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°. Relevant details also apply to CASE 2.

5. The plan view for CASE 2 applies where the skew angle (Ø) > 0°. The slab shown represents a skew to the right for an approach slab at the 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.

GENERAL NOTES

PLAN VIEW (CASE 1)

- Bars C @ 1'-0" Max. (Top of Slab)
- Bars 5B @ 1'-0" Max. (Bottom of Slab)
- Bars 5A @ 9" Max. (Bottom of Slab)
- Bars 5B @ 9" Max. (Top of Slab)
- Bars 5A @ 1'-0" Max. (Bottom of Slab)
- Bars 5B @ 9" Max. (Top of Slab)

PLAN VIEW (CASE 2)

- Bars C @ 1'-0" Max. (Top of Slab)
- Bars 5B @ 9" Max. (Top of Slab)
- Bars 5B @ 9" Max. (Bottom of Slab)

CROSS REFERENCES:
For Section B-B, Longitudinal Construction Joint Detail and Approach Slab Details see Sheet 2.
**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 (Ø) = 0°. Relevant details also apply to CASE 2.**

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. 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 may be required. The permitted construction joint shown in 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 additional 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.

**SECTION A-A**

- **APPROACH SLABS (50 FT.)**
- **(RIGID PAVEMENT APPROACHES)**

**PLAN VIEW (CASE 1)**

**PLAN VIEW (CASE 2)**
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.

* Bars C1

Bars 5A1

Bars 8A2

2'-2" Min.

Longitudinal Const. Joint

Edge of Approach Slab (Coping)

Approach Slab

Bridge Deck

Approach Slab

End Bent Wingwall

VIEW C-C AT BEGIN OR END BRIDGE (BEAM BRIDGE SHOWN, FLAT SLAB BRIDGE SIMILAR)

VIEW D-D AT BEGIN OR END BRIDGE (BEAM BRIDGE SHOWN, FLAT SLAB BRIDGE SIMILAR)

SECTION B-B

STANDARD APPROACH SLAB

SECTION B-B

APPROACH SLAB WITH TRAFFIC SEPARATOR

SECTION B-B

APPROACH SLAB WITH MEDIAN TRAFFIC RAILING

SECTION B-B

APPROACH SLAB WITH SIDEWALK

SECTION B-B

APPROACH SLAB WITH RAISED SIDEWALK

COPING TRANSITION DETAIL FOR RETAINING WALLS WITH 2'-3" COPING HEIGHT

(Railing Not Shown For Clarity)

INDEX 400-091 SHEET 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 8.

**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.

---

**TABLE 1 - MINIMUM BAR SPLICE LENGTHS FOR LONGITUDINAL REINFORCING**

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>CLASS II (3400 psi)</th>
<th>CLASS IV (5500 psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#3</td>
<td>1'-4&quot;</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>#4</td>
<td>1'-4&quot;</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>#5</td>
<td>2'-2&quot;</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>#6</td>
<td>2'-7&quot;</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

**TABLE 1 NOTE:** Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.
WINGWALL ELEVATION - Variable Height
(Left End shown - other corners similar)

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.

CULVERT BARREL NOTES:
1. Space Bars 110 and 112 with a bar in each corner, and at the edge of interior walls (for multiple barrel culverts only), and the remaining bars placed at equal spacing shown in the Contract Plans. Adjust last bar spacing when required.
2. Place Bars 113 and 114 at spacing shown in the Contract Plans evenly between Bars 109 and 111.
3. Locate the first transverse bar from the ends of the culvert at one half the bar spacing, but provide the minimum reinforcement cover and not greater than 4" clear.

CONCRETE BOX CULVERT DETAILS

TYPICAL SECTION THRU SINGLE BARREL CULVERT

TYPICAL SECTION THRU MULTIPLE BARREL CULVERT

INDEX

CONCRETE BOX CULVERT DETAILS

FY 2019-20

STANDARD PLANS

INDEX

400-289

2 of 8
NOTES:
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail "C" (Sheet 5).
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:
   - Inside 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. ft./transverse reinforcing.

**DETAIL "B"**

**UNDERDRAIN DETAIL**

(Similar to Type II – Index 440-001)

* Included in the cost of the Traffic Railing.

**DETAIL "G"**

**SECTION H-H**

**LEFT CUTOFF WALL SECTION**

(Right Cutoff Wall similar)

**DETAIL "I"**

**TRAFFIC RAILING ATTACHMENT TO HEADWALL**

Provide supplemental top bars (Min. 5'-0" long) (See Note 6)

* Included in the cost of the Traffic Railing.

**DETAIL "D"**

**DETAIL "F"**

**DETAIL "E"**

**CROSS REFERENCE:**

See Sheet 3 for locations of Details "D", "E", "F" & "K".

See Sheet 4 for locations of Detail "C".

**DETAIL "C"**

**PLAN VIEW**

WINGWALL TO BOX CONNECTION

(Left Begin Corner Shown, Other Corners Similar)
Remove Wingwalls and Footings
Sufficient to Construct Culvert Extension

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

Culvert Extension (LC, Tabulated on Box Culvert Data Tables for Standard Box Section Extension)

Cut back Existing Walls, Top Slab & Bottom Slab to Beginning of Radius (2'-0" Min.)

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

Wrap Filter Fabric Around Construction Joint (2'-0" Min. Width)

NOTE:
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.

DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION
(Interiors Single Walls Similar)

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

Type I Connection Details for Concrete Box Culvert Extensions
(Cut Back Existing Concrete)
**FLARED WINGWALL**

- **SECTION A-A**
  - Details for Box Culvert Extension
  - Length for Estimated Quantities
  - Culvert Extension (Tabulated on Box Culvert Data Tables)
  - See Transition Details

- **SECTION B-B**
  - Details for Box Culvert Extension
  - Length for Estimated Quantities
  - Culvert Extension (Tabulated on Box Culvert Data Tables)
  - See Transition Details

**OUTSIDE WALLS OF BOXES**

- **FLARED WINGWALL**
  - 2'-0" Straight
  - 2'-0" Tapered Transition
  - Face of Footing/Cut off Wall

- **INTERIOR DOUBLE WALLS OF BOXES**
  - 2'-0" Straight
  - 2'-0" Tapered Transition
  - Face of Footing/Cut off Wall

- **SECTION C-C**
  - Details for Box Culvert Extension
  - Trim Wall Reinforcing to provide 2" Min. Clearance
  - existing Box Culvert Wall

**INTERIOR SINGLE WALLS OF BOXES PLAN VIEWS**

- **DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION**
  - 2'-0" Min. - Walls
  - 2'-0" Transition
  - Varies - Slabs

- **DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS**
  - 2'-0" Straight
  - 2'-0" Tapered Transition

**STRAIGHT WINGWALL**

- **SECTION A-A**
  - Details for Box Culvert Extension
  - Length for Estimated Quantities
  - Culvert Extension (Tabulated on Box Culvert Data Tables)
  - See Transition Details

- **SECTION B-B**
  - Details for Box Culvert Extension
  - Length for Estimated Quantities
  - Culvert Extension (Tabulated on Box Culvert Data Tables)
  - See Transition Details

**OUTSIDE WALLS OF BOXES**

- **FLARED WINGWALL**
  - 2'-0" Straight
  - 2'-0" Tapered Transition
  - Face of Footing/Cut off Wall

- **INTERIOR DOUBLE WALLS OF BOXES**
  - 2'-0" Straight
  - 2'-0" Tapered Transition
  - Face of Footing/Cut off Wall

- **SECTION C-C**
  - Details for Box Culvert Extension
  - Trim Wall Reinforcing to provide 2" Min. Clearance
  - existing Box Culvert Wall

**INTERIOR SINGLE WALLS OF BOXES PLAN VIEWS**

- **DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION**
  - 2'-0" Min. - Walls
  - 2'-0" Transition
  - Varies - Slabs

- **DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS**
  - 2'-0" Straight
  - 2'-0" Tapered Transition

**TYPE II CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS**

- (ADHESIVE DOWEL TO EXISTING CONCRETE)

**INDEX**

- **CONCRETE BOX CULVERT DETAILS**
  - FY 2019-20 STANDARD PLANS
  - 400-289
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"

10'-0"

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

EXTRA BASE FOR BOX CULVERTS CROSSING UNDER FLEXIBLE PAVEMENT

APSHOTIC CONCRETE 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.

BLACK PLASTIC FIGURES 3" IN HEIGHT MAY BE USED IN LIEU OF NUMBERS FORMED BY 3/8" V-GROOVES. V-GROOVES SHALL BE FORMED BY PREFORMED FIGURES.

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

Bridge Culvert

TOP VIEW OF HEADWALL

BRIDGE CULVERT NUMBER LOCATION

INLET TYPE B GRATE

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.

APSHOTIC CONCRETE 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.

BLACK PLASTIC FIGURES 3" IN HEIGHT MAY BE USED IN LIEU OF NUMBERS FORMED BY 3/8" V-GROOVES. V-GROOVES SHALL BE FORMED BY PREFORMED FIGURES.

INLET IN TOP OF BOX CULVERT

Location of Number

Bridge Culvert

TOP VIEW OF HEADWALL

BRIDGE CULVERT NUMBER LOCATION

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

Bridge Culvert

TOP VIEW OF HEADWALL

BRIDGE CULVERT NUMBER LOCATION

INLET TYPE B GRATE

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.

APSHOTIC CONCRETE 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.

BLACK PLASTIC FIGURES 3" IN HEIGHT MAY BE USED IN LIEU OF NUMBERS FORMED BY 3/8" V-GROOVES. V-GROOVES SHALL BE FORMED BY PREFORMED FIGURES.

INLET IN TOP OF BOX CULVERT

Location of Number

Bridge Culvert

TOP VIEW OF HEADWALL

BRIDGE CULVERT NUMBER LOCATION

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

Bridge Culvert

TOP VIEW OF HEADWALL

BRIDGE CULVERT NUMBER LOCATION

INLET TYPE B GRATE

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.

APSHOTIC CONCRETE 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.

BLACK PLASTIC FIGURES 3" IN HEIGHT MAY BE USED IN LIEU OF NUMBERS FORMED BY 3/8" V-GROOVES. V-GROOVES SHALL BE FORMED BY PREFORMED FIGURES.
**Direction of Bottom Section Placement**

**Bottom Slab**

**Direction of Flow**

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

**Joint Sealant**

3" Min.

**3" Min. Tongue length (8° to 15° bevel)**

1" Min. cover inside at joint

2" Cover

1/2" Min. Joint Sealant

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

**Joint Sealant**

3" Min. Tongue length (8° to 15° bevel)

1" Min. cover inside at joint

2" Cover

1/2" Min. Joint Sealant

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".

**SECTION A-A**
(2" Cover - Thin Wall Detail)

**SECTION A-A**
(2" Cover - Thick 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".
- Transverse wire in tongue may be cut at corners of box to allow bending of the WWR.

**SCHEMATIC "A"**
TYPE B BOX SECTION PLACEMENT FOR SINGLE TONGUE & GROOVE JOINTS

**TWO-PIECE PRECAST SEGMENT ADDITIONAL JOINT DETAILS (TYPE B BOX)**

---

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

---

**PRECAST CONCRETE BOX CULVERTS - SUPPLEMENTAL DETAILS**

**INDEX**

400-291

2 of 5
PIPE BLOCKOUT DETAILS:

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'-0" 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.

