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<td>Bracketing for HAWK Signal Displays</td>
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<td>SIG-431-A</td>
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<td>Span Wire Mounted Video Detection Camera</td>
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<td>SIG-440-A</td>
<td>Microwave Vehicle Detector</td>
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<td>SIG-460-A</td>
<td>Radar Stop Bar Detection</td>
<td>2</td>
</tr>
</tbody>
</table>
**Typical Span Wire Installation T.S. on Steel and Wood Poles**

**NOTE:**
1. Use number & type of T.S. as called for on plan.
2. Align red indications at same height per approach.
3. This dimension will exceed 17’ when there is a 4 section head on the same span (in order to keep red indications at same elevation).
4. Preformed lashing rod to be installed the full length where signal wire is installed with span wire.

<table>
<thead>
<tr>
<th>NO.</th>
<th>ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Traffic signal (no. heads as indicated)</td>
</tr>
<tr>
<td>2</td>
<td>Span wire hanger</td>
</tr>
<tr>
<td>3</td>
<td>5/36&quot; extra high strength span wire</td>
</tr>
<tr>
<td>4</td>
<td>3&quot; Service cap (weatherhead), (metal for steel and PVC for wood poles)</td>
</tr>
<tr>
<td>5</td>
<td>P.J. traffic signal cable (as specified)</td>
</tr>
<tr>
<td>6</td>
<td>Preformed lashing rod</td>
</tr>
<tr>
<td>7</td>
<td>Pole band clamp (Steel pole)</td>
</tr>
<tr>
<td>8</td>
<td>Guy thimble (2&quot; dia.)</td>
</tr>
<tr>
<td>9</td>
<td>(2) 5/8&quot; x 4&quot; long bolt, nut, washers per pole band clamp (steel pole)</td>
</tr>
<tr>
<td>10</td>
<td>Install span wire preformed (lumbar rod) under each span hanger</td>
</tr>
<tr>
<td>11</td>
<td>Access hand hole all new &amp; existing steel poles</td>
</tr>
<tr>
<td>12</td>
<td>5/8&quot; eyebolt, oval eye and nut</td>
</tr>
<tr>
<td>13</td>
<td>Wood mending or plastic duct (10' from ground level)</td>
</tr>
<tr>
<td>14</td>
<td>3&quot; schedule 80 PVC or rigid metal (#) See notes on sheet 2 of 5</td>
</tr>
<tr>
<td>15</td>
<td>Preformed guy grip dead ends</td>
</tr>
</tbody>
</table>

**DETAIL "A"**

- Tinned brass split bolt connector for ground wire
- Copper jumper
- Tail of span
- Tinned brass split bolt connector for ground wire

**NOTE:**
Porcelain strain insulator (if required) shall meet the codes and placement requirements of the local utility company.
NOTE:
1) Preformed lashing rod to be installed the full length where signal wire is installed with span wire.

TYPICAL FLASHING BEACON INSTALLATION ON STEEL AND WOOD POLES

<table>
<thead>
<tr>
<th>NO.</th>
<th>ITEM</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Traffic signal (no. heads as indicated)</td>
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<td>P.I. traffic signal cable (as specified)</td>
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<td>Pole band clamp (steel pole)</td>
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<td>8</td>
<td>Guy thimble (2&quot; dia.)</td>
</tr>
<tr>
<td>9</td>
<td>(2) 5/8&quot; x 4&quot; long bolt, nut, washers per pole band clamp (steel pole)</td>
</tr>
<tr>
<td>10</td>
<td>Install span wire preformed (armor rod) under each span hanger</td>
</tr>
<tr>
<td>11</td>
<td>Access hand hole all new &amp; existing steel poles</td>
</tr>
<tr>
<td>12</td>
<td>5/8&quot; eyebolt, oval eye and nut</td>
</tr>
<tr>
<td>13</td>
<td>Wood mouting or plastic duct (10' from ground level)</td>
</tr>
<tr>
<td>14</td>
<td>1 1/2&quot; to 2&quot; schedule 80 PVC or rigid metal (**) See note</td>
</tr>
<tr>
<td>15</td>
<td>Preformed guy grip dead ends</td>
</tr>
</tbody>
</table>

NOTES:
(*) For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10' (min.) above grade or as directed by the Engineer.

(#) For projects maintained by the Road Commission for Oakland County (RCOC), use drip loop (without coil) for future adjustment of signal span.

NOT TO SCALE

Michigan Department of Transportation
Bureau of Highways Delivery Standard Plan
FHWA Approval Date

Plan Date

File: RefDoc/Tr/Sigats/Tr/Sigat/SIG-010-A.dgn Rev: 02/16/17
POLE BAND CLAMP ON STEEL POLE

ASTM A36 steel pole band clamps must be stamped with identification that is traceable back to the manufacturer, which can be used to determine the month and year of clamp manufacture. The stamping method must be a low-stress stamping method. The stamp cannot be located near the bolted flange, must be located near the center of the clamp on the back side facing away from traffic, and be visible after galvanizing. All bend radii are to be a minimum of 1.5 times the pole band thickness.

CABLE ON STEEL POLE

NOT TO SCALE
DETAIL "D"
SPAN WIRE POLE PLATE AND HARDWARE ON WOOD POLE

NOTE:
Porcelain strain insulator (if required) shall meet the codes and placement requirements of the local utility co.

Service cap (PVC)
(3" for traffic signal installation)
(use 1 1/2" to 3" PVC for flashing beacon installation)

No splices allowed between signal head & controller box

Preformed dead end

3 layers of black friction tape over end of lashing rod

Loop span wire with a minimum 5' tail for adjustment

Multiconductor traffic signal cable. Coil 30' of traffic signal cable (Drip Loop) for future adjustment.

#6 copper min. to grounding rod in wood or plastic moulding

Galvanized steel 2 hole strap (3 ft spacing) (1/4" x 1/2" Hex head lag screw U-guard fastener or approved equal)

DETIAL "E"
CABLING ON WOOD POLE

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MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL) FHWA APPROVAL DATE

SIG-010-A SHEET 4 of 7
DETAIL
3-WAY TIE OFF BULL RING

GALVANIZED STEEL
BULL RING 1" THICK
3 layers of black friction tape
around each of dead end & span

Thimble (2" dia)
Span wire
Preformed dead end

Thimble (2" dia)
Span wire
Preformed dead end

DETAIL COPPER JUMPER
3-WAY TIE OFF

Tinned brass split bolt
connector for ground wire

Tail of span

Tinned brass split bolt
connector for ground wire

# 6 copper jumper

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL)
FHWA APPROVAL DATE

SIG-010-A

Rev. 02/16/17

File: RefDoc/TR/Sigdats/Mod/Sp Dev/F in/1100104.png
PULL-OFF CONNECTION DETAIL (ALTERNATE)
FOR 3-WAY SUSPENSION

DETAIL COPPER JUMPER (ALTERNATE)
SPAN WIRE GROUNDING

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL)
FHWA APPROVAL DATE

FILE: RocDoc/TR/Sigeats/Web/Sig P010a/SIG-010-A.001 Rev 02/16/17
PLAN DATE SIG-010-A SHEET 6 OF 7
NOTE:
1) Pole Contact Height (POCH) will be 23'-0" on box span unless otherwise specified on plans or as directed by the Engineer.
2) All red indications should align horizontally.

DETAIL A: INSTALLATION OF BOX SPAN WIRE T.S. ON STEEL OR WOOD POLES

NOTE:
1) Pole Contact Height (POCH) will be 24'-0" on box span with a left turn phase unless otherwise specified on plans or as directed by the Engineer.
2) All red indications should align horizontally.

Provide 17'-0" of underclearance

DETAIL B: INSTALLATION OF BOX SPAN WIRE T.S. W/ LT PHASE OR 4TH LEVEL ON STEEL OR WOOD POLES

NOTE:
1) Pole contact height (POCH) will be 24'-0" on box span with a flashing yellow arrow unless otherwise specified on plans or as directed by the Engineer.
2) All red indications should align horizontally.

Provide 17'-0" of underclearance

DETAIL C: INSTALLATION OF BOX SPAN WIRE T.S. FYA AND DOGHOUSE ON STEEL OR WOOD POLES

BOX SPAN WIRE T.S. ON STEEL OR WOOD POLES

For use on Oakland County roads only.
5/8" eyebolt or 5/8" D & bolt with oval eye
(If thimble is required, 1/2" thimble is required)

90 Deg. Corner Pole
Detail "F"

10 Deg. - 45 Deg. Angle Pole
Detail "G"

9/16" thru-bolt
Double nuts with lock washer

Wood pole

Steel or concrete pole
Stainless steel pole band (Typical)

Tangent Pole (Wood Pole)
Detail "H"

Tangent Pole (Steel or Concrete Pole)
Detail "I"

NOTE FOR DETAILS "E", "F", "G":
Individual connectors to be taped with 3 layers of approved plastic tape & overall one layer of half lap approved plastic tape

NOT TO SCALE
DESCRIPTION:
Integral messenger wire consists of a support wire and a conductor core laid parallel and covered with a single extrusion of black low density polyethylene. The single extrusion provides a jacket over the support wire and core, and forms a web joining the two. See detail “A” this sheet. The support wire is 0.134 inches in diameter. Grade 190 steel, Class A galvanized, Extra High Strength steel having a rated breaking strength of 2680 pounds.

INSTALLATION:
Every effort shall be made to limit the length of spans to a maximum of 250 feet. Integral messenger wire is prone to low frequency wind vibration commonly referred to as “dancing” while “dancing” may not be so violent in low wind areas as to attract attention. Prolonged low amplitude vibration will eventually cause open circuits and/or support wire failure. Therefore, REA recommends that all integral messenger distribution wire be spiraled approximately one spiral for each 15 feet of span.

Spiraling of the wire should be done from every other pole by applying the spiraling torque to the support clamp after the two outside bolts have been properly tightened, thus keeping the spiraling torque on the support wire and not on the core. As spiraling operations proceed along a lead, spiraling at alternate poles should be in opposite directions, thereby reducing the torsion otherwise imposed on those clamps which are at the intermediate poles. The procedure to be followed in spiraling distribution wire is shown in detail “B” of this sheet.

If clamps are not adequately tightened the torsion developed in spiraling will cause the support wire to turn in the clamp resulting in the migration of the spirals from the spans toward the pole. “Dancing” of the wire and damage to it at the poles will be the final results of inadequate clamping. The proper type of support clamps must be used on all corners as shown in details “E”, “F”, “G” and “I” of this sheet.

When pulling the wire up to correct sag, a suitable wire grip should be used directly on the insulated support wire. The grip should be of such design as to give proper holding power and yet not damage the support wire jacket. The Crescent Tool Company #600 or an equivalent grip is suggested. A standard line wire grip should not be used because it will damage the insulation. If the insulation is damaged in any way, it must be repaired with sealing compound or by cutting out the damaged portion. At deadends, it is necessary to remove the support wire covering before applying the deadend grips. It must be done carefully to avoid damaging the support wire or core the electrical continuity of the support wire must be maintained throughout the lead.
Step 1 - Support and position integral messenger wire with cable brackets.

Step 2 - Fasten and support clamp to the support messenger at the pole. Tighten the carriage bolts to the manufacturer's specifications.

Step 3 - Spiral wire in the opposite direction from which the previous adjacent spiraling operation was performed. If the adjacent spans are unequal, use the shorter span for determining the number of spirals.

Step 4 - Place the clamp on the machine bolt and tighten nuts to the manufacturer's specifications.

I.M. CABLE SPIRALS
DETAIL "B"

NOT TO SCALE
Optional Polygon Cross Section

- Single ply shown, but multi-ply is allowed
- Longitudinal weld joint

Steel Strain Pole

- Round steel
- ORIENTATION OF 3" COUPLING 90° or 270° FROM POLE HAND HOLE

Section A-A

- SCH. 40 pipe oriented 180° TO POLE HAND HOLE
- * SINGLE PLY SHOWN, BUT MULTI-PLY IS ALLOWED

Detail A

- Orientation of 3" coupling 90° or 270° from pole hand hole
- Round steel strain pole
- SCH. 40 pipe
- 3" coupling
- SCH. 40 pipe

Detail B

- Hand hole (Sheet 3)
- Pole ID tag (Sheet 2)
- Pole band clamp

Pre drilled and tapped holes fitted with 1/2" stainless steel bolts 180° from weatherhead.

File: RefDoc/TR/Signage/Web/Sp Det/Fin/SIG020B.dgn  Rev.: 11/05/18

Ref: MDOT TR/Signage Web/Sp Det/Fin/SIG020B.dgn
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<tr>
<td>POLE BAND (SPAN CLAMP)</td>
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NOTES:
1. THE DESIGN OF THIS STRUCTURE IS BASED ON THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS, FIFTH EDITION, 2009.
2. S.S. DENOTES STAINLESS STEEL. GA. DENOTES GAUGE. O.D. DENOTES OUTSIDE DIAMETER. I.D. DENOTES INSIDE DIAMETER. H.S. DENOTES HIGH STRENGTH. SCH. DENOTES SCHEDULE.

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MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

FHWA APPROVAL DATE

SIG-020-B

2 of 7
**SECTION C-C**

- **Hand Hole Frame**
  - Field Drill Hole for Pole Mounted Controller: Maintain 6" (Min) above the top of hand hole frame.
  - Hand Hole & Hand Hole Cover
  - Strain Pole & Hand Hole
  - Round Steel Strain Pole
  - Hole Drilled (Max)
  - 1/2" Hole Drilled

- **Back Up Bar**
  - Horizontal Orientation
  - Hand Hole Cover

- **1" X 1" X 1/2" Square Stock (Drill & Tap)**

- **Grounding Provision**
  - 3/8" S.S. Hex Bolt to Mount Mechanical Lug to Accommodate Min. 1/4" Wire
  - 1/4" X 1" S.S. Back Up Bar to Secure Hand Hole Cover (Horizontal Orientation)

- **1/2" Ø -13 N.C. Drilled and Tapped Hole With 1/2" Stainless Steel Bolt With Maximum Projection of 1/4".

- **11 Ga. Cover With S.S. Chain & 1/4" Ø Hex Head S.S. Screw**

- **Sig-020-B**

**SECTION B-B**

- See Orientation of Strain Pole Below
  - Single Ply Shown, But Multi-Ply is Allowed

- **Hand Hole Cover**
  - Threaded Tinned Bronze Clamp for Lightning Protection

- **1/4" X 1" S.S. Back Up Bar**

- **1/2" Ø Stainles Steel Bolt With Copper Down Conductor Attached Via Threaded Tinned Bronze Clamp for Lightning Protection**

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**MICHIGAN DEPARTMENT OF TRANSPORTATION**
**BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN**

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**Rev.** 11/05/18
DETAIL B
ANCHOR BOLTS NOT SHOWN FOR CLARITY

SECTION D-D - BASE PLATE
SEE CHART ON PAGE 2 FOR ANCHOR BOLT CIRCLE Ø.
ANCHOR BOLT HOLE Ø, AND ANCHOR BOLT Ø.
(STRAIN POLE NOT SHOWN FOR CLARITY)

STRAIN POLE CAP DETAIL

SECTION E-E
NOT TO SCALE

Michigan Department of Transportation Bureau of Highways Delivery Standard Plan

File: Ref/Doc/Tr/Signals/Web/Sp Det/Fin/SIG020-B.dgn
Rev: 11/05/18

Plan Date

FHWA Approval Date

Sheet

SIG-020-B

5 of 7

---

## Strain Pole Foundation Requirements

<table>
<thead>
<tr>
<th>Pole Length (ft)</th>
<th>30 ft</th>
<th>36 ft</th>
<th>40 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor Bolt Diameter (in)</td>
<td>1 ½</td>
<td>1 ¾</td>
<td>1 ½</td>
</tr>
<tr>
<td>Anchor Bolt Circle Diameter (in)</td>
<td>18</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Anchor Bolt Length (in)</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Foundation Diameter (in)</td>
<td>36</td>
<td>42</td>
<td>42</td>
</tr>
</tbody>
</table>

### Notes:

1. All work and materials must be in accordance with the Mdot Standard Specifications for Construction. Construct strain pole foundations according to Section 718.03 of the Mdot Standard Specifications for Construction.
2. If soil conditions indicate there is no need for a casing pay item as shown on the plans, the contractor shall request permission of the engineer to install the foundation without casing.
3. When the casing pay item is including on the plans for a foundation due to granular soils or a wet hole, steel casing (smooth walled) is to be installed to enable the foundation to be poured. The thickness of the steel casing is to be determined by the contractor. The steel must be left in place. Smooth walled steel casing outside diameter must meet or exceed foundation diameter. A suitable method of compaction must be employed to ensure the soil immediately outside the casing is compacted properly.
4. When the casing pay item is called for on the plans, the steel casing may stop at the conduit entrance to foundation. Top of foundation must then be formed separately, even though the steel casing stops at the conduit entrance. The casing pay item quantity will be paid for based on actual linear feet installed.
5. Dewatering of wet shafts is not allowed. A wet shaft is defined as having more than 3" of standing water or as having water infiltrating at a rate equal to or exceeding 12" per hour. For wet shafts, concrete is to be placed in accordance with Section 705 (Wet Construction Method) with a tremie tube or concrete pump beginning at the shaft bottom. Grade T concrete must be used for underwater placement. Grade S2 may be used in dry excavations only. See Mdot Standard Specifications Table 701-1 (Concrete Structure Mixtures).
6. Per Mdot Standard Specifications 718.02, the Grade S2 acceptable slump range is 4-6 inches. The Grade T acceptable slump range is 6-10 inches.
7. Construct strain pole foundations, cased or uncased, according to Subsection 810-03-J and 705 of the Standard Specifications for Construction. All work and materials must be in accordance with the Mdot Standard Specifications for Construction.
8. Steel reinforcement must conform to Section 921 of the Mdot Standard Specifications for Construction.
9. Exposed concrete surfaces must be cast in forms.
10. Steel reinforcement must have a clear cover of 3.00 inches unless otherwise noted. Steel reinforcement may be adjusted to ensure proper clear cover.
11. Conduits and anchor bolts must be rigidly installed before concrete is placed. Anchor bolts must be spaced by means of a template. The center of the template must coincide with the center of the foundation.
12. Grounding of pole includes adding #4 bare copper ground wire bonded by listed mechanical connection to foundation reinforcing steel and having 24" of slack above the top of foundation.
13. Install copper clad ground rod(s) as directed by the engineer and in accordance with current N.E.C. All grounds must provide less than 10 ohm resistance to ground.
14. Refer to the following special provisions for 6 anchor bolt strain poles:
   - Steel Strain Pole
   - Strain Pole Foundation and Anchor Bolts
   - Casing Used with Strain Poles and Mast Arm Poles
**PLAN VIEW - FOUNDATION DETAIL**

SEE CHART ON PAGE 5 FOR ANCHOR BOLT CIRCLE Ø, ANCHOR BOLT Ø, AND FOUNDATION Ø.

