GENERAL NOTES:

1. Install conduit in accordance with Specification 630.

2. Trench not to open more than 250' at a time when construction area is subject to vehicular or pedestrian traffic.

3. Sawcut asphalt at the edges of the trench to leave neat lines.

4. When installing conduit under sidewalk by open trench, replace the entire sidewalk slab.

5. Pull Box (635-001) (See Index 635-001)
**VERTICAL CLEARANCE NOTE:**
Maintain 1'-0" minimum vertical clearance when crossing over pipe and/or utilities. If minimum vertical clearance cannot be maintained, conduit is to be routed under pipe maintaining 1'-0" minimum vertical clearance.

**PLACEMENT WITHIN THE UTILITY STRIP**

**PLACEMENT UNDER SIDEWALK**

**PLACEMENT BEHIND GUARDRAIL**

**PLACEMENT IN FRONT OF GUARDRAIL**

**CONDUIT INSTALLATION DETAILS**
NOTES:
1. Pavement Removal: The removal and replacement of the additional pavement width (i.e., 6" Width either side of trench) will not be required when the trench can be constructed without disturbing the asphalt surface on either side.

2. Placement Under Existing Pavement: Place conduit prior to installation of base and pavement, unless otherwise shown in the Plans or approved by the Engineer.
**Conduit Installation Details**

**Overview**

Below Existing

- **Details:**
  - Pull Box (See Index 635-001)
  - Conduit

**ABOVE EXISTING - DEPTH 2'-6" OR LESS**

- **Details:**
  - 3" Warning Tape
  - Orange Insulated Locate Wire (When Required)

**ABOVE EXISTING - DEPTH 2'-6" OR GREATER**

- **Details:**
  - Conduit
  - Railroad R/W

**NOTES:**

1. Where conduits are to be installed over existing underground structures (e.g., drainage pipes or utility lines) which are less than 2'-6" deep, encase the conduit in Class NS concrete for the entire length of conduit that is installed at a depth of less than 2'-6" deep, encase the conduit in concrete.

2. Place 3" Warning Tape when new conduit is installed at a depth of 1'-6" or greater, and the new conduit is not encased in concrete.
NOTES:
1. Meet all grounding requirements of Specification 620.
2. If accessible, ground the messenger wire of the interconnect cables to the copper ground wire of the pole or to the external wire extending down the pole.
3. When utilizing the external ground wire, install a piece of 1/2" conduit extending up 8' from the finish grade to protect the ground wire connecting the messenger wire to the ground rod.
4. Use either locking cable ties or lashing wire, placed no further than 12" apart. Except at the point of cable drop or terminations, place one (1) at the point where the cables separate from the messenger wire and place another at a maximum distance of 4" from that tie.
5. When installing Figure 8 interconnect cable, only use locking cable ties.
6. Lashing wire should normally be used for distances of 12' or greater.
NOTES:
1. Provide fiber optic splice boxes with cable hanger racks designed to support cables and splice enclosures.
2. Install a 1'-0" wide (Min.) concrete apron around all boxes using Class N5 concrete. Slope the apron away from the box.
3. Where multiple pull boxes are placed side by side, maintain at least 8" between the pull boxes.
4. Rectangular boxes shown, others similar.
GENERAL NOTES:
1. It shall be the contractor's responsibility to provide a complete service assembly as per the plans and service specifications.
2. The service installation shall meet the requirements of the national electric code and applicable local codes.
3. Shop drawings are not required for service equipment, unless noted in the plans.
4. A Pull Box is required at each service point, see Index 635-001.

DETAIL A
AERIAL FEED

DETAIL B
UNDERGROUND FEED
Keyed Notes:
2. Service Feeder in Rigid Galvanized Steel Conduit.
3. Meter Socket by Contractor
4. Service Main Disconnect
6. Concrete Riser Pole.
7. Weatherhead
8. Electrical Panel. Number and Rating of Branch Circuit Breakers shall be as indicated on Distribution Point Description on Lighting Plan Sheets.
10. Copper Clad Ground Rod, 40 Long.
11. Insulated Copper Ground Wire. Bond the Service Neutral to Ground at Service Main Disconnect.
12. Fused Control Power Transformer 0.5 KVA, Single Phase, 480V Primary, 120V Secondary (Part of Lighting Contactor, Shown Outside for Clarity).
13. Lightning Arrestor Mounted on Outside of Enclosure
15. 2 Pole Electrical Lighting Contactor.
16. Photo Electric Switch-120V Rated.
17. Hand-off Automatic Selector Switch (Part of Lighting Contactor, Shown Outside for Clarity).
18. Concrete Pad.
20. Mount on Riser Pole.
21. Ground BUS.
22. NEMA 4X SST Ground Mounted Storage Cabinet with Two Shelves. Only Required for High Mast Lighting Systems.

PHOTO ELECTRIC CONTROLLER DETAIL

Cut a 2" hole in the side of the Lighting Control Panel enclosure for the operation and mounting of the Photo Electric controller. Use a gasket and a clear silicone sealant to cover hole, install Photo Electric Controller.

TYPICAL DISTRIBUTION POINT SCHEMATIC DETAIL

RISER DIAGRAM - TYPICAL DISTRIBUTION POINT
NOTES:

1. The lightning arrester can be located on the side or bottom of the service disconnect enclosure at the Contractor's option.

2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.

3. Bond all elements together to form an Intersection Grounding Network in accordance with Specification 620. The bond wire shall be run in conduit with the Electrical Service Wire or Signal Cable.

4. Meet all grounding requirements of Specification 620.

5. The Service Disconnect shall be lockable by padlock and four keys provided to the maintaining agency. The door shall have a minimum of three hinges and be lockable. No screws to be used to attach door.

6. The Service Disconnect shall be NEMA 3R or better.
GENERAL NOTES:

1. Work these Index drawings with the Strain Pole Schedule in the Plans.
2. Shop Drawings: This Index is considered fully detailed and no shop drawings are necessary. Submit shop drawings for minor modifications not detailed in the plans.
3. Materials:
   A. Concrete: Class V Special or Class VI
   B. Prestress Strands & Spiral Reinforcing: Specification Section 644
   C. Hand and coupler cover plates: Non-corrosive material
   D. Screws: Round headed, chrome plated
4. Fabrication:
   A. Pole Taper for pole width, strands, reinforcing and void: 0.001 in/ft per face.
   B. Concrete Taper: 1" minimum
   C. Spiral Reinforcing: As shown, plus one turn for splices and two turns at both the tip and butt ends of the pole.
   D. The design dimensions for Front Face (FF) and Back Face (BF) of the poles may vary transversely from the section shown by ±1/4" to assist with removal from forms. Balance addition and subtraction of the face widths to maintain section areas shown.
   E. Tie ground wires to the interior of reinforcing steel to prevent displacement during concreting operations.
   F. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
   G. Provide cover plates and screws for hand hole and couplers. Attach cover plates to the poles using lead anchors or embedded threaded inserts.
   H. Provide aluminum identification tags on the poles with the following information:
      a. Financial Project ID:
      b. Pole Manufacturer
      c. Standard Pole Type Number
      d. Pole Length (L)
5. Support locations are for strand release, storage, lifting and transport. Keep BF oriented downward until final erection.
6. Pick-up and support locations shown may vary within a tolerance of ±3".
7. Two point attachment: provide an eye bolt hole for the messenger wire.
8. Tether Wire: When required, field-drill the eyebolt hole prior to installation.
SERVICE POLE P-II A (12 Ft.) & P-II B (36 Ft.) ELEVATION
(Strands Not Shown)

PEDESTAL POLE P-II C (12 Ft.) ELEVATION
(Strands Not Shown)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance of 4 Ft. (for P-II A & P-II C) or 10 Ft. (for P-II B) from the Tip End.
- * Dimension may vary from 2½" to 3½" to accommodate smaller radius of distance of 4 Ft. (for P-II A & P-II C) or 10 Ft. (for P-II B) from the Tip End.
- The void diameter shall not be less than 2".
- Optional stepped (PVC) void.
SPIRAL REINFORCING ELEVATION
(Strands, Holes, and Fixtures Not Shown)

POLE ELEVATION
(Strands and Reinf. Not Shown)

NOTES:
- Strands shown are continuous from Tip End to Butt End.
- Elevation view scale is exaggerated vertically for clarity.
- For final erection, tilt pole upright with single point attachment located a distance 33.3% L from Tip End.
- * Dimension may vary from 2½" to 3¾" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 2½".

