
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### TABLE 14 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 10’ SPANS

<table>
<thead>
<tr>
<th>SPAN (S) (Ft)</th>
<th>RISE (R)</th>
<th>GT (in.)</th>
<th>SIZE (in.)</th>
<th>MAUNCH (Ht) (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 Ext Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 x 5</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>10 x 6</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>10 x 7</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>10 x 8</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>10 x 9</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>10 x 10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 5</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 6</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 7</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 8</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 9</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 10</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
</tbody>
</table>

### TABLE 15 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 11’ SPANS

<table>
<thead>
<tr>
<th>SPAN (S) (Ft)</th>
<th>RISE (R)</th>
<th>GT (in.)</th>
<th>SIZE (in.)</th>
<th>MAUNCH (Ht) (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 Ext Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 x 4</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 5</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 6</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 7</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 8</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 9</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
<tr>
<td>11 x 10</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>4 0.33 -&lt;2</td>
<td>0.60 0.73 0.81 0.24 0.24 0.50 0.57</td>
</tr>
</tbody>
</table>

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
### TABLE 16 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 12' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>DESIGN EARTH COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./ft.)</th>
<th>A1 EXT LENGTH (M)</th>
</tr>
</thead>
<tbody>
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<td>(FT)</td>
<td>AQ1</td>
<td>AQ2</td>
<td>AQ3</td>
</tr>
<tr>
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<td>0.33 - &lt;2'</td>
<td>0.59</td>
<td>0.64</td>
</tr>
<tr>
<td>12</td>
<td>2 - &lt;3'</td>
<td>0.60</td>
<td>0.64</td>
</tr>
<tr>
<td>12</td>
<td>3 - &lt;8'</td>
<td>0.60</td>
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<tr>
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<td>5 - 10'</td>
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<tr>
<td>14.5</td>
<td>20</td>
<td>1.65</td>
<td>1.38</td>
</tr>
</tbody>
</table>

### NOTES:
1. See Sheet 2 of 14 for General Notes.
2. See Sheet 7 of 14 for Reinforcing Details and dimension locations.

---

### WELDED WIRE REINFORCEMENT BENDING DIAGRAM

- **WRR PIECE NO. 1**
  - (2 Req'd. per segment)

- **WRR PIECE NO. 2**
  - (2 Req'd. per segment)

- **WRR PIECE NO. 3**
  - (2 Req'd. per segment)

---

### TYPE 2 BOX SECTION (DESIGN EARTH COVER 2' OR GREATER)

- As4 (3 Wires Min.)
- As9 (Top Slab)
- As9 (Bot. Slab)
- S48' Min.

- Option 2 or 3 (See Sheets 1 & 7)

---

### TYPE 1 BOX SECTION (DESIGN EARTH COVER LESS THAN 2')

- As4 (Top Slab)
- As4 (Bot. Slab)
- As9 (Top Slab)
- As9 (Bot. Slab)
- S48' Min.

- Option 2 or 3 (See Sheets 1 & 7)
1. Neoprene in Type D, E, F & AA bearing pads shall have a shear modulus (G) of 110 psi. Neoprene in Type G, H, J, K & AB bearing pads shall have a shear modulus (G) of 150 psi.

2. Steel Plates in bearing pads shall conform to ASTM A1011 Grade 36.

3. See Bearing Pad Data Table in Structures Plans for quantities of Type D, E, F, G, H, J, K, AA and/or AB Bearing Pads.
NOTE: For Bar Dimensions See REINFORCING BAR LIST Sheet(s) in Structures Plans.
1. Work this Index with the Florida-I Beam Standard Details (Index 450-036 thru 450-096) and the Table of Beam Variables in Structures Plans.

2. All bar bend dimensions are out-to-out.

3. Concrete cover: 2 inches minimum.

4. Strands N: ⅜ minimum, stressed to 10,000 lbs. each.

5. Place one (1) Bar 3D1, 5K, 3D2, 4M1, 4M2, 5Y and 5Z at each location. Alternate the direction of the ends for each bar (see "STRAND PATTERN" on the Table of Beam Variables sheet in Structures Plans).

6. Tie Bars 5K and 5Z to the fully bonded strands in the bottom or center row (see "STRAND PATTERN" in Standard Details).

7. Place Bars 3C1, 3C2, 3D1, 3D2, 4M1 and 4M2 in beam END 1, and Bars 3C3, 3D2 and 4M2 in beam END 2.

8. For beams with vertically beveled end conditions: Place first row of Bars 3C1, 3C2, 3D1, 3D2, 5K, 5Y and 5Z parallel to the end of the beam. Progressively rotate remaining bars within the limits of Bars 5Z until vertical by adjusting the spacing at the top of beam up to a maximum of 1". For deformed WWR, cut top cross wire and rotate bars as required or reduce end cover at top of beam to 1" minimum.

9. For beams with skewed end conditions:

   A. Place end reinforcement parallel to the skewed end of the beam. End reinforcement is defined as Bars 3C1, 3C2, 3D1, 3D2, 4M1, 4M2, 5K, 5Y and 5Z placed within the limits of the spacing for Bars 3C in "ELEVATION AT END OF BEAM".

   B. Beyond the limits of the spacing for Bars 3C, place Bars 3D3, 5K and 4M3 equal to the longitudinal axis of the beam. Fan Bars as needed to avoid overlapping bars at the transition to Bars 3D3 and 4M3, and field cut to minimum cover. Provide additional Bars 4M1, 4M2, 3D1 and 3D2 as required; additional bars are not included in the "BILL OF REINFORCING STEEL". For placement locations see "Skewed Beam End Details for Widening Existing Bridges".

   C. Adjust the dimensions of Bars 3C1, 3C2, 3D1, 3D2, 4M1, 4M2 as shown on the Bending Diagram.

   D. WWR is not permitted for end reinforcement Bars 3D1, 3D2, 4M1 and 4M2; use bar reinforcement.

10. Contractor Options:

   A. Deformed WWR may be used in lieu of Bars 3D, 5K, 4M, and 5Z as shown on the Standard Details; except at skewed ends (see Note 9).

   B. Bars 3D1, 3D2 and 3D3 may be fabricated as a single bar with a 1'-0" minimum lap splice of the top legs, or the length of the bottom legs may be extended to facilitate tying to the exterior strands.

11. Embedment of Safety Line Anchorage Devices are permitted in the top flange to accommodate fall protection systems. See shop drawings for details and spacing of any required anchorage devices.

12. For beams with ends that will not be permanently encased in concrete diaphragms, cut wedges and recess prestressing strands at the end of the beam without damaging the surrounding concrete. See "STRAND CUTTING AND PROTECTING DETAIL" on Sheet 2. Protect end of wedged recessed strands in accordance with Specification Section 450.

13. Holes in the beam web for temporary bracing or shipping devices must be formed prior to casting. Fill holes not meeting all the following criteria in accordance with Specification Section 450.

   A. The superstructure environmental classification is slightly or moderately aggressive

   B. Clear cover to adjacent steel reinforcing is 1" or greater

   C. Hole inside diameter is 2" maximum

   D. Non-metallic, non-water absorbing forming materials such as PVC, may be left in place permanently.

SCHEMATIC PLAN VIEWS AT BEAM ENDS

SCHEMATIC END ELEVATIONS OF BEAMS

(Showing Vertical Bevel of Beam End)
For number of Bars, spacing and placement details see Index 450-036 thru 450-096. See Sheet 1 for Conventional Reinforcement, Sheet 2 for WWR.

*For number of Bars, spacing and placement details see Index 450-036 thru 450-096. See Sheet 1 for Conventional Reinforcement, Sheet 2 for WWR.

1 ~ Additional Bar 3D1 or 3D2 placed with alternate Bars 5K.

2 ~ Additional Bars 3D1 or 3D2 for Skews > 10° (shown dashed) rotate and space equally between last Bar 3D1 or 3D2 and first Bar 3D3 as shown.

WWR not permitted for Bars 4M1 or 4M2 in this area, for skewed beam ends.

WR not permitted for Bars 4M1 or 4M2 in this area, for skewed beam ends.

Begin WWR Option when applicable, Pieces H-3 & S-1, see Sheet 2 of Index 450-036 thru 450-096

For WWR pieces and how to use, refer to Sheet 2 of Index 450-036 thru 450-096.

For WWR pieces and how to use, refer to Sheet 2 of Index 450-036 thru 450-096.
FLORIDA-I 36 BEAM - STANDARD DETAILS

SECTION A-A FOR CONVENTIONAL REINFORCING
(Showing Bars 5K, 5Y & 5Z Only)

END VIEW

END OF BEAM

Bar 5Z (shown as ( ) Typ.)

Bar 3C (Typ.)

BARS 5Z & N

Bar 5A

BARS 4M & 4N

Strand N

Strand N

Spacing Bars 4M1 or 4M2 (Typ.)

Spacing Bars 4M1 or 4M2 (Typ.)

Spacing Bars 5K or 5Z

Spacing Bars 5K or 5Z

Spacing Bars 5K or 5Z

ELEVATION AT END OF BEAM
(End 1 Shown, End 2 Similar)

A = Bars 3C1 or 3C2 & 3D1 or 3D2 (Pairs) @ 6" sp.

A = Bars 3C1 or 3C2 & 3D1 or 3D2 (Pairs) @ 6" sp.

A = Bars 3C1 or 3C2 & 3D1 or 3D2 (Pairs) @ 6" sp.

A = Bars 3C1 or 3C2 & 3D1 or 3D2 (Pairs) @ 6" sp.

A = Bars 3C1 or 3C2 & 3D1 or 3D2 (Pairs) @ 6" sp.

1 1/2" Cover

1 1/2" Cover

ELEVATION

DIM. L = Beam Casting Length

(Overall length of Beam along Beam including length increase as required for Beam placed on grade and Dim. R (to compensate for elastic and time dependent shortening effects)

Direction of Stationing

BARS 5K & 5Z

BARS 3D1, 3D2 & 3D3

BARS 3C1 & 3C2

BARS 5A, 4M1, 4M2, BARS 3C1 & 3C2

4M3 & 5Y

BARS 5A, 4M1, 4M2, BARS 3C1 & 3C2

4M3 & 5Y

BARS 5A, 4M1, 4M2, BARS 3C1 & 3C2

4M3 & 5Y

BARS 5A, 4M1, 4M2, BARS 3C1 & 3C2

4M3 & 5Y

BARS 5A, 4M1, 4M2, BARS 3C1 & 3C2

4M3 & 5Y
ALTERNATE REINFORCING STEEL (WWR) DETAILS

PIECES M END VIEW

PIECES K & S END VIEW

PIECES D END VIEW

PIECE K-1 (Aligned EF) (4 Required ~ 2 Pairs)

PIECE D-1 (4 Required ~ 2 Pairs)

PIECE D-2 (4 Required ~ 2 Pairs)

PIECE D-3 (4 Required ~ 2 Pairs)

PIECE K-2 (FF Shown Solid, BF Shown Dashed) (4 Required)

PIECE K-1 (Aligned EF) (2 Required)

PIECE M-1 (2 Required)

PLAN VIEW

PLAN VIEW

End of Beam

2 1/2" Cover

Pieces D-1 ties to Piece K-2

Match spacing of adjacent Piece S-1, S-2, S-3 or S-4

S1 = D25's @ 1'-0" sp. (Piece S-1 shown)
S2 = D25's @ 9" sp. (Piece S-2)
S3 = D25's @ 1'-3" sp. (Piece S-3)
S4 = D25's @ 1'-6" sp. (Piece S-4)

6 = D18's @ 6" sp. = 4'-0"

Varies = D18's @ 1'-0" sp.

6" Cover (Typ.)

END VIEW

END VIEW

END VIEW

END VIEW

Notes:

a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.

b. Place Conventional Reinforcement Bars 5A & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.

c. Pieces may be fabricated in multiple length sections.

d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.
**FLORIDA-I 45 BEAM - STANDARD DETAILS**

**ELEVATION AT END OF BEAM**

- **End View**
  - Bars 5Y (shown as ( ) Typ.)
  - Bar S2
  - Embedded Bearing Plate A
  - (Flanges Not Shown For Clarity)
  - (End 1 Shown, End 2 Similar)

**SECTION A A FOR CONVENTIONAL REINFORCING**

- **(Showing Bars 5K, 5Y & 5Z Only)**

**BILL OF REINFORCING STEEL**

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**CONVENTIONAL REINFORCING BAR BENDING DETAILS**

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**NOTES:**

A. Work this Index with Index 450-010 - Typical Florida-I Beam Details and Notes and the Florida-I Beam - Table of Beam Variables in Structures Plans.

B. For referenced notes, see Index 450-010.

C. For Dimensions A, B, C, D, L, R & V1 and number of spaces S1 thru S4, see Florida-I Beam - Table of Beam Variables in Structures Plans.
ALTERNATE REINFORCING STEEL (WWR) DETAILS

PLAN VIEW
PIECE M-1
(2 Required)

PLAN VIEW
PIECE M-3
(2 Required)

SECTION A-A
FOR WELDED WIRE REINFORCEMENT

NOTES:
- See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.
- Place Conventional Reinforcement Bars 5Y & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.
- Pieces may be fabricated in multiple length sections.
- For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used. Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.

PIECES M
END VIEW

PIECES K & S
END VIEW

PIECE K-1
(Aligned EF)
(2 Required ~ 2 Pairs)

PIECE K-2
(FF Shown Solid, BF Shown Dashed)
(4 Required Each Piece)

PIECE S-1, S-2, S-3 or S-4
(2 Required Each Piece)

PARTIAL SECTION AT CENTER BEAM

PARTIAL BEAM END VIEW

(Conventional Reinforcing Bars A, C, Y and Strands not Shown for Clarity)

LEGEND:
EF = Each Face
FF = Front Face
BF = Back Face

W4.4
W6.4
W10
W12.4

SECTION A-A FOR CONVENTIONAL REINFORCING
(Showing Bars 5K, 5Y & 5Z Only)

END VIEW

ELEVATION AT END OF BEAM
(End 1 Shown, End 2 Similar)

BENDING DIAGRAMS

END 1

END 2

FLORIDA-I 63 BEAM - STANDARD DETAILS

INDEX

450-063
SECCTION A A FOR CONVENTIONAL REINFORCING
(Showing Bars 5K, 5Y & 5Z Only)

END VIEW

Embedded Bearing Plate A

BAR BENDING DETAILS

ELEVATION AT END OF BEAM
(Flanges Not Shown For Clarity)
(End 1 Shown, End 2 Similar)

ELEVATION

BILL OF REINFORCING STEEL

CONVENTIONAL REINFORCING
BAR BENDING DETAILS

FLORIDA-1 72 BEAM - STANDARD DETAILS

INDEX

450-072

1 of 2
ALTERNATE REINFORCING STEEL (WWR) DETAILS

NOTES:

a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.

b. Place Conventional Reinforcement Bars 6A & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.

c. Pieces may be fabricated in multiple length sections.

d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.
**FLORIDA-1 78 BEAM - STANDARD DETAILS**

**BENDING DIAGRAMS**

- **ELEVATION AT END OF BEAM**
  - (Flanges Not Shown For Clarity)
  - (End 1 Shown, END 2 Similar)
  - Dim. L = Beam Casting Length
  - Direction of Stacking
  - Overall length of beam along beam including length increase as required for beam placed on grade and Dim. L to compensate for elastic and time dependent shortening effects

**SECTION A A FOR CONVENTIONAL REINFORCING**

- (Showing Bars 5K, 5Y & 5Z Only)

**CONVENTIONAL REINFORCING BAR BENDING DETAILS**

**BILL OF REINFORCING STEEL**

**NOTES:**

A. Work this Index with Index 450-010 - Typical Florida-I Beam Details and Notes and the Florida-I Beam - Table of Beam Variables in Structures Plans.

