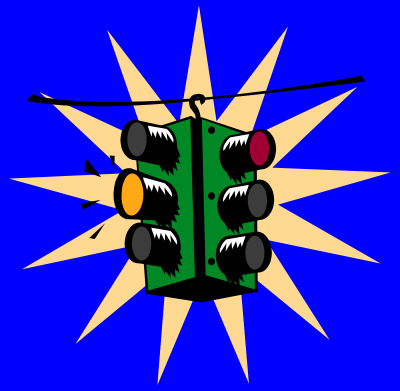
Advanced Inspection Class
Illumination, Signal & ITS
WSDOT



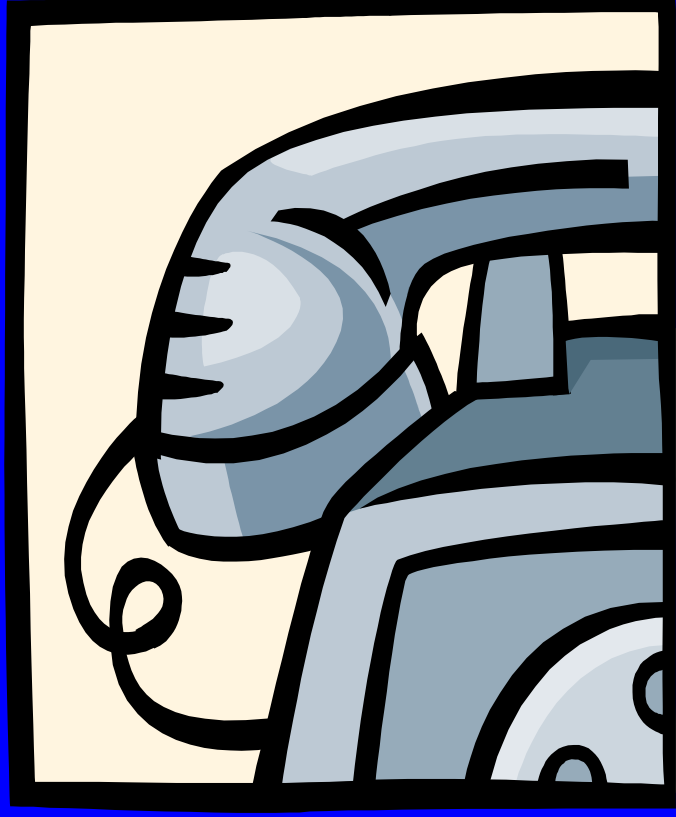
This Class Was Gary's Plan to Improve the Process

Document Hierarchy

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)
6) Standard Specifications, “Regulations and Code” (includes NEC).
7) Standard Plans (J)

Standard Specifications
1-04.2

Contacts



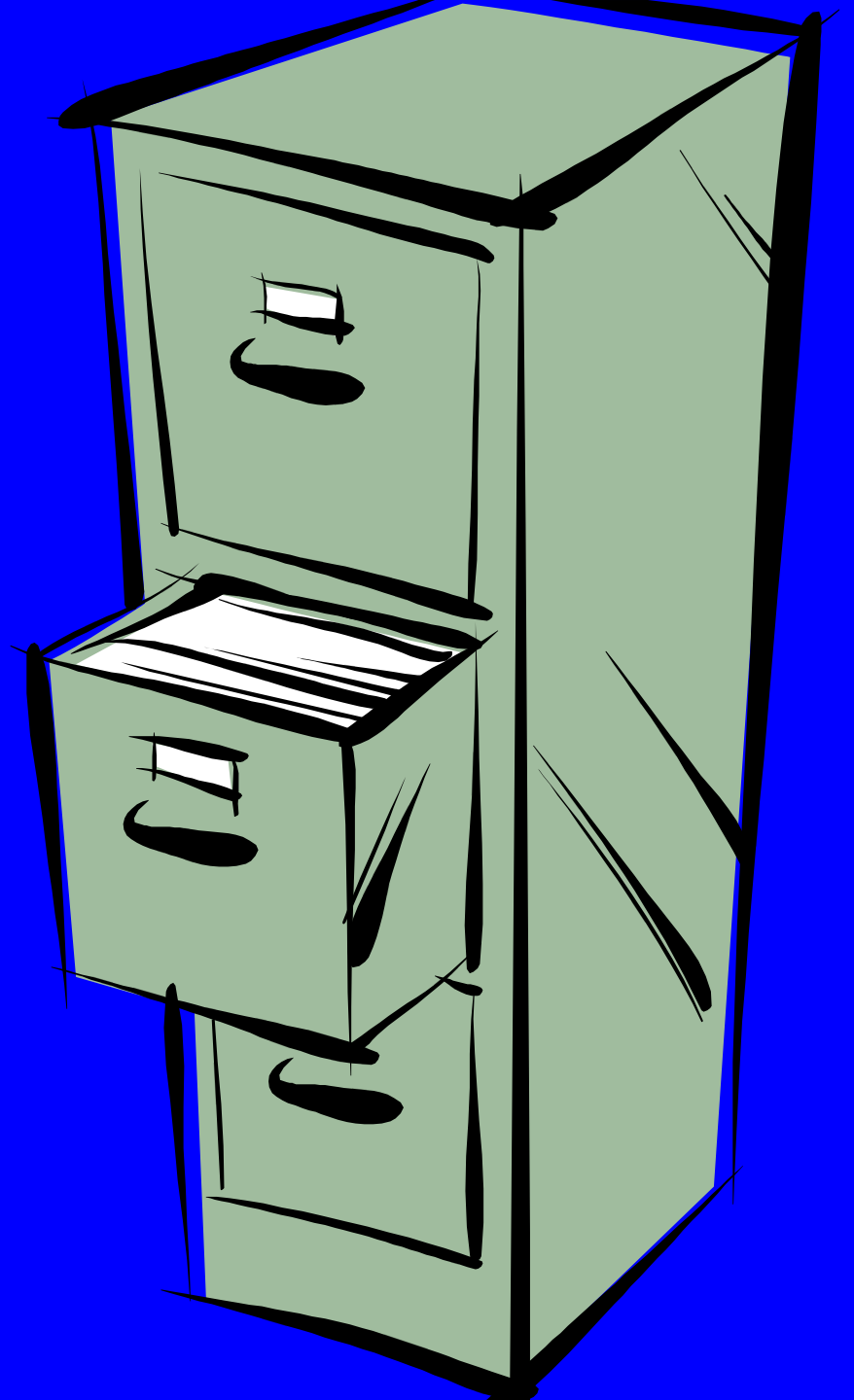
1) Electrical Inspector
2) Maintenance / Signal Division / ITS
3) Regional Traffic Engineer
4) Fabrication Inspector
5) Headquarters Bridge and Materials Laboratory
6) Serving Utility, Vendors, Manufacturer's Representatives and Utility Engineer.

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.

Standard Specifications
6-02.3(2)B Pg. 6-7

Concrete Cylinders (For 6-02.3(5)H)
Signal Standards 8-20.3(14)E

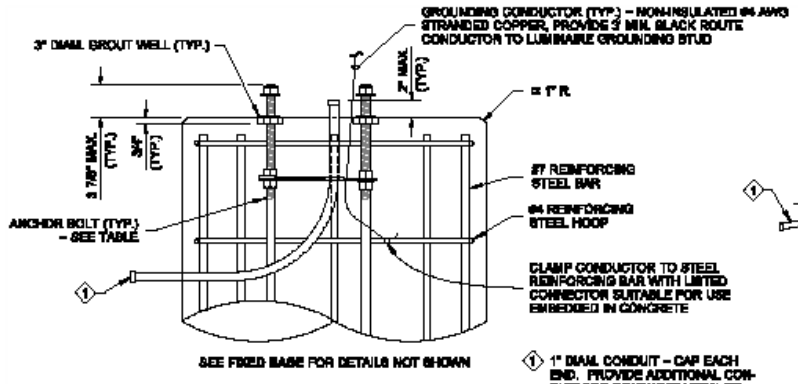
Standard Spec 6-02.3(5)G
Page 6-15

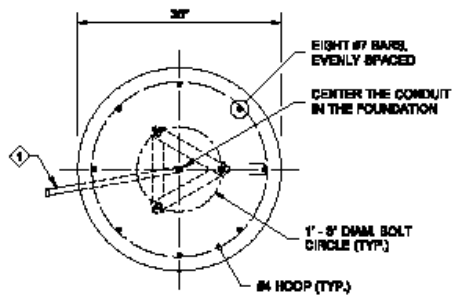
Standard Spec 8-20.3(14)E
Page 8-91

J-28.30 1 of 2

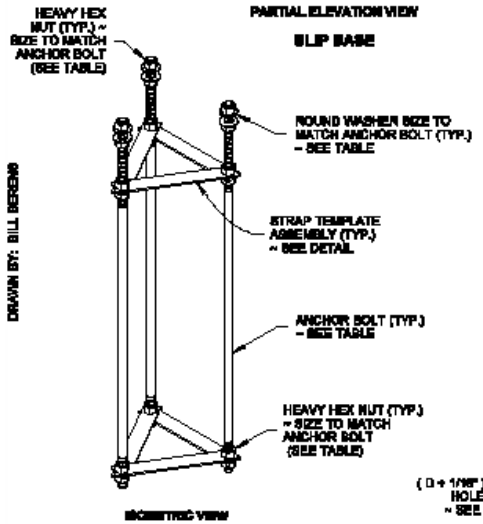
1H:1V slope require Special Design/Note #3