POLE TYPE P-III

CONCRETE POLES

INDEX

FY 2019-20

STANDARD PLANS

641-010

3 of 8
SPiral Reinforcing Elevation
(Strands, Holes, and Fixtures Not Shown)

1. 24" No. 6 Bare Copper Ground Wire
2. 0.162 in./ft. Total Taper
3. Front Face (Roadway)
4. Identification Markings
5. Pole Height Dim. L
6. Butt End (Bottom)
7. Final Grade Location
8. 48" No. 6 Bare Copper Ground Wire
9. Pole Length Dim. l
10. Support Locations

POLE ELEVATION
(Strands and Reinforcing Not Shown)

1. 2½" Galv. Nipple (On l)
2. Ø" Hole (Two-Wire System Only)
3. Ø" Hole (Two-Wire System Only)
4. #5 Gauge Spiral Reinforcing
5. #5 Gauge Spiral Reinforcing
6. Ø Void & Section
7. Front Face (Roadway)
8. Ø Void & Section
9. Ø Void & Section
10. Ø Void & Section

NOTES:
1. Strands shown are continuous from Tip End to Butt End.
2. Elevation view scale is exaggerated vertically for clarity.
3. For final erection, tilt pole upright with single point attachment located a distance 10% L from Tip End.
4. 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.

STRAIN POLE TYPE P-VI

STRAND LEGEND
- Prestressed Strand
0.3 in. ~ 31 kips Before Transfer
- Dormant Strand
0.5 in. (4 strands total)
One 24" Splice Allowed Per Strand

1. Ø Void & Section
2. Ø Void & Section
3. Ø Void & Section
4. Ø Void & Section
5. Ø Void & Section

SECTION A-A
(Typical Square Section)

1. Ø Void & Section
2. Ø Void & Section
3. Ø Void & Section
4. Ø Void & Section
5. Ø Void & Section

TIP END SECTION (TOP)
(For Dormant Strand Locations,
See Section A-A)

1. Ø Void & Section
2. Ø Void & Section
3. Ø Void & Section
4. Ø Void & Section
5. Ø Void & Section

CONCRETE POLES
CONCRETE POLES

STRAIN POLE TYPE P-VIII

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

POLE ELEVATION
(Strands and Reinforcing Not Shown)

TIP END SECTION (TOP)
(For Dormant Strand Locations, See Section A-A)

SECTION A-A
(Typical Square Section)

STRAND LEGEND

- Prestressed Strand
  0.5 in. – 31 kips Before Transfer (12 Strands Total)

- Dormant Strand
  0.5 in. (8 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 10% L from the Tip End.

* Dimension may vary from 3¾" to 5" to accommodate smaller radius of optional stepped (PVC) void. The void diameter shall not be less than 6½".

(For Dormant Strand Locations, See Section A-A)
GENERAL NOTES:
1. Work this Index with Specifications 641.
2. This Index is considered fully detailed and no shop drawings are necessary. Submit Shop Drawings for minor modifications not detailed in the Plans.
3. Install pole plumb.
4. Provide either round or 12-sided Poles.
5. See Index 635-001 for additional details for Pull Boxes.
6. Materials:
   A. Pole: Use Class VI concrete with 6 ksi minimum strength at transfer.
   B. Prestressing Strands: ASTM A416, Grade 270 low relaxation.
   C. Reinforcing Steel: ASTM A615, Grade 60
   D. Spiral Reinforcing: ASTM A138B Cold-Drawn
   E. Bolts: ASTM F1554, Grade 55
   F. Nuts: ASTM A563, Grade A Heavy Hex
   G. Washers: ASTM F2329
   H. Steel plates and Pole Cap: AISI A36 or ASTM A709, Grade 50
   I. Galvanization bolts, nuts and washers: ASTM F2092
   J. All other steel: ASTM A124
7. Pole Fabrication:
   A. Cut the tip end of the prestressed strand first or simultaneously with the butt end.
   B. For spiral reinforcing, one turn is required for spiral splices and two turns are required at the top and bottom of pales.
   C. For Reinforcing Steel lap splice to consist of a 3'-0" lap length at each splice. No more than two opposing rebars to be spliced at the same cross section. Stagger lap splices as needed.
   D. Provide a Class 3 surface finish in accordance with Specification 400.
   E. Provide a 1" minimum cover.
   F. Provide handleless and coupler cover plates made of non-corrosive materials. Attach cover plates to poles using lead anchors or threaded inserts embedded in the poles in conjunction with round headed chrome plated screws.
   G. Provide identification markings on the poles where indicated on the following sheets. Include the following information using inset numerals with 1" height or as approved in the Producers' Quality Control Program:
   H. Tie ground wires to the interior of reinforcing steel as necessary to prevent displacement during concreting operations.
   I. Storage, Handling and Erection locations shown may vary within ± 3".
8. Cabinet Installation:
   A. Splice fiber optic cables in cabinet to preterminator patch panel.
   B. Furnish and install Surge Protection Devices (SPDs) in all cabinets in cabinet.
   C. Furnish and install secondary SPD's protection on outlets for equipment in cabinet.
   D. Ensure that all electronic equipment power is protected and conditioned with SPDs.
   E. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   F. Install the pole mounted cabinet with the hinges next to the pole.
   G. Provide Identification Markings on the poles where indicated on the following sheets. Include the following information using inset numerals with 1" height or as approved in the Producers' Quality Control Program:
   H. Storage, Handling and Erection locations shown may vary within ± 3".
9. Lowering Device Installation:
   A. Place the lowering cable that moves within the pole in an interior conduit to prevent it from tangling or interfering with any electrical wire that is in the pole. Ensure that any electrical work within the pole is routed securely and free from slack.
   B. Mount lowering arm perpendicular to the roadway or as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
   C. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking slots, etc.) with lowering device manufacturer.
   D. Ensure that all electronic equipment power is protected and conditioned with SPDs.
   E. Ensure that equipment cabinet is bonded to CCTV pole grounding system.
   F. Install the pole mounted cabinet with the hinges next to the pole.
   G. Provide Identification Markings on the poles where indicated on the following sheets. Include the following information using inset numerals with 1" height or as approved in the Producers' Quality Control Program:
   H. Storage, Handling and Erection locations shown may vary within ± 3".

CCTV POLE ASSEMBLY
**NOTES:**

1. Diameter of 12-sided poles are measured flat to flat.

2. Total Taper applies to pole, strands and reinforcing.

3. For 12-Sided Pole and Round Roles Option 2, Stress prestressed strand to 70% of ultimate before transfer. For Round Pole Option 3, stress prestressed strand to 60% of ultimate before transfer.

4. Pole Design Tables. Burial Depth is based on level ground (flatter than 1:5). For poles within slabs 1:5 and greater, increase the burial depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

**ADDITIONAL BURIAL DEPTH DUE TO GROUND SLOPE**

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<th>Ground Slope</th>
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**12-SIDED POLE DESIGN TABLE**

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**ADDITIONAL NOTES:**

1. Diameter of 12-sided poles are measured flat to flat.

2. Total Taper applies to pole, strands and reinforcing.

3. For 12-Sided Pole and Round Roles Option 2, Stress prestressed strand to 70% of ultimate before transfer. For Round Pole Option 3, stress prestressed strand to 60% of ultimate before transfer.