- STEEL TEMPLATE MUST BE KEPT LEVEL AT ALL TIMES. CONTRACTOR TO DETERMINE MATERIAL TYPE.
- ELEVATION VIEW - FOUNDATION DETAIL
- BOTTOM STEEL TEMPLATE REQUIRED. (SEE BOTTOM ANCHOR BOLT STEEL TEMPLATE DETAIL ON SHEET 7)
- #4 AWG OR LARGER STANDARD BARE GROUND WIRE WITH 24" (MIN) BLACK ABOVE TOP OF FOUNDATION. BOND GROUND WIRE TO REINFORCEMENT.
- KEEP ANCHOR BOLT PLUMB (TYP)
- V05 BAR (TYP)
- PER PLAN

**ELEVATION VIEW - FOUNDATION DETAIL**

- * SEE FOUNDATION NOTES AND PLANS FOR STEEL CASING PAY ITEM
- V05 BAR (TYP)
- V05 BAR (TYP)
- 2'-2" LAP
- TOP OF FINISHED GRADE
- 3/4" X 3/4" CHAMFER

- 6" THICK
- 2'-2" LAP
- V05 BARS 3/4" X 3/4" CHAMFER
- * STEEL CASING PER PLAN
- (24) HEAVY HEX NUTS,
- (24) FLAT WASHERS,
- AND (6) LOCK WASHERS
- FOR ANCHOR BOLT CAGE ASSEMBLY

**NOT TO SCALE**

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

FILE: RefDoc/TR/Signals/Web/Sp Det/Fin/SIG020B.dgn
Rev.: 11/05/18

FHWA APPROVAL DATE

PLAN DATE

SIG-020-B

SHEET 6 of 7
TO ENSURE PLACEMENT PRIOR TO CONCRETE POUR.

SECURE CONDUIT TOGETHER WITH SUITABLE BANDING

SECTION F-F

SECURE CONDUITS TOGETHER WITH SUITABLE BANDING TO ENSURE PLACEMENT PRIOR TO CONCRETE POUR.

BOTTOM ANCHOR BOLT STEEL TEMPLATE DETAIL

SEE CHART ON PAGE 5 FOR ANCHOR BOLT CIRCLE ø, ANCHOR BOLT HOLE ø, AND FOUNDATION ø
NOT TO SCALE

TRAFFIC SIGNAL MAST ARM POLE AND MAST ARM DETAILS - CATEGORY I

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

PREPARED BY TRAFFIC AND SAFETY

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT (SPECIAL DETAIL)

FHWA APPROVAL DATE

FILE: RefDoc/TR/Signals/Web/Sp-Det/FIn/SIG030B.dgn - Rev. 11/05/18

SIG-030-B SHEET 1 of 6
### MAST ARM TUBE TAPER IS 0.140 IN/FT

* DIAMETERS GIVEN ARE O.D.

** TO BE DETERMINED BY CONTRACTOR BASED ON REQUIRED MAST ARM LENGTH AND TELESCOPIC SPLICE LENGTH.

### NOTES:

1. THE DESIGN OF THIS STRUCTURE IS BASED ON THE 2001 AASHO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS FOR 90 MPH WIND LOAD AND CATEGORY I WITH GALLOPING, NATURAL WIND GUSTS, AND TRUCK INDUCED FATIGUE LOADS.

2. WELD THE LONGITUDINAL ARM SEAM ON THE INBOARD AND OUTBOARD SECTIONS OF THE TELESCOPIC FIELD SPLICE WITH A COMPLETE JOINT PENETRATION (CJP) WELD A MINIMUM OF 36 INCHES LONG. IN ADDITION, LONGITUDINAL ARM SEAM MUST BE CJP FOR A MINIMUM OF 6 INCHES FROM TUBE TO PLATE CJP WELDS.

3. SEAM WELDS MUST BE 90° < FROM HAND HOLE AT BASE.

4. LUMINARE ARM IS 11 GAUGE ROUND STEEL WITH 0.140 INCH PER FOOT TAPER.

5. BACKING BAR FOR PIPE TO BASE PLATE (**) AND MAST ARM TO MAST ARM PLATE MUST BE MINIMUM 5/16 INCH X 2 INCH PLATE.

6. 1/2 INCH DIAMETER (**) ROUND STOCK C-HOOK ATTACHED TO ALL POLE SIZES. 3/4 INCH SCHEDULE (SCH.) 40 PIPE ATTACHED TO ALL POLE SIZES AND INBOARD AND OUTBOARD ARM.

7. S.S. DENOTES STAINLESS STEEL, GA. DENOTES GAUGE, O.D. DENOTES OUTSIDE DIAMETER, I.D. DENOTES INSIDE DIAMETER, H.S. DENOTES HIGH STRENGTH.

---

**ARM/POLE S.S. ID TAG DETAIL**

TO BE ATTACHED TO POLE OR MAST ARM AT LOCATIONS SHOWN 4" FROM BASE OF TUBE BELOW HANDHOLE WITH (4) #8 X 3/8" S.S. TYPE U DRIVE SCREWS.

**BASE S.S. ID TAG DETAIL**

WELD TAG TO EDGE OF BASE (**)

(LETTERS STAMPED IN 3/8" CHARACTERS)
DETAIL A
Orientat of SCH. 40 PIPE 180° FROM HAND
HOLE AT BASE & C-HOOK 180° FROM SCH. 40 PIPE

SECTION A-A

DETAIL B
(35'-0" ARMS AND GREATER)

INBOARD/OUTBOARD ARM LIFTING DEVICE
**DETAIL C**

- **3/8" X 2'-6" STEEL CLAMP HALF SHELLS**
- **3/16" Ø HOLE THRU PIPE & BOLT FOR 1/8" X 1/2" COTTER PIN (TYP)**

**MAST ARM WELD DETAIL**

- SIDE GUSSET R'S AND SADDLE E'S
- NOT SHOWN FOR CLARITY

**SECTION B-B**

- **4" Ø HOLE IN FRONT CLAMP HALF SHELL FOR WIRING**
- **FIELD DRILL 4" Ø HOLE IN POLE FOR WIRING**
- **(4) 3/4" SCH. 80 PIPE X 3/4" LONG WELDED TO BACK E**
- **FIELD DRILL (4) 11/16" Ø HOLES FOR 5/8" Ø X 3½" LONG HEX. HEAD BOLTS**
- **(4) 3/8" GUSSET SADDLE E'S (TOP AND BOTTOM)**
- **1½" Ø STUDS EACH WITH (2) HEX NUTS, (2) FLAT WASHERS, AND (2) LOCK WASHERS**

**SECTION C-C**

- **SIDE GUSSET R'S AND SADDLE E'S NOT SHOWN FOR CLARITY**
- **STEEL CLAMP HALF SHELL**
- **1" Ø HOLE (MAST ARM E)**
- **1½" Ø HOLE (STEEL CLAMP HALF SHELL E)**

**NOT TO SCALE**
**SECTION D-D**

1. BACKING BAR
2. 3/16" CAULK
3. 3/8" CAULK
4. 3/4" SQUARE STOCK
5. POLE & HAND HOLE
6. BASE ID TAG

**SECTION E-E**

1. 3/4" SQUARE STOCK
2. SCH. 40 PIPE
3. POLE & HAND HOLE
4. 3/16" STEEL CAP
5. 3/16" H.S. BOLT

**POLE AND MAST ARM CAP DETAIL**

1. 1/2" H.S. BOLT
2. 3/16" NUT OR TAP HOLE IN 3/4" SQUARE STOCK
3. C-HOOK

**NOT TO SCALE**

**FILE:** RefDoc/TR/Signals/Web/Sp Def/Fin/SIG030B.dgn

**PLAN DATE:** 11/05/18

**BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN**

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**FHWA APPROVAL DATE**

**PLAN DATE**

**SIG-030-B**

**SHEET 6 of 6**
### Notes:

1. The design of this structure is based on the 2001 AASHTO standard specifications for structural supports for highway signs, luminaires and traffic signals for 90 MPH wind load and Category II with gallopping, natural wind gusts, and truck induced fatigue loads.

2. Weld the longitudinal arm seam on the inboard and outboard sections of the telescopic field splice with a complete joint penetration (CJP) weld a minimum of 36 inches long. In addition, longitudinal seam welds must be CJP for a minimum of 6 inches from tube to plate. CJP welds.

3. Seam welds must be 90° from hand hole at base.

4. Luminaire arm is 11 gauge round steel with 0.140 inch per foot taper.

5. Backing bar for pipe to base plate (P) and mast arm to mast arm plate must be minimum 5/16 inch x 2 inch plate.

6. 1/2 inch diameter (4) round stock C-Hook attached to all pole sizes. 3/4 inch schedule (SCH.) 40 pipe attached to all pole sizes and inboard and outboard arm.


### MAST ARM TAPERED STEEL MAST ARM

<table>
<thead>
<tr>
<th>MAST ARM LENGTH</th>
<th>MAST ARM DIMENSIONS</th>
<th>MTG HT SINGLE</th>
<th>MTG HT TWIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>20'-0&quot;</td>
<td>0.2500&quot;-8.50&quot; x 5.70&quot; x 20'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25'-0&quot;</td>
<td>0.2500&quot;-9.50&quot; x 6.00&quot; x 25'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30'-0&quot;</td>
<td>0.2500&quot;-10.50&quot; x 6.30&quot; x 30'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35'-0&quot;</td>
<td>0.4790&quot;-12.00&quot; x 10.60&quot; x 10'-0&quot;</td>
<td>19'-0&quot; &amp; 18'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>40'-0&quot;</td>
<td>0.5000&quot;-12.00&quot; x 10.60&quot; x 10'-0&quot;</td>
<td></td>
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<td>45'-0&quot;</td>
<td>0.5000&quot;-12.00&quot; x 9.90&quot; x 15'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50'-0&quot;</td>
<td>0.7500&quot;-12.00&quot; x 9.20&quot; x 20'-0&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ROUND TAPERED STEEL MAST ARM POLE

<table>
<thead>
<tr>
<th>POLE DIMENSIONS</th>
<th>LUMINAIRE ARM</th>
<th>MAST ARM LENGTH (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.313&quot;-14.00&quot; x 10.92&quot; x 22'-0&quot;</td>
<td>NO</td>
<td>20&quot;, 25</td>
</tr>
<tr>
<td>0.313&quot;-14.00&quot; x 9.94&quot; x 29'-0&quot;</td>
<td>YES</td>
<td>30&quot;, 35</td>
</tr>
<tr>
<td>0.358&quot;-14.00&quot; x 10.92&quot; x 22'-0&quot;</td>
<td>NO</td>
<td>40&quot;, 45</td>
</tr>
<tr>
<td>0.478&quot;-14.00&quot; x 10.92&quot; x 22'-0&quot;</td>
<td>NO</td>
<td>30&quot;, 35</td>
</tr>
<tr>
<td>0.478&quot;-14.00&quot; x 9.94&quot; x 29'-0&quot;</td>
<td>YES</td>
<td>50</td>
</tr>
</tbody>
</table>

### Pole Tube Taper is 0.140 in/ft

* Diameters given are O.D.

** To be determined by contractor based on required mast arm length and telescopic splice length.

### Arm/Pole S.S. ID Tag Detail

To be attached to pole or mast arm at locations shown 4" from base of tube below handhole with (4) #8 x 3/4" S.S. Type U Drive Screws. (Letters stamped in 3/8" characters)

### Base S.S. ID Tag Detail

Weld tag to edge of base P. (Letters stamped in 3/8" characters)
DETAIL A

ORIENTATION OF SCH. 40 PIPE 180° FROM HAND
HOLE AT BASE & C-HOOK 180° FROM SCH. 40 PIPE

SECTION A-A

DETAIL B

FOR 35'-0" ARMS AND GREATER

INBOARD/OUTBOARD ARM LIFTING DEVICE

NOT TO SCALE
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

FILE: RefDoc/TR/Signals/Web/Sp Det/Fin/SIG031B.dgn
Rev. 11/05/18

3/8" (MAX)

3/8"

3/16"

0.478*

0.358*

0.313*

6" X 10" BAR BOTTOM HAND HOLE

6" X 10" BAR BOTTOM HAND HOLE

( VIEW ROTATED 90 DEGREES)

1/4" X 1" S.S. BACK UP BAR TO SECURE HAND HOLE COVER.

( HORIZONTAL ORIENTATION)

1/4" X 1" SQUARE STOCK (DRILL & TAP)

1/4" X 1" S.S. BACK UP BAR TO SECURE HAND HOLE COVER.

( HORIZONTAL ORIENTATION)

1/4" X 1" S.S. BACK UP BAR TO SECURE HAND HOLE COVER.

( HORIZONTAL ORIENTATION)

1/2" Ø - 13 N.C. DRILLED AND TAPPED HOLE WITH 1/2" STAINLESS STEEL BOLT WITH MAXIMUM PROJECTION OF 1/4".

11 GA. COVER WITH 1/4" -20 S.S. MACH. SCREW & S.S. CHAIN

3/4" X 3/8" Ø (0.313-.358)*

1" X 4" Ø (0.478)*

1/2" ROUND J-HOOK

3/4" OR 1" Ø

1/4" X 1" S.S. BACK UP BAR TO SECURE HAND HOLE COVER.

( HORIZONTAL ORIENTATION)

SOCKET HEAD CAP SCREW (TYP)

1/4" -20 S.S. MACH. SCREW & S.S. CHAIN

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

FILE: RefDoc/TR/Signals/Web/Sp Det/Fin/SIG031B.dgn
Rev. 11/05/18

4" X 6 1/2" BAR TOP HAND HOLE

ORIENTATION OF HAND HOLE

DESIGN WITH 29'-0" POLE ONLY

* THICKNESS OF POLE

NOT TO SCALE
**SECTION D-D**

* Seal joint with caulk after galvanizing

---

**DETAIL D**

(View rotated 90 degrees)

* SEAL JOINT WITH CAULK AFTER GALVANIZING

---

**SECTION E-E**

---

**POLE AND MAST ARM CAP DETAIL**

---

**NOT TO SCALE**

---

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**FHWA APPROVAL DATE**

**SIG-031-B**

**SHEET 6 of 6**

---

**RefDoc/TR/Signals/Web/Sp Det/Fin/SIG031B.dgn**

Rev. 11/09/18
NOTES:

1. THE DESIGN OF THIS STRUCTURE IS BASED ON THE 2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS FOR 90 MPH WIND LOAD AND CATEGORY III WITH GALLOPING, NATURAL WIND GUSTS, AND TRUCK INDUCED FATIGUE LOADS.

2. THE LONGITUDINAL ARM SEAM ON THE INBOARD AND OUTBOARD SECTIONS OF THE TELESCOPIC FIELD SPICE WITH A COMPLETE JOINT PENETRATION (CJP) MOD A MINIMUM OF 8 INCHES LONG. IN ADDITION, LONGITUDINAL ARM WELDS MUST BE CJP FOR A MINIMUM OF 6 INCHES FROM TUBE TO PLATE CJP WELDS.