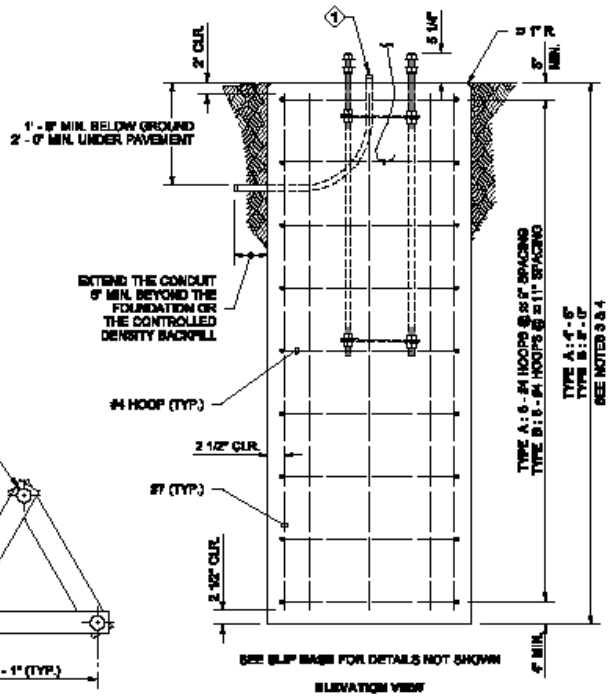
Standard Plan J-28.30

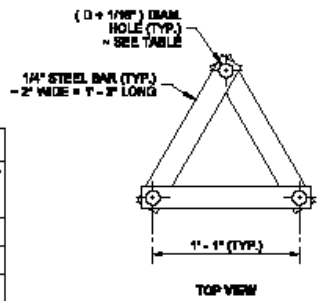




① 1" DIAM. CONDUIT – CAP EACH END. PROVIDE ADDITIONAL CONDUIT FOR COMMUNICATION OR SIGNAL CABLE WHERE SHOWN IN THE CONTRACT.







ANCHOR BOLT TABLE			
LUMINAIRE HEIGHT (H1)	MAST ARM TYPE	MAST ARM LENGTH	ANCHOR BOLT DIAMETER "D"
20' TO 30'	SINGLE	6' TO 16'	1"
20' TO 30'	DOUBLE	6' TO 8'	1"
20' TO 40'	DOUBLE	10' TO 16'	1"
40' TO 50'	DOUBLE	10' TO 16'	1 1/8"

NOTES

1. See Standard Plan J-28.40 for luminaire pole base mounting details.
2. The Strap Template shall be held in place by nuts, 6" from the top of the foundation and 3" from the bottom of the anchor bolts. 16 heavy duty hex nuts and 8 round washers are required for a Slip Base assembly. 16 heavy duty hex nuts and 8 plate washers are required for a Fixed Base assembly.
3. Use Steel Light Standard Foundation Type A on level 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 Luminaire Pole height shall not exceed 50' (H1).
6. Slip Bases shall not be installed on 50' (H1) 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 barrier.
8. Foundations constructed within Ecology Embankments shall be increased in depth by the depth of the Ecology Embankment.
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 A449, with heavy hex nuts and hardened washers. Galvanize the Anchor Bolts according to AASHTO M232.
12. The foundation shall meet the requirements of Standard Specification Sect. 8-20.3(9).
13. See Standard Plan C-8b and C-14h for steel light standards on traffic barrier.

ANCHOR BOLT LAYOUT

STEEL LIGHT STANDARD FOUNDATION TYPES A & B

STANDARD PLAN J-28.30-00

SHEET 1 OF 2 SHEETS

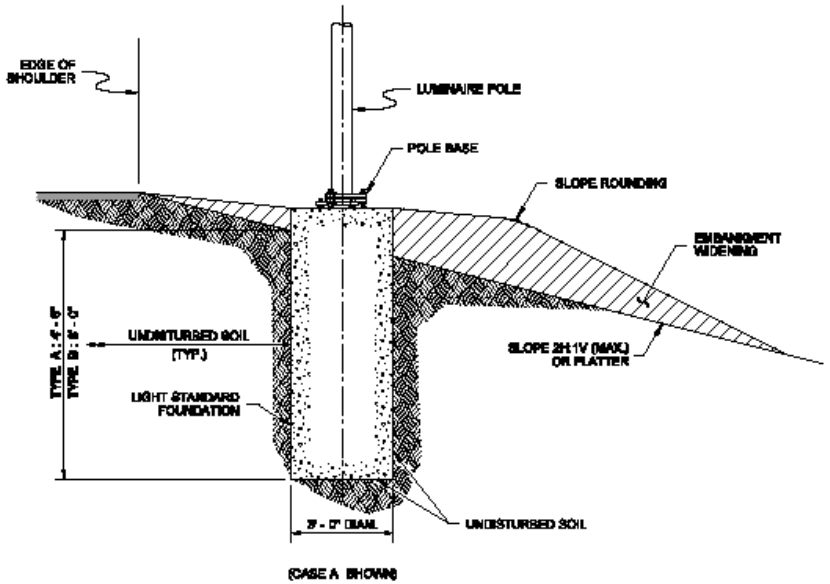
APPROVED FOR PUBLICATION

Pasco Bakotich III 06-07-07

Washington State Department of Transportation

DRAWN BY: BILL BERGEMO

J-28.30 2 of 2



(CASE A SHOWN)

METHOD 1

NO SUBSURFACE FORM

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

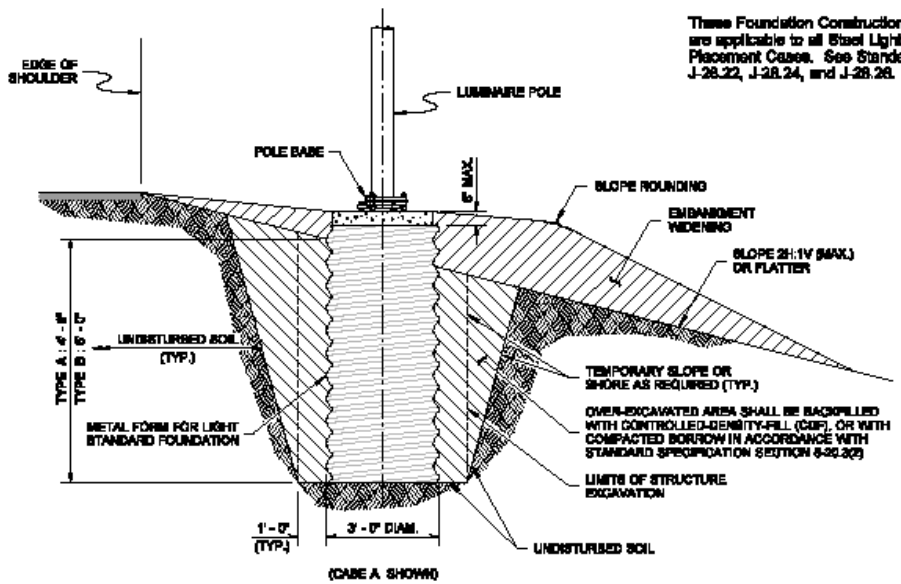
Auger the hole for the foundation. Use paper or cardboard form to achieve a smooth finish on the final exposed cement concrete. Support the form as necessary to remain plumb.

See Standard Plans J-28.24 and J-28.26 for maximum 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).



(CASE A SHOWN)

METHOD 2

METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not retain a vertical face, over-excavate the foundation area and install a 36" 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 remain plumb.

See Standard Plans J-28.24 and J-28.26 for maximum 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.

Backfill with controlled-density fill or compacted borrow in accordance with Standard Specification 8-20.3(2).

Construct the embankment widening (if required).

NOTES

These Foundation Construction Methods are applicable to all Steel Light Standard Placement Cases. See Standard Plans J-28.22, J-28.24, and J-28.26.

DRAWN BY: BILL BERNENS

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 28470 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES NOVEMBER 11, 2008

STEEL LIGHT STANDARD FOUNDATION TYPES A & B

STANDARD PLAN J-28.30-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Pasco Bakotich III 06-07-07

Washington State Department of Transportation

CONSTRUCTION METHODS

Standard Plan J-28.30

3 Bolt Template

Luminaire Foundation

Full depth Sono-tube is not allowed!

Luminaire Foundation

Completed Pour

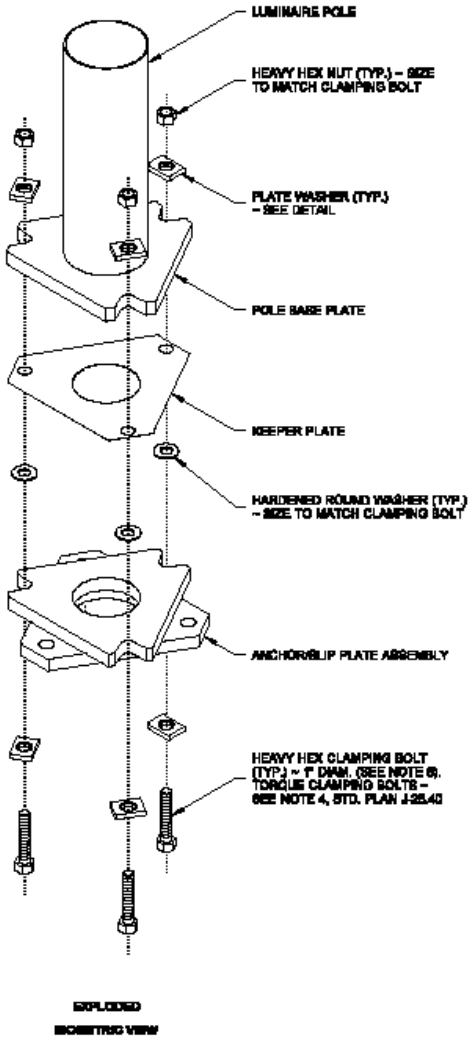
Corrugated Tube/Wet Hole

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.