SECTION I-I

(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)

SECTION F-F

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

**PRECAST CONCRETE BOX CULVERTS**

**SUPPLEMENTAL DETAILS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQ'D</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>d</td>
<td>As Req'd</td>
<td>As Req'd</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.

**DESIGN NOTE:**

1. Link Slab required when joint openings from differential settlement exceed \( \frac{1}{16} \)" as determined in Link Slab Note 1.

**LONG-TERM DIFFERENTIAL SETTLEMENT**

\[ \Delta Y \leq \frac{11V}{760 \times R \times W} \]

Where:

- \( \Delta Y \) = Maximum Long-Term Differential Settlement (ft.)
- \( R \) = Exterior height of Box Culvert (ft.)
- \( W \) = Length of Box Culvert Segments (ft.)
- \( L \) = Effective length for single curvature deflection (ft.)

2. Extend Link Slab to back face of headwalls and to limits of existing box culverts for extensions.

**NOTE:** All bar dimensions are out to out.

**Lap splice length for Bars 4M is 1'-4" minimum.**

**NOTE:** 1. Link Slab required when joint openings from differential settlement exceed \( \frac{1}{16} \)" as determined in Link Slab Note 1.

**NOTES:**

1. Provide a Cast-In-Place Link Slab to ensure uniform joint opening of precast box culverts when the differential settlement shown in the plans exceeds the following limits, except that a Link Slab is not required for differential settlements less than \( \frac{1}{16} \)".

**FILTER FABRIC:**

2'-0" Min. overlaps

**REINFORCING STEEL:**

**REINFORCING STEEL BENDING DIAGRAMS**

**SPECIFICATION:**

* Install dowels with an Adhesive Bonding Material System in accordance with Specification Section 416. The Contractor may substitute mechanical couplers in lieu of adhesive bonded dowels. Shift dowels to clear box culvert reinforcing.

**CONSTRUCTION JOINTS:**

Permitted at mid span of precast box segment

**FILTER FABRIC:**

6" 1'-0" spacing (Max.)

**Dowel Bars 4L**

**Precast Box Culvert (Typ.)**

4" Non-Shrink Grout

**Dowel Bars 4L**

**Precast Box Culvert (Typ.)**

2" Non-Shrink Grout

**Bars 4L**

**Precast Box Culvert (Typ.)**

3" Cl. (Typ.)

**Bars 4M**

**Bars 4M**

**Filter Fabric (Typ.)**

**Bars 4L**

**1'-0" spacing (Max.)**

**1'-0" spacing (Max.)**

**Bars 4M**

**Dowel Bars 4L**

**Precast Concrete Box**

**Bars 4M**

**Precast Concrete Box**

**C-I-P Link Slab**

**Bars 4M**

**Bars 4M**

**4""
Min. length equal to spacing of longitudinal wires + 2" (Typ.)

As9 (Top, Bot. & Sides)

See Section A-A for reinforcement in this area

TYPICAL BOX SECTION (TYPE 2)
DESIGN EARTH COVER 2' OR GREATER
(Option 1 Reinforcing Configuration Shown)

3" Min. – 6" Max. Tongue length (8° to 15° bevel)

Top As2 Bot. As3

As1

As4

As9 (Bot. & Sides)

NOTES:
1. Work this Index with Index 400-291.
2. See sheets 2 thru 5 for dimensions and areas of reinforcement.

TYPICAL BOX SECTION (TYPE 1)
DESIGN EARTH COVER LESS THAN 2'
(Option 1 Reinforcing Configuration Shown)

1 – Longitudinal Wire space plus 2"
TABLE 1B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (FL)</th>
<th>SLAB / WALL THICKNESS (in.)</th>
<th>DESIGN EARTH COVER (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./ft.)</th>
<th>AS1 EXT LENGTH (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x 3</td>
<td>2' - 0'</td>
<td>0.40 - 0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2' - 0'</td>
<td>0.17 - 0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3' - 0.5'</td>
<td>0.19 - 0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4' - 1.0'</td>
<td>0.20 - 0.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 x 3</td>
<td>2' - 0'</td>
<td>0.39 - 0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2' - 0'</td>
<td>0.18 - 0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3' - 0.5'</td>
<td>0.20 - 0.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4' - 1.0'</td>
<td>0.22 - 0.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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: HL-93 & any fill heights between the minimum & maximum shown.
3. Only one design of precast box culvert is to be used in 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 #2.5 or #4.0 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 configuration options 2 and 3 shown in Detail "A" and "B" (Sheet 1), As may be extended to the middle of either slab and lap spliced with As7 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.
9. Submittal of redesign calculations is 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 interpolate 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 segment is 4 feet and maximum length is 16 feet.
12. See Index 400-291 for connections to wingwalls, headwalls and other general details.

NOTE: 1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 14 for WWR Bending Diagram.

FAA/MTA 01/01/15

LAST REVISION: FY 2019-20 STANDARD PLANS

INDEX: 400-292 SHEET 2 OF 14
### Table 2A - Standard Precast Box Culvert Designs (2" Cover) - 5' & 6' Spans

<table>
<thead>
<tr>
<th>Span (R)</th>
<th>Slope</th>
<th>Top Slab (in)</th>
<th>Wall Thickness (in)</th>
<th>Base Slab (in)</th>
<th>Total Thickness (in)</th>
<th>Aisle Length (ft)</th>
<th>Reinforcement Areas (sq.in./ft)</th>
<th>Aisle Width (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 3</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
<tr>
<td>5' x 4</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
<tr>
<td>6' x 3</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
<tr>
<td>6' x 4</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
</tbody>
</table>

### Table 2B - Standard Precast Box Culvert Designs (2" Cover) - 5' & 6' Spans

<table>
<thead>
<tr>
<th>Span (R)</th>
<th>Slope</th>
<th>Top Slab (in)</th>
<th>Wall Thickness (in)</th>
<th>Base Slab (in)</th>
<th>Total Thickness (in)</th>
<th>Aisle Length (ft)</th>
<th>Reinforcement Areas (sq.in./ft)</th>
<th>Aisle Width (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 3</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
<tr>
<td>5' x 4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
<tr>
<td>6' x 3</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
<tr>
<td>6' x 4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.33 - 0.27</td>
<td>0.31 - 0.26</td>
<td>4</td>
<td>0.20 - 0.19</td>
<td>0.20 - 0.18</td>
</tr>
</tbody>
</table>

**Note:** All dimensions are approximate and should be verified with specific design criteria.
### TABLE 3 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 7' 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 (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0.33 - &lt;2</td>
<td>0.37 leaves 0.20</td>
<td>0.29 leaves 0.37</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### TABLE 4 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 8' 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 (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>0.33 - &lt;2</td>
<td>0.37 leaves 0.20</td>
<td>0.29 leaves 0.37</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>0.36 leaves 0.10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**NOTES:**
1. See Sheet 1 for reinforcing details and dimension locations.
2. See Sheet 2 for general notes.
3. See Sheet 14 for welded wire reinforcement bending diagram.
### TABLE 5 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 9' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>BOLT (T)</th>
<th>SIZE (in.)</th>
<th>MAUCH (in.)</th>
<th>DESIGN EARTH COVER (sq. in./Ft.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Ft.)</td>
<td>(m)</td>
<td>(in.)</td>
<td>(in.)</td>
<td>TOP SLAB</td>
<td>TOP SLAB</td>
<td></td>
</tr>
<tr>
<td>9 x 5</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.33 - &lt;2</td>
<td>0.41 0.62 0.53 0.22 0.23 0.34 0.38</td>
<td>0.33 - &lt;7</td>
</tr>
<tr>
<td>9 x 6</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.22 - &lt;2</td>
<td>0.24 0.48 0.54 0.21 0.22 0.33 0.38</td>
<td>0.37 - &lt;5</td>
</tr>
<tr>
<td>9 x 7</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.37 - &lt;2</td>
<td>0.39 0.63 0.59 0.24 0.25 0.36 0.40</td>
<td>0.40 - &lt;6</td>
</tr>
<tr>
<td>9 x 8</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.50 - &lt;2</td>
<td>0.52 0.80 0.67 0.27 0.28 0.40 0.44</td>
<td>0.46 - &lt;8</td>
</tr>
<tr>
<td>9 x 9</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.63 - &lt;2</td>
<td>0.65 0.93 0.72 0.30 0.31 0.44 0.48</td>
<td>0.50 - &lt;9</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>BOLT (T)</th>
<th>SIZE (in.)</th>
<th>MAUCH (in.)</th>
<th>DESIGN EARTH COVER (sq. in./Ft.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Ft.)</td>
<td>(m)</td>
<td>(in.)</td>
<td>(in.)</td>
<td>TOP SLAB</td>
<td>TOP SLAB</td>
<td></td>
</tr>
<tr>
<td>10 x 5</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.37 - &lt;2</td>
<td>0.46 0.62 0.52 0.24 0.24 0.34 0.38</td>
<td>0.37 - &lt;7</td>
</tr>
<tr>
<td>10 x 6</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.40 - &lt;3</td>
<td>0.42 0.64 0.54 0.26 0.27 0.38 0.42</td>
<td>0.40 - &lt;8</td>
</tr>
<tr>
<td>10 x 7</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.50 - &lt;3</td>
<td>0.52 0.80 0.67 0.30 0.31 0.44 0.48</td>
<td>0.50 - &lt;9</td>
</tr>
<tr>
<td>10 x 8</td>
<td>10</td>
<td>2</td>
<td>-</td>
<td>0.63 - &lt;3</td>
<td>0.65 0.93 0.72 0.30 0.31 0.44 0.48</td>
<td>0.60 - &lt;10</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) - 11' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (Ft)</th>
<th>SLAB / WALL THICKNESS</th>
<th>DESIGN EAST COVER ABOVE TOP SLAB</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 to</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.51</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.51</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.48</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.48</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.47</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.47</td>
<td>0.50</td>
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<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.59</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.59</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.32 - &lt;2</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>0.92 to 0.95</td>
<td>0.92</td>
<td>0.95</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 EAST COVER ABOVE TOP SLAB</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT LENGTH (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12' x 4</td>
<td>12</td>
<td>12</td>
<td>12 to</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.52</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.33 - &lt;2</td>
<td>0.50</td>
<td>0.45</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' 4' x 4'</td>
<td>9 9 9</td>
<td>0.33 - 2' 0.17 0.37 0.22 0.22 0.22</td>
<td>0.22 0.24 0.26 0.22 0.22 0.22</td>
<td>31</td>
</tr>
</tbody>
</table>

