NOTES:

1. Boxes shall not be installed in roadways or driveways.

2. Boxes shall be on the Approved Product List (APL).

3. Boxes shall be installed flush with the finished grade surface.

4. Fiber optic splice boxes shall be provided with cable hanger racks designed to support cables and splice enclosures. Cost of racks to be included in cost of splice box.

5. Fiber optic boxes shall contain only Fiber Optic Cable, Conduit, and Locate Wire.

6. Conduit center line shall be aligned to top edge of box to facilitate cable pulling.

7. All boxes shall have 1'-0" wide (min) concrete apron. Concrete for concrete aprons shall be Class NS with a minimum strength of 28 days of f'c=2.5 Ksi. Aprons shall be sloped away from box. Cost of apron to be included in the cost of each box.

8. Prevent the ingress of Water, Dirt, Sand, and other foreign materials into the conduit prior to, during and after construction using a foam-sealing material, rubber plug, or other device designed for this application and approved.
FOR USE IN AREAS NOT EXPOSED TO VEHICULAR TRAFFIC

FIGURE A

Note:
1. Sidewalk patches to match existing joints.
2. Entire sidewalk slab must be replaced when specified in the plans.
3. Backfill and tamp with material from trench except at driveways. At driveways, backfill a length of trench within the driveway entirely with flowable fill.

FOR USE IN ASPHALT ROADWAY ADJACENT TO GUTTER WHEN PLACEMENT OUTSIDE OF THE PAVEMENT IS NOT FEASIBLE

FIGURE B

Note:
1. Trench not to be open more than 250 ft at a time when construction area is subject to vehicular or pedestrian traffic.
2. Asphalt to be sawcut to leave neat lines at the pavement cut.
3. See note 3 Figure C.

*May be adjusted due to field conditions upon approval of project engineer.

FOR USE IN INSTALLING CONDUIT UNDER EXISTING ASPHALT PAVEMENT NOT ADJACENT TO GUTTER WHEN JACKING OR DIRECT BORING IS NOT FEASIBLE

FIGURE C

Note:
1. Rigid conduit must be used when jackin under existing pavement at 36" minimum depth.
2. Asphalt to be sawcut at the edges of the trench.
3. The removal and replacement of the additional pavement width (6") will not be required when the trench can be constructed without disturbing the asphalt surface on either side.

FOR USE IN INSTALLING CONDUIT UNDER A NEW ROADWAY PRIOR TO INSTALLATION OF BASE AND PAVEMENT

FIGURE D

FOR USE IN INSTALLING CONDUIT UNDER SIDEWALK

FIGURE E

FOR USE IN INSTALLING CONDUIT UNDER SIDEWALK

FIGURE F

PULLBOX ENTRY OF CONDUIT UNDER SIDEWALKS

FIGURE A

CONDUIT INSTALLATION DETAILS ACROSS EXISTING DRAIN PIPES OR UTILITIES

Note:
Ends of conduit shall be sealed in accordance with Section 630 of the Standard Specifications for Road and Bridge Construction.

FIGURE C
FOR USE UNDER RAILROADS

GENERAL NOTES:
1. The contractor, with approval from the Engineer, may adjust the final burial depth of the conduit(s) in order to transverse nonmovable object conflicts.
2. Backfill with excavated material and compact the soil until firm and unyielding. Remove rock and debris from backfill material.
3. Where conduits are to be installed over existing underground structures (e.g., drain pipes or utility lines) which are less than 30" deep, the contractor shall encase the conduit in 2500 PSI Class I concrete for the entire length of conduit that is installed at a depth of less than 30".
4. If the amount of cover over the encasement is less than 6", the contractor shall install the conduit to pass below the underground structures (e.g., drain pipes).

SECTION AA

SIDE STREET

PLAN

ROADWAY

UNDER ROADWAY

UNDER NONTRAFFIC BEARING SURFACE

FIGURE B

CONDUIT INSTALLATION DETAILS

CONDUIT INSTALLATION DETAILS ACROSS EXISTING DRAIN PIPES OR UTILITIES
NOTES:

1. Work with Index 17727 for grounding and span wire details. See the Plans for clamp spacing, cable sizes and forces, signals and sign mounting locations and details.
2. Shop Drawings:
   This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.
3. Materials:
   Split-lock washers and self-locking nuts are not permitted
   A. Strain Pole and Backing Rings:
      a. Less than 1/4" ASTM A1011 Grade 50, 55, 60 or 65
      b. Greater than or equal to 1/4" ASTM A36 (Grade A) or ASTM A572 Grade 50, 55, 60 or 65
   B. Steel Ribs: ASTM A36
   C. Weld Metal: E70XX
   D. Bolts, Nuts and Washers:
      a. High Strength Bolts: ASTM A325 Type 1
      b. Nuts: ASTM A325 Grade FH or Grade A
      c. Washers: ASTM A193 Type 1, one under turned element
   E. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM F1554 Grade 55
      b. Nuts: ASTM A325 Grade A or Grade 70
      c. Plate Washers: ASTM A167 (2 per bolt)
   F. Handhole Cover: ASTM A409 or ASTM A36, Grade 36
   G. Handhole Cover: ASTM A409 or ASTM A36, Grade 36
   H. Carbon Steel Clamp: ASTM A36
   I. Aluminum Pole Caps and Nut Covers: ASTM B26 (319-F)
   J. Threaded Bars/Studs: ASTM A36 or ASTM A307
   K. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
   L. Reinforcing Steel: Specification Section 415

4. Fabrication:
   A. Pole Taper: Change diameter at a rate of 0.14 inches per foot.
   B. Upright splices are not allowed. Transverse welds are only permitted at the base.
   C. Provide bolt hole diameters as follows:
      b. Anchor Bolts: Bolt diameter plus 1/4", maximum.
      c. Plate Washers: ASTM A36 (2 per bolt)
   D. Handhole:
      a. Handholes: 180° from 2" wire entrance pipe.
      b. Identification Tag: (Submit details for approval.)
        a. 2" x 2" (Max) aluminum identification tag.
        b. Locate on the inside of the pole and visible from the handhole.
        c. Secure to pole with 1/4" diameter stainless steel rivets or screws.
        d. Include the following information on the ID Tag:
           1. Financial Project ID
           2. Pole Type
           3. Pole height
           4. Manufacturer's Name
           5. Fe of Steel
           6. Base Wall Thickness
   E. Anchor Bolts, Nuts and Washers:
      a. Anchor Bolts: ASTM A325 Type 1
      b. Nuts: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      c. Washers: ASTM F436 Type 1, one under turned element
   F. Bolts, Nuts and Washers:
      a. High Strength Bolts: ASTM A325 Type 1
      b. Nuts: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      c. Plate Washers: ASTM A36 (2 per bolt)
   G. Anchor Bolts:
      b. Anchor Bolts: Bolt diameter plus 1/4", maximum.
      c. Plate Washers: ASTM A36 (2 per bolt)
   H. Concrete:
      a. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      b. Handhole Frame: ASTM A709 or ASTM A36, Grade 36
      c. Plate Washers: ASTM A36 (2 per bolt)
   I. Stainless Steel Screws:
      a. Stainless Steel Screws: AISI Type 316
   J. Threaded Bars/Studs:
      a. Threaded Bars/Studs: ASTM A36 or ASTM A307
   K. Concrete:
      a. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
   L. Reinforcing Steel:
      a. Reinforcing Steel: Specification Section 415

5. Coatings:
   A. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F2329
   B. All other steel items: ASTM A123

6. Construction:
   A. Foundation:
      a. Foundation: Specification Section 455, except that payment is included in the cost of the strain pole.
      b. After installation, place wire screen between top of foundation and bottom of base plate in accordance with Specification Section 649-6.
   B. Concrete:
      a. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      b. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      c. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      d. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      e. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      f. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      g. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      h. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      i. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      j. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      k. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      l. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      m. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      n. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      o. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      p. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      q. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      r. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
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      t. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      u. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      v. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      w. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      x. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      y. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
      z. Concrete: Class IV (Drilled Shaft) for all environmental classifications.