J-28.42

Standard Plan J-28.42

DRAWN BY: BILL BERENS



EXPLODED ISOMETRIC VIEW

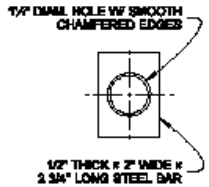


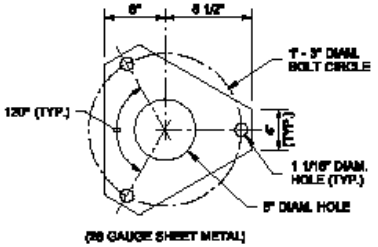
PLATE WASHER DETAIL

CLAMPING BOLT TABLE			
LUMINAIRE HEIGHT (H1)	MAST ARM TYPE	MAST ARM LENGTH	CLAMPING BOLT DIAMETER "D"
20' TO 30'	SINGLE	6' TO 15'	1"
20' TO 45'	DOUBLE	6' TO 8'	1"
45' TO 50'	DOUBLE	6' TO 8'	①
20' TO 45'	DOUBLE	10' TO 15'	①
45' TO 50'	DOUBLE	10' TO 15'	①

① SLIP BASE NOT ALLOWED

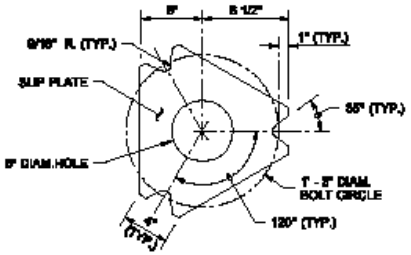
NOTES

1. 50' (H1) 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 A572 GR.50 or ASTM A588. All Slip Plate notched surfaces shall be finished smooth.
3. The Clamping Bolts shall be high strength steel, manufactured from AASHTO M164, with heavy hex nut and hardened washer. Galvanize the Clamping Bolts according to AASHTO M232.
4. Round and smooth all edges along wire-way to protect the conductors. See Standard Plan J-28.70 for wiring details.
5. Galvanize the Anchor/Slip Plate after fabrication according to AASHTO M 111.
6. Clamping Bolt diameters may vary on existing installations. Replace them with the same size as the originals when repairing or reusing a luminaire pole.



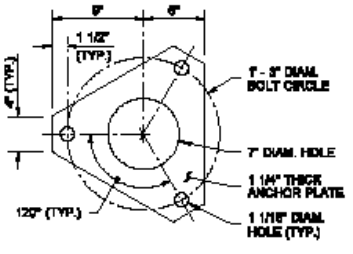
TOP VIEW

KEEPER PLATE



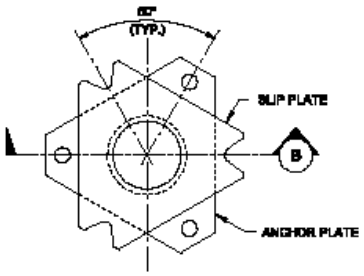
TOP VIEW

SLIP PLATE



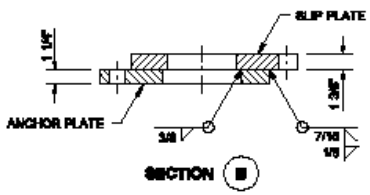
TOP VIEW

ANCHOR PLATE

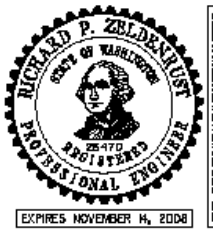


TOP VIEW

ANCHOR/SLIP PLATE ASSEMBLY



SECTION B



EXPIRES NOVEMBER 11, 2008

STEEL LIGHT STANDARD ANCHOR/SLIP PLATE FOR SLIP BASE

STANDARD PLAN J-28.42-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Pasco Bakotich III 06-07-07

Washington State Department of Transportation

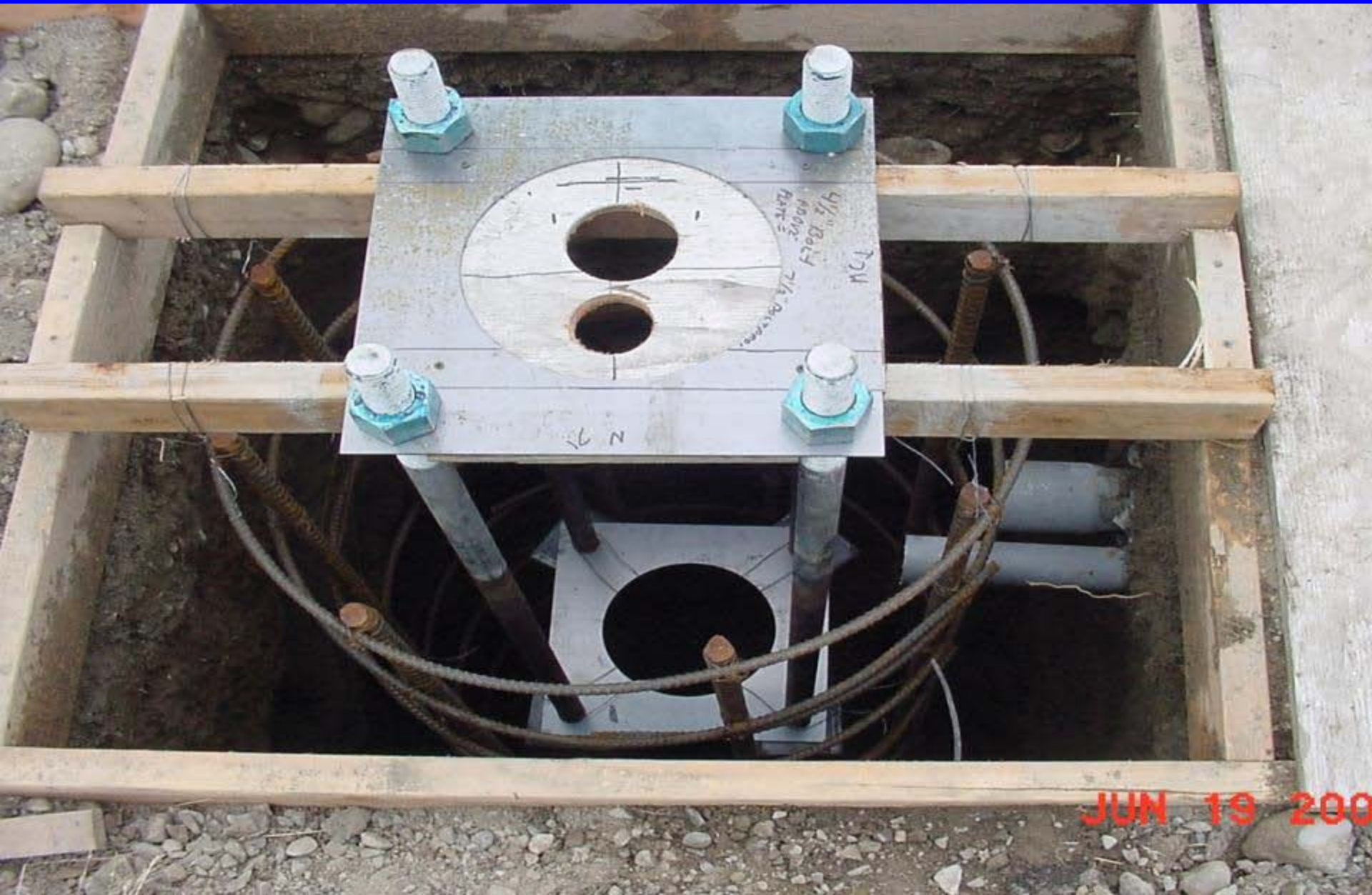
Foundations 8-20.3(4)

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.

Signal Base Template



Two Different Templates

Bottom Template (Note 1” Thick)

Shaft Pour

Shaft Pour

Shaft Pour

Shaft Pour

Shaft Pour

Shaft Pour

Shaft Pour

Concrete Vibrator

5-05.3(7) and 6-02.3(9)