4. Pole Design Tables. Burial Depth is based on level ground (flatter than 1:5). For poles within slabs 1:5 and greater, increase the burial depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

**NOTES:**

1. Diameter of 12-sided poles are measured flat to flat.

2. Total Taper applies to pole, strands and reinforcing.

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**NOTES:**

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3. For 12-Sided Pole and Round Roles Option 2, Stress prestressed strand to 70% of ultimate before transfer. For Round Pole Option 3, stress prestressed strand to 60% of ultimate before transfer.

4. Pole Design Tables. Burial Depth is based on level ground (flatter than 1:5). For poles within slabs 1:5 and greater, increase the burial depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.
1. Install all handhole and opening covers prior to shipping.
2. Install ½" x 5' long stud with hex nut in insert before shipment.
3. As an alternate, embed 4½" Ø x 18" stainless steel threaded rods with a threaded nut. At top of rod, thread a coupling nut to attach plate at 4½" x 1½" stainless steel bolts.
4. Handhole frame may be Cast Aluminum 356.2.
NOTES:

1. Work with Index 634-001 for grounding and span wire details. See the Plans for clamp spacing, cable sizes and forces, signals and sign mounting locations and details.

2. Shop Drawings:

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

3. Materials:

A. Strain Pole and Backing Rings:
- Greater than or equal to Yield; ASTM A572 Grade 50, 55, 60 or 65
- ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield)

B. Steel Plates: ASTM A36

C. Bolt Steel: ASTM A307

D. Bolts, Nuts and Washers:
- Anchor Bolts: ASTM F1554 Grade 55
- Nuts: ASTM A563 Grade A Heavy Hex (5 per anchor bolt)
- Washers: ASTM A120 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 A120 (2 per bolt), split-lock washers and self-locking nuts are not permitted

F. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65

G. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65

H. Aluminum Pole Caps and Nut Covers: ASTM B26 (319-F)

I. Stainless Steel Screws: AISI Type 316

J. Threaded Bars/Studs: ASTM A36 or ASTM A307

K. Concrete: Class IV (Drilled Shaft) for all environmental classifications.

L. Reinforcing Steel: Specification 415

4. Fabrication:

A. Pole Taper: Change diameter at a rate of 0.14 inches per foot, round or 12-sided (Min.)

B. Upright splice is not permitted. Transverse welds are only permitted at the base.

C. Provide bolt hole diameters as follows:
- Bolts (except Anchor Bolts): Bolt diameter plus 1/4" prior to galvanizing.

D. Locate handhole 180° from 2" wire entrance pipe.

E. Identification Tag: Submittal details for approval.

F. Anchor Bolts: Bolt diameter plus 3/4", prior to galvanizing.

G. Provide a 2" x 4" (Max.) identification tag.

5. Coatings:

A. Foundation: Specification 455, except that payment is included in the cost of the strain pole.

B. After installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification 649-6.
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'-7". Use one clamp per cable.
2. Install a properly sized Weather Head, fastened securely to the standard pipe for each pole location. At locations other than the wire entrance, the Weather Head Face is to be left closed to outside atmosphere. Wire entrance installed per Index 634-001.
3. Any combination of Option 'a' or 'b' may be used provided both lifting and wiring is accommodated.

CLAMP THICKNESS TABLE

<table>
<thead>
<tr>
<th>Cable Diameter (in)</th>
<th>Minimum Breaking Strength (kip)</th>
<th>Plate Thickness (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/16</td>
<td>28</td>
<td>3/8</td>
</tr>
<tr>
<td>3/8</td>
<td>27.5</td>
<td>3/4</td>
</tr>
<tr>
<td>7/16</td>
<td>21.5</td>
<td>3/4</td>
</tr>
</tbody>
</table>

through Handhole

(See DETAIL 'A')

CATENARY AND MESSENGER WIRE CLAMPS

DETAIL "B"

2 - 1/2" holes for 2 - 1/8" x 2' Steel Passivated Cotter Pins

Wire Clamp

Flat Washer

Pole Cap Plate

1/2" Min. Bolt

1/2" Thick (Min.)

Steel Clamp, ASTM A500 Grade 50 (See Table For Thickness)

Wire Clamp

Partial Penetration Weld

Threaded Hole

Head Screw (Typ.)

1/2" Stainless Steel Hex Head Screw (Typ.)

1/4" Bolt With Double Nuts And Washers (Typ.)

1/4" Bolt With Double Nuts And Washers (Typ.)

(See Note 2)

2" NPS, Sch. 80 Pipe 28' Long, ASTM A530 Grade B

2 1/2" Hole For 2'-8" (Nominal) Ø Sch. 40 Pipe

(See DETAIL 'A')

HANDHOLE

WIRE ENTRANCE DETAIL

SECTION C-C

Pole

Center Of Pole, Pole Cap And Lifting Bar

2 1/2" Lifting Bar With 1/4" Hole And Matching Nut Tack Welded To Underside Of Bar

1/2" Overhang (Min.)

1/2" Hook For Wiring.

1/2" Commercial Grade Hot Rolled Bar Welded To Inside Of Pole

POLE TOP

ATTACHMENT DETAILS

FAA

DESCRIPTION:

FY 2019-20

STANDARD PLANS

INDEX

649-010

3 of 3

STEEL STRAIN POLE
GENERAL NOTES:
1. Work this Index with Specification 649.
2. This Index is considered fully detailed; only submit shop drawings for minor modifications not detailed in the Plans.
3. Materials:
   A. Pole: ASTM A1011 Grade 50, 55, 60 or 65 (less than \( f_y \)) or ASTM A372 Grade 50, 60 or 65 (greater than or equal to \( f_y \)) or ASTM A995 Grade A (55 ksi yield) or Grade B (60 ksi yield).
   B. Steel Plates and Pole Cap: ASTM A36 or ASTM A599 Grade 50.
   C. Weld Metal: E70XX.
   D. Bolts: ASTM F73216, Grade A325, Type 1.
   E. Washers: ASTM A563.
   F. Anchor Bolts: ASTM F1554 Grade 55 with ASTM A563 Grade A hex nuts and ASTM A36 plate washers.
   G. Handhole Frame: ASTM A109 Grade 36 or ASTM A36.
   H. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65.
   I. Stainless Steel Screws: AISI Type 316.
4. Reinforcing Steel: ASTM A615 Grade 60.
   J. Galvanization: Bolts, nuts and washers: ASTM F33216 All other steel including plate washer: ASTM A123.
   K. Concrete: Class IV (Drilled Shaft) for all environment classifications.
5. Fabrication:
   A. Welding:
      a. Specification Section 460-6.4 and
   B. Poles:
      a. Round or 16-sided (Min.)
      b. Taper pole diameter at 0.14 inches per foot
      c. Fabricate Pole longitudinal seam welds (2 maximum) with 60 percent minimum penetration or fusion welds except as follows:
         1. Use a full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection
         2. Use full-penetration groove welds on the female end section of telescopic (i.e., slip type) field splices for a minimum length of one and one-half times the inside diameter of the female section plus 6 inches.
      d. Pole shaft may be either one or two sections (with telescopic field splices)
      e. Circumferentially welded pole shafts and laminated pole shafts are not permitted
   C. Identification Tag: (Submit details for approval)
      a. 2" x 4" (Max.) aluminum tag
      b. Locate on the inside of the pole and visible from the handhole
   D. Except for Anchor Bolts, bolt hole diameters are bolt diameter plus \( f_y \) and anchor bolt holes are bolt diameter plus \( f_y \) (Max) prior to galvanizing.
6. Pole Installation:
   A. Do not install additional wire access holes (not shown in this Index) with a diameter that exceeds \( f_y \) in diameter.
   B. Install Anchor Bolts in accordance with Specification 649-5.
   C. Cable Supports: Electrical Cable Guides and Eyebolts.
      a. Locate top and bottom guide cables within the pole aligned with each other.
      b. Position one cable guide 2" below the handhole.
      c. Position other cable guide 1" directly below the top of the tenon.
      d. Position Park Stands 2" below the top of the handhole.
   D. Pole Supports: Bollard and Eye Bolts.
      a. 2" x 4" (Max.) aluminum tag
      b. Locate on the inside of the pole and visible from the handhole
      c. Secure with \( f_y \) diameter stainless steel rivets or screws.
   E. Include the following information on the ID Tag:
      1. Financial Project ID
      2. Pole Type
      3. Pole Height
      4. Manufacturers’ Name
      5. Yield Strength (\( f_y \) of Steel)
      6. Base Wall Thickness
   F. Accessory Installation:
      a. Pole Top (See Sheet 5)
      b. Pull Box (See Sheet 6)
      c. Air Terminal (See Sheet 6)
      d. Ground Rod (See Sheet 5)
   G. Pole Mount Cabinet Option (See Sheet 6)
   H. Ground Mounted Cabinet Option (See Sheet 6)
   I. Pull Box Option (See Sheet 6)
   J. Fiber Optic Pull Box (See Sheet 6)
   K. Shaft Diameter (See Sheet 3)
   L. Shaft Length (See Sheet 2)
7. Lowering Device Installation:
   A. Place the lowering cable that moves within the pole in an interior conduit to prevent it from tangling or interfering with any electrical wire that is in the pole. Ensure that any electrical wire within the pole is routed securely and free from slack.
   B. Mount the lowering device perpendicular to the roadway or as shown in the plans. Position CCTV pole so that the camera can be safely lowered without requiring lane closures.
   C. Coordinate all lowering device hardware requirements (including Tenon, Tenon mounting plates, parking stands, etc.) with lowering device manufacturer.
**SHAFT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Shaft Diameter</th>
<th>Shaft Length</th>
<th>Longitudinal Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>6'-0&quot;</td>
<td>11'-0&quot;</td>
<td>(14) #11</td>
</tr>
<tr>
<td>60</td>
<td>6'-6&quot;</td>
<td>12'-0&quot;</td>
<td>(14) #11</td>
</tr>
<tr>
<td>70</td>
<td>7'-0&quot;</td>
<td>14'-0&quot;</td>
<td>(18) #11</td>
</tr>
</tbody>
</table>

**ADDITIONAL BURIAL DEPTH DUE TO GROUND SLOPE**

<table>
<thead>
<tr>
<th>Ground Slope</th>
<th>4'-0&quot; Shaft Diameter</th>
<th>5'-0&quot; Shaft Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1.4</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1.3</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>1.2</td>
<td>9'-0&quot;</td>
<td>9'-0&quot;</td>
</tr>
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</table>

**BASE PLATE AND ANCHOR BOLT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Thickness (in.)</th>
<th>Anchor Bolt Diameter (in.)</th>
<th>Number of Bolts</th>
<th>Anchor Bolt Embedment (in.)</th>
<th>Minimum Anchor Bolt Projection (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>3.75</td>
<td>0.375</td>
<td>10</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>60</td>
<td>2.50</td>
<td>0.375</td>
<td>12</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>70</td>
<td>2.50</td>
<td>0.375</td>
<td>12</td>
<td>2.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**POLE DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Section 1 (Top)</th>
<th>Section 2 (Bottom)</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>12'-0&quot;</td>
<td>38'-0&quot;</td>
<td>0.375</td>
</tr>
<tr>
<td>60</td>
<td>12'-0&quot;</td>
<td>38'-0&quot;</td>
<td>0.375</td>
</tr>
<tr>
<td>70</td>
<td>12'-0&quot;</td>
<td>38'-0&quot;</td>
<td>0.375</td>
</tr>
</tbody>
</table>

**FOUNDATION NOTES:**
1. Shaft Length is based on 1'-0" height above the finished grade.
2. Shaft Design Table values are based on level ground (Flatter than 1:5). For foundation within slopes 1:5 and greater, increase the foundation depth in accordance with the Additional Burial Depth Due To Ground Slope table. For values in-between those shown in the table, use the higher value.

**BASE PLATE AND ANCHOR BOLT DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Base Plate Thickness (in.)</th>
<th>Anchor Bolt Diameter (in.)</th>
<th>Number of Bolts</th>
<th>Anchor Bolt Embedment (in.)</th>
<th>Minimum Anchor Bolt Projection (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>3.75</td>
<td>0.375</td>
<td>10</td>
<td>2.0</td>
<td>3.0</td>
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<tr>
<td>60</td>
<td>2.50</td>
<td>0.375</td>
<td>12</td>
<td>2.0</td>
<td>3.0</td>
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<tr>
<td>70</td>
<td>2.50</td>
<td>0.375</td>
<td>12</td>
<td>2.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**POLE DESIGN TABLE**

<table>
<thead>
<tr>
<th>Pole Overall Height (ft)</th>
<th>Section 1 (Top)</th>
<th>Section 2 (Bottom)</th>
<th>Joint</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>12'-0&quot;</td>
<td>38'-0&quot;</td>
<td>0.375</td>
</tr>
<tr>
<td>60</td>
<td>12'-0&quot;</td>
<td>38'-0&quot;</td>
<td>0.375</td>
</tr>
<tr>
<td>70</td>
<td>12'-0&quot;</td>
<td>38'-0&quot;</td>
<td>0.375</td>
</tr>
</tbody>
</table>
NOTES:
1. Shaft Length is based on 1'-0" height above the finished grade.
2. Double Nuts: Bottom nut may be half-height (last nut); provide individual nut covers (not shown) for each bolt.
3. Conduit and CSL Tubes not shown for clarity.
4. Work these details with data Table on Sheet 2.
NOTE:
To secure the cover plate, install a steel chain from the cover to the pole or by mounting the cover with hinges and install a pad lock tab.
Pole Top Or Tenon

4 1 7

1 1 5

2

4 3 1

2 1 2

2" R

Cable Guide
Tenon Cap Plate ¾" Thick
Tenon Wall
½" Ø Hole (Typ.)
12 ⅜" X 3" Slots Equally Spaced

Pole Tip O.D. + ½"

8 ⅜" Ø Holes Equally Spaced

1" Plate

4 ½" X 3 ½" Bolts With Double Nuts and Washers

ELEVATION

PLAN VIEW

Equally Spaced Ø Holes

16 13 8~

CAP PLATE

POLE TOP DETAIL

1'-7" (Typ.)

1'-9" For 70' Poles

1'-5" (Typ.)