ELEVATION AND NOTES

STRAIN POLE ASSEMBLY

INDEX NO. 17723

1 of 3
TABLE OF STRAIN POLE VARIABLES

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>MAXIMUM ALLOWABLE MOMENT (kip-ft)</th>
<th>POLE</th>
<th>BASE CONNECTION</th>
<th>SHAFT</th>
</tr>
</thead>
<tbody>
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<td>PS-IV</td>
<td>95.8</td>
<td>0.250</td>
<td>14</td>
<td>8</td>
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<tr>
<td>PS-V</td>
<td>128.9</td>
<td>0.313</td>
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<td>18</td>
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<td>PS-IX</td>
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<td>25</td>
<td>18</td>
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</table>

**DESCRIPTION:**

REVISION

INDEX NO.

SHEET

FOUNDATION AND BASE DETAILS

STEEL STRAIN POLE

FY 2016-17

DESIGN STANDARDS

17723 2 of 3
POLE ASSEMBLY

NOTES:
1. Clamps have been sized for Design Cable Loads shown in the Clamp Thickness Table, and a Maximum Pole Diameter at the Clamp location of 2'-1". Use one clamp per cable.
2. Install a properly sized Weather Head Face to be left closed when the wire entrance is to be left closed when the wire entrance, the Weather Head Frame is to be left closed to outside atmosphere. Wire entrance installed per Index 17727.
3. Any combination of Option 'a' or 'b' may be used provided both lifting and wiring is accommodated.

<table>
<thead>
<tr>
<th>Cable Diameter (in)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in)</th>
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</thead>
<tbody>
<tr>
<td>3/8</td>
<td>17.5</td>
<td>3/16</td>
</tr>
<tr>
<td>3/4</td>
<td>31.6</td>
<td>3/16</td>
</tr>
</tbody>
</table>

Diameters at the Clamp location of 2'-1". Use one clamp per cable.

Catenary And Messenger Wire Clamps

DETAL 'B'

Wire Entrance Detail

Handhole Frame

11 Gage Handhole Cover

Handhole Frame

CUT-AWAY

POLE TOP

ATTACHMENT DETAILS

STEEL STRAIN POLE

INDEX NO. 17723

SHEET NO. 3 of 3

DESIGN STANDARDS

FY 2016-17

LAST REVISION 07/01/15

DESCRIPTION:

ATTACHMENT DETAILS

5/8" Bolt With Nut, Lock Nut & Flat Washers (Typ.)

WIRE ENTRANCE DETAIL

HANDHOLE

SECTION C-C

ELEVATION

PLAN

FRAME

COVER

HANDHOLE

WEATHER HEAD

POLE TOP

POLE CAP PLATE

WIRE ENTRANCE DETAIL

DETAIL 'B'

POLE ASSEMBLY

NOTES:
1. Clamps have been sized for Design Cable Loads shown in the Clamp Thickness Table, and a Maximum Pole Diameter at the Clamp location of 2'-1". Use one clamp per cable.
2. Install a properly sized Weather Head Face to be left closed when the wire entrance is to be left closed to outside atmosphere. Wire entrance installed per Index 17727.
3. Any combination of Option 'a' or 'b' may be used provided both lifting and wiring is accommodated.

<table>
<thead>
<tr>
<th>Clamp Thickness Table</th>
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<tbody>
<tr>
<td>Cable Diameter (in)</td>
</tr>
<tr>
<td>3/8</td>
</tr>
<tr>
<td>3/4</td>
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</tbody>
</table>

Diameters at the Clamp location of 2'-1". Use one clamp per cable.

Catenary And Messenger Wire Clamps

DETAL 'B'

Wire Entrance Detail

Handhole Frame

11 Gage Handhole Cover

Handhole Frame

CUT-AWAY

POLE TOP

ATTACHMENT DETAILS

STEEL STRAIN POLE

INDEX NO. 17723

SHEET NO. 3 of 3

DESIGN STANDARDS

FY 2016-17

LAST REVISION 07/01/15

DESCRIPTION:
GENERAL NOTES:

1. Work these Index drawings with the Strain Pole Schedule in the Plans.
2. Shop Drawings: This Design Standard is considered fully detailed and no shop drawings are necessary.
3. Submit shop drawings for minor modifications not detailed in the plans.
4. Fabrication:
   a. Pole Taper for pole width, strands, reinforcing and void: 0.001 in/ft per face.
   b. Concrete: Class V Special or Class VI
   c. Prestress Strands & Spiral Reinforcing: Specification Section 641
   d. Hand and coupler cover plates: Non-corrosive material
   e. Screws: Round headed, chrome plated
5. Support locations are for strand release, storage, lifting and transport. Keep BF oriented downward until final erection.
6. Pick-up and support locations shown may vary within a tolerance of ±3".
7. Two point attachment: provide an eye bolt hole for the messenger wire.
8. Tether Wire: When required, field-drill the eyebolt hole prior to installation.
SERVICE POLE P-II (12 Ft.) & P-IIB (36 Ft.) ELEVATION
(Strands Not Shown)

PEDESTAL POLE P-IIC (12 Ft.) ELEVATION
(Horizontal Pole)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance of 4 ft. (for P-IIA & P-IIB) or 10 ft. (for P-IIB) from the Tip End.
- * Dimension may vary from 2¼" to 3½" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2".

STRAND LEGEND
- Prestressed Strand: 0.5 in. = 24 kips Before Transfer or 0.375 in. = 14 kips Before Transfer (4 strands total)

SERVICE AND PEDESTAL POLE TYPE P-II

CONCRETE POLES

INDEX

SYNO

17725

2 of 8
LIGHTING AND TRAFFIC MONITORING POLES TYPE P-III

**DESCRIPTION:**

**PILOT LAMP POLES TYPE P-III**

**INDEX NO.:** 17725

**CONCRETE POLES**

**SHEET NO.:** 3 of 8

**REV: 07/01/15**

**Design Standards FY 2016-17**

**INDEX:**

**REVISION:**

**CONCRETE POLES**

**SPIRAL REINFORCING ELEVATION**

(Strands, Holes, and Fixtures Not Shown)

**POLE ELEVATION**

*(Strands and Reinforcing Not Shown)*

*(See Design Standard Index 17900 and Specification 744 for Modifications to Type P-III Poles Used at Traffic Monitoring Sites)*

**NOTES:**

- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 33.3% L from Tip End.

*Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2½".*

**STRAND LEGEND**

- Prestressed Strand: 0.5 in. ~ 31 kips Before Transfer (4 strands total)

**SECTION A-A**

*(Typical Square Section)*

**TIP END SECTION (TOP)**

**Pole Height Dim. H**

**Pole Length Dim. L**

**20% L**

**Depth Dim. D**

**Pole Elevation**

**Support Locations**

*Horizontal Poles*

**Plug Void End with Min. 2" of Concrete**

**Final Grade Location**

**Bolt End**

**2" Dia. Tie with Cover**

**48" No. 6 Bare Copper Ground Wire**

**2 ½" Dia. Pipe with Cover**

**Identification Markings**

**20% L**

**2'-0"**

**2'-6"**

**3'-0"**

**3'-6"**

**4'-0"**

**Front Face**

**Strand Locations**

**Transfer (4 strands total)**

**Back Face**

**#5 Gauge Spiral Reinforcing**

**Circular Void**

**Circular Void**

**Tip End (Top)**

**Front Face**

**Back Face**

**#5 Gauge Spiral**

**NOTES:**

- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 33.3% L from Tip End.

*Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2½".*

**Transfer (4 strands total)**

0.5 in. ~ 31 kips Before Transfer (4 strands total)

**Circular Void**

**Circular Void**

**Front Face**

**Back Face**

**#5 Gauge Spiral**

**NOTES:**

- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 33.3% L from Tip End.

*Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2½".*

**Transfer (4 strands total)**

0.5 in. ~ 31 kips Before Transfer (4 strands total)
Spiral Reinforcing Elevation
(Strands, Holes, and Fixtures Not Shown)

Pole Elevation
(Strands and Reinforcing Not Shown)

Strand Legend
- Prestressed Strand
  0.5 in. - 31 kips Before Transfer (6 strands total)
- Dormant Strand
  0.5 in. (3 strands total)
One 24" Splice Allowed Per Strand

Notes:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 20% L from the Tip End.
- Dimension may vary from 3" to 4¼" to accommodate smaller radius of optional stepped (PVC) void.
- The void diameter shall not be less than 2½".

Typical Square Section

Pole Height Dim. H
Pole Length Dim. L
Depth Dim. D

Transfer (6 strands total)
3" ~ 31 kips Before
Transfer (6 strands total)
CONCRETE POLES

SPINAL REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

POLE ELEVATION
(Strands and Reinforcing Not Shown)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 10% L from Tip End.
- Dimension may vary from 3" to 4½" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½".

STRAIGHT POLE TYPE P-VI

STRAIGHT POLE TYPE P-VI
**SPRAL REINFORCING ELEVATION**

(Strands, Holes, and Fixtures Not Shown)

**POLE ELEVATION**

(Strands and Reinforcing Not Shown)

**STRAND LEGEND**

- Prestressed Strand
  - 0.5 in. – 31 kips Before Transfer
  - (16 strands total)
- Dormant Strand
  - 0.5 in. (6 strands total)
  - One 24" splice allowed per strands

**NOTES:**

- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 10% L from the Tip End.
- *Dimension may vary from 3½" to 5" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½".*
SPIRAL REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

<table>
<thead>
<tr>
<th>Dim. A</th>
<th>Dim. B</th>
<th>Dim. C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Front Face
- #5 Gauge Spiral Reinforcing

Back Face
- #5 Gauge Spiral Reinforcing

Identification Markings
- 4" x 6" Hand Hole with Cover
- 2" x 5" Conduit
d- 2" x 5" Galv. Coupler with Cover
- 48" No. 6 Bare Copper Ground Wire

POLE ELEVATION
(Strands and Reinforcing Not Shown)

<table>
<thead>
<tr>
<th>Dim. A</th>
<th>Dim. B</th>
<th>Dim. C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Front Face (Roadway)
- #5 Gauge Spiral Reinforcing

Back Face (Roadway)
- #5 Gauge Spiral Reinforcing

Identification Markings
- 4" x 6" Hand Hole with Cover
- 2" x 5" Conduit
d- 2" x 5" Galv. Coupler with Cover
- 48" No. 6 Bare Copper Ground Wire

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 10% L from the Tip End.
- * Dimension may vary from 3 ½" to 5" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 8".
Notes:
1. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.
2. Lashing wire should normally be used for distances of 12' or greater.
3. All hardware for signal attachment shall be stainless steel.
4. Hole for eye bolt will require field reaming for 1" & 1 1/4" eye bolts.
5. Meet all grounding requirements of Section 620 of the Standard Specifications.

Method Of Framing Corner
Strain Poles Angles 10° To 120°

* The load face of pole shall be perpendicular to load.
Notes:

1. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.

2. Use only span wire mounting assemblies listed on the APL.

Field Drill Two ½" Drain Holes In Bottom Of Installed Signals To Allow Water To Drain.

Adjustable Hanger Assembly

Extension Bar

Tri-Stud Disconnect Hub

Traffic Signal

Tri-Stud Tether Wire Clamp (if required)

Details:

1. Use only span wire mounting assemblies listed on the APL.

2. With the approval of the resident engineer, the service head hole for joint use poles may be drilled by the utility company at an angle of 90° but not less than 45° to the face of the pole.

Notes:
Interconnect cable shall be grounded to the copper ground wire at the pole or to the external wire extending down the pole.

When utilizing the external ground wire to the pole, a piece of 1/2" conduit shall extend up the pole externally to a point 8' above finish grade to protect the ground wire connecting the messenger wire to the ground rod.

Interconnect cable only the locking cable ties shall be used.

If accessible, the internal ground wire of the support pole may be used to ground the messenger wire.

Lashing wire should normally be used for distances of 12' or greater.

Meet all grounding requirements of Section 620 of the Standard Specifications.

Notes:
1. The messenger wire of the interconnect cables shall be grounded to the copper ground wire at the pole or to the external wire extending down the pole.
2. When utilizing the external ground wire to the pole, a piece of 1/2" conduit shall extend up the pole externally to a point 8' above finish grade to protect the ground wire connecting the messenger wire to the ground rod.
3. Locking cable ties or lashing wire when used shall be placed at not more than 12" apart except at the point where the cables separate from the messenger wire and another placed 8' (max) from that tie. When using Figure "8" connector only the locking cable ties shall be used.
4. If accessible, the internal ground wire of the support pole may be used to ground the messenger wire.
5. Lashing wire should normally be used for distances of 12" or greater.
6. Meet all grounding requirements of Section 620 of the Standard Specifications.
NOTES:
1. The lightning arrester can be located on the side or bottom of the service disconnect enclosure at the Contractor's option.
2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.
3. Bond all elements together to form an Intersection Grounding Network in accordance with Section 620 of the Department's current Standard Specifications for Road and Bridge Construction. The bond wire shall be run in conduit with the Electrical Service Wire or Signal Cable.
4. Meet all grounding requirements of Section 620 of the Standard Specifications.
5. The Service Disconnect shall be lockable by padlock and four keys provided to the maintaining agency. The door shall have a minimum of three hinges and be lockable. No screws to be used to attach door.
6. The Service Disconnect shall be Nema 3R or better.
### POLE SELECTION TABLE - SINGLE ARM - WITH & WITHOUT LUMINAIRE