Supplementary Ground

Wrong

Correct

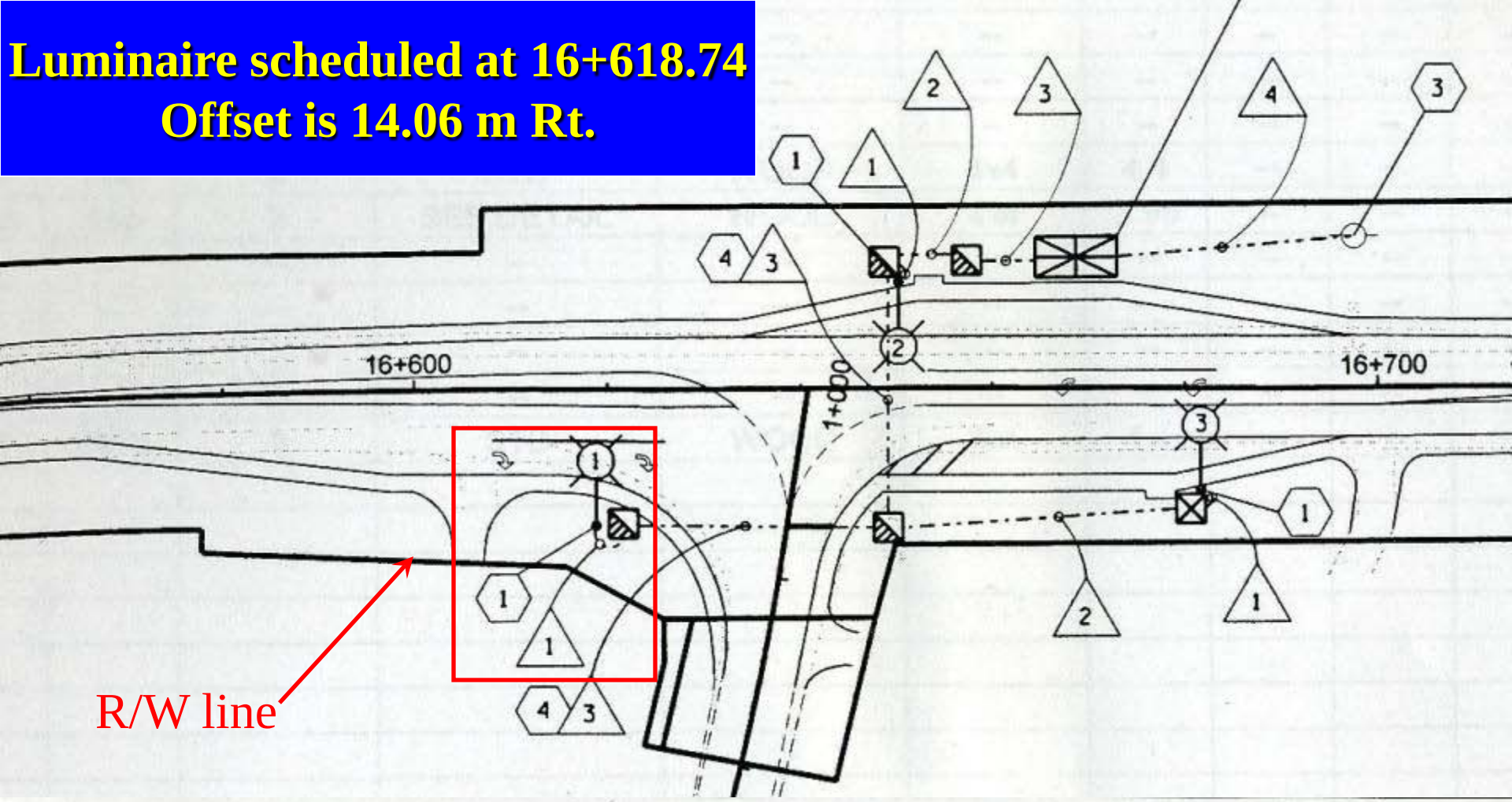
8-20.3(9) SS 2008. The grounding conductor shall be a non-insulated 4 AWG stranded copper conductor, which shall be connected to the foundation rebar (all rebar crossings shall be wire tied) by means of a listed grounding connector identified for use in concrete. (NEC 250.53(E) allows 6 AWG) NEC 250.54

Foundation Stability

8-20.3(4) Foundations 2008 Standard Specifications

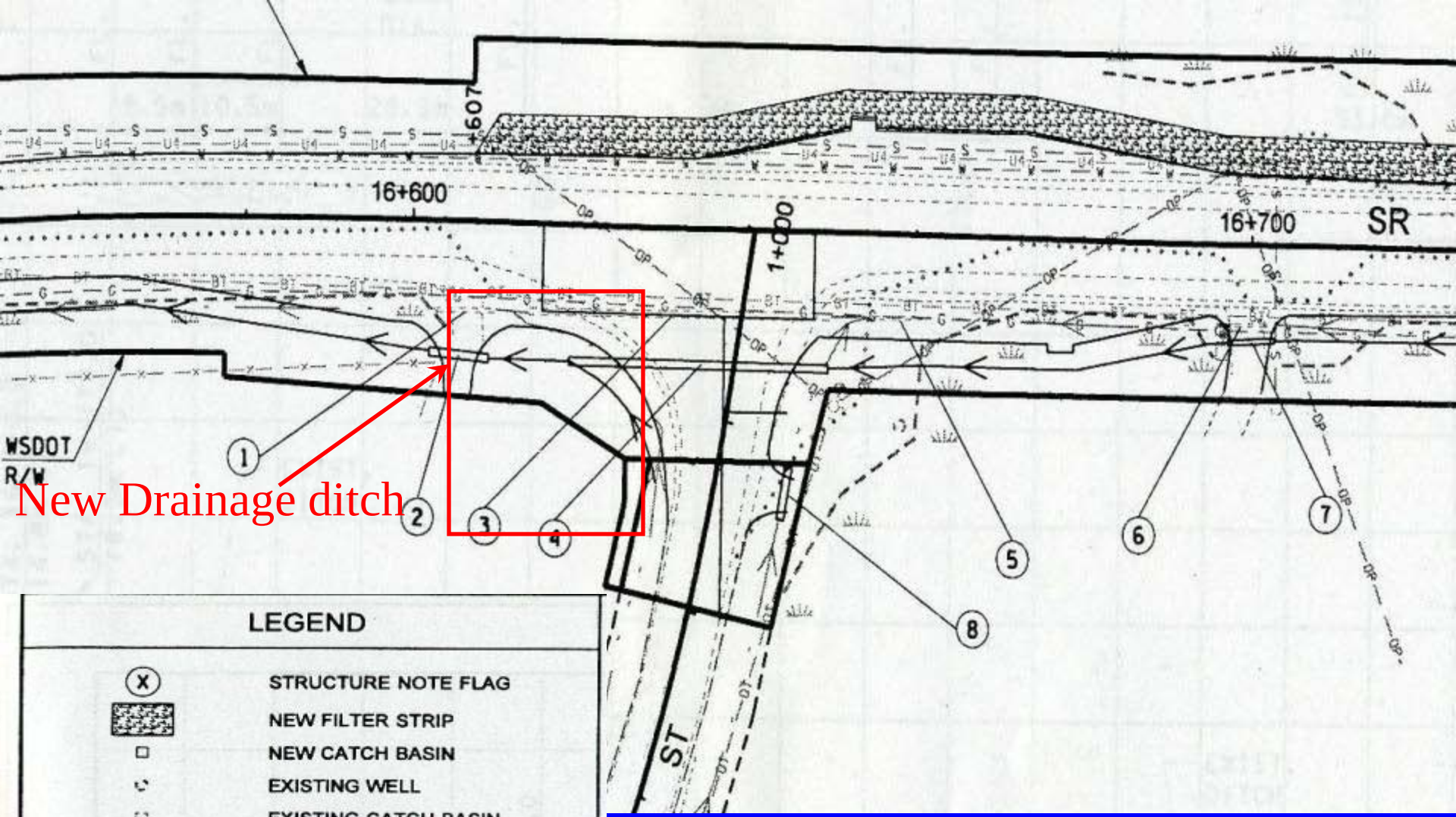
- **Foundations shown in the plans shall be extended if conditions require additional depth, and galvanized culvert pipe, of the correct size shall be installed for forming purposes where soil conditions are poor. Such additional work, if ordered by the Engineer, will be paid for as extra work as provided in Section 1-04.4**

Luminaire scheduled at 16+618.74
Offset is 14.06 m Rt.



LUMINAIRE SCHEDULE — SERVICE NO.

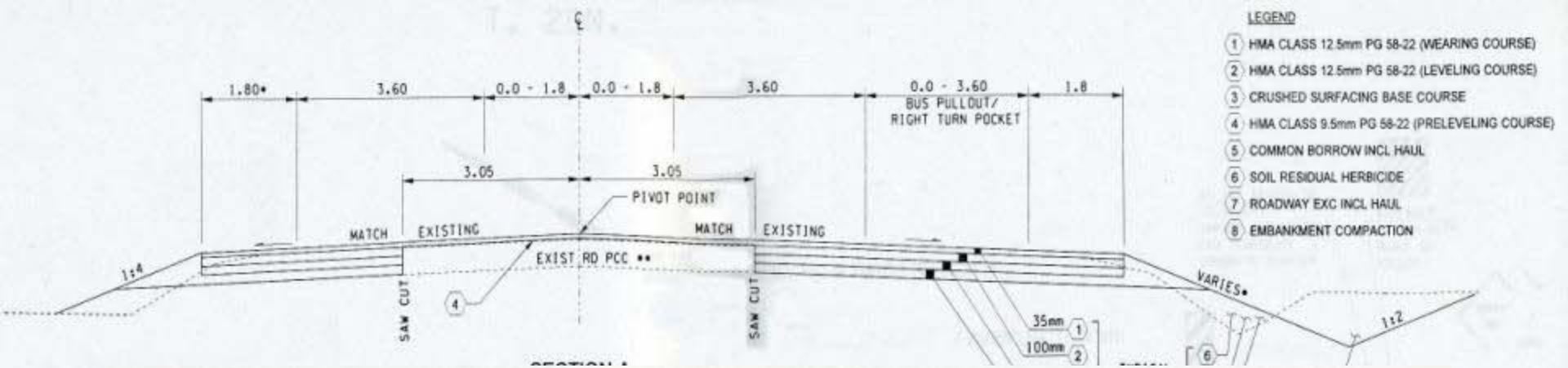
LUMINAIRE NUMBER	CIRCUIT	LOCATION			TYPE-DISTRIBUTION-WATTAGE	MAST ARM	Hi	BASE TYPE	COMMENTS
			STATION	OFFSET					
1	A	SR	STA 16+618.74	14.06m RT	III-MED CUTOFF-400 HPS	4.88m	15.2m	SLIP	
2	A	SR	STA 16+650.22	11.01m LT	III-MED CUTOFF-400 HPS	4.88m	15.2m	SLIP	
3	A	SR	STA 16+681.56	10.54m RT	III-MED CUTOFF-400 HPS	4.88m	15.2m	SLIP	

