Advanced Inspection Class
Illumination, Signal & ITS
WSDOT
This Class Was Gary’s Plan to Improve the Process
1) Addenda
2) Proposal form
3) Special Provisions (white pages)
   a. A list is included for all Standard Plan Sheets that are applicable to that contract.
4) Contract Plans
5) Amendments to Standard Specifications (pink pages)
7) Standard Plans (J)
Contacts

1) Electrical Inspector
2) Maintenance / Signal Division / ITS
3) Regional Traffic Engineer
4) Fabrication Inspector
5) Headquarters Bridge and Materials Laboratory
6) Serving Utility, Vendors, Manufacturer’s Representatives and Utility Engineer.
Materials Documents

1) Record of Materials
2) RAM and QPL
   a. Preliminary Samples
3) Catalog Cuts
4) Shop Drawings
5) Fabrication Inspection
6) Plant Certifications and Mix Design
7) Review Salvaged, Abandoned, As Ordered
Contractor Submittals

1) Traffic Control Plan
2) Pollution Control Plan
3) Schedule
Access to Signal and ITS Cabinets and Services

1) The locks on the cabinets have been changed for security.

2) At the start of the project request locks to be changed to construction cores in cabinets the contractor will need to have access to.
   
   a. Locks will not be changed in Hubs or the front doors of Signal Cabinets.

   b. This should be done through the Project Office.

   c. Contact Signals or ITS Field Superintendent.

3) At the end of the project, or when work in cabinet has been completed, advise Signals/ITS to get the locks switched back.
Foundations

NEC Articles
250.54, 344, & 352

Standard Specifications
6-02.3(2)B
• 8-20.3(4)
• 9-29.6(5)
6-02.3(2)B

Commercial concrete does not require plant approval, mix design, or source approvals for cement, aggregate, and other admixtures.

Commercial class concrete shall not be used for structural items such as: Foundation for High Mast Lights, Foundations for Mast arm Signals, Foundations for Cantilever Signs, Foundations for Sign Bridges

6-02.3(5)A General

All other concrete will be accepted based on conformance to the requirement for temperature, slump, air content for concrete placed above finished ground line, and the specified compressive strength at 28-days for sublots as tested and determined by the Contracting Agency.
Concrete Cylinders (For 6-02.3(5)H)
Signal Standards 8-20.3(14)E
J-28.30 1 of 2

1H:1V slope require Special Design/Note #3

NOTES


2. The Slip Base templates shall be held in place by nuts from the bottom of the foundation and 3' from the bottom of the anchor bolts. 18 heavy duty hex nuts and 6 round washers are required for a Slip Base assembly. 18 heavy duty hex nuts and 6 flat washers are required for a Fixed Base assembly.

3. Use Steel Light Standard Foundation Types A and B on waist ground or slopes not exceeding 4H:1V. Use Type B for slopes steeper than 4H:1V, but not exceeding 2H:1V. Slopes steeper than 2H:1V shall require a special design.

4. These foundations are designed for a minimum of 2,000 PSF (TYPE A) or 1,500 PSF (TYPE B) allowable lateral bearing pressure for the soil. A special foundation shall be required for soil with lower allowable lateral bearing pressure than 1,500 PSF.

5. The Luminance Pole height shall not exceed 50' (HI).

6. Slip Bases may not be installed on 50' (HI) poles with Double Mast Arms, nor on poles weighing more than 1000 lbs.

7. Slip Bases are not required on poles placed outside of the Design Clear Zone, nor on poles installed behind traffic barriers.

8. Foundations constructed within Ecology Environments shall be increased in depth by the depth of the Ecology Environment.

9. Exposed portions of the foundation shall be formed to create a smooth finished surface. All forming shall be removed upon completion of foundation construction.

10. For excavation, concrete placement, and backfill options, see METHOD 1 and METHOD 2 on Sheet 2 of 2.

11. The Anchor Bolts shall be high strength steel, manufactured from ASTM A490, with heavy hex nuts and hardened washers. Galvanize the Anchor Bolts according to AASHTO M232.

12. The foundation shall meet the requirements of Standard Specifications Sect. 6-20.308.


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**Steel Light Standard Foundation Types A & B**

**Standard Plan J-28.30**

Sheet 1 of 2 Sheets


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**Anchor Bolt Table**

<table>
<thead>
<tr>
<th>Luminance Height (FT)</th>
<th>Anchor Bolt Type</th>
<th>Anchor Bolt Diameter &quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 24</td>
<td>1/2&quot; to 16&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>25 to 49</td>
<td>3/4&quot; to 16&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>50 to 100</td>
<td>1/2&quot; to 16&quot;</td>
<td>1 1/8&quot;</td>
</tr>
</tbody>
</table>

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**Anchor Bolt Layout**

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**Steel Light Standard Foundation Types A & B**

**Standard Plan J-28.30**

Sheet 1 of 2 Sheets


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**Approved for Publication**

P. ee e Beheeltie 11 00-07-07

Washington State Department of Transportation

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**Typical Drawing**

9/30/2000
CONSTRUCTION METHODS

METHOD 1

NO SUBSURFACE FORM

This option is only used when the existing soil in the hole will remain standing and the concrete can be placed without causing the soil to collapse. Concrete shall be cast directly against undisturbed soil.