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<tr>
<th>POLE TYPE</th>
<th>D1</th>
<th>D3</th>
<th>D5</th>
<th>D6</th>
<th>D7</th>
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### POLE SELECTION TABLE - DOUBLE ARM - WITHOUT LUMINAIRE

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<th>POLE TYPE</th>
<th>S1</th>
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<th>S3</th>
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<td>S1 &amp; S22 Lum</td>
<td>36</td>
<td>0.375</td>
<td>0.375</td>
<td>0.1793</td>
<td>0.1793</td>
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</table>

### ARM DESIGN TABLE - ALL CASES

<table>
<thead>
<tr>
<th>ARM TYPE</th>
<th>ARM LENGTH</th>
<th>MAST ARM</th>
<th>ARM EXTENSION</th>
<th>ARM CONNECTION &amp; WELDS</th>
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<tbody>
<tr>
<td>D1</td>
<td>36'-0&quot;</td>
<td>36</td>
<td>8.99</td>
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<td>D2</td>
<td>36'-0&quot;</td>
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<td>D3</td>
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<td>8.95</td>
<td>14</td>
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<tr>
<td>D4</td>
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### POLE, CONNECTION AND SHAFT DESIGN TABLE - SINGLE & DOUBLE ARM

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>UA (ft)</th>
<th>UC (in)</th>
<th>UD (in)</th>
<th>UE (in)</th>
<th>UG (ft)</th>
<th>DRILLED SHAFT DATA</th>
<th>UPRIGHT BASE CONNECTION</th>
<th>CONNECTION PLATE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
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<td>S24 Lum</td>
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### LUMINAIRE AND LUMINAIRE CONNECTION

<table>
<thead>
<tr>
<th>LA (ft)</th>
<th>LB (ft)</th>
<th>LC (in)</th>
<th>LD (in)</th>
<th>LE</th>
<th>LF (ft)</th>
<th>LG (in)</th>
<th>LH (in)</th>
<th>LI (in)</th>
<th>LK (in)</th>
<th>LL (deg)</th>
<th>UG (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>10</td>
<td>3</td>
<td>0.125</td>
<td>0.5</td>
<td>8</td>
<td>0.5</td>
<td>0.75</td>
<td>0.25</td>
<td>0</td>
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**POLE SELECTION TABLE - SINGLE ARM - WITH & WITHOUT LUMINAIRE**

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>T1 &amp; T2 Lum</th>
<th>T2 &amp; T22 Lum</th>
<th>T3 &amp; T23 Lum</th>
<th>T4 &amp; T24 Lum</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARM TYPE</td>
<td>E1</td>
<td>E3</td>
<td>E5</td>
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</table>

Arm 1 is listed first

---

**POLE SELECTION TABLE - DOUBLE ARM - WITHOUT LUMINAIRE**

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
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<tr>
<td>ARM TYPE</td>
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**ARM DESIGN TABLE - ALL CASES**

<table>
<thead>
<tr>
<th>ARM TYPE</th>
<th>ARM LENGTH</th>
<th>MAST ARM</th>
<th>ARM EXTENSION</th>
<th>ARM CONNECTION &amp; WELDS</th>
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<tbody>
<tr>
<td>E1</td>
<td>36'-0&quot;</td>
<td>36.0</td>
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<tr>
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Arm Cantor Angle = 2 degrees

---

**POLE, CONNECTION AND SHAFT DESIGN TABLE - SINGLE & DOUBLE ARM**

<table>
<thead>
<tr>
<th>POLE TYPE</th>
<th>LA (ft)</th>
<th>LB (ft)</th>
<th>LC (in)</th>
<th>LD (in)</th>
<th>LE</th>
<th>LF (ft)</th>
<th>LG (in)</th>
<th>LH (in)</th>
<th>LI (in)</th>
<th>LK (in)</th>
<th>LL (deg)</th>
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</thead>
<tbody>
<tr>
<td>T1</td>
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<td>10.53</td>
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<tr>
<td>T2</td>
<td>25</td>
<td>12.53</td>
<td>16</td>
<td>0.375</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>T3</td>
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<tr>
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<tr>
<td>T23 Lum</td>
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<tr>
<td>T24 Lum</td>
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**LUMINAIRE AND LUMINAIRE CONNECTION**

<table>
<thead>
<tr>
<th>LA (ft)</th>
<th>LB (ft)</th>
<th>LC (in)</th>
<th>LD (in)</th>
<th>LE</th>
<th>LF (ft)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>10</td>
<td>3</td>
<td>0.125</td>
<td>0.5</td>
<td>8</td>
<td>0.375</td>
<td>0.25</td>
<td>0</td>
<td>37.5</td>
<td>0.25</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:
1. Work this Index with Index No. 17745.
2. Design Wind Speed = 150 mph without Signal Backplates.
3. 150 mph with or without Signal Backplates.
4. 110 mph with or without Signal Backplates.

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**"E" MAST ARMS**

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**DESIGN STANDARDS**

**FY 2016-17**

**STANDARD MAST ARM ASSEMBLIES**

**INDEX NO.**

**SHEET NO.**

**LAST REVISION 07/01/16**

**DESCRIPTION:**

**FDDOT**
GENERAL NOTES

1. Shop Drawings: This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.

2. Prior to Fabrication: Verify the installed foundation elevation will result in the required signal elevation and adjust the Pole height as needed.

3. Details for Signal and Sign locations, Signal Head attachment, Sign attachment, Pedestrian Head attachment, and Foundation-Cond is not shown for simplicity.

4. Materials:
   - Split-lock washers and self-locking nuts are not permitted
   - A. Poles, Mast Arms and Basing Rings
      - Less than 1/16": ASTM A1011 Grade 30, 55, 60 or 65
      - Greater than or equal to 1/16": ASTM A572 Grade 50, 60 or 65
      - ASTM A595 Grade A (35 ksi yield or Grade B (60 ksi) yield)
   - B. Steel Plates: ASTM A572
   - C. Weld Metal: E70XX
   - D. Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F436 Grade 55
      - Nuts: ASTM A563 Grade A Heavy-Hex
      - Washers: ASTM F436 Type 1, one under turned element
      - Washers: ASTM A606 (For Type 1), one under turned element
   - E. Anchor Bolts, Nuts and Washers:
      - Anchor Bolts: ASTM F1554 Grade 55
      - Nuts: ASTM A563 Grade A Heavy-Hex (5 per anchor bolt)
      - Plate Washers: ASTM A241 (2 per bolt)
   - F. Threaded Bar/Study: ASTM A307
   - G. Handhole Frames: ASTM A470 or ASTM A36, Grade 30
   - H. Handhole Cover: ASTM A511 Grade 30, 55, 60 or 65
   - I. Aluminum Plate Cap and Nut Covers: ASTM B26 (319-F)
   - J. Stainless Steel Screws: A55 (Type 316)
   - K. Concrete: Class IV (Drilled Shaft) for all environmental classifications
   - L. Reinforcing Steel: Specification Section 415