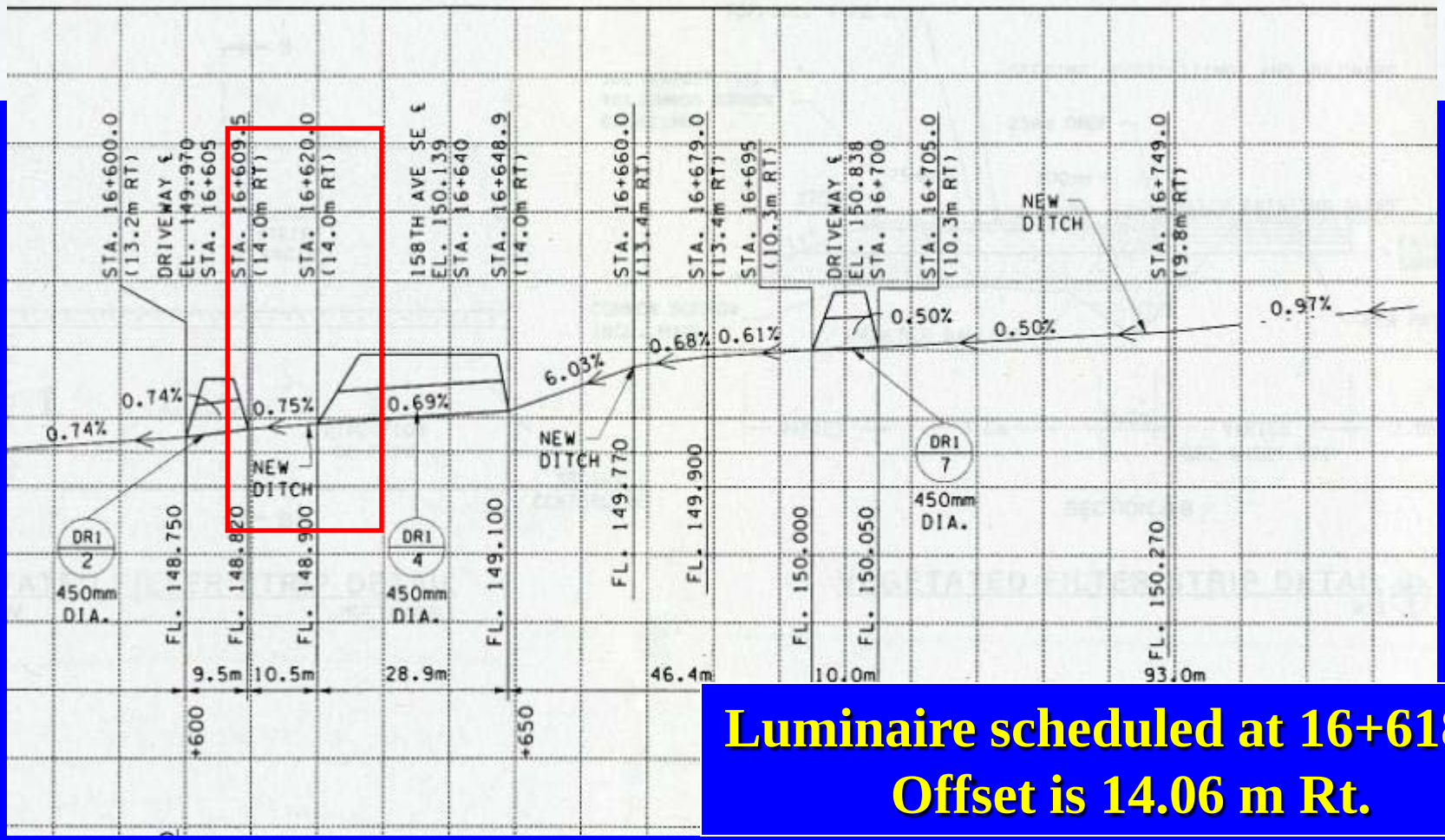


LEGEND

- STRUCTURE NOTE FLAG
- NEW FILTER STRIP
- NEW CATCH BASIN
- EXISTING WELL
- EXISTING CATCH BASIN
- NEW PIPE
- EXISTING CULVERT
- NEW DRAINAGE DITCH
- EXISTING DRAINAGE DITCH
- EXISTING WETLAND BOUNDARY
- EXISTING WETLAND BUFFER
- WETLAND SYMBOL

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.

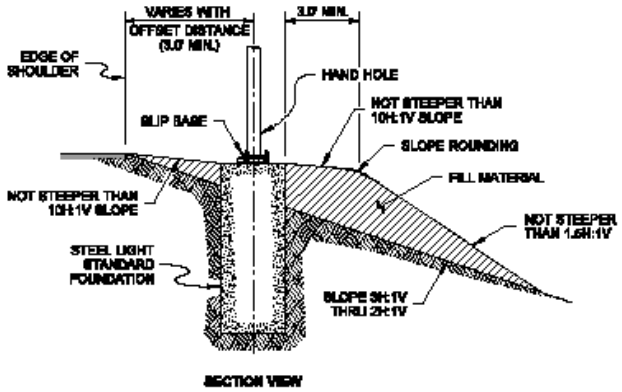
Slip base installed in front on rock wall.

Base Needs a Foundation Capped

Completed light base

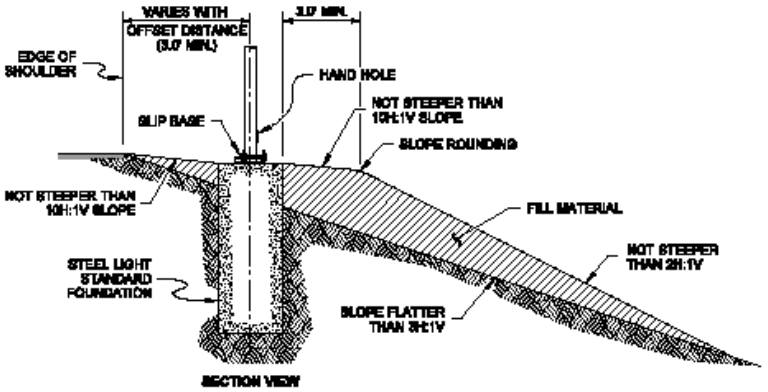
Slip base installed in front of rock wall and foundation to high.

J28.22 Base Placement



CASE A

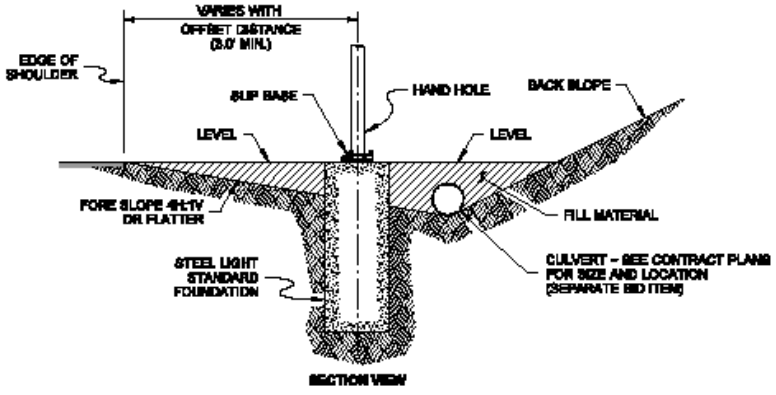
SLOPES 3H:1V THRU 2H:1V (MAX.)



CASE B

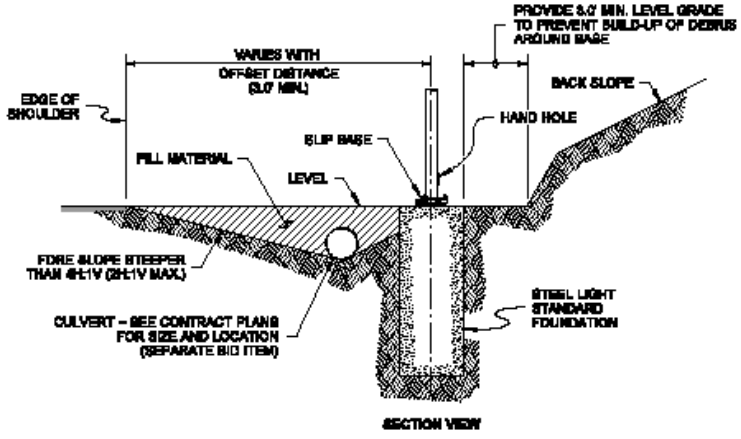
SLOPES FLATTER THAN 3H:1V

EMBANKMENTS



CASE C

FORE SLOPES 4H:1V OR FLATTER



CASE D

FORE SLOPES STEEPER THAN 4H:1V (2H:1V MAX.)

DITCH SECTIONS

THEODORE I. TRAFANTER
STATE OF WASHINGTON
25336
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES AUGUST 9, 2007

STEEL LIGHT STANDARD PLACEMENT (SLIP BASE)

STANDARD PLAN J-28.22-0

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Pasco Bakotich III 06-07-0

Washington State Department of Transportation

Standard Plan J-28.22

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.