1'-7" For 70' Poles

CAP PLATE DETAIL

POLE TOP DETAIL

POLE TOP PLATE

POLE TOP PLATE

LOWERING DEVICE TENON

TENON COVER

PLAN VIEW

Cap Plate ½" Thick

Cap Plate ½" Thick

Cap Plate ½" Thick

2'-0"

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'

20'
### Standard Mast Arm Assemblies

#### ARM AND BASE PLATE

<table>
<thead>
<tr>
<th>Arm ID</th>
<th>Arm</th>
<th>Arm Extension</th>
<th>Base Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A30/H</td>
<td>30</td>
<td>11</td>
<td>0.250</td>
</tr>
<tr>
<td>A30/SH</td>
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<td>12</td>
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<td>50</td>
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<td>17</td>
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<tr>
<td>A70/SH</td>
<td>70</td>
<td>18</td>
<td>0.250</td>
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</tbody>
</table>

#### POLE, BASE PLATE AND ARM CONNECTION

<table>
<thead>
<tr>
<th>Pole ID</th>
<th>Upright</th>
<th>Arm-Upright Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1/S</td>
<td>16</td>
<td>0.375</td>
</tr>
<tr>
<td>P1/10</td>
<td>9</td>
<td>37.5</td>
</tr>
<tr>
<td>P1/12</td>
<td>25</td>
<td>37.5</td>
</tr>
<tr>
<td>P1/D</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>P2/S</td>
<td>18</td>
<td>0.375</td>
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<td>P2/10</td>
<td>9</td>
<td>37.5</td>
</tr>
<tr>
<td>P2/12</td>
<td>25</td>
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#### DRILLED SHAFT

<table>
<thead>
<tr>
<th>Drilled Shaft ID</th>
<th>DA (ft)</th>
<th>DB (ft)</th>
<th>RA</th>
<th>RB</th>
<th>RC</th>
<th>RD (in)</th>
<th>RE</th>
<th>RC (in)</th>
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<tbody>
<tr>
<td>DS/12/4.0</td>
<td>12</td>
<td>4.0</td>
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<td>12</td>
<td>4.5</td>
<td>11</td>
<td>16</td>
<td>8</td>
<td>12</td>
<td></td>
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<tr>
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<td>5.0</td>
<td>11</td>
<td>18</td>
<td>10</td>
<td>8</td>
<td></td>
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</tr>
<tr>
<td>DS/16/4.5</td>
<td>16</td>
<td>5.0</td>
<td>11</td>
<td>18</td>
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<td>11</td>
<td>18</td>
<td>10</td>
<td>8</td>
<td></td>
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</tr>
<tr>
<td>DS/20/5.0</td>
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<td>11</td>
<td>18</td>
<td>10</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DS/25/5.0</td>
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<td>5.0</td>
<td>11</td>
<td>18</td>
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<td>9</td>
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</table>

#### LUMINAIRE AND CONNECTION

<table>
<thead>
<tr>
<th>LA (in)</th>
<th>LB (in)</th>
<th>LC (in)</th>
<th>LD (in)</th>
<th>LE (in)</th>
<th>LG (in)</th>
<th>LM (in)</th>
<th>LJ (in)</th>
<th>LK (in)</th>
<th>LL (in)</th>
<th>US (deg)</th>
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<tbody>
<tr>
<td>30</td>
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<td>0.75</td>
<td>0.25</td>
<td>0.25</td>
<td>0</td>
</tr>
</tbody>
</table>

**NOTE:**
1. Work this Index with Index 649-031.
GENERAL NOTES:
1. Shop Drawings. This Index is considered fully detailed, only submit shop drawings for minor modifications not detailed in the Plans.
2. Prior to Fabrication: Verify that the installed foundation elevation will result in the required signal elevation and adjust the Pole height as needed.
3. Details for Signal and Sign locations, Signal Head attachment, Sign attachment, Pedestrian Head attachment, and Foundation Conduit are not shown for simplicity.

4. Materials:
   A. Poles, Mast Arm and Backing Rings
      a. Less than 34" ASTM A1011 Grade 50, 55, 60 or 65
      b. Greater than or equal to 34" ASTM A52 Grade 50, 55, 60 or 65
   B. Steel Plates: ASTM A36
   C. Weld Retal: E6011
   D. Bolts, Nuts and Washers:
      i. High Strength Hex Head Bolts: ASTM F3125, Grade A325, Type 1
      ii. Nuts: ASTM A563 DH Heavy-Hex
   E. Anchor Bolts, Nuts and Washers:
      i. Anchor Bolts: ASTM F1554 Grade 55
      ii. Nuts: ASTM A563 Grade 56 (Grade 56 or Grade 60 per anchor bolt)
      iii. Plate Washers: ASTM A96 (2 per bolt)
   F. Threaded Bars/Studs, ASTM A307
   G. Handhole Frame: ASTM A1009 or ASTM A490, Grade 36
   H. Handhole Cover: ASTM A1011 Grade 50, 55, 60 or 65
   I. Aluminum Pole Caps and Nut Covers: ASTM B26 (319-F)
   J. Stainless Steel Screws: ASME B26 Type 16
   K. Concrete: Class IV (Drilled Shaft) for all environmental classifications.
   L. Reinforcing Steel: Specification 415

5. Fabrication:
   A. Welding:
      i. Specification Section 460-6-4 and
      ii. ASME LRFD Specification for Structural Supports for Highway Signs, Luminaries, and Traffic Signals Section 14.4
   B. Poles and Mast Arms:
      i. Round or 12-sided (Min)
      ii. Taper pole diameter at 0.14 inches per foot
      iii. Upright poles must be a single section
      iv. Arms may be either one or two sections
      v. Upright poles must be a single section
      vi. Arms may be either one or two sections
   C. Upright poles must be a single section
      i. Fabricate longitudinal seam welds with 60 percent minimum penetration or fusion welds except:
         1. Use full-penetration groove weld within 6 inches of the face of the plate connection
         2. Use full-penetration groove weld on the face of the pole-facing side of the joint (i.e., slip type) field splices for a minimum length of one and one-half times the inside diameter of the female section plus 6 inches
      d. Locate longitudinal seams weld along the:
         i. Lower quadrant of the arms
         ii. Same side of the pole as the arm connections
      e. Fabricate longitudinal seam welds with 60 percent minimum penetration or fusion welds except:
         1. Use full-penetration groove weld within 6 inches of the circumferential tube-to-plate connection
         2. Use full-penetration groove weld on the face of the pole-facing side of the joint (i.e., slip type) field splices for a minimum length of one and one-half times the inside diameter of the female section plus 6 inches
      f. Locate longitudinal seams weld along the:
         i. Lower quadrant of the arms
         ii. Same side of the pole as the arm connections
      g. Face handhole perpendicular from arm on single arm poles, perpendicular from the first arm of double arms poles facing away from traffic or see special instructions on the Mast Arm Tabulation Sheet
      h. Provide a 2’-0” x 4’-0” square hole at the top of the pole for signal wiring support (See Sheet 6)
         i. First and Second arm camber angle = 2°
         j. Bolt holes diameters as follows:
            i. Bolts (except Anchor bolts): Bolt diameter plus 1/8” (Max.)
            ii. Anchor Bolts: Bolt diameter plus 1/4” (Max.)
   6. Coatings:
      A. All Nuts, Bolts, Washers and Threaded Bars/Studs: ASTM F2329
      B. All other steel items including plate washers ASTM A123

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

ELEVATION AND NOTES

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</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 649-030 and the plans for actual quantity of bolts in the Base Plate Connection.

3. The bottom hex nut of the Double Nuts shown in Section A-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

DESCRIPTION:

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

2. See Index 649-030 and the plans for actual quantity of bolts in the Base Plate Connection.

3. The bottom hex nut of the Double Nuts shown in Section A-A may be substituted by a half-height "jam" nut. Provide individual nut covers (not shown) for each bolt.

SECTION A-A

FOUNDATION AND BASE PLATE DETAILS

BASE PLATE CONNECTION

FOUNDATION

MAST ARM ASSEMBLY

PLAN

ELEVATION

JOINT WELD DETAIL

DETAIL 'A'

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INDEX

SHEET

REV ISIO N

DESCRIPTION:

CENTRE OF DRILLED SHAFT, BASE PLATE AND POLE

BASE PLATE DIA.

6" COVER

6 SPACES @ 4"

#5 TIE BARS

EQ Spacing

(Ll N eed e d)

#5 TIE BARS

RE" SPACES @ RE"

"R" # "R" BARS

EQ Spacing

"R" # "R" BARS

EQ Spacing

CSL TUBE (Typ.)

