

ORE - TRAFFIC: January 2026 Proposed PIS & SCD's Updates Summary

Each SCD is bookmarked in this document for easier navigation to drawing of interest

Revision Type	Reference	Section Description (Red indicates Change of name from existing)	Description of Revision	New or Deletion	Primary POC
PIS	203020	Prepare to Stop When Flashing (PTSWF) Sign Installation	Updated to reflect new pedestal design		Beck
PIS	208320	Uninterruptible Power Supply (UPS) and Controller Cabinet Foundation	Delete this PIS. UPS are now standard in TC-83.20	Deletion	Beck
SCD	HL-10.11	Light Pole Styles	Added Support Information Tag requirements and additional aesthetic considerations		Beck / Eberhardt
SCD	HL-10.12	Light Pole Details	Added Support Information Tag requirements		Beck
SCD	HL-10.31	Light Tower Details	Added Support Information Tag requirements		Beck
SCD	HL-20.11	Misc. Light Pole Foundations & Trench Details	Added Dimension lines to anchor bolts to show height above ground level and added corresponding AASHTO note		Duemme
SCD	HL-20.21	Light Tower Foundations	Added Note 8 to provide cross reference to C&MS to Contractor when Ground Rod refusal occurs due to bedrock. Also reformmated notes and made other minor edits for clarity.		Duemme
SCD	HL-30.11	Pull Box Details	Updated to provide additional details for pulling cable		Duemme
SCD	HL-40.10	Power Service, Pole-Mounted	Added an additional enclosure manufacturer on note 8 on page 2		Duemme
SCD	HL-50.11	Grounding Details	Retire this drawing. Content now shown on SCD F-3.5.	Deletion	Holloway
SCD	HL-50.21	Structure Grounding	The SCD has been completely revised to be more detailed, with excerpted detail views showing current bridge standard construction from the Office of Structural Engineering.		Duemme
SCD	HL-60.12	Pole Wiring II	Add a callout for Type WR (Weather Resistant) outlet on Pole Wiring - Light Pole with Festoon Outlet detail		Duemme
SCD	HL-60.31	Control Center Wiring	Added 3rd page to drawing to show daylighting power service		Duemme
SCD	ITS-12.10	Concrete CCTV Camera Pole	Added Support Information Tag requirements		Beck
SCD	ITS-12.11	Steel CCTV Camera Pole	Added Support Information Tag requirements		Beck
SCD	ITS-12.12	Tilt CCTV Camera Pole	New SCD showing tilt CCTV camera pole requirements	New	Beck
SCD	ITS-14.11	32" Pull Box with Pad	Add info to install Comm Cable Markers on high side of slope		Beck
SCD	ITS-14.20	48" Pull Box with Pad	Add info to install Comm Cable Markers on high side of slope		Beck
SCD	ITS-14.60	Micro-Duct Details	Correct TEM reference in Note 3 to indicate 1303-5 instead of 1303-4		Beck
SCD	ITS-15.10	Power Service, Ground-Mounted Details	Multiple clarifying updates including removing fuse requirements and added that fusing shall be per the ITS Engineer.		Beck
SCD	ITS-15.11	Power Service, Pole-Mounted Details	Multiple clarifying updates including removing fuse requirements and added that fusing shall be per the ITS Engineer.		Beck

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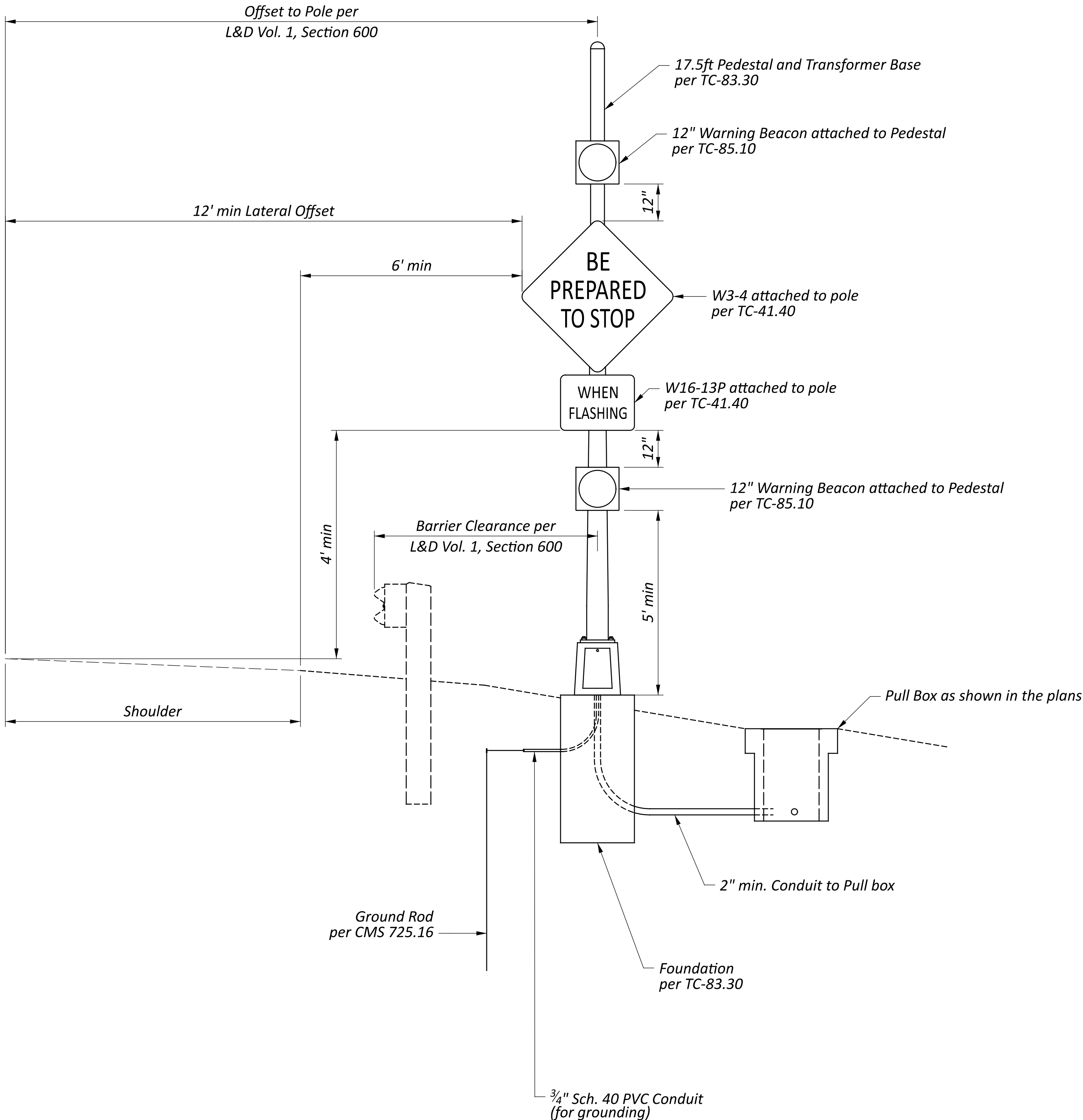
Each SCD is bookmarked in this document for easier navigation to drawing of interest

Revision Type	Reference	Section Description (Red indicates Change of name from existing)	Description of Revision	New or Deletion	Primary POC
SCD	ITS-30.11	Dynamic Message Sign - Pedestal Catwalk	Page 1 - clarify dimension to catwalk ladder. Page 2 - correct bolt size in Section C-C and View J-J to be consistent 5/8"		Beck
SCD	ITS-30.12	Dynamic Message Sign - Pedestal Foundation - ROW	To be consistent with TC-21.21 update thread length on anchor bolts to be 12"		Beck
SCD	ITS-30.13	Dynamic Message Sign - Pedestal Support	Added Support Information Tag requirements		Beck
SCD	ITS-35.11	Dynamic Message Sign - Truss Catwalk	Page 1 - clarify dimension to catwalk ladder.		Beck
SCD	ITS-35.12	Dynamic Message Sign - Truss Foundation - ROW	To be consistent with TC-21.21 update thread length on anchor bolts to be 12"		Beck
SCD	ITS-35.13	Dynamic Message Sign - Truss Support	Added Support Information Tag requirements		Beck
SCD	ITS-50.10	Site Grounding	Revise reference from HL-50.11 (since that drawing going to be retired) and instead refer to SCD F-3.5 since grounding information now contained on that drawing		Beck
SCD	ITS-76.10	Ramp Meter Installation	Page 1 - In note 2 change to 17.5 ft pedestal, base, and foundation per TC-83.30. Page 3 - on Typ Ramp Meter Sign Placement detail change to 17.5 ft pedestal, base, and foundation per TC-83.30.		Beck
SCD	MT-97.12	Flagger Closing 1 Lane of a 2-Lane Highway for Paving Operations	Multiple clarifying updates		Beck / Willis
SCD	MT-103.20	Steel Plate over Trench	New Drawing showing info to provide steel plate over trench	New	Beck / Willis
SCD	MT-120.00	New Signal Activation	Multiple clarifying updates		Beck / Willis
SCD	MT-125.00	2-Way Stop to All-Way Stop Conversion	Multiple clarifying updates to be consistent with OMUTCD and TEM terminology		Beck / Willis
SCD	MT-125.50	Conversion of Overhead Flasher to 2-Way or All-Way Stop	Multiple clarifying updates to be consistent with OMUTCD and TEM terminology		Beck / Willis
SCD	TC-9.11	Semi Overhead Sign Support	Added Support Information Tag requirements		Beck
SCD	TC-9.31	Center Mount Overhead Sign Support	Added Support Information Tag requirements		Beck
SCD	TC-12.31	Cantilever Overhead Sign Support	Add roadway in Elevation view and provide minimum clearance dimension and added Support Information Tag requirements		Soisson
SCD	TC-15.116	Steel Truss Overhead Sign Support	Show a sign and provide minimum clearance dimension to bottom of sign and added Support Information Tag requirements		Soisson
SCD	TC-16.22	Single Arm Overhead Sign Support	Added Support Information Tag requirements		Beck
SCD	TC-17.11	Span Wire Overhead Sign Support	Added Support Information Tag requirements		Beck
SCD	TC-21.11	Sign Support Foundations Steel Truss Overhead Sign Support Foundation	Delete note at bottom left of planview detail since reinforcing schedule table is provided directly on this sheet. Also revise SCD Title.		Soisson
SCD	TC-21.50	Concrete Median Barrier Overhead Sign Support Foundations (Single Slope)	Add reference to TC-21.21 and TC-21.11 for vertical bar numbers. Delete Vertical Rebar schematic		Soisson
SCD	TC-41.10	Structural Beam Sign Supports	Change Note 4 term 'snugly' to 'snug tight'. Fonts and border updates.		Soisson
SCD	TC-41.20	Yielding Post	Fonts and border updates.		Soisson

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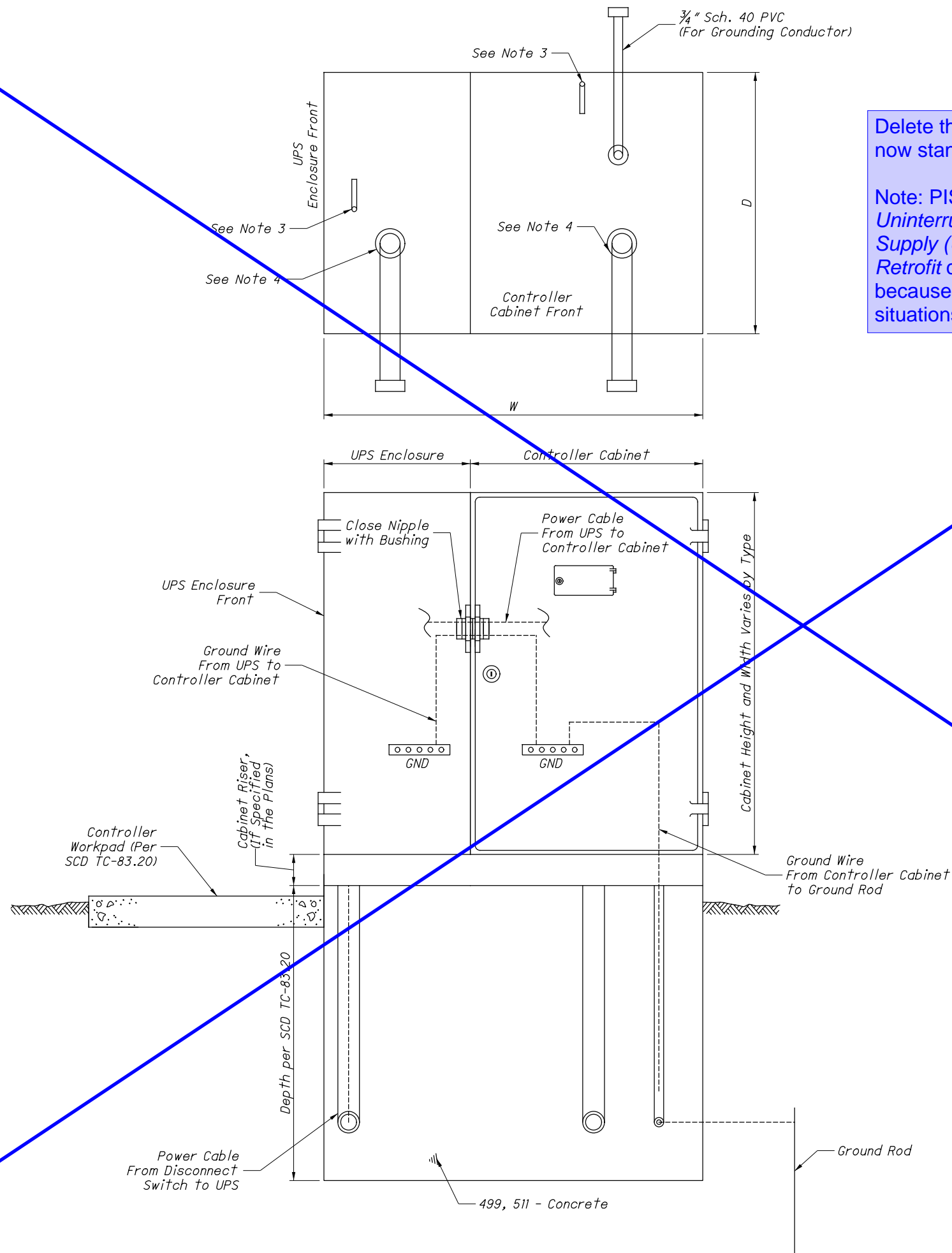
Revision Type	Reference	Section Description (Red indicates Change of name from existing)	Description of Revision	New or Deletion	Primary POC
SCD	TC-41.25	Laminated Veneer Wooden Box Beam Sign Support	Fonts and border updates.		Soisson
SCD	TC-41.40	Special Sign Attachments and Supports	Add Type 3 for use with other parapet types. Fonts and border updates.		Soisson
SCD	TC-41.41	Special Sign Attachments	Fonts and border updates.		Soisson
SCD	TC-41.50	One Way Sign Support Details	Fonts and border updates.		Soisson
SCD	TC-42.10	Typical Guide Sign Placement	Fonts and border updates.		Soisson
SCD	TC-42.20	Typical Flat Sheet Sign Placement	Fonts and border updates.		Soisson
SCD	TC-52.10	Sign Blank Details I	Fonts and border updates.		Soisson
SCD	TC-64.10	Rumble Stripes	Separate edge line marking from edge line rumble by a distance of 6"		Soisson
SCD	TC-65.10	Raised Pavement Marker Placement Details	Fonts and border updates.		Soisson
SCD	TC-71.10	Word and Symbol Pavement Markings	Changes to dotted line on Lane Reduction to provide clarification on placement. Added clarification on Handicap Symbol markings		Soisson
SCD	TC-72.20	Freeway and Expressway Entrance and Exit Pavement Markings	<ul style="list-style-type: none"> Re-orient chevrons in the entrance ramp gores on sheet 2 Change width of dotted line along auxiliary lane Add dotted line at option lane exit 		Soisson
SCD	TC-73.20	Enhanced Wrong-Way Traffic Control for Ramps	Add callout and details showing raised curb or barrier delineation in the partial cloverleaf interchange detail		Soisson
SCD	TC-74.10	Crosswalk Markings	Typo correction. Min distance from last marking to the curb ramp is 1.5 feet, not 1.5 inches		Soisson
SCD	TC-75.10	Speed Reduction and Speed Measurement Markings	NEW standard drawing providing info for Speed Reduction and Speed Measurement Markings	New	Eberhardt
SCD	TC-81.11	Strain Pole Details	Added Support Information Tag requirements		Beck
SCD	TC-81.22	Single Arm Overhead Signal Support	Added Support Information Tag requirements		Beck
SCD	TC-83.10	Pole Mountings for Controllers and Power Service	Update to clarify notes		Beck
SCD	TC-83.20	Cabinet Foundations and Pedestals Traffic Control and UPS Cabinets	Rename drawing, pedestal info removed, revised cabinet details to include UPS, added other details to modernize details		Beck
SCD	TC-83.30	Pedestals	New drawing showing pedestal information with information pulled from TC-83.20	New	Beck
SCD	TC-85.10	Pole and Pedestal Mounting for of Signal Heads	Rename drawing and update throughout to clarify		Beck
SCD	TC-87.10	RRFB Assemblies	Remove pedestal foundation and replace with transformer base		Soisson
SCD	TC-87.20	School Speed Limit Sign with Flashing Beacons	New drawing showing the sign assemblies	New	Beck



NOTES

1. Make electrical connections inside the AT-A Base with a Connection, Fused Pull Apart.
2. Contact between aluminum and galvanized parts shall be prevented with a minimum 1/16" thick chloroprene gasket or approved substitute. Gaskets are not required between stainless steel and aluminum.



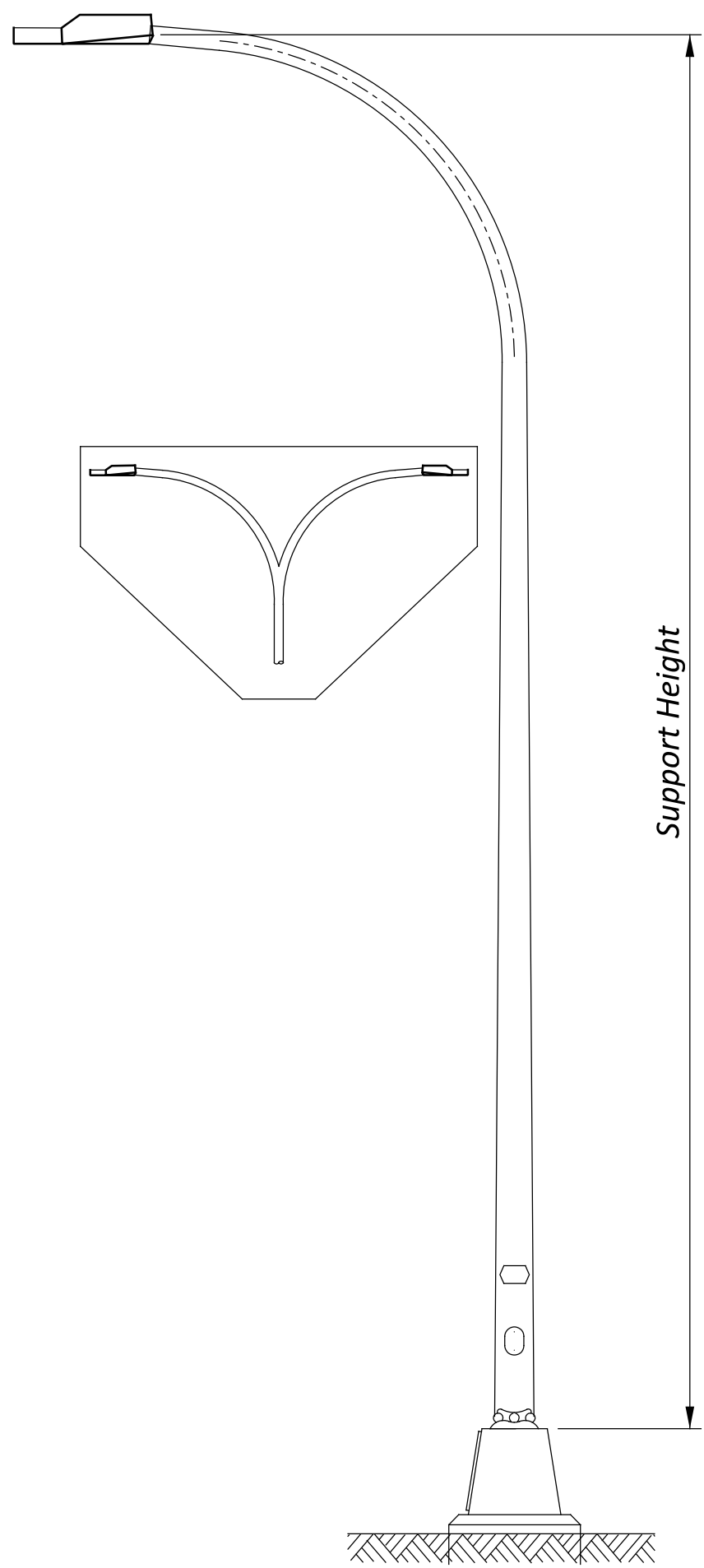


Delete this PIS. UPS are now standard in TC-83.20

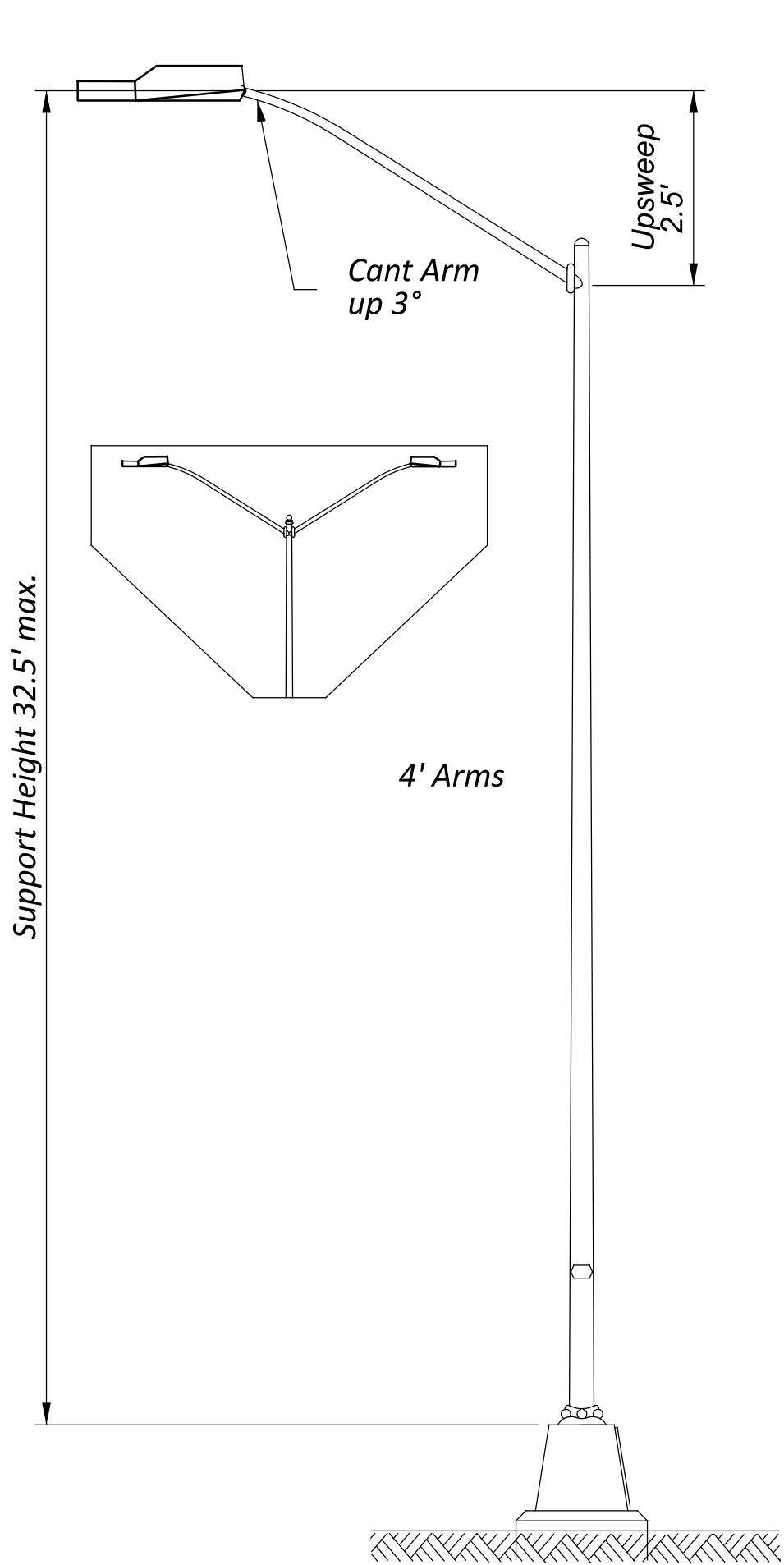
Note: PIS 208321, Uninterruptible Power Supply (UPS) Foundation Retrofit can remain because it is for retrofit situations

- NOTES:
1. The Uninterruptible Power Supply (UPS) enclosure shall be mounted flush up against the traffic signal cabinet and sealed with silicone. The Contractor shall be responsible for providing the necessary power cable between the UPS unit and signal cabinet.
 2. The UPS should be placed on the opposite side of the pull box on a 332/336 cabinet (per Standard Construction Drawing (SCD) TC-83.20). The UPS placement for a NEMA cabinet varies, placement should provide adequate access with respect to slope, guardrail spacing, etc.
 3. The size, number, and location of anchor bolts shall be in accordance with the manufacturer's recommendations.
 4. The size, number, and orientation of conduit ells shall be as shown in the plan, except that a 3/4" schedule 40 PVC shall be installed in each foundation.
 5. 1/2" preformed joint filler as per CMS 705.03 shall be used between foundations and adjacent paved areas.
 6. See SCD TC-83.20 for further details.

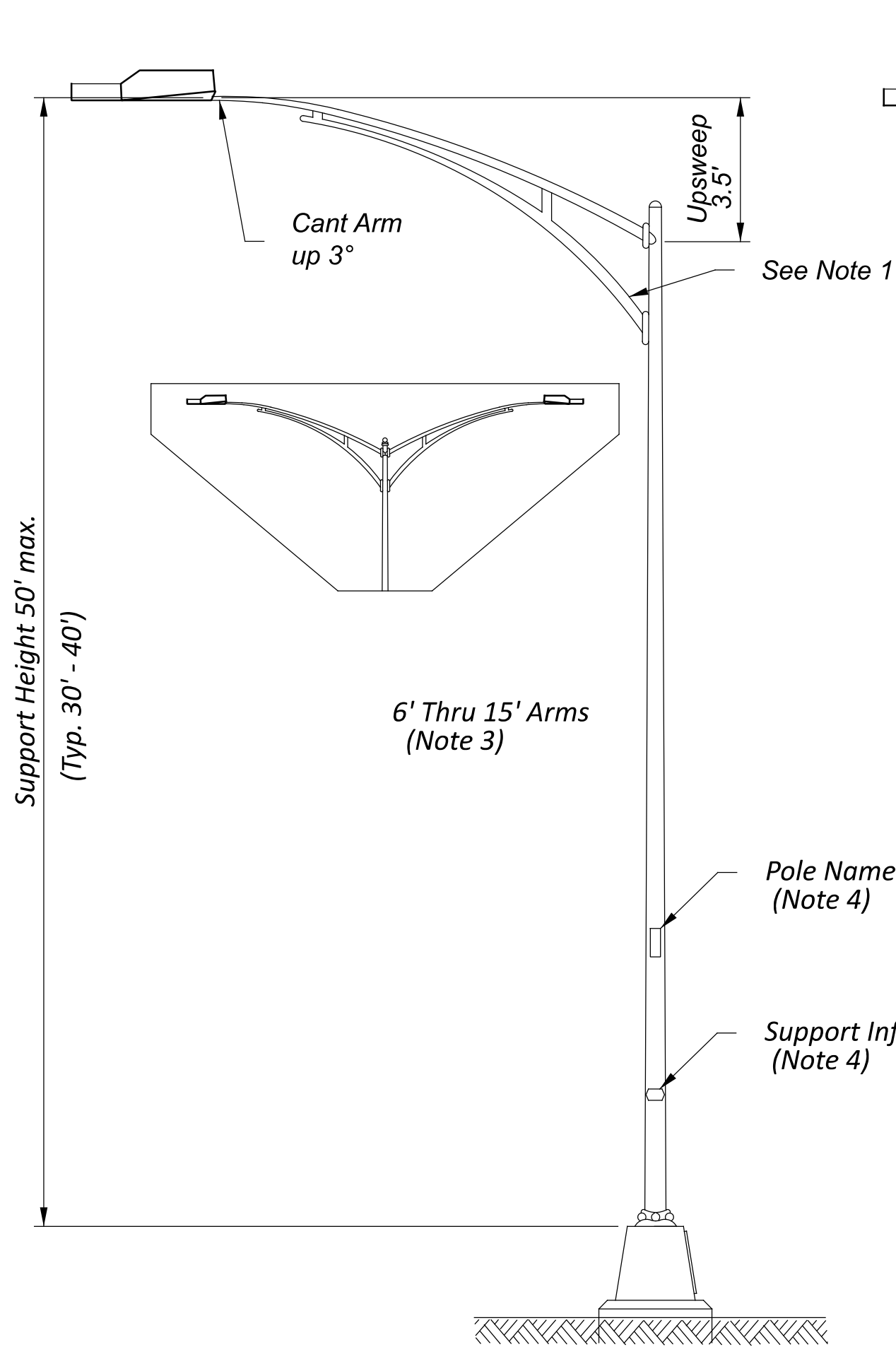
TYPE	W (IN.)	D (IN.)	FOUNDATION CONCRETE (CU. YD.)
TS-1	60	24	1.23
TS-2	70	36	2.16
2070/170	50	36	1.54



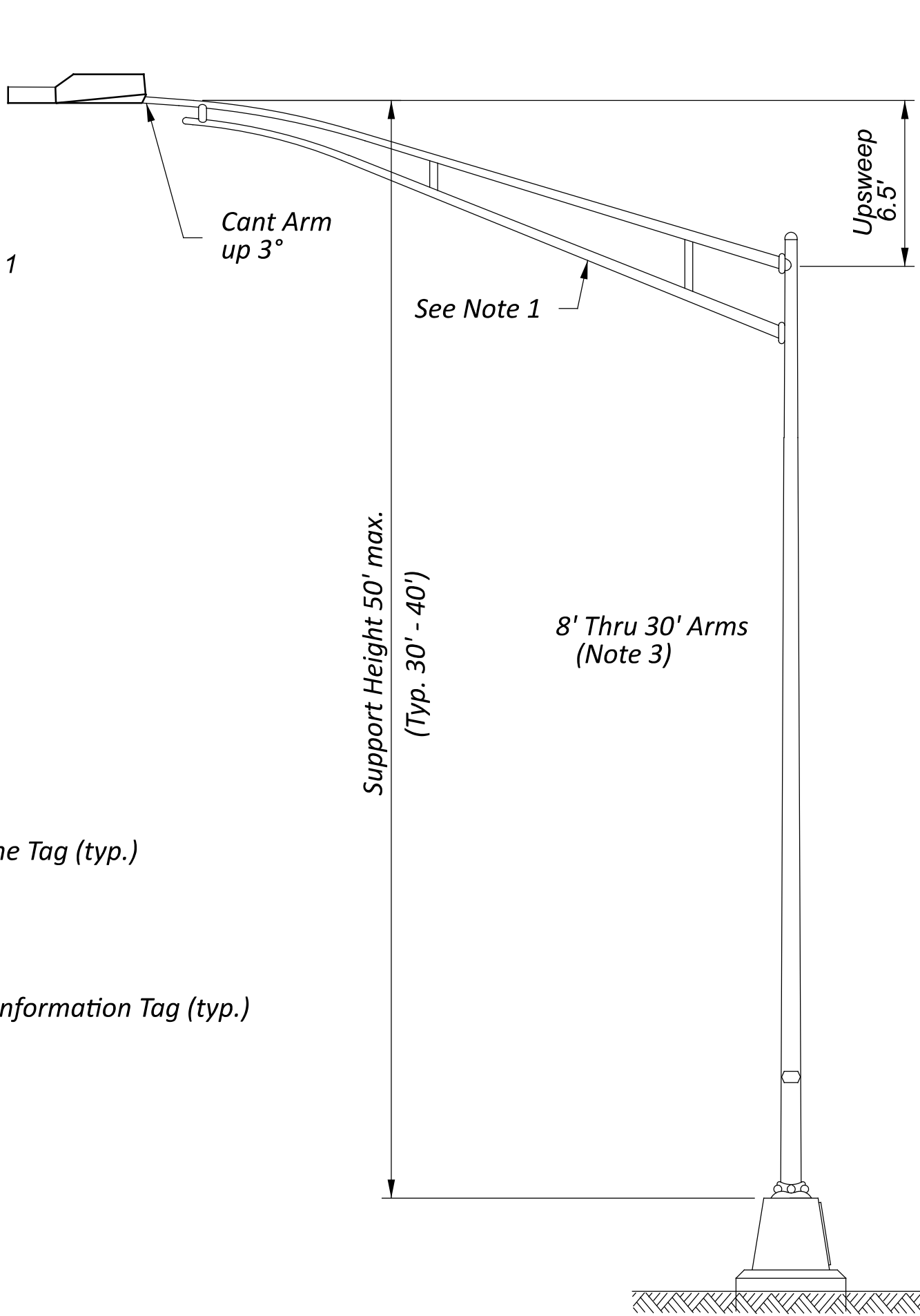
STANDARD DAVIT



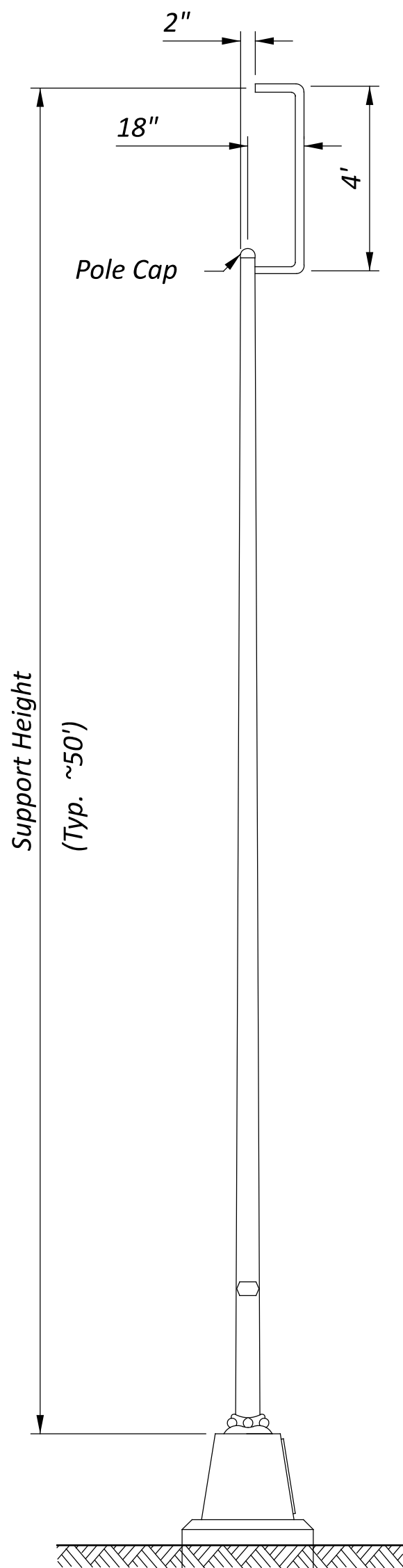
STANDARD MONOARM



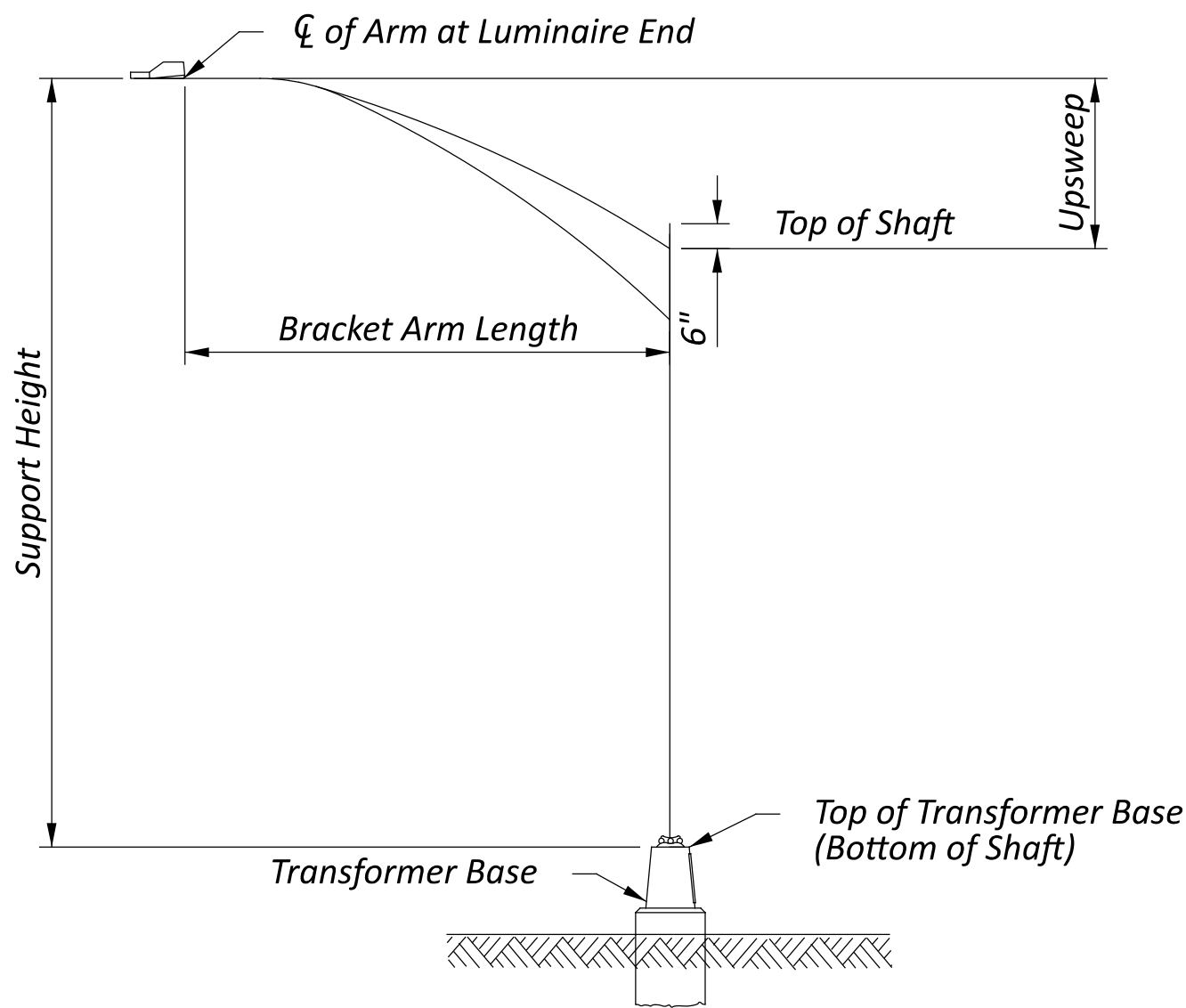
STANDARD TRUSS ARM,
LOW RISE



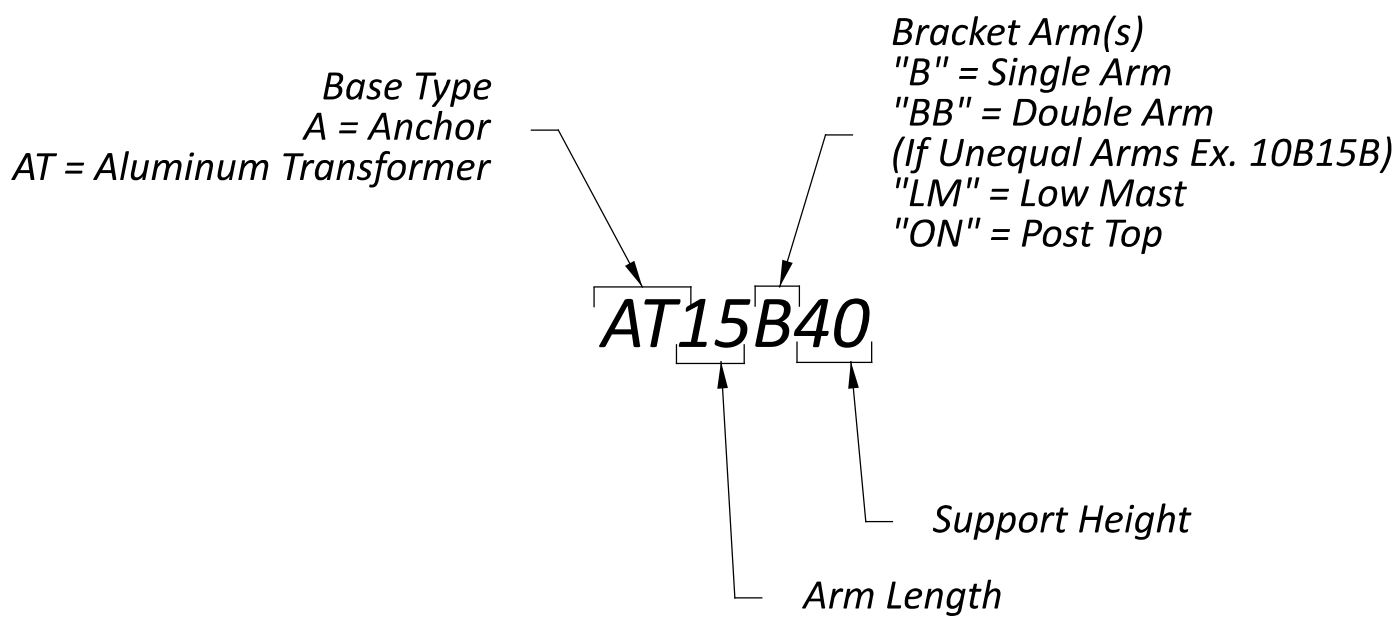
STANDARD TRUSS ARM
HIGH RISE



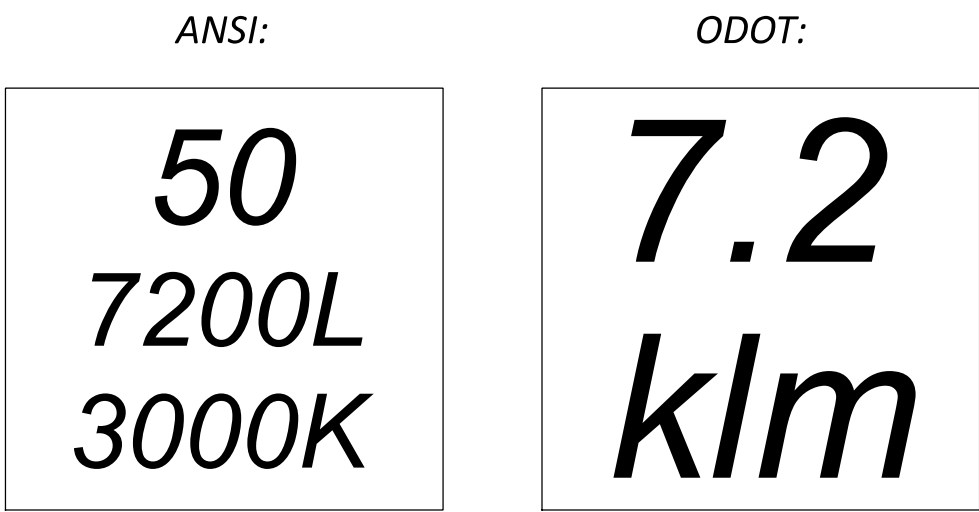
STANDARD LOW MAST



POLE COMPONENTS



LIGHT POLE DESIGN NUMBER

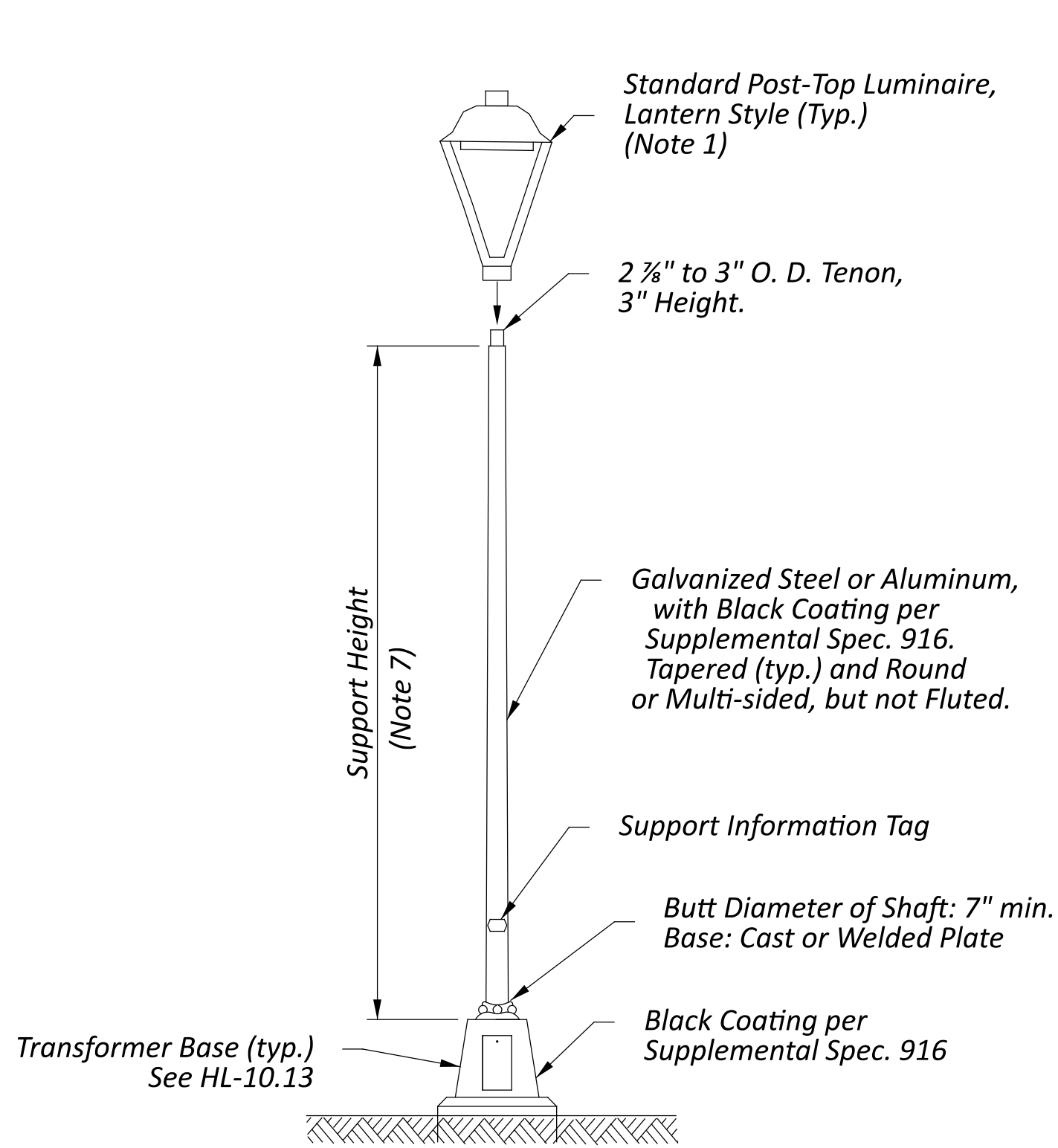


LED LUMINAIRE LABEL
(Note 7)

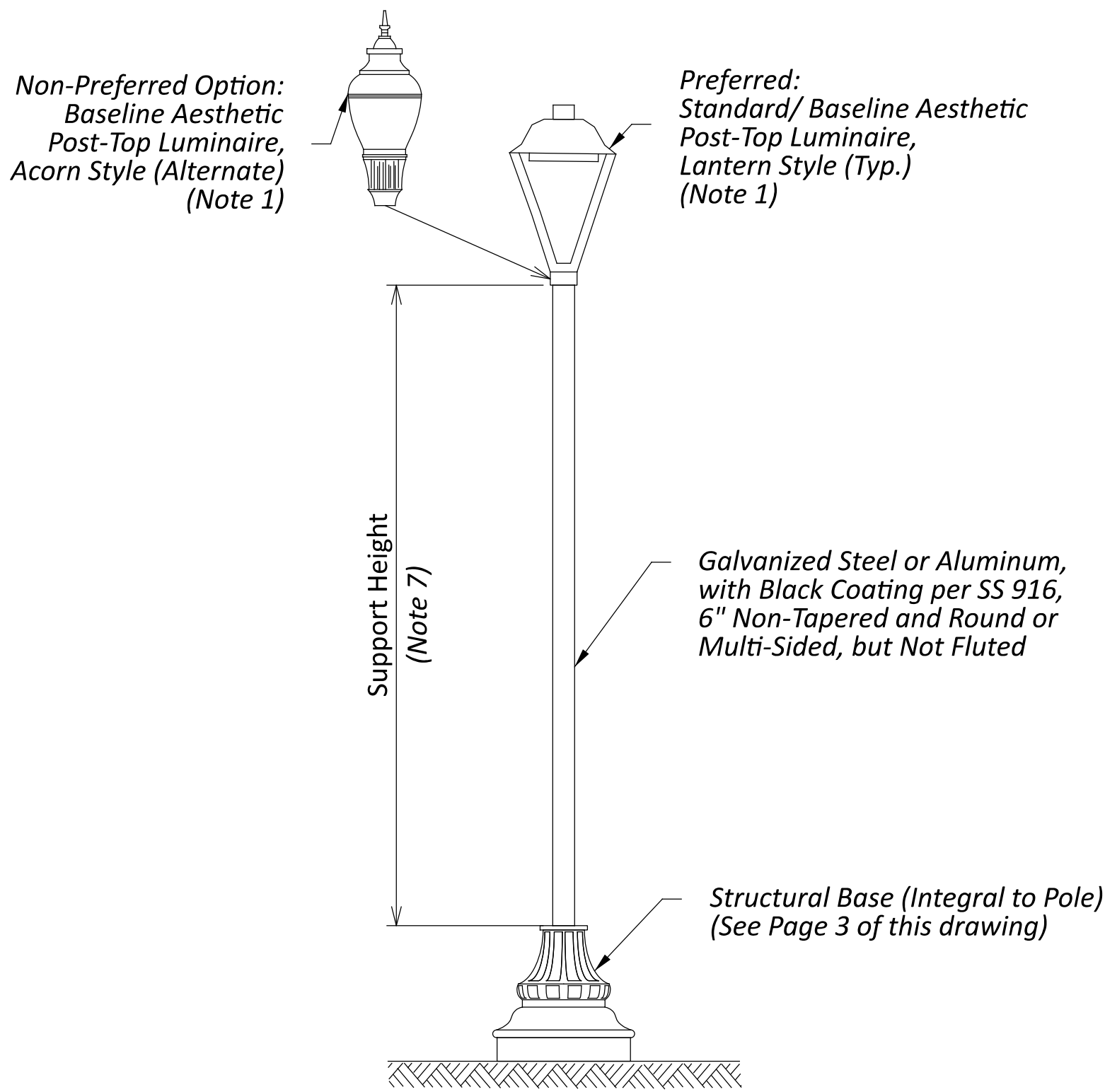
NOTES:

1. Truss arms shown are schematic. Actual truss arm construction may vary slightly depending upon manufacturer (e.g., straight vs. curved lower-chords).
2. Do not provide nut covers for the pole base.
3. Do not exceed pole manufacturer's recommended height/arm length combination.
4. Attach a Support Information Tag per C&MS 732.11 and a Pole Name Tag per C&MS 725.21 to each pole.
5. All HL-10.11 standard and baseline aesthetic poles are of round cross section with smooth walls (no flutes). Fluted poles are considered Enhanced Aesthetic items.
6. See ODOT Aesthetic Design Guidelines for the Definitions of "Standard," "Baseline Aesthetic," and "Enhanced Aesthetic."
7. NEMA C136.15-compliant or ODOT-style luminaire label is required on all luminaires, except those where placement is not possible.
8. Bracket arm attachment per manufacturer unless specified in the Plans. ODOT-preferred is 4-bolt flange, but Simplex, socket or 4-bolt saddle are acceptable.



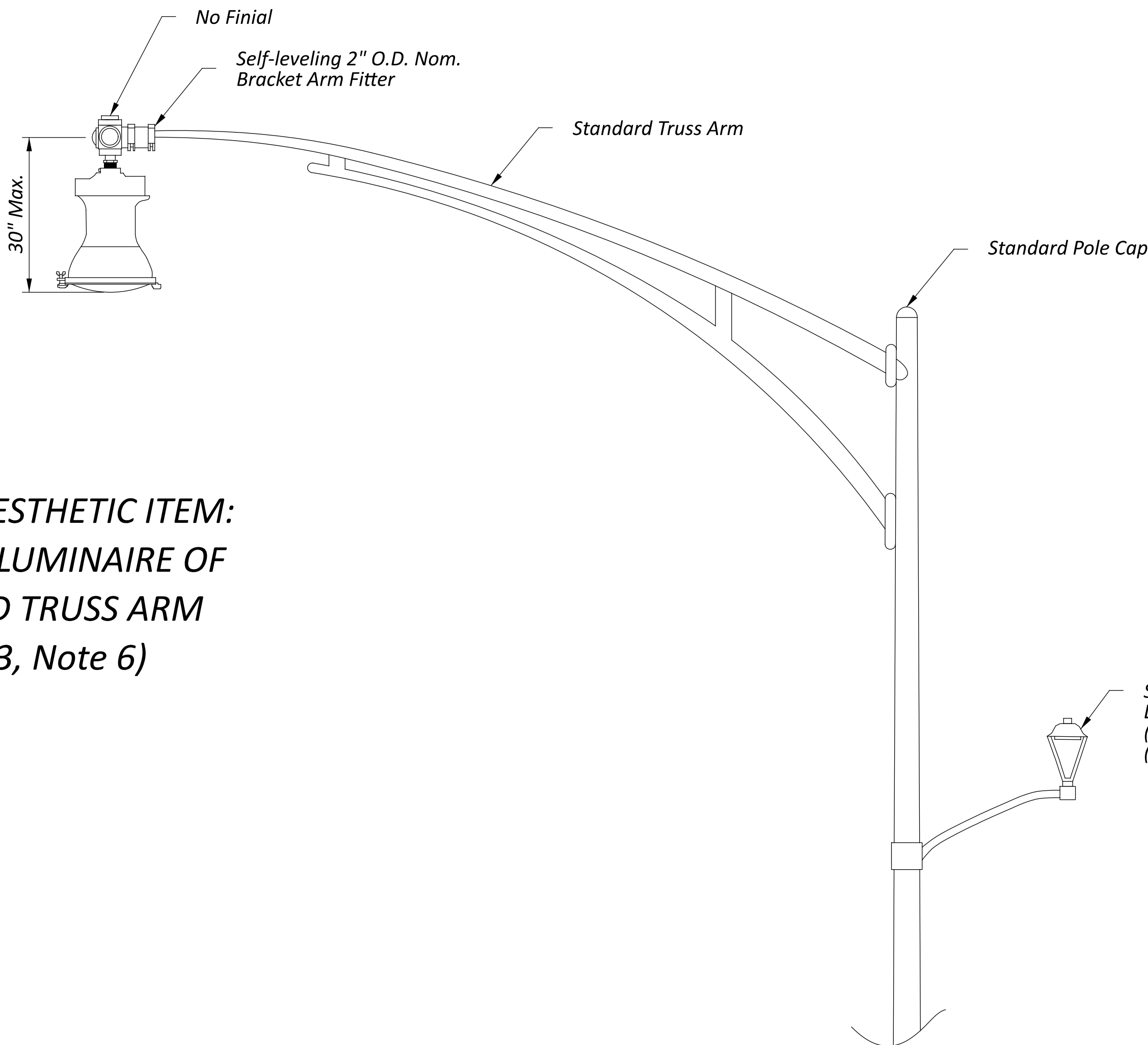


STANDARD POST-TOP SUPPORT

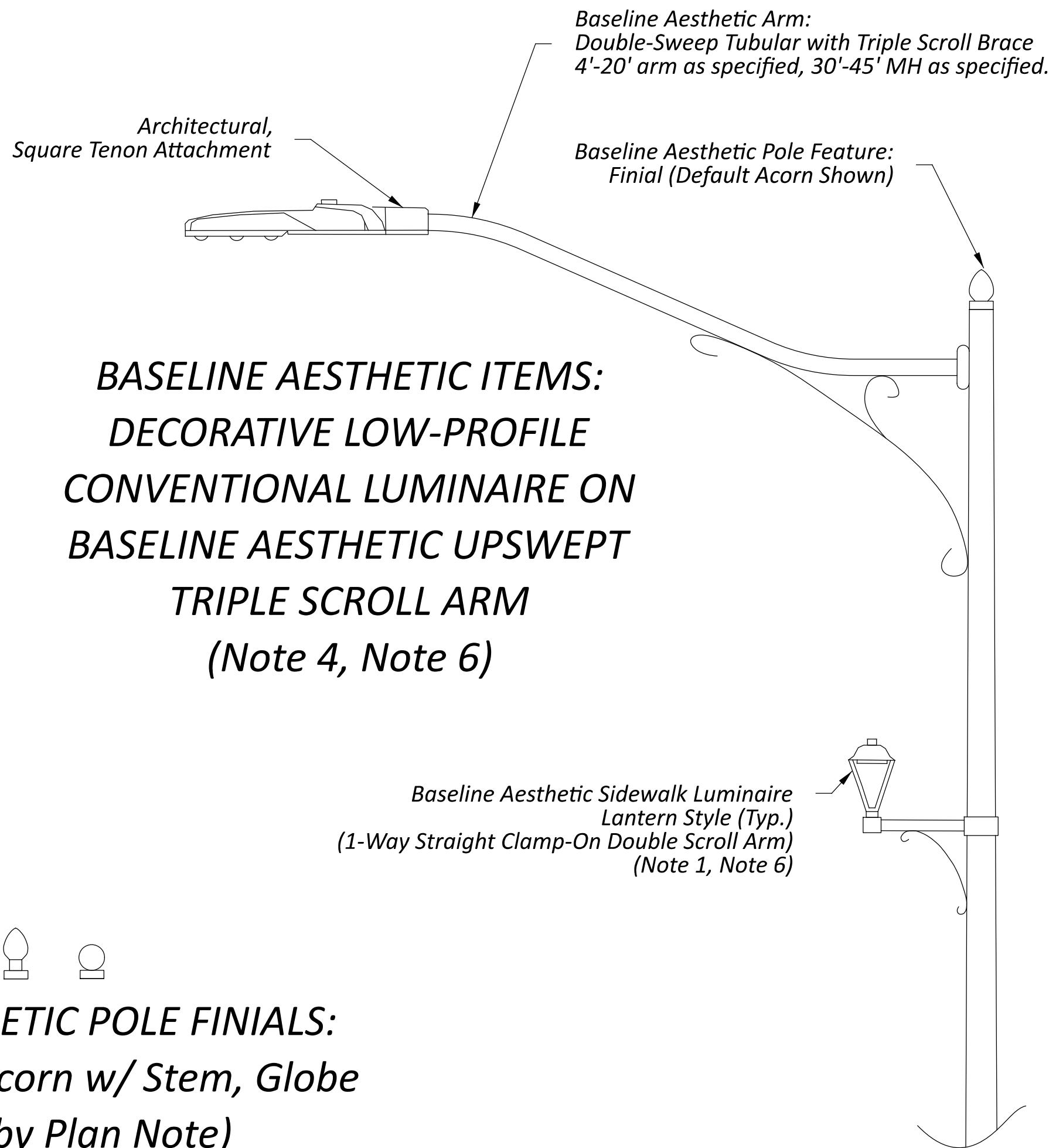


BASELINE AESTHETIC POST-TOP SUPPORT

BASELINE AESTHETIC ITEM:
TEARDROP LUMINAIRE OF
STANDARD TRUSS ARM
(Note 3, Note 6)



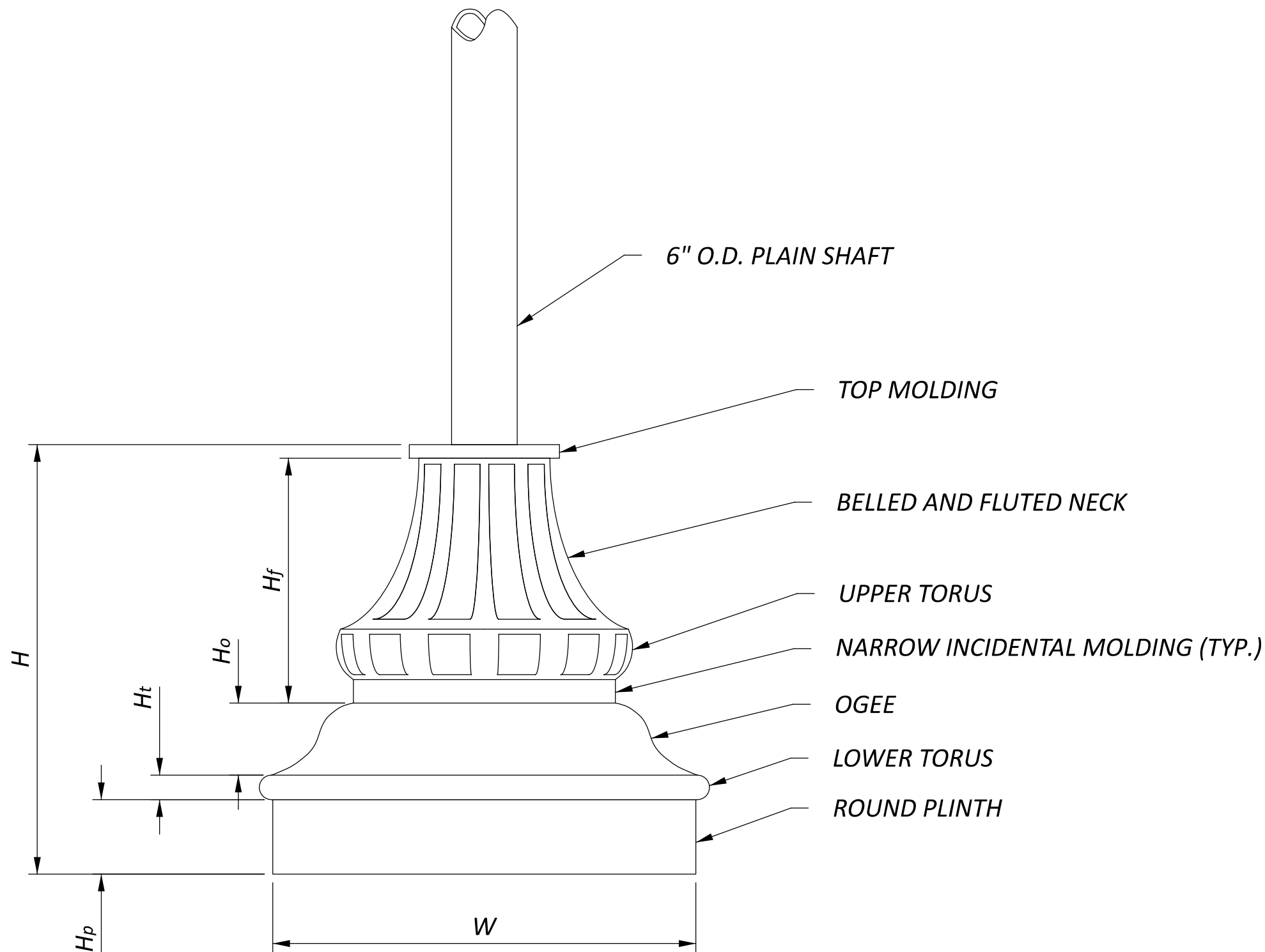
BASELINE AESTHETIC POLE FINIALS:
Acorn (default), Acorn w/ Stem, Globe
(Specified by Plan Note)



BASELINE AESTHETIC ITEMS:
DECORATIVE LOW-PROFILE
CONVENTIONAL LUMINAIRE ON
BASELINE AESTHETIC UPSWEPT
TRIPLE SCROLL ARM
(Note 4, Note 6)

- NOTES:**
- See ODOT Aesthetic Design Guidelines for the Definitions of "Standard," "Baseline Aesthetic" and "Enhanced Aesthetic".
 - Aesthetic accessories are as follows:
 - Baseline Aesthetic**
 - a. Banner Arms, up to two arms per pole
 - b. Single or dual flagpole sockets
 - c. Straight Street Name Sign arms
 - Enhanced Aesthetic**
 - a. Dual Luminaire arms
 - b. Plant Hangers
 - c. Medallions
 - d. Collars
 - Teardrop Luminaire is specified by Plan Note.
 - Low-Profile Luminaire is specified by Plan Note.
 - All HL-10.11 poles are of round cross section with smooth walls (no flutes).
 - Baseline Aesthetic roadway and sidewalk support arms for conventional poles shall be specified by plan note as Truss Arm or Tubular arm, Double Scroll Arm, or Triple Scroll arm.
 - Sidewalk Luminaire Mounting Height (MH) is specified by Plan Note. For dedicated sidewalk or bikeway lighting, MH is 12'-14', typical. For roadway lighting, post-top MH is 14'-18' typical. Maximum height is 20 feet. Construct foundation per HL-20.11, 24" or 30" diameter.

BASELINE AESTHETIC POLE BASE, TYPE WA
ARCHITECTURAL DETAILS
AND ADDITIONAL REQUIREMENTS



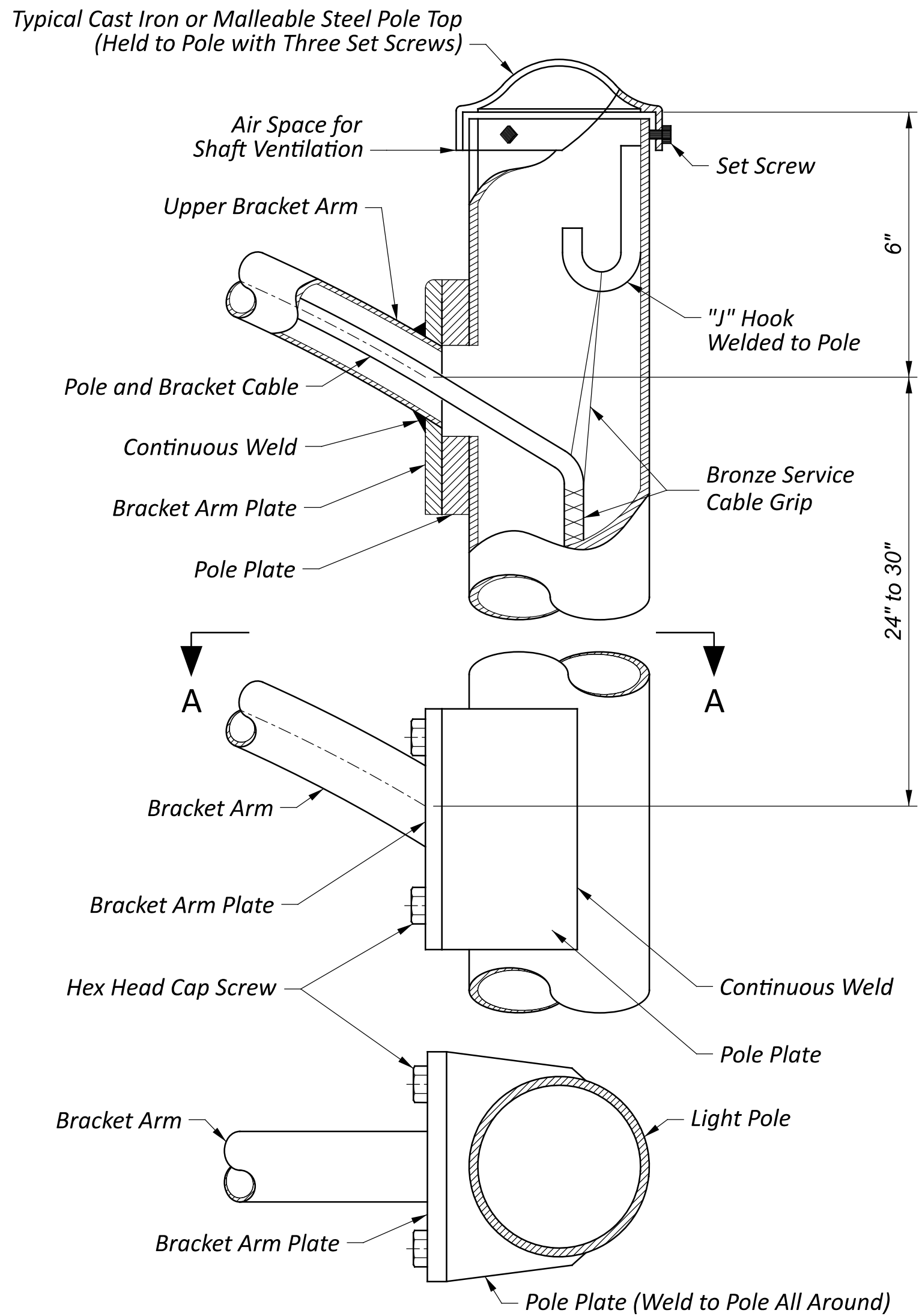
NOTES:

- The required architectural features of the Type WA base are as follows, from bottom to top:

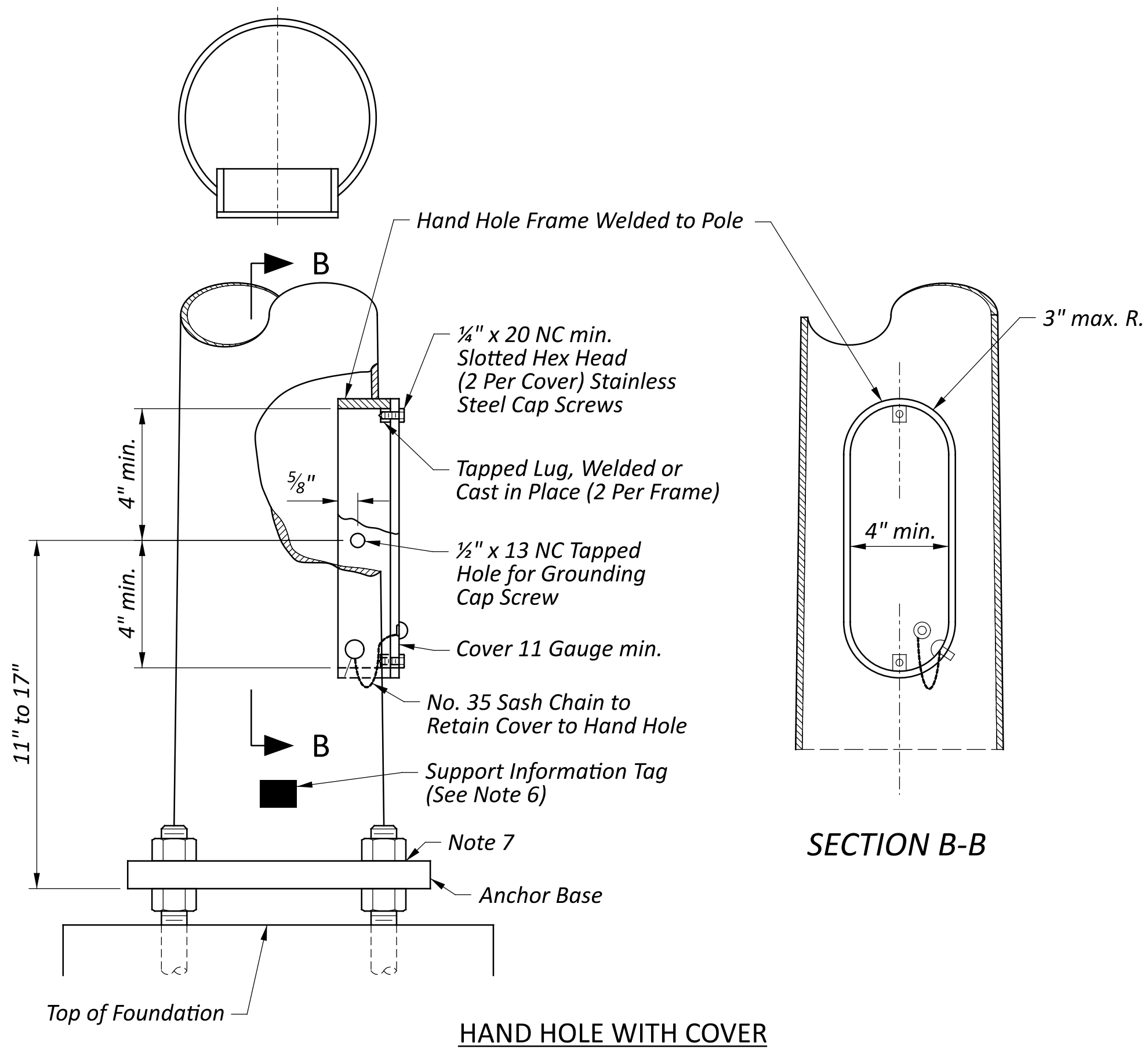
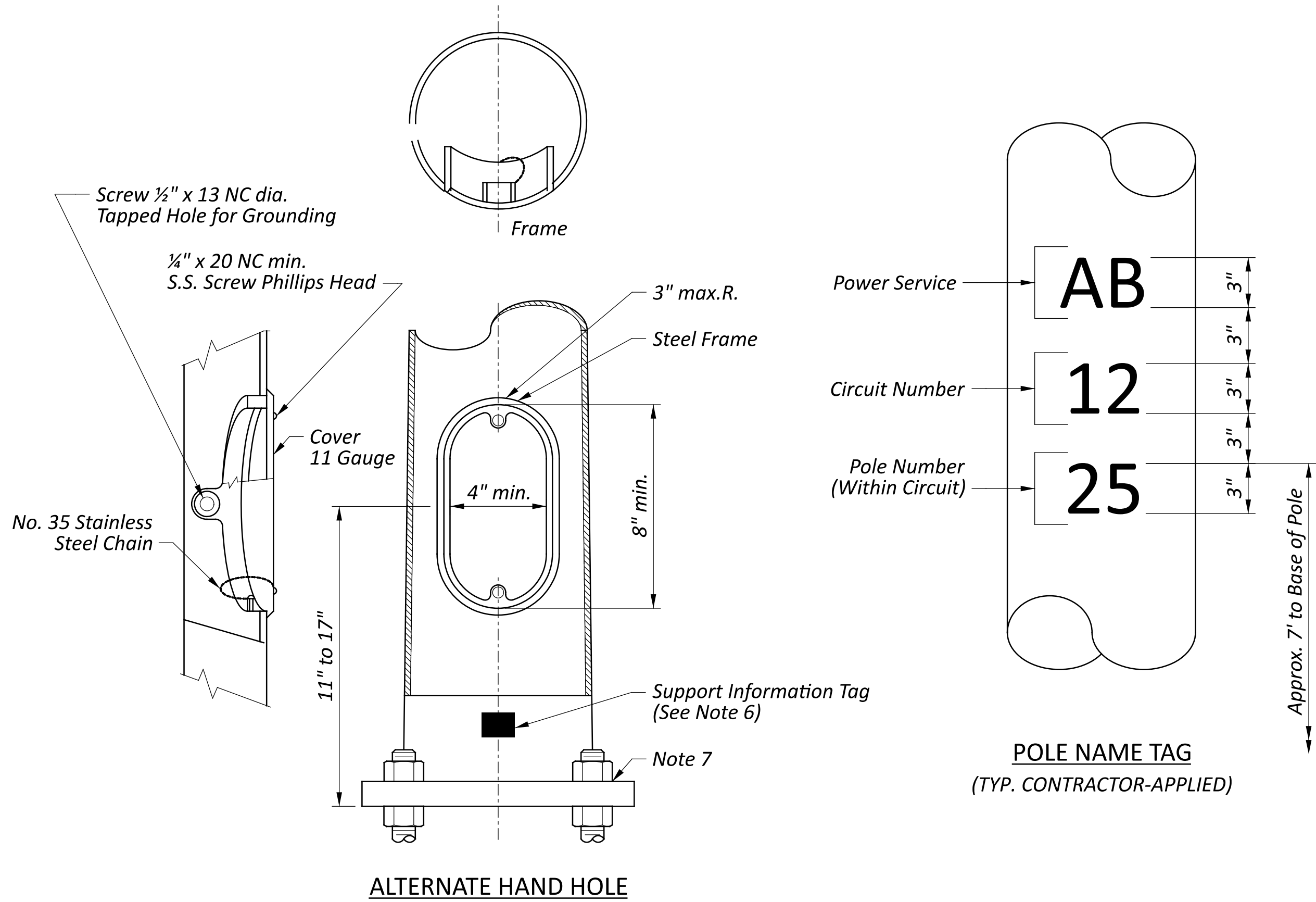
A round plinth as the base, $H_p = 0.13H - 0.20H$.
A Lower Torus, $H_t = 0.05H - 0.10H$
An Ogee, $H_o = 0.08H - 0.15H$
A fluted (typ. 12) Upper Torus
A belled and fluted (typ.12) Neck. Combined height of the fluted section, H_f , is $0.45H - 0.55H$.
A narrow top molding consisting of a bead, astragal, collar, annulet, etc. The diameter of the top molding shall be $0.33W - 0.50W$.
- In addition to the required architectural features, various narrow moldings may be included, provided they do not exceed $0.25H$ in combined height.
- The height of the base, H , shall be roughly equal to the base diameter, W (within 15%).
- The following bases are approved by ODOT as the Type WA Baseline Aesthetic Item:

Cooper Washington WA3
Hapco Arlen 17
Holophane Wadsworth
King Washington
Nova Washington
Spring City Washington
Sternberg Barrington 5200
Valmont Washington
- The Baseline Aesthetic Post-Top Light Pole has the following features:
 - A 6-inch straight, non-tapered pole with no fluting.
 - A 5-inch straight, non-tapered pole with no fluting may be specified by Plan Note.
 - A nominal 3-inch top tenon to attach a post-top luminaire.
 - A Structural Base that is integral to the pole.
 - FHWA Breakaway base, if specified in the Plans.
 - A Tapered pole may be specified by Plan Note.
 - Clamshell or slip-over bases may be specified by Plan Note.
 - Urethane or ABS polymer bases may be specified by Plan Note.
- Anchor bolt size and embedment are subject to the minimum dimensions below, and shall be fully galvanized ATSM F1554 Gr 55 or Gr 105, with bolt circle per pole manufacturer specifications. Anchor bolts must be headed or nutted. The drilled shaft foundation diameter shall be at least 2 inches greater than W , the integral base plinth diameter, and foundation constructed per HL-20.11.
Anchor Bolt Minimum Diameter: 3/4"
Anchor Bolt Minimum Embedment Depth: 30"



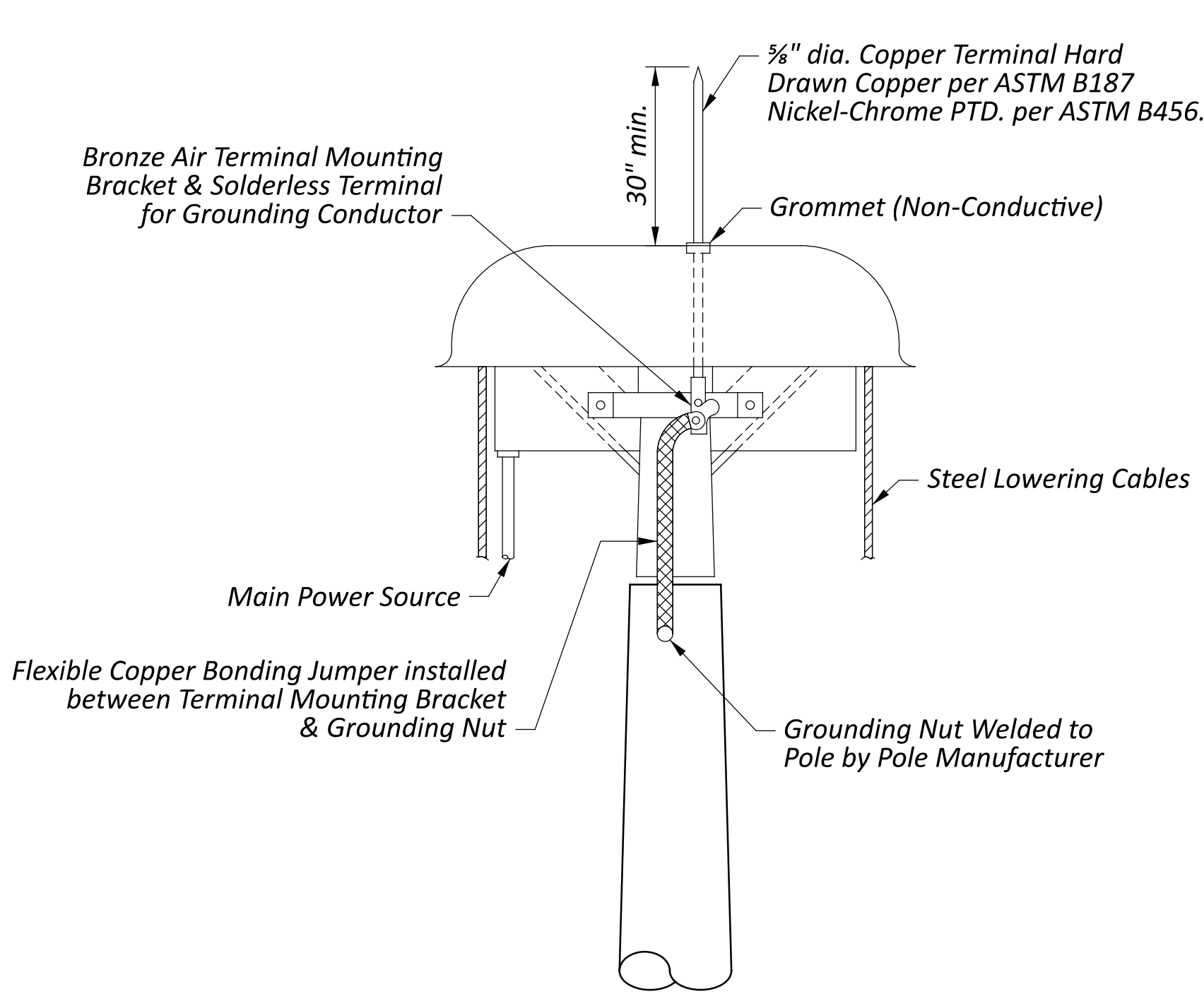


SECTION A-A
POLE TOP AND BRACKET ARM ASSEMBLIES (TYP.)

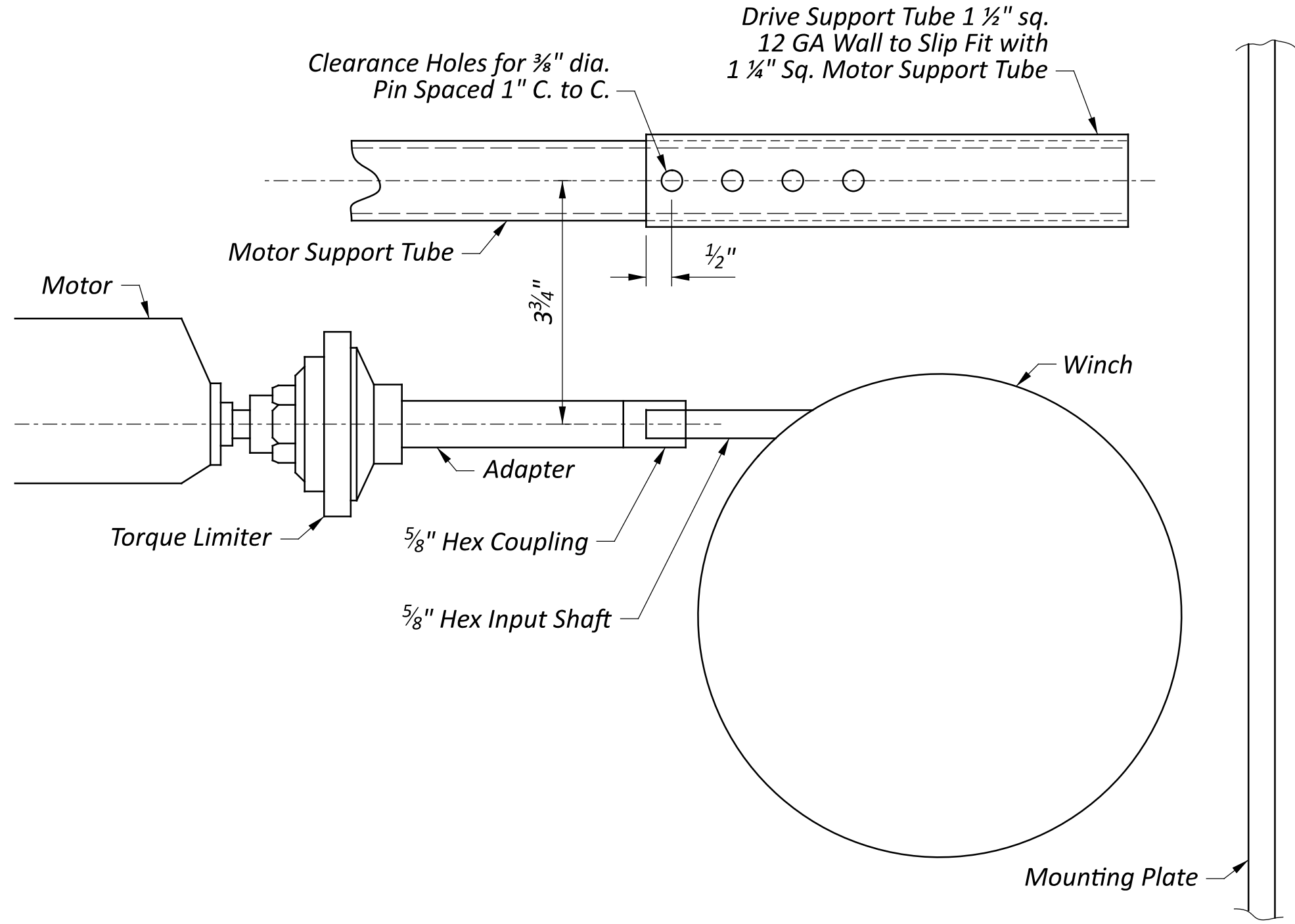


NOTES:

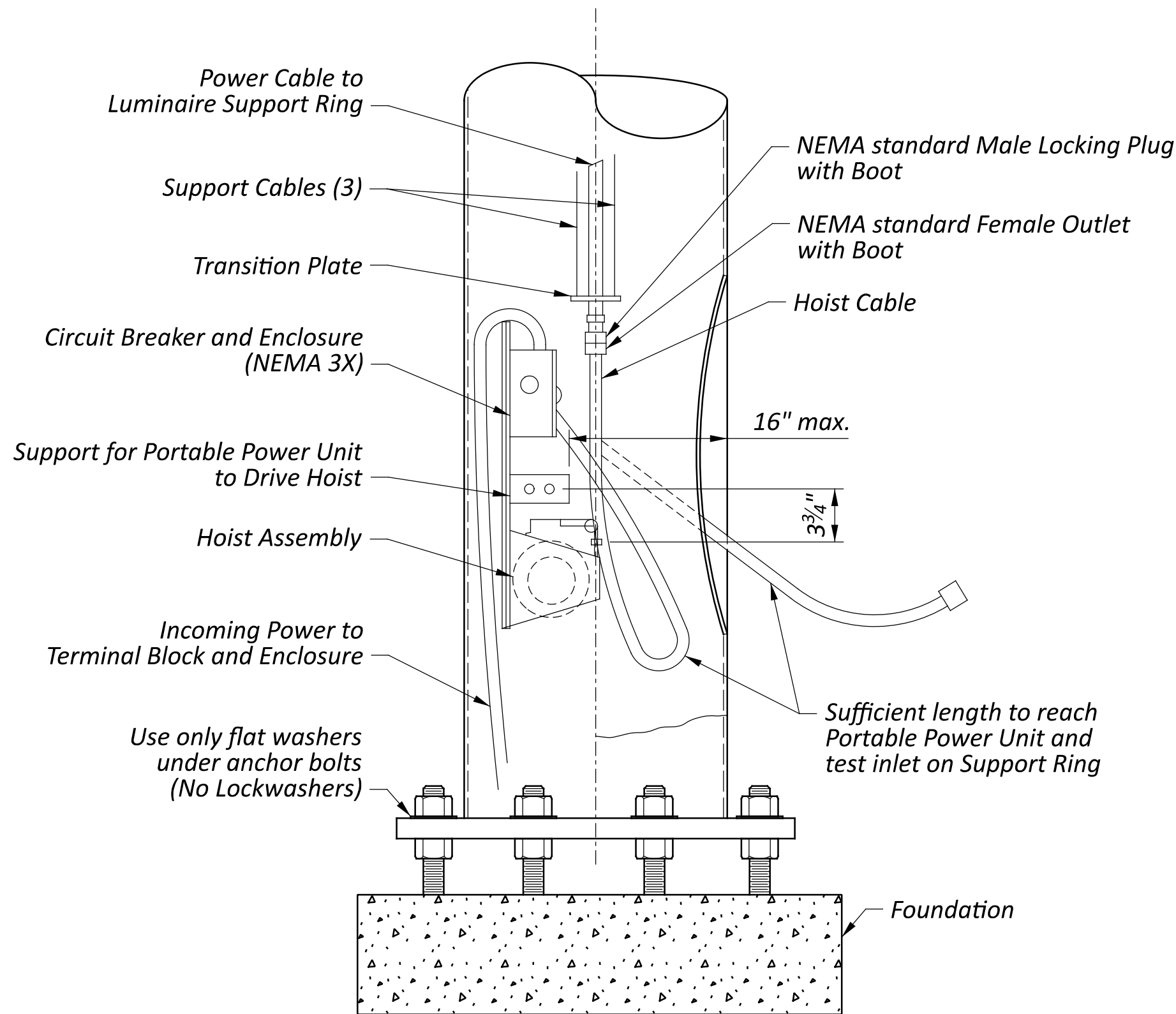
- Hand holes are not required on poles with transformer bases.
- Hand holes shall be opposite the roadway unless such location renders them inaccessible. All light poles mounted on raised concrete median barriers shall be equipped with hand holes. Hand holes shall be located beneath the bracket arm extending over the northbound or eastbound traffic lanes.
- Arm to pole connection using "simplex" fitting with or without reinforcing gusset is acceptable provided structural requirements of specifications are met. Clamp-on connections not permitted for steel poles. If used on aluminum poles, a manufacturer-approved method (through-bolting, etc.) shall be used to prevent rotation.
- Pole Name Tags shall be per C&MS 725.21, with details per the Lighting plan sheets.
- Circuit identification details are applicable to all pole designs.
- Support Information Tag per C&MS 732.11.
- Do not use lock washers.
- Recessed anchor bolt heads or nuts are not permitted.



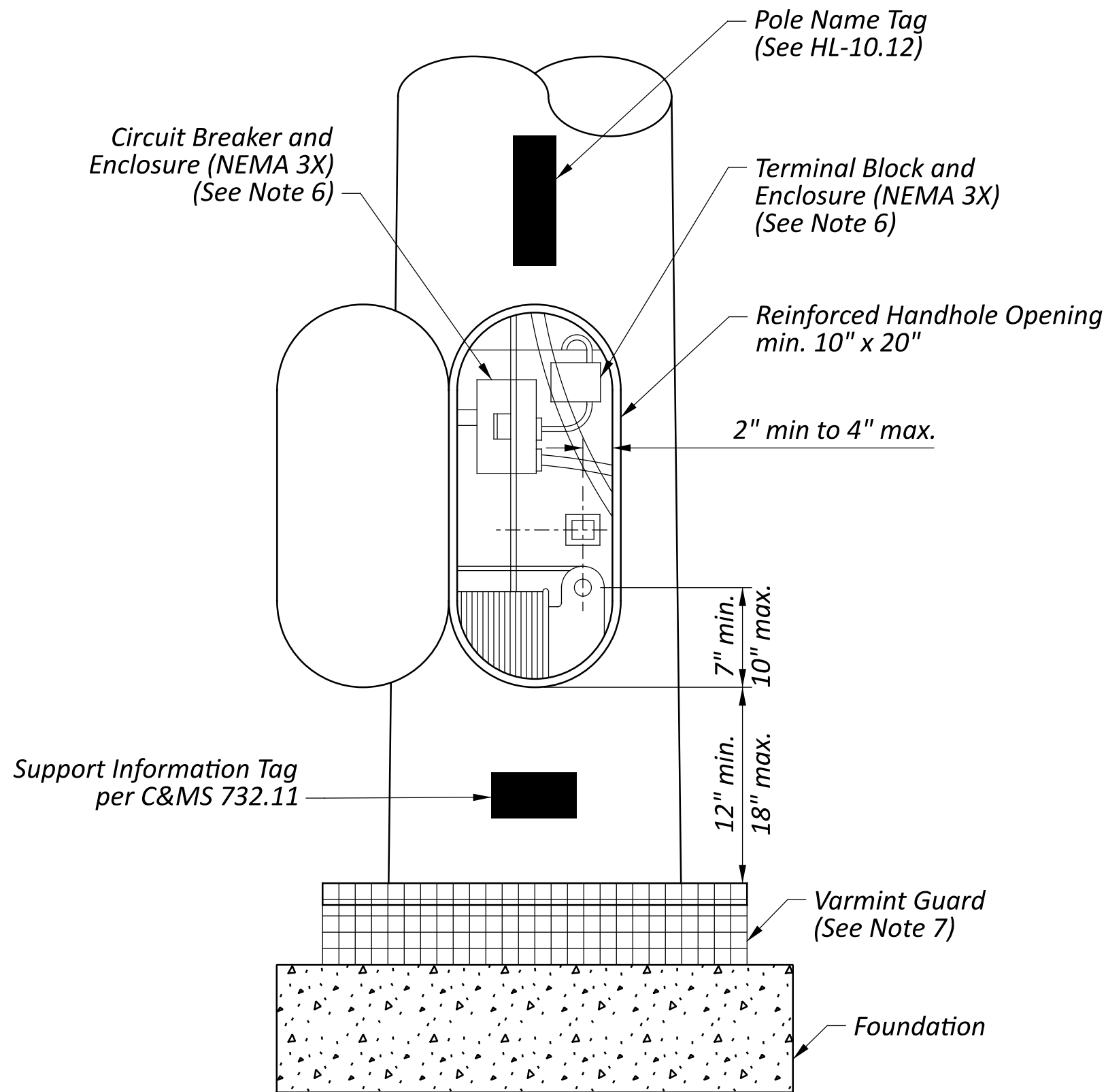
LIGHTNING PROTECTION SYSTEM



PORTABLE POWER UNIT DETAILS
(ELEVATION VIEW)



VIEW A

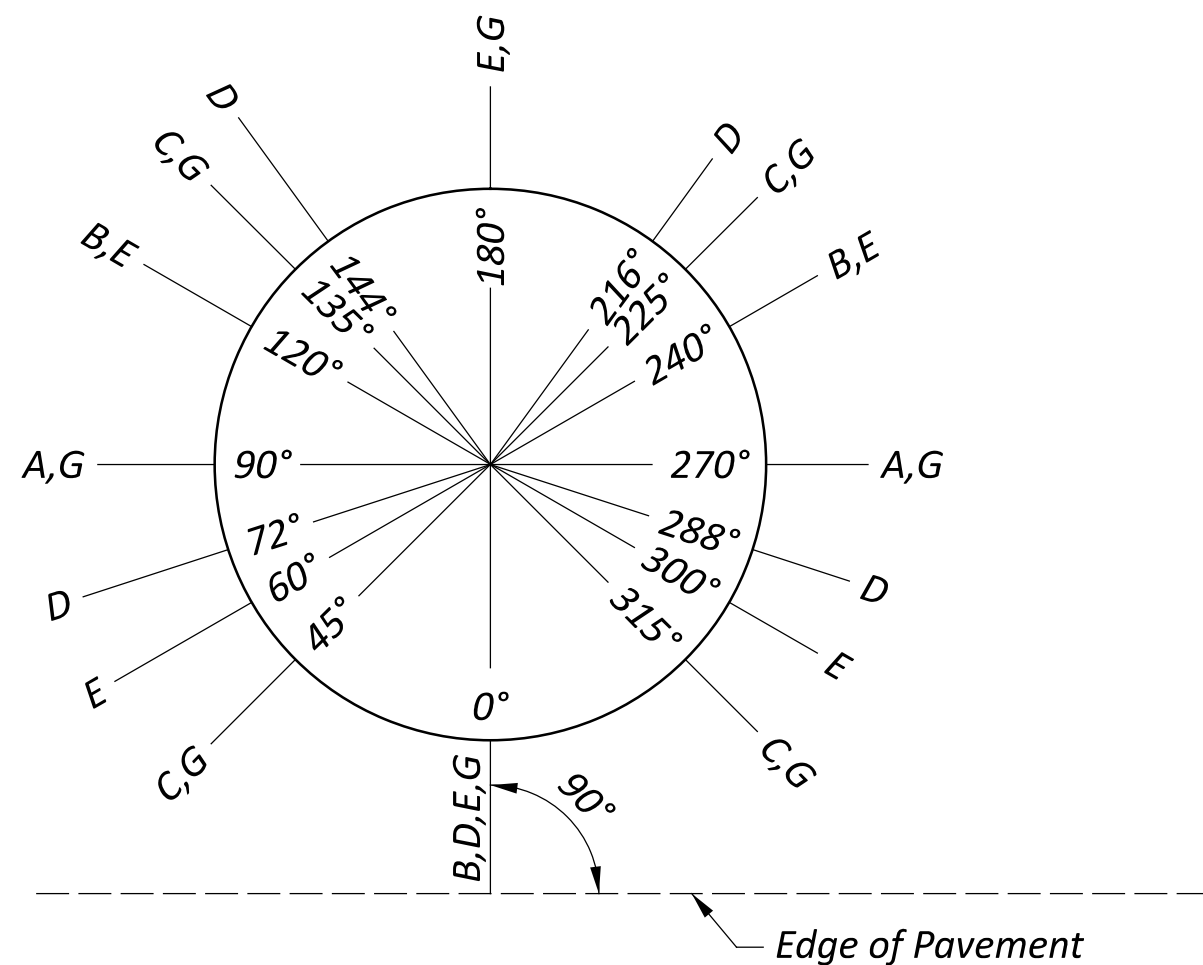


VIEW B

POLE BASE DETAILS

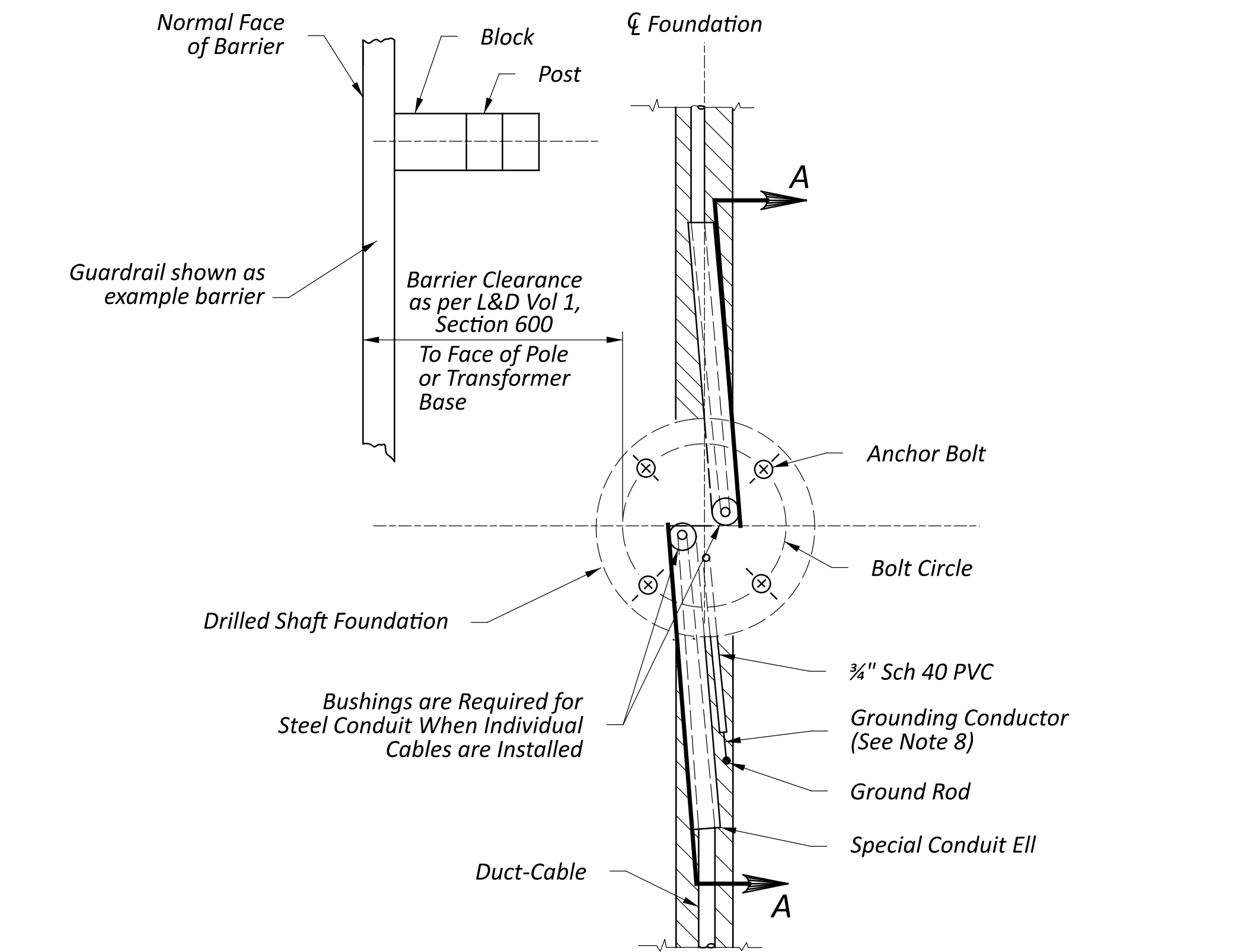
NOTES:

- Motor support tube may be 1 1/4" square or 1 3/4" square to mate on the inside or outside of drive support tube.
- The drive assembly shall have sufficient output torque to handle the payload. Minimum driving torque shall be 40 ft-lbs. The drive system shall include a torque limiter of a size and rating as recommended by the manufacturer to prevent overloading.
- Electrical connector on flexible power cords, support ring and portable power unit shall conform to NEMA standard pin configurations for locking type connectors and be rated for 20 amperes for 480 volt circuits and 30 amperes for 250 volt circuits.
- When grading or maintenance platform is required, pole handhole shall be on the downslope side of pole. All other handholes shall be located on the side of the pole opposite the roadway from which the tower is stationed.
- Unless otherwise specified in the plans, all luminaires with asymmetric distributions shall be installed so the "arrow" or "street side" designation on the optical assembly is positioned perpendicular to the centerline or baseline of the pavement from which the tower is stationed. Any optical rotation called for will be expressed as a clockwise (CW) or counterclockwise (CCW) angular measurement from the normal "arrow" orientation.
- Terminal block and circuit breaker are shown in separate NEMA 3X enclosures. If housed in a single enclosure, it shall meet NEMA 3X requirements. All cable penetrations of enclosures shall be sealed with UL-listed cord grips to prevent rodent intrusion.
- Attach varmint guard with stainless steel band and minimum 2" overlap. Tie overlapping guard with stainless steel wire ties. Guard shall be solid sheet, welded wire mesh or expanded metal sheet, stainless steel or galvanized, with openings no larger than 3/8", or approved equal.
- Towers shall conform to AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1), with Fatigue Importance Category I, Yearly Mean Wind Velocity Range B (9-11 mph), 50-year Design Life, 115 mph Basic Wind Speed, and Ice Load of 3.0 psf. The handhole width criterion of 11.9.2 is not required by ODOT.

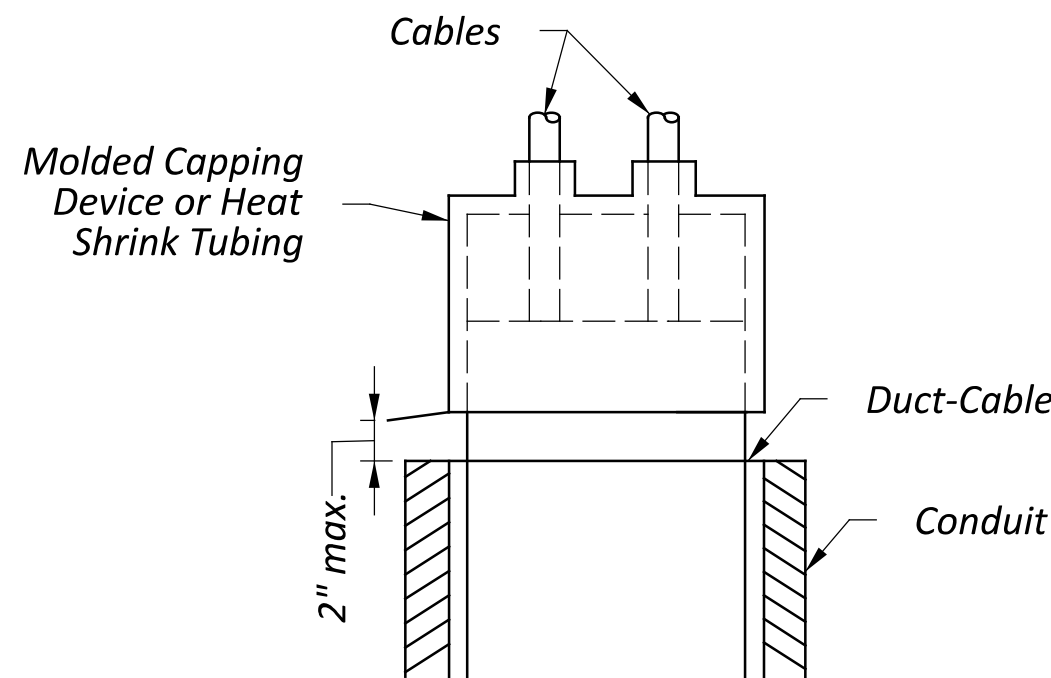
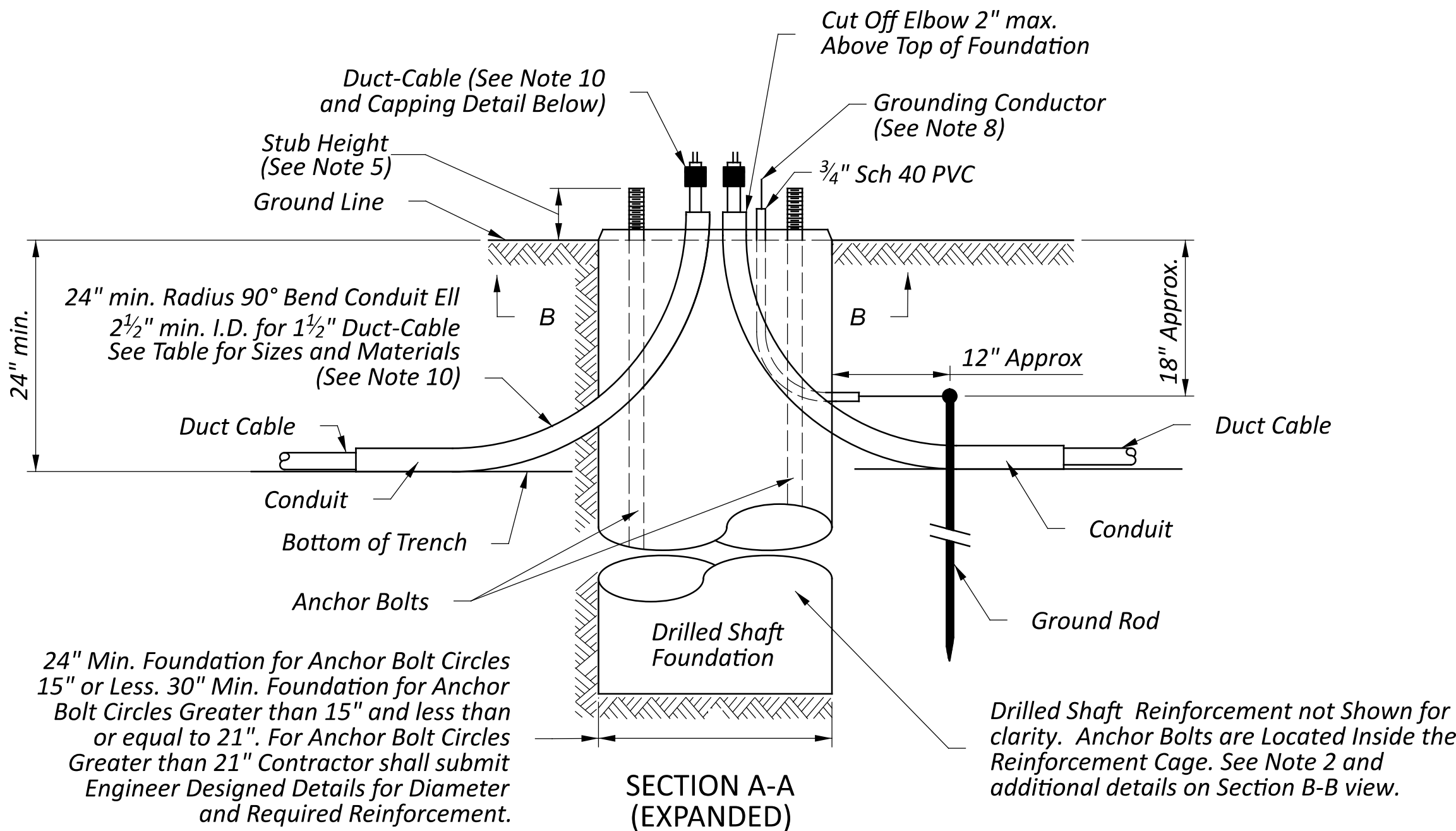


LUMINAIRE TENON LOCATIONS

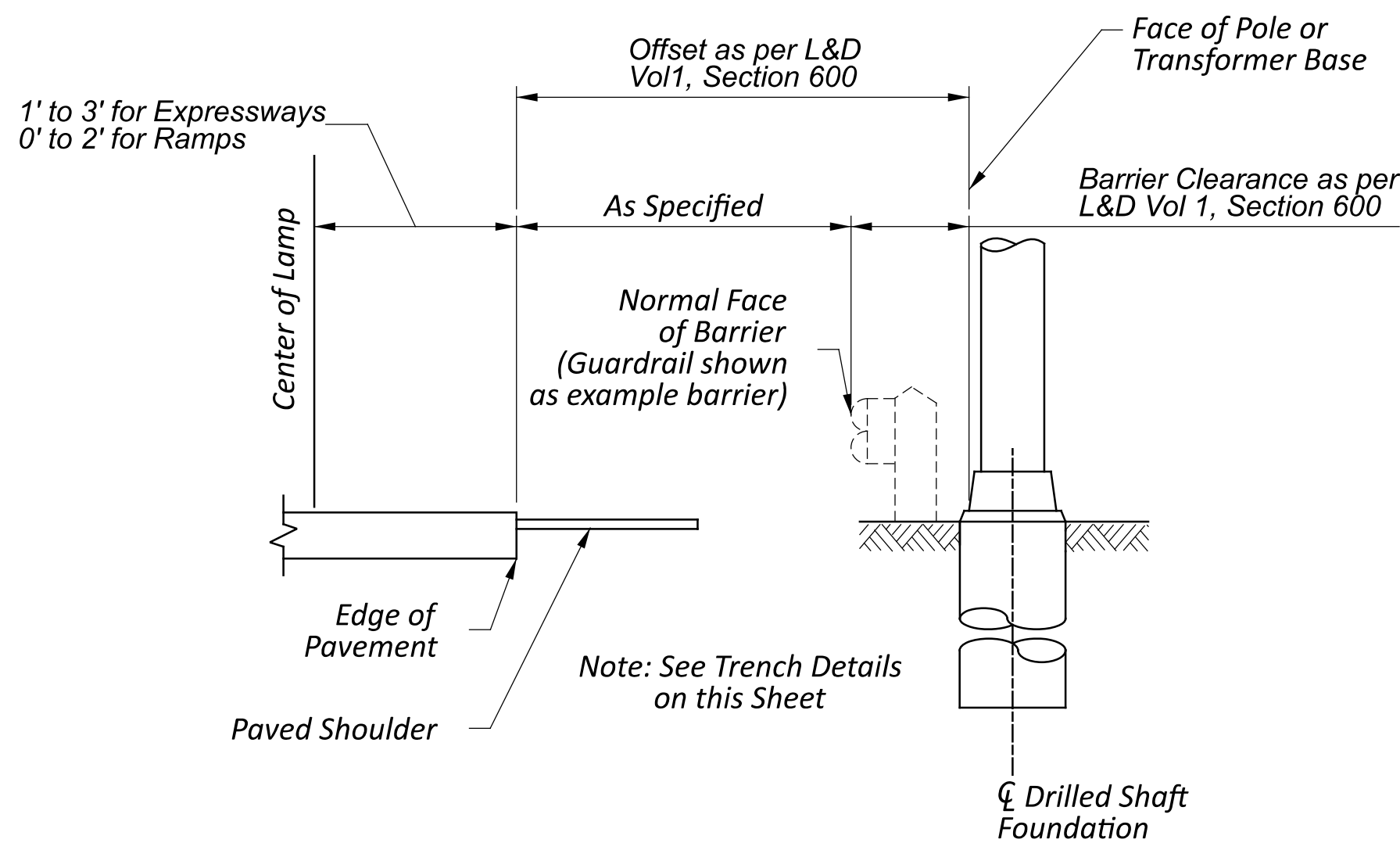
No. of Luminaires	Location
2	A
3	B
4	C
5	D
6	E
8	G



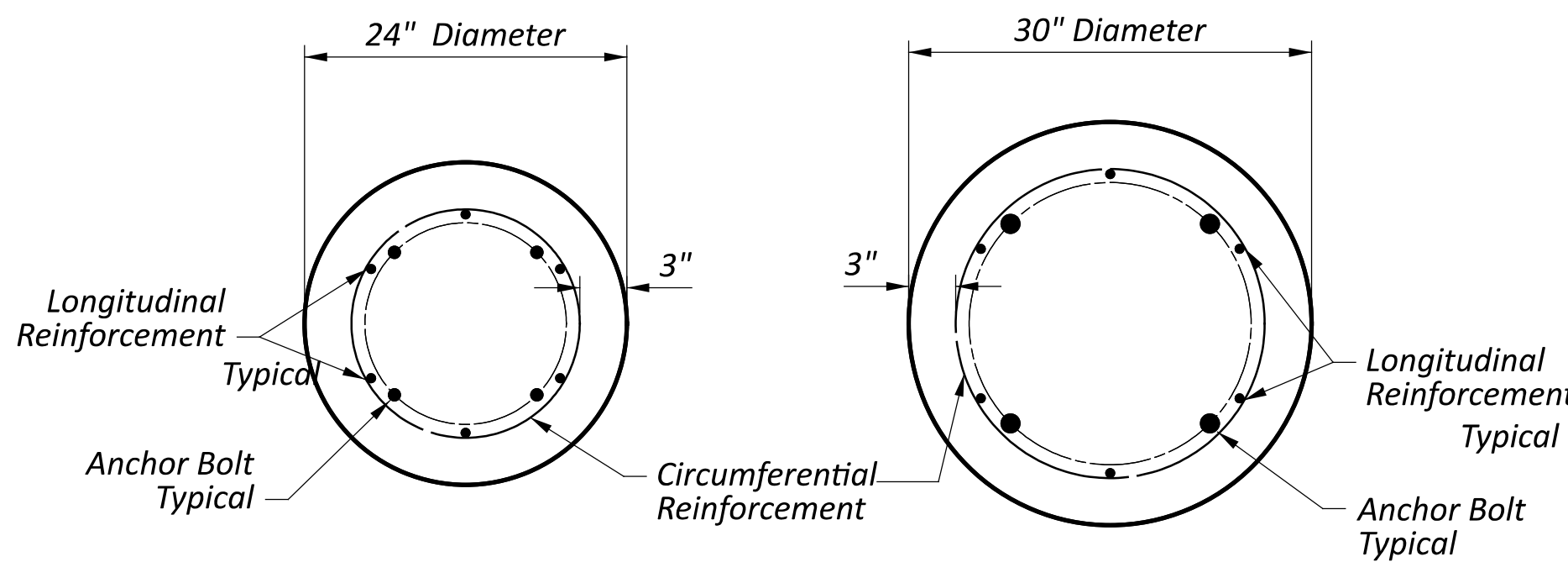
TRENCH ALIGNMENT NEAR GUARDRAIL



CAPPING DETAIL



NORMAL LOCATION OF LIGHT POLE FOUNDATION



SECTION B-B

24" Diameter Drilled Shaft w/15" Diameter Bolt Circle and 1" Diameter Anchor Bolts Shown. Other Bolt Circle Patterns Similar.

Conduits and Cables not shown for Clarity.

SECTION B-B

30" Diameter Drilled Shaft w/21" Diameter Bolt Circle and 1-1/2" Diameter Anchor Bolts Shown. Other Bolt Circle Patterns Similar.

Conduits and Cables not shown for Clarity.

SPECIAL CONDUIT ELLS
90° BEND IN INCHES

R = Bending Radius S = Straight Section Y = R+S	2", 2 1/2" & 3"		
	R	S	Y
	24	11	35
	30	11	41
	36	11	47
	42	12	54
	48	12	60

NOTES:

- The design of the drilled shaft foundations presented on this drawing meet the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
- Minimum drilled shaft foundation depth to be as follows:
6' for poles having a support height of less than 40'.
8' for poles having a support height 40' thru 44'.
9' for poles having a support height 45' thru 49'.
10' for poles having a support height of 50' thru 55'.

Longitudinal reinforcement consists of quantity of 6, 3/4" (No. 6) vertical bars extending to within 6" to 8" from the top and bottom of concrete, evenly spaced within the hoops.

Circumferential reinforcement consists of 1/2" diameter (No. 4) tie bars required as follows:

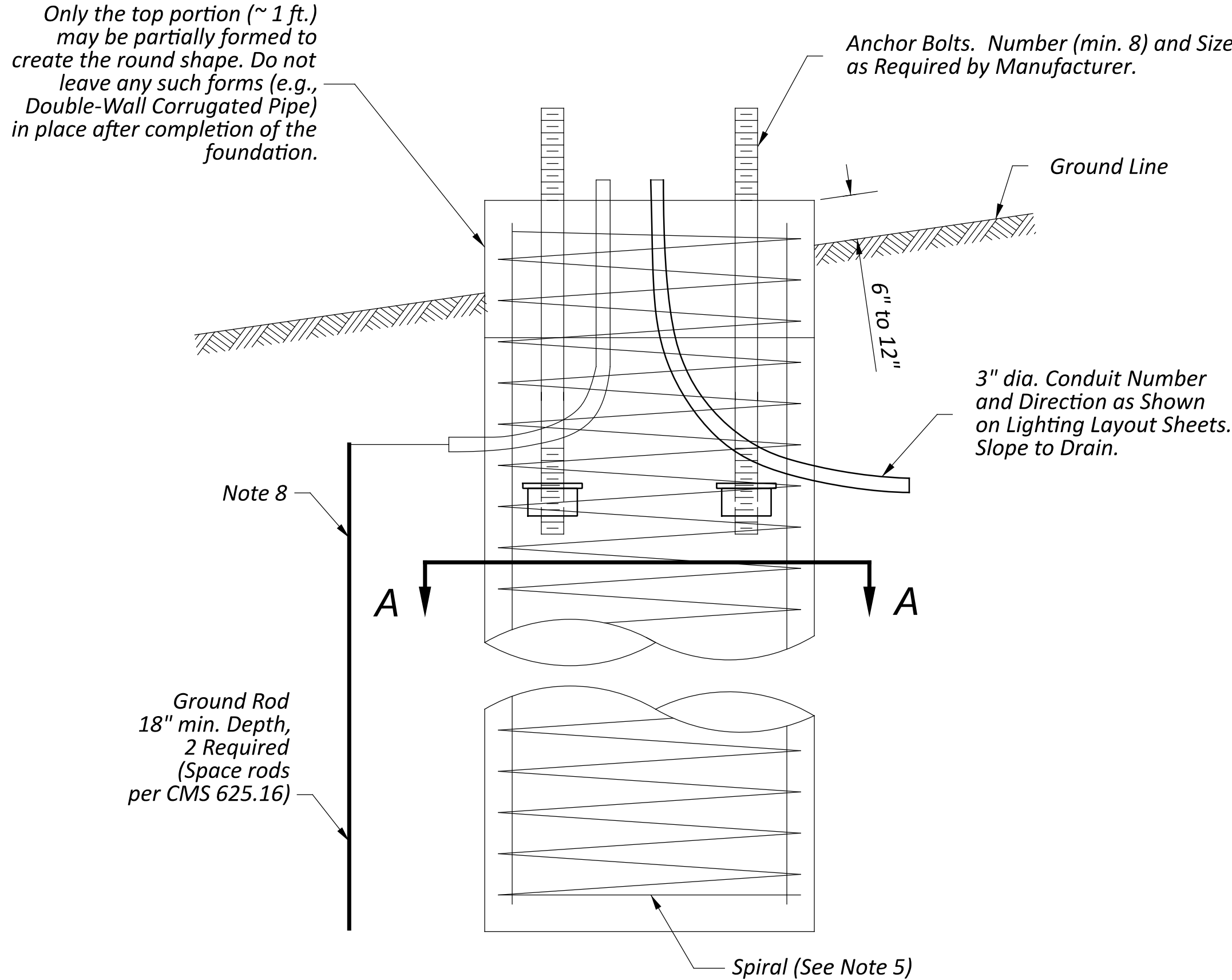
- 4 No. 4 diameter tie bars for 6' depth
 - 5 No. 4 tie bars for 8' depth
 - 6 No. 4 tie bars for 10' depth
- Rotate bars to clear conduits.

All reinforcing steel shall be Grade 60 Epoxy Coated and comply with and be placed in accordance with C&MS Item 509. Rebar end hooks are not required.

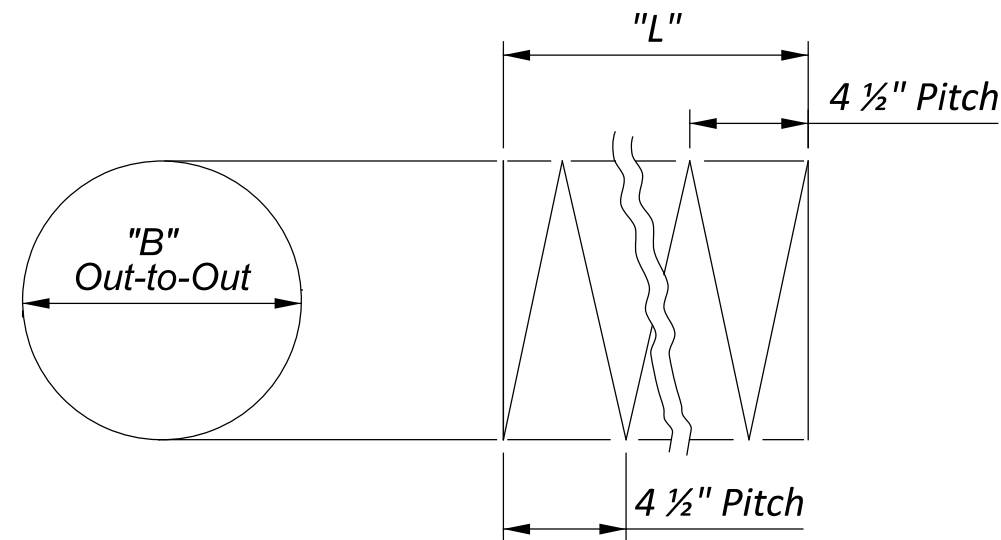
Minimum concrete cover for reinforcement is 3", per ACI 318 Section 7.7.