### 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' 4' x 4'</td>
<td>10 10 10 10</td>
<td>0.33 - 2' 0.17 0.37 0.22 0.22 0.22</td>
<td>0.22 0.24 0.26 0.22 0.22 0.22</td>
<td>31</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 (S)</th>
<th>TOP (Tt)</th>
<th>BOT (Tt)</th>
<th>SIDE (Tt)</th>
<th>MAUNAL (Tt)</th>
<th>TOP SLAB</th>
<th>SLAB / WALL THICKNESS</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1</th>
<th>AS2</th>
<th>AS3</th>
<th>AS4</th>
<th>AS5</th>
<th>AS6</th>
<th>AS7</th>
<th>AS8</th>
<th>AS9</th>
</tr>
</thead>
<tbody>
<tr>
<td>5' x 3</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<td>45</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5' x 4</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>0.27</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>TOP (Tt)</th>
<th>BOT (Tt)</th>
<th>SIDE (Tt)</th>
<th>MAUNAL (Tt)</th>
<th>TOP SLAB</th>
<th>SLAB / WALL THICKNESS</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1</th>
<th>AS2</th>
<th>AS3</th>
<th>AS4</th>
<th>AS5</th>
<th>AS6</th>
<th>AS7</th>
<th>AS8</th>
<th>AS9</th>
</tr>
</thead>
<tbody>
<tr>
<td>6' x 3</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>0.27</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6' x 4</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>0.27</td>
<td>45</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See General Notes.
### TABLE IIA - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S) (Ft)</th>
<th>TOP SLAB (Tt) (in.)</th>
<th>BUTT (Tu) (in.)</th>
<th>SIDE WALL (Tm) (in.)</th>
<th>MAUNCH (Tm) (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>DESIGN</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7' x 4</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 5</td>
<td>9</td>
<td>9</td>
<td>12</td>
<td>9</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 6</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 7</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 8</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 9</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 10</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SPAN x RISE (S) (Ft)</th>
<th>TOP SLAB (Tt) (in.)</th>
<th>BUTT (Tu) (in.)</th>
<th>SIDE WALL (Tm) (in.)</th>
<th>MAUNCH (Tm) (in.)</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>DESIGN</th>
<th>AS1 EXT LENGTH (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7' x 4</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 5</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>7' x 6</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>-</td>
<td></td>
<td>-</td>
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<tr>
<td>7' x 7</td>
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<td>10</td>
<td>-</td>
<td></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 12A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 8' SPANS**

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>BGT / WALL THICKNESS</th>
<th>MAUNCH</th>
<th>EARTH COVER</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT. LENGTH (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8' x 4</td>
<td>9 9 9 9</td>
<td>10</td>
<td>0.33 - &lt;2</td>
<td>AS1 AS2 AS3 AS4 AS5 AS6 AS7 AS8 AS9</td>
<td></td>
</tr>
<tr>
<td>3 - &lt;3</td>
<td>0.52 0.66 0.83 0.72 0.22 0.24 0.42 0.52</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.48 0.49 0.52 0.17</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - 10</td>
<td>0.52 0.48 0.49 0.11</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.71 0.72 0.71 0.11</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1.00 0.98 0.97 0.11</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 9 9 8 10</td>
<td>25 1.75 1.24 1.14 0.11</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 10.5 9 12</td>
<td>30 1.31 1.29 1.21 0.11</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**TABLE 12B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 8' SPANS**

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>BGT / WALL THICKNESS</th>
<th>MAUNCH</th>
<th>EARTH COVER</th>
<th>REINFORCEMENT AREAS (sq. in./Ft.)</th>
<th>AS1 EXT. LENGTH (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8' x 4</td>
<td>10 10 10 10</td>
<td>10</td>
<td>0.33 - &lt;2</td>
<td>AS1 AS2 AS3 AS4 AS5 AS6 AS7 AS8 AS9</td>
<td></td>
</tr>
<tr>
<td>3 - &lt;3</td>
<td>0.42 0.54 0.52 0.12 0.24 0.32 0.41</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - &lt;5</td>
<td>0.38 0.42 0.48 0.17</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - 10</td>
<td>0.41 0.38 0.39 0.17</td>
<td>45</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.53 0.36 0.37 0.12</td>
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<td></td>
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<tr>
<td>12</td>
<td>0.78 0.73 0.76 0.12</td>
<td>41</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9.5 9 9 8 10</td>
<td>25 0.97 0.96 0.98 0.12</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 10.5 9 12</td>
<td>30 1.71 1.16 1.10 0.12</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 13B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

<table>
<thead>
<tr>
<th>Stake</th>
<th>Rise</th>
<th>Thrust</th>
<th>Spacing</th>
<th>Elevation</th>
<th>3'</th>
<th>4'</th>
<th>5'</th>
<th>6'</th>
<th>7'</th>
<th>8'</th>
<th>9'</th>
<th>10'</th>
<th>11'</th>
<th>12'</th>
<th>13'</th>
<th>14'</th>
<th>15'</th>
<th>16'</th>
<th>17'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39</td>
<td>44</td>
<td>49</td>
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<td>79</td>
<td>84</td>
<td>89</td>
<td>94</td>
<td>99</td>
<td>104</td>
<td>110</td>
</tr>
</tbody>
</table>

See General Note 5

See Sheet 14 for WWR Bending Diagrams.

See Sheet 2 for General Notes.

See Sheet 1 for WSR Bending Diagrams.

See Sheet 1 for General Notes.
### Table 15 - Standard Precast Box Culvert Designs (3" Cover) - 11' Spans

<table>
<thead>
<tr>
<th>SPAN x RISE</th>
<th>EARTH COVER</th>
<th>LENGTH (M)</th>
<th>SPAN x RISE</th>
<th>EARTH COVER</th>
<th>LENGTH (M)</th>
<th>SPAN x RISE</th>
<th>EARTH COVER</th>
<th>LENGTH (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10' x 10'</td>
<td>0.33' - &lt;2'</td>
<td>47</td>
<td>10' x 10'</td>
<td>0.33' - &lt;2'</td>
<td>47</td>
<td>10' x 10'</td>
<td>0.33' - &lt;2'</td>
<td>47</td>
</tr>
<tr>
<td>12.5' x 20'</td>
<td>3' - &lt;5'</td>
<td>52</td>
<td>12.5' x 20'</td>
<td>3' - &lt;5'</td>
<td>52</td>
<td>12.5' x 20'</td>
<td>3' - &lt;5'</td>
<td>52</td>
</tr>
<tr>
<td>11' x 6'</td>
<td>2.5' - &lt;3'</td>
<td>58</td>
<td>11' x 6'</td>
<td>2.5' - &lt;3'</td>
<td>58</td>
<td>11' x 6'</td>
<td>2.5' - &lt;3'</td>
<td>58</td>
</tr>
</tbody>
</table>

*See General Note 5*
### TABLE 16 - STANDARD PRECAST BOX CULVERT DESIGNS (3” COVER) - 12' SPANS

<table>
<thead>
<tr>
<th>SPAN x RISE (S)</th>
<th>WALL THICKNESS (T)</th>
<th>DEPTH (D)</th>
<th>A13 EXT LENGTH (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12' x 4'</td>
<td>12' x 12'</td>
<td>4</td>
<td>A13 - A23 - A33 - A43 - A53 - A63 - A73 - A83 - A93</td>
</tr>
<tr>
<td>12' x 8'</td>
<td>12' x 20'</td>
<td>8</td>
<td>A17 - A27 - A37 - A47 - A57 - A67 - A77 - A87 - A97</td>
</tr>
<tr>
<td>12' x 10'</td>
<td>12' x 20'</td>
<td>10</td>
<td>A21 - A31 - A41 - A51 - A61 - A71 - A81 - A91 - A101</td>
</tr>
</tbody>
</table>

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

**WELDED WIRE REINFORCEMENT BENDING DIAGRAM**

- **WWR PIECE NO. 1**
  - (2 Req'd. per segment)
  - **A**
  - **As9** (Typ.)
  - 8" Max.
  - **S+8" Min.**

- **WWR PIECE NO. 2**
  - (2 Req'd. per segment)
  - **As9** (Typ.)
  - 8" Max.
  - **S+2Tw+10" Cover-M**

- **WWR PIECE NO. 3**
  - (2 Req'd. per segment)
  - **As9** (Typ.)
  - 8" Max.

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

- **WWR PIECE NO. 1**
  - (2 Req'd. per segment)
  - **A**
  - **As1** (Typ.)
  - 8" Max.
  - **S+8" Min.**

- **WWR PIECE NO. 2**
  - (2 Req'd. per segment)
  - **As1** (Typ.)
  - 8" Max.
  - **S+2Tw+10" Cover-M**

- **WWR PIECE NO. 3**
  - (2 Req'd. per segment)
  - **As1** (Typ.)
  - 8" Max.

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

- **WWR PIECE NO. 1**
  - (2 Req'd. per segment)
  - **A**
  - **As5** (Typ.)
  - 8" Max.
  - **S+8" Min.**

- **WWR PIECE NO. 2**
  - (2 Req'd. per segment)
  - **As5** (Typ.)
  - 8" Max.
  - **S+2Tw+10" Cover-A**

**REINFORCEMENT NOTES:**
1. Reinforcement bending dimensions are out-to-out.
2. See General Notes 4, 5 and 6 on Sheet 2.
3. See Tables 1 thru 16 for dimensions M, R, S, Tb, Tt and Tw.
4. Dimension "R" is determined by the Manufacturer in accordance with the requirements of Detail "B" on Sheets 1 and 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.
BAR BENDING DETAILS (STEEL)

STIRRUP & TIE HOOK DIMENSIONS

<table>
<thead>
<tr>
<th>STYLE</th>
<th>90° HOOKS</th>
<th>135° HOOKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>1'-1&quot;</td>
<td>1'-11½&quot;</td>
</tr>
<tr>
<td>#2</td>
<td>1'-2&quot;</td>
<td>1'-12½&quot;</td>
</tr>
<tr>
<td>#3</td>
<td>1'-3&quot;</td>
<td>1'-13½&quot;</td>
</tr>
<tr>
<td>#4</td>
<td>1'-4&quot;</td>
<td>1'-14½&quot;</td>
</tr>
<tr>
<td>#5</td>
<td>1'-5&quot;</td>
<td>2'</td>
</tr>
<tr>
<td>#6</td>
<td>1'-6&quot;</td>
<td>2-1'</td>
</tr>
<tr>
<td>#7</td>
<td>1'-7&quot;</td>
<td>2-2'</td>
</tr>
</tbody>
</table>

* Dimension is approximate. Hook Styles Detailed on this sheet are for Illustration Only. Actual Hook Style for any particular bar will be shown under A or G Heading on REINFORCING BAR LIST Sheet(s) in Structures Plans. All Dimensions are out-to-out.

NOTE: For Bar Dimensions See REINFORCING BAR LIST Sheet(s) in Structures Plans.
SCHEMATIC PLAN VIEWS AT BEAM ENDS

SCHEMATIC END ELEVATIONS OF BEAMS
(Showing Vertical Bevel of Beam End)

**BEAM NOTES**

1. Work 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: Ø minimum, stressed to 10,000 lbs. each.

5. Place one (1) Bar 3K or 3Z at each location. Alternate the direction of the ends for each bar. (See “ELEVATION AT END OF BEAM” in Standard Details).

6. Tie Bars 3K and 3Z to the fully bonded strands in the bottom or center row (see “STRAND PATTERN” on the Table of Beam Variables sheet in Structures Plans).

   A. At the Contractor’s option, the length of the bottom legs of Bars 3K and 3Z may be extended to facilitate tying to the exterior strands.

   B. For deformed WWR, supplemental transverse #4 bars are permitted to support Pieces K & S under the cross wires on the bottom row of strands.

   C. Holes in the beam web for temporary bracing or shipping devices must be formed prior to casting. See “STRAND CUTTING AND PROTECTING DETAIL” on Sheet 2. Protect end of wedged recessed strands in recess Prestressing strands at the end of the beam without damaging the surrounding concrete. See shop drawings for details and spacing of any required anchorage devices.

   D. 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 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.

   E. Bars 3D1, 3D2, 3D3 and 4M1, 4M2, 4M3 and 4M4 as shown on the Bending Diagram.

   F. WWR is not permitted for end reinforcement Bars 3D1, 3D2, 4M1 and 4M2; use bar reinforcement.
When Intermediate Diaphragms are Required by Design

Bars 5K spaced perpendicular to end of beam @ 3/8". Skewed Bars 5Z, 4M1 or 4M2 placed with Bars 5K.