B. For referenced notes, see Index 450-010.

C. For dimensions A, B, C, D, L, R & V1 and number of spacers 51 thru 54, see Florida-I Beam - Table of Beam Variables in Structures Plans.

- FLORIDA-I 78 BEAM - STANDARD DETAILS
- FY 2020-21
- STANDARD PLANS

- LAST REVISION: 01/01/19
- DESCRIPTION: 450-078
- INDEX 1 of 2
LEGEND:
EF = Each Face
FF = Front Face
BF = Back Face

VARIES 9" MAX.
D11's @ 1'-6" SPACES
(14 ~ D11's @ 6" = 6'-6"
W4.4
1" EXTENSION (Typ.)
W4.4
2" COVER
(2" MIN.)

PIECES M END VIEW
PIECES K & S END VIEW
PIECES D END VIEW

PLAN VIEW
PIECE M-1
(2 REQUIRED)
(4 REQUIRED - 2 PAIRS)

PIECE K-1
(ALIGNED EF)
(FF SHOWN SOLID, BF SHOWN DASHED)
(4 REQUIRED - EACH PIECE)

PIECE K-2
(FF SHOWN SOLID, BF SHOWN DASHED)
(4 REQUIRED)

PIECE S1, S2, S3 OR S4
(2 REQUIRED - EACH PIECE)

PIECE D-1
(4 REQUIRED - 2 PAIRS)

PIECE D-2
(4 REQUIRED - 2 PAIRS)

PIECE D-3
(4 REQUIRED - 2 PAIRS)

NOTES:
a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1. 
b. Place Conventional Reinforcement Bars A, C, Y and Strands N not shown for clarity.
c. Pieces may be fabricated in multiple length sections.
d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details.

PLATE FIRST REVISION
11/11/16

ALTERNATE REINFORCING STEEL (WWR) DETAILS
FLORIDA-178 BEAM - STANDARD DETAILS
INDEX 450-078

REVISION
LAST REVISION
DESCRIPTION
FY 2020-21
STANDARD PLANS
11/01/16
2 of 2
ALTERNATE REINFORCING STEEL (WWR) DETAILS

PLAN VIEW

PIECE M-1
(2 Required)

PLAN VIEW

PIECE M-3
(2 Required)

PLAN VIEW

PIECE D-1
(4 Required ~ 2 Pairs)

PLAN VIEW

PIECE D-2
(4 Required ~ 2 Pairs)

PLAN VIEW

PIECE D-3
(4 Required ~ 2 Pairs)

END VIEW

PIECES M
END VIEW

END VIEW

PIECE K & S
END VIEW

END VIEW

PIECE D
END VIEW

END VIEW

PIECE D
END VIEW

NOTES:

a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.
b. Place Conventional Reinforcement Bars A, C, Y and Strands N not Shown for Clarity.
c. Pieces may be fabricated in multiple length sections.
d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details. Shift Pieces K & Bars S7 to accommodate skewed end conditions and line up with bars C and D.
**PLAN VIEW**

- **PIECE M-1** (2 Required)
  - Piece M-1 tied to Piece K-2
  - 5½" sp. = 1'-5½"
  - 7° extension (Typ.)

- **PIECE M-3** (2 Required)
  - 17 ~ D25's @ V1 sp. (Piece S-3 shown)
  - 3" Offset (Typ.)
  - Match spacing of adjacent Piece S-1, S-2, S-3 or S-4

**PIECE K-S END VIEW**

- **PIECE K-1** (Aligned EF) (4 Required ~ 2 Pairs)
  - Piece D-1 lies to Piece K-1
  - 6 ~ D11's @ 6" sp. = 1'-0"

- **PIECE K-2** (FF Shown Solid, BF Shown Dashed) (4 Required)
  - 17 ~ D11's @ 6" sp. = 1'-0"

- **PIECE S-1, S-2, S-3 or S-4** (2 Required ~ Each Piece)
  - S1 ~ D25's @ 1'-0" sp. (Piece S-1 shown)
  - S2 ~ D25's @ 9" sp. (Piece S-2)
  - S3 ~ D25's @ 1'-0" sp. (Piece S-3)
  - S4 ~ D25's @ 1'-6" sp. (Piece S-4)

**PLAN VIEW**

- **PIECE D-1** (4 Required ~ 2 Pairs)
  - Piece D-1 lies to Piece K-2
  - 6 ~ D11's @ 6" sp. = 1'-0"

- **PIECE D-2** (4 Required ~ 2 Pairs)
  - 1° extension (Typ.)

- **PIECE D-3** (4 Required ~ 2 Pairs)
  - 7° extension (Typ.)

**SECTION A-A**

- **FOR WELDED WIRE REINFORCEMENT**
  - Pieces S (Single Mat) Tied to Strands at Beam
  - Pieces M-1 (2 Required)

**NOTES:**

- a. See Sheet 1 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.
- b. Place Conventional Reinforcement Bars 6A & 3C as shown on Sheet 1. Place additional Bars 5Y as shown in Section A-A for WWR. Bars 5Z will not be used with the WWR Option.
- c. Pieces may be fabricated in multiple length sections.
- d. For beams with skewed end conditions, Pieces D-1, D-2 & M-1 shall not be used; Conventional Reinforcement Bars D1, D2, C1, C2, M1 & M2 shall be used. See Index 450-010 Skewed Beam End Details and Note 9 for placement details.
- e. Shift Pieces K & Bars 5Y to accommodate skewed end conditions and align with Bars C and D.

**DESCRIPTION:**

- ALTERNATE REINFORCING STEEL (WWR) DETAILS

**INDEX:**

- FLORIDA-1 96 BEAM - STANDARD DETAILS

**REVISION:**

- 11/01/16

**LAST REV:**

- 11/01/16

**REV.:**

- 450-096

**SHEET:**

- 2 of 2
BEAM NOTES

1. Work this Index with the Table of Beam Variables in Structures Plans.
2. All bar bend dimensions are out to out.
3. Concrete cover: 2 inches minimum.
4. Strands N: $\frac{3}{8}$" Ø minimum, stressed to 10,000 lbs. each.
5. Place one (1) Bar 4K or 5Z at each location. Alternate the direction of the ends for each bar.
6. Tie Bars 4K and 5Z to the fully bonded strands in the bottom or center row (see "STRAND PATTERN" on the Table of Beam Variables sheet in Structures Plans).
7. Place Bars 3D1 in beam END 1, and Bars 3D2 in beam END 2.
8. For Beams with vertically beveled end conditions:
   A. Place first row of Bars 3D1, 3D2, 4K, 4Y and 5Z parallel to the end of the beam. Progressively rotate remaining bars within the limits of Bars 5Z until vertical by adjusting the spacing at the top of beam up to a maximum of 1".
   B. For deformed WWR, cut top cross wire and rotate bars as required or reduce end cover at top of the beam to minimum 1".
9. For beams with skewed end conditions:
   A. WWR is not permitted for end reinforcement Bars 3D1, and 3D2 on skewed ends; use bar reinforcement.
   B. Place end reinforcement parallel to the skewed end of the beam. End reinforcement is defined as Bars 3D1, 3D2, 4K, 4Y and 5Z placed within the limits of the spacing for bars 3D in "ELEVATION AT END OF BEAM".
   C. Beyond the limits of the spacing for Bars 3D, place Bars 4K perpendicular to the longitudinal axis of the beam. For placement see "SKEWED BEAM END DETAILS FOR WIDENING EXISTING BRIDGES" (Sheet 2).
10. Contractor Options:
   A. Deformed WWR may be used in lieu of Bars 3D, 4K, and 5Z as shown on Sheet 4; except at skewed ends (See Note 9).
   B. Bars 3D1 and 3D2 may be fabricated as a two-piece bar with a 1'-0" minimum lap splice at the bottom legs.
   C. For deformed WWR, supplemental transverse #4 bars are permitted to support Pieces K & S under the cross wires on the bottom row of strands or above Strands N.
11. Embedment of Safety Line Anchorage Devices are permitted in the top flange to accommodate fall protection systems. See shop drawings for details and spacing of required anchorage devices.
12. For beams with ends that will not to be encased in concrete diaphragms, cut wedges and recess Prestressing Strands at the end of the beam without damaging the surrounding concrete. See "STRAND CUTTING AND PROTECTING DETAIL" on Sheet 2.
13. Holes in the beam web for temporary bracing or shipping devices must be formed prior to casting. Fill holes not meeting all the following criteria in accordance with Specification Section 450.
   A. The superstructure environmental classification is slightly or moderately aggressive
   B. Clear cover to adjacent steel reinforcing is 1' or greater
   C. Hole inside diameter is 2" maximum
   D. Non-metallic, non-water absorbing forming materials such as PVC, may be left in place permanently.

DETAILS AND NOTES

1. Work this Index with the Table of Beam Variables in Structures Plans.
2. All bar bend dimensions are out to out.
3. Concrete cover: 2 inches minimum.
4. Strands N: $\frac{3}{8}$" Ø minimum, stressed to 10,000 lbs. each.
5. Place one (1) Bar 4K or 5Z at each location. Alternate the direction of the ends for each bar.
6. Tie Bars 4K and 5Z to the fully bonded strands in the bottom or center row (see "STRAND PATTERN" on the Table of Beam Variables sheet in Structures Plans).
7. Place Bars 3D1 in beam END 1, and Bars 3D2 in beam END 2.
8. For Beams with vertically beveled end conditions:
   A. Place first row of Bars 3D1, 3D2, 4K, 4Y and 5Z parallel to the end of the beam. Progressively rotate remaining bars within the limits of Bars 5Z until vertical by adjusting the spacing at the top of beam up to a maximum of 1".
   B. For deformed WWR, cut top cross wire and rotate bars as required or reduce end cover at top of the beam to minimum 1".
9. For beams with skewed end conditions:
   A. WWR is not permitted for end reinforcement Bars 3D1, and 3D2 on skewed ends; use bar reinforcement.
   B. Place end reinforcement parallel to the skewed end of the beam. End reinforcement is defined as Bars 3D1, 3D2, 4K, 4Y and 5Z placed within the limits of the spacing for bars 3D in "ELEVATION AT END OF BEAM".
   C. Beyond the limits of the spacing for Bars 3D, place Bars 4K perpendicular to the longitudinal axis of the beam. For placement see "SKEWED BEAM END DETAILS FOR WIDENING EXISTING BRIDGES" (Sheet 2).
10. Contractor Options:
   A. Deformed WWR may be used in lieu of Bars 3D, 4K, and 5Z as shown on Sheet 4; except at skewed ends (See Note 9).
   B. Bars 3D1 and 3D2 may be fabricated as a two-piece bar with a 1'-0" minimum lap splice at the bottom legs.
   C. For deformed WWR, supplemental transverse #4 bars are permitted to support Pieces K & S under the cross wires on the bottom row of strands or above Strands N.
11. Embedment of Safety Line Anchorage Devices are permitted in the top flange to accommodate fall protection systems. See shop drawings for details and spacing of required anchorage devices.
12. For beams with ends that will not to be encased in concrete diaphragms, cut wedges and recess Prestressing Strands at the end of the beam without damaging the surrounding concrete. See "STRAND CUTTING AND PROTECTING DETAIL" on Sheet 2.
13. Holes in the beam web for temporary bracing or shipping devices must be formed prior to casting. Fill holes not meeting all the following criteria in accordance with Specification Section 450.
   A. The superstructure environmental classification is slightly or moderately aggressive
   B. Clear cover to adjacent steel reinforcing is 1' or greater
   C. Hole inside diameter is 2" maximum
   D. Non-metallic, non-water absorbing forming materials such as PVC, may be left in place permanently.
Bars 4K spaced perpendicular to end of beam @ 3". Skewed Bars 5Z, placed with Bars 4K.

Bars 3D1 or 3D2, placed with alternate Bars 4K *

Bars 4K spaced along Beam @ 3".

Bars 4K spaced along Beam @ 3". Skewed Bars 5Z, placed with Bars 4K.

Bars 3D1 or 3D2, placed with alternate Bars 4K *

PARTIAL PLAN VIEW (SHOWING TOP FLANGE)
(End 1 Shown, End 2 Similar)
(Bars 5A, 4Y & Strands N not shown for clarity)

* For number of Bars, spacing and placement details see Sheet 3. See Sheet 3 for Conventional Reinforcement, Sheet 4 for WWR.

Bars 4K spaced perpendicular to end of beam @ 3". Skewed Bars 5Z, 3D1 or 3D2 placed with Bars 4K.

Bars 4K spaced along Beam @ 3". Skewed Bars 5Z, 3D1 or 3D2 placed with Bars 4K.

PARTIAL SECTION THRU WEB (SHOWING BOTTOM FLANGE)
(End 1 Shown, End 2 Similar)
(Bars 4Y & Strands not shown for clarity)
BEAM CAMBER AND BUILD-UP NOTES:
The build-up values given in the Data Table* are based on theoretical beam cambers. The Contractor shall monitor beam cambers for the purpose of predicting camber values at the time of the deck pour. If the predicted cambers based on field measurements differ more than ±1/2" from the theoretical "Net Beam Camber @ 120 Days" shown in the Data Table*, obtain approval from the Engineer to modify the build-up dimensions as required. When the measured beam cambers create a conflict with the bottom mat of deck steel, notify the Engineer a minimum of 21 days prior to casting.

Dim. "A" includes the weight of the Stay-In-Place Formwork.