See Section B/B for additional reinforcement details.

- A special foundation design will be required when cohesive soil with undrained shear strength of less than 2000 lb./sq.ft. or granular soil with an angle of internal friction less than 30 degrees and a wet density less than 120 lb./cu.ft. is encountered along the predicted length of the drilled shaft. Special foundation design calculations and drawings shall be stamped by an Ohio Registered Engineer and shall be submitted to the Engineer for review and acceptance. For special foundation design, conform to the current edition of the ODOT Geotechnical Design Manual, Section 1200.
- Construct drilled shaft foundation in accordance with C&MS 524.
- Upslope side of foundation for pole with breakaway feature shall be flush with grade if pole is exposed to traffic. Maximum stub height in flat and sloped areas is 4 inches for Breakway Supports only, per AASHTO LRFDLTS-1, Section 12.5.3.
- Reinforcing steel may be assembled in cages by approved welding of bars. Subject to acceptance of the Engineer, cages may be assembled in a spiral conformation.
- Squared section in top 6" of foundation shall only be installed when foundation is in tree lawn or contiguous to or in paved surround.
- Grounding conductor shall be 4 AWG, insulated copper. Exothermically weld cable to ground rod, run free and through 3/4" Sch 40 PVC and connect as shown on Standard Construction Drawing (SCD) HL-60.11. Use two coats of insulating varnish over exothermic weld and exposed conductor.
- For anchor bolt data see SCD HL-10.13, Pole Base Details.
- Where 2" or 3" diameter conduit terminates in a foundation, the conduit elbows in the foundation shall be the same as the conduit. The ends of the conduit elbows containing distribution cable shall closed be as described in CMS 625.12. When the terminating conduit is steel, the conduit elbows in the pole foundations shall also be steel. At the last light pole on a circuit, the vacant conduit elbow in the light pole foundation shall be stubbed out and capped.
- In areas of steep slopes (2:1 or greater), the Contractor should consider use of jacking or boring.



FOUNDATION



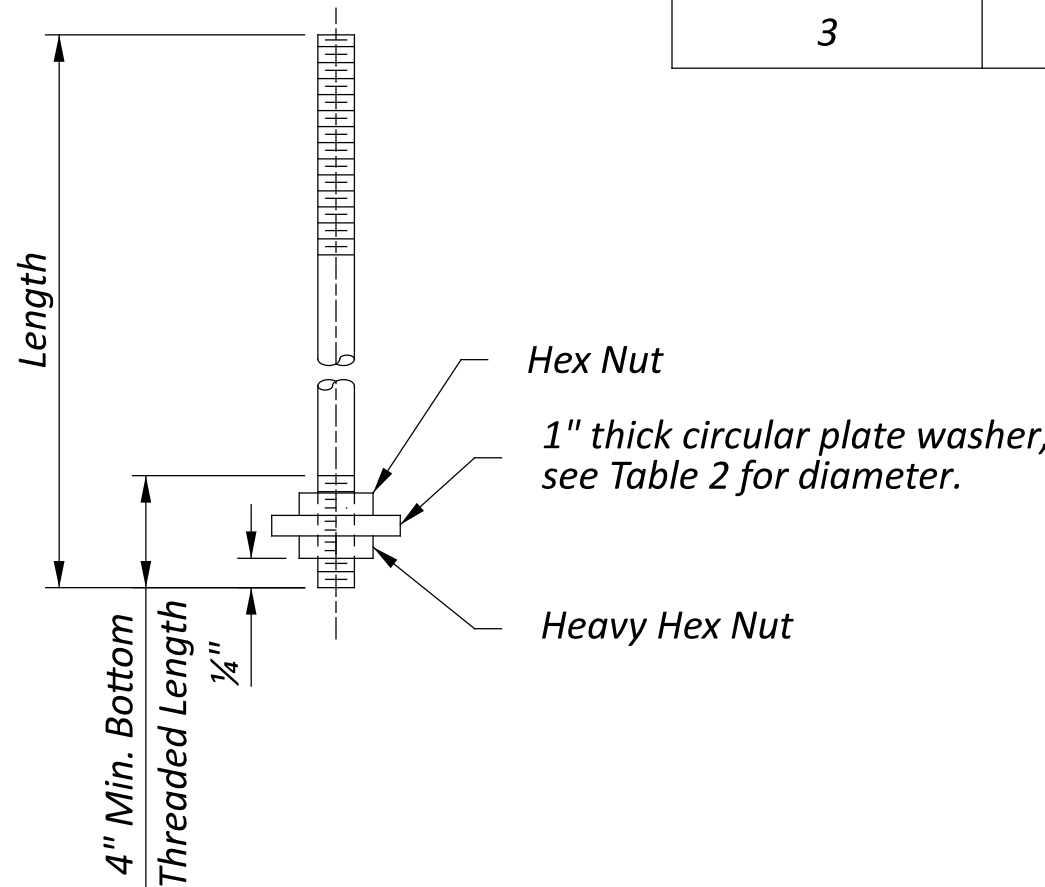
SPIRAL BAR BENDING DIAGRAM

TABLE 1

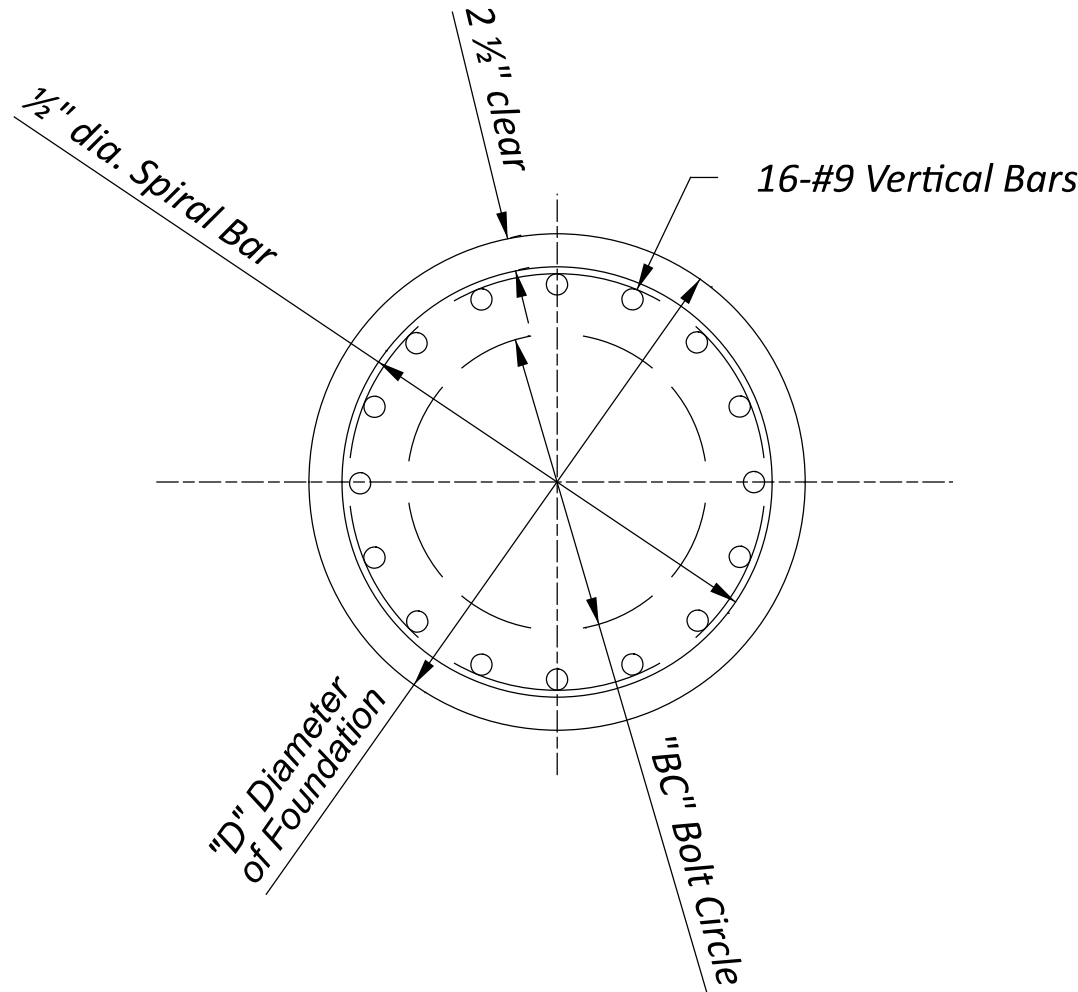
FOUNDATION DATA (IN.)			
FOUNDATION TYPE	D	B	BC MAX.
I	36	31	26
II	42	37	32

TABLE 2

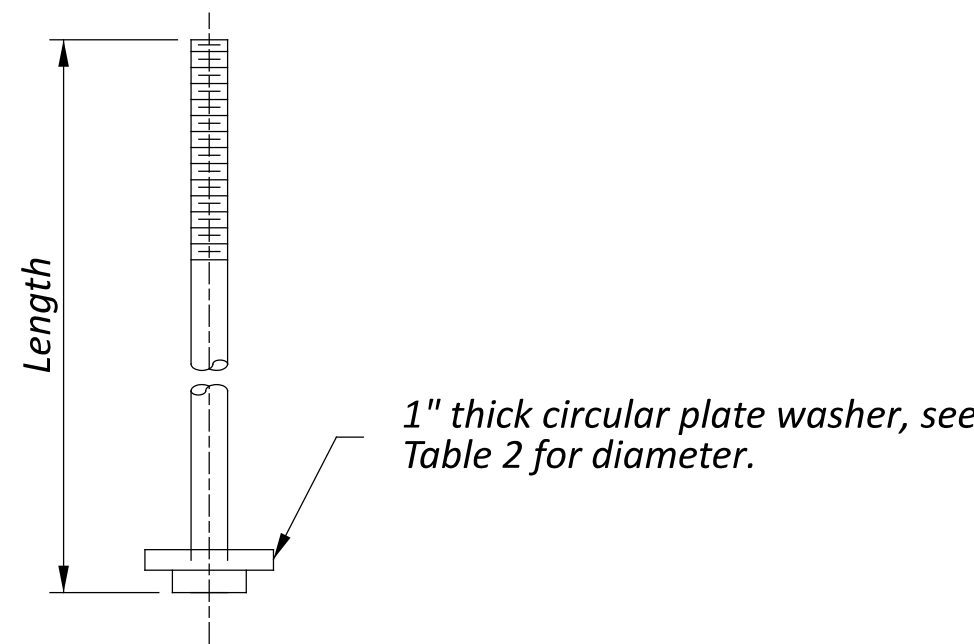
ANCHOR BOLT DIAMETER (IN)	PLATE WASHER DIAMETER (IN)
1 1/4	3
1 1/2	3
1 3/4	4
2	4
2 1/4	5
2 1/2	5
3	6



NUTTED ANCHOR BOLT OPTION



SECTION A-A



HEADED ANCHOR BOLT OPTION

NOTES:

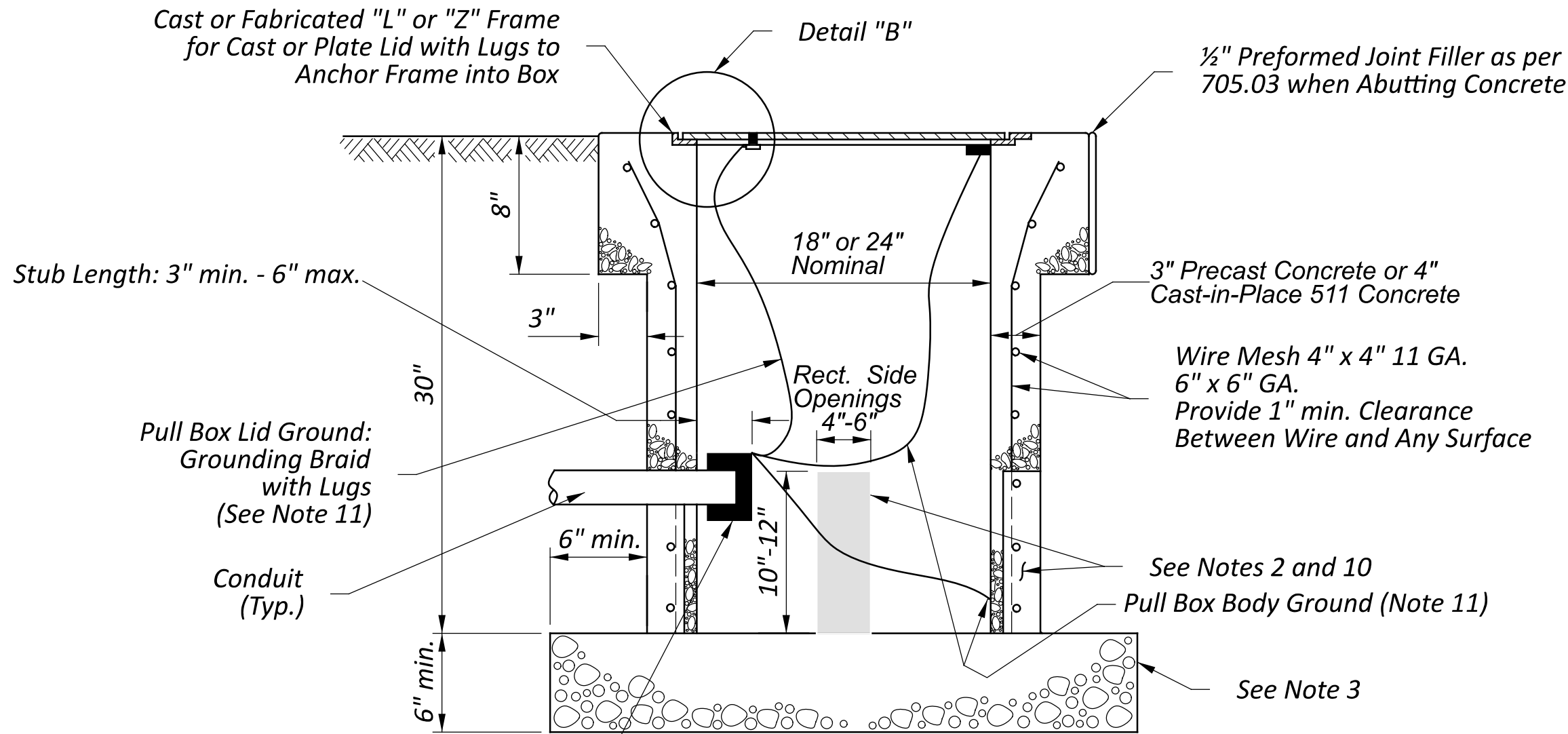
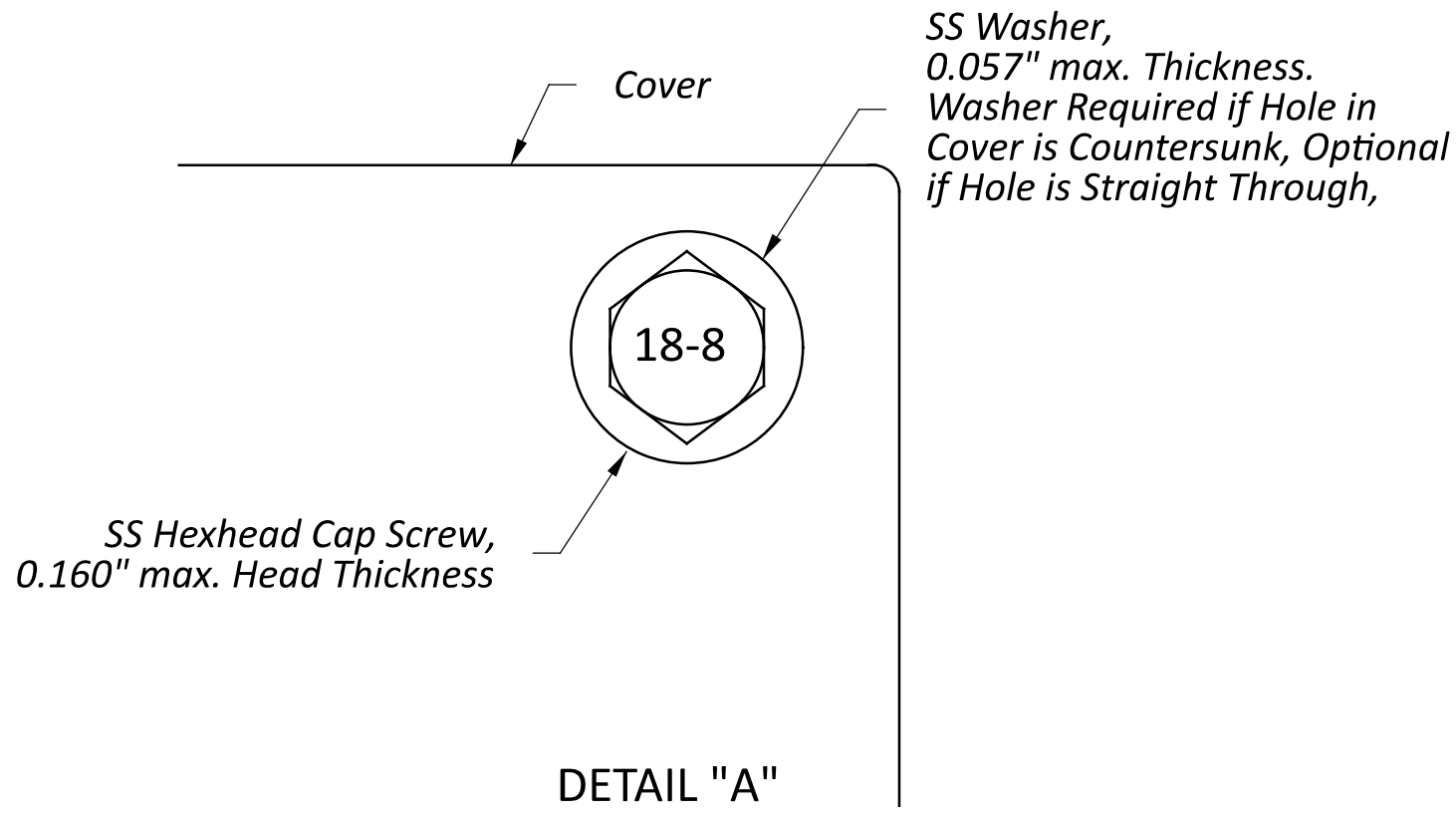
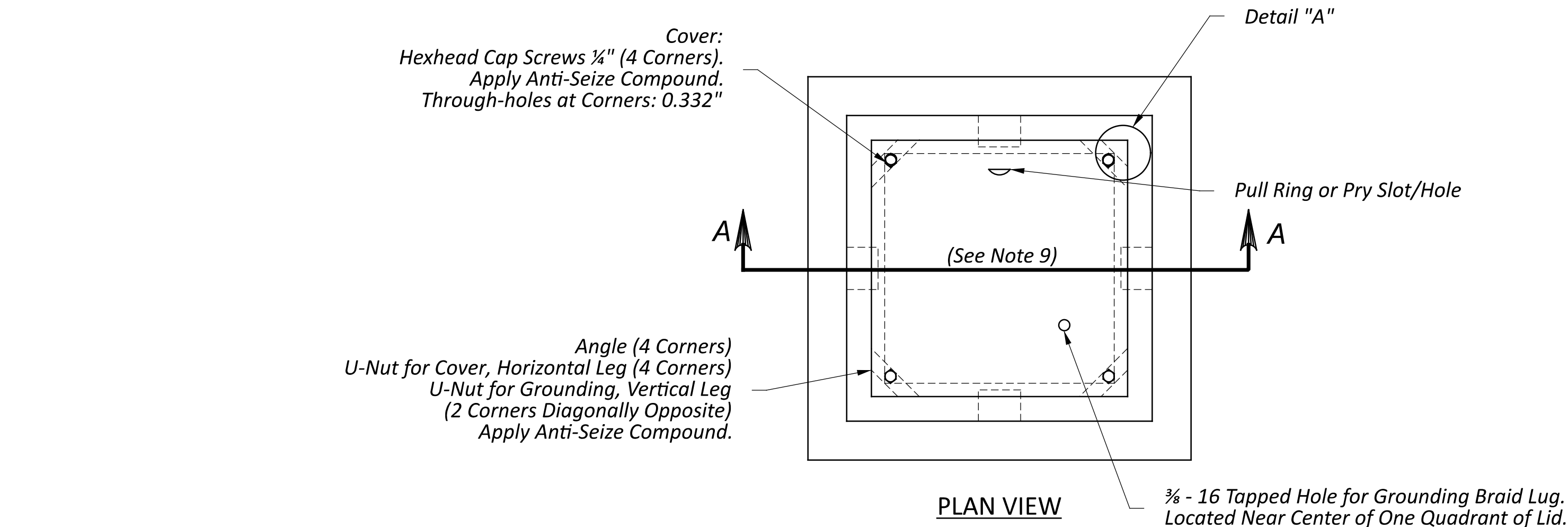
- Light towers are round tapered tubes designed in accordance with AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1), as noted in SCD HL-10.31, Note 8.
- Position tower handholes shall be on downslope side of tower.
- Drilled shaft foundation diameter "D" based on Table 1. Drilled shaft length based on foundation analysis in accordance with Geotechnical Design Manual Section 1200. See chart in plans for required lengths.
- Light tower manufacturer responsible for anchorage design, which shall incorporate a minimum of eight anchor bolts per LRFDLTS-1 (2015), 5.16. Manufacturer shall design anchor bolts using ACI 318-11 Appendix D and shall design any additional foundation reinforcing necessary.

Nominal material strengths are:
 $f'_c = 4,000 \text{ psi}$
 $f_y = 60,000 \text{ psi}$

Anchor bolts shall be located inside the drilled shaft reinforcing cage. Anchor bolts shall be ASTM 1554.

Anchor bolt size and spacing to fit mounting plate supplied with tower. However, bolt circle shall be equal to or less than the maximum bolt circle permitted in Table No. 1. The bolts shall be headed or have a heavy hex nut on the embedded end. Threads shall be UNC-2A, and may be either rolled or cut, and coarse threaded. The embedded end of the anchor bolt shall be headed or threaded with a heavy hex nut. Anchor bolt material may be smooth steel rod that is threaded at the ends or threaded over its entire length. Hex nuts shall be ASTM A563, American Standard heavy hex, Grade DH, with UNC-2B threads. Plate washers shall be A709 Grade 36 or Grade 50. Anchor bolts shall be hot-dip galvanized over their entire length, as per C&MS 711.02, after fabrication and threading. All nuts and plate washers shall be galvanized per C&MS 711.02.

- The length "L" of the 1/2" diameter spiral bar is the drilled shaft length with a 3" clearance at each end. In addition to the longitudinal rebar shown in Section A-A, construct the spiral using four channels, tees or angle spacers weighing approximately 0.80 pounds per foot of spacer, or four steel #5 rebar spacers. They shall be equally spaced along the periphery of the coil. Spiral lap splice length shall be 3'-0". Provide one and a half turns at spiral ends. Minimum concrete cover shall be 2-1/2" to spiral rebar and 3" to longitudinal rebar.
- Conduits in the foundation shall conform to C&MS 625 and 725. The foundation conduit shall be of the same material as that used to protect the circuit extension beyond the foundation.
- All reinforcing steel shall be epoxy coated, handled, fabricated, and placed in accordance with C&MS 509.
- If bedrock is encountered that prevents the ground rod tip from reaching the minimum total depth of 11.5 feet, then a lateral run of bare copper grounding electrode conductor in soil may be used to account for the difference in depth as described in 625.16, with permission of the Engineer.

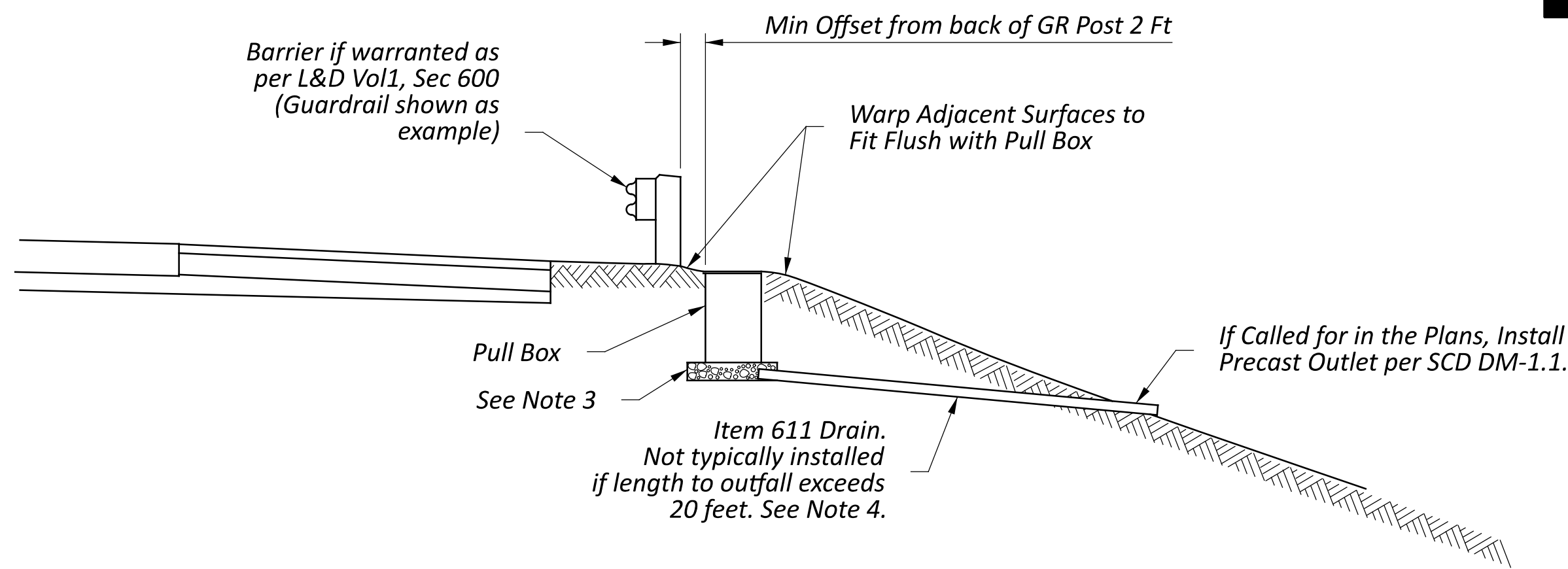


PORTLAND CEMENT CONCRETE PULL BOX (725.08)

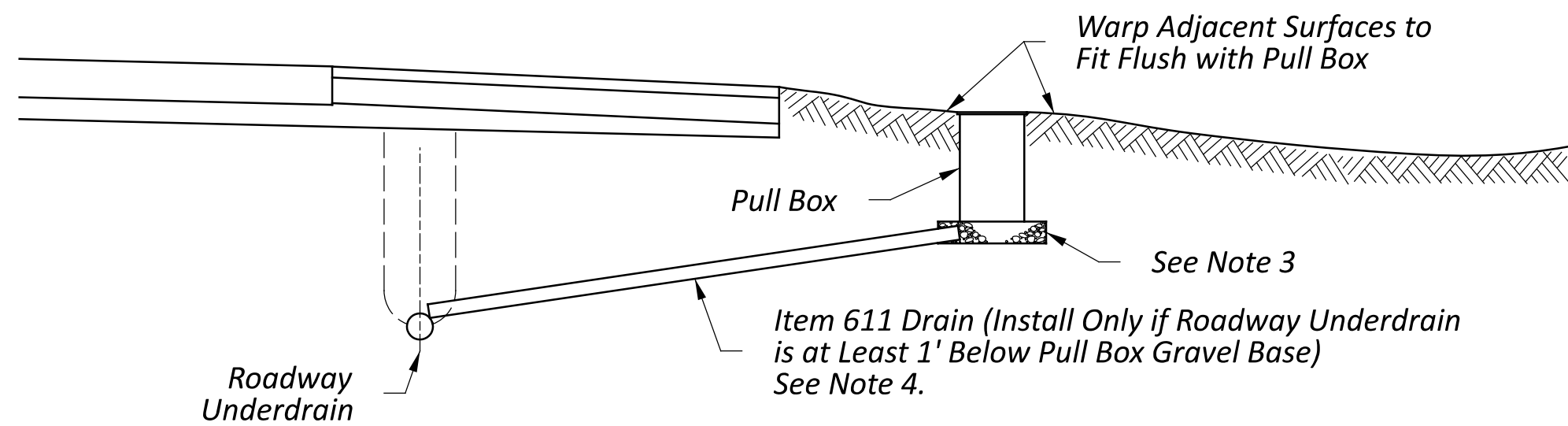
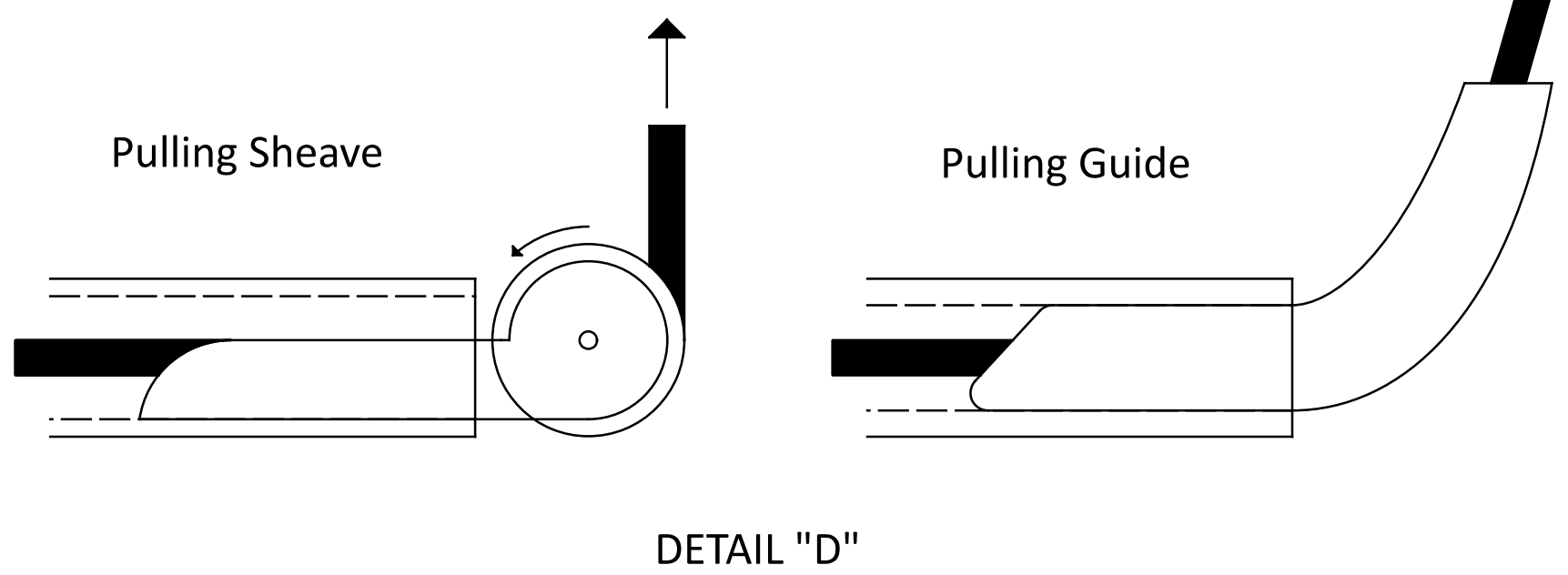
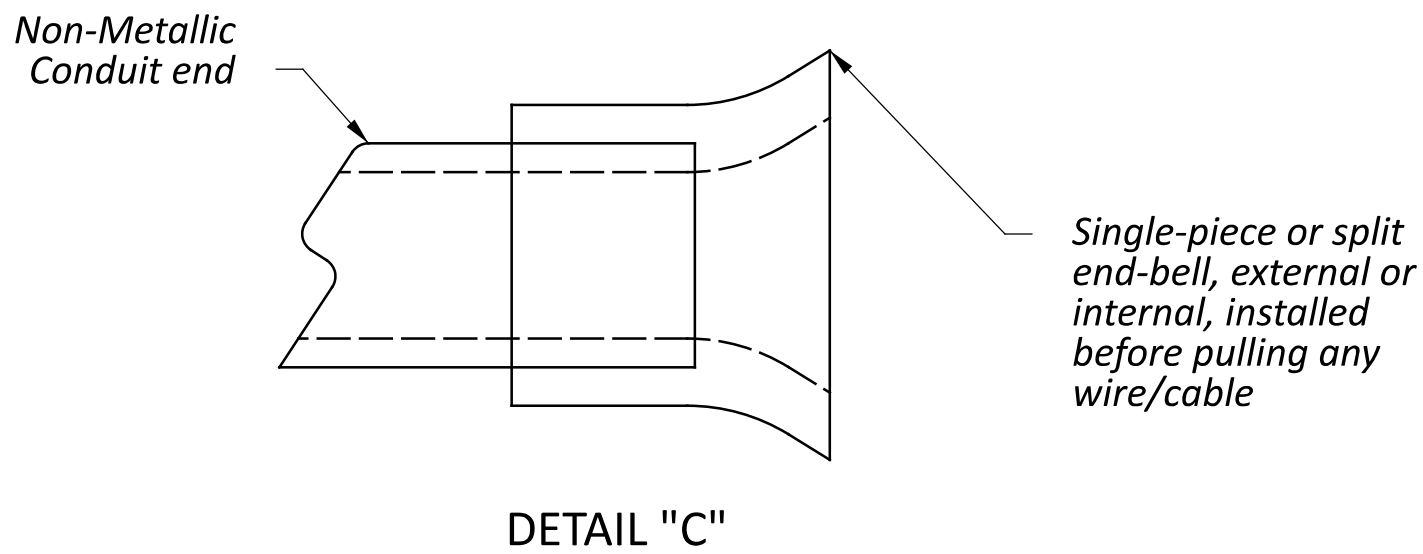
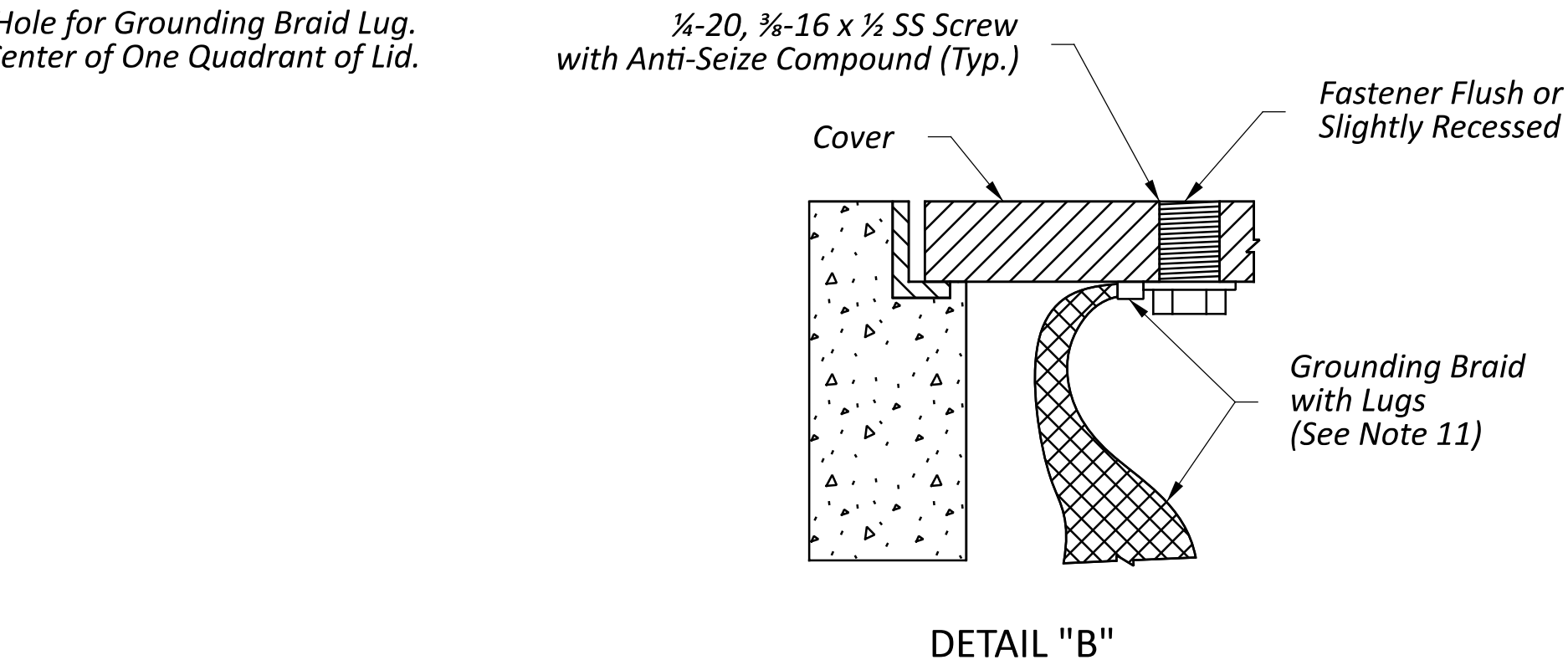
Required on metallic conduits: Grounding Bushing Shown, or Make Connection to Grounding Conductor

Required on non-metallic conduits: See detail "C" and "D"

Required on all conduits: Use a sheave or cable guide on the feeding end while pulling



INSTALLATION WITH INDEPENDENT DRAIN

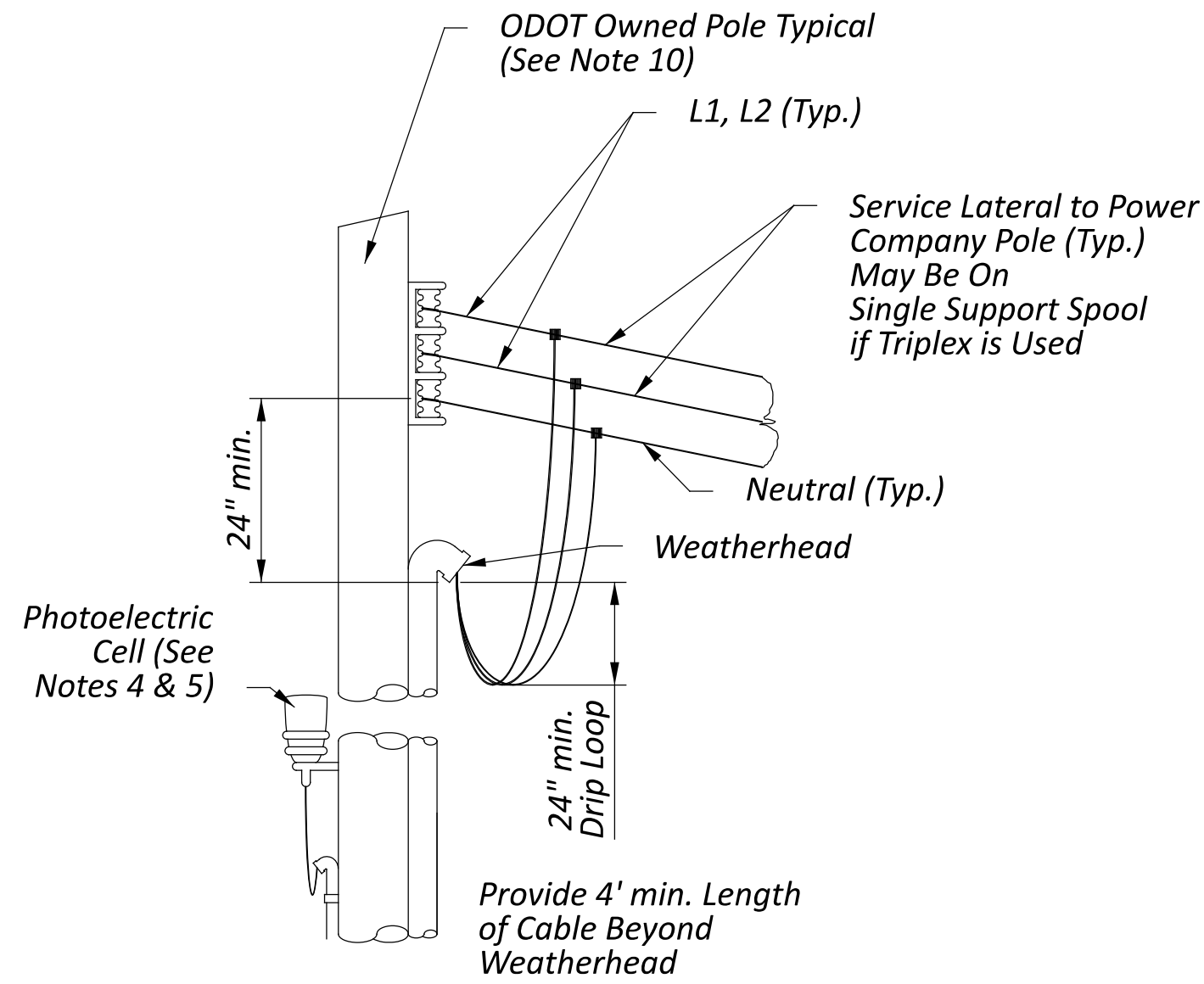


INSTALLATION WITH CONNECTION TO ROADWAY UNDERDRAIN

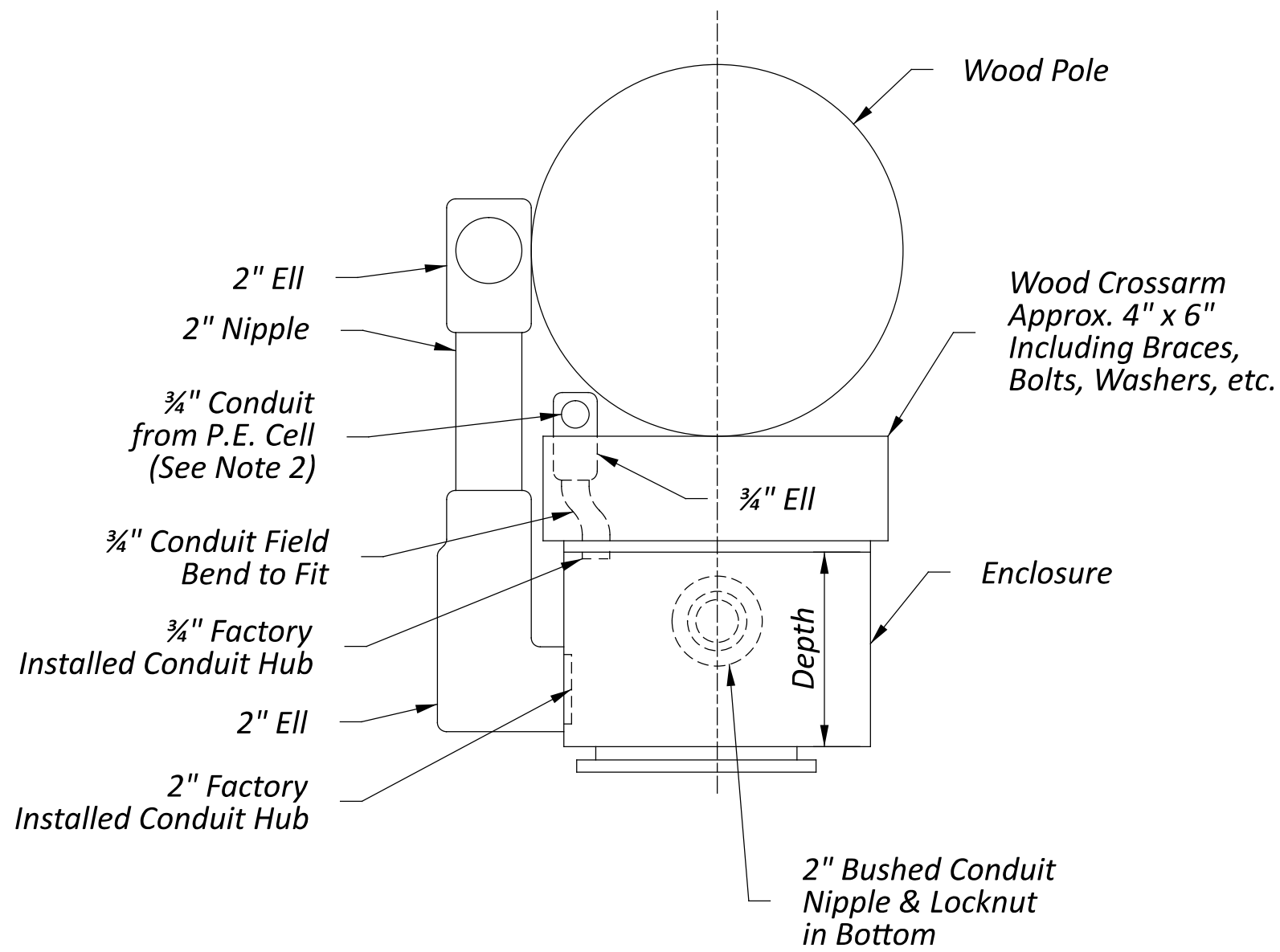
NOTES:

- Pull boxes shall conform with C&MS 625.11 and 725.07 or 725.08 or 725.06.
- Conduit openings shall be sealed after conduit installation.
- Aggregate used for pull boxes shall be No. 7 or 8, at least 6" deep. Cost for aggregate shall be included with the unit price bid for each pull box.
- Install pull box drains in accordance with C&MS Item 611 as specified in the plans unless otherwise directed by the Engineer.
- A durable label reminding of the need to lubricate the threads of the cover hold down screws with grease or anti-seize compound shall be on the inside of the frame or upper wall.
- See C&MS Item 625.11 for cover marking requirements.
- Portland cement concrete pull box covers shall be cast iron with reinforcing ribs and matching frames by Neenah, Josam or Zurn foundries, or approved equal, or covers may be 1/2" minimum galvanized plate steel.
- Tapered thickness portland cement concrete pull box walls may be used; however, minimum wall thickness shall be as indicated.
- Lifting rings or wire pulling rings may be incorporated into precast portland cement concrete pull box walls.
- Conduit entries for cast-in-place portland cement concrete pull boxes shall be cast as required. Precast portland cement concrete pull boxes may have field core drilled or sawed openings, or may have precast openings or knockouts. Knockouts shall be arranged to avoid compromising the structural integrity of the box.
- Grounding braid, with lugs, shall be tinned copper, equivalent to #4 AWG. Do not use wire for the lid grounding conductor. Braid shall be bonded to the circuit grounding conductor by an approved (UL-listed) means. Braid length shall allow for complete removal of cover and placement on ground adjacent to the pull box, 48" minimum. Also, ground the pull box body using the braid or #4 AWG green wire. Pull box body ground attachment may be made on the corner angle U-nuts or on a body-mounted grounding stud (if provided).
- Provide polymer concrete, fiberglass and plastic pull boxes (725.06, 725.07, and 725.12) in the following nominal sizes based on volume. Linear dimensions shall match to ± 10% and volume by ± 10%.

SIZE (nominal)	LENGTH (in.)	WIDTH (in.)	DEPTH (in.)
1.5	11	18	12
4	13	24	24
7	17	30	24
18	24	36	36
30	30	48	36

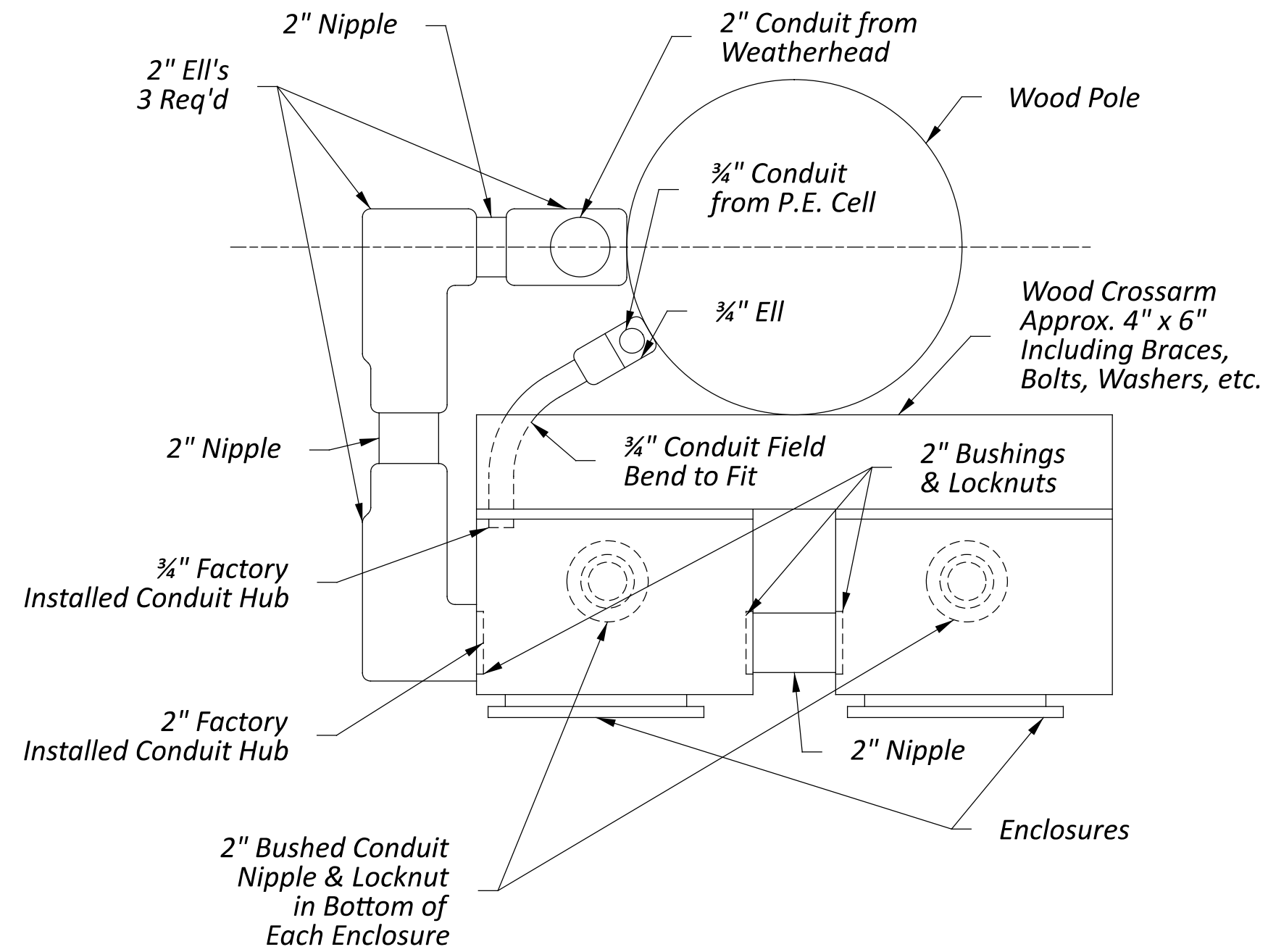


TYPICAL 3-WIRE SERVICE POLE HEAD



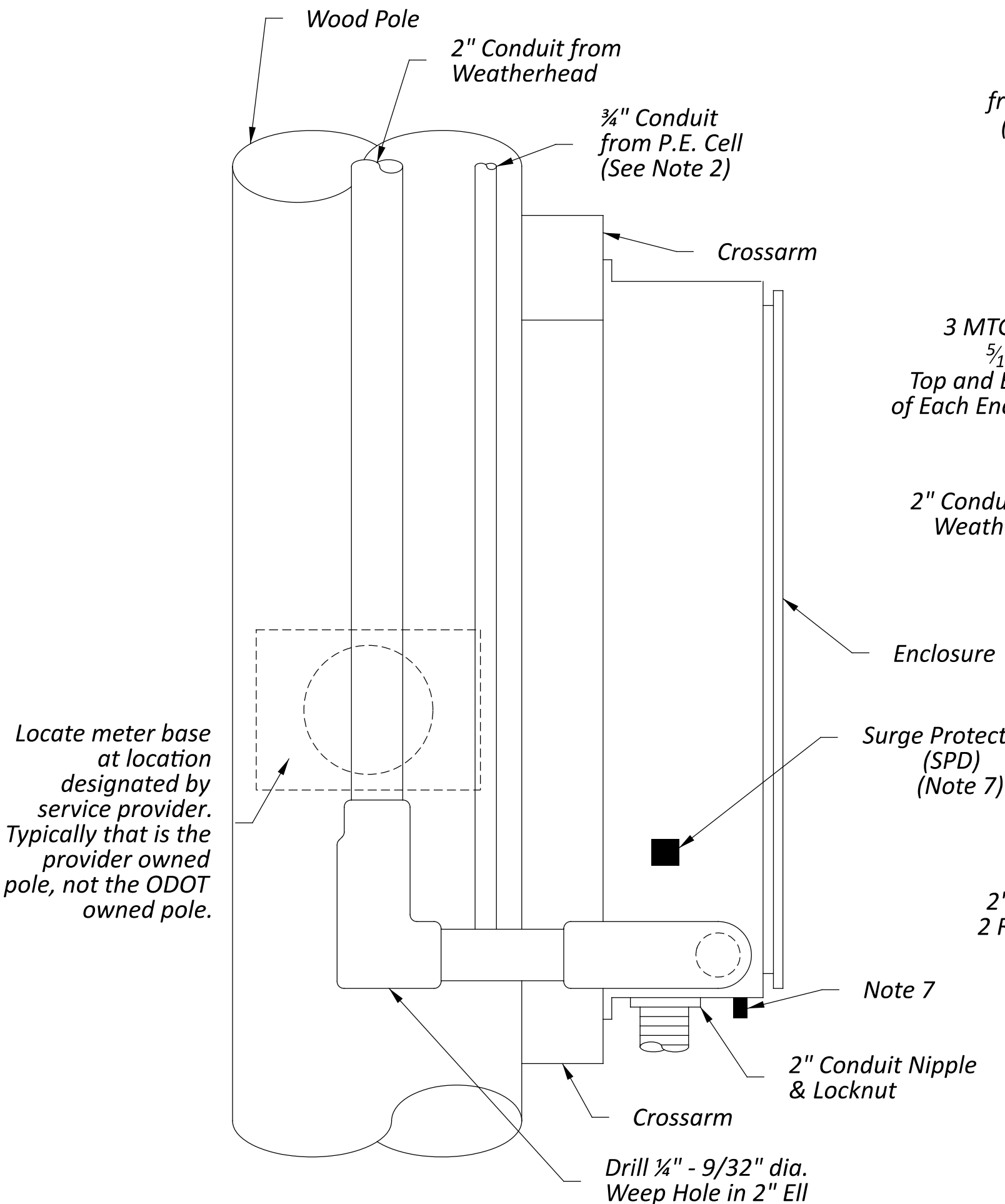
PLAN

SINGLE ENCLOSURE



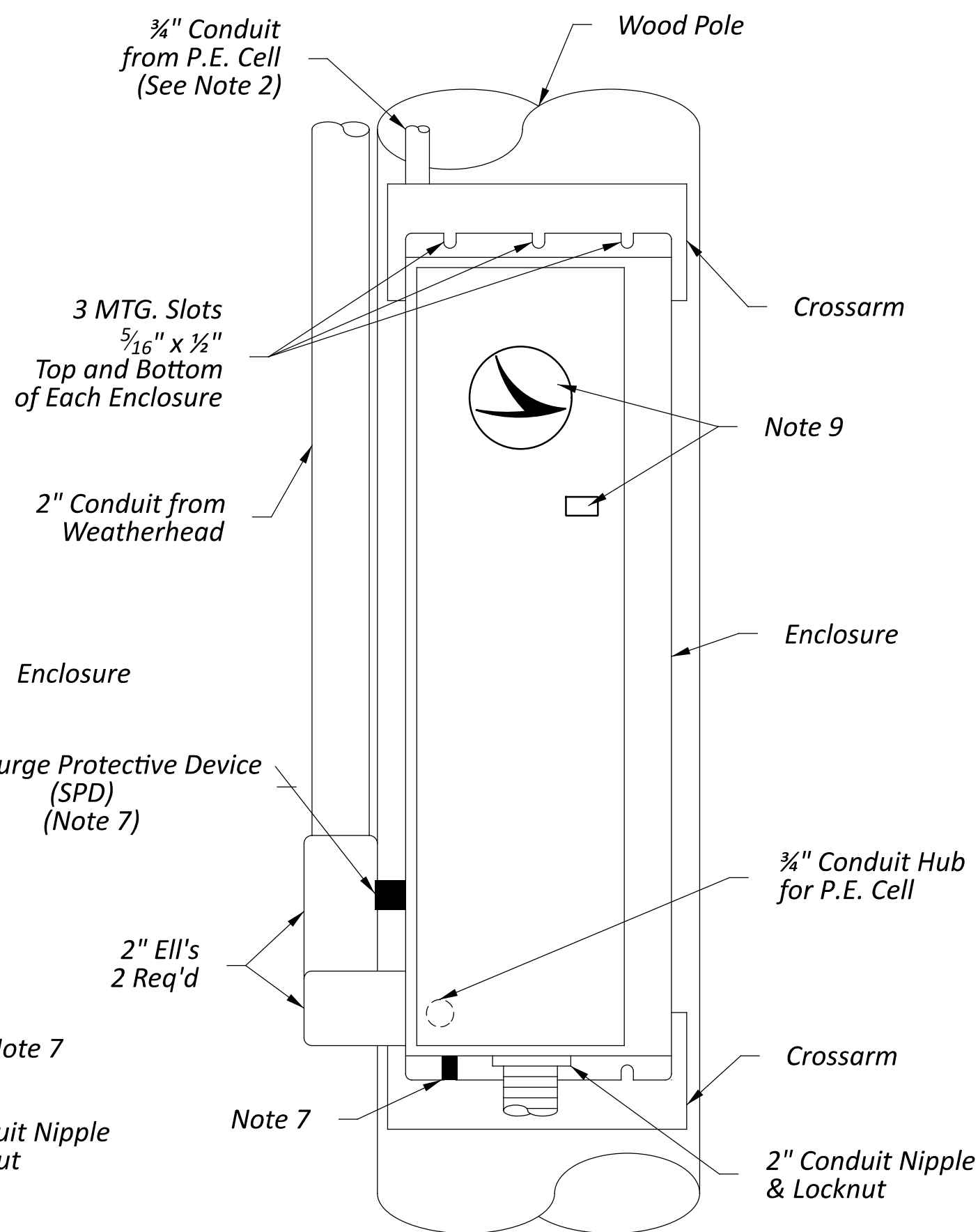
PLAN

DOUBLE ENCLOSURE

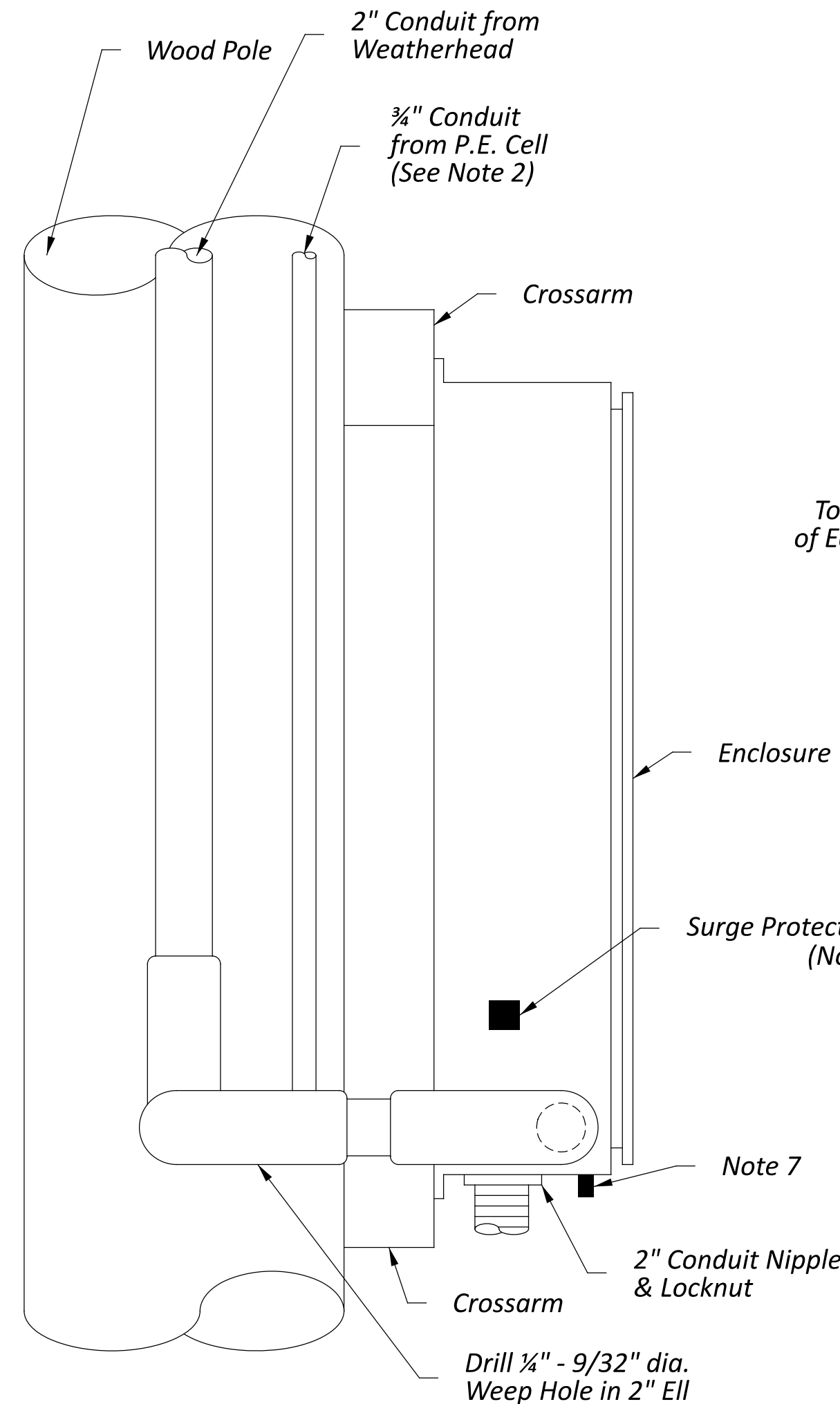


LEFT SIDE VIEW

SINGLE ENCLOSURE

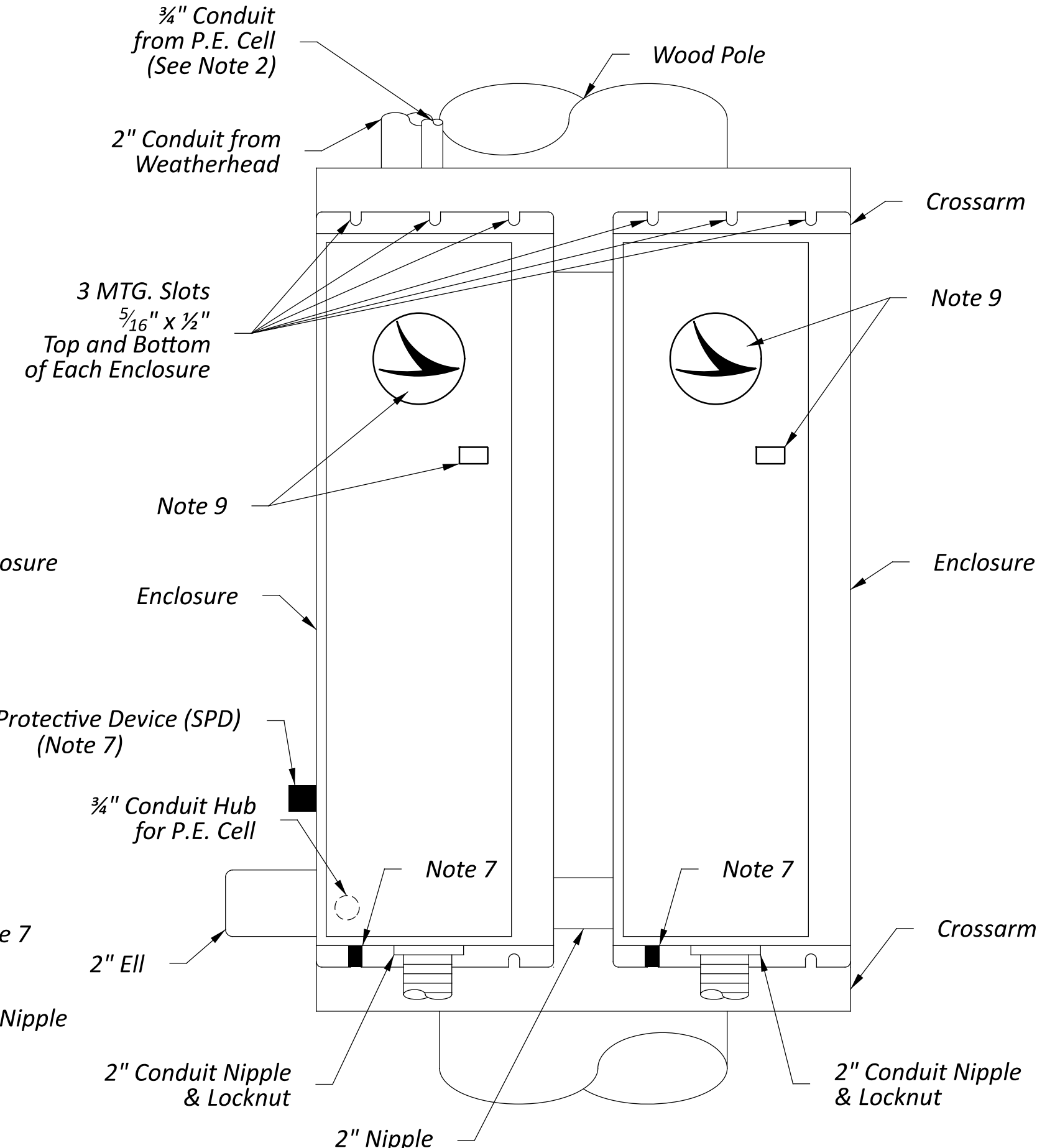


FRONT ELEVATION



LEFT SIDE VIEW

DOUBLE ENCLOSURE



FRONT ELEVATION

See Notes on Pg 2/2

NOTES:

1. All openings in enclosures shall be made by fabricator.
2. The 3/4" conduit for control wiring between P.E. cell and contactor enters the back of the enclosure at the bottom.
3. All conduit shall conform to C&MS 725.04.
4. If no marking is provided to aim the P.E. cell, face the "window" of the sensing element due north.
5. Photocell height shall be 10' unless specified otherwise in an as-per-plan Power Service, Pole-Mounted note. Use a conduit mounting bracket at 5' midpoint.
6. For Day-lighting systems, provide a radiation shield at least as wide as the crossarm, with a top angle to the sheet per HL-40.20. Mount day-lighting controllers with shield side facing south.
7. Provide SPD and Vent Drain per HL-40.20.
8. Enclosures per 625.15 and 725.19. Approved enclosures are manufactured by:

A) Central Systems

B) Millbank

C) Dewsbury
9. Apply ODOT Decal (available from the ODOT District) to all ODOT maintained installations. Apply equipment label complying with NFPA 70E Part 130.5.
10. See Plan Notes for construction details specific to the Project. The typical installation of a pole-mounted power service is depicted in this SCD. This typical installation consists of one or more ODOT-owned poles inside the ROW and a single power company pole on the ROW line. Typically, the meter base, meter disconnect (if required) and CT cabinet (if required) are located on the power company pole, and are included in the pole-mounted power service item, even though they are not shown here.

MINIMUM INTERIOR DIMENSIONS OF ENCLOSURE TYPES

TYPE	PRINCIPLE CONTENTS	WIDTH	HEIGHT	DEPTH*
S-60	60 Ampere Fused Switch	10"	18"	6"
S-100	100 Ampere Fused Switch	14"	24"	7"
SC-60	60 Ampere Fused Switch 60 Ampere Contactor	14"	34"	8"
SC-100	100 Ampere Fused Switch 100 Ampere Contactor	18"	38"	8"

* See "PLAN" View of Single Enclosure.
The Interior Depth Dimension Shall Not Include Any Part of the Enclosure Door Which May Protrude into the Interior of the Enclosure.

OFFICE OF
ROADWAY
ENGINEERING

REVISIONS
01-16-2026
07-19-2024
07-21-2023
07-17-2020
01-20-2017
01-17-2014
01-19-2007
04-19-2002...

STDS ENGINEER
Duemmel

STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR
Adam Koenig

POWER SERVICE, POLE-MOUNTED

DESIGN AGENCY



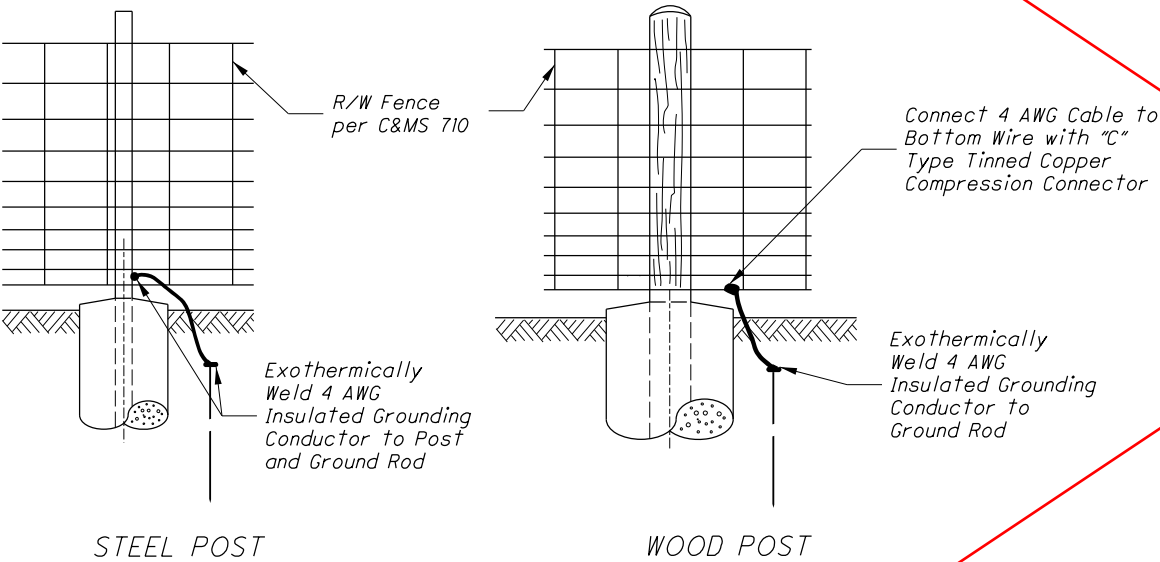
SCD NUMBER
HL-40.10

SHEET	TOTAL
P.2	2

Retire Drawing. Content now shown
on SCD F-3.5

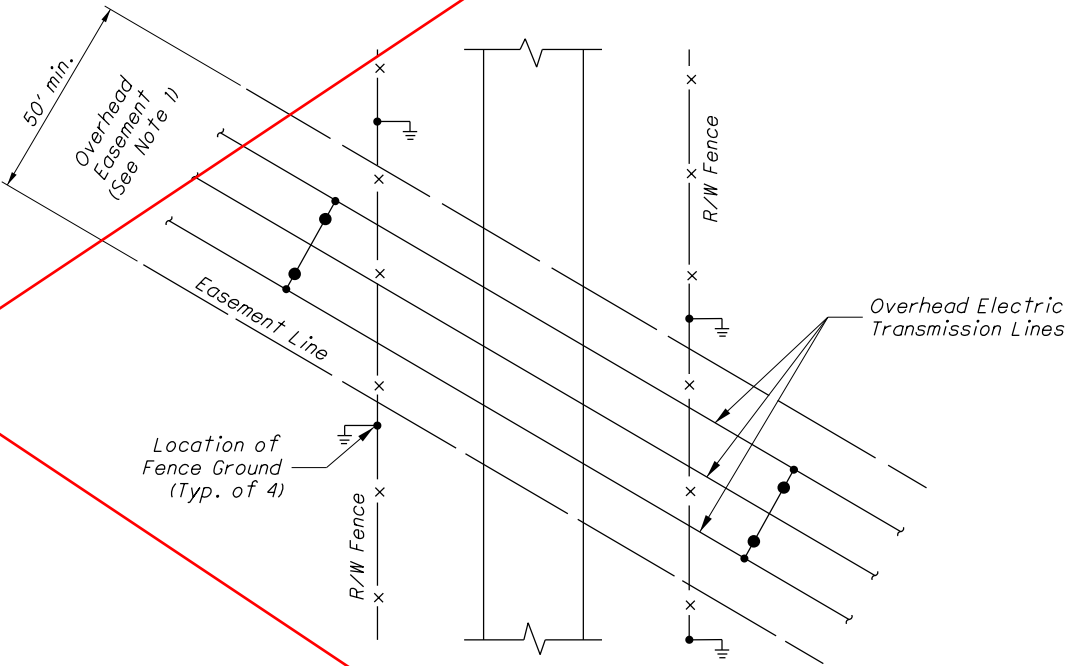
NOTES:

1. Where overhead transmission line easements 50' or more in width cross a fenced roadway right-of-way, each fence shall be grounded as shown hereon.
2. Where overhead electric power line easements less than 50' in width cross a fenced roadway right-of-way, each fence shall be grounded directly below the centerline of the power line crossing.
3. Where overhead transmission lines rated 110 KV or higher are parallel to roadway fences and the transmission line easement is contiguous to the roadway right-of-way the roadway fences shall be grounded at least every 300'.
4. Fence grounds will be paid for at the unit price bid for C&MS 625, Ground Rod.
5. Apply two coats of insulating varnish over exothermic welds and exposed cable.



R/W FENCE GROUND

When Specifically Noted on the Plans, and in Notes 1, 2, and 3, R/W Fences Shall be Grounded as Shown Above. Also see Note 4.



FENCE GROUNDS AT
TRANSMISSION LINES CROSSING

THIS DRAWING REPLACES HL-50.11 DATED 01-17-2014.

SCD NUMBER

HL-50.11

STANDARD ROADWAY CONSTRUCTION DRAWING

GROUNDING DETAILS

OFFICE OF
ROADWAY
ENGINEERING

STDS.
ENGINEER
Duemmel

STATE OF OHIO DEPARTMENT OF
TRANSPORTATION ADMINISTRATOR
Rick Bruce

REVISION DATE
01-16-2015

GENERAL NOTES

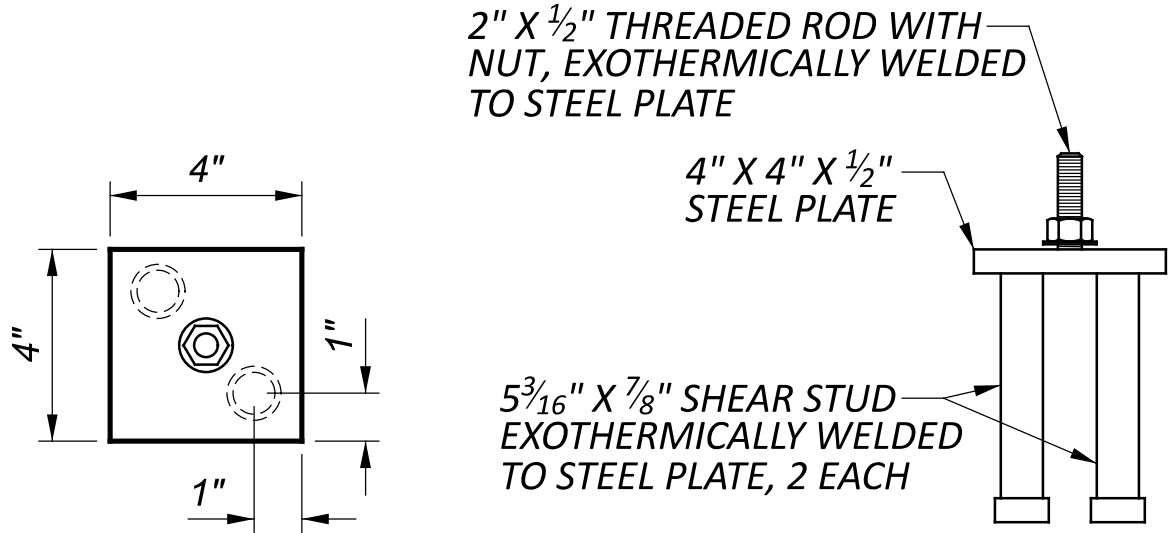
1. ALL VANDAL PROTECTION FENCE, MATAL RAILING, LIGHT POLES, SIGNAL SUPPORTS, AND SIGN SUPPORTS SHALL BE BONDED TO THE STRUCTURE GROUNDING SYSTEM.
2. THERE SHALL BE A MINIMUM OF TWO (2) ELECTRODES FOR EACH BRIDGE RAIL THAT REQUIRES GROUNDING, ONE (1) AT EACH ABUTMENT. IF BOTH EXTERIOR BRIDGE RAILS REQUIRE GROUNDING A MINIMUM OF FOUR (4) ELECTRODES, TWO (2) AT EACH ABUTMENT, SHALL BE INSTALLED FOR EACH BRIDGE. NO POINT ON THE STRUCTURE SHALL BE MORE THAN TWO SPANS FROM AN ELECTRODE. STRUCTURES WITH FIVE (5) SPANS OR GREATER WILL REQUIRE ADDITIONAL ELECTRODES AT PIER LOCATIONS.
3. PROVIDE A GROUNDING ELECTRODE CONDUCTOR WITHIN EACH OUTSIDE COLUMN AT PIER LOCATIONS WHEN REQUIRED.
4. PROVIDE GROUNDING PLATES FOR EACH GROUNDING ELECTRODE CONDUCTOR WHEN REQUIRED.
5. DO NOT USE SURFACE-MOUNTED GROUND CONDUCTORS FOR NEW CONSTRUCTION.
6. INSTALL GROUNDING PLATE AT EACH END AND AS SHOWN IN DETAIL A TO ASSURE VANDAL PROTECTION FENCE (TYPICALLY INSTALLED AFTER RAILING IS COMPLETE) HAS AN ADEQUATE BONDING POINT.
7. **ANCHOR BOLT GROUNDING:** ALWAYS GROUND METAL RAILING, LIGHT POLE, SIGNAL SUPPORT, AND SIGN SUPPORT ANCHOR BOLTS ON THE ROADWAY SIDE DOWNSTREAM OF ADJACENT TRAFFIC. IDENTIFY THE GROUNDED BOLT WITH A LIGHT COAT OF RED, WEATHER-RESISTANT PAINT ON THE EXPOSED END. GROUND ONE ADDITIONAL ANCHOR BOLT FOR LIGHT POLES.
8. **ALTERNATE METHOD/RETROFIT AT ABUTMENTS:** ROUTE GROUNDING CONDUCTORS THROUGH ONE OR MORE 1" GALVANIZED RIGID CONDUITS TO AN ELECTRODE LOCATED IN A PULL BOX. ASSURE ALL RIGID CONDUITS ENCLOSING GROUNDING CONDUCTORS ARE BONDED AT EACH END. CONDUIT AND PULLBOX ARE INCIDENTAL. ALTERNATE METHOD BY PERMISSION OF THE ENGINEER ONLY, OR BY PLAN NOTE. SEE SHEET 6 FOR DETAILS.
9. **ENGINEER REPORT:** PROVIDE TWO CERTIFIED COPIES OF THE THE COMPLETED TEST RECORDS TO THE ENGINEER ON TEST REPORTING FORMS SUPPLIED TO THE CONTRACTOR BY THE ENGINEER OR ON A ALTERNATIVE FORM APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL ALSO PROVIDE A REPORT (INCLUDING PHOTOGRAPHIC IMAGES) SHOWING ALL COMPLETED EXOTHERMIC WELDS BEFORE THEY ARE ENCASED IN CONCRETE. INCLUDE A CARD IN EACH PHOTO THAT DENOTES THE LOCATION ON THE STRUCTURE.
10. **STEEL GIRDER/BEAM/RAILING CONTINUITY:** INSTALL BONDING JUMPERS AND GOUNDING CABLE TO ALLOW FOR AT LEAST 2 INCHES OF EXPANSION BETWEEN CONNECTIONS WHEN UNITS ARE SEPARATED, E.G., INTERMEDIATE EXPANSION JOINT. SEE SHEET 9 FOR STEEL GIRDER/BEAM CONTINUITY DETAILS AND DETAIL B FOR STEEL RAILING DETAILS.
11. **PULL BOX:** SEE STANDARD DRAWING HL-30.11 FOR PULL BOX DETAILS.
12. **JUNCTION BOXES:** IF REQUIRED FURNISH JUNCTION BOXES THAT CONFORM TO THE MATERIAL SPECIFICATIONS SHOWN IN C&MS 725.10.
13. **RIGID GALVANIZED CONDUIT AND FITTINGS:** IF REQUIRED FURNISH 1" RIGID GAVLVANIZED CONDUIT AND FITTINGS THAT CONFORM TO THE MATERIAL SPECIFICATIONS SHOWN IN C&MS 725.04.
14. **GROUND ROD:** ENSURE EACH GROUND ROD IS ONE PIECE, AT LEAST ¾ INCH IN DIAMETER AND 10 FEET IN LENGTH WITH A DRIVING POINT ON THE LOWER END. ENSURE THAT THE GROUND ROD IS OF SOLID CONSTRUCTION AND IS 100% STAINLESS STEEL AND UL LISTED. SEE C&MS 725.16. ONCE INSTALLED THE EARTH RESISTANCE MEASUREMENT SHALL NOT EXCEED 25 OHMS. IF A TRAFFIC SIGNAL CONTROLER OR A LIGHT TOWER ARE INCLUDED IN THE GROUNDING SYSTEM THE EARTH RESISTANCE SHALL NOT EXCEED 10 OHMS. SEE C&MS 625.16 IF THE EARTH RESISTANCE EXCEEDS THE LIMITS LISTED ABOVE.
15. **1/0 INSULATED GROUND WIRE:** FURNISH 1/0 INSULATED GROUND WIRE THAT CONFORMS TO THE MATERIAL SPECIFICATIONS SHOWN IN C&MS 732.19. FOR NEW CONSTRUCTION ALL GROUND WIRE SHALL BE EMBEDDED IN CONCRETE AS SHOWN IN THESE STANDARD DRAWINGS, UNLESS OTHERWISE NOTED IN THE PLAN OR BY PERMISSION OF THE ENGINEER.

16. **UNCOATED COPPER GROUNDING PLATE:** IF REQUIRED FURNISH UNCOATED GROUNDING PLATES THAT CONFORM TO THE SPECIFICATIONS SHOWN ON PAGE 8 OF THIS DRAWING.
17. **ROD TYPE PLANE ELECTRODE:** IF REQUIRED FURNISH ROD TYPE PLANE ELECTRODES THAT CONFORM TO THE SPECIFICATIONS SHOWN ON PAGE 8 OF THIS DRAWING.
18. **CABLE TYPE PLANE ELECTRODE:** IF REQUIRED FURNISH CABLE TYPE PLANE ELECTRODES THAT CONFORM TO THE SPECIFICATIONS SHOWN ON PAGE 8 OF THIS DRAWING.
19. **GROUNDING PLATE:** IF CONCRETE BRIDGE RAILING IS TO BE CONSTRUCTED BY WAY OF SLIPFORMIMG, THE EXPOSED 2" X ½" THREADED BOLT SHALL BE EXOTHERMICALLY WELDED TO THE STEEL PLATE AFTER SLIPFORMING HAS BEEN COMPLETED.

STEEL GROUNDING PLATE ASSEMBLIES SHALL CONFORM TO THE FOLLOWING MATERIAL SPECIFICATIONS:

- STEEL SHALL CONFORM TO ASTM A709 GRADE 36 OR 50 STEEL
- THREADED ROD SHALL CONFORM TO ASTM A325
- NUT SHALL CONFORM TO ASTM A563

GALVANIZE ASSEMBLY AS PER CMS 711.02.



PLAN VIEW

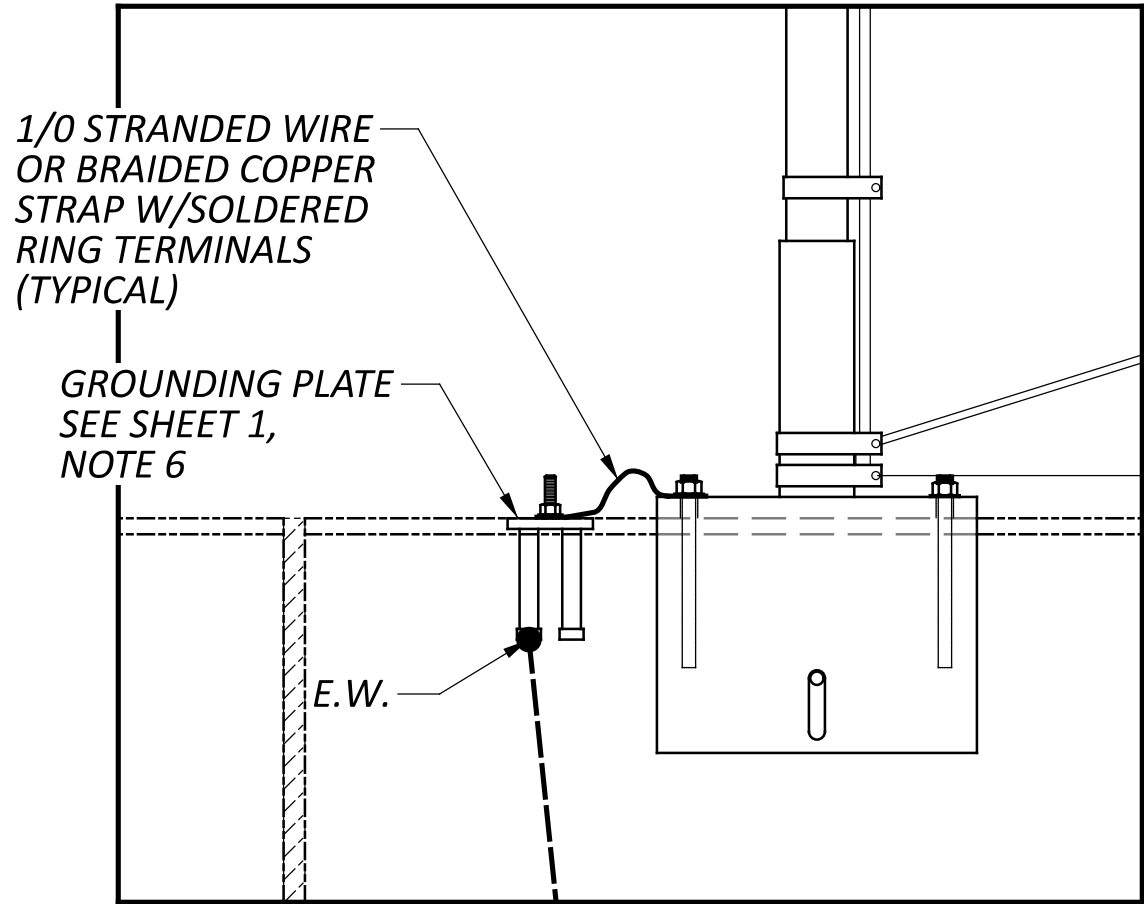
ELEVATION VIEW

GROUNDING PLATE DETAILS

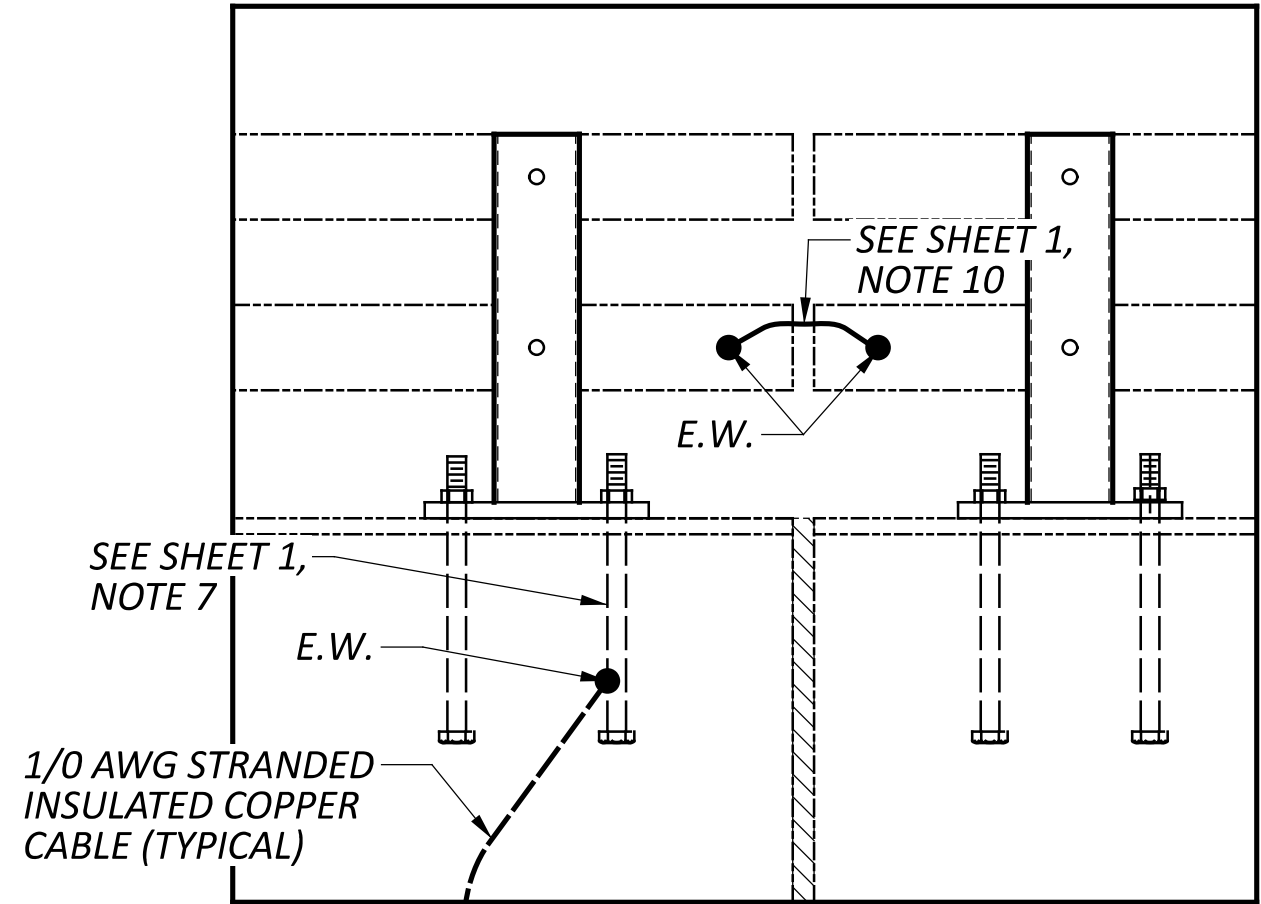
20. **METHOD OF MESUREMENT:** THE DEPARTMENT WILL MEASURE THE QUANTITY OF A STRUCTURE GROUNDING SYSTEM PER UNIT EACH. ONE (1) STRUCTURE GROUNDING SYSTEM SHALL BE QUANTIFIED FOR EACH BRIDGE THAT REQUIRES A STRUCTURE GROUNDING SYSTEM.
21. **BASIS OF PAYMENT:** THE DEPARMENT WILL PAY FOR THE ACCEPTED QUANTITIES AT THE CONTRACT PRICE FOR "ITEM 625 STRUCTURE GROUNDING SYSTEM, EACH", WHICH INCLUDES THE WORK PERTAINING TO AND THE INSTALLATION OF THE FOLLOWING ITEMS AS REQUIRED:

- GROUND ROD(S)
- PULL BOX(ES)
- GROUNDING PLATE(S)
- EXOTHERMIC WELDING AND REPAIR OF STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING.
- 1/0 INSULATED GROUND WIRE AND MASTIC COVERING IF REQUIRED
- JUNCTION BOX(ES)
- RIGID GALVANIZED CONDUIT AND FITTINGS
- UNCOATED COPPER GROUNDING PLATE(S)
- ROD TYPE PLANE ELECTRODE(S)
- CABLE TYPE PLANE ELECTRODE(S)
- ALL OTHER WORK DESCRIBED IN THESE STANDARD DRAWINGS

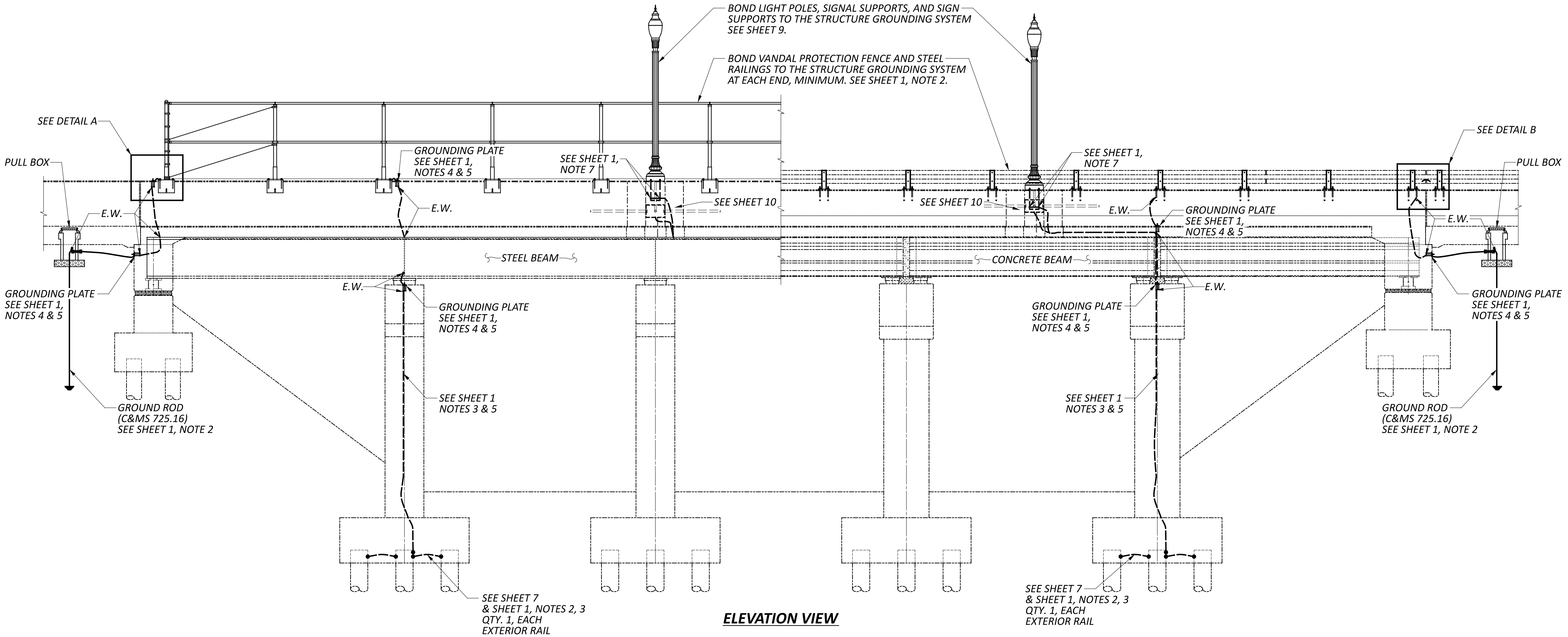




DETAIL A
VANDAL PROTECTION FENCE (VPF-1)



DETAIL B
BRIDGE SIDEWALK RAILING (BR-2)



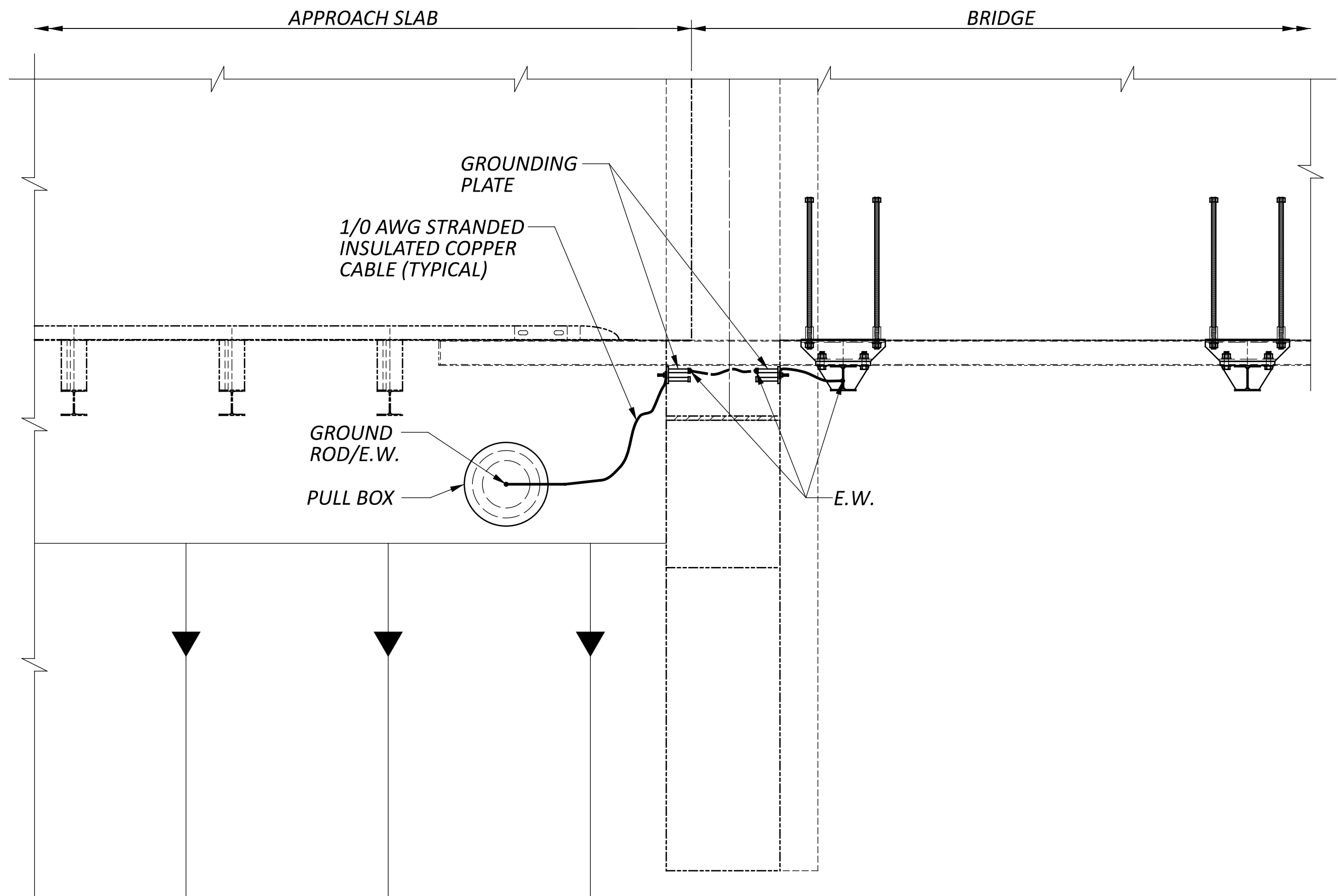
ELEVATION VIEW

LEGEND

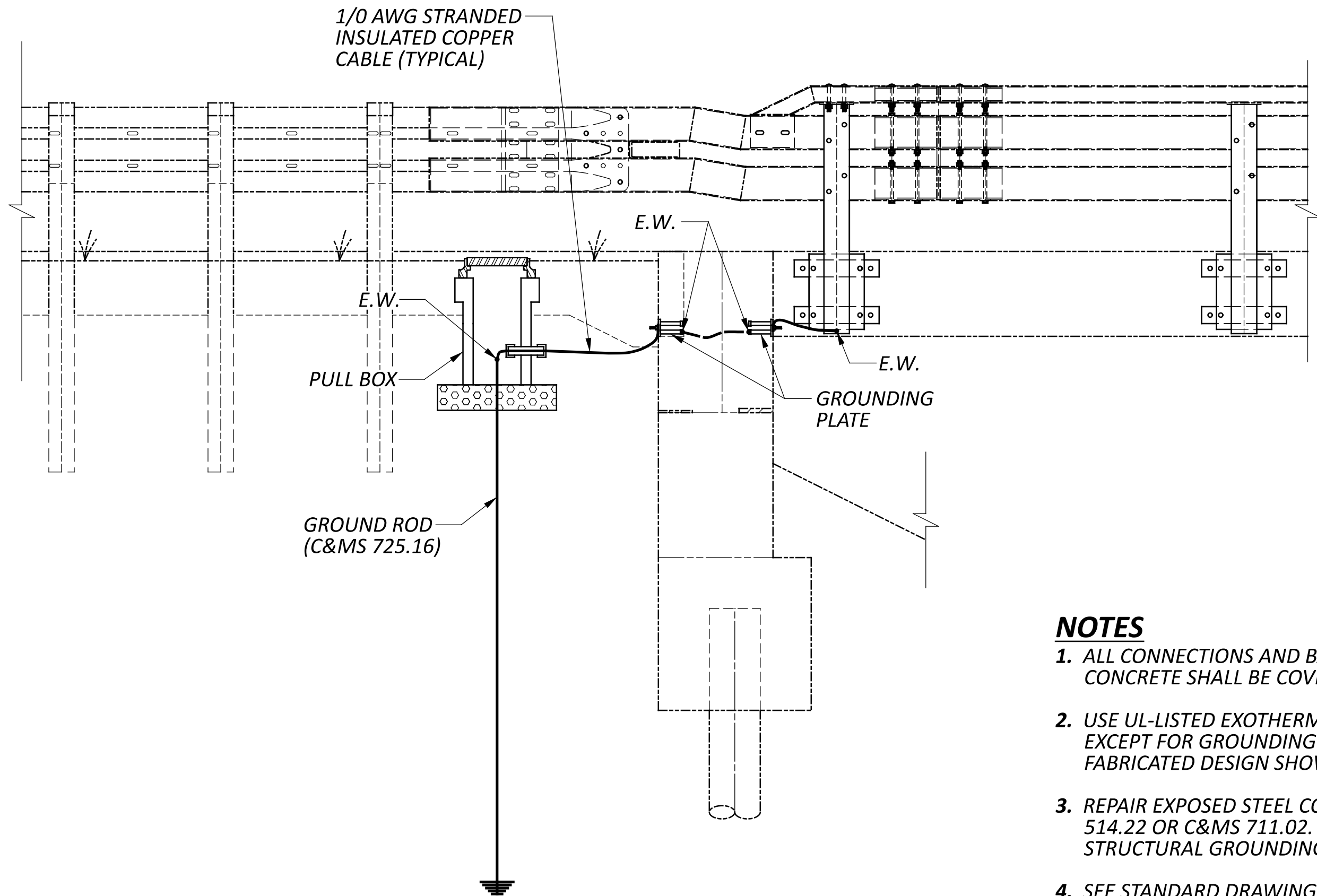
E.W. - EXOTHERMICALLY WELDED

--- 1/0 AWG STRANDED INSULATED COPPER CABLE EMBEDDED IN CONCRETE





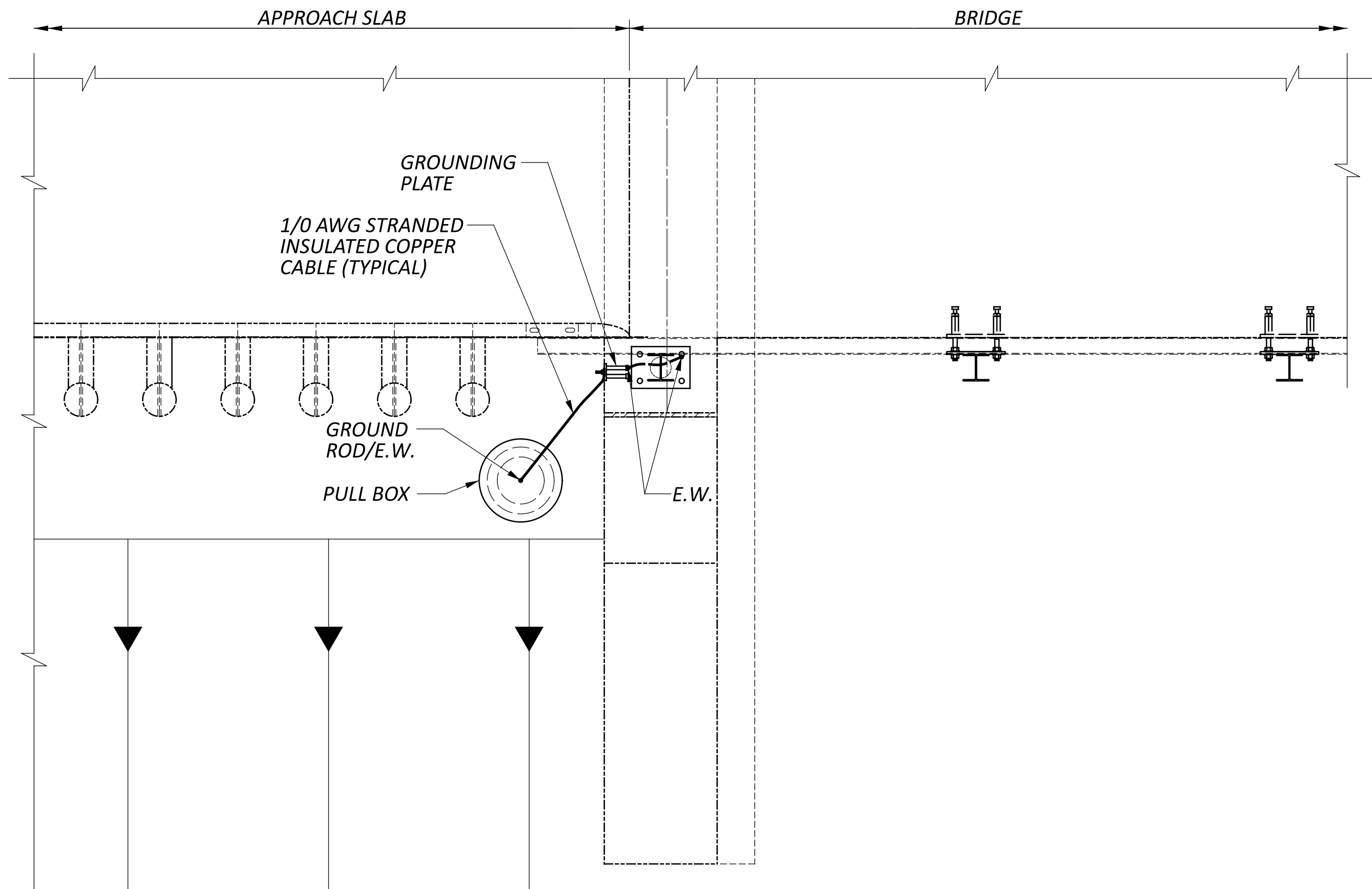
BRIDGE RAILING (TST-2)
CONCRETE SLAB BRIDGE AT ABUTMENT
(PLAN VIEW)



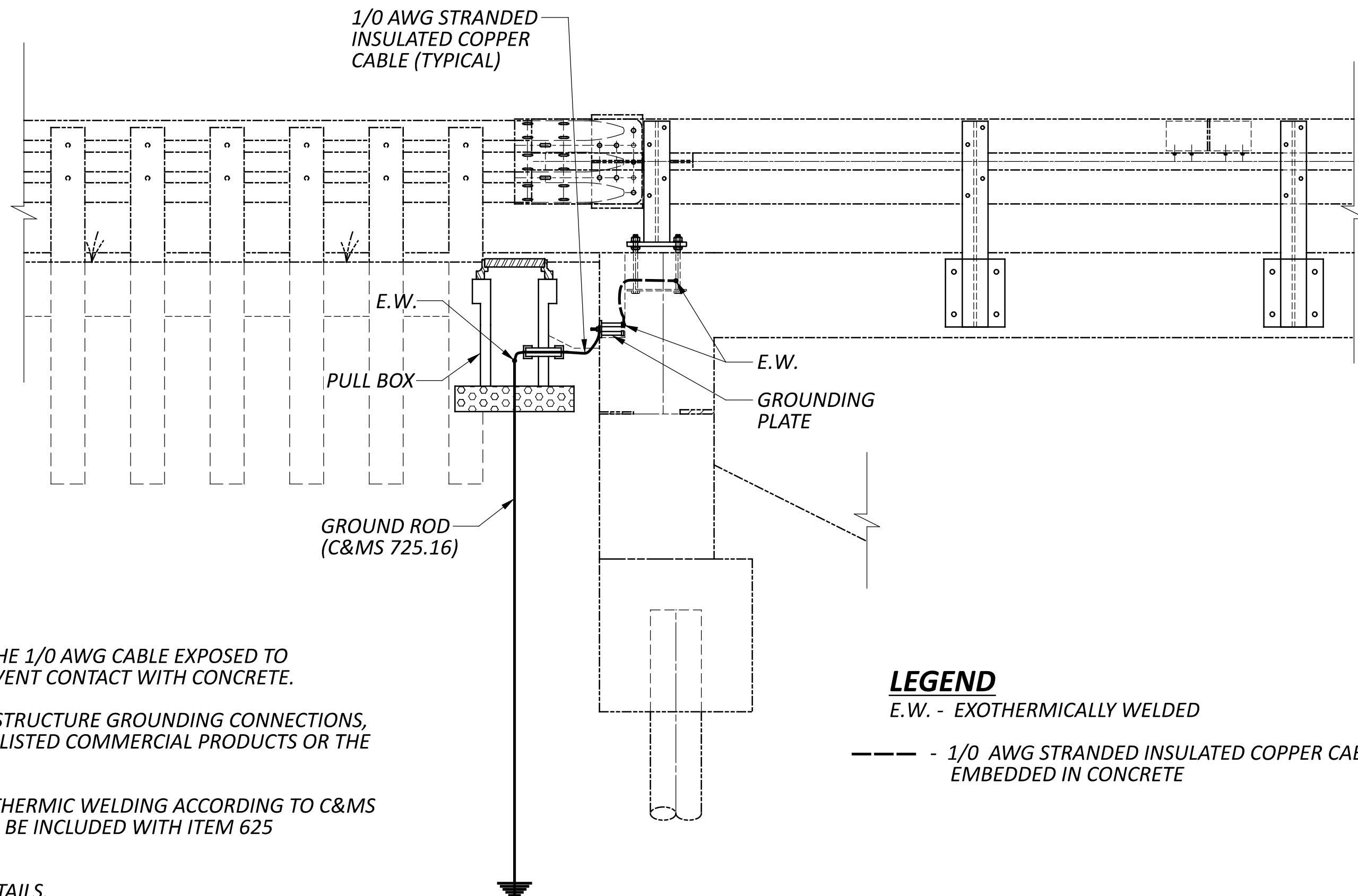
BRIDGE RAILING (TST-2)
CONCRETE SLAB BRIDGE AT ABUTMENT
(ELEVATION VIEW)

NOTES

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.
3. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO C&MS 514.22 OR C&MS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.
4. SEE STANDARD DRAWING HL-30.11 FOR PULL BOX DETAILS.



BRIDGE RAILING (TST-1)
CONCRETE SLAB BRIDGE AT ABUTMENT
(PLAN VIEW)

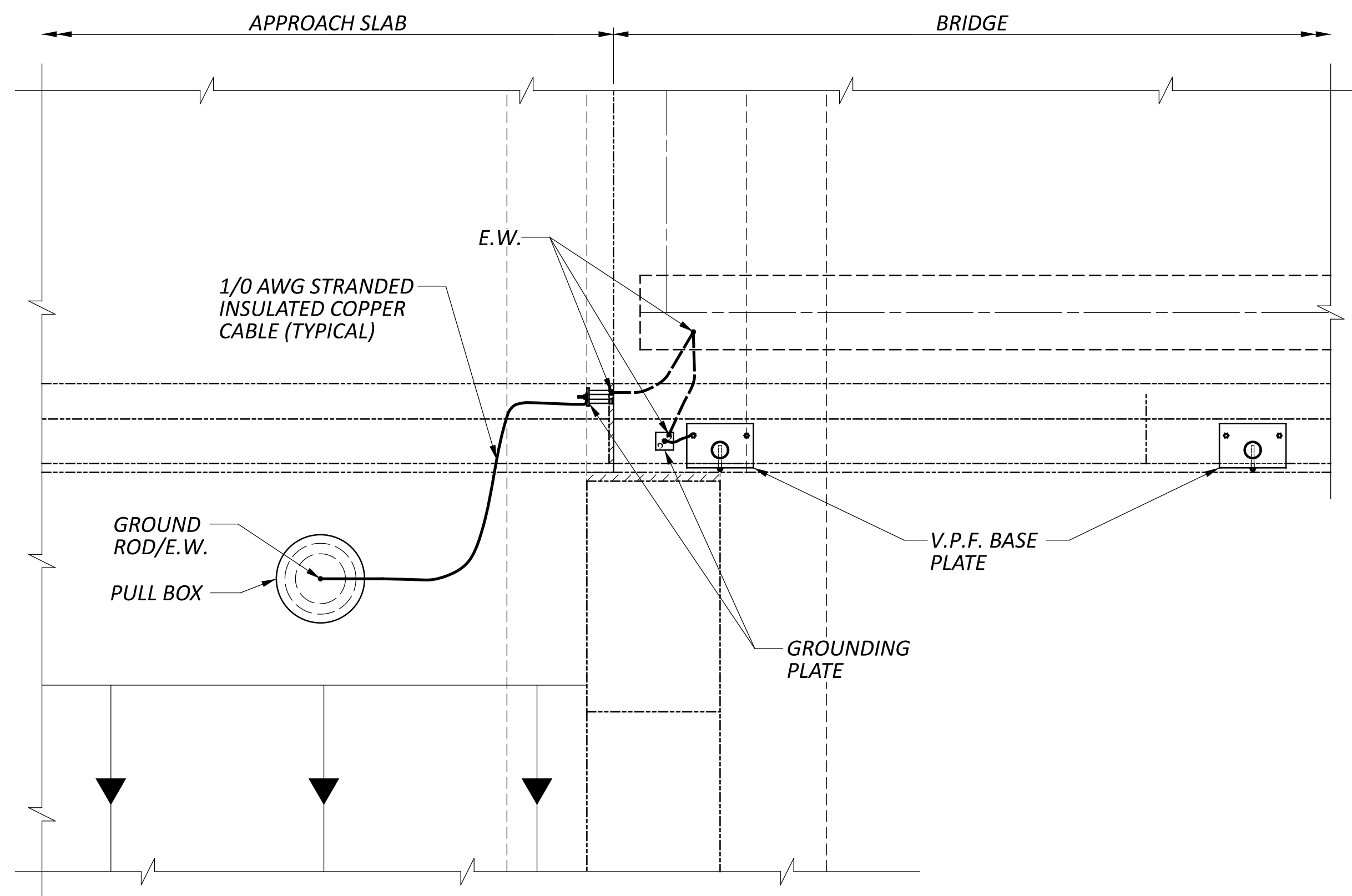


BRIDGE RAILING (TST-1)
CONCRETE SLAB BRIDGE AT ABUTMENT
(ELEVATION VIEW)

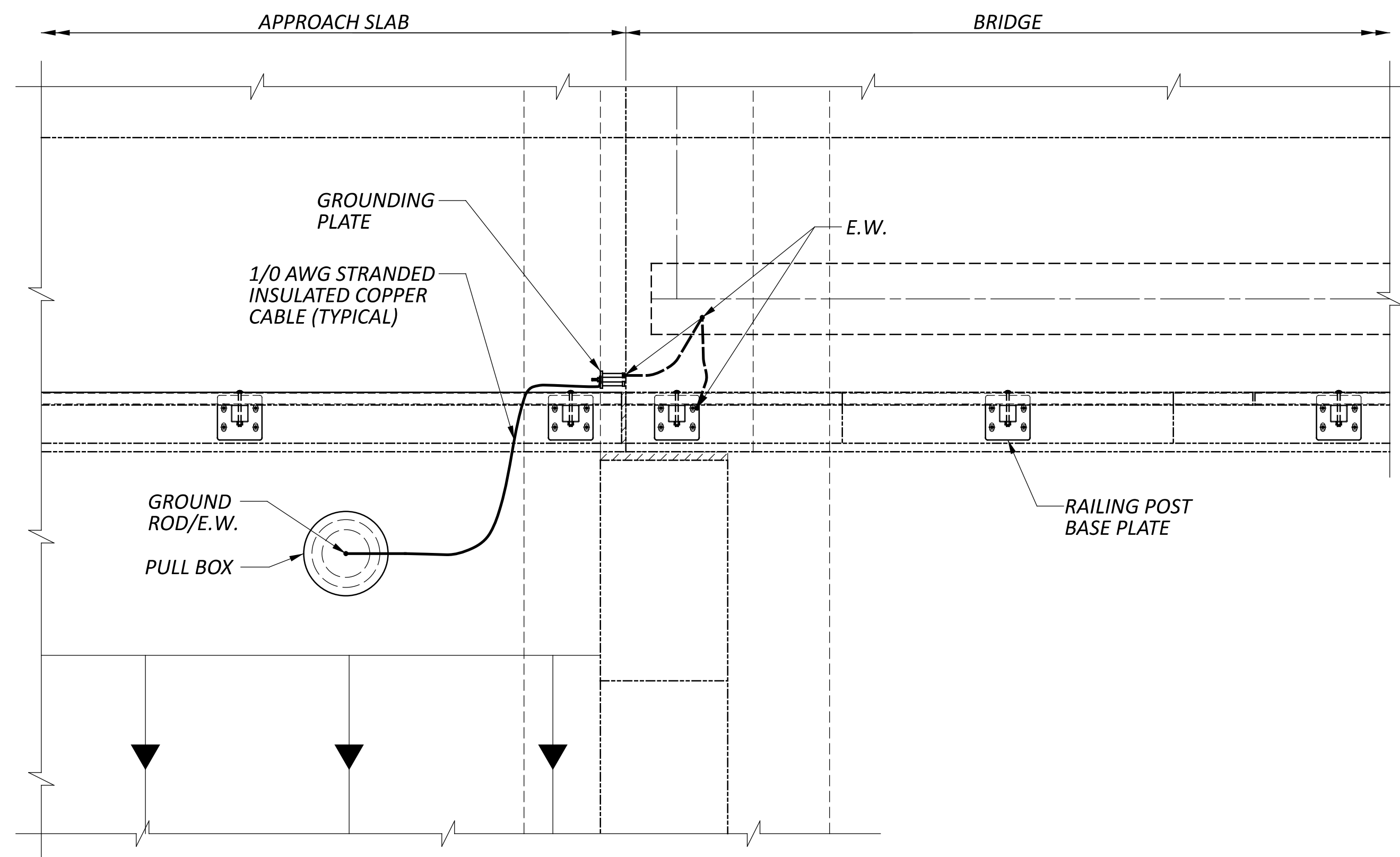
LEGEND

E.W. - EXOTHERMICALLY WELDED

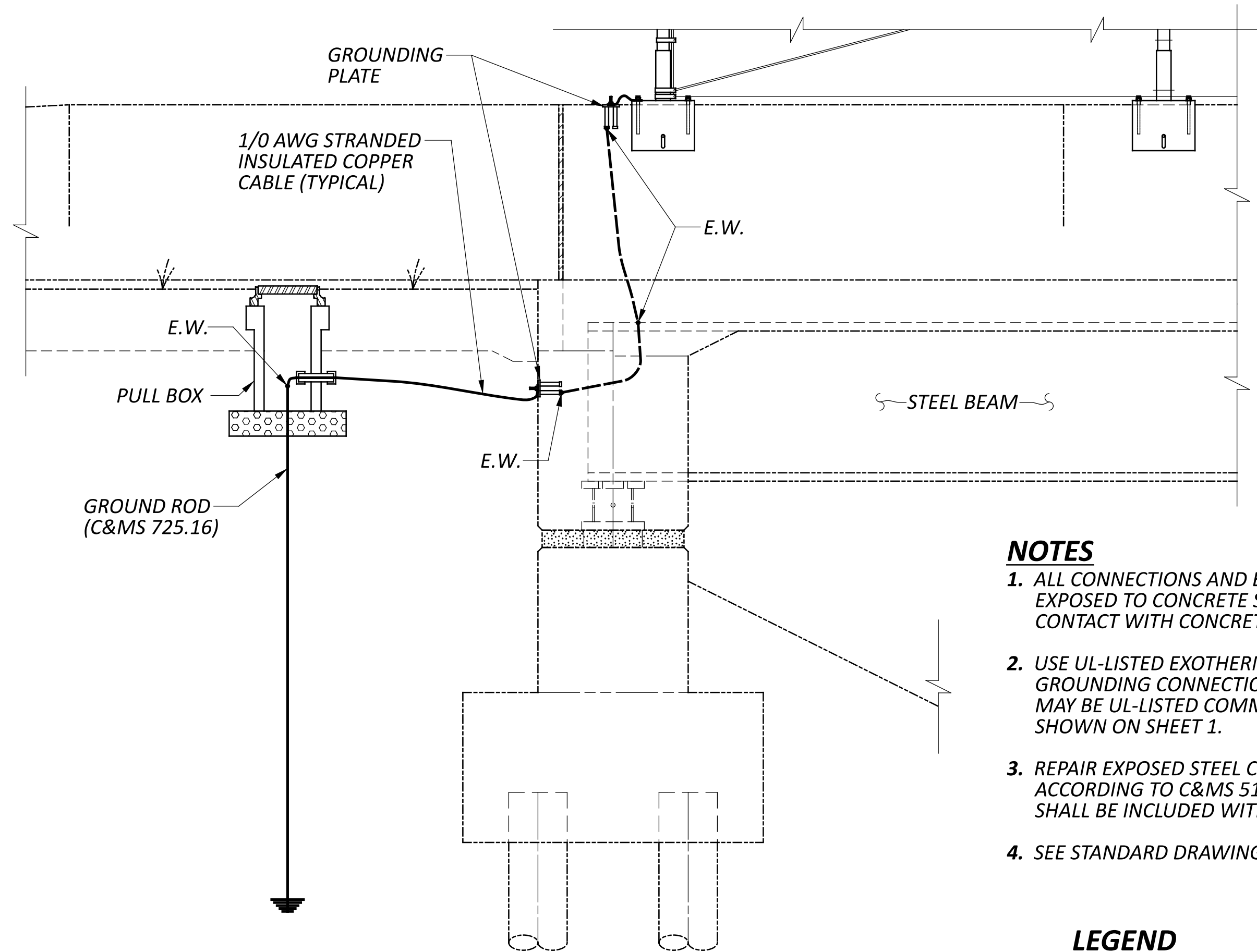
--- - 1/0 AWG STRANDED INSULATED COPPER CABLE
EMBEDDED IN CONCRETE



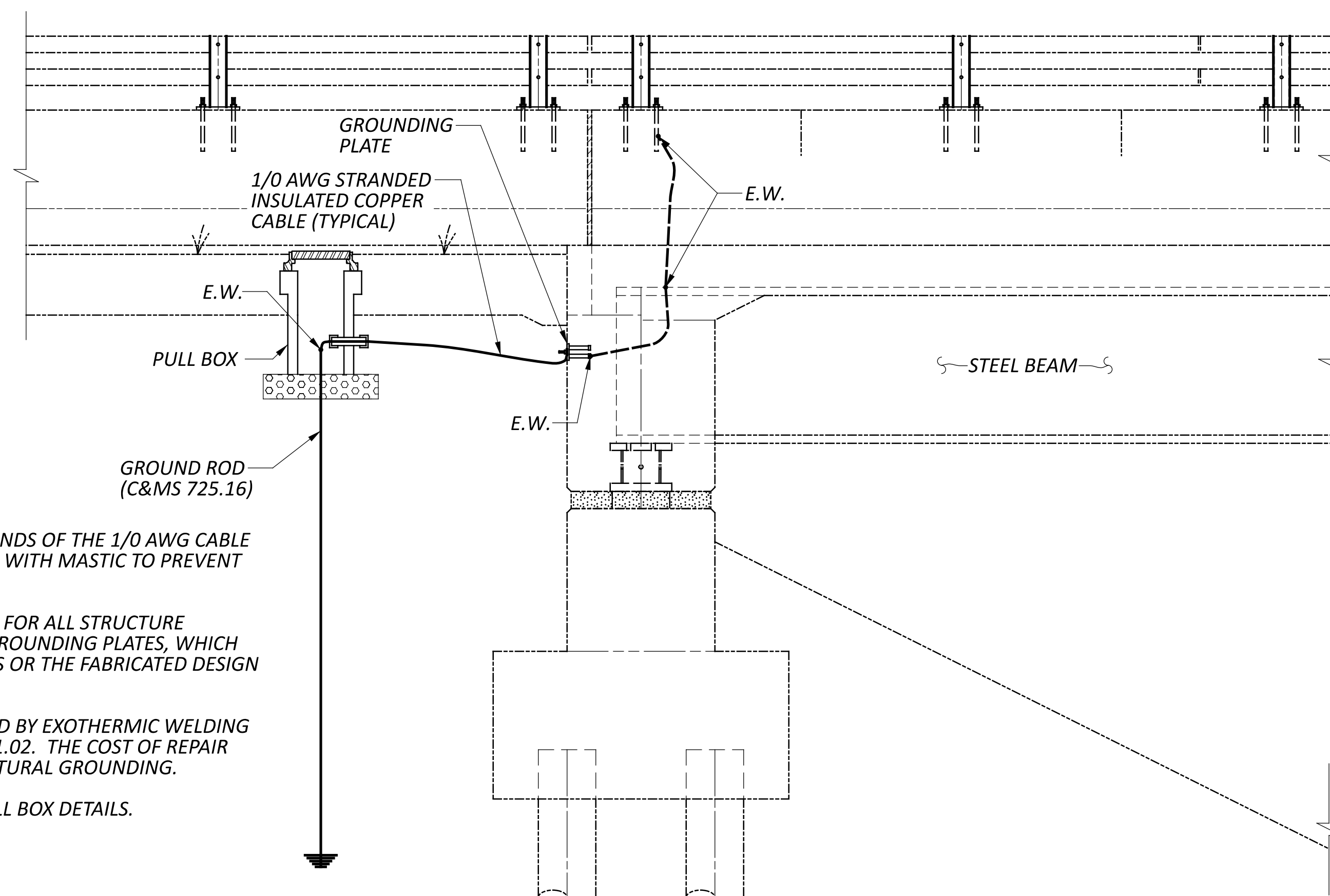
VANDAL PROTECTION FENCE (SBR OR BR-1)
STEEL BEAM BRIDGE AT ABUTMENT
(PLAN VIEW)



BRIDGE SIDEWALK RAILING (BR-2)
STEEL BEAM BRIDGE AT ABUTMENT
(PLAN VIEW)



VANDAL PROTECTION FENCE (SBR OR BR-1)
STEEL BEAM BRIDGE AT ABUTMENT
(ELEVATION VIEW)



BRIDGE SIDEWALK RAILING (BR-2)
STEEL BEAM BRIDGE AT ABUTMENT
(ELEVATION VIEW)

NOTES

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.
3. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO C&MS 514.22 OR C&MS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.
4. SEE STANDARD DRAWING HL-30.11 FOR PULL BOX DETAILS.