3. SEAL WELDS MUST BE 90° FROM HAND HOLE AT BASE.

4. LUMINAIRE ARM IS 11 GAUGE ROUND STEEL WITH 0.140 INCH PER FOOT TAPER.

5. BACKING BAR FOR PIPE TO BASE PLATE (>) AND MAST ARM TO MAST ARM PLATE MUST BE MINIMUM 5/16 INCH X 2 INCH PLATE.

6. 1/2 INCH DIAMETER (O) ROUND STOCK C-HOOK ATTACHED TO ALL POLE SIZES. 3/4 INCH SCHEDULE (SCH.) 40 PIPE ATTACHED TO ALL POLE SIZES AND INBOARD AND OUTBOARD ARM.

7. S.S. DENOTES STAINLESS STEEL, GA. DENOTES GAUGE, O.D. DENOTES OUTSIDE DIAMETER, I.D. DENOTES INSIDE DIAMETER, H.S. DENOTES HIGH STRENGTH.
DETAIL A

ORIENTATION OF SCH. 40 PIPE 180° FROM MAST
HOLE AT BASE & C-HOOK 180° FROM SCH. 40 PIPE

DETAIL B

145'-0" ARMS AND GREATER

INBOARD/OUTBOARD ARM LIFTING DEVICE
DETAIL C

Mast Arm Weld Detail
Side Gusset R's and Saddle R's
Not shown for clarity

SECTION B-B

Side Gusset R's and Saddle R's
Not shown for clarity

(not shown for clarity)
**SECTION D-D**

(VIEW ROTATED 90 DEGREES)

* SEAL JOINT WITH CAULK AFTER GALVANIZING

---

**SECTION E-E**

---

**POLE AND MAST ARM CAP DETAIL**

---
NOTES:

1) All ground rods shall be 3/4" x 30' copper clad rod at a minimum of 2 ground rods shall be used (one for the service disconnect and one for the messenger cable & pole).

2) Ground rod placement shall not be less than 12" from the foundation with a minimum of 6' between ground rods. Placement shall be as directed by the Engineer and in compliance with N.E.C.

3) Ground wire connection to grounding rod(s) shall utilize a non-solder type connection.

4) Indicate the direction of conduits in foundation top with an arrow.

5) Install pole that the foundation & anchor bolts are plumb.

6) All grounds shall provide less than 10 ohm resistance to ground.

ELEVATION

MAST ARM FOUNDATION CONDUIT AND GROUNDING

**FILE:** Rev:Loc/18/Signals/Web/Site/Detail/MS040A.dgn   **REV.** 02/15/17

**ENGINEER OF DELIVERY**

**ENGINEER OF DEVELOPMENT**

**TRAFFIC SIGNAL MAST ARM STANDARD FOUNDATIONS**

**FHWA APPROVAL DATE**

**SIG-040-A**

**SHEET** 1 of 4
ANCHOR BOLTS

NOTE:
Trench for placement of conduits after casing is in place and before dewatering.

PLAN

ELEVATION

DRILLED FOUNDATION SHAFT (SHOWN WITH CASING PAY ITEM)

NOT TO SCALE
NOTES:

1. Anchor bolts shall be set and held vertical at the correct location and at the proper elevation with a 3/4" steel bar or approved equal template to a minimum of 24 hours after the concrete placement has been completed.

2. (6) 3/4" - 72" Anchor bolts with (4) Hex nuts and (4) washers per bolt.

3. 24" dia bolt circle for Category I, Category II, and Category III Mast Arms.

4. Mast arm orientation is not dependent on anchor bolt position.

5. Use #4 AWG or larger standard bare ground wire bonded by mechanical connection to foundation reinforcing steel and having 24" of slack above the top of foundation.

6. Galvanize all exposed nuts, bolts, and washers according to ASTM F2239. Galvanize all other steel items according to ASTM A325. Embedded nuts, bolts, washers, and steel rings need not be galvanized.

---

**SECTION A-A**

- 8 - #3 vertical bars equally spaced.
- 2'-2" Min. lap
- #3 bar horizontal reinforcement
- 3 3/8" Thick
- 24"
- (16) Std holes, equally spaced 1 5/8" to 1 3/8"

---

**PLAN VIEW**

- Anchor bolts - 1 3/4" dia. 72" equally spaced at 60 33/64 is required
- Bolt circle See note 3 (typ)
- Anchor bolt hole
- 3" wide steel template 3/4" stock thickness
- Steel template must be kept horizontal at all times after installation
- Top temp. template (Contractor to determine material type)
- Heavy hex nuts (24), flat washers (24) for anchor bolt cage assembly
- Bond ground wire to reinforcement. See note 5.
- Keep anchor bolts plumb (typ)
- Bottom template required ASTM A36 steel
- Foundation length per plan
- Steel casing per plan

---

**ELEVATION**

Mast Arm Foundation
(Shown with Casing Pay Item)

---

**BOTTOM STEEL TEMPLATE**

---

NOT TO SCALE

**SIG-040-A**

---

**MICHIGAN DEPARTMENT OF TRANSPORTATION**
**BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN**

**FHWA APPROVAL DATE**

**PLAN DATE**

File:ReDoc14/Sgndtls/Web/Sp_Doc/inc5/0404a.png
Rev:02/16/17

3 of 4
Foundation Notes:

1. Refer to the following special provisions related to 6 anchor bolt mast arm poles:
   - Traffic Signal Mast Arm Poles and Mast Arm Mast Arm Pole Foundations and anchor bolts
   - Casing Used With Strand Poles and Mast Arm Poles

2. Templates shall be shop fabricated and assembled prior to being approved by MDOT for shipping.

3. Diameter of bolt holes in template shall be 1/16" larger than anchor bolt diameter.

4. Conduits and anchor bolts shall be rigidly installed before concrete is placed. The center of the template shall coincide with the center of the foundation. The template and handles shall be well supported, horizontally level and firmly anchored in place a minimum of 24 hours after the concrete placement is completed.

5. Due care shall be taken during the concrete placement to avoid displacing the anchor bolts.

6. No hammering on the anchor bolts or template will be allowed.

7. After template is removed, thread nuts on to the bolt flush with the bolt end to protect threads until signal support is erected.

8. For anchor bolt material refer to section 906.31 a and b of the Michigan Standard Specifications for Construction. For anchor bolt installation and tightening refer to section 810.03 N.

9. Dewatering of wet shafts is not allowed. A wet shaft is defined as having more than 3 inches of standing water or as having water infiltrating at a rate equal to or exceeding 12 inches per hour. For wet shafts, concrete is to be placed in accordance with section 718.03 (wet construction method) with a tremie tube or concrete pump beginning at the shaft bottom. Grade T concrete must be used for underwater placement. Grade S2 may be used in dry excavations only. See MDOT standard specifications Tables 701-15 and 701-18 (Concrete Structure Mixtures).

10. Per MDOT standard specifications 718.02, the Grade S2 acceptable slump range is 6-8 inches. The Grade T acceptable slump range is 7-9 inches.

11. If soil conditions indicate there is no need for a casing pay item as shown on the plans, the contractor should request permission of the engineer to install the foundation without casing.

12. When the casing pay item is included on the plans for a foundation (due to granular soils or a wet hole), steel casing (smooth walled) is to be installed to enable the foundation to be poured. The thickness of the steel is to be determined by the contractor. The steel casing shall be left in place, a suitable method of compaction must be employed to ensure the soil immediately outside the casing is compacted properly.

13. When the casing pay item is called for on the plans, the steel casing may stop at the conduit entrance to foundation. Top of foundation must then be formed separately. The casing pay item quantity will be paid for based on actual linear feet installed.

14. Construct mast arm foundations, according to subsections 718.03 of the Standard Specifications for Construction. All work and materials shall be in accordance with the MDOT Standard Specifications.

15. Steel reinforcement shall be ASTM A605 grade 60 without epoxy coating.

16. Exposed concrete surfaces shall be cast in forms. Exposed concrete edges shall be beveled 3/4".

17. Steel reinforcement shall have a clear cover of 3 inches unless noted otherwise. Steel reinforcement may be adjusted to ensure proper clear cover.

18. Grounding of pole includes adding #4 bare copper ground wire bonded by mechanical connection to foundation reinforcing steel and having 24" of slack above the top of foundation.
SLOPE LIMITS FOR ANCHOR GUYS

POLE GUY

ARM GUY

GUY STRUT

(*) NOTE: "A"
This dimension to be 10' unless otherwise specified.

STRAIN INSULATOR POSITIONS IN GUY WIRES

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
WOOD POLE GUYS AND SETTING DEPTH

SIC-050-A
WOOD POLE INSTALLATION

SELF SUPPORTING WOOD POLE IN CONCRETE

**WOOD POLE SETTING DEPTHS**
Reference Standard Specification for Construction Section 819.03

<table>
<thead>
<tr>
<th>POLE HEIGHT</th>
<th>SETTING DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>6.0'</td>
</tr>
<tr>
<td>40</td>
<td>6.0'</td>
</tr>
<tr>
<td>45</td>
<td>6.5'</td>
</tr>
<tr>
<td>50</td>
<td>7.0'</td>
</tr>
<tr>
<td>55</td>
<td>7.5'</td>
</tr>
<tr>
<td>60</td>
<td>8.0'</td>
</tr>
</tbody>
</table>
Steel Pole Mount Truss Bracket Assembly

"Dimensions" Size Table

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>18'-0&quot;</td>
<td>81 3/4&quot;</td>
<td>21 3/4&quot;</td>
<td>84&quot;</td>
<td>18'</td>
<td>23&quot;</td>
</tr>
<tr>
<td>15'-0&quot;</td>
<td>65&quot;</td>
<td>18&quot;</td>
<td>66&quot;</td>
<td>18&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>50 3/8&quot;</td>
<td>14 1/4&quot;</td>
<td>54&quot;</td>
<td>18&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>9'-0&quot;</td>
<td>36 3/4&quot;</td>
<td>12&quot;</td>
<td>36&quot;</td>
<td>18&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>23&quot;</td>
<td>10&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>21&quot;</td>
</tr>
</tbody>
</table>

NOT TO SCALE
Ensure each plate incorporates two 0.562 inch slot holes and one 0.687 x 1.50 inch keyhole for tagging to the wood pole.

Top View

3.1/2" Radius at 150'

3/8" ASTM A-36 plate

3/8" x 8" ASTM A-36 flat bar

1/4" x 2" ASTM A-36 flat bar

2 3/8" O.D. x .120 Wall tube,
ASTM A500 Grade B

7/8" rubber grommet

3/32" bar

3/4" dia.

6" 2" cap plug "B" ± 3/8"

16 1/2"

1/2" x 2" ASTM A-36 flat bar

Wood Pole Mount Truss Bracket Assembly

"Dimensions" Size Table

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>15' 0&quot;</td>
<td>47 3/4&quot;</td>
<td>18&quot;</td>
<td>66&quot;</td>
<td>18&quot;</td>
<td>23&quot;</td>
</tr>
<tr>
<td>12' 0&quot;</td>
<td>36&quot;</td>
<td>14 3/8&quot;</td>
<td>48&quot;</td>
<td>18&quot;</td>
<td>23&quot;</td>
</tr>
<tr>
<td>9' 0&quot;</td>
<td>26 3/8&quot;</td>
<td>12&quot;</td>
<td>36&quot;</td>
<td>18&quot;</td>
<td>23&quot;</td>
</tr>
<tr>
<td>6' 0&quot;</td>
<td>12 1/2&quot;</td>
<td>8 1/2&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>23&quot;</td>
</tr>
</tbody>
</table>

Mounting Plate Detail

.687 x 1.50 keyhole

.562 x .687 slot
(2 FLCS.)
Ensure each plate incorporates two 0.562 inch slot holes and one 0.687 x 1.50 inch keyhole for lagging to the wood pole.

Top View

Wood Pole Mount Truss Bracket Assembly

Front View

Mounted Plate Detail

"Dimensions" Size Table

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;-6&quot;</td>
<td>60&quot;</td>
<td>28&quot;</td>
<td>80&quot;</td>
<td>19&quot;</td>
<td>26&quot;</td>
</tr>
</tbody>
</table>

NOT TO SCALE
NOTE:
Where bracket arm of length other than 8 ft is called for on plans contractor shall submit to M.D.O.T. shop drawings showing all information & obtain M.D.O.T. approval.

CLAMP ON BRACKET ARM ASSEMBLY (STREET LIGHT)

SECTION "A-A"

SECTION "B-B"

(2) 5/8" dia. "U" bolts, cadmium or zinc phosphate plating with lockwashers & nuts.

BRACKET DETAIL

CLAMP SIZE TABLE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POLE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.6&quot; - 4.5&quot;</td>
</tr>
<tr>
<td>B</td>
<td>6.1&quot; - 6.9&quot;</td>
</tr>
<tr>
<td>C</td>
<td>7.5&quot; - 8.5&quot;</td>
</tr>
</tbody>
</table>
Aluminum Pedestal
6063-T6 alloy, 4" x .237" wall schedule 40-3.73 #/ft.
spun finish.

3/8"x1 1/4" stainless steel set screw

Cover held in place with a 1/4"x20 UNC Hex head 300 grade stainless steel machine screw.

Frangible Square aluminum base
See Note 1 on sheet 3 of 3.

Square Aluminum Base

3/8" x 20 UNC x 2" stainless steel set screw

Cover held in place with a 1/4"x20 UNC Hex head 300 grade stainless steel machine screw.

Frangible Octagonal aluminum base
See Note 4 on sheet 3 of 3.
See Note 51 on sheet 3 of 3 for RCDD preference.

Octagonal Base

Ground lug

SQUARE BASE BOTTOM PLAN

Bolt circle

OCTAGONAL BASE BOTTOM PLAN

Bolt circle

NOTE: Use pedestal collar for pedestal length greater than or equal to 14" (typical for 3 color traffic signals with pedestrian signals).

MDOT
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
PEDESTAL FOUNDATION

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)

FHWA APPROVAL DATE

PLAN DATE

SIG-070-A

1 of 3
PEDESTAL FOUNDATION
See notes 1, 2 & 3 on sheet 3 of 3.

HANDHOLE DETAIL

3/4" x 10'-0" copper clad ground rods (Ground rods must be installed in handhole outside of fdn. at min. of 12" from fdn. 6" below grade) or as directed by the Engineer.)
ANCHOR BOLT DETAIL

NOTE: Anchor bolts are to be ASTM-A307 steel (4-required)

NOTES:
1) Alternate foundation may be constructed 22"x22" square - 48" deep.
2) Grounding system shall measure 10 ohm or less to ground.
3) Construction joints not permitted in foundation.
4) Pedestal base must meet the requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) or Manual for Assessing Safety Hardware (MASH) and have Federal Highway Administration (FHWA) acceptance. Pedestal base must also be certified to have a 4-inch maximum stub height after the support has broken away from its base, as specified in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals and the AASHTO Roadside Design Guide.
5) Use the Octagonal Base as a preference by the Road Commission for Oakland County (RCOC), for use on Oakland County roads only.
Standard Pipe Cap

3' ∠

Ground Wire

Grounding Provision nut retainer (Allow sufficient space between weld and nut to accommodate the attachment of a #6 ground wire.)

Base plate

\( \frac{3}{8} \) base plate bolts

Galvanized steel washers and Galvanized steel locking washers to fit \( \frac{3}{8} \) bolts

4' x \( \frac{3}{8} \) couplers

\( \frac{3}{8} \) anchor bolts with \( \frac{3}{8} \) hex nuts

NOT TO SCALE

ASSEMBLY VIEW

Galvanized steel washer to fit \( \frac{3}{8} \) bolt (3 REQUIRED)

\( \frac{3}{8} \) x 1\( \frac{3}{4} \)" stainless steel set screw (1 REQUIRED)

\( \frac{3}{8} \) galvanized steel anchor bolts (3 REQUIRED)

\( \frac{3}{8} \) galvanized steel couplers (3 REQUIRED)

\( \frac{3}{8} \) galvanized steel base plate bolts (3 REQUIRED)

\( \frac{3}{8} \) hex nut (3 REQUIRED)

NOTE:
1) Anchor bolts, steel couplers, and base plate bolts shall conform to ASTM F1554, Grade 36 (not dipped galvanized)

2) All flat washers, lock washers and hex nuts are (not dipped) galvanized

MDOT
Michigan Department of Transportation
Bureau of Highways Delivery Standard Plan Fir

PREPARED BY:
TRAFFIC AND SAFETY

ENG. OF DELIVERY
(SPECIAL DETAIL)
FHWA APPROVAL DATE

ENGINEER OF DEVELOPMENT

PLAN DATE

ALT. ANCHORING DETAILS

SIG-071-A

1 of 2 SHEET
NOTE: WHERE THE 1 1/2" CONDUIT DOES NOT FEED INTO A HANDBOARD, INSTALL AN ADDITIONAL 3/4" SCHEDULE 80 PVC CONDUIT FOR GROUNDING. 3/4" X 10'-0" COPPER CLAD GROUND RODS IN ACCORDANCE WITHIN THE CURRENT N.E.C.
ISOMETRIC VIEW

TOP PLATE
GRADE LEVEL

SQUARE BASE
BOTTOM PLAN

OCTAGONAL BASE
BOTTOM PLAN

18" min. below top plate of flak to top of handhole
56" min.