PLAN

ELEVATION

JOINT WELD DETAIL

DETAIL 'A'

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MAST ARM ASSEMBLIES

INDEX

SHEET

REV ISIO N

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

1. **MAST ARM ASSEMBLY**
   - Install the ‘Slip Joint’ splice with a tight fit and no change in the mast arm taper due to the splice.
   - 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.
   - Match mark the arm and connection plates to ensure proper assembly and the seam weld is in the proper location (seam located at the bottom side of the arm).
   - ‘UF’ measured counter clockwise from ‘F’ first mast arm extension.
   - Adjust width of top and bottom connection plates to maintain minimum clearance shown.

2. **DOUBLE ARM CONNECTION & SPLICE DETAILS**
   - Six ‘SP’ Ø connection bolts (may vary for special design).
   - A Ø wiring hole 4" Ø threaded bar/stud with self locking nut.
   - Provide ultrasonic testing for lamellar tearing in connection plates when seam weld (typ. seam weld flat to flat).
   - Minimum internal bend radius = 5x wall thickness (1" Min.)
   - ‘F’, ‘S’, ‘SE’ – Base diameters measured flat to flat.
   - 2x ‘SP’ dia. connection bolt.
   - Minimum internal bend radius (see note 3).
   - Seam weld (typ.) 2" Min. (typ.)
   - 2x ‘SP’ dia. connection bolts.
   - Inside radius measured center to flat.
   - 1" Min. (Nominal) ‘ST’ = 2'-0".

**NOTE:**

- **SECTION E-E**
  - ‘S’Ø connection bolt.
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.

- **SECTION F-F**
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.
  - ‘ST’Ø dia. connection bolt.

- **SECTION G-G**

**LAST REVISION:** 11/01/17

**INDEX:** 649-031

**SHEET:** 4 of 6
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 1/2" 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

SECTION I-I

LUMINAIRE ORIENTATION

LUMINAIRE CONNECTION ELEVATION

LUMINAIRE ELEVATION

LUMINAIRE ARM AND CONNECTION DETAILS

DESCRIPTION:

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NOTES:

1. Handhole covers may be omitted when Terminal Compartment is provided.

2. See Mast Arm Tabulation sheet to see if Terminal Compartment is required for locations.

3. Terminal Compartment Frame Height 2'-0" minimum to 2'-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.
NOTES:
1. As an option, pedestrian signals may be installed on concrete poles and pedestals using lead anchors (two bolts same size per hub) in lieu of the stainless steel bands.
2. Repair drilled or punched holes in galvanized steel poles or pedestals in accordance with Specifications 562. Install grommets or bushings in each hole.
3. Meet grounding requirements of Specifications 620.
4. See APL for Department-approved Pedestrian Signal Assemblies and hardware.
5. Construct footing with Class I Concrete, footing may be Cast-In-Place (CIP) or Precast.
6. For Steel Strain Poles see Index 649-010.
7. For Prestressed Concrete Poles see Index 641-010.
8. Install 4 ~ \( \frac{3}{8} \) x 18' Anchor Bolts With Double Nuts. (ASTM F1554 Grade 55)
9. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.
NOTES:
1. A transformer base is required for both conventionally-powered and solar-powered applications (conventional power shown).
2. Install the RRFB in pairs, one on either side of approach traffic.
3. Install controller on the backside of post from approach traffic.
4. Install a 30" X 30" W11-2 sign on two-lane roadways and a 36" X 36" W11-2 sign for multilane roadways.
5. Install push button and R10-25 sign in accordance with Index 665-003.
6. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.
7. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.
8. Install a concrete slab around all pull boxes. The minimum slab dimension is 4'-0" by 4'-0". In urban areas where space is limited slab dimensions may be adjusted as shown in the Plans.
9. For assemblies connected to conventional power, provide single pole non-fused watertight breakaway electrical connectors in the fragile transformer base.
10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.
11. For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.

3 " 1 '-0 "

V a rie s

(If Installed) and Controller

7 '-0 "
W11-2 Sign (See Note 5)

W11-2 Sign for Conventionally-Powered Applications)

Transformer Base and Foundation (See Detail "B"

Transformer Base is required for both conventionally-powered applications.

1. A transformer base is required for both conventionally-powered and solar-powered applications (conventional power shown).

2. Install the RRFB in pairs, one on either side of approach traffic.

3. Install controller on the backside of post from approach traffic.

4. Install a 30" X 30" W11-2 sign on two-lane roadways and a 36" X 36" W11-2 sign for multilane roadways.

5. Install push button and R10-25 sign in accordance with Index 665-003.

6. Engage all threads on the transformer base and post unless the aluminum post is fully seated into base.

7. Meet the requirements of Specifications 646 for aluminum poles and transformer bases.

8. Install a concrete slab around all pull boxes. The minimum slab dimension is 4'-0" by 4'-0". In urban areas where space is limited slab dimensions may be adjusted as shown in the Plans.

9. For assemblies connected to conventional power, provide single pole non-fused watertight breakaway electrical connectors in the fragile transformer base.

10. When wire entry holes are drilled in the sign column, use a bushing or rubber grommet to protect conductors.

11. For solar-powered applications, orient solar panel to face South for optimal exposure to sunlight.
NOTES:

1. Materials:
   A. Sign panels, wind beams and associated hardware: See Index 700-020
   B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL
   C. Wire and additional hardware requirements: See Specification 634

2. Type B and C Attachments:
   A. Extend wind beams to within 6" of the sign edge.
   B. Number of sign hangers required based on sign width:
      a. Sign width < 4' - 0": One
      b. 4' - 0" ≤ sign width ≤ 7' - 0": Two
   C. Number of wind beams required based on sign depth:
      a. Sign depth < 3' - 0": One
      b. 3' - 0" ≤ Sign depth ≤ 7' - 0": Two

3. Type D Attachments:
   Maximum sign width = 7' - 0"

4. Align the bottom edges of signs to approximately the same elevation.

5. Use a minimum of 2 bolts with a minimum spacing of 2" for overlapped connection of the adjustable hangers.

---

TYPICAL INSTALLATIONS FOR SIGN PANEL(S) MOUNTED ON SPAN WIRE

1. Materials:
   A. Sign panels, wind beams and associated hardware: See Index 634-001
   B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL
   C. Wire and additional hardware requirements: See Specification 634

B. Sign adjustable hangers, wire rope clamps and associated hardware: See APL

---

OPPOSING SIGN MOUNTING DETAIL
GENERAL NOTES:

1. Lowering device to be shipped ready for pole attachment to include 100 ft. of composite power and signal cable prewired to lowering device at the factory.
2. The lowering device manufacturer shall supply both a portable lowering tool with a manual hand crank and a half-inch chuck variable-speed reversible industrial-duty electric drill that matches the winch's manufacturer-recommended revolutions per minute. One lowering tool per every 10 lowering devices is required.
3. The lowering device manufacturer shall provide an on-site installation inspection and operator instruction and certification. This ensures the product is assembled correctly and that all necessary persons are trained in the proper, safe operation of the system. Before erecting the first pole the contractor must contact the lowering device supplier and schedule a manufacturer's representative to be on-site.
5. Camera to be mounted to camera junction box and stabilizing weight via 1 1/2" Standard NPT Pipe Thread.
6. Use air terminal extension when the pole top junction box is wider than top of pole.
7. The stainless steel device lowering cable shall be installed inside the pole within a 1 1/2" diameter PVC conduit.
8. All communication and power cables must be neatly bundled and secured.
10. See Index 641-020 for concrete pole details and Index 649-020 for steel pole details.
**DESCRIPTION:**

REVISION DESCRIPTION

Revised: 11/01/17

EXAMPLES:

- Camera Mounting Details
- Pole Plate with Stainless Steel Band (Or Method Approved By Engineer)
- Camera Connector Harness Supplied To Match Camera
- Camera Mounting With Fixed Bracket

**GENERAL NOTES:**

1. Verify the pole type, the dimensions of the pole at the point of installation of the camera mount, and angle with respect to the roadway before manufacturing camera mount assembly.