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. Provide 1" Ø zinc-electroplated ferrule wing nut or coil inserts, UNC threads, 1/8 minimum gage wire, not more than 4" in depth with a minimum ultimate tensile strength of 11,400 lbs. in 4,000 psi concrete.

2. If inserts are needed on both sides (faces) of beam webs, an assembly as long as the thickness of the beam web, consisting of two (2) ferrule or coil inserts attached by two (2) or more struts may be utilized. The connecting struts shall have a minimum ultimate tensile strength of 11,400 lbs.

3. Inserts for diaphragm reinforcing are required at each end of each intermediate diaphragm shown on the Beam Framing Plan and may be required at the end of the beams when end diaphragms are shown. See Superstructure and Beam Framing Plans for longitudinal location of inserts for each face of beam.

**INSERT DETAIL**

**INSERT NOTES**

1. Provide 1" Ø, zinc-electroplated ferrule wing nut or coil inserts, UNC threads, 1/8 minimum gage wire, not more than 4" in depth with a minimum ultimate tensile strength of 11,400 lbs. in 4,000 psi concrete.

2. If inserts are needed on both sides (faces) of beam webs, an assembly as long as the thickness of the beam web, consisting of two (2) ferrule or coil inserts attached by two (2) or more struts may be utilized. The connecting struts shall have a minimum ultimate tensile strength of 11,400 lbs.

3. Inserts for diaphragm reinforcing are required at each end of each intermediate diaphragm shown on the Beam Framing Plan and may be required at the end of the beams when end diaphragms are shown. See Superstructure and Beam Framing Plans for longitudinal location of inserts for each face of beam.

**STRAND CUTTING AND PROTECTING DETAIL**

**TYPICAL SECTION**

**SHOWING CUT STRAND RECESS LIMITS**

**Epoxy Coating** (1/2" minimum thickness) (See Note 12, Sheet 1)

**PRESTRESSING Strand** (formed by cutting or grinding)

**RECESSED Strand**

**End of Beam**

**End of Beam**

**1 1/2 Min.**

**1/2 Min.**

**FLORIDA-I BEAM**

**TYPICAL DETAILS & NOTES**

**INDEX**

**SHEET**

**450-010**

2 of 2
**CONVENTIONAL REINFORCING**

**BAR BENDING DETAILS**

**BILL OF REINFORCING STEEL**

**FLORIDA-I 45 BEAM - STANDARD DETAILS**

**ELEVATION AT END OF BEAM**

(Flanges Not Shown For Clarity)

(End 1 Shown, End 2 Similar)

**SECTION A-A FOR CONVENTIONAL REINFORCING**

(Showing Bars 5K, 5Y & 5Z Only)
ALTERNATE REINFORCING STEEL (WWR) DETAILS

PIECES M  END VIEW

PIECES K & S  END VIEW

PIECES D  END VIEW

PLAN VIEW PIECE M-3  (2 Required)

PLAN VIEW PIECE K-2  (Aligned EF)  (FF Shown Solid, BF Shown Dashed)  (4 Required)

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

PLAN VIEW PIECE D-3  (4 Required ~ 2 Pairs)

PLAN VIEW PIECE D-1  (4 Required ~ 2 Pairs)

PLAN VIEW PIECE M-1  (2 Required)

END VIEW

PHASED VIEW

SECTION A-A  FOR WELDED WIRE REINFORCEMENT

PIECES K & S  END VIEW

END VIEW

PLAN VIEW

PIECES M  END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

END VIEW

PLAN VIEW

PIECES M-1  (2 Required)

PIECES M-3  (2 Required)

PARTIAL SECTION AT CENTER BEAM

PARTIAL BEAM 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 shall 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.
**ALTERNATE REINFORCING STEEL (WWR) DETAILS**

**PLAN VIEW**
- **PIECE M-1** (2 Required)
  - 9 - D25's (FF) @ 6" sp. = 4'-0"
  - 9 - D25's (BF) @ 6" sp. = 4'-0"

**PIECE M-3** (2 Required)
- 9 - D11's @ 6" sp. = 4'-0"

**PIECE M-2 ties to Piece K-2**
- Optional W6.4
- 2" Cover

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

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

**PIECE K-2** (4 Required ~ 2 Pairs)

**PIECE K-3** (4 Required ~ 2 Pairs)

**PIECE S-1, S-2, S-3 or S-4** (2 Required Each Piece)
- S1 - D25's @ V1 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)

**Partially Section A-A**
- For Welded Wire Reinforcement

**Partially Beam End View**
- Conventional Reinforcing Bars A, C, Y and Strands not Shown for Clarity

**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 & 5C 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.

**Material List:**
- W24 (Piece K-1)
- W10 (Pieces K-2 & S)
- D31 (Pieces K-1)
- D25 (Pieces K-2 & S)
- W12 (Pieces K-1)
- W10 (Pieces K-2 & S)
- D11 (Typ. Pieces D-1, D-2 & D-3)
- W4.4

**wire D31 (shown as ( ) Typ.)**

**Bar D16's @ 1'-0" sp.**

**Cover:**
- 7/8" Ceiling Cover
- 1 7/8" End Cover

**Legends:**
- FF = Each Face
- BF = Front Face
- EF = Each Face

**Index:**
- 450-054

**Revision:**
- 11/01/16

**Description:**
- FY 2019-20 Standard Plans

**Page:**
- 2 of 2
**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>BAR NUMBERS</th>
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</table>

**ELEVATION AT END OF BEAM**

*Flanges Not Shown For Clarity*

*End 1 Shown, End 2 Similar*

**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, K, 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

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 not Shown for Clarity 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.

PIECES M-1 (~ 2 Required ~ Each Piece)

PIECES M-3 (~ 2 Required ~ Each Piece)

PIECES D-1 (~ 2 Required ~ Each Piece)

PIECES D-2 (~ 2 Required ~ Each Piece)

PIECES D-3 (~ 2 Required ~ Each Piece)

PIECES K-1 (~ 2 Required ~ Each Pair)

PIECES K-3 (~ 2 Required ~ Each Pair)

PIECES S-1 (~ 2 Required ~ Each Pair)

PIECES S-3 (~ 2 Required ~ Each Pair)

PIECES S-4 (~ 2 Required ~ Each Pair)

PIECES M (~ 2 Required)

PLAN VIEW

PLAN VIEW

PLAN VIEW

PLAN VIEW

PLAN VIEW

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PLAN VIEW

PLAN VIEW
ALTERNATE REINFORCING STEEL (WWR) DETAILS

PIECES M
END VIEW

PIECES K & S
END VIEW

PIECES D
END VIEW

PLAN VIEW
PIECES M-1
(2 Required)

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

PLAN VIEW
PIECES M-3
(2 Required)

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

PARTIAL SECTION AT CENTER BEAM

PARTIAL BEAM 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 SY to accommodate skewed end conditions and align with Bars C and D.

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

1 0 /2 4 /2 0 1 8
2 :5 2 :4 4  PM

FLORIDA-1 78 BEAM - STANDARD DETAILS

INDEX
450-078

2 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 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 5Y to accommodate skewed end conditions and align with Bars C and D.

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

End of Beam

Bars 5Y (16 Required) (shown as (    ) Typ.)

Wires D31 (shown as (    ) Typ.)

PARTIAL SECTION AT CENTER BEAM

PARTIAL BEAM END VIEW

(Conventional Reinforcing Bars A, C, Y and Strands N not Shown for Clarity)
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: 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 top splice of 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. See "STRAND CUTTING AND PROTECTING DETAIL" on Sheet 2.
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 3' or greater
   C. Inside inside diameter is 2" maximum
   D. Non-metallic, non-water absorbing forming materials such as PVC, may be left in place permanently.
1. Provide 1" B, zinc-electroplated, ferrule wing nut or coil inserts, UNC threads, 1/8 minimum gage wire, not more than 4" in depth with a minimum ultimate tensile strength of 11,400 lbs. in 4,000 psi concrete.
2. If inserts are needed on both sides (faces) of beam webs, an assembly as long as the thickness of the beam web, consisting of two (2) ferrule or coil inserts attached by two (2) or more struts may be utilized. The connecting struts shall have a minimum ultimate tensile strength of 11,400 lbs.
3. Inserts for diaphragm reinforcing are required at each end of each intermediate diaphragm shown on the Beam Framing Plan and may be required at the end of the beams when end diaphragms are shown. See Superstructure and Beam Framing Plans for longitudinal location of inserts for each face of beam.

**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.

**PARTIAL SECTION THRU WEB (SHOWING BOTTOM FLANGE)**

(End 1 Shown, End 2 Similar)

(Bars 4Y & Strands not shown for clarity)

**STRAND CUTTING AND PROTECTING DETAIL**
END VIEW

ELEVATION AT END OF BEAM
(Flanges Not Shown For Clarity)

SECTION A-A
(Showing Bars 4K, 4Y & 5Z Only)
ALTERNATE REINFORCING STEEL WWR DETAILS

SECTION A-A
FOR WELDED WIRE REINFORCEMENT

PIMES K & S END VIEW

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

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

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

MATCH SPACING OF ADJACENT PIECE S-1, S-2, S-3 OR S-4

2" Offset

Vary 9' Max.

PIECES D END VIEW

PIECE D-1
(4 Required ~ 2 Pairs)

PIECE D-2
(4 Required ~ 2 Pairs)

NOTES:
a. See Sheet 3 for placement details & Table of Beam Variables in Structures Plans for variables S1, S2, S3, S4 & V1.
b. Place Conventional Reinforcement Bars 5A as shown on Sheet 3. Place additional Bars 4Y 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 shall not be used. Conventional Reinforcement Bars D1 & D2 shall be used. See Sheet 2 Skew Details and Sheet 1 Note 9 for placement details. Shift Pieces K & Bars 4Y to accommodate skewed end conditions and align with Bars D.

STANDARD DETAILS

STANDARD PLANS

FY 2019-20

REVISED: 11/01/16

AASHTO TYPE II BEAM

INDEX

SHEET

450-120

STANDARD PLANS

4 of 4
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 \( \pm \frac{1}{2} " \) 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: \( \frac{3}{8} \)” Ø minimum, stressed to 10,000 lbs. each.

6. Tie 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 8), the Engineer may approve the use of deformed WWR in lieu of Bars 6A1, 4A2, 5B, 4C, 3D, 4H, 4I, 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 SE, 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 anchorage devices 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).
   - Drain Pipe: 2” NPS Schedule 80 PVC.
   - Cover, wrap and secure wire screen around the end of the pipe prior to casting.
   - Extend screen a minimum of 1” down the pipe sides.

12. Protection of Strands:
   - Provide a 2” deep recess around all strands (including dormant) or strand groups.
   - After detensioning, cut strands \( \frac{3}{8} “ \) from recessed surface and fill the blockout to the web face and bottom of the flange for the bottom row of strands.
   - Provide removable pipe plugs during casting. Remove plugs from the inside of pipes after casting.