* NOTE:
Work this Index with the Build-up and Deflection Data Table for Florida-I and AASHTO Type II Beams in Structures Plans.
BEAM NOTES

1. Work this Index with the Florida-U Beam Standard Details (Index 450-248, 450-254, 450-263 and 450-272) and the Table of Beam Variables in Structures Plans.
2. All bar bend dimensions are out-to-out.
3. Concrete cover: 2 inches minimum. Maximum aggregate size is a No. 67.
4. Concrete face may be sloped with a maximum 1:24 draft to facilitate formwork removal.
5. Strands N: ¼ Ø minimum, stressed to 10,000 lbs. each.
6. Tie the bars SK to the fully bonded strands in the bottom row (see "STRAND PATTERN" on the Table of Beam Variables sheet in Structures Plans).
7. For beams without skewed ends or vertically beveled end conditions (see Note B) the Engineer may approve the use of deformed WWR in lieu of Bars 4A1, 4A2, 5B, 4C, 3D, 4F, 4G, 4H, 5K, 5L and 4M. The spacing and sizes of deformed WWR must match the reinforcing sizes shown on the Florida-U Beam Standard Details sheets.
8. For beams with vertically beveled end conditions, where "Dim. P" exceeds 1", place Bars 5E, and the first Bars 4F and 5K parallel to the end of the beam. Fan the remaining Bars 4F and 5K within the limits of "Dim. P" (End Diaphragm) at equal spaces until vertical.
9. Embedment of Safety Line Anchorages Devices are permitted in the top flange to accommodate fall protection systems. See shop drawings for details and spacing of any anchorages or other required embedded hardware.
10. Intermediate diaphragms must be cast and concrete release strength obtained prior to removing the beam from casting bed.
11. Place drain pipes adjacent to each web at each beam end (four drains per beam). A. Drain Pipe: 2" NPS Schedule 80 PVC. B. Cover, wrap, and secure wire screen around the end of the pipe prior to casting. C. Extend screen a minimum of 1" down the pipe sides.
12. Protection of Strands: A. Provide a 3" deep recess around all strands (including dormant) or strand groups. B. After deforming, cut strands ½" from recessed surface and fill the blockout to protect strands with Type F-2 or 2 Epoxi Compound in accordance with Specification Section 926.
13. Use Stay-In-Place metal deck forms inside the beams.
14. Prior to deck placement, provide temporary blocking under each web at both ends of every beam. Ensure the temporary blocking is adequate to resist movements and rotations during deck placement. Leave temporary blocking and bracing in place for a minimum of four days after the deck is placed.
15. Based on the deck forming system and deck placement sequence, evaluate and provide any required temporary bracing between the U Beams.

SCHEMATIC PLAN VIEWS AT BEAM ENDS
**TYPICAL STRAND BLOCKOUT DETAIL**

* Dim. B is 1'-6" for Florida-U 48 and 54 Beams and 2'-0" for Florida-U 63 and 72 Beams.

**Note 4, Sheet 1.**

**CONDITION 1**

\( P = 0.0 \)

**CONDITION 2**

SCHEMATIC END ELEVATIONS OF BEAMS

(Showing Vertical Bevel of Beam End)

**CONDITION 3**

**TEMPORARY BLOCKING OF BEAM ENDS**

Temporary Blocking (See Note 14) (Typ.)

Florida-U Beam

Composite Neoprene Bearing Pad

Pier/Bent Cap

Pedestal
** Intermediate Diaphragms shall be provided:
1) At midspan.
2) At 20'-0" Max. from midspan when beam length (L) exceeds 60 Ft.

* Reinforcing steel is symmetrical about \( \frac{a}{2} \) Beam for Half Sections A-A and B-B.

Notes:
- Bars 6A1, 4A2 and Strand N
- Strands N Blockouts
- Bars 6A1, 4A2
- Bars 3D1 and 3D2 ~ 12 sp. @ 6" with Bars 5K as shown

For referenced notes see Index 450-210.
Chamfer along the Vertical Face of the Top Flange and Web and Underside of the Top Flange (Typ.)

Bars 4F

Spacing Bars 5B and 5E

Bars 5K (Typ.)

3" Chamfer (Typ.)

Bars 4C (Typ.)

Bars 5L (NS) and Bars 4C (FS)

Bars 5L (NS)

Bars 4 F and 4 M are Paired with Bars 5 K as shown

End of Beam

1'-6"

BAR CLEARS

Bars 4C

Bars 5B

1½" x 3½" Chamfer

3" Spacing

Bars 5B and 5E

Bars 5L (NS)

Bars A (Shown as ( )

Strand N

Bars SL (NS) and Bars 4C (FS)

Void Face

End of Beam

Galv. Screen Wire Drain Cover with ½" Mesh

Void Face

Bars 5E (NS) and Bars 5B (FS)

Bars 5K (Typ.)

75° ≤ Ø ≤ 90°

NOTES:

For referenced notes see Index 450-220.

TOP VIEW OF END DIAPHRAGM

(Bars 3D1 and 3D2 Not Shown For Clarity)

TOP VIEW OF SKEWED END DIAPHRAGM

AND STIRRUP TRANSITION ZONE

(Bars 3D2 Not Shown For Clarity)
**TYPICAL SECTION**

- Bars 3D1 lap with Bars 3D2 and 5K as shown (Typ.).
- Bars 4M lap with Bars 5L as shown (Typ.).
- Bars 4F (Typ.)
- Bars 5K (Typ.)
- Bars 6A1, 4A2 and Strand N

**ELEVATION AT END OF BEAM**

- Bars SK (Typ.)
- Bars 4A2 (Typ.)
- Bars 3D1 and 3D2 ~ 14 sp. @ 6" sp. with Bars 5K as shown (Typ.)

**NOTES:**

- Work this Index with Index 450-210 – Typical Florida-U Beam Details and Notes and the Florida-U Beam - Table of Beam Variables in Structures Plans.
- For referenced notes see Index 450-210.

**DESIGNATION:**

- End Face (Typ.)
- Direction of Stationing
- END 1
- Varies
- 19'-0" Min. – 20'-0" Max.
- END 2

**REVISION:**

- 11/01/16

**DESCRIPTION:**

- 450-254
END VIEW AT END DIAPHRAGM

SECTION C-C

TOP VIEW OF END DIAPHRAGM
(Bars 3D1 and 3D2 Not Shown For Clarity)

TOP VIEW OF SKEWED END DIAPHRAGM
AND STIRRUP TRANSITION ZONE
(Bars 3D2 Not Shown For Clarity)

NOTES:
For referenced note see Index 450-210.
**BEAM CAMBER AND BUILD-UP NOTES:**

The build-up values given in the Data Table are based on theoretical beam cambers. The Contractor shall monitor beam cambers for the purpose of predicting camber values at the time of the deck pour. If the predicted cambers based on field measurements differ more than 1/8" from the theoretical "Net Beam Camber @ 120 Days" shown in the Data Table, obtain approval from the Engineer to modify the build-up dimensions as required. When the measured beam cambers create a conflict with the bottom mat of deck steel, notify the Engineer a minimum of 21 days prior to casting.

Dim. "A" includes the weight of the Stay-In-Place Formwork.

**NOTE:**

Work this Index with the Build-up and Deflection Data Table for Florida-U Beams in Structures Plans.

**BEAM CAMBER AND BUILD-UP NOTES:**

The build-up values given in the Data Table are based on theoretical beam cambers. The Contractor shall monitor beam cambers for the purpose of predicting camber values at the time of the deck pour. If the predicted cambers based on field measurements differ more than 1/8" from the theoretical "Net Beam Camber @ 120 Days" shown in the Data Table, obtain approval from the Engineer to modify the build-up dimensions as required. When the measured beam cambers create a conflict with the bottom mat of deck steel, notify the Engineer a minimum of 21 days prior to casting.

Dim. "A" includes the weight of the Stay-In-Place Formwork.

**NOTE:**

Work this Index with the Build-up and Deflection Data Table for Florida-U Beams in Structures Plans.
1. Work this sheet with the 'BEVELED BEARING PLATE DATA TABLE' in the plans.
2. Beveled Bearing Plates B with Embedded Bearing Plates A are required for beams only as scheduled in the 'TABLE OF BEAM VARIABLES' on Beam Sheets.
3. Bearing plate material shall conform to ASTM A36 or ASTM A709 (Grade 36 or 50). Headed Concrete Anchor Studs shall conform to Specification Section 302. Hot-dip galvanized Bearing Plates A & B after fabrication except Galvanized Caps may be welded in place after hot-dip galvanizing. Drill Bearing Plates A and B as an assembled unit, Thread Bearing Plate A only. Drill and thread holes perpendicular to bottom of Plate A and prior to plates being galvanized (ASTM A 123).
4. Provide Electroplated, Flat Countersunk Head Cap Screws in accordance with ASTM F 835. Electroplating shall be ASTM B 633, SC 2, Type 1. Provide screws long enough to maintain a 5⁄8" minimum embedment into Embedded Bearing Plate A and Galvanized Caps. Provide steel Galvanized Caps with 3⁄8" Min. to 13⁄8" Max. height and nominal 1" inside diameter.
5. Include the cost of Beveled Bearing Plates in the pay item for Prestressed Beams (Florida U-Beams).
6. For Dimensions C and D, see 'BEVELED BEARING PLATE DATA TABLE' in the Structures Plans. For Dimensions J, K1 and K2, see 'TABLE OF BEAM VARIABLES' on Beam Sheets.
7. All details and dimensions shown are along the Beam for single bearings or Plate parallel to Beam for double bearings, except for dimensions to 5⁄8" Dia. Screws and 3⁄8" Dia. x 5⁄8" Anchor Studs, which are along Screws or Anchor Studs. Positive Slope shown. Negative Slope similar.
8. When Skew = 0°, dimensions for Embedded Bearing Plate A are D x C ≤ 5⁄8" and for Beveled Plate B are D x C ≤ 5⁄8" Min.
BEVELED BEARING PLATE B FOR ELASTOMERIC BEARING PAD TYPES AA, AB, D, E, F, G, H, & J (Along Q Beam)  

(Positive slope shown; Negative slope similar)

1. Work this sheet with Index 400-510 - Composite Elastomeric Bearing Pads, and the BEARING PLATE DATA TABLE in the Structures Plans.

2. Embedded Bearing Plates A are required for all Florida-I beams. Beveled Bearing Plates B with Embedded Bearing Plates A are required for beams as scheduled in the BEARING PLATE DATA TABLE in the Structures Plans.

3. Bearing plate material shall conform to ASTM A36 or ASTM A209 (Grade 36 or 50). Headed Concrete Anchor Studs shall conform to Specification Section S20. Hot-dip galvanize Bearing Plates A & B after formation except that Galvanized Caps may be welded in place after hot-dip galvanizing. Drill Bearing Plates A and B as an assembled unit, thread Bearing Plate A only. Holes are not required in Plate A when Plate B is not required. Drill and thread holes perpendicular to Embedded Plate A and prior to plates being galvanized (ASTM A 123).

4. Provide Electroplated, Flattened Cap Screws in accordance with ASTM F 833. Electroplated shall be ASTM B633, S.S. Type I. Provide screws long enough to maintain a 1½ min. embedment into Embedded Bearing Plate A and Galvanized Cap. Provide steel Galvanized Caps with 1½ Min. to 1½ Max. height and nominal 1½ inside diameter.

5. Include the cost of Bearing Plates in the pay item for Prestressed Beams.

6. For Pad Type and Dimensions C, D, E, F, G, and H, see the BEARING PLATE DATA TABLE in the Structures Plans. For Dimensions J, K1, and K2, see TABLE OF BEAM VARIABLES in the Structures Plans.

7. All details and dimensions shown are along Q Beam except for Dimensions J, K1, and K2. Positive Slope shown, Negative Slope similar.

8. When Skew = 0°, F = D = 3'-0" (Florida-I Beams) or 1'-4" (AASHTO Type II Beams) E = C, and G = 1'-3½".

9. Slope is determined along Q Beam at Bearing. See BEARING PLATE DATA TABLE in the Structures Plans for Slope and Angle Ø.

CROSS REFERENCE:  
See Sheet 2 for Detail "A".
**BEVELED BEARING PLATE B**  
(Along Q Beam)  
(Positive Slope shown; Negative Slope similar)

**NOTES:**
1. Work this sheet with Index 400-510 - Composite Elastomeric Bearing Pads, and "BEARING PLATE DATA TABLE" in the Structures Plans.
2. Embedded Bearing Plates A are required for all Florida-I beams. Beveled Bearing Plates B with Embedded Bearing Plates A are required for beams as scheduled in "BEARING PLATE DATA TABLE" in the Structures Plans.
3. Bearing plate material shall conform to ASTM A36 or ASTM A709 (Grade 36 or 50). Headed Concrete Anchor Studs shall conform to Specification Section 302. Hot-dip galvanize Bearing Plates A & B after fabrication except that Galvanized Caps may be welded in place after hot-dip galvanizing. Drill Bearing Plates A and B as an assembled unit, thread Bearing Plate A only. Holes are not required in Plate A when Plate B is not required. Drill and thread holes perpendicular to Embedded Plate A and prior to plates being galvanized (ASTM A 123).
4. Provide Electroplated, Flat Head Cap Screws in accordance with ASTM F 583. Electroplating shall be ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ½” minimum embedment into Embedded Bearing Plate A and Galvanized Cap. Provide steel Galvanized Caps with ½” Min. to 1½” Max. height and nominal 1” inside diameter.
5. Include the cost of Bearing Plates in the pay item for Prestressed Beams.
6. For Pad Type and Dimension C, see the "BEARING PLATE DATA TABLE" in the Structures Plans. For Dimensions J, K1 and K2, see "TABLE OF BEAM VARIABLES" in the Structures Plans.
7. All details and dimensions shown are along Q Beam. Positive Slope shown, Negative Slope similar.
8. Slope is determined along Q Beam at Q Bearing. See "BEARING PLATE DATA TABLE" in the Structures Plans for Slope.

**CROSS REFERENCE:**  
See Sheet 2 for Detail "A"
**Bearings Plate (Type 2) - Prestressed Florida-I and AASHTO Type II Beams**

**SIDE ELEVATION**

1. **Without Beveled Bearing Plates**
   - (Slopes ≤ 0.5% along g Beam) (See Note 7)
   - ½" Dia. × 2½" Anchor Studs
   - Composite Elastomeric Bearing Pad
   - See Structures Plans

2. **Without Beveled Bearing Plate**
   - (Slopes ≤ 0.5% along g Beam) (See Note 7)
   - ½" Dia. End Welded, Headed Concrete Anchor Stud
   - Embedded Bearing Plate A
   - See Structures Plans

**END ELEVATION**

- 3'-0" (Florida-I Beam)
- Florida-I Beam

**Cross Reference:**
See Sheet 1 for Notes.

**Revision:**
07/01/14

**Description:**
FY 2020-21

**Index:**
450-512

**Sheet:**
2 of 2
1. Work this Index with the Square Prestressed Concrete Pile Splices (Index 455-002), the Prestressed Concrete Pile Standards (Index 455-012 thru 455-030), the High Moment Capacity Square Prestressed Concrete Pile (Index 455-031) and the Pile Data Table in the Structures Plans.

2. Concrete:
   A. Piles: Class V (Special), except use Class VI for High Moment Capacity Pile (Index 455-031).
   B. High Capacity Splice Collar: Class V (Special).
   C. Silica Fume: See “GENERAL NOTES” in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.