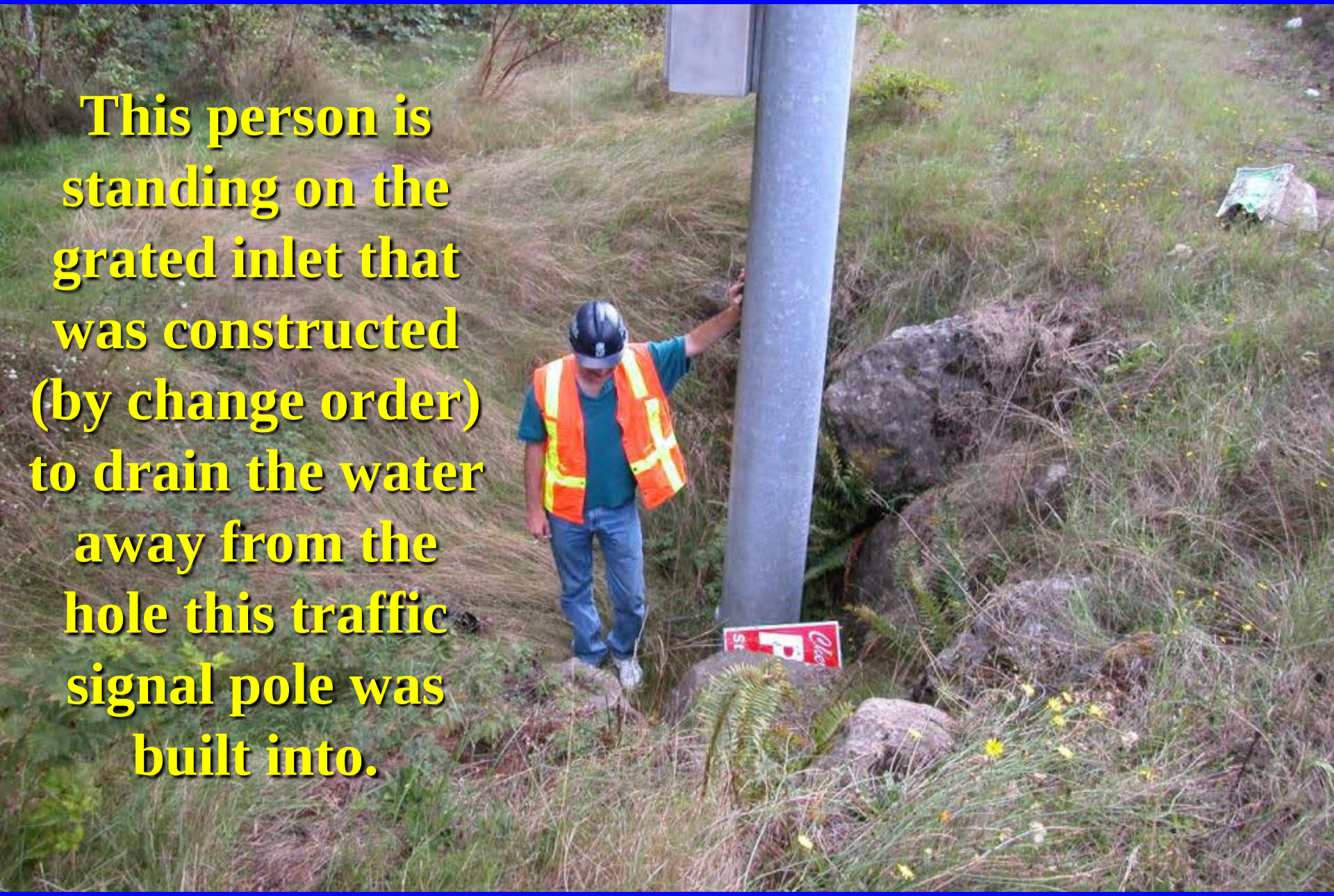
Pole base number	Depth of unstable material at **2-ft. 4-inches** back of foundation	and **1-foot back** of foundation
# 12	4'5"	2'
# 11	2'	1'
# 10	3'1"	3'8"
# 9	3'6"	3'
# 8	3'	3'

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.

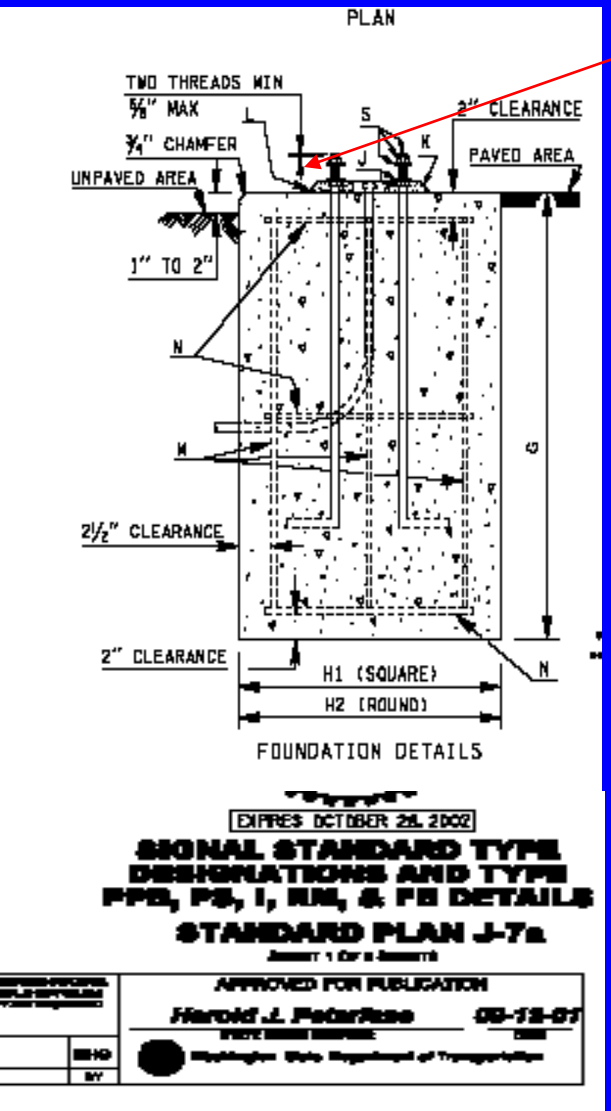
Slip base in soft soil conditions


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.

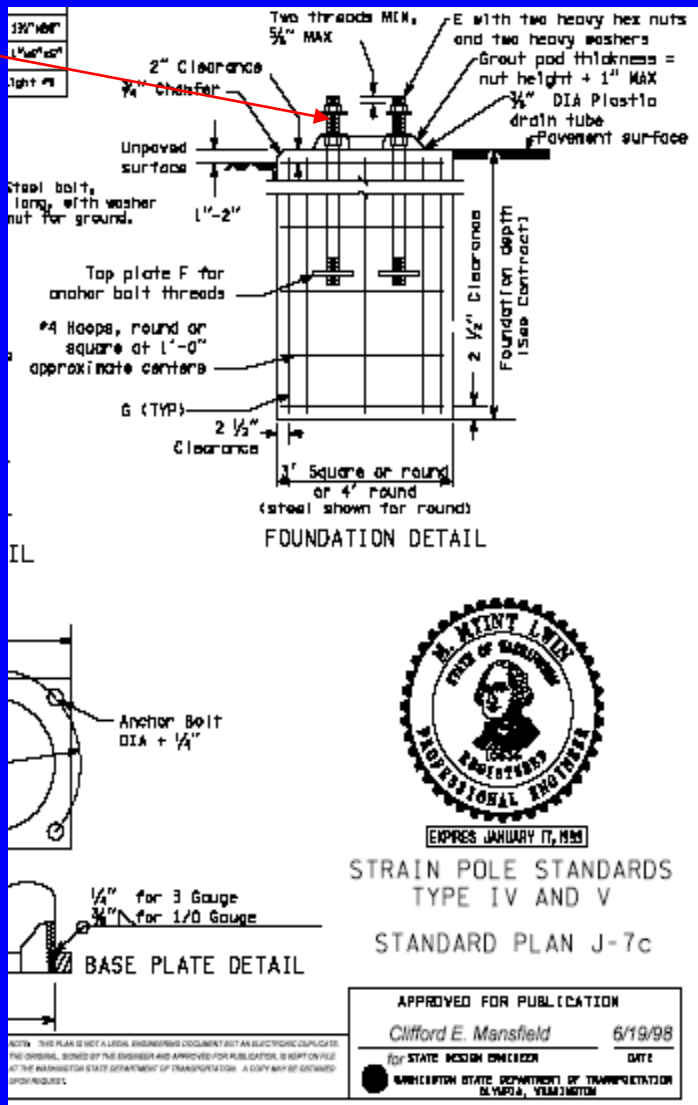
Signal Pole Foundation with Wrong Elevation.

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

Luminaire Base / Barrier

Bolts should be “true level” not leveled to barrier.