3/4" galv. hex head nuts (4 required)
3/4" galv. flat washers (4 required)
3/16" galv. plate washers (4 required)

Steel flak hot dipped galv.
ASTM A523
FBE-5364 type or approved equal

Belt circle from 7 3/4" to 14 3/4"
3/4" keyhole slot

2" x 3" access handhole
Helix blade

3/4" ~ 10NC x 3" square head galv. ASTM 325
anchor bolts (4 required)

4 1/2" O.D.

1/2" schedule 80 PVC conduit

Ground wire

T.S. Cable

Bell End

3/4" x 10' x 10' x 10' x 10' copper clad ground rods
a variable distance from foundation as
directed by Engineer and in accordance
with the current N.E.C.

HANDHOLE DETAIL

11/2" schedule 80
PVC conduit

#6 or larger standard
ground wire with 18"
min. slack above
foundation top

Handhole

Use non-solder type connection

Gravel

HELIX FOUNDATION ANCHOR ASSEMBLY
FOR PEDESTRIAN PUSHBUTTON PEDESTAL ONLY
(REFER TO SIG-120-A)

NOT TO SCALE
STEEL DRIVER ADAPTER

(FOR 4", 6", OR 8" SCREW IN FOUNDATION ANCHORS)

NOTE: Typically the driver adapter is attached between the Kelly Bar Adapter (hub) on the drill equipment and the top plate of the foundation anchor.

NOT TO SCALE
TRAFFIC SIGNAL CONTROLLER CABINET MOUNTED ON STEEL POLES

Note:
Only 1-3" hole in steel pole allowed for mounting controller

TRAFFIC SIGNAL CONTROLLER CABINET MOUNTED ON WOOD POLES

NOT TO SCALE
Cable
Steel pole
Mounting plate with two holes to fit 3/8" bolt. (typical).
Nut on inside of cabinet

Equipment box, type cabinet
NEMA, Aluminum, Gran Industrial grade with white interior
(size: 14" x 26" x 12"
Metal band bushing (inside cabinet)
see detail "A" sheet 3 of 3

3/4" x .030" min. stainless steel banding (typ.)

Metal band bushing (inside pole)

Lock nut if required

NOTE:
Only 1-3" hole in steel pole allowed for mounting controller

FLASHING BEACON CONTROLLER CABINET
(EQUIPMENT BOX) MOUNTED ON STEEL POLES

Wood pole

1 1/2" to 2" rigid metal or schedule 80 PVC to disconnect
Cabinet grounding terminal bus.
Galvanized steel 2 hole strap (3 + 1 spacing)

1 1/2" to 2" schedule 80 PVC or rigid metal conduit

1 1/2" to 2" entrance LB (metal) (drill 1/8" min. weep hole in lowest point of LB)

See detail "C" sheet 1 of 3

FLASHING BEACON CONTROLLER CABINET (EL 240 TYPE OR EQUIVALENT)
MOUNTED ON WOOD POLES

NOT TO SCALE

4'-6" to grade

Log screw
Bolt & nut 5/16" or 3/8" (typ.)

Controller cabinet EL 240 type

Grounding wire no. 6 bare copper. (If metered service; grounding wire shall be installed to meet utility co. specs.)

Metal band bushing (ground)
see detail "B" sheet 3 of 3

1 1/2" to 2" close nipple (metal)
1 1/2" to 2" entrance LB (metal) (drill 1/8" min. weep hole in lowest point of LB)
Galvanized steel 2 hole strap

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)
FHWA APPROVAL DATE

SIG-100-A

PLAN DATE

SHEET 2 of 3

File: R:\Doc\11\Signals\Web\3p\Rev+Fin\SIG100-A.dgn Rev: 02/16/17
CONTROLLER CABINET MOUNTED ON STEEL POLE DETAIL "A"

CONTROLLER CABINET MOUNTED ON WOOD POLE DETAIL "B"

NOTE:
The distance between LB's as shown on this detail is for clarity of the drawing only. Actual distance between LB's shall be minimized as is practical to the installation.

NOTE:
If rigid metal conduit is used, the conduit must be bonded according to the current N.E.C.
BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET

3" spacing between conduits (typ)
Cap any unused conduit(s)

Bushing required on all conduits
Refer to contract documents for the finished concrete surface requirement for foundations.

NOTE:
Bolt pattern to manufacturer's specifications (2) required.

(4) 3" schedule 80 PVC conduits (min)
or as shown on the plans

#6 insulated or larger stranded copper
ground wire with 48" slack above
foundation.

3/4" x 42" galvanized foundation
bolts, nuts & washers (2 required)
(Refer to Detail "A" on
Sheet 6 of 7 for use of
Drop in type bolts
and anchors.)

NOTE:
1) Grounding system shall measure 10 ohm
or less to ground, with a 10' (min)
spaceing between ground rods.
2) All insulated jackets are to remain
on cable entering controller.
3) Keep 1-3" conduit on left side open
for ITS

NOT TO SCALE
BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET

3" spacing between conduits (typ)
Cap any unused conduit(s)

Bushings required on all conduits
Refer to contract documents for the finished concrete surface requirement for foundations.

NOTE:
Bolt pattern to manufacturer's specifications (2) required.

(4) 3" schedule 80 PVC conduits (min) or as shown on the plans

1 1/2" schedule 80 PVC rigid metal conduit

Grade level

1 1/2" schedule 80 PVC conduit

Handhole

To Service Disconnect

System Grounding
Use non-solder type connection

3/4" x 10'-0" copper clad ground rod(s) a variable distance from foundation as directed by Engineer and in accordance with the current N.E.C.

Insulated ground wire
Gravel

3 1/2"

NOTE:
1) Grounding system shall measure 10 ohm or less to ground, with a 10' (min) spacing between ground rods.

2) All insulated jackets are to remain on cable entering controller.

3) Keep 1-3" conduit on left side open for ITS.

NOT TO SCALE
BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET

3" spacing between conduits (typ)
Cap any unused conduit(s)

Grade level
1 1/2" schedule 80 PVC conduit
Handhole
To Service Disconnect
System Grounding
Use non-solder type connection
3/4" x 10'-0" copper clad ground rod(s) a variable distance from foundation as directed by Engineer and in accordance with the current N.E.C.

3/4" x 2 1/2" galvanized bolts, nuts & washers (4 required)
Washer
Lock washer
Nut

BASE ADAPTOR (spacer if required)

NOTE:
Bolt pattern to manufacturers specifications (4) required.

NOTE:
Bushing required on all conduits
Refer to contract documents for the finished concrete surface requirement for foundations.

(4) 3" schedule 80 PVC conduits

46" MIN
48" MIN

3/4" x 42" galvanized foundation (4) bolts, (4) nuts & (4) washers (required)
(Refer to Detail "A" on Sheet 6 of 7 for use of Drop In type bolts and anchors.)

NOTE:
1) Grounding system shall measure 10 ohm or less to ground, with a 10' (min) spacing between ground rods.
2) All insulated jackets are to remain on cable entering controller.
3) Keep 1-3" conduit on left side open for ITS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL)
FHWA APPROVAL DATE

PLAN DATE

SIG-110-A SHEET
3 of 7
BASE MOUNTED TRAFFIC SIGNAL ITS CONTROLLER CABINET (IF USED)

3/4" x 2 1/2" galvanized bolts, nuts & washers (4 required)

Washer

Lock washer

NUT

SECTION A-A

3" spacing between conduits (Typ)
Copy any unused conduit(s)

3 1/2" schedule 80 PVC rigid metal conduit

1 1/2" schedule 80 PVC rigid metal conduit

Grade level

Handhole

To Service Disconnect

System Grounding

Use non-solder type connection

3/4" x 10'-0" copper clad ground rods (a variable distance from foundation as directed by Engineer and in accordance with the current N.E.C.)

Ground Wire

Gravel

Insulated Ground Wire

ELEVATION

FOUNDATION

NOTE:
1) Grounding system shall measure 10 ohm or less to ground, with a 10' (min) spacing between ground rods.
2) All insulated jackets are to remain on cable entering controller.
3) Keep 1-3" conduit on left side open for ITS

Refer to contract documents for the finished concrete surface requirement for foundations.

NOTE:
Bolt pattern to manufacturers specifications (4) required.

4/6 insulated or larger stranded copper ground wire with 48" slack above foundation.

141 3" schedule 80 PVC conduits

Bushings required on all conduits

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)
FHWA APPROVAL DATE

PLAN DATE
SIG-110-A

SHEET 4 of 7
BASE MOUNTED CONTROLLER PAD

NOTE:
Payment for controller pad to be included in controller foundation pay item. Controller cabinet door to open toward pad.
Notes:
1. Use AISI 300 Series Stainless Steel for all bolts and anchors.
2. Use [Drop in foundation bolts and anchors as directed by the Engineer.]

Alternative Detail "A": Drop in Foundation Bolts & Anchors
### Traffic Signal NEMA 3R Size 6 Cabinet Requirements

#### Traffic Signal NEMA 3R Size 6 Stretch Cabinet Requirements for ITS Applications

- **Cabinet Interior Left Side**
  - T.S. Thermostat
  - Shelves
  - T.S. "D" Connector (mount horizontal and slide down & light bulb)
  - T.S. Detector terminations (slide this down to bottom of rail)

- **Cabinet Interior Back Side**
  - T.S. Power Supply PS 250
  - T.S. Detection Rack
  - T.S. Controller
  - T.S. Monitors
  - T.S. Video Monitors

- **Cabinet Interior Right Side**
  - Reserved for Power Distribution

---

**NOT TO SCALE**

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN**

**(SPECIAL DETAIL)**

**FHWA APPROVAL DATE**

**PLAN DATE**

**SIG-110-A**

**SHEET 7 of 7**
POLE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET

POLE MOUNTED TRAFFIC SIGNAL ITS CONTROLLER CABINET (IF USED)
Note: For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10’ (min.) above grade or as directed by the Engineer.

GLOBAL POSITIONING SYSTEM (GPS) MODULE MOUNTED ON WOOD/CONCRETE POLE
GLOBAL POSITIONING SYSTEM (GPS) MODULE MOUNTED ON STEEL POLE
CAST ALUMINUM COMPARTMENT DETAIL

NOTE: All hardware is stainless steel
ANTENNA ATTACHMENT DETAIL (STEEL POLE)
FOR REMOTE LOCATION

(*) NOTE:
ANTENNA ATTACHMENT SIMILAR TO
PED SIGNAL BRACKET ASSEMBLY.
(FINISHED ASSEMBLY HAS NO THREADS EXPOSED.)

1 1/2" DIAMETER BLACK PIPE
16" THREADED NIPPLE

12"
16"

STEEL POLE

THREADED CAP (PLASTIC OR METAL)
(2) 1 1/2" HEX HEAD NUTS
3/4"K (.030" MIN) STAINLESS STEEL BANDS (TYP)
SEE PAGES 4 AND 5 FOR ALTERNATE ATTACHMENTS
PLASTIC SNAP-IN PLUG
16" THREAD NIPPLE 1 1/2" DIAMETER BLACK Pipe
SET SCREWS
(PLASTIC OR METAL)

THREADED CAP
(PLASTIC OR METAL)

SEE SHEET 5 FOR
BRACKET DETAIL

IRON CROSS
FRONT VIEW

SNAP-IN PLUG
PLASTIC

(2) 1 1/2" HEX HEAD NUTS
BETWEEN ANTENNAS

BLACK PIPE
1 1/2" DIAMETER
16" THREADED NIPPLE
1 1/2" DIAMETER BLACK PIPE

(3/4"X .030"(MIN) STAINLESS
STEEL BANDS (TYP)
SEE "DETAIL A" FOR
ALTERNATE ATTACHMENTS

3/4"X .030"(MIN) STAINLESS
STEEL BANDS (TYP)
SEE "DETAIL A" FOR
ALTERNATE ATTACHMENTS

ALUMINUM
(CAP (TYP))

SET SCREWS

1 1/2" DIAMETER BLACK PIPE

1 1/2" DIAMETER BLACK PIPE

40"

40"

STEEL POLE

SEE SHEET 5 FOR
BRACKET DETAIL

6' VERTICAL SPACING (MIN.)

SINGLE BRACKET METHOD PREFERRED

(*) NOTE:
ANTENNA ATTACHMENT SIMILAR TO
PED SIGNAL BRACKET ASSEMBLY.
(FINISHED ASSEMBLY HAS NO
THREADS EXPOSED.)

ANTENNA ATTACHMENT DETAIL (STEEL POLE)
FOR MASTER OR REPEATER LOCATION
SINGLE BRACKET METHOD PREFERRED

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

SIG-130-B

PLAN DATE

SHEET 2 of 6
**ANTENNA ATTACHMENT DETAIL (STEEL POLE)**

For master or repeater location

Use when 2 brackets are required

---

**NOTE:**

Antenna attachment similar to Ped signal bracket assembly. (Finished assembly has no threads exposed.)
CONTINUOUS FLEXIBLE NON-METALLIC TUBING (INNERDUCT) TO CONTROLLER CABINET.
INNERDUCT IS NOT REQUIRED IF COMMUNICATION CABLE IS 600V RATED.

ANTENNA CABLE TO CONTROLLER CABINET

FRONT VIEW
CONTINUOUS FLEXIBLE NON-METALLIC TUBING (INNERDUCT) TO CONTROLLER CABINET
ANTENNA CABLE TO CONTROLLER CABINET

ANTENNA ATTACHMENT DETAIL (STEEL POLE)

3/4" X .030" (MIN) STAINLESS STEEL BANDS (TYP)
SEE "DETAIL A" FOR WOOD POLE ATTACHMENT AND CONDUIT CONNECTION

LAG SCREWS W/WASHERS (TYP)
3/8" X 5" STAINLESS STEEL

FRONT VIEW

ANTENNA ATTACHMENT DETAIL (WOOD POLE)

3/8" X 5" STAINLESS STEEL LAG SCREWS W/WASHERS (TYP)

FRONT VIEW
CONTINUOUS FLEXIBLE NON-METALLIC TUBING (INNERDUCT) TO CONTROLLER CABINET
ANTENNA CABLE TO CONTROLLER CABINET

GALVANIZED STEEL 2 HOLE STRAP
SCHEDULE 80 PVC OR RIGID METAL CONDUIT

NOT TO SCALE
(*) NOTE:
WHEN 2 ANTENNAS ARE USED
A MINIMUM OF 6' SEPARATION
SHALL BE USED.
CELL MODEM TRANSMITTER BRACKET DETAIL "A"

ANTENNA ATTACHMENT DETAIL (STEEL POLE)
FOR CELL MODEM TRANSMITTER

FOR WOOD POLE ATTACHMENT
STEEL BANDS (TYP) SEE SHEET 3
3/4"X .030"(MIN) STAINLESS
STEEL BANDS (TYP) SEE SHEET 3
FOR WOOD POLE ATTACHMENT

SET SCREWS

PLASTIC SNAP-IN PLUG

16" THREADED NIPPLE
1 1/2" DIAMETER BLACK PIPE

THREADED CAP
(PLASTIC OR METAL)

(12) 1 1/2" HEX HEAD NUTS

LMR 400DB TYPE CABLE

1 1/2" DIAMETER BLACK PIPE

1 1/2" HEX HEAD NUTS

BLACK PIPE
1 1/2" DIAMETER

IRON CROSS

12"

ALUMINUM CAP (TYP)

PLASTIC SNAP-IN PLUG

16" THREADED NIPPLE
1 1/2" DIAMETER BLACK PIPE

STEEL POLE

SET SCREWS

ALUMINUM CAP (TYP)

PLASTIC SNAP-IN PLUG

16" THREADED NIPPLE
1 1/2" DIAMETER BLACK PIPE

STEEL POLE

Hose Clamps

LMR 400DB TYPE CABLE

1 1/2" DIAMETER BLACK PIPE

1 1/2" DIAMETER BLACK PIPE

12"
(*Note: RSU shall be mounted between 19' and 25'.)