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 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 temporary bracing between the U Beams.
**TYPICAL STRAND BLOCKOUT DETAIL**

**TEMPORARY BLOCKING OF BEAM ENDS**

---

**CONDITION 1**

$(P = 0.0)$

**CONDITION 2**

**CONDITION 3**

**SCHEMATIC END ELEVATIONS OF BEAMS**

(Showing Vertical Bevel of Beam End)

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**Note 4, Sheet 1.**

- Dimension B is 1'-6" for Florida-U 48 and 54 Beams and 2'-0" for Florida-U 63 and 72 Beams.
- **P = 0.0**
- **Note 4, Sheet 1.**

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**TYPICAL STRAND BLOCKOUT DETAIL**

**TEMPORARY BLOCKING OF BEAM ENDS**

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**FLORIDA-U BEAM**

- **TYPICAL DETAILS & NOTES**

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**FY 2019-20**

**STANDARD PLANS**

**INDEX**

**450-210**

**SHEET**

2 of 2
** 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 \( \nu \) Beam for Half Sections A-A and B-B.

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** 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.
### Bill of Reinforcing Steel

#### For One Beam Only

<table>
<thead>
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<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
</tr>
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<td>B</td>
<td>5</td>
<td>12</td>
<td>6'-3&quot;</td>
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<td>C</td>
<td>4</td>
<td>28</td>
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<tr>
<td>D1</td>
<td>3</td>
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<td>7'-6&quot;</td>
</tr>
<tr>
<td>D2</td>
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<td>38</td>
<td>4'-6&quot;</td>
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<td>6'-0&quot;</td>
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<td>4</td>
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<td>19'-4&quot;</td>
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<tr>
<td>M</td>
<td>4</td>
<td>See Table</td>
<td>2'-11&quot;</td>
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<td>N</td>
<td>3/8&quot;</td>
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<td>Dim. l - 3&quot;</td>
</tr>
</tbody>
</table>

#### Dimensions

- **Bars 4G**
- **Bars 5K**
- **Bars 4M**
- **Bars 4H**
- **Bars 4G**
- **Bars 5K**
- **Bars 4M**
- **Bars 4H**
- **Bars 4G**
- **Bars 5K**
- **Bars 4M**
- **Bars 4H**

### Notes:

- Field Bend as Required for Skew
- Top of Intermediate Diaphragm
- Drain Pipe as Required for Skew
- **Bars 6A1, 4A2 and 3D2**
- **Bars 5B**
- **Bars 5E**
BEAM CAMBER AND BUILD-UP NOTES:

The build-up values given in the Data Table are based on the theoretical beam camber. 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.

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

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

DEAD LOAD DEFLECTION DIAGRAM
(ALONG Q BEAM)

* Dimensions are along slope.

SECTION A-A
BUILD-UP OVER BEAMS
(LOOKING AHEAD STATION)
BEVELED BEARING PLATE B FOR ELASTOMERIC BEARING PAD TYPES AA, AB, D, E, F, G, H, & J (Along G Beam)  

(Positive Slope shown; Negative Slope similar)
Level Bearing Seat (Top of Substructure)

Bottom of Beam

Composite Elastomeric Bearing Pad

Sloped Bearing Seat (Top of Substructure) See Structures Plans

1 1/2" x 2 1/2" Anchor Studs

Embedded Bearing Plate A 1/2" x 1 1/2" x 3'-0"

Bottom of Beam Slope (See Note 8)

SIDE ELEVATION WITHOUT BEVELED BEARING PLATES

(Slopes ≤ 0.5% along Q Beam) (See Note 7)

* 1/2 for Pad Type K

Sloped Bearing Seat (Top of Substructure) See Structures Plans

SIDE ELEVATION WITHOUT BEVELED BEARING PLATES

(0.5% < Slopes ≤ 2% along Q Beam) (See Note 7)

Embedded Bearing Plate A

Bottom of Beam Slope (See Note 8)

Sloped Bearing Seat (Top of Substructures) See Structures Plans

CROSS REFERENCE:
See Sheet 1 for Notes.
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.

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**Prestressed Concrete Pile Notes:**

1. 2-Point Support
2. 3-Point Support
3. 4-Point Support

**Storage and Transportation Support 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>
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<td>12</td>
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<td>85</td>
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<td>99</td>
<td>107</td>
<td>121</td>
</tr>
</tbody>
</table>

**Typical Pile Shape**

- For Mold Forms
- 1" Rad. or 1/2" Chamfer (Typ.)

**Detail Showing Typical Cover**

- Spiral Ties - W4.0 (30" Piles)
- W3.4 (All others)
NOTES:
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 S60, 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)

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)

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**

**NOTES:**

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**

- **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 ~ 0.375” Ø, Grade 270 LRS, at 21 kips**
- **16 ~ 0.35” 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.
** See Note 4 on Index 455-002

ALTERNATE STRAND PATTERNS

12 – 0.6" Ø, Grade 270 LRS, at 35 kips
12 – 5/8" Ø (Special), Grade 270 LRS, at 34 kips
16 – 5/8" Ø, Grade 270 LRS, at 36 kips
20 – 7/8" Ø, Grade 270 LRS, at 28 kips
24 – 3/4" 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.
ALTERNATE STRAND PATTERNS

12 ~ 0.6" Ø, Grade 270 LRS, at 42 kips
16 ~ 0.6" Ø, Grade 270 LRS, at 31 kips
16 ~ 0.6" Ø (Special), Grade 270 LRS, at 31 kips
24 ~ 0.6" 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.
** ALTERNATE STRAND PATTERNS **

16 – 0.6” Ø, Grade 270 LRS, at 44 kips
20 – ½” Ø (Special), Grade 270 LRS, at 34 kips
24 – ½” 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 Note 4 on Index 455-002
Pile Splice Reinforcement Details

**ALTERNATE STRAND PATTERNS**

- **20 ~ 0.6" Ø, Grade 270 LRS, at 41 kips**
- **24 ~ 0.8" Special, Grade 270 LRS, at 34 kips**
- **28 ~ 0.8" Ø, Grade 270 LRS, at 29 kips**

NOTES:

1. 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 local 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.
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 requirements 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 called for 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.
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>
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<td>119</td>
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<tr>
<td>170</td>
<td>2, 3, or 4 point</td>
<td>2 Point</td>
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DRIVABLE UNFORESEEN FIELD SPLICE DETAIL
(Cast-In-Place Plug)

CLEAN INSIDE SURFACE OF 54" Ø PILE WITH A HIGH PRESSURE WATER BLAST (3000 PSI MIN.) AND APPLY BONDING AGENT FOR DRIVEN PRESTRESSED PILE

ROUGHEN INSIDE SURFACE OF 54" Ø PILE TO 1/8 AMPLITUDE FOR SPLICED PILE SECTION

FULL epoxy compound joint around cylinder pile wall only (see detail "A")

24 - No. 11 Bars

1 3/8" Ø formed hole (1 tendon per hole; 2 - 5/16" Ø (special) strands per tendon shown as (*); grout per specification 938)

SECTION A-A

SECTION B-B

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 in/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 forlocations 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 pick-up points to indicate the proper points for attaching handling lines.
Concrete Seal

2'-0" M in. C o v e r  D r i v e n  P r e s t r e s s e d  P i l e

3'-0" M in. C o v e r  D r i v e n  P r e s t r e s s e d  P i l e

10'-6" Closed No. 4 Bars or W20 Wire Ties @ 1'-0" ± (Typ.)

Spliced Prestressed Pile Section

10'-6" Ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 60" Ø Pile to 4" amplitude for Spliced Pile Section

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

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

24 - No. 11 Bars @ Equal Spaces

1'-0" Ø Void

3" Min. Cover (Typ.)

Spiral Ties W11 Wire

2" Min. Cover (Typ.)

Cast in Place Plug

36 - 0.6" Ø Strands @ Equal Spaces

60" Ø

36 - 0.6" Ø Strands @ Equal Spaces

60" Ø

DETAIL "A"

Full epoxy compound joint

Temporary Blocking Form to retain epoxy compound

Gasket Form to retain epoxy compound

DRIVABLE UNFORESEEN FIELD SPLICE DETAIL (Cast in Place Plug)
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.

### 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>
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<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>
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<td>3 or 4 point</td>
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<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
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</tbody>
</table>

### TYPICAL PILE SHAPE

- **1" Rad. or 1/2" Chamfer (Typ.)**

### TYPICAL COVER

- **0.2" Ø CFRP Strand or W4.0 SS Wire**

### DETAIL SHOWING TYPICAL COVER
NOTES:
1. For Sections D-D, & E-E, see Index 455-112, 455-114, 455-118, 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, 455-124. 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 1/2" 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

TYPICAL SPICE
BEFORE BONDING

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

NONDRIVABLE UNFORESEEN
REINFORCED PRECAST
PILE BUILD-UP DETAIL

DRIVABLE UNFORESEEN
PRESTRESSED PRECAST
PILE SPICE DETAIL

DRIVABLE PREPLANNED
PRESTRESSED PRECAST
PILE SPICE DETAIL

C-I-P Concrete
Bent Cap, Pile Cap
or Footing

Pile Cut-off
Elevation

1" Cover
at End

No. 6 CFRP Bars
or No. 10 SS Bars
Full length of
Build-up

No. 6 CFRP Bars
or No. 10 SS Bars
Full length of
Build-up

No. 6 CFRP Bars
or No. 10 SS Bars
Full length of
Build-up

No. 6 CFRP Bars
or No. 10 SS Bars
Full length of
Build-up

Bar Embedment
Bar Extension

Top of
Prestressed Pile

Pile Build-up

5'-6" Max.

No. 6 CFRP Bars
or No. 10 SS Bars
Extended into
Cap/ Footing to
Pile cut-off
Elevation, See Note 5.

See Detail A

See Detail A

See Detail A

No. 6 CFRP Bars
or No. 10 SS Bars

Full epoxy compound joint

Epoxy compound
to fill hole with
Bars in place

1/2" Ø Drilled or
preformed holes
for CFRP Bars, or
1" 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.

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.

FORM TO RETAIN
EPoxy COMPOUND

Gasket

Full epoxy compound joint

No chamfer,
flat surface
required

No. 6 CFRP Bars
or No. 10 SS Bars

No. 6 CFRP Bars
or No. 10 SS Bars

No. 6 CFRP Bars
or No. 10 SS Bars

No. 6 CFRP Bars
or No. 10 SS Bars

Epoxy compound
Note No. 4)

No. 6 CFRP Bars
or No. 10 SS Bars

Extended into
Cap/ Footing to
Pile Cut-off
Elevation;
See Note 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.
**ALTERNATE STRAND PATTERNS**

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

**CFRP 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.

**SECTION A-A**

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

**SECTION E-E**
(See Drivable Unforeseen Reinforced Precast Pile Splice Detail)
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.
ALTERNATE STRAND PATTERNS

- 8 - 0.6" Ø, CFRP 7-Strand, at 31.5 kips
- 8 - ½" Ø, CFRP Single-Strand, at 30.5 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. 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.

CFRP PRESTRESSED PILE DETAILS

SECTION A-A

ELEVATION

SECTION D-D

SEE NON-DRIVABLE UNFORESEEN REINFORCED PRECAST PILE BUILD-UP DETAIL

SECTION E-E

SEE DRIVABLE UNFORESEEN PRESTRESSED PRECAST PILE SPlice DETAIL

DESCRIPTION:

14" SQUARE CFRP & SS PRESTRESSED CONCRETE PILE
**SS PRESTRESSED PILE 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 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.
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.
3. 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

** 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. 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 final strand pattern shall be concentric with the nominal concrete section of the pile.