When filling the hole for the foundation, use paper or cardboard forms to achieve a smooth finish on the final exposed cement concrete. Support the form as necessary to prevent slippage.

See standard plans J-28.24 and J-28.26 for minimum heights of exposed foundation when no embankment widening is to be installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form portion.

Construct the embankment widening (if required).

METHOD 2

METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not remain a vertical face, over-excavate the foundation area and install a 30° diameter, corrugated metal (pipe) form. The corrugated metal form shall not extend more than 6" below any portion of the foundation that will remain exposed upon final grading. Continue forming to full height using paper or cardboard form to achieve a smooth finish on final exposed cement concrete. Support the form as necessary to prevent slippage.

See standard plans J-28.24 and J-28.26 for minimum heights of exposed foundation when an embankment widening is to be installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form portion.

Bedding with controlled-density soil or compacted borrow in accordance with standard specification 9-3.3.2(c).

Construct the embankment widening (if required).
Full depth Sono-tube is not allowed!
Luminaire Foundation

Completed Pour
Corrugated Tube/Wet Hole

Install foundation per J-28.30 showing corrugated tube. Back fill and compact around the tube per 2-09.3(1)E or back fill with CDF.
Standard Plan J-28.42

CLAMPING BOLT TABLE

<table>
<thead>
<tr>
<th>LUMINAR HEIGHT (in)</th>
<th>BOLT AKB</th>
<th>BOLT LENGTH</th>
<th>CLAMPING BOLT DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 TO 36</td>
<td>SINGLE</td>
<td>6&quot; to 10&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>30 TO 40</td>
<td>DOUBLE</td>
<td>6&quot; to 10&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>48 TO 60</td>
<td>DOUBLE</td>
<td>12&quot; to 16&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

NOTES:
1. 50' (15.2) poles with double mast arms or poles weighing in excess of 1000 lbs. shall not be installed on a Slip Base.
2. The Slip and Anchor Plates shall be manufactured from ASTM A573 GR 50 or ASTM A36. All Slip Plates notched surfaces shall be finished smooth.
3. The Clamping Bolts shall be high strength steel, manufactured from AASHTO M164, with heavy hex cut and hardened washer. Galvanize the Clamping Bolts according to AASHTO M232.
5. Galvanize the Anchor/Slip Plate after fabrication according to AASHTO M-141.
6. Clamping bolt diameters may vary on existing installations. Replace them with the same size as the originals when repairing or making a luminance pole.
Foundations 8-20.3(4)

Forms shall be true to line and grade. Tops of foundations for posts and standards, except special foundations, shall be finished to ground line or sidewalk grade, unless otherwise noted in the plans.

Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be plumbed and rigidly placed in proper position and to proper height prior to placing concrete and shall be held in place by means of a template until the forms are removed.

Anchor bolts shall be installed so that 2 full threads extend above the top of the top heavy-hex nut, except that slip base anchor bolt extensions shall conform to the specified slip base clearance requirements. Anchor bolts shall be installed plumb, plus or minus 1-degree.
Two Different Templates
Bottom Template (Note 1” Thick)
Shaft Pour
Shaft Pour
8-20.3(9) SS 2008. The grounding conductor shall be a non-insulated 4 AWG stranded copper conductor, which shall be connected to the foundation rebar (all rebar crossings shall be wire tied) by means of a listed grounding connector identified for use in concrete. (NEC 250.53(E) allows 6 AWG) NEC 250.54
Foundation Stability

8-20.3(4) Foundations 2008 Standard Specifications

- Foundations shown in the plans shall be extended if conditions require additional depth, and galvanized culvert pipe, of the correct size shall be installed for forming purposes where soil conditions are poor. Such additional work, if ordered by the Engineer, will be paid for as extra work as provided in Section 1-04.4
Luminaire scheduled at 16+618.74
Offset is 14.06 m Rt.
New Drainage ditch

Note: Luminaire would be in the drainage ditch.
Luminaire scheduled at 16+618.74
Offset is 14.06 m Rt.
Luminaire moved forward, ditch line moved back still not stable with 4.5-foot deep foundation.
Slip base installed in front on rock wall.
Base Needs a Foundation Capped
Completed light base
Slip base installed in front of rock wall and foundation to high.
Standard Plan J-28.22

Base Placement

**CASE A**
SLOPE 3H:1V THRU 2H:1V (MAX)

**CASE B**
SLOPE FLATTER THAN 2H:1V

**CASE C**
FORE SLOPE 4H:1V OR FLATTER

**CASE D**
FORE SLOPE STEEPER THAN 4H:1V (2H:1V MAX)

DITCH SECTIONS
Fix base installed behind guard rail, foundation exposed on back.
I met with Diane and we probed and took measurements of several foundation where the ecology embankment has been installed behind the foundation.