**Antenna Attachment Detail (Steel Pole)**

*For Cell Modem Transmitter*

**Top View**

**Section A-A**

**Side View**

**Set Screws**

**Iron Cross**

**Plastic Snap-in Plug**

**1 1/2" Hex Head Nuts**

**3/4"x .030" (Min) Stainless Steel Bands (Typ) See Sheet 3 for Wood Pole Attachment**

**16" Threaded Nipple**

**1 1/2" Diameter Black Pipe**

**1 1/2" Diameter Black Pipe**

**16" Threaded Nipple**

**1 1/2" Diameter Black Pipe**

**1 1/2" Hex Head Nuts**

**Aluminum Cap (Typ)**

**Set Screws**

**Thru Bolt Cap**

**Plastic or Metal**

**Steel Band (Typ) See Sheet 3**

**3/4"x .030" (Min) Stainless Steel Bands (Typ) See Sheet 3 for Wood Pole Attachment**

**RATED Cable**

**Cat 5e 600V Rated Cable**

**Roadside Unit**

**See Section A-A**

NOT TO SCALE
**ANTENNA ATTACHMENT DETAIL (WOOD POLE)**

FOR CELL MODEM TRANSMITTER AND RSU COMBO

(*) NOTE:
RSU SHALL BE MOUNTED BETWEEN 19' AND 25'

**THREADED CAP (PLASTIC OR METAL)**

**CELL MODEM TRANSMITTER**

SEE "DETAIL B" FOR BRACKET DETAIL

**HOSE CLAMPS**

**LMR 400DB TYPE CABLE**

1 1/2" DIAMETER BLACK PIPE (TYP)

DRILL 9/16" HOLE IN ALUMINUM PLUG FOR CABLE

IRON CROSS

**SET SCREWS**

**12"**

**RSU BRACKET**

**STEEL POLE**

(2) 1 1/2" HEX HEAD NUTS

3/8" X 5" STAINLESS STEEL LAG SCREWS W/WASHERS (TYP)

**PLASTIC SNAP-IN PLUG**

16" THREADED NIPPLE 1 1/2" DIAMETER BLACK PIPE

**THREADED CAP (PLASTIC OR METAL)**
U.P.S. Cabinet Base Mounted

TRAFFIC SIGNAL CONTROLLER/CABINET BASE MOUNTED

Foundation bolts (2 required)

ELEVATION

CABINET FOUNDATION

NOTE:
1. Refer to SIG-011-A for Controller Cabinet Mounting on Steel or Wood Pole
2. Refer to SIG-045-A for T.S. Base Mounted Controller Cabinet Foundations.
3. Refer to SIG-153-A for strain pole foundation details.

NOTE TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
TRAFFIC SIGNAL
UNINTERRUPTIBLE POWER SYSTEM

SIG-140-A SHEET 1 of 2
SECONDARY SERVICE/DISCONNECT
FOR WOOD POLES-OVERHEAD POWER FEED
NON- METERED SERVICE

NOT TO SCALE
NOTES:
(*) If rigid metal conduit is used the conduit must be bonded according to the current N.E.C.

(#) For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10' (min.) above grade or as directed by the Engineer.

(2) 3/8" x 2 1/2" Galvanized Hex head lag screw w/washers

60A service disconnect
(NEPA 4-X stainless steel)
Fused at 60A. Orientation on backside facing away from curb.

1 1/2" to 2" male adapter schedule 80 PVC

1 1/2" to 2" schedule 80 PVC
or rigid metal conduit (#) see note

1 1/2" to 2" male adapter schedule 80 PVC

Control cabinet

Utility Handhole
(as per plans)

Refer to cabinet details for distance to grade

1 1/2" to 2" nipple (metal)

1 1/2" to 2" nipple (metal)

Use non-solder-type connection

Ground wire

Underground electrical service

Ground rod(s)

Galvanized 2 hole strap

Galv. Steel 2 hole strap
(3 ft spacing)
(1/4" or 1/2" hex head lag screw
U-guard fastener or approved equal)

Mount at 11'
or as directed
by Engineer

Expansion joint

1 1/2" to 2"
LB (metal)

Expansion joint

Grade level

1 maximum to grade

SECONDARY SERVICE/DISCONNECT FOR
WOOD POLES-UNDERGROUND POWER FEED
NON-METERED SERVICE

NOT TO SCALE
SECONDARY SERVICE/DISCONNECT FOR
WOOD POLES—OVERHEAD POWER FEED
METERED SERVICE

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

UNDERWRITTEN BY

(SPECIAL DETAIL)
FHWA APPROVAL DATE

PLAN DATE

SIG-200-A

SHEET
3 of 4

(*NOTE:
This detail is illustrated as a metered installation. If the plans call for an un-metered installation, then the meter shall be omitted and a direct electrical supply shall run to the service disconnect (fused at 60 amps).

Porcelain strain insulator (if required) shall meet the codes and placement requirements of the local utility co.

Wood pole

1 1/2" to 2" service cap (PVC) (weather head)

3-1/2#8 AWG service cable
-or-
1-3/2#8 AWG service cable

Galvanized steel
2 hole strap
(3 ft spacing)

1 1/2" to 2" schedule 80 PVC
or rigid metal conduit

Expansion joints

Meter shall be installed to meet N.E.C. and utility co. specs.

1 1/2" to 2" nipple (metal)

1 1/2" to 2" male
adapter schedule 80 PVC

1 1/2" to 2" LB (metal)

Grade level

Ten to grade

Mount at 10
or as directed
by Engineer

(2) 3/8" x 2 1/2" Galvanized
Hex head lag screw w/washers

5/8" DA bolt

Power Co. secondary service

Wood or plastic
molding

(120/240V A.C., Single Phase)

1/2" Round molding for grounding
with 2" x 1/2" x 0.152" Galvanized
pointed staples or equal

60A service disconnect
(NEMA 4-X stainless steel)
fused at 60A. Orientation
on backside facing away
from curb.

1 1/2" to 2" male
adapter schedule 80 PVC

Control cabinet

1 1/2" to 2" close nipple
(metal)

1 1/2" to 2" nipple
(metal)

Galvanized Steel
2 hole strap

Half Round molding for grounding
with 2" x 1/2" x 0.152" Galvanized
pointed staples or equal

Handhole (as per plans)

Bell end

Use non-solder type connection

Ground rods)
(*) NOTE:
This detail is illustrated as a metered installation. If the plans call for an un-metered installation, then the meter shall be omitted and a direct electrical supply shall run to the service disconnect (fused at 60 amps).

NOTES:
If rigid metal conduit is used the conduit must be banded according to the current N.E.C. (*) For projects maintained by the Wayne Co. Department of Public Services (WCDPS) use rigid metal conduits from grade level to 10’ (min.) above grade or as directed by the Engineer.

SECONDARY SERVICE/DISCONNECT FOR WOOD POLES-UNDERGROUND POWER FEED

METERED SERVICE
NOTE:
Porcelain strain insulator (if required) shall meet the codes and placement requirements of the local utility co.

Steel pole
3" metal service cap (weather head)

1 1/2" to 2" close nipple (metal)

1 1/2" to 2" LB (metal)

3" metal service cap (weather head)

60A Service disconnect (NEMA 4-X stainless steel) fused at 60A. Orientation on backside facing away from curb.

Steel pole
3" metal service cap (weather head)

1 1/2" to 2" close nipple (metal)

1 1/2" to 2" LB (metal)

Stainless steel banding

Front view

Grade level

SERVICE DISCONNECT

NOTE:
Only 1-2" hole in steel pole allowed for mounting disconnect.

Steel pole
3" metal service cap (weather head)

1 1/2" to 2" service cap

240V 3 wire service cable
3-JC #6 AWG

1 1/2" to 2" service cap

240V 3 wire service cable
3-JC #6 AWG

1 1/2" to 2" PVC or rigid

Band saddle and hanger refer to detail

60A Service disconnect (NEMA 4-X stainless steel) fused at 60A. Orientation on backside facing away from curb.

1 1/2" to 2" close nipple (metal)

1 1/2" to 2" LB (metal)

Grade level

Close nipple (metal)

NOTE:
The distance between LB's as shown on this detail is for clarity of the drawing only. Actual distance between LB's shall be minimized as practical to the installation.

METERED SERVICE WITH 1-3/C #6 AWG SERVICE CABLE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY
STANDARD PLAN FOR
SECONDARY SERVICE/DISCONNECT
FOR STEEL POLES

MDOT
PREPARED BY TRAFFIC AND SAFETY
DRAWN BY: DJF
CHECKED BY: 

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)

FHWA APPROVAL DATE

PLAN DATE

SIC-201-A

SHEET
1 of 2

Rev. 02/16/17
NON-METERED SERVICE WITH
1-3/C #6 AWG SERVICE CABLE

NON-METERED SERVICE WITH
3-1/C #6 AWG SERVICE CABLE

NOT TO SCALE
ACCORDANCE WITH THE CURRENT N.E.C.

AS DIRECTED BY ENGINEER AND IN

3/4" X 10'-0" COPPER CLAD GROUND ROD(S)

BELL END

GRAVEL

HANDHOLE

36"

TYPE CONNECTION

USE NON-SOLDER

UNDERGROUND SERVICE

METERED AND UNMETERED

(SPECIAL DETAIL)

32"

22.5"

20.19"

8"

ANCHOR BOLTS

TO MATCH FLANGE PATTERN (*)

(*) NOTE: STAINLESS STEEL ANCHOR BOLTS OR STAINLESS STEEL DROP INS,

TO BE USED ON EXISTING FOUNDATIONS WITH PROPER GRADE AND SIZE.

LUG TERMINAL

BAR (LONE LUGS)

6 CIRCUIT LOAD CENTER,

STAINLESS STEEL

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

FRONT VIEW

UNDERGROUND (UG) SERVICE PEDESTAL (METAL)

MOUNTED ON FOUNDATION

48"

1/4" SIDEWALK

1/2"

1 1/2"

GRADE LEVEL

TS CABLE TO CONTROLLER CABINET

1 1/2" SCHEDULE 80 PVC CONDUIT

(1) 1 1/2" SCHEDULE 80 PVC CONDUIT

(1) 1 1/2" SCHEDULE 80 PVC CONDUIT

(1) 2" SCHEDULE 80 PVC CONDUIT

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,

WITH MAIN DOOR LOCK

SIDE VIEW

HANDHOLE DETAIL

WASHER TO PROVIDE A MINIMUM

OF 1/4" CLEARANCE (TYP)

STAINLESS STEEL SQUARE

ANCHOR BOLTS

WITH MAIN DOOR LOCK

100 AMP. SERVICE RATED,
**PREFERRED SITE ORIENTATION PLAN**

- DISCONNECT AND SERVICE ENTRANCE DOORS MUST NOT FACE STREET (TYP.)
- 36" MIN.
- 12" MIN.

**CABINET DOOR**

**CONCRETE FOUNDATION**

24" DIA. ROUND

**CUSTOMER SECTION**

UTILITY SECTION

- 8.25" 6"

- 24" DIA. ROUND CONCRETE FOUNDATION

**BOLT PATTERN LAYOUT**

**PREFERRED PEDESTAL & FOUNDATION ORIENTATION PLAN**

- U.G. SERVICE PEDESTAL

- PLACE PEDESTAL SO IT DOES NOT INTERFERE WITH FULL OPERATION OF CABINET DOOR

- 36" MIN.

- 12" MIN.

- MAIN STREET

- CROSS STREET

- 8.25" 6"

**NOT TO SCALE**

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)

FHWA APPROVAL DATE

SIG-210-B

PLAN DATE

Rev. 02/05/18
UNDERGROUND METERED SERVICE
(120/240V 60 HZ)

NOTES:
1) The 6" x 8" wood post shall meet the requirement of the current M.D.O.T. Standard Specifications for Construction.

2) The meter and socket shall be as approved and required by the local power company.

3) All National Electric Code and local utility requirements for underground metered service shall be met.

4) For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10' (min.) above grade or as directed by the Engineer.

NOT TO SCALE
UNDERGROUND NON-METERED SERVICE,
(120/240V 60 HZ)

NOTES:

1) The 6" x 8" wood post shall meet the requirement of the current M.D.O.T. Standard Specifications for Construction.

2) All National Electric Code and local utility requirements for underground non-metered service shall be met.
DOUBLE SERVICE
STREET LIGHT DETAIL FOR OVERHEAD
POWER FEED ON WOOD POLE

(*) NOTE:
Metal conduit shall be bonded according to the current N.E.C.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
SECONDARY SERVICE FOR STREET LIGHTING AND STREET NAME SIGNS

02/16/17 SIG-220-A SHEET 1 of 4

Use 1-3/0#6 Secondary Service Cable for 120/240v T.S. Feed overhead "Signal Service" tag.

Engraved plaque Labeled "Signal Service Disconnect".

Engraved plaque Labeled "Street Lighting Service Disconnect" or as approved by Engineer. Label Brecker Space within disconnect.

Mount at 11' or as directed by the Engineer. Notice:

Metal conduit shall be bonded according to the current N.E.C.

DOUBLE SERVICE STREET LIGHT DETAIL FOR OVERHEAD POWER FEED ON STEEL POLE
**UNDERGROUND DOUBLE SERVICE STREET LIGHTING**

**WIRING DIAGRAM**

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL) FHWA APPROVAL DATE 02/16/17

PLAN DATE SHEET 3 of 4

FILE: ReDoc/10/Signals/Rev/Sp&Dbl/Plan/SIG2204.png

(*) NOTE: Detail is diagramatic only. Actual layout and conduit routing varies by site. All underground Conduit shall be Schedule 80 PVC.
Steel pole

3" Chase Nipple

3" metal service cap (weather head)

120/240V 3 wire service cable
1-3/C #6 AWG

3" Steel Coupling
With Steel Chase Nipple

4" OD
3 1/8" ID
3 3/8"

Steel Coupling

1 1/4"

Chase Nipple A

2" Typ
3 1/8" ID

Chase Nipple B

STRAIN POLE WEATHER HEAD INSTALLATION

NOT TO SCALE
COLOR CODE FOR WIRING CONNECTING TRAFFIC SIGNAL LAMPS

NOTE: No splices allowed between traffic signal head and controller.

COLOR CODE FOR WIRING CONNECTING PEDESTRIAN SIGNAL LAMPS
(WALKING PERSON - HAND SYMBOL)

NOT TO SCALE

MDOT
PREPARED BY
TRAFFIC AND SAFETY

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT
(SPECIAL DETAIL)
FHWA APPROVAL DATE

PLAN DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
COLOR CODE WIRING/EQUIPMENT GROUNDING

SIG-230-A SHEET
1 of 6
STANDARD - 3 COLOR SIGNAL DISPLAY

FLAShING YELLOW ARROW (FYA) - 4 COLOR SIGNAL DISPLAY

DOG HOUSE W/RIGHT TURNS - 5 COLOR SIGNAL DISPLAY

COLOR CODE FOR WIRING CONNECTING TRAFFIC SIGNAL LAMPS
NOTE:
For all cable poles, install 3/4" x 10'-0" ground rod(s) as shown on "ground rod installation". Connect ground rod(s) with #6 min. copper wire to messenger wire with non-solder type connection.

STEEL POLE/PEDESTAL GROUNDING DETAIL
GROUNDING

Install 3/4" x 10'-0" copper clad ground rod(s) as required to provide less than 10 OHM resistance to ground.

Grounding wire #6 AWC min. bare copper grounding wire shall be installed to meet N.E.C. and utility company specs.

Ground wire from disconnect to ground rod to be in moulding (wood pole or post) or inside the pole (steel). Ground wire from disconnect to controller cabinet to be in conduit (wood pole, wood post, and steel pole).

CONTROLLER CABINET GROUNDING DETAIL
1. All ground rods shall be 3'6" x 1/2" in length, except for ground rods located within 10' of any other ground rods, each shall have its own separate grounding rod, and an additional ground rod shall be located in the adjacent hardwire system and shall be connected to a ground rod with a 5' wood pole.

2. Ground rods shall be driven straight down, so that only the required portions of the ground rod extend to the ground surface.