** See Strand Pattern W4.0 Spiral Ties 16 – ½" Ø, HSSS, at 26 kips 

** SEE Diagram A-A (See Non-Drivable Unforeseen Reinforced Precast Pile Build-Up Detail)

** SEE Diagram F-F (See Drivable Prestressed Precast Pile Splice Detail)
Spiral Ties

** See Note 4 on Index 455-102

ALTERNATE STRAND PATTERNS

16 ~ 0.6" Ø, CFRP 7-Strand, at 42 kips
16 ~ 1/2" 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.

SECCTION A-A

SPIRAL TIE ELEVATION

Spiral Ties

0.2" Ø CFRP Strand Spiral Ties

SECTION A-A

0.2" Ø CFRP Strand Spiral Ties

24" SQUARE CFRP & SS PRESTRESSED CONCRETE PILE

INDEX

455-124

1 of 2

REVISED

11/01/16

LAST REVISED

01/01/16

DESCRIPTION:

FY 2019-20 STANDARD PLANS
SS PRESTRESSED PILE DETAILS

** See Note 4 on Index 455-102

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.

SECTION A-A

STRAND PATTERN
28 – ½ Ø, HSSS @ 26 kips

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)

SS PRELIMINARY REINFORCEMENT DETAILS

INDEX 455-124
ALTERNATE STRAND PATTERNS

20 – 0.6” Ø, CFRP 7-Strand at 38 kips
20 – ½” Ø, CFRP Single-Strand at 37 kips

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 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.

SECTION B-B
(See Pile Splice Reinforcement Details)

SECTION C-C
(See Pile Splice Reinforcement Details)

SECTION D-D
(See Non-Drivable Unforeseen Reinforced Prestressed 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)
SS PRESTRESSED PILE 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 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 455-101 - Typical Details and Notes for Square CFRP & SS Prestressed Concrete Piles and Index 455-102 - Square CFRP & SS Prestressed Concrete Pile Splices.

**STRAND PATTERN**
32 ~ ½" Ø, HSSS at 26 kips
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 for options using stainless steel strand and reinforcing.
3. Concrete Strength at time of prestress transfer:
   A. Piles: 6,000 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 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. Drive 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 5,500 psi.
6. Mark piles at the pick-up points to indicate the proper points for attaching handling lines.
**SECTION A-A**

- **54" Ø Void**
- **3" Min. Cover**
- **1½" Ø Formed Holes for Tendons @ Equal Spaces**

**ALTERNATE STRAND PATTERNS**

- 48 ~ 0.5" Ø, Single-Strand, at 28 kips
- 48 ~ 0.6" Ø, 7-Strand, at 29 kips

**DETAIL "A"**

- Full Epoxy Compound Joint around cylinder pile wall only (See 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 in/year or less; otherwise, a 3-inch concrete cover is required.

**SECTION B-B**

- **54" Ø Void**
- **3" Min. Cover**
- **1½" Ø Formed Holes for Tendons @ Equal Spaces**

**CFRP POST-TENSIONED PILE DETAILS**

- No. 3 CFRP Bars or 0.3" Ø CFRP Strand
- Spiral Ties

**ALTERNATE STRAND PATTERNS**

- 48 ~ 0.5" Ø, Single-Strand, at 28 kips
- 48 ~ 0.6" Ø, 7-Strand, at 29 kips

**DETAILED "A"**

- Inside Face Unforeseen Field Splice Detail (Cast-In-Place Plug)

- 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 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

**SECTION A-A**

24 ~ No. 10 Bars

3" Min.*

Cover (Typ.)

**SECTION B-B**

**ALTERNATE STRAND PATTERNS**

72 ~ ½" Ø, HSSS Strands, at 21 kips (24~3 strand tendons)

58 ~ ½" Ø, HSSS Strands, at 24 kips (29~2 strand tendons)

48 ~ 0.6" Ø, HSSS Strands, at 32 kips (24~2 strand tendons)

* 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 in per year or less; otherwise, a 3-inch concrete cover is required.

**DETAIL "A"**

Inside Pile Wall

Full epoxy compound joint

Temporary Blocking
Form to retain epoxy compound

Cast in Place Plug

W20 Wire Ties

No. 4 Bars or W20 Wire Ties

1'-0" Ø Void

**Form to retain**

epoxy compound

Outside Pile Wall

**DRIVABLE UNFORESEEN FIELD SPLICE DETAIL**

(Cast-In-Place Plug)

**Concrete Seal**

Roughen inside surface of 54" Ø Pile to ½" amplitude for Spliced Pile Section

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

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

24 ~ No. 10 Bars

3" Min.*

Cover (Typ.)

**W11 Spiral Wire Ties**

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

**W20 Wire Ties**

No. 4 Bars or W20 Wire Ties

3" Min.*

Cover (Typ.)

**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

**SECTION A-A**

24 ~ No. 10 Bars

3" Min.*

Cover (Typ.)

**SECTION B-B**

**ALTERNATE STRAND PATTERNS**

72 ~ ½" Ø, HSSS Strands, at 21 kips (24~3 strand tendons)

58 ~ ½" Ø, HSSS Strands, at 24 kips (29~2 strand tendons)

48 ~ 0.6" Ø, HSSS Strands, at 32 kips (24~2 strand tendons)

* 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 in per year or less; otherwise, a 3-inch concrete cover is required.

**DETAIL "A"**

Inside Pile Wall

Full epoxy compound joint

Temporary Blocking
Form to retain epoxy compound

Cast in Place Plug

W20 Wire Ties

No. 4 Bars or W20 Wire Ties

1'-0" Ø Void

**Form to retain**

epoxy compound

Outside Pile Wall

**DRIVABLE UNFORESEEN FIELD SPLICE DETAIL**

(Cast-In-Place Plug)

**Concrete Seal**

Roughen inside surface of 54" Ø Pile to ½" amplitude for Spliced Pile Section

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

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

24 ~ No. 10 Bars

3" Min.*

Cover (Typ.)

**W11 Spiral Wire Ties**

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

**W20 Wire Ties**

No. 4 Bars or W20 Wire Ties

3" Min.*

Cover (Typ.)

**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

**SECTION A-A**

24 ~ No. 10 Bars

3" Min.*

Cover (Typ.)

**SECTION B-B**

**ALTERNATE STRAND PATTERNS**

72 ~ ½" Ø, HSSS Strands, at 21 kips (24~3 strand tendons)

58 ~ ½" Ø, HSSS Strands, at 24 kips (29~2 strand tendons)

48 ~ 0.6" Ø, HSSS Strands, at 32 kips (24~2 strand tendons)

* 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 in per year or less; otherwise, a 3-inch concrete cover is required.
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.
   C. 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>Maximum Pile Length (Feet)</th>
<th>Required Storage and Transportation Detail</th>
<th>Pick-Up Points</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>
1'-0" Ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 60" Ø Pile to 1/8" 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

Drivable Unforeseen Field Splice Detail (Cast in Place Plug)

ALTERNATE STRAND PATTERNS

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

SECTION A-A

SECTION B-B

DETAIL "A"
Concrete Seal

2'-0" 3" Min. Cover

Driven Prestressed Pile

10'-6"

Spliced Prestressed Pile Section

10'-6"

Spiral Ties

2'-0" Ø Void, open top and bottom to allow through venting of sections

Roughen inside surface of 60" Ø Pile to 3" amplitude for Spliced Pile Section

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

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

2' Min. Cover (inside)

3' Min. Cover (Typ.)

0.6" Ø HSSS Strands @ Equal Spaces

SECTION A-A

ALTERNATE STRAND PATTERNS

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

深远未见的套接节详图

洞管混凝土

13/20 18:58 AM

REVISION

DESCRIPTION:

REV  01/01/16

INDEX  455-160

FY 2019-20

60" PRESTRESSED CFRP & SS CONCRETE CYLINDER PILE

LAST SHEET

STANDARD PLANS

INDEX

3 of 3
TYPICAL SECTION THRU STRIP SEAL EXPANSION JOINT
(Begin or End Concrete Girder Bridge shown, 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.
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.
**NOTE:**
Sleeve Anchors are required at the two outside corners of the Sidewalk Cover Plate. Space Sleeve Anchors uniformly between the corner anchors.

**FLUSH SIDEWALK DETAIL**

**PARTIAL SECTION ALONG Q JOINT**

- Bevel top edge @ 1:2 slope & round over bottom edge 1/8" radius
- 3/8" Ø x 2½" Long Sleeve Anchors

**SECTION A-A**

**PARTIAL PLAN VIEW**

- Bridge Deck or Approach Slab
- Match skew angle of Joint as required (Typ.)
- Sidewalk Cover Plate
- Poured Joint Material
- Slope Varies

**PARTIAL PLAN VIEW OF NON-SKEWED JOINTS**

- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck or Approach Slab

**PARTIAL PLAN VIEW OF SKewed JOINTS**

- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck or Approach Slab

**RAISED SIDEWALK DETAIL**

- Raised Sidewalk
- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck or Approach Slab

**FLUSH SIDEWALK DETAIL**

- Raised Sidewalk
- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck (shown)

**PARTIAL SECTION ALONG Q JOINT**

- Raised Sidewalk
- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck (shown)

**FLUSH SIDEWALK DETAIL**

- Raised Sidewalk
- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck (shown)

**FLUSH SIDEWALK DETAIL**

- Raised Sidewalk
- Outside Corner Anchor (Typ.)
- 3/8" Corner Clip (Typ. all corners)
- Bridge Deck (shown)
HINGE NOTE:
Orient the Access Hatch so that the hinges are located down-grade.

NOTES:
1. All Structural Steel material in Access Hatch Assemblies shall conform to ASTM A709 Grade 36.
2. 1½" Ø Pipe Grab Rail shall be in accordance with ASTM A53 Grade B for standard weight pipe (Schedule 40).
3. ½" Ø Hatch Handle Bar, Hitch Pin and 1" Ø Ladder Brace 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. Place Ladder Brace near the End Bents exclusively and only when the height is reasonable for access by a Ladder.
7. See Framing Plan sheets for locations of Access Hatch Openings.
8. Coat structural steel in accordance with Specification Section 560.
9. Include the cost of the Access Hatch Assembly and incidental items in the cost of the Steel Box Girders. No separate payment will be made for coating structural steel.

<table>
<thead>
<tr>
<th>LAST REVISION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/01/15</td>
<td>FY 2019-20 STANDARD PLANS</td>
</tr>
</tbody>
</table>

INDEX
460-250 1 of 1
ACCESS DOOR NOTES:

**STRUCTURAL STEEL**

Fabricate Door Assemblies using structural steel in accordance with Specification 962, any grade. Grind all exposed edges and burrs smooth. Non-destructive testing of welds is not required. See Plans for details of Diaphragm, Stiffeners and Top and Bottom Plates.

**EXPANDED METAL MESH:**

Extended metal mesh shall be ½" No. 16 expanded carbon steel mesh in accordance with ASTM F1267, Type I or II, Class 2, Grade A.

**BOLTS, NUTS AND STEEL WASHERS:**

Bolts shall be stainless steel hex head bolts meeting the requirements of ASTM F593, Type 316. Nuts shall be ASTM F594, Type 316. Steel washers shall be stainless steel compatible with the bolts and nuts.

**PTFE WASHERS:**

PTFE washers shall be ½" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with ½" or ½" diameter bolts as shown.

**COATING:**

Coat Access Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blasted cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.

**DOOR HINGE LOCATION:**

Place door hinges on the transverse downward side of the access opening.

**PADLOCKS:**

Provide a suitable keyed commercial grade, weather resistant padlock with a 2" shackle for each Access Door Assembly located at Bridge Aperatures. Key all padlocks for Access Door Assemblies and Access Hatches (if present) on an individual bridge alike.