5. Fabrication:
   - A. Pole and Mast Arm Taper: Change diameter at a rate of 0.14 inches per foot
   - B. Upright splices are not allowed. Transverse welds are only permitted at the base.
   - C. First and Second arm camber angle = 2°
   - D. Provide bolt hole diameters as follows:
      - Bolt: (except Anchor Bolts): Bolt diameter plus 1/32". Prior to galvanizing
      - Anchor Bolts: Bolt diameter plus 1/16" (Max)
   - E. Face handhole perpendicular from arm on single arm poles, perpendicular from first arm of double arm poles facing away from traffic or see special instructions on the Mast Arm Tabulation Sheet.
   - F. Seam weld on bottom side of arm. Seam weld under Arm 1 side of pole.
   - G. Perform all welding in accordance with Specification Section 460-6.4
   - H. Weld Metal: E70XX
   - I. Hot Dip Galvanize after fabrication.

6. Coatings:
   - A. All Nuts, Bolts, Washers and Threaded Bars/Study: ASTM F2329
   - B. All other steel items ASTM A123

7. Construction:
   - A. Foundation Specification Section 455 Drilled Shaft, except that payment is included in the cost of the Mast Arm.
   - B. Insulate Pole vertically.
   - C. Place structural grout pad with drain between top of foundation and bottom of baseplate in accordance with Specification Section 649-7.
   - D. Attach Sign Panels and Signals centered on the elevation of the Mast Arm.
   - E. Wire Access holes are 1/2" or less in diameter.

---

**ELEVATION AND NOTES**

**Mast Arm Assemblies**

**Table of Contents**

<table>
<thead>
<tr>
<th>SHEET NO.</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General and Notes</td>
</tr>
<tr>
<td>2</td>
<td>Foundation and Base Plate Details</td>
</tr>
<tr>
<td>3</td>
<td>Mast Arm Connection and Splice Details</td>
</tr>
<tr>
<td>4</td>
<td>Double Arm Connection and Splice Details</td>
</tr>
<tr>
<td>5</td>
<td>Luminaire Arm and Connection Details</td>
</tr>
<tr>
<td>6</td>
<td>Handhole and Pole Top Details</td>
</tr>
</tbody>
</table>
NOTES:

1. The Structural Grout Pad diameter may be reduced where the footprint of the Grout Pad does not provide adequate clearance for the sidewalk and/or accessibility considerations.

2. See Index No. 17743 and the plans for actual quantity of bolts.

3. The top hex nut may be substituted by a 3/4" height jam nut. Provide individual nut covers (not shown) for each bolt.

1. The Structural Grout Pad diameter may be reduced where the footprint of the Grout Pad does not provide adequate clearance for the sidewalk and/or accessibility considerations.

2. See Index No. 17743 and the plans for actual quantity of bolts.

3. The top hex nut may be substituted by a 3/4" height jam nut. Provide individual nut covers (not shown) for each bolt.

DESCRIPTION:

Foundation and Base Plate Details

mast arm assembly

notes:

1. The Structural Grout Pad diameter may be reduced where the footprint of the Grout Pad does not provide adequate clearance for the sidewalk and/or accessibility considerations.

2. See Index No. 17743 and the plans for actual quantity of bolts.

3. The top hex nut may be substituted by a 3/4" height jam nut. Provide individual nut covers (not shown) for each bolt.
**MAST ARM ASSEMBLY**

**ARM SPLICE**

- 2" Ø Threaded Bar/Stud
- With Self-Locking Nut

**SINGLE ARM CONNECTION**

- 4" Ø Wiring Hole (Typ.)

**NOTE:**
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.

**SECTION B-B**

**SECTION C-C**

**SECTION D-D**

**DETAIl 'B'**

**DETAIl 'C'**

**DETAIl 'D'**

**SINGLE ARM CONNECTIONS & SPLICE DETAILS**
DOUBLE ARM CONNECTIONS & SPLICE DETAILS

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
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MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
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MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

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1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
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3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.

MAST ARM ASSEMBLIES

SELECT F-F

DOUBLE ARM CONNECTION

SECTION G-G

NOTE:
1. Install the 'Slip Joint' splice with a tight fit and no change in the Mast Arm taper due to the splice.
2. Details shown on this sheet are for 12 sided pole sections. However, sections with more than 12 sides and round sections are permitted provided outside diameter and wall thickness are not reduced.
3. Match mark the Arm and Connection Plates to ensure proper assembly.
4. "SF" measured counter clockwise from "First Mast Arm Extension.
5. Adjust width of top and bottom Connection Plates to maintain minimum clearance shown.
**NOTES:**

1. Luminaire type and luminaire length may be found in the Lighting Plans.

2. Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.

3. The fabricator may substitute a 1/4" thick bent plate with the same flange width, height, and length as the MC 10x33.6 Channel section.

4. 'L' measure counter clockwise from First Mast Arm.

**SECTION H-H**

- 'LM' Luminaire Base Plate Thickness
- Partial Penetration Weld Typ. for Ø < 60°
- Ø Bolt (Typ.)
- 'L' Bolt Width
- Center Of Pole
- NC 10x33.6 (See Note #3)

**SECTION I-I**

- Ø Connection Plate Wiring Hole
- Center Of Round Luminaire Shaft
- Ø Bolt (Typ.)
- 'L' Bolt Width
- NC 10x33.6 (See Note #3)

**LUMINAIRE CONNECTION ELEVATION**

- 'L' Luminaire Base Plate Thickness
- Ø Round Luminaire Shaft 0.14 in/ft Taper 1/3 Wall Thickness
- Ø Bolt (Typ.)
- Ø Min. Pole Dia. At Luminaire Connection
- 'L' Luminaire Connection

**DETAIL 'G'**

- 'L' Luminaire Arm
- 'L' Luminaire Connection
- Pole
- First Mast Arm
- Second Mast Arm

**LUMINAIRE ORIENTATION**

- 'L' Luminaire Arm
- 'L' Luminaire Connection
- Pole
- 'L' First Mast Arm
- 'L' Second Mast Arm

**LUMINAIRE ELEVATION**

- 'L' Luminaire Arm
- 'L' Luminaire Connection
- Pole
- 'L' First Mast Arm
- 'L' Second Mast Arm

**MAST ARM ASSEMBLY**

- Notes:
  1. Luminaire type and luminaire length may be found in the Lighting Plans.
  2. Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.
  3. The fabricator may substitute a 1/4" thick bent plate with the same flange width, height, and length as the MC 10x33.6 Channel section.
  4. 'L' measure counter clockwise from First Mast Arm.