2. Design camera mounting arm and connection to the pole according to FDOT Structures Manual (current edition).

3. No field welding shall be permitted.

4. Mounting bracket arm shall be level after installation.

5. The contractor shall submit shop drawings for the proposed fixed mounting arm, signed and sealed by a Professional Engineer registered in the State of Florida, to the Engineer for review and approval.


7. Galvanized pipe connections and conduit entry points shall be sealed in accordance with Specification 630.

**CAMERA MOUNTING WITH FIXED BRACKET**

**SECTION AA**

- Pole Plate with Stainless Steel Band (Or Method Approved By Engineer)
- Camera Support Base by Aluminum To Copper #2-#14 AWG Lug, Attatched To Camera Base With A Stainless Steel Screw. Remove Paint or Protective Coating Where Attaching Lug.
- Strain Relief Fitting
- Camera Connector Harness Supplied To Match Camera
- Do not exceed 30" (max.) Dia.
- Varieties (2' Max.)
- Pole Plate With Stainless Steel Band (Or Method Approved By Engineer)
- Bond #4 AWG Tin-Plated Bare Solid Copper Ground Wire To Camera Support Base By An Aluminum To Copper #2-#14 AWG Lug, Attached To Camera Base With A Stainless Steel Screw. Remove Paint or Protective Coating Where Attaching Lug.

**CLEANING & REMOVAL:**

- Stainless Steel Band
- Stainless Steel Screw

**NOTES:**

- Mounting bracket arm shall be level after installation.
- The contractor shall submit shop drawings for the proposed fixed mounting arm, signed and sealed by a Professional Engineer registered in the State of Florida, to the Engineer for review and approval.
- The contractor shall coordinate with the CCTV camera manufacturer for bracket design and flange connection.
- Provision for CCTV camera designed to match mounting.
- Fixed mounting bracket must be designed to match mounting.
- galvanized nipple for steel poles. hold with nipple grommet for steel poles.
- Cast in Place 2" Galvanized Nipple for Concrete Poles, hold with nipple grommet for steel poles.
- Stainless Steel Band
- Stainless Steel Screw

**INDEX 659-020**
GENERAL NOTES:

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

2. Provide sufficient saw-cut width to allow unforced placement of loop wires or lead-in cables into the saw-cut. Except across expansion joints, saw-cut to a standard depth of 3", but no more than 4" below the top of the final surface.

3. On resurfacing or new roadway construction projects, drill the loop wires and lead-in cables in the asphalt structural course prior to the placement of the asphalt friction course. Place the loop wires and lead-in cables in a saw-cut in the structural course.

4. Use nonmetallic hold down material to secure loop wires and lead-ins to the bottom of saw-cuts. Place the hold down material approximately 12" intervals around loops and 24" intervals on lead-ins.

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

6. Splice Connections in pull boxes with UL listed, watertight, insulated enclosures. Pre-drill and seal holes. Use a nonmetallic material to prevent excessive loop sealant from entering the rigid conduit.

7. Do not disturb more than a 6" x 6" area of asphalt. Restore asphalt as directed by the Engineer.

8. Alternative installations may be approved by the State Traffic Operations Engineer.

NOTES:

1. Drill a hole through the curb at the point which the required saw-cut depth is obtained just prior to pulling the top inside edge of the curb.

2. Install a section of flexible conduit at least 6" into the hole from the back side of the curb but not within 2" of the top of the hole.

3. Insure the conduit fits snug within the drilled hole.

4. Fill the top of the hole with loop sealant to the level of the curb surface.

5. Use a nonmetallic material to prevent excessive loop sealant from entering the flexible conduit.

ELEVATION

INSTALLATION WITHOUT CURB & GUTTER

ALTERNATIVE 1

To Pullbox or Cabinet

PVC Coated Flexible Conduit

Twisted Pair or Loop Lead-In in Saw-Cut

Intermediate Pullbox

To Pullbox or Cabinet

PVC Coated Flexible Conduit

Twisted Pair or Loop Lead-In in Saw-Cut

Gutter

NOTE:

1. Drill a hole 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.

2. Install a molded bushing (nonmetallic) on the roadway (or concrete) surface and base at an appropriate angle to intercept the trench or pull box hole.

3. Place the top of the rigid conduit approximately 2" below the roadway surface.

4. Fill the hole with loop sealant to the level of the roadway surface.

5. Use a nonmetallic material to prevent excessive loop sealant from entering the rigid conduit.

INSTALLATION WITH CURB & GUTTER

ALTERNATIVE 2

To Pullbox or Cabinet

PVC Coated Flexible Conduit

Twisted Pair or Loop Lead-In in Saw-Cut

Intermediate Pullbox

Slot (See General Note 8)

Rigid Conduit

Gutter

CONNECTOR

NOTE:

1. Install the conduit at least 6" into the roadway pavement and approximately 2" below the top of the roadway surface.

2. The departure angle of the conduit from the roadway is between 30° to 45°.

3. The departure angle of the conduit from the roadway pavement and approximately 2" below the top of the final surface.

4. Fill the top of the hole with loop sealant to the level of the roadway surface.

5. Use a nonmetallic material to prevent excessive loop sealant from entering the rigid conduit.

VEHICLE LOOP INSTALLATION DETAILS

DESCRIPTION:

REVISION

LAST

REVIEW

INDEX

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STANDARD PLANS

1 of 2
**NOTES:**

1. The number of "Turns" indicated at the specified point on the loop refers to the number of passes of loop wires which are placed in the saw-cut forming the complete loop.

2. Loop types or details not drawn to scale.

3. Loop Types are centered in a single lane except Type E which is centered on two lanes.

4. The number of individual loops in the Type G loop may vary up to a maximum of four (4).

5. Lead-in may be connected to either end of loop.

6. When shown in the Plans, the leading edge of loop Types A, C, D, & F may extend past the stop line a maximum of 10' and the length of these loops may be extended to a maximum of 60'.

7. Do not install loop lead-in wires in the same pull box with signal power cable.

---

**LOOP TYPES, EXPANSION JOINTS, AND DETAILS**

**LOOP TYPES**

- **TYPE A**
- **TYPE B**
- **TYPE C**
- **TYPE D**
- **TYPE E**
- **TYPE F**
- **TYPE G**

**CONCRETE PAVEMENT EXPANSION JOINTS**

**LOOP CORNER AND LEAD-IN DETAILS**
NOTES:
1. Mount Signs above the detectors. See Index 700-102 for sign details.
2. Install Pushbuttons and Pedestrian Actuation Signs with faces parallel to the crossing direction.
3. Mount pushbuttons and Signs in accordance with Specification 665.
4. Install all grounding per Specification 620.
5. Pushbutton mounting height shown above is taken at the center of the actuation switch.
**SIGNAL CLEARANCE TABLE**

<table>
<thead>
<tr>
<th>Fm</th>
<th>R</th>
<th>G</th>
<th>WALK</th>
<th>DONT WALK</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR</td>
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<tr>
<td>IR</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**

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

Vehicle movements & signal head number assignments are not directionally oriented but shall maintain their relative orientation about the intersection (I.E., movements 7 and 4 are always to the right of movements 1 and 6 etc.).

**Vehicle Movement Number**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

**Pedestrian Movement Number**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

**Timing Function Number**

- 1
- 2
- 3
- 4

**Phase Number**

- 1
- 2
- 3
- 4

**Green Arrow (Left or Right)**

- Left
- Right

**Red Arrow**

- Red

**Yellow Arrow**

- Yellow

**Major Street**

- North
- South
- East
- West

**Minor Street**

- North
- South
- East
- West

Vehicle movements & signal head number assignments are not directionally oriented but shall maintain their relative orientation about the intersection (I.E., movements 7 and 4 are always to the right of movements 1 and 6 etc.).
NOTES:
1. If cabinet mounting requires relocation of hole in concrete pole, fill existing hole with concrete or cover with a noncorrosive cover plate.
2. Liquidtight flexible conduit is approved for use from the electrical disconnect to the cabinet when both are installed on the same pole.