**EXPANDED METAL MESH ASSEMBLY:**

Expanded metal mesh shall be ½" No. 16 expanded carbon steel mesh in accordance with ASTM F1267, Type I or II, Class 2, Grade A.

**BOLTS, NUTS AND STEEL WASHERS:**

Bolts shall be stainless steel hex head bolts meeting the requirements of ASTM F593, Type 316. Nuts shall be ASTM F594, Type 316. Steel washers shall be stainless steel compatible with the bolts and nuts.

**PTFE WASHERS:**

PTFE washers shall be ½" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with ½" or ½" diameter bolts as shown.

**COATING:**

Coat Access Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blasted cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.

**DOOR HINGE LOCATION:**

Place door hinges on the transverse downward side of the access opening.

**PADLOCKS:**

Provide a suitable keyed commercial grade, weather resistant padlock with a 2" shackle for each Access Door Assembly located at Bridge Aperatures. Key all padlocks for Access Door Assemblies and Access Hatches (if present) on an individual bridge alike.

**EXPANDED METAL MESH**

Expanded metal mesh shall be ½" No. 16 expanded carbon steel mesh in accordance with ASTM F1267, Type I or II, Class 2, Grade A.

**BOLTS, NUTS AND STEEL WASHERS**

Bolts shall be stainless steel hex head bolts meeting the requirements of ASTM F593, Type 316. Nuts shall be ASTM F594, Type 316. Steel washers shall be stainless steel compatible with the bolts and nuts.

**PTFE WASHERS**

PTFE washers shall be ½" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with ½" or ½" diameter bolts as shown.

**COATING**

Coat Access Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blasted cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.

**DOOR HINGE LOCATION**

Place door hinges on the transverse downward side of the access opening.

**PADLOCKS**

Provide a suitable keyed commercial grade, weather resistant padlock with a 2" shackle for each Access Door Assembly located at Bridge Aperatures. Key all padlocks for Access Door Assemblies and Access Hatches (if present) on an individual bridge alike.

**EXPANDED METAL MESH ASSEMBLY**

Expanded metal mesh shall be ½" No. 16 expanded carbon steel mesh in accordance with ASTM F1267, Type I or II, Class 2, Grade A.

**BOLTS, NUTS AND STEEL WASHERS**

Bolts shall be stainless steel hex head bolts meeting the requirements of ASTM F593, Type 316. Nuts shall be ASTM F594, Type 316. Steel washers shall be stainless steel compatible with the bolts and nuts.

**PTFE WASHERS**

PTFE washers shall be ½" or 1" O.D. (nominal), 1/16" or 1/8" thick, sized for use with ½" or ½" diameter bolts as shown.

**COATING**

Coat Access Door Assemblies after complete fabrication, including the expanded metal mesh, using an Interior Box Girder Coating System in accordance with Specification 975. Weld expanded metal mesh to the door frame after the door frame has been abrasive blasted cleaned and prior to coating. Install Bolts and PTFE Washers after coating. Touch-up tack weld on Latch Bolt after welding.

**DOOR HINGE LOCATION**

Place door hinges on the transverse downward side of the access opening.

**PADLOCKS**

Provide a suitable keyed commercial grade, weather resistant padlock with a 2" shackle for each Access Door Assembly located at Bridge Aperatures. Key all padlocks for Access Door Assemblies and Access Hatches (if present) on an individual bridge alike.
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.

**THREE-BEAM GUARDRAIL:** Steel Three-Beam Elements shall meet the requirements for Class B (10 Gauge) Guardrail of AASHTO M 186. The minimum panel length for Three-Beam Elements shall be 12'-6". Field drilled holes for Post connections shall be 3/8" by 2 1/2" slotted holes.

**GUARDRAIL BOLTS:** Guardrail bolts, nuts and washers shall be in accordance with AASHTO M 180.

**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 F436 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 coated 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 416. The field testing proof loads required by Specification Section 416 shall be 15,000 lbs. for 3/8" 0 anchor bolts; 55,000 lbs. for the 1/2" anchor bolts with 13" embedment; and 30,500 lbs. for the 1 1/2" 0 anchor bolts with 0" 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'-1 1/2" 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.

**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 F436 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 coated 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 416. The field testing proof loads required by Specification Section 416 shall be 15,000 lbs. for 3/8" 0 anchor bolts; 55,000 lbs. for the 1/2" anchor bolts with 13" embedment; and 30,500 lbs. for the 1 1/2" 0 anchor bolts with 0" embedment.

**BRIDGES ON CURVED ALIGNMENTS:** Thrie-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 2 1/2" 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 guardrail bolts in 2 1/2" slots at guardrail posts that lie between the slotted expansion splice and bridge deck joint so that the bolt heads are in full contact with Three-beam elements, but not so tight as to impede movement due to expansion.

**BEARING PADS:** Provideplain neoprene pads with a durometer hardness of 60 or 70 and meeting the requirements of Specification Section 932, for ancillary structures.

**ELEVATION MARKERS:** Elevation Markers need not be replaced when portions of the existing traffic railing carrying existing elevation markers are removed.

**BARRIER DELINEATORS:** Install Barrier Delineators at the top of the guardrail offset blocks in accordance with Specification Section 705.

**PEDESTRIAN SAFETY TREATMENTS:** Pedestrian Safety Treatment is required when called for in the Plans. See Index 536-001 for details.

**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 details of letters and numbers.

**PAYMENT:** Payment will be made under Metal Traffic Railing (Thrie-Beam Retrofit) which shall include all materials and labor required to fabricate and install the barrier and lapped guardrail where necessary to maintain post spacing. Transition Blocks and Curves, Bridge Name Plate and Barrier Delineators and Installation of Elevation Markers, where required, will not be paid for directly but shall be considered as incidental work.
PARTIAL PLAN
INTERMEDIATE JOINT SKEW DETAIL

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
MODIFIED POST SPACING AT INTERMEDIATE DECK JOINTS DETAIL
FOR INDEX 460-471, 460-475 & 460-476

PARTIAL ELEVATION OF INSIDE FACE OF RAILING
MODIFIED POST SPACING AT INTERMEDIATE DECK JOINTS DETAIL
FOR INDEX 460-472, 460-473 & 460-474

THRIE-BEAM EXPANSION SECTION
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 grinding or grouting 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

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
Shim with washers around 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.

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

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

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 ½” Ø x 8" Adhesive-Bonded Anchor may be omitted as shown when 2" clear cover cannot be provided.
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
(Existing Traffic Railing not shown for clarity)

PARTIAL PLAN OF RAILING

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

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

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 SKewed DETAIL INDEX 460-470, SHEET 2 (TYP.)

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

1. If last offset block (typ.) is required between guardrail post assembly (typ.) and edge of existing approach slab (location varies), see Sheet 2.

2. Final riding surface, existing curb, and edge of existing approach slab (location varies) when present (varies).

PARTIAL PLAN OF RAILING

PARTIAL ELEVATION OF INSIDE FACE OF RAILING

RAILING END TREATMENT FOR PARALLEL OR FLARED CURBS WITH DETACHED SIDEWAYS OR INTEGRAL SIDEWAYS 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.

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 PLAN OF RAILING (see Note 1, Sheet 1)

PARTIAL ELEVATION OF INSIDE FACE OF RAILING (Existing Wing Post and Traffic Railing Not Shown for Clarity)
PARTIAL PLAN OF RAILING
Front Face of Backwall & Begin or End Bridge
Existing Curb

Intermediate Deck Joint
(See Note 2, Sheet 1)
Existing Traffic Railing (Type Varies)

Guardsrail Post Assembly with Offset Block (Typ.)
Existing Bridge Deck

Existing Approach Slab
Post Spacing Scheme 3 as measured to 2 Post Bolts

Dowel Bars 4L (10" Embedment)

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

SCHEMES 3 AND 4
RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

PARTIAL PLAN OF RAILING
Front Face of Backwall & Begin or End Bridge
Existing Curb

Intermediate Deck Joint
(See Note 2, Sheet 1)
Existing Traffic Railing (Type Varies)

Guardsrail Post Assembly with Offset Block (Typ.)
Existing Bridge Deck

Existing Approach Slab
Post Spacing Scheme 5 as measured to 2 Post Bolts

Dowel Bars 4L (10" Embedment) (Place 3 Bars Min. Top and 1 Bar Min. Bottom)

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

SCHEMES 5 AND 6
RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

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 1" 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.

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

TYPICAL TREATMENT OF RAILING ALONG BRIDGE
**SECTION A-A**

**TYPICAL SECTION THRU RAILING ON BRIDGE DECK**

**BILL OF REINFORCING STEEL**

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**BAR BENDING DIAGRAMS**

- **Dowel Bar 4D**
- **Dowel Bar 4L**
- **Bar 4M**

**NOTE:** All bar dimensions are out to out.

**SECTION B-B**

**TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB**

(Schemes 5 and 6 shown, schemes 3 and 4 similar)

**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.

**DETAIL "A"**

**VIEW C-C**
RAILING END TREATMENT FOR PERPENDICULAR OR ANGLED WING WALLS

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.

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

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

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.

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.

TRAFFIC RAILING - (THRIE-BEAM RETROFIT)

WIDE STRONG CURB TYPE 2

INDEX

460-473

3 of 4

FA-2019-20

STANDARD PLANS
Dowel Bars 4L (10" Embedment)

Existing Curb

DESCRIPTION:
Varies (6'-3" Max. spacing)

Post Bolts

Asphalt Overlay when present (Varies)

Guardrail Post Assembly (Typ.)

Existing Bridge Deck

Front Face of Backwall & Begin or End Bridge

Intermediate Deck Joint

(See Note 2, Sheet 1)

POST BOLTS MATCH LINE (APPROX. OR TRAILING END) (SEE SHEET 1)

PARTIAL PLAN OF RAILING

Varies (6'-3" Max., 3'-0" Min.)

Post Spacing Scheme 3 as measured to ≤ Post Bolts

Post Spacing Scheme 4 as measured to ≤ Post Bolts

Asphalt Overlay when present (Varies)

Additional Posts required for Scheme 4 (shown dashed, number Req'd. varies)

Guardrail Post Assembly (Typ.)

Existing Bridge Deck

Front Face of Backwall & Begin or End Bridge

Intermediate Deck Joint

(See Note 2, Sheet 1)

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

SCHEMES 3 AND 4

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

SCHEMES 5 AND 6

RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

SCHEMES 5 AND 6 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.

INDEX

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

460-473

4 of 4

FY 2019-20

STANDARD PLANS

LAST REVISION
01/01/08

DESCRIPTION:

WIDE STRONG CURB TYPE 2
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 Joint 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.

CROSS REFERENCES:
For Match Line see Sheets 3 & 4.
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

BILL OF REINFORCING STEEL

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BAR BENDING DIAGRAM

NOTE: All bar dimensions are out to out.

SECTION B-B (SCHEME 2)

TYPICAL SECTION THRU RAILING ALONG APPROACH SLAB

NOTE: All bar dimensions are out to out.

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

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.
Partial Plan of Railing

Partial Elevation of Inside Face of Railing

Scheme 3
Railing End Treatment for Flared Wing Walls

Section C-C (Scheme 3)
Typical Section Thru Railing Along Approach Slab

Scheme 3 Note:
1. A single 5/8 \( \times \) 8" Adhesive-Bonded Anchor may be omitted as shown when 2" clear cover cannot be provided (see Section C-C).