**DESCRIPTION:**

- Luminaire type and luminaire length may be found in the Lighting Plans.
- Align Luminaire Arm with Single Mast Arm or First Arm of Double Mast Arm unless indicated otherwise in the plans.
- The fabricator may substitute a 1/4" thick bent plate with the same flange width, height, and length as the MC 10x33.6 Channel section.
- 'L' measure counter clockwise from First Mast Arm.
NOTES:
1. Handhole covers may be omitted when Terminal Compartment is provided.
2. Terminal Compartment is optional. See Mast Arm Tabulation to see if required and for locations.
3. Terminal Compartment Frame Height 2'-0" minimum to 2'-6" maximum. Align bottom of Terminal Compartment a minimum of 1" below the bottom of the Handhole Frame.
4. Any combination of Option 'a' or 'b' may be used, provided both lifting and wiring is accommodated.
FREE-SWINGING INTERNALLY-ILLUMINATED STREET SIGN ASSEMBLIES

NOTES:

1. Free-swinging, internally-illuminated street signs shall only be installed on the signal pole for span wire assemblies. For mast arm assemblies the street sign may be installed on the arm or pole.

2. Free-swinging, internally-illuminated street signs shall meet the requirements of Section 700 of the Standard Specifications for Road and Bridge Construction.

3. Pole attachments and cantilever arm (or truss) assemblies may be accepted by Contractor certification provided the signs being supported meet the weight and area limitations included in Section 700 for “Acceptance by Certification”.

4. Pole attachments and cantilever arm (or truss) assemblies supporting signs not meeting the weight or area limitations included in Section 700 for “Acceptance by Certification” require the submission of structural calculations and Shop Drawings that have been prepared by and sealed by the Specialty Engineer.
Notes:

1. As an option, the contractor will be allowed to install pedestrian signals on concrete poles and pedestals with the use of lead anchors (two bolts same size per hub) in lieu of the stranded steel bands.

2. Holes drilled or punched in metal poles or pedestals shall be thoroughly reamed, cleaned of all burrs and covered with two (2) coats of zinc rich paint as specified in the standard specifications for road and bridge construction. Grommets or bushings shall be installed in holes.

3. Meet all grounding requirements of Section 620 of the Standard Specifications.
ALTERNATIVE 1
Drill A Hole Through The Curb At The Point Which The Required Saw-Cut Depth Is Obtained Just Prior To Cutting The Top Inside Edge Of The Curb. Slide A Section Of Flexible Conduit Of At Least 6" Into The Hole From The Back Side Of The Curb But Not Within 2" Of The Top Of The Hole. The Conduit Shall Be Snug Within The Drilled Hole. Fill The Top Of The Hole With Loop Sealant To The Level Of The Curb Surface. A Nonmetallic Material Should Be Used To Prevent Excessive Loop Sealant From Entering The Flexible Conduit.

ALTERNATIVE 2
Drill A Hole 1/2" To 1" Larger In Diameter Than The Rigid Conduit To Be Used Through The Roadway Asphalt (or Concrete) Surface And Base At An Appropriate Angle To Intercept The Trench Or Pull Box Hole. Place A Predetermined Length Of Rigid Conduit In The Hole And Drive The Conduit Into The Trench Or Hole. Install A Molded Bushing (Nonmetallic) On The Roadway End Of The Rigid, Conduit. The Top Of The Rigid Conduit Shall Be Approximately 2" Below The Roadway Surface. Place The End Of The Flexible Conduit At Least 6" Into The Roadway And approximately 2" Below The Top Of The Roadway Surface. The Departure Angle Of The Conduit From The Roadway Shall Be 30° To 45°.

NOTE:
Other alternatives may be approved by the State Traffic Operations Engineer.

NOTE:
Other alternatives may be approved by the State Traffic Operations Engineer.

GENERAL NOTES
1. If the loop lead-in is 75' or less from the edge of the loop detector to controller cabinet, continue the twisted pair to the cabinet. If the loop lead-in is greater than 75' continue the twisted pair to the specified pullbox, splice to shielded lead-in wire and continue to the controller cabinet.

2. The width of all saw cuts shall be sufficient to allow unforced placement of loop wires or lead-in cables into the saw cut. The depth of all saw cuts, except across expansion joints, shall be 3" standard with a maximum of 4".

3. On resurfacing or new roadway construction projects, the loop wires and lead-in cables will be installed in the asphalt structural course prior to the placement of the final asphalt wearing course. The loop wires and lead-in cables shall be placed in saw cuts in the structural course. The depth of the saw cuts below the top of the final surface shall comply with note 2.

4. A nonmetallic hold down material shall be used to secure loop wires and lead-ins to the bottom of saw-cuts. Hold down material shall be placed at approximately 12" intervals around loops and 24" intervals on lead-ins.

5. The maximum distance between the twisted pairs of loop lead-in wire is 6' from the loop to 12' from the pavement edge or curb.

6. Splice Connections in pull boxes with UL listed, watertight, insulated enclosures. Place one enclosure over the end of each conductor and place a third enclosure over the exposed end of the shielded cable.

7. As an alternate, a larger diameter enclosure that will accommodate both the splices of the conductors and the exposed end of the shielded cable may be used.

8. The maximum area of asphalt to be disturbed shall be 6'x 6'. This area shall be restored as directed by the Engineer.
Loop conductors must follow saw-cut to bottom forming slack section at joint.

Notes:
1. The "number of turns" indicated at the specified point on the loop refers to the number of passes of loop wires which are placed in the saw-cut forming the complete loop.
2. Loop types or details not drawn to scale.
3. Loop Types are centered in a single lane except Type E which is centered on two lanes.
4. The number of individual loops in the Type G loop may vary up to a maximum of four (4).
5. Lead-in may be connected to either end of loop.
6. The leading edge of loop Types A,C,D, & F may extend past the stop line a maximum of 10'. The length of these loops may be extended to a maximum of 60'. Each intersection should be individually designed and if the modifications noted above is required it must be noted or detailed in the plans.
7. Loop lead-in wires should not be installed in the same pull box with signal power cable.

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Loop lead-in wires should not be installed in the same pull box with signal power cable.
**PEDESTRIAN DETECTOR ASSEMBLY INSTALLATION DETAILS**

**DESCRIPTION:**
- Pedestrian Actuated Signal Sign (See FIGURE D)
- Conduit
- Grade Cap
- Signal Sign Actuated Pedestrian Button Push Button
- Lead Anchor Bolts
- Concrete Pedestal
- Concrete Strain Pole
- Metal Strain Pole
- Push Button
- Pedestrian Actuated Signal Sign
- Pedestrian Push Button
- Transformer Base
- Anchor Base
- Pedestrian Actuated Signal Sign
- FIGURE E
- FIGURE D
- FIGURE B
- FIGURE A

**Notes:**
1. Payment for sign is included in the price for the pedestrian detector.
2. Signs shall be mounted above detectors, explaining their purpose and use.
3. The positioning of pedestrian push button should clearly indicate which crosswalk signal is actuated by each push button.
4. Push buttons and signs are to be mounted in accordance with Standard Specifications, section 665.
5. Meet all grounding requirements of Section 670 of the Standard Specifications.
6. A 30"X48" maneuvering area is required on each push button.