POLE MOUNTED CONTROLLER CABINET

NEW CONTROLLER CABINET

EXISTING CONTROLLER CABINET

PEDESTAL MOUNTED CABINET

INTERCONNECT JUNCTION BOX
CABINET LAYOUT DETAILS (Four Lanes or Less)

1. Traffic monitoring site cabinet includes:
   A. One adjustable shelf; (equipped as shown)
   B. One backplane assembly; (equipped as shown)
   C. One J1 receptacle with mounting bracket; (See Note 5)
   D. One J1 equipment cable 5 ft. long (Reference Sheet 4);
   E. All associated wiring and wiring harnesses.

2. Basic backplane assembly consists of:
   A. Two inductive loop terminal strips;
   B. One piezo sensor terminal strip;
   C. One battery terminal strip;
   D. One solar panel terminal strip;
   E. All associated wiring and wiring harnesses.

3. The contractor is responsible for contacting the TMS manager at the Transportation Statistics office for lane number information and verification.

4. Speed/Classification unit and Modem furnished separately.

5. Cable ends must be fabricated to fit the vehicle speed/classification unit (Reference Sheet 4).

NOTE:
Fabricate bracket out of 3/8 - 1/8 inch thick aluminum. Dimensions may vary depending on the manufacturer of the J1 receptacle being furnished. The cabinet manufacturer will construct the mounting bracket to fit the receptacle.

CABINET LAYOUT DETAILS (Four Lanes or Less)
CABINET LAYOUT DETAILS (Five to Eight Lanes)

NOTES:
1. Traffic monitoring site cabinet includes:
   A. One adjustable shelf (equipped as shown)
   B. Two basic backplane assembly (equipped as shown)
   C. Two J1 receptacle with mounting bracket
   D. One J1 equipment cable 5 ft. long (Reference Sheet 4)
   E. All Associated wiring and wiring harnesses
2. Basic backplane assembly consists of:
   A. Two inductive loop terminal strips
   B. One piezo sensor terminal strip
   C. One battery terminal strip
   D. One solar panel terminal strip
3. The contractor is responsible for contacting the TMS Manager in the Transportation Statistics Office for lane number information and verification
4. Speed/Classification unit and modem furnished separately
5. Cable ends must be fabricated to fit the vehicle speed/classification unit (Reference Sheet 4 for Pinout Charts, receptacle and plug details)
NOTES:
1. Reference Sheet 1 or 2, Note 2 for items to be included with backplane.
2. All terminal strip contacts are on 1/2" centers (Clinch 142 Series or equal)
   Use insulated fork wire terminations.
3. The contractor is responsible for contacting the TMS Manager in the Transportation
   Statics office for lane number information and verification.
1. The contractor is responsible for contacting the TMS Manager in the Transportation Statistics Office for lane number information and verification.

2. The equipment cable can accommodate up to four lanes of inductive loop and sensor inputs. (Reference Sheet 1 for cabinet layout)

3. For more than four lanes and up to eight lanes of inputs, the following options are available:
   - Second Vehicle Speed/Classification Unit and separate equipment cable connecting to a second J1 receptacle; or
   - Single Vehicle Speed/Classification Unit capable of up to eight lanes of inputs and a single equipment cable with split ends to fit two J1 receptacles. (Reference Sheet 2 detail)

4. Numbers in parenthesis in the pinout chart identify lane numbers when a second backplane for lanes 5 through 8 is required.

5. Cable ends must be fabricated to fit the vehicle Speed/Classification Unit.
ROADWAYS WITH PAVED SHOULDERS

1. Install axle sensors and loops associated with axle sensors after placement of the friction course.

2. Cut a 3/8" deep slot for the Inductive loops. Loop slots will be cut wide enough to allow unforced placement of the loop wire into the bottom of the slot. Floor turns of #14 AWG plus the IMCA 51-7 copper wire in the slot. Place short pieces of backer rod (2'-0" in length) every 18'-0" to 24'-0" to hold the loop wire in the bottom of the slot.

3. Twist loop leads at the rate of 8 to 16 twists per foot. Leads that are within 15'-0" of the cabinet, extend the twisted pair loop wire directly to the cabinet. For distances over 15'-0", #14 IMCA 50-2 shielded lead-in cable must be spliced to the loop wire twisted pair at the first pull box to which the loop wire is pulled.

4. Marking will consist of two rounds of contrasting colored tape, one color for the lane number and the second color for the lead loop location in the lane. The first band closest to the cabinet will represent the lane number, one round of tape will be lane 1 and two rounds will be lane 2, etc. The lead loop in lane one would have one round of tape and a second round of a contrasting colored tape for the lead loop in the lane. The trailing loop would not have a second contrasting colored band of tape.

5. See Index 635-001 for pull box and apron details.

6. All splices will be performed using splice kits designed for direct burial. Splice kits will include screw on wire connectors and a housing with sufficient sealant to fully encapsulate the spliced connections. Taped splices are not permitted.

7. Use a chalk line or string and paint to layout the position of the sensor and lead-in cable slots. Ensure saw cuts do not deviate more than 0.5 inches from the chalk line. Use a single blade or ganged blade saw wide enough to cut the axle sensor slot at full width in a single pass. Cutting two slots and chipping out roadway material between them is not allowed.

8. All sensor slots and any cuts in the roadway will be thoroughly blown out to ensure there is no dust or debris prior to installation of sensors or leads.

9. Install Exit Windows at least 2'-0" apart.

NOTES:

- TYPICAL FOR UP TO 4 LANES OF SENSOR LEADS PULLED TO ONE SIDE OF THE ROADWAY
- LANE LAYOUT FOR TMS INDUCTIVE LOOP AND AXLE SENSOR

INDEX 695-001

SHEET 5 of 7
NOTES:

1. The unit must be capable of detecting up to eight lanes of traffic (in either or both directions) when mounted perpendicular to the roadway.

2. Coverage area of the unit is affected by the roadway geometry: distance from the travel lanes, median type and width, barrier walls, etc.

3. Mounting height of the unit and offset from the roadway must be determined on a site-by-site basis, in accordance with the manufacturer’s recommended guidelines. Offset of pole must be greater than or equal to minimum clear zone requirements.

4. Non-Intrusive Vehicle Sensor Mounting. Height must be adjusted to optimize the unit’s coverage area.
NOTE:

1. Cabinet installed per Index 676-010 except cabinet center will be 4 feet above grade.

2. Place pole in accordance with the Standard Specification 125.4 and 125.8.2.

3. Use #10 AWG stranded copper wire for Solar Panel Array installations. Red insulation is THHN or THWN for positive 12 volts wiring, Black insulation is THHN or THWN for negative, 12 volts wiring, Green insulation is THHN or THWN for ground bonding of the solar panel frame to the pole and earth.

4. Solar panel should be installed facing due south with angle of tilt equal to the sum of the following equation: The Latitude of the panel's location multiplied by 0.76, plus 3.1 degrees. Equation expressed as (LAT)(0.76)+(3.1°)

5. Encase all wiring from the weather head to the solar panel in outdoor flexible conduit.

6. Concrete Base Requirements.
   a. 4 poles, 2'-0" X 2'-0" wide, a depth of 2'-0"
   b. 12', 15' or 20' poles: 3'-0" X 3'-0" wide, a depth of 3'-0"
   c. 30' or 35' poles: 3'-0" X 3'-0" wide, a depth of 4'-0"

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