3. Concrete strength at time of prestress transfer:
   A. Piles: 4,000 psi minimum.
   B. High Moment Capacity Piles: 6,500 psi minimum.

4. Carbon-Steel Reinforcing:
   A. Bars: Meet the requirements of Specification Section 415.
   B. Prestressing Strands: Meet the requirements of Specification Section 933.
   C. Protect all strands permanently exposed to the environment and not embedded under final conditions in accordance with Specification Section 450.

5. Spiral Ties:
   A. Tie each wrap of the spiral strand to a minimum of two corner strands.
   B. One full turn required for spiral splices.

6. Pile Splices: Fill dowel holes and form the joint between pile sections with a Type AB Epoxy Compound in accordance with Specification Section 962. Use an Epoxy Bonding Compound or an Epoxy Mortar as recommended by the Manufacturer.

**PRESTRESSED CONCRETE PILE NOTES:**

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**STORAGE AND TRANSPORTATION SUPPORT DETAILS**

**PILE PICK-UP DETAILS**

**TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS**

<table>
<thead>
<tr>
<th>D = Square Pile Size (inches)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
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<tr>
<td>18</td>
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<tr>
<td>30</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Pile Length (Feet)</th>
<th>2, 3, or 4 point</th>
<th>3 Point</th>
</tr>
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<tbody>
<tr>
<td>48</td>
<td>2, 3, or 4 point</td>
<td>3 Point</td>
</tr>
<tr>
<td>69</td>
<td>2, 3, or 4 point</td>
<td>3 Point</td>
</tr>
<tr>
<td>99</td>
<td>3 or 4 point</td>
<td>3 Point</td>
</tr>
</tbody>
</table>

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**SQUARE PRESTRESSED CONCRETE PILES**

- **TYPICAL DETAILS & NOTES**

**TYPICAL PILE SHAPE FOR MOLD FORMS**

**DETAIl SHOWING TYPICAL COVER**

**INDEX**

455-001

**1 of 1**
1. For Sections D-D, E-E, & F-F see Index 455-012 thru 455-030 for applicable concrete pile size and Pile Splice Reinforcement Details.

2. Prestressing strands, spiral ties and/or reinforcement are not shown for clarity.

3. In cases where pile splices are desired due to length limitations in shipping and/or handling, the "Drivable Preplanned Prestressed Precast Splice Detail" shall be used. Mechanical Pile Splices contained on the Approved Products List (APL) may also be used.

4. When preformed dowel holes are utilized, the 1" spiral tie pitch shall be continued to 4'-0" below the head of the pile. See Index 455-018, 455-020 & 455-024. Preformed holes shall utilize either removable preforming material or stay-in-place corrugated galvanized steel ducts. Stay-in-place ducts shall be fabricated from galvanized sheet steel meeting the requirements of ASTM A653. Coating Designation: G90, 26 gauge. Ducts shall be 2" diameter with a minimum corrugation (rib) height of 0.12 in. Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of welded seams will not be required.

5. For tension piles where top of Prestressed Pile is less than 3 feet below Pile Cut-off Elevation, extend No. 10 Dowels into cap beyond Pile Cut-off Elevation to achieve development as approved by the Engineer.
Face of Concrete
Bottom surfaces of enclosure to be epoxy coated just prior to concrete casting per manufacturer's installation procedures.

Dataport Interface Cable (to radio module assembly)

void (Typical for 30" and larger piles)

Top Gauge
Tip Gauge

D /2
3" Cover (Typ.)

D /2

ELEVATION

SECTION A-A
(Strand Pattern with odd number of strands per face)

SECTION A-A
(Strand Pattern with even number of strands per face)

SECTION B-B
(Showing Voided Pile, Solid Pile Similar)

3'-0" 2D (Min.)

DATA PORT INTERFACE CABLE (TO RADIO MODULE ASSEMBLY)

Bottom surfaces of enclosure to be epoxy coated just prior to concrete casting per manufacturer's installation procedures.

NOTES:
1. For piles 18" and larger installed for bridge foundations, provide EDC Instrumentation in accordance with Specification Section 455.
2. Attach Tip Gauge extension cable to the underside of the strand shown in Section A-A. Secure cable to strand with nylon wire ties spaced a maximum of 6 ft. along cable.
PILE SPLICE REINFORCEMENT DETAILS

1. Work this Index with Index 450-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

ALTERNATE STRAND PATTERNS

- 4 - 6" Ø, Grade 270 LRS, at 44 kips
- 8 - ½" Ø (Special), Grade 270 LRS, at 25 kips
- 8 - ½" Ø, Grade 270 LRS, at 24 kips
- 8 - ¾" Ø, Grade 270 LRS, at 23 kips
- 12 - ¾" Ø, Grade 270 LRS, at 16 kips

NOTES:

See Alternate Strand Patterns

SECTION A-A

SECTION E-E

(See Drivable Unforeseen Reinforced Precast Pile Splice Detail)

SECTION D-D

(See Non-Drivable Unforeseen Reinforced Precast Pile Splice Detail)
ALTERNATE STRAND PATTERNS

- 8 - 0.6" Ø, Grade 270 LRS, at 33 kips
- 8 - 0.6" Ø (Special), Grade 270 LRS, at 31 kips
- 8 - 0.6" Ø, Grade 270 LRS, at 31 kips
- 12 - 0.6" Ø, Grade 270 LRS, at 21 kips
- 16 - 0.6" Ø, Grade 270 LRS, at 16 kips

NOTES:
1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

PILE SPLICE REINFORCEMENT DETAILS
** ALTERNATE STRAND PATTERNS **

- 12 – 0.6” Ø, Grade 270 LRS, at 35 kips
- 12 – 0.6” Ø (Special), Grade 270 LRS, at 34 kips
- 16 – 0.6” Ø, Grade 270 LRS, at 26 kips
- 20 – 0.6” Ø, Grade 270 LRS, at 21 kips
- 24 – 0.6” Ø, Grade 270 LRS, at 17 kips

** NOTES:**

1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.

The strands shall be located as follows:

- Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
- The total strand pattern shall be concentric with the nominal concrete section of the pile.
ELEVATION

** See Note 4 on Index 455-002

ALTERNATE STRAND PATTERNS

- 12 - 0.6" Ø, Grade 270 LRS, at 42 kips
- 16 - 1/2" Ø (Special), Grade 270 LRS, at 31 kips
- 16 - 1/2" Ø, Grade 270 LRS, at 31 kips
- 24 - 5/8" Ø, Grade 270 LRS, at 21 kips

NOTES:
1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
   - The strands shall be located as follows:
     - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
     - The total strand pattern shall be concentric with the nominal concrete section of the pile.

SECTION A-A

See Alternate Strand Patterns

SECTION D-D

See Non-Drivable Unforeseen Reinforced Precast Pile Splice Detail

SECTION E-E

See Drivable Prestressed Precast Pile Splice Detail

SECTION F-F

See Drivable Preplanned Pile Splice Detail

PILE SPLICE REINFORCEMENT DETAILS
** See Note 4 on Index 455-002

ALTERNATE STRAND PATTERNS

16 – 0.6" Ø, Grade 270 LRS, at 44 kips
20 – 1/2" Ø (Special), Grade 270 LRS, at 34 kips
24 – 1/2" Ø, Grade 270 LRS, at 31 kips

NOTES:
1. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

SEE ALTERNATE STRAND PATTERNS

SECTION A-A

SECTION D-D

SECTION E-E

SECTION F-F

(See Non-Drivable Unforeseen Reinforced Precast Pile Splice Detail)
**ALTERNATE STRAND PATTERNS**

1. Place one strand at each corner and place the remaining strands equally spaced between the corner strands. The total strand pattern shall be concentric with the nominal concrete section of the pile.

2. CONTRACTOR OPTION: The 30" pile may be cast SOLID by omitting the 18" Ø void. In this event, the Contractor shall submit calculations for approval and a proposed strand configuration that provide net prestressing after losses equal to 1000 psi. Alternate configurations for the Diagonal Ties, to maintain the position of the 4 ~ #8 Bars, may be approved by the Engineer.

3. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles and Index 455-002 - Square Prestressed Concrete Pile Splices.
NOTES:
1. After the pile is driven and cut to grade, the top 8'-0" of the 18" Ø Void shall be filled with concrete.
   Prior to filling the top 8'-0" of the 18" Ø Void with concrete, strip the cardboard form material from the void and sand/water blast all interface surfaces. Seal void and fill with potable water for 4-5 hours. Remove water to a surface-saturated-dry condition prior to making the concrete pour. In lieu of the cardboard form material and the surface preparation requirement described above, a stay-in-place corrugated thin wall galvanized pipe may be used. The concrete fill material shall be of the same type and strength as specified in the pile cap and paid for as substructure concrete.
2. Collar concrete shall reach a strength of 6,000 psi before pile driving is resumed.
3. Work this Index with Index 455-001 - Typical Details and Notes for Square Prestressed Concrete Piles.
1. Work this Index with the Pile Data Table in the Structures Plans.

2. Concrete:
   A. Piles: Class V (Special).
   B. Splice: Class IV.
   C. Silica Fume: See "GENERAL NOTES" in Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.

3. Concrete Strength at time of prestress transfer:
   A. Piles: 6,000 psi minimum.

4. Carbon-Steel Reinforcing:
   A. Bars: Meet the requirements of Specification Section 415.
   B. Prestressing Strands: Meet the requirements of Specification Section 933.
   C. Tendons: Two seven-wire 1/2" dia. (Special) Grade 270, low-relaxation strands tensioned to 33.8 kips.
   D. Protect all carbon-steel strands permanently exposed to the environment and not embedded under final conditions in accordance with Specification Section 450.
   E. Spiral Ties:
      a. One half turn is required for carbon-steel spiral splice.
      b. One full turn is required at the pile head and tip.

5. Pile Splices:
   A. Epoxy: Type AB Epoxy Compound or Mortar must meet the requirements of Specification Section 926.
      a. Use a Type AB Epoxy Bonding Compound or Epoxy Mortar, as recommended by the Manufacturer, to form the joint between pile sections
      b. Use a Type AB Epoxy Bonding Compound as a bonding agent on internal pile surfaces.
   B. Driving: Resume pile driving after splice concrete reaches a minimum strength of 3,500 psi.

6. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.
**SECTION A-A**

- **Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")**
- **Clean inside surface of 54" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile**
- **Concrete Seal**
- **Roughen inside surface of 54" Ø Pile to 1/8" amplitude for Spliced Pile Section**

**SECTION B-B**

- **4 - Longitudinal Spacers (No. 3 Bars or W11 wire) for Spiral Ties @ Equal Spaces**
- **1-1/2" Ø Formed Holes for Tendons @ Equal Spaces**
- **24 - No. 11 Bars @ Equal Spaces**

**DETAIL "A"**

- **For Spun Cast Cylinder Piles, the following requirements for concrete cover apply:**
  1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.
  2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in2 per year or less; otherwise, a 3-inch concrete cover is required.
**TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS**

<table>
<thead>
<tr>
<th>Maximum Pile Length (Feet)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>122</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
</tr>
<tr>
<td>174</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
</tr>
</tbody>
</table>

**NOTES**

1. Work this Index with the Pile Data Table in the Structures Plans.
2. Concrete:
   A. Piles: Class V (Special)
   B. Splice Collar: Class IV
   C. Silica Fume: See "GENERAL NOTES" in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.
3. Concrete Strength at time of prestress transfer:
   A. Piles: 4,000 psi minimum.
4. Carbon-Steel Reinforcing:
   A. Bars: Meet the requirements of Specification Section 415
   B. Prestressing Strands: Use 0.6 dia. carbon-steel, Grade 270, low-relaxation strand stressed to 44.0 kips that meets the requirements of Specification Section 933.
   C. Protect all carbon-steel strands permanently exposed to the environment and not embedded under final conditions in accordance with Specification Section 450.
5. Spiral Ties:
   A. One half turn is required for carbon-steel spiral splices
   B. One full turn is required at the head and tip of each pile
6. Pile Splices:
   A. Epoxy: Type AB Epoxy Compound or Epoxy Mortar must meet the requirements of Specification Section 926.
      a. Use a Type AB Epoxy Bonding Compound or Epoxy Mortar, as recommended by the Manufacturer, to form the joint between pile sections.
      b. Use a Type AB Epoxy Bonding Compound as a bonding agent on internal pile surfaces.
   B. Splices: Resume pile driving after the splice concrete reaches a minimum strength of 5,500 psi.
7. Mark piles at the pickup points to indicate the proper points for attaching handling lines.
Concrete Seal

2'-0" M in. Cover

Driven Prestressed Pile

10'-6"

Closed No. 4 Bars or W20 Wire Ties @ 1'-0" ± (Typ.)

Spliced Prestressed Pile Section

10'-6"

1'-0" Ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 60" Ø Pile to q- amplitude for Spliced Pile Section

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

Clean inside surface of 60" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

3" Min. Cover (Typ.)

24 - No. 11 Bars @ Equal Spaces

60" Ø

Spiral Ties

W11 Wire

36 - 0.6" Ø Strands @ Equal Spaces

SECTION A-A

SECTION B-B

Lap Splice

No. 4 Bars or W20 Wire Ties

3" Min. Cover (Typ.)

Cast in Place Plug

36 - 0.6" Ø Strands @ Equal Spaces

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

Inside Pile Wall

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

Gasket

Form to retain epoxy compound

Outside Pile Wall

DETAIL "A"

DRIVABLE UNFORESEEN FIELD SPLICE DETAIL (Cast in Place Plug)
1. Work this Index with the Square Prestressed Concrete Pile Splices (Index 455-102), the Prestressed Concrete Pile Standards (Index 455-112, 455-114, 455-118, 455-124, 455-130, and the Pile Data Table in the Structures Plans.

2. Concrete:
   A. Piles: Class V (Special)
   B. Silica Fume: See "GENERAL NOTES" in the Structures Plan for locations where the use of silica fume, metakaolin or ultra-fine flyash is required for options using stainless steel strand and reinforcing.

3. Concrete strength at time of prestress transfer:
   A. Piles: 4,000 psi minimum.

4. Reinforcing:
   A. Bars:
      a. Stainless Steel: Meet the requirements of Specification Section 931 for Type 304, Grade 75.
      b. Carbon FRP: Meet the requirements of Specification Section 932.
   B. Prestressing Strands:
      a. Stainless Steel: Seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
      b. Carbon FRP: Meet the requirements of Specification Section 933.

5. Spiral Ties:
   A. Tie each wrap of the spiral strand to a minimum of two corner strands.
   B. One full turn required for spiral splices.

6. Pile Splices: Fill dowel holes and form the joint between pile sections with a Type AB Epoxy Compound in accordance with Specification Section 926. Use an Epoxy Bonding Compound or an Epoxy Mortar as recommended by the Manufacturer.

**TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS**

<table>
<thead>
<tr>
<th>D = Square Pile Size (inches)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
</tr>
<tr>
<td>14</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
</tr>
<tr>
<td>18</td>
<td>3 or 4 point</td>
<td>3 Point</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TYPICAL PILE SHAPE FOR MOLD FORMS**

**DETAIL SHOWING TYPICAL COVER**

**PRESTRESSED CONCRETE PILE NOTES:**

1. Work this Index with the Square Prestressed Concrete Pile Splices (Index 455-102), the Prestressed Concrete Pile Standards (Index 455-112, 455-114, 455-118, 455-124, 455-130, and the Pile Data Table in the Structures Plans.

2. Concrete:
   A. Piles: Class V (Special)
   B. Silica Fume: See "GENERAL NOTES" in the Structures Plan for locations where the use of silica fume, metakaolin or ultra-fine flyash is required for options using stainless steel strand and reinforcing.

3. Concrete strength at time of prestress transfer:
   A. Piles: 4,000 psi minimum.

4. Reinforcing:
   A. Bars:
      a. Stainless Steel: Meet the requirements of Specification Section 931 for Type 304, Grade 75.
      b. Carbon FRP: Meet the requirements of Specification Section 932.
   B. Prestressing Strands:
      a. Stainless Steel: Seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
      b. Carbon FRP: Meet the requirements of Specification Section 933.

5. Spiral Ties:
   A. Tie each wrap of the spiral strand to a minimum of two corner strands.
   B. One full turn required for spiral splices.

6. Pile Splices: Fill dowel holes and form the joint between pile sections with a Type AB Epoxy Compound in accordance with Specification Section 926. Use an Epoxy Bonding Compound or an Epoxy Mortar as recommended by the Manufacturer.
NOTES:
1. For Sections D-D & E-E, see Index 455-112, 455-114, 455-124 or 455-130 for applicable concrete pile size and Pile Splice Reinforcement Details.
2. Prestressing strands, spiral ties and/or reinforcement are not shown for clarity.
3. In cases where pile splices are desired due to length limitations in shipping and/or handling, the "Drivable Preplanned Prestressed Precast Splice Detail" shall be used.
4. When preformed dowel holes are utilized, the 1" spiral tie pitch shall be continued to 4'-0" below the head of the pile. See Index 455-118. Preformed holes shall utilize either removable preforming material or stay-in-place corrugated galvanized steel ducts. Stay-in-place ducts shall be fabricated from galvanized sheet steel meeting the requirements of ASTM A653. Coating Designation G90, 26 gauge. Ducts shall be 1" diameter for CFRP Bars, and 2" diameter for SS Bars with a minimum corrugation (rib) height of 0.12 in. Ducts shall be fabricated with either welded or interlocked seams. Galvanizing of welded seams will not be required.
5. For tension piles where top of Prestressed Pile is less than 3 feet below Pile Cut-off Elevation, extend No. 6 CFRP Bars or No. 10 SS into cap beyond Pile Cut-off Elevation to achieve development as approved by the Engineer.

TYPICAL SPLICE
BEFORE BONDING

FORM TO RETAIN
EPoxy COMPOUND
Gasket

Full epoxy compound joint

No chamfer, flat surface required

1⅛" Ø Drilled or preformed holes for CFRP Bars, or 1½" Ø Drilled or preformed holes for SS Bars (see Splice Details)

Auxiliary SS reinforcing Bars cast with pile. See Section F-F; Not Required for CFRP Prestressed Pile Option.

UNFORESEEN REINFORCED C-I-P PILE BUILD-UP DETAIL

NONDRIVABLE UNFORESEEN REINFORCED PRECAST PILE BUILD-UP DETAIL

DRIVABLE UNFORESEEN PRECAST PRESTRESSED PILE SPLICE DETAIL

DRIVABLE PREPLANNED PRECAST PRESTRESSED PILE SPLICE DETAIL

TYPICAL SPLICE
BEFORE BONDING

1 1/4/2019
3:33:26 PM
REVISION

DESCRIPTION:

REVISION

INDEX

FY 2020-21 STANDARD PLANS

SQUARE CFRP & SS PRESTRESSED CONCRETE PILE SPLICES

455-102

INDEX

1 of 1
**CFRP PRESTRESSED PILE DETAILS**

**ALTERNATE STRAND PATTERNS**

- 4 ~ 0.6" Ø, CFRP 7-Strand, at 42 kips
- 4 ~ ½" Ø, CFRP Single-Strand, at 41 kips

**NOTES:**
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
SS PRESTRESSED PILE DETAILS

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

INDEX 455-112

SS PILE SPLICE REINFORCEMENT DETAILS

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E
(See Drivable Unforeseen Prestressed Precast Pile Splice Detail)

STRAND PATTERN
8 ~ 0.5" Ø, HSSS at 24 kips

3" Cover (Typ.)

See Strand Pattern

SECTION A-A
ALTERNATE STRAND PATTERNS

8 - 0.6" Ø, CFRP 7-Strand, at 31.5 kips
8 - ⅜" Ø, CFRP Single-Strand, at 30.5 kips

0.2" Ø CFRP Strand

Section A-A

3" Cover
(Typ.)
0.2" Ø CFRP Strand
Spiral Ties

ELEVATION

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and equally space the remaining strands between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.
SS PRESTRESSED PILE DETAILS

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Alternate Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

SS PILE SPLICE REINFORCEMENT DETAILS

SECTION E-E
(See Drivable Unforeseen Prestressed Precast Splice Detail)
** See Note 4 on Index 455-102

** ALTERNATE STRAND PATTERNS **

12 ~ 0.6" Ø, CFRP 7-Strand, at 34 kips
12 ~ 0.6" Ø, CFRP Single-Strand, at 33 kips

NOTES:
1. Work this Index with Index 455-101 – Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 – Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   - The total strand pattern shall be concentric with the nominal concrete section of the pile.

SEE ALTERNATE STRAND PATTERNS
18" SQUARE CFRP & SS PRESTRESSED CONCRETE PILE

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

** See Note 4 on Index 455-102

SS PRESTRESSED PILE DETAILS
Spiral Tie 1’ Spacing

** See Note 4 on Index 455-102

SECTION A-A

SPIRAL TIE ELEVATION

ALTERNATE STRAND PATTERNS
16 – 0.6” Ø, CFRP 7-Strand, at 42 kips
16 – ½” Ø, CFRP Single-Strand, at 41 kips

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFMP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized.
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E
(See Drivable Prestressed Precast Pile Splice Detail)

SECTION F-F
(See Drivable Preplanned Prestressed Precast Pile Splice Detail)

CFRP PRESTRESSED PILE DETAILS

CFRP PILE SPLICE REINFORCEMENT DETAILS

INDEX 455-124

FY 2020-21
STANDARD PLANS

24” SQUARE CFRP & SS PRESTRESSED CONCRETE PILE

INDEX SHEET

1 of 2
Prestressing Strands
3" Cover (Typ.)

STRAND PATTERN
28 − ½" Ø, HSSS @ 26 kips

Spiral Ties @
6" pitch, full length

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

SECTION E-E
(See Drivable Prestressed Precast Pile Splice Detail)

SECTION F-F
(See Drivable Preplanned Pile Splice Detail)

NOTES:
1. Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFMP & SS Prestressed Concrete Pile Splices.
2. Any of the given Strand Patterns may be utilized.
   The strands shall be located as follows:
   Place one strand at each corner and place the remaining strands equally spaced between the corner strands.
   The total strand pattern shall be concentric with the nominal concrete section of the pile.

SS PILE SPLICE REINFORCEMENT DETAILS
**NOTES:**

1. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands. The local strand pattern shall be concentric with the nominal concrete section of the pile.
   - CONTRACTOR OPTION: The 30" pile may be cast SOLID by omitting the 18" Ø void. In this event, the Contractor shall submit calculations for approval and a proposed strand configuration that provide net prestressing after losses equal to 1000 psi. Alternate configurations for the Diagonal Ties, to maintain the position of the 4 ~ 6 ~ No. 6 Bars, may be approved by the Engineer.
   - Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.

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**SECTION C-C**

(See Pile Splice Reinforcement Details)

**SECTION D-D**

(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

**SECTION E-E**

(See Drivable Prestressed Precast Pile Splice Detail)

**SECTION F-F**

(See Drivable Preplanned Prestressed Precast Pile Splice Detail)
**Omit 4 ~ #8 Bars and Diagonal Ties in pre-planned mechanical splice.**

3" Cover (Typ.)

(See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

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**Notes:**

1. Any of the given Strand Patterns may be utilized. The strands shall be located as follows:
   - Place one strand at each corner and place the remaining strands equally spaced between the corner strands. The total strand pattern shall be concentric with the nominal concrete section of the pile.
   - CONTRACTOR OPTION: The 30" pile may be cast SOLID by omitting the 18" Ø void. In this event, the Contractor shall submit calculations for approval and a proposed strand configuration that provide net prestressing after losses equal to 1000 psi. Alternate configurations for the Diagonal Ties, to maintain the position of the 4 ~ #8 Bars, may be approved by the Engineer.
   - Work this Index with Index 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.
TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS

<table>
<thead>
<tr>
<th>Maximum Pile Length (Feet)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>2, 3, or 4 point</td>
<td>1 Point</td>
</tr>
<tr>
<td>170</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
</tr>
</tbody>
</table>
Outside Pile Wall
Form to retain epoxy compound

Inside Pile Wall
Temporary Blocking
Form to retain epoxy compound

Gasket
Cover (Typ.)
1'-0" Min.
Lap Splice
Cast in Place Plug
Cover (Typ.)

24 ~ 1 bitmap Ø Formed Holes for Tendons @ Equal Spaces

1'-0" Ø Void, open top and bottom to allow through venting of sections

Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")

Clean inside surface of 54" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile

Full Epoxy Compound Joint (applied) (final thickness)

* For Spin Cast Cylinder Piles, the following requirements for concrete cover apply:
1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.
2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in year or less; otherwise, a 3-inch concrete cover is required.
**Outside Pile Wall**
Form to retain epoxy compound

**Inside Pile Wall**
Temporary Blocking
Form to retain epoxy compound

**Gasket**

**Cover (Typ.)**
W20 Wire Ties
No. 4 Bars or 1'-0" Min.
Lap Splice

**W11 Spiral Wire Ties**
4 ~ Longitudinal Spacer Bars (No. 3 Bars or W11 wire) for Spiral Ties @ Equal Spaces

**24 ~ No. 10 Bars @ Equal Spaces**

**Cast in Place Plug**

**Roughen inside surface of 54" Ø Pile to \( \frac{1}{b} \) amplitude for Spliced Pile Section**

**Clean inside surface of 54" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile**

**Concrete Seal**
2'-0" M in. Cover

**For Spun Cast Cylinder Piles, the following requirements for concrete cover apply:**
1. Slightly or Moderately Aggressive Environments: The concrete cover may be reduced to 2 inches.
2. Extremely Aggressive Environments: The concrete cover may be reduced to 2 inches as long as the concrete has a documented chloride ion penetration apparent diffusion coefficient with a mean value of 0.005 in² per year or less; otherwise, a 3-inch concrete cover is required.

**SECTION A-A**

**SECTION B-B**

**DETAIL "A"**

**SECTION 8-8**

**ALTERNATE STRAND PATTERNS**
72 ~ \( \frac{1}{b} \) Ø, HSSS Strands, at 21 kips (24~3 strand tendons)
58 ~ \( \frac{1}{b} \) Ø, HSSS Strands, at 24 kips (29~2 strand tendons)
48 ~ 0.6" Ø, HSSS Strands, at 32 kips (24~2 strand tendons)

**DETAIL 8-8**

**54" PRECAST/POST-TENSIONED CFRP & SS CONCRETE CYLINDER PILE**
**Notes**

1. Work this Index with the Pile Data Table in the Structures Plans.
2. Concrete:
   - A. Piles: Class V (Special)
   - B. Splice Collar: Class IV
   - C. Silica Fume: See "GENERAL NOTES" in the Structures Plans for locations where the use of silica fume, metakaolin or ultra-fine flyash is required.
3. Concrete Strength at time of prestress transfer:
   - A. Piles: 4,000 psi minimum.
4. Reinforcing:
   - A. Bars:
     - a. Stainless Steel: Meet the requirements of Specification Section 931 for Type 304, Grade 75.
     - b. Carbon FRP: Meet the requirements of Specification Section 932.
   - B. Prestressing Strands:
     - a. Stainless Steel: Seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
     - b. Carbon FRP: Meet the requirements of Specification Section 933.
   - C. Spiral Ties:
     - a. One half turn is required for carbon steel spiral splice.
     - b. One full turn is required at the pile head and tip.
5. Pile Splices:
   - A. Epoxy: Type AB Epoxy Compound or Epoxy Mortar must meet the requirements of Specification Section 926.
     - a. Use a Type AB Epoxy Bonding Compound or Epoxy Mortar, as recommended by the manufacturer, to form the joint between pile sections.
     - b. Use a Type AB Epoxy Bonding Compound as a bonding agent on internal pile surfaces.
   - B. Splices: Resume pile driving after the splice concrete reaches a minimum strength of 5,500 psi.
6. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.

**TABLE OF MAXIMUM PILE PICK-UP AND SUPPORT LENGTHS**

<table>
<thead>
<tr>
<th>Pick-Up Points</th>
<th>2-Point Pick-Up</th>
<th>1-Point Pick-Up</th>
<th>3-Point Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Pile Length</td>
<td>Required Storage and Transportation Details</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Concrete Seal**

2"-0" in.