3. The ground system shall extend a 10' radius or less.

4. Each ground rod shall be connected to the ground system with a single 26 AWG copper conductor.

5. Do not install any ground rod within 10' of any other ground rod.

6. The ground system shall be connected to the grounding system of the adjoining hardwire system.

7. A separate ground rod shall be installed in the ground system at every 20' interval.

8. Each ground rod shall be connected to the ground system with a single 26 AWG copper conductor.

9. All ground rods shall be driven straight down, so that only the required portions of the ground rod extend to the ground surface.
LIGHTNING PROTECTION DETAIL

LIGHTNING PROTECTION ON STEEL POLE

- **GROUND ROD (10') 3/4" COPPER CLAD**
- **STEEL POLE**
- **LIGHTNING PROTECTION ON STEEL POLE FOR HANDHOLE PLACEMENT AND "DETAIL C" SEE "DETAIL B"**
- **12" POLYMER CONCRETE HH** SEE "DETAIL B" AND "DETAIL C" FOR HANDHOLE PLACEMENT
- **3/4" COPPER CLAD GROUND ROD (10')**

**NOT TO SCALE**

**LIGHTNING PROTECTION DETAIL**

**MICHIGAN DEPARTMENT OF TRANSPORTATION**
**BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR**

SIG-231-A

**REFERENCE**
RefDoc/TR/Signs/WEB/Sp Det/Fin/SIG231A.dgn
11/05/18
5/8" COPPER CLAD GROUND ROD (10')

SEE "DETAIL E" FOR CLAMP ASSEMBLY

WOOD POLE

GRADE LEVEL

12" POLYMER CONCRETE HH

3/4" COPPER CLAD GROUND ROD (10')

LPI CLASS II COPPER DOWN CONDUCTOR IN 1" SCHEDULE 80 CONDUIT

LIGHTNING PROTECTION ON WOOD POLE

NOT TO SCALE
LIGHTNING PROTECTION ON MAST ARM

POLE HANDHOLE "DETAIL A"
(3) 3" PVC SCHEDULE 80 CONDUIT

(2) 1" PVC SCHEDULE 80 CONDUIT
APPROXIMATELY 180° APART

SUPPORT STRUCTURE FOUNDATION

12" HANDHOLE WITH GROUNDING ROD

12" HANDHOLE WITH GROUNDING ROD

(1) 1 1/2" PVC SCHEDULE 80 CONDUIT

SEE DETAIL "SIG-040-A" FOR
CONDUITS TO THIS HANDHOLE
MAINTAIN 10" MIN. SEPARATION
FROM LIGHTNING PROTECTION
HANDHOLES

STEEL POLE HANDHOLE PLAN VIEW
LAYOUT "DETAIL B"

LP1 CLASS II COPPER
DOWN CONDUCTOR
IN 1" SCHEDULE 80 CONDUIT

GRADE (LEVEL)

HANDHOLE

12"X12" POLYMER CONCRETE 24" DEEP, BOXES WILL BE STACKABLE,
OR AS APPROVED BY ENGINEER

4"X4" TREATED WOOD FRAME
(PER LATEST STANDARD
SPECIFICATIONS FOR CONSTRUCTION)

CRUSHED STONE

3/4" COPPER CLAD GROUNDING ROD(S) (10') AS DIRECTED BY
ENGINEER AND IN ACCORDANCE WITH THE CURRENT N.E.C.

GROUND RODS SHALL BE PLACED MINIMUM
10' APART AT APPROXIMATELY 180°

STEEL POLE HANDHOLE ELEVATION VIEW
LAYOUT "DETAIL C"
**ADDITIONAL TINNED BRONZE THREADED CAP AND DOWN CONDUCTOR FOR SINGLE DOWN CONDUCTOR CONFIGURATION.**

**5/8" COPPER CLAD GROUND ROD (10')**

**THREADED TINNED BRONZE CAP (TYP)**

**TINNED BRONZE CLAMP (TYP)**

**1/2" NUT (TYP)**

**1/2" WASHER (TYP)**

**LIGHyN PROTECTITON CLAMP ON STEEL POLE "DETAIL D"**

**5/8" COPPER CLAD GROUND ROD (10')**

**STAINLESS STEEL FENDER WASHER (TYP)**

**TINNED BRONZE CLAMP (TYP)**

**1/2" NUT (TYP)**

**1/2" WASHER (TYP)**

**LIGHTNING PROTECTION CLAMP ON WOOD POLE "DETAIL E"**

**DRILL HOLE THROUGH POLE TO ACCOMMODATE 1/2"-13 N.C STAINLESS STEEL THREADED ROD IN HANDHOLE**

**LP I CLASS I TINNED COPPER DOWN CONDUCTOR TO GROUND ROD IN HANDHOLE**
*NOTE:*
AIR TERMINAL SHALL BE ABOVE THE DEVICE(S) IT'S PROTECTING BY A MINIMUM OF 12 INCHES.
2' PRECAST ROUND HANDHOLE WITH FLOOR

NOTE:
Logo imprinted on lid shall read "MDOT Traffic Signal"

TYPICAL CONDUIT ENTRANCE AT HANDHOLE
3/4" letters (recessed flush)

(12) 3/4" dia holes
13 1/2" apart

Top View of Cover

Note:
Machined Surface

COVER SECTION

FRAME SECTION

TOP VIEW OF COVER

7/8" dia handling hole

TOP VIEW OF FRAME

FRAME AND COVER

NOTE:
Logo imprint may read "Traffic Signal" for non MDOT Installation

36" PRECAST ROUND HANDHOLE
SECTION DETAIL

3' DIAMETER ROUND PRECAST CONCRETE HANDHOLE

NOT TO SCALE
NOTE:
Logo imprint may read "Traffic Signal" for non MDOT installations.

NOTES PERTAIN TO PRECAST OR BRICK:
1) The material and workmanship shall be in accordance with the current

2) All concrete masonry shall be grade 30M.

3) The inner surface of the handhole shall be smooth.

4) Heavy Duty covers shall be castings which meet the requirements of the
   current specifications for gray iron castings ASTM designation A48 and
   shall have a minimum strength as provided for Class No. 30 gray iron
   castings.

5) All castings shall be cleaned by sand blasting.

6) The seating face of the cover and the seat for the same on the frame if
   required, shall be ground or machined so that the cover shall have an
   even bearing on its seat to prevent rocking or tilting.

7) The castings shall be free of pouring faults, blow holes, cracks and
   other imperfections. They shall be sound, true to form and thickness,
   clean and neatly finished and shall be coated with tar pitch varnish.

8) Light Duty cover shall be bolted to frame with not less than 2
   countersunk Hex head bronze bolts.

9) The Heavy Duty cover & frame shall be East Jordan Iron Works #8206 Neenah
   Foundry, #R-6662-HP for square cover or East Jordan Iron Works #2860
   Type "A", Neenah Foundry #R-6052 D for circular cover or an approved equal.

10) Handhole shall be equipped with cable rack and hooks to train cable.

NOT TO SCALE
Galvanized step is standard with grade ring ASTM C478.

Grade ring with 39" I.D. &
46 1/2" RECESS

<table>
<thead>
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<th>Length</th>
<th>Width</th>
<th>Height</th>
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<tr>
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<td>Outside</td>
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<tr>
<td>Roof</td>
<td>Bottom 3850</td>
</tr>
<tr>
<td>Floor</td>
<td>Total 1150</td>
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</tbody>
</table>

4' x 4' x 4' PRECAST CONCRETE HANDBO严

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL)
FHWA APPROVAL DATE

SIG-240-A SHEET 4 of 6
NOTE:
Logo imprint it on cover shall read "MDOT Traffic Signal" for MDOT installations.

Frame E.J. #12042 or approved equal gray iron (ASTM A48CL35)
3/4" letters recessed flush
(1) Open pin hole
(2) 3/4" dia holes 13 1/2" apart

Cover E.J. #12042 or approved equal gray iron (ASTM A48CL35)

7/8" Handling hole

33 1/4" dia
1 1/8"
7 7/8"

29 1/2" dia
31 5/8" dia
45" dia

FRAMING SECTION
MANHOLE FRAME (HEAVY DUTY)
Estimated weight 410 lbs

NOTE:
Machined surface

COVER SECTION
MANHOLE COVER (HEAVY DUTY)
Estimated weight 245 lbs

BOTTOM VIEW OF COVER

NOTE:
Machined surface

4' x 4' x 4' PRECAST CONCRETE HANDHOLE

NOT TO SCALE
Concrete: 4500 p.s.i. @ 28 days
Reinforcement: Grade 60 rebar
All bars are #4

PLAN VIEW
Without frame & cover

SECTION VIEW
Typical reinforcement all walls

2' x 2' SQUARE x 3' HANDHOLE
For use on Oakland County roads only.
(†) NOTE:
Marking tape shall have proper logo as supplied by the Engineer and installed by the Contractor.

DIRECT BURIAL CONDUIT(S)/CABLE(S)

NOTE:
Preferred trench width "W" not wider than conduit encasement width "D".

TYPICAL SECTION OF TRENCH
ENCASED CONDUIT

NOT TO SCALE
(*) NOTE:
Jacking-pit is to be a minimum of 25 ft from R.R. track and located within highway R.O.W.

PLAN

CROSS-SECTION (STEEL CONDUIT)

CROSS-SECTION (NON-FLAMMABLE SUBSTANCES)

HORIZONTAL DISTANCES ARE MEASURED AT RIGHT ANGLES TO CENTERLINE OF TRACK

NOT TO SCALE
NOTES:
1) The conduit shall be installed at a min. depth of 5'-6" with reinforced bars (if required per R.R. requirements) as shown in detail and as indicated on the plans within the entire crossing of railroad R.O.W.

2) Track support devices shall be placed & removed to carry the railroad, tracks over the open trench installation with the trench properly supported with sheeting & any other supports required to complete the conduit installation within the railroad R.O.W. the extra cost of such installation shall be incidental to the encased conduit item.

3) Contractor shall contact Division Engineer of railroad before starting excavation for conduit installation.

4) Contractor shall reimburse railroad Co. for services performed by railroad Co. where required.

5) All work shall be conducted so as not to interfere with, interrupt or endanger the integrity of rail operation.

CONDUIT UNDER RAILROAD TRACKS

(1) 3" CONDUIT
N.T.S.

(1) 3" REINFORCED CONDUIT
N.T.S.

5/8" bars 4" O.C.
longitudinal & 4" 0" O.C. transverse
NOTES: 1) Splice box to be constructed to provide a weather tight enclosure.
2) All cables shall enter TS splice box through bottom of enclosure with a water tight fitting.
3) Bushing for cable entrance into enclosure to be liquid tight and sized per cable used.

TRAFFIC SIGNAL (TS) SPLICE BOX MOUNTED ON STEEL OR WOOD POLES
(*) NOTE: Cotter key required as shown.

ONE-WAY TRAFFIC SIGNAL HEAD

OH SIGNAL LOCK NUT DETAIL

HANGER ATTACHMENT
NOTE:
2-way T.S. shown
3-way T.S. & 4-way similar

MULTIPLE-WAY TRAFFIC SIGNAL HEAD(S)

NOTE:
1) Exterior surface of all mounting assembly located below
   span clamps, including stems, lock nuts, and related hardware
   must match the current FHWA Highway yellow color tolerance
   chart per the Standard Specifications for Construction.

2) Tolerance within $\frac{1}{8}$" for all bracketing.

NOT TO SCALE
TYPICAL SIGNAL DISPLAYS

SIGNAL HEAD BRACKET ADJUSTMENT

ROTATIONAL ADJUSTMENT
RIGHT AND LEFT

ROTATIONAL ADJUSTMENT
ABOUT BRACKET ARM

VERTICAL ADJUSTMENT

ROTATIONAL ADJUSTMENT
ABOUT MAST ARM

NOT TO SCALE

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

MAST ARM MOUNTED
T.S. BRACKET ASSEMBLY

SIG-301-A
1W-3C With 12" x 27" Case Sign
1-W Case Sign (24" x 30" Shown)
1-WAY Bracket Assembly
Detail "A"

1-WAY Bracket Arm Assembly

+ Note: Use 46" tube for 3 section I.S.
Use 88" tube for 4 section I.S.

NOT TO SCALE
1-WAY 5-Section Cluster Bracket Assembly

Detail "D"

Aluminum Female Cable Mount Clamp

Aluminum Male Cable Mount Clamp

5/16"-18x1-1/2" Hex Head Tap Bolt Type 304 Stainless

5/16" Split Lock Washer Type 304 Stainless

5/16"-18 Stainless V-Bolt Kit

Note: All hardware Stainless Steel

Aluminum Plate with
5/16"-18x7/8" Hex Head Bolt Type 304 Stainless
5/16" Split Lock Washer Type 304 Stainless

Toggle Bolt Assembly Type Zinc 2

Aluminum Clamp With Galvanized Cable

Detail "C"
1W-Illuminated Street Name Sign

- Free-swinging tri-stud mast arm sign hanger assembly
- 3/16" x 1/4" zinc 1 pin groove
- 5/8" Stainless band clamp
- Socket hd 5/16"-18 x 1/4" stainless set screw
- Mini brac w/ galv screw
- All thread 1 1/2" NPS x 2" alum nipple
- 1 1/2" clevis alum adapter
- Sq head 1/4"-20 x 5/8" stainless set screw
- 5/8" x 2 1/4" galv clevis pin
- Slotted neoprene gasket
- Slotted zinc 2 washer
- 5/16" stainless split lock washer
- 5/16"-18 stainless hex nut

2W-Illuminated Street Name Sign

BAND LENGTH OPTIONS
- 29" fits 4"-8" pole dia
- 42" fits 4"-32" pole dia

STAINLESS STEEL BUSHINGS
STAINLESS UPGRADE (AB-0503-SS)

Note: All hardware stainless steel

NOT TO SCALE
5-SECTION CLUSTER (DOGHOUSE) TRAFFIC SIGNAL

COMBINATION 5-SECTION CLUSTER & 1-WAY T.S. (ALUMINUM)

(+) NOTES:
1) Traffic signals must conform to the current ITE publication "Vehicle Traffic Control Signal Heads."
2) Provide cast aluminum alloy housings with a 2" diam. hole top and bottom to receive 1 1/2" inch supporting pipe.
3) Provide a detachable, sheet aluminum visor (min. 0.050" thick), for each signal indication.
4) Provide twist on slots for visor mounting that are either in the visor or on the tabs formed on the visor.

TWIN 5-SECTION CLUSTER TRAFFIC SIGNAL

NOT TO SCALE
HIGH INTENSITY ACTUATED CROSSWALK BEACON
(TO STOP TRAFFIC FOR PEDESTRIAN CROSSING LOCATIONS)

NOT TO SCALE

MDOT
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
BRACKETING FOR
HAWK SIGNAL DISPLAY

SIG-303-A

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT
(SPECIAL DETAIL)

FHWA APPROVAL DATE

PLAN DATE

1 of 2

PREPARED BY
TRAFFIC AND SAFETY

DRAWN BY: JAM
CHECKED BY:
NOTES:
1) Backplates are to be used for mast arm type (fixed support) or tethered span wire type installations as indicated on the plans or as directed by the Engineer.
2) Backplates must be a one piece construction unless otherwise directed by the Engineer.
3) Do not cut the backplate for installation.
4) Use one inch border with yellow signal heads and visors.

TRAFFIC SIGNAL BACKPLATES
**TETHER DETAILS**

**SPAN WIRE**

- Span Wire runs straight across.
- Attach Tether assembly so that Tether Span Wire runs straight across.
- ALL Vehicle signals and signs hung on a span shall be tethered. Span pole contact heights need not be at the same elevation.

**ELEVATION VIEW: TOP TETHER INSTALLATION**

- Tether Span Wire (1/4" Galv. Steel Strand Min.) with Armor Rod
- 1 1/2" Galv. Steel Pipe
- 2'-0" Minimum
- 10 SS Screw 5 Places
- Washer
- Nut, Nylon Lock, 5/16"-18, Type 304 Stainless Steel (2)
- Cotter Key

**DETAIL “A”: SPAN WIRE INSTALLATION WITH TOP TETHER SPAN WIRE**

- Univ. Stabilizer Bar, Aluminum, 4" x 1.5", for 5/16" U-Bolt (2)
- Ø.38 thru 3 Places
- Washer, Flat, 5/16" x 3/4" OD, Type 304 Stainless Steel (2)

**DETAIL “B”: BREAK-AWAY TETHER ASSEMBLY FOR TOP OF SIGNAL HEAD**

- Anchor Guy
- Wood Pole
- UNIVERSAL STABILIZER BAR, ALUMINUM, 4" X 1.5", FOR 5/16" U-BOLT (2)
- Ø.38 THRU 3 PLACES
- WASHER, FLAT, 5/16" X 3/4" OD, TYPE 304 STAINLESS STEEL (2)
- NUT, NYLON LOCK, 5/16"-18, TYPE 304 STAINLESS STEEL (2)
TOP TETHER SPAN WIRE STEEL POLE CONNECTION DETAIL

Refer to break-away tether assembly see detail "A" & detail "B"

Install the tether wire with 500 to 750 lbs. tension

TOP TETHER SPAN WIRE WOOD POLE CONNECTION DETAIL

Refer to break-away tether assembly see detail "A" & detail "B"

Install the tether wire with 500 to 750 lbs. tension

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

FHWA APPROVAL DATE

SIG-305-C

PLAN DATE

SHEET 2 of 5
WITH ARMOR ROD
(1/4" GALV. STEEL STRAND MIN.)

TETHER SPANN WIRE
ALUMINUM, 4" X 1.5", FOR 5/16" BOLT (2)

UNIVERSAL STABILIZER BAR, 1/2"

ROADWAY

SPAN WIRE
19' MAX.
17' MIN.
19' MAX.

ELEVATION VIEW: BOTTOM TETHER INSTALLATION

ATTACH TETHER ASSEMBLY SO THAT TETHER SPANN WIRE RUNS STRAIGHT ACROSS.

ALL VEHICLE SIGNALS AND SIGNS HUNG ON A SPAN SHALL BE TETHERED. SPAN POLE CONTACT HEIGHTS NEED NOT BE AT THE SAME ELEVATION.