Cross Reference:
For application of Dim. A see Post Dimension Table on Index 460-470, Sheet 3.
NOTES:
1. On approach end provide Index 536-002 (as shown) or other site specific treatment. For traffic railing end 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 adjacent 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

CROSS REFERENCES:
For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index 460-470.
**NOTE:** All bar dimensions are out to out.

**SECTION A-A**
TYPICAL SECTION THRU RAILING ON BRIDGE DECK

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**BAR BENDING DIAGRAMS**

- **DOWEL BAR 4D**
- **DOWEL BAR 4L**

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

**CROSS REFERENCES:**
- For location of Section A-A see Sheet 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.
**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.

2. Field bend Dowel Bars 4L 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 and on bridges with flared Approach Slab Curb.

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 PLAN OF RAILING (See Note 1, Sheet 1)**

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

**INDEX**

<table>
<thead>
<tr>
<th>Page Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Railing End Treatment for Perpendicular or Angled Wing Walls</td>
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<td>3</td>
<td>Railing End Treatment for Parallel or Flared Curb with Detached Sidewalks or Integral Sidewalks Less than 6&quot; Thick</td>
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**TRAFFIC RAILING**

- **Type:** Thrie-Beam
- **Wide Curb Type 1**

**LAST REVISION:** 01/01/08

**INDEX:** 460-475

**HIGHLIGHTS:**

- **Post Spacing:** As measured
- **Embedment:** 10" for Dowel Bars
- **Curb Height:** 9" for wide curbs
- **Gutter Line:** Front Face of Backwall & Begin or End Bridge
RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

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

SCHEMES 3 AND 4

RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

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

SCHEMES 3 AND 4 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 existing Approach 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.

TYPICAL TREATMENT OF RAILING ALONG BRIDGE

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

PARTIAL PLAN OF RAILING

For Section A-A see Sheet 2.
For Traffic Railing Notes and Details see Index 460-470.
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 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.

SCHEME 1 NOTES:

1. Provide Transition Block (as shown) or Curb if existing Approach Slab Curb does not extend to end of Approach Slab.

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

PARTIAL PLAN OF RAILING

PARTIAL PLAN OF RAILING

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 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 PLAN OF RAILING

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

SCHEMES 3 AND 4
RAILING END TREATMENT FOR FLARED INTEGRAL CURBS

SCHEMES 5 AND 6
RAILING END TREATMENT FOR PARALLEL INTEGRAL CURBS

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 at trailin 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.
**THRIE-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.

---

**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).

**THRIE-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'-0". Field drilled holes for Post connections shall be %- by %- slotted holes.

**BOLTS, NUTS AND WASHERS:** Bolts, nuts and round washers shall be in accordance with AASHTO M180. Plate Washers shall be in accordance with ASTM A36 or ASTM A709 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.

**THRIE-BEAM EXPANSION SECTION:** Thrie-Beam Expansion Sections shall be installed at locations shown in the Plans. Install nuts for splice bolts finger-tight at 2'-6" 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'-0" spacing.

**WOOD BLOCKS:** All wood blocks, including required wedge shaped blocks shall be Pressure Treated lumber in accordance with Specifications Section 953. Bolt holes in blocks to be centered (±-4").

**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, required, where will not be paid for directly but shall be considered incidental work.
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).

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

5. Guardrail Approach Transition

6. PARTIAL PLAN - APPROACH TRANSITION

7. PARTIAL ELEVATION - APPROACH TRANSITION

8. PARTIAL PLAN - TRAILING END TRANSITION

9. PARTIAL ELEVATION - TRAILING END TRANSITION

10. Limits of Payment for Thrie-Beam Panel Retrofit

11. Limits of Payment for Guardrail

12. Transition Block

13. Guardrail Post (Typ.)

14. Wood Block

15. Wingwall mounted railing section (if present; length varies)

16. Direction of Adjacent Traffic

17. Existing Bridge Coping

18. Existing Concrete Traffic Railing

19. Existing Bridge Deck

20. Existing Approach Slab (if present)

21. Thrie-Beam Panel

22. Limits of Payment for W-Beam Guardrail

23. W-Beam Guardrail

24. See Index 536-001

25. (a) (b) (c) (d) (e) (f) (g) (h)
**ELEVATION VIEW A-A**

(At Double Posts)

(At Intermediate Double Posts shown; View at Expansion Joints similar)

ELEVATION VIEW A-A

(At Single Post)

**ELEVATION VIEW A-A**

(At End Post)

**NOTES:**

1. Post Bolts shall be 5/8" x 14' long set in 7/8" 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. For End Posts with an existing wedge shaped wood block, remove existing wood block and replace with new Wedge Shaped Wood Block (see Sheet 1 for notes and details).
New Guardrail Posts, positioned as required to clear Transition Block (Typ.)

#3 Stirrups (Field Bend) (Typ.)

Transition Block

End View A-A

Top of Existing Curb

Top of Existing Approach Slab or Bridge Deck

1'-0"

1'-6"

8"

10"

8"

4"

10"

3'

12'

4'

Varies

Top of Existing Approach Slab or Bridge Deck

Top of Existing Curb

Existing Approach Slab or Bridge Deck

Gutter Line

Plan View of Transition Block
(Guardrail Not Shown for Clarity)

Elevation of Transition Block
(Guardrail and Posts Not Shown for Clarity)

#3 Stirrup (Field Bend)

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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<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Class II (Bridge Deck)</td>
<td>CY</td>
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</tr>
<tr>
<td>Reinforcing Steel</td>
<td>LB</td>
<td>61</td>
</tr>
<tr>
<td>Guardrail (Reset)</td>
<td>LF</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Rev. 4 07/01/13

Description:

Thrie-Beam Panel Retrofit
(Concrete Handrail)
AT BRIDGE DECK EXPANSION JOINTS
1" (min.) 2'-0" (max.) Length of HSS 8 x 4 x ¼ members

AT INTERMEDIATE BENTS OR PIERS WITH CONTINUOUS DECK
1'-0" (min.) 3'-0" (max.)

AT INTERMEDIATE OPEN JOINTS IN RAILING

PLAN
(Reinforcing Steel in Existing Railing not shown for clarity)

AT INTERMEDIATE (TYPICAL) LOCATIONS

AT LIGHT POLES AND OVERHEAD SIGN SUPPORTS

AT INTERMEDIATE BENTS OR PIERS WITH CONTINUOUS DECK

AT INTERMEDIATE OPEN JOINTS IN RAILING

AT OUTER TUBE SPLICE LOCATIONS

AT BRIDGE DECK EXPANSION JOINTS

ELEVATION
(Reinforcing Steel in Existing Railing not shown for clarity)
(Railing on Bridge Deck shown, Railing on Approach Slab and Retaining Wall similar)

GENERAL NOTES

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.

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. Hot-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.

ASHLER 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)

AT BEGIN RETROFIT

Begin Rectangular Tube Retrofit

3/8" Anchor Rod, Nut and Washer (typ.)

AT END RETROFIT

End Rectangular Tube Retrofit

3/8" Anchor Rod, Nut and Washer (typ.)

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)

OFFSET DETAIL FOR INSTALLATIONS ON HORIZONTAL CURVES
TYPICAL PROFILES FOR TENDONS WITH FLEXIBLE FILLER

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 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 F5

Profile F6

Profile F7

Profile F8

Profile F9

Profile F10

Profile F11

Profile F12

Profile F13

Profile F14

Profile F15

(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.
**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.
FILLER INLET AND OUTLET DETAILS FOR BAR TENDONS

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

OUTLET END
(VERTICALLY ORIENTED TENDON SHOWN; HORIZONTALLY ORIENTED TENDON SIMILAR)

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.

FILLER OUTLET DETAIL AT VERTICAL SURFACES

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.

TENDONS AT HIGH POINTS AND 3' FROM HIGH POINTS (FILLER OUTLET)

FILLER INLET AND OUTLET DETAILS FOR I-GIRDERS

DETAILS FOR C.I.P. BOXES WITH INTERNAL TENDONS SIMILAR. WEB REINFORCING NOT SHOWN FOR CLARITY.
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 a 0.5" diameter Low Relaxation Strands fabricated in accordance with Index 455-014.

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 Docking 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, THREAD BAR, 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 Screw in accordance with ASTM F593 Type 305. Furnish stainless steel Washers compatible with Bolts, Threaded Nuts 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. 5/8" diameter 6x19, 6x25 or 6x37 class IWRC Type 316 stainless steel wire rope with a minimum breaking strength of 18,000 lbs.

2. 5/8" diameter 6x19 galvanized wire rope with ultraviolet ray resistant polypropylene impregnation having an outside diameter of 51/8" 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.
See Structures Plans, Plan and Elevation and Foundation Layout Sheets for magnitude and orientation of Channel Skew Angle.

**SCHEMATIC OF FENDER SYSTEM SHOWING TREATMENT OF SINGLE FIXED BRIDGE WITH NONSKEWED CHANNEL**

**SCHEMATIC OF FENDER SYSTEM SHOWING TREATMENT OF DUAL FIXED BRIDGES WITH NONSKEWED CHANNEL**

(PARALLEL DUAL FIXED BRIDGES SHOWN, NONPARALLEL DUAL FIXED BRIDGES SIMILAR)

**SCHEMATIC OF FENDER SYSTEM SHOWING TREATMENT OF SINGLE FIXED BRIDGE WITH SKEWED CHANNEL**

**SCHEMATIC OF FENDER SYSTEM SHOWING TREATMENT OF DUAL FIXED BRIDGES WITH SKEWED CHANNEL**

(PARALLEL DUAL FIXED BRIDGES SHOWN, NONPARALLEL DUAL FIXED BRIDGES SIMILAR)

CROSS REFERENCES:
For Stations and Offsets of referenced Control Points A, B, C and D, Dimension "L" and Clear Channel Width see Fender System Table of Variables in Structures Plans.
For Navigation Light Details see Design Standards Index 510-001.

* See Structures Plans, Plan and Elevation and Foundation Layout Sheets for magnitude and orientation of Channel Skew Angle.
**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**

**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 View F-F (showing fender end; decking and handrail not shown for clarity)

Splice Plate Detail

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 'A' and location of Section E-E see Sheet 2.

For location of View F-F see Sheet 1.

Section E-E

Typical Flared Section (8° turn shown, 4° turn similar)

Section E-E

Typical Straight Section

Splice Plate top and bottom of Wale, center plate about splice and ¾ Wale (Typ. at each Wale splice location, except along top Wale)
### Structural Composite Lumber Bill of Materials

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<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>DIMENSIONS</th>
<th>BOARD FT. PER EACH</th>
<th>NO. REQD.</th>
<th>QUANTITY</th>
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<td>A1</td>
<td>10&quot; X 10&quot; COMPOSITE LUMBER</td>
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<td>266.6</td>
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<td>32'-0&quot;</td>
<td>266.6</td>
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<td>A3</td>
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<td>16'-0&quot;</td>
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<td>A5</td>
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<td>16'-0&quot;</td>
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<td>A6</td>
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### Plastic Lumber Bill of Materials

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<td>(Trim &amp; Miter Ends as required)</td>
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<td>D</td>
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<td>(Miter as required, 8&quot; Min. width)</td>
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<td>H1</td>
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<td>PILE CUTOFF ELEV. MINUS NLW OR MLW ELEV. PLUS 5'-0&quot; (STRAIGHT)</td>
<td>1.3 PER LF EACH</td>
<td></td>
<td></td>
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<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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</tbody>
</table>

* 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.