- Driven Prestressed Pile

**SECTION A-A**

- 1'-0" Ø Void, open top and bottom to allow through venting of sections
- Roughen inside surface of 60" Ø Pile to 1/4” amplitude for Spliced Pile Section
- Closed No. 4 CFRP Bars or 0.3" Ø CFRP Strand Ties @ 1'-0" ± (Typ.)
- Full Epoxy Compound Joint around cylinder pile wall only (See Detail "A")
- 24 – No. 6 CFRP Bars
- Clean inside surface of 60" Ø Pile with a high pressure water blast (3000 psi Min.) and apply bonding agent for Driven Prestressed Pile
- Concrete Seal

**ALTERNATE STRAND PATTERNS**

- 0.3" Ø, CFRP Single-Strand, at 39 kips
- 0.8" Ø, CFRP 7-Strand, at 40 kips

**SECTION B-B**

- 60" Ø
- No. 3 Bars or 0.3" Ø CFRP Strand Spiral Ties
- 3" Min. Cover (Typ.)
- 45" Ø Void
- 36 – CFRP Strands @ Equal Spaces
- 24 – No. 6 CFRP Bars @ Equal Spaces

**DETAIL "A"**

- Cast in Place Plug
- 1'-0" Ø Void
- 3" Min. Cover (Typ.)
- 1'-0" Ø Void
- 3" Min. Lap Splice
- No. 4 Bars or 0.3" Ø CFRP Strand Spiral Ties
- Full epoxy compound joint
- 2" Min.
- Temporary Blocking Form to retain epoxy compound

**DRIVABLE UNFORESEE FIELD SPLICE DETAIL**

- Cast in Place Plug

**INDEX**

- Standard Plans

**Fy  2020-21**

**60" Prestressed CFRP & SS Concrete Cylinder Pile**

**REV.**

**3/1/20**

**REVISION**

**01/01/16**

**INDEX**

**455-160**

**2 of 3**
**DESCRIPTION:**

**LAST REV:** 01/01/16

**REVISION:**

**INDEX SHEET:**

**FY 2020-21 STANDARD PLANS**

**60" PRESTRESSED CFRP & SS CONCRETE CYLINDER PILE**

**DETAIL "A"**

**SECTION A-A**

- 60" Ø Void (44 strands)
- 48" Ø Void (36 strands)
- 2" Min. Cover (inside)
- 3" Min. Cover (Typ.)
- 2" Min., Cover (inside) 0.6" Ø HSSS Strands @ Equal Spaces

**SECTION B-B**

- 1'-0" Ø Void
- 24 – No. 10 SS Bars @ Equal Spaces
- No. 4 SS Bars or W20 SS Wire Ties
- 2" Min. Cover (Typ.)
- Cast in Place Plug
- 0.6" Ø HSSS Strands @ Equal Spaces

**ALTERNATE STRAND PATTERNS**

- 44 – 0.6" Ø HSSS Strand, at 36 kips
- 36 – 0.6" Ø HSSS Strand, at 36 kips

**DRIVABLE UNFORESEEN FIELD SPLICE DETAIL**

(Cast in Place Plug)

**SS PRESTRESSED PILE DETAILS**
TYPICAL SECTION THRU STRIP SEAL EXPANSION JOINT

Intermediate Supports and Steel Girder Bridge similar. Reinforcing Steel and Girder details not shown for clarity.

GENERAL NOTES:

1. Furnish Strip Seal Expansion Joint Systems in accordance with Specification Section 458.
2. Shape of Edge Rail shown is representative; minor variations depending on manufacturer are permitted.
3. Recess the Edge Rail below the concrete surface in accordance with Specification Section 458.
4. Refer to the Expansion Joint Data Table in the Structures Plans for joint movement and Dimension A.
5. Refer to Specification Section 458 for installation and fabrication requirements.
Expansion Joint Assemblies

Sidewalk

3” Sidewalk Cover Plate

D im . V aries

T op  of S id ew alk

Down Grade

Ƅ Ø x  2 Ɔ L ong S leeve A nch ors

Bevel top  edge @ 1:2 S lope &  rou nd over bottom  edge 1½ radius (Typ.)

Sidewalk C over P late

Construction Joint

Match skew angle of Joint as required (Typ.)

PARTIAL PLAN VIEW

Front Face of Traffic Railing or Post

PARTIAL PLAN VIEW OF SKEWED JOINTS

Front Face of Traffic Railing

PARTIAL PLAN VIEW OF NONSKEWED JOINTS

Front Face of Railing

PARTIAL SECTION ALONG Q. JOINT

RAISED SIDEWALK DETAIL

FLUSH SIDEWALK DETAIL

Distance from ø Sleeve Anchor to edge of concrete is 2 inches minimum, 3 inches maximum.

REVISION

STANDARD PLANS

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EXPANSION JOINT SYSTEM - STRIP SEAL

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EXPANSION JOINT SYSTEM - STRIP SEAL

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STANDARD PLANS

458-100

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FY 2020-21
GENERAL NOTES:

1. Furnish and install Poured Joint With Backer Rod Expansion Joint Systems in accordance with Specification Sections 458 and 932 using Type D silicone sealant material.

2. Refer to the Structures Plans, Poured Expansion Joint Data Table for Dim. A @ 70° F.
PARTIAL PLAN VIEW OF SKEWED JOINTS

PARTIAL PLAN VIEW OF NON-SKEWED JOINTS

PARTIAL SECTION ALONG Q. JOINT

NOTE:
Sleeve Anchors are required at the two outside corners of the Sidewalk Cover Plate. Space Sleeve Anchors uniformly between the corner anchors.
FY 2020-21
STANDARD PLANS

ACCESS HATCH ASSEMBLY
FOR CONCRETE BOX SECTIONS

HINDE NOTE:
1. Orient the Access Hatch so that the hinges are located down-grade.

SECTION THRU ACCESS OPENING

NOTES:
1. All Structural Steel material in Access Hatch Assemblies shall conform to ASTM A36 except Grade 36.
2. 1/2" Pipe Grab Rail shall be in accordance with ASTM A53 Grade B for standard weight pipe (Schedule 40).
3. 1/2" Hatch Handle Bar and Hitch Pin shall be in accordance with ASTM A36.
4. All bolts shall conform to ASTM A307 or A449. All nuts shall conform to ASTM A563 and all washers shall conform to ASTM F-436.
5. All exposed edges of plates and openings shall be ground smooth.
6. See Framing Plan sheets for locations of Access Hatch Openings.
7. Coat structural steel in accordance with Specification Section 560.
8. Include the cost of the Access Hatch Assembly and incidental items in the cost of the Concrete Box Section.

No separate payment will be made for coating structural steel.
This Traffic Railing Retrofit has been structurally evaluated to be equivalent or greater in strength to a design which has been successfully crash tested in accordance with NCHRP Report 350 TL-4 criteria.

CONCRETE: Concrete for Transition Blocks and Curbs shall be Class II (Bridge Deck).

REINFORCING STEEL: Reinforcing steel shall be ASTM A615, Grade 60.

THRIE-BEAM GUARDRAIL: Steel Thrie-Beam Elements shall meet the requirements for Class B (10 Gauge) Guardrail of AASHTO M 180, Type II (Zinc coated). The minimum panel length for Thrie-Beam Elements shall be 12'-6". Field drilled holes for Post connections shall be 3\(\frac{1}{2}\) by 2\(\frac{1}{2}\) slotted holes.

GUARDRAIL BOLTS: Guardrail bolts, nuts and washers shall be in accordance with AASHTO M180.

GUARDRAIL POSTS AND BASE PLATES: Posts and Base Plates shall be in accordance with ASTM A36 or ASTM A709 Grade 36.

ANCHOR BOLTS, NUTS AND WASHERS: Adhesive-Bonded Anchors and Anchor Bolts shall be fully threaded rods in accordance with ASTM F1554 Grade 105 or ASTM A193 Grade B7. At the Contractor's option, Anchor Bolts for through bolting may be in accordance with ASTM A490. All Nuts shall be single self-locking hex nuts and in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F368 and Plate Washers (for long slotted holes only) shall be in accordance with ASTM A36 or ASTM A709 Grade 36. After the nuts have been snug tightened, the anchor bolt threads shall be distorted to prevent removal of the nuts. Distorted threads and the exposed trimmed ends of anchors shall be coded with a galvanizing compound in accordance with the Specifications.

COATINGS: All Nuts, Bolts, Anchors, Washers, Guardrail Posts, Anchor Plates and Base Plates shall be hot-dip galvanized in accordance with the Specifications. Guardrail Post Assemblies shall be hot-dip galvanized after fabrication.

ADHESIVE-BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchors and Dowels shall comply with Specification Section 937 and be installed in accordance with Specification Section 146. The field testing proof loads required by Specification Section 146 shall be 15,000 lbs. for 3\(\frac{1}{2}\) Ø anchor bolts; 35,000 lbs. for the 2\(\frac{1}{2}\) anchor bolts with 13" embedment; and 30,500 lbs. for the 1\(\frac{1}{2}\) Ø anchor bolts with 9" embedment.

BRIDGES ON CURVED ALIGNMENTS: The details presented in these Indexes are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

POST SPACING: Posts shall be located along the length of the bridge at typical 6'-3" or 3'-12" spaces. Utilize the Modified Post Spacing at Intermediate Deck Joints Details as required to clear deck joints. Establish post spacing along the bridge and Roadway Guardrail Transition beginning with the Key Post. The variable post spacings located near begin and end bridge may be utilized to optimize the typical post spacing. Variable lengths of guardrail overlap are also permitted to optimize the typical post spacing. Symmetry of post spacing is not necessary.
PARTIAL PLAN OF RAILING

NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index 460-470.
**SECTION A-A**

TYPICAL SECTION THRU RAILING ON BRIDGE DECK

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**BILL OF REINFORCING STEEL**

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*Bil'

**NOTES:**

1. All bar dimensions are out to out.
2. The 7'-11" vertical dimension shown for Bar 4D is based on a curb height of 9". If curb height is less or more than 9", decrease or increase this dimension by an amount equal to the difference in curb height.

---

**SECTION B-B**

TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

(SCHME 2 SHOWN, SCHEME 3 SIMILAR)

---

**NOTES:**

1. Shim with washers around Anchors as required to maintain tolerance.
2. Offset may vary ±1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.
SCHEME 1 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
SCHEME 3 NOTES:

1. Provide Cast-In-Place Curb as shown. Shape and height of Transition Block and Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Field cut and bend Bars 4A and rotate Dowel Bars 4B within Curb and Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

3. A single 5/8" Ø x 8" Adhesive-Bonded Anchor may be omitted as shown when 2" clear cover cannot be provided.

Traffic Railing (Three-Beam Retrofit) Limits of Payment

Roadway Guardrail Transition (See Note 1, Sheet 1)

Cast-In-Place Curb with Transition Block (See Detail)

Existing Approach Slab

Intermediate Deck Joint

Existing Bridge Curb

Front Face of Backwall & Begin or End Bridge

Asphalt Overlay when present (Varies)

Guardrail Post Assembly (Typ.)

Guardrail Post Assembly (Typ.)

Existing Flared Wing Wall shown, Existing Wing Wall with combined Parain and Flared portion similar

Construction Joint with organic felt bond breaker

Cast-In-Place Curb with Transition Block (See Detail)

Roadway Guardrail Transition (See Note 1, Sheet 1)

Provide 2" chamfer

Edge of Existing Approach Slab (Location Varies)

Edge of Existing Approach Slab

Front Face of Backwall & Begin or End Bridge

Final Riding Surface

Organic Felt bond breaker along joint

Organic Felt bond breaker along joint

Existing Curb

Existing Approach Slab

Cast-In-Place Curb with Transition Block (See Detail)

Match Curb height

Asphalt Overlay when present (Varies)

Partial Plan of Railing

Partially Elevation of Inside Face of Railing

Section C.C.

Plan of Cast-In-Place Curb & Transition Block Detail

Approach End with Transition Block Shown, Trailing End without Transition Block Similar

Depth of shaded portion extending off Approach Slab shall be 1'-0" Min.
NOTES:

1. On approach end provide index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

PARTIAL PLAN OF RAILING

6'-3" spacing (Typ. except as noted along Bridge, see Note 2)

1'-6" Min. for non skewed joints. For treatment of skewed Intermediate Deck Joints see Skew Detail Index 460-470, Sheet 2 (Typ.)

POST BOLTS AND MATCH LINE (APPROACH END) (SEE SHEETS 3 AND 4)

POST BOLTS AND MATCH LINE (TRAILING END) (SEE SHEETS 3 AND 4)
**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

**SECTION B-B**

**TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB**

**DIM. A**

**CROSS REFERENCES:**
For location of Section A-A see Sheets 1, 3 & 4.
For location of Section B-B see Sheet 4.
For location of View C-C see Sheet 3.
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.

**NOTE:** All bar dimensions are out to out.
SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend or tilt Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

PARTIAL ELEVATION OF INSIDE FACE OF RAILING (Existing Wing Post and Traffic Railing not shown for clarity)

SCHEME 1 = RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

SCHEME 2 = RAILING END TREATMENT FOR PARALLEL OR FLARED CURBS WITH DETACHED SIDEWALKS OR INTEGRAL SIDEWALKS LESS THAN 6" THICK

CROSS REFERENCES:
For Section A-A and View C-C see Sheet 2.

ROADWAY GUARDRAIL TRANSITION (See Note 2, Sheet 1)

Existing Curb

FRONT FACE OF BACKWALL & BEGIN OR END BRIDGE

PARTIAL ELEVATION OF INSIDE FACE OF RAILING (Existing Wing Post and Traffic Railing not shown for clarity)

SCHEME 1 = RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

SCHEME 2 = RAILING END TREATMENT FOR PARALLEL OR FLARED CURBS WITH DETACHED SIDEWALKS OR INTEGRAL SIDEWALKS LESS THAN 6" THICK

CROSS REFERENCES:
For Section A-A and View C-C see Sheet 2.

ROADWAY GUARDRAIL TRANSITION (See Note 2, Sheet 1)
NOTES:

1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grooving or grinding as required. Exposed existing reinforcing steel shall be burnished or "1" below existing concrete and grouted over.

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index 460-470.
Dowel Bars 4D (10" Embedment) (See Note 2, Sheet 4)

Edge of Existing Approach Slab

1'-4" x 10" x 3/4"

Asphalt Overlay when present (Varies)

Match shape of existing curb

** Shims with washers around Anchor Bolts and Anchors as required to maintain tolerance.

** Offset may vary ± 1" for Adhesive-Bonded Anchors and Anchor Bolts to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

SECTION A-A

TYPICAL SECTION THRU RAILING ON BRIDGE DECK

SECTION B-B

TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

(Schemes 5 and 6 SHOWN, SCHEMES 3 AND 4 SIMILAR)

NOTE: All bar dimensions are out to out.

Dowel Bar 4D

Dowel Bar 4L

Bar Bending Diagrams

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Control Line

Thrie-Beam Guardrail

 Existing Traffic Railing (Type Varies)

Guardrail Post (Type Varies)

Existent Curb Overhang

Slope: Varies

5" Min. Embedment

2" Cover Min.

2 - 1/4" Ø x 1'4" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (T-1'5" Max. Depth)

 existing Wing Post

Existing Wing Wall

 Existing Wing Post

Guardrail Post Assembly "A", "B" or "C" (See Roadway Plans)

Existing Wing Overhang

5" Min. Embedment

2 - 3/8" Ø x 8" Adhesive-Bonded Anchors with Heavy Hex Nuts and Washers set in drilled holes (5"") Max. Depth respectively).

Shade with washers around Anchor Bolts and Anchors as required to maintain tolerance.

Offset may vary ± 1" for Adhesive-Bonded Anchors and Anchor Bolts to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

VIEW C-C

Detail "A"

CROSS REFERENCES:

For location of Section A-A see Sheet 1, 3 and 4.
For location of Section B-B see Sheet 4.
For location of View C-C see Sheet 3.
For Traffic Railing Notes and Details see Index 460-470.
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.
SCHEME 1

1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic. See Roadway Plans for Details of Sidewalk replacement.

2. Field bend Dowel Bars 4D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic. See Roadway Plans for Details of Sidewalk replacement.