These are on the off ramp from SR 18 WB to 244 Ave. SE. The measurements are taken from top of foundation to the depth that we could push the bar down into the material. We probed the sides also and they stayed fairly consistent at 8 inches of unstable material on the surface.

<table>
<thead>
<tr>
<th>Pole base number</th>
<th>Depth of unstable material at 2-ft. 4-inches back of foundation and 1-foot back of foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td># 12</td>
<td>4'5&quot;</td>
</tr>
<tr>
<td># 11</td>
<td>2'</td>
</tr>
<tr>
<td># 10</td>
<td>3'1&quot;</td>
</tr>
<tr>
<td># 9</td>
<td>3'6&quot;</td>
</tr>
<tr>
<td># 8</td>
<td>3'</td>
</tr>
</tbody>
</table>

The last pole we checked was on SE 200 Street at SE 257 St. This is King County pole base number K 31.

# K 31 20-inches back: 3'4" of unstable material and at 36-inches back: 3' of unstable material.

I have attached 2 pictures of the foundation number 12 with the bar pushed into the ground at 2 foot 4 inches back of the foundation and a straight edge laying across the top of the foundation. The red mark on the bar is at 4-foot. This is how we took the measurements listed above.
Slip base in soft soil conditions
This person is standing on the grated inlet that was constructed (by change order) to drain the water away from the hole this traffic signal pole was built into.
The guardrail was also constructed (by change order) to keep vehicles away from the hole this traffic signal pole was built into.
Signal Pole Foundation with Wrong Elevation.
Signal Base Foundation

Maximum and minimum bolt protrusion

Survey is critical on signal bases, do at least a visual verification of location and elevation.
Slip Base Not Needed Behind Guard Rail.
Needs Additional Fill Around Foundation
Bolts should be “true level” not leveled to barrier.
Bridge El

Something to Remember!!

Working Clearances at Hand Hole

NEC Table 110.26(A)(1)

0 – 150 volts = 900mm clearance (3’)
151 – 600 volts = 1.1m clearance (3.5’)

Bridge El

Something to Remember!!

Working Clearances at Hand Hole

NEC Table 110.26(A)(1)

0 – 150 volts = 900mm clearance (3’)
151 – 600 volts = 1.1m clearance (3.5’)

Standard Plan J-28.45

**NOTES**

1. Grind the Elbow Assembly after fabrication according to AASHTO M 111.

**STEEL LIGHT STANDARD ELBOW DETAIL**

FOR LUMINAR POLES WITH SINGLE MAST ARM ON OR LEFT AND DOUBLE MAST ARMS ON OR LEFT, MOUNTED ON BRIDGE OR RETAINING WALLS.

**TYPICAL SECTIONS**

- **Bridge Pedestrian Barrier**
- **Single Slope Bridge Traffic Barrier**
- **F-Shaped Bridge Traffic Barrier**
Light Base (Slip Base)
Approved extended base method.
Foundations That Were Done Poorly and Replaced
High Mast Shaft and Bolts With Ground Ring Being Installed
Rebar Cage and Bolts
Check the Grade

Have survey give you a grade mark.
Ready for the First Pour

Wood or pipe can be used as dobe block, and must be removed.
Concrete should not be allowed to drop more than 5-feet.
Another Tremie
43 Foot Deep Signal Base
Set Up
Deep Base
Set up to Pour Pad Foundations

Standard Plan J-3C, Install conduit couplings on all conduits. Place coupling flush with top of concrete foundation.
Coupling Flush With Surface

- Each cabinet should have a drain tube.
- A supplemental ground should be connected to the rebar and routed to the Transformer Cabinet Ground.
PVC Coupling Flush to Top of Foundation
Couplings at Foundation Surface

Use PVC Coupling with PVC Conduit
No Coupling Poor Placement

120 volt wire chase.
Keep ground tile far enough in that the corners will not break off.

Roughly 3 inches to edge of tile.
Removal of Forms

- 6-02.3(17)N
- Forms shall be removed whether above or below ground level.
- Foundations poured with the approved corrugated metal pipe (CMP) do not need to be stripped. The CMP should be installed below grade and top portion of foundation formed with sono-tube.