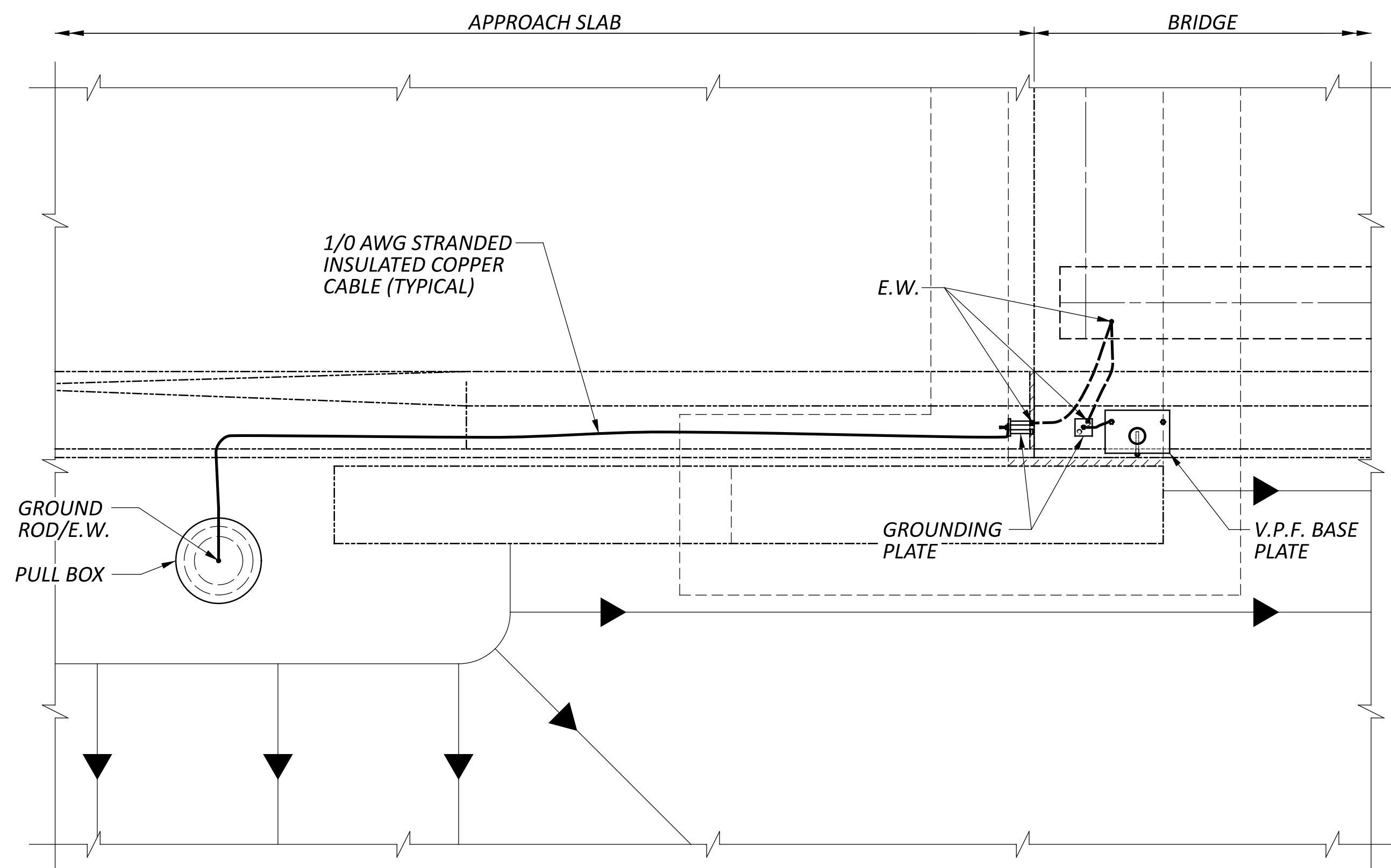
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E.W. - EXOTHERMICALLY WELDED

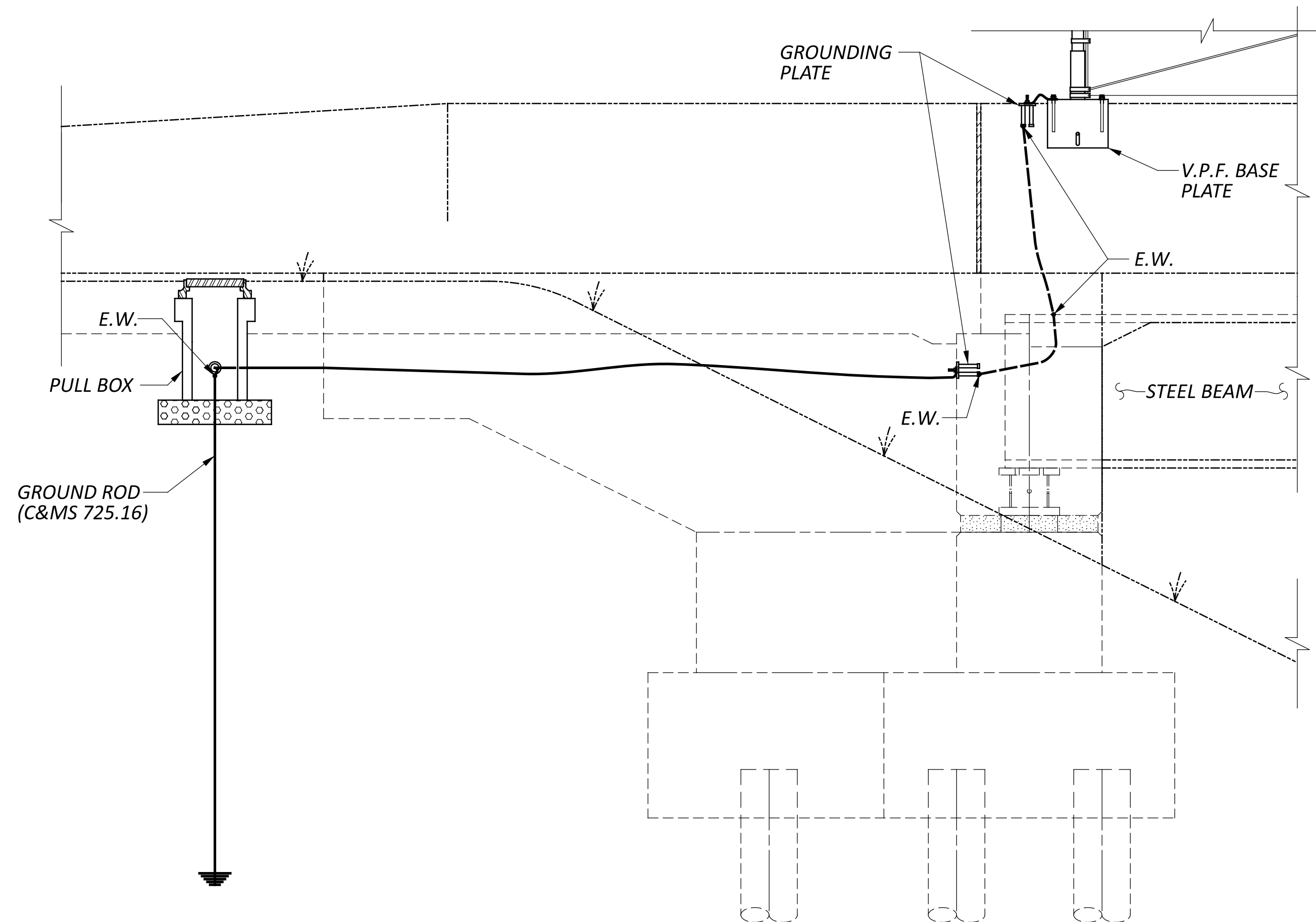
V.P.F. - VANDAL PROTECTION FENCE

— 1/0 AWG STRANDED INSULATED COPPER CABLE
EMBEDDED IN CONCRETE

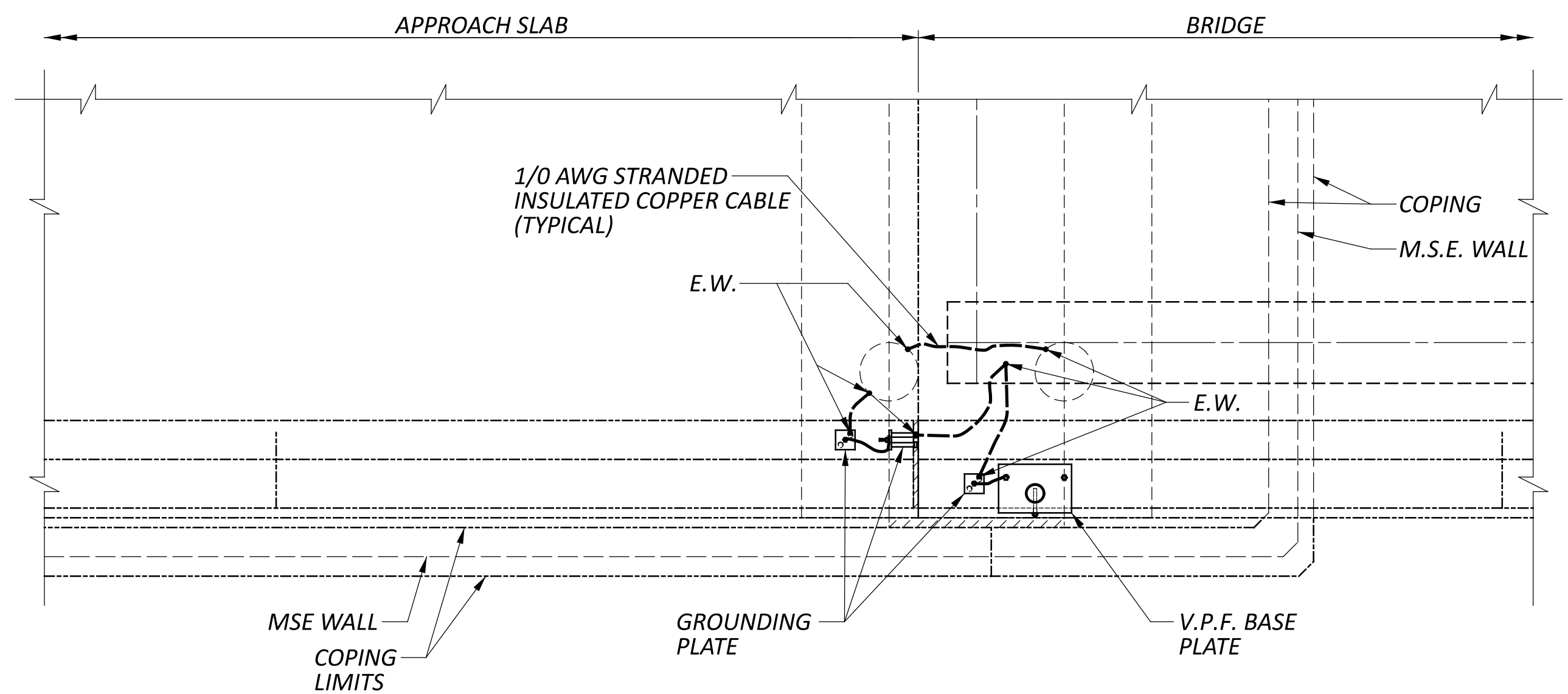




VANDAL PROTECTION FENCE (SBR OR BR-1)
ABUTMENT WITH TURNBACK WINGWALLS
(PLAN VIEW)



VANDAL PROTECTION FENCE (SBR OR BR-1)
ABUTMENT WITH TURNBACK WINGWALLS
(ELEVATION VIEW)



VANDAL PROTECTION FENCE (SBR OR BR-1)
ABUTMENT SUPPORTED ON M.S.E. WALLS
(PLAN VIEW)

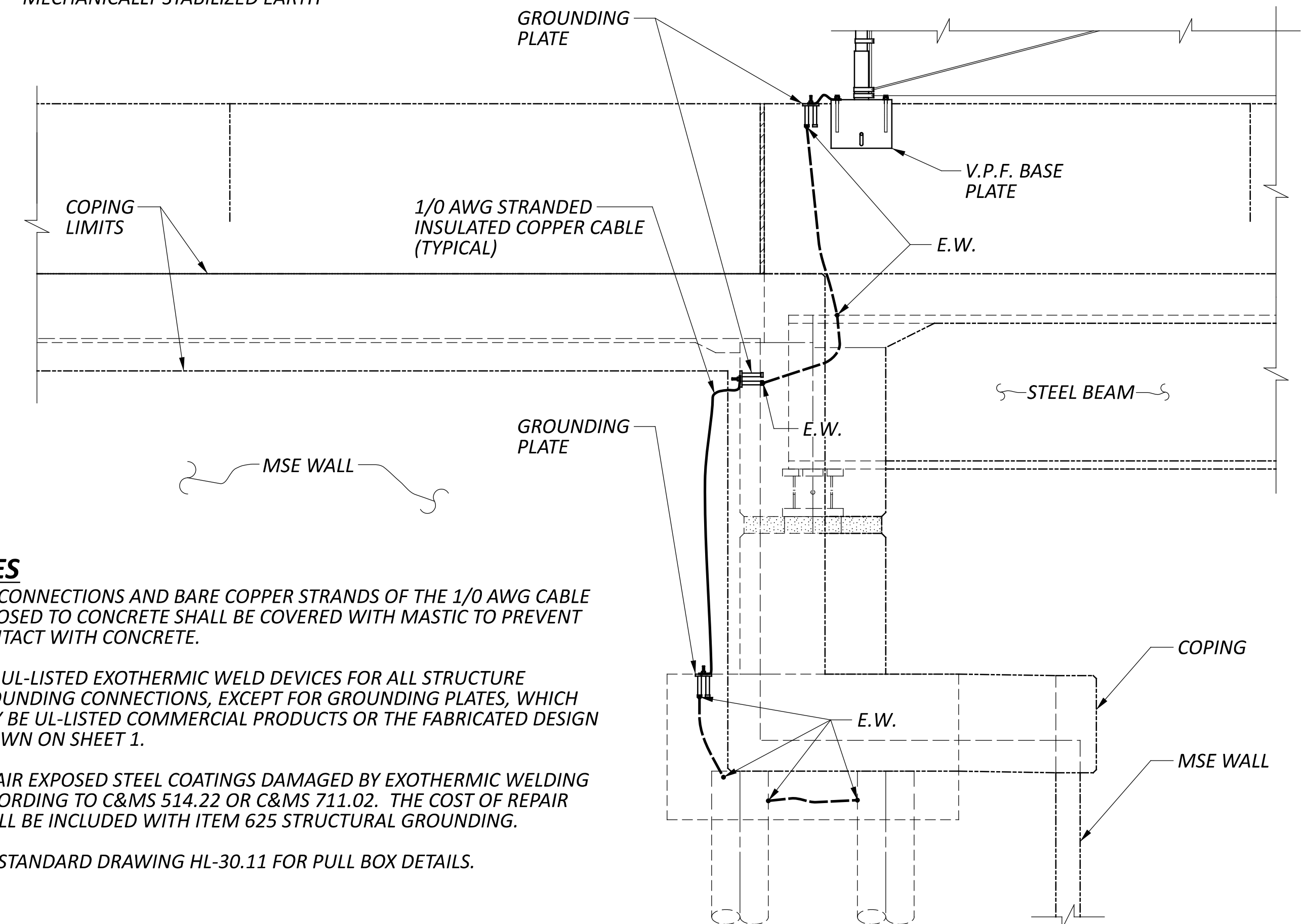
LEGEND

E.W. - EXOTHERMICALLY WELDED

V.P.F. - VANDAL PROTECTION FENCE

—— - 1/0 AWG STRANDED INSULATED COPPER CABLE
EMBEDDED IN CONCRETE

MSE - MECHANICALLY STABILIZED EARTH

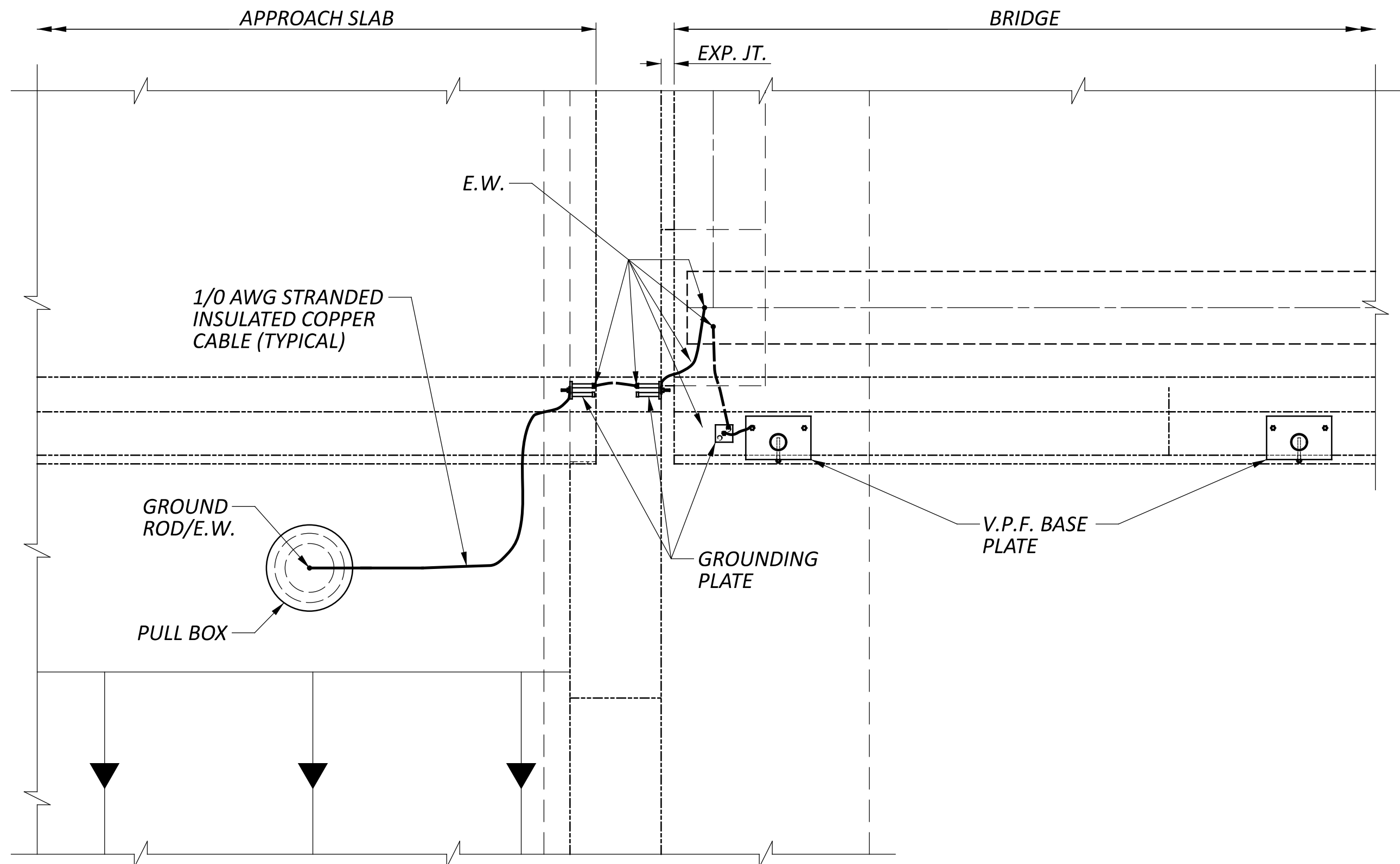


VANDAL PROTECTION FENCE (SBR OR BR-1)
ABUTMENT SUPPORTED ON MSE WALLS
(ELEVATION VIEW)

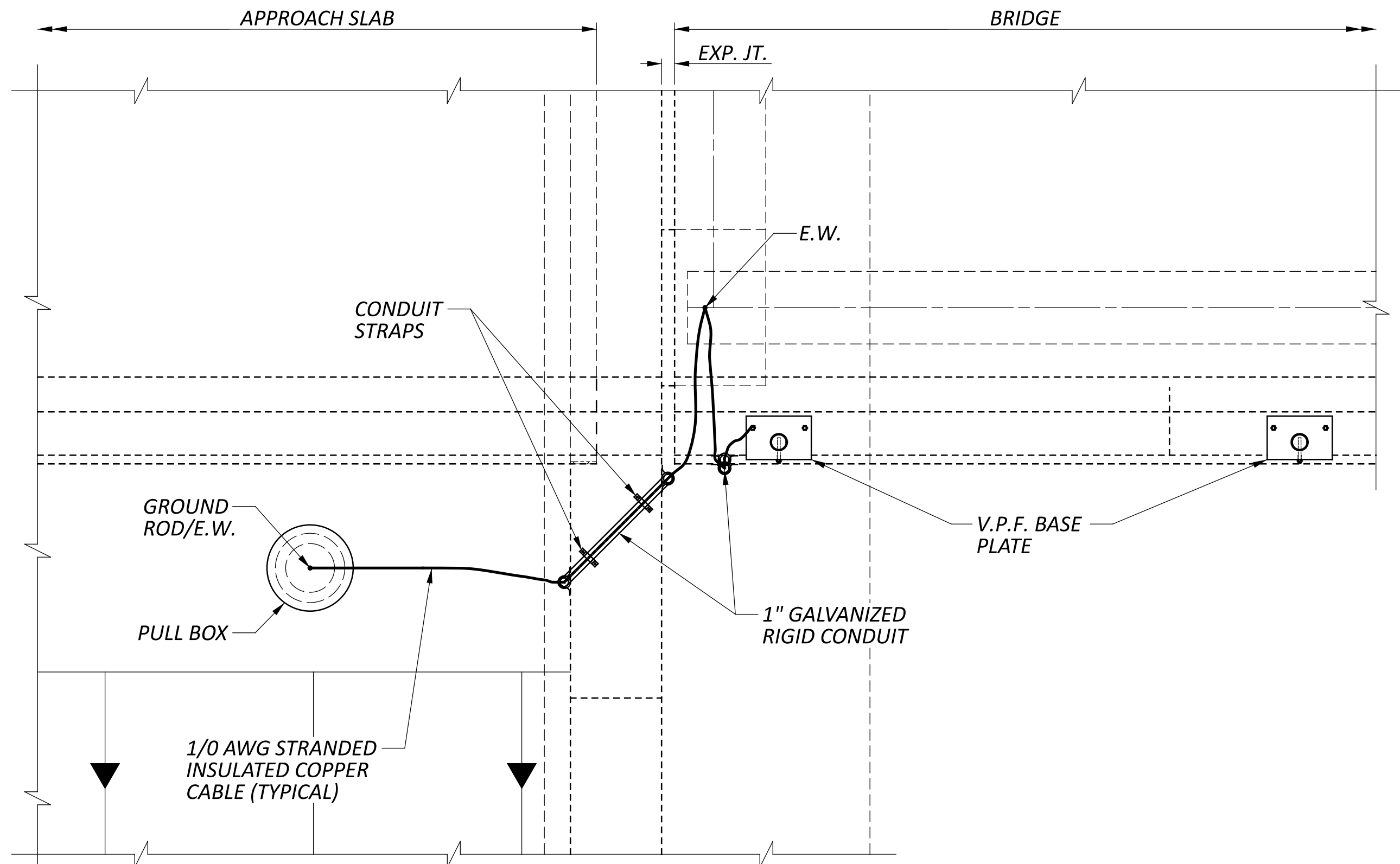
NOTES

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.
3. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO C&MS 514.22 OR C&MS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.
4. SEE STANDARD DRAWING HL-30.11 FOR PULL BOX DETAILS.

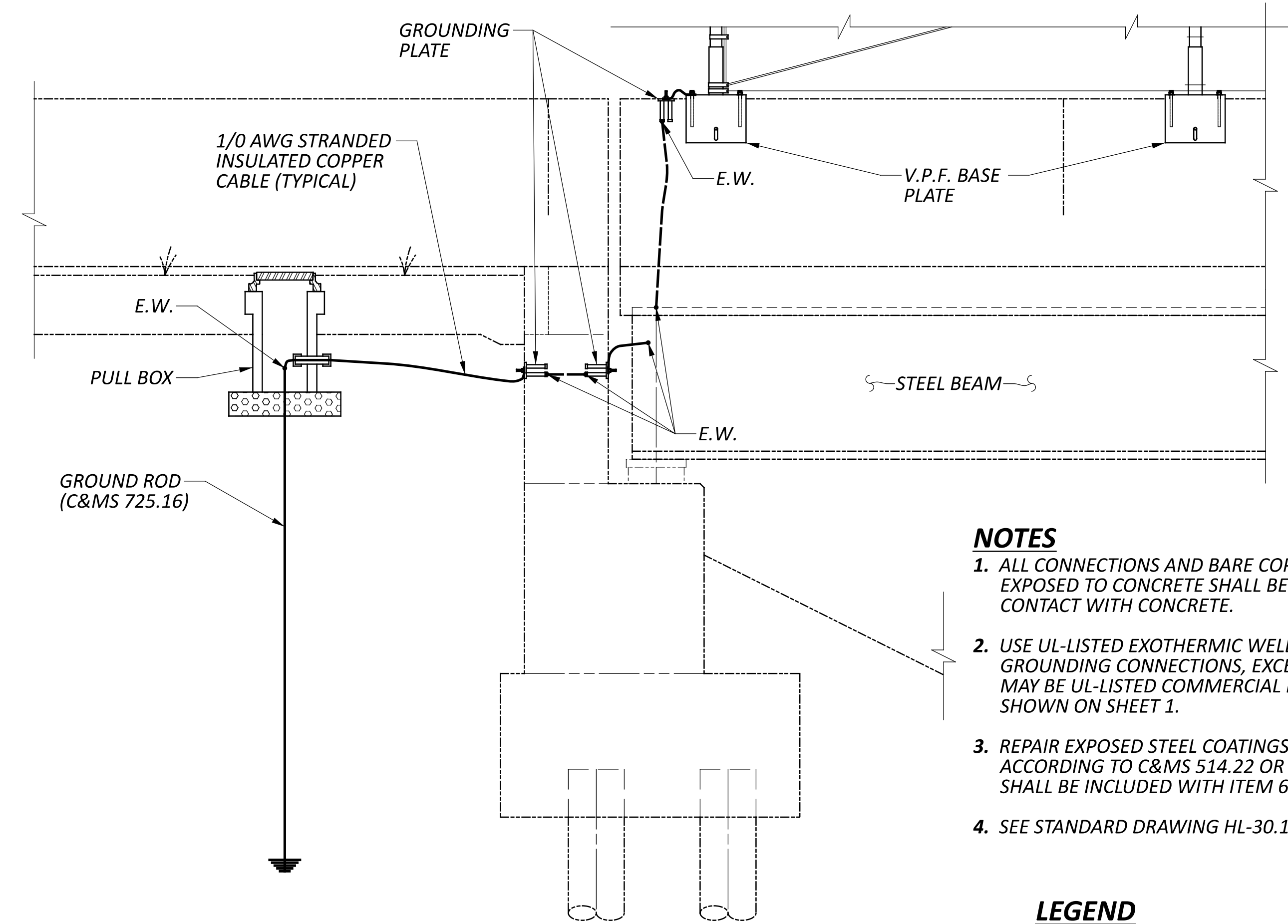




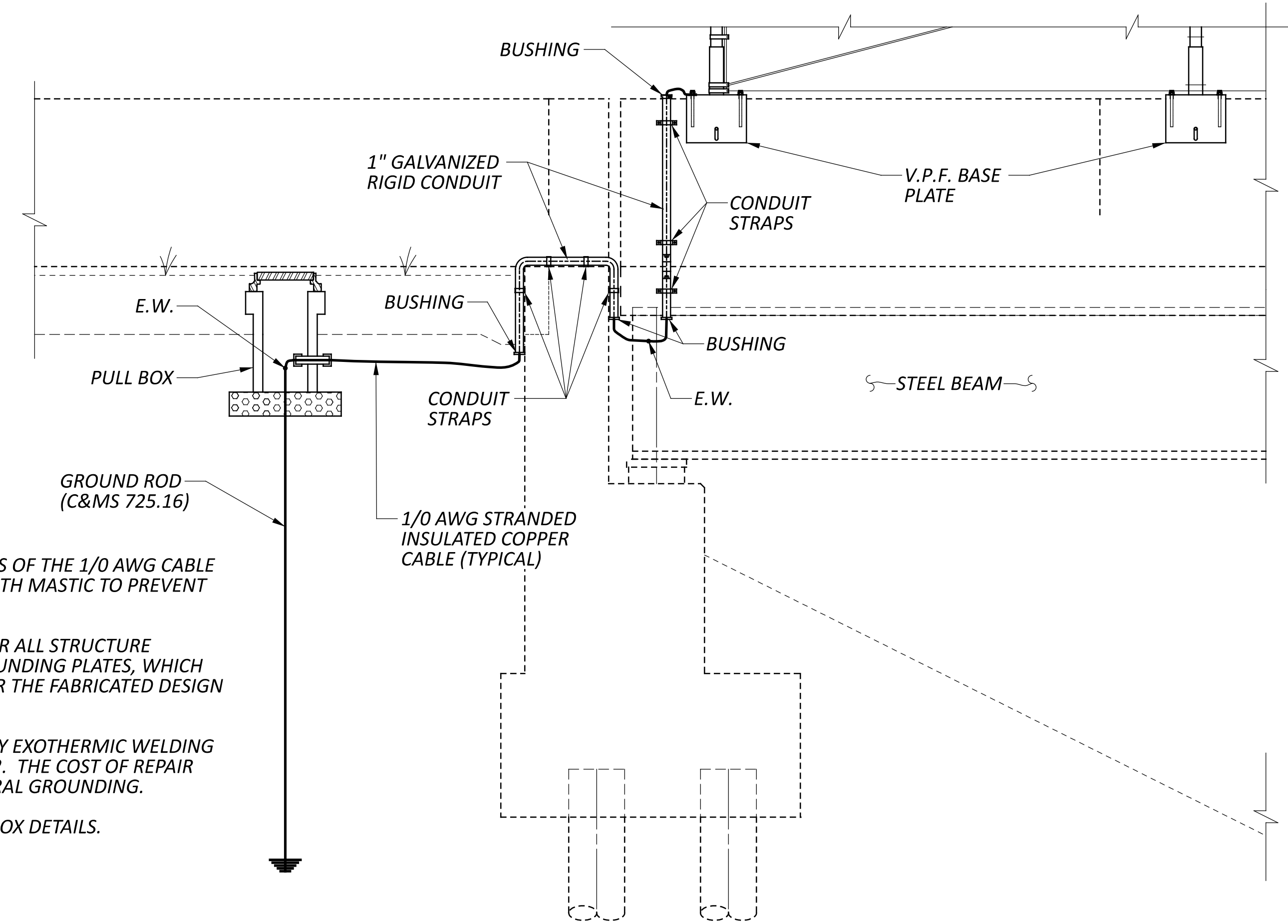
VANDAL PROTECTION FENCE (SBR OR BR-1)
ABUTMENT WITH EXPANSION JOINT AND V.P.F. SHOWN
(PLAN VIEW)



ALTERNATE METHOD OR RETROFIT
ABUTMENT WITH EXPANSION JOINT AND V.P.F. SHOWN
(PLAN VIEW)



VANDAL PROTECTION FENCE (SBR OR BR-1)
ABUTMENT WITH EXPANSION JOINT AND V.P.F. SHOWN
(ELEVATION VIEW)



ALTERNATE METHOD/RETROFIT
ABUTMENT WITH EXPANSION JOINT AND V.P.F. SHOWN
(ELEVATION VIEW)

NOTES

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.
3. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO C&MS 514.22 OR C&MS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.
4. SEE STANDARD DRAWING HL-30.11 FOR PULL BOX DETAILS.

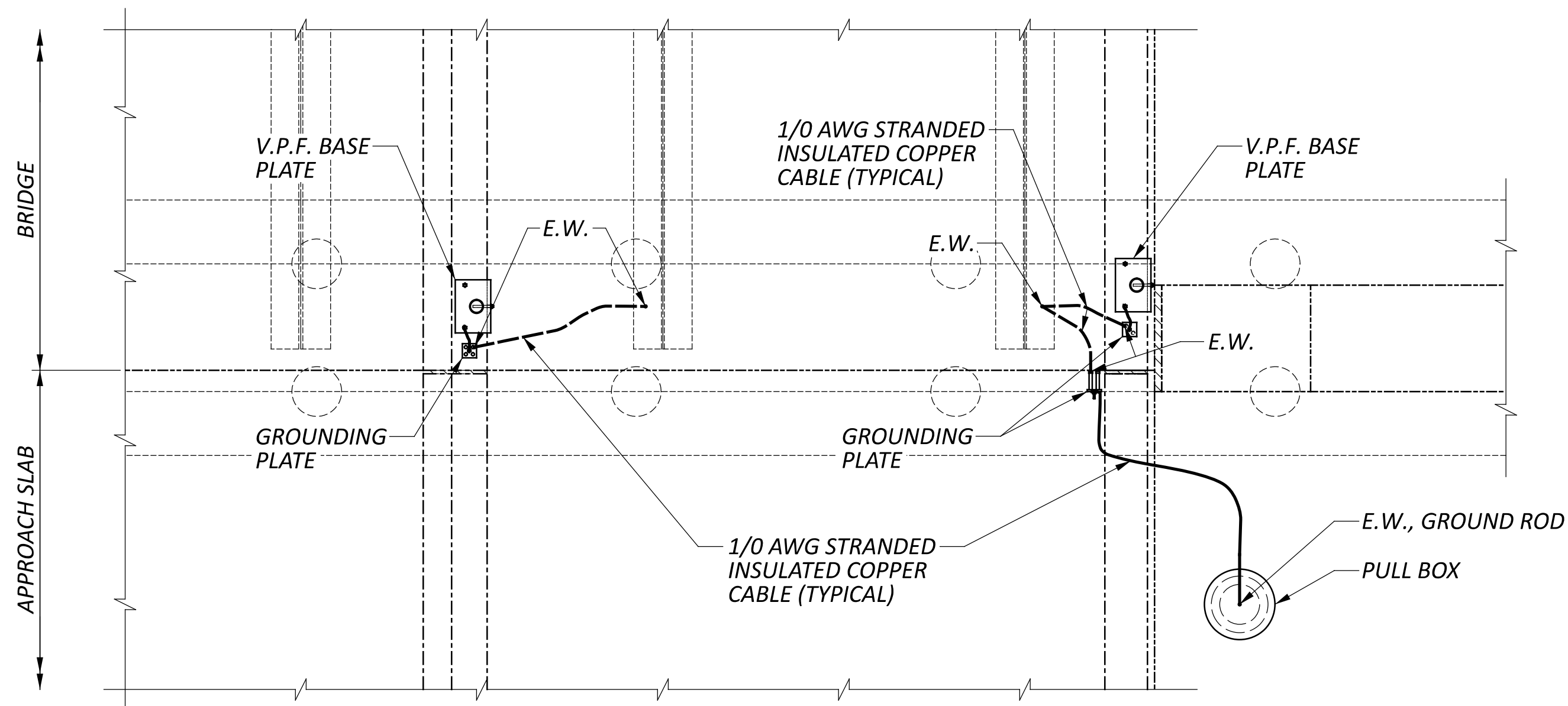
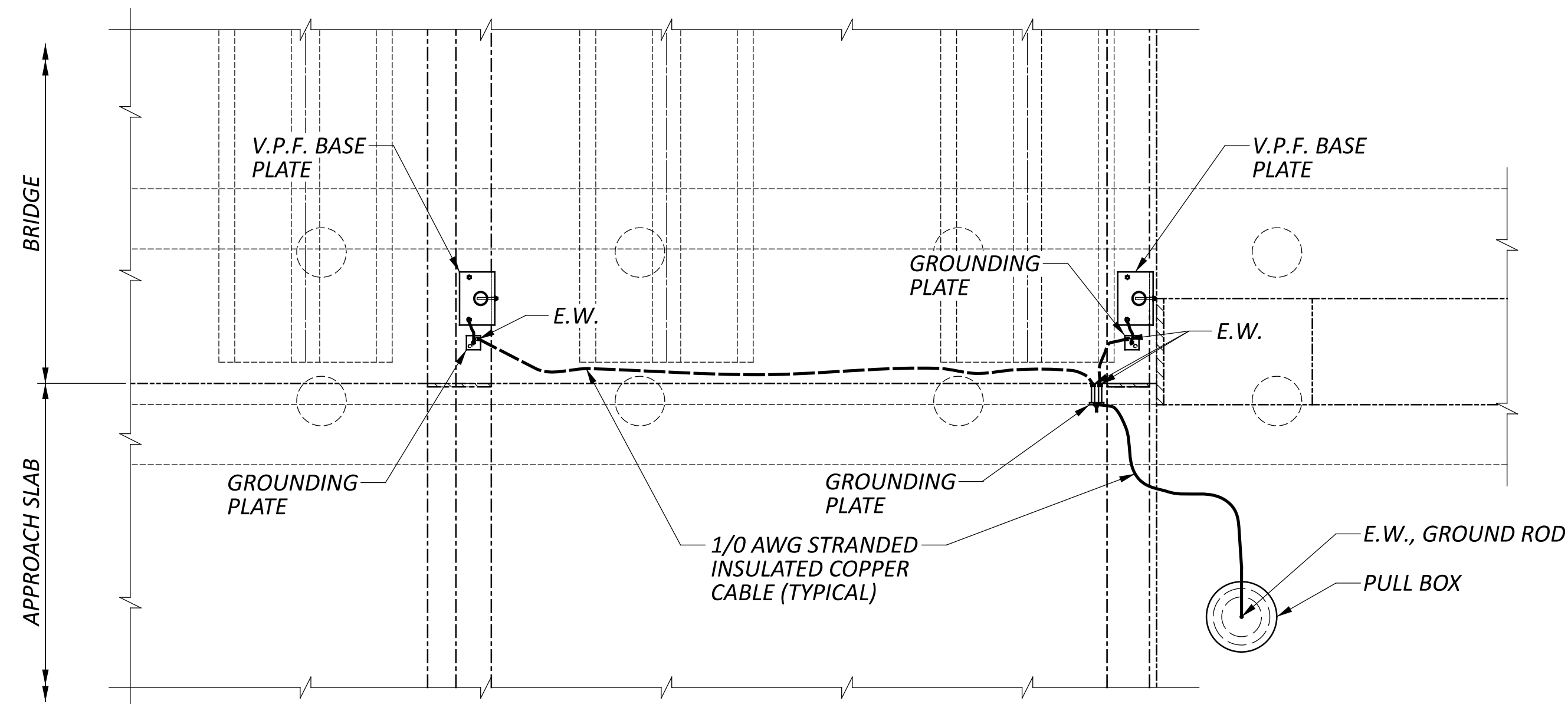
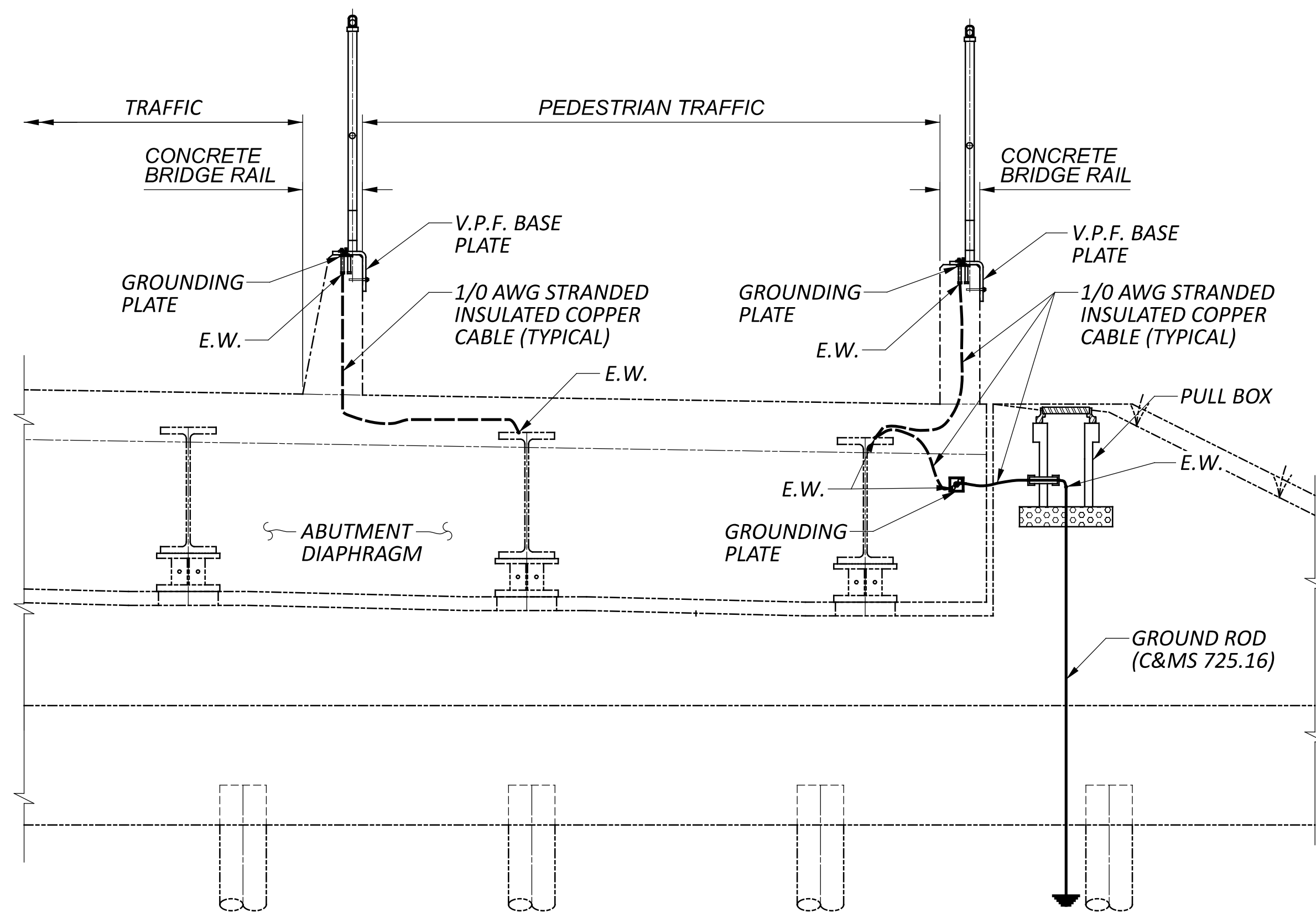
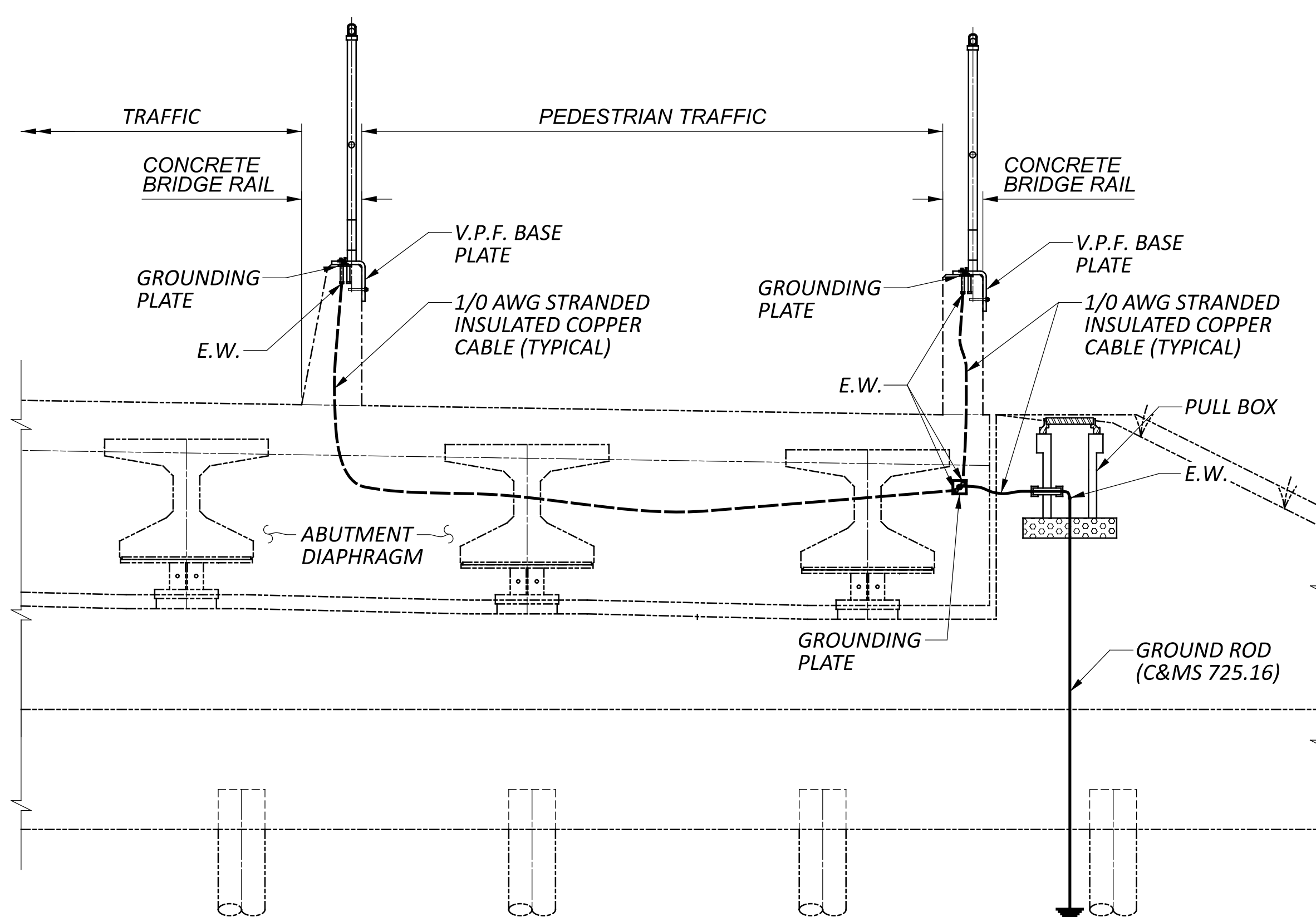
LEGEND

E.W. - EXOTHERMICALLY WELDED

V.P.F. - VANDAL PROTECTION FENCE

--- 1/0 AWG STRANDED INSULATED COPPER CABLE
EMBEDDED IN CONCRETE



**VANDAL PROTECTION FENCE (SHARED USE PATH)**STEEL BEAM BRIDGE AT ABUTMENT
(PLAN VIEW)**VANDAL PROTECTION FENCE (SHARED USE PATH)**PRESTRESSED CONCRETE I-BEAM BRIDGE AT ABUTMENT
(PLAN VIEW)**VANDAL PROTECTION FENCE (SHARED USE PATH)**STEEL BEAM BRIDGE AT ABUTMENT
(ELEVATION VIEW)**VANDAL PROTECTION FENCE (SHARED USE PATH)**PRESTRESSED CONCRETE I-BEAM BRIDGE AT ABUTMENT
(ELEVATION VIEW)**NOTES**

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.

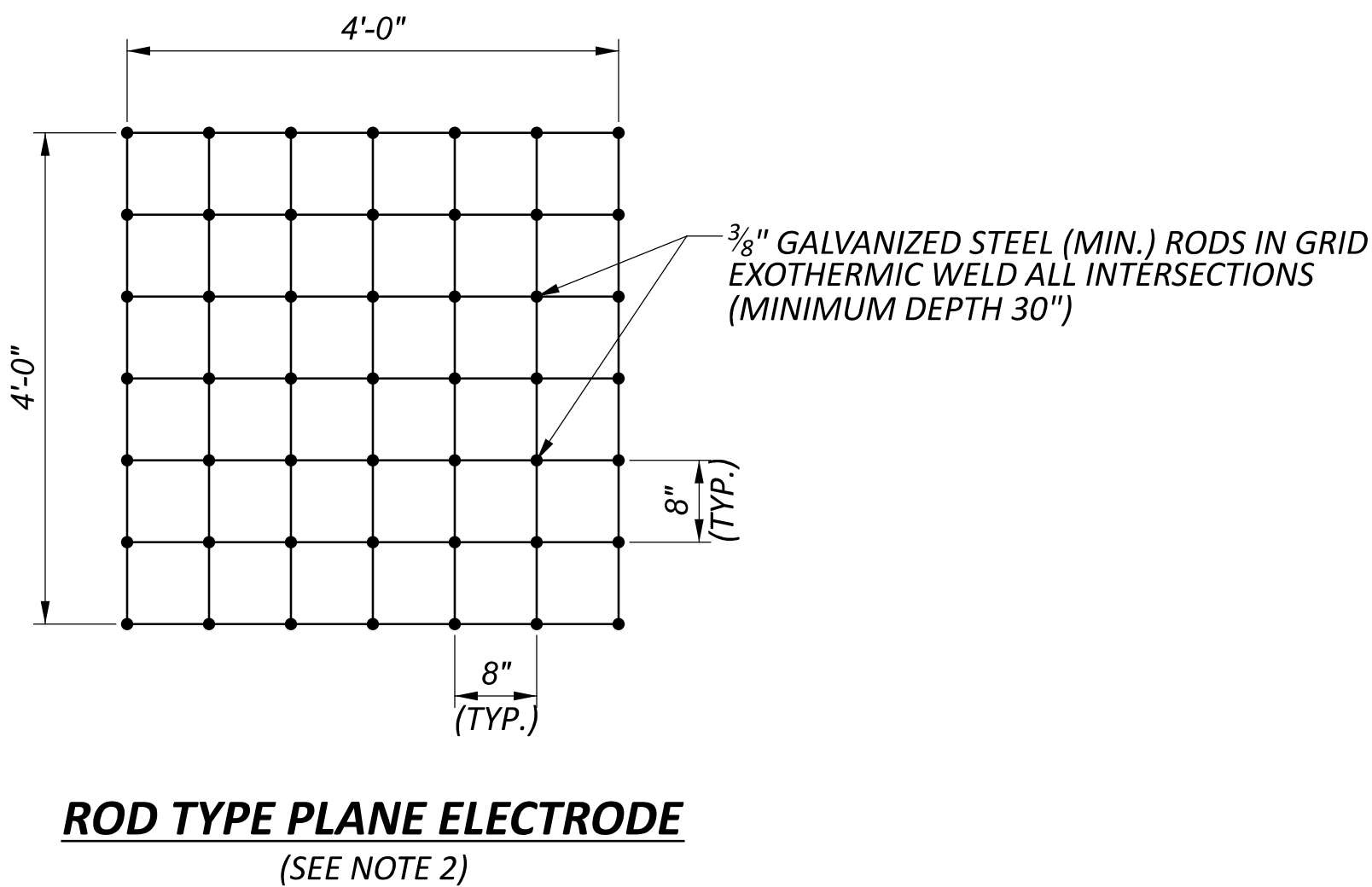
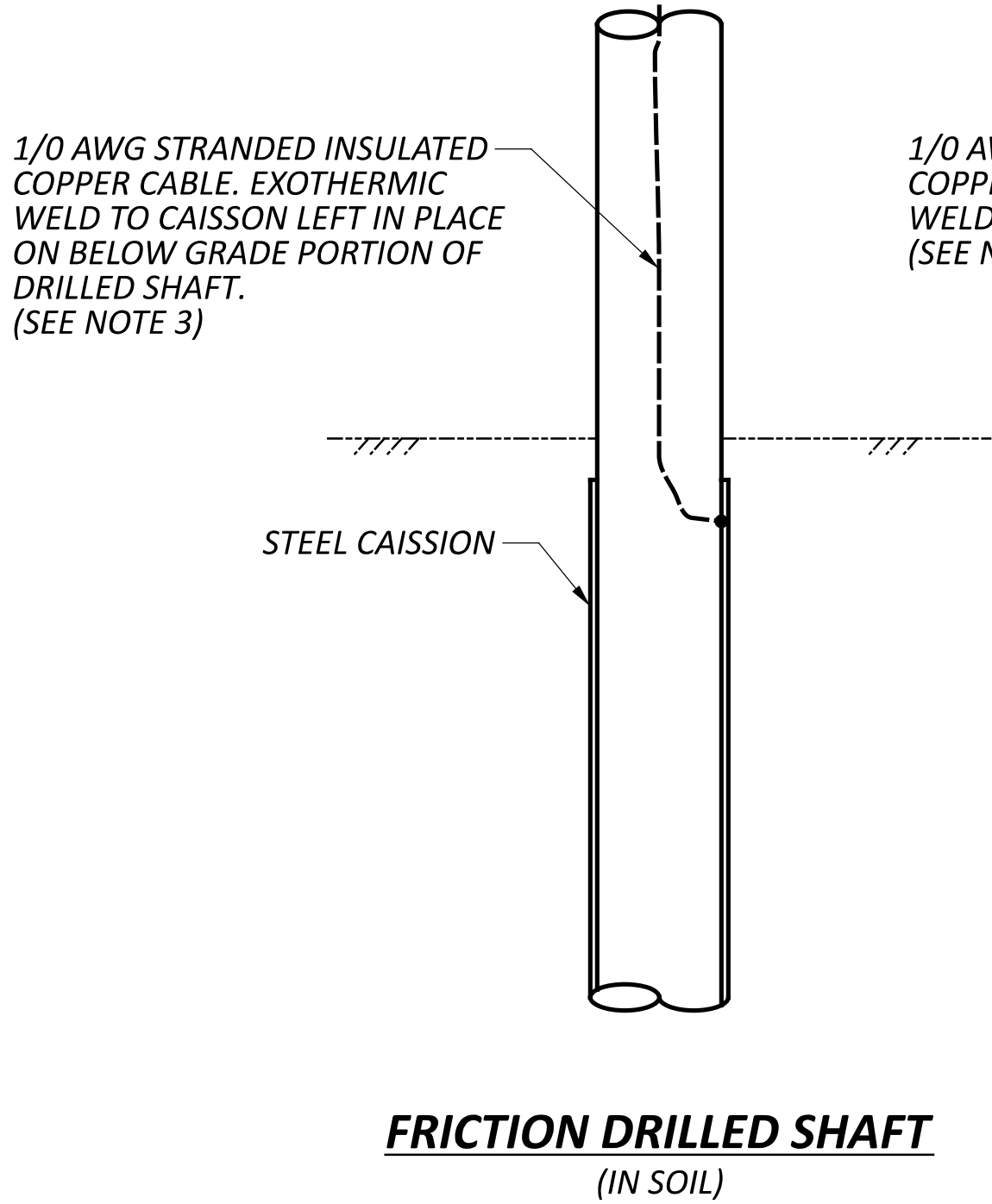
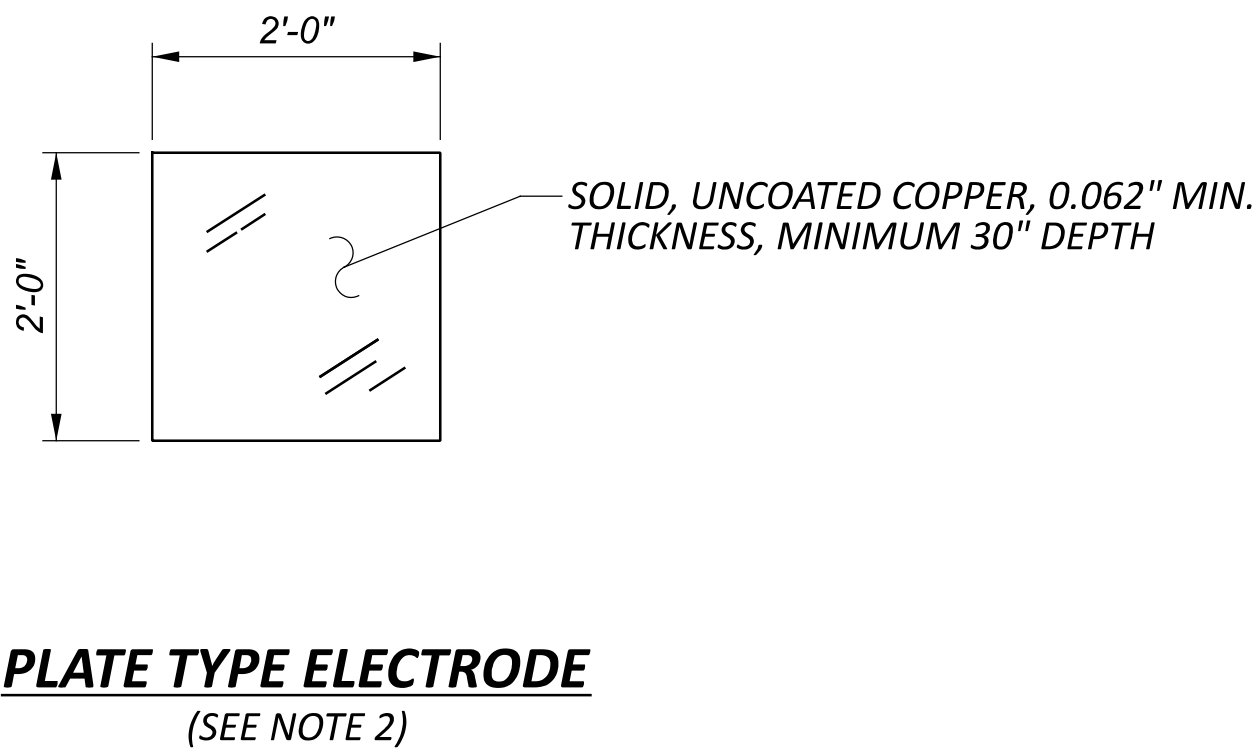
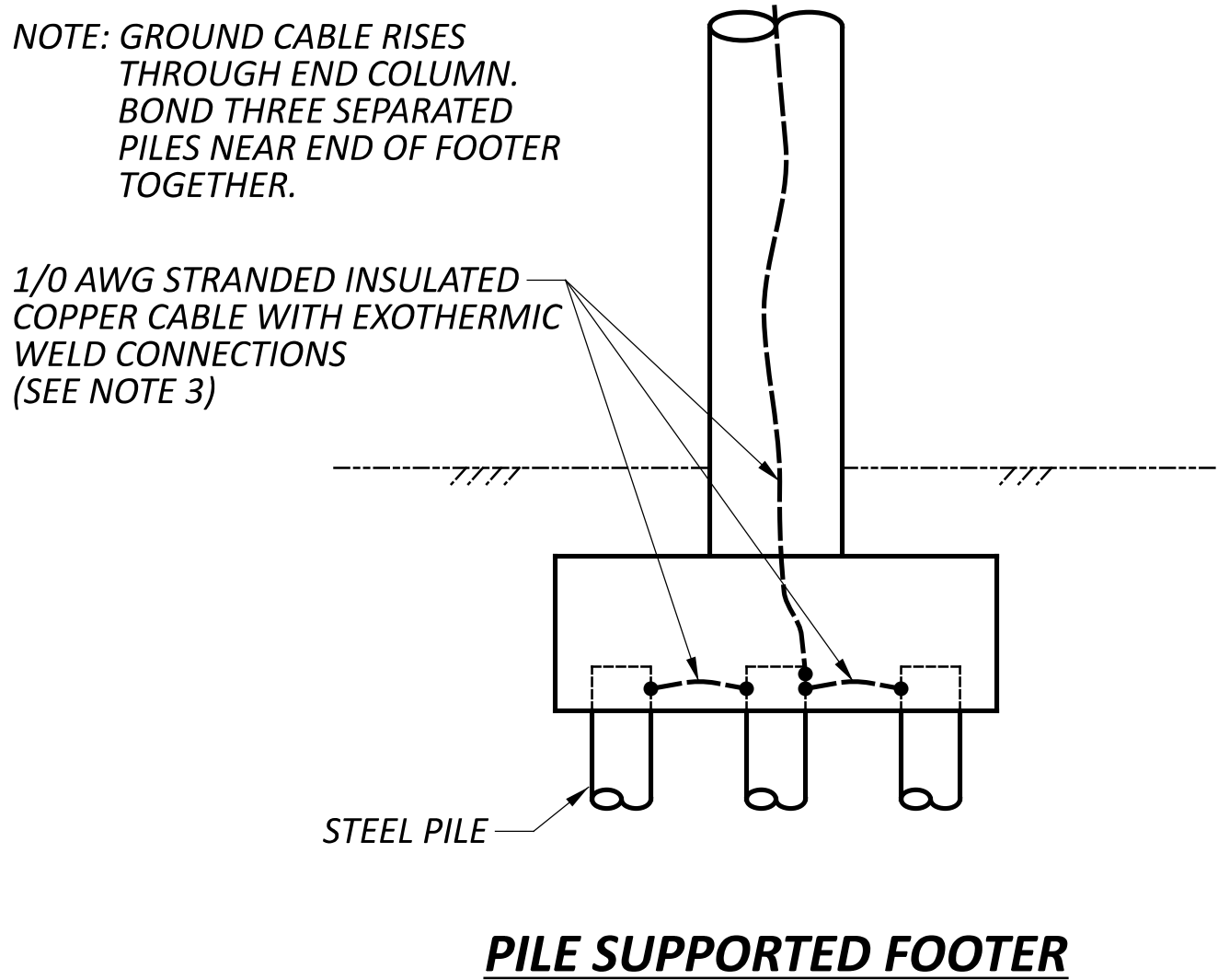
3. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO C&MS 514.22 OR C&MS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.
4. SEE STANDARD DRAWING HL-30.11 FOR PULL BOX DETAILS.

LEGEND

E.W. - EXOTHERMICALLY WELDED

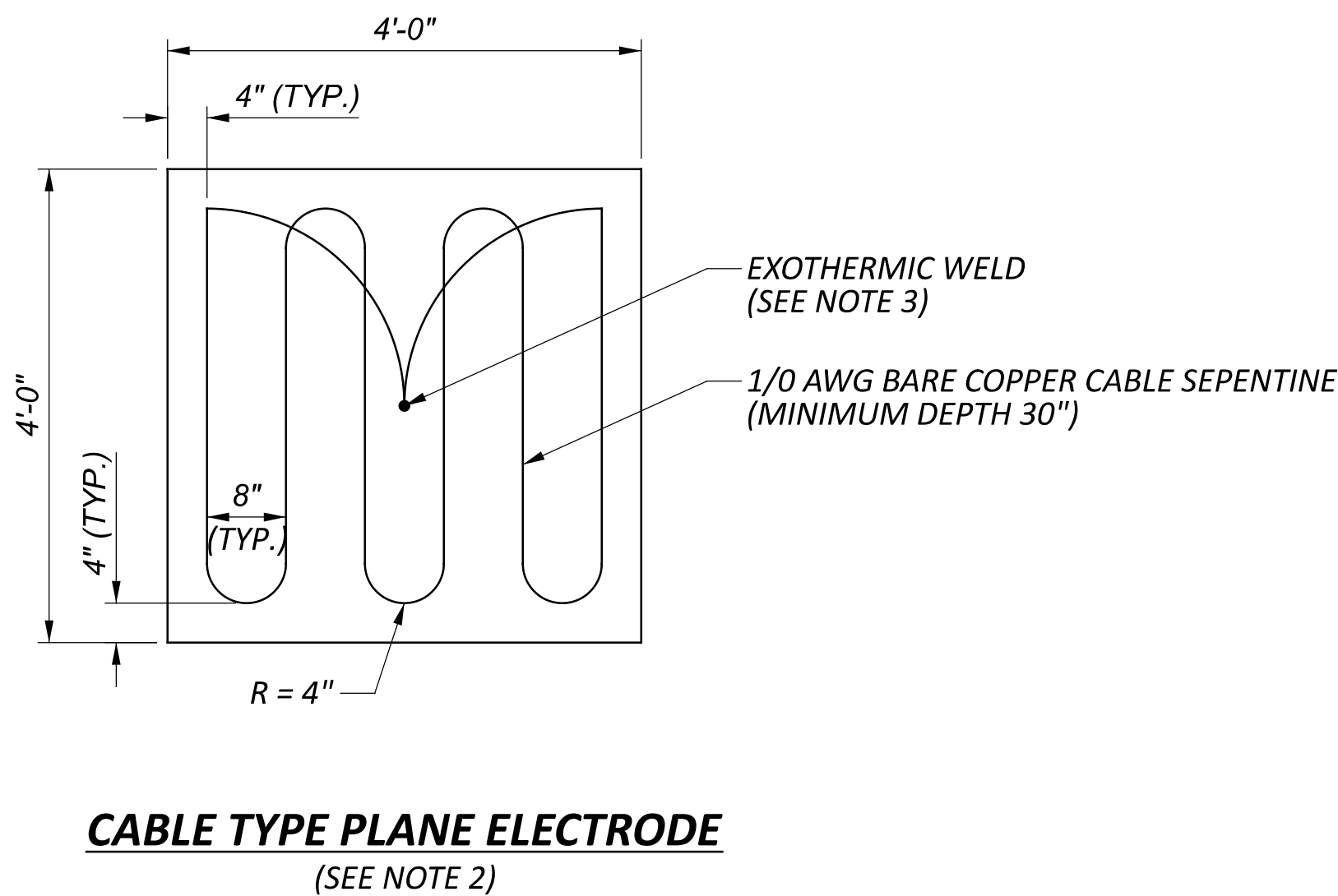
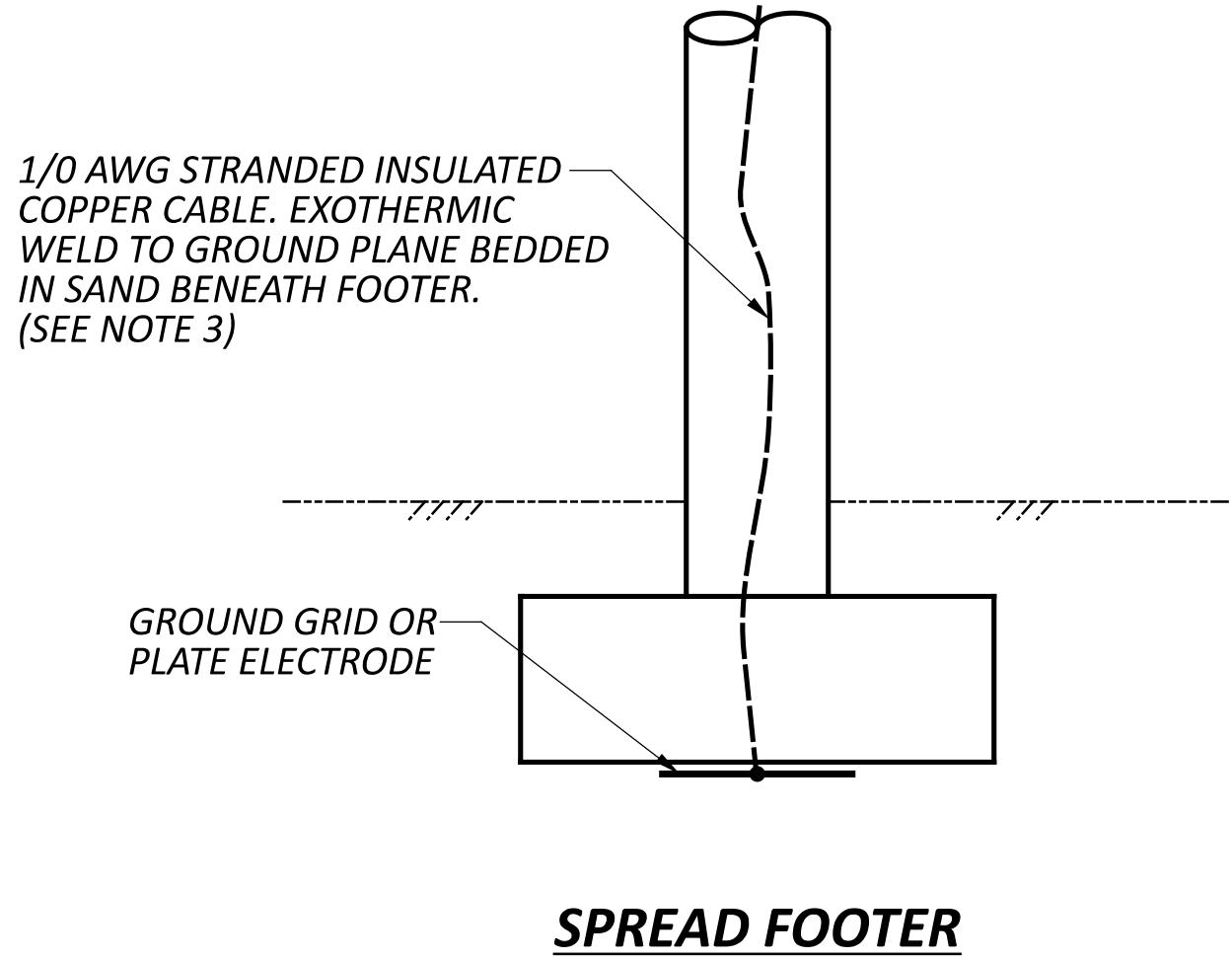
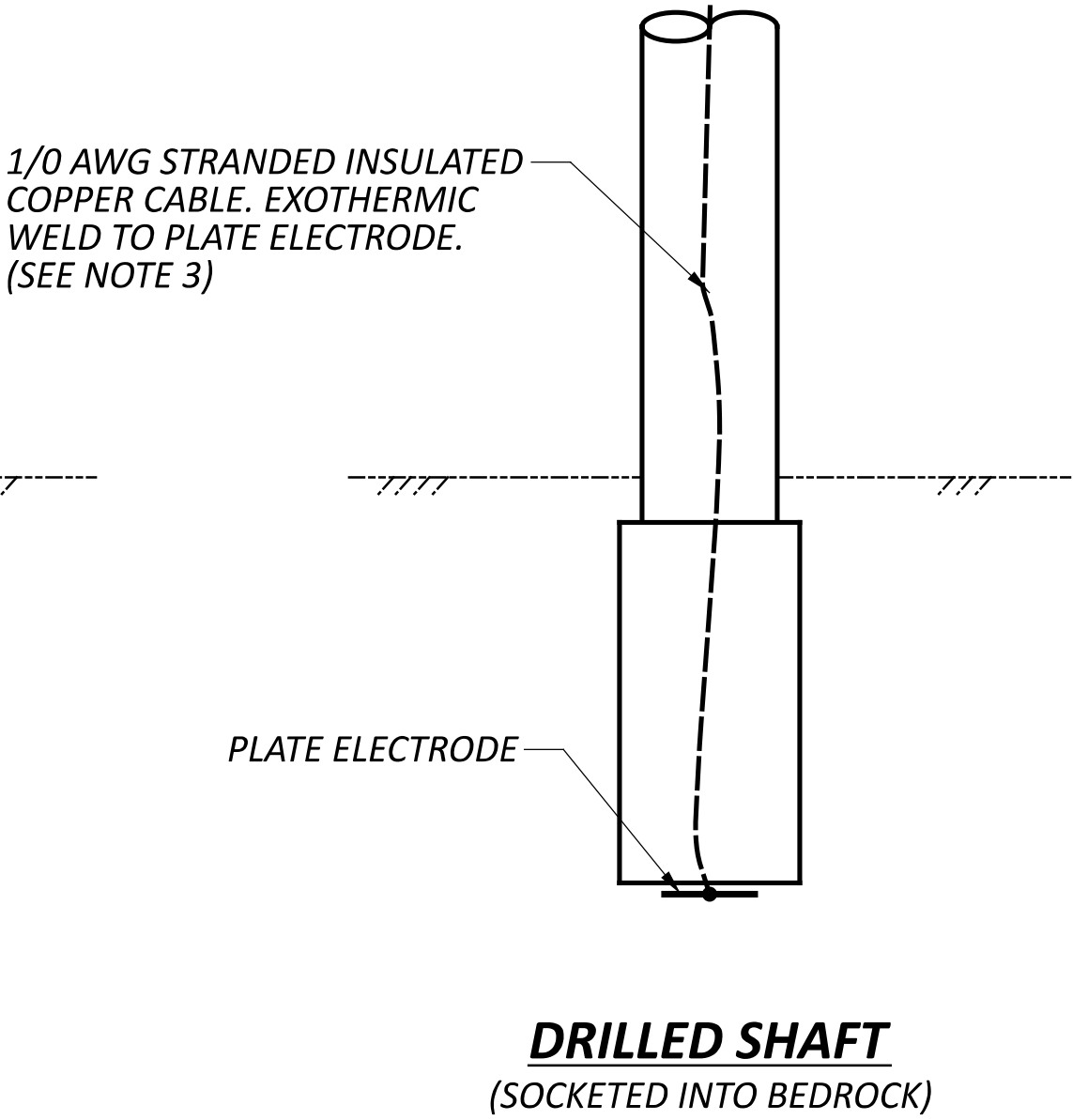
V.P.F. - VANDAL PROTECTION FENCE

--- - 1/0 AWG STRANDED INSULATED COPPER CABLE
EMBEDDED IN CONCRETE



LEGEND

----- - 1/0 AWG STRANDED INSULATED COPPER CABLE EMBEDDED IN CONCRETE



- NOTES**
1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
 2. INSTALLATION OF PLANE-TYPE AND PLATE-TYPE ELECTRODES IN DRY AREAS AND UNDER PAVEMENTS REQUIRES THE USE OF SOIL GROUND ENHANCEMENT MATERIAL, INCIDENTAL TO THE STRUCTURAL GROUNDING ITEM.
 3. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHERE A UL-LISTED DEVICE IS OPTIONAL.

REVISIONS	
07-18-2025	
07-15-2022	
01-15-2021	
04-17-2020	
01-18-2019	
07-20-2018	
01-19-2018	
07-21-2017...	

STDS ENGINEER
Duemmel

STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR

Adam Koenig

STRUCTURE GROUNDING

DESIGN AGENCY



SCD NUMBER
HL-50.21

SHEET	TOTAL
P.8	10

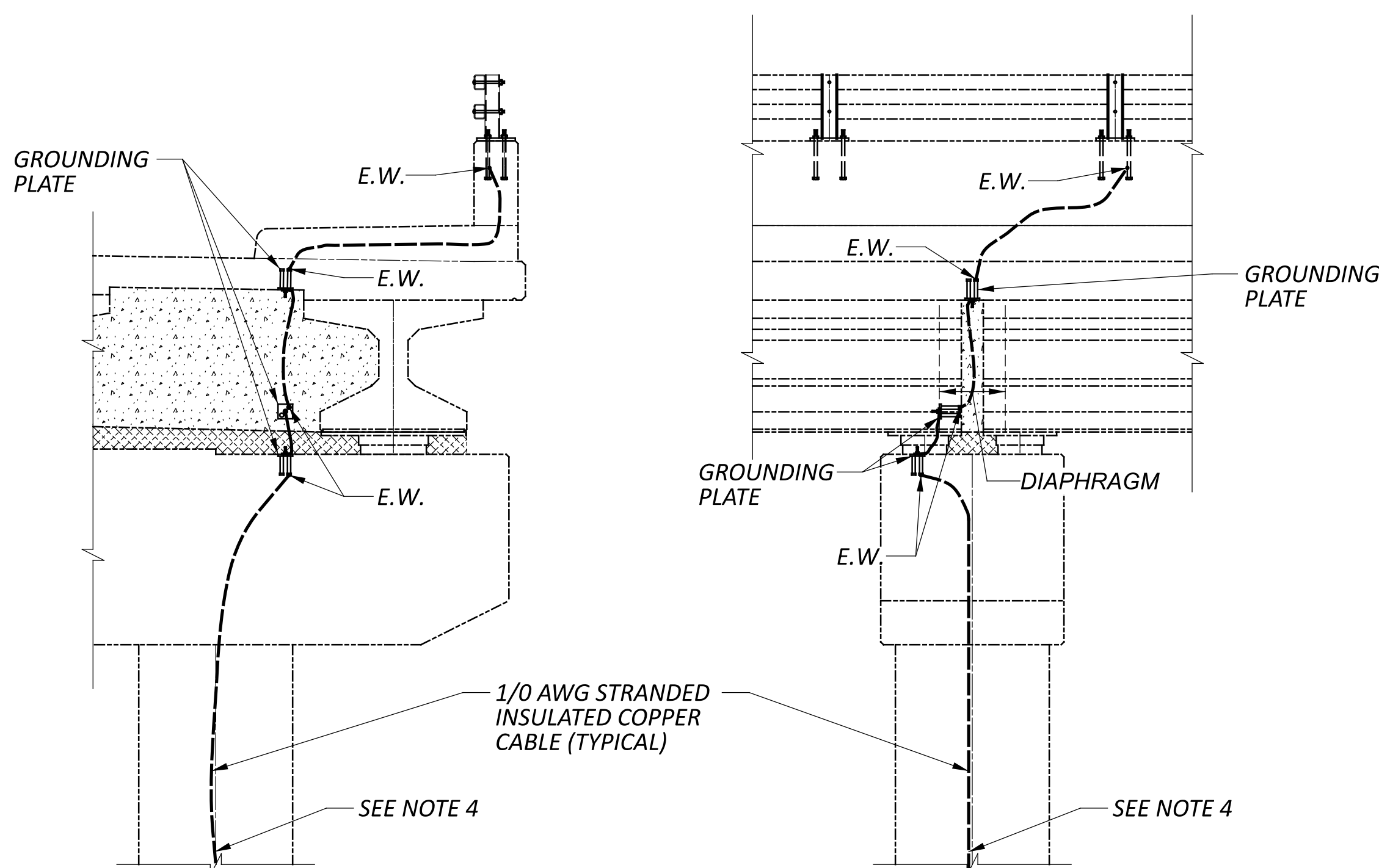
NOTES

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.
3. WHEN EXOTHERMICALLY WELDING ANCHOR BOLTS, ALWAYS GROUND ANCHOR BOLTS ON THE ROADWAY SIDE DOWNSTREAM OF ADJACENT TRAFFIC. IDENTIFY THE GROUNDED BOLT WITH A LIGHT COAT OF RED, WEATHER-RESISTANT PAINT ON THE EXPOSED END.

4. SEE SHEET 8 FOR CONNECTING THE GROUNDING CABLE IN THE PIER FOOTING OR DEEP FOUNDATION.
5. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO CMS 514.22 OR CMS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.

LEGEND

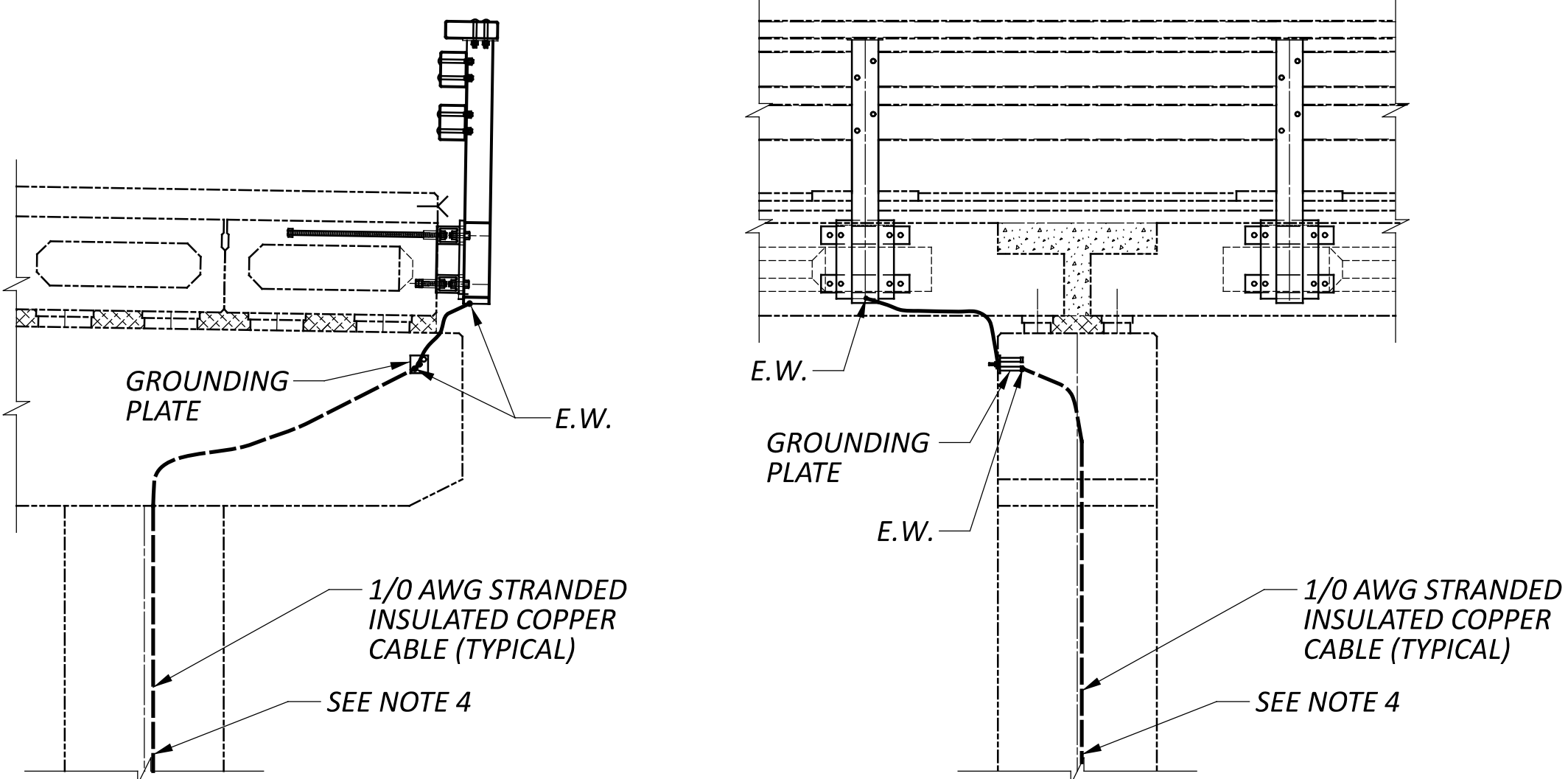
E.W. - EXOTHERMICALLY WELDED
V.P.F. - VANDAL PROTECTION FENCE
--- - 1/0 AWG STRANDED INSULATED COPPER CABLE EMBEDDED IN CONCRETE

**BRIDGE SIDEWALK RAILING (BR-2)**

PRESTRESSED CONCRETE I-BEAM
ON CAP AND COLUMN PIER
(PIER TRANSVERSE VIEW)

BRIDGE SIDEWALK RAILING (BR-2)

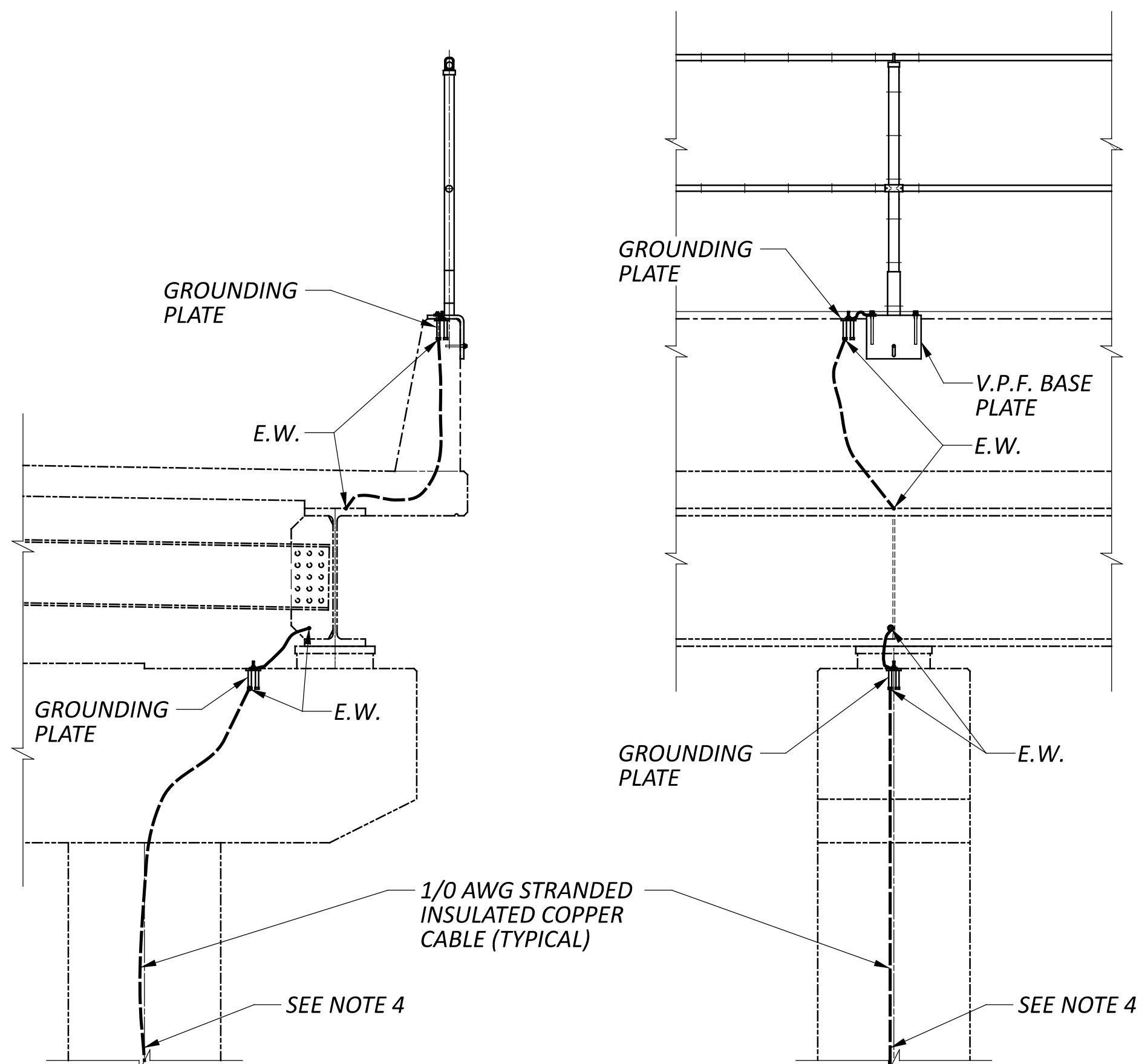
PRESTRESSED CONCRETE I-BEAM
ON CAP AND COLUMN PIER
(PIER ELEVATION VIEW)

**BRIDGE RAILING (TST-2)**

PRESTRESSED CONCRETE BOX BEAM
ON CAP AND COLUMN PIER
(PIER TRANSVERSE VIEW)

BRIDGE RAILING (TST-2)

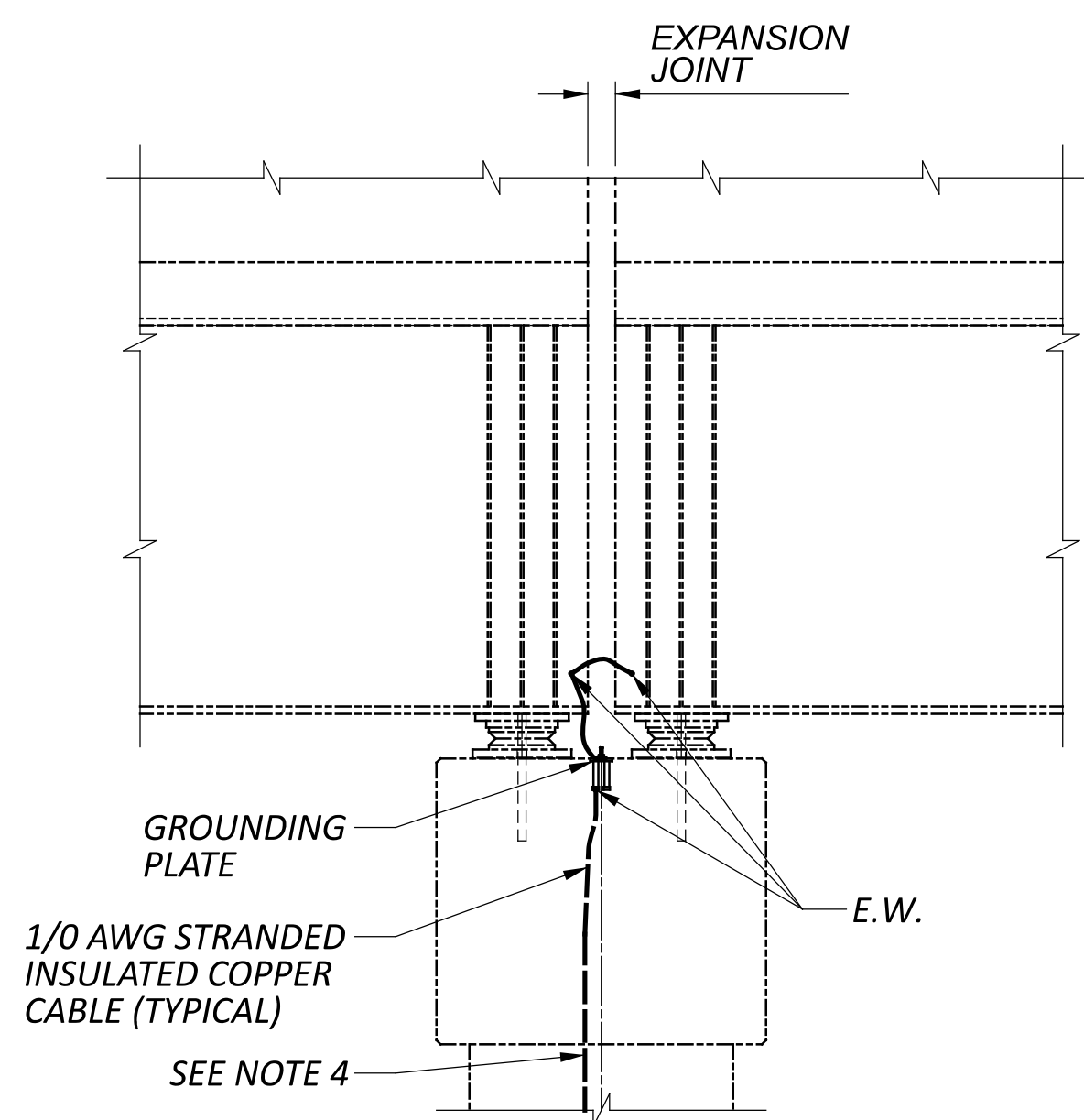
PRESTRESSED CONCRETE BOX BEAM
ON CAP AND COLUMN PIER
(PIER ELEVATION VIEW)

**V.P.F. (SBR OR BR-1)**

CONTINUOUS STEEL I-BEAM
ON CAP AND COLUMN PIER
(PIER TRANSVERSE VIEW)

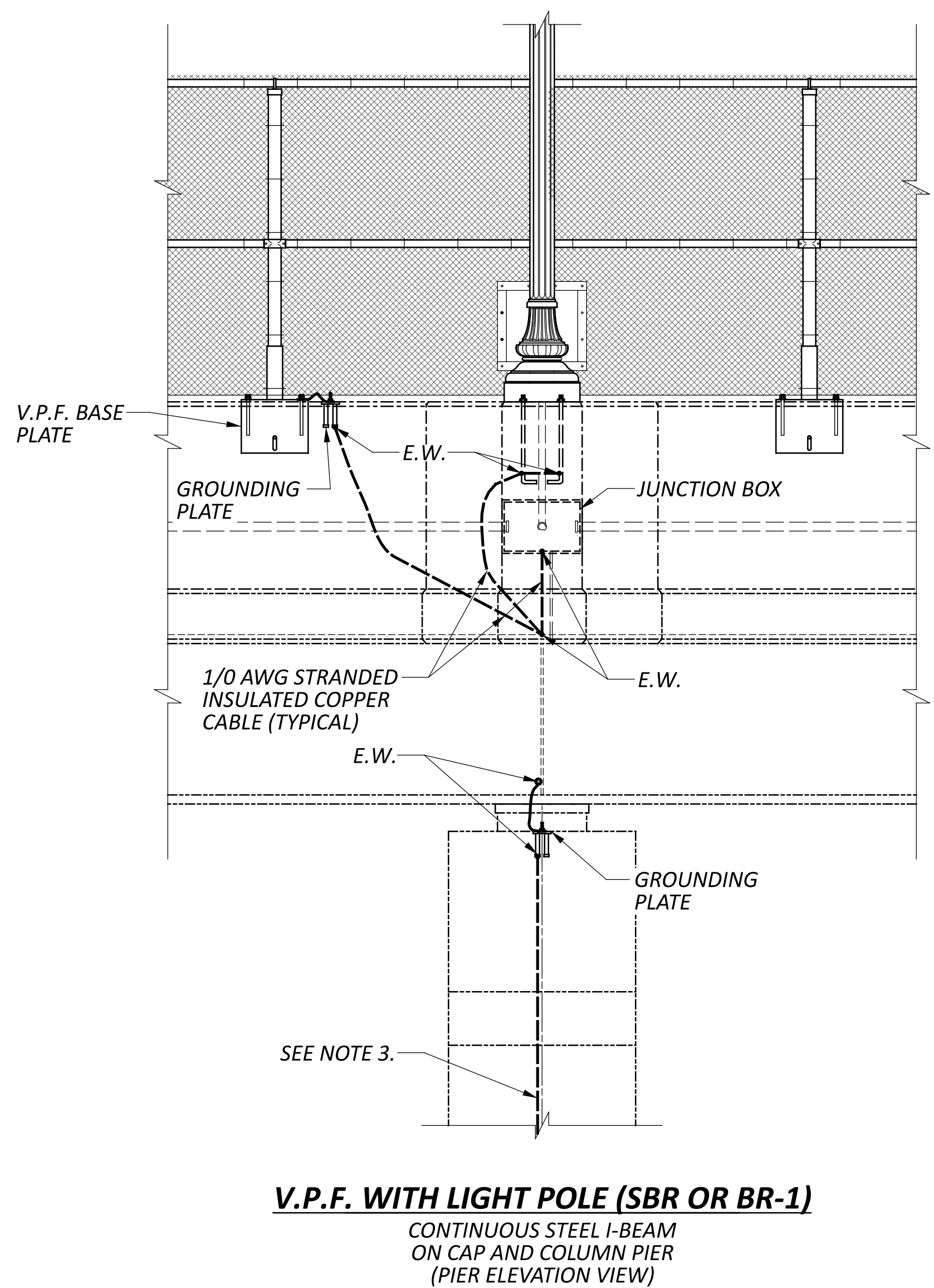
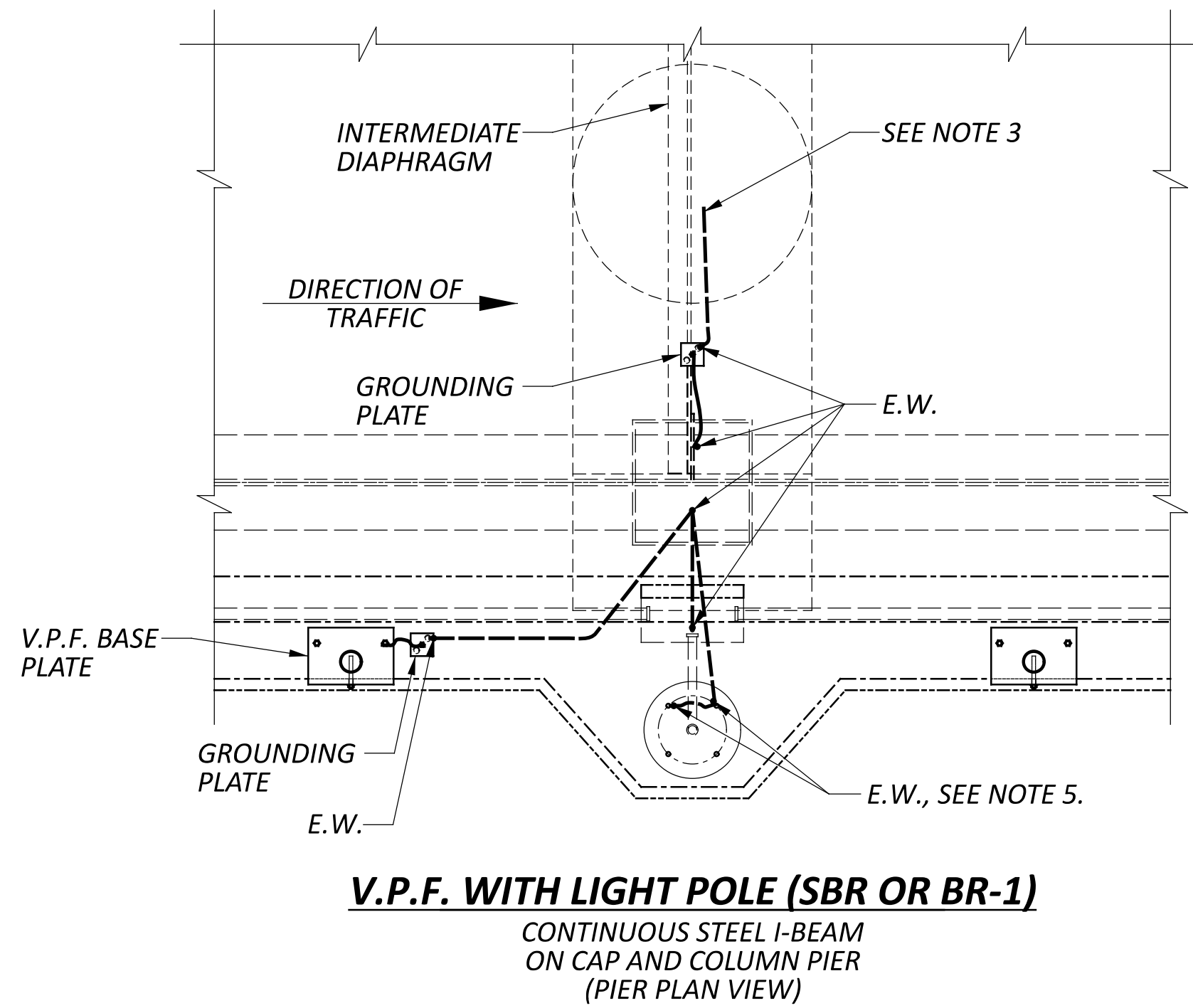
V.P.F. (SBR OR BR-1)

CONTINUOUS STEEL I-BEAM
ON CAP AND COLUMN PIER
(PIER ELEVATION VIEW)

**STEEL GIRDER/BEAM CONTINUITY**

STEEL GIRDER
INTERMEDIATE EXPANSION JOINT
(PIER ELEVATION VIEW)



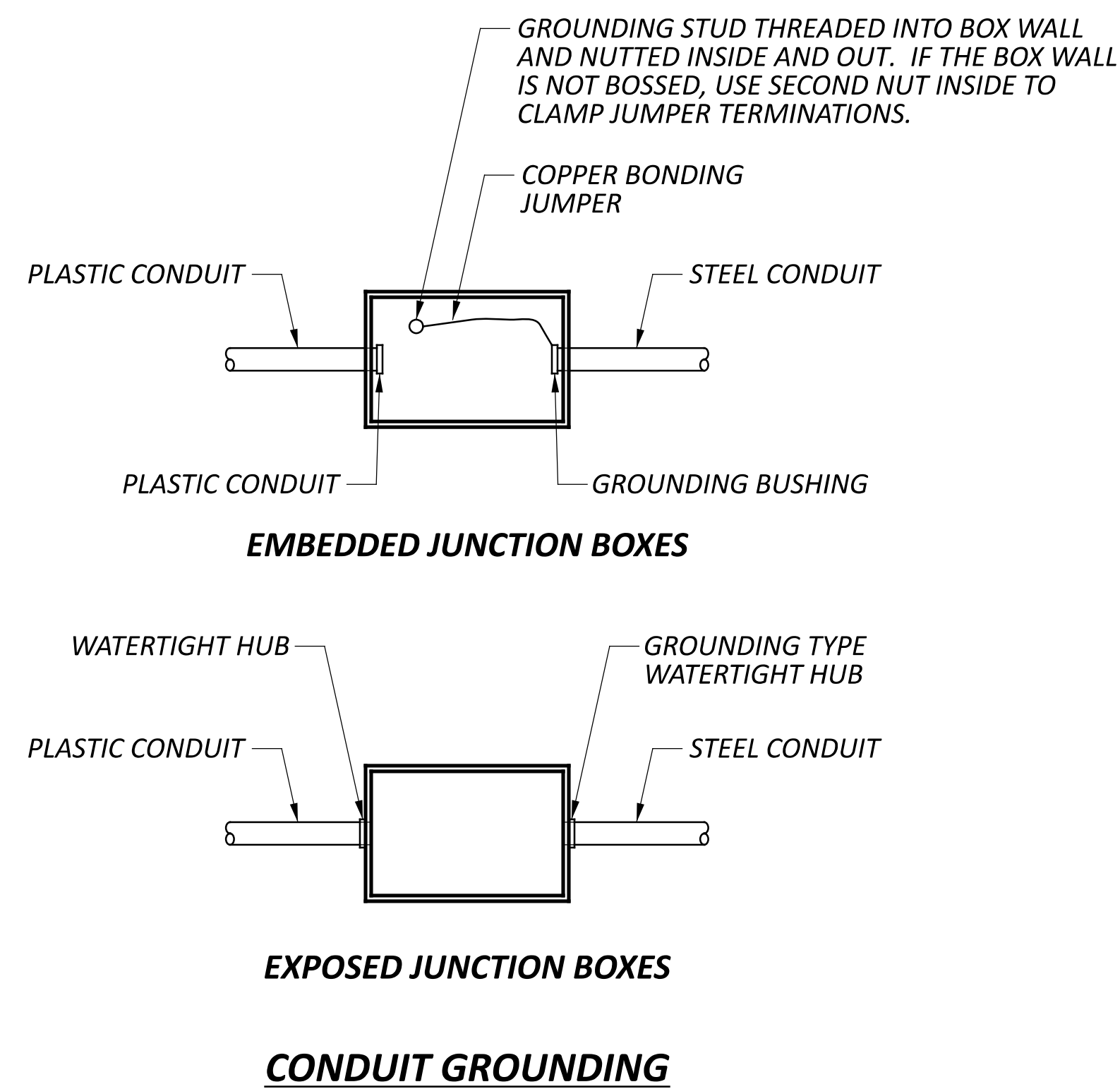
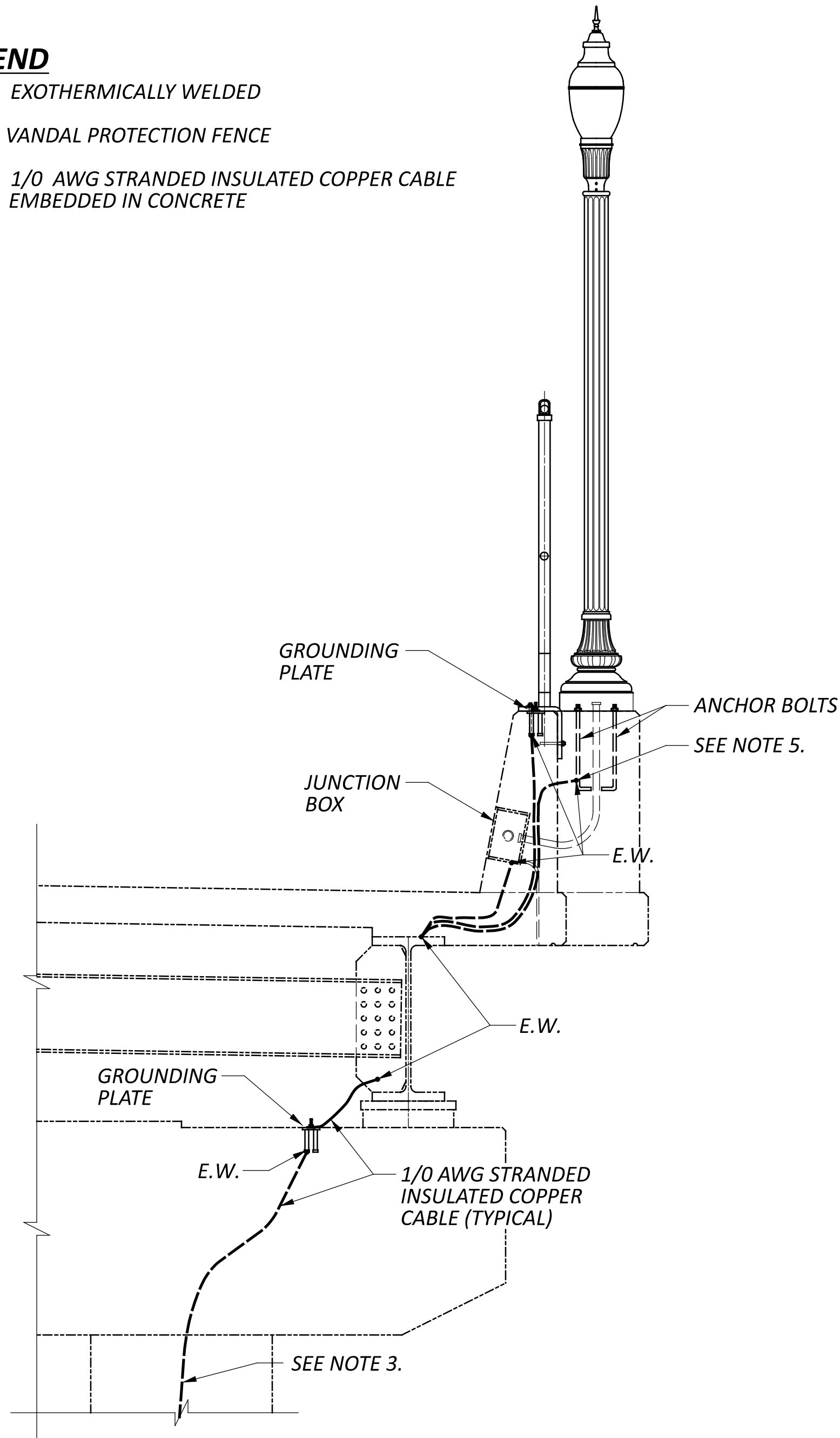
**NOTES**

1. ALL CONNECTIONS AND BARE COPPER STRANDS OF THE 1/0 AWG CABLE EXPOSED TO CONCRETE SHALL BE COVERED WITH MASTIC TO PREVENT CONTACT WITH CONCRETE.
2. USE UL-LISTED EXOTHERMIC WELD DEVICES FOR ALL STRUCTURE GROUNDING CONNECTIONS, EXCEPT FOR GROUNDING PLATES, WHICH MAY BE UL-LISTED COMMERCIAL PRODUCTS OR THE FABRICATED DESIGN SHOWN ON SHEET 1.
3. SEE SHEET 8 FOR CONNECTING THE GROUNDING CABLE IN THE PIER FOOTING OR DEEP FOUNDATION.
4. REPAIR EXPOSED STEEL COATINGS DAMAGED BY EXOTHERMIC WELDING ACCORDING TO CMS 514.22 OR CMS 711.02. THE COST OF REPAIR SHALL BE INCLUDED WITH ITEM 625 STRUCTURAL GROUNDING.
5. ALWAYS GROUND LIGHT POLE, SIGNAL SUPPORT, AND SIGN SUPPORT ANCHOR BOLTS ON THE ROADWAY SIDE DOWNSTREAM OF ADJACENT TRAFFIC. IDENTIFY THE GROUNDED BOLT WITH A LIGHT COAT OF RED, WEATHER-RESISTANT PAINT ON THE EXPOSED END. GROUND ONE ADDITIONAL ANCHOR BOLT FOR LIGHT POLES.
6. SEE STANDARD DRAWING HL-20.14 FOR ADDITIONAL LIGHT POLE PILASTER AND JUNCTION BOX DETAILS.

LEGEND

E.W. - EXOTHERMICALLY WELDED

V.P.F. - VANDAL PROTECTION FENCE

--- 1/0 AWG STRANDED INSULATED COPPER CABLE
EMBEDDED IN CONCRETE



Odd Numbered Pole Shown. For Even Numbered Poles, Reverse L1 and L2 on Both the Lighting Circuit and the Outlet Circuit.

If specified, lighting loads may be wired L1-L2 (240V L-L), with a Neutral wire required only for the Outlet.

NOTES:

1. *GFCI outlet must be UL-listed for damp locations, per NEC Article 406. The "WR" label must be visible on the outlet face.*
2. *Wiring diagram shows two optional branch circuits with alternating L2 Lighting and L2 Outlet energized conductors. These shall be installed only if called for by Plan Note; the standard construction uses only L1 Lighting and L1 Outlet to each pole.*
3. *Photocell control of light poles with festoon outlets shall be at the standard control center unless luminaire-mounted photocells are called for by the Plan Note. The festoon outlet circuits shall not be photocell controlled unless such operation is called for by Plan Note.*

REVISIONS

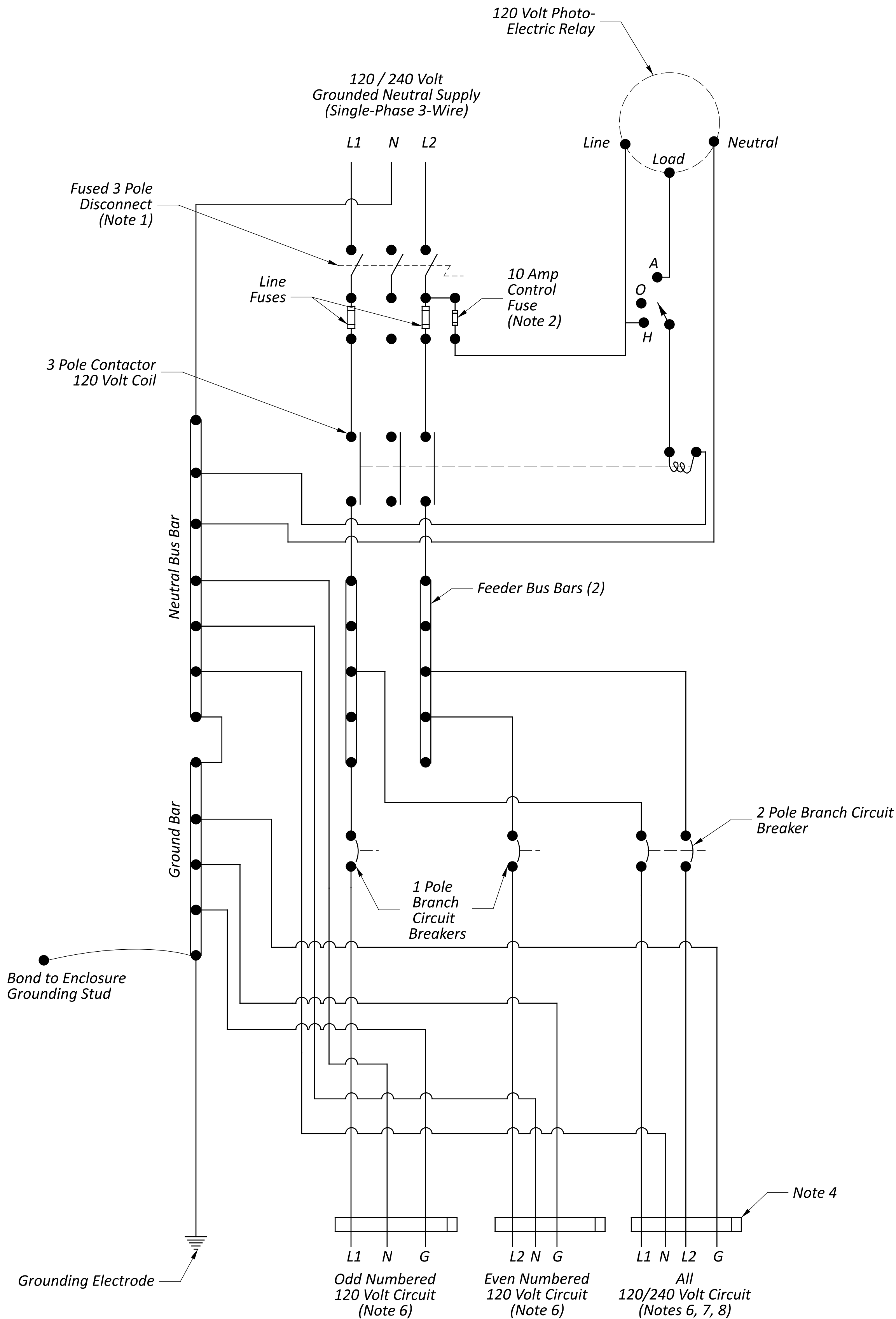
01-16-2026
07-21-2023
07-16-2021
01-15-2021
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10-21-2011

STDS ENGINEER
Duemmel

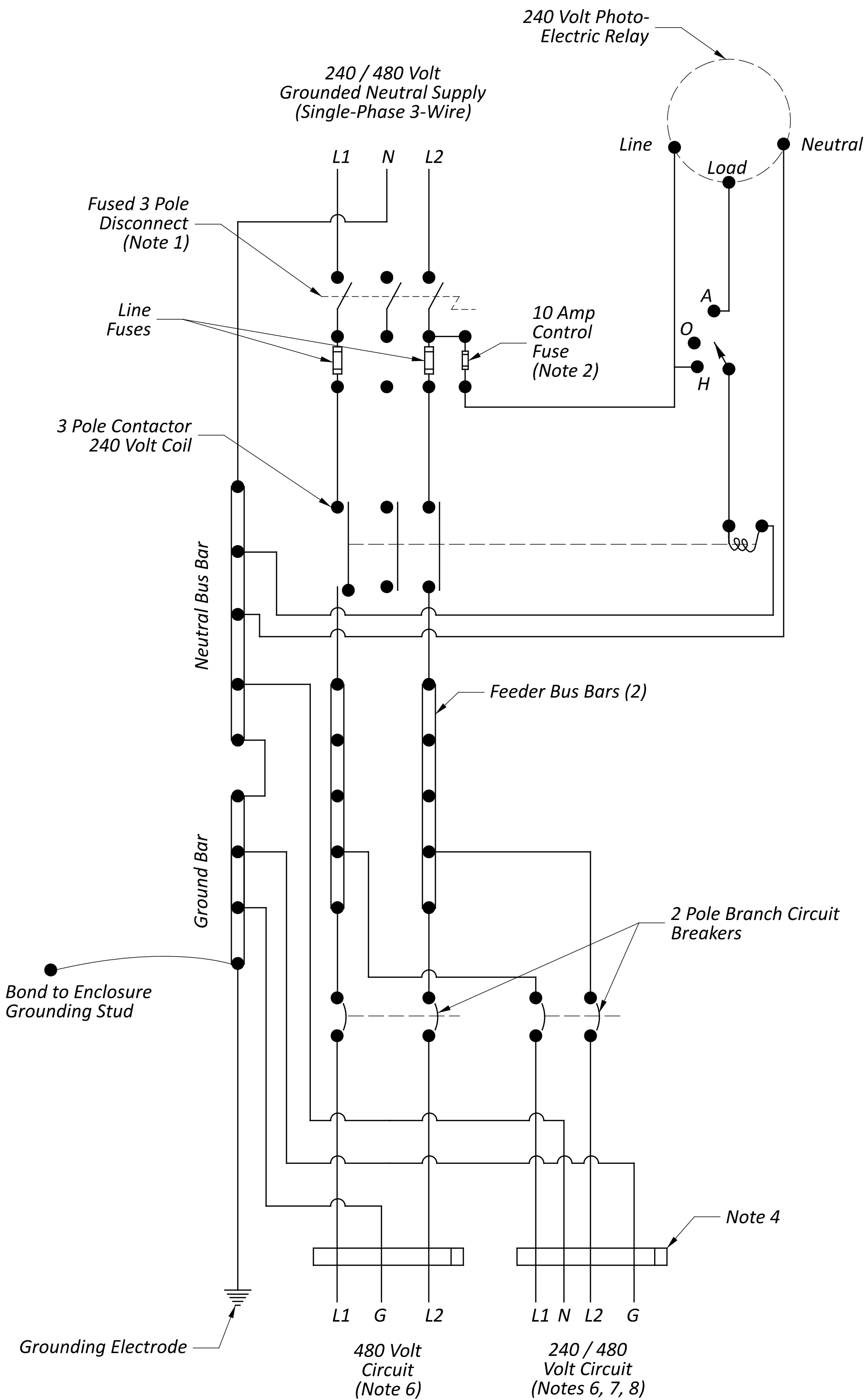
STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR

Adam Koenig





120 and 120/240 VOLT CONNECTIONS



480 and 240/480 VOLT CONNECTIONS (SINGLE-PHASE)

NOTES:

1. Power line fuses shall be Class RK1.
2. Control fuse shall be Class CC.
3. See standard ampere ratings in NEC 240.6 (2011). Disconnect fuse and circuit breakers shall be coordinated per NEC 240.12(1) (2011).
4. Group multiwire branch circuit conductors within enclosure per NEC 210.4(D) (2011). Install branch circuit breakers Eaton EGS20xxFFG, Square D BGL 160xx, Square D QOU2xx or Approved Equal.
5. Enclosure construction shall conform to NEC Art. 409.
6. Lighting branch circuits shown are schematic. Typically all branch circuits emanating from a control center have the same configuration. Voltages on all conductors for new construction shall not exceed 277V to ground.
7. Do not include neutral conductor in lighting branch circuits if all loads are connected line-to-line. See HL-60.11, HL-60.12 and HL-60.21.
8. Alternate luminaire loads L1 -N/L2 -N for the length of the branch circuit.
9. For lighting branch circuits fed from 3-phase service, apply colored phase tape on the load side of the circuit breakers as follows:

φA one stripe
φB two stripes
φC three stripes

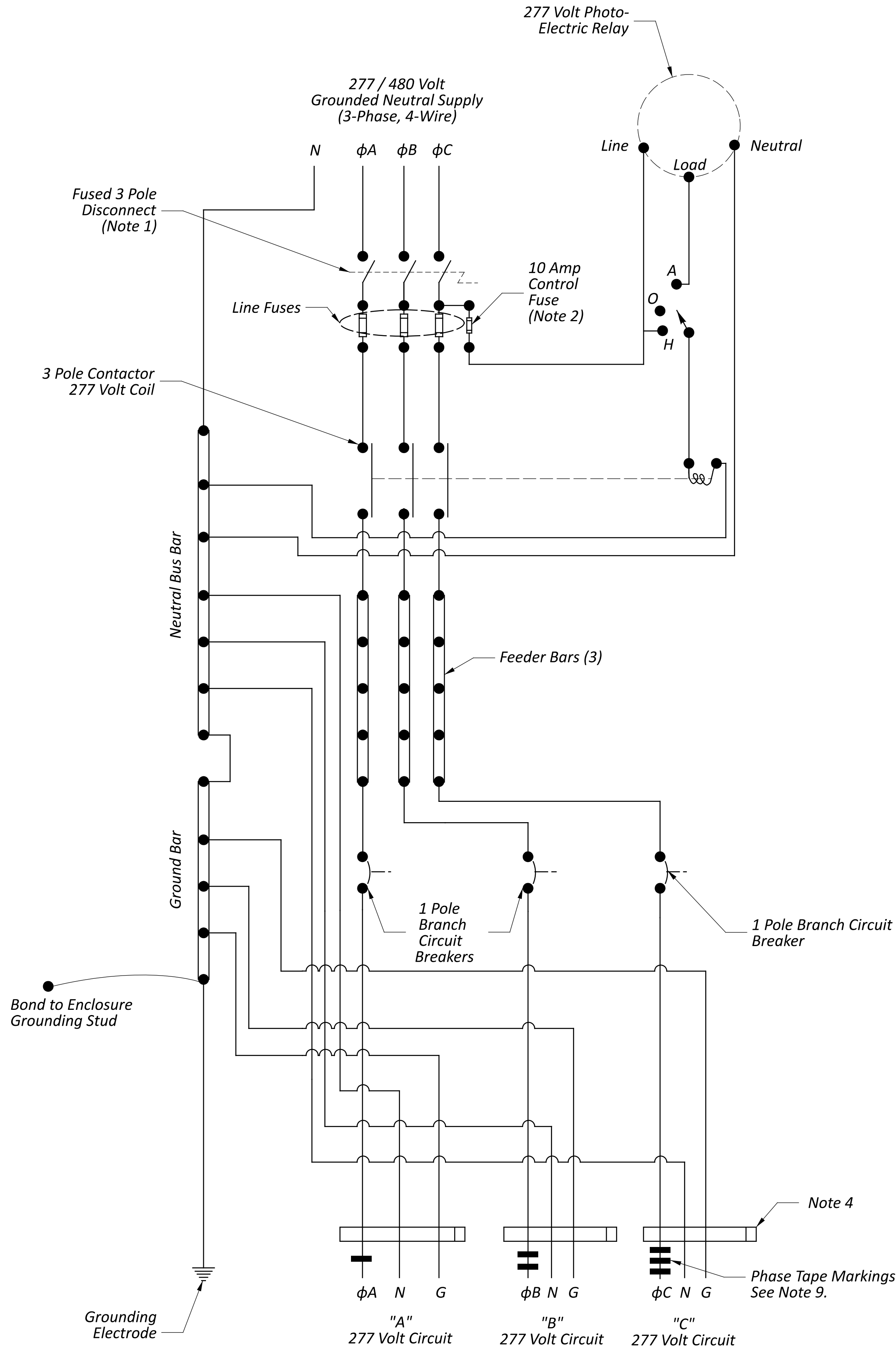
Use a different colored tape for each branch circuit.
Do not use red or blue for branch circuits.

Phase marking tape is in addition to CMS 625.17 and 725.02 marking requirements for circuit identification.

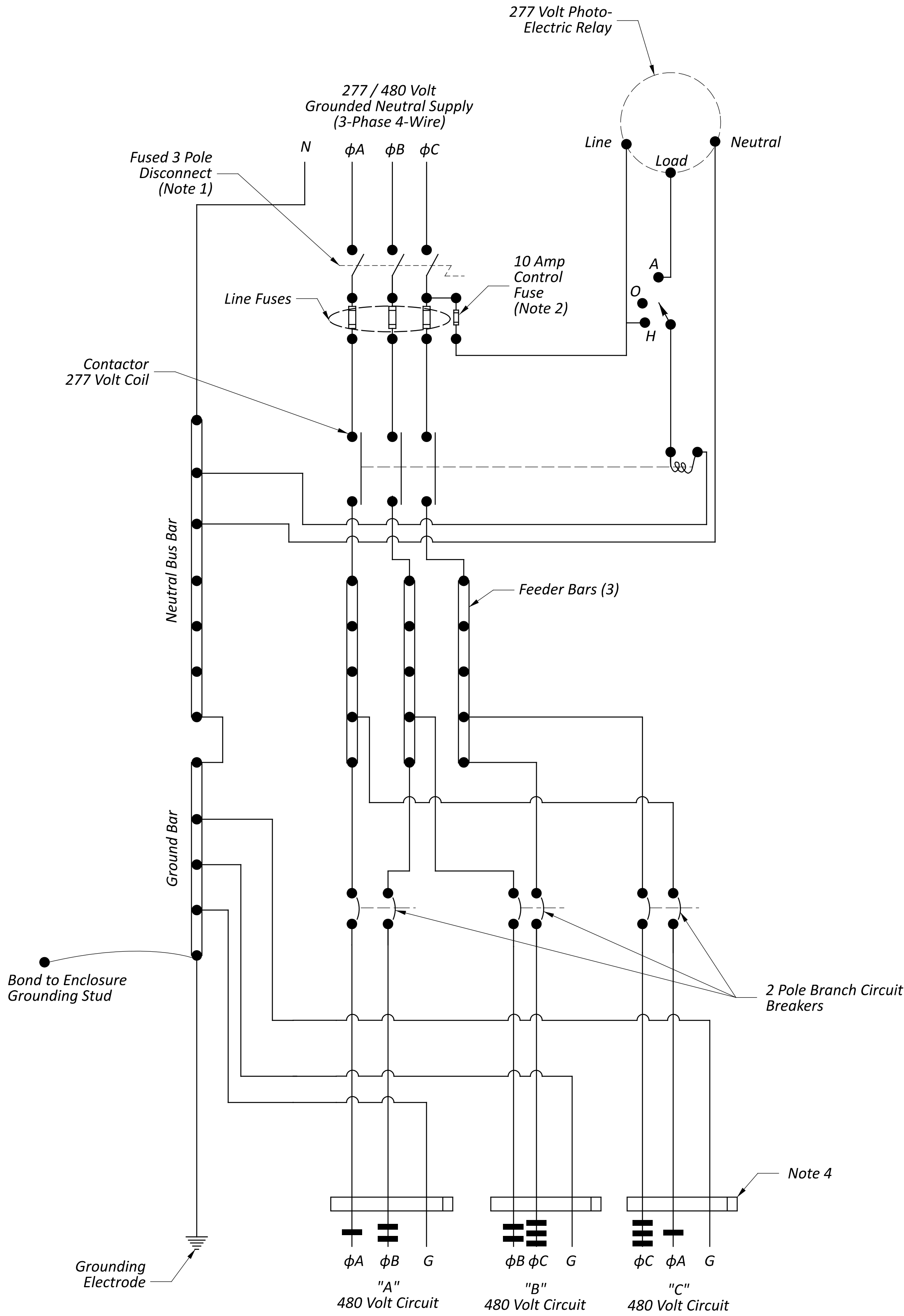
For all ungrounded conductors inside the control center on the line side of the branch circuit breakers, apply phase tape as follows:

φA Black (or no tape)
φB Red
φC Blue

10. For lighting branch circuits fed from single-phase service, apply colored tape to all underground conductors. Use a different colored tape for each branch circuit. For all ungrounded conductors inside the control center on the line side of the branch circuit breakers, apply colored tape, but do not use the same color as any branch circuit.
11. Post identification means inside each enclosure per NEC 210.5.
12. Bus bars and ground bars are required.
13. Remove enamel coating from under ground bar.
14. Surge Protective Device (SPD) required, see HL-40.20. Connect power leads to line side of fused disconnect, neutral lead to neutral bus bar.

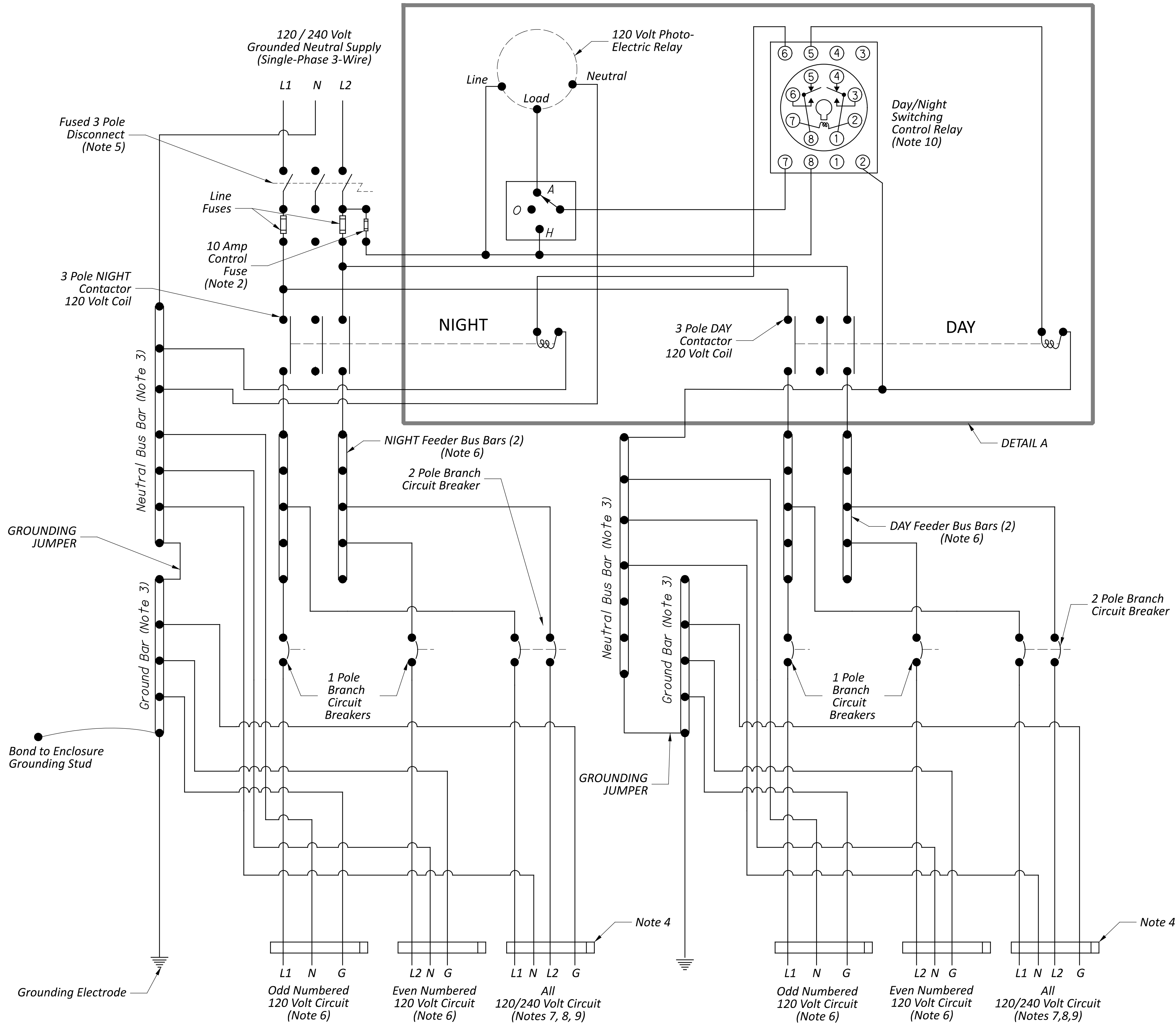


277/480 VOLT CONNECTIONS
(LINE-TO-NEUTRAL LOADS)



277/480 VOLT CONNECTIONS
(LINE-TO-LINE LOADS)

DAYLIGHTING CONTROL CENTER
(120/240 3-WIRE SERVICE SHOWN, NOTE 1)

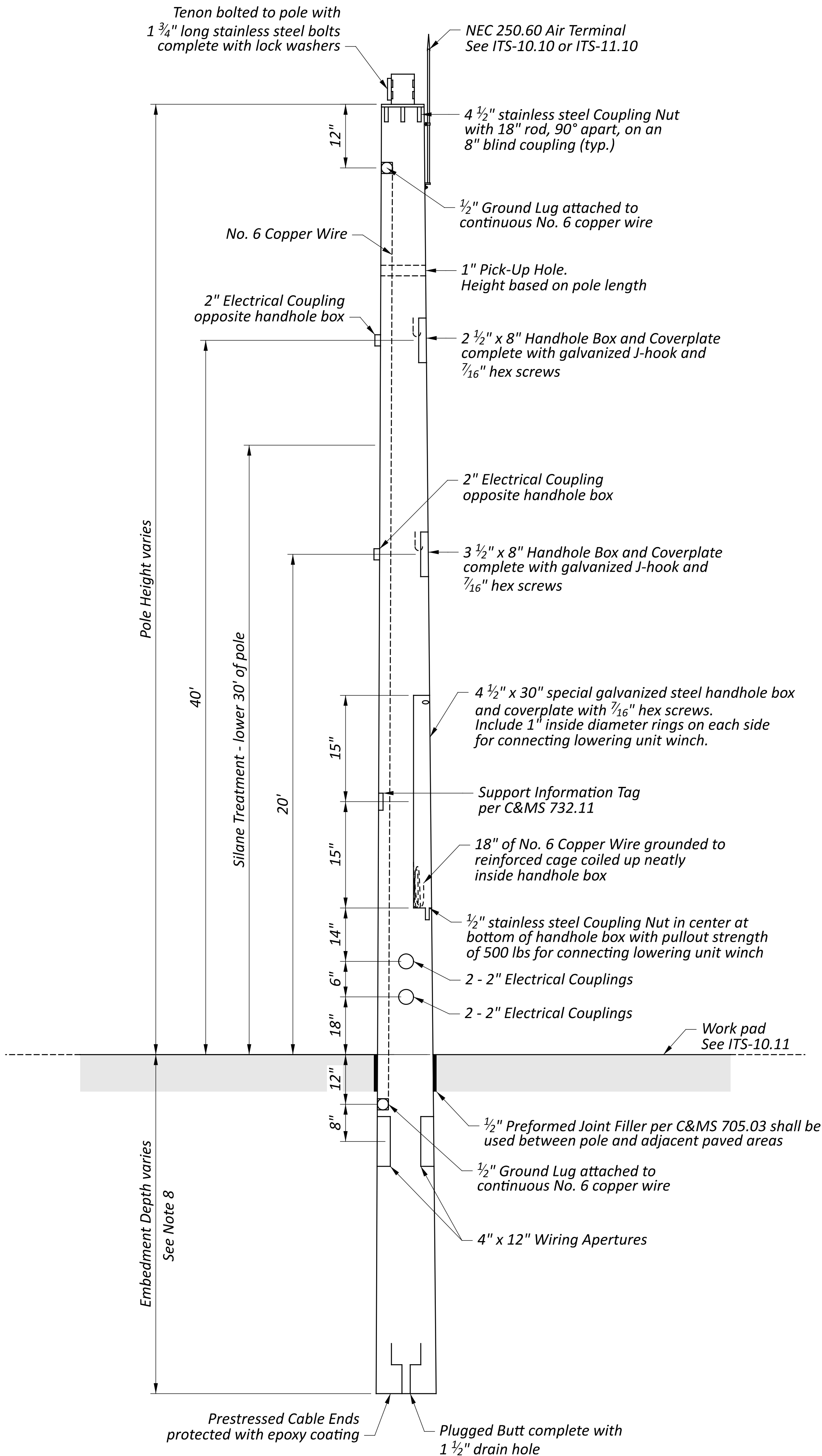


120 and 120/240 VOLT CONNECTIONS
(NIGHT TIME CIRCUITS)

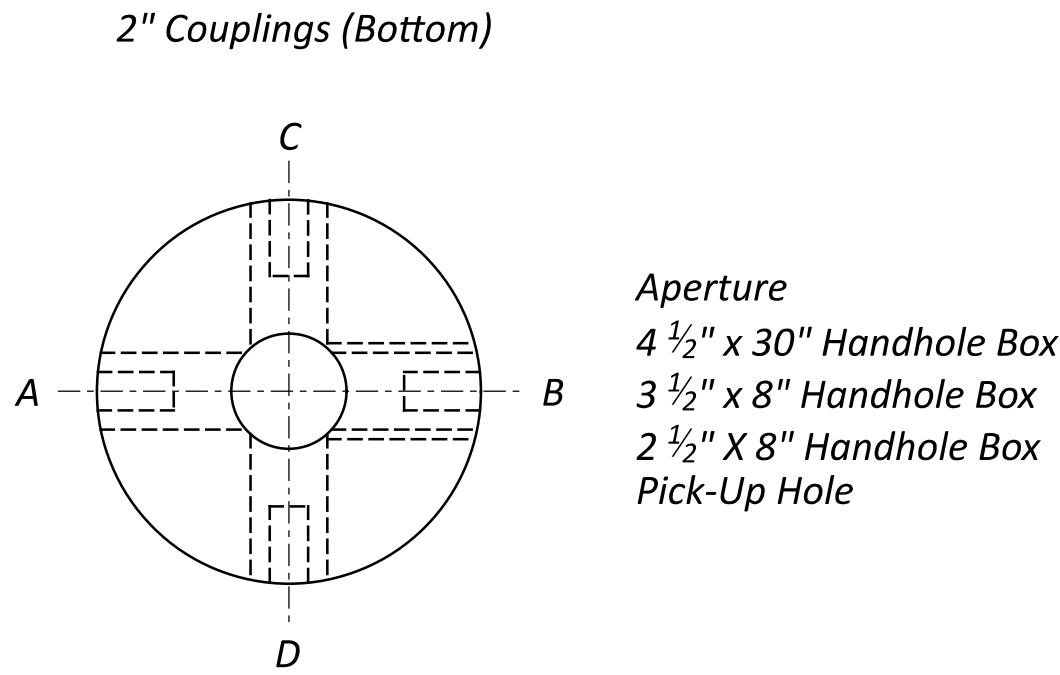
120 and 120/240 VOLT CONNECTIONS
(DAY TIME CIRCUITS)

NOTES:

- To avoid duplication and save space, this schematic shows daylighting LCC details for 120/240 3-wire grounded neutral service only. Other service voltages and configurations are similarly constructed, and reference shall be made to Pages 1 and 2 of this Drawing. The distinctive control circuit features of a daylighting LCC are shown inside the shaded rectangle at left (Detail A) for emphasis.
- Control Fuse shall be Class CC. Connect the line side of the control fuse to the load side of the fused disconnect, so it can be de-energized.
- The schematics at left show two sets of bus bars for clarity: one for night time circuits and one for day time circuits. The LCC actual construction shall utilize one neutral and one ground bus bar for the entire enclosure.
- Group multiwire branch circuit conductors within enclosure per NEC 210.4(D) (2011). Install branch circuit breakers Eaton EGS20xxFFG, Square D BGL 160xx, square D QOU2xx or Approved Equal.
- Power line fuses shall be Class RK1.
- Day and Night Feeder Bus bars are separate, and shall be clearly labeled on the backpanel such that the label is visible when all wires are installed.
- Lighting branch circuits shown are schematic. Typically all branch circuits emanating from a control center have the same configuration. Voltages on all conductors for new construction shall not exceed 277V to ground.
- See Note 7, Page 1.
- See Note 8, Page 1.
- Relay is socketed octal base, Magnecraft 788XBXM4L (120VAC coil, 16A @ 277VAC contacts) or equal. Assure the relay coil voltage matches control voltage when control voltage is not 120VAC and the relay contact voltage meets or exceeds the contactor voltage.
- If called for in the Plans, the Daytime and Nighttime branch circuits may emanate from two or more separate Lighting Control Center Enclosures. Separate enclosures may share a single photocell (default) or utilize separate photocells if called for in the Plans.

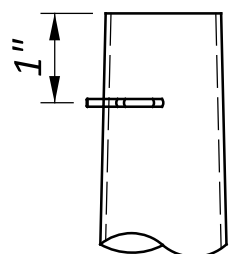


Lowering Device
Aperture
Support Information Tag
2" Couplings (Top)
Pick-Up Hole

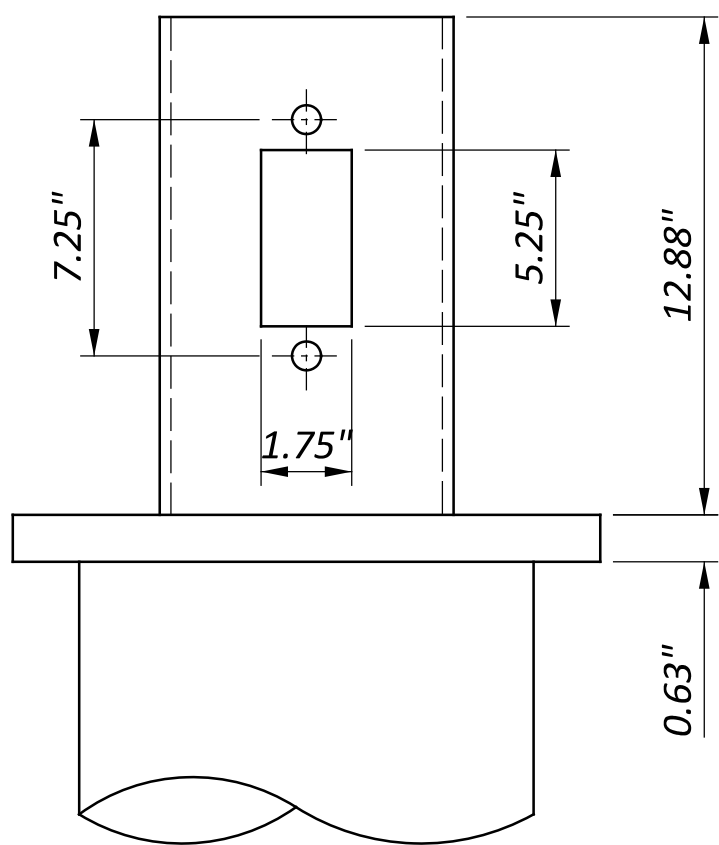


2" Couplings (Bottom)
ORIENTATION DETAIL

0.38" diameter Wire Eye.
Bolt having 1.00" inside diameter
for wire tie off



TENON TOP DETAIL



See Pole Schedule and Orientation View
for Qty. Required and Proper Orientations

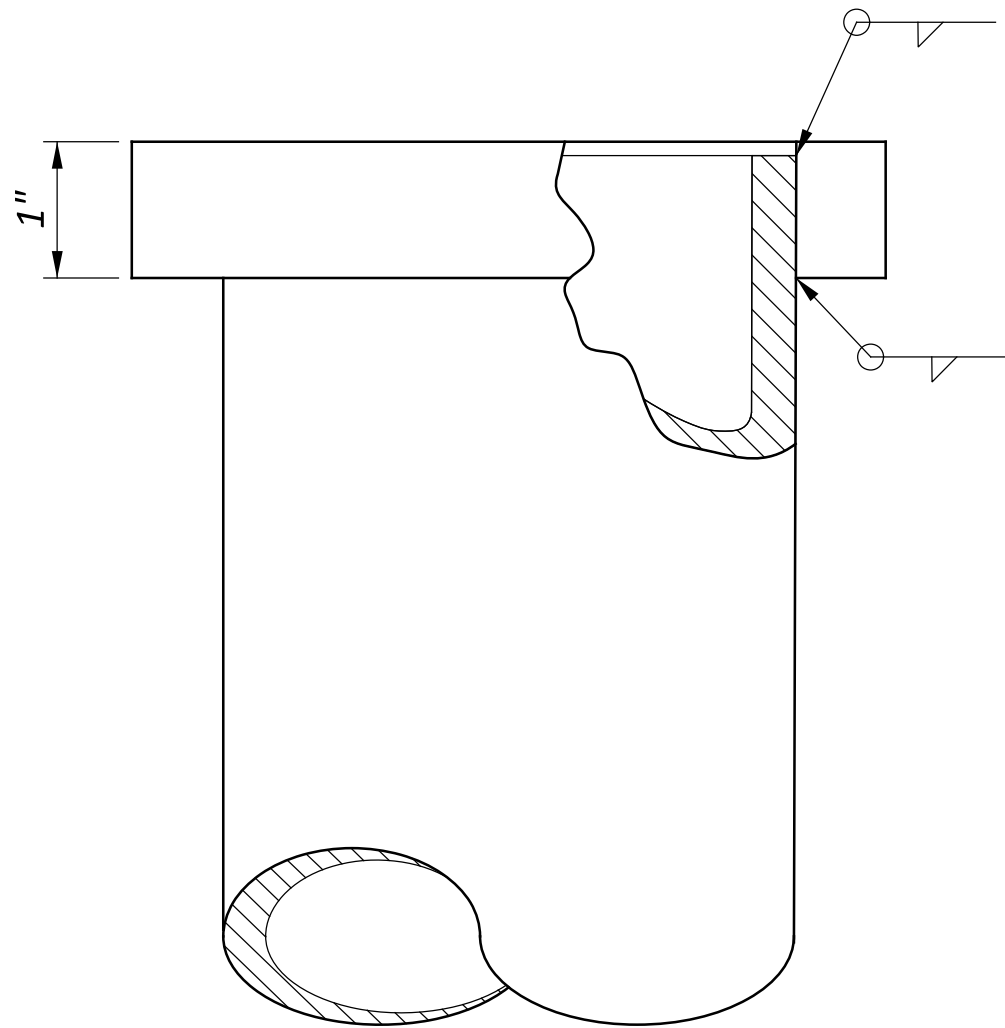
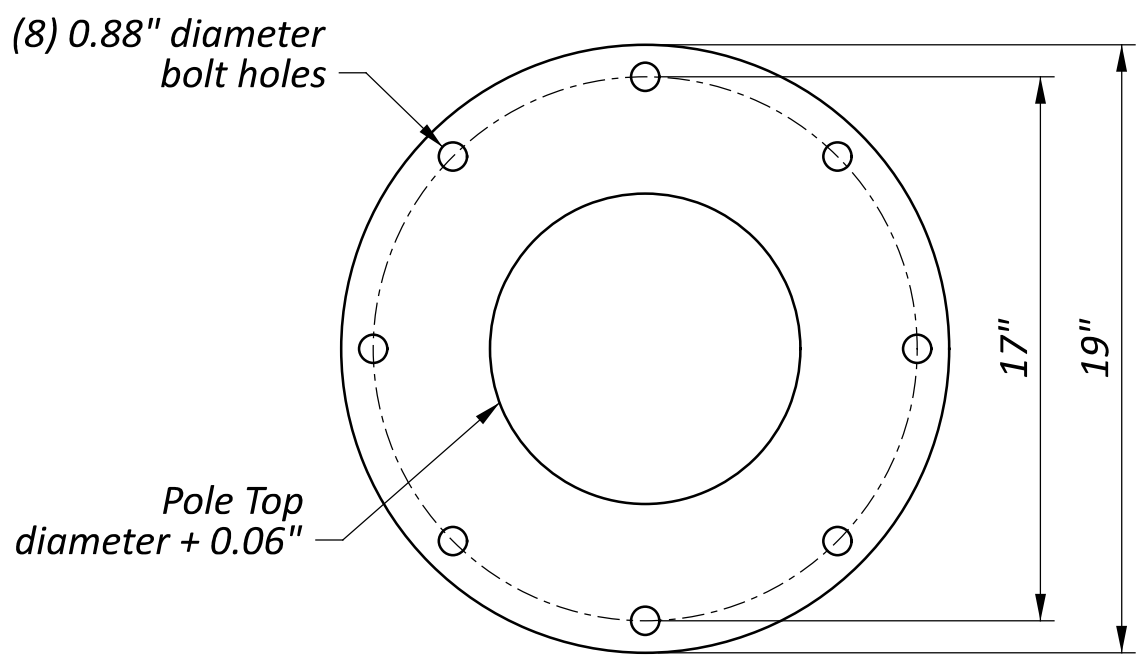
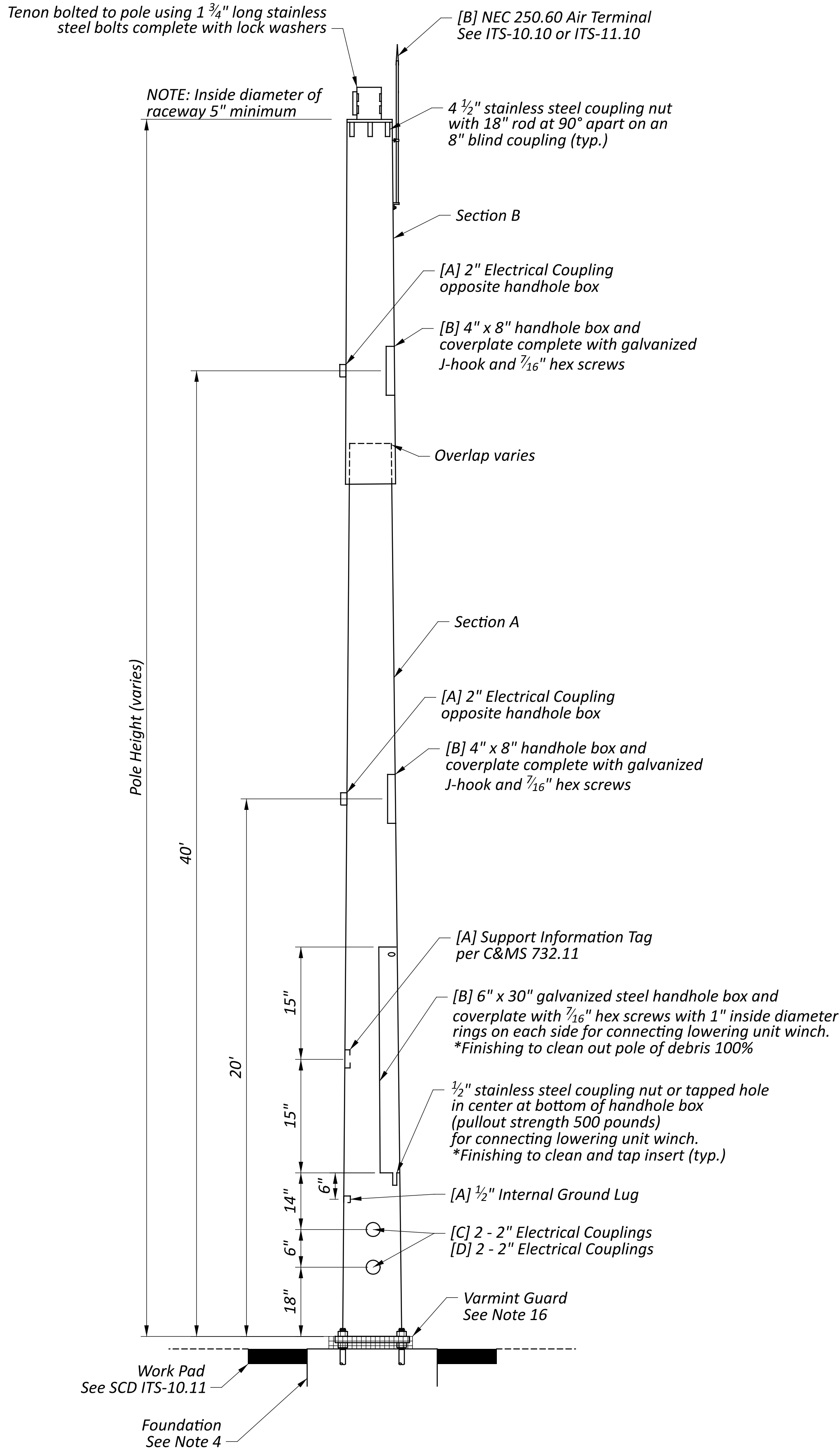
Tenon Tip Shall be Sized
to House Camera Selected

POLE TENON DETAIL

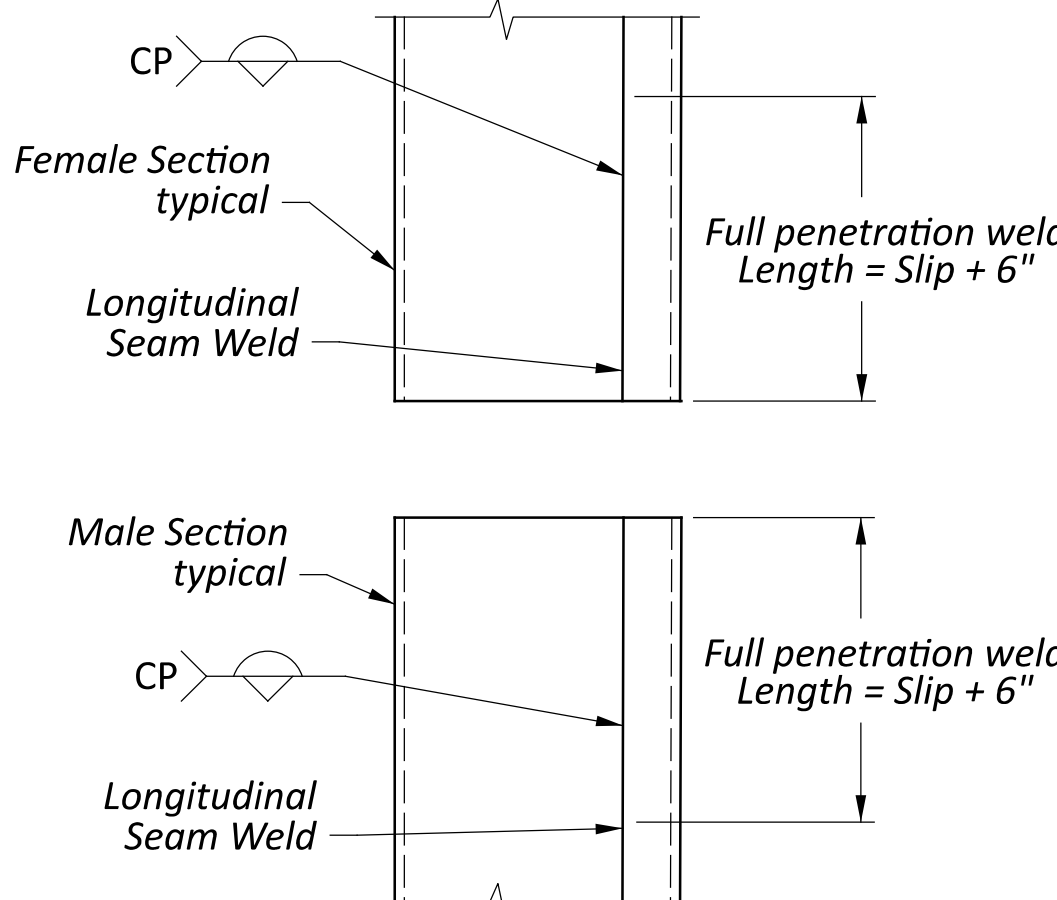
Notes

1. If the ITS Cabinet is pole-mounted, it shall be oriented on Side (C) of the pole, above the 2" couplings.
2. If the Communication Cabinet (if required) is pole-mounted, it shall be oriented on Side (D) of the pole, above the 2" couplings.
3. The tenon at the top of the pole shall be bolted so that the lowering device and camera arm are oriented on Side (A) of the pole. It shall be oriented 90° from Side (C) and (D) to avoid lowering the camera over the lowering device operator or any cabinets/ devices mounted to the pole. It shall also be oriented 180° from the large handhole.
4. The grounding system/ lugs shall be integrated nearby the 4 1/2" x 30" handhole opening to allow for easy inspection and attachment of grounding wire to lug. The grounding lug shall in no way interfere with the placement/ operation of the camera lowering device or winch.
5. The maximum horizontal deflection of the pole is 1" for a sustained 30 mph wind velocity with no gust.
6. The design of the Concrete CCTV Camera Pole presented on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
7. All unused coupling holes shall be plugged with threaded PVC plugs to prevent any kind of weather/ rodent intrusion. Rubber caps are not acceptable.
8. See project plans and Supplemental Specification 809 for foundation requirements.
9. Interior raceway inside diameter shall be 5" min.

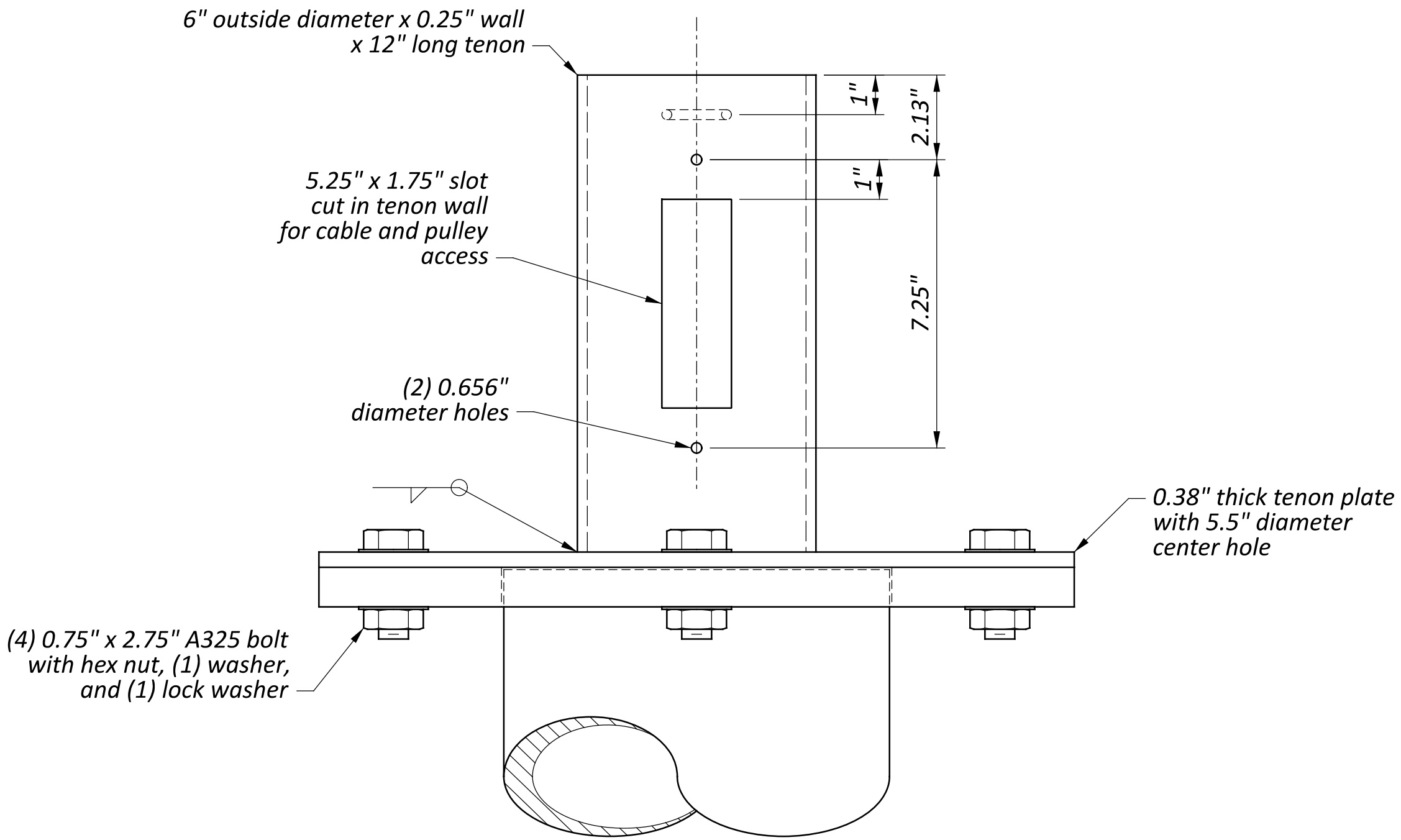
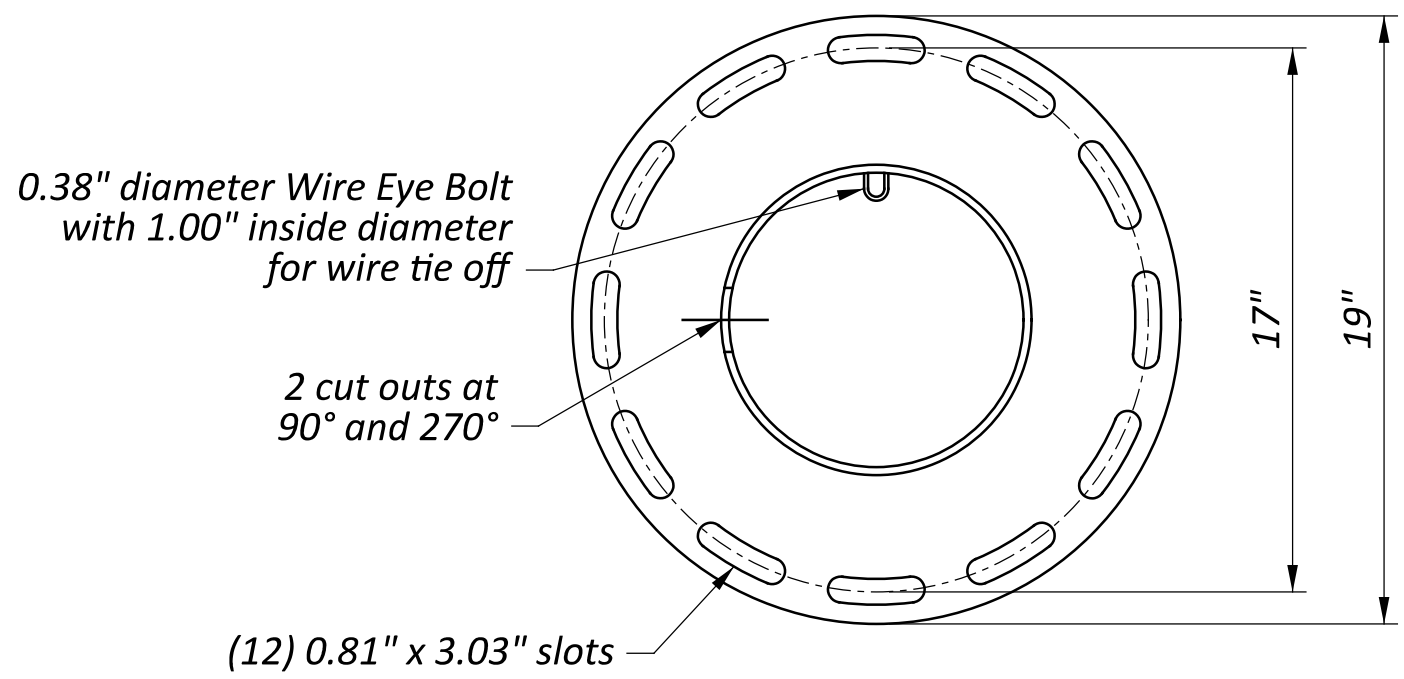




POLE TOP PLATE



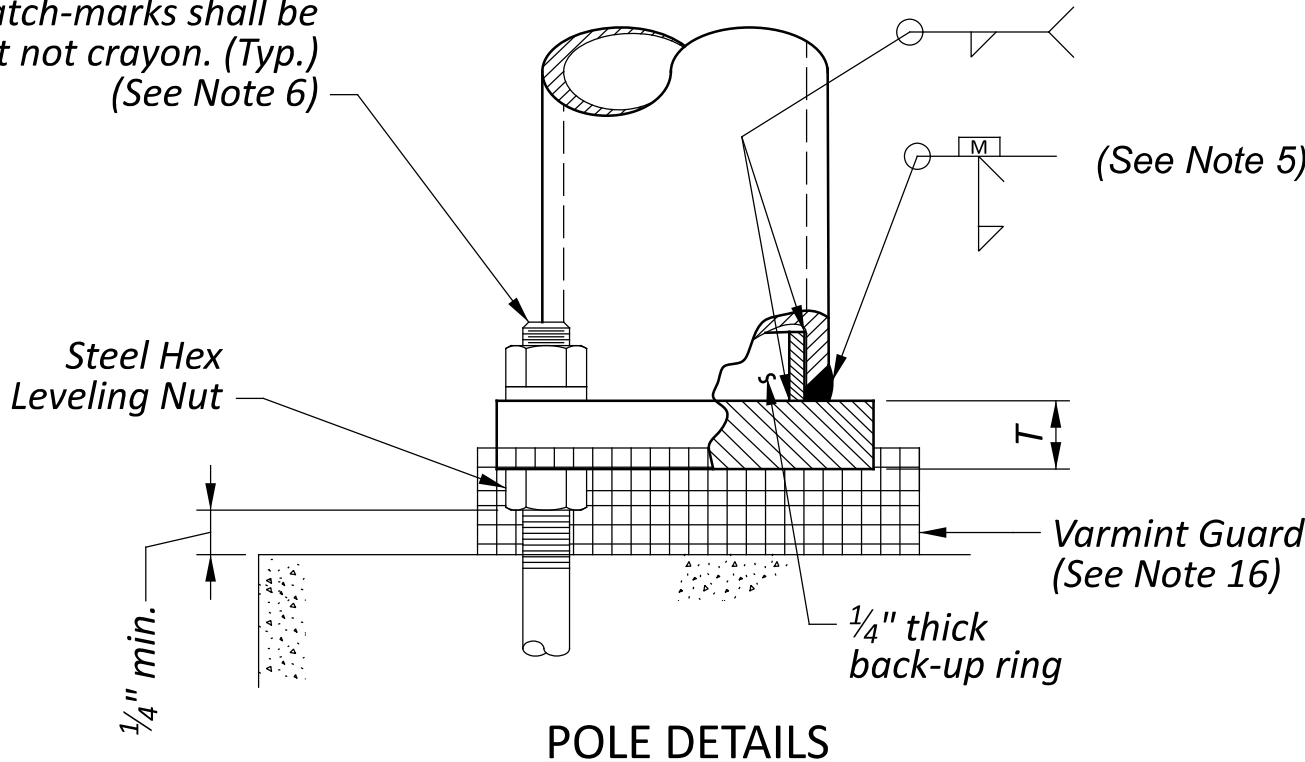
SLIPOVER JOINT



See Pole Schedule and Orientation View for quantity required and proper orientations.
Tenon Tip shall be sized to house camera selected.

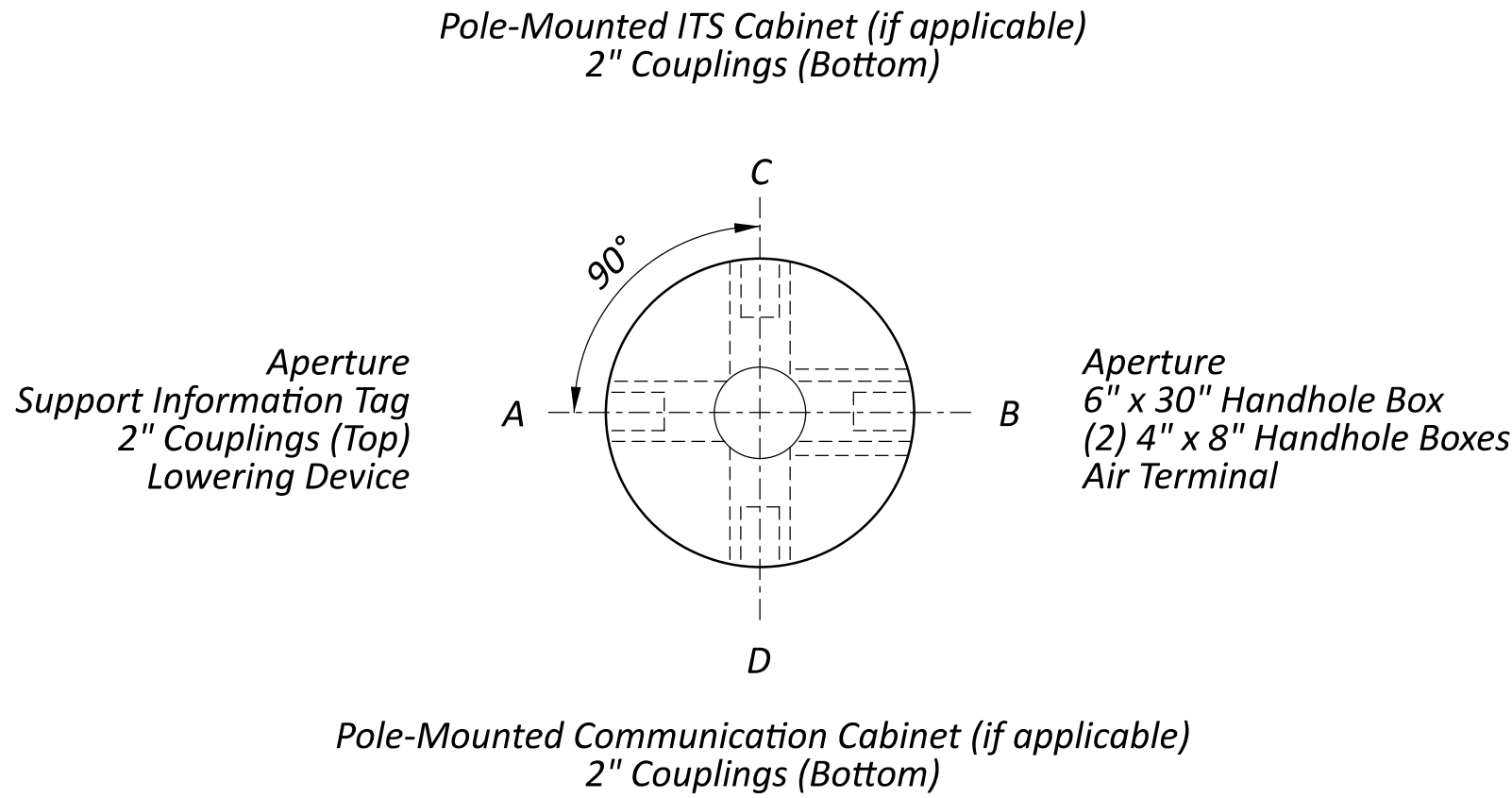
TENON ASSEMBLY

Anchor Bolts with Standard Steel Hex Nuts and Plain Washers.
Tighten nuts using turn-of-the-nut method according to C&MS 630.06 and 513.20.C except that match-marks shall be paint not crayon. (Typ.)
(See Note 6)



POLE DETAILS





ORIENTATION DETAIL

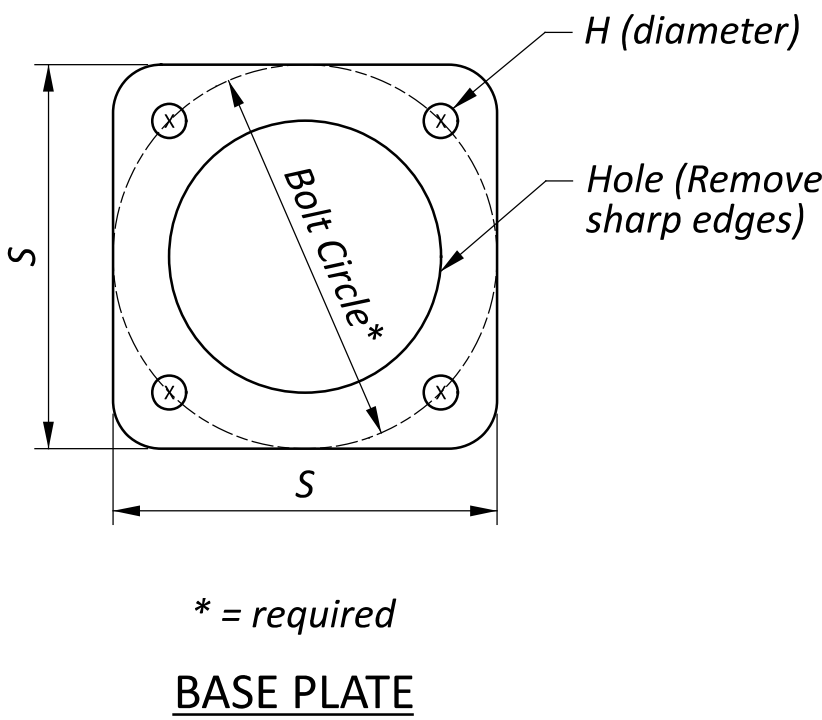


Table I

POLE HEIGHT (FT)	POLE				ANCHOR BASE						
	POLE SECTION	WALL THICKNESS	SIZE	SLIP LENGTH	CENTER HOLE DIAMETER	BOLT CIRCLE*	# ANCHOR BOLTS	ANCHOR BOLT SIZE	S	T	H
50	N/A	0.25	14" x 7" x 50'	N/A	12.5	20	4	1.75 x 30	20.5	2	2.13
70	A	0.375	19" x 14.09" x 35.07'		17	24	4	1.75 x 36	24	2	2.13
	B	0.25	15" x 9.70" x 37.86'	35.12							

ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

* = Required dimension, See Note 2

NOTES

- The design of the Steel CCTV Camera Poles presented in this drawing meet the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, First Edition 2015 (LRDFLTS-1) and all interim releases prior to the bid date of the project.
- Dimensions noted as required shall be as indicated on the drawing and shall not be altered.
- Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of LRDFLTS-1 and the design criteria below. Calculations shall be stamped by a Registered Ohio Engineer and shall be submitted for review and approval with the shop drawings.
- Drilled shaft foundation and anchor bolt details shall be per TC-21.21, with modifications as below and in Table I:

50 ft Pole - TC-16.22 Design 7, as modified
70 ft Pole - TC-12.31 Design 10, as modified

A special foundation design will be required when cohesive soil with an undrained shear strength, S_u , of less than 1500 lb./sq.ft. or granular soil with an angle of internal friction, Φ , $\Phi_f < 40^\circ$ is encountered (average soil properties along length of drilled shaft).
- The pole attachment to the base plate shall be welded using a full penetration weld.
- A minimum of one full bolt thread shall remain above the anchor nut.
- Tapered steel tubes for the poles shall meet the requirements of ASTM A595 Grade A or ASTM A572 Grade 55 or 65. 50 ft poles shall be one section. 70 ft poles may be two sections.
- All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped) (Not ASTM B 695 Class 50)
- Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
- Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F436.
- Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 731.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts, not at least 2 inches beyond the threads.
- Anchor bolt nuts shall meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
- Anchor bolt washers shall meet the requirements of ASTM F436 Type 1 (Hot-dip galvanized) according to ASTM A153.
- Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match misaligned anchor bolts will not be permitted.
- All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.

- Attach varmint guard between the base plate and top of concrete foundation with stainless steel band and minimum 2" overlap. Tie overlapping screen with stainless steel wire ties. Screen shall be stainless steel welded wire mesh with openings no larger than $\frac{3}{8}$ ".
- If ITS cabinet is pole-mounted, it shall be oriented on side (C) of pole, above 2" couplings.
- If communication cabinet is pole-mounted, it shall be oriented on side (D) of pole, above 2" couplings (if required).
- The tenon at the top of the pole shall be bolted so that the lowering device and camera arm are oriented on side (A) of the pole, 90 degrees towards towards side (C) or (D) to avoid lowering the camera over the lowering device operator or any cabinets or devices mounted to the pole. The lowering device and camera arm shall also be oriented 180 degrees in either direction from the large handhole.

The camera arm shall be oriented so the camera is capable of viewing in all directions, including major routes and side streets. The pole shall not block a view of the roadway unless approved by the Engineer.
- The grounding system/ lugs shall be integrated internally nearby the 6" x 30" handhole opening to allow for easy inspection and attachment of grounding wire to lug. The grounding lug shall in no way interfere with the placement/ operation of the camera lowering device or winch.
- All unused coupling holes shall be plugged with threaded PVC plugs to prevent any kind of weather/ rodent intrusion. Rubber caps shall be unacceptable.
- Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRDFLTS-1 11.9.3

Service II Wind Velocity: 76 mph per LRDFLTS-1 Table 3.4.1 and Figure 3.8-4b

Serviceability Parameters:

Horizontal Deflection at Top of Pole: maximum 1 inch for a sustained 30mph wind velocity with no gust

OFFICE OF
ROADWAY
ENGINEERING

REVISIONS
01-16-2026
07-18-2025
01-17-2025

STDS ENGINEER
Beck

STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR
Adam Koenig

STEEL CCTV CAMERA POLE

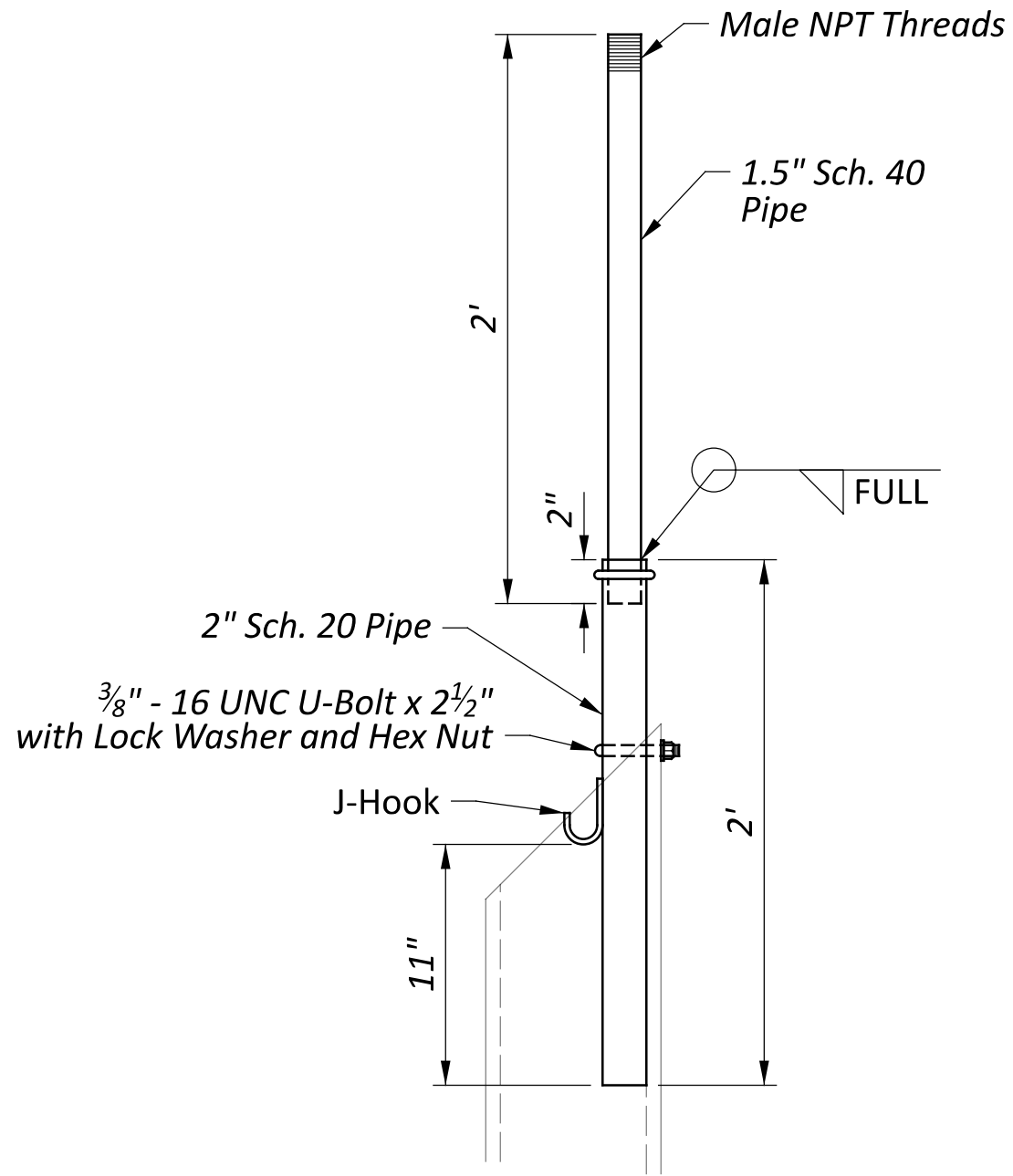
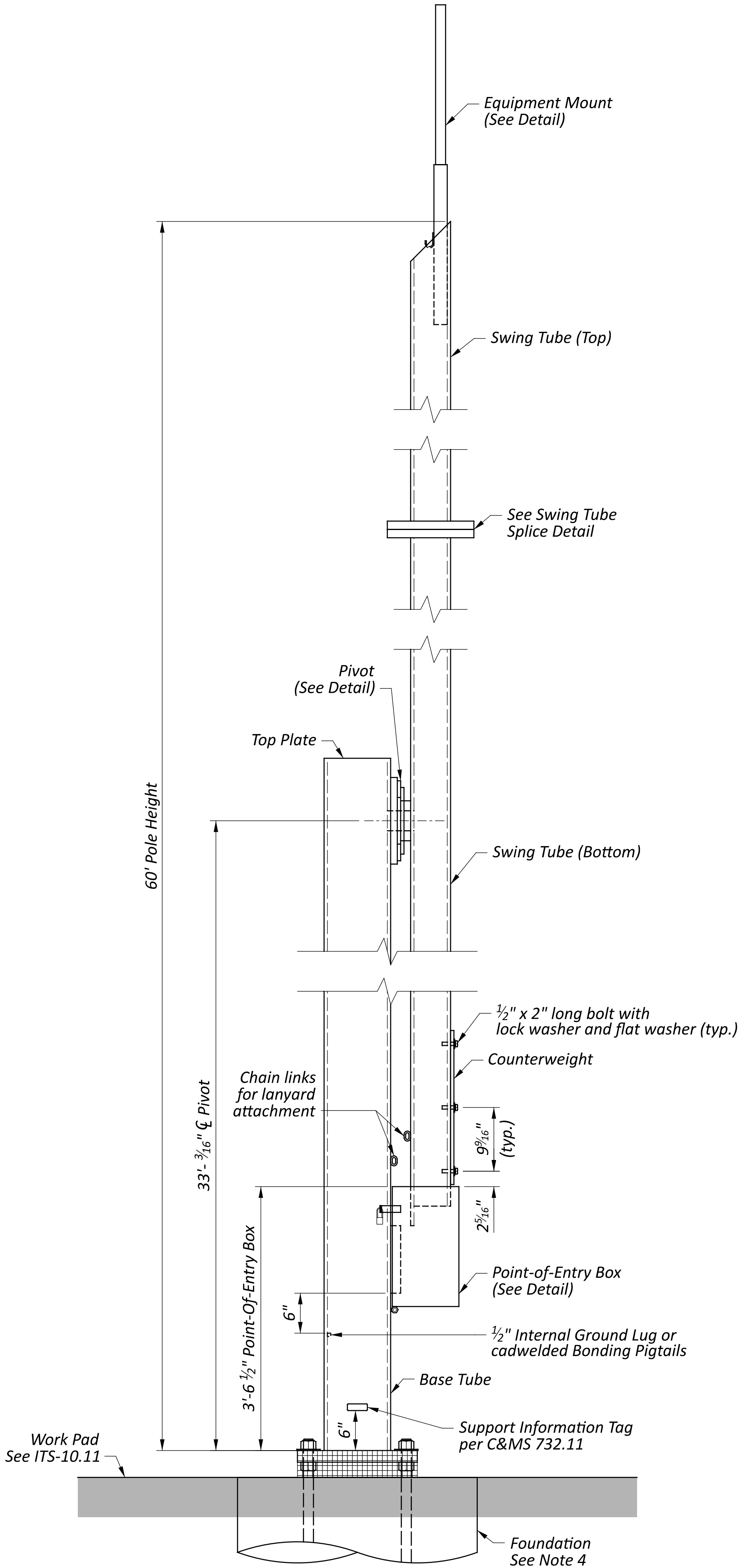
DESIGN AGENCY



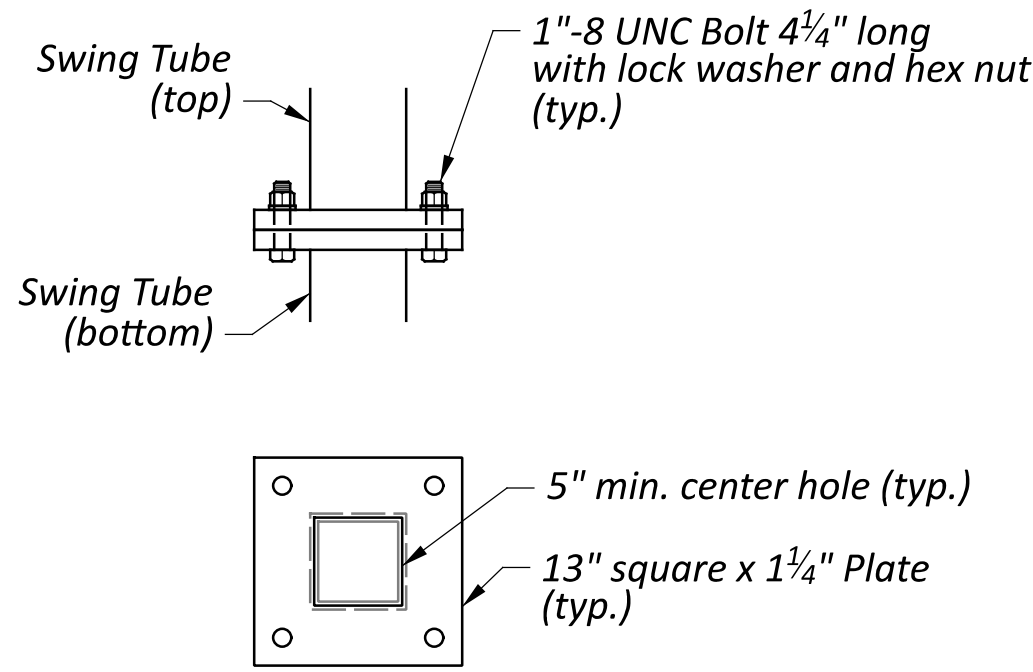
SCD NUMBER
ITS-12.11

SHEET
P.2

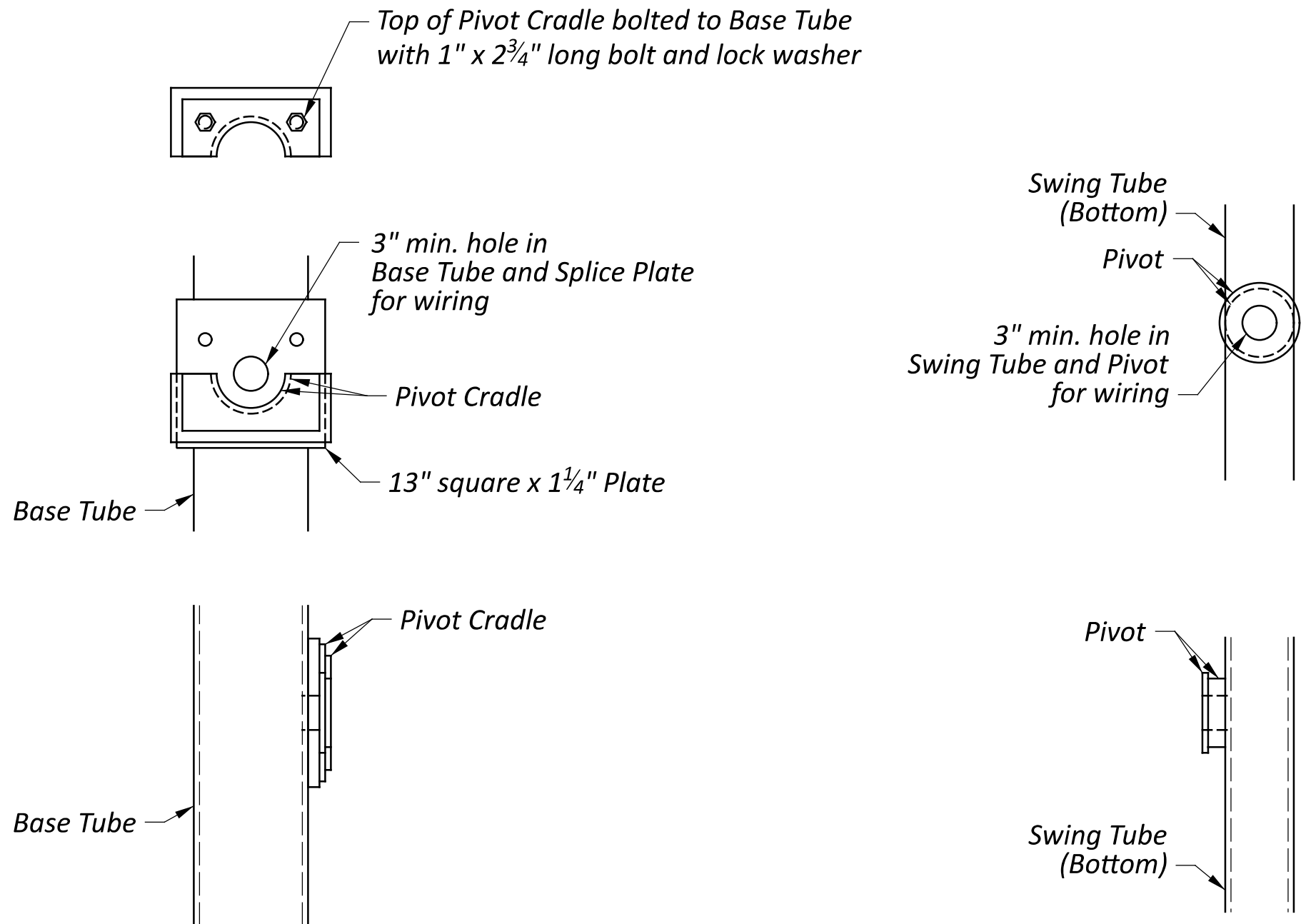
TOTAL
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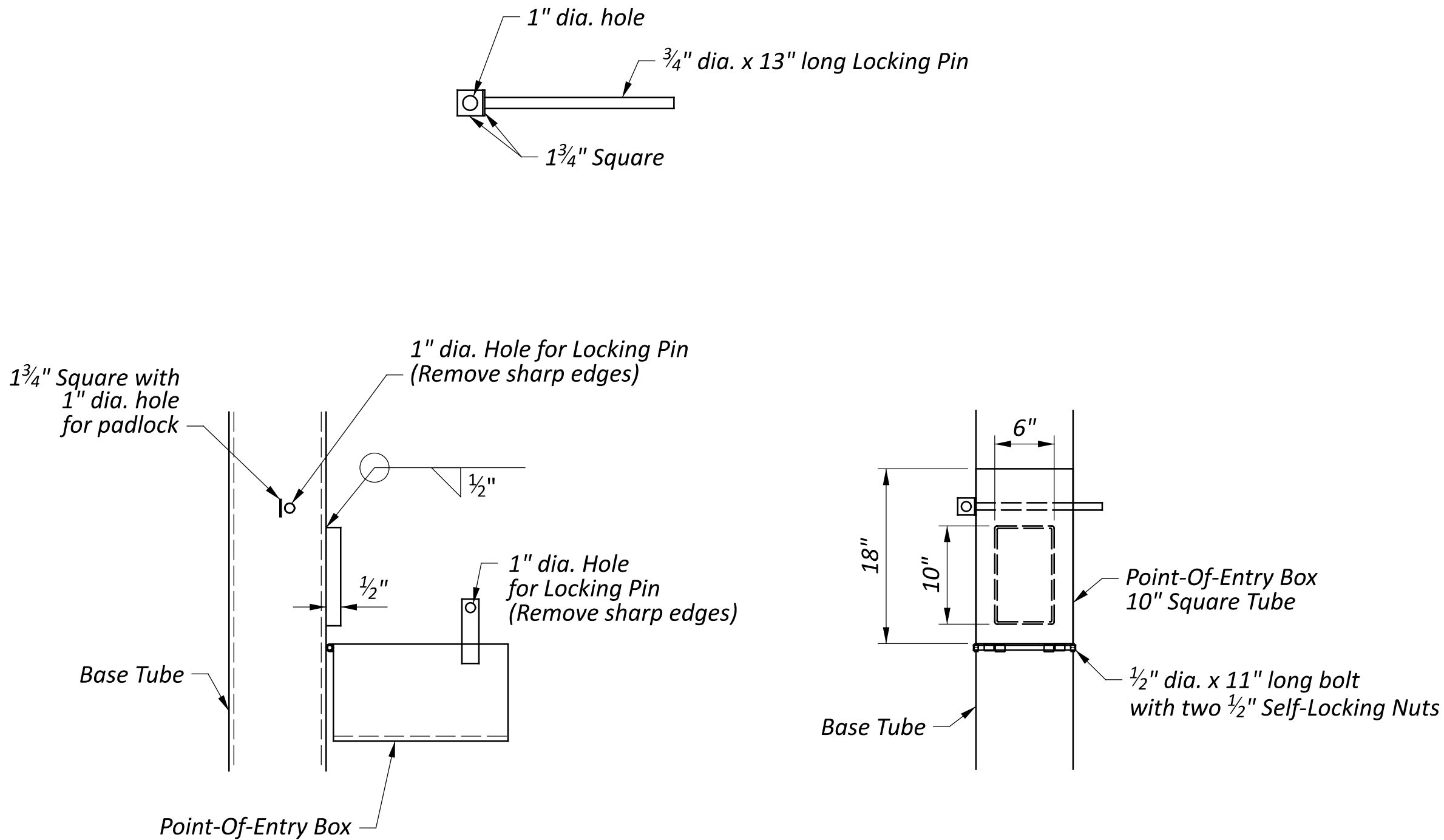
EQUIPMENT MOUNT
DETAIL



SWING TUBE SPLICE
DETAIL

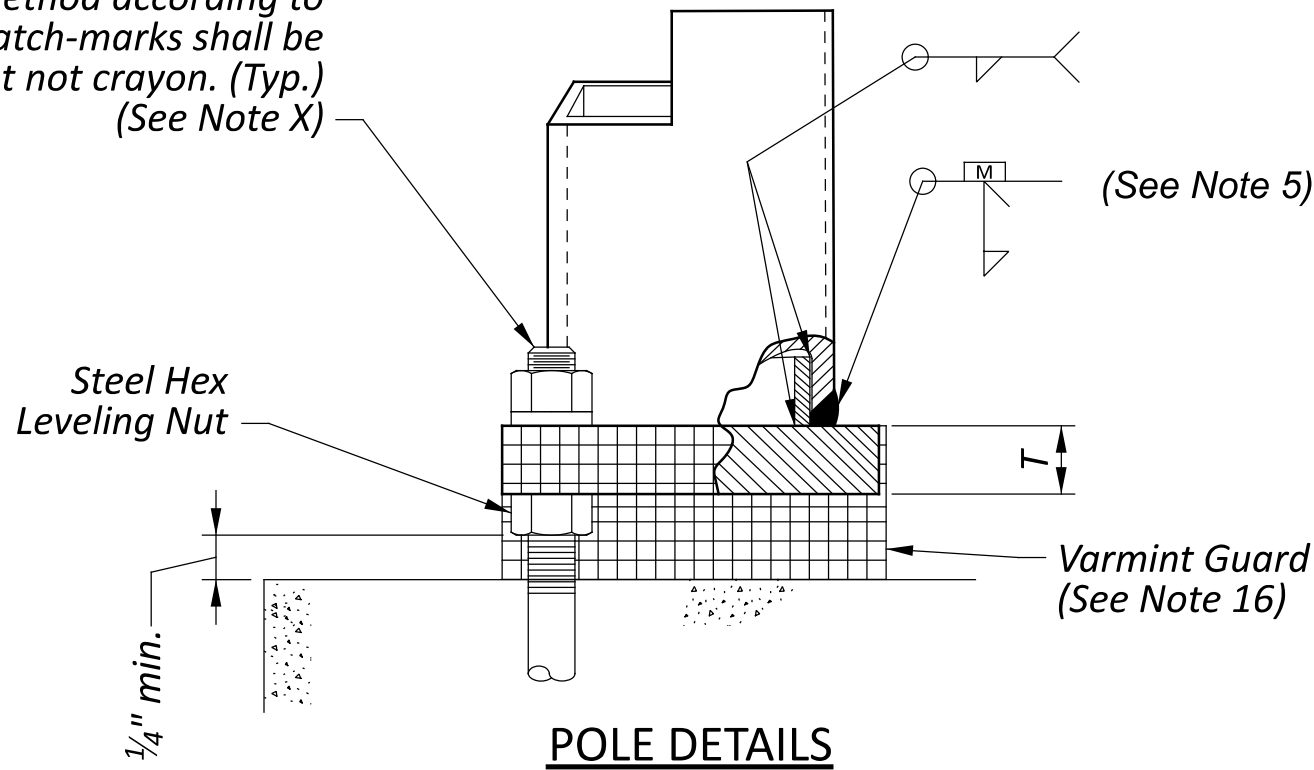


PIVOT DETAIL

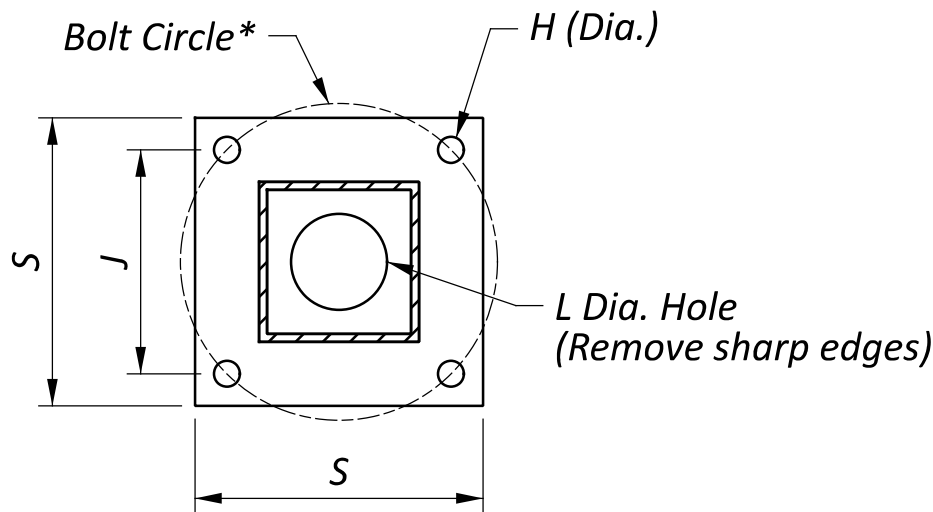


POINT-OF-ENTRY BOX
DETAIL

Anchor Bolts with Standard Steel Hex Nuts and Plain Washers.
Tighten nuts using turn-of-the-nut method according to
C&MS 630.06 and 513.20.C except that match-marks shall be
paint not crayon. (Typ.)
(See Note X)



POLE DETAILS



* = required

BASE PLATE

POLE HEIGHT (FT)	POLE			ANCHOR BASE							
	POLE SECTION	WALL THICKNESS	SIZE	NO. ANCHOR BOLTS	ANCHOR BOLT SIZE	BOLT CIRCLE*	S	J	T	H	L
60	BASE TUBE	0.5	10" Square x 33.40'	4	1.5 x 50	20 13/16	18	12.23	1.75	1 5/8	6
	SWING TUBE (BOTTOM)	0.5	6" Square x 38.95'								
	SWING TUBE (TOP)	0.5	6" Square x 19.95'								

ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

* = Required dimension, See Note 2

NOTES

1.

The design of the Tilttable CCTV Camera Pole presented in this drawing meet the requirements of the Telecommunications Industry Association (TIA) standard 222-H and all interim releases prior to the bid date of the project.
2.

Dimensions noted as required shall be as indicated on the drawing and shall not be altered.
3.

Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of the Telecommunications Industry Association (TIA) standard 222-H and the design criteria below. Calculations shall be stamped by a Registered Ohio Engineer and shall be submitted for review and approval with the shop drawings.
4.

Use a TC-81.22 Design 7 foundation per TC-21.21 for cohesive soils with a minimum undrained shear strength of Su = 1750 psf. A custom foundation design will be required for other soil conditions.

Modify the anchor bolts per the table below.
5.

The pole attachment to the base plate shall be welded using a full penetration weld.
6.

A minimum of one full bolt thread shall remain above the anchor nut.
7.

Pole steel shall meet the following TIA requirements:
Pole Steel: A500B
Flange Steel: A572-50
Pipe Steel: A53-B

All other steel shall be 36 ksi minimum. All structural steel shall be hot dip galvanized per ASTM A 123.
8.

All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped) (Not ASTM B 695 Class 50)
9.

Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
10.

Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F436.
11.

Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 731.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts, not at least 2 inches beyond the threads.
12.

Anchor bolt nuts shall meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
13.

Anchor bolt washers shall meet the requirements of ASTM F436 Type 1 (Hot-dip galvanized) according to ASTM A153.
14.

Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match misaligned anchor bolts will not be permitted.
15.

All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.

16.

Attach varmint guard between the base plate and top of concrete foundation with stainless steel band and minimum 2" overlap. Tie overlapping screen with stainless steel wire ties. Screen shall be stainless steel welded wire mesh with openings no larger than 3/8".
19.

The camera arm shall be oriented so the camera is capable of viewing in all directions, including major routes and side streets. The pole shall not block a view of the roadway unless approved by the Engineer.
20.

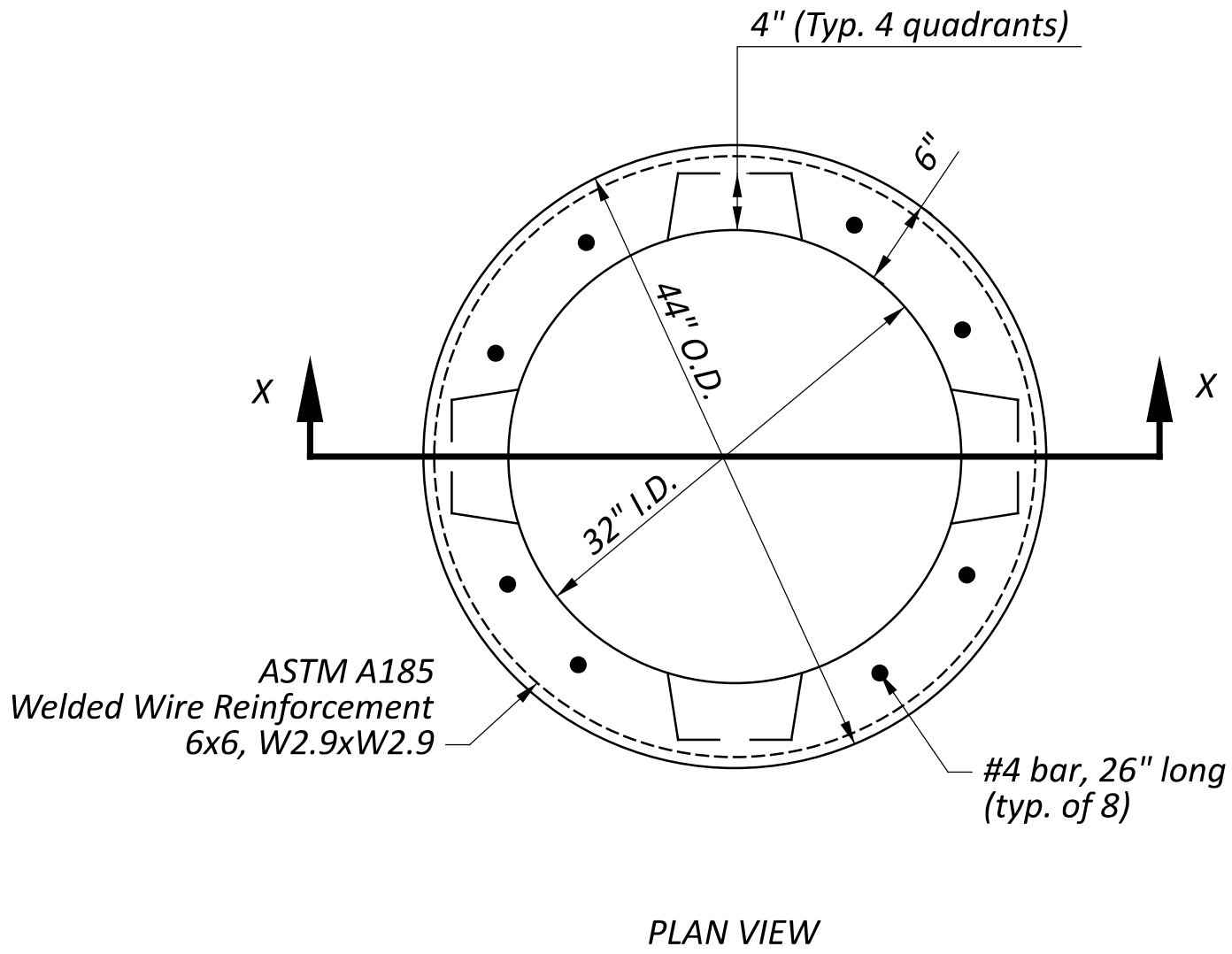
The grounding system/ lugs shall be integrated internally nearby the 6" x 10" handhole opening to allow for easy inspection and attachment of grounding wire to lug.
21.

Design Criteria

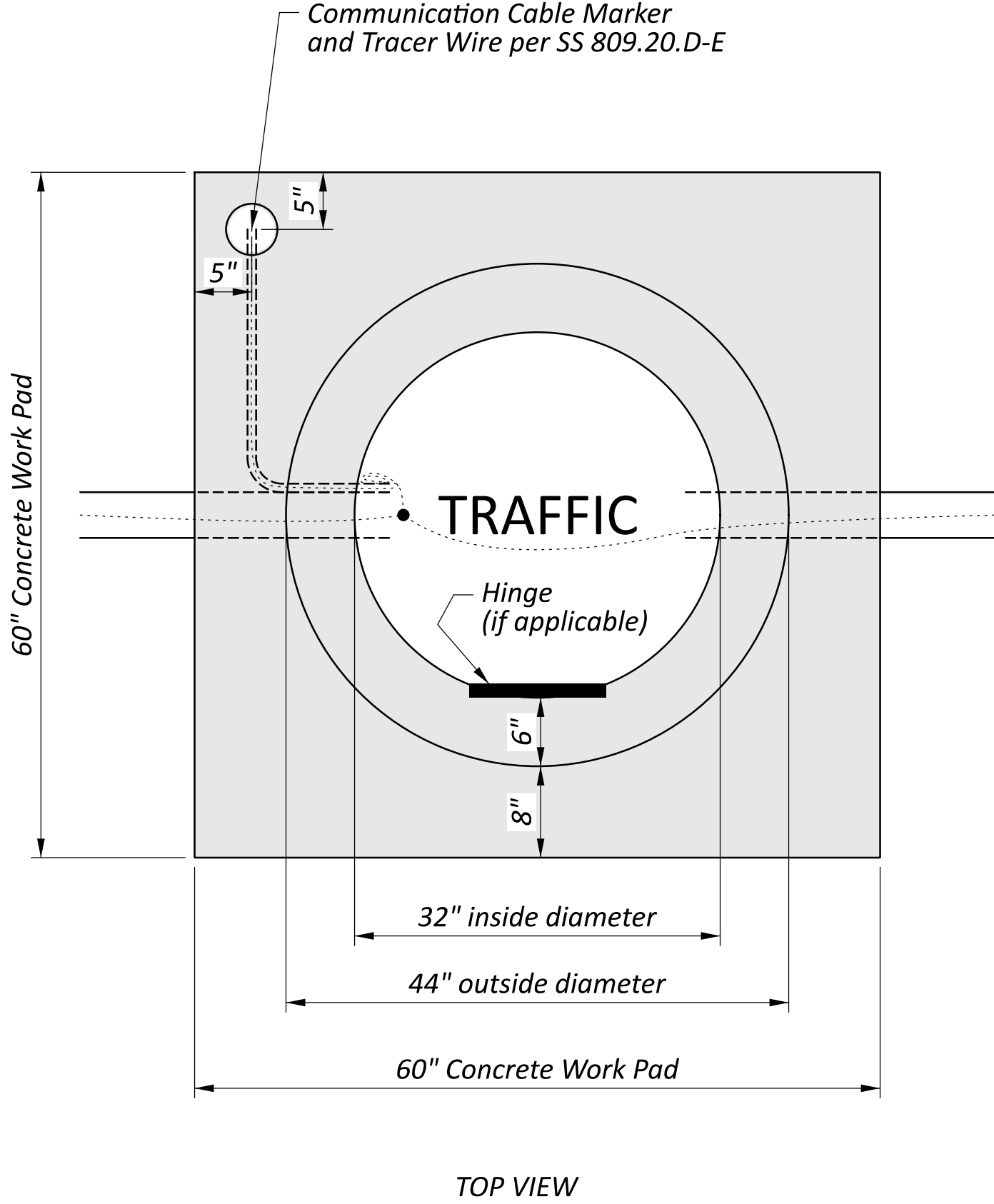
TIA 222-H
Wind: 110 MPH
Ice: 50 MPH (1" ice)
Exposure Category: C
Topographic Category: 1
Risk Category: 1



32" ITS PULL BOX DETAIL



32" ITS PULL BOX WORK PAD DETAIL



Notes

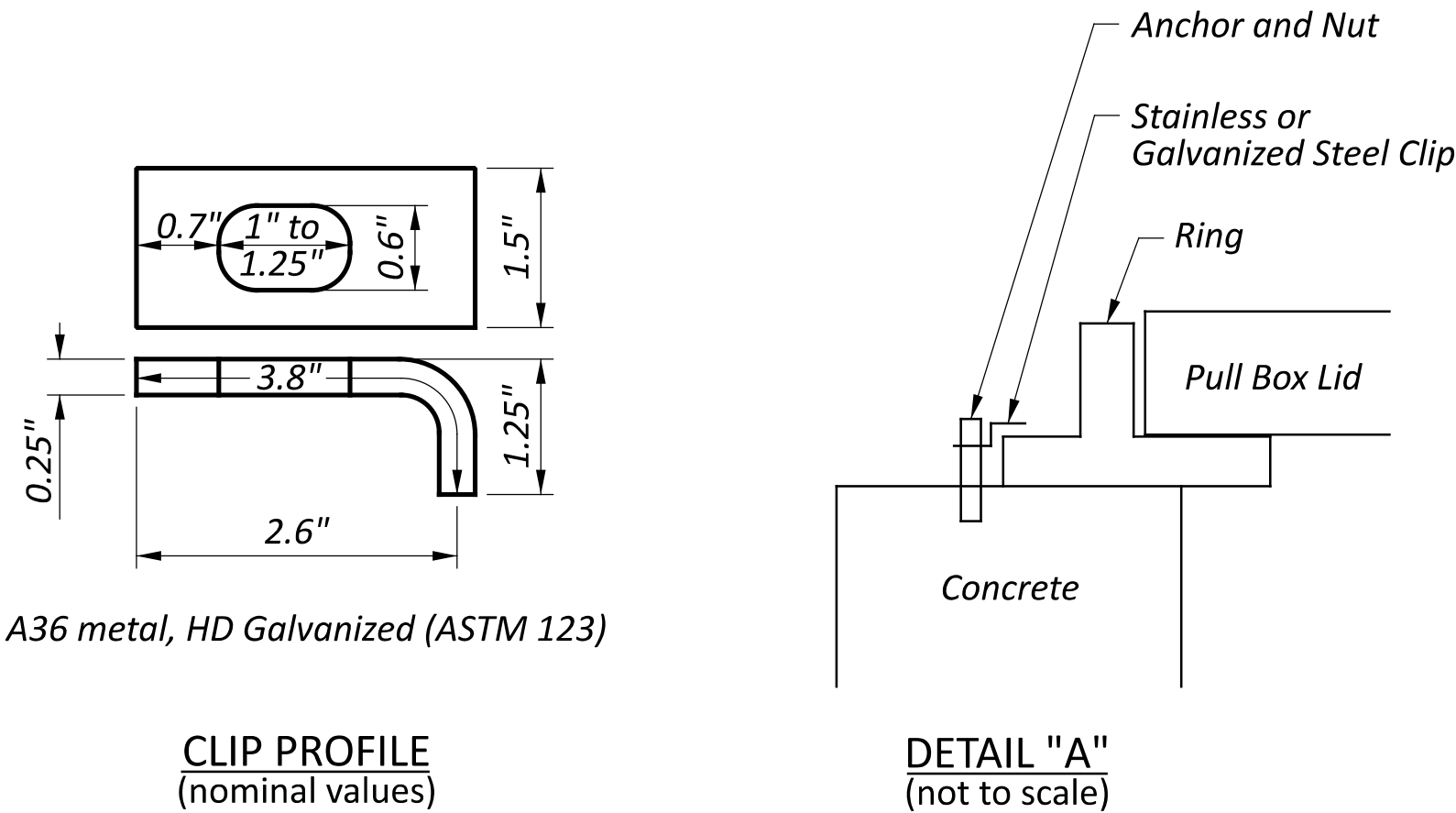
- One coat of water repellant sealer, such as Enviro Seal 40, shall be applied to the inside and outside of the pull box.
- Concrete shall have air entrainment of 6% \pm 2% and shall have minimum 4500 PSI compressive strength at 28 days. Concrete shall meet the requirements of SS 909.15.
- Conduits are to enter the pull box a minimum of 3 inches and a maximum of 6 inches from the wall of the pull box. Cap conduits per SS 809.20
- Conduits should enter the pull box via a knockout. When approved by the Engineer, conduits may enter the pull box through its wall only if the opening is sawn or core drilled. Conduits shall not enter via the bottom of the pull box without approval by the Engineer. Conduits shall enter the knockout as close to 90 degrees as possible.
- After the conduits have been installed, any opening in the pull box wall shall be totally filled with mortar or concrete and finished flush with the inside of the pull box wall (no voids).
- Pull box bearing capacity to exceed 40,000 pounds.
- Enlarging the knockout area, if required, shall be done by saw cutting or core drilling the concrete. No other methods are allowed. The Contractor shall replace the concrete housing, if damaged, at their expense.
- Duct seal shall be placed on all conduits in pull box which enter a cabinet.
- No conduit drains are allowed in ITS pull boxes. Type 1 pull boxes shall have a 2.5" diameter drain hole in the base.
- Slope the proposed raceway to drain into the pull box on either side of the freeway shoulder, where applicable.
- Install a concrete pull box pad per CMS 633.11 and as detailed on this drawing. The pull box pad shall be incidental to the pull box.
- Install appropriate lid and frame assemblies per SS 809.

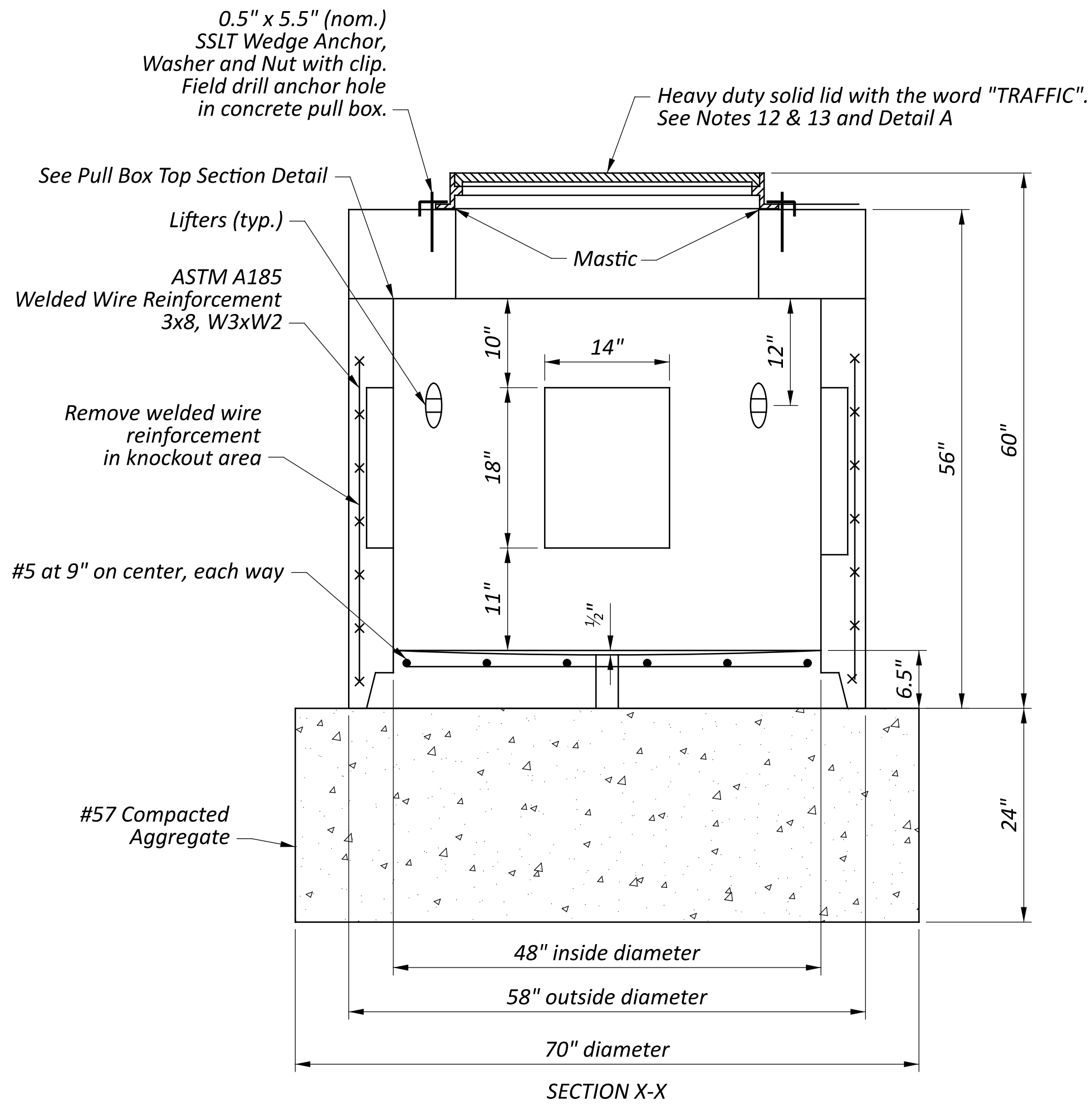
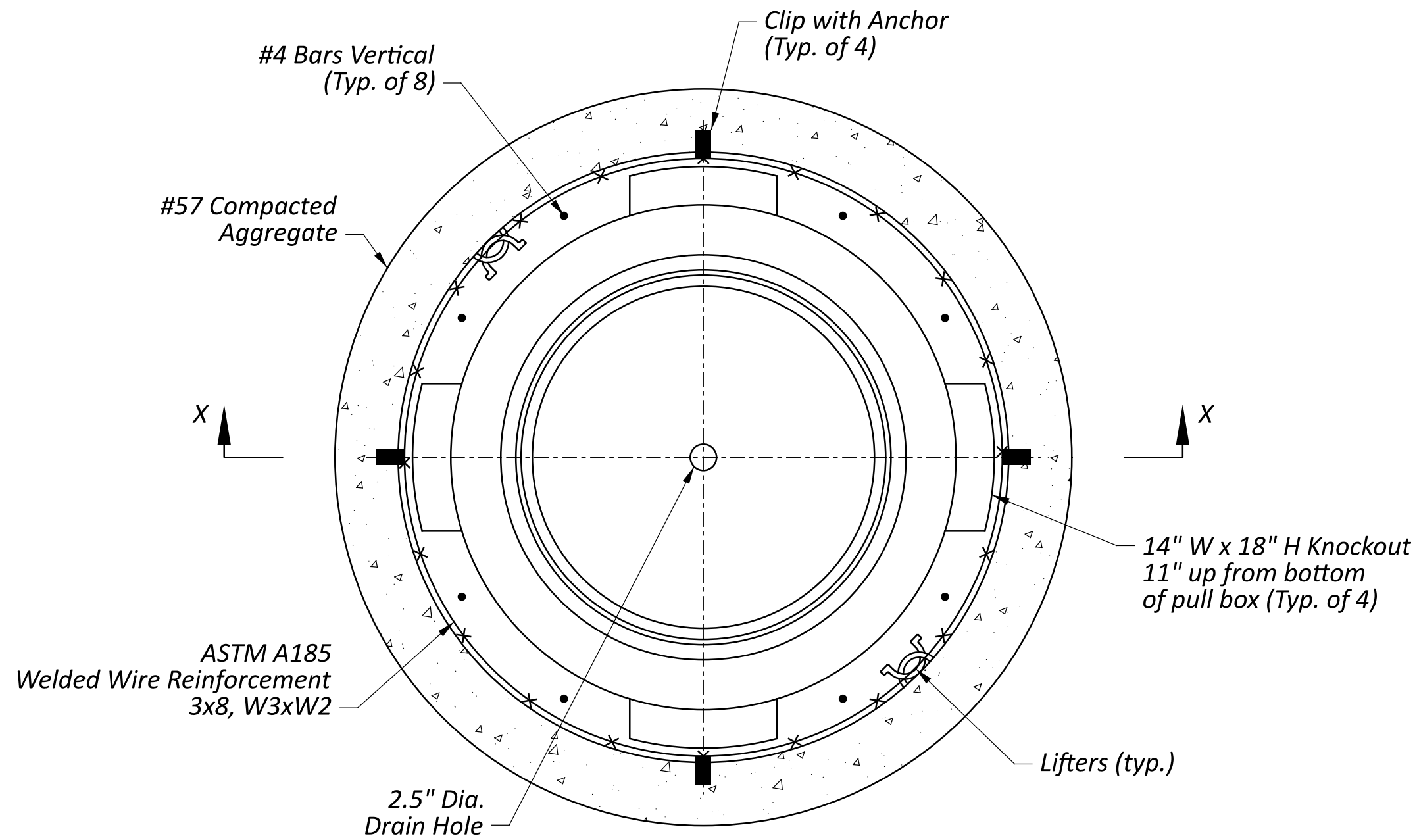
Install communication cable markers on the high side of the slope.

Install hinged pull box lids so that the lid swings towards the bottom of the slope (i.e. hinge on the low side).

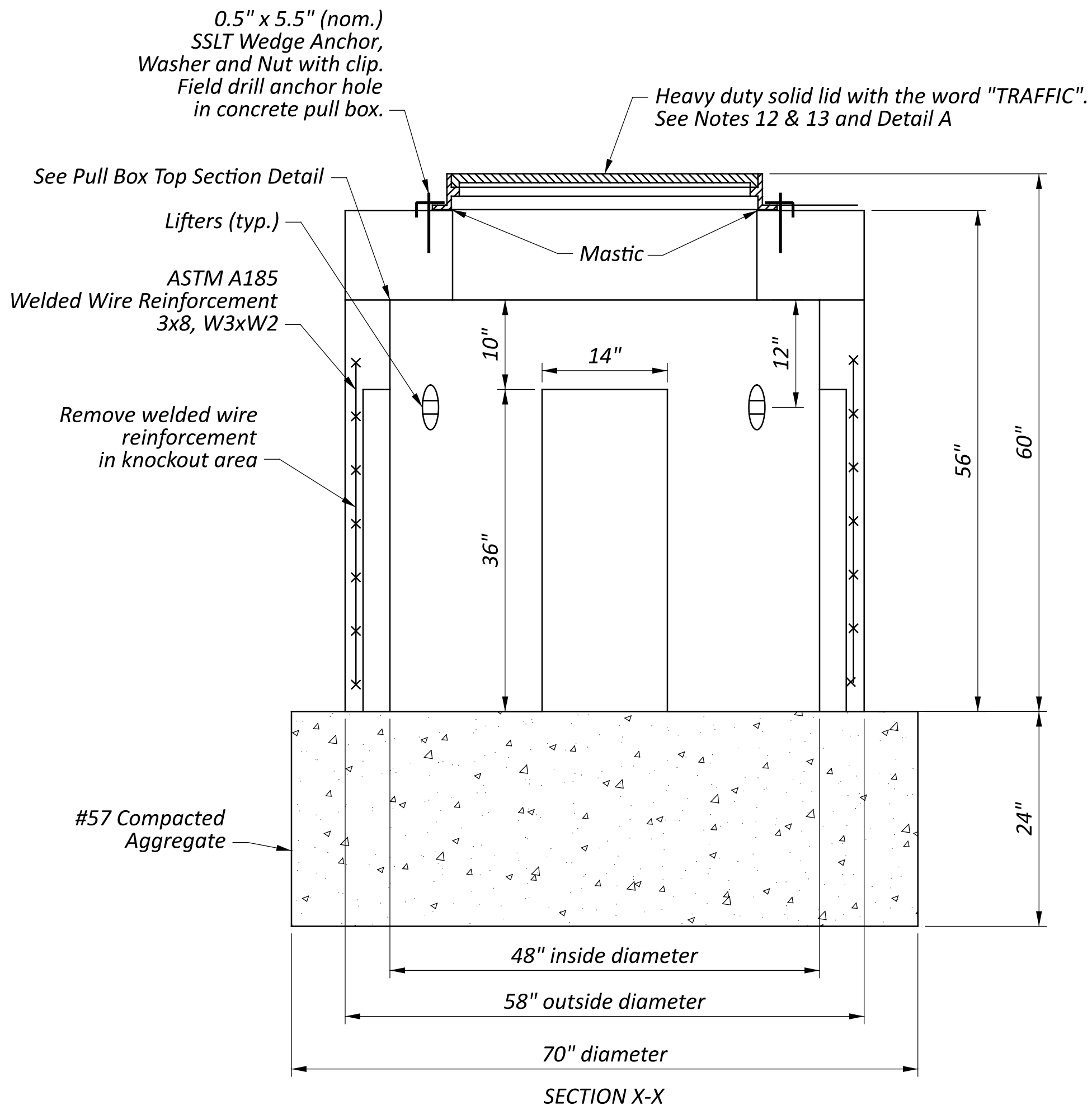
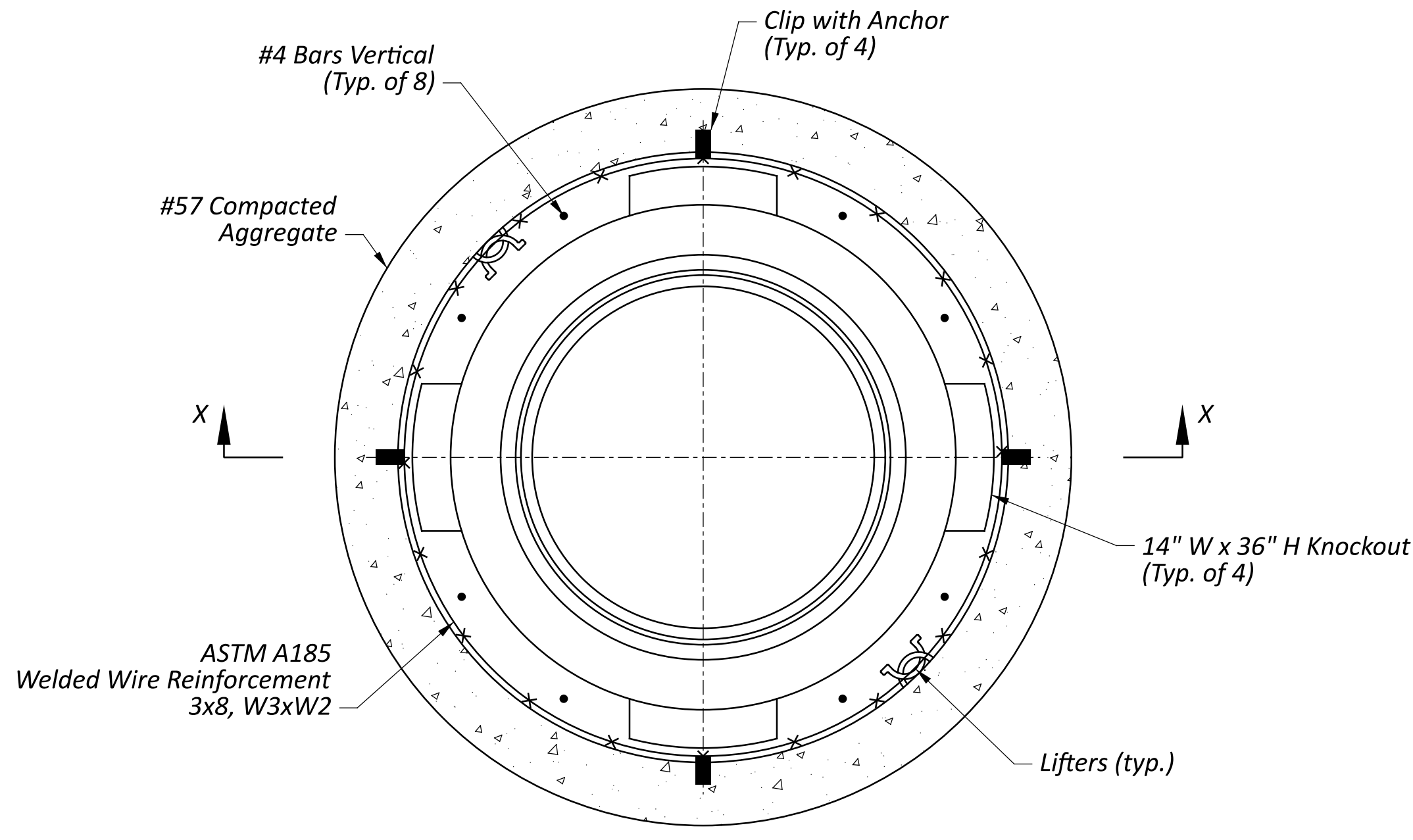
Lid ring load transfer is to be distributed by the use of a preformed mastic joint material and stainless or galvanized steel clips as shown in Detail A.

- Contractor shall make necessary provisions to ensure that the lid and ring (frame assembly) are secure before pouring concrete. Contractor shall inspect the frame assembly for any deficiencies and/ or voids prior to pouring concrete. All voids shall be filled prior to pouring the work pad. All deficiencies shall be reported to ODOT personnel on scene so that prompt corrections can be made. Work pads shall be sloped so that all sides are even with the ground. Contractor shall ensure that all debris and excess concrete is removed from the inside of the ring so that the lid can be easily removed and replaced.
- The base of a Type 1 pull box may be manufactured as a separate piece and joined to the walls with dowels.

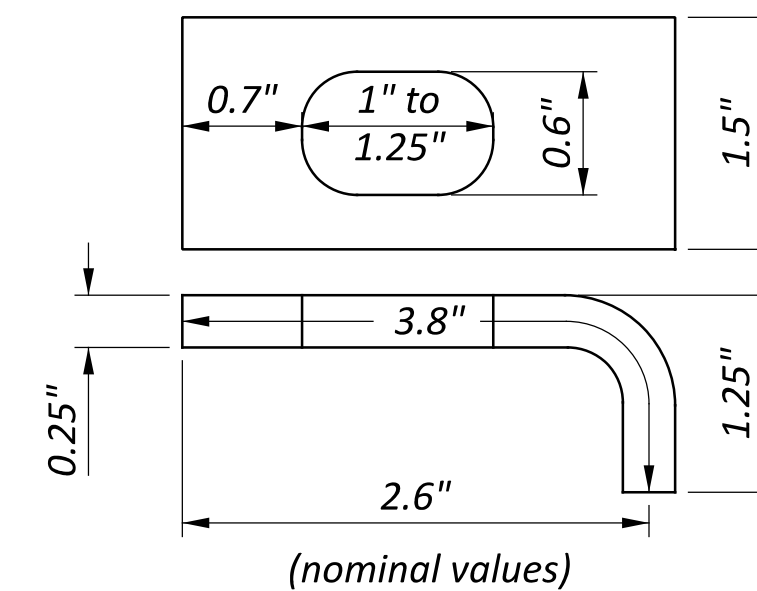
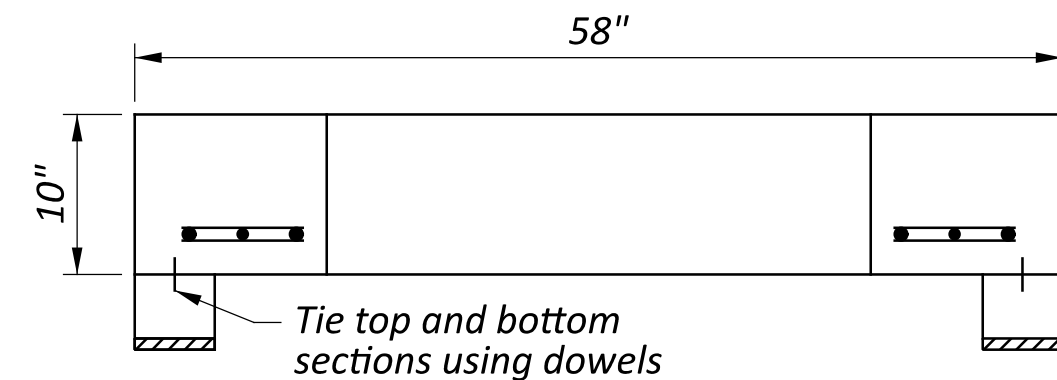
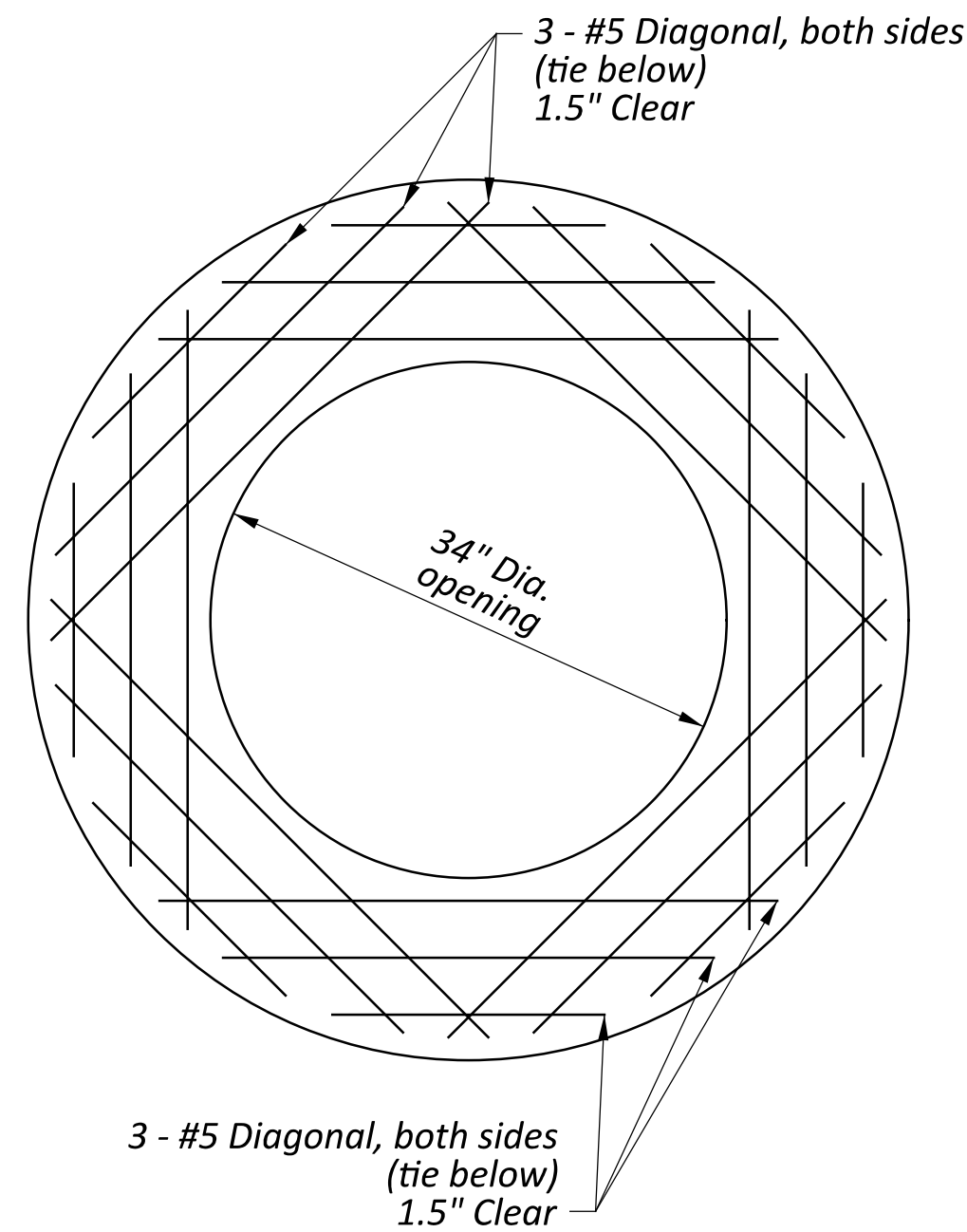




PULL BOX WITH FRAME AND LID, TYPE 1



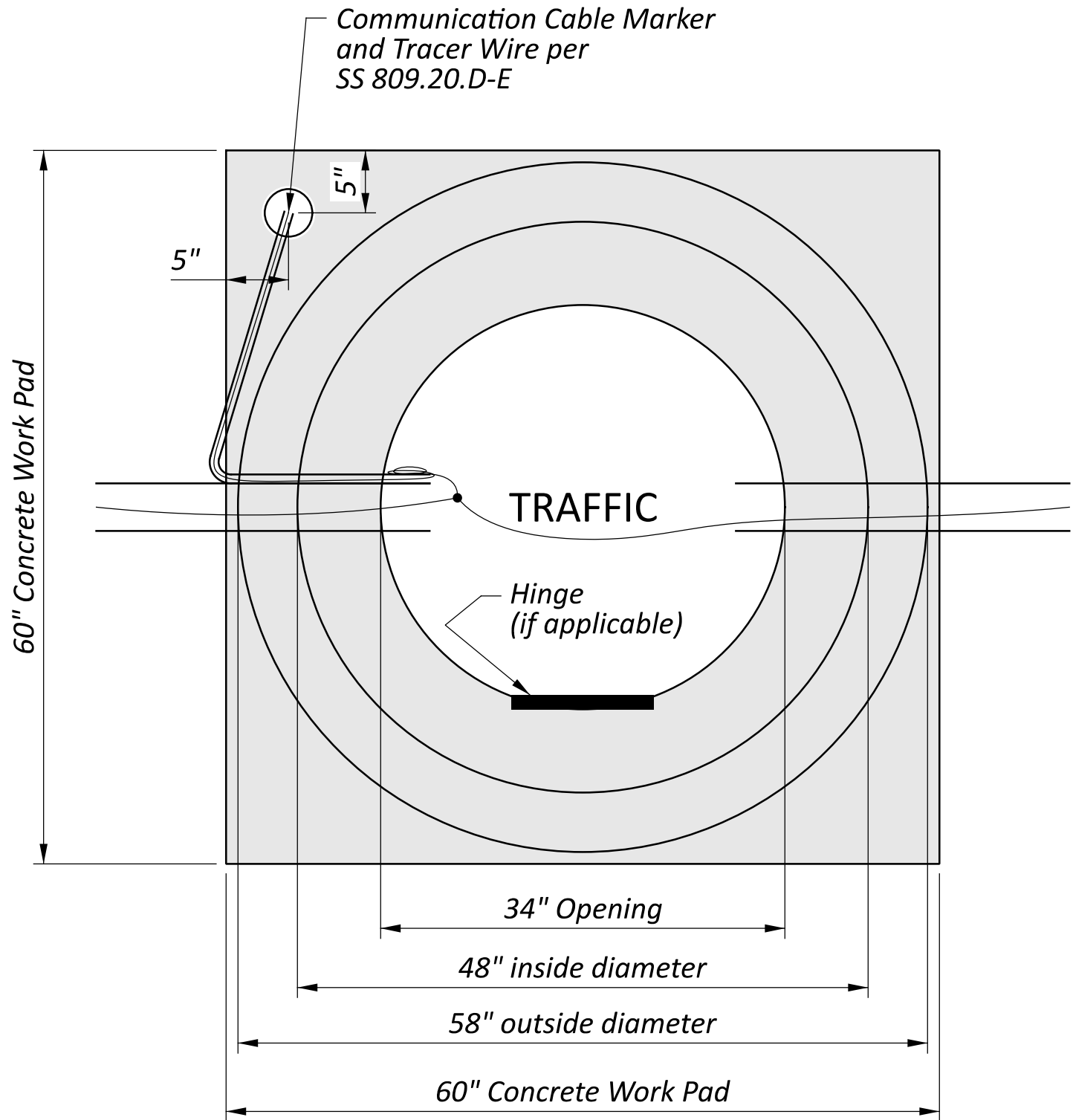
PULL BOX WITH FRAME AND LID, TYPE 2
(use when placing pull box over existing conduits)



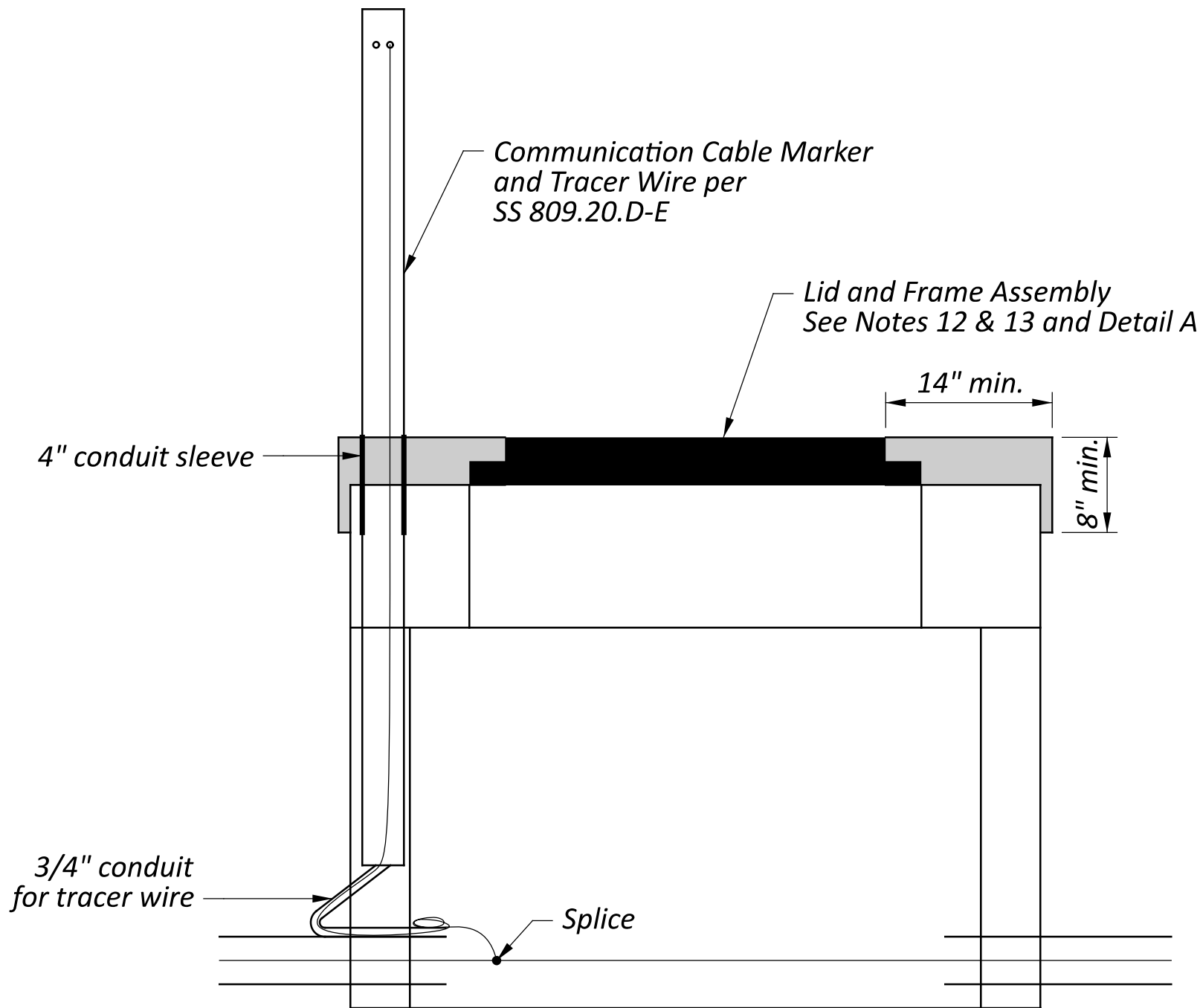
ASTM A36 steel with ASTM A123 HD Galvanizing

CLIP PROFILE

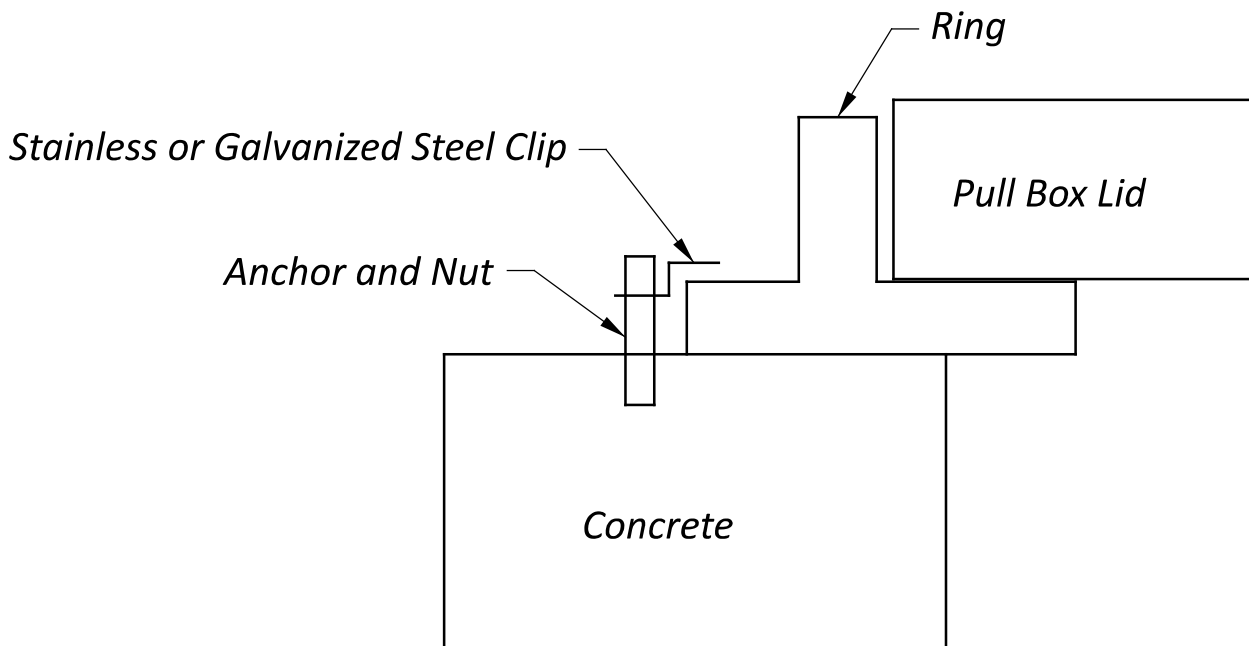
48" ITS PULL BOX WORK PAD DETAIL



TOP VIEW



SIDE VIEW



DETAIL A
(Not to scale)

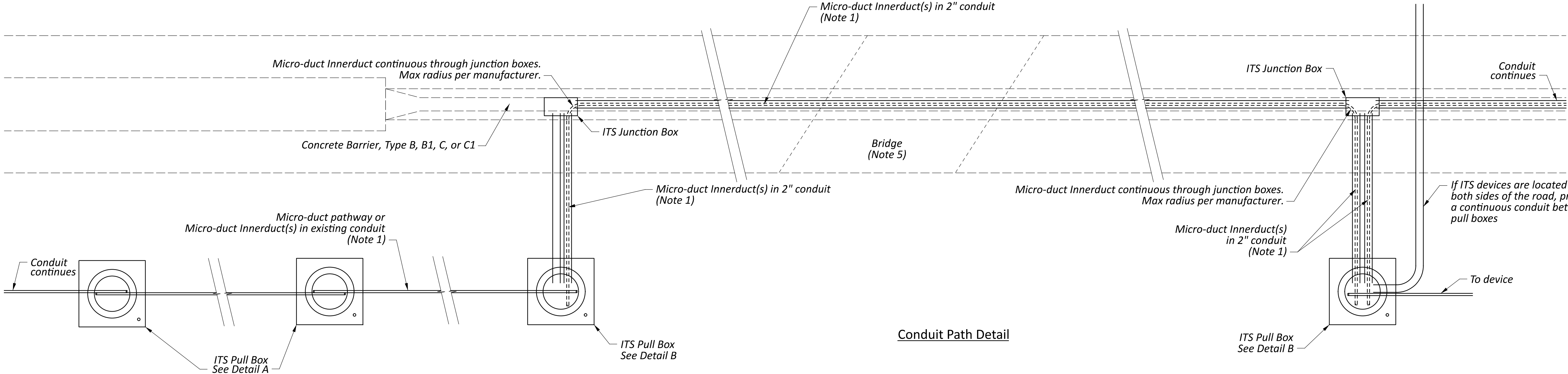
Notes

- One coat of water repellant sealer, such as Enviro Seal 40, shall be applied to the inside and outside of the pull box.
- Concrete shall have air entrainment of 6% ± 2% and shall have minimum 4500 PSI compressive strength at 28 days. Concrete shall meet the requirements of SS 809.15.
- Conduits are to enter the pull box a minimum of 3 inches and a maximum of 6 inches from the wall of the pull box. Cap conduits per SS 809.20
- Conduits should enter the pull box via a knockout. When approved by the Engineer, conduits may enter the pull box through its wall only if the opening is sawn or core drilled. Conduits shall not enter via the bottom of the pull box without approval by the Engineer. Conduits shall enter the knockout as close to 90 degrees as possible.
- After the conduits have been installed, any opening in the pull box wall shall be totally filled with mortar or concrete and finished flush with the inside of the pull box wall (no voids).
- Pull box bearing capacity to exceed 40,000 pounds.
- Enlarging the knockout area, if required, shall be done by saw cutting or core drilling the concrete. No other methods are allowed. The Contractor shall replace the concrete housing, if damaged, at their expense.
- Duct seal shall be placed on all conduits in pull box which enter a cabinet.
- No conduit drains are allowed in ITS pull boxes. Type 1 pull boxes shall have a 2.5" diameter drain hole in the base.
- Slope the proposed raceway to drain into the pull box on either side of the freeway shoulder, where applicable.
- Install a concrete pull box pad per CMS 633.11 and as detailed on this drawing. The pull box pad shall be incidental to the pull box.
- Install appropriate lid and frame assemblies per SS 809.

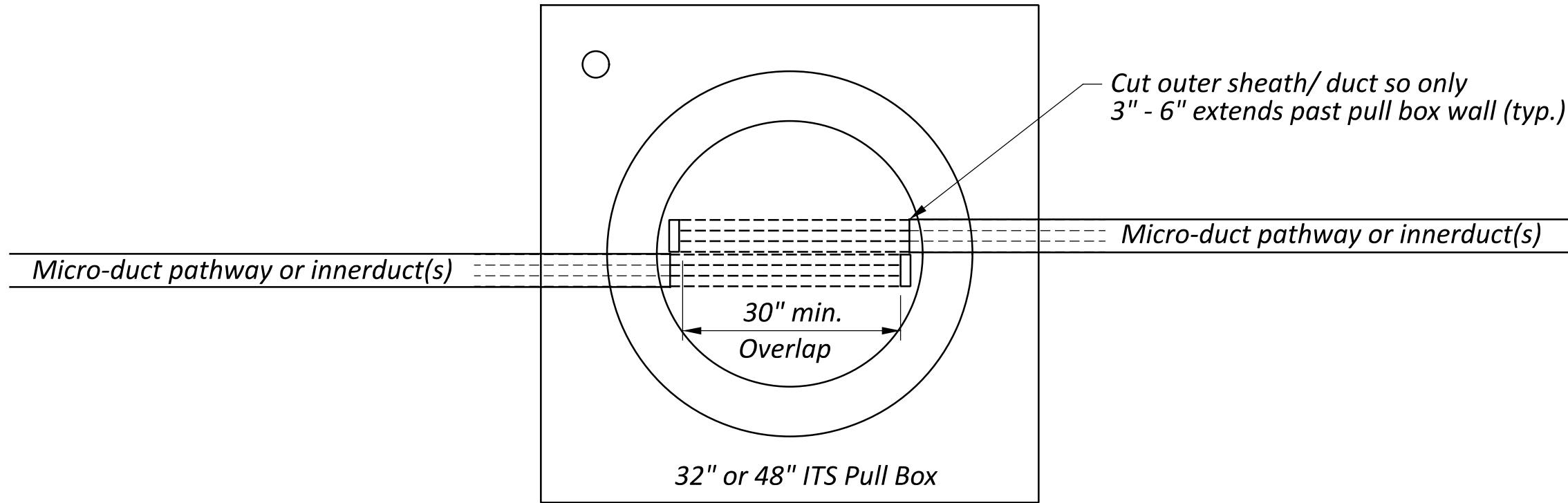
Install communication cable markers on the high side of the slope.

Install hinged pull box so that the lid swings towards the bottom of the slope (i.e. hinge on the low side).

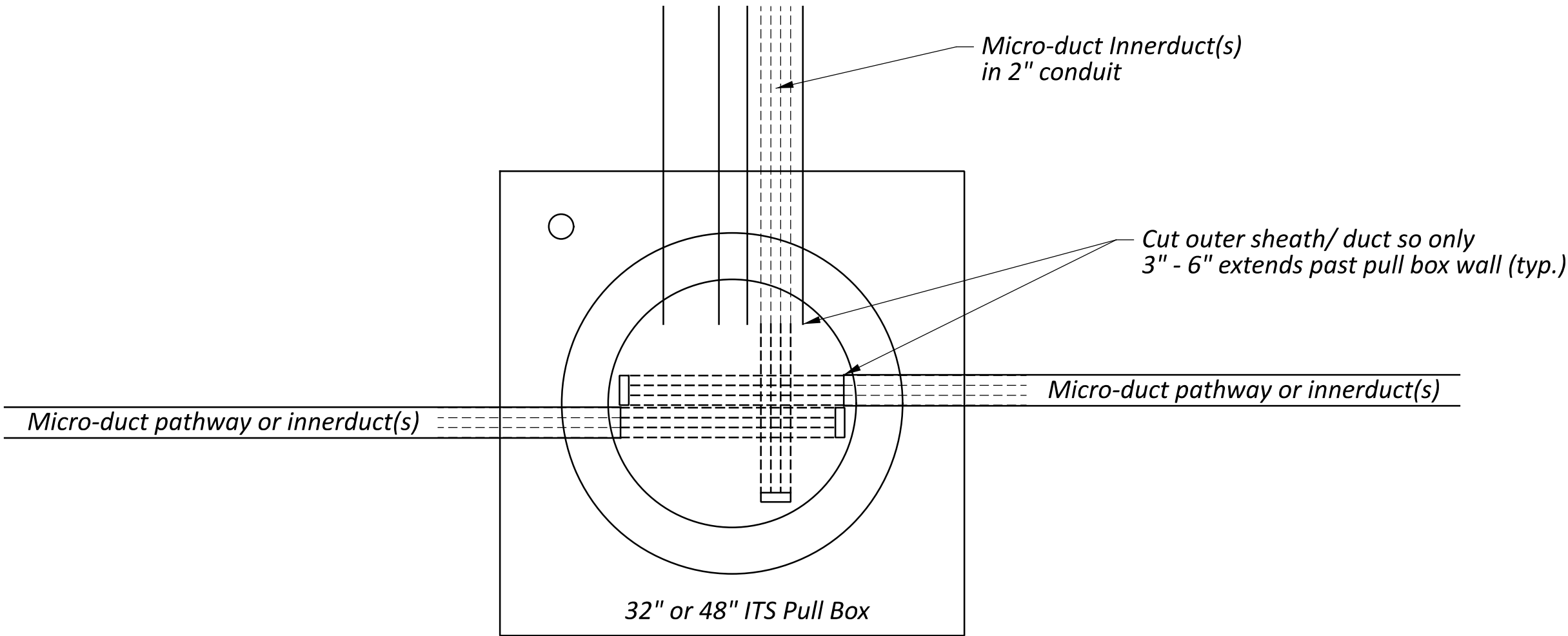
Lid ring load transfer is to be distributed by the use of a preformed mastic joint material and stainless or galvanized steel clips as shown in Detail A.
- Contractor shall make necessary provisions to ensure that the lid and ring (frame assembly) are secure before pouring concrete. Contractor shall inspect the frame assembly for any deficiencies and/ or voids prior to pouring concrete. All voids shall be filled prior to pouring work pad. All deficiencies shall be reported to ODOT personnel on scene so that prompt corrections can be made. Work pads shall be sloped so that all sides are even with the ground. Contractor shall ensure that all debris and excess concrete is removed from the inside of the ring so that the lid can be easily removed and replaced.
- The base of a Type 1 pull box may be manufactured as a separate piece and joined to the walls with dowels.



Conduit Path Detail



Micro-duct Overlap in Pull Boxes
Detail A



Pull Boxes with Conduit Laterals
Detail B

Notes

1. Micro-duct pathway cell count and/ or number of micro-duct innerducts are project specific per Supplemental Specifications 809 and 909. Innerducts are not a bundled pathway. Confirm with ITS Engineer.
2. Micro-ducts shall be capped with pulling eye during installation and with manufacturer approved push on caps immediately after installation to prevent contamination inside.
3. Pull box and junction box spacing per TEM 1303-5.
4. Micro-duct is restricted to 5,000 ft continuous runs (maximum reel length manufactured)
5. See ITS-14.50 for bridge transition and routing requirements.



WORK BY UTILITY -

- 1
- Splicing of Utility's service entrance cable onto Contractor's service entrance cable by Utility.

- 2
- Connection to existing/ proposed electric utility transformer or wood pole with riser. The Contractor shall coordinate with the Utility Company to ensure this connection can be made according to the Utility Company's standards.

WORK BY CONTRACTOR -

- 1
- Install rigid 90° conduit sweeps.
- 2
- Underground Warning/ Marking Tape 12" above service lateral.
- 3
- Contractor-installed equipment stand per HL-40.20. Channel strut attached to pole per conduit mounting bracket detail. Contractor shall install conduit no closer than 2' from edge of utility transformer pad. Approach to transformer must be coordinated with utility.
- 4
- Utility meter. Contractor to supply manual bypass type socket. Apply a durable, permanent and weatherproof label with the power service address above the meter on the enclosure.
- 5
- Fusible service disconnect switch per SS 809.03. Apply a durable, permanent and waterproof label with "ODOT ITS" on the enclosure. Fuse sizes shall be approved by the ITS Engineer.
- 6
- Concrete pull box, 18" will be installed within 5' of every electrical service.

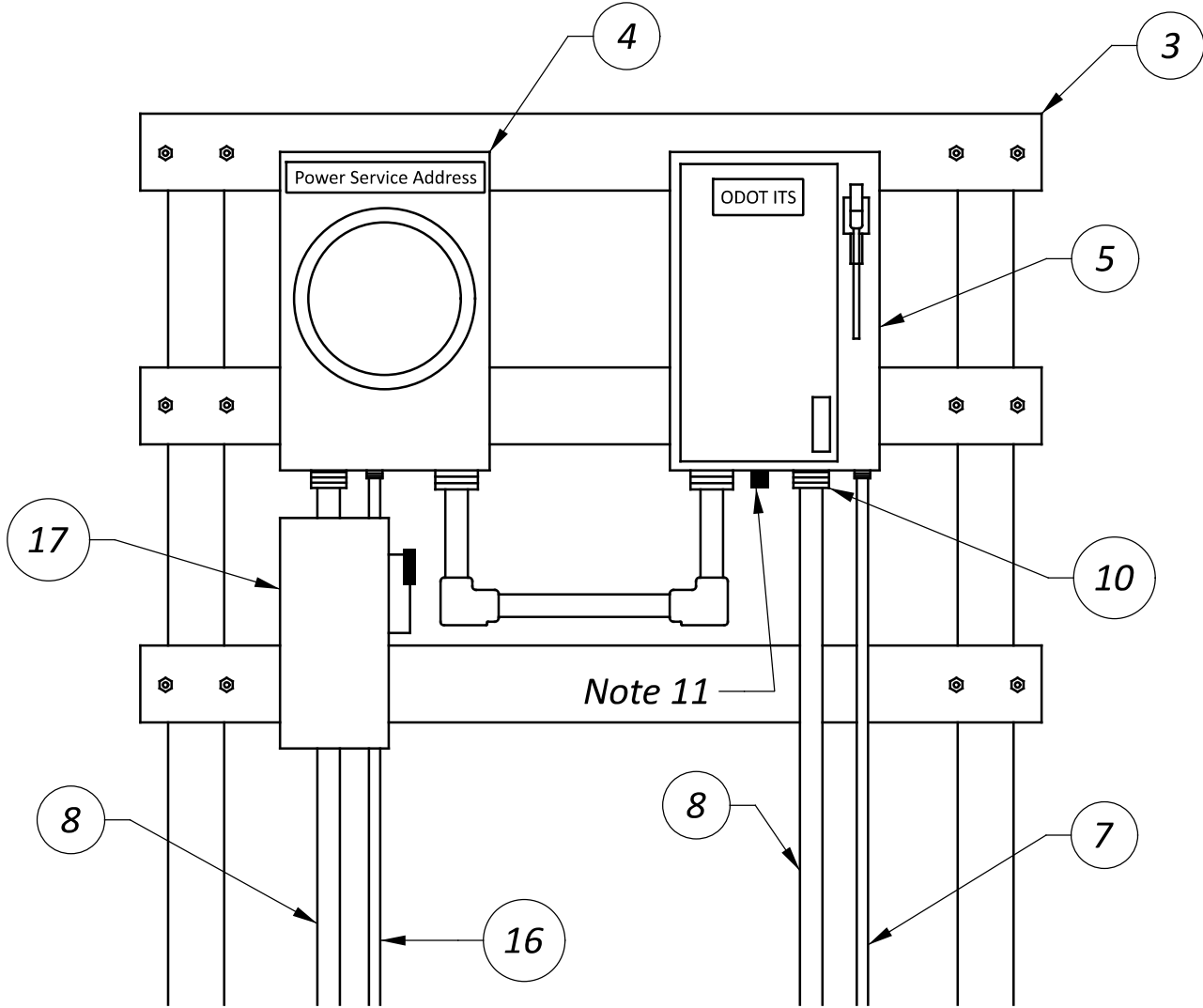
Where No. 1/0 AWG wire is used between the power service and the device/ cabinet, splice it to No. 2 AWG wire, using a Connection Unfused Permanent per CMS 725.15, in the pull box nearest the disconnect switch. The No. 2 AWG wire shall run from the pull box to the disconnect switch. A splice to smaller sized cable may be acceptable if the approved disconnect switch has smaller rating requirements.

No other electrical splices are permitted.

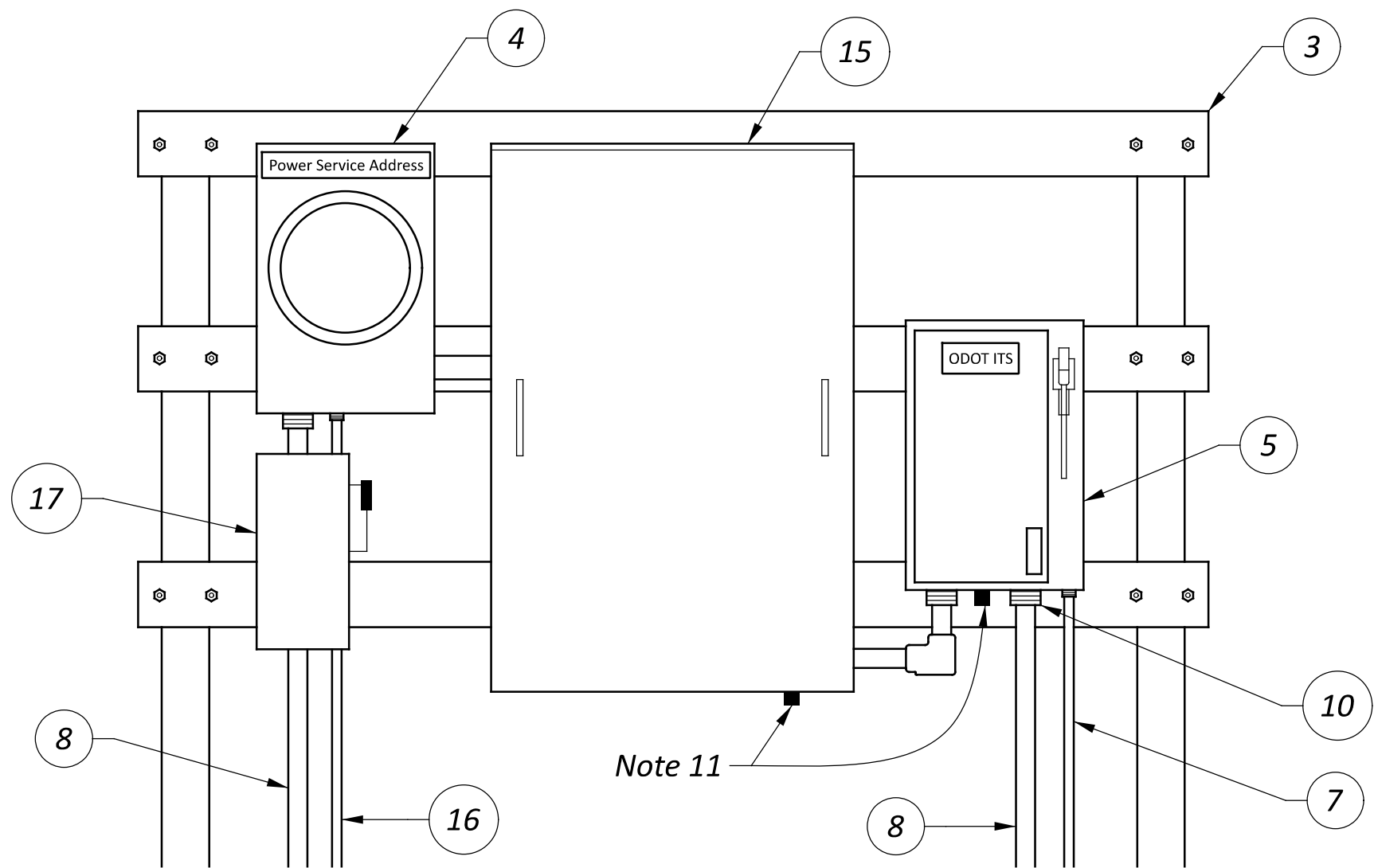
The splice connections and smaller sized cable shall be incidental to the power service pay item.

- 7
- Copper ground conductor in 3/4" rigid conduit to disconnect switch neutral bus. Ground conductor shall match circuit conductor (or be larger). The ground conductor must always be directed downward or horizontal. Bond the ground conductor at both ends with conduit bushings.
- 8
- 1.5" rigid conduit riser. See conduit mounting bracket for mounting details.
- 9
- Service entrance cable in conduit by Contractor. All service entrance cable shall be #4-MV90-2.4KV for 100A services and #1/0 for 200A services, or as required by utility. Coordinate with the utility company for how to leave cable for their splicing.
- 10
- Threaded hub type conduit coupling between enclosures sized to accommodate conductors. See plan for wire requirements.
- 11
- Ground rod electrode per CMS 725.16 attached to grounding conductor at least 12" below grade and at least 12" off edge of pole/ foundation. Attach with ground clamps suitable for direct burial. See ITS-50.10 for other grounding requirements.
- 12
- Rigid 1.5" conduit with sweeps shall terminate into pull box. Conduit installed a minimum of 30" below grade.
- 13
- Conduit and cable per plan by Contractor.
- 14
- 1.5" C&MS 725.04 conduit installed a minimum of 30" below grade. Conduit run is continuous between equipment stand and utility pole/ transformer or as indicated on plan sheets.
- 15
- Aluminum current transformer enclosure for 240/ 480V service (single-phase or three-phase) per Utility Company specifications.
- 16
- Ground wire conduit if required by Utility Company specifications.
- 17
- Switched meter disconnect if required by Utility Company specifications.

120/ 240V, 3-WIRE, 1-PHASE
GROUND MOUNTED POWER SERVICE



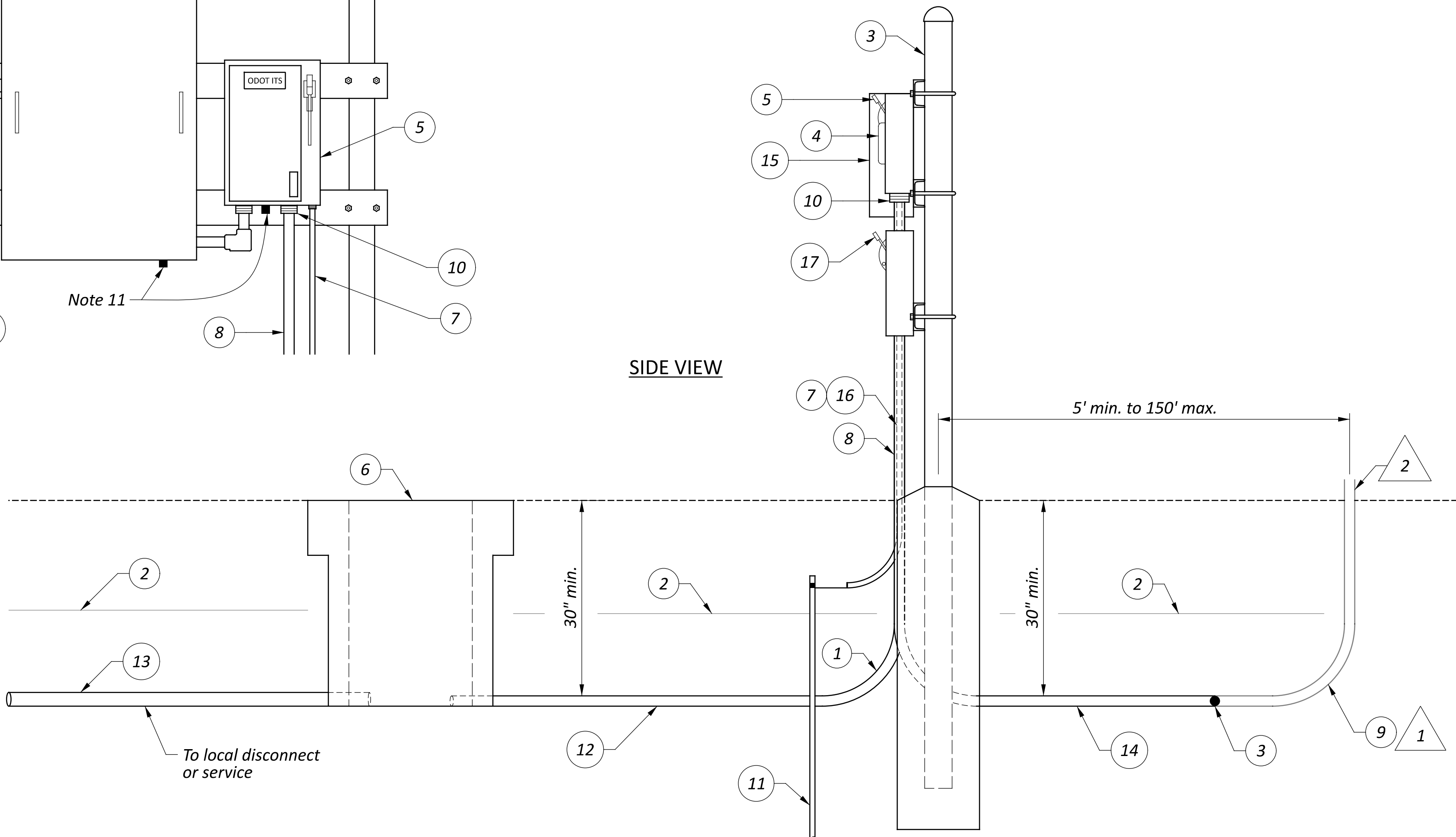
240/ 480V, 3-WIRE, 1-PHASE
GROUND MOUNTED POWER SERVICE







NOTES

- 1
- Contractor must coordinate with utilities' field engineer. Contractor shall be responsible for scheduling and coordinating of all utilities, related work, and inspections as necessitated by the project.
- 2
- All work and materials shown on electrical service details from the electric utility pole to the disconnect is incidental to power service pay items.
- 3
- Service provider power conduit systems shall be installed per NEC and local requirements.
- 4
- Do not extend conduit above the secondary or neutral position at any time.
- 5
- Conduit shall maintain a minimum clearance of 6" below the secondary or neutral.
- 6
- All proposed service types and locations are subject to approval from utility. Contractor is responsible for furnishing and installing all equipment according to Engineer's approval.
- 7
- If power service is needed to provide 480V, the service shall be a 480/240V single phase service. The contractor shall coordinate with the power company to determine if they have any special requirements for a metered 480 volt service drop, such as but not limited to, an additional enclosure or disconnect ahead of the meter, current transformers, or conduit boxes. If so, the contractor shall modify the power service as needed, as approved by the engineer.
- 8
- All conduit used in Power Service construction shall be rigid metallic conduit (RMC) per 725.04.
- 9
- All energized parts shall be guarded against accidental contact using guards supplied or approved by the electrical device manufacturer.
- 10
- Power conductors shall be labeled in meter bases and disconnects per 725.02, except that labeling may be achieved by phase tape or cable insulation. The following colors shall be used:
Line 1 (left of disconnect): black
Line 2 (right of disconnect): red
Neutral: white
Ground: Green or bare copper
- 11
- Install Vent Drain in lowest available location of all enclosures on the customer side of the service. Install Hoffman H20MIT, Eaton DPE303083, or approved equal.








SIDE VIEW



WORK BY UTILITY -

-  Aerial service entrance cable furnished and installed by utility.
-  Splicing of utility's service entrance cable onto Contractor's service entrance cable by utility.
-  Existing/ proposed electric utility pole installed by utility. (No Work).
-  Communication cable furnished and installed by communication provider if needed. See SCD ITS-13.10 for details.











WORK BY CONTRACTOR -

-  Install rigid 90° conduit sweeps.
-  Underground Warning/ Marking Tape 12" above service lateral.
-  Wood pole per CMS 725.19.H.
-  Contractor-installed wood crossarm or strut channel equipment rack. See details on next sheet and HL-40.10.
-  Utility meter. Contractor to supply manual bypass type socket. Apply a durable, permanent and weatherproof label with the power service address above the meter on the enclosure.
-  Fusible service disconnect switch per SS 809.03. Apply a durable, permanent and waterproof label with "ODOT ITS" on the enclosure. Fuse sizes shall be approved by the ITS Engineer.
-  Concrete pull box, 18" will be installed within 5' of every electrical service.

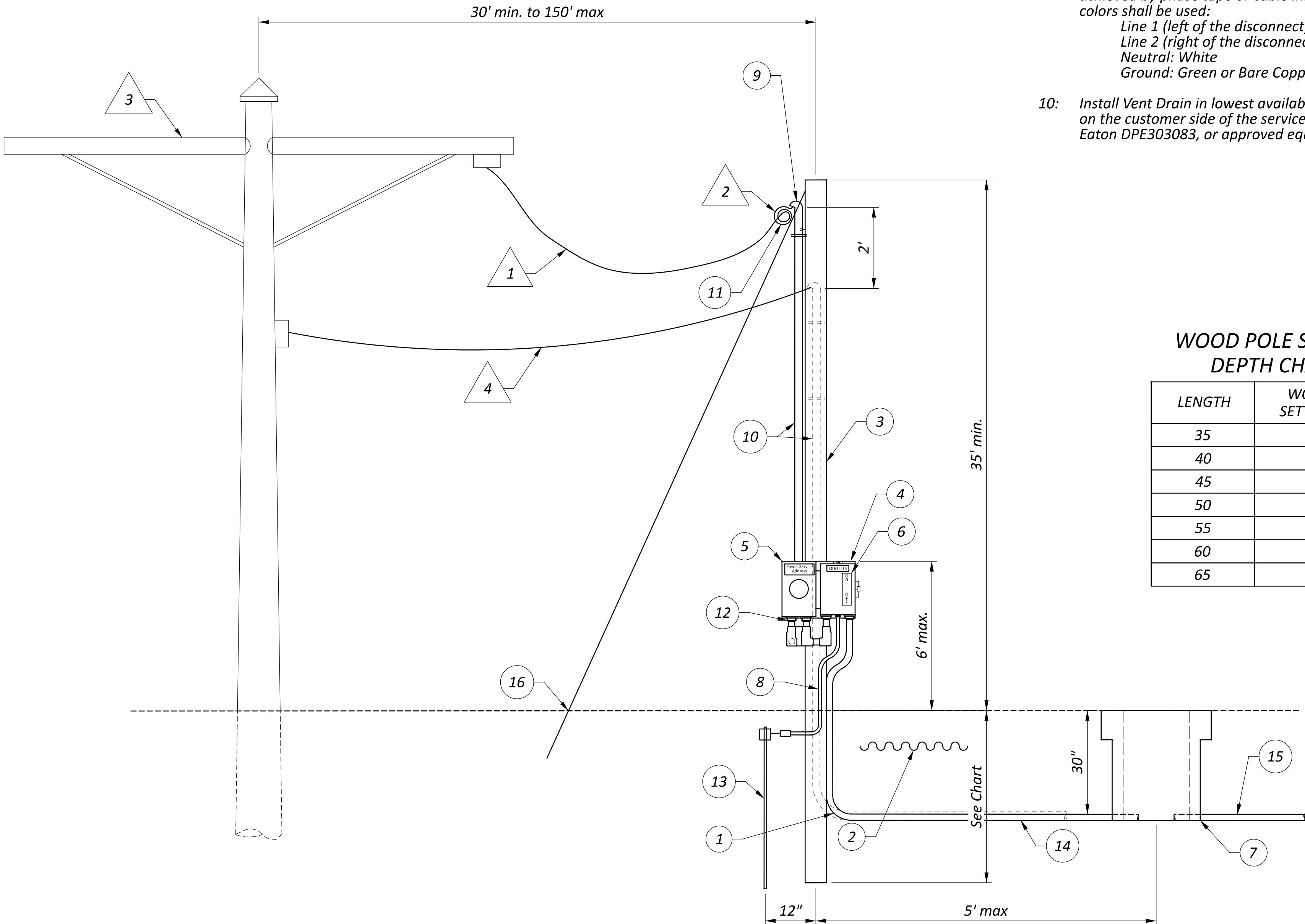
Where No. 1/0 AWG wire is used between the power service and the device/ cabinet, splice it to No. 2 AWG wire, using a Connection Unfused Permanent per CMS 725.15, in the pull box nearest the disconnect switch. The No. 2 AWG wire shall run from the pull box to the disconnect switch. A splice to smaller sized cable may be acceptable if the approved disconnect switch has smaller rating requirements.

No other electrical splices are permitted.

The splice connections and smaller sized cable shall be incidental to the power service pay item.

-  Copper ground conductor in 3/4" rigid conduit to disconnect switch neutral bus. Ground conductor shall match circuit conductor (or be larger). The ground conductor must always be directed downward or horizontal. Bond the ground conductor at both ends with conduit bushings.
-  1.5" weatherhead and strain relief hardware furnished and installed by Contractor.
-  Two 1.5" rigid conduit risers. One for power (and one for communication, if included per plan, to connect to a separate communication pull box). See conduit mounting bracket for mounting details.
-  Service entrance cable in conduit by Contractor. All service entrance cable shall be #4-MV90-2.4KV for 100A services and #1/0 for 200A services, or as required by utility. Coordinate with the utility company for how to leave cable for their splicing.
-  Threaded hub type conduit coupling between enclosures sized to accommodate conductors. See plan for wire requirements.
-  Ground rod electrode per CMS 725.16 attached to grounding conductor at least 12" below grade and at least 12" off edge of pole/ equipment foundation. Attach with ground clamps suitable for direct burial. See ITS-50.10 for additional grounding requirements.
-  Rigid 1.5" conduit with sweeps shall terminate into pull box. Conduit installed a minimum of 30" below grade.
-  Conduit and cable per plan by Contractor. No splices permitted in pull box unless approved by Engineer.
-  If the aerial feed distance is to be longer than 70', a guy wire anchor shall be installed to anchor the wood pole.
-  ¼" steel cable - eyebolt ½" x 8' with appropriate nut and large washer. Anchor -1 1/16" x 4' with 6" plate (auger style). Distance from anchor entering the ground to the center of the wood pole shall be 10' minimum.

120/ 240V, 3-WIRE, 1-PHASE
POLE MOUNTED POWER SERVICE

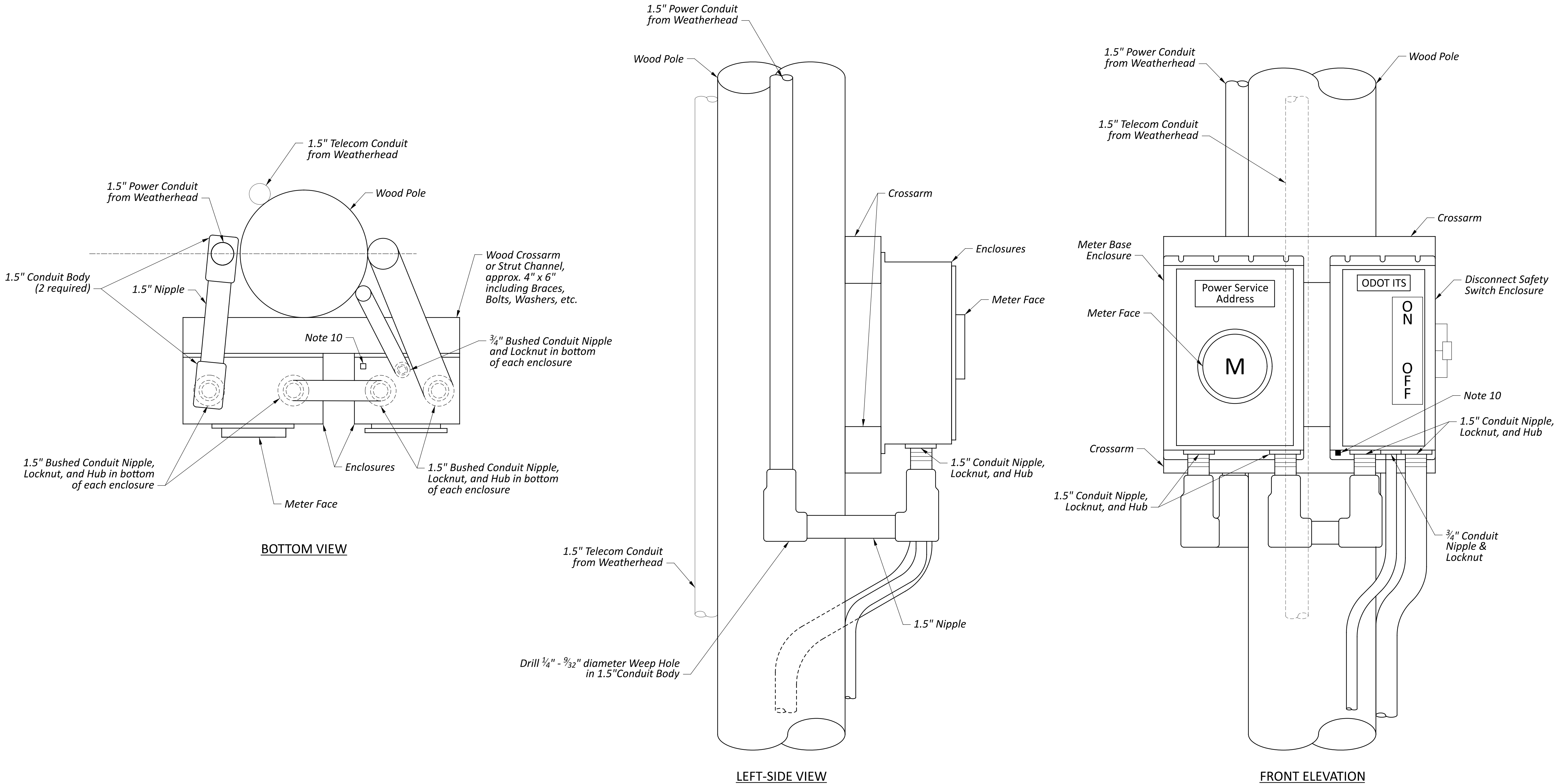


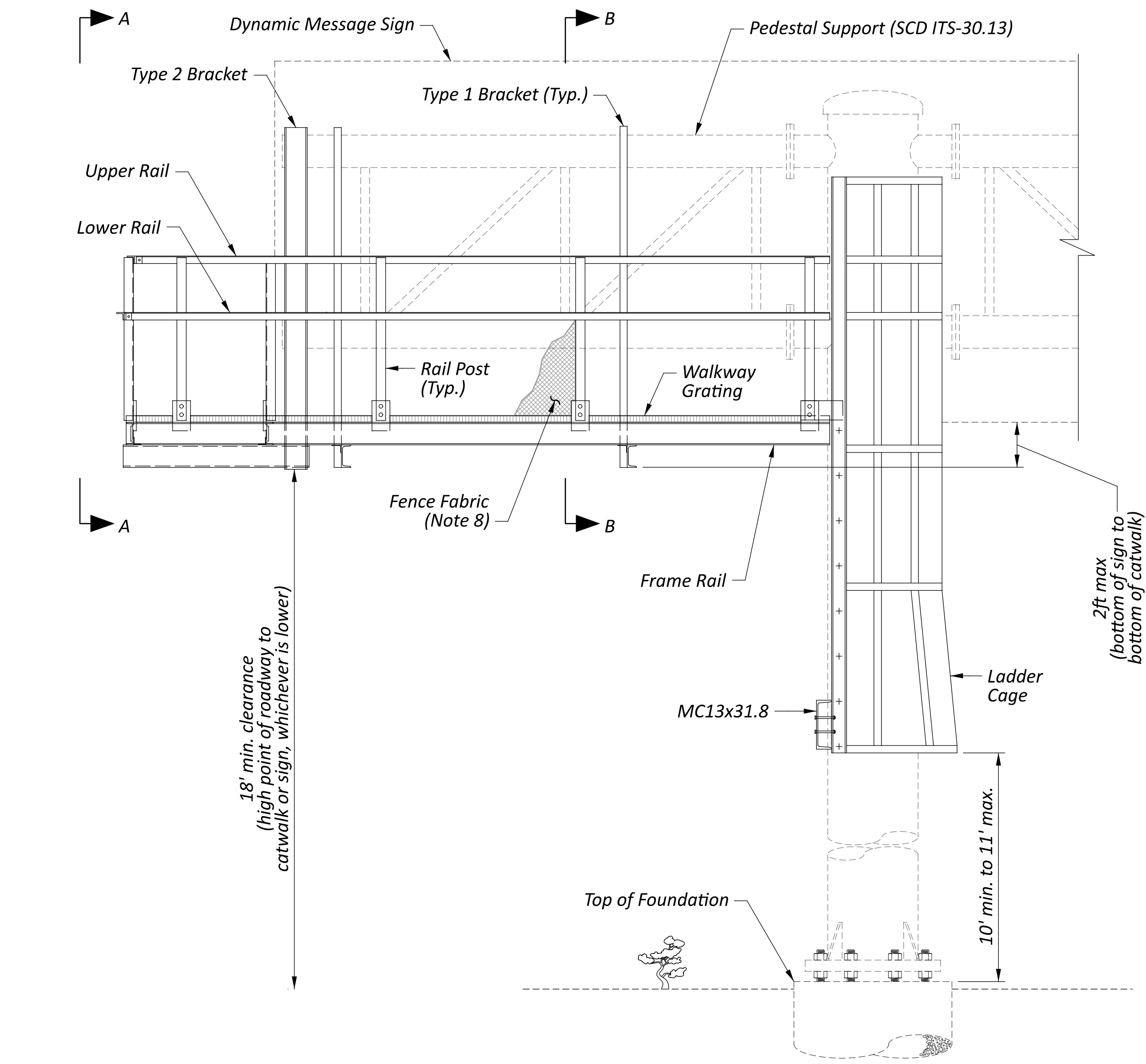
WOOD POLE SETTING
DEPTH CHART

LENGTH	WOOD POLE SETTING DEPTH
35	6'-0"
40	6'-0"
45	6'-6"
50	7'-0"
55	7'-6"
60	8'-0"
65	8'-6"

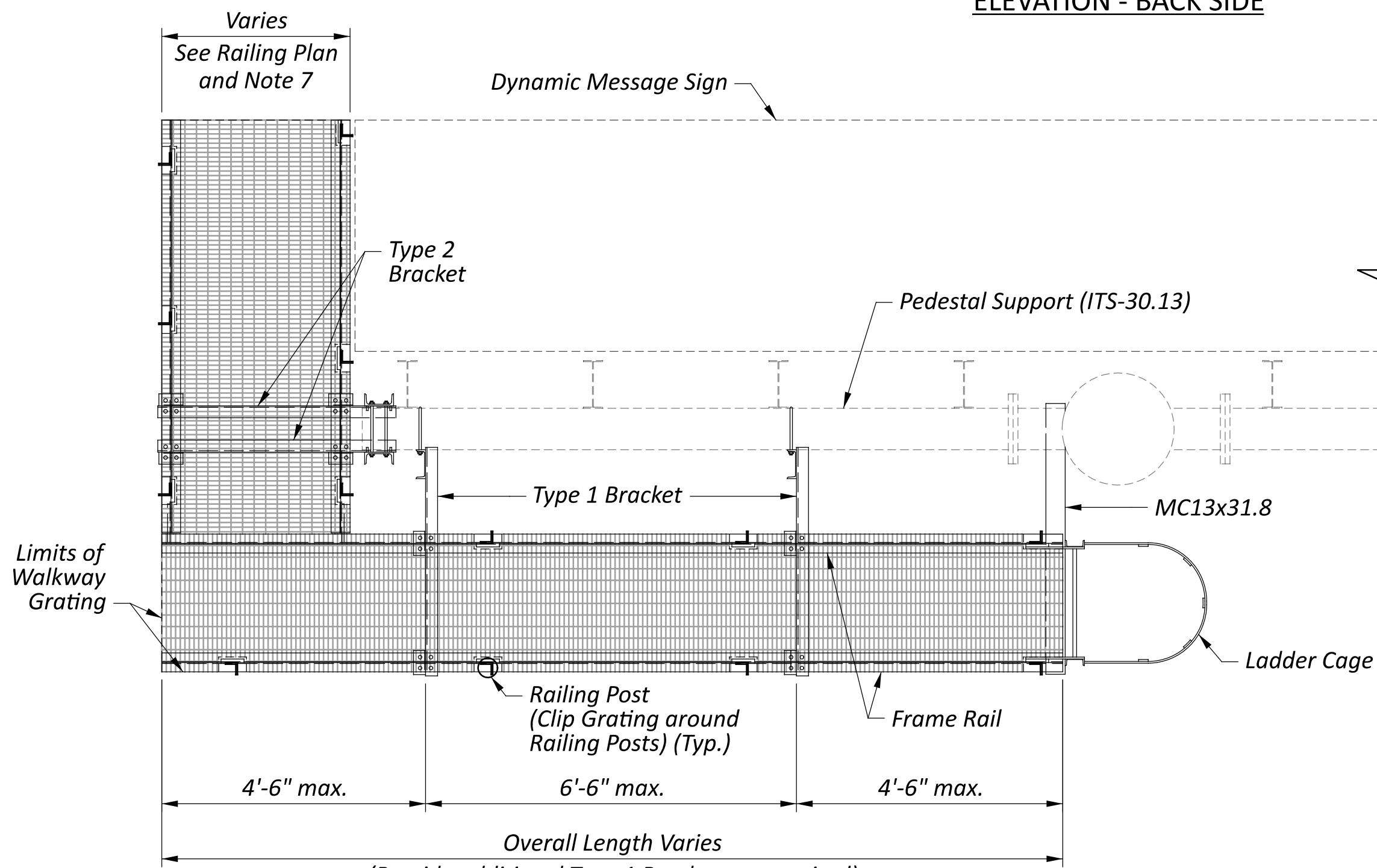
Notes

- Contractor must coordinate with Utilities' Field Engineer. Contractor shall be responsible for scheduling and coordinating of all utilities, related work, and inspections as necessitated by the project.
- All work and materials shown on the electrical service details from the electric utility pole to the disconnect is incidental to power service pay items.
- Service provider power conduit systems shall be installed per NEC and local requirements.
- Do not extend conduit above the secondary or neutral position at any time.
- Conduit shall maintain a minimum clearance of 6" below the secondary or neutral.
- All proposed power service types and locations are subject to approval from utility. Contractor is responsible for furnishing and installing all equipment according to Engineer's approval.
- All conduit used in power service construction shall be rigid metallic conduit (RMC) per CMS 725.04.
- All energized parts shall be guarded against accidental contact using guards supplied or approved by the electrical device manufacturer.
- Power conductors shall be labeled in meter bases and disconnects per CMS 725.02, except that labeling may be achieved by phase tape or cable insulation. The following colors shall be used:
Line 1 (left of the disconnect): Black
Line 2 (right of the disconnect): Red
Neutral: White
Ground: Green or Bare Copper
- Install Vent Drain in lowest available location of all enclosures on the customer side of the service. Install Hoffman H20MIT, Eaton DPE303083, or approved equal.



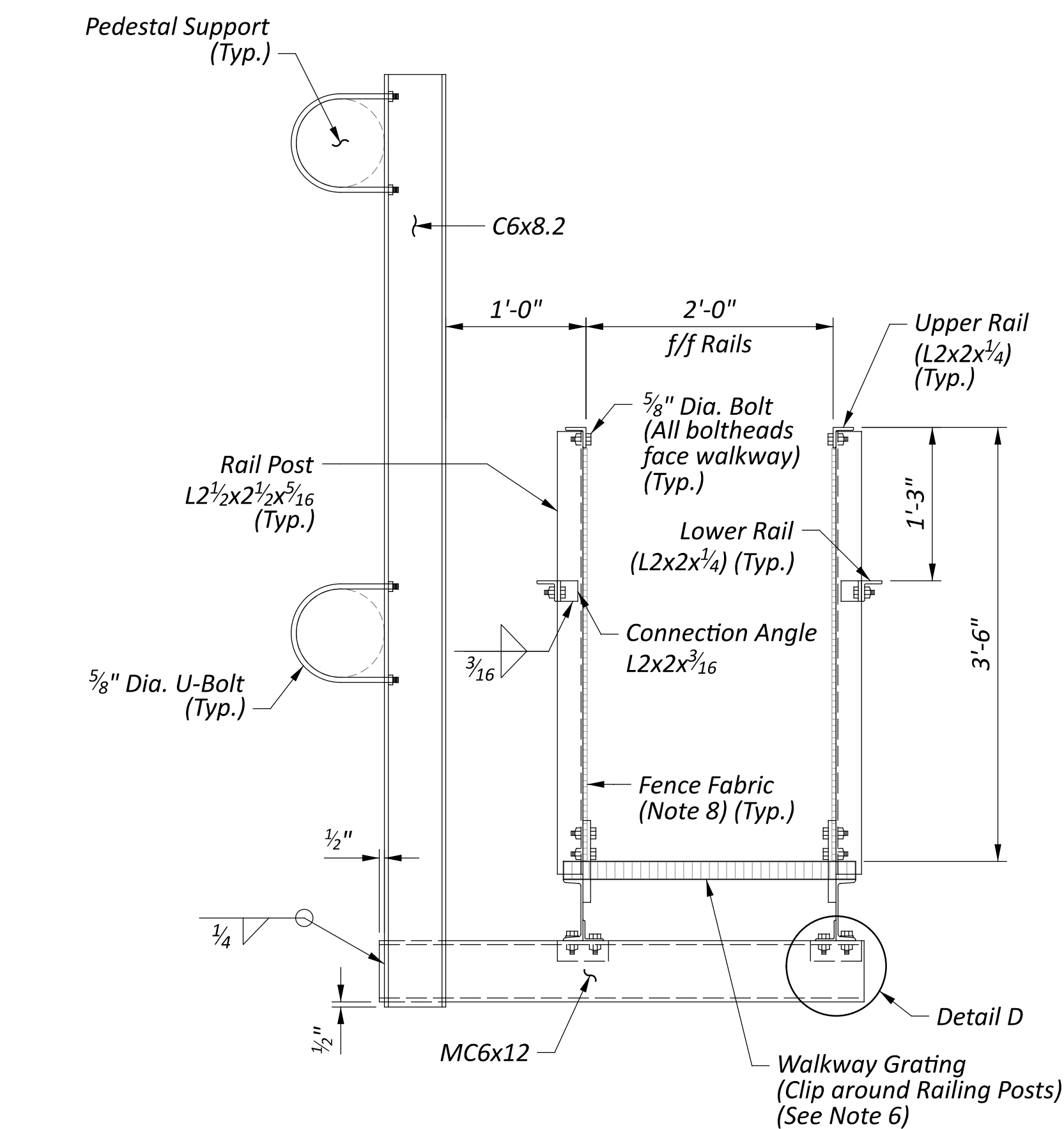


ELEVATION - BACK SIDE



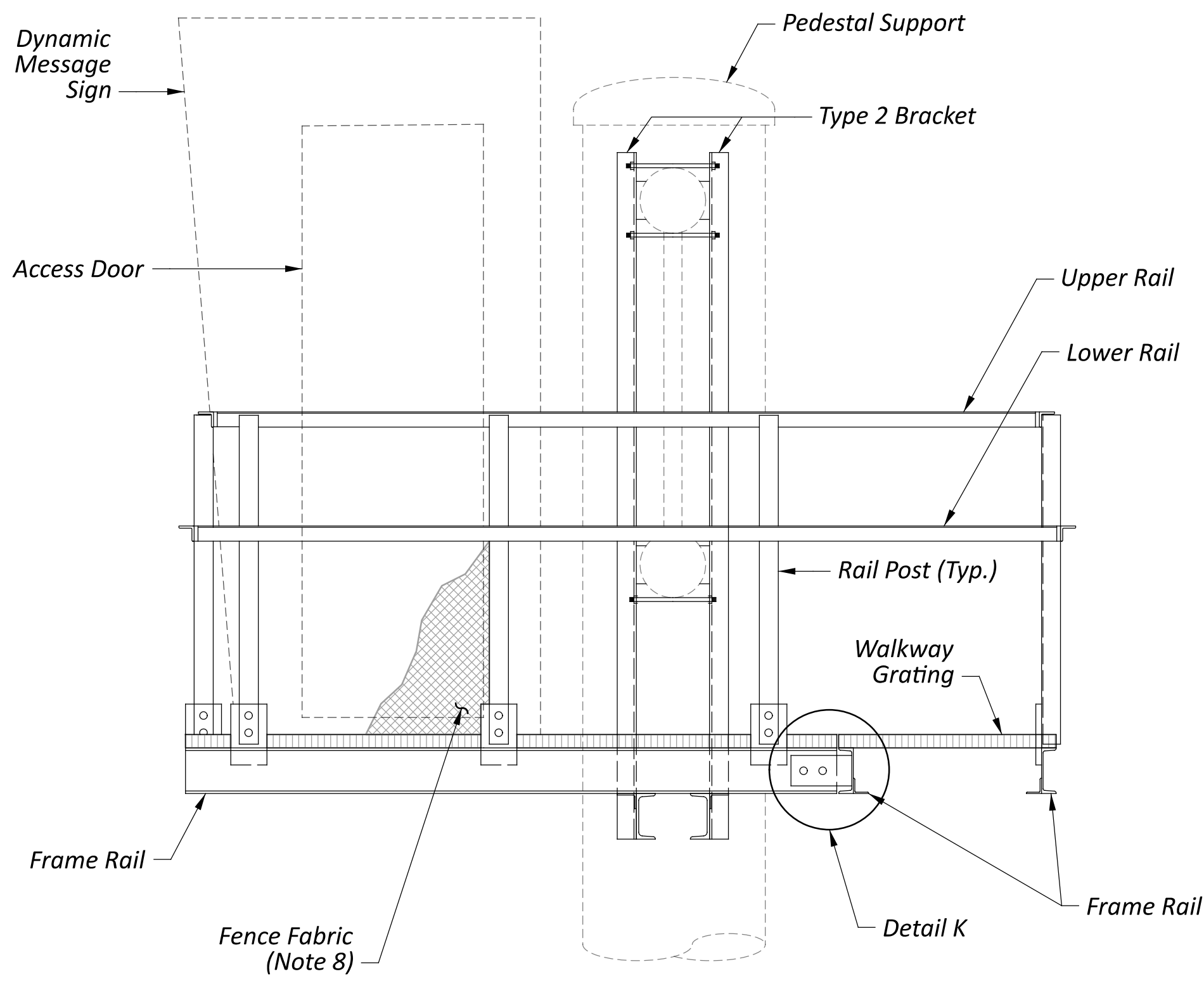
PLAN

(Upper and Lower Rail not shown)

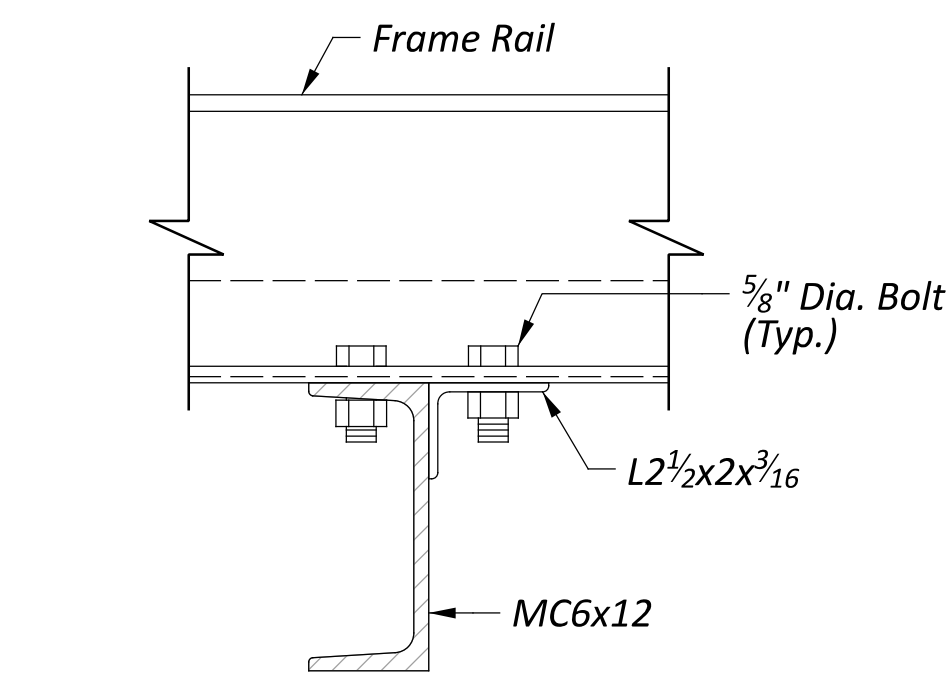


SECTION B-B

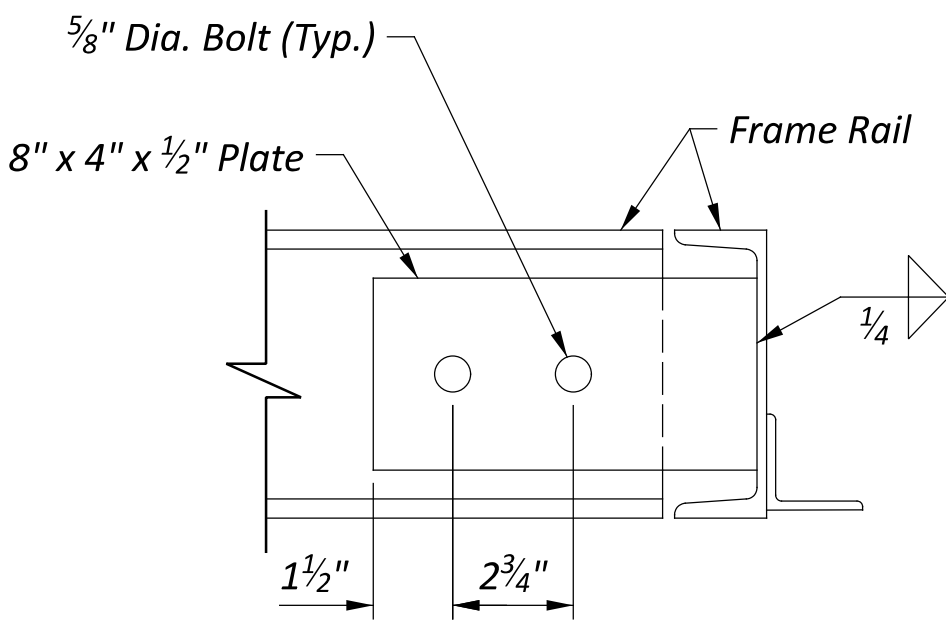
Type 1 Bracket



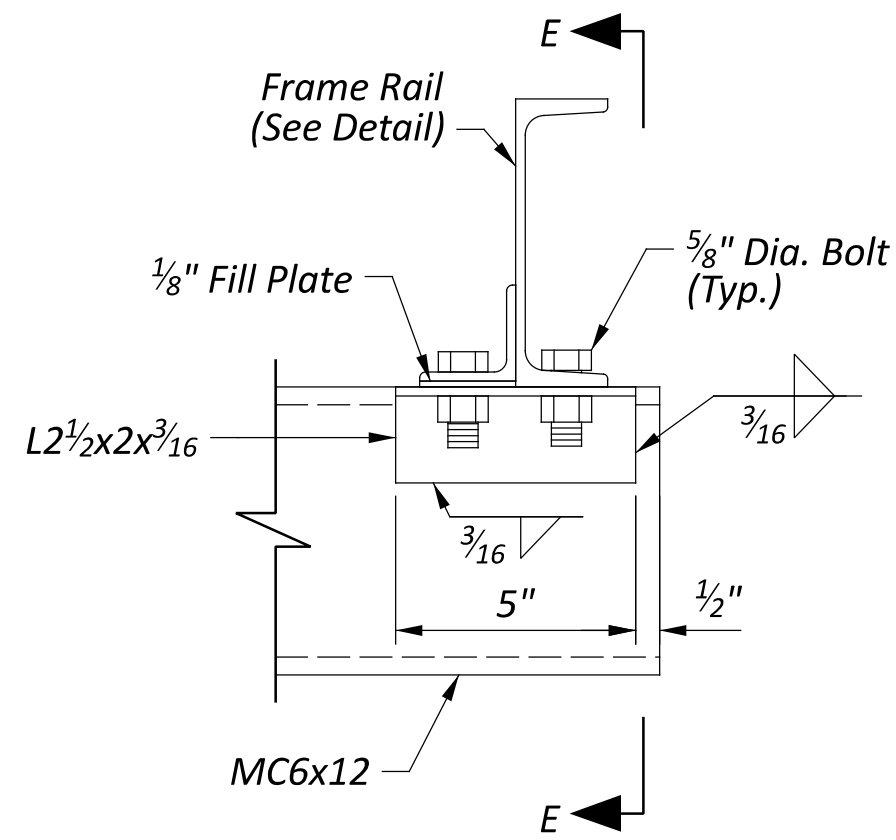
VIEW A-A



SECTION E-E

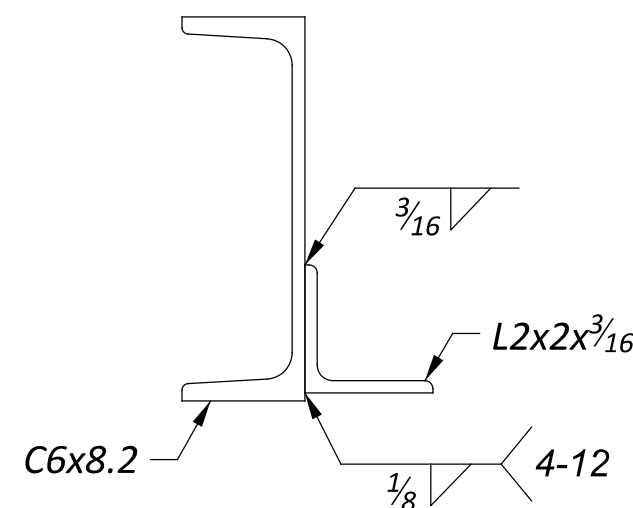


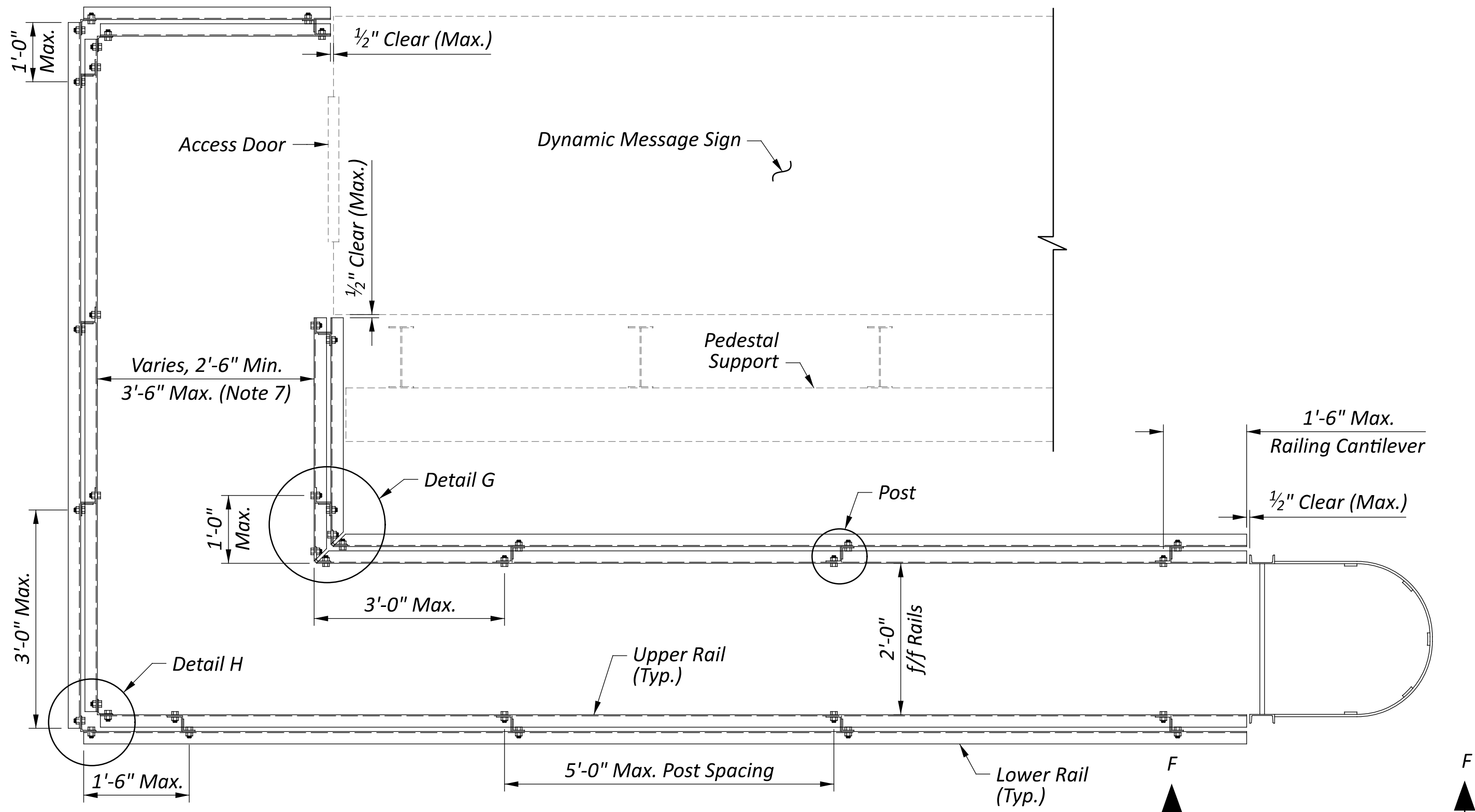
DETAIL K



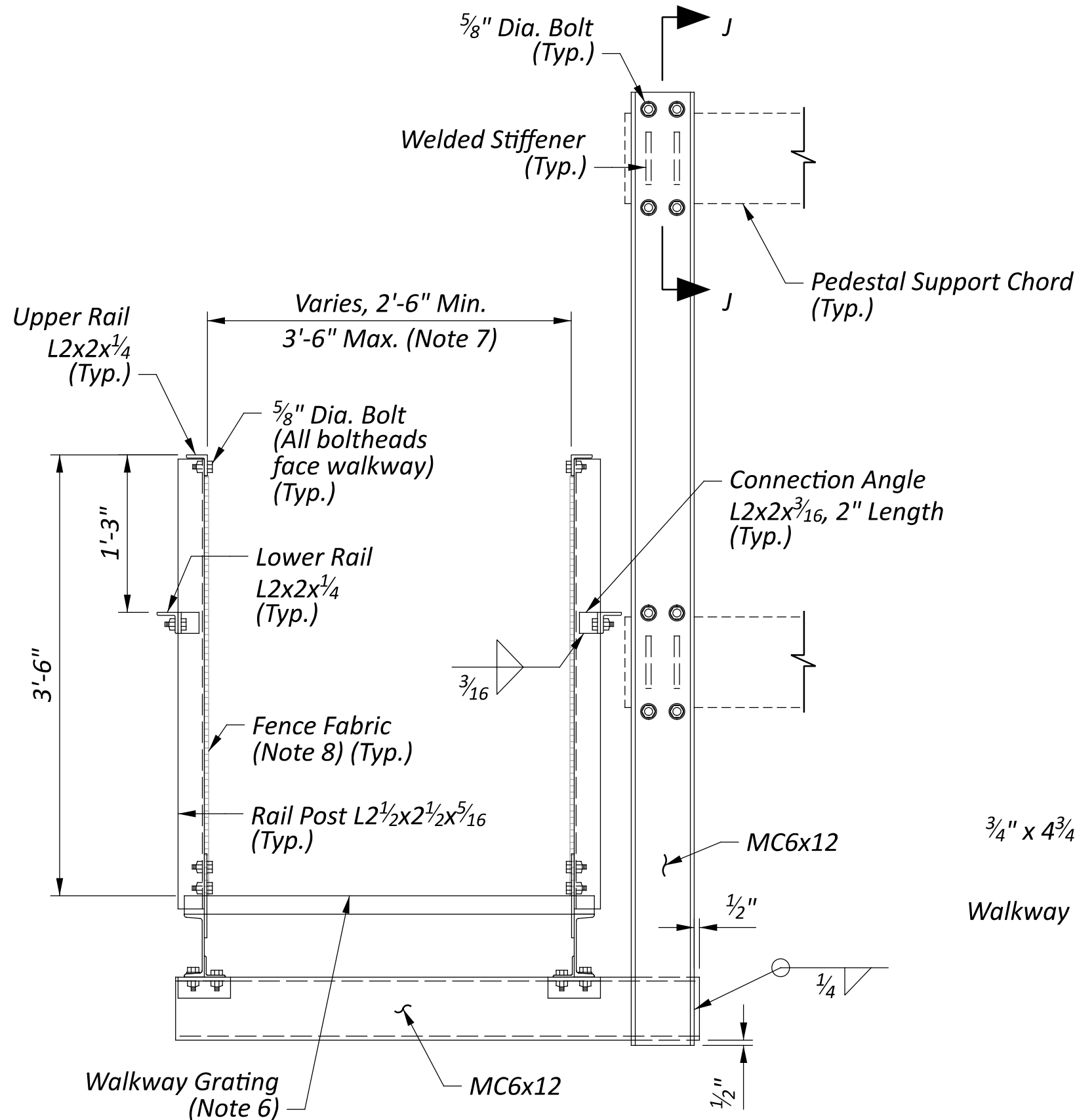
DETAIL D

FRAME RAIL DETAIL

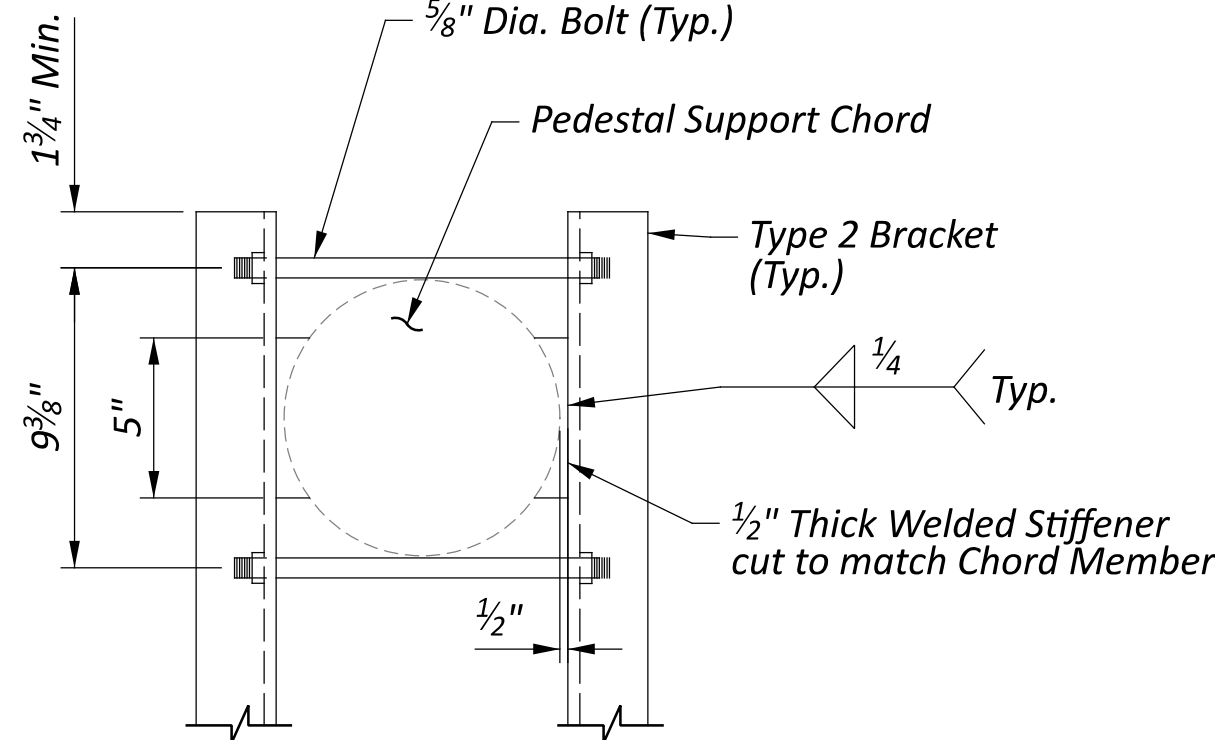




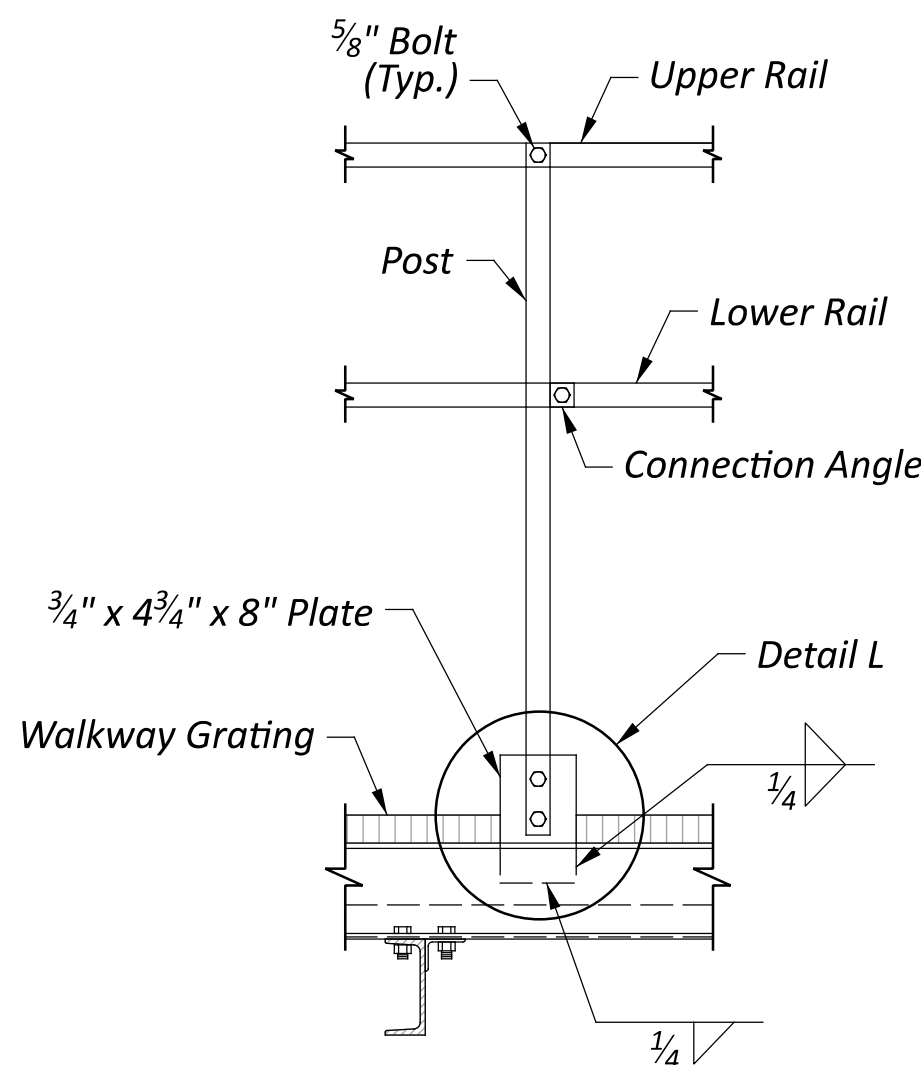
RAILING PLAN
Grating and Support Members Not Shown



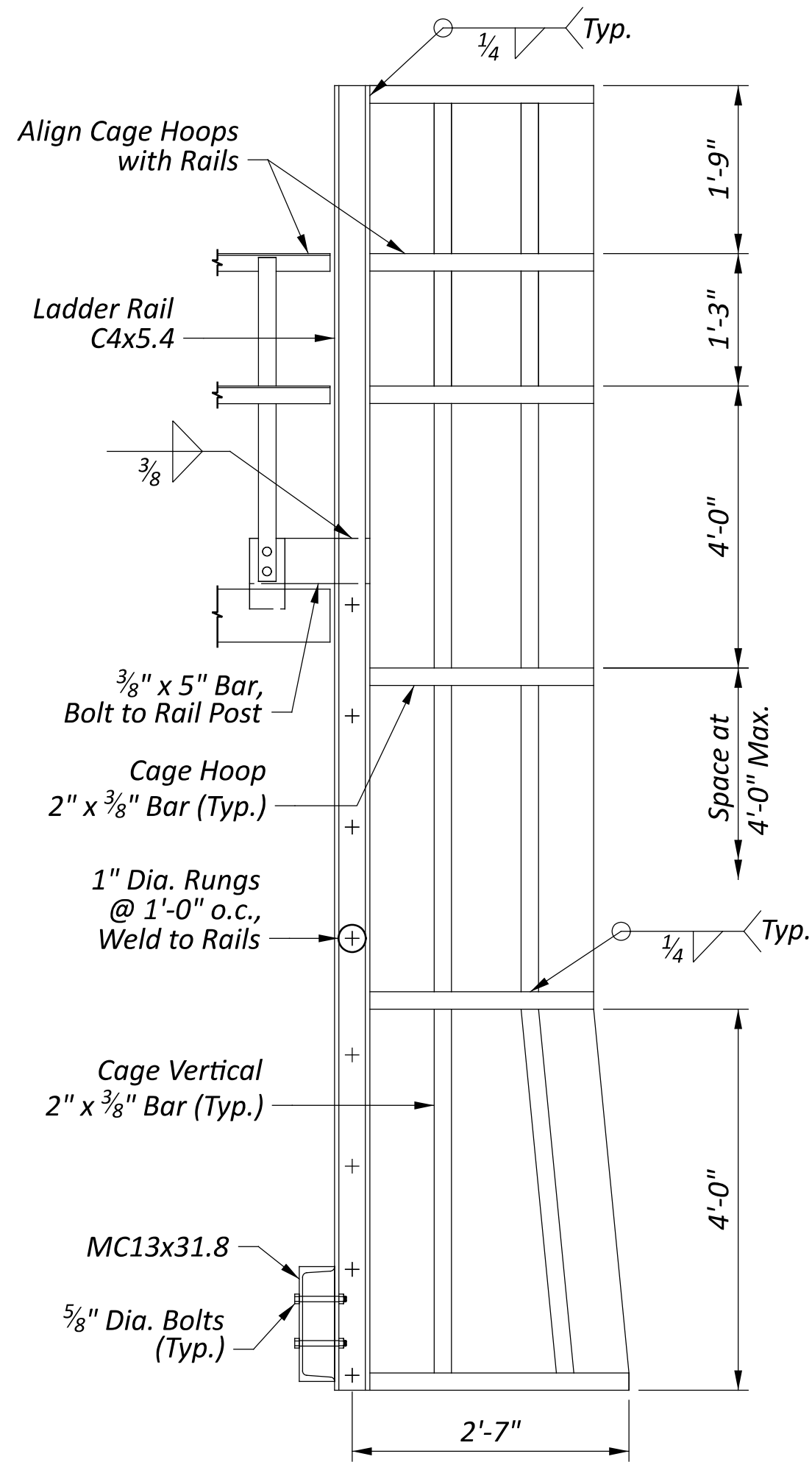
SECTION C-C
Type 2 Bracket



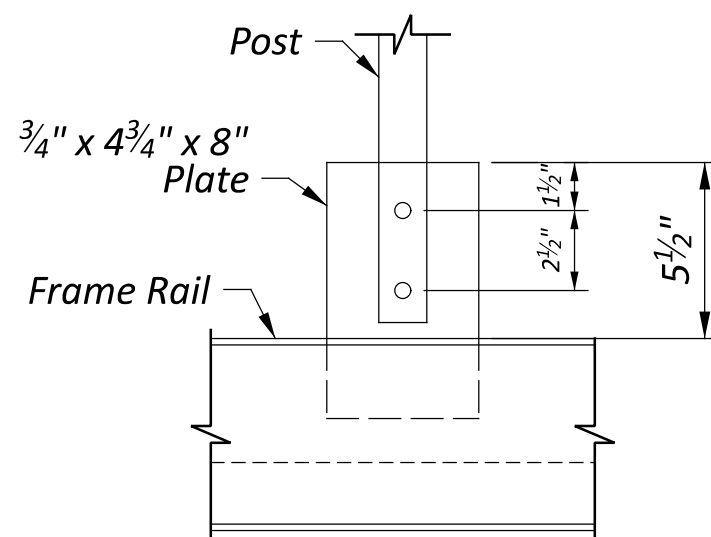
VIEW J-J



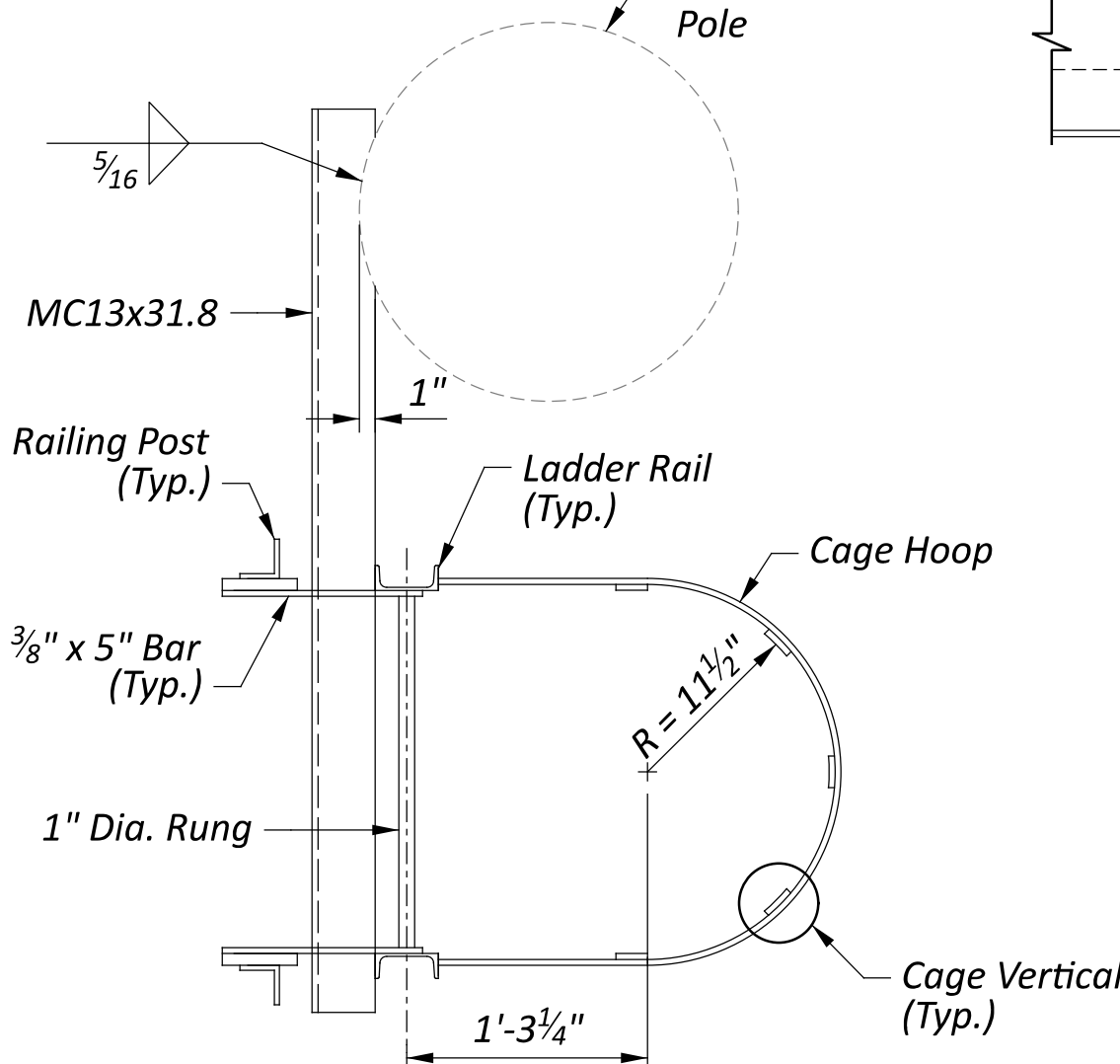
HANDRAIL AND POST



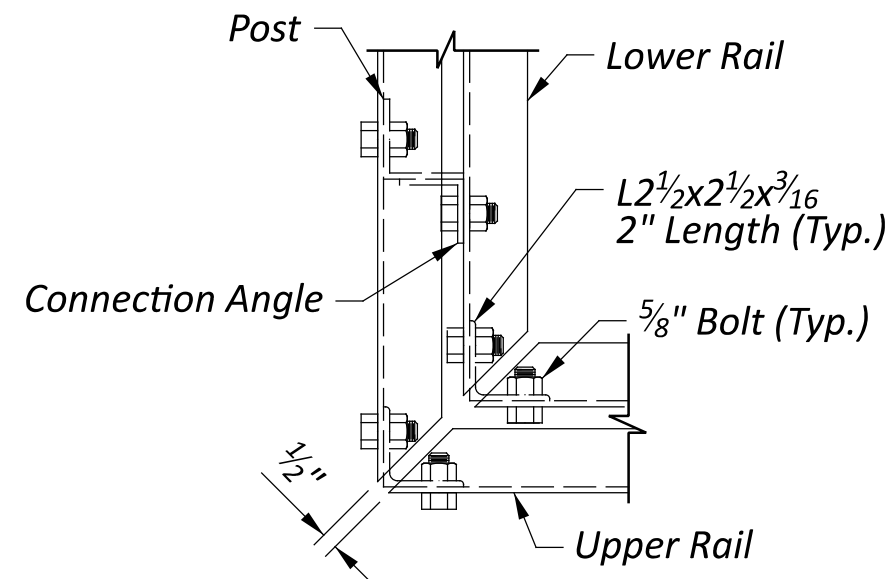
VIEW F-F



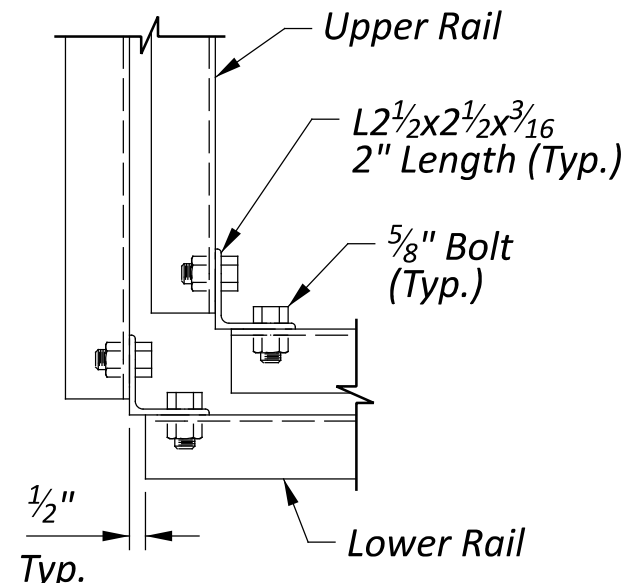
DETAIL L



LADDER PLAN



DETAIL G
Railing Connection
Inside Corner



DETAIL H
Railing Connection
Outside Corner

NOTES

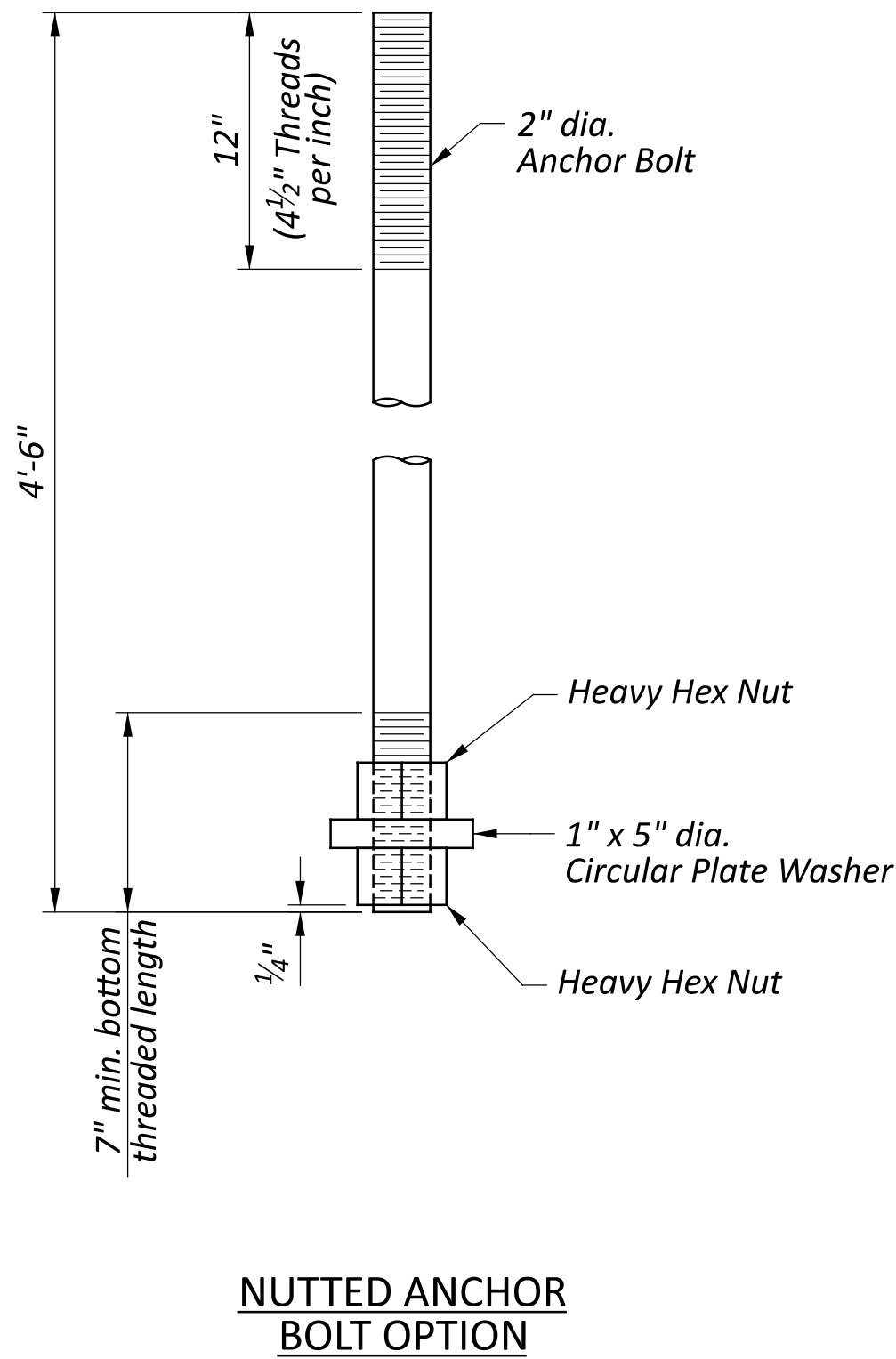
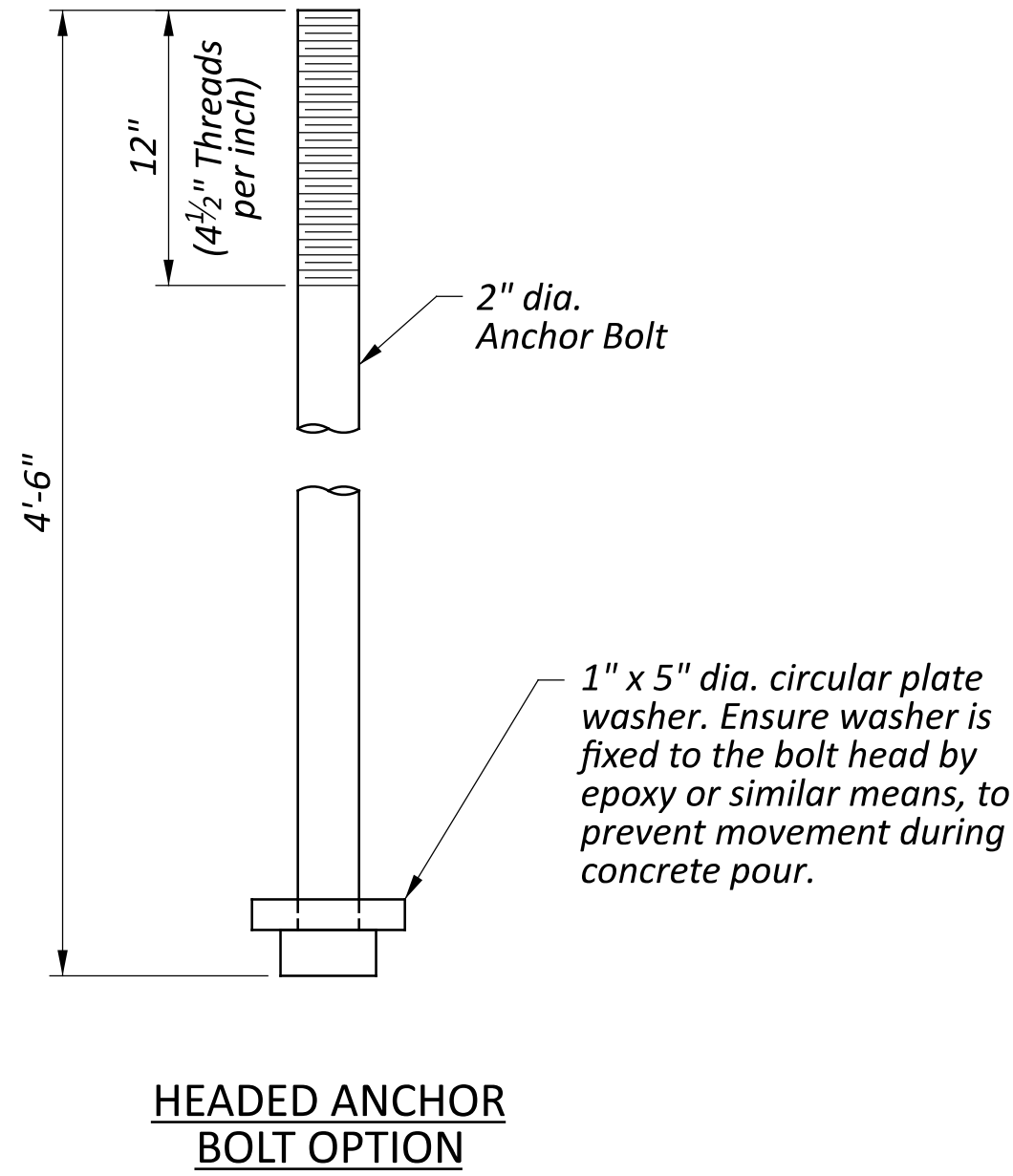
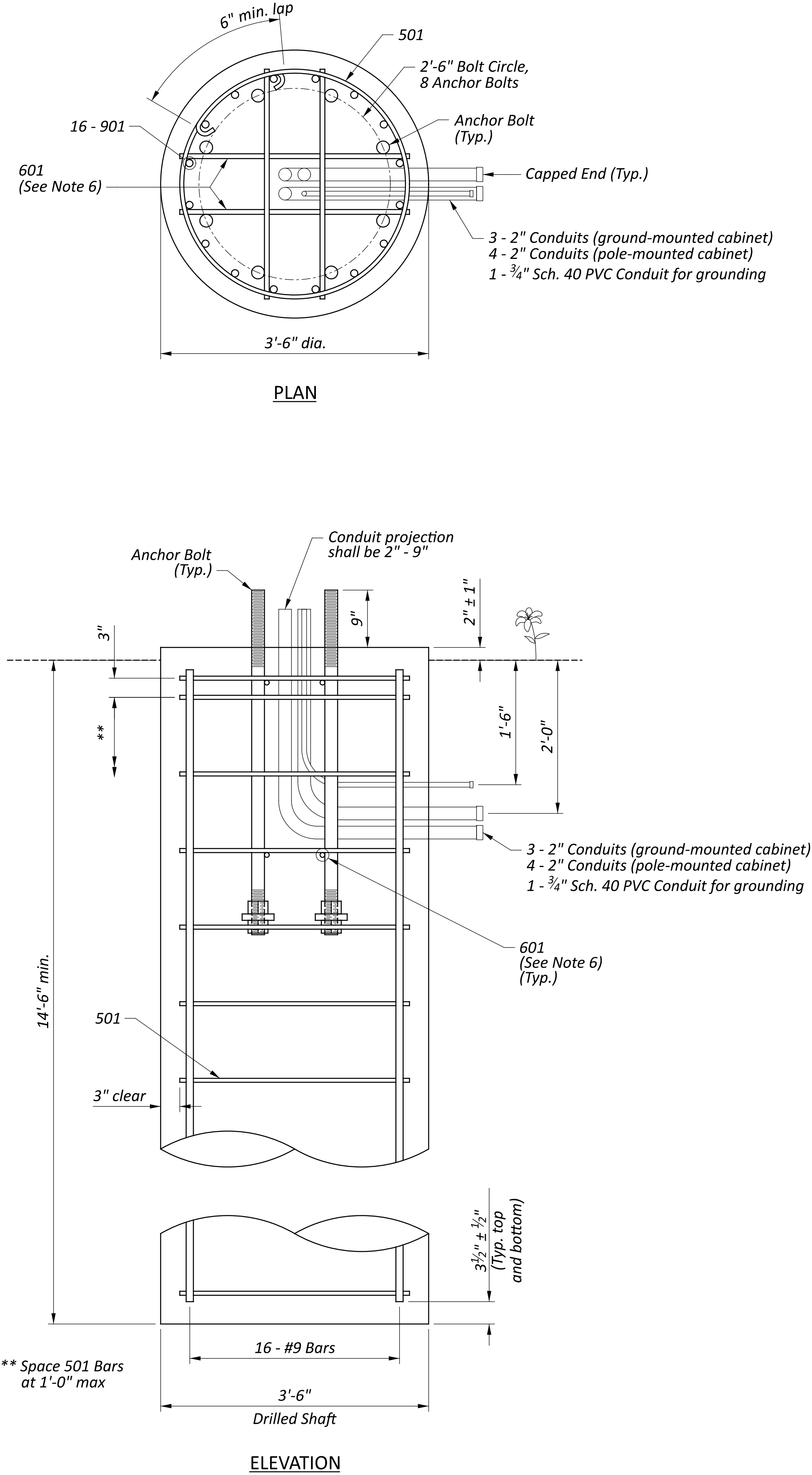
- The design of the catwalk structure conforms to the AASHTO LRFD Bridge Design Specifications (LRFDBDS), 9th Edition, 2020.
- The catwalk structure is designed for a walkway live load of 60 pounds per square foot. Rails are designed to support a 200 pound point load and 50 pound per linear foot load simultaneously applied in the horizontal and vertical directions.
- Calculations are required for any modifications to the information shown in the drawings. Modifications shall meet the requirements of the current AASHTO LRFDBDS and be designed for the loading described in Note 2, shall be stamped by a Professional Engineer registered in the State of Ohio, and shall be submitted for review and approval with shop drawings per C&MS 630.
- Perform construction according to the requirements of C&MS 630.06 and provide material meeting the requirements of C&MS 630.02 with the following modifications:

Structural Steel
ASTM A709 Grade 50 (50 ksi minimum yield)

Steel Hardware (nuts, bolts, washers)
ASTM F3125 Grade A325, Type 1 Galvanized Tension bolts per C&MS 513.20.

Provide beveled washers for bolted connections at channel flanges. All material shall be galvanized per C&MS 711.02

- The Contractor shall prepare full catwalk structure construction drawings meeting the requirements of the project plans, the project specifications, and the standard drawings. The Contractor shall determine the exact placement of the sign on the sign support pedestal to calculate the length of catwalk required. If the walkway surface of the proposed catwalk is not at the same level as the bearing deck of the sign, steps shall be provided. The Contractor shall determine the width of tread and height of riser steps to ensure that the sign enclosure door will open out. A landing area shall be provided to allow total opening of the door.
- Provide steel grating or walkway designed to carry 60 pounds per square foot of live load for the required spans. Grating or walkway shall be galvanized and shall be connected to the supporting members according to the manufacturer's recommendations.
- The width of the catwalk at the door of the DMS enclosure is set by the Contractor based on the dimensions of the access door. Set the width so that the access door can be opened outward 90° from the sign housing.
- Provide fence fabric consisting of a 1 inch diamond mesh using 0.120 inch dia. (11 gage) wire. Fabric shall be PVC coated, conforming to ASTM F668 Class 2A or 2B. PVC coating shall be gray in color closely approaching federal standard no. 595B-16251. Fabric shall extend vertically from the upper rail to the top of the walkway grating. Tie fabric to the upper rail, lower rail and railing posts using coated tie wires. Fabric shall extend to the ladder rail to fill the gap between the ladder and the first railing post.
- Provide shop drawings according to the requirements of C&MS 630.03. Shop drawings shall be submitted to the Engineer 10 days before fabrication.
- Payment for materials and installation of catwalk and ladder is incidental to the DMS support structure.



REINFORCEMENT SCHEDULE (See plan view)			
MARK	No.	LENGTH	TYPE
501	1'-0" o.c. + 1	10'-10"	Bent
901	16	14'-1" (Note 4)	Straight

6" min. lap

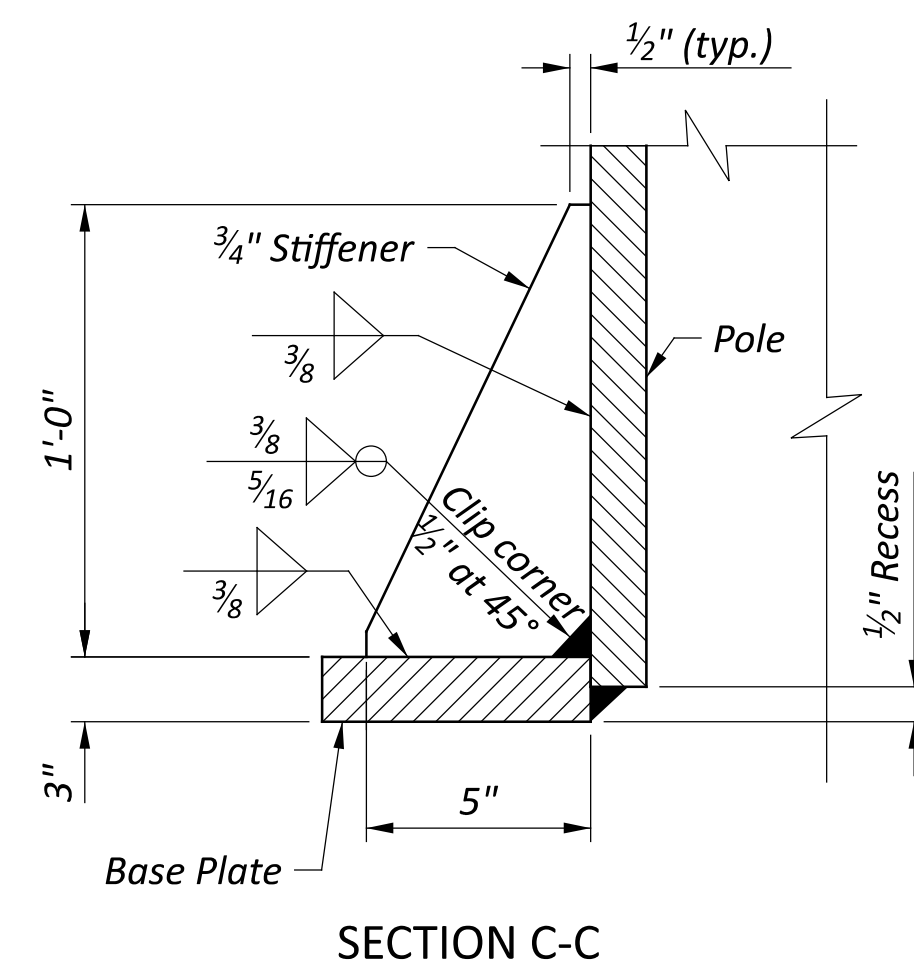
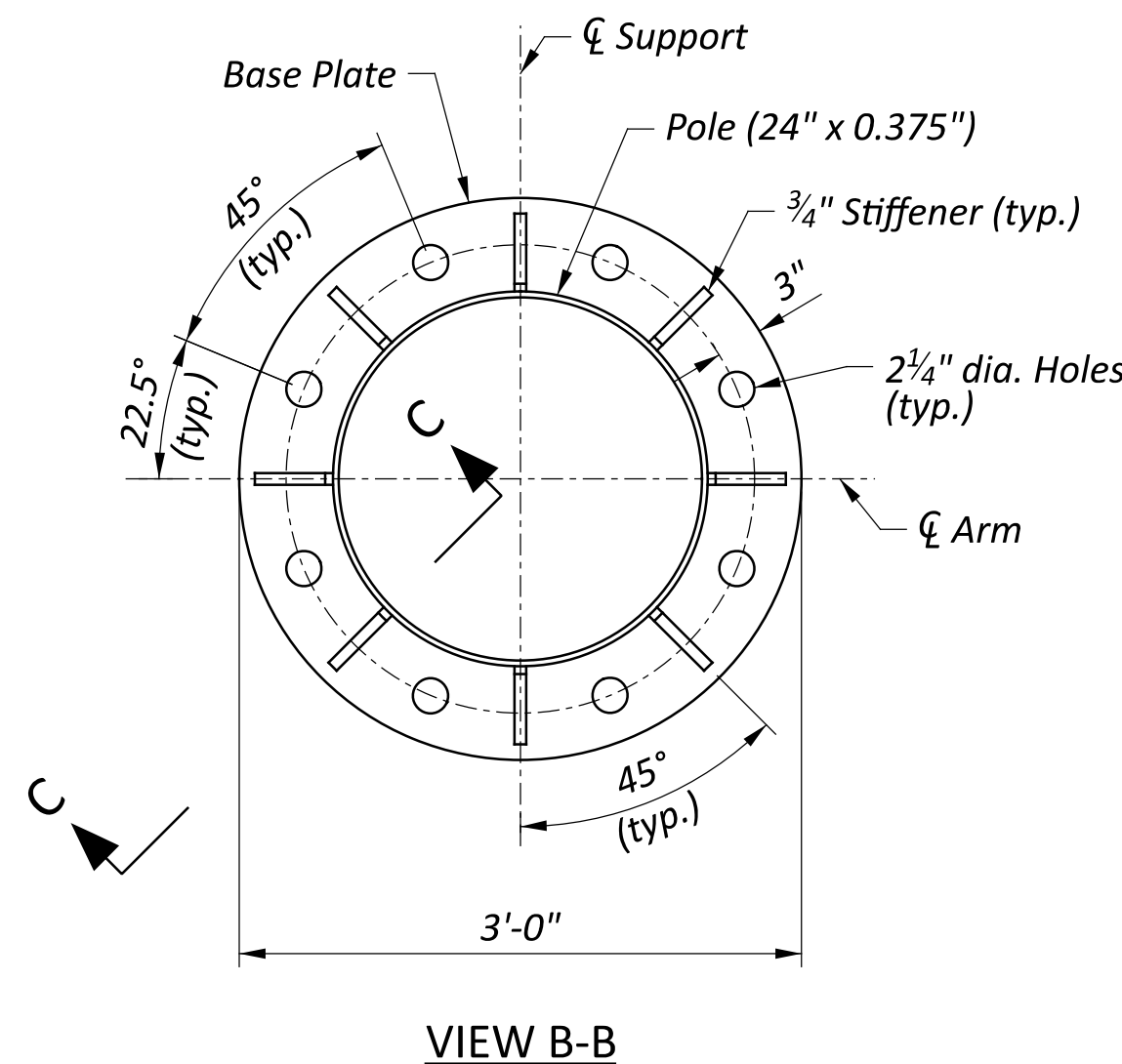
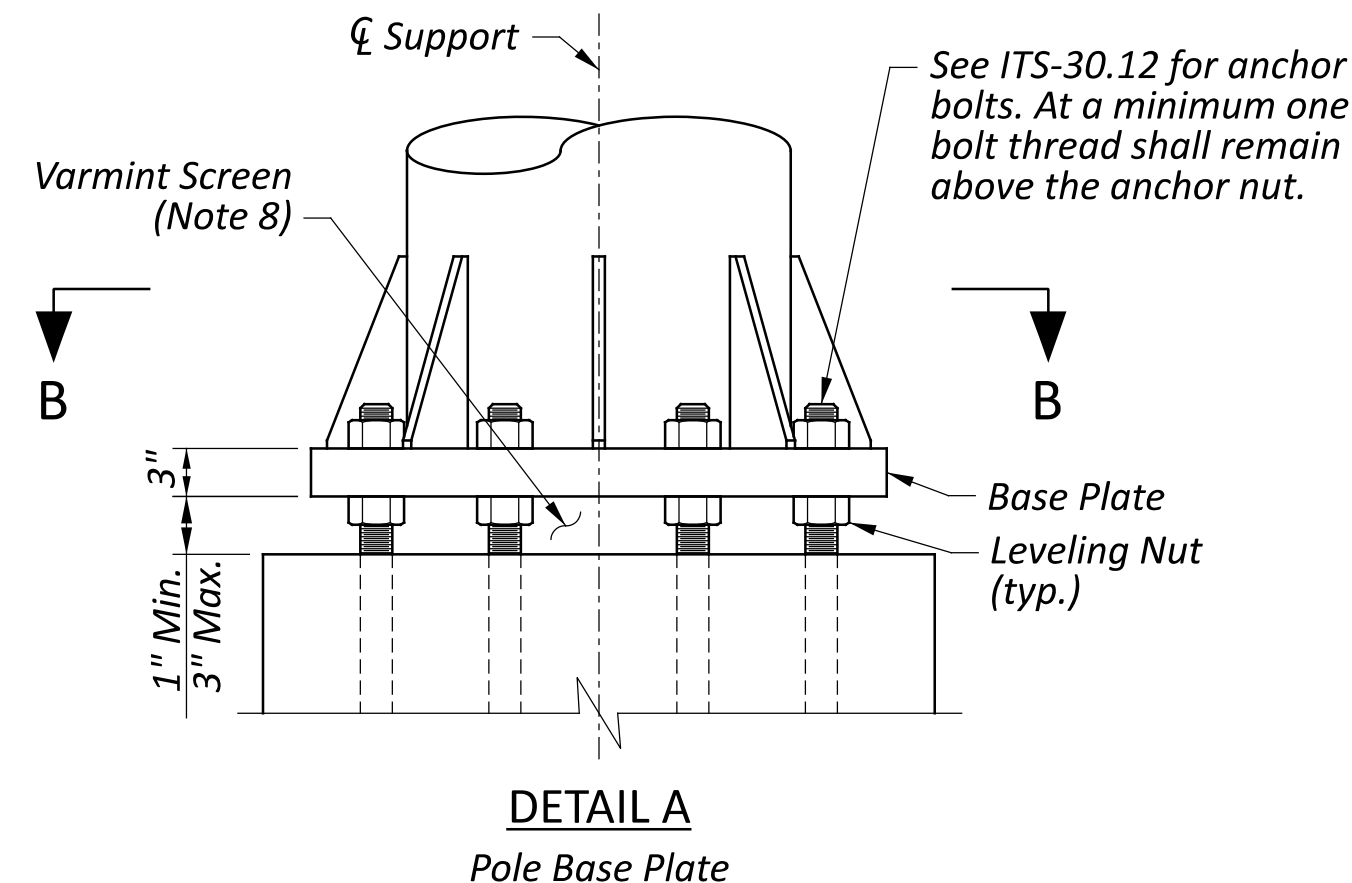
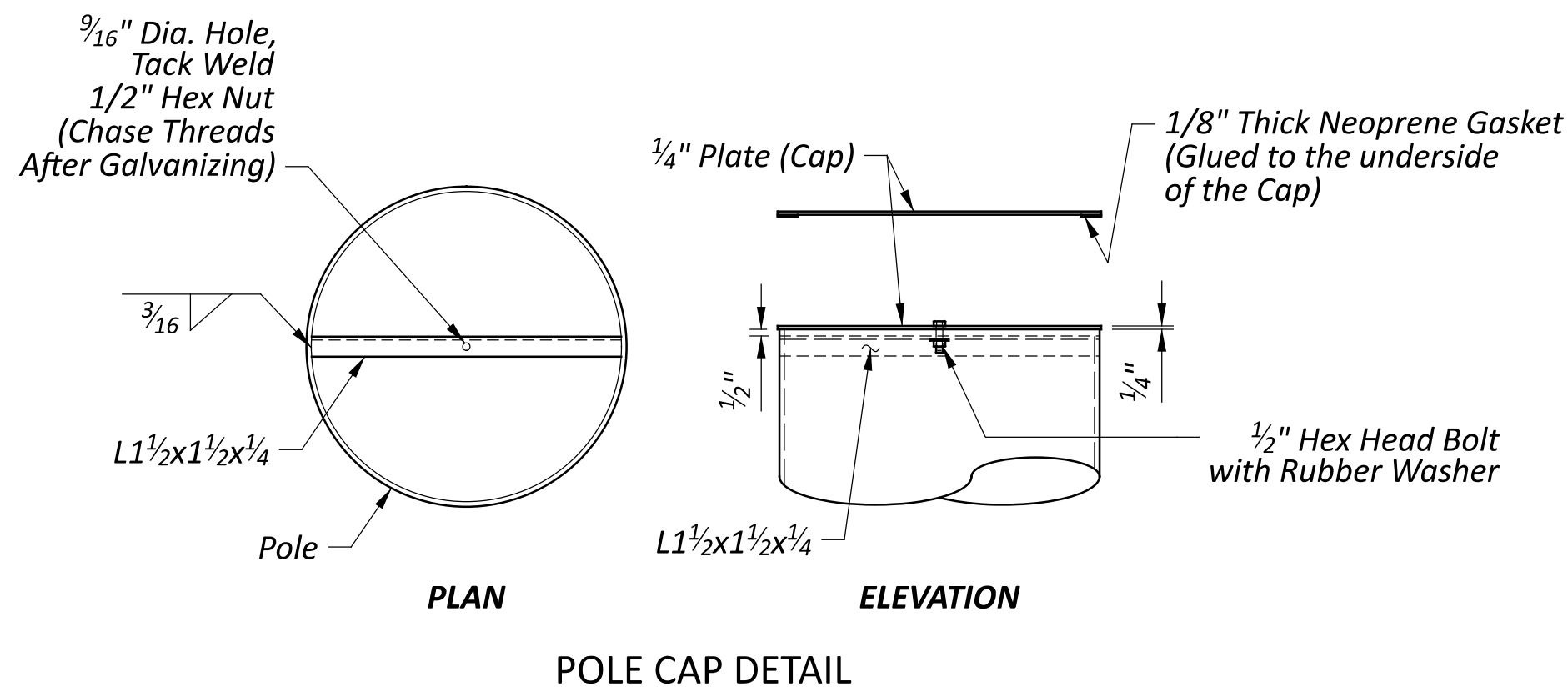
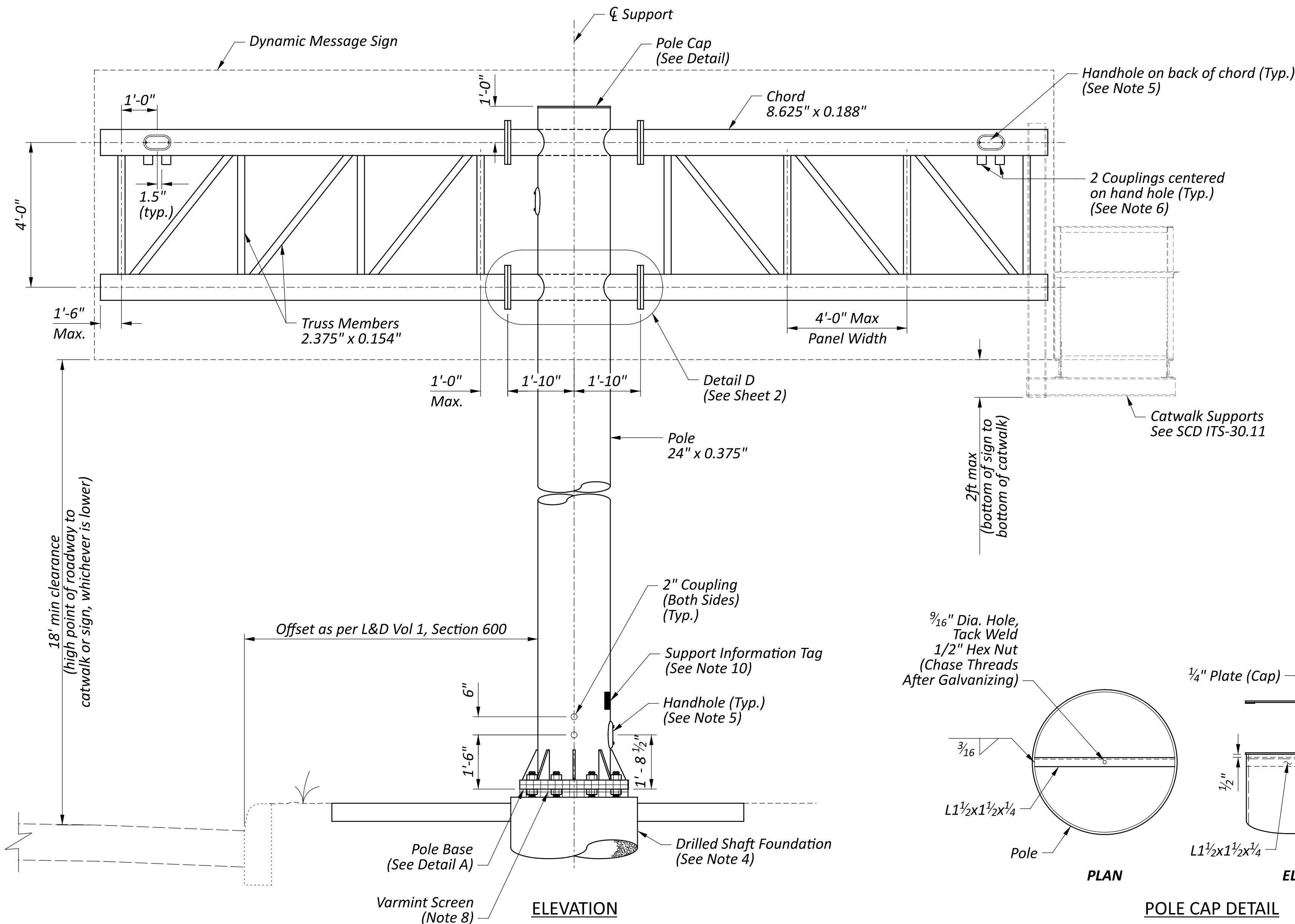
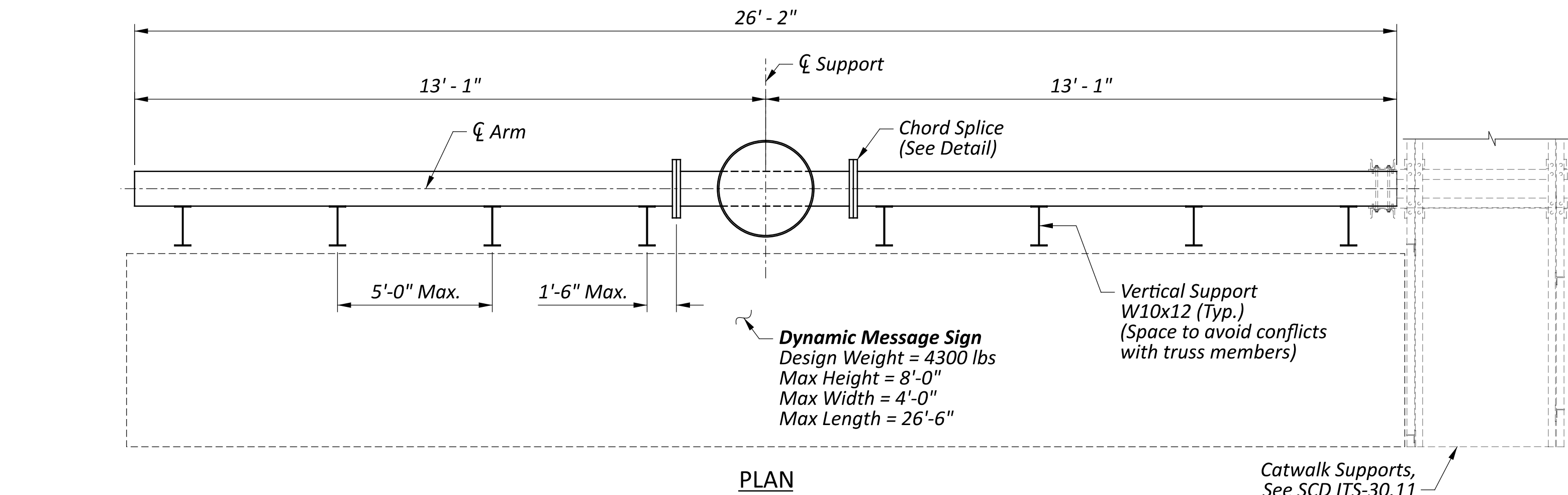
Stagger laps in adjacent ties

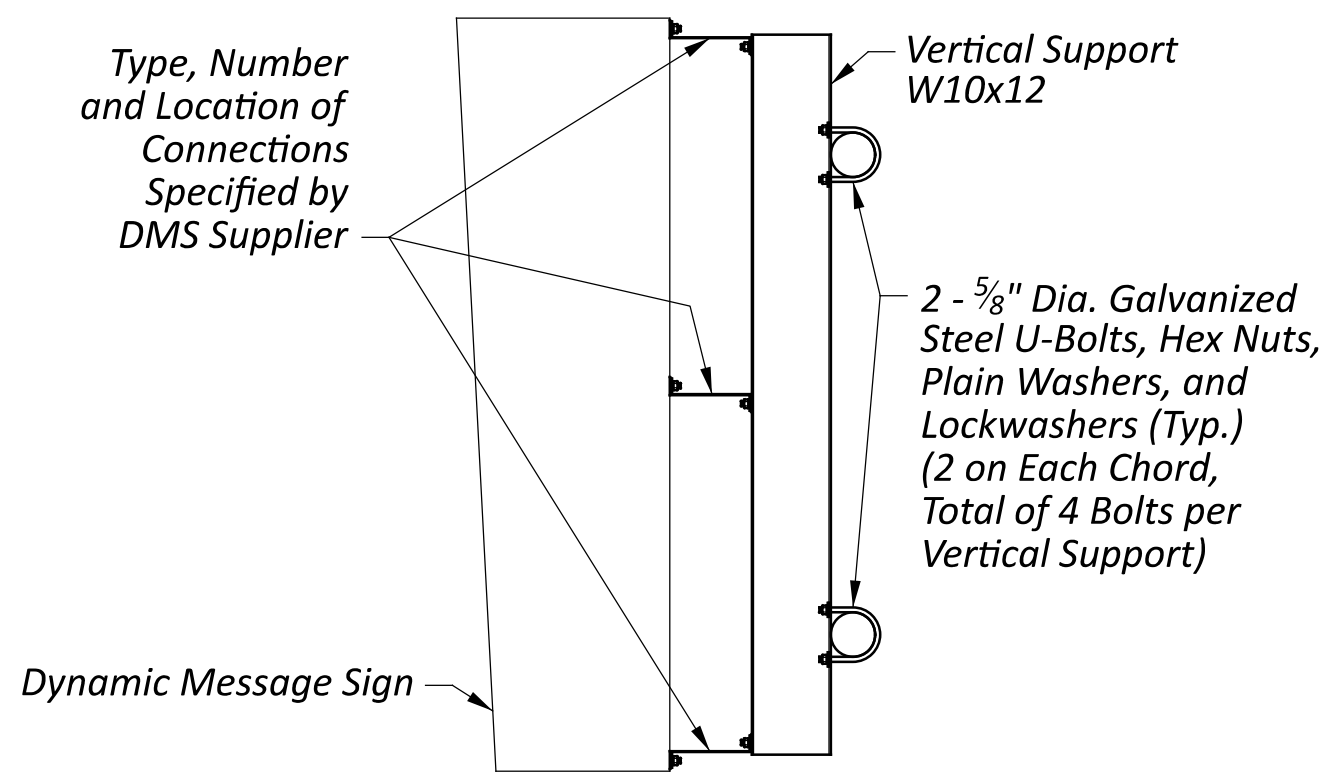
3'-0" dia. (501)

501

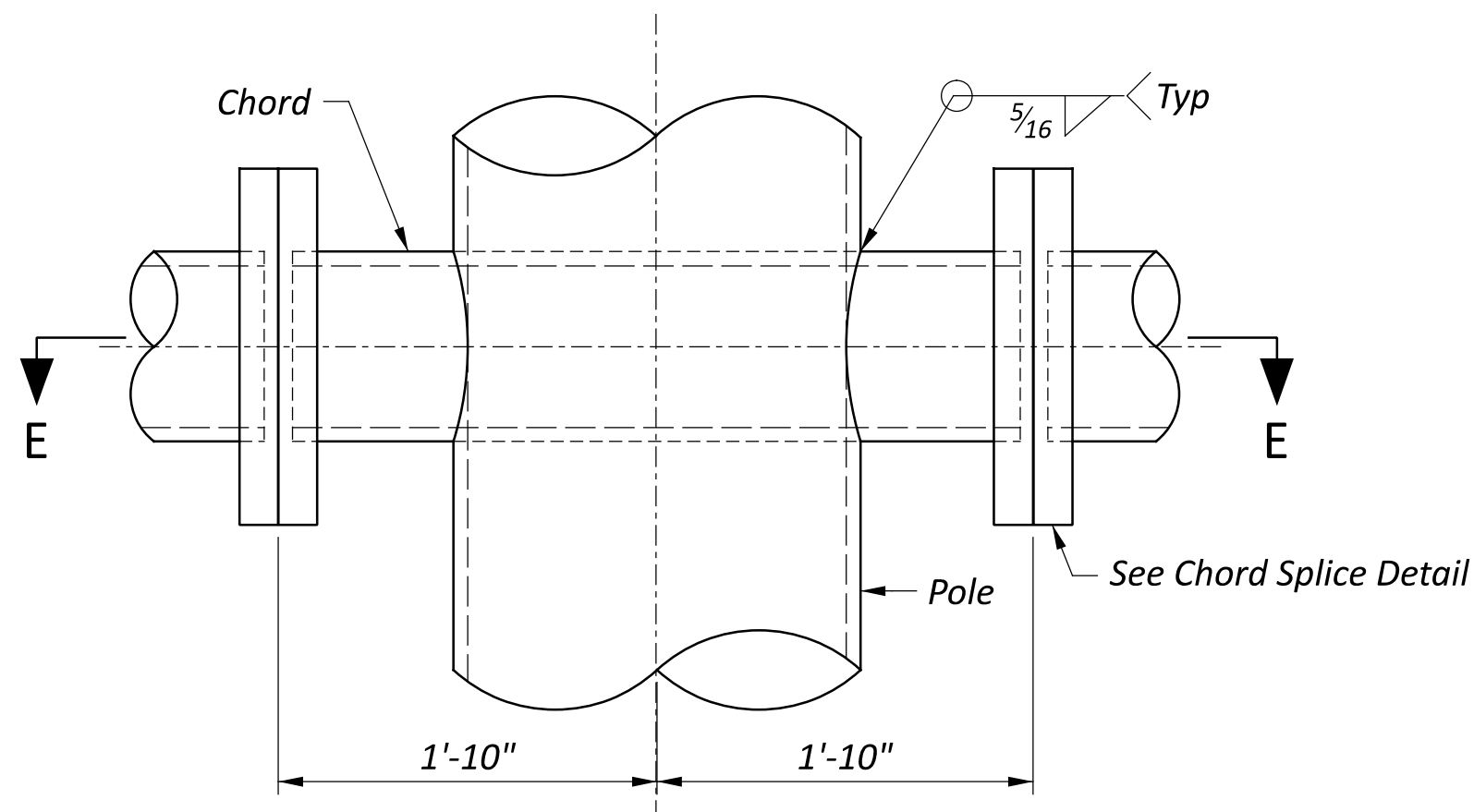
NOTES

- The design of the Drilled Shaft Support Foundations presented on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) with interim revisions through 2020.
- A special foundation design will be required when cohesive soil with an undrained shear strength of less than 2000 lb./sq.ft., or granular soil with an angle of internal friction less than 30 degrees, or a wet density less than 120 lb./cu.ft. is encountered (average soil properties along the length of the drilled shaft).
- For special foundation design, conform to the current edition of the ODOT Geotechnical Design Manual, Section 1200.
- When approved by the Engineer, alternate foundation designs are acceptable. Alternate foundation design calculations and drawings shall be stamped by an Ohio Registered Engineer and shall be submitted to the Engineer for review and acceptance.
- Construct drilled shaft foundation in accordance with C&MS Item 524.
- At locations where the existing slope is 6:1 or steeper, the buried depth of foundation shall apply to the low side of the slope. Set the top of the foundation 2" above the existing surface on the high side of the slope.
- Tie anchor bolts to rebar cage near the top and bottom of the anchor bolts with 601 bars.
- Anchor bolts shall meet the requirements of C&MS Item 630, except that bolts shall be galvanized per C&MS 711.02 and galvanizing limits shall be full length of the anchor bolts. Provide a standard steel hex nut, leveling nuts, and plain washers with all anchor bolts. The nuts shall be capable of developing the full strength of the anchor bolts.
- All reinforcing steel shall be Grade 60 epoxy coated and comply with and be placed in accordance with C&MS 509. Lap all rebar per the lap length table in C&MS 509. 3" minimum cover is required.

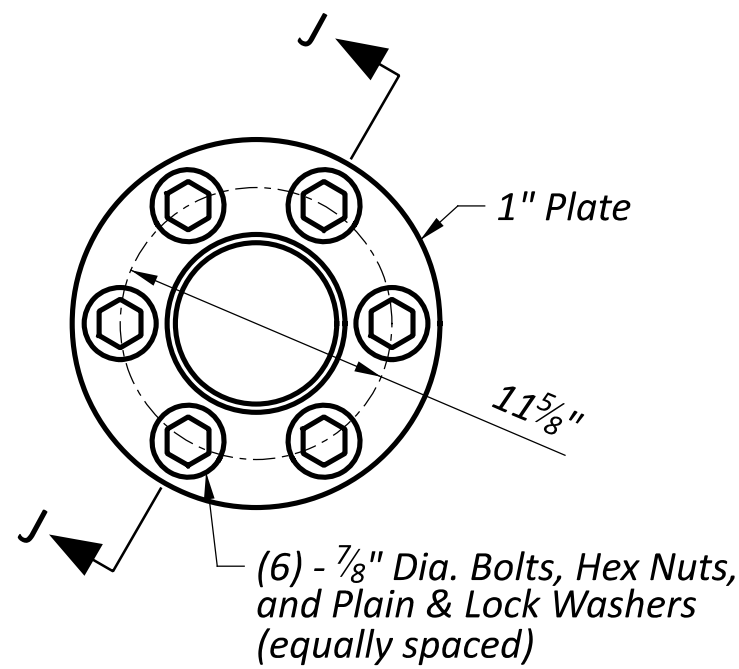




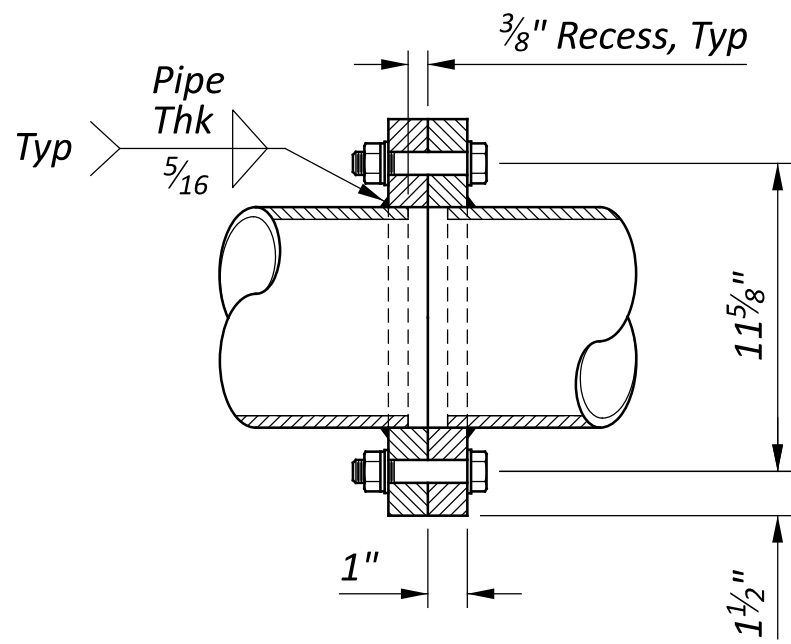
SECTION AT DMS SUPPORT



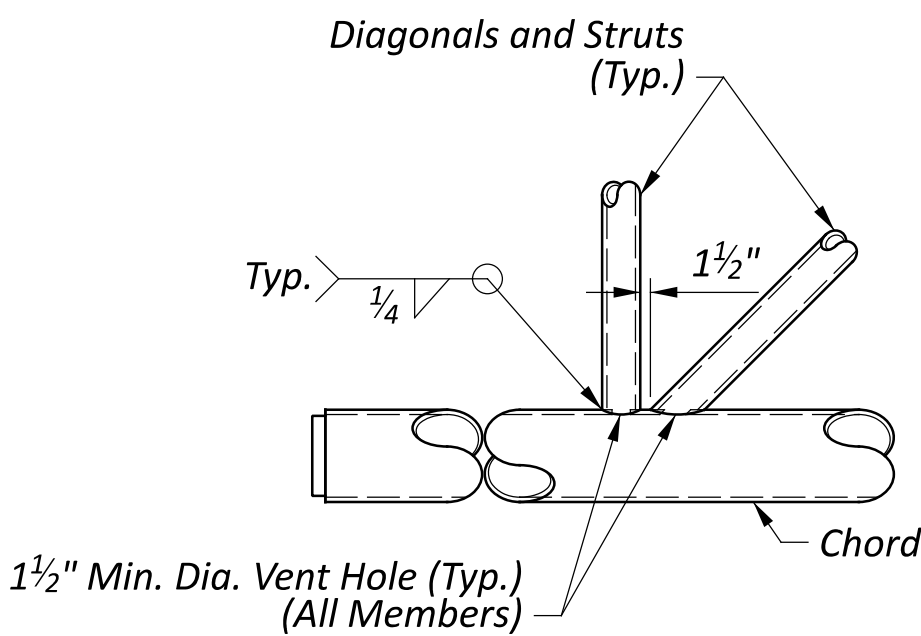
DETAIL D
POLE TO TRUSS CONNECTION



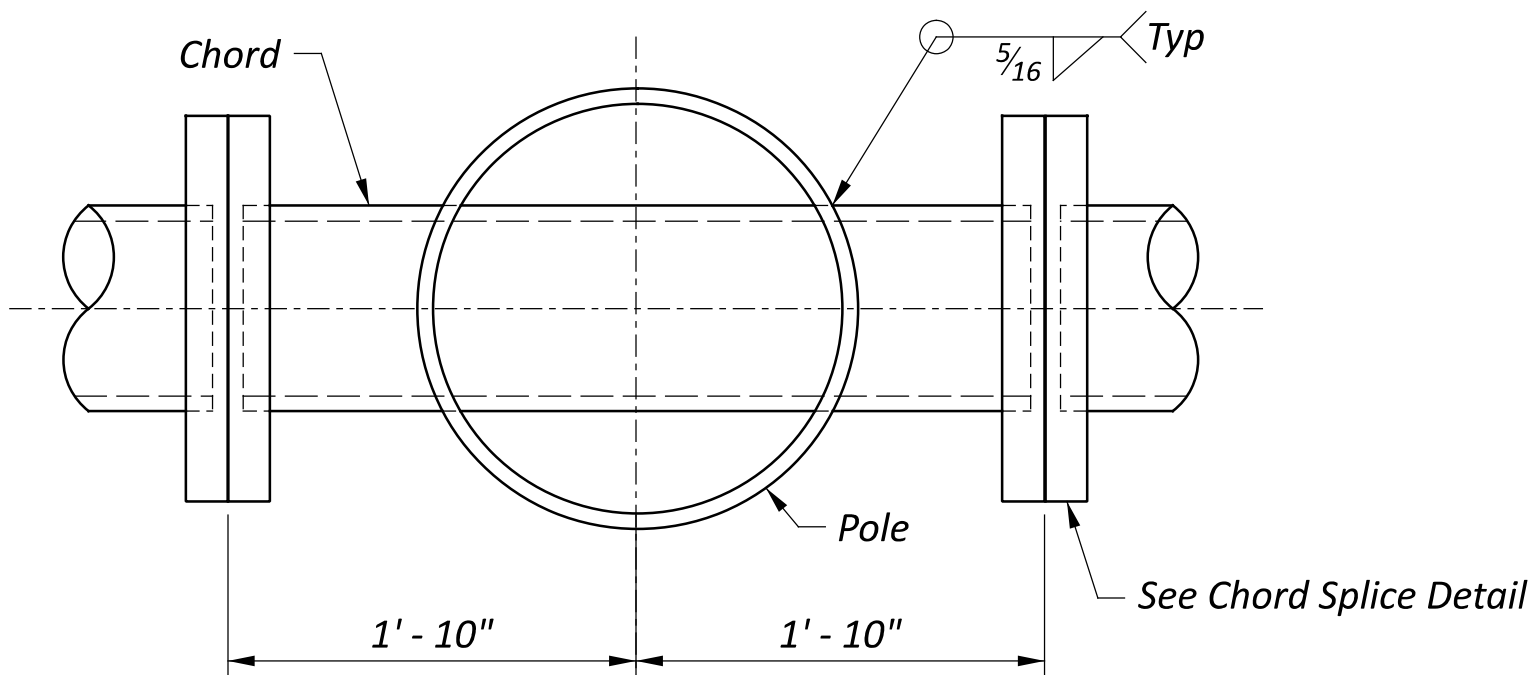
CHORD SPLICE DETAIL



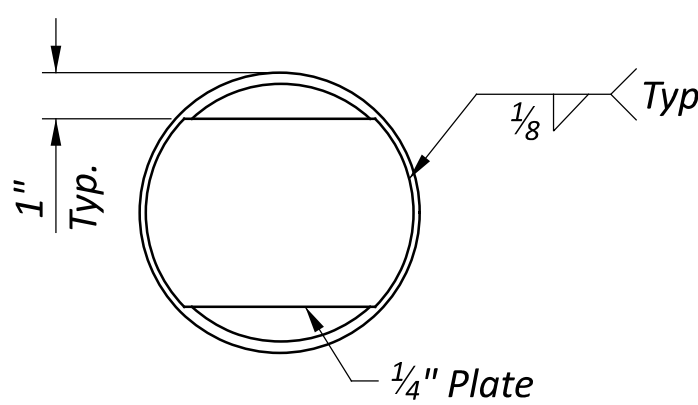
SECTION J-J



TRUSS JOINT



SECTION E-E



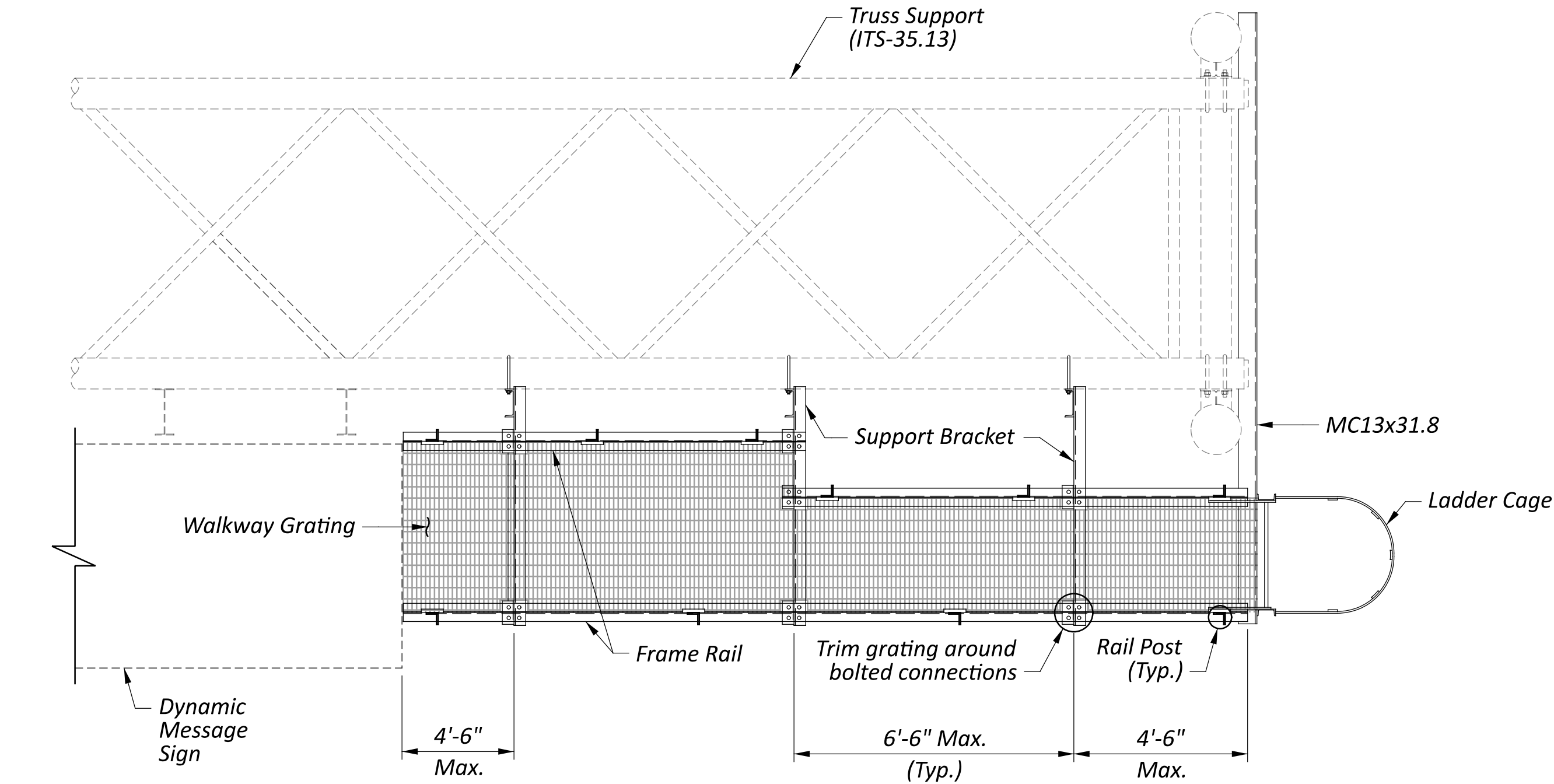
NOTES

- The design of the Dynamic Message Sign Pedestal Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) with interim revisions through 2020.
- Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of LRFDLTS-1 and the design criteria shown below. Calculations shall be stamped by a Professional Engineer registered in the state of Ohio and shall be submitted for review and approval with the shop drawings.
- All material shall meet the requirements of C&MS 630 with the following limitations:
Steel tube and pipe - ASTM A500 Grade B (42 ksi min yield)
Structural steel - ASTM A709 Grade 50 (50 ksi min yield)
Steel hardware (nuts, bolts, and washers) - ASTM F3125 Grade A325, Type 1 Galvanized
- For foundation and anchor bolt details see SCD ITS-30.12.
- For handhole details see SCD TC-22.10.
- Weld 4 threaded steel pipe couplings to the chord members at the locations indicated. Remove all sharp edges inside the chord and pipe coupling. Couplings shall be 2" female NPT. The depth/length of the coupling should be sufficient for a 2" male NPT pipe/fitting to seat securely.
- All unused couplings shall be provided with a removable galvanized cast iron plug.
- Attach varmint screen between the base plate and top of concrete foundation with stainless steel band and minimum 2" overlap. Tie overlapping screen with stainless steel wire ties. Screen shall be stainless steel welded wire mesh with openings no larger than 3/8".
- Design Criteria:
Wind Load: 1700-year MRI, 120 mph Design Wind Velocity
Service I Wind Velocity: 76 mph

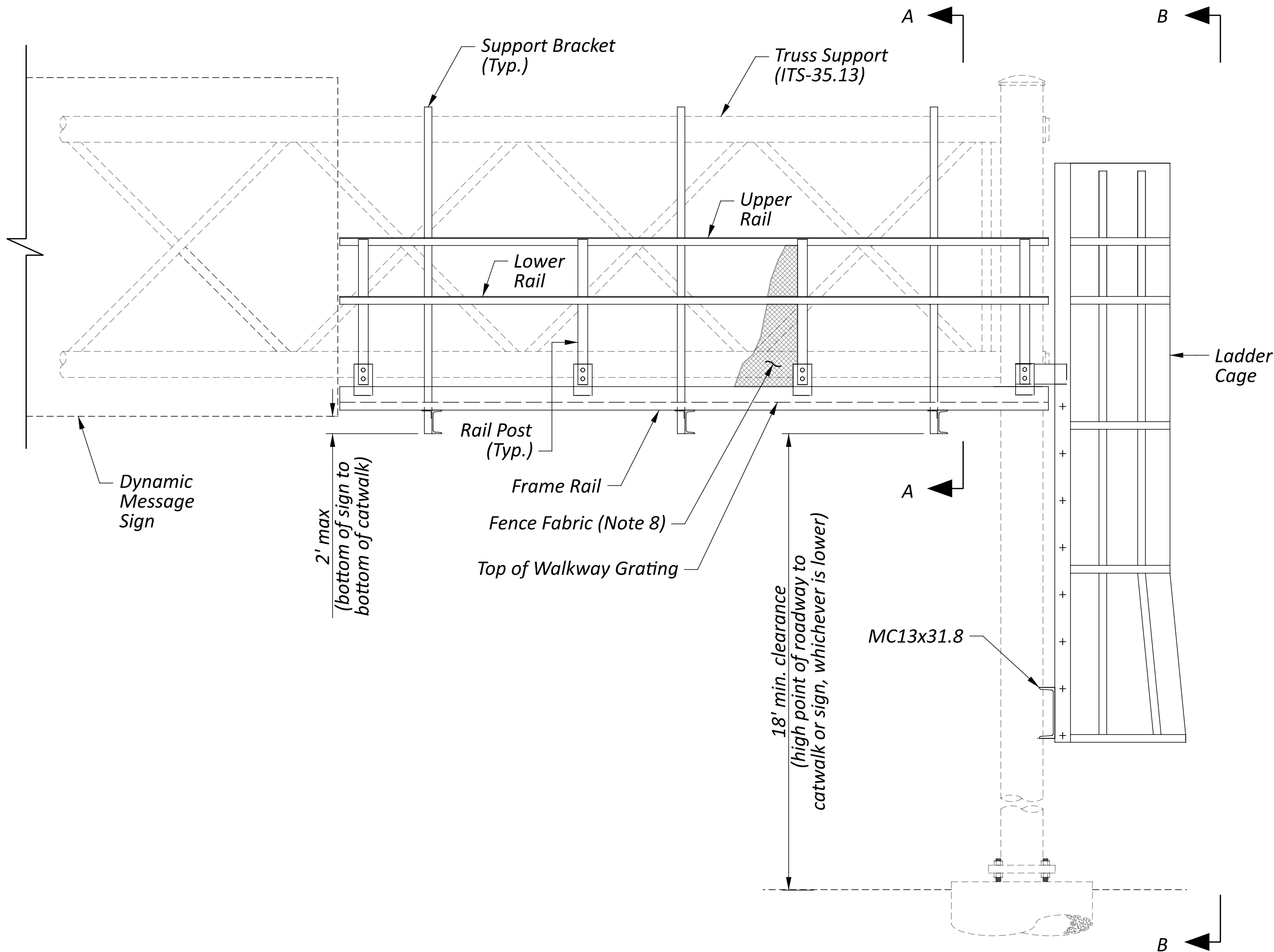
Serviceability Parameters:
Maximum Vertical Deflection of Horizontal Support
Resulting from Service I Load Combination (Dead Load + Wind):
L/150 per LRFDLTS-1 10.4.1

Fatigue Parameters:
Fatigue Category I
Natural Wind Gust: Included
Truck-Induced Gust: Included
- Use a Support Information Tag per C&MS 732.11 mounted above the handhole, except that it shall also include the standard construction drawing of the catwalk. Any catwalk that differs from the ODOT standard drawing shall include the phrase "NON_STANDARD CATWALK" on the tag.

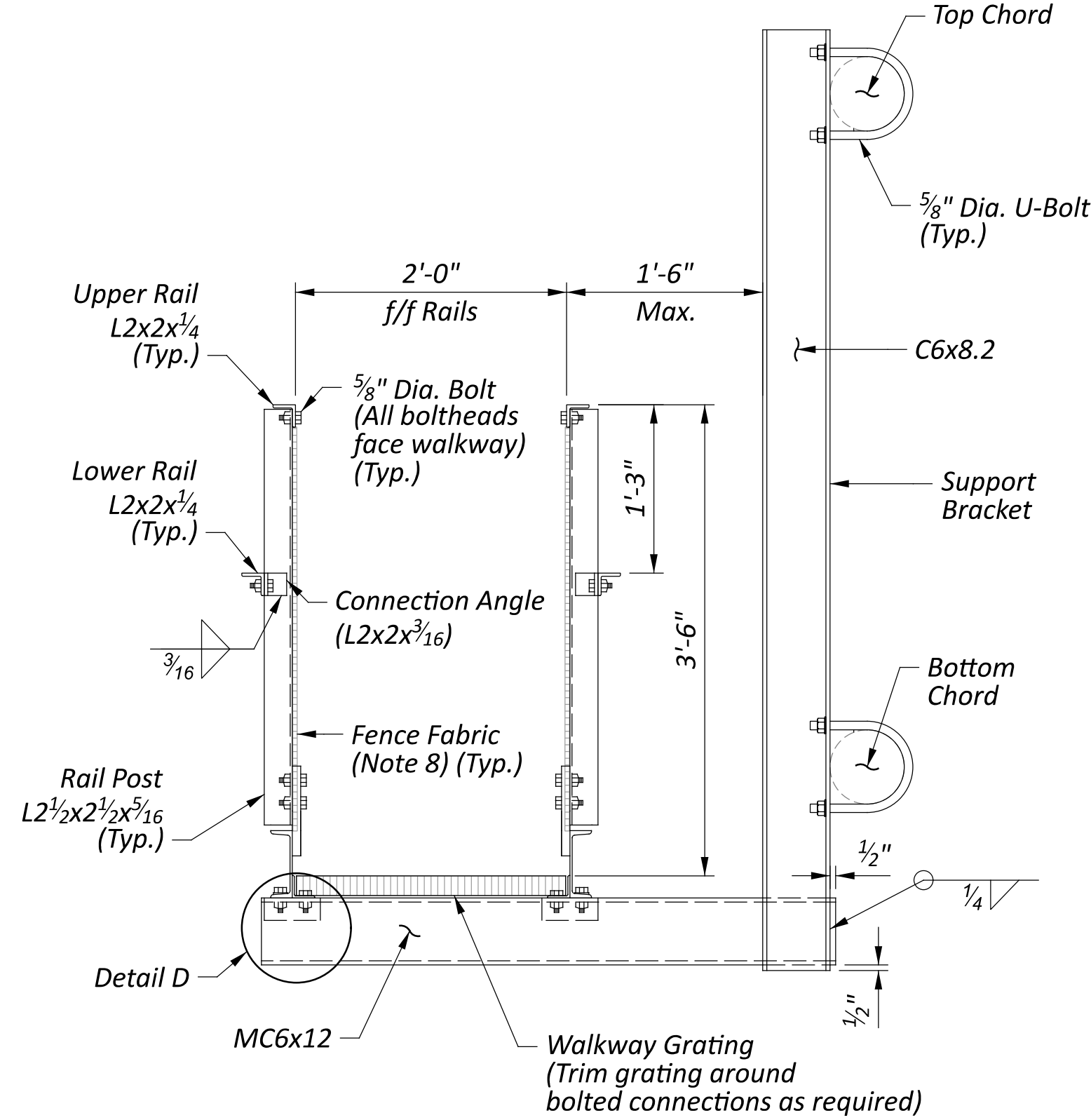




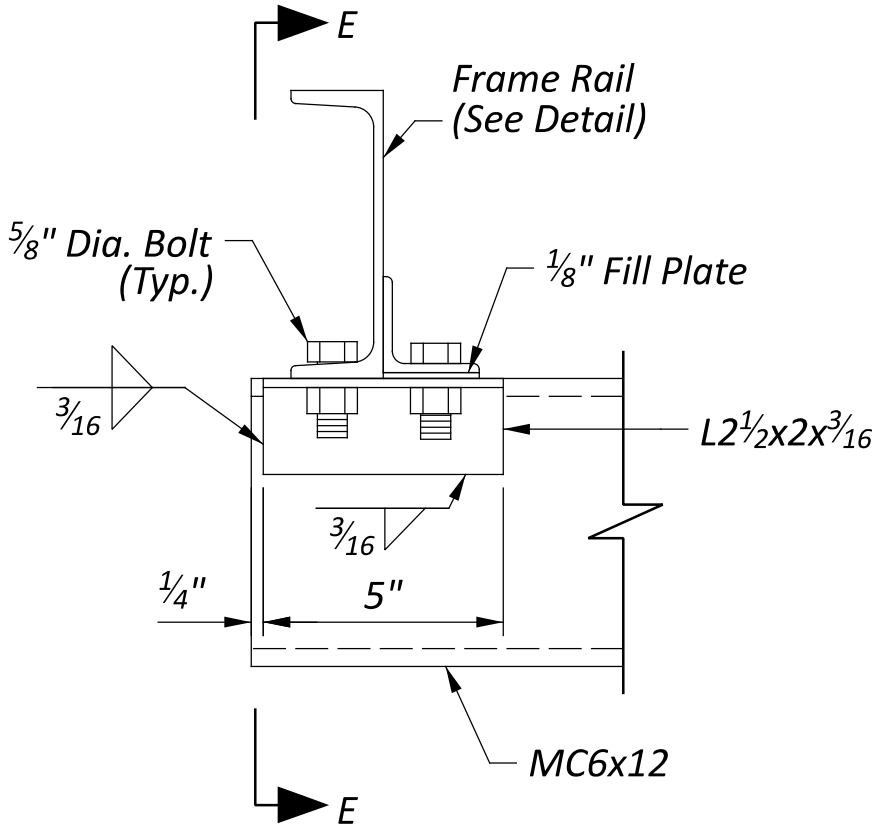
PLAN
Upper and Lower Rail not shown



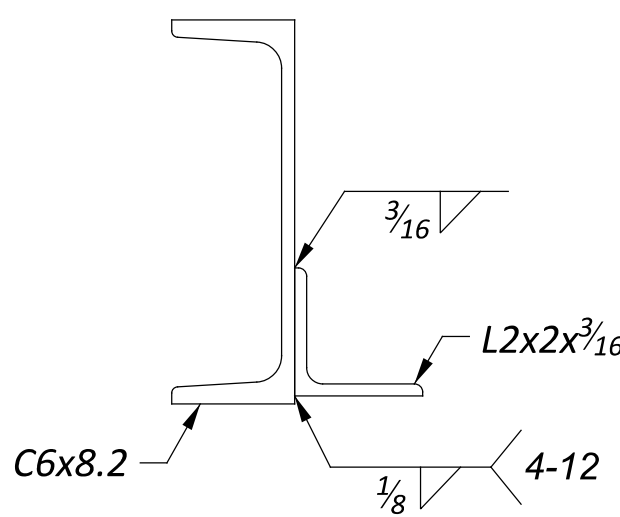
ELEVATION



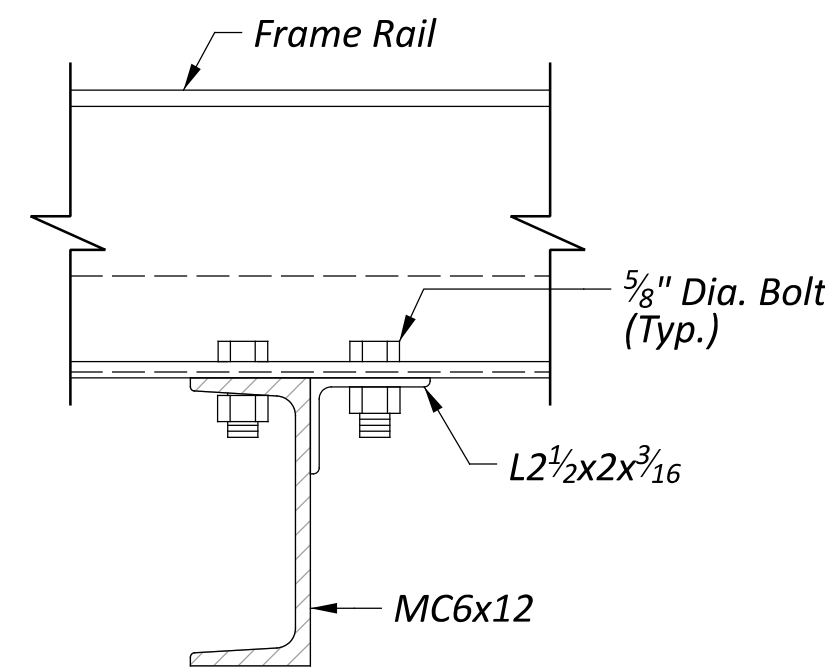
SECTION A-A



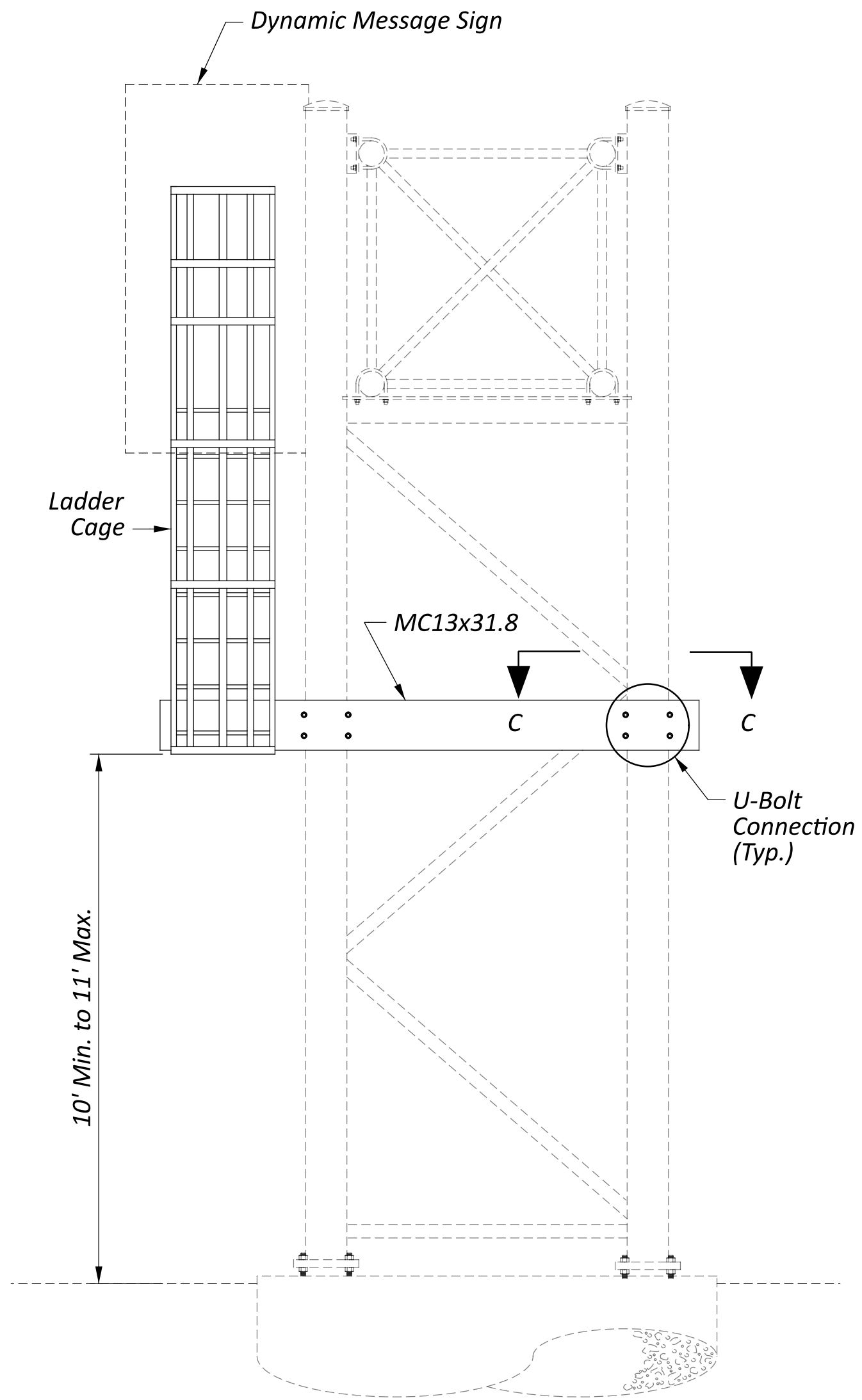
DETAIL D



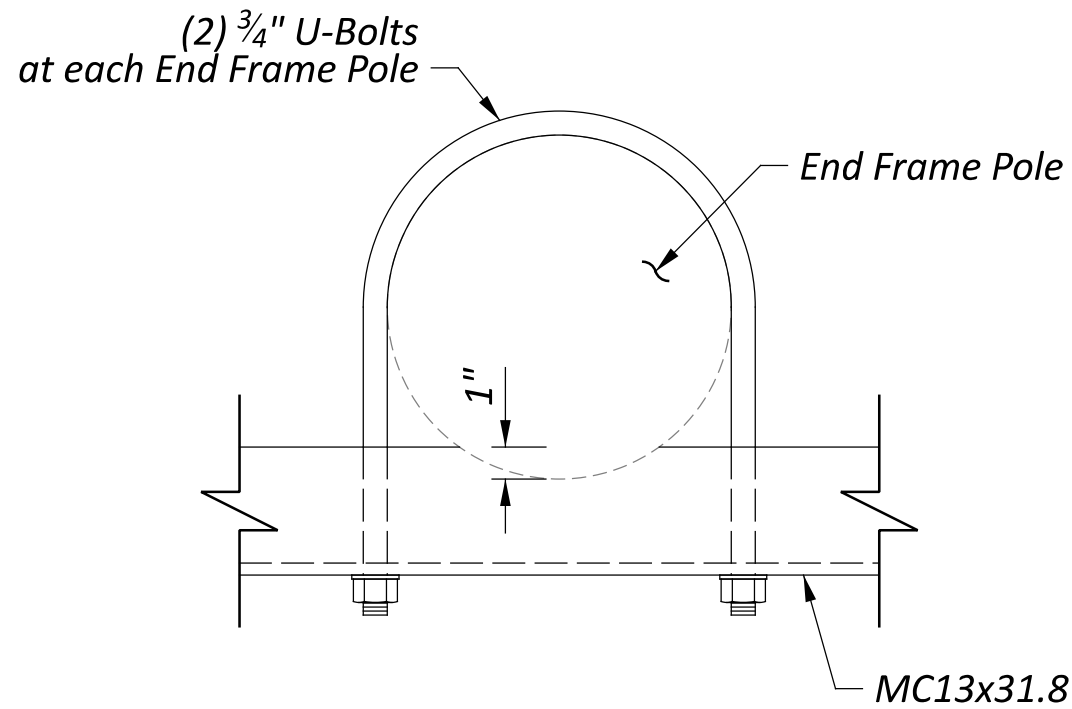
FRAME RAIL DETAIL



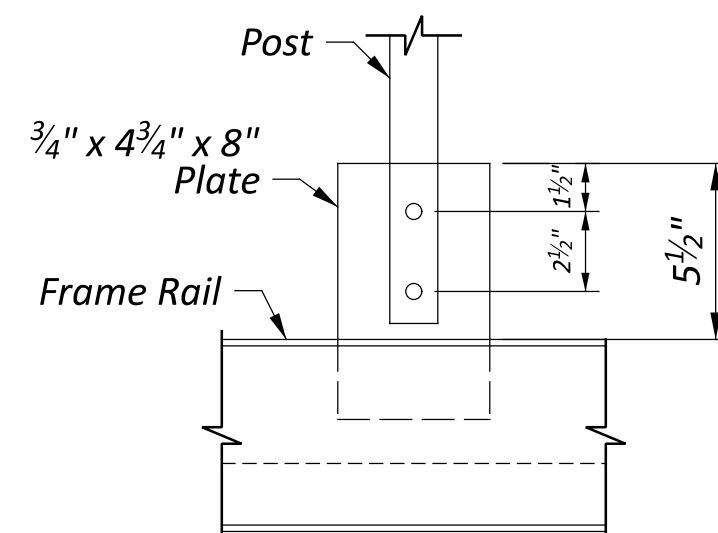
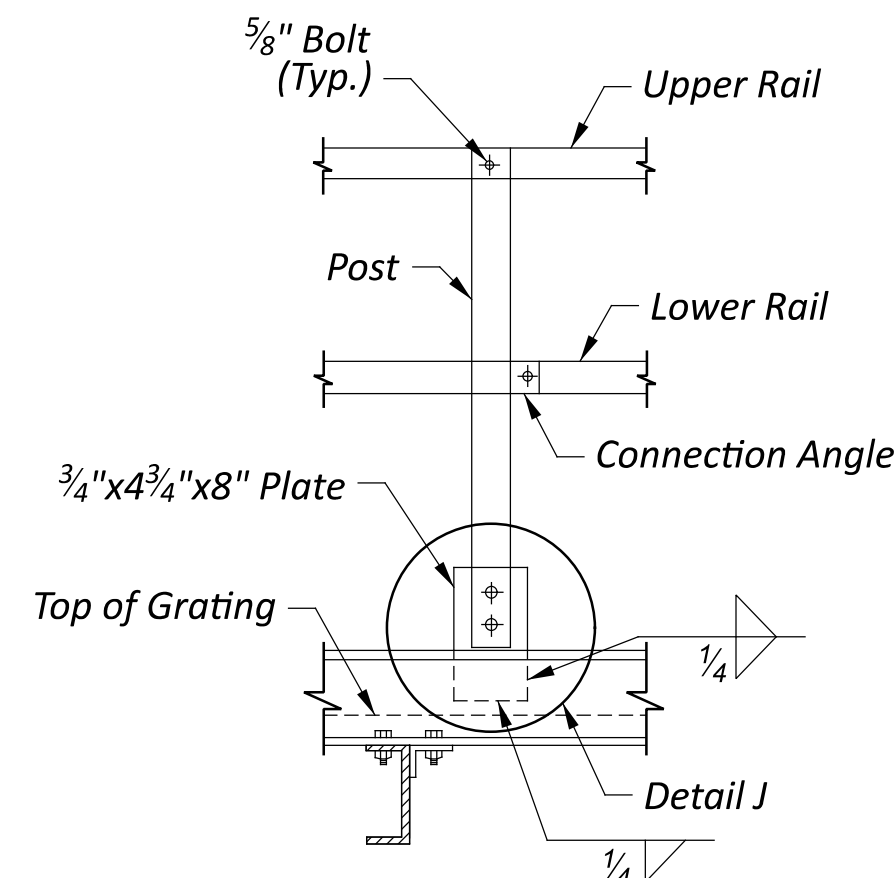
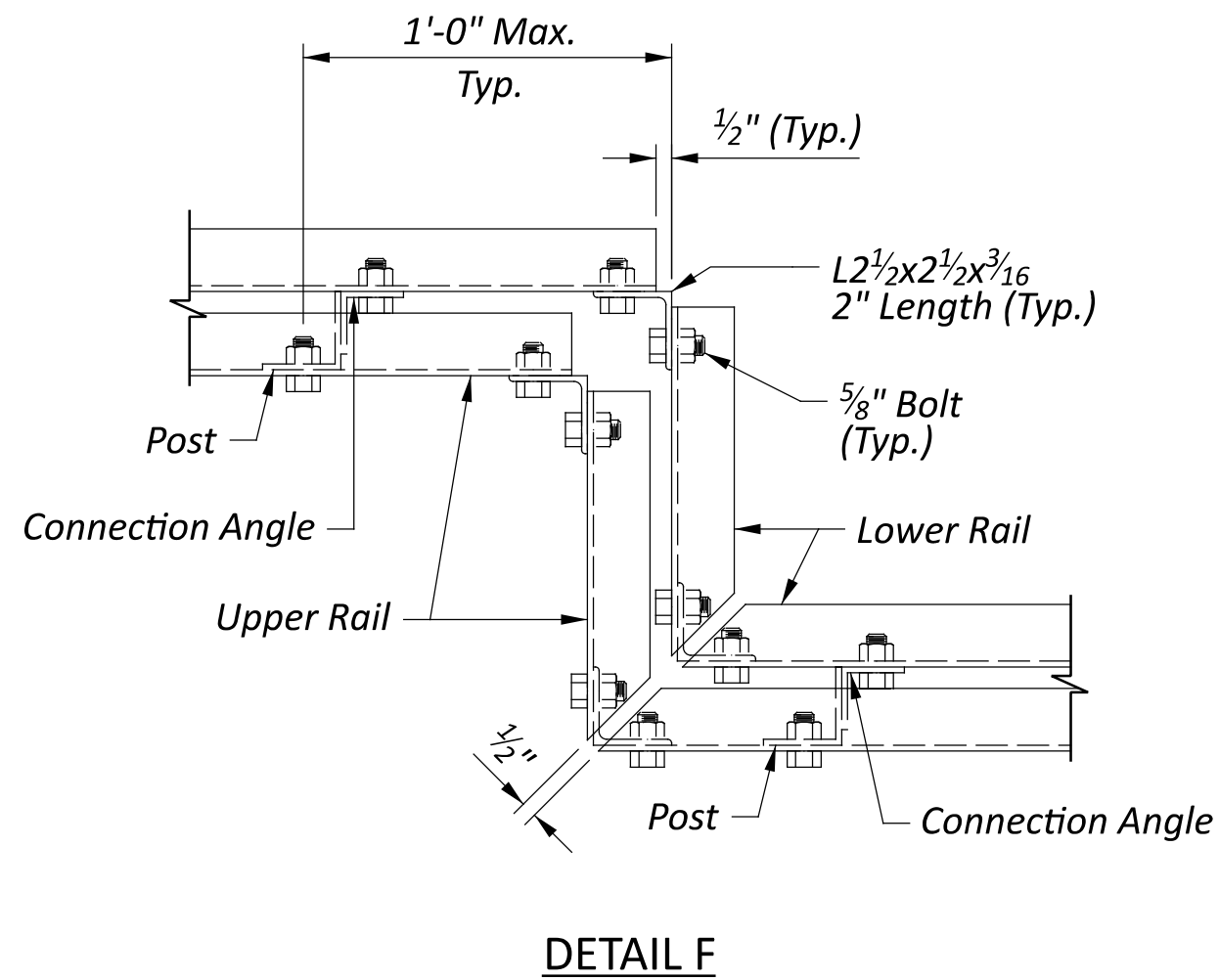
SECTION E-E



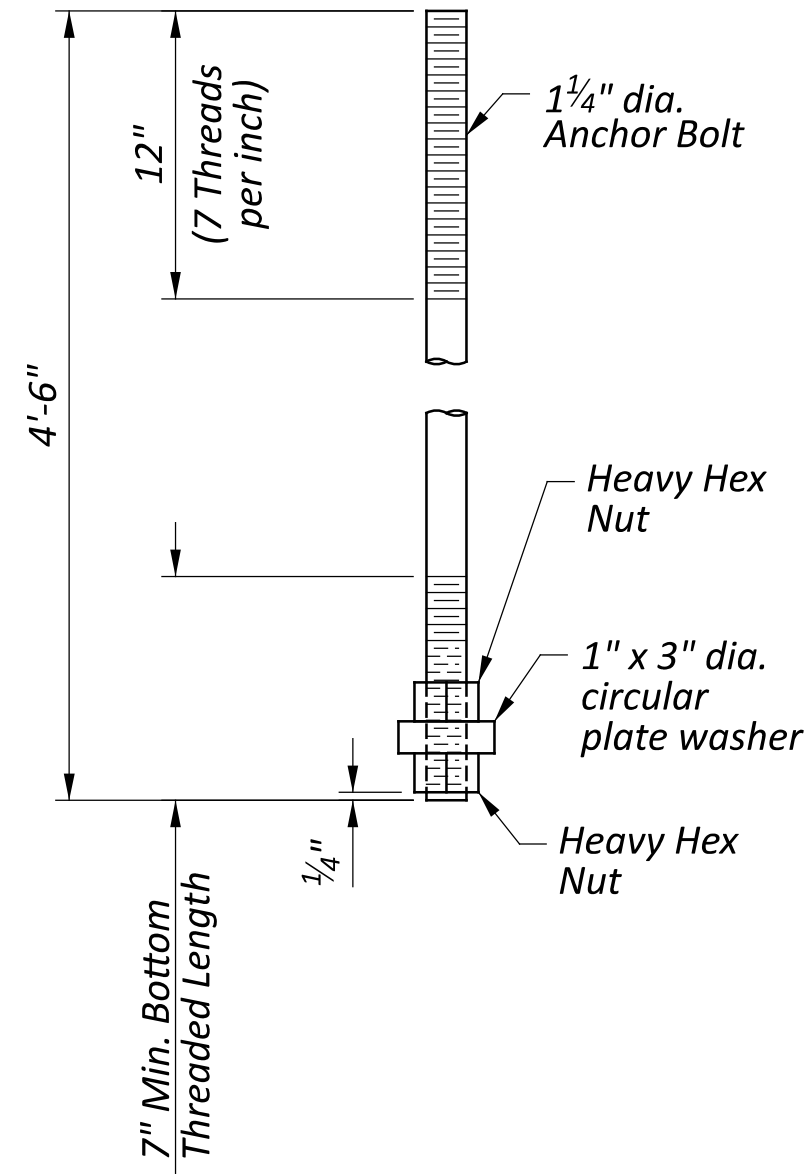
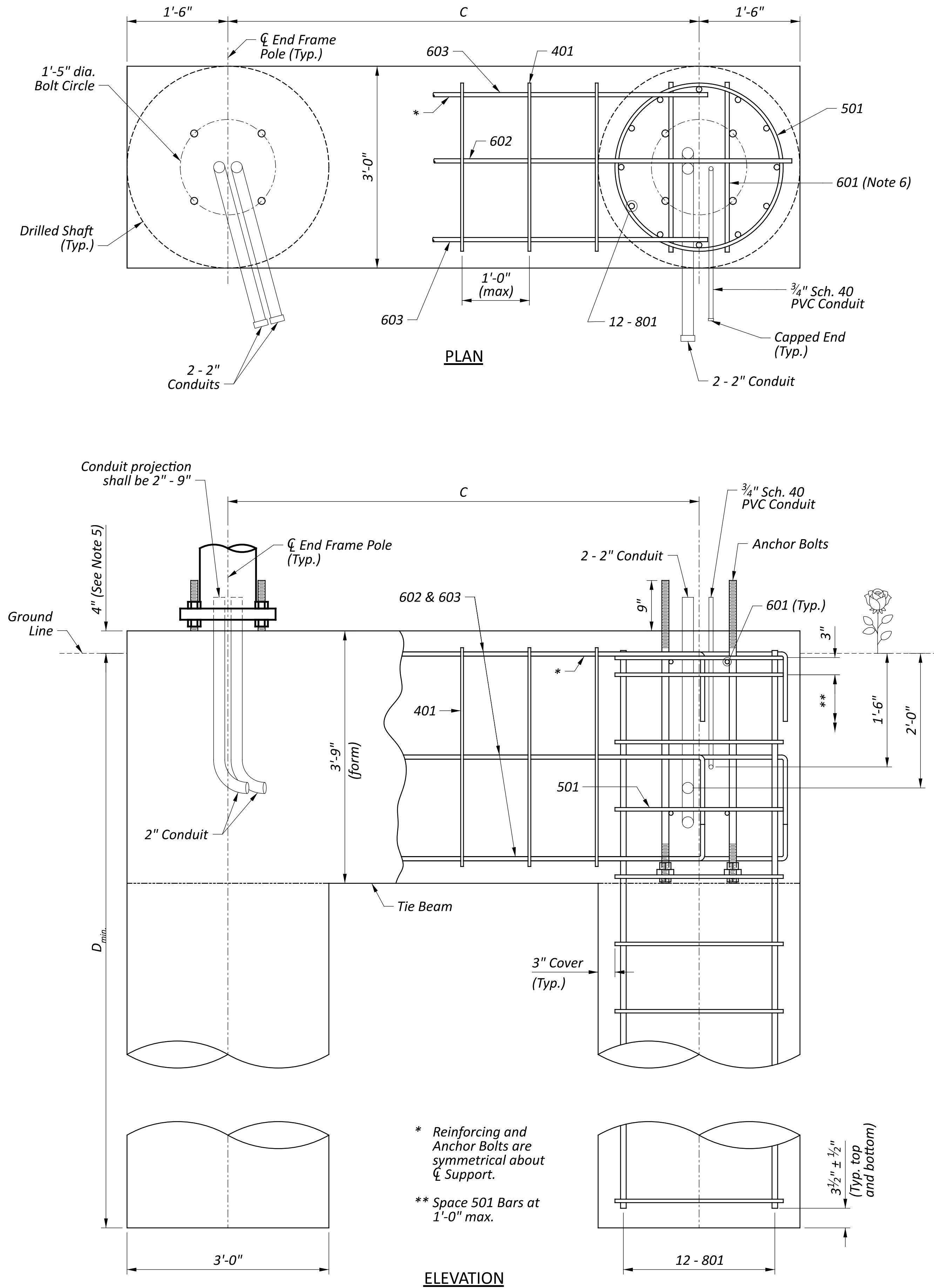
VIEW B-B



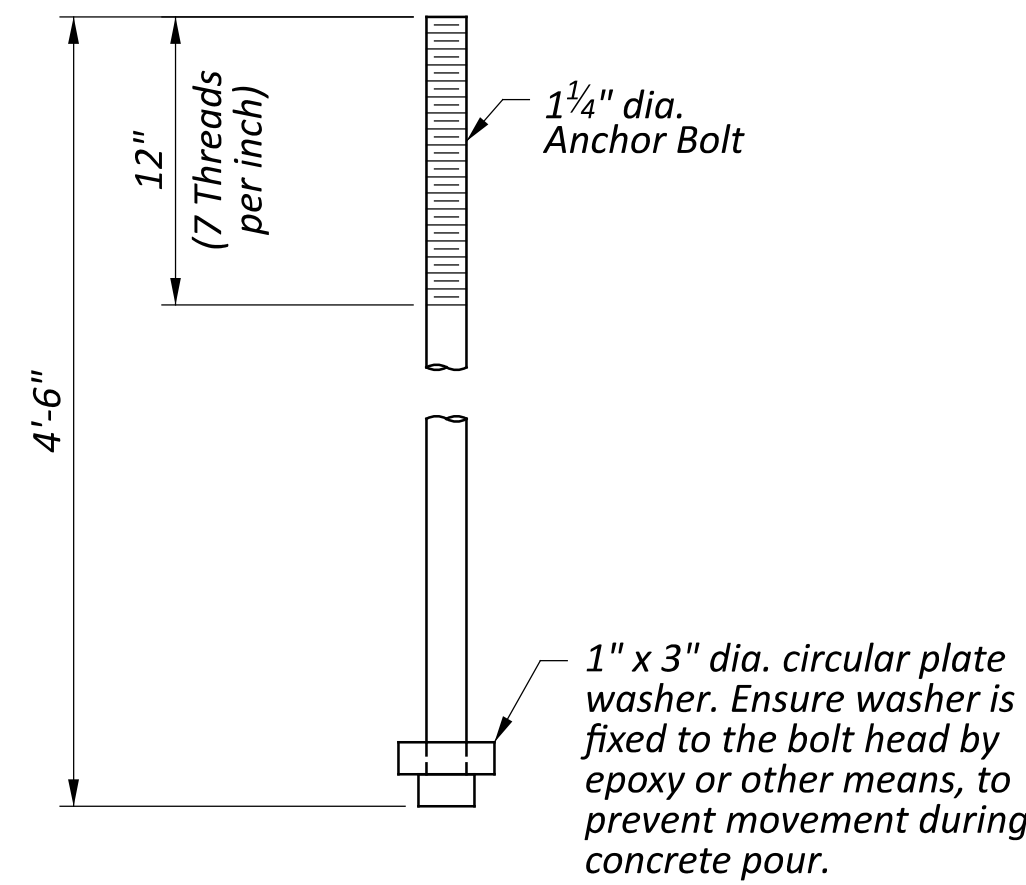
SECTION C-C



- 5. The Contractor shall prepare full catwalk structure construction drawings meeting the requirements of the project plans, the project specifications, and the standard drawings. The Contractor shall determine the exact placement of the sign on the sign support pedestal to calculate the length of catwalk required. If the walkway surface of the proposed catwalk is not at the same level as the bearing deck of the sign, steps shall be provided. The Contractor shall determine the width of tread and height of riser steps to assure that the sign enclosure door will open out. A landing area shall be provided to allow total opening of the door.*
- 6. Provide steel grating or walkway designed to carry 60 pounds per square foot of live load for the required spans. Grating or walkway shall be galvanized and shall be connected to the supporting members according to the manufacturer's recommendations.*
- 7. The width of the catwalk at the door of the DMS enclosure is set by the Contractor based on the dimensions of the access door. Set the width so that the access door can be opened outward ninety degrees from the sign housing.*
- 8. Provide fence fabric consisting of a 1 inch diamond mesh using 0.120 inch dia. (11 gauge) wire. Fabric shall be PVC coated, conforming to ASTM F668 Class 2A or 2B. PVC coating shall be gray in color closely approaching federal standard no. 595B-16251. Fabric shall extend vertically from the upper rail to the top of the frame rail. Tie fabric to the upper rail, lower rail and railing posts using coated tie wires. Fabric shall extend to the ladder rail to fill the gap between the ladder and the first railing post.*
- 9. Provide shop drawings according to the requirements of C&MS 630.03. Shop drawings shall be submitted to the Engineer 10 days before fabrication.*
- 10. Payment for materials and installation of catwalk and ladder is incidental to the DMS support structure.*



NUTTED ANCHOR BOLT OPTION



HEADED ANCHOR BOLT OPTION

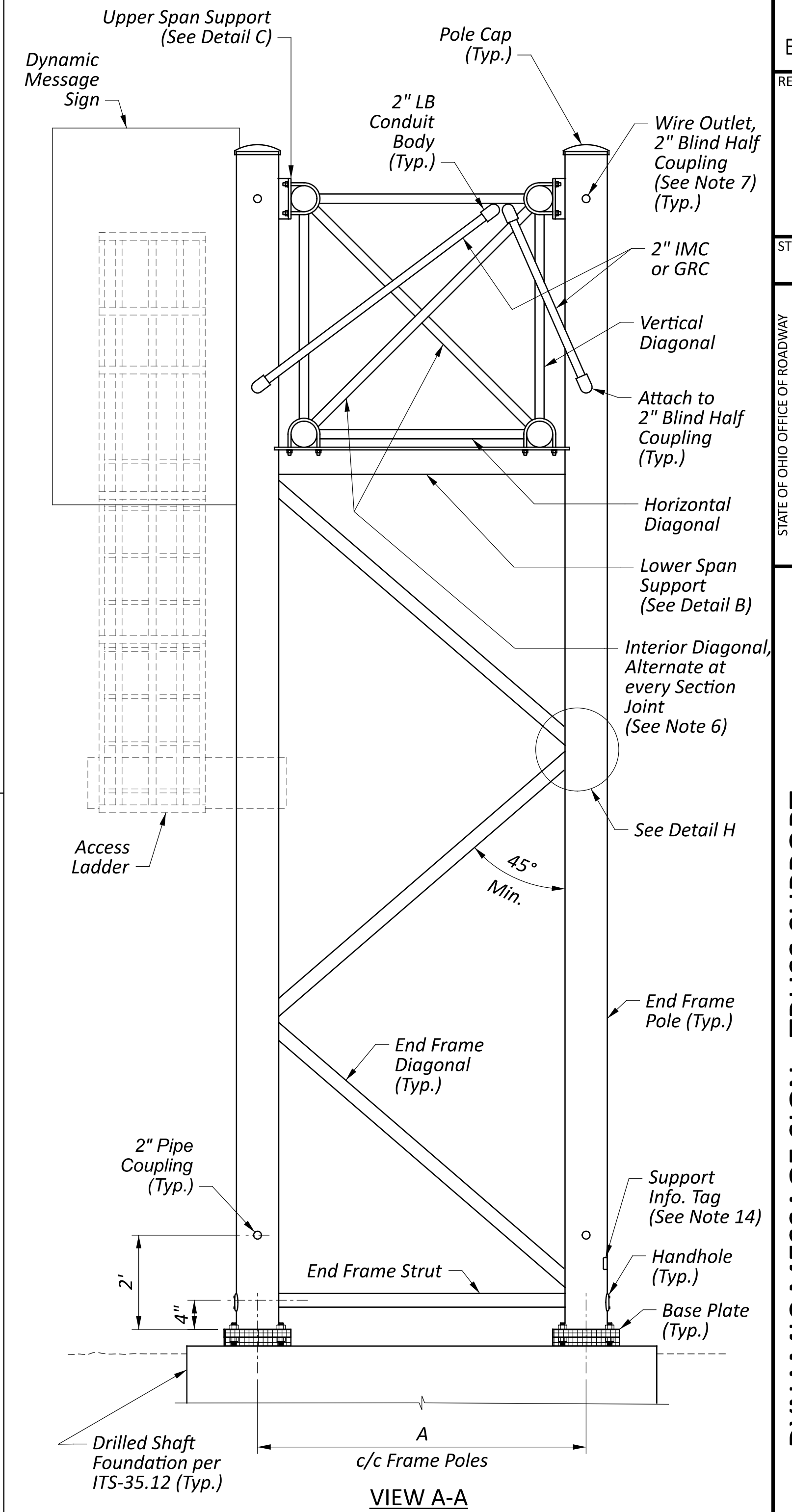
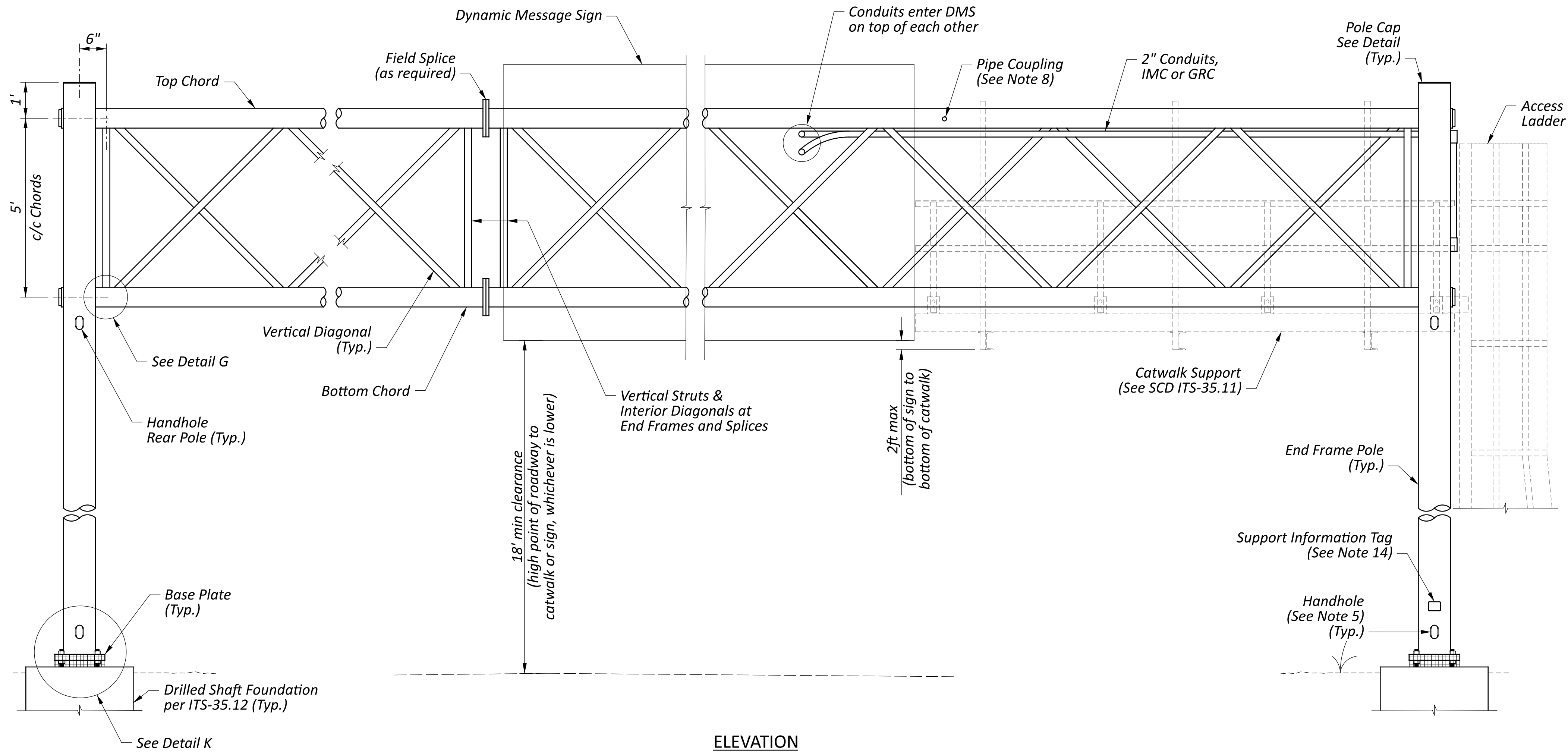
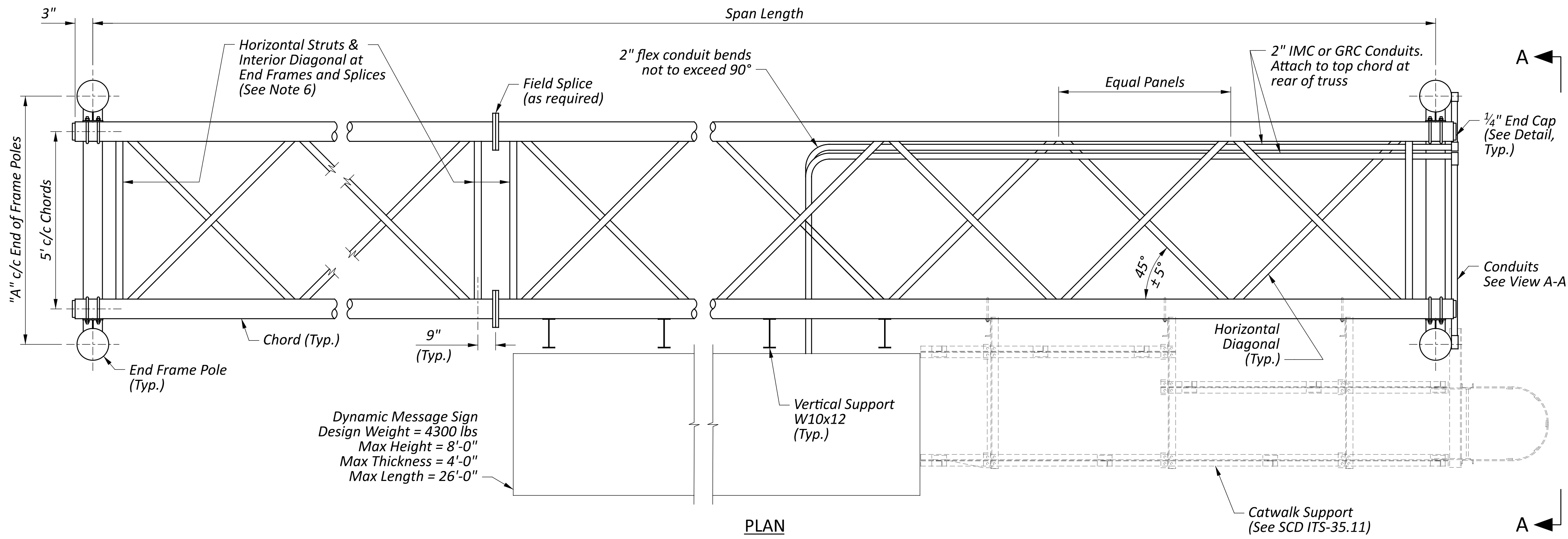
Notes

- The design of the drilled shaft Support Foundations presented on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) with interim revisions through 2020.
- A special foundation design will be required when cohesive soil with an undrained shear strength of less than 2000 lb./sq.ft. or granular soil with an angle of internal friction less than 30 degrees or a wet density less than 120 lb./cu.ft. is encountered (average soil properties along the length of the shaft).

For special foundation design, conform to the current edition of the ODOT Geotechnical Design Manual, Section 1200.
- When approved by the Engineer, alternate foundation designs are acceptable. Alternate foundation design calculations and drawings shall be stamped by an Ohio Registered Engineer and shall be submitted to the Engineer for review and acceptance.
- Construct the drilled shaft foundation in accordance with C&MS Item 524.
- At locations where the existing slope is 6:1 or steeper, the buried depth of foundation shall apply to the low side of the slope. Set the top of the foundation 2" above the existing surface on the high side of the slope.
- Tie anchor bolts to rebar cage near the top and bottom of the anchor bolts with 601 bars.
- Anchor bolts shall meet the requirements of C&MS Item 630, except that bolts shall be galvanized per C&MS 711.02 and galvanizing limits shall be full length of the anchor bolts. Provide a standard steel hex nut, leveling nuts, and plain washers with all anchor bolts. The nuts shall be capable of developing the full strength of the anchor bolts.
- All reinforcing steel shall be Grade 60 epoxy coated and comply with and be placed in accordance with C&MS 509. Lap all rebar per the lap length table in C&MS 509. 3" minimum cover is required.

FOUNDATION DIMENSIONS		
SUPPORT TYPE	C	D _{min.}
ITS-35.13 Design 1	6'-9"	16'-0"
ITS-35.13 Design 2	7'-0"	18'-0"
ITS-35.13 Design 3	7'-0"	20'-0"

REINFORCEMENT SCHEDULE, TIE BEAM			
MARK	No.	LENGTH (Note 4)	TYPE
401	5	12'-0"	Bent
501	1'-0" c/c + 1	9'-3"	Bent
601	8	2'-6"	Straight
602	3	C + 4'-6"	Bent
603	6	C + 2'-0"	Bent
801	24	D _{min.} - 3"	Bent



REVISIONS
01-16-2026
07-19-2024
07-15-2022
04-16-2021
01-15-2021
01-18-2019
01-15-2016

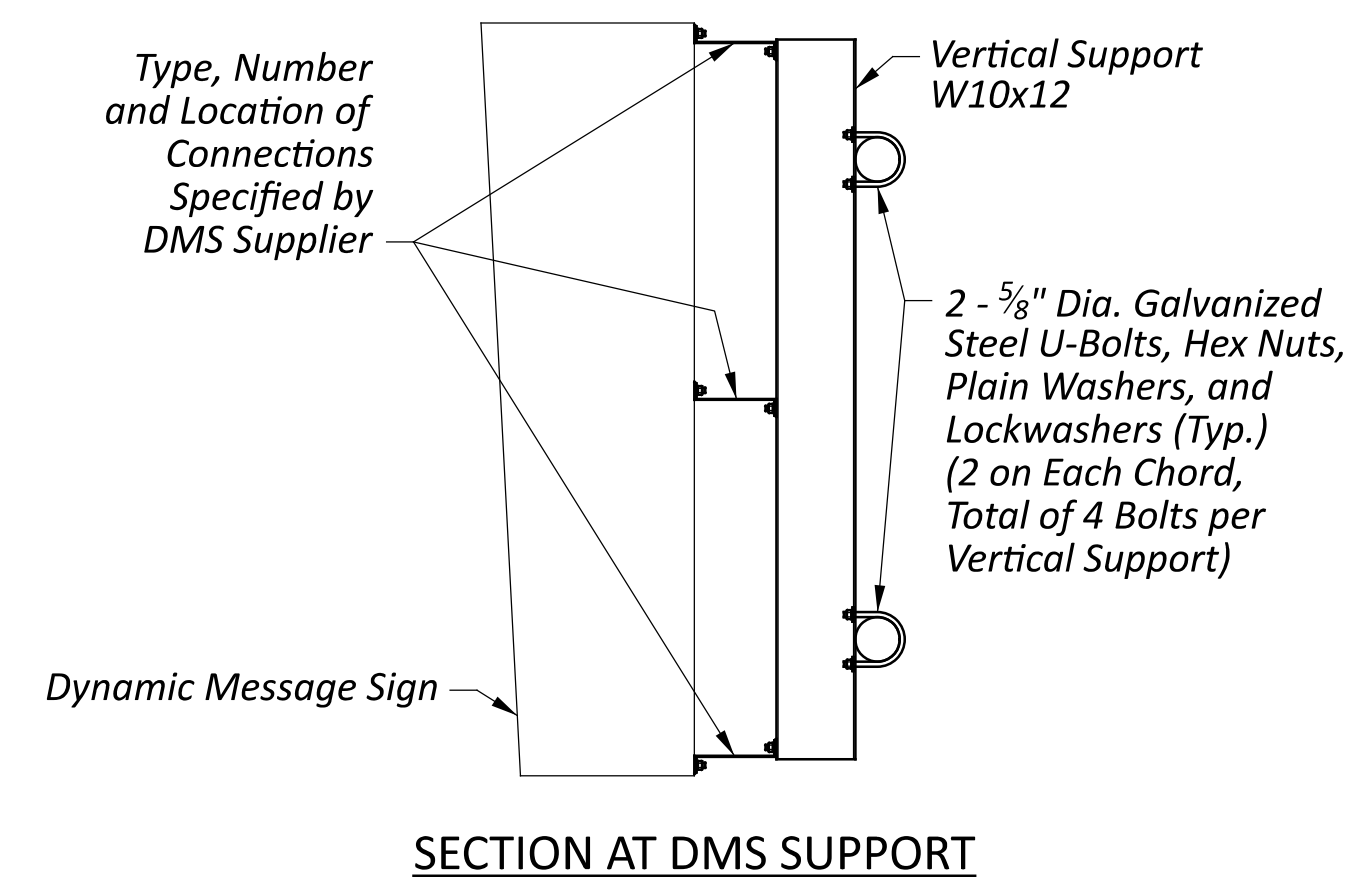
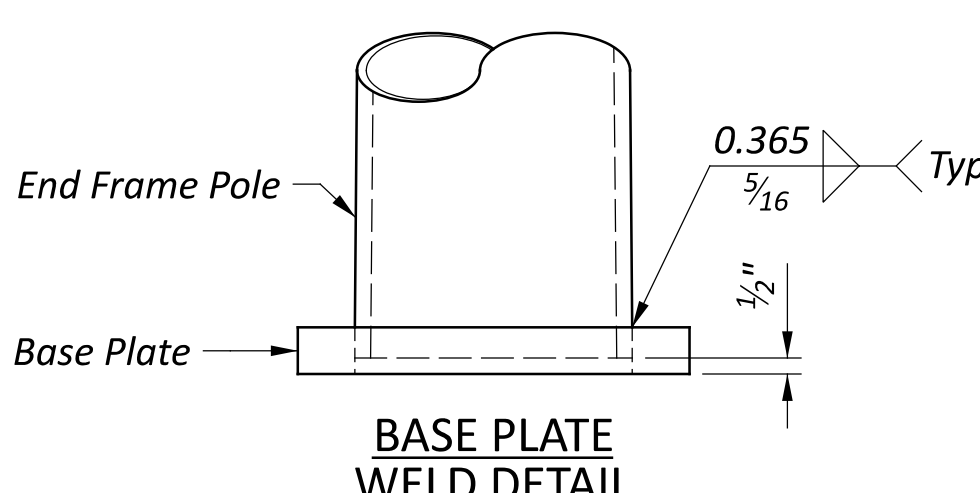
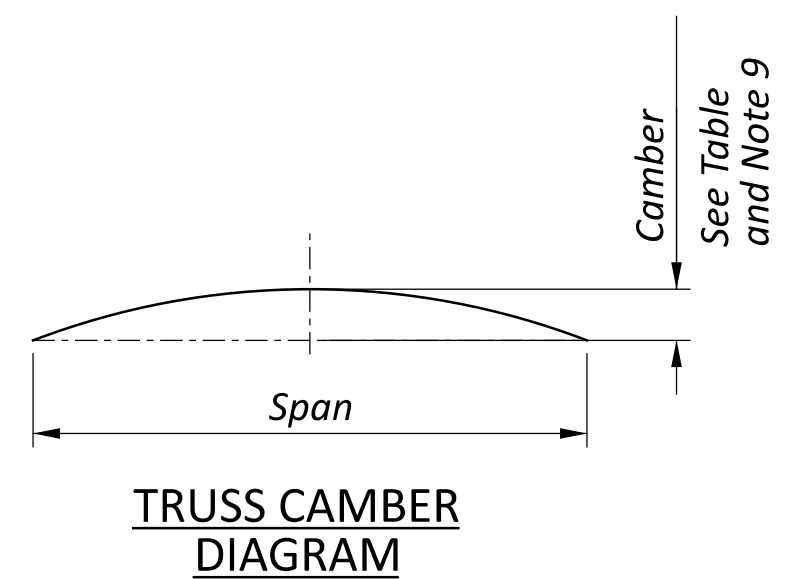
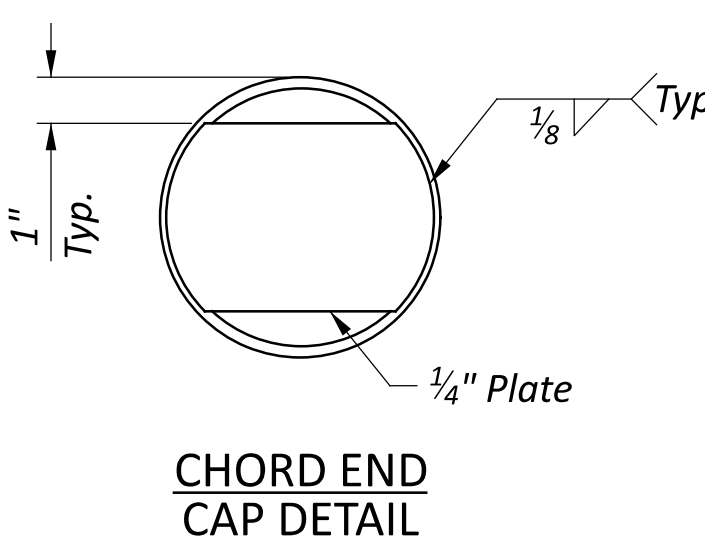
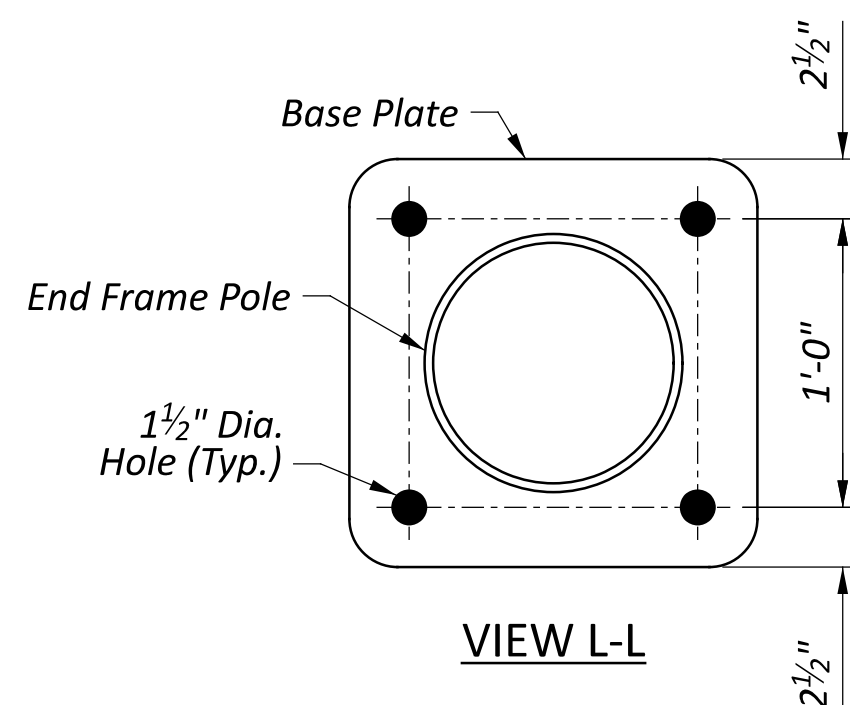
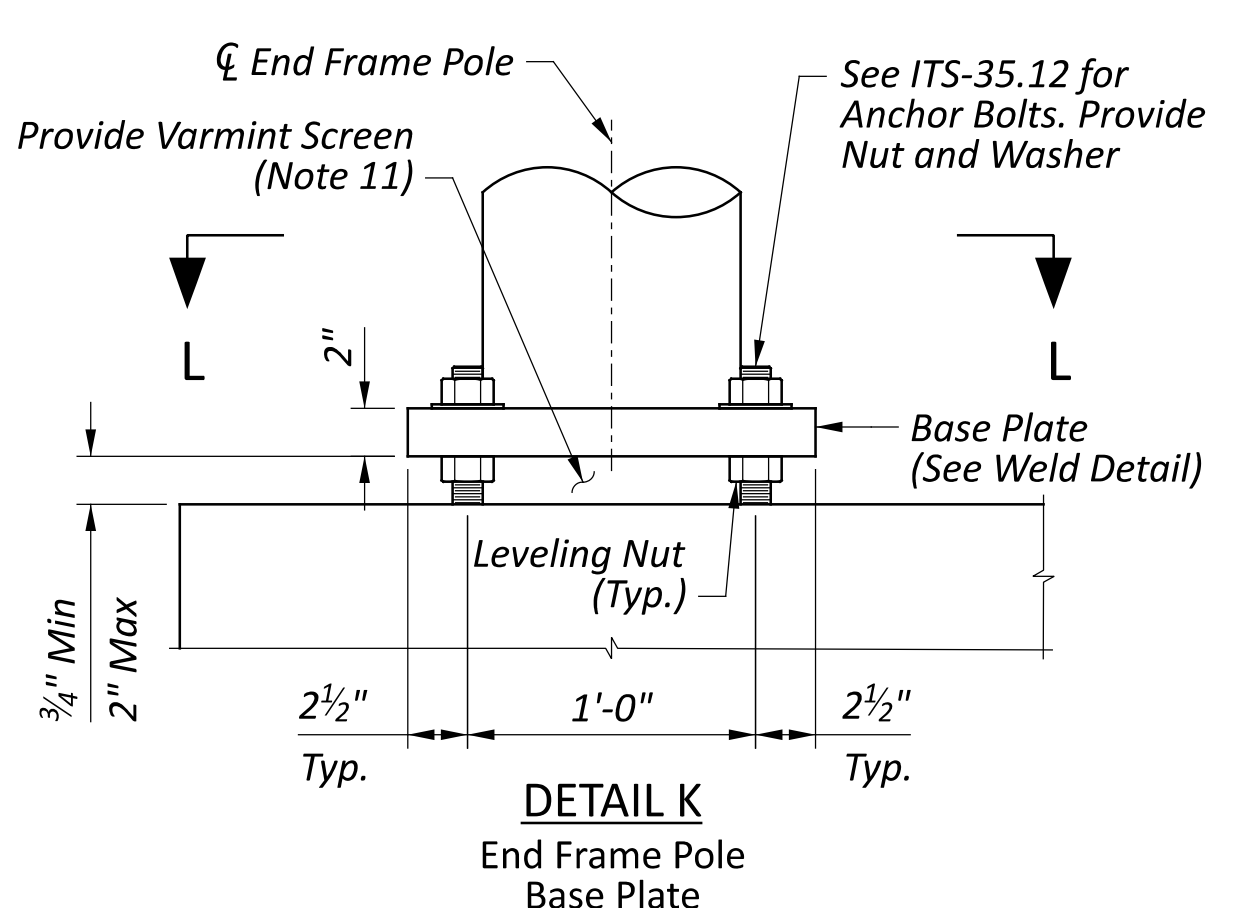
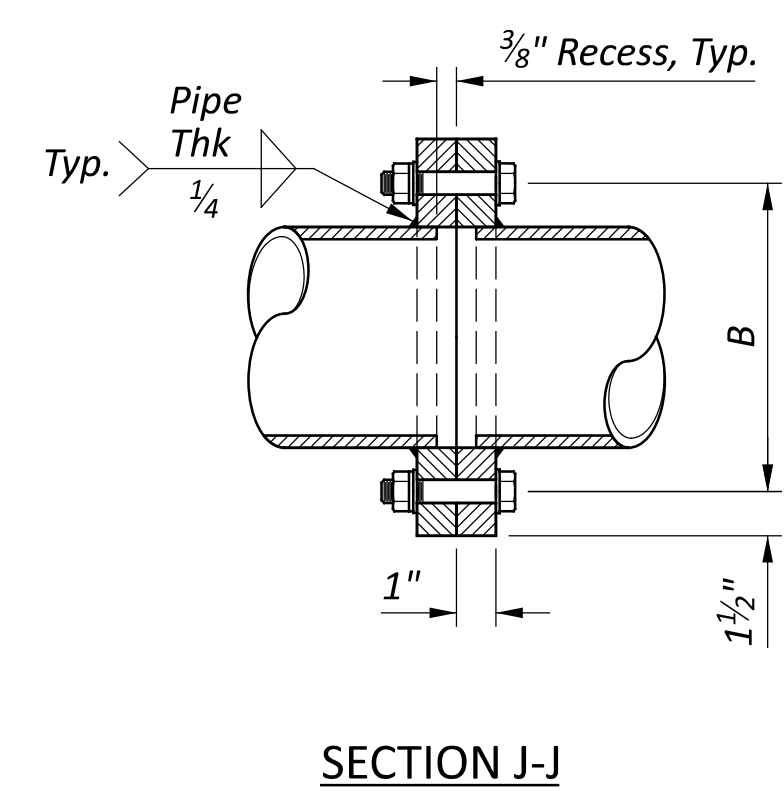
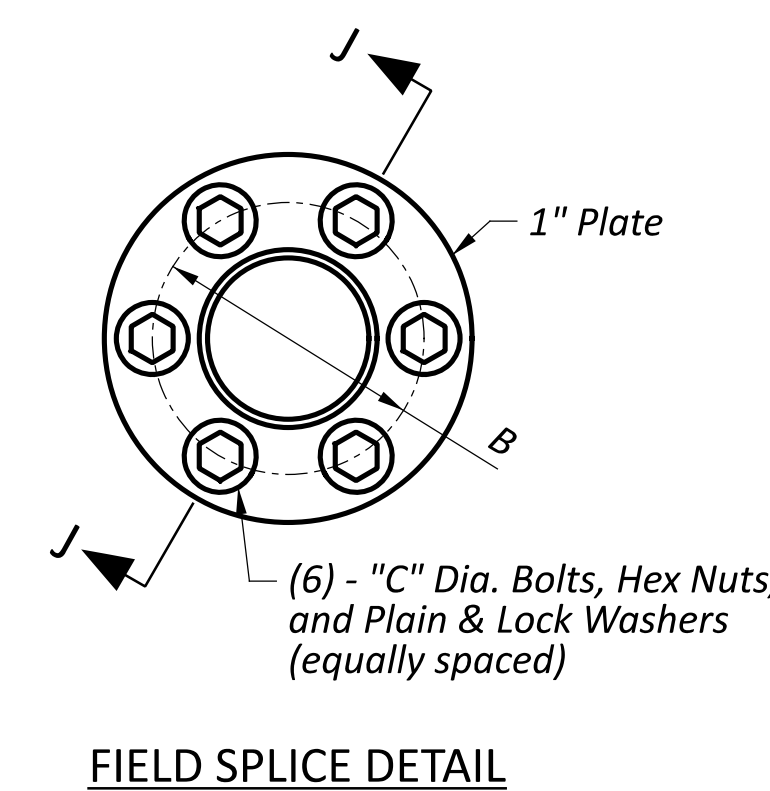
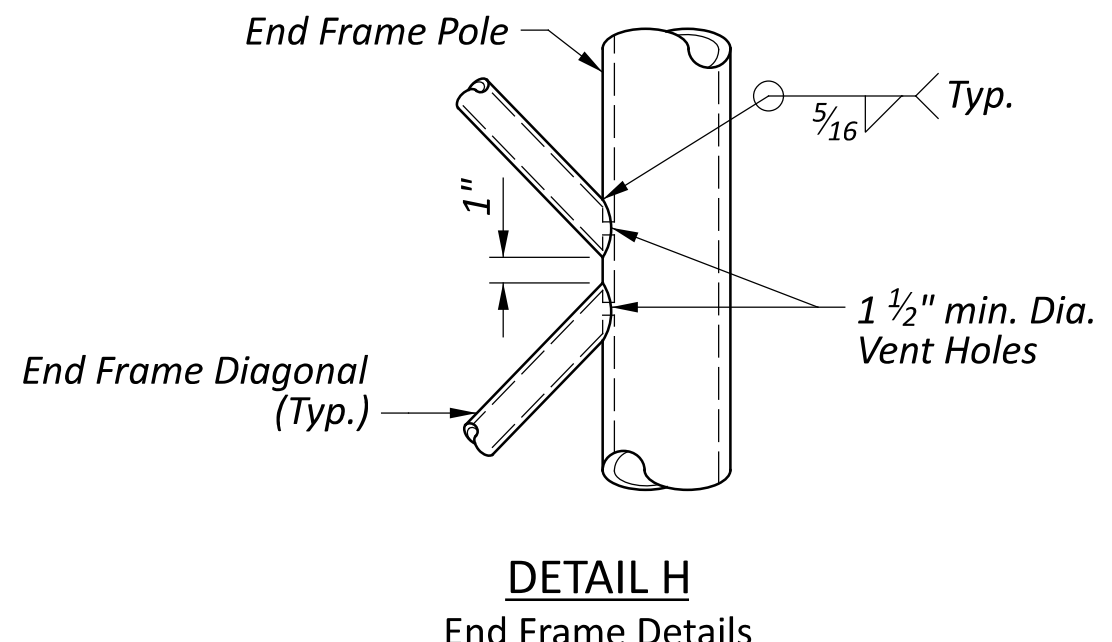
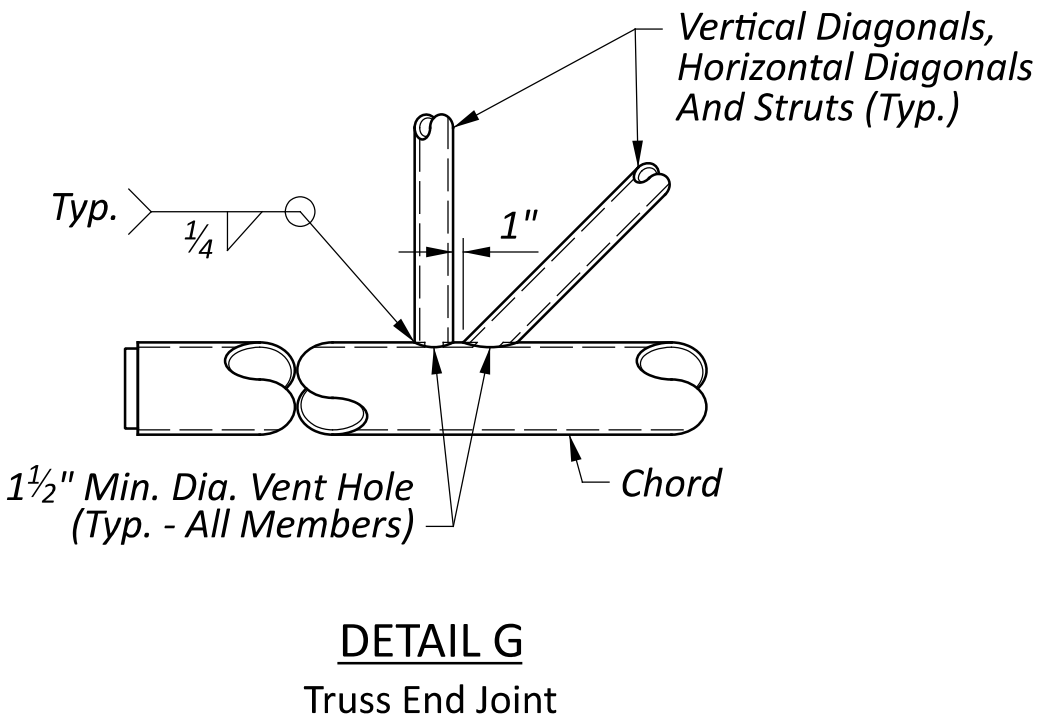
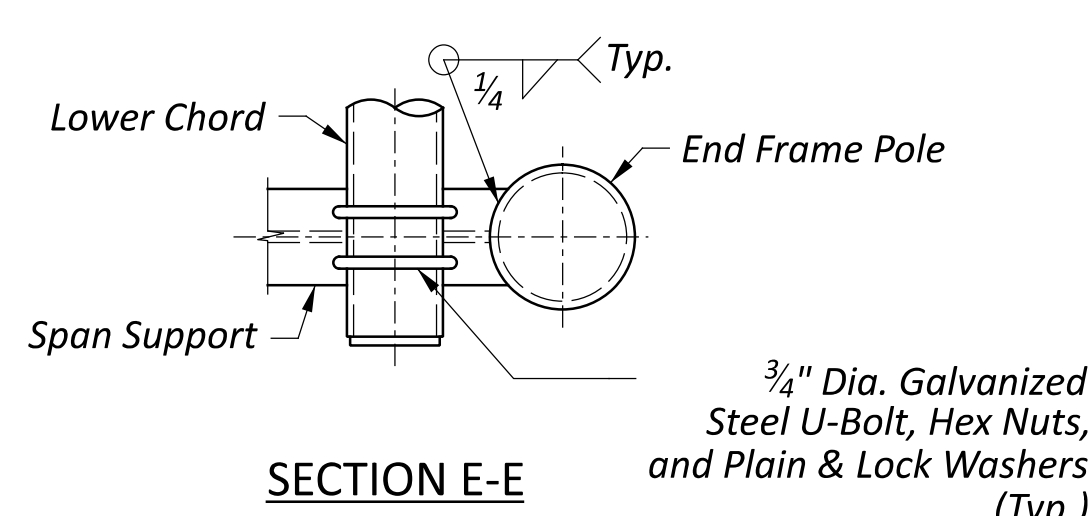
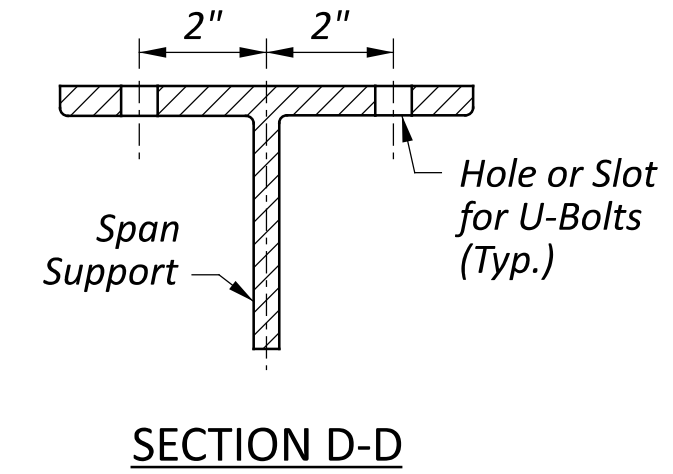
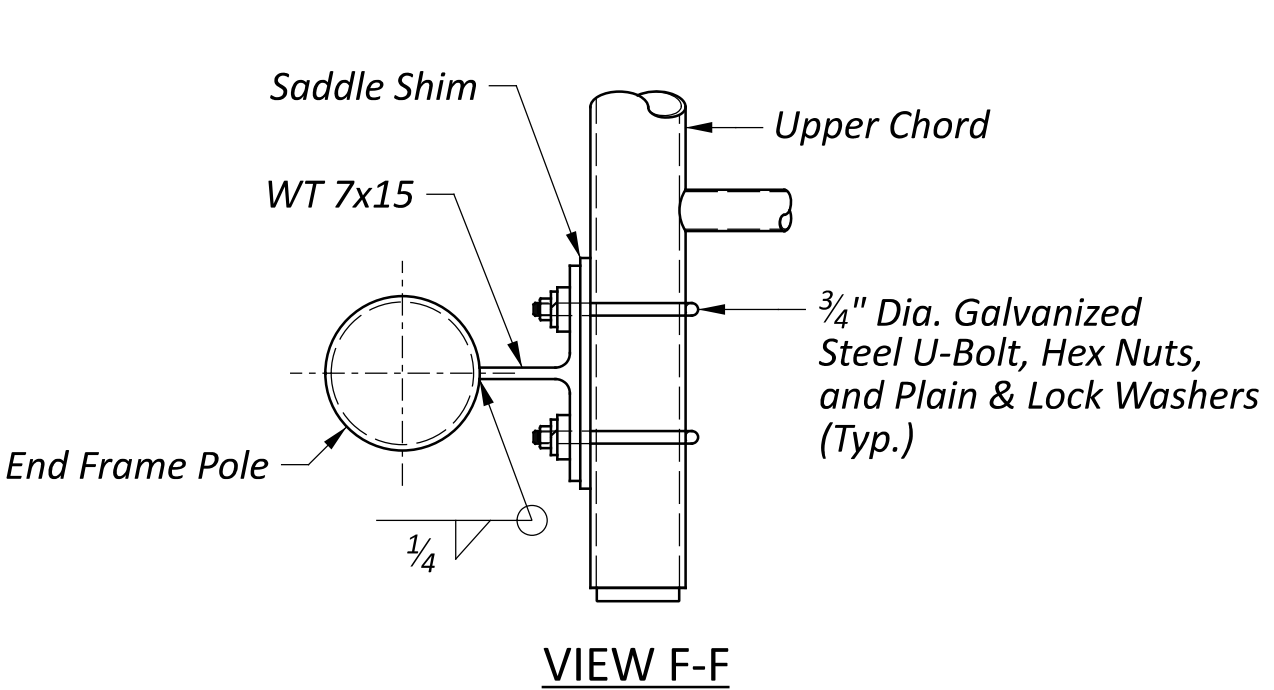
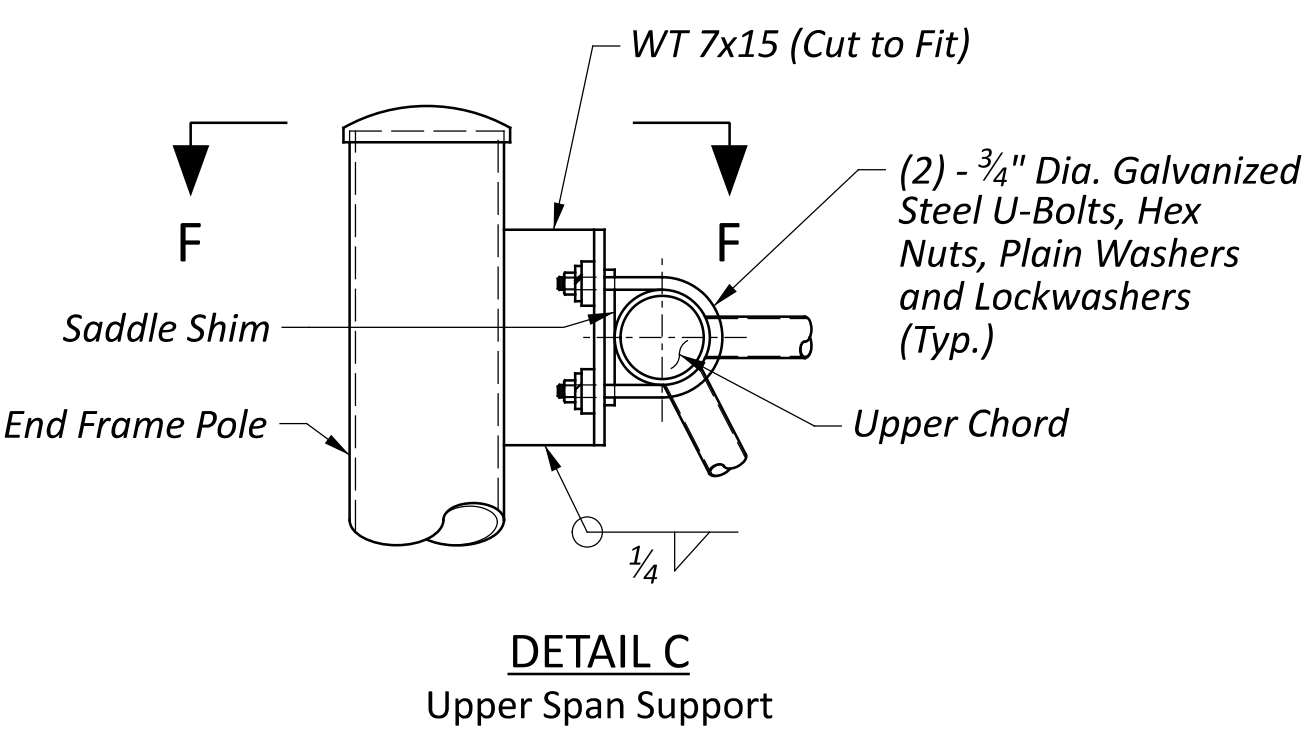
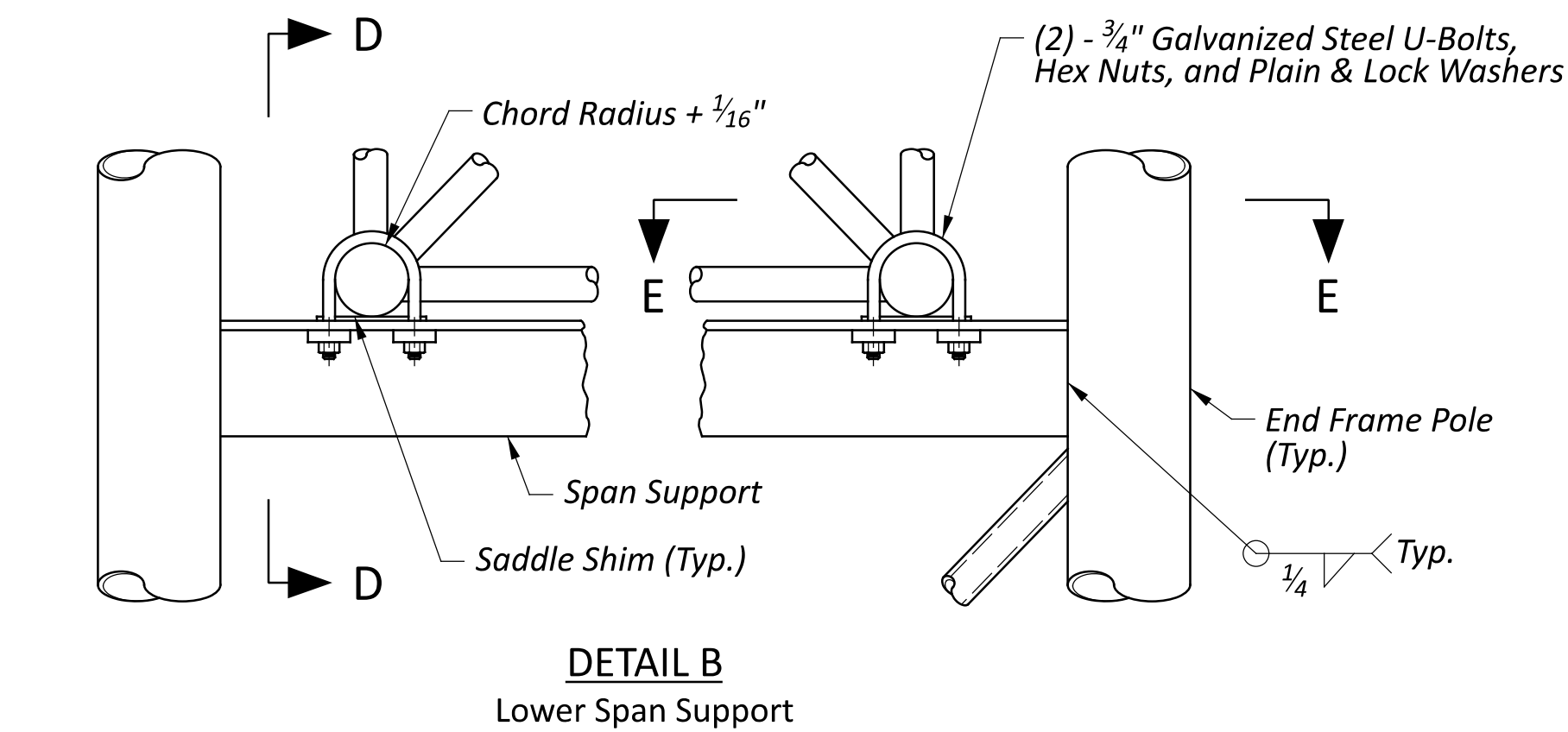
STDS ENGINEER
Beck

STATE OF OHIO OFFICE OF ROADWAY ENGINEERING ADMINISTRATOR
Adam Koenig

DYNAMIC MESSAGE SIGN - TRUSS SUPPORT



SCD NUMBER
ITS-35.13
SHEET
P.1
TOTAL
2



STRUCTURE	MAX. SPAN	TRUSS				END FRAMES			A	B	C	CAMBER (Note 9)
		CHORDS	VERT. DIAG.	HORIZ. DIAG.	STRUTS	POLES	DIAG. & STRUT	SPAN SUPPORT				
DESIGN 1	80'-0"	5.563 X .258	2.375 X .250	2.375 X .250	2.375 X .250	10.750 X .365	3.500 X .300	WT6x20	6'-9"	8 1/2"	7/8"	2 1/2"
DESIGN 2	115'-0"	6.625 X .280	3.000 X .250	3.000 X .250	3.000 X .250	10.750 X .365	4.000 X .318	WT6x20	7'-0"	9 1/2"	7/8"	4 1/4"
DESIGN 3	150'-0"	6.625 X .375	3.500 X .250	3.500 X .250	3.500 X .250	10.750 X .365	4.500 X .337	WT7x24	7'-0"	9 1/2"	1"	6"

All Pipe Sizes Are Outside Diameter

NOTES

- The design of the Dynamic Message Sign Truss Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) with interim revisions through 2020.
- Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of LRFDLTS-1 and the design criteria shown below. Calculations shall be stamped by a Professional Engineer registered in the state of Ohio and shall be submitted for review and approval with the shop drawings.
- All material shall meet the requirements of C&MS 630 with the following limitations:
Steel tube and pipe - ASTM A500 Grade B (42 ksi min yield)
Structural steel - ASTM A709 Grade 50 (50 ksi min yield)
Steel hardware (nuts, bolts, and washers) - ASTM F3125 Grade A325 Type 1 Galvanized
- For foundation and anchor bolt details see SCD ITS-35.12 or ITS-36.12.
- For sign attachment assemblies to be furnished with this support, construction details and location of handhole details, see SCD TC-22.10 and TC-22.20.
- One internal diagonal is required at each end of each truss section and at the panel point nearest the centerline of the truss section when the section exceeds 25' in length. Tube-to-tube type butted connections are required. Tube-to-gusset plate type connections are not permitted.
- Weld one threaded steel pipe coupling to the outside of each end frame pole as shown in View A-A. Remove all sharp edges inside the pole and pipe coupling. Couplings shall be 2" female NPT. The depth/ length of the coupling should be sufficient for a 2" male NPT pipe/ fitting to seat securely.
- Weld one threaded steel pipe coupling to the front top chord of the truss approximately 1'-0" outboard of the first sign bracket. Remove all sharp edges inside the chord and pipe coupling. Couplings shall be 2" female NPT. The depth/ length of the coupling should be sufficient for a 2" male NPT pipe/ fitting to seat securely.
- Camber the truss a minimum of 1" for a span of 50' or less. Increase the camber 1/4" for each 5' of span over 50' up to 80'. For spans over 80' interpolate from the value given in the table.
- All unused couplings shall be provided with a removable galvanized cast iron plug.
- Attach varmint screen between the base plate and top of drilled shaft foundation with stainless steel band and minimum 2" overlap. Tie overlapping screen with stainless steel wire ties. Screen shall be welded wire mesh or expanded metal sheet, stainless steel, with openings no larger than 3/8".
- Saddle shims can be preformed bearing pads meeting the requirements of C&MS 516 and 711.21 or ASTM A709 Grade 36 steel galvanized according to C&MS 711.02.
- Design Criteria:

Additional Signs: Design loading includes 512 sq. ft. of mounted signs in addition to the Dynamic Message Sign.

Wind Load: 1700-year MRI, 120 mph Design Wind Velocity

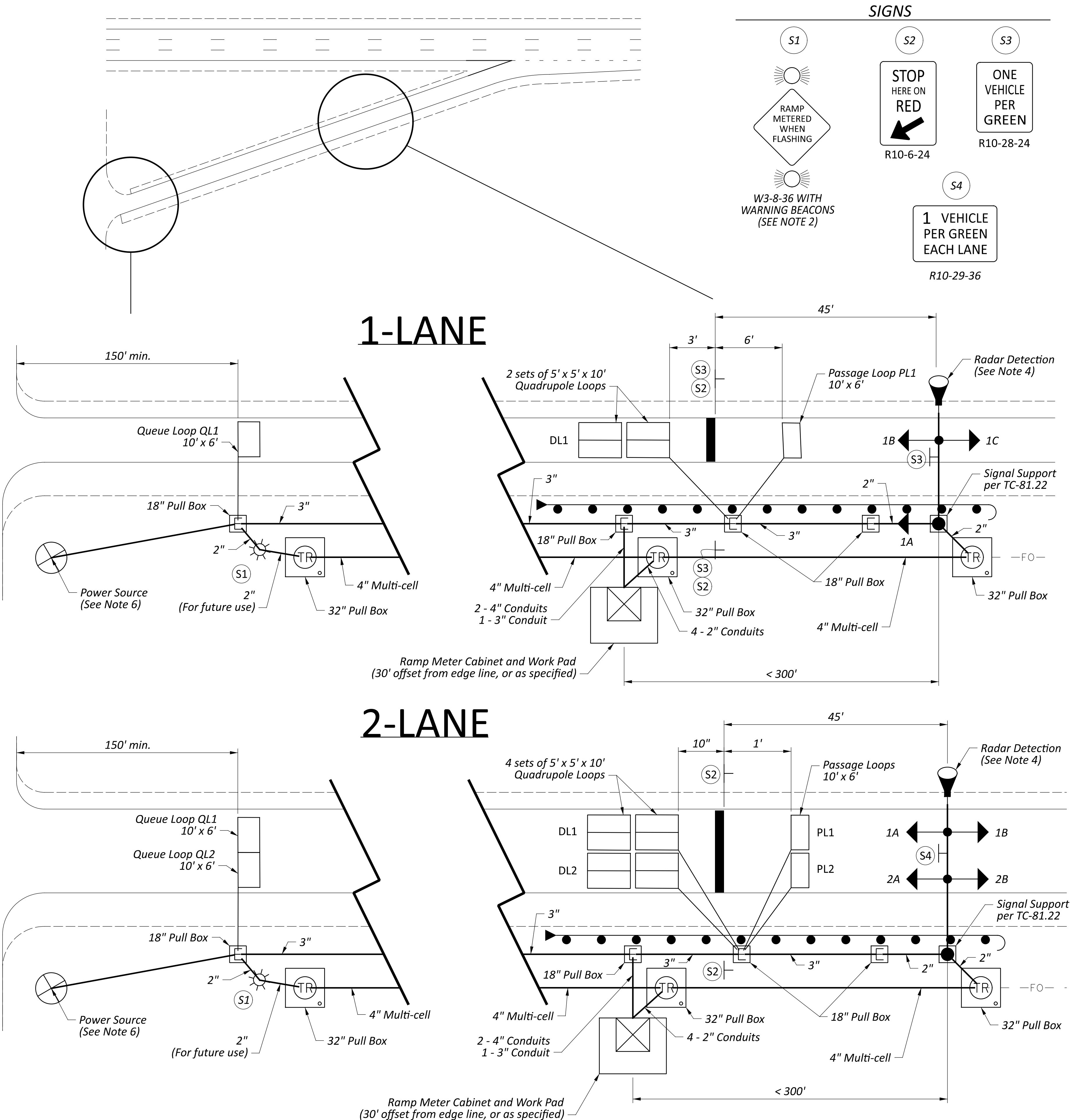
Service I Wind Velocity: 76 mph

Serviceability Parameters:
Maximum Vertical Deflection of Horizontal Support Resulting from Service I Load Combination (Dead Load + Wind): L/150 per LRFDLTS-1 10.4.1

Fatigue Parameters:
Fatigue Category I
Natural Wind Gust: Included
Truck-Induced Gust: Included
- Use a Support Information Tag per C&MS 732.11 mounted above the handhole, except that it shall also include the standard construction drawing of the catwalk. Any catwalk that differs from the ODOT standard drawing shall include the phrase "NON_STANDARD CATWALK" on the tag.



1. Additional ground rod electrodes shall be added to grounding conductor as required until resistance to ground is 25 ohms or less for device locations and 25 ohms or less at power service and pull box. If additional ground rod electrodes are required in order to achieve required resistance they shall radiate out from existing ground rod electrodes, shall be connected with copper conductor as specified in the plans, and shall be 30' from connected ground rod. All communication equipment grounding sites shall be tested for resistance to ground using the three-point/fall-of-potential test per ANSI/ IEEE Std. 81. See grounding specifications.
2. Ground rod electrodes shall not be routed through foundations.
3. Fences and other metallic structures with paths to ground shall be connected to the grounding conductor if they are located within 10' of the grounding electrode system or any object grounded to the grounding electrode system. See SCD F-3.5.
4. Ground rod electrodes per CMS 725.16 shall be buried to a minimum depth of 12" below finished grade.
5. All equipment grounds shall be properly bonded to a chassis; all paint and other coatings, including galvanization, shall be removed prior to termination of a ground. After the ground is terminated a non-oxidizing coating shall be painted over the exposed metal surfaces.
6. Grounding electrode system connections to fencing shall be made using heavy duty tinned listed pipe clamps designed for grounding and stainless steel hardware. See SCD F-3.5.
8. All metallic members of the DMS truss and the DMS sign within 6' of each other shall be bonded together. Welds shall be considered an acceptable bonding method. U-bolt connections shall NOT be considered an acceptable bonding method.
9. At least an 8" minimum bending radius shall be maintained on all grounding electrode conductors. The angle of any bend shall not be less than 90°.
10. Grounding conductors shall always route as straight as possible. "U" form jumpers shall be acceptable only for gates and doors.
11. The quantity of grounding electrode conductors connected to a ground rod electrode shall be limited to four.
12. Grounding electrode conductors shall be installed in one continuous length. Splicing shall be permitted only by irreversible compression-type connectors listed as grounding and bonding equipment or by exothermic welding process.
13. A ground rod shall be installed at each electric pull box installed on this project and connected to the pull box frame and lid. At each pull box location, the ground rod shall also be tied into the distribution cable used as the ground wire to service the camera cabinet, in order to provide a complete grounding system.
14. At sites with transformers, the ground cable shall NOT be bonded to the neutral in the disconnect switch on the primary side of the transformer if there is another disconnect upstream of the transformer. The ground cable SHALL be bonded to the neutral on the disconnect on the secondary side of the transformer.



Notes

- Ramp meter signal displays shall be located as shown in the plans. The foundation and mast arm signal support shall conform to Standard Construction Drawings (SCD) TC-21.21 and TC-81.22. Signal heads shall be 12" LED, two section, red over green, black polycarbonate housing with black aluminum visor, reflective backplates, and shall conform to C&MS 732.01. The side-mounted signal head shall be mounted following SCD TC-85.10.

Payment shall be made at the contract unit price for each item bid separately.
- Ramp meter signs and warning beacons shall be located as shown in the plans.

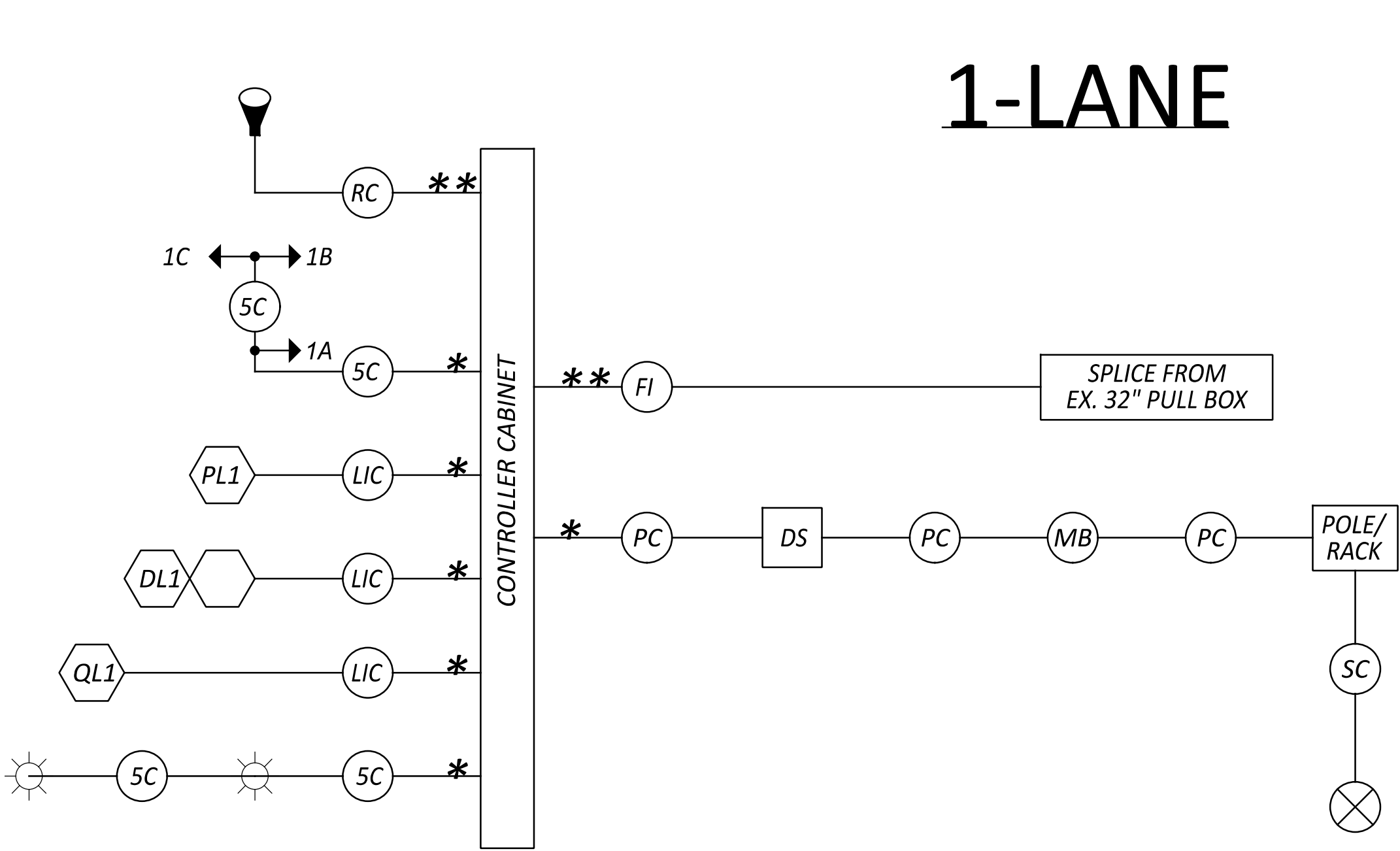
A W3-8-36 flat sheet sign and two 12" yellow LED warning beacons shall be mounted on a 17.5ft pedestal per TC-83.30 as shown in this drawing. The beacons shall flash simultaneously. See Sheet 3 for elevation view.

Payment will be made at the contract unit price for each Item 632 Signalization, Misc.: Ramp Meter Sign and shall include the foundation excavation and construction, anchor bolts, ground rod, breakaway base, pole, sign, sign brackets, warning beacons, mounting hardware and all other items necessary for a complete installation. Electrical cable will be paid as a separate item.
- Ramp meter control equipment shall be located as shown in the plans. Control equipment, cabinet and cabinet items shall conform to the specifications established by SS 909 and the Construction and Material Specifications. Each ramp meter cabinet with controller shall consist of all hardware needed to be fully functional. For full specification, see ramp meter specification in the plan set.

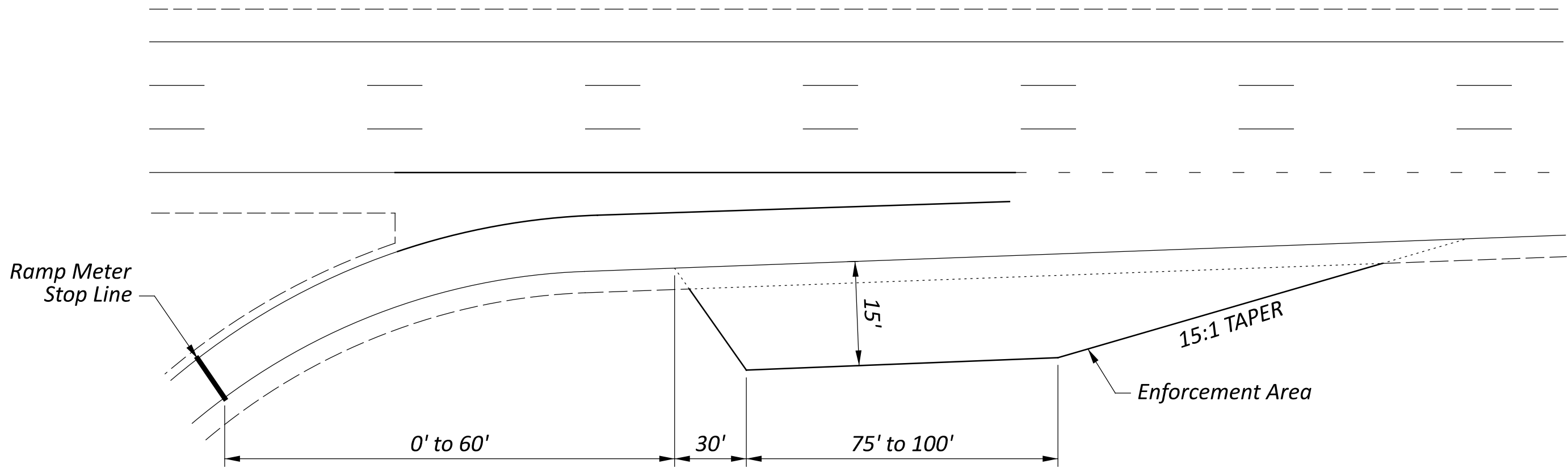
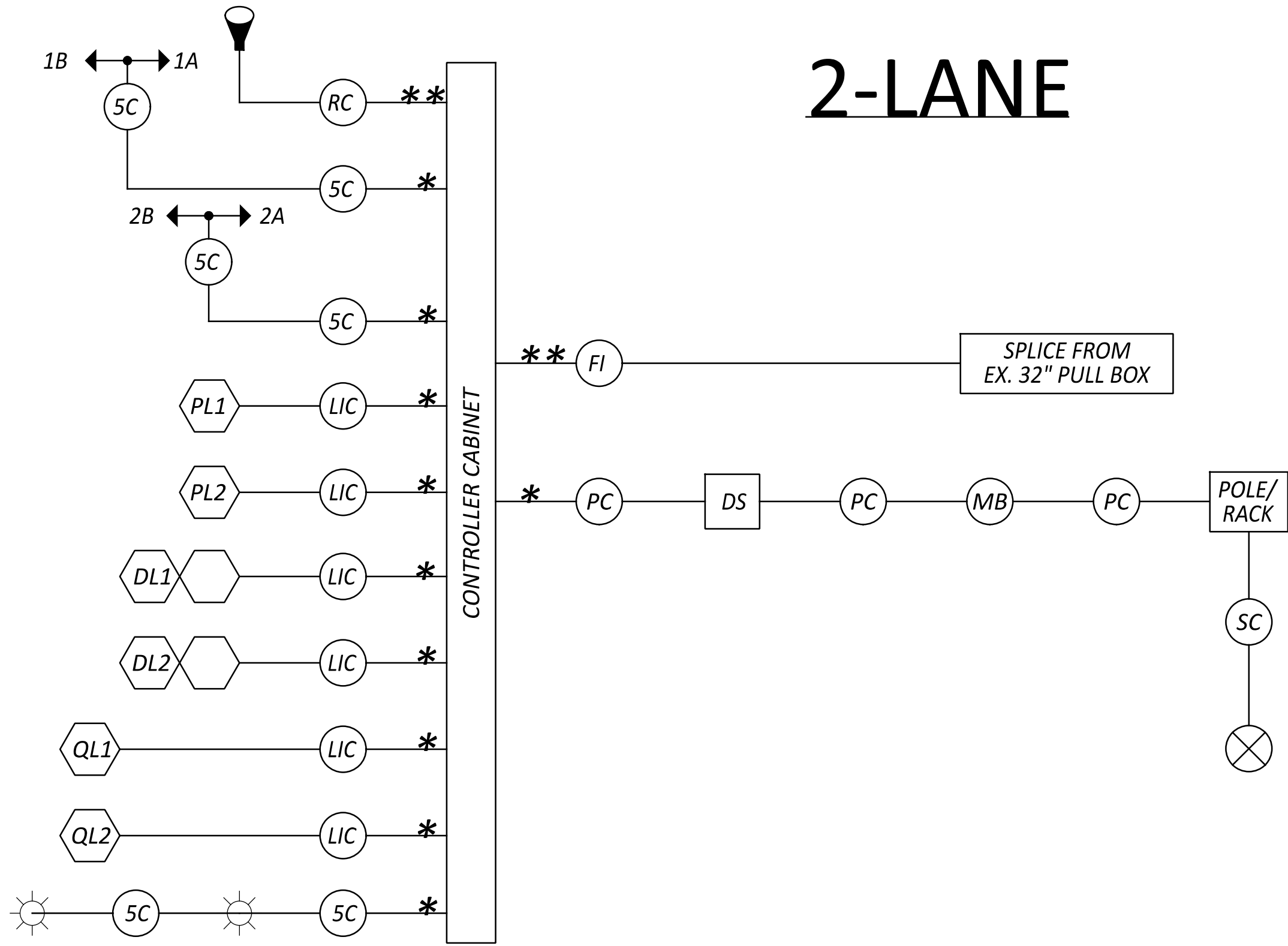
Payment will be made at the contract unit price for separate bid items including use of 809 ATC Controller, APP and 809 ITS Cabinet - Ramp Meter.
- The preferred radar detector location is on the mast arm. If the ramp configuration prevents this location, a separate pole and foundation per ITS-60.10 are to be used to accurately detect the lanes.
- All signal conductors and power cables shall be routed through 18" pull boxes. All radar and fiber interconnect shall be routed through 32" pull boxes.
- Power service shall follow ITS-15.10 or ITS-15.11 depending on power utility infrastructure.
- Before the ramp meter is activated, all vehicular signal heads and warning beacons shall be covered using an opaque covering consistent with C&MS 632.25. See SCD MT-120.00 for activation requirements.
- 32" pull boxes shall be per SS 809.15. 18" pull boxes shall be per C&MS 725.08. 2" and 3" conduit shall be per C&MS 725.051 or 725.052. 4" multi-cell conduit shall be per SS 809.20

LEGEND

- TRAFFIC SIGNAL, 2 UNIT
- RADAR DETECTION UNIT
- SIGNAL SUPPORT POLE
- CONTROLLER CABINET AND WORK PAD
- 18" PULL BOX
- 32" PULL BOX
- DETECTOR LOOP
- RAMP METER WARNING BEACON



* USES 18" PULL BOXES
** USES 32" PULL BOXES



RAMP METER ENFORCEMENT AREA

THE LOCATION OF THE ENFORCEMENT AREA SHALL BE APPROVED BY THE ENGINEER.

LEGEND

TRAFFIC SIGNAL, 2 UNIT

RADAR DETECTION UNIT

SIGNAL SUPPORT POLE

RAMP METER WARNING BEACON

METER BASE

POWER SOURCE

LIC

2/C NO. XX AWG (LEAD-IN CABLE)

L

VEHICLE LOOP DETECTOR

5C

SIGNAL CABLE, 5 CONDUCTOR, NO. XX AWG

RC

RADAR DETECTION CABLE

SC

SERVICE CABLE, 3 CONDUCTOR, NO. X AWG

PC

POWER CABLE, X CONDUCTOR, NO. X AWG

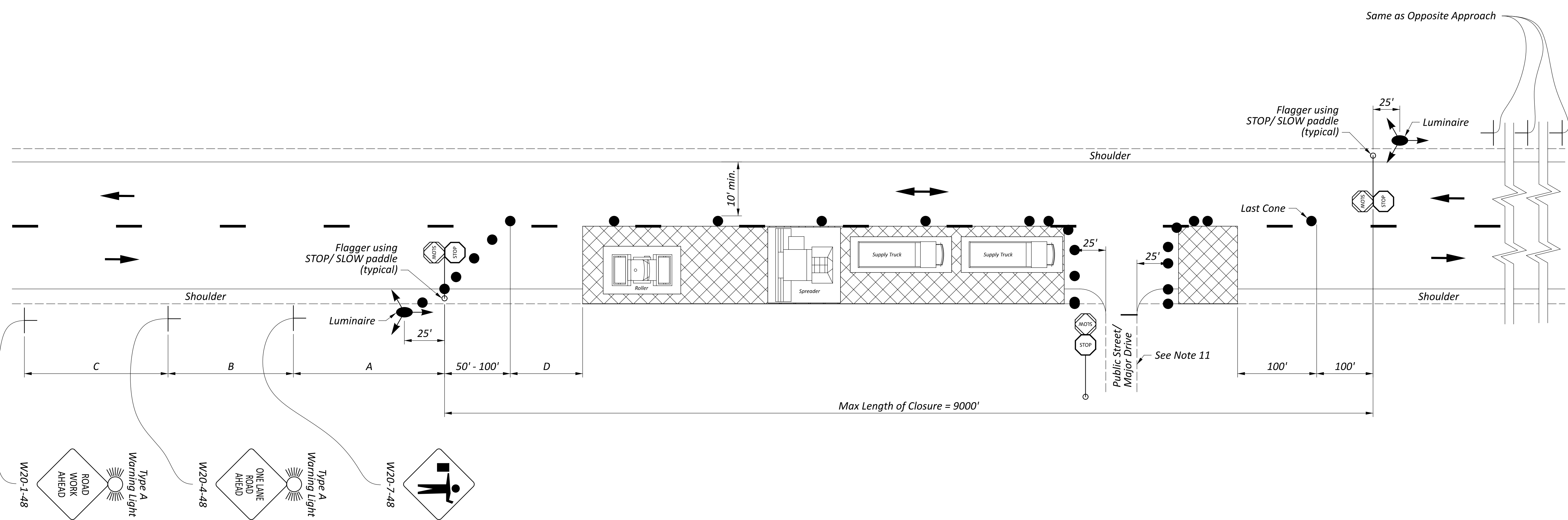
FI

FIBER INTERCONNECT

SP 1

SIGNAL SUPPORT POLE NO. __





LEGEND

WORK AREA

CONES

DIRECTION OF TRAVEL

TABLE I (SIGN SPACING)

ROAD TYPE	DISTANCE BETWEEN SIGNS (FT)		
	A	B	C
Two-Lane (≤ 40 MPH)	100	100	100
Two-Lane (45-50 MPH)	350	350	350
Two-Lane (55-60 MPH)	500	500	500

TABLE II

SPEED LIMIT (MPH)	BUFFER (D) (FT) MIN.
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570



FLAGGERS

1. *Flaggers, one for each direction, shall be used to control traffic continuously for as long as a one-lane, two-way operation is in effect. The flaggers shall be able to communicate with each other at all times.*

LENGTH OF CLOSURE

2. It is required that the length of closure be kept to a minimum at all times, as directed by the Engineer, with a maximum allowable length of 9000'.

When the ambient temperature exceeds 80°F the Engineer may increase the maximum allowable length of closure to allow for sufficient cooling of new pavement.

The Engineer may shorten the maximum allowable length of closure to relieve excessive traffic backups or to improve traffic operation.

SIGN LOCATION AND SPACING

- 3A. *The minimum spacing between work zone signs is shown in Table I. Maximum spacing should not be greater than 1.5 times the distances shown in Table I.*
- 3B. *Sign spacing should be adjusted to avoid conflict with existing signs. Minimum spacing to existing signs shall be 200' for speeds of 45 mph or less and a minimum of 400' for speeds of 50 mph or greater.*
- 3C. *The location of the advance warning signs should be adjusted to provide for adequate sight distance for the existing vertical and horizontal roadway alignment.*

ADJUSTMENTS FOR SIGHT DISTANCE

4. *The location of the flagger station and the advance warning signs should be adjusted to provide for adequate sight distance for the existing vertical and horizontal roadway alignment.*

BASIC SIGNING

- 5A. ROAD WORK AHEAD (W20-1) signs shall be provided on entrance ramps or roadways entering the work limits.
- 5B. END ROAD WORK (G20-2) signs are only required for lane closures of more than 1 day. It is intended that these signs be placed on the mainline, on all exit ramps, and on roadways exiting the work limits.
- 5C. Overlapping of signing for adjacent projects should be avoided where the messages could be confusing. Any ROAD WORK AHEAD or END ROAD WORK sign which falls within the limits of another traffic control zone shall be omitted or covered during the period when both projects are active.

SIGNING DETAILS

- 6A. The Advisory Speed (W13-1P) plaque shall be used when specified in the plan.
- 6B. 36" warning signs may be used when the approach speed limit is 40 mph or less.

FLASHING WARNING LIGHTS

7. *Type A flashing warning lights shown on the ROAD WORK AHEAD (W20-1) signs and on the ONE LANE ROAD AHEAD (W20-4) signs are required whenever a night lane closure is necessary.*

CONES

- 8A. *Cone spacing shall be as follows:*
 - a) *Spacing along the buffer and along the work space (entire closed length beyond the buffer) shall be 40' center-to-center.*
 - b) *Spacing along the approach taper shall be 10' center-to-center.*
- 8B. *Cone sizes shall be as follows:*
 - a) *Cones used for daytime traffic control shall have a minimum height of 28".*
 - b) *Cones used for nighttime traffic control shall have a minimum height of 42".*
- 8C. *Provisions shall be made to stabilize the cones to prevent them from blowing over.*
- 8D. *A minimum of two cones shall be used to close the paved shoulder.*

(RESERVED FOR FUTURE USE)

- 9A. (intentionally blank)

AREA ILLUMINATION

- 10A. Adequate area illumination of each flagger station shall be provided at night. Use of portable flood lighting is acceptable.
- 10B. To ensure the adequacy of floodlight placement and the elimination of glare, the Contractor and the Engineer shall drive through the worksite each night when the lighting is in place. Light placement and shielding shall be adjusted to the satisfaction of the Engineer.

INTERSECTION/ DRIVEWAY ACCESS

11. *Within the length of closure, provision shall be made to control traffic entering from intersecting streets and major drives as necessary to prevent wrong way movements and to keep vehicles off of new pavement not ready for traffic. The Contractor shall:*

- a) Place across the closed lane, either three cones or barricades, and/ or
- b) Provide an additional flagger at every public street intersection and major driveway.

Cones placed across the closed lane shall be located 25' beyond the projected pavement edges of the driveway or cross highway. For barricades, see Standard Construction Drawing MT-101.60.

Existing STOP signs shall be relocated as necessary to ensure proper location for the traffic conditions.

The method of control shall be subject to the approval of the Engineer.

CHIP SEAL OPERATIONS




12. *For chip seal operations, additional signing shall be incorporated in accordance with CMS 422.09.*

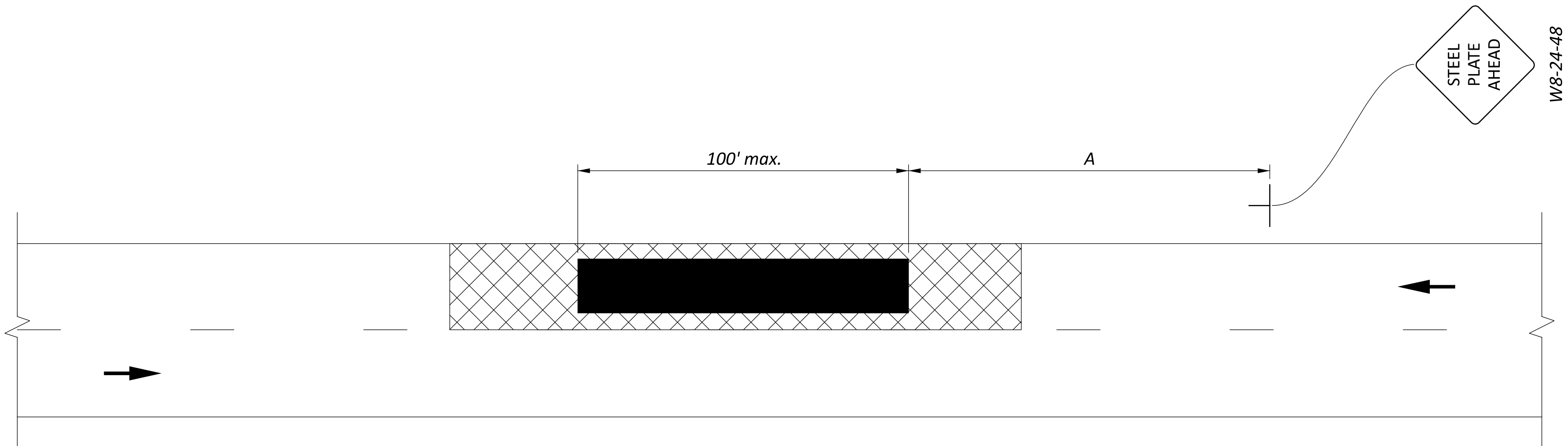
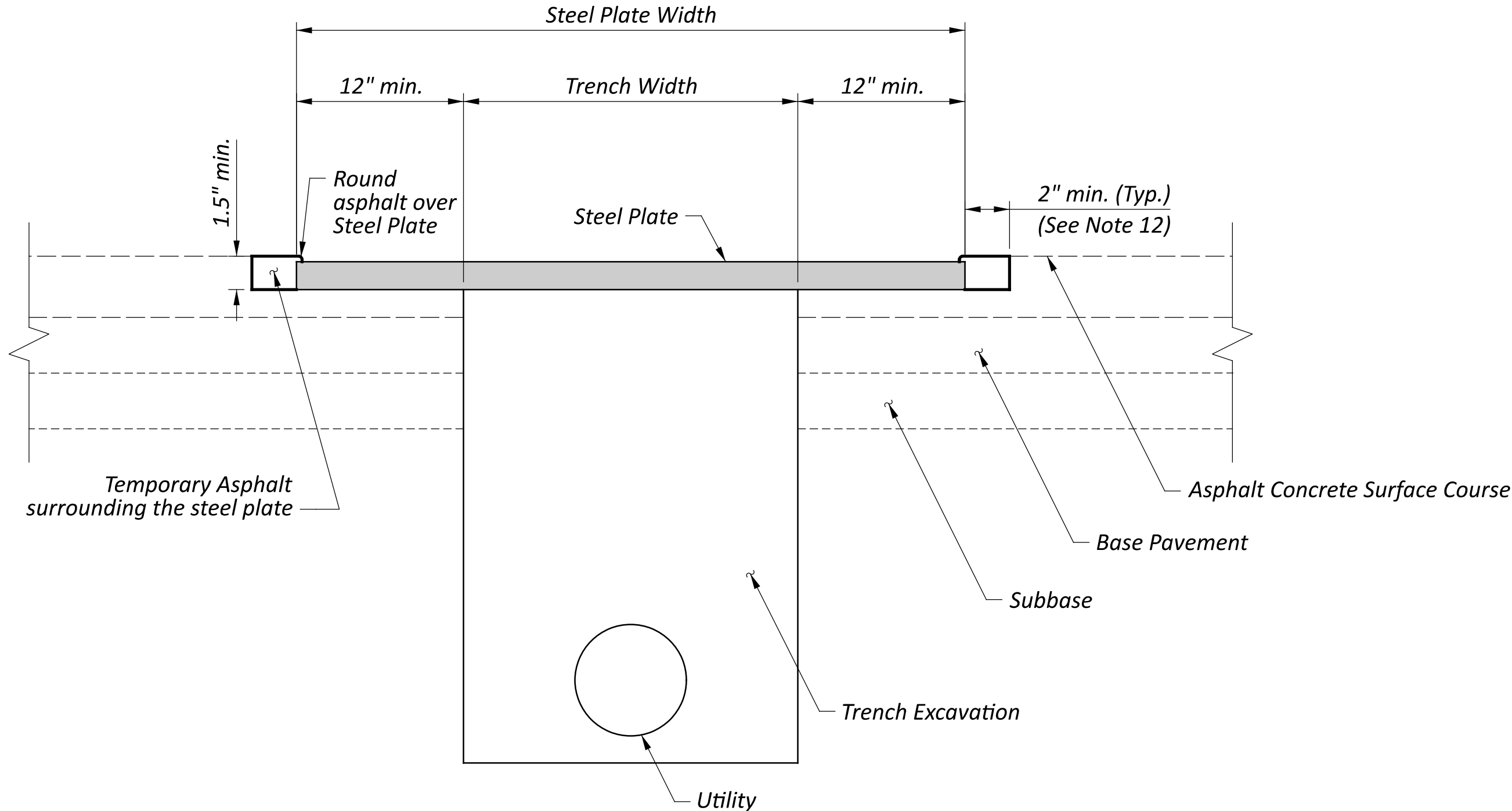


TABLE I (SIGN SPACING)

ROAD TYPE	DISTANCE (FT)
	A
URBAN (≤ 40 MPH)	100
URBAN (45 MPH)	350
RURAL	500

LEGEND

Steel Plate	
Work Area	
Direction of Travel	



NOTES

Intended Use

- This drawing is only to be used for trenches that must be kept open for utility testing. For other situations involving utility trenches, proper maintenance of traffic shall be designed (including temporary backfill).
- This drawing is intended to be used on non-limited access roadways with an original posted speed limit of 45 mph or less. Use of steel plates on freeways, expressways, or on any other roadway is strictly prohibited.
- Use of steel plates from November 1st to March 31st is prohibited.

Steel Plate Specifications

- Steel plates shall have a minimum thickness of 1 1/2". Skid resistant steel plates manufactured with a minimum nominal coefficient of friction of 0.35 shall be used.
- The recessed steel plate shall extend at least 12" beyond the edges of the excavated trench.
- This drawing is intended for use with utility trenches with widths up to 6'-0". A structural design from an Ohio licensed Engineer is required for trench widths exceeding 6'-0".
- The total length of steel plates over the roadway shall not exceed 100' in length, as shown in this drawing.

Signing Details

- STEEL PLATE AHEAD (W8-24) signs are only required for one direction of travel unless the steel plate crosses the center line. If warning signage is to be used, it shall follow the placement shown in this drawing.
- The work zone sign spacings shown in Table 1 are minimums. Maximum spacing should not be greater than 1.5 times the distances shown in Table 1.
- Sign spacing should be adjusted to avoid conflict with existing signs. Minimum spacing to existing signs shall be 200'.

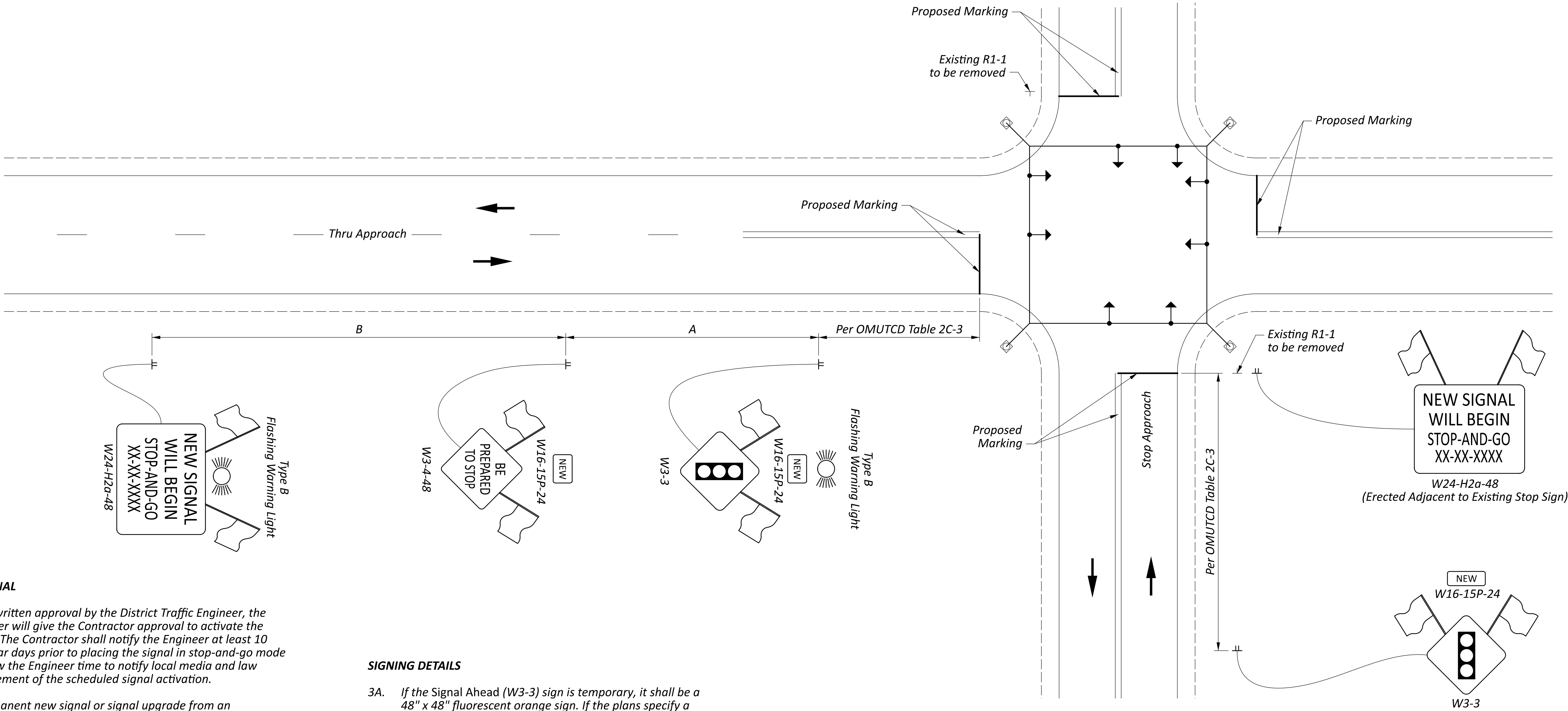
Pavement Details

- Prior to trench excavation, the existing asphalt surface shall be removed to the required width according to Item 202 Wearing Course Removed. The asphalt surface shall be milled to within 1/8" of the thickness of the steel plate.
- Wearing Course Removed should include 2" on each side of the steel plate for the temporary asphalt patch.

Payment

- Wearing course removed, trenching (including restoration), and utilities shall be paid for under separate pay items in the plans. All other labor, equipment and materials necessary to complete this work shall be included in the lump sum price bid for Item 614 Maintaining Traffic.





NOTES

TRAFFIC SIGNAL

- 1A. Upon written approval by the District Traffic Engineer, the Engineer will give the Contractor approval to activate the signal. The Contractor shall notify the Engineer at least 10 calendar days prior to placing the signal in stop-and-go mode to allow the Engineer time to notify local media and law enforcement of the scheduled signal activation.
- 1B. A permanent new signal or signal upgrade from an intersection control beacon shall operate in flash mode for 10 - 14 calendar days before being placed in a stop-and-go mode. The Flash Pattern is to be determined by the District Traffic Engineer.
- A 10-day Performance Test per CMS 632.28.G may be required by the Engineer. Once the signal is in stop-and-go operation, the 10-day performance test shall begin, which places all maintenance and responsibility on the contractor to ensure the device is functioning as directed in the plans. Contractor maintenance shall end when both the 10-day performance test ends and written approval of the Signal Inspection is granted by the District Traffic Engineer.
- 1C. The signal shall not be activated to stop-and-go operation on a Friday, Saturday or Sunday, or the day preceding or during a national holiday (New Years, Memorial Day, Independence Day, Labor Day, Thanksgiving, or Christmas), except with written permission from the District Construction Engineer.

SIGNS (GENERAL)

- 2A. The Contractor shall furnish, install, maintain and remove all signs, warning lights (when required) and flags as shown above, including supports and all necessary mounting hardware.
- 2B. Type B flashing warning lights shall be installed on the thru approaches as shown above.
- 2C. Flags shall be erected as shown above. The flags shall be 18" x 18", made of orange vinyl material, and securely fastened to the sign or sign support.

SIGNING DETAILS

- 3A. If the Signal Ahead (W3-3) sign is temporary, it shall be a 48" x 48" fluorescent orange sign. If the plans specify a permanent Signal Ahead (W3-3) sign, it shall be fluorescent yellow and sized according to the plans.
- 3B. NEW (W16-15P) plaques shall be provided above the BE PREPARED TO STOP (W3-4) and Signal Ahead (W3-3) signs. The W16-15P plaque shall match the color of its associated warning sign.
- 3C. On multi-lane divided thru approaches, erect signs in median identical to those on the right to create dual installations, including supplemental signs, flags and flashing warning lights.
- 3D. For multi-way stop approaches, each approach controlled by a STOP sign shall be treated as shown above for the stop approach.
- 3E. The BE PREPARED TO STOP sign installation (including the W16-15P plaque and flags) on the thru approach shall be omitted when a permanent Prepare To Stop When Flashing (PTSWF) sign assembly is erected.

SIGNING SCHEDULE

- 4A. The Contractor shall erect the W24-H2a-48 (with activation month, day, year, e.g., 1-31-2026) signs equipped with orange flags as shown above on each approach to the intersection a minimum of 14 calendar days before beginning stop-and-go.
- 4B. Immediately before placing the new signal installation in stop-and-go mode, the Contractor shall remove or cover the W24-H2a-48 signs. At the same time, the Contractor shall install or uncover the W3-3 and W3-4 sign assemblies as shown above.

- 4C. Immediately after placing the new signal installation in stop-and-go mode, the Contractor shall remove or cover the STOP (R1-1) signs.
- 4D. The Contractor shall remove the flashing warning lights, flags and brackets, the orange W3-3 signs, the W3-4 signs and the W16-15P plaques 21-30 calendar days after the signal is placed in stop-and-go mode.

PAVEMENT MARKINGS

5. Proposed pavement markings shall be installed as shown in the plans.

REMOVAL OF WORK VEHICLES

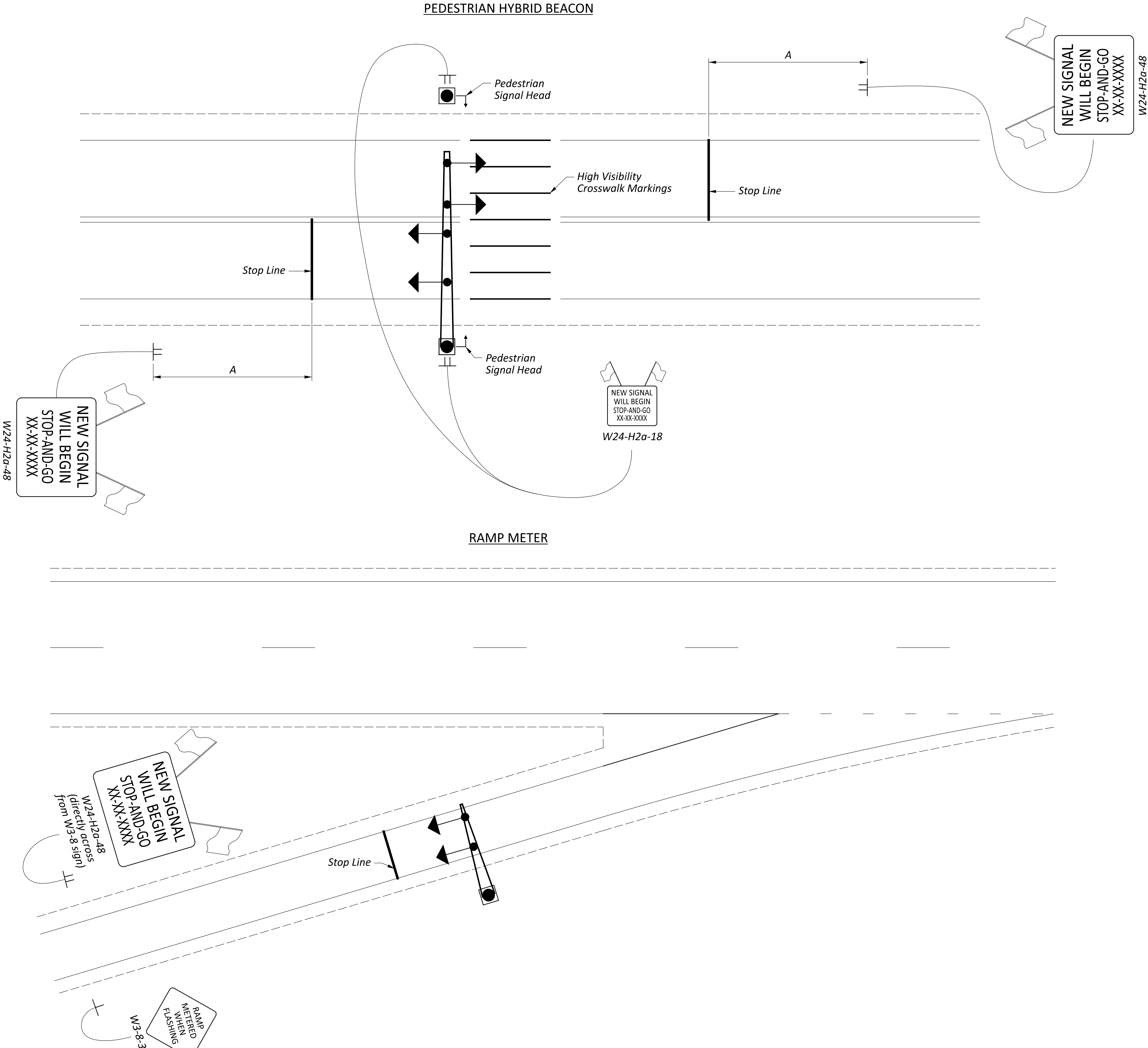
6. The Contractor shall remove all work vehicles from the intersection prior to beginning the signal activation process.

PAYMENT

7. Permanent supports and permanent signs (fluorescent yellow W3-3) and their removal (R1-1) shall be paid for under separate pay items in the plans. Payment for all other labor, equipment and materials necessary to complete this work shall be included in the Lump Sum price bid for CMS 614 Maintaining Traffic.

TABLE I (SIGN SPACING)

DISTANCE (FT)	A	B	C
URBAN (≤ 40 MPH)	100	100	100
URBAN (≥ 45 MPH)	350	350	350
RURAL	500	500	500



NOTES

If the PHB is replacing a traffic signal, there shall be a plan note describing the implementation of this work.

Pedestrian Hybrid Beacon (PHB) and Ramp Meter

- 1A. Upon written approval by the District Traffic Engineer, the Engineer will give the Contractor approval to activate the PHB or ramp meter. The Contractor shall notify the Engineer at least 10 calendar days prior to placing the device in stop-and-go mode to allow the Engineer time to notify local media and law enforcement of the scheduled activation.
- 1B. A permanent new PHB shall operate in yellow flash mode for 10 - 14 calendar days before being placed in stop-and-go mode. Cover and do not operate pedestrian signal heads and pushbuttons per CMS 632.25 during this period.

A permanent new ramp meter shall rest in green for 10 - 14 calendar days before being placed in stop-and-go mode.

A 10-day Performance Test per CMS 632.28.G may be required by the Engineer. Once the PHB or ramp meter is in stop-and-go operation, the 10-day performance test shall begin, which places all maintenance and responsibility on the contractor to ensure the device is functioning as directed in the plans. Contractor maintenance shall end when both the 10-day performance test ends and written approval of the PHB or ramp meter inspection is granted by the District Traffic Engineer.

- 1C. The PHB or ramp meter shall not be activated to stop-and-go operation on a Friday, Saturday or Sunday, or the day of or preceding a national holiday (New Years, Memorial Day, Independence Day, Labor Day, Thanksgiving, or Christmas), except with written permission from the District Construction Engineer.

SIGNS AND PAVEMENT MARKINGS (GENERAL)

- 2A. All Signs and Pavement Markings must be in place (and uncovered) at the time of activation. See ITS-76.10 for additional requirements for ramp meters.
- 2B. The Contractor shall erect the W24-H2a signs (with activation month, day, and year, e.g. 1-31-2026) equipped with orange flags as shown above a minimum of 14 calendar days before beginning stop-and-go.
- 2C. Immediately before placing the new device installation in stop-and-go mode, the Contractor shall remove or cover the W24-H2a signs.
- 2D. Proposed pavement markings shall be installed as shown in the plans.

REMOVAL OF WORK VEHICLES

3. The Contractor shall remove all work vehicles from the intersection prior to beginning the PHB or ramp meter activation process.

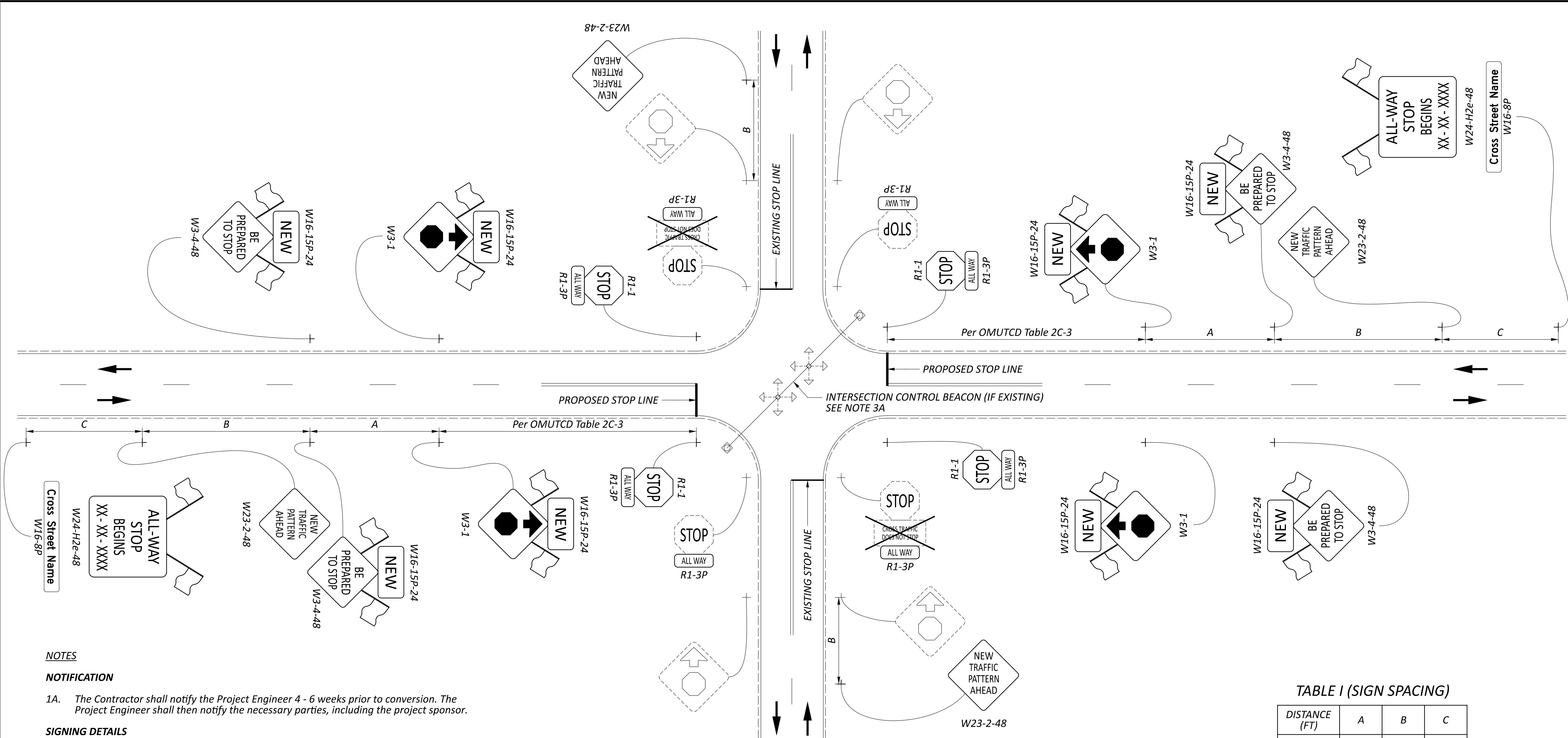
PAYMENT

4. Permanent supports and permanent signs and their removal shall be paid for under separate pay items in the plans. Payment for all other labor, equipment and materials necessary to complete this work shall be included in the Lump Sum price bid for CMS 614 Maintaining Traffic.

TABLE I (SIGN SPACING)

DISTANCE (FT)	A	B	C
URBAN (≤ 40 MPH)	100	100	100
URBAN (≥ 45 MPH)	350	350	350
RURAL	500	500	500





NOTES

NOTIFICATION

- 1A. The Contractor shall notify the Project Engineer 4 - 6 weeks prior to conversion. The Project Engineer shall then notify the necessary parties, including the project sponsor.

SIGNING DETAILS

- 2A. The Contractor shall furnish, install, maintain and remove all signs, warning lights (when required) and flags as shown above, including supports and all necessary mounting hardware per ODOT standards.
- 2B. Flags shall be erected as shown above. The flags shall be 18" x 18", made of orange vinyl material, and securely fastened to the sign or sign support.
- 2C. ALL-WAY STOP BEGINS (W24-H2e) signs with W16-8P plaque shall be placed 2 weeks in advance of the conversion.
- 2D. NEW (W16-15P) plaques shall be provided above the BE PREPARED TO STOP (W3-4) and Stop Ahead (W3-1) signs along the existing thru approaches. The W16-15P plaque shall match the color of its associated warning sign.
- 2E. The ALL WAY (R1-3P) plaque shall be provided below all existing and proposed STOP (R1-1) signs.
- 2F. The BE PREPARED TO STOP (W3-4) sign, NEW (W16-15p) plaques, NEW TRAFFIC PATTERN AHEAD (W23-2) sign, ALL-WAY STOP BEGINS (W24-H2e) sign, and orange flags shall remain in place for 30 days after conversion. The Stop Ahead (W3-1) sign, STOP (R1-1) sign, and ALL WAY (R1-3p) plaques shall be installed as permanent signs.
- 2G. The BE PREPARED TO STOP (W3-4) sign, NEW TRAFFIC PATTERN AHEAD (W23-2) sign, NEW (W16-15p) plaques, and STOP AHEAD (W3-1) sign shall be installed on the day of conversion, unless the signs (without flags) are covered.
- 2H. New sign placement should be adjusted to avoid obscuring existing signs, following the minimum spacing requirements established in the table provided.

- 2I. LEDs for conspicuity enhancement of signs R1-1 and W3-1 shall be used if specified in the plans.
- 2J. Existing signs/ pavement markings shall be replaced on the existing approaches. Dual signs shall be replaced as a pair so their retroreflectivity matches. Sign post reflectors shall also be replaced.
- 2K. Warning signs that will not be remaining permanently shall be fluorescent orange. Temporary warning signs will be 48", but can be reduced to 36" if the approach speed is 40 MPH or less and approved by the Engineer.
- 2L. Warning signs that will be remaining permanently shall be fluorescent yellow. The size of all permanent signs and plaques is dependent on speed and shall be as specified in the plans.
- 2M. On multi-lane, divided, existing thru approaches, erect signs in the median identical to those on the right to create dual installation (including supplemental signs, plaques, and flags).

SIGNAL DETAILS

- 3A. If an existing intersection control beacon is to remain, the yellow signal indications shall be replaced with red signal indications.

TABLE I (SIGN SPACING)

DISTANCE (FT)	A	B	C
URBAN (≤ 40 MPH)	100	100	100
URBAN (≥ 45 MPH)	350	350	350
RURAL	500	500	500

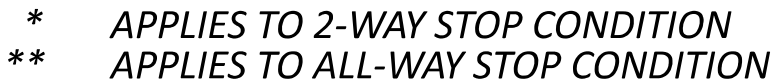
PAVEMENT MARKINGS

- 4A. Proposed pavement markings shall be installed as shown in the plans.
- 4B. Stop lines shall be placed to accommodate vehicle turning radii.

PAYMENT

- 5A. Permanent signs and their removal shall be paid for under separate pay items in the plans. If not itemized separately, payment for all other labor, equipment and materials necessary to complete this work shall be included in the lump sum price bid for CMS 614 Maintaining Traffic.





NOTIFICATION

- 1A. *The Contractor shall notify the Project Engineer 4-6 weeks prior to conversion. The Project Engineer shall then notify the necessary parties, including the project sponsor.*
- 1B. *2 weeks prior to the removal of the intersection control beacon, the Contractor shall install notice of its pending removal and inform the district Public Information Officer.*

SIGNING DETAILS

- 2A. The Contractor shall furnish, install, maintain and remove all signs, warning lights (when required) and flags as shown above, including supports and all necessary mounting hardware per ODOT standards.
- 2B. Flags shall be erected as shown above. The flags shall be 18" x 18", made of orange vinyl material, and securely fastened to the sign or sign support.
- 2C. 2 weeks prior to the removal of the intersection control beacon, the Contractor shall erect the BEACON WILL BE REMOVED (W24-H2d) signs, with orange flags, on each approach as shown. The W24-H2d signs shall state the removal date as XX-XX-XXXX (e.g. 02-29-2024). The Contractor shall remove the signs on the day of the removal of the intersection control beacon.
- 2D. LEDs for conspicuity enhancement of signs R1-1, W2-1 and W3-1 shall be used if specified in the plans.
- 2E. The Contractor shall verify that all existing signs to remain (R1-1, W2-1, W3-1 and W4-4P) meet the standards established in the current edition of the OMUTCD. Any signs not meeting the current OMUTCD standards shall be removed and replaced.
- 2F. Existing signs/ pavement markings shall be replaced on the existing approaches. Dual signs shall be replaced as a pair so that their retroreflectivity matches. Sign post reflectors shall also be replaced.
- 2G. The Intersection Ahead (W2-1) signs with ROAD NAME (W16-8P) plaques shall be installed as permanent signs along the thru approaches.
- 2H. Warning signs that will not be remaining permanently shall be fluorescent orange. Temporary warning signs will be 48", but can be reduced to 36" if the approach speed is 40 MPH or less and approved by the Engineer.
- 2I. Warning signs that will be remaining permanently shall be fluorescent yellow. The size of all permanent signs and plaques is dependent on speed and shall be as specified in the plans.
- 2J. On multi-lane, divided, existing thru approaches, erect signs in the median identical to those on the right to create a dual installation (including supplemental signs, plaques, and flags).

PAVEMENT MARKINGS

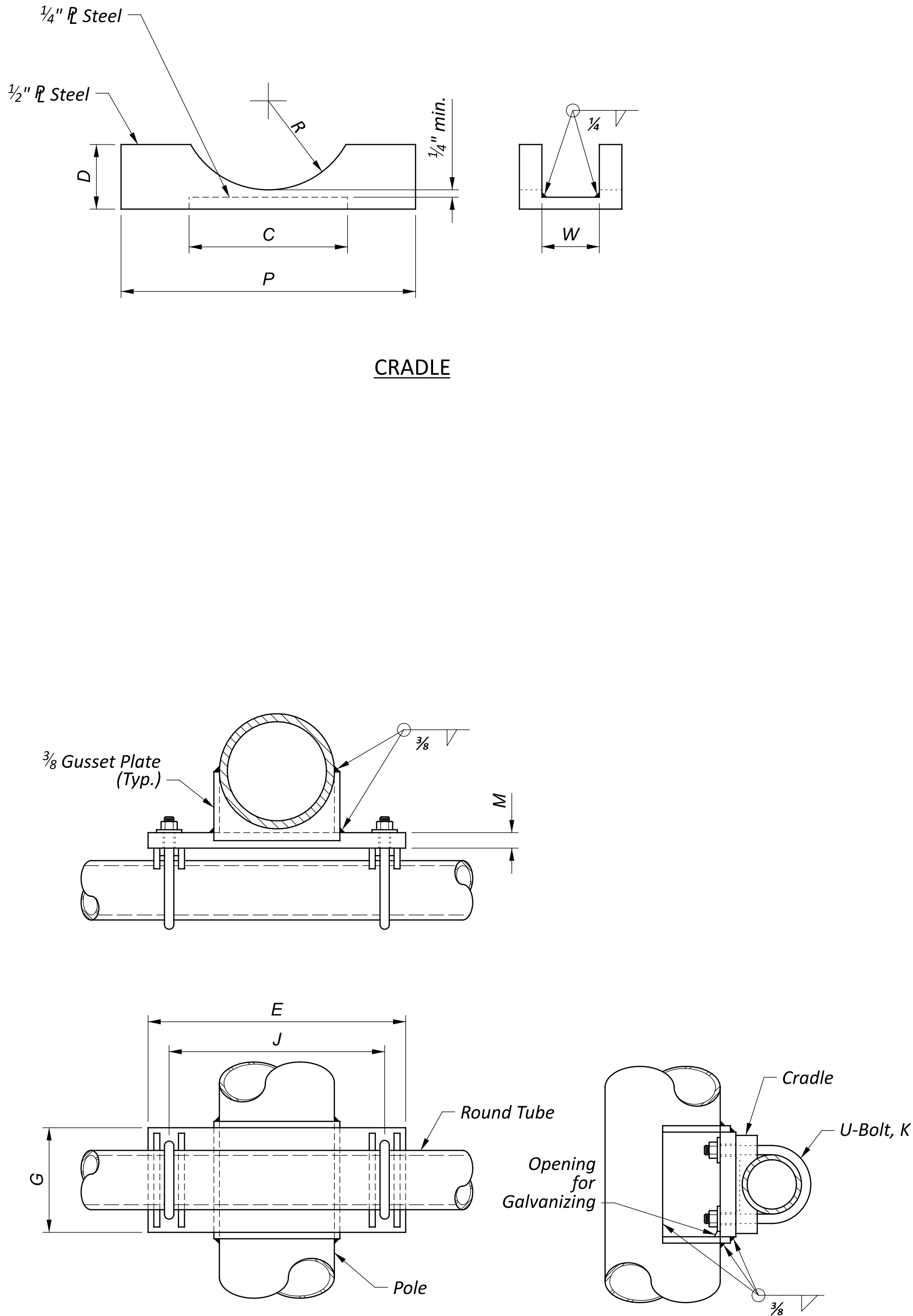
- 3A. *Proposed pavement markings shall be installed as shown in the plans.*
- 3B. *Stop lines shall be placed to accommodate vehicle turning radii.*

PAYMENT

- 4A. *Permanent signs and their removal shall be paid for under separate pay items in the plans. If not itemized separately, payment for all other labor, equipment and materials necessary to complete this work shall be included in the lump sum price bid for CMS 614 Maintaining Traffic.*

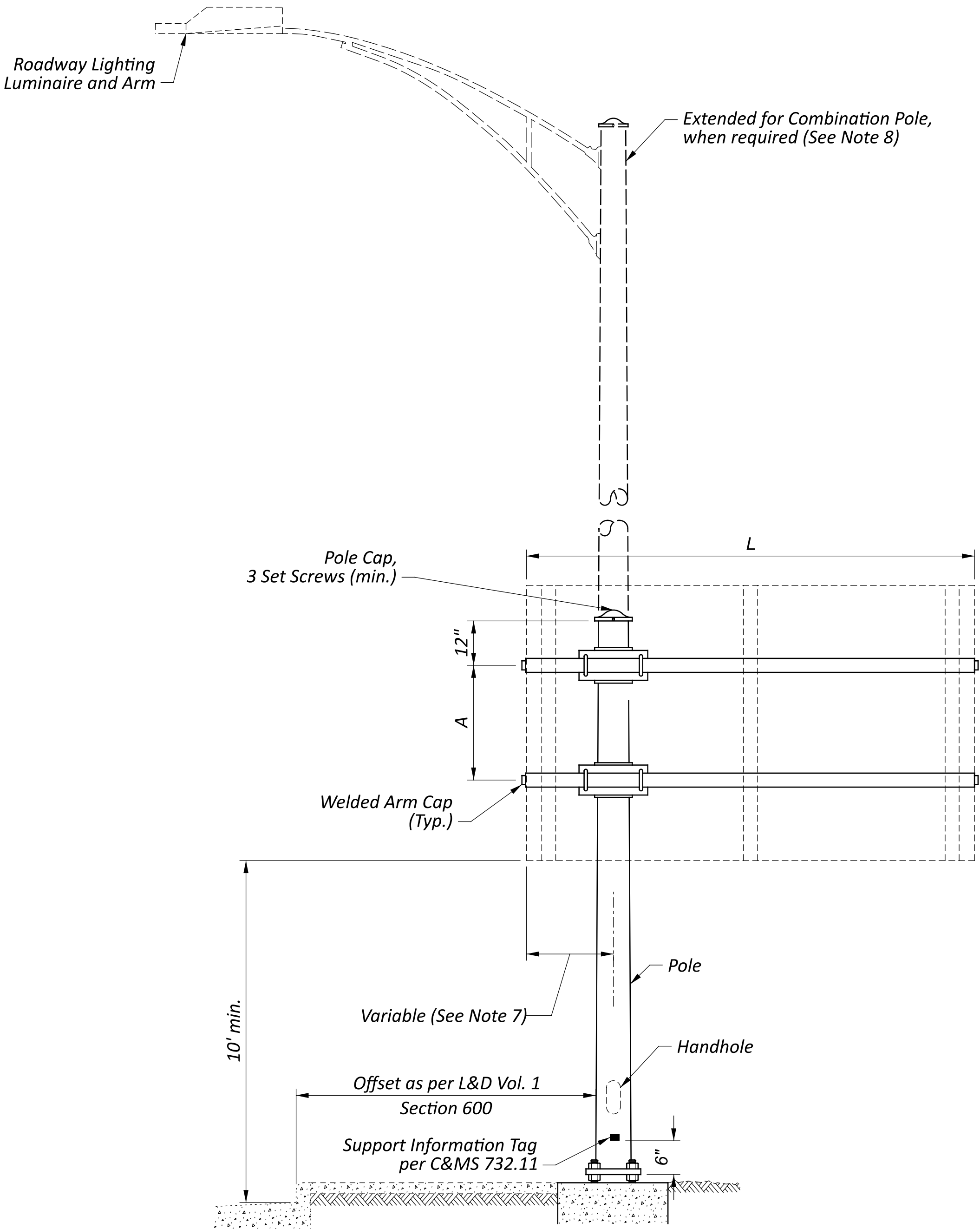
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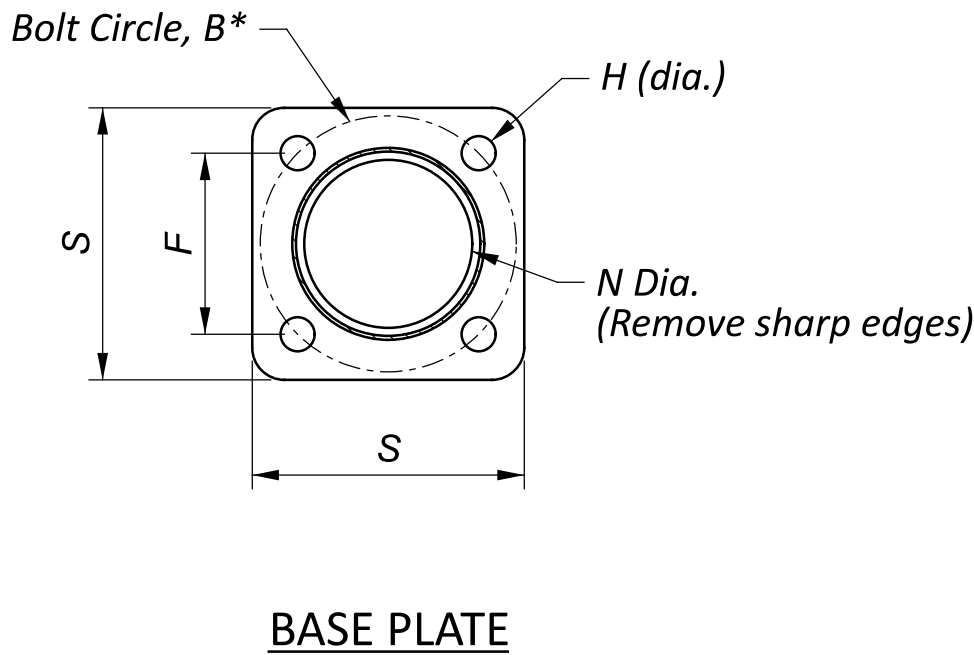
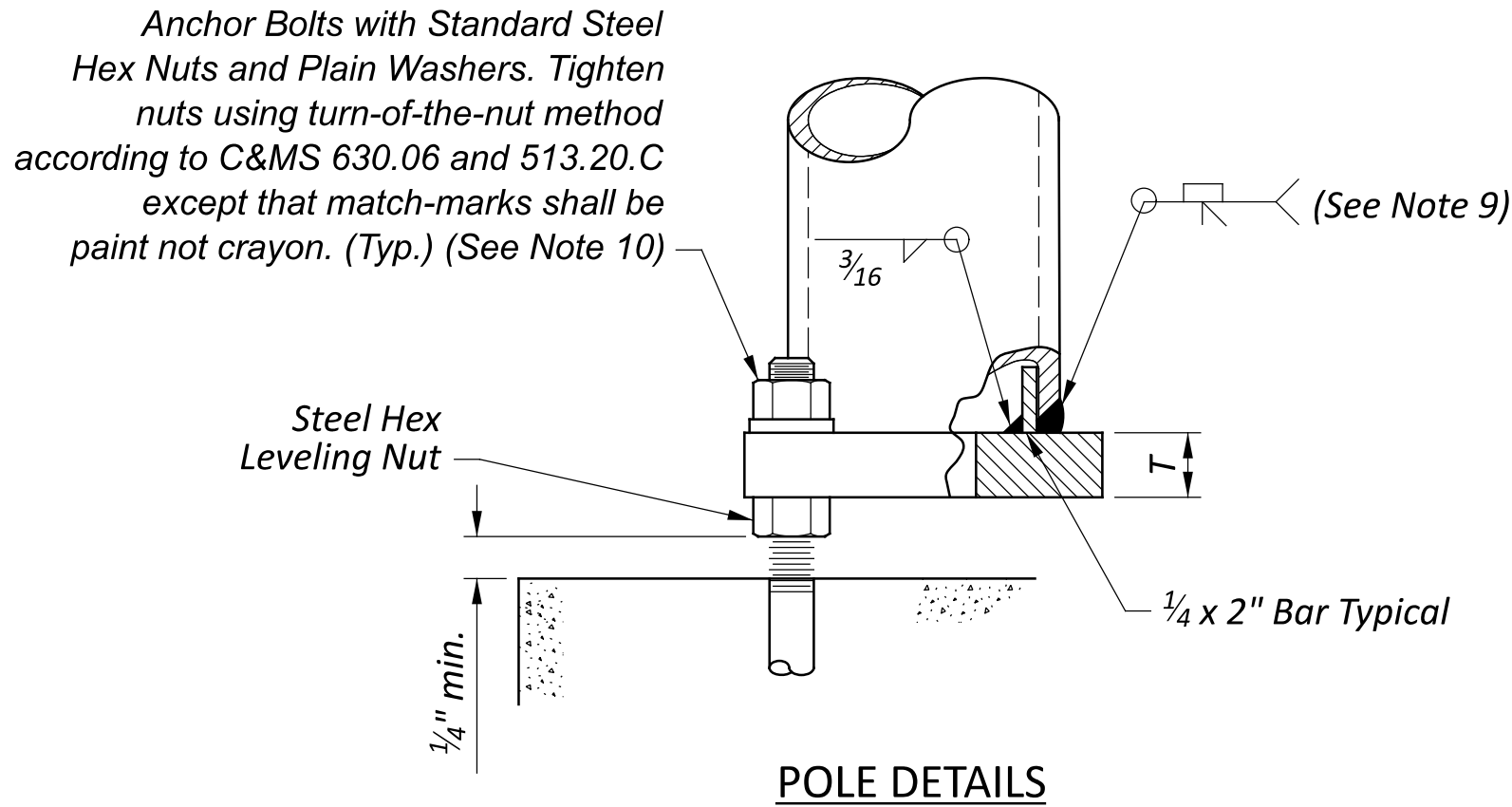
<i>DISTANCE (FT)</i>	<i>A</i>	<i>B</i>	<i>C</i>
<i>URBAN (≤ 40 MPH)</i>	<i>100</i>	<i>100</i>	<i>100</i>
<i>URBAN (≥ 45 MPH)</i>	<i>350</i>	<i>350</i>	<i>350</i>
<i>RURAL</i>	<i>500</i>	<i>500</i>	<i>500</i>



CRADLE

ROUND ARM ATTACHMENT





Notes

- The design of the Semi-Overhead Sign Support presented on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
- Dimensions noted as required shall be as indicated on the drawing and shall not be altered.
- ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawings. Calculations are required for any modifications to the information shown on this drawing. Modifications shall meet the requirements of LRFDLTS-1 and the design criteria shown in Note 22. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.
- For sign attachment assemblies to be furnished with this support, construction details, and location of handholes, see Standard Construction Drawings (SCDs) TC-22.10 and TC-22.20.
- For foundation details, see SCD TC-21.21.
- Steel for round tube arms shall conform to C&MS 730.01.
- Signs with arms may be adjusted eccentric to the pole; however, a minimum of 2' of sign length shall remain to one side of the pole center line.
- For modification of pole to support roadway lighting, see SCD HL-10.12.
- The pole attachment to the base plate shall be welded using a full penetration weld.
- A minimum of one bolt thread shall remain above the anchor nut.
- For pole and base plate dimensions, see Sheet 2.
- The design was based on Fatigue Category II. See Note 22 for additional design criteria.
- Tapered poles shall be one piece assemblies conforming to ASTM A 595 Grade A (minimum yield strength of 55,000 psi) with a constant linear taper of 0.14 inch/ foot. See Note 14 for Tube Pole material requirements.
- All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped) (Not ASTM B 695 Class 50)
- Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.
- Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F436.

- Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.
- Anchor bolt nuts shall meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.
- Anchor bolt washers shall meet the requirements of ASTM F 436 Type 1 (Hot-dip galvanized) according to ASTM A 153.
- Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match misaligned anchor bolts will not be permitted.
- All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.
- Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000

Serviceability Parameters:

Rake (Pole Tilt): H/180 (H = pole height)

Horizontal Deflection at Top of Pole: maximum 1.5% of pole height

Slope at Top of Pole: maximum of 0.35 inch/foot (1.67 degrees) per LRFDLTS-1 10.4.2.1

Fatigue Parameters:

Fatigue Category: II

Natural Wind Gust: Include

Truck-Induced Gust: Include

Galloping: Do not include

- Support shall be manufactured to accommodate the maximum sign area given in the Table or greater, even if the sign area in the Plans is smaller.

LEGEND:

* = Required dimension see Note 2

THESE DESIGNS USE FULL PENETRATION WELDS AT THE BASE PLATE CONNECTIONS

ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

DESIGN NO.	POLE HEIGHT (FT)	MAXIMUM SIGN AREA (SQ FT) (Note 23)	TAPERED POLE (STANDARD)		TUBE POLE (ALTERNATE)		ARM			ARM ATTACHMENT					CRADLE					ANCHOR BASE					
			BASE DIAMETER	MIN. WALL THICKNESS	DIAMETER	MIN. WALL THICKNESS	ROUND TUBE (NOTE 6)	L MAXIMUM (FT)	A (FT)	E	G	J	K	M	C	D	P	R	W	B *	F	S	T	H	N
2	16.5	100	10	.239	8 ½	.312	4 ½ x .237	12	2.5	18	8	16	¾	1	4 ½	1 ¾	6 ½	2 ¼	1	13 ½	9 ⅝	14 ¼	1 ½	1 ¾	8 ½
3	17.5	150	12	.239	10 ¾	.307	5 ⅝ x .258	15	3.0	18	8	16	¾	1	5 ½	1 ¾	7 ½	2 ¼	1	16	11 ⅝	17	2	2 ¾	10 ½

OFFICE OF ROADWAY ENGINEERING

REVISIONS
01-16-2026
01-19-2024
07-21-2023
07-16-2021
04-17-2020

STDS ENGINEER
Duemmel

STATE OF OHIO OFFICE OF ROADWAY ENGINEERING ADMINISTRATOR

Adam Koenig

SEMI-OVERHEAD SIGN SUPPORT

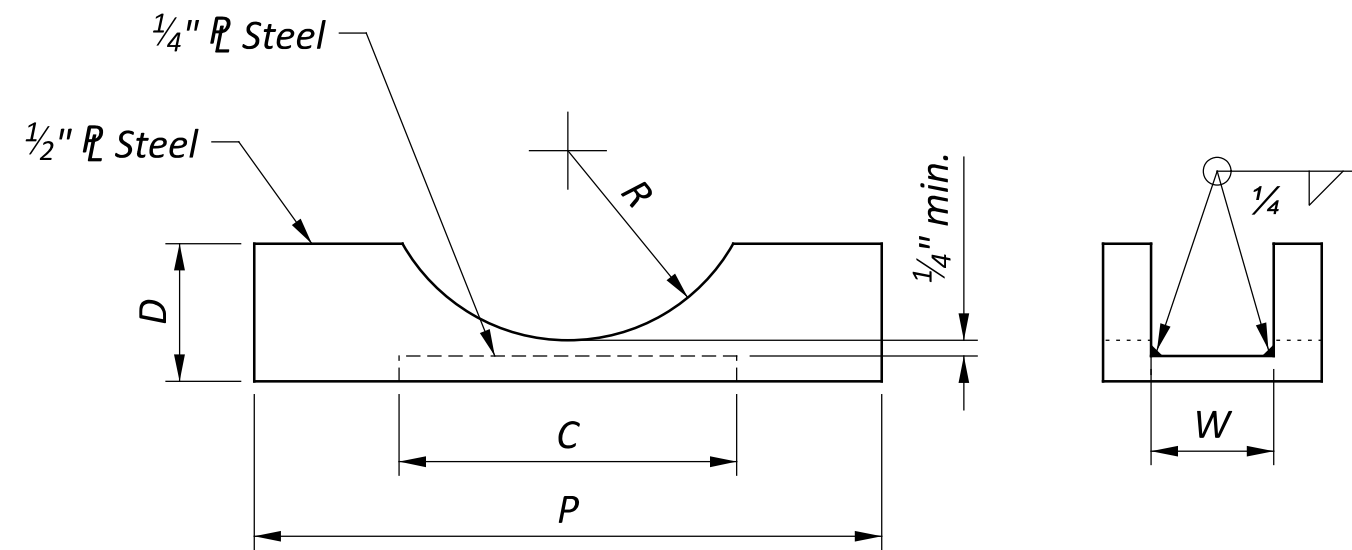
DESIGN AGENCY



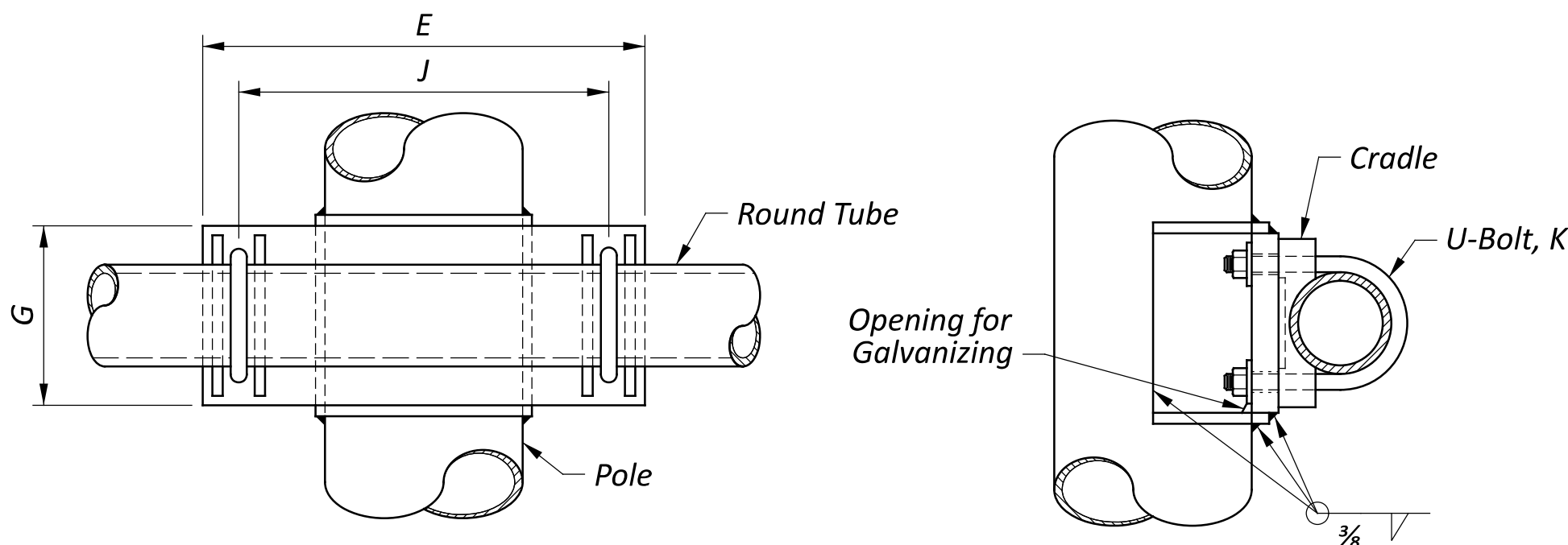
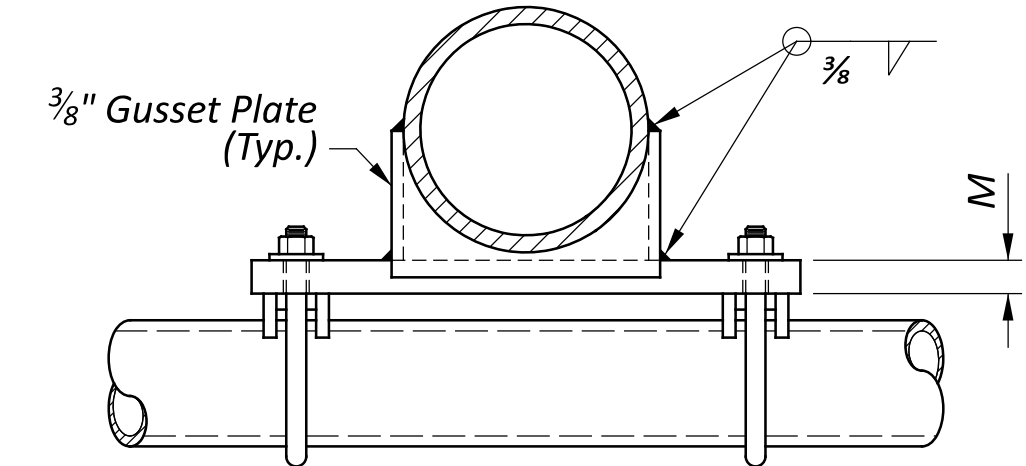
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TC-9.11

SHEET
P.2

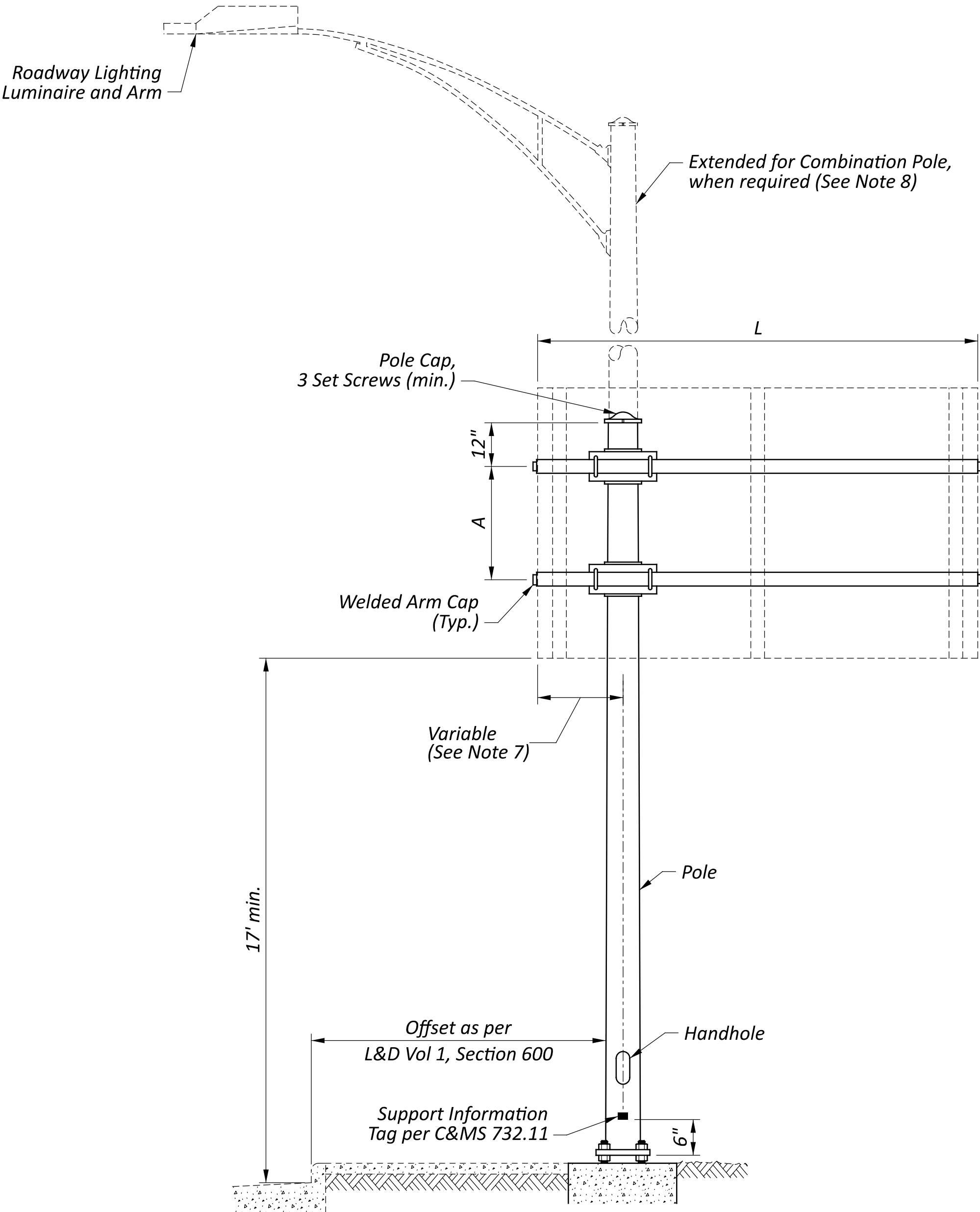
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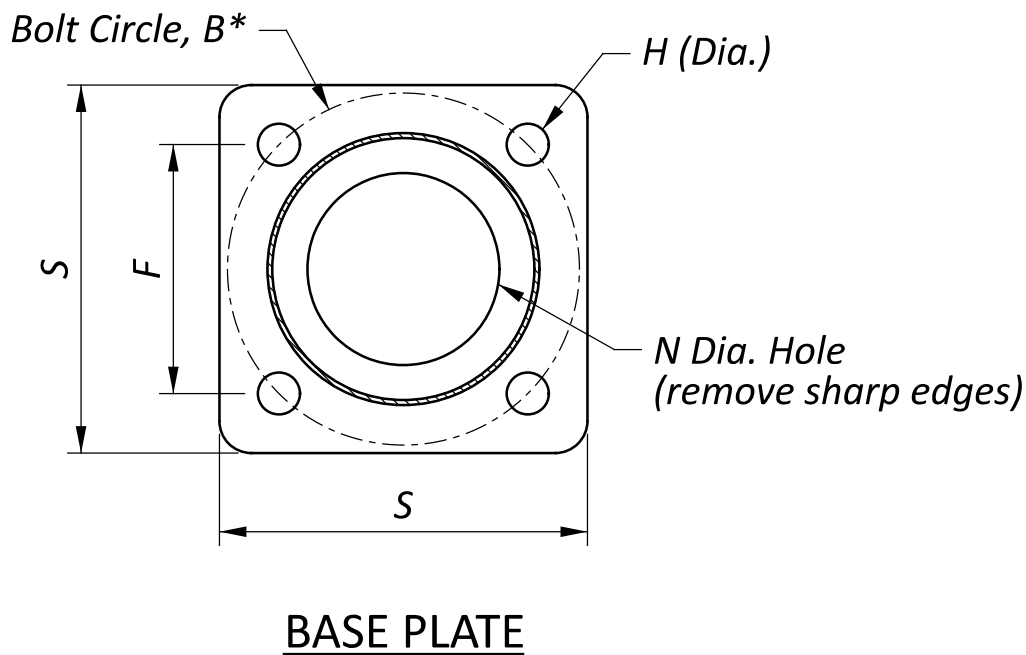
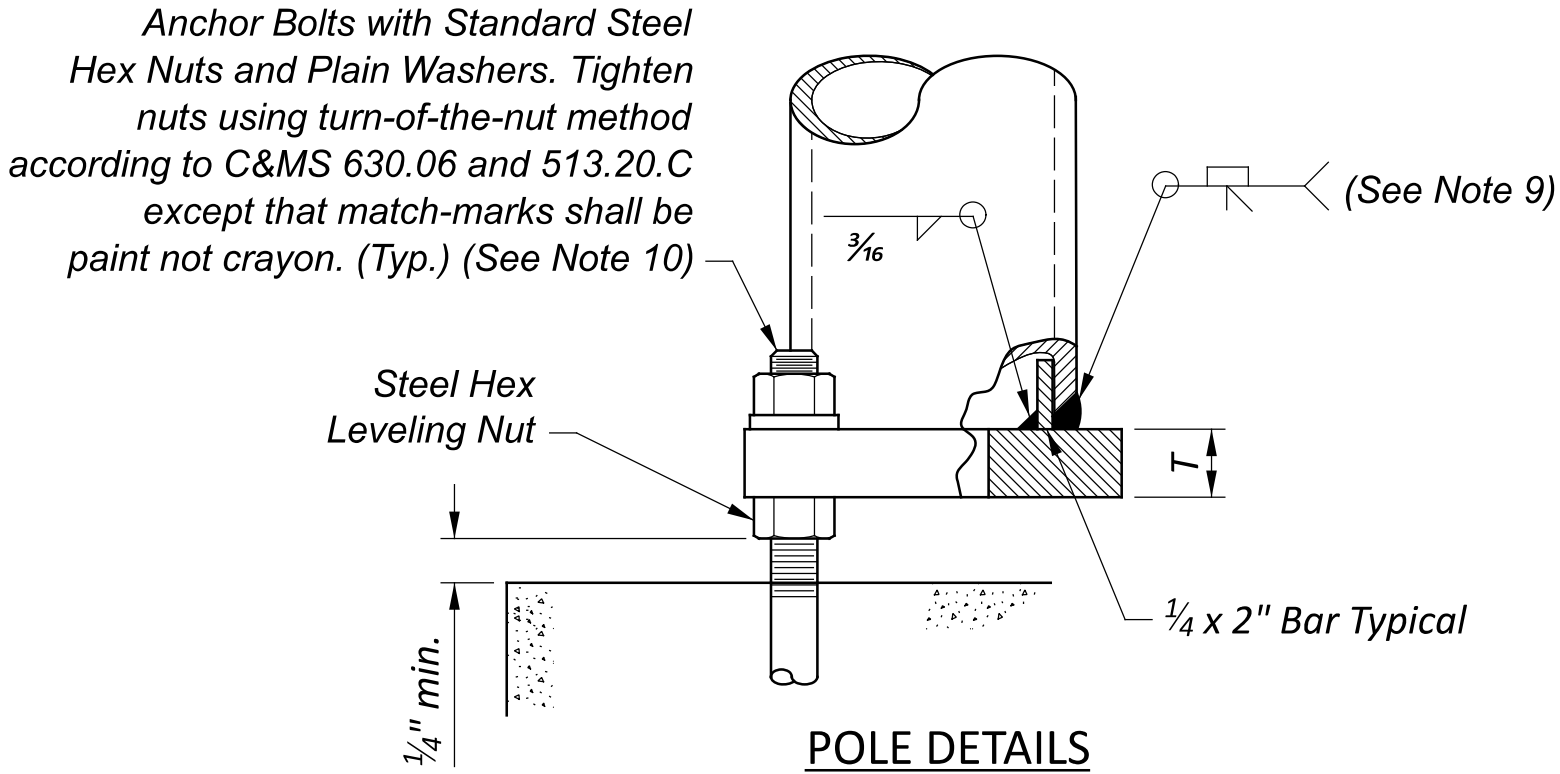


CRADLE



ROUND ARM ATTACHMENT





Notes

- The design of the Center Mount Overhead Sign Support presented on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
- Dimensions noted as required shall be as indicated on the drawing and shall not be altered.
- ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawing. Calculations are required for any modifications to the information shown on this drawing. Modifications shall meet the requirements of LRFDLTS-1 and the design criteria shown in Note 22. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.
- For sign attachment assemblies to be furnished with this support, construction details, and location of handholes, see Standard Construction Drawings (SCDs) TC-22.10 and TC-22.20.
- For foundation details, see SCD TC-21.21.
- Steel for round tube arms shall conform to C&MS 730.01.
- Signs with arms may be adjusted eccentric to the pole; however, a minimum of 2' of sign length shall remain to one side of the pole center line.
- For modification of pole to support roadway lighting, see SCD HL-10.12.
- The pole attachment to the base plate shall be welded using a full penetration weld.
- A minimum of one bolt thread shall remain above the anchor nut.
- For pole and base plate dimensions, see Sheet 2.
- The design was based on Fatigue Category II. See Note 22 for additional design criteria.
- Tapered poles shall be one piece assemblies conforming to ASTM A 595 Grade A (minimum yield strength of 55,000 psi) with a constant linear taper of 0.14 inch/ foot. See Note 14 for Tube Pole material requirements.
- All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped) (Not ASTM B 695 Class 50)
- Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
- Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F436.

- Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.
- Anchor bolt nuts shall meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
- Anchor bolt washers shall meet the requirements of ASTM F436 Type 1 (Hot-dip galvanized) according to ASTM A153.
- Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match misaligned anchor bolts will not be permitted.
- All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.
- Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000

Serviceability Parameters:

Rake (Pole Tilt): H/180 (H = pole height)

Horizontal Deflection at Top of Pole: maximum 1.5% of pole height

Slope at Top of Pole: maximum of 0.35 inch/foot (1.67 degrees) per LRFDLTS-1 10.4.2.1

Fatigue Parameters:

Fatigue Category: II

Natural Wind Gust: Include

Truck-Induced Gust: Include

Galloping: Do not include

- Support shall be manufactured to accommodate the maximum sign area given in the Table or greater, even if the sign area in the Plans is smaller.
- Multi-sided vertical main tube (12 sides, min.) may be provided.

LEGEND:

* = Required dimension see Note 2

THESE DESIGNS USE FULL PENETRATION WELDS AT THE BASE PLATE CONNECTIONS

ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

DESIGN NO.	POLE HEIGHT (FT)	MAXIMUM SIGN AREA (SQ FT) (Note 23)	TAPERED POLE (STANDARD)		TUBE POLE (ALTERNATE)		ARM			ARM ATTACHMENT					CRADLE					ANCHOR BASE					
			MIN. BASE DIAMETER	MIN. WALL THICKNESS	MIN. DIAMETER	MIN. WALL THICKNESS	MIN. ROUND TUBE (NOTE 6)	L MAXIMUM (FT)	A (FT)	E	G	J	K	M	C	D	P	R	W	B*	F	S	T	H	N
2	24	100	12	.239	10 ¾	.307	4 ½ x .237	12	3	18	8	16	¾	1	4 ½	1 ½	6 ½	2 ¼	1	16	11 5/16	17	2	2 ¾	9 ½
4	26	200	16	.250	14	.34	6 ¾ x .500	20	6	21	11	17	1	1 ¼	6 ½	2	9	3 5/16	1 ¼	22	15 ½	23	2 ½	2 ¾	12
5	27	250	17	.3125	16	.34	6 ¾ x .500	20	6	21	11	17	1	1 ¼	6 ½	2	9	3 5/16	1 ¼	22	15 ½	23	2 ½	2 ¾	12

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Adam Koenig

CENTER MOUNT OVERHEAD SIGN SUPPORT

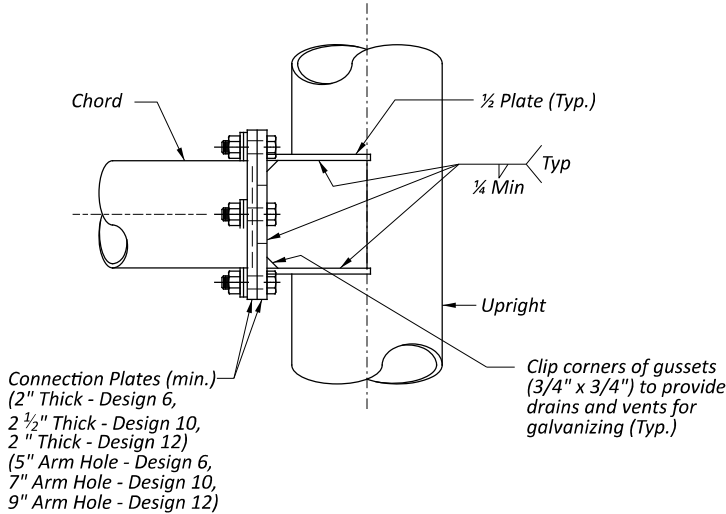
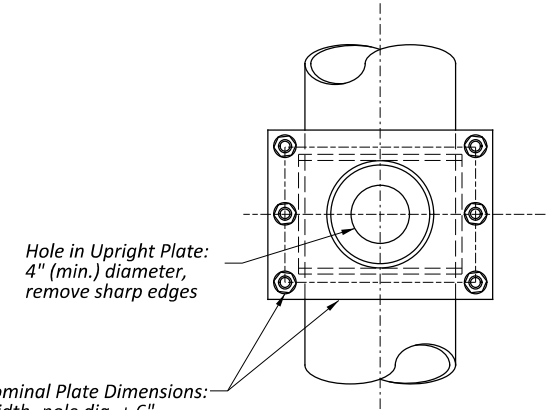
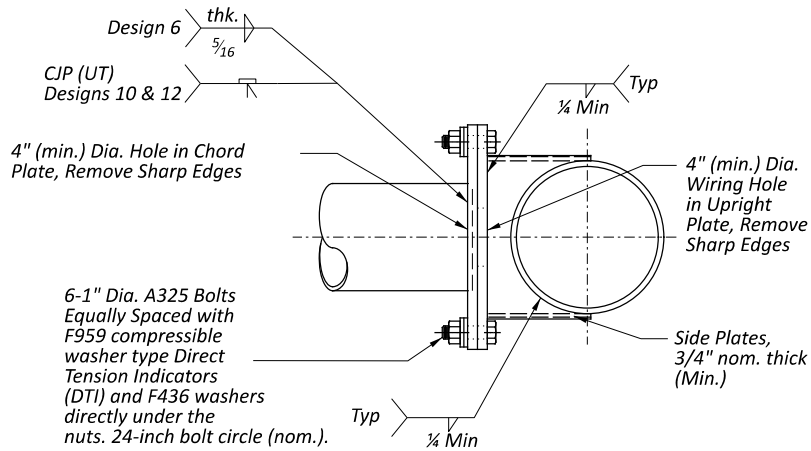
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SCD NUMBER
TC-9.31

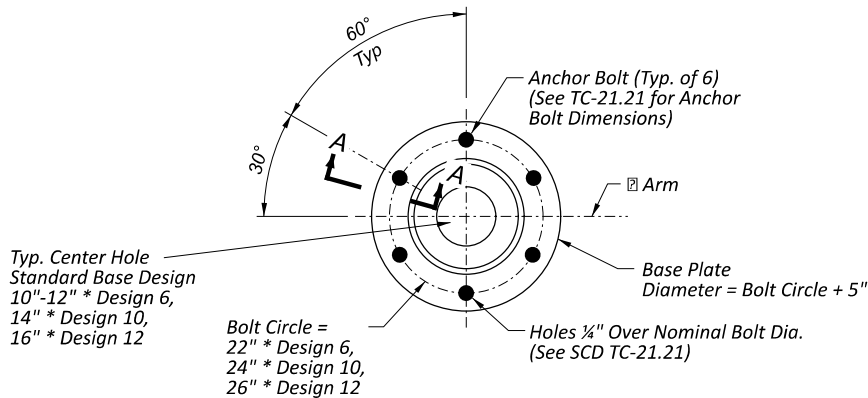
SHEET
P.2

TOTAL
2

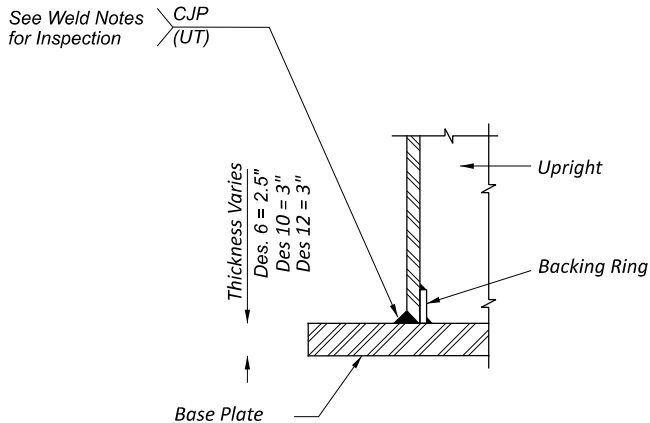


TYPICAL ARM TO UPRIGHT CONNECTION

Details Shown are Similar to LRFDLTS-1 Table 11.9.3.1-1
(5.6 Fillet-Welded Gusseted Box Connections)
(5.7-Fillet Welded Ring Stiffened Connections, also Permitted)

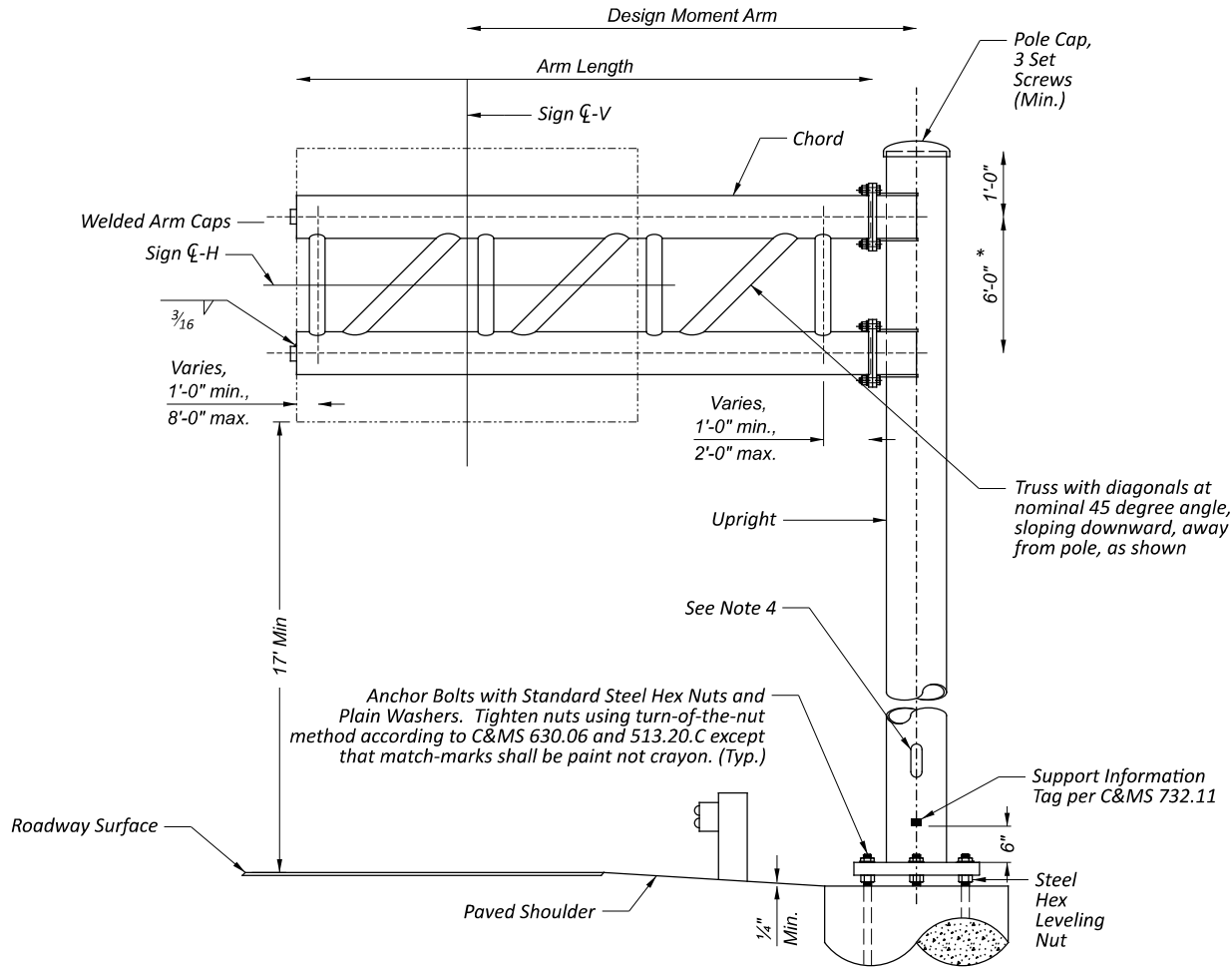


**POLE BASE DETAIL
(Standard Base Shown)**

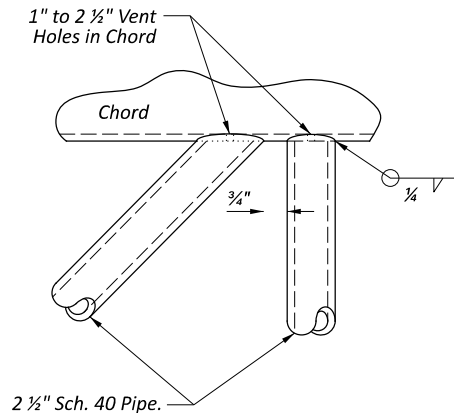


SECTION A-A

Connection shall be LRFDLTS-1 Table 11.9.3.1-1:
4.4 CJP with Backing Ring (Standard Base)



**ELEVATION:
STANDARD BASE DESIGN**



**TRUSS JOINTS,
BUTTED AND WELDED**

LEGEND:

* = Required dimension. See Note 2 on Sheet 2/2

NOTES:

For Notes and Table see Sheet 2/2

NOTES:

- 1A. The design of the Standard Cantilever Overhead Sign Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1), as of 2019.

1B. The design of the Alternate Cantilever Overhead Sign Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2022 Interim Revisions.
2. Dimensions marked as required shall be as indicated on the drawing and shall not be altered. Dimensions marked as minimum must be met.

3. ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawing. Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project, and the design criteria shown in Note 18. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.
4. For sign attachment assemblies to be furnished with this support, construction details, and location of handholes, see Standard Construction Drawings (SCDs) TC-22.10 and TC-22.20.

5. For foundation details, see SCD TC-21.21.

6. For modification of the pole to support roadway lighting, see SCD HL-10.12.

7. Assure arm attachment bolts do not contact pole.

8. The arm shall be cambered and the upright shall be tilted to provide a horizontal arm and a plumb upright upon erection.

9. Structural steel plate shall meet the requirements of C&MS 630 and 711.01 with the following limitations:

Structural steel plate - ASTM A 709 Grade 50 (A572)
(Not Grade 36, 50W or 70W)

10. All material shall meet the requirements of C&MS 730 with the following limitations:

Steel tube and pipe - conform to minimum dimensions in this Drawing when utilizing tube/pipe with minimum yield greater than 42ksi:

A. ASTM A 500 Grade B (42ksi min.) or Grade C (46ksi)
(Not ASTM A 36 or ASTM A 53 or ASTM A 501 Grade A)

B. ASTM A 572 Grade 42 or Grade 50

C. ASTM A 106 Grade C (requires batch test proving min. 42ksi)

D. ASTM A 501 Grade B (50ksi)

F. ASTM A 595 Grade 50 (Tapered Design)

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped)
(Not ASTM B 695 Class 50)

11. Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.

12. Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F 436.

13. Anchor bolts shall meet the requirements of C&MS 630, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.
14. Anchor bolt nuts shall meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.

15. Anchor bolt washers shall meet the requirements of ASTM F 436 Type 1 (Hot-dip galvanized) according to ASTM A 153.

16. Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match mis-aligned anchor bolts will not be permitted.

17. All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.

18. Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000

Serviceability Parameters:

Permanent Camber: L/1000 per LRFDLTS-1 10.5

Rake (Pole Tilt): H/180 maximum (H = pole height)

Horizontal Deflection at Top of Pole: maximum 1.5% of pole height

Slope at Top of Pole: maximum of 0.35 inch/foot (1.67 degrees) per LRFDLTS-1 10.4.2.1

Fatigue Parameters:

Fatigue Category: II

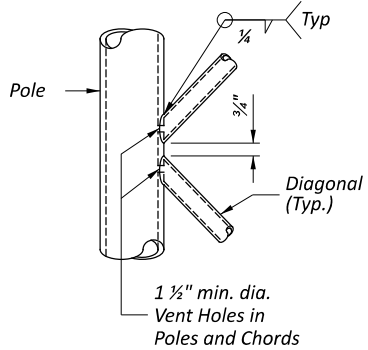
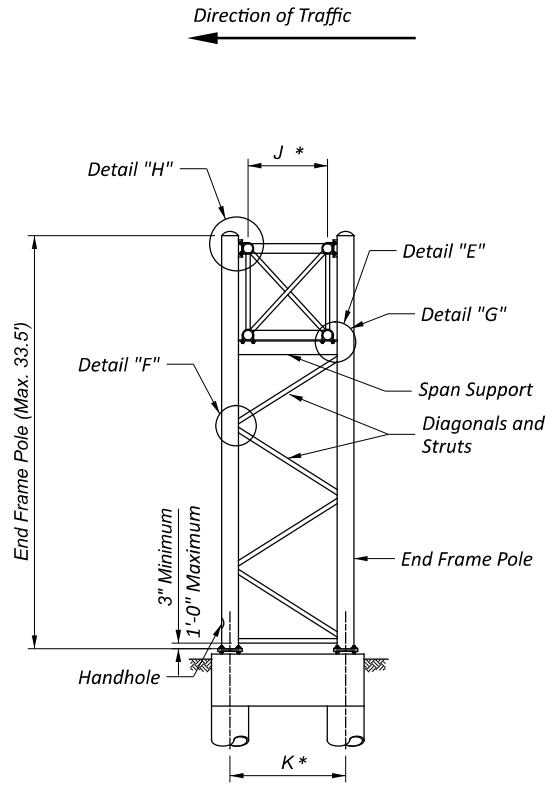
Natural Wind Gust: Include

Truck-Induced Gust: Include

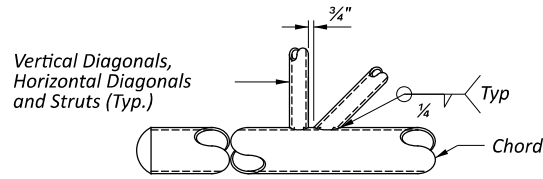
Galloping: Not Included

19. Support shall be manufactured to accommodate the design sign area and moment arm given in the Table, or greater, even if the sign area and moment arm in the Plans are smaller.

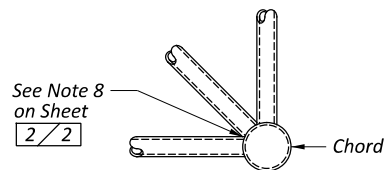
20. Multi-sided vertical main tube (12 sides, min.) may be provided.
- | ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED | | | | |
|--|---|--|---------------------------------|-----------------------------------|
| DESIGN NUMBER | OUTSIDE DIAMETERS | | DESIGN SIZE (SQ. FT.) (Note 19) | DESIGN MOMENT ARM (FT.) (Note 19) |
| | POLE SIZE (Diameter and Wall are Minimums, Length is Maximum) | ARM SIZE (Diameter and Wall are Minimums, Length is Maximum) | | |
| 6 | 16" x .375 WALL x 32'-0" | 8 ¾" x .322 WALL x 26'-0" | 150 | 17 |
| 6 ALT | 16" x 11.52" x .375 WALL x 32'-0" | 10" x 6.36" x .313 WALL x 26'-0" | 150 | 17 |
| 10 | 18" x .500" WALL x 32'-0" | 10 ¾" x .365 WALL x 30'-0" | 225 | 20 |
| 10 ALT | 18" x 13.52" x .500 WALL x 32'-0" | 13" x 8.80" x .375 WALL x 30'-0" | 225 | 20 |
| 12 | 20" x .500 WALL x 32'-0" | 12 ¾" x .375 WALL x 30'-0" | 300 | 24 |
| 12 ALT | 20" x 15.52" x .500 WALL x 32'-0" | 13" x 8.80" x .375 WALL x 30'-0" | 300 | 24 |
- NOTE: See TC-21.21 for anchor bolt dimensions.
Alternate Designs based on 0.14 in/ft taper
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- STDS ENGINEER
Soisson
- STATE OF OHIO OFFICE OF ROADWAY ENGINEERING ADMINISTRATOR
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- CANTILEVER OVERHEAD SIGN SUPPORT
- DESIGN AGENCY
-
- SCD NUMBER
TC-12.31
- SHEET P.2 TOTAL 2



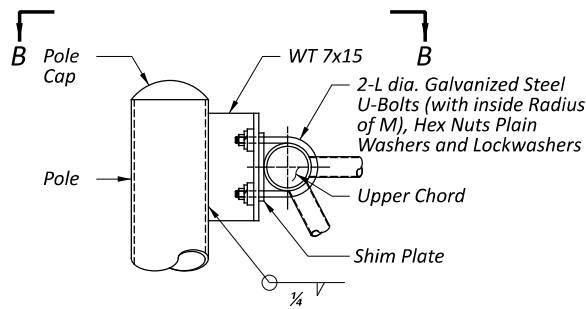
DETAIL "F"
END FRAME AND TRUSS
END JOINT DETAILS
 (See Note 6 on Sheet 2/2)



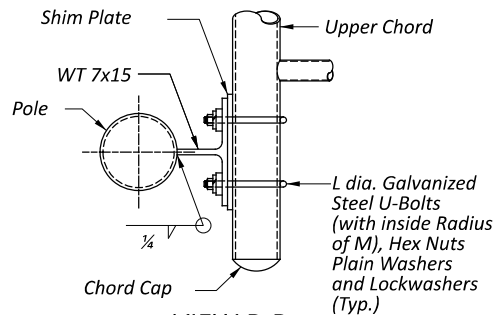
(SIDE VIEW)
 (DOTTED LINES OF HORIZONTAL MEMBERS OMITTED FOR CLARITY)



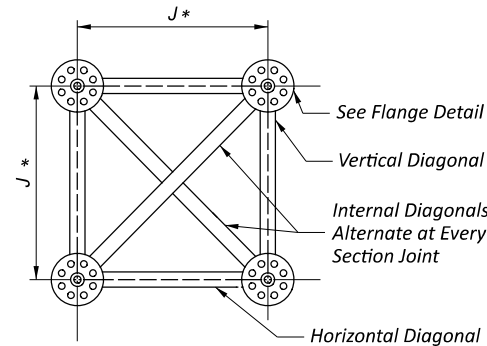
DETAIL "G"
TRUSS END JOINT DETAILS



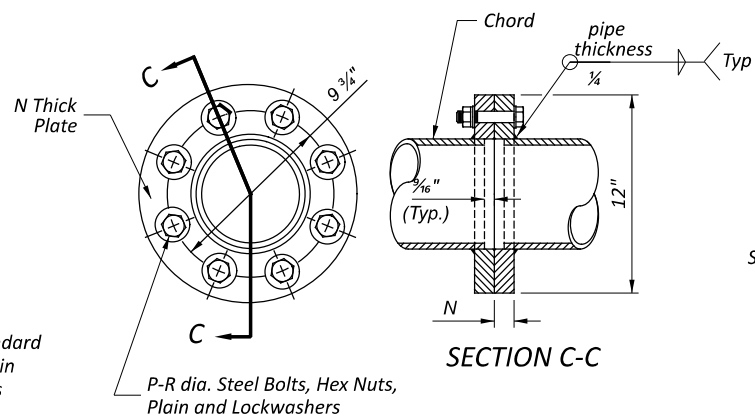
DETAIL "H"
UPPER SPAN SUPPORT



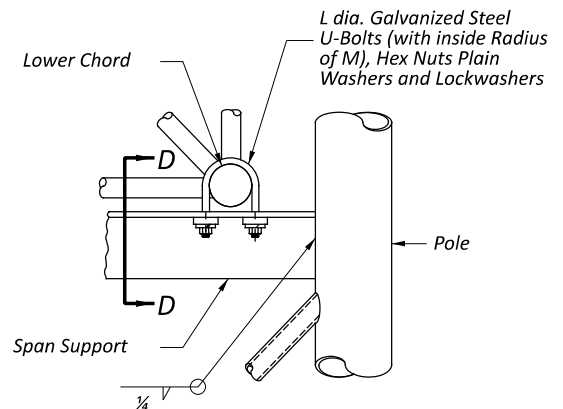
VIEW B-B



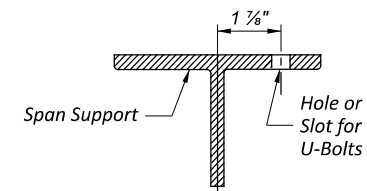
SECTION A-A



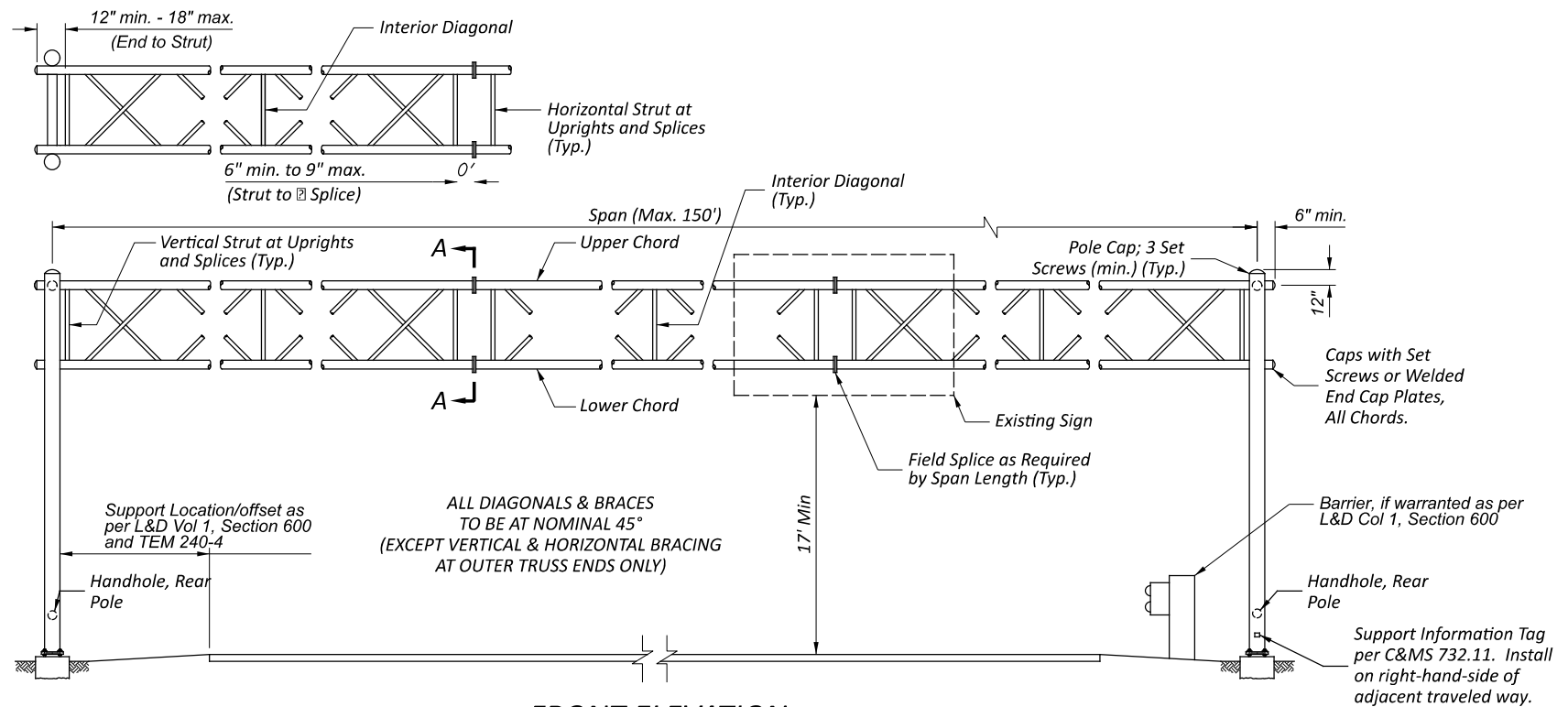
FLANGE DETAIL



DETAIL "E"
LOWER SPAN SUPPORT



SECTION D-D
STRUCTURAL TEE
SPAN SUPPORT



FRONT ELEVATION

LEGEND:

* = Required dimension. See Note 2 on Sheet 2/2

NOTES:

For Notes and Table see Sheet 2/2



NOTES:

1. The design of the Steel Truss Overhead Sign Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1), as of 2019.

2. Dimensions marked as required shall be as indicated on the drawing and shall not be altered. Dimensions marked as minimum must be met.

3. ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawing. Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project, and the design criteria shown in Note 18. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.

4. For sign attachment assemblies to be furnished with this support, construction details, and location of handholes, see Standard Construction Drawings (SCDs) TC-22.10 and TC-22.20.

5. For foundation details, see SCD TC-21.11.

6. For truss bracing members, one internal diagonal is required at each end of each section and at the panel point nearest the centerline of the truss section when the section exceeds 25' in length. Tube-to-tube type butted connections are required. Tube-to-gusset plate type connections are not permitted.

7. Camber the truss for full dead load including signs a minimum of 1" for a span of 50' or less. Increase the camber ¼" for each 5' of span over 50'.

8. Internal diagonals only may be relocated from the indicated position to avoid weld joint overlap.

9. Structural steel plate and WT sections shall meet the requirements of C&MS 630 and 711.01 with the following limitations:

Structural steel - ASTM A 709 Grade 50 (A572)
(Not Grade 36, 50W or 70W)

10. All material shall meet the requirements of C&MS 730 with the following limitations:

Steel tube and pipe - ASTM A 500 Grade B
(Not ASTM A 53 Grade B and ASTM A 501)

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped)
(Not ASTM B 695 Class 50)

11. Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.

12. Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F 436.

13. Anchor bolts shall meet the requirements of C&MS 630, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.

14. Anchor bolt nuts shall meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.

15. Anchor bolt washers shall meet the requirements of ASTM F 436 Type 1 (Hot-dip galvanized) according to ASTM A 153.

16. Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match mis-aligned anchor bolts will not be permitted.

17. All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.

18. Saddle shims can be aluminum castings meeting the requirements of C&MS 730.14, preformed bearing pads meeting the requirements of C&MS 516 and 711.21 or ASTM A 709 Grade 36 steel galvanized according to C&MS 711.02.

19. Design Criteria:

Load Parameters:

Wind Load: 1700-year MRI Basic Wind Speed Map, 120 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000

Serviceability Parameters:

Maximum Vertical Deflection of Horizontal Support Resulting from Service I Load Combination (Dead Load + Wind): L/150 per LRFDLTS-1 10.4.1

Fatigue Parameters:

Fatigue Category: I

Natural Wind Gust: Include

Truck-Induced Gust: Include

Galloping: Do not include

20. Support shall be manufactured to accommodate the maximum sign area and span given in theTable, or greater, even if the sign area in the Plans is smaller.

Design	Maximum Span (Note 20)	Maximum Sign Area (ft') (Note 20)	Chords	Vertical Diagonals	Horizontal Diagonals	Struts	End Frame Pole	End Frame Diagonal and Strut	Span Support	J	K	L	M	N	P	R
Design 1	75'	600	5.563" x .258"	1.90" x .145"	1.90" x .145"	1.90" x .145"	10.75" x .25"	2.875" x .203"	WT6x13	3'-0"	5'-0"	⅝"	2⅞"	1"	6	⅞"
Design 2	120'	700	6.625" x .375"	2.375" x .218"	2.375" x .218"	2.375" x .218"	10.75" x .25"	2.875" x .203"	WT7x15	5'-0"	7'-0"	¾"	3⅜"	1"	6	1"
Design 3	150'	1150	6.625" x .562"	2.875" x .203"	2.875" x .203"	2.875" x .203"	10.75" x .365"	3" x .216"	WT7x15	5'-0"	7'-0"	⅞"	3⅜"	1 ¼"	8	1"

All members are HSS round sections (outside diameter x nominal wall thickness) unless otherwise noted.

All tube diameters and wall thicknesses are minimums.

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04-17-2020

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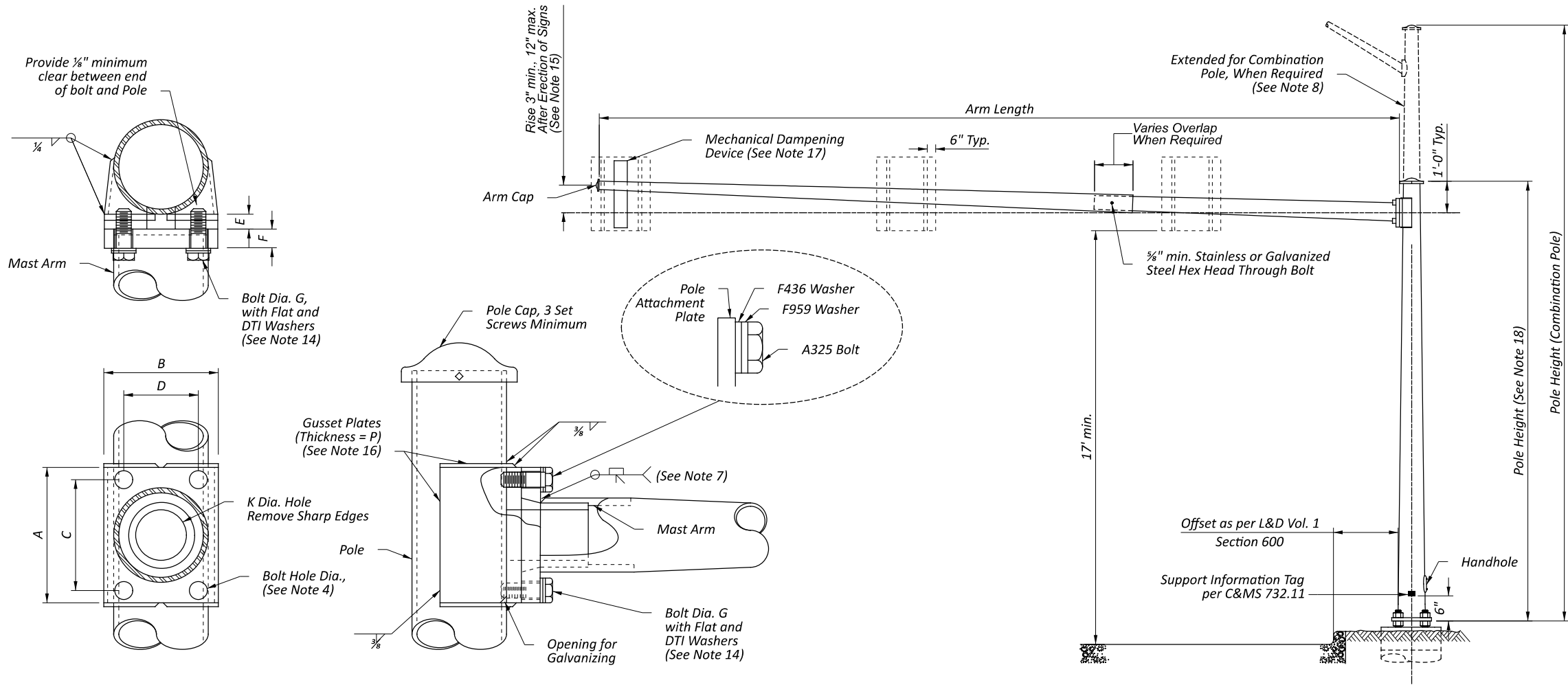
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Adam Koenig

STEEL TRUSS OVERHEAD SIGN SUPPORT

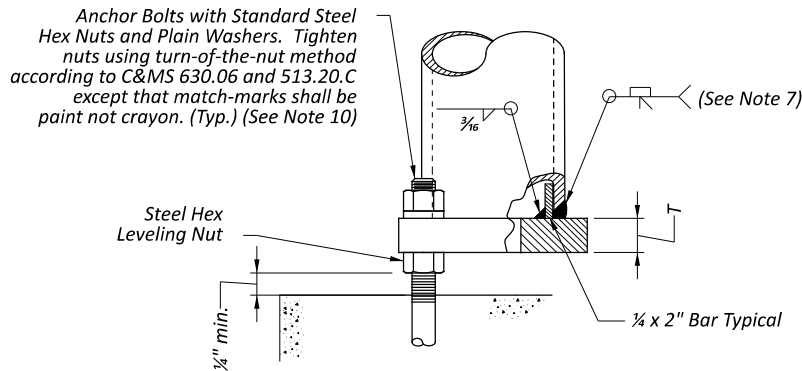
DESIGN AGENCY

SCD NUMBER
TC-15.116

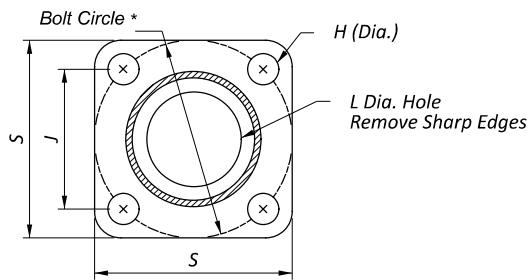
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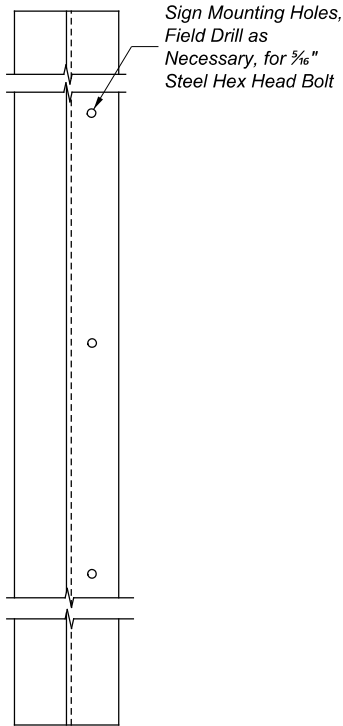
ARM ATTACHMENT



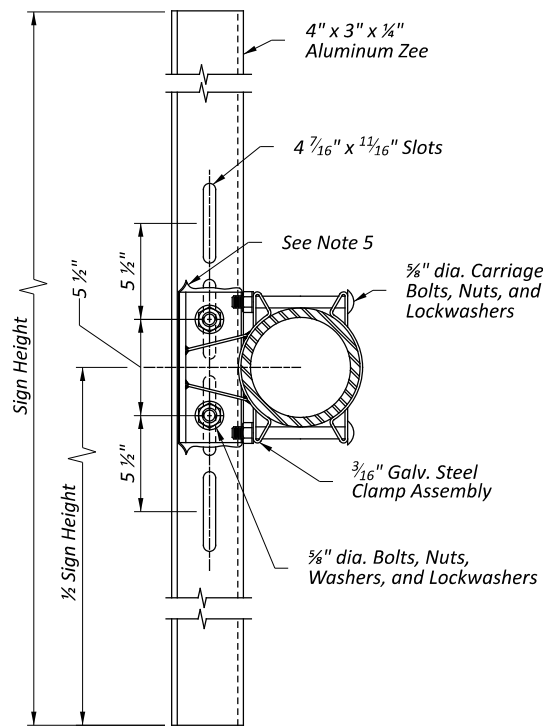
POLE DETAILS



BASE PLATE



SIGN BRACKET



NOTES:

- The design of the Standard Cantilever Overhead Sign Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1), as of 2019.
- Dimensions marked as required shall be as indicated on the drawing and shall not be altered. Dimensions marked as minimum must be met.
- ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawing. Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project, and the design criteria shown in Note 18. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.
- Arm plate hole diameter to be bolt diameter plus 1/8". Pole plate tapped hole to have threads with 75% min. full profile height. Threads may be retapped after galvanizing.
- Prevent contact between aluminum and galvanized parts with a minimum 1/16" thick chloroprene gasket or approved equal.
- For foundation details, see Standard Construction Drawing (SCD) TC-21.21.
- The arm attachment plate and the pole attachment to the base plate shall be welded using a full penetration weld.
- For modification of pole to support roadway lighting, see SCD HL-10.12.
- For additional sign mounting details, see SCD TC-41.41.
- A minimum of one bolt thread shall remain above the anchor nut.
- For pole and base plate dimensions, see Sheet 2.
- For construction details and location of handholes, see SCD TC-22.10.
- The design was based on Fatigue Category II. See Note 28 for additional design criteria.
- Connection bolts shall be ASTM F3125 Grade A325. Washers shall be ASTM F959 compressible washer type Direct Tension Indicators (DTI). If necessary, I.D. of DTI washers shall be ground or reamed to properly fit over attachment bolts. Provide proper DTI feeler gage to Engineer. An ASTM F436 washer shall be used directly under the head of the bolt with all DTI washers. Assume that the flat washer does not spin during bolt tightening with DTI washer.
- Negative arm end slope is acceptable to achieve rise requirement.
- Ring-stiffened wrap-around horizontal plates are permitted as an alternative shown to the horizontal plates shown.

(cont'd - see Sheet 2)

LEGEND:

* = Required dimension see Note 2

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07-21-2023
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07-17-2020
04-17-2020

STDS ENGINEER

Duemme

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ENGINEERING ADMINISTRATOR

Adam Koenig

SINGLE ARM OVERHEAD SIGN SUPPORT

DESIGN AGENCY



SCD NUMBER

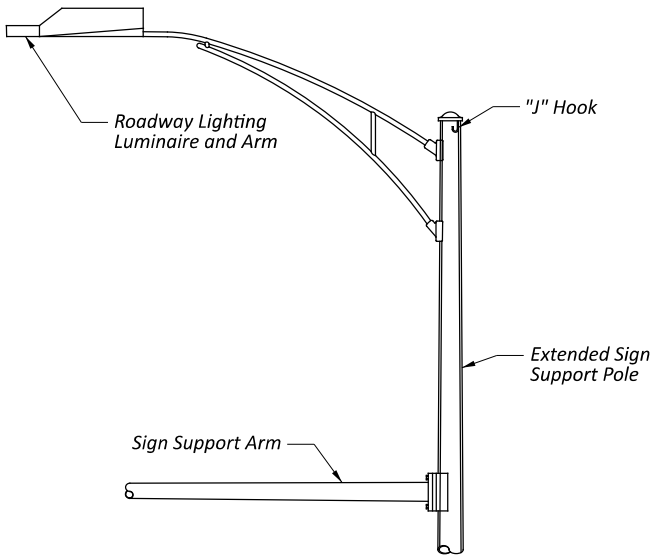
TC-16.22

SHEET

1

TOTAL

2



POLE EXTENSION FOR
LIGHTING LUMINAIRE

NOTES: (cont. from Sheet 1)

17.

A Mitigator TR1 Traffic Damper manufactured by Valmont Structures or a Stockbrige type damper shall be installed as close as possible to the end of the arm. Required on arms over 39' in length. Install on arms 39' or less if directed by the plans or engineer.
18.

Actual pole height shall be calculated based off the critical pavement and foundation elevations, as outlined in Traffic Engineering Manual section 440.
19.

Tapered steel tubes for the poles and arms shall meet the requirements of ASTM A 595 Grade A.
20.

All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped)
(Not ASTM B 695 Class 50)
21.

Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.
22.

Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F 436.
23.

Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.
24.

Anchor bolt nuts shall meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.
25.

Anchor bolt washers shall meet the requirements of ASTM F 436 Type 1 (Hot-dip galvanized) according to ASTM A 153.
26.

Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match mis-aligned anchor bolts will not be permitted.
27.

All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.
28.

Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000

Serviceability Parameters:

Deflection: maximum of L/150 under Service Load 1 (Dead Load + Wind) per ODOT

Permanent Camber: L/1000 per LRFDLTS-1 10.5

Rake (Pole Tilt): H/180 (H = pole height)

Horizontal Deflection at Top of Pole: maximum 1.5% of pole height

Slope at Top of Pole: maximum of 0.35 inch/foot (1.67 degrees) per LRFDLTS-1 10.4.2.1

Fatigue Parameters:

Fatigue Category: II

Natural Wind Gust: Include

Truck-Induced Gust: Include

Galloping: Do not include (since Mechanical Dampening device is required)
29.

Multi-sided vertical main tube (12 sides, min.) may be provided.

THESE DESIGNS USE FULL PENETRATION WELDS AT THE ARM AND BASE PLATE CONNECTIONS

ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

DESIGN NO.	POLE		ARM			TWO PIECE ARM			ARM ATTACHMENT								ANCHOR BASE						
	MIN. WALL THK.	SIZE	MIN. WALL THK.	SIZE	MAX. ARM LENGTH	MIN. WALL THK.	SIZE	OVERLAP	A	B	C	D	E	F	G	K	P	BOLT CIRCLE *	S	J	T	H	L
7	.239	11 x 8.06 x 21'	.179	8 x 3.80 x 30'	30'				14.5	12.0	10.5	8.0	2.0	2.0	1.25	6.00	0.375	15.0	15.63	10.63	2	2.00	9.50
9	.239	13 x 10.06 x 21'	.239	10 x 4.96 x 36'	36'				16.5	14.5	12.5	9.5	2.0	2.0	1.25	8.75	0.375	18.0	18.50	12.73	2	2.00	11.25
12	.250	14 x 11.06 x 21'	.239	12 x 5.7 x 45'	45'				16.5	14.5	12.5	9.5	2.0	2.0	1.5	9.50	0.375	20.0	20.50	14.13	2	2.38	10.50
13	.3125	16 x 13.06 x 21'			60'	.250 .179	14 x 9.32 x 33'-5½" + 10 x 5.96 x 28'-10¾"	27.5	24.0	24.0	20.0	20.0	2.25	2.25	1.5	7.00	0.375	22.0	23.0	15.56	2	2.38	9.50
14	.3125	17 x 14.06 x 21'			72'	.3125 .239	14 x 9.20 x 34'-3¾" + 10 x 4.40 x 40'-0"	27.5	24.0	24.0	20.0	20.0	2.5	2.5	1.5	7.00	0.375	22.0	23.0	15.56	2	2.38	10.75

REVISIONS

01-16-2026	
07-18-2025	
07-21-2023	
07-16-2021	
07-17-2020	
04-17-2020	

STDS ENGINEER

DuemmeI

STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR

Adam Koenig

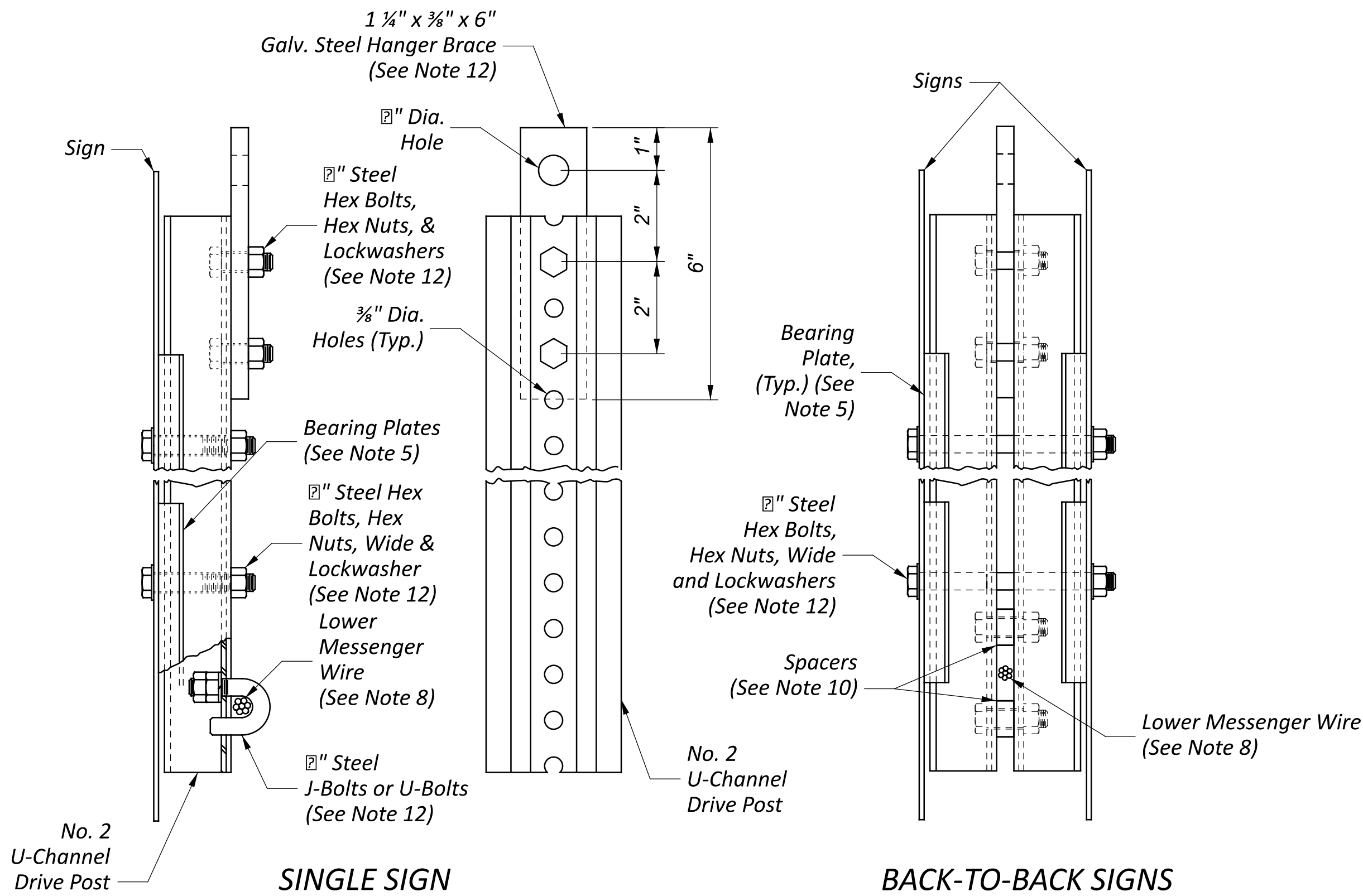
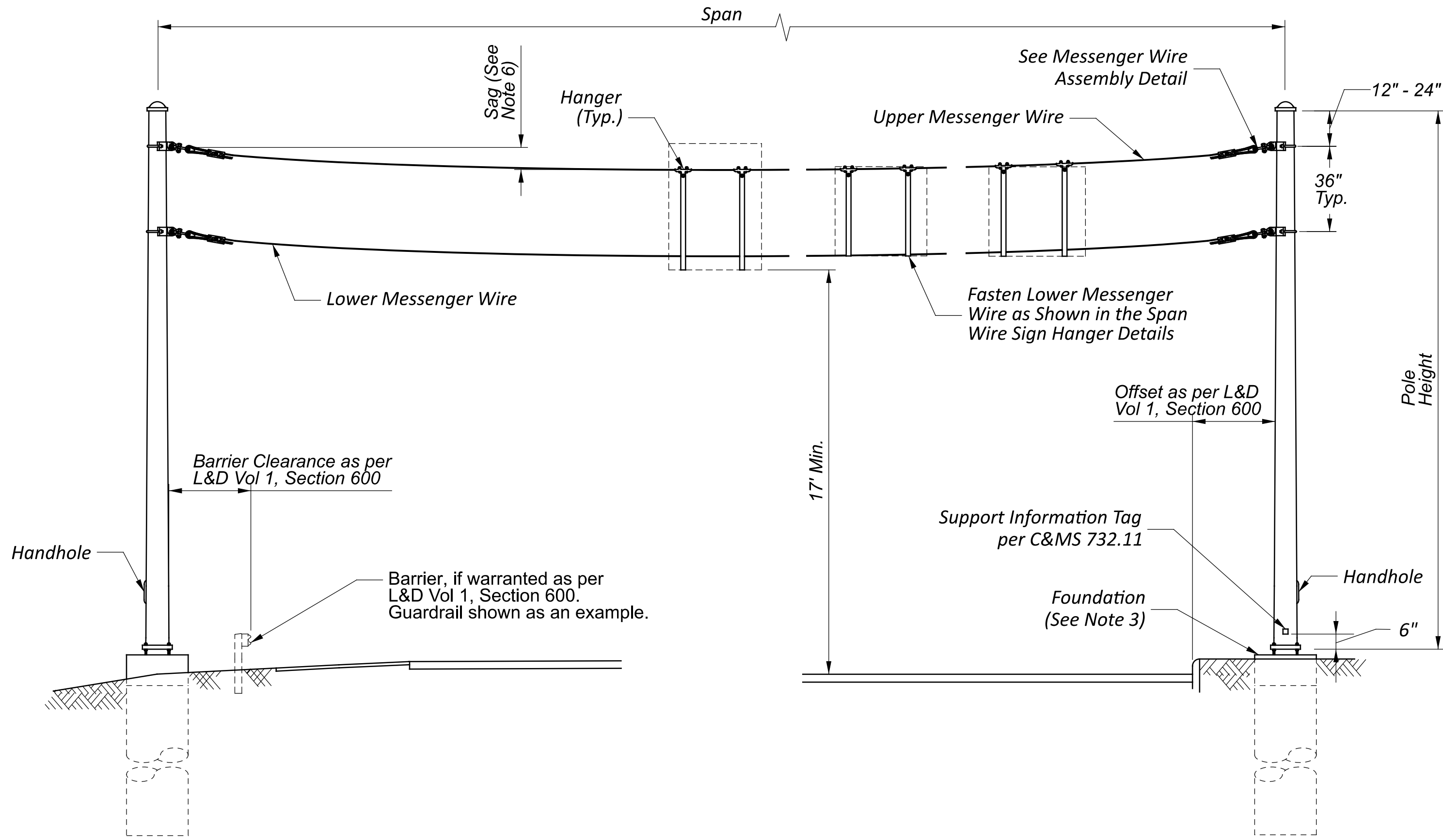
SINGLE ARM OVERHEAD SIGN SUPPORT

DESIGN AGENCY



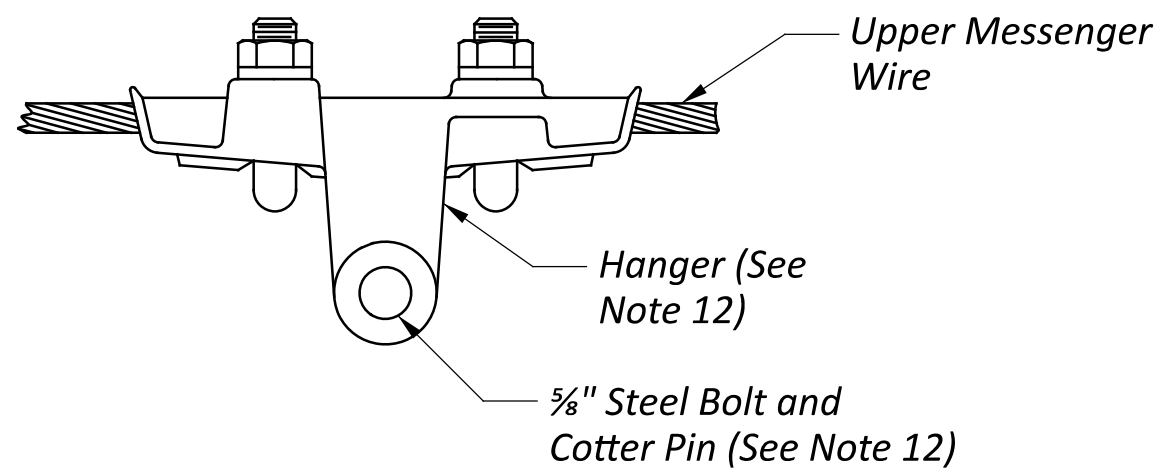
SCD NUMBER
TC-16.22

SHEET	TOTAL
2	2

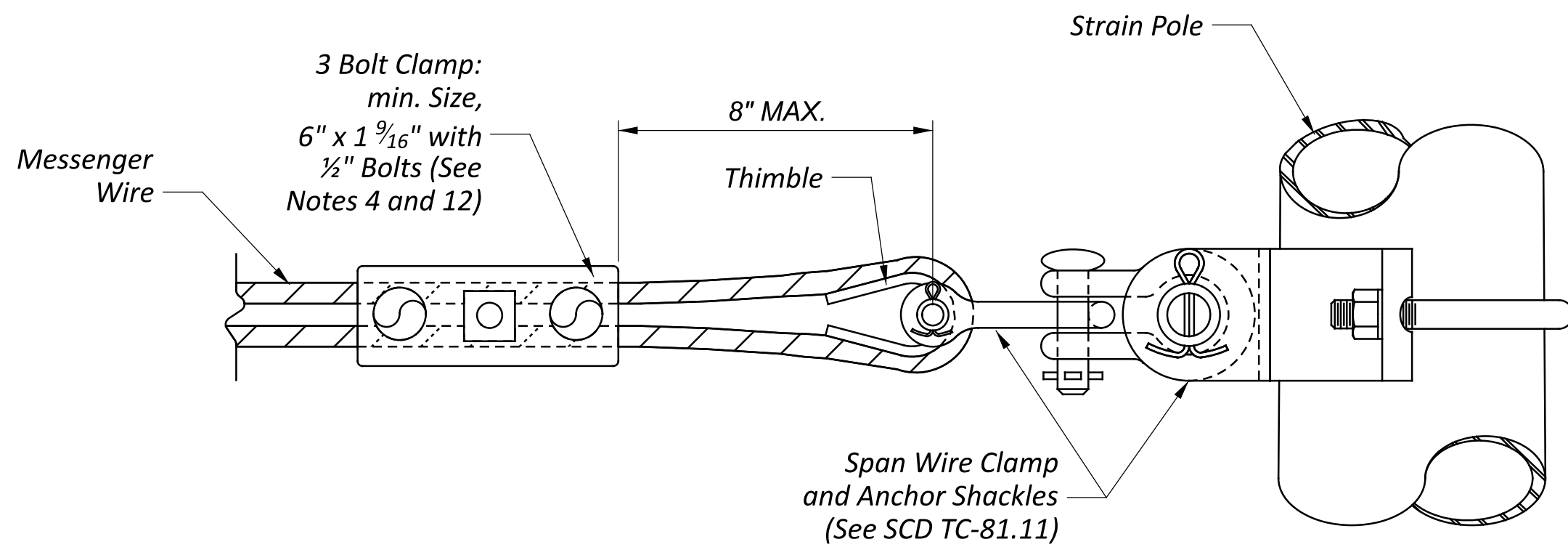


SIGN HANGER ASSEMBLY, SPAN WIRE, TYPE 1

DESIGN NO. (SEE NOTE 2)	POLE HEIGHT (FEET)	MIN. POLE FACTORED FLEXURAL RESISTANCE AT BASE (FOOT KIPS)	MESSENGER WIRE MIN. DIA. (INCH)
8	30	206.0	3/8
10	32	270.0	7/16
12	32	385.0	1/2
13	32	590	1/2
14	32	900	1/2



HANGER ELEVATION



MESSENGER WIRE ASSEMBLY

NOTES:

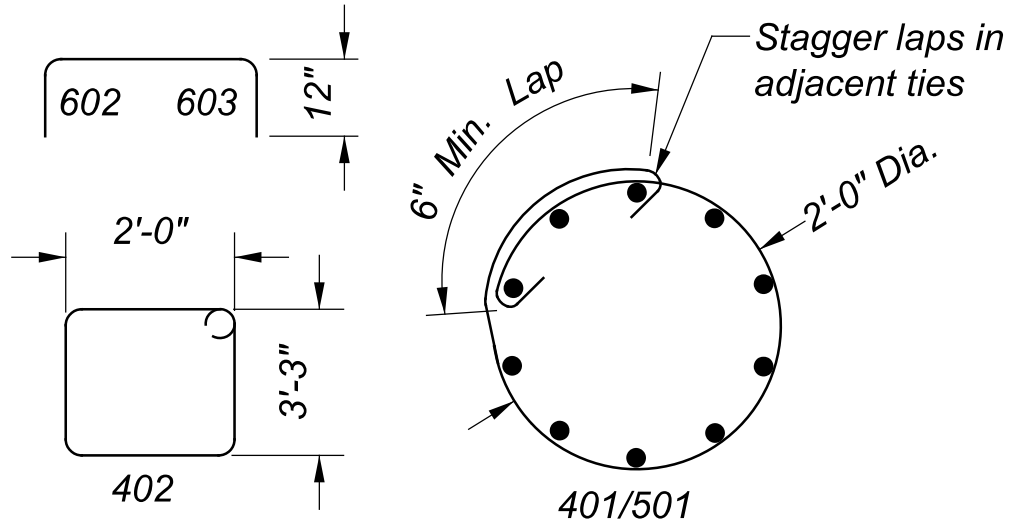
- The design of the Span Wire Overhead Sign Support on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
- For details and design requirements of poles and appurtenances, see Standard Construction Drawing (SCD) TC-81.11. Poles for span wire support design numbers are identical with poles of the same design number on SCD TC-81.11.
- For foundation details, see SCD TC-21.21.
- Preformed guy grips shall not be used to attach the messenger wire to the span wire clamps.
- Bearing plates shall conform to details on SCD TC-41.20.
- Assemble the upper messenger wire with signs installed, and adjust proper clearance to the bottom of the sign with a sag between 4% and 5%. Position the signs on brackets such that after erection is completed the signs are approximately centered vertically on the wires.
- Assemble and adjust the lower messenger wire with a sag approximately 3" greater than the upper wire. Adjust the sag prior to any fastening of sign hangers to the lower wire.
- Clamp sign hangers snugly to the lower wire. J or U-bolts shall have nylon or deformed thread lock nuts. On back-to-back signs, spacers shall be 1/16" less than the messenger wire diameter.
- Install strain poles with an initial outward rake of 3" to 5".
- Use aluminum or galvanized steel spacers for sign hanger assemblies.
- For location of handholes, see SCD TC-22.10.
- See SCD TC-81.11 for material requirements and TC-84.20 for Messenger Wire Details.

NOTES:

- The design of the Sign Support Foundations presented on this drawing meet the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
- Tie anchor bolts to rebar cage near the top and bottom of the anchor bolts.
- D_{min} may be deeper as required in the plans.
- When required by local conditions and approved by the Engineer, alternate foundation designs are acceptable. Alternate foundation design calculations and drawings shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted to the Engineer for review and acceptance.
- Anchor bolts shall meet the requirements of C&MS 630, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be full length of the anchor bolts not at least 2 inches beyond the threads. Threads shall be UNC-2A, and may be either rolled or cut, and coarse threaded. The embedded end of the anchor bolt shall be headed or threaded with a heavy hex nut. Provide smooth steel rod anchor bolt material threaded at the ends or over its entire length. Hex nuts shall be ASTM A563, American Standard heavy hex, Grade DH or A 194 Grade 2H, with UNC-2B threads. Plate washers shall be A709 Grade 36 or Grade 50. All nuts and plate washers shall be galvanized per C&MS 711.02. Anchor bolt washers shall meet the requirements of ASTM F 436 Type 1 (hot-dip galvanized) according to ASTM A 153.
- At locations where the existing slope is 6:1 or greater, the buried depth of foundation shall apply to the low side of the slope. Set the top of the foundation 2" above the existing surface on the high side of the slope. The additional depth of foundation necessary to meet these requirements shall be added to the formed top.
- Use 601 bars to tie the anchor bolts to the 603 bars.
- A special foundation design will be required when cohesive soil with an undrained shear strength of less than 2000 lb./sq.ft. or granular soil with an angle of internal friction less than 30 degrees and a wet density less than 120 lb./cu.ft. is encountered. Special foundation designs shall meet the requirements of Note 4.
- All reinforcing steel shall be epoxy coated and comply with and be placed in accordance with C&MS 509. Lap all rebar per the lap length table in C&MS 509. Rebar end hooks not required.

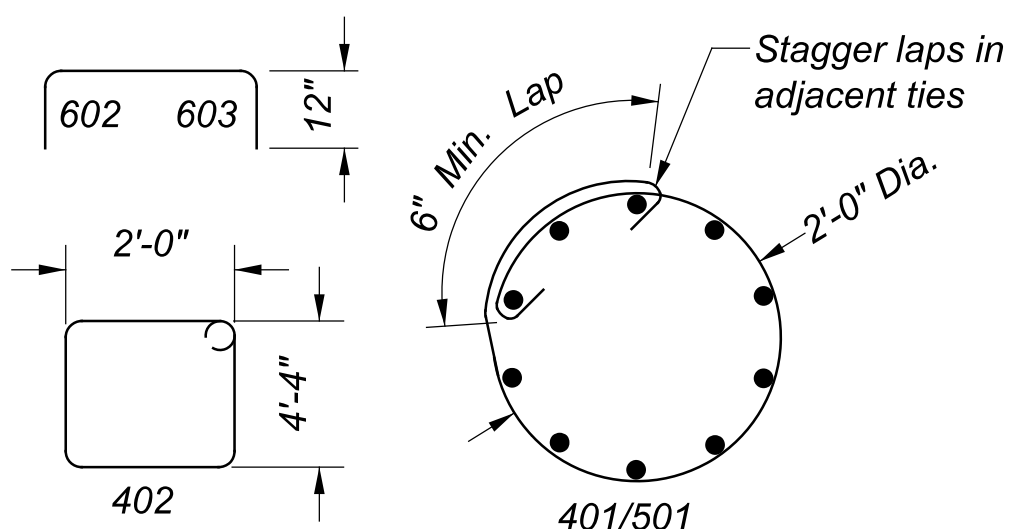
* Reinforcement Schedule for TC-21.11 Tie Beam and TC-21.50 - 42" Wall
(For Each Foundation)

MARK	No.	LENGTH	TYPE
401/501	12" c/c + 1	7'-6"	Bent
402	12" c/c	11'-0"	Bent
601	8	2'-0"	Straight
602	3	C + 4'-0"	Bent
603	6	C + 2'-0"	Bent

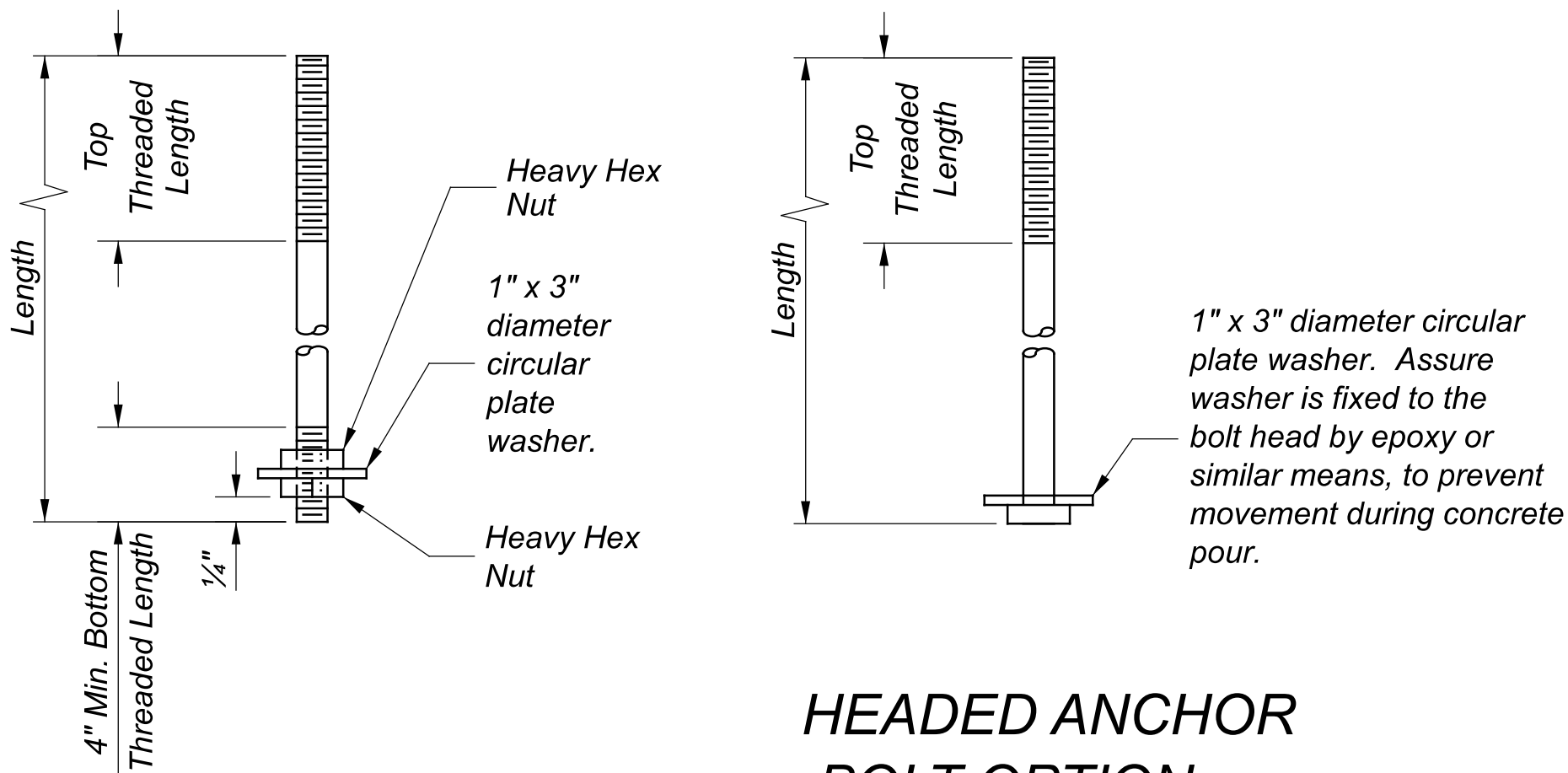


* Reinforcement Schedule for TC-21.50 - 57" Wall
(For Each Foundation)

MARK	No.	LENGTH	TYPE
401/501	12" c/c + 1	7'-6"	Bent
402	12" c/c	13'-2"	Bent
601	8	2'-0"	Straight
602	4	C + 4'-0"	Bent
603	8	C + 2'-0"	Bent



* Length of Vertical Steel = $D_{min} - 5"$ (all bar sizes)
(See table below for number and diameter of bars)

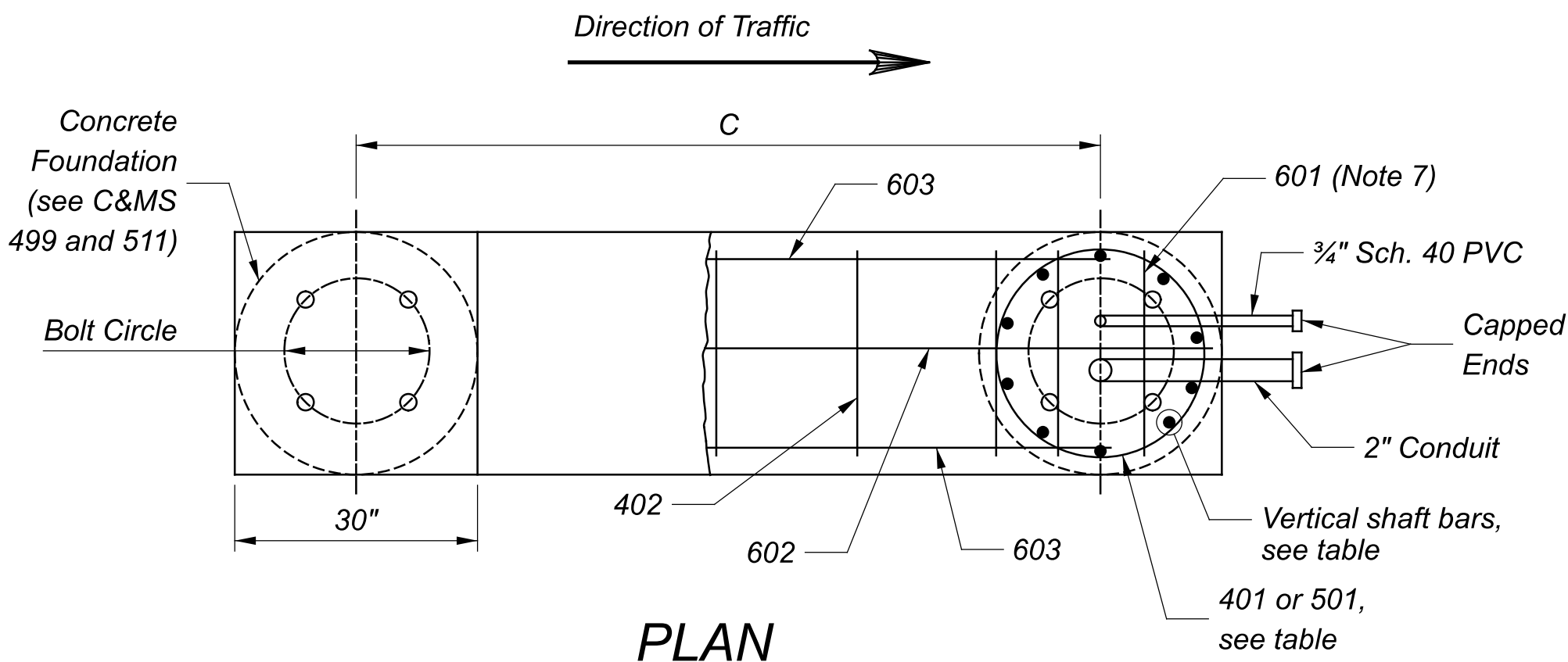


HEADED ANCHOR
BOLT OPTION

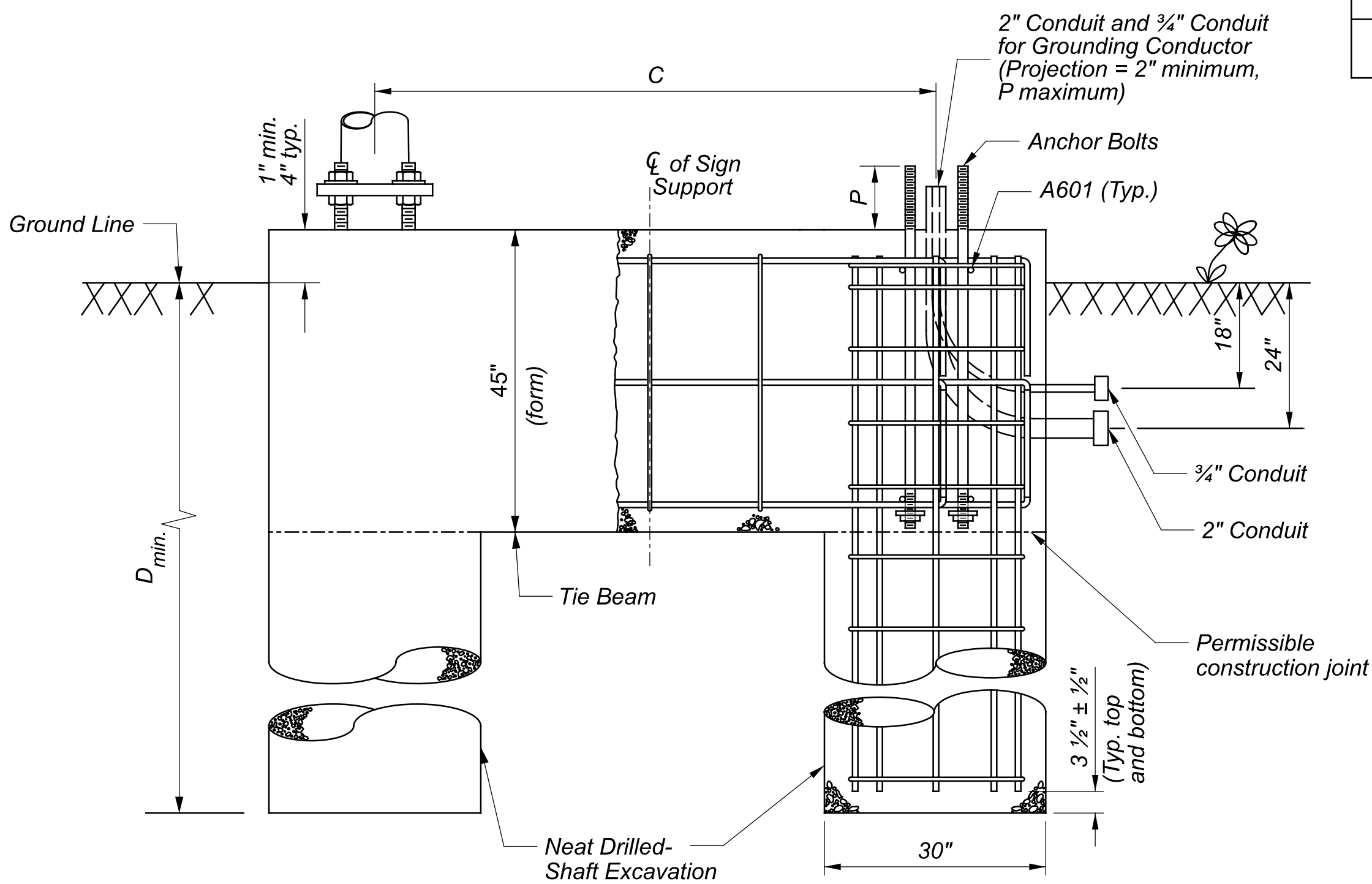
NUTTED ANCHOR
BOLT OPTION

ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

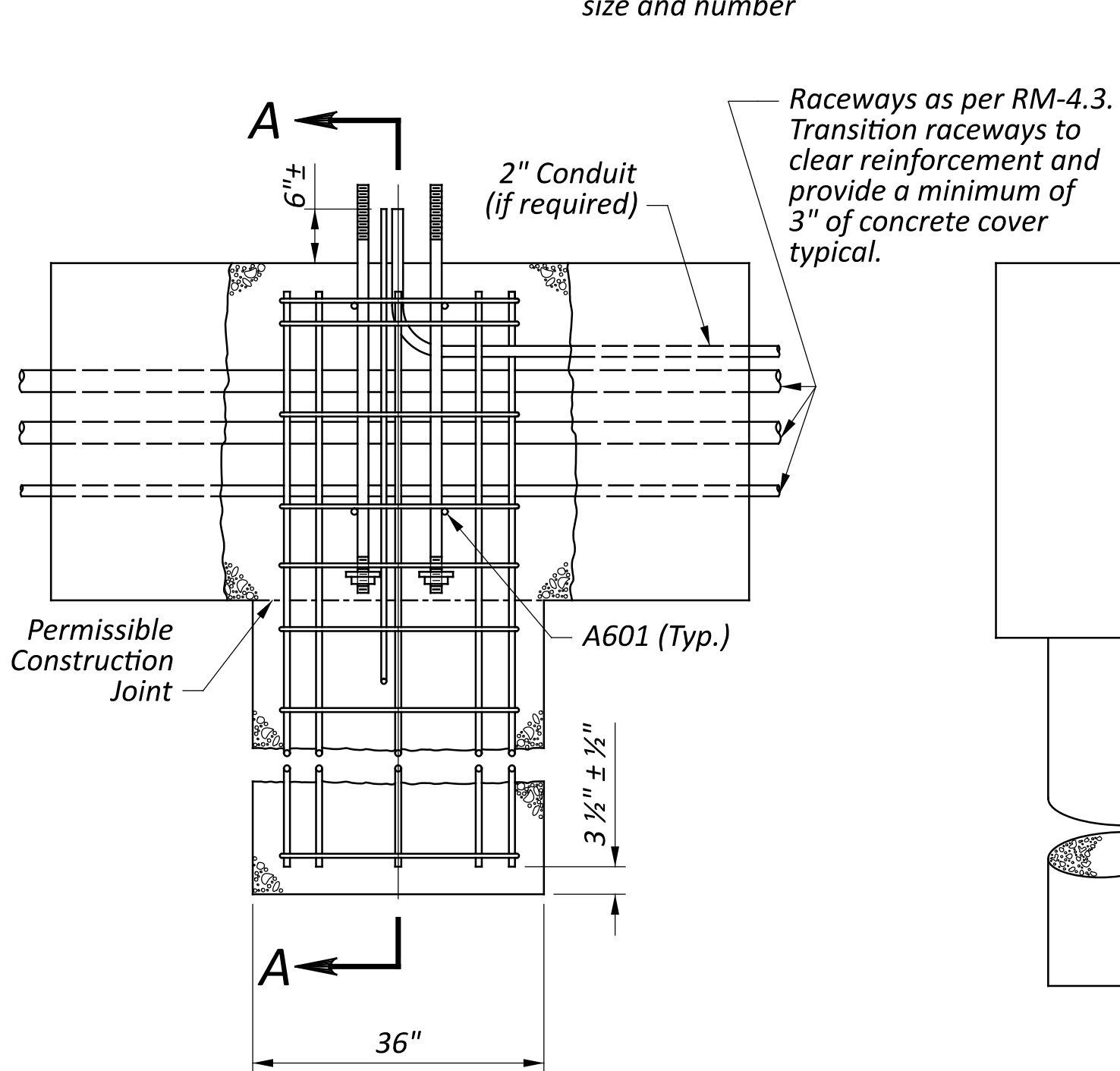
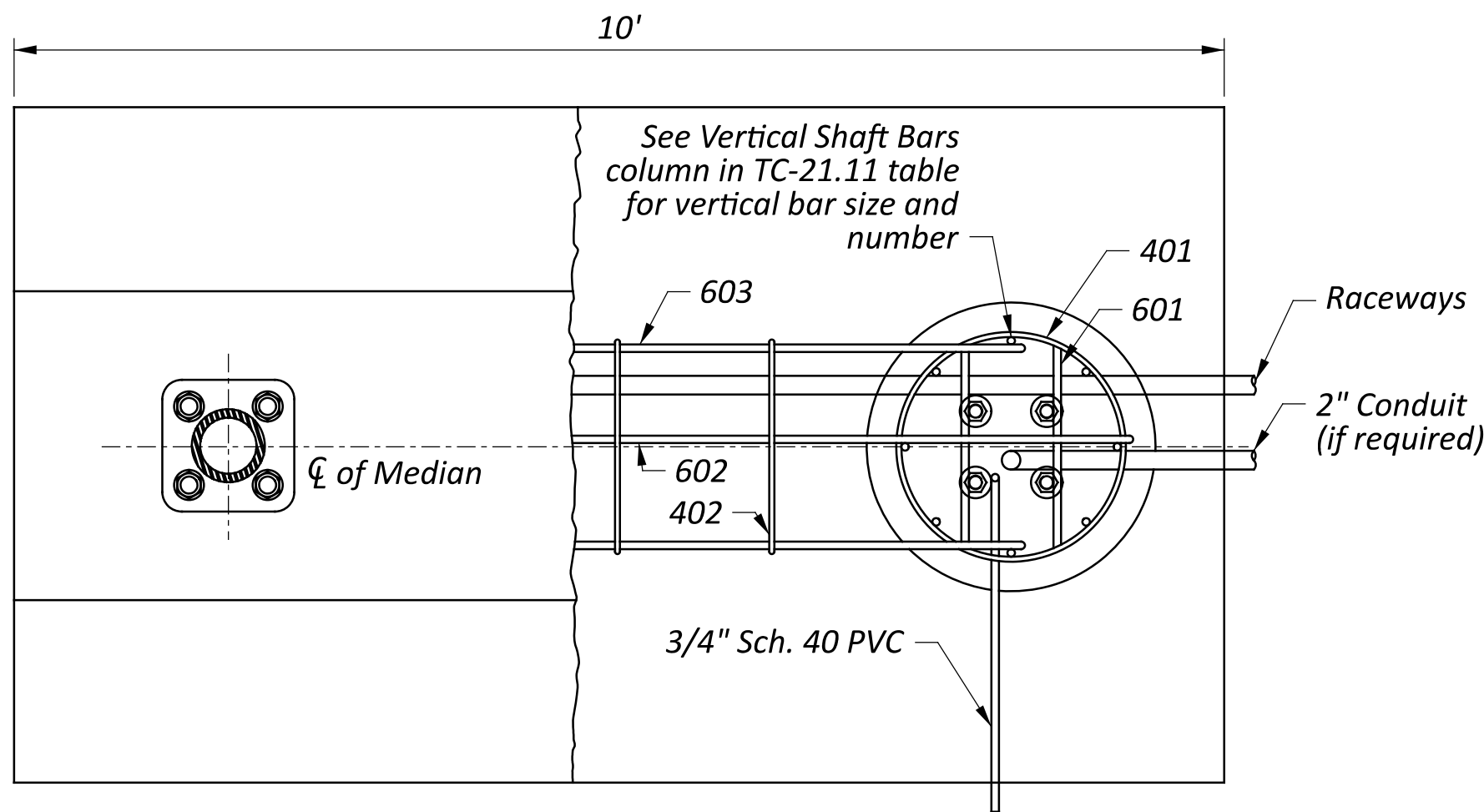
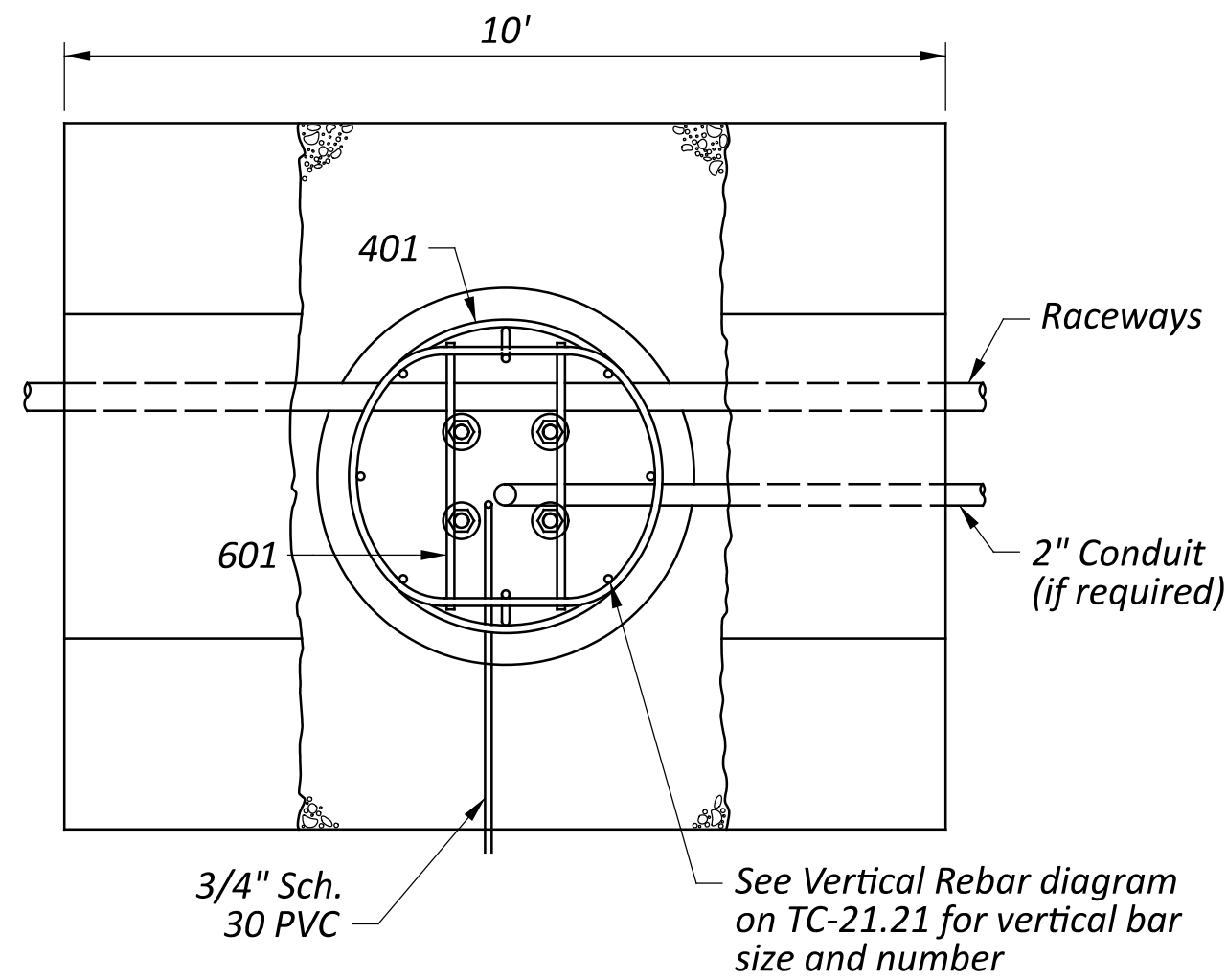
SUPPORT TYPE	TRUSS TYPE	TRUSS BOX SIZE	C	D_{min}	ANCHOR BOLTS						VERTICAL SHAFT BARS	TIES
					CIRCLE	DIA.	LENGTH	TOP THREAD LENGTH	P	THREADS PER INCH		
15.116 Design 1	Steel	3'-0"	5'-0"	12'-0"	17	1 1/4	54	12	9	7	10 - #8	401
15.116 Design 2	Steel	5'-0"	7'-0"	14'-0"	17	1 1/4	54	12	9	7	11 - #8	401
15.116 Design 3	Steel	5'-0"	7'-0"	18'-0"	17	1 1/2	54	12	9	6	12 - #9	501



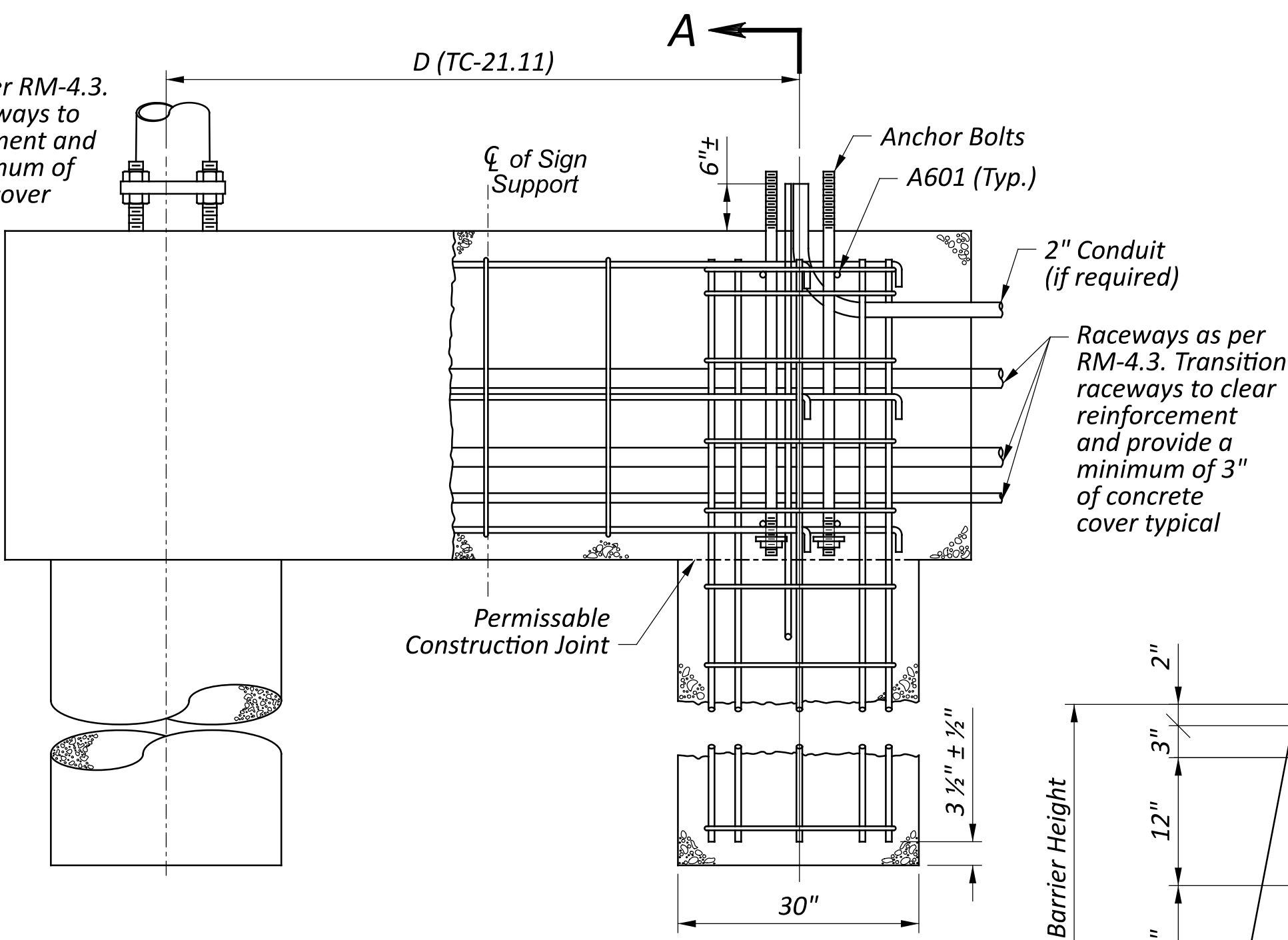
PLAN



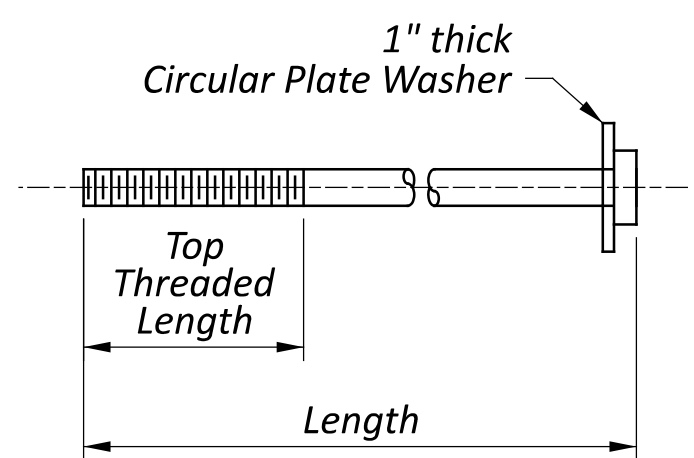
ELEVATION



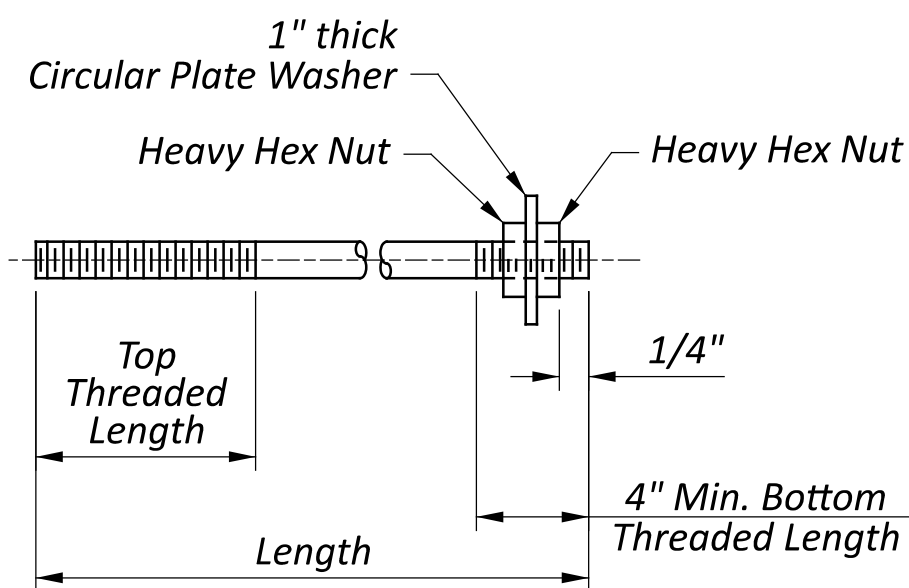
CANTILEVER,
BUTTERFLY
OR CENTER-MOUNT TYPE



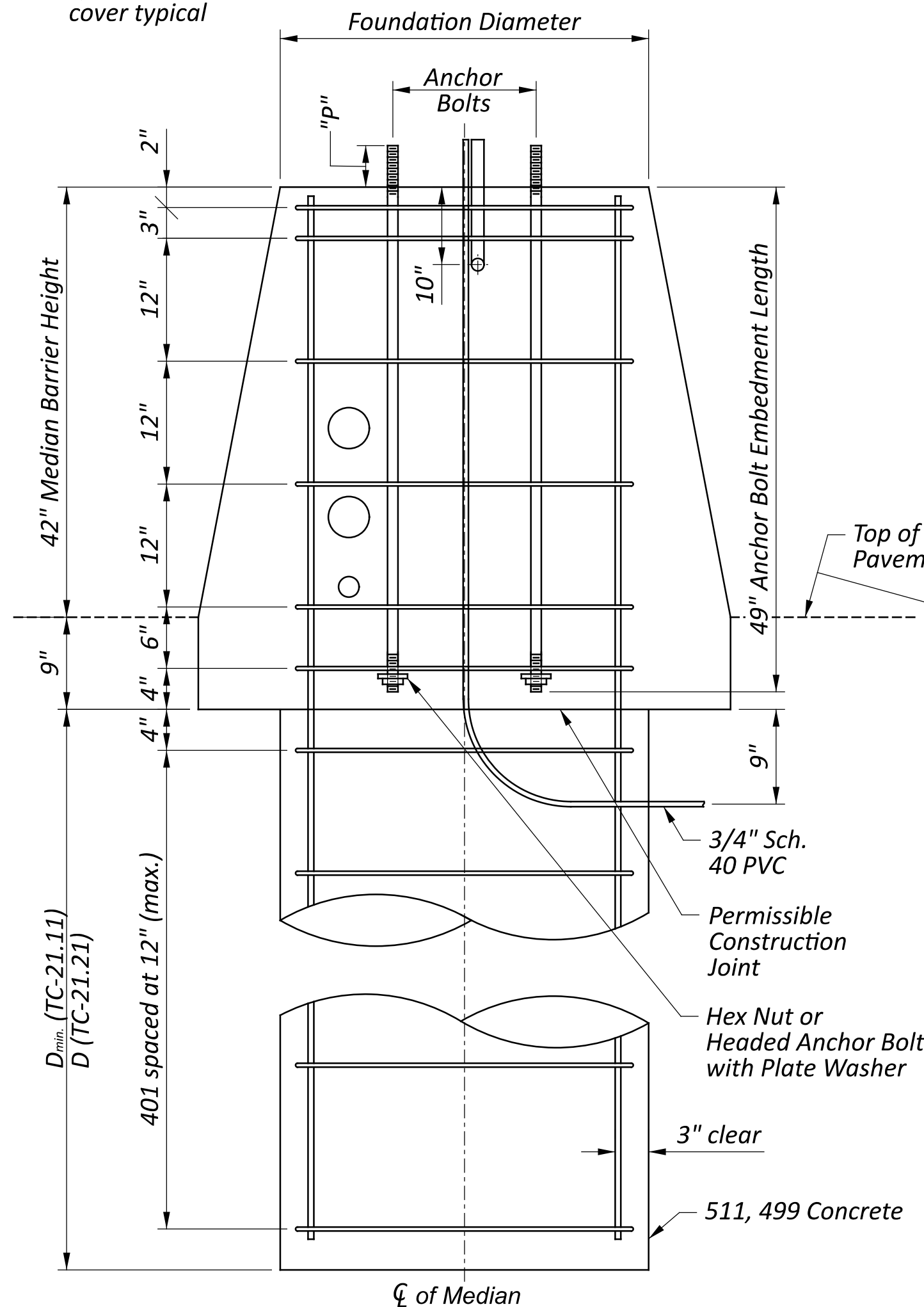
SPAN TYPE



HEADED ANCHOR
BOLT OPTION



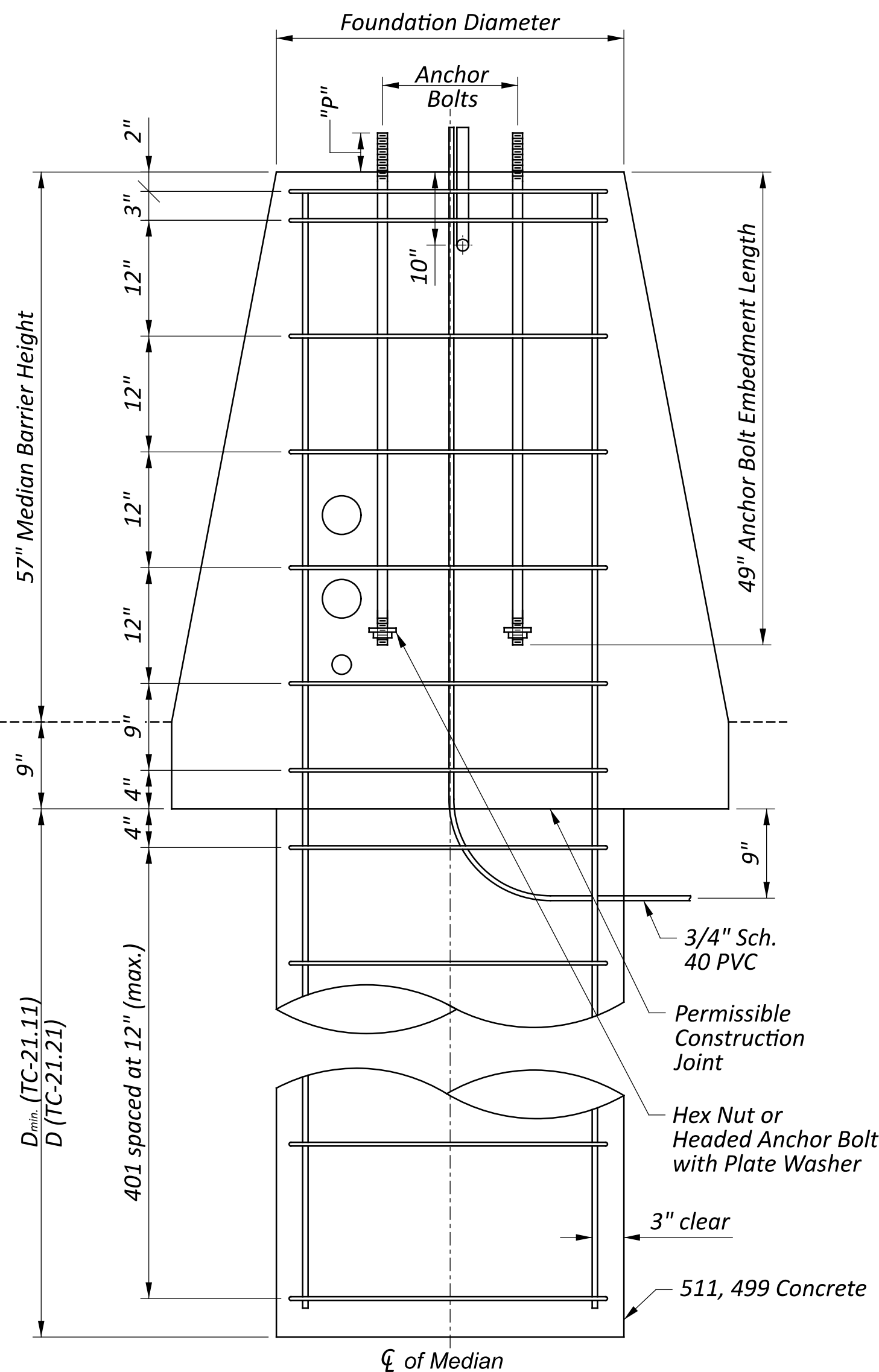
NUTTED ANCHOR
BOLT OPTION



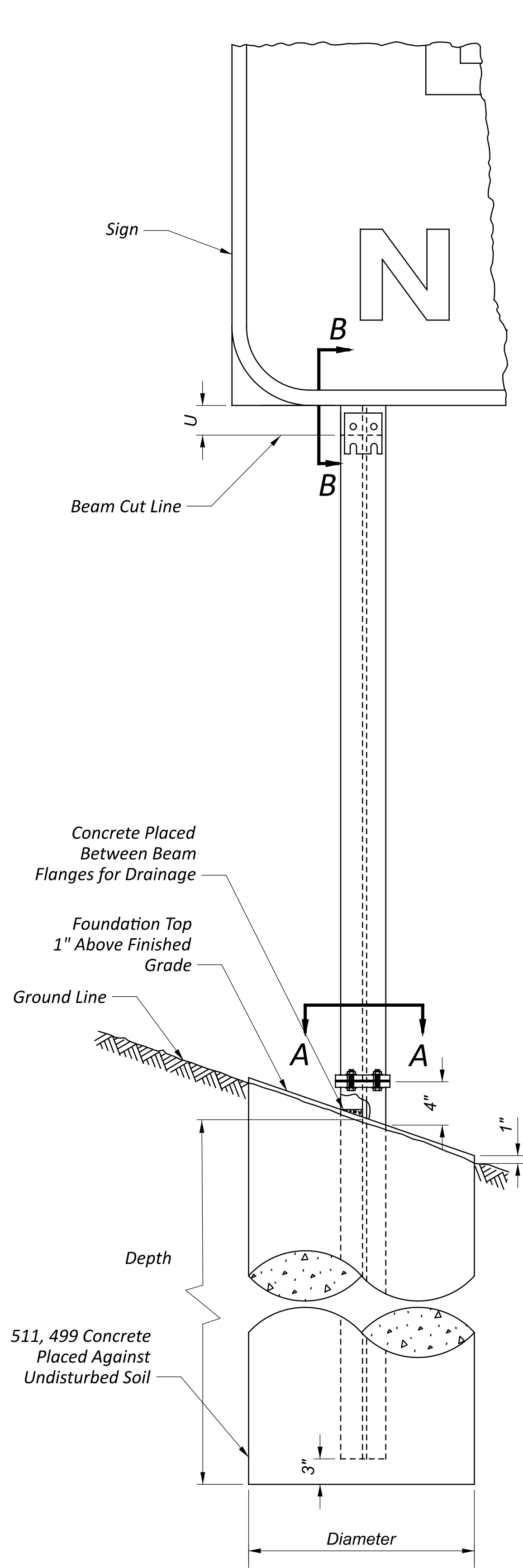
SECTION A, TYPE B BARRIER
Note: 402, 601, 602, and 603 bars not shown

NOTES

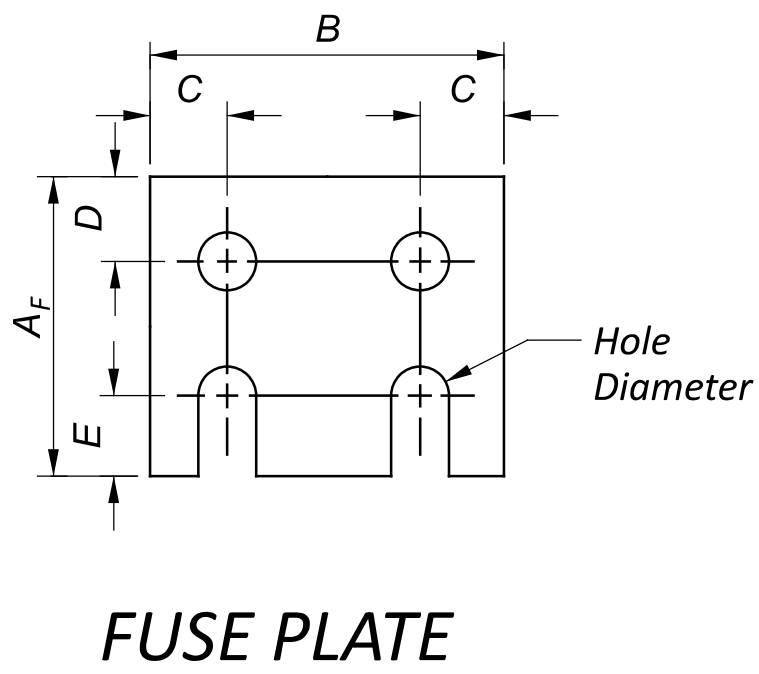
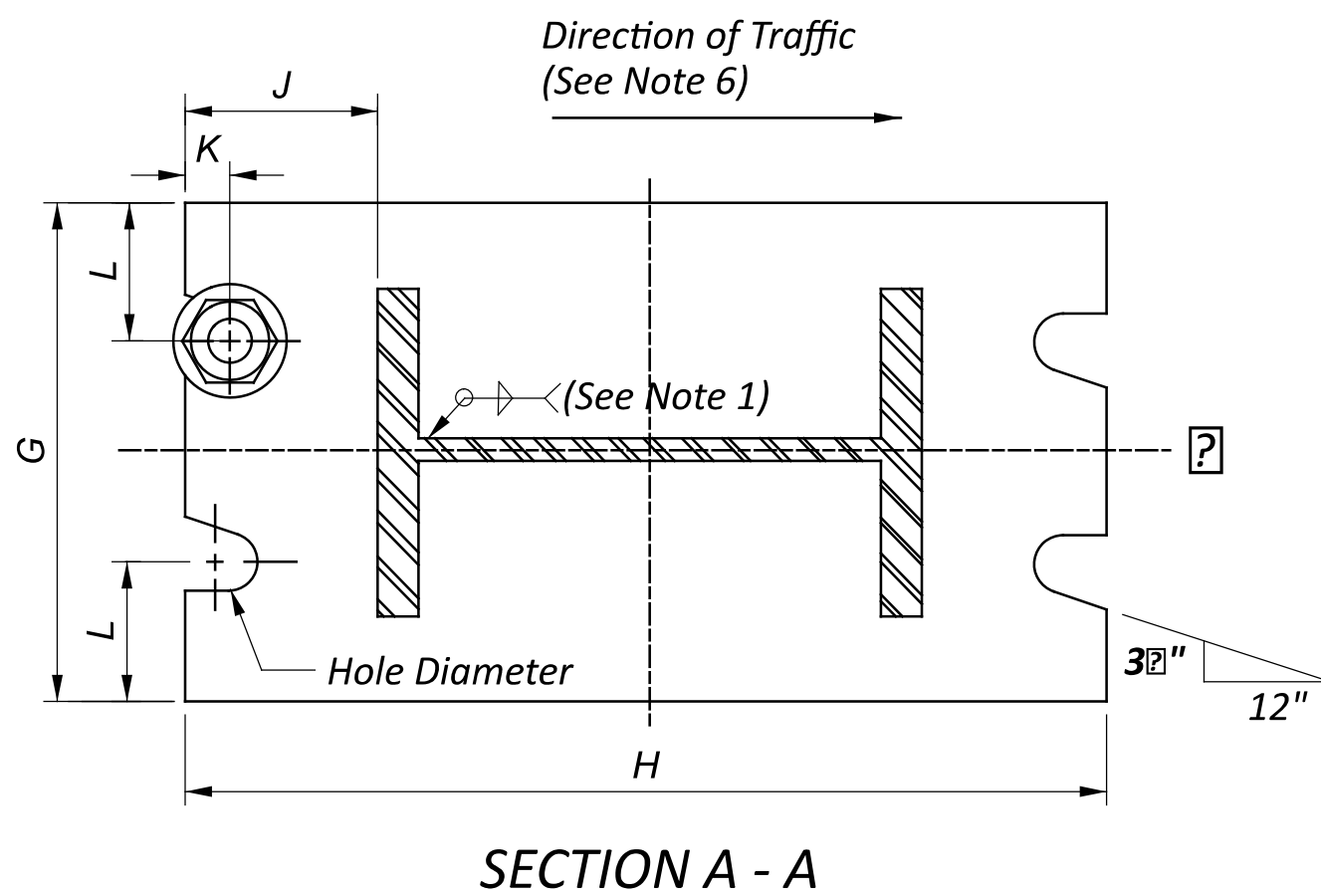
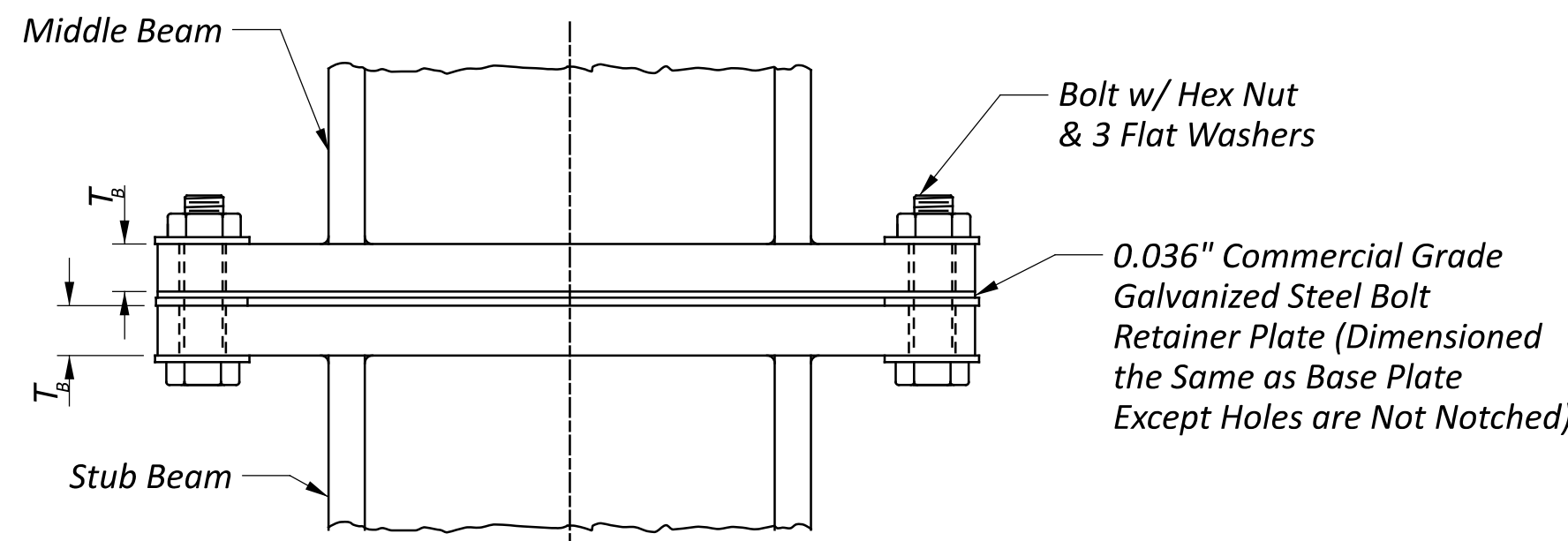
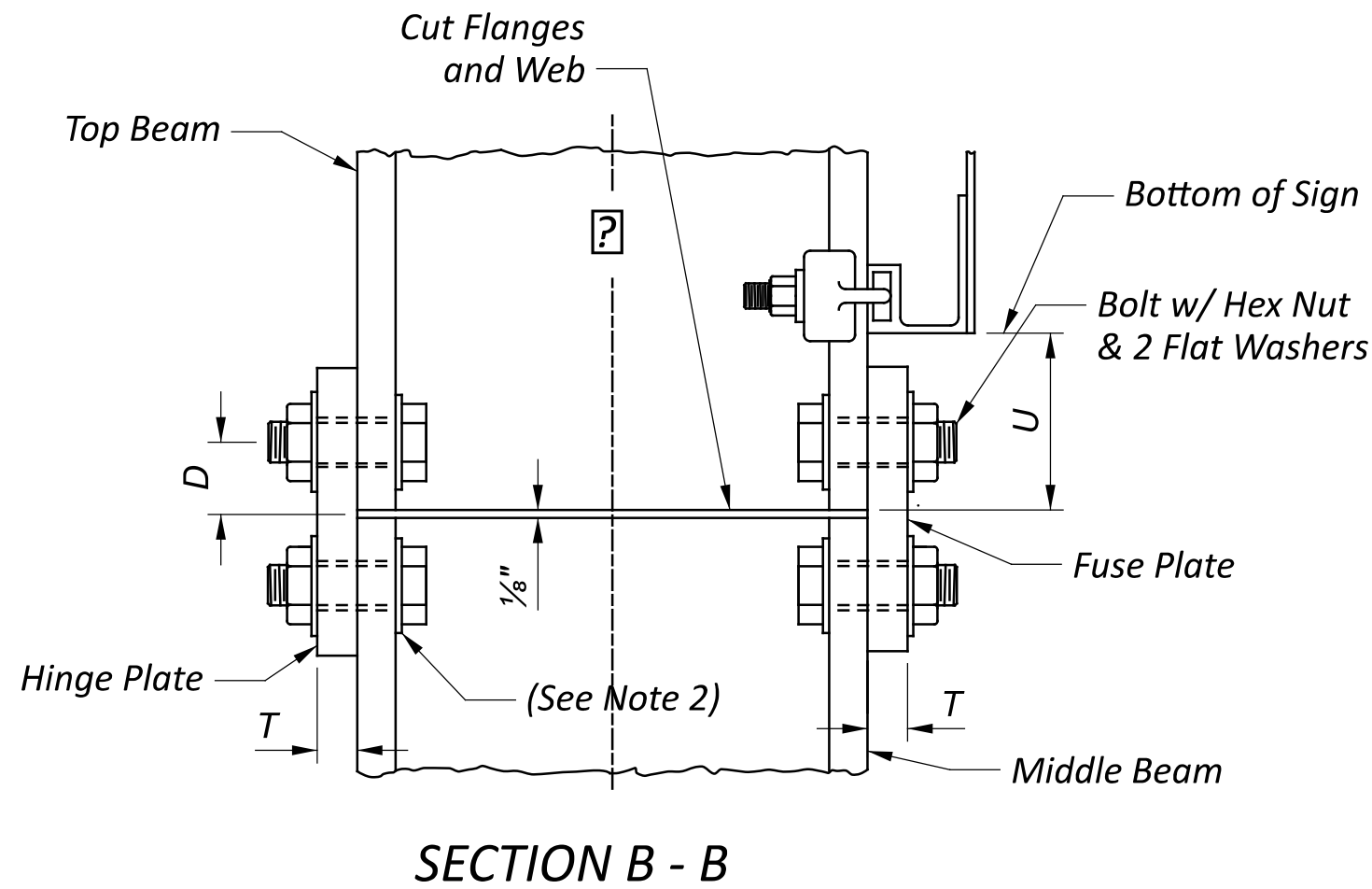
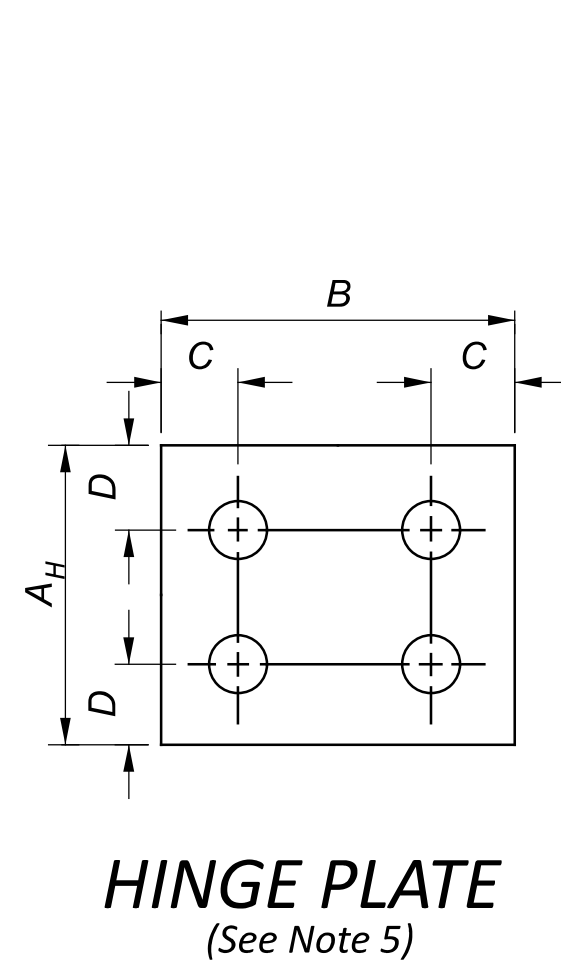
1. If Type B1 wall is required, the reinforcing steel in the drilled shaft connecting wall shall remain in the same position, relative to the top of the wall, as in the Type B wall.
2. Refer to Standard Construction Drawings (SCDs) TC-21.11 and TC-21.21 for reinforcement schedules and details.
3. For information regarding the transition sections of the barrier wall, see SCD RM-4.4.
4. For single slope concrete barrier shapes, see SCD RM-4.3.
5. All reinforcing steel shall be epoxy coated, comply with and be placed in accordance with C&MS 509.
6. Provide all anchor bolts with standard steel hex nuts, leveling nuts, and plain washers. The nuts shall be capable of developing the full strength of the anchor bolts. Anchor bolts shall be Grade 105. Threads shall be UNC-2A, and may be either rolled or cut, and coarse threaded. The embedded end of the anchor bolt shall be headed or threaded with a heavy hex nut. Provide smooth steel rod anchor bolt material threaded at the ends or over its entire length. Hex nuts shall be ASTM A563, American Standard heavy hex, Grade DH, with UNC-2B threads. Plate washers shall be A709 Grade 36 or Grade 50. Anchor bolts shall be hot-dip galvanized over their entire length, as per C&MS 711.02, after fabrication and threading. All nuts and plate washers shall be galvanized per C&MS 711.02.
7. See SCDs TC-21.11 and TC-21.21 for anchor bolt projection length, "P".



SECTION A, TYPE B1 BARRIER
Note: 402, 601, 602, and 603 bars not shown



SLIP BASE DESIGN

**NOTES:**

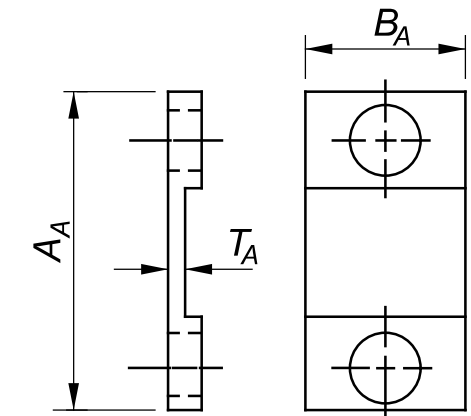
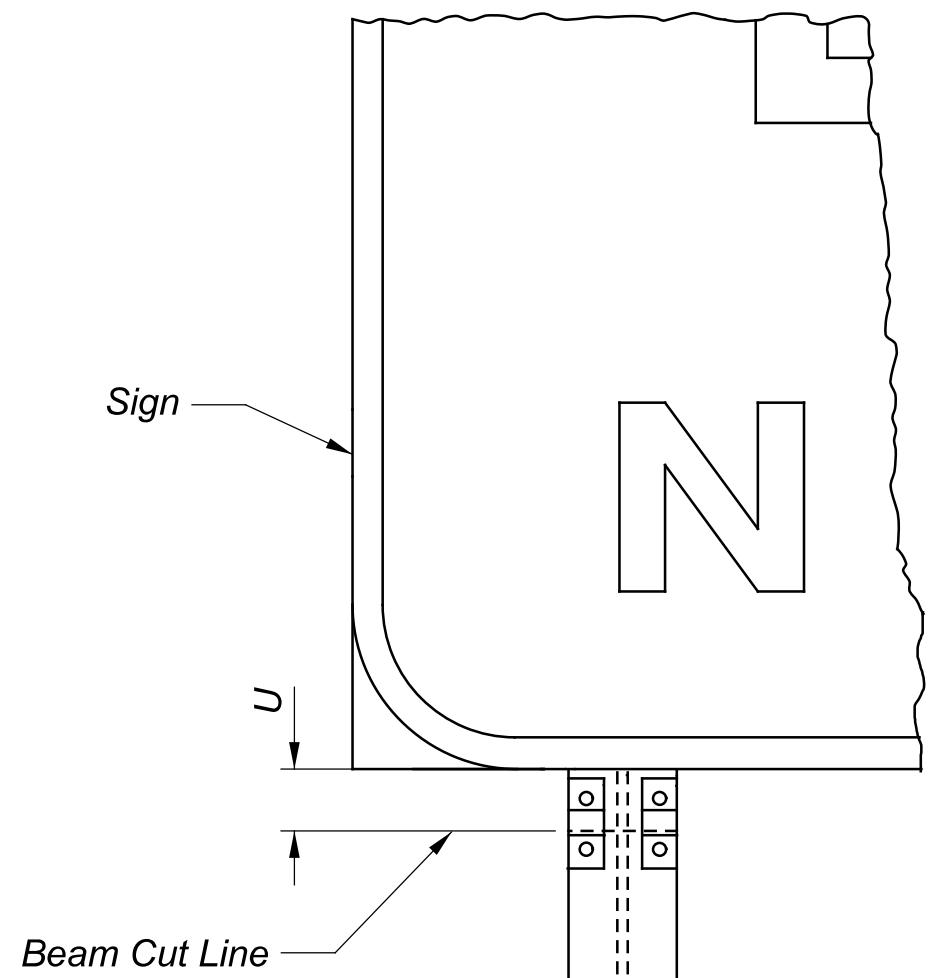
1. Base plate weld size shall be equal to the beam flange and web thickness respectively, but no less than 3/4" in either instance.
2. With the S4 x 7.7 beam, use malleable iron beveled washers conforming to ASTM A47 grade 35018.
3. Tighten fuse and hinge plate connections in the shop following a method approved by the Engineer to produce the minimum bolt preload specified.
4. Use the following procedure in assembling the breakaway base plate:

After all bolts, washers, standard nuts and bolt retainer plates are in place, tighten all standard nuts snug tight with a 12" wrench. Loosen each bolt in turn and retighten in a systematic manner to the specified maximum torque. Calibrate wrenches at least once each working day for each bolt diameter being torqued. Burr threads at junction with nut using a center punch.
5. For beams subject to impact from opposite directions, such as in freeway medians, provide fuse plates on both sides.
6. Notches are shown for the installation to the right of traffic. For installations to the left of traffic, fabricate with skewed edge of notches reversed from that shown.
7. Dimensions shown for alternate designs are approximate. Specified dimensions for alternate designs require prequalification. An approved list of suppliers can be provided by ODOT. Payment for alternate designs will be based on the plan quantities for embedded beams.

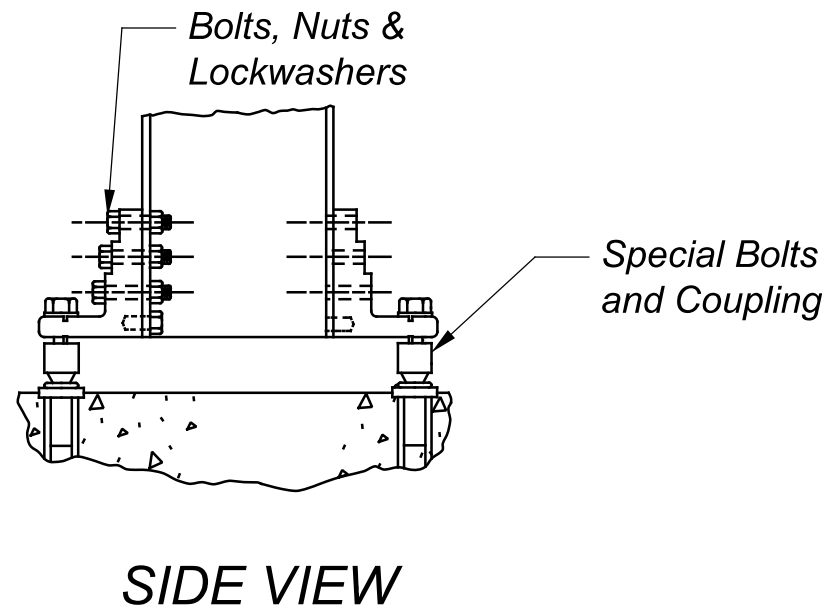
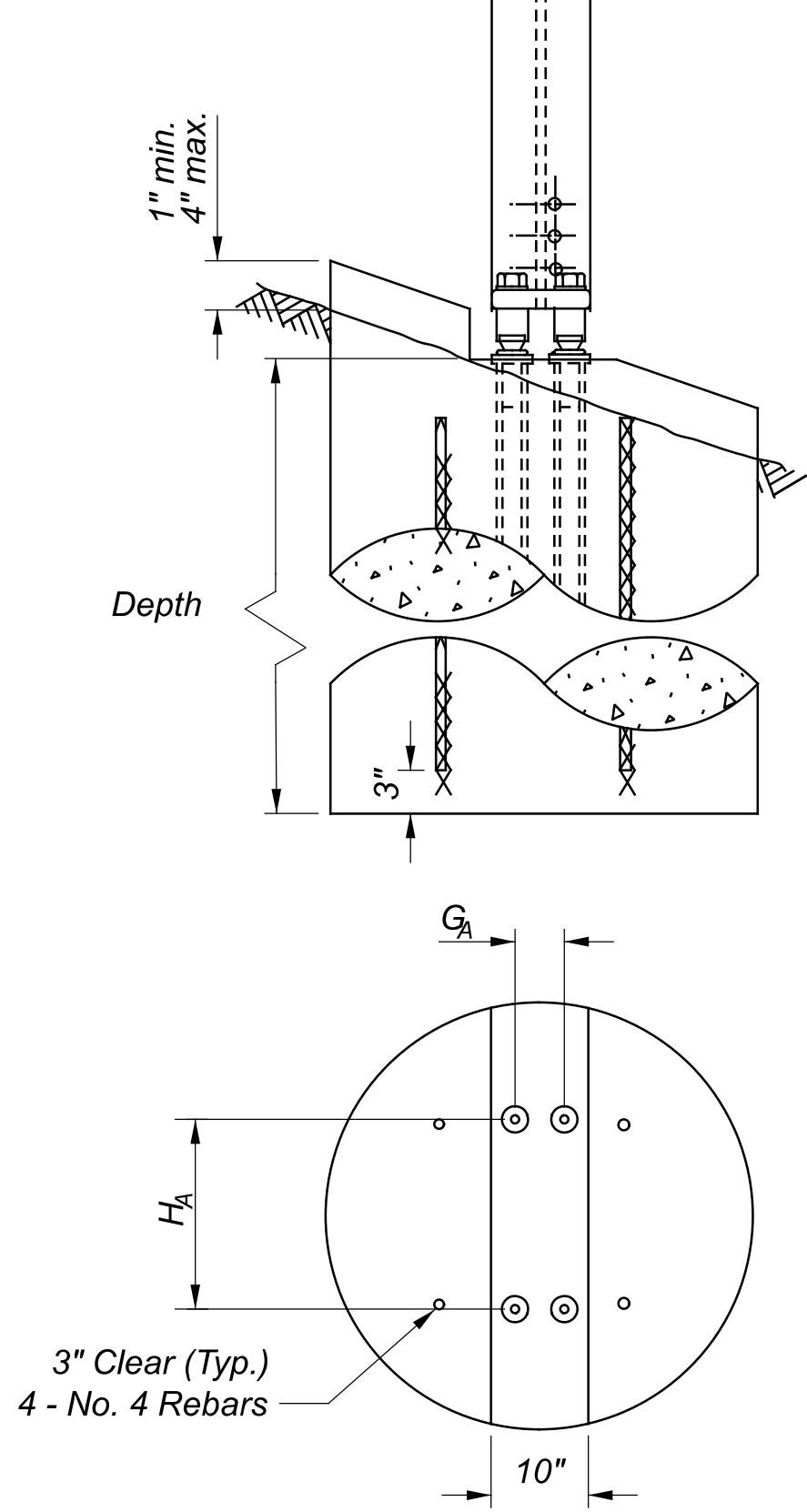
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

BEAM		HINGE AND FUSE PLATE DIMENSIONS											FOUNDATIONS			BASE PLATE DIMENSIONS								
TYPE	SIZE	A _H	A _F	B	C	D	E	T	U	HOLE DIA.	BOLT SIZE	MIN. PRELOAD (LB)	DIA. (FT)	DEPTH (FT)	CONCRETE (CU YD/EA)	DIMENSIONS						HOLE DIA.	BOLT SIZE	MAX. TORQUE (IN/LBS)
																G	H	J	K	L	T _B			
S4 X 7.7	4 x 2-5/8	4-1/8	3-5/8	2-5/8	9/16	1	1/2	3/16	2-1/2	9/16	1/2	10,000	1.5	4	0.27	4	8	2	1/2	1	3/4	9/16	1/2	200
W6 X 9	5-7/8 x 4	4-1/8	3-5/8	4	7/8	1	1/2	3/16	2-1/2	9/16	1/2	10,000	1.5	5	0.33	5-1/2	10	2-1/16	1/2	1	3/4	9/16	1/2	200
W10 X 12	9-7/8 x 4	6-1/8	5-3/8	4	7/8	1-1/2	3/4	3/16	3-1/2	13/16	3/4	25,000	2.5	6	1.10	8	14-1/2	2-5/16	3/4	1-1/2	3/4	13/16	3/4	750
W8 X 18	8-1/8 x 5-1/4	7-1/8	6-1/4	5-1/4	1-1/4	1-3/4	7/8	1/4	4	15/16	7/8	35,000	2.5	6	1.10	8	14-1/2	3-1/4	3/4	1-1/2	1	13/16	3/4	750
W10 X 22	10-1/8 x 5-3/4	8-1/8	7-1/8	5-3/4	1-1/2	2	1	5/16	4-1/2	1-1/16	1	46,000	2.5	6.75	1.23	8	14-1/2	2-5/16	15/16	2	1	1-1/16	1	1325
W12 X 30	12-3/8 x 6-1/2	8-1/8	7-1/8	6-1/2	1-1/2	2	1	5/16	4-1/2	1-1/16	1	46,000	2.5	8.25	1.50	10	17	2-7/16	15/16	2	1-1/4	1-1/16	1	1325





ALTERNATE HINGE
AND FUSE PLATES
(4 PER BEAM)



ALTERNATE DESIGN

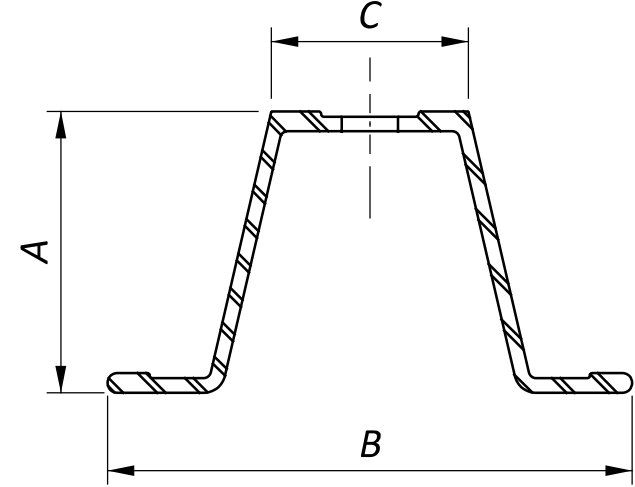
ALTERNATE DESIGN

(See Note 7)

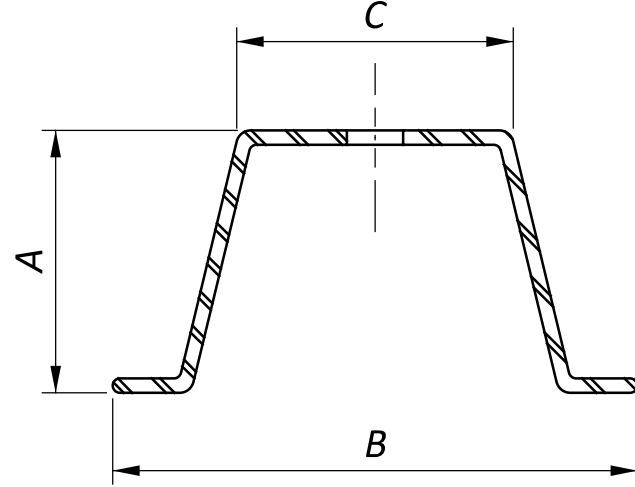
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

BEAM		HINGE AND FUSE PLATE				FOUNDATIONS			BASE PLATE DIMENSIONS		
TYPE	SIZE	A _A	B _A	BOLT SIZE	T _A	DIA. (FT)	DEPTH (FT)	CONCRETE (CU YD/EA)	G _A	H _A	BOLT SIZE
S4 X 7.7	4 x 2-5/8	3-3/4	1	1/2	0.071	1.5	4	0.27	4-1/4	7-11/16	1/2
W6 X 9	5-7/8 x 4	3-3/4	1	1/2	0.071	1.5	5	0.33	4-1/4	9-9/16	1/2
W10 X 12	9-7/8 x 4	3-3/4	1	1/2	0.071	2.5	6	1.10	4-1/4	13-5/8	1/2
W8 X 18	8-1/8 x 5-1/4	4-3/4	1-1/2	3/4	0.113	2.5	6	1.10	3	16-1/4	1/2
W10 X 22	10-1/8 x 5-3/4	4-3/4	1-1/2	3/4	0.113	2.5	6.75	1.23	4	18-5/16	5/8
W12 X 30	12-3/8 x 6-1/2	4-3/4	1-1/2	3/4	0.113	2.5	8.25	1.50	4	20-7/16	5/8

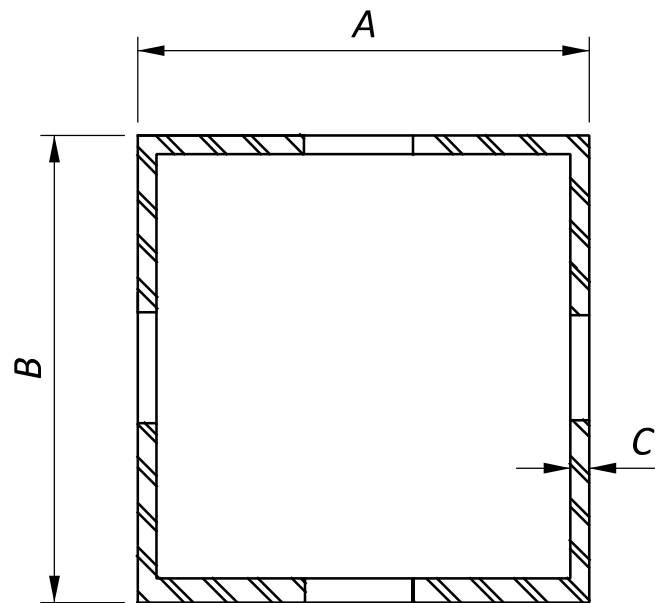




TYPE P

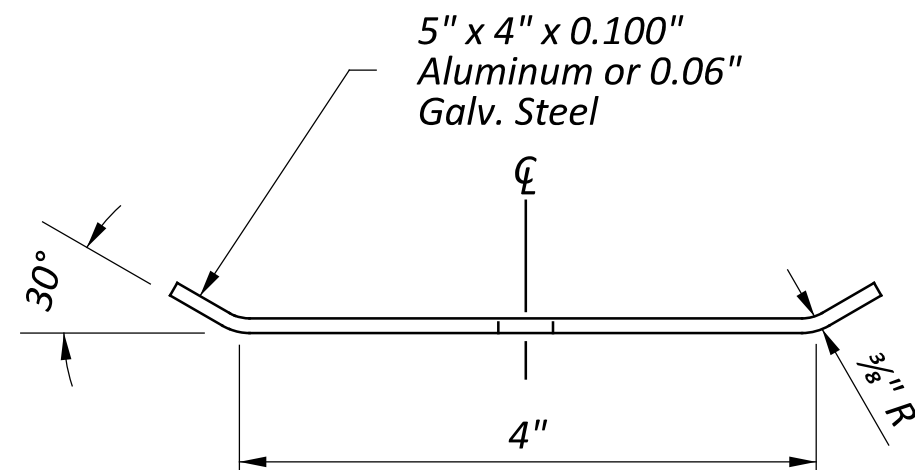


TYPE F

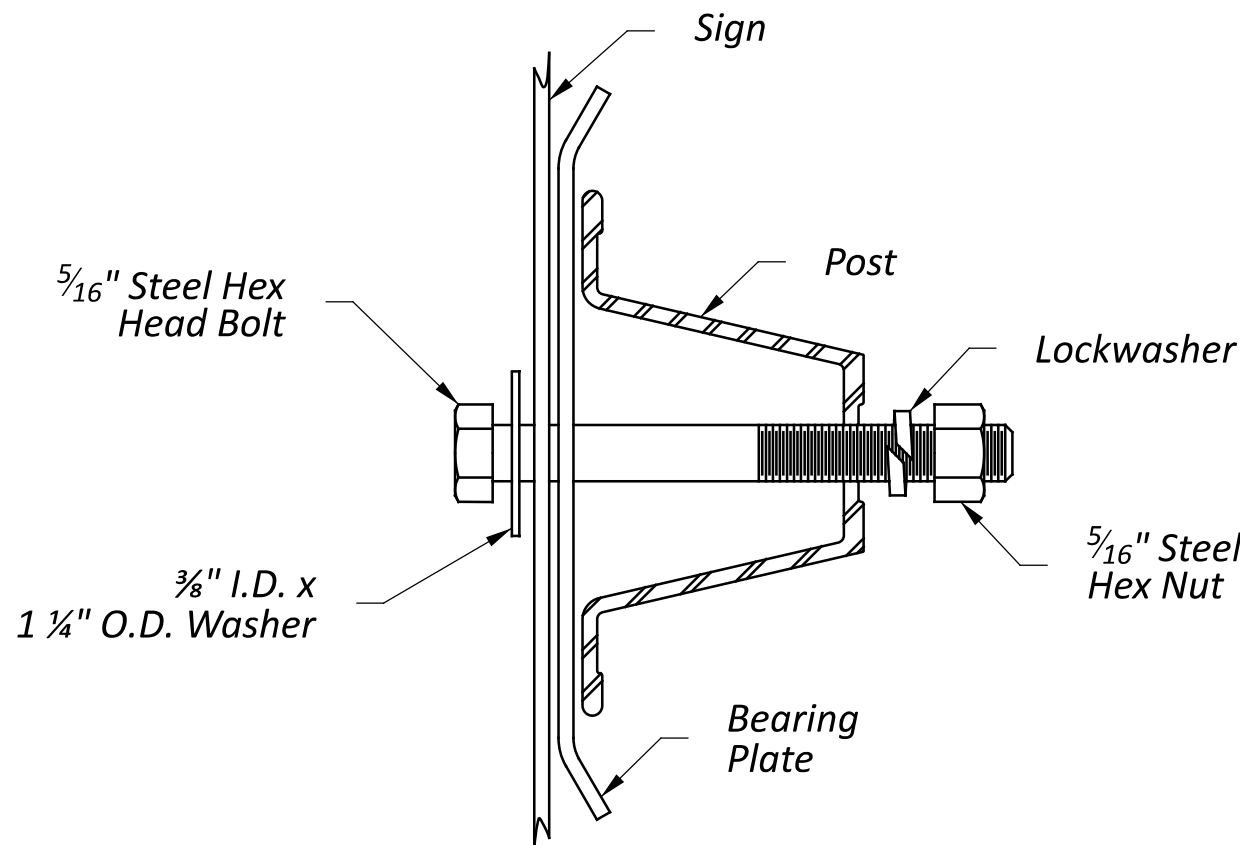


TYPE S

POST NO.	TYPE	LB/FT	POST DIMENSIONS (INCHES)			ANCHOR DIMENSIONS			# OF POSTS PERMITTED IN 7' PATH IN EXPOSED LOCATIONS
			A	B	C	A	B	C	
1	F	1.12	0.875	2.063	0.813				
2	P	2.00	1.469	3.063	1.281				2
	F	2.00	1.516	3.125	1.250				2
	S		1.750	1.750	0.083	2.000	2.000	0.105	2
3	P	3.00	1.875	3.500	1.313				2
	F	3.00	1.750	3.500	1.625				2
	S		2.00	2.00	0.083	2.250	2.250	0.105	2
4	P	4.00	TWO NO.2 POST						0
	F	4.00	TWO NO.2 POST						0
	S		2.500	2.500	0.105	3.000	3.000	0.188	1
6	P	6.00	TWO NO.3 POST						0
	F	6.00	TWO NO.3 POST						0

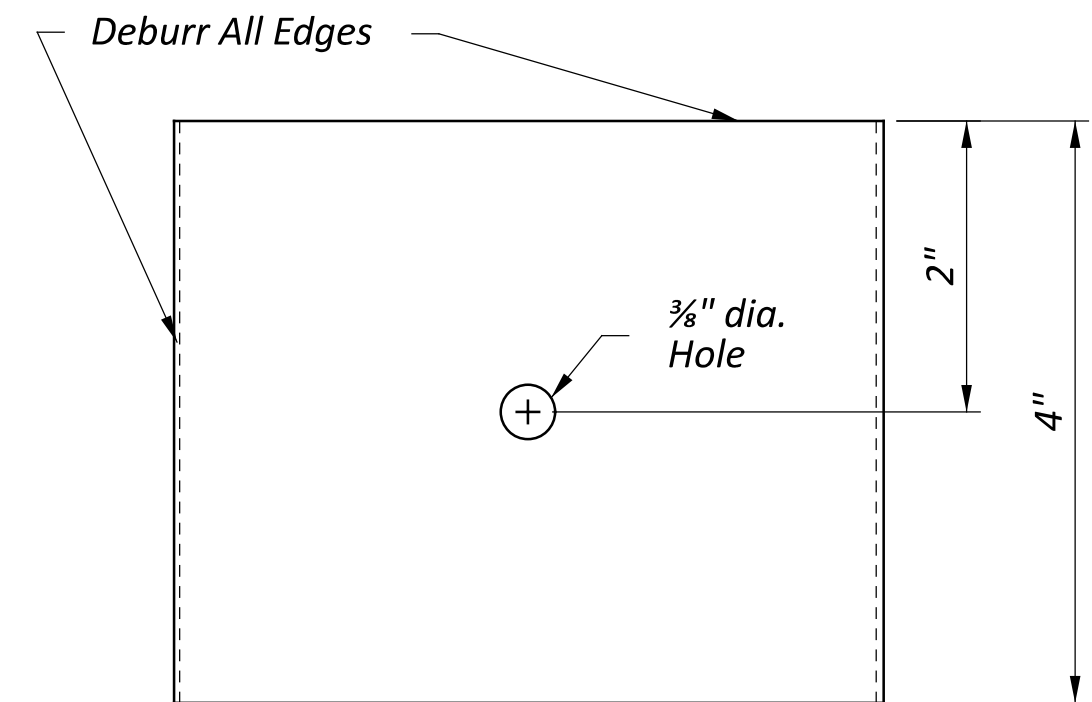


U-CHANNEL
SIGN ATTACHMENT DETAIL

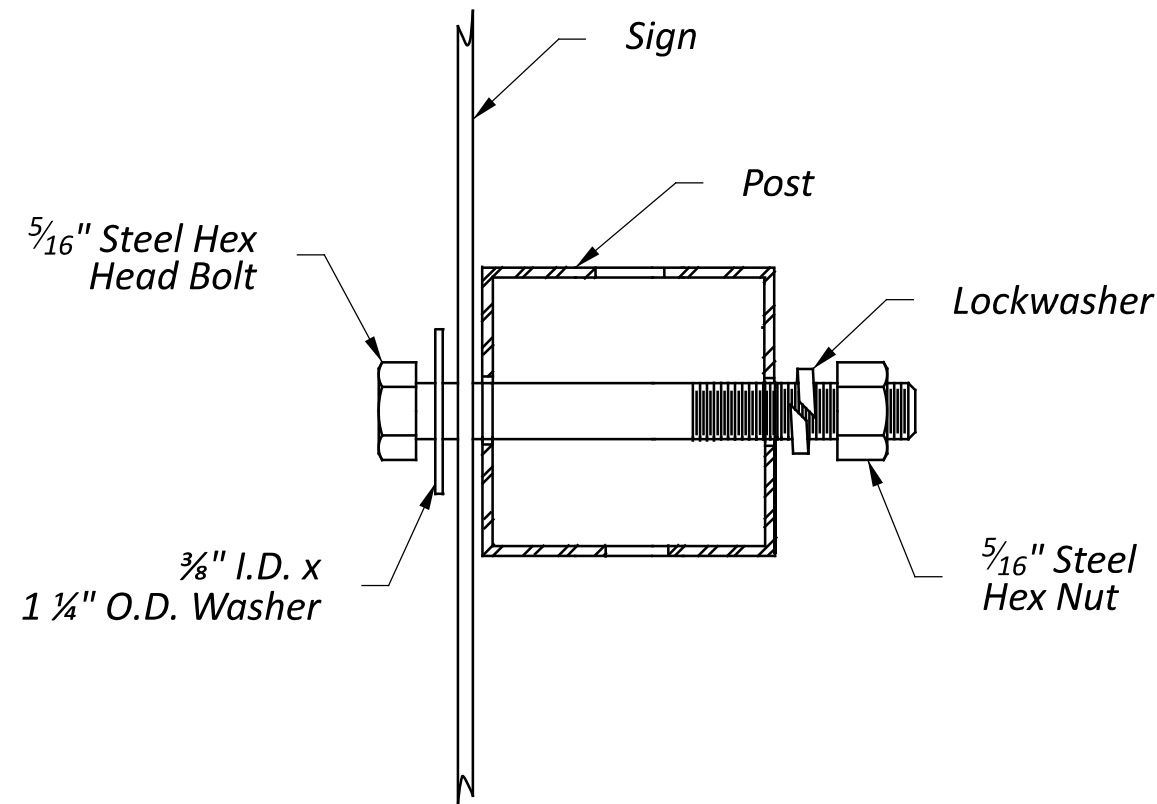


NOTES:

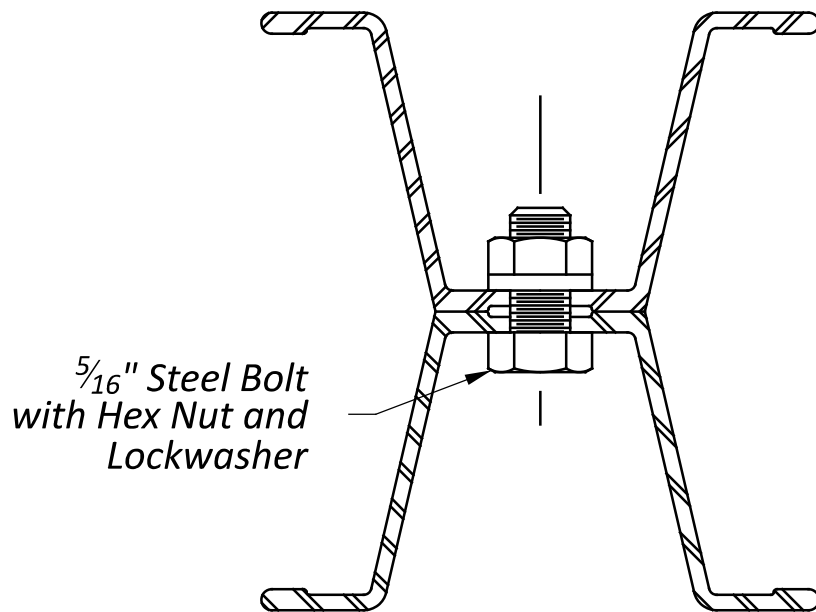
1. Install No. 4 type P and F posts, and No. 6 type P and F posts, only in protected locations (e.g., behind guardrail). Install two post installations of number 4 type S posts within 7 foot path only in protected locations.
2. Use of anchor base with No. 2 and No. 3 square post is optional. Use of anchor base with No. 4 square post is required.
3. Square post may have die-cut knockouts or open holes.



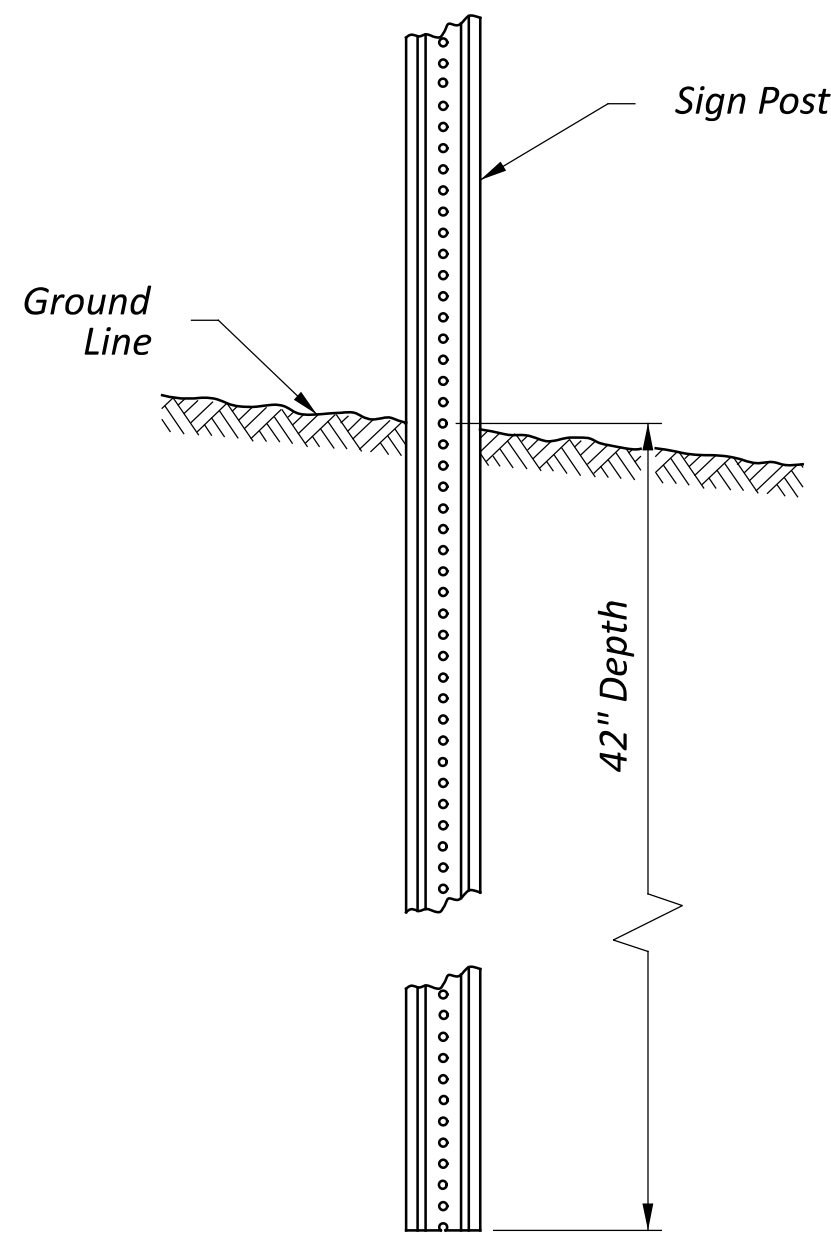
BEARING PLATE



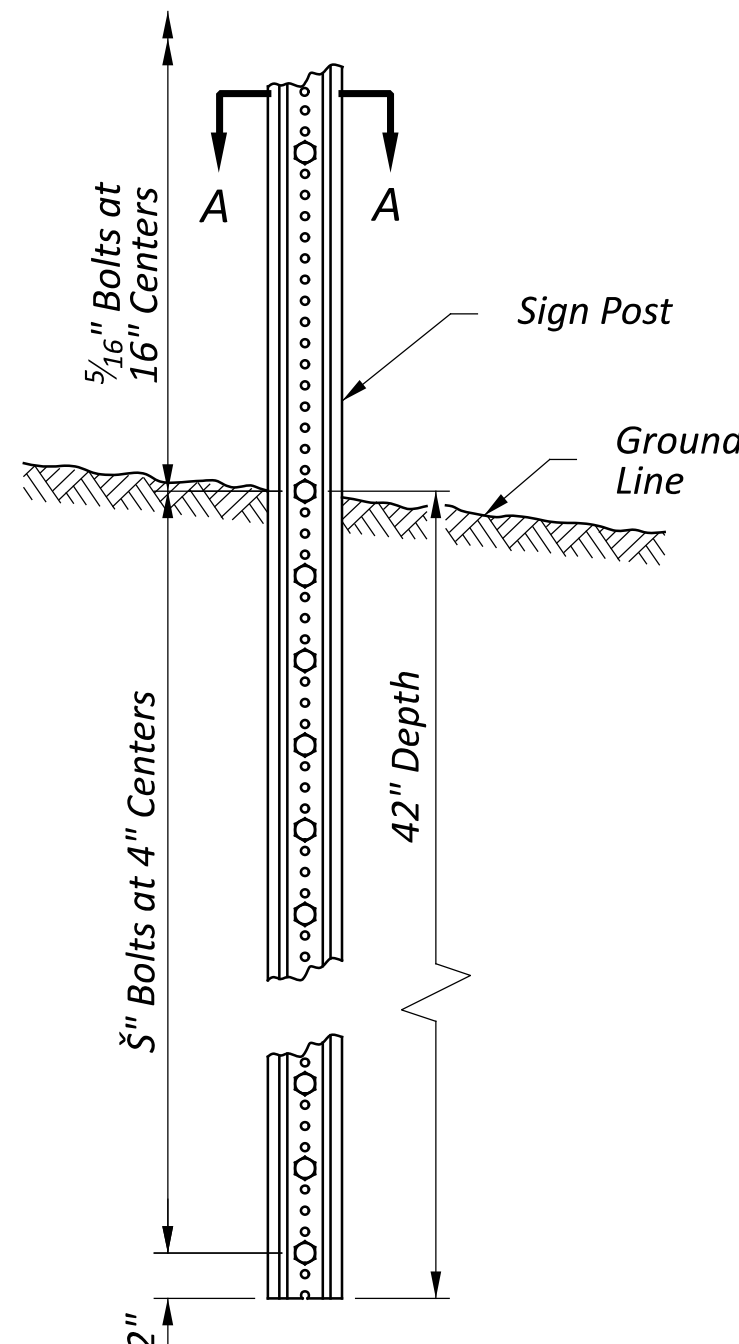
SQUARE POST
SIGN ATTACHMENT DETAIL



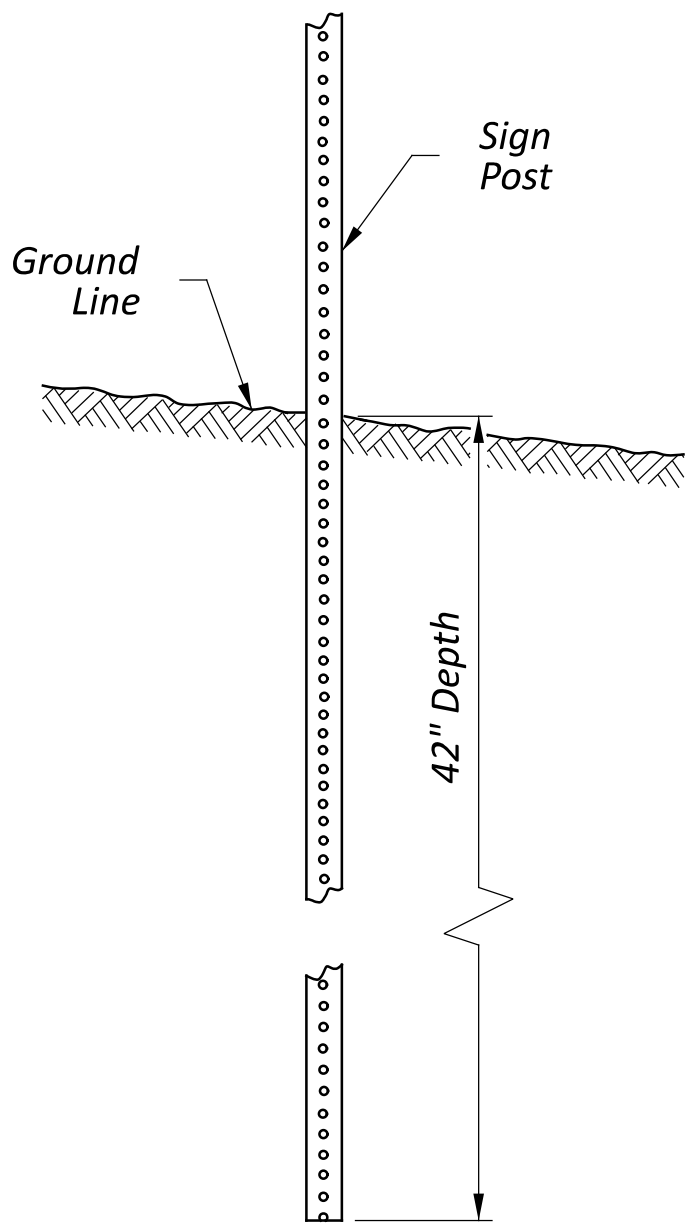
SECTION A-A



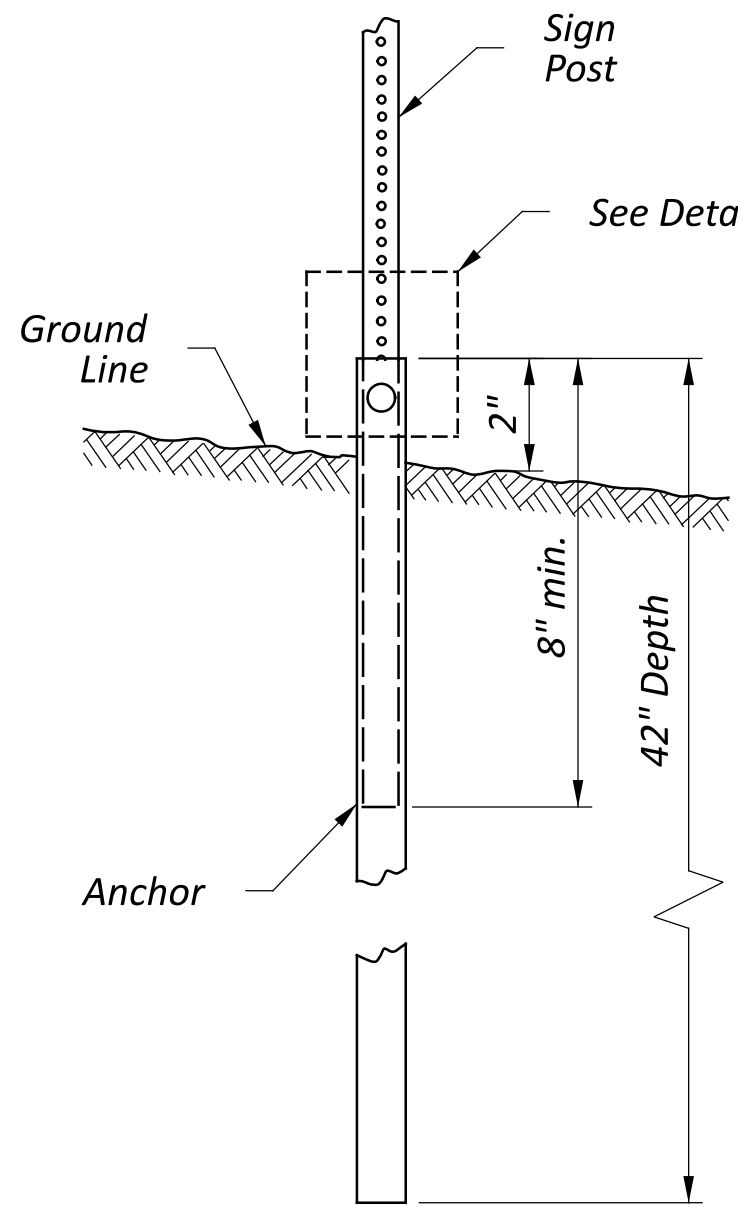
TYPICAL NO. 1, NO. 2
AND NO. 3 U-CHANNEL
DRIVEN INSTALLATION



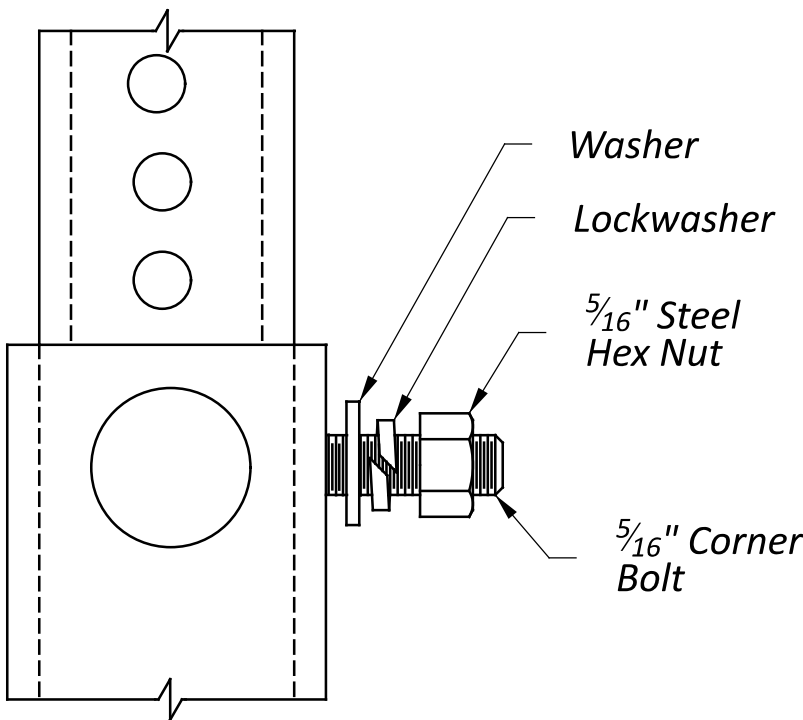
TYPICAL NO. 4 AND
NO. 6 U-CHANNEL
DRIVEN INSTALLATION



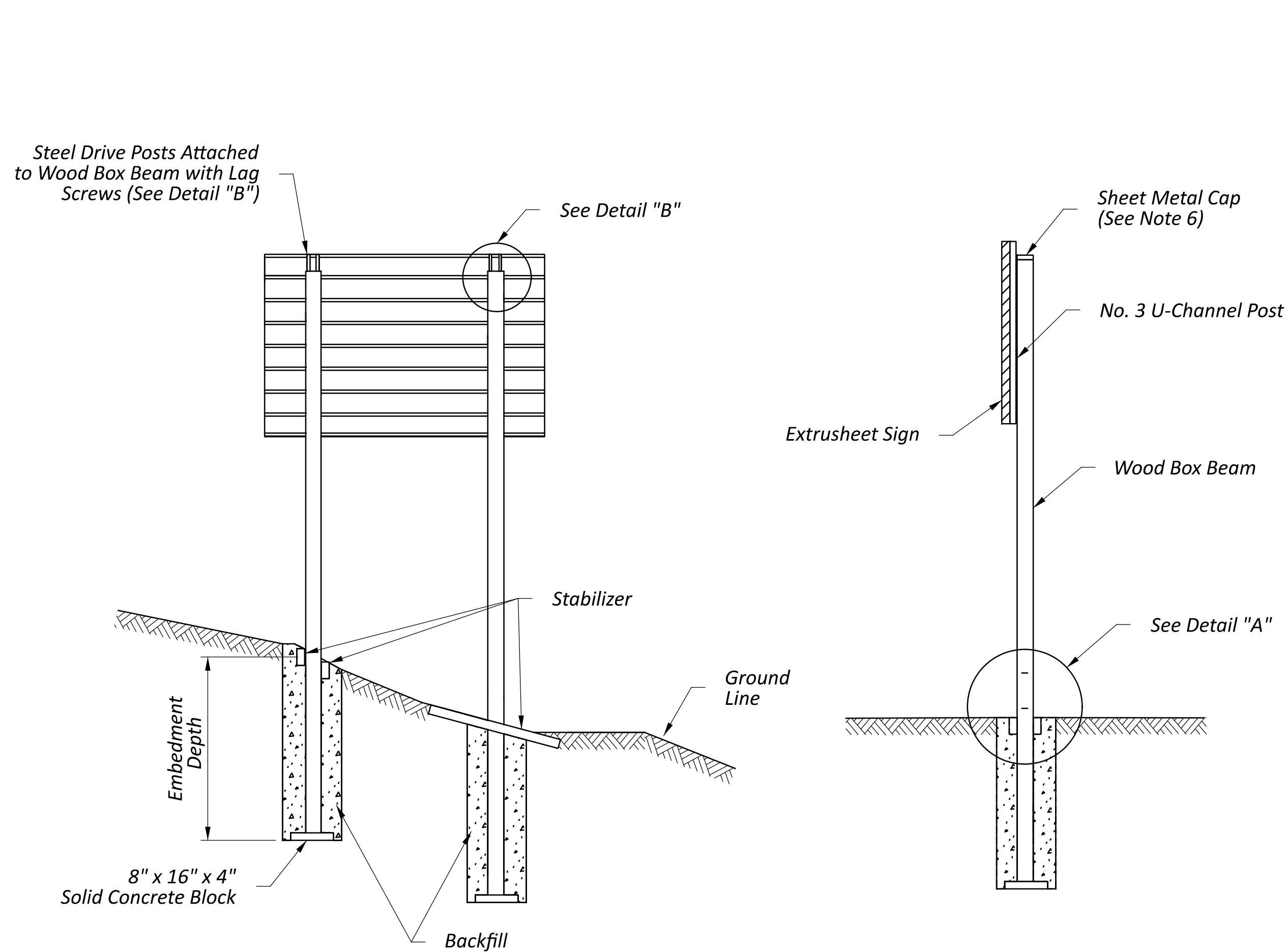
TYPICAL SQUARE POST
DRIVEN INSTALLATION



TYPICAL SQUARE POST ANCHOR
BASE INSTALLATION