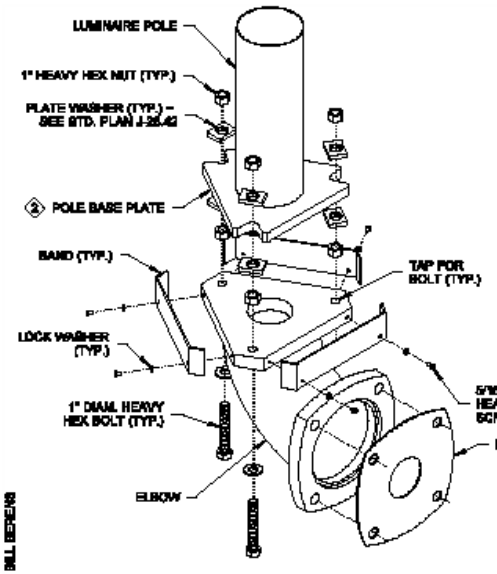
Bridge “El” Bolts

Bridge El

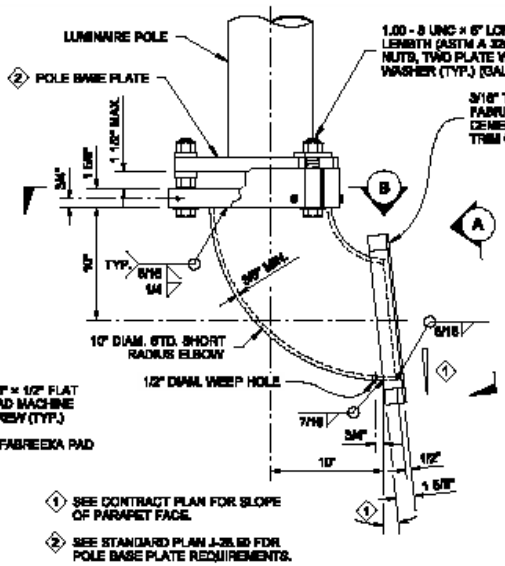
Something to Remember!!
Working Clearances at Hand Hole
NEC Table 110.26(A)(1)
0 – 150 volts = 900mm clearance (3’)
151 – 600 volts = 1.1m clearance (3.5’)

J-28.45

Standard Plan J-28.45



EXPLODED ISOMETRIC VIEW

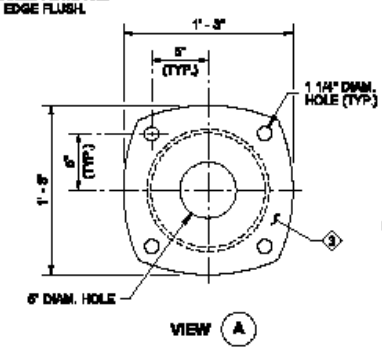


① SEE CONTRACT PLAN FOR SLOPE OF PARAPET FACE.

② SEE STANDARD PLAN J-28.50 FOR POLE BASE PLATE REQUIREMENTS.

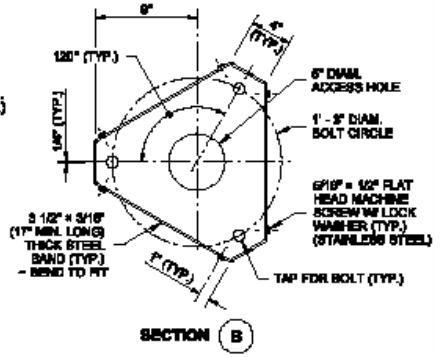
NOTES

1. Galvanize the Elbow Assembly after fabrication according to AASHTO M 111.
2. See Standard Plan J-28.50 for Pole Base and Hand Hole details.



VIEW (A)

③ THE FACE SHALL BE PLANE AFTER FABRICATION, TO PROVIDE A SEAL BETWEEN THE BARRIER AND THE ELBOW

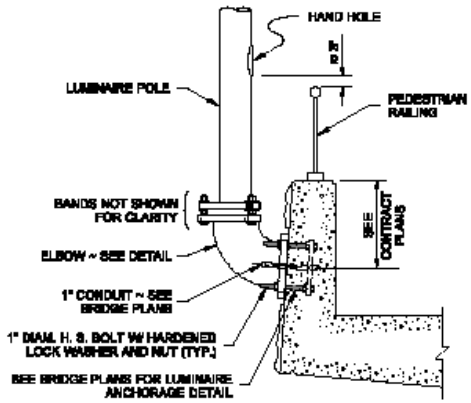


SECTION (B)

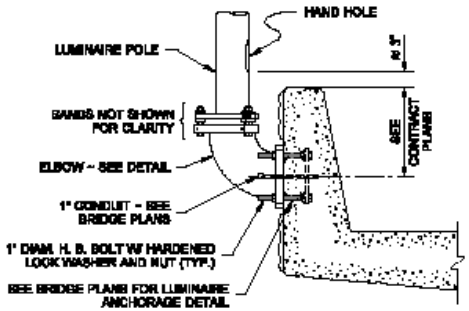
STEEL LIGHT STANDARD ELBOW DETAIL

FOR LUMINAIRE POLES WITH SINGLE MAST ARM 12' OR LESS, AND DOUBLE MAST ARMS 5' OR LESS, MOUNTED ON BRIDGE OR RETAINING WALLS.

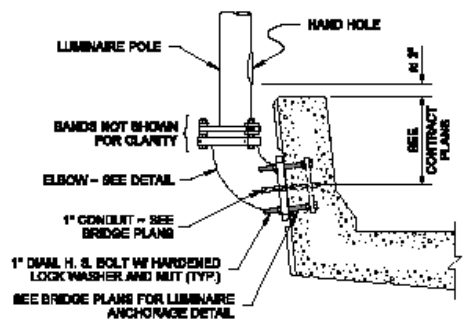
DRAWN BY: BILL BERENS



BRIDGE PEDESTRIAN BARRIER



SINGLE SLOPE BRIDGE TRAFFIC BARRIER



F-SHAPE BRIDGE TRAFFIC BARRIER

WHEN TRAFFIC BARRIER HEIGHT IS 42", MAINTAIN APPROX. HEIGHT FROM TOP OF BARRIER TO HAND HOLE SHOWN.

TYPICAL SECTIONS

RICHARD P. ZELDENRUST — STATE OF WASHINGTON — 28470 — REGISTERED PROFESSIONAL ENGINEER

EXPIRES NOVEMBER 11, 2008

STEEL LIGHT STANDARD ELBOW MOUNTING ON BRIDGE & RETAINING WALL STANDARD PLAN J-28.45-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

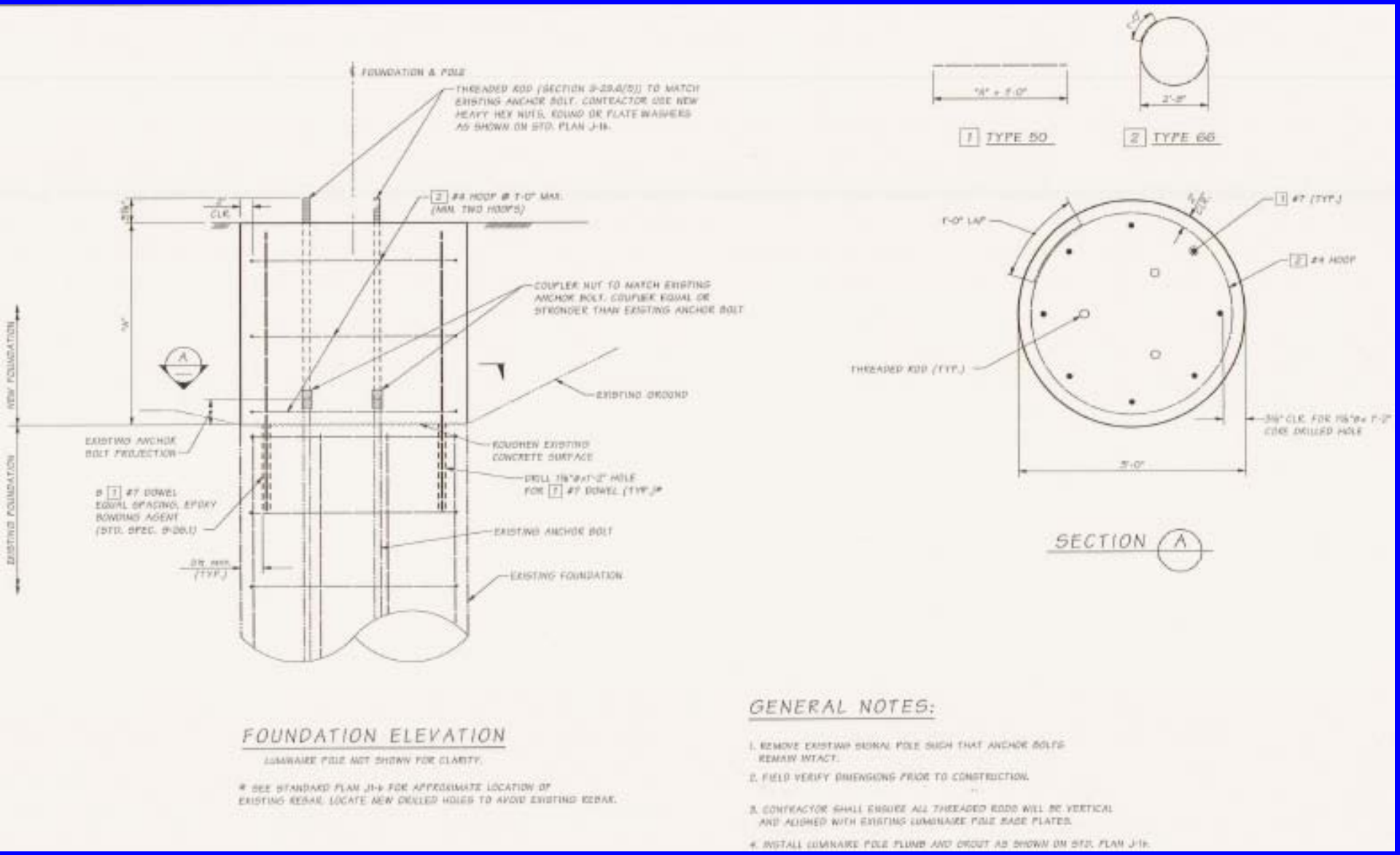
Pasco Bakotich III — 08-07-07

Washington State Department of Transportation

Light Base (Slip Base)

Approved extended base method.