DETAIL "C": TETHER ASSEMBLY TRI-STUD BREAK-A-WAY

DETAIL "D": BREAK-AWAY TETHER ASSEMBLY FOR BOTTOM OF SIGNAL HEAD

NOT TO SCALE
#6 COPPER MIN. GROUNDING WIRE
FROM OVERHEAD WEATHERHEAD

1 1/2" GALV. STEEL POLE

SPLIT BOLT

PREFORMED DEAD END BAIL

THIMBLE

EYEBOLT

TURNBUCKLE

POLE CLAMP

750 LBS. TENSION WIRE WITH 500 TO 750 LBS. TENSION

INSTALL THE TETHER WIRE WITH 500 TO 750 LBS. TENSION

REFER TO BREAK-AWAY TETHER ASSEMBLY SEE DETAIL "C"

REFER TO BREAK-AWAY TETHER ASSEMBLY SEE DETAIL "C"

THEME

END BAIL

PREFORMED DEAD END BAIL

THIMBLE

BREAKAWAY LINK SEE DETAIL "D"

750 LBS. TENSION WIRE WITH 500 TO 750 LBS. TENSION

INSTALL THE TETHER WIRE WITH 500 TO 750 LBS. TENSION

REFER TO BREAK-AWAY TETHER ASSEMBLY SEE DETAIL "C"

REFER TO BREAK-AWAY TETHER ASSEMBLY SEE DETAIL "C"

THEME

END BAIL

PREFORMED DEAD END BAIL

THIMBLE

BREAKAWAY LINK SEE DETAIL "D"

5/8" DA BOLT

750 LBS. TENSION WIRE WITH 500 TO 750 LBS. TENSION

INSTALL THE TETHER WIRE WITH 500 TO 750 LBS. TENSION

REFER TO BREAK-AWAY TETHER ASSEMBLY SEE DETAIL "C"

REFER TO BREAK-AWAY TETHER ASSEMBLY SEE DETAIL "C"

THEME

END BAIL

PREFORMED DEAD END BAIL

THIMBLE

BREAKAWAY LINK SEE DETAIL "D"
EXTENDER OPTION 8", 11", 19", 24", & 72"
(CUT TO LENGTH)

NOTES

1. BREAKAWAY LINK AND TURNBUCKLE ARE REQUIRED AT BOTH ENDS OF ALL BOTTOM TETHER SPANS. IF BREAKAWAY LINK BEGINS TO YIELD DURING INSTALLATION, IT SHALL BE REMOVED AND REPLACED. THE WIRE TENSION SHALL BE ADJUSTED TO MINIMIZE MOVEMENT OF SIGNAL HEADS IN HIGH WINDS. TYPICAL TENSION IS 500 TO 750 LBS.

2. INSTALL GROUND WIRE AT BOTH ENDS OF TOP AND BOTTOM TETHERING.

3. IF SIGNAL ORIENTATION IS NOT PERPENDICULAR TO SPAN AND TETHER WIRE, THEN USE AN ANCHOR EXTENSION. CLAMP ASSEMBLY MUST BE ATTACHED TO THE FLAT SIDE OF THE EXTENDER BAR.

4. BREAKAWAY LINK SHALL YIELD AT 3325 LBS OF TENSION.

5. TETHER WIRE SHALL BE 7-STRAND ASTM A475 HS 1/4 INCH. ON ALL SPANS, INSTALL TETHER HORIZONTALLY. MAINTAIN CLEARANCE OF 17’ OVER ROADWAY.

6. GROUNDING WIRE ANCHOR HEIGHT TO THE SPAN WIRE IS ADJUSTED IN THE FIELD BEFORE BREAKAWAY LINK IS INSTALLED. GROUNDING WIRE LENGTH SHALL BE ADJUSTED SO THAT THE MINIMUM VERTICAL CLEARANCE OF THE SAGGING TETHER WIRE ABOVE THE PAVEMENT WITHOUT THE BREAKAWAY LINK INSTALLED IS AT LEAST 14’.

7. TRAFFIC SIGNAL HOUSING REINFORCEMENT PLATES ARE REQUIRED WHEN TETHERING.
   A. TOP TETHERING REQUIRES REINFORCEMENT PLATES AT THE TOP OF THE POLYCARBONATE HOUSING. (2 PLATES TOTAL)
   B. BOTTOM TETHERING REQUIRES REINFORCEMENT PLATES AT THE TOP AND BOTTOM OF POLYCARBONATE HOUSING. (4 PLATES TOTAL)
   C. BOTTOM TETHERING 5-SECTION HEADS REQUIRES REINFORCEMENT PLATES ON THE TOP AND BOTTOM OF THE POLYCARBONATE HOUSING (8 TOTAL) AND AN ALUMINUM TRI-STUD UPPER ARM ASSEMBLY IN PLACE OF THE BOTTOM BRACKET.
   D. IF POLYCARBONATE HOUSING CONNECTS TO AN ALUMINUM CASE SIGN, REINFORCEMENT PLATES MUST BE USED AT THE CONNECTION.
NOTE:
Where field conditions require deviation from these standards, Engineer will furnish specific directional setting for signals at time of installation.

"W" Faces to be directed to intersect a point on the centerline of the street they control 200 ft. from the stop bar.

"X" Faces to be directed parallel to the centerline of the street they control.

"Y" Faces used as starting signals with rear side signals to be directed to intersect a point on the opposite stop bar approximately 4 ft. from the curb.

"Z" Faces used as pedestrian signals to be directed along crosswalks.

DIAGONAL SPAN WIRE STANDARD FOR DIRECTIONAL SETTINGS OF TRAFFIC SIGNALS
1-WAY T.S./CASE SIGN COMBINATION BELOW HUB

Balance adjuster (if needed)
2-Way, 12" span wire
T.S. top bracket
1 1/2" pipe (length as needed)

24"x30" case sign with aluminum block & two 1 1/2" hubs
1 1/2" pipe nipple (length as needed)
2-Way, 12" span wire
T.S. pipe bottom bracket

1-WAY (ALUMINUM) & 1-WAY T.S./CASE SIGN COMBINATION ABOVE HUB

Balance adjuster (if needed)
Entrance fitting
2-Way, 12" span wire
T.S. top bracket
1 1/2" pipe (length as needed)

1-Way, 3-section, 12" T.S.
(Aluminum) See 1) Aluminum Head Notes

2-Way, 12" span wire T.S. pipe bottom bracket

1-WAY (ALUMINUM) & 1-WAY T.S./CASE SIGN COMBINATION BELOW HUB

Balance adjuster (if needed)
Entrance fitting
2-Way, 12" span wire
T.S. top bracket
1 1/2" pipe (length as needed)

1-Way, 3-section, 12" T.S.
(Aluminum)
(4) See Aluminum Head Notes

2-Way, 12" span wire
T.S. pipe bottom bracket

1-Way, non-aluminum
3-section, 12" T.S.

(6) Aluminum Head Notes:
6) Traffic signals must conform to the requirements of the current FHWA publication “Vehicle Traffic Control Signal Heads.”
7) Provide cast aluminum housings with a 2" diam. hole top & bottom to receive 1 1/2" supporting pipe.
8) Provide a detachable, sheet alum. visor (min. 0.057" thick), for each signal indication.
9) Provide twist on slots for visor mounting that are either in the visor or on the tabs formed on the visor.
SPAN WIRE MOUNTED T.S. BRACKET ASSEMBLY
WITH 4-WAY CASE SIGN COMBINATION BELOW HUB

NOTES for all details:
1) All pipe sizes include thread.
2) Install pinnacles in all unused openings in hubs, crosses & tees.
3) 4-Way case sign legend to be as shown on plans.
4) Denotes 1/4" stainless steel set screw (typical).
5) Apply silicon sealant to the fittings on the top of case signs, and the top and bottom connections of signal heads.

SIGNAL ATTACHMENT DETAIL

NOT TO SCALE

1 1/2" rigid metal nipple

4-Way, 12" x 21" case sign (use blank cutout face when required)

See signal attachment detail below

1 1/2" chase nipple
1 1/2" nipple (metal)
1 1/2" locknut
Aluminum cap (typ)
Iron cross

1-Way, 3-section, 12" T.S.
2-Way T.S. shown
3-Way T.S., and 4-Way T.S. similar

2-Way flat strap

bottom pinnacle

Entrance head

Plastic bushing to be securely installed.
Signal nut with recess down.

1/4" stainless steel set screw with cup point

1/4" set screw (typical)
(see note #5)
Bottom of Case Sign

Hole Openings for Signal Joiner

Holes for connection to top of T.S. (4 required)
Stainless steel hex bolt 10-32 with flat washer & hex head nut (4 required)

Top of Case Sign

Hole Opening for Chase Nipple

Holes for connection to hub plate (4 required)

Entrance head

Plastic bushing to be securely installed.

\( \frac{1}{4} \) (min.) stainless steel set screw with cup point

Lock Nut

1 1/2" rigid metal nipple (length as needed)

1 1/2" Threaded Metal Hub Plate with Set Screw

Signal Joiner

Stainless steel hex bolt 10-32 with flat washer & hex head nut (4 required)

1 Way, 12"x27" Case Sign

Aluminum O.S. Reinforcing Plate

1-Way, 3 section 12" T.S. Shown

T.S. MOUNTED BELOW CASE SIGN

ALTERNATE SIGNAL JOINER DETAIL

NOT TO SCALE
1/8" Thick Stainless Steel Plates

1/4-20 x 2" Stainless Steel Carriage Bolt with nut and serrated washer (3 required)

0.234" (7/30") square holes typical (3 required)

0.234" (7/30") radius lobes typical

1.8756" (1 7/8") diameter Plate

1/8" Thick Steel Plate

SIGNAL JOINER
ALTERNATE SIGNAL JOINER DETAIL

1 1/2" rigid metal nipple (length as needed)

1/4" steel set screw with cup point

1 1/2" Heavy Duty lock nut

T.S. MOUNTED ON CASE SIGN

NOT TO SCALE
SINGLE SIGN MOUNTED FLASHING BEACON
INSTALLED ON ONE WOOD POST

NOT TO SCALE

FILE: Re:Doc/WIP/Signals/Web/Special/Fin/SIG320A.dgn  Rev: 02/16/17
**SINGLE SIGN MOUNTED FLASHING BEACON**

Installated on two wood posts.

**DETAIL A**
- 1 1/2" Galvanized Rigid Conduit
- 13/16" x 1 5/8" Galvanized steel solid strut channel (12 ga.) variable length
- 1 1/2" Galv Rigid "Tee" with back plate
- Four hole galvanized corner angle with hex. head bolts, washers & nuts (see detail "B")
- Stainless Steel hex. head bolts with lock washers & spring nuts (see detail "A")
- 1 1/2" Galvanized Steel Pipe Plug (weep hole drilled)

**DETAIL B**
- 1 1/2" Female PVC Adapter
- 1 1/2" Female PVC Adapter
- 1 1/2" Schedule 80 PVC or rigid metal conduit
- 1 1/2" Zinc plated steel 2 hole rigid pipe clamp with (2) 3/8" galvanized lag screws (3'-0" Spacing)
- U.G. Conduit/Cable to Flasher Controller (see note on sheet 1 of 9)

**DETAIL C**
- 1 5/8" x 3 3/4" x 3 15/16" Four hole galvanized corner angle
- (2) lock nuts
- 13/16" x 1 5/8" Galvanized steel solid strut channel (12 ga.)
- 1 1/2" Galvanized Steel Coupling
- 1 1/2" Galvanized Steel Pipe Plug (weep hole drilled)

**NOT TO SCALE**

**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN**

**FHWA APPROVAL DATE**

**SIG-320-A**

**SHEET 2 of 9**
DETAIL "D"

13/32" 1 5/8" galvanized steel solid strut channel (12 ga.)

1 5/8" x 3 3/4" x 3 15/16"
Four hole galvanized corner angle

2 1/2" perforated steel square tube (10 ga.)

1 5/8"

2 (2) lock washers
(2) square nuts
(1) 3/8" x 1 1/2" stainless steel hex. head bolts with lock washers and hex. head nuts
(1) flat washers

FRONT VIEW
See Sign Optical detail "A-2" on sheet 6 of 9

FORCED VIEW

1 1/2" galvanized rigid conduit
Stainless steel hex. head bolts with lock washers & spring nuts (See detail "A" sheet 2 of 9)

4 hole galvanized corner angle with hex. head bolts, flat washers and nuts (see detail "D")

1/2" schedule 80 PVC or rigid metal conduit (+) see note sheet 1 of 9

1" to grade maximum

U.S. conduit/cable to flasher controller.

BACK VIEW

3" Warning Sign
Perforated steel square tube breakaway system

1 1/2" galvanized rigid conduit
Stainless steel hex. head bolts, washers and square nuts (see detail "D")

3/8" x 3 3/4" x 3 15/16"
Four hole galvanized corner angle (see Detail "D") (typ)

2 1/2" perforated steel square tube (10 ga.)
variable length

Expansion joint

Grade Level

SINGLE SIGN MOUNTED FLASHING BEACON
INSTALLED ON TWO STEEL POSTS
(PERFORATED STEEL SQUARE TUBE BREAKAWAY SYSTEM)

NOT TO SCALE
SIGN MOUNTED DUAL FLASHING BEACONS
INSTALLED ON TWO STEEL POSTS
(PERFORATED STEEL SQUARE TUBE BREAKAWAY SYSTEM)
SIGN MOUNTED FLAShING BEACON

Note: Use 6" x 8" wood post(s) when supporting solar panel(s)

U.G. conduit/cable to dual advance warning sign optical location when required.

SIGN MOUNTED FLAShING BEACON (ONE SOLAR ENGINE ASSEMBLY)

NOT TO SCALE
Solar Engine Assembly (Orientation Facing South)

Steel/Concrete Pole

Tilt Mount Top Plate/Base Bracket

Aluminum Cap (Typ.)

1 1/16" x 18" Rigid Pipe

Iron Cross slip fit

Pole Foot 1 1/4" Hole

3/4" x 0.30 Min. Stainless Steel Band

1 1/4" Plug to close hole

1 1/2" x 16" Rigid Pipe

3/4" x 0.30 Min. Stainless Steel Band (5' Spacing)

1 1/4" Schedule 80 PVC or Rigid Metal Conduit (*) see note sheet 1 of 9

U.G. Conduit/Cable to Solar Power Beacon Advance warning sign location

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN (SPECIAL DETAIL)

FHWA APPROVAL DATE

SIG-320-A

PLAN DATE

8 of 9
Solar Engine Assembly
(Orientation Facing South)

12" Extension Height

Tilting Mount Top Plate Bracket

Cap

Post top (slip fitter)

Iron Cross (Typ.)

Band Saddle

3/4" x 0.30" Min. Stainless Steel Band

Band Saddle
(30" or less, strap at 2 locations)

Aluminum Pedestal

Fragile Square Aluminum Base

Note: Use pedestal collar for pedestal length greater than 14'
PERMANENT POWER SOURCE (RRFB)

SIDE VIEW

CONTROL BOX ENCLOSURE DETAIL

INSIDE VIEW

NOT TO SCALE
Class 1 amber LED Array
(13" W x 7" H min.)

Front View

One-Way RRFB (4 LED's)

Top View

Side View

Class 1 amber LED Array
(13" W x 7" H min.)

Two-Way RRFB (8 LED's)
Two one way mounted back to back

Notes:
1) All dimensions are approximate.
2) Use manufacturer's recommended mounting brackets, fittings, and connectors.
3) Use AISI 300 series stainless steel hardware.

Not to Scale
(*) Refer to Note 4 on Sheet 2 of 2.

DETAIL "A-2"

DETAIL "B-2"

DETAIL "C-2"

DETAIL "D-2"

DETAIL "E-2"

DETAIL "F-2"

DETAIL "G-2"

DETAIL "H-2"

DETAIL "J-2"

DETAIL "J-2"

DETAIL "K-2"

DETAIL "L-2"

DETAIL "M-2"

DETAIL "N-2"

DETAIL "O-2"

Left Turn Green Arrow (LTGA)

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN 5IR

PEDESTAL MOUNTED
SIGNAL DISPLAYS

SIG-330-A

1 of 2
NOTE:
1) Pipe assembly shall be such length and height as to accommodate traffic signals and pedestrian signals for proper maintenance and clear vehicular and pedestrian viewing.

2) Pipe assembly shall be of such length and height as to accommodate an illuminated (12"x27") case sign for proper maintenance and clear vehicular viewing.

3) Bracket lengths are 16 inches for LED pedestrian signals and for LED pedestrian countdown signals.

4) Tolerance within +/- 1/8" for bracketing.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown for the RCOC mounting detail.
NOTES:

1) The relative position of 2-Way T.S. & pedestrian bracket arm signals within the bracket assembly shall be reversed (i.e. the signal nearest the pole goes to the outside of the bracket assembly & the outside signal goes inboard or nearest to pole) according to the plan view to provide clear vehicular and pedestrian viewing.

2) Pipe assembly shall be of such length and height as to accommodate traffic signals and pedestrian signals for proper maintenance and clear vehicular and pedestrian viewing.