**Note to Designers:**
The designer should ensure the distance to the Push Button in FIGURE A & B is maintained. This distance can vary depending on post or pedestal type or whether a frangible base is used and sidewalk configuration. This is specified to meet Americans with Disabilities Act.

**PLAN:**
- FIGURE A
- FIGURE B
- FIGURE C
- FIGURE D
- FIGURE E

**DESIGN STANDARDS**

**REVISED:** 07/01/15

**INDEX NO.:** 17784

**SHEET NO.:** 1 of 2
NOTE:
1. Refer to the MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES Figure 2B-26 Pedestrian Signs. The STANDARD HIGHWAY SIGNS MANUAL English Sign R10-3b for Text Size, Spacing and Symbol size. Also see DESIGN STANDARDS Index 17355 for details of FTP signs.
CABINET INSTALLATION DETAILS

**NEW CONTROLLER CABINET**

- **Notes:**
  1. The number, size, and orientation of conduit sweep will vary according to site condition or locations. Two spare 2" PVC conduits shall be provided in all bases. The spares shall exist in the direction of the center rear of the cabinet base, into a pullbox and capped with a weatherproof fitting. If obstructions prevent the spare conduit from exiting to the rear, or the rear of the cabinet is located on the R/W line, a side exit of the spare conduits will have to be approved by the project engineer. All spare conduit sweeps shall be capped with a weatherproof fitting.
  2. Meet all grounding requirements of the Standard Specifications 610.
  3. New Controller Cabinet installation shall meet the requirements of the Standard Specifications 676.

**EXISTING CONTROLLER CABINET**

- **Notes:**
  1. Existing controller cabinets to be retrofitted shall meet the requirements of the Standard Specifications 676.
  2. The signalized intersection controller cabinet retrofit installation procedures are located at: http://www.dot.state.fl.us/TrafficOperations/Doc_Library/Doc_Library.shtm

**POLE MOUNTED CABINET**

- **Notes:**
  1. The number, size, and orientation of conduit sweep will vary according to site condition or locations. Two spare 2" PVC conduits shall be provided in all bases. The spares shall exist in the direction of the center rear of the cabinet base, into a pullbox and capped with a weatherproof fitting. If obstructions prevent the spare conduit from exiting to the rear, or the rear of the cabinet is located on the R/W line, a side exit of the spare conduits will have to be approved by the project engineer. All spare conduit sweeps shall be capped with a weatherproof fitting.
  2. Meet all grounding requirements of the Standard Specifications 610.
  3. New Controller Cabinet installation shall meet the requirements of the Standard Specifications 676.
**Notes:**

1. The number, size and orientation of conduit sweep will vary according to site condition or locations. Two spare 2" PVC conduits shall be provided in all bases. The spares shall exit in the direction of the center rear of the cabinet base, into a pullbox and capped with a weatherproof fitting. If obstructions prevent the spare conduit from exiting to the rear, or the rear of the cabinet is located on the R/W line, a side exit of the spare conduits will have to be approved by the project engineer. All spare conduit sweeps shall be capped with a weatherproof fitting.

2. Meet all grounding requirements of the Standard Specifications 620.

3. New Controller Cabinet installation shall meet the requirements of the Standard Specifications 676.

---

**NEW CONTROLLER CABINET**

- **Ground Line Or Grade**
- **Conduit**
  - **1" Chamber**
  - **39" Min.**
  - **4" Max.**

**SIDE VIEW**

- **Generator Panel**
- **Service Slab (Slope 3/4" Per 1' For Drainage) Not Required In Sidewalk Or Pavement Areas Or Where R/W Is Restricted**

---

**EXISTING CONTROLLER CABINET**

- **Ground Line Or Grade**
- **Conduit**
  - **24"**
  - **18" Min.**

**SIDE VIEW**

- **Transfer Switch**
- **Grounding Electrode**

---

**POLE MOUNTED CABINET**

- **Pole Plate With Steel Band Or Load Anchor And Bolts**
- **Conduit**
  - **4" Max.**
  - **1" Chamfer**

**FRONT VIEW**

- **Service Slab (Slope 3/4" Per 1' For Drainage) Not Required In Sidewalk Or Pavement Areas Or Where R/W Is Restricted**
- **Pole Clamp**
- **Pulling Elbow Type LB**

---

**BASE MOUNTED CABINET**

- **Conduit (Rigid)**
- **Ground Line Or Ground**
- **Pole Plate**

**SIDE VIEW**

- **Junction Box**
- **Anchor Bolts**
- **Conduit**
  - **4" Min.**
  - **F" Chamber**

---

**PEDESTAL MOUNTED CABINET**

- **Conduit**
- **Ground Line Or Grade**
- **Transfer Switch**

**SIDE VIEW**

- **Grounding Electrode**
- **18""
Signal Indications

Legend:
- Vehicle Movement Number
- Pedestrian Movement Number
- Timing Function Number
- Phase Number
- Green Arrow (Left or Right)
- Red Arrow
- Yellow Arrow

Signal Clearances Table

Vehicle movements & signal head number assignments are not directionally oriented but shall maintain their relative orientation about the intersection (i.e., movements 7 and 8 are always to the right of movements 1 and 6 etc.).

SOP 1

SOP 2

SOP 3

SOP 4

SOP 5

SOP 6

SOP 7

SOP 8

SOP 9

SOP 10
<table>
<thead>
<tr>
<th>DESIGN STANDARDS FY 2016-17 STANDARD SIGNAL OPERATING PLANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEET 2 of 2</td>
</tr>
</tbody>
</table>

**Description:**

**Revision No.:** 17870

**Sheet No.:** 2 of 2

<table>
<thead>
<tr>
<th>Index No.:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>LOW VOLUME (DIAMOND INTERCHANGE OPERATIONS)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Only Ø2 or Ø4 Used, Not Both To Obtain ABC or ACB Operation.

2. Operation ABC or ACB Operation.

3. From Normal Operation (Dwell) To Normal Operation (Dwell)

4. From Normal Operation (Track Clearance) To Normal Operation (Dwell)

5. From Normal Operation (Track Clearance) To Normal Operation (Dwell)

**Diagram:**

- SOP 21
- SOP 12
- SOP 13
- SOP 14
- SOP 15
- SOP 16
- SOP 17
- SOP 18
- SOP 19

**Legend:**

- TF 1
- TF 2
- TF 3
- TF 4

**Legend:**

- Ø1 (A)
- Ø2 (B)
- Ø3 (C)
- Ø4 (D)

**Legend:**

- TF 1
- TF 2
- TF 3
- TF 4

**Legend:**

- POP 1
- POP 2
- POP 3
- POP 4
**FUNCTIONAL BLOCK DIAGRAM**

**ADVANCE WARNING FOR R/R CROSSING**

**DESCRIPTION:**
ADVANCE WARNING FOR R/R CROSSING

**INDEX NO.**
17881

**SHEET NO.**
1 of 1

**REVISION**
07/01/05

**DESIGN STANDARDS**
FY 2016-17

**NOTE:**
- "STOP AHEAD" is standard and preferred sign message. Another message may be approved when appropriate for specific situations.
- Conduit and cable from the normally closed relay of RR controller cabinet to the junction box shall be furnish & installed by RR.
GENERAL NOTES

1. The location of flashing signals and stop lines shall be established based on future or present installation of gate with appropriate track clearances.