Usable Design Plan for Extended Base.



FOUNDATION ELEVATION

LUMINAIRE POLE NOT SHOWN FOR CLARITY.

* SEE STANDARD PLAN J1-k FOR APPROXIMATE LOCATION OF EXISTING REBAR. LOCATE NEW DRILLED HOLES TO AVOID EXISTING REBAR.

GENERAL NOTES:

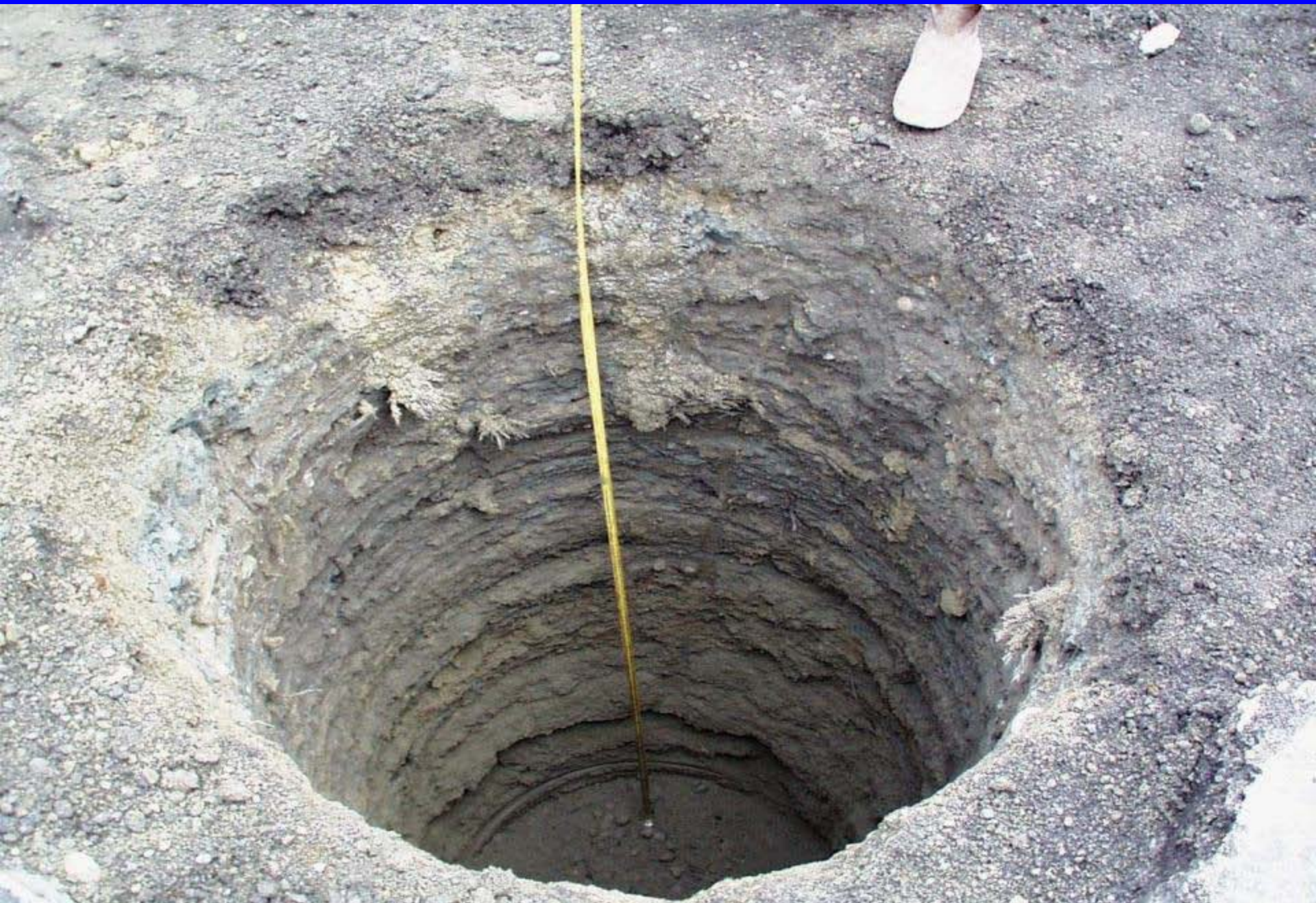
1. REMOVE EXISTING SIGNAL POLE SUCH THAT ANCHOR BOLTS REMAIN INTACT.
2. FIELD VERIFY DIMENSIONS PRIOR TO CONSTRUCTION.
3. CONTRACTOR SHALL ENSURE ALL THREADED RODS WILL BE VERTICAL AND ALIGNED WITH EXISTING LUMINAIRE POLE BASE PLATES.
4. INSTALL LUMINAIRE POLE PLUMB AND ORIENT AS SHOWN ON STD. PLAN J-1k.

Foundations That Were Done Poorly and Replaced

High Mast Shaft and Bolts With Ground Ring Being Installed

Drilling a Sign Base

Augured Hole

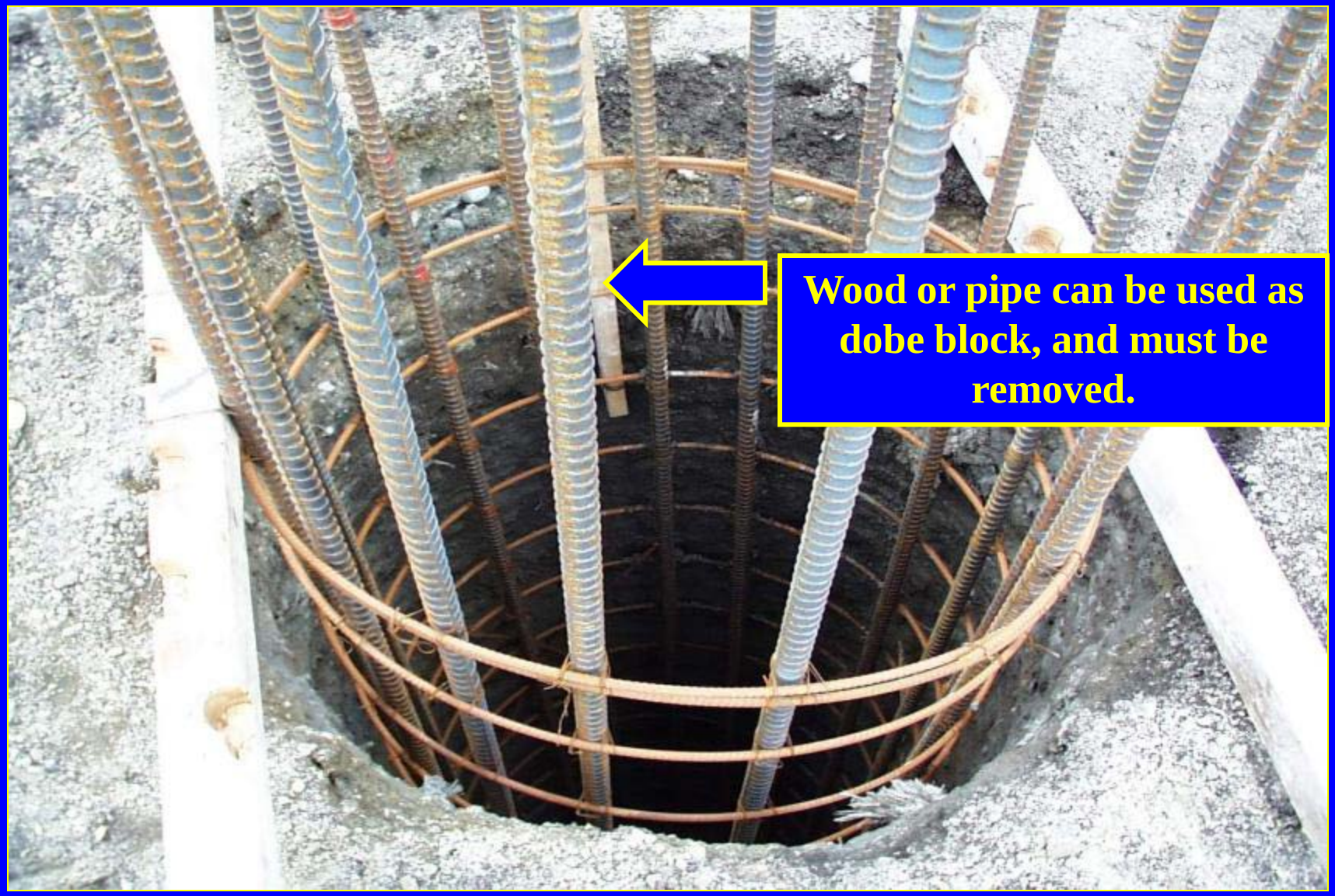


Rebar Cage and Bolts

Check the Grade

Have survey give you a grade mark.

Ready for the First Pour



Concrete should not be allowed to drop more than 5-feet

6-02.3(6)
Page 6-18

8-20.3(4)

Use a Tremie for Deep Pours

Tremie for More Than 5’ Drop

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

Keep ground tile far enough in that the corners will not break off.
Roughly 3 inches to edge of tile.
DEC 22 2004

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.

6-02.3(17)N
Page 6-70