2. Field bend or tilt Dowel Bars 4D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

PARTIAL PLAN OF RAILING

PREFERRED PLANS

RAILING END TREATMENT FOR PARALLEL OR FLARED CURBS WITH DETACHED SIDEWALKS OR INTEGRAL SIDEWALK LESS THAN 6" THICK

SCHEME 2 NOTES:

- Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab.
- Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic. See Roadway Plans for Details of Sidewalk replacement.

- Field bend or tilt Dowel Bars 4D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
NOTES:

1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.

2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.

3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
SECTION A-A
TYPICAL SECTION THRU RAILING ON BRIDGE DECK

BILL OF REINFORCING STEEL

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BAR BENDING DIAGRAM

DOWEL BAR 4L

NOTE: All bar dimensions are out to out.

TYPICAL SECTION THRU EXISTING TRAFFIC RAILING SHOWING LIMITS OF REMOVAL (BRIDGE DECK SHOWN, WING WALL SIMILAR)

SECTION B-B (SCHEME 2)
TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

* Shin with washers around Anchor Bolts and Anchors as required to maintain tolerance.

** Offset may vary ± 1" for Adhesive-Bonded Anchors to clear existing curb reinforcing and provide minimum edge clearance. Offset shall be consistent along length of bridge.

CROSS REFERENCES:
For location of Section A-A see Sheet 1 and 3.
For location of Section B-B see Sheet 3.
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.
**SCHEME 1 NOTES:**
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

**SCHEME 2 NOTES:**
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans.
   For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at
   Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by
   grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing
   concrete and grouted over.

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Traffic Railing not shown for clarity)

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
**SECTION A-A**
TYPICAL SECTION THRU RAILING ON BRIDGE DECK

**BAR BENDING DIAGRAMS**

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Dowel Bar 4D

**SECTION B-B**
TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB
(SCHEMES 5 AND 6 SHOWN, SCHEMES 3 AND 4 SIMILAR)

**VIEW C-C**

**BILLS OF REINFORCING STEEL**

NOTE: All bar dimensions are out to out.
DESCRIPTION:
Post Spacing as measured 3".

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post and Traffic Railing not shown for clarity)

SCHEME 1

RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

SCHEME 1 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb. See Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.
2. Field bend Dowel Bars 4L within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2

RAILING END TREATMENT FOR PARALLEL OR FLARED CURBS WITH DETACHED SIDEWALKS OR INTEGRAL SIDEWALKS LESS THAN 6" THICK

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curb.
2. Field bend or till Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment, see Roadway Plans. For treatment of trailing end see Roadway Plans.
2. Actual joint dimension and orientation vary. For Intermediate Deck Joints use the Modified Post Spacing at Intermediate Deck Joints Detail, Index 460-470, Sheet 2, as required.
3. Areas where existing structure has been removed shall match adjoining areas and shall be finished flat by grouting or grinding as required. Exposed existing reinforcing steel shall be burned off 1" below existing concrete and grouted over.

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Traffic Railing not shown for clarity)

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
1. Provide Transition Block (as shown) or Curb if existing Approach Slab does not have a curb, see Roadway Plans. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic.

2. Provide Dowel Bars 4D within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.

SCHEME 2 NOTES:
1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of Transition Block or Curb shall match existing bridge curb. Transition Block may be omitted on trailing ends with no opposing traffic and on bridges with flared Approach Slab Curbs.

2. Field bend Dowel Bars 4D and Bars 4M within Transition Block as required to maintain 2" top and side clearance and 3" bottom clearance.
PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
(Existing Wing Post and Traffic Railing not shown for clarity)

RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

SCHEMES 3 AND 4

TRAFFIC RAILING - (THRIE-BEAM RETROFIT)
WIDE CURB TYPE 2

INDEX

460-476
TRAFFIC RAILING RETROFIT NOTES

See Index 536-001 for component details, geometric layouts and associated notes not fully detailed herein.

CONCRETE: Concrete for Transition Blocks shall be Class II (Bridge Deck).

THREE-BEAM PANEL: Steel Thrie-Beam Elements shall meet the requirements for Class B (10 Gauge Guardrail of AASHTO M 180), Type II (Zinc coated). The minimum panel length for Thrie-Beam Elements shall be 12'-6". Field drilled holes for Post connections shall be 7/8" by 21⁄2" slotted holes.

BOLTS, NUTS AND WASHERS: Bolts, nuts and round washers shall be in accordance with AASHTO M 180. Plate Washers shall be in accordance with ASTM A 325 or ASTM A 309 Grade 36.

COATINGS: All Nuts, Bolts, Anchors, and Washers shall be hot-dip galvanized in accordance with the Specifications.

BRIDGES ON CURVED ALIGNMENTS: The details presented herein are shown for bridges on tangent alignments. Details for bridges on horizontally curved alignments are similar.

THREE-BEAM EXPANSION SECTION: Thrie-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 21⁄2" slots in thrie-beam expansion sections. Nuts shall fully engage bolts with a minimum of one bolt thread extending beyond the nuts. Distort the first thread on the outside of the nut to prevent loosening. Tighten bolts in 3′ slots of guardrail post(s) that lie between the slotted expansion splice and bridge deck joint so that the bolt heads are in full contact with thrie-beam elements, but not so tight as to impede movement due to expansion.

WOOD BLOCKS: All wood blocks, including required wedge shaped blocks shall be Pressure Treated lumber in accordance with Specifications Section 955. Bolt holes in blocks to be centered (+/-).

BRIDGE NAME PLATE: If a portion of the existing Traffic Railing is to be removed that carries the bridge name, number and or date, or if the installation of the Traffic Railing (Thrie-Beam Retrofit) will obscure the bridge name, number and or date, then replace the information that has been removed or obscured, with 3" tall black lettering on white nonreflective sheeting applied to the top of the adjacent guardrail. The information must be clearly visible from the right side of the approaching travel lane. The sheeting and adhesive backing shall comply with Specification Section 994 and may comprise of individual decals of letters and numbers.

PAYMENT: Payment will be made under Thrie-Beam Panel Retrofit which shall include all materials and labor required to fabricate and install the retrofit railing, Transition Blocks and Curb, Bridge Name Plate and Barrier Delineators, where required, will not be paid for directly but shall be considered incidental work.

TRAFFIC RAILING RETROFIT

CONCRETE HANDRAIL

STANDARD PLANS

INDEX 460-477

1 of 4

THREE-BEAM PANEL SPlice

NOTE: All Thrie Beam Panels shall be lapped in the direction of adjacent traffic. At the Contractor’s option, laps may be extended. Field drill holes in Trailing Thrie-Beam Panel as required.

THREE-BEAM PANEL RETROFIT

CONCRETE HANDRAIL

WEDGE SHAPEd BLOCK DETAIL
NOTES:

1. Dimensions and elevations for existing guardrails to be verified by the Contractor before beginning construction.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of the traffic face of Transition Block or Curb shall match existing bridge curb. See Sheet 4 for Transition Block details. Block may be omitted on trailing ends with no opposing traffic.

3. Do not bolt nested rails to the blocks and posts at posts (a), (c) & (e).

Traffic Railing (Thrie-Beam Panel Retrofit) - Class B (10 Gauge) Panels

PARTIAL ELEVATION - APPROACH TRANSITION

Wingwall mounted railing section (if present; length varies)

Existing Bridge Coping

Existing Concrete Traffic Railing

Existing Bridge Deck

Wedge Shaped Wood Block

Guardrail Post (Typ.)

PARTIAL PLAN - APPROACH TRANSITION

Limits of Payment for Thrie-Beam Panel Retrofit

Limits of Payment for Guardrail

PARTIAL PLAN - TRAILING END TRANSITION

W-Beam Guardrail - See Index 536-001

Guardrail Trailing End Transition

Traffic Railing (Thrie-Beam Panel Retrofit) - Class B (10 Gauge) Panels

PARTIAL ELEVATION - TRAILING END TRANSITION

NOTE:

1. Dimensions and elevations for existing guardrails to be verified by the Contractor before beginning construction.

2. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab. Shape and height of the traffic face of Transition Block or Curb shall match existing bridge curb. See Sheet 4 for Transition Block details. Block may be omitted on trailing ends with no opposing traffic.

3. Do not bolt nested rails to the blocks and posts at posts (a), (c) & (e).
**DESCRIPTION:**

**REVISION**

**INDEX**

**SHEET**

**REV IS IO N**

**LAST**

**STANDARD PLANS**

**THRIE-BEAM PANEL RETROFIT**

**(CONCRETE HANDRAIL)**

**FY 2020-21**

**NOTEs:**

1. Post Bolts shall be \( \frac{3}{16} \) a 14' long set in \( \frac{3}{8} \) core drilled holes, see Sheet No. 1.
2. Shift Post Bolt holes minimally inward toward center of posts if existing reinforcement is encountered during drilling of holes. If reinforcement is still encountered, notify the Engineer before proceeding with drilling.
3. Post Bolt spacing not to exceed 8'-0" (± 1').

**TYPICAL SECTION THRU RAILING POST ON BRIDGE DECK**

**PLAN OF END POST**

**NOTES:**

1. Post Bolts shall be \( \frac{3}{16} \) a 14' long set in \( \frac{3}{8} \) core drilled holes, see Sheet No. 1.
2. Shift Post Bolt holes minimally inward toward center of posts if existing reinforcement is encountered during drilling of holes. If reinforcement is still encountered, notify the Engineer before proceeding with drilling.
3. Post Bolt spacing not to exceed 8'-0" (± 1').

**NOTES:**

1. Post Bolts shall be \( \frac{3}{16} \) a 14' long set in \( \frac{3}{8} \) core drilled holes, see Sheet No. 1.
2. Shift Post Bolt holes minimally inward toward center of posts if existing reinforcement is encountered during drilling of holes. If reinforcement is still encountered, notify the Engineer before proceeding with drilling.
3. Post Bolt spacing not to exceed 8'-0" (± 1').
### PLAN VIEW OF TRANSITION BLOCK
(GUARDRAIL NOT SHOWN FOR CLARITY)

- Existing Bridge or Approach Slab Mounted Curb
- Transition Block
- Top of Existing Approach Slab or Bridge Deck
- Top of Existing Curb
- Match existing curb height and slope at traffic face
- Reinforcing Steel:
  - #4 Adhesive-Bonded Dowels (6 Required)
- Concrete Class II (Bridge Deck)

### ELEVATION OF TRANSITION BLOCK
(GUARDRAIL AND POSTS NOT SHOWN FOR CLARITY)

- #3 Stirrups (Field Bend) (Typ.)
- #4 Adhesive-Bonded Dowels (6 Required)
- 1" Anchor Rods 3'-0" long driven into ground prior to casting concrete
- Edge of Existing Approach Slab (Location varies)

### NOTES:
- ANCHOR RODS: Steel Anchor Rods shall be ASTM A36, ASTM A709 Grade 36 or ASTM A615 Grade 60 hot-dip galvanized in accordance with Specification Section 962.
- ADHESIVE-BONDED DOWELS: Adhesive Bonding Material Systems for Dowels shall comply with Specification Section 937 (Type HV) and be installed in accordance with Specification Section 416.
- Adhesive Bonded Dowels are shown installed in an existing curb or sidewalk integrally reinforced with Approach Slab, Wingwall or Bridge Deck. For installations in existing detached curbs or sidewalks, install dowels in available sound concrete.
- Shift bars (as needed) to install six dowels into existing bridge or approach slab mounted curb.

### ESTIMATED QUANTITIES PER TRANSITION BLOCK

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<th>UNIT</th>
<th>QUANTITY</th>
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<tr>
<td>Reinforcing Steel</td>
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<tr>
<td>Guardrail (Reset)</td>
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</table>

**Revision: 07/01/13**

**Description:**

**FY 2020-21 STANDARD PLANS**

**THREE-BEAM PANEL RETROFIT (CONCRETE HANDRAIL)**

**INDEX**

**SHEET**
AT BRIDGE DECK EXPANSION JOINTS

1" (min.) 2'-0" (max.)

AT INTERMEDIATE BENTS OR PIERS WITH CONTINUOUS DECK

1'-0" (min.) 9" (max.)

AT INTERMEDIATE OPEN JOINTS IN RAILING

1'-0" (min.) 9" (max.)

AT OUTER TUBE SPLICE LOCATIONS

1'-0" (min.) 9" (max.)

AT LIGHT POLES AND OVERHEAD SIGN SUPPORTS

1'-0" (min.) 9" (max.)

Bent or Pier

Intermediate

Splice Tube

Intermediate

Assemblies

End Cap

GENERAL NOTES

HSS TUBES: HSS Tubes shall be ASTM A500 Grade B.

ANCHOR RODS, NUTS AND WASHERS: Adhesive Bonded anchors shall be fully threaded rods in accordance with ASTM F1554 Grade 36 or ASTM A193 Grade B7. All Nuts shall be single self-locking hex nuts and in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436. After the nuts have been snug tightened, distort the anchor rod threads to prevent removal of the nuts. Coat distorted threads and the exposed trimmed ends of anchor rods with a galvanizing compound in accordance with the Specifications.

COATINGS: Galvanize all Anchor Rods, Nuts, Bolts, Washers and HSS Tube Assemblies in accordance with the Specifications. Not dip HSS Tubes and Tube Assemblies after fabrication.

ADHESIVE-BONDED ANCHORS AND DOWELS: Adhesive Bonding Material Systems for Anchor Rods shall comply with Specification Section 937 and be installed in accordance with Specification Section 416. The field testing proof loads required by Specification Section 416 shall be 10,000 lbs.

INSTALLATIONS ON CURVED ALIGNMENTS AND GRADES: The details presented in this Standard are shown for installations on tangent alignments and constant grades except as shown in the Offset Detail for Retrofit Installations on Horizontally Curved Alignments. Details for installations on horizontally curved alignments and or vertically curved profiles are similar. Straight sections of HSS Tube may be installed in a chorded manner within the offset limit shown in the Offset Detail for Retrofit Installations on Horizontally Curved Alignments. Shop bend HSS Tubes for use on horizontally curved alignments where the offset limit shown cannot be met using straight sections of HSS Tube. Straight and horizontally curved sections of HSS Tube may be field bent during installation for use on vertically curved profiles.

SHOP DRAWINGS: Submit shop drawings and obtain approval prior to fabrication in accordance with Specification Section 5. Show project specific geometry (line and grade) and bolt hole, expansion joint and splice locations. Include other project specific details as required.