3) Pipe assembly shall be of such length and height as to accommodate an illuminated (12"x27") case sign for proper maintenance and clear vehicular viewing.

4) Bracket lengths are 16 inches for LED pedestrian signals and LED pedestrian countdown signals.

5) For poles located 6' or less from face of curb, contact Engineer for traffic and/or pedestrian bracket type and orientation if field installation requires a change from information shown on the plans.

6) Tolerance within +/- 1/8" for bracketing.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown for the RCOC mounting detail.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(FHWA APPROVAL DATE) (SPECIAL DETAIL)

SIG-340-A SHEET 2 of 2

PLN DATE
1 1/4" schedule 80 PVC or rigid metal conduit.
1 1/4" pulling "L" box (Type C)

NOTES:
1) Exterior surface of all mounting assemblies of pedestrian signals including brackets, nuts and related hardware shall be weather-resistant black enamel.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown on SIG-028A, SIG-029A or SIG-029B for the RCOC Mounting Detail.

DETAIL "E"

NOTE:
If rigid metal conduit is used, the conduit must be bonded according to the current N.E.C.

Schedule 80 PVC conduit (size of conduit as shown on plans)

UNDERGROUND ALTERNATE (COUPLING NOT SHOWN)
DETAIL A
WOOD POLE

3/8" x 5" Hex head lag screw (2 min.)
Tapped for 1 1/4" pipe (if no conduit is used; use 1 1/4" pipe plug to close hole)

1 1/2" horizontal threaded hub
Tapped for 1 1/4" pipe (if no conduit is used; use 1 1/4" pipe plug to close hole)

3/4" x 0.30" min. stainless steel band

DETAIL B
STEEL OR CONCRETE POLE

2-hole brackets (galvanized steel) 5 ft spacing

DETAIL C
TYPICAL CONDUIT ATTACHMENT TO WOOD POLE

HANGER
To fit conduit size hanger as called for on plans. (zinc plated)

DETAIL D
TYPICAL CONDUIT ATTACHMENT TO STEEL OR CONCRETE POLE:

NOTES:
1) Install 3/4" x 10'-0" copper clad ground rod(s) as required to provide less than 10 ohm resistance to ground. Install #6 min. copper wires from ground rod(s) to span wire at each supporting pole using non-solder type connections for span wire ground.

2) Use conduit size specified (min.) unless current N.E.C. indicates a larger size is required.

NOT TO SCALE
NOTES:

1) The relative position of 2-Way T.S. & pedestrian bracket arm signals within the bracket assembly shall be reversed (i.e. the signal nearest the pole goes to the outside of the bracket assembly & the outside signal goes inboard or nearest to pole) according to the plan view to provide clear vehicular and pedestrian viewing.

2) Pipe assembly shall be of such length and height as to accommodate traffic signals and pedestrian signals for proper maintenance and clear vehicular and pedestrian viewing.

3) Pipe assembly shall be of such length and height as to accommodate an illuminated (12"x27") case sign for proper maintenance and clear vehicular viewing.

4) Bracket lengths are 16 inches for LED pedestrian signals and LED pedestrian countdown signals.

5) Tolerance within +/- 1/8" for bracketing.

(*) For projects maintained by the Road Commission for Oakland County (RCOC), use the bottom heights and bracket assemblies as shown for the RCDC mounting detail.
NOTES:

1) "SIGN MESSAGE" shall utilize a single row of LED's to form each character or numeral, and capable of displaying messages in one direction.

2) Message displays and colors:

   SPEED LIMIT 45
   School SPEED LIMIT 30

   Message 1 (white)
   Message 2 ("SCHOOL" - yellow, "SPEED LIMIT 30" - white)

3) Provide a dimming device with photo cell for improved night time visibility.
4) Sign housing shall be pre-drilled for power entry through top mounting hub.
5) Provide a sign with nominal viewing area of 24" by 36" or otherwise indicated on the plans or directed by the Engineer.
6) Provide a three-sided visor
7) All hardware shall be AISI series 300 stainless steel
NOT TO SCALE

1 1/2" NPT mounting hub (metal)

Visor (alum.)

7/8" Heyco wire bushing

 mata/clear polycarbonate lens

Face plate (alum.)

Housing (extruded alum.)

NOTES:
1) All fillets to be 1 1/8", unless specified
2) Mount to sign housing with four (4)
   5/16"-18 x 1 1/4" stainless steel hex
   machine screw bolts, hex locknuts, flat washers,
   and bonded seal washers
3) All hardware to be AISI 300 series
   stainless steel

SIDE VIEW

1 1/2" standard pipe thread

0.375" dia. drill 4 places

TOP VIEW

DETAIl "A"
1 1/2" NPS Metal Hub Plate
(4" Pipe)

3/4" x 0.30" Min. Stainless Steel Band

2 3/8" R. 1/36" 0.260" dia.

2 3/16" drill and top

for 5/16"-18 set screw

R. 3/8"

3/8"

FRONT VIEW

DETAIl "B"
1 1/2" Threaded Metal Hub Plate

DETAIL "A"
1 1/2" NPS Metal Hub Plate
(4" Pipe)
I-BEAM CONDUIT ATTACHMENT DETAILS

(1) 1 1/2" schedule 80 PVC conduit

See detail "A"

Hanger

Offset

I-Beam support

I-Beam clamp

Sign Foundation

DETAIL "B"

1/4"-20 bolt & nut

(1) 1 1/2" schedule 80 PVC conduit

Note: Fit conduit size hanger as called for on plans. (Zinc plated)

HANGER

J-Beam Clamp

5/16"-20 bolt threaded 3/4" long

Hex head bolt

DETAIL "A"
Note: (*) For projects maintained by the Wayne Co. Department of Public Services (WCDPS), use rigid metal for conduit(s) from grade level to 10' (min.) above grade or as directed by the Engineer.

(#) If pushbutton is from 10" to 24" from edge of sidewalk, an acceptable range is 38" to 46".

PEDESTRIAN PUSH BUTTON DETAILS ON WOOD POLE

Michigan Department of Transportation
Bureau of Highways Delivery
Standard Plan for

PEDESTRIAN PUSH BUTTON DETAILS

SIG-400-A

1 of 4
CAST MOUNTING BRACKET FOR PEDESTRIAN PUSHBUTTON

PEDESTRIAN PUSHBUTTON INSTALLATION
ON STEEL POLE OR PEDESTAL

NOTES:
1) Alternate foundation may be constructed 22"x22" square - 48" deep.
2) Grounding system shall measure 10 ohm or less to ground.

PUSH BUTTON PEDESTAL
PEDESTRIAN PUSHBUTTON SIGN INSTALLATION ON WOOD POLE

TOP VIEW

WOOD POLE

Accommodate up to
3/4" Schedule 80 PVC
conduit (size of conduit
shown on plans)

NU-Lock nut
1/4"-20
(stainless steel)

1/4"-20 bolt
(stainless steel)

WOOD POLE

Pedestrian pushbutton

2 1/4" #20
Galvanized Hex head
lag screws (2 required)

Casting mounting bracket
1/4"x2" Hex head lag screw
U-guard fastener or equal
galvanized steel 2 holes

Pedestrian pushbutton

1 1/2" rigid
pipe clamp

1/4" - 20 x 3/4"
Stainless steel screws
(4 required)

F-10 series
Pushbutton Sign

PEDESTRIAN PUSHBUTTON INSTALLATION ON WOOD POST

NOT TO SCALE

ANCHOR BOLT DETAIL

NOTE:
Anchor bolts are to be ASTM
A-307 steel (4 required)
PUSHBUTTON & WOOD POST

** Refer to Standard Plan for Wood Posts

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NOT TO SCALE
2 to 4 turns of wire per specification (wires not twisted in loop slot)
see detail "D" sheet 2 of 4
for wire restraints

Overlap cuts so that slot has full depth see detail "A" sheet 2 of 4

Wire pairs twisted in lead-in slot

Expansion joint cuts see detail "E" sheet 2 of 4
and cross sections sheets

Maximum of 2 loops per lead-in slot.

Edge of pavement

Face of curb

Bore hole (Type II)
1 1/4" dia. typical
(see sheet 3 of 4)

NOTES:
Lead-in slot may be on either near or far side of loop approach as directed by the Engineer.
Two loops maximum allowed per saw cut from loop to curb.
3 turns required for loops equal to or greater than 6'x10'
4 turns required for loops less than 6'x10'
Refer to contract documents for high pressure washing or saw cuts and removal of debris
**DETAIL A**
**CORNER CUTS**

Slot

Round off edge

1/2"

5/16" nominal or minimum

**DETAIL B**
**EXPANSION JOINT CUTS**

Lead-in slot

Expansion joint

Clean cut joint or crack 6" (min) on either side of joint or crack

Crack 5/16" or larger

**DETAIL C**
**TERMINATION OF LEAD-IN SLOTS**

Lead-in slots

Traffic loop

Bore hole type (Type II)

Edge of pavement

Face of curb

Bore hole (Type I)

**DETAIL D**
**WIRE RESTRAINTS**

Loop wires

Wire restraints

2' max.

3' max.

Loop Slot

Lead-in Slot

3' max.

Wire restraints

Lead-in wires

3' max.
TYPE I
SECTION "E-E"
UNDER CURB INSTALLATION

Plug caulking (duct seal) around wires to keep loop sealant from entering conduit.

BORE HOLE & LOOP WIRING
SECTION F-F
UNDER PAVEMENT INSTALLATION

HANDHOLE & PULL-BOX SPLICES
(WATERPROOF)

SINGLE LOOP CONNECTION

CONTROLLER CABINET CONNECTION

NOT TO SCALE
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL) FHWA APPROVAL DATE

SIG-410-A SHEET
PLAN DATE

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3 of 4
SLOT CROSS SECTIONS
BETONJOUS PAVEMENT OVER CONCRETE

SECTION A-A
LOOP SLOT
1\" 1/16" (min)
1\" 1/16" (min)
3\" 1/16" (min)

SECTION B-B
LEAD-IN SLOT
5/32\" nominal or minimum

SECTION A-A
LOOP SLOT
1\" 1/16" (min)
1\" 1/16" (min)
3\" 1/16" (min)

SECTION B-B
LEAD-IN SLOT
5/32\" nominal or minimum

SLOT CROSS SECTIONS
CONCRETE PAVEMENT

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN
(SPECIAL DETAIL)
FHWA APPROVAL DATE
PLAN DATE

SIG-410-A

4 of 4
TYPICAL VEHICLE SENSOR NODE CONFIGURATION
INTERSECTION DETECTION CROSS ROAD ACTIVATED (NON-LOCKING)

150' MAX RANGE
SFP TO SENSOR

(SPP) (POLE LOCATION)

STOP BAR

2000' MAX CABLE LENGTH
WITH ISOLATOR Module
SFP TO CONTROLLER

STOP BAR

(SPP) (POLE LOCATION)

AS REQUIRED

(POLE LOCATION)

150' MAX RANGE
SFP TO SENSOR

TS CONTROLLER
TRAFFIC SIGNAL

© VEHICLE SENSOR NODE (VSN)

© SERIAL PORT PROTOCOL RADIO
(48 SENSORS PER SPP)

© REPEATER
(10 SENSORS PER RP)

NOTE: REPEATER SHOULD BE LOCATED BEHIND SENSORS

MDOT
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR
WIRELESS VEHICLE DETECTION SYSTEM

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)

FHWA APPROVAL DATE

PLAN DATE

SIG-420-A

1 of 10
TYPICAL VEHICLE SENSOR NODE CONFIGURATION
INTERSECTION DETECTION CROSS ROAD ACTIVATED (LOCKING)
TYPICAL VEHICLE SENSOR NODE CONFIGURATION
INTERSECTION DETECTION LEFT-TURN ACTIVATED
PERMISSIVE PROTECTED (NON-LOCKING)
TYPICAL VEHICLE SENSOR NODE CONFIGURATION
INTERSECTION DETECTION LEFT-TURN ACTIVATED
PROTECTED ONLY (LOCKING)
VEHICLE SENSOR NODE (VSN)

DIRECTION OF TRAVEL

TYPICAL 6' X 6' DETECTION ZONE

TYPICAL 6' X 20' DETECTION ZONE

TYPICAL 6' X 30' DETECTION ZONE

NOT TO SCALE
BACK OF CURB

PLACE VSN BASED ON RIGHT TURN TRAFFIC FLOW PATTERNS

10-15'  10-15'
TYPICAL  TYPICAL

TANGENT LINE

10'

STOP BAR

12'

6'

12'

3'

10-15'

TYPICAL  TYPICAL

6'

12'

6'

12'

6'

10-15'

TYPICAL

10-15'

TYPICAL

TYPICAL VEHICLE SENSOR NODE (NON-LOCKING) INSTALLATION DIAGRAM

FOR A TWO PHASE (NON-COORDINATED) APPROACH WITH (NON-LOCKING) PERMISSIVE OR PERMISSIVE-PROTECTED LEFT TURN PHASING

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)

FHWA APPROVAL DATE

SHEET

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06/18/2013

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PLAN DATE
TYPICAL VEHICLE SENSOR NODE (LOCKING) INSTALLATION DIAGRAM

FOR AT TWO PHASE APPROACH WITH (LOCKING)
PROTECTED ONLY LEFT TURN PHASING

NOT TO SCALE

SIG-420-A
PLACE VSN BASED ON RIGHT TURN TRAFFIC FLOW PATTERNS

10-15' TYPICAL

10-15' TYPICAL

TYPICAL

STOP BAR

TANGENT LINE

BACK OF CURB

TYPICAL VEHICLE SENSOR NODE (NON-LOCKING) INSTALLATION DIAGRAM

FOR A TWO PHASE (COORDINATED) APPROACH WITH (NON-LOCKING)
PERMISSIVE OR PERMISSIVE-PROTECTED LEFT TURN PHASING

NOT TO SCALE
TYPICAL VEHICLE SENSOR NODE (LOCKING) INSTALLATION DIAGRAM

FOR A TWO PHASE APPROACH WITH PROTECTED ONLY LEFT TURN PHASING

* RIGHT TURNS MAY BE NON-LOCKING OR LOCKING WITH RIGHT TURN DELAYS
(* ) NOTE:  
Use 2 guy strands at 90° orientation.

CAMERA/GUY STRAND ORIENTATION

=6 stranded copper ground wire from bracket arm to ground rod(s)

Use non-solder type connector

3/4" x 10'-0" copper clad ground rod(s) as required to provide less than 10 ohm resistance to ground.

NOT TO SCALE

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

FHWA APPROVAL DATE

PLAN DATE

SIG-430-A

SHEET 1 of 2
HEMISPHERICAL CAMERA

Signal Cat 5e 600V. cable for power and data

Housed in 3/4" milled aluminum. JP68

Lens: 180° Fisheye
2560 x 1920 pixel resolution

9.3" Dia.

TYPICAL WIRING OF BRACKET ARM/MAST ARM MOUNTED HEMISPHERICAL CAMERA AND MOUNTING BRACKET

Mounting Bracket

Cat 5e 600V. burial grade cable
HEMISPHERICAL CAMERA PLACEMENT
RELATIVE TO INTERSECTION

Notes:
1. Camera should be mounted at least 30' high when using a luminaria arm and no less than 25' when using a mast arm, or as specified on the plans.
2. Mast arm mounts are only acceptable if the camera can be located near the center of the intersection with no occlusion.
3. Camera must be less than 75' from the intersection center when mounted on a luminaria arm and 50' on mast arm.
4. Camera should be located with the least amount of occlusion.
5. Installer should aim for the best "head-on" view of all approaches.
6. Hemispherical camera shall only be installed on steel poles.

NOT TO SCALE
SPAN WIRE MOUNTED VIDEO DETECTION CAMERA
BOTTOM TETHER MOUNTING OPTION

TOP TETHER MOUNTING OPTION
(* ) NOTE:
For Span Wires over 1/2" to 7/8" use Bolt, Hex HD,
Full THD 1/4-20 X 1.75 LG, SST.
NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)
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PLAN DATE

SIG-440-A SHEET 2 of 4

Notes:
1. Use 3/8" x 5" hex head screw (2" min.) for mounting to wood poles.
2. Use 3/8" x 0.30 min. stainless steel band for mounting to steel poles,
   pedestals or bracket truss arms.

SIDE POLE MOUNTED

BRACKET TRUSS ARM MOUNTED
VERTICAL ORIENTATION

HORIZONTAL ORIENTATION

MICROWAVE VEHICLE SENSOR ORIENTATION DIAGRAM

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

(SPECIAL DETAIL)
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SIG-440-A

PLAN DATE

3 of 4
RADAR VEHICLE PRESENCE
STOP-BAR DETAIL

Radar step bar detector

Steel pole or Wood pole

Grade level

Handhole

Ground rod

Note:
Radar Vehicle Presence Stop-bar Detector (RVPSD) shall be installed and configured in coordination with agency and/or manufacturer representative.