2. Where plans call for railroad traffic control devices to be installed in curbed medians, the minimum median width shall be 12'-6".

3. Location of railroad traffic control device is based on the distance available between face of curb & sidewalk. 0'-6" - Locate device outside sidewalk. Over 6'-0" - Locate device between face of curb and sidewalk.

4. Stop line to be perpendicular to edge of roadway, approx. 15' from nearest rail; or 8' from and parallel to gate when present.

5. When a cantilevered-arm flashing-light signal is used, the minimum vertical clearance shall be 12'-6" from above the Crown of Roadway to the lowest point of the Overhead Signal Unit.

SIGNAL PLACEMENT AT RAILROAD CROSSING
(2 LANES, CURB & GUTTER)

SIGNAL PLACEMENT AT RAILROAD CROSSING
(2 LANES, CURB & GUTTER)
**NOTES:**

1. When computing pavement message quantities do not include traverse lines.

2. Placement of sign W10-1 in a residential or business district, where low speeds are prevalent, the W10-1 sign may be placed a minimum distance of 100 ft from the crossing. Where street intersections occur between the RR pavement message and the tracks an additional W10-1 sign and additional pavement message should be used.

3. A portion of the pavement markings symbol should be directly opposite the W10-1 sign.

4. Recommended location for FTP-61-06 or FTP-62-06 signs, 100' urban and 300' rural. See Index 17355 for sign details.

5. Gate Length Requirements:
   - For Two-way undivided sections: The gate should extend to within 3' of the center line. For those cases, the distance from the gate to the center line shall be a maximum of 4'.
   - For one-way or divided sections: The gate shall be of sufficient length such that the distance from the gate tip to the inside of the pavement is a maximum of 4'.
### Railroad Gate Arm Light Spacing

<table>
<thead>
<tr>
<th>Specified Length Of Gate Arm</th>
<th>Dimension &quot;A&quot;</th>
<th>Dimension &quot;B&quot;</th>
<th>Dimension &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Ft.</td>
<td>6&quot;</td>
<td>36&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>15 Ft.</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>5</td>
</tr>
<tr>
<td>16-17 Ft.</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>5</td>
</tr>
<tr>
<td>18-19 Ft.</td>
<td>28&quot;</td>
<td>41&quot;</td>
<td>7</td>
</tr>
<tr>
<td>20-23 Ft.</td>
<td>38&quot;</td>
<td>4&quot;</td>
<td>5</td>
</tr>
<tr>
<td>24-28 Ft.</td>
<td>28&quot;</td>
<td>5&quot;</td>
<td>6</td>
</tr>
<tr>
<td>29-33 Ft.</td>
<td>38&quot;</td>
<td>6&quot;</td>
<td>6</td>
</tr>
<tr>
<td>34-38 Ft.</td>
<td>38&quot;</td>
<td>7&quot;</td>
<td>7</td>
</tr>
<tr>
<td>35-37 Ft.</td>
<td>38&quot;</td>
<td>9&quot;</td>
<td>9</td>
</tr>
<tr>
<td>38 And Over</td>
<td>36&quot;</td>
<td>10&quot;</td>
<td>10</td>
</tr>
</tbody>
</table>

**NOTE:**

### Median Section At Signal Gates

#### Median Signal Gates for Multilane Undivided Urban Sections

(Two Or More Driving Lanes In One Direction, 45 MPH Or Less)
TYPICAL BRIDGE MOUNTS

TYPE I
TO BE USED WHERE BRIDGE OPERATORS ARE FULL TIME OR A DAILY BASIS.

LEGEND:
1. TRAFFIC SIGNALS
2. DRAWBRIDGE SIGN
3. DRAWBRIDGE AHEAD SIGN WITH YELLOW FLASHING BEACON
4. STOP HERE ON RED SIGN WITH YELLOW FLASHING BEACON
5. ENTRANCE GATE
6. EXIT GATE
7. 24" THERMOPLASTIC STOP BAR

NOTES:
1. A bypass switch shall be installed to override each timing interval in case of a malfunction.
2. "STOP HERE ON RED" is omitted in Type I operation and "TRAFFIC SIGNALS" are omitted in Type II operation.
3. The time between beginning of flashing yellow on "Drawbridge Ahead" sign and the clearance of traffic signal to red, or beginning of flashing red should not be less than the travel time of a passenger car, from the sign location to the stop line, travelling at the 85th percentile approach speed.
4. Beginning of operation of drawbridge gates shall not be less than 15 seconds after steady red or 20 seconds after flashing red (actual time may be determined by the bridge tender.)
5. Time of gate lowering and raising is dependent upon gate type.
6. Time of bridge opening is determined by the bridge tender.
7. Each gate shall be operated by a separate switch.
8. On each approach (Type II), all four red signals shall be on the same two circuit flashers, with the two top signal on one circuit, and the two bottom signal on the alternately flashing circuit.
9. A Drawbridge Ahead sign is required for both types of signal operation. However, a flashing beacon shall be added to the sign when physical conditions prevent a driver traveling at the 85% approach speed from having continuous view of at least one signal indication for approximately 10 seconds.
10. Requirements on gate installation are contained in Section 4I of the "Manual on Uniform Traffic Control Devices".
11. "STOP HERE ON RED" is omitted in Type I operation and "TRAFFIC SIGNALS" are omitted in Type II operation.

SEQUENCE CHART

Variable Time 5 Sec. 15 Sec. Min. Variable Time Variable Time Variable Time
Time 5 Sec. (See Note No.3) (See Note No.4) Bridge Open (See Note No.5) (See Note No.5)

- Normal Operation
- Operation During Bridge Preemption

FLAShING BEACON
DRAWBRIDGE AHEAD SIGN
(See Note 9)
STOP HERE ON RED
(See Note 7)
TRAFFIC SIGNALS
(See Note 8)
ENTRANCE GATE
EXIT GATE

* Field conditions may require adjustment of this standard distance.
FIGURE - A  MONOTUBE SUPPORT MOUNTING

FIGURE - B  SIGN PANEL MOUNTING ASSEMBLY

FIGURE - C  SIGNAL HEAD MOUNTING ASSEMBLY

FIGURE - D

FIGURE - E

FIGURE - F

FIGURE - G

* Measured from the bottom of the sign to the near edge of the pavement. Horizontal distance between edge of pavement and inside edge of sign will vary with condition at job site.
BLACK OPAQUE LEGEND AND BORDER ON REFLECTORIZED YELLOW BACKGROUND
TO BE USED WITH TYPE I OPERATION, AS SHOWN ON PREVIOUS SHEET
MONOTUBE SUPPORT MOUNTING

NOTES:
1. 12 volt flashing red lights shall be mounted on gate arm and shall operate in the flashing mode only when gate arm is in the lower position or in the process of being hoisted. The number of lights shall vary accordingly to length of the gate arm.
2. Alternating 16" pattern of fully reflectorized red and white stripes.

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TYPICAL LAMP PLACEMENT