PAYMENT: Payment will be made under Metal Traffic Railing (Rectangular Tube Retrofit) which shall include all materials and labor required to fabricate and install the Rectangular Tube Retrofit.
PLAN AT BEGIN AND END RECTANGULAR TUBE RETROFIT
(Reinforcing Steel in Existing Railing not shown for clarity)

OFFSET DETAIL FOR INSTALLATIONS
ON HORIZONTAL CURVES

SECTION A-A
F-Shape Traffic Railing

SECTION A-A
Corral Shape Traffic Railing

SECTION A-A
Vertical Face Retrofit Traffic Railing

SECTION A-A
New Jersey Shape Traffic Railing

ELEVATION AT BEGIN AND END RECTANGULAR TUBE RETROFIT
(Reinforcing Steel in Existing Railing not shown for clarity)

(Railing on Bridge Deck shown, Railing on Approach Slab and Retaining Wall similar)
TYPICAL PROFILES FOR TENDONS WITH FLEXIBLE FILLER

Profile F1
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile F2
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile F3
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile F4

Profile F6

Profile F7

Profile F5

Profile F8

Profile F9

Profile F10

Profile F11

Profile F12

Profile F13

Profile F14

LEGEND:
- Strand, Wire or Bar Tendon
- Anchorage with Filler Inlet at lower end of Tendon
- Anchorage with Filler Outlet at higher end of Tendon
- Alternate tendon profile immediately adjacent to Anchorage
- Supplementary Filler Inlet
- Filler Port / Outlet
- Drain (See Specifications Section 462 for additional Drain location requirements)
- Direction of Filler Flow
- Inspection Location

* Adjust location to coincide with the true high or low point(s) of the tendon.

PROFILE F11

(2 Span Profile shown; Profiles for 3 or more Spans similar)

PROFILE F13

(2 Span Profile shown; Profiles for 3 or more Spans similar)

(2 Span Profile shown; Profiles for 3 or more Spans similar)

(2 Span Profile shown; Profiles for 3 or more Spans similar)

(2 Span Profile shown; Profiles for 3 or more Spans similar)
TYPICAL PROFILES FOR TENDONS WITH GROUT FILLER

Profile G1
(2 Span Profile shown; Profiles for 3 or more Spans similar)

Profile G2
(Profile for Single Cell Box shown; Profiles for Multiple Cell Boxes similar)

Profile G3

Profile G4

Profile G5

Profile G6

NOTE: See Sheet 1 of 2 for Typical Profiles for Tendons with Flexible Filler and for Legend of Symbols.
**Post-Tensioning Anchorage and Tendon Filling Details**

**PROCEDURE:**
1. After filler injection is completed, remove pocket forming material and rigid filler pipe.
2. Inspect tendon for voids as necessary.
3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
4. Clean threads and rethread as required.
5. Install threaded plug into outlet to form a tight fit.
6. Clean and roughen sides of pocket.
7. Fill pocket with epoxy grout.

**NOTES:**
1. Holes used for the inspection and filler inlets/outlets may be formed using tapered pipes or mandrels.
2. Where a vacuum system is connected to an anchorage, connect both the anchorage outlet and the cap outlet to the vacuum system.
INLET END
(EMBEDDED ANCHORAGE SHOWN; ANCHORAGE AT CONCRETE SURFACE SIMILAR)

FILLER INLET AND OUTLET DETAILS FOR BAR TENDONS
(VERTICALLY ORIENTED TENDON SHOWN; HORIZONTALLY ORIENTED TENDON SIMILAR)

OUTLET END

NOTES:
1. Anchor or Nut to allow for flow of Filler into Cap.
2. Where a vacuum system is connected to an anchorage, connect both the anchorage outlet and the cap outlet to the vacuum system.

INLET END
(EMBEDDED ANCHORAGE SHOWN; ANCHORAGE AT CONCRETE SURFACE SIMILAR)

FILLER INLET AND OUTLET DETAILS FOR BAR TENDONS
(VERTICALLY ORIENTED TENDON SHOWN; HORIZONTALLY ORIENTED TENDON SIMILAR)

OUTLET END

NOTES:
1. Anchor or Nut to allow for flow of Filler into Cap.
2. Where a vacuum system is connected to an anchorage, connect both the anchorage outlet and the cap outlet to the vacuum system.

POST-TENSIONING ANCHORAGE AND TENDON FILLING DETAILS

1. FILLER OUTLET CONNECTION TO TENDON

PROCEDURE:
1. Remove Rigid Filler Pipe or drill Grout in flexible pipe.
2. Inspect tendon for voids.
3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
4. Install Threaded Plug into Outlet to form a tight fit.
5. Over-ream hole (1/4" Ø over-ream). Clean and roughen sides.
6. Fill pocket with epoxy grout.

2. POCKET PREPARATION

PROCEDURE:
1. Remove Rigid Filler Pipe or drill Grout in flexible pipe.
2. Inspect tendon for voids.
3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
4. Install Threaded Plug into Outlet to form a tight fit.
5. Over-ream hole (1/4" Ø over-ream). Clean and roughen sides.
6. Fill pocket with epoxy grout.

3. FILLING POCKET

FILLER OUTLET DETAIL AT VERTICAL SURFACES

4. POCKET PREPARATION

PROCEDURE:
1. Remove Rigid Filler Pipe or drill Grout in flexible pipe.
2. Inspect tendon for voids.
3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
4. Install Threaded Plug into Outlet to form a tight fit.
5. Over-ream hole (1/4" Ø over-ream). Clean and roughen sides.
6. Fill pocket with epoxy grout.

5. FILLING POCKET

FILLER OUTLET DETAIL AT VERTICAL SURFACES

6. POCKET PREPARATION

PROCEDURE:
1. Remove Rigid Filler Pipe or drill Grout in flexible pipe.
2. Inspect tendon for voids.
3. Vacuum inject as required. If grout is used, allow grout to cure. If flexible filler is used, replace filler displaced by inspection. Remove pipe used for vacuum injecting.
4. Install Threaded Plug into Outlet to form a tight fit.
5. Over-ream hole (1/4" Ø over-ream). Clean and roughen sides.
6. Fill pocket with epoxy grout.
GENERAL NOTES:

U.S. COAST GUARD NOTIFICATION: Notify the local office of the U.S. Coast Guard at least 30 days prior to beginning of construction of the Fender System.

14" SQUARE PRESTRESSED CONCRETE PILES: Provide 14" Square Prestressed Concrete Piles of sufficient length to achieve a minimum embedment of 20' into soil having a blow count greater than or equal to 6 (N > 6). Pile splices and build-ups are not permitted. Use only 14" Square Prestressed Concrete Piles with 0 - 1/2 diameter Low Relaxation Strands fabricated in accordance with Index 453-014.

PLASTIC LUMBER AND STRUCTURAL COMPOSITE LUMBER WALES: Provide only Plastic Lumber (Thermoplastic Structural Shapes) and Structural Composite Lumber (Reinforced Thermoplastic Structural Shapes) Wales in accordance with Specification Section 973. Wales shall be continuous and spliced only at locations shown on the plans.

PLASTIC LUMBER DECKING FOR CATWALKS: Provide Plastic Lumber decking for catwalks when called for in the Plans in accordance with Specification Section 973.

Install Plastic Lumber Decking according to manufacturer's recommendations using stainless steel #10 x 3" (minimum) deck screws.

FIBERGLASS OPEN GRATING FOR CATWALKS: Provide Fiberglass Open Grating for catwalks when called for in the Plans. Fiberglass Open Grating shall be a heavy duty design suitable for exterior installations. Maximum gap opening on the walkway surface shall be 1/2". Design live loads and deflections shall be a 50 psf uniformly distributed load with a maximum deflection of 3/8" or L/120 at the center of a simple span and a concentrated load of 250 pounds with a maximum deflection of 3/8" at the center of a simple span. Color of Fiberglass Open Grating shall be gray or black.

Install Fiberglass Open Grating according to manufacturer's recommendations using stainless steel hardware, screws, bolts, nuts and washers. Attach Fiberglass Open Grating to Wales and Deck Supports at a 2'-0" maximum spacing so as to resist pedestrian live loads and uplift forces from wind, buoyancy and wave action.

CLEARANCE GAUGE AND LIGHT: Clearance Gauge to be furnished and installed by the Contractor. Clearance Gauge width and numeral height is dependent on visibility distance. The required visibility distance shall be determined by the United States Coast Guard District Commander. Provide and install Clearance Gauge Light in accordance with Specification Section 510 and Index 510-001.

NAVIGATION LIGHTS: Provide and install Navigation Lights in accordance with Specification Section 510. Index 510-001 and/or project specific details. Provide and maintain Temporary Navigation Lights during construction until permanent Navigation Lights are operational.

BOLTS, THREADED BARS, NUTS, SCREWS AND WASHERS: Furnish stainless steel Bolts in accordance with ASTM F593 Type 316. Furnish stainless steel Threaded Bars in accordance with ASTM A193 Grade B8M. Furnish stainless steel Nuts in accordance with ASTM F594 Type 316. Furnish stainless steel Screws in accordance with ASTM F593 Type 305. Furnish stainless steel Washers compatible with Bolts, Threaded Rods and Nuts under heads and nuts. Torque Nuts on 1" diameter Bolts and Threaded Bars to 150 lb-ft. Keep threads on Bolts, Threaded Bars and Nuts Free from dirt, coarse grime and sand to prevent galling and seizing during tightening.

SPICE PLATES: Furnish Splice Plates in accordance with ASTM A240 Type 316.

WIRE ROPE: Provide wire rope meeting one of the following requirements:

1. 1/2" diameter 6x19, 6x25 or 6x37 class IWRC Type 316 stainless steel wire rope with a minimum breaking strength of 18,000 lbs.

2. 1/2" diameter 6x19 galvanized wire rope with ultraviolet ray resistant polypropylene impregnation having an outside diameter of 5/8" with a minimum breaking strength of 22,000 lbs. Protect all ends with heat shrinkable end caps compatible with the rope's polypropylene that provide an effective water-tight seal.

GENERAL NOTES:

FENDER SYSTEM ENERGY CAPACITY

Energy Capacity = 38 ft-k

FENDER SYSTEM - PRESTRESSED CONCRETE PILES & FRP WALES

INDEX 471-030

1 of 7
CROSS REFERENCES:
For Sections A-A and B-B see Sheet 4.
For View F-F see Sheet 5.

NOTE:
Plastic Lumber and Composite Lumber Dimensions shown are based on Nominal Lumber Dimensions and may vary depending on Actual Lumber Dimension.

PARTIAL PLAN VIEW (TYPICAL FLARE)
(FLARE AT CONTROL POINT B SHOWN, CONTROL POINTS A, C & D SIMILAR)
(HANDRAIL NOT SHOWN FOR CLARITY)

EXPANDED PARTIAL ELEVATION View
Composite Lumber 10" x 10" Wales  Mark A (Typ.)

14" Sq. Prestressed Concrete Piles

Plastic Lumber 8" x 8" Spacer Block Mark B (Typ.)

See Detail "A"

Splice Plate top and bottom of Wale, center plate about splice and 1/4 Wale
(Typ. at each Wale splice location, except along top Wale)

1" Ø Stainless Steel Threaded Bars, Locking Nuts and Washers (Typ.)

SCH 80 PVC Electrical Conduit

Plastic Lumber 8" x 8" Spacer Block Mark B (Typ.)

Compressive Lumber 10" x 10" Wales Mark A

Provide oversized hole to accept nut & washer

Recess Threaded Bar 1/2" from front face of Wale as shown

CROSS REFERENCES:
For Navigation Lights and SCH 80 PVC Electrical Conduit Details see Index 510-001.
For View G-G and Clearance Gauge Details see Sheet 4.
For Detail 'B' and location of Section E-E see Sheet 2.
For location of View F-F see Sheet 1.

SPLICE PLATE DETAIL

PARTIAL VIEW F-F
(SHOWING FENDER END; DECKING AND HANDRAIL NOT SHOWN FOR CLARITY)

VIEW F-F
(SHOWING FENDER END WITH CLEARANCE GAUGE)

SECTION E-E
TYPICAL FLARED SECTION
(8° TURN SHOWN, 4° TURN SIMILAR)

SECTION E-E
TYPICAL STRAIGHT SECTION

PARTIAL VIEW F-F
(SHOWING FENDER END; DECKING AND HANDRAIL NOT SHOWN FOR CLARITY)

VIEW F-F
(SHOWING FENDER END WITH CLEARANCE GAUGE)

CROSS REFERENCES:
For Navigation Lights and SCH 80 PVC Electrical Conduit Details see Index 510-001.
For View G-G and Clearance Gauge Details see Sheet 4.
For Detail 'B' and location of Section E-E see Sheet 2.
For location of View F-F see Sheet 1.
**STRUCTURAL COMPOSITE LUMBER BILL OF MATERIALS**

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<th>MARK</th>
<th>SIZE (NOMINAL)</th>
<th>DIMENSIONS</th>
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*All Plastic Lumber and Composite Lumber Dimensions and Quantities shown are based on Nominal Lumber Dimensions and may vary depending on Actual Lumber Dimension.*

**PROVIDE FIBERGLASS OPEN GRATING IN LIEU OF 2' X 12' PLASTIC LUMBER WHEN CALLED FOR IN THE PLANS. MOUNTING HARDWARE SHALL BE STAINLESS STEEL, INSTALL PER MANUFACTURER'S RECOMMENDATIONS. SEE STRUCTURES PLANS FOR NOTES AND DETAILS.**

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**PLASTIC LUMBER BILL OF MATERIALS**

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<tr>
<td>D</td>
<td>2&quot; X 6&quot; PLASTIC LUMBER</td>
<td>4'-4' (STRAIGHT)</td>
<td>8.7</td>
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</tr>
<tr>
<td><strong>E</strong></td>
<td>2&quot; X 12&quot; PLASTIC LUMBER</td>
<td>2'-0' (STRAIGHT)</td>
<td>5.0</td>
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</tr>
<tr>
<td>F1</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>32'-0' (STRAIGHT)</td>
<td>160.0</td>
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<tr>
<td>F2</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>31'-11&quot;</td>
<td>159.6</td>
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<tr>
<td>F3</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>15'-11&quot;</td>
<td>79.6</td>
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<td>F4</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>15'-9&quot;</td>
<td>78.8</td>
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<tr>
<td>F5</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>15'-1&quot;</td>
<td>78.4</td>
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<tr>
<td>F6</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>15'-10&quot;</td>
<td>79.3</td>
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<tr>
<td>G1</td>
<td>6&quot; X 10&quot; PLASTIC LUMBER</td>
<td>3'-0&quot; (STRAIGHT)</td>
<td>18.3</td>
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<tr>
<td>G2</td>
<td>6&quot; X 6&quot; PLASTIC LUMBER</td>
<td>4'-1&quot; (STRAIGHT)</td>
<td>12.3</td>
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<tr>
<td>H1</td>
<td>4&quot; X 4&quot; PLASTIC LUMBER</td>
<td>PILE CUTOFF ELEV. MINUS NLW OR NLW ELEV. PLUS 5'-6&quot; (STRAIGHT)</td>
<td>1.3 PER LF EACH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>2&quot; X 6&quot; PLASTIC LUMBER</td>
<td>1'-2&quot; (STRAIGHT)</td>
<td>1.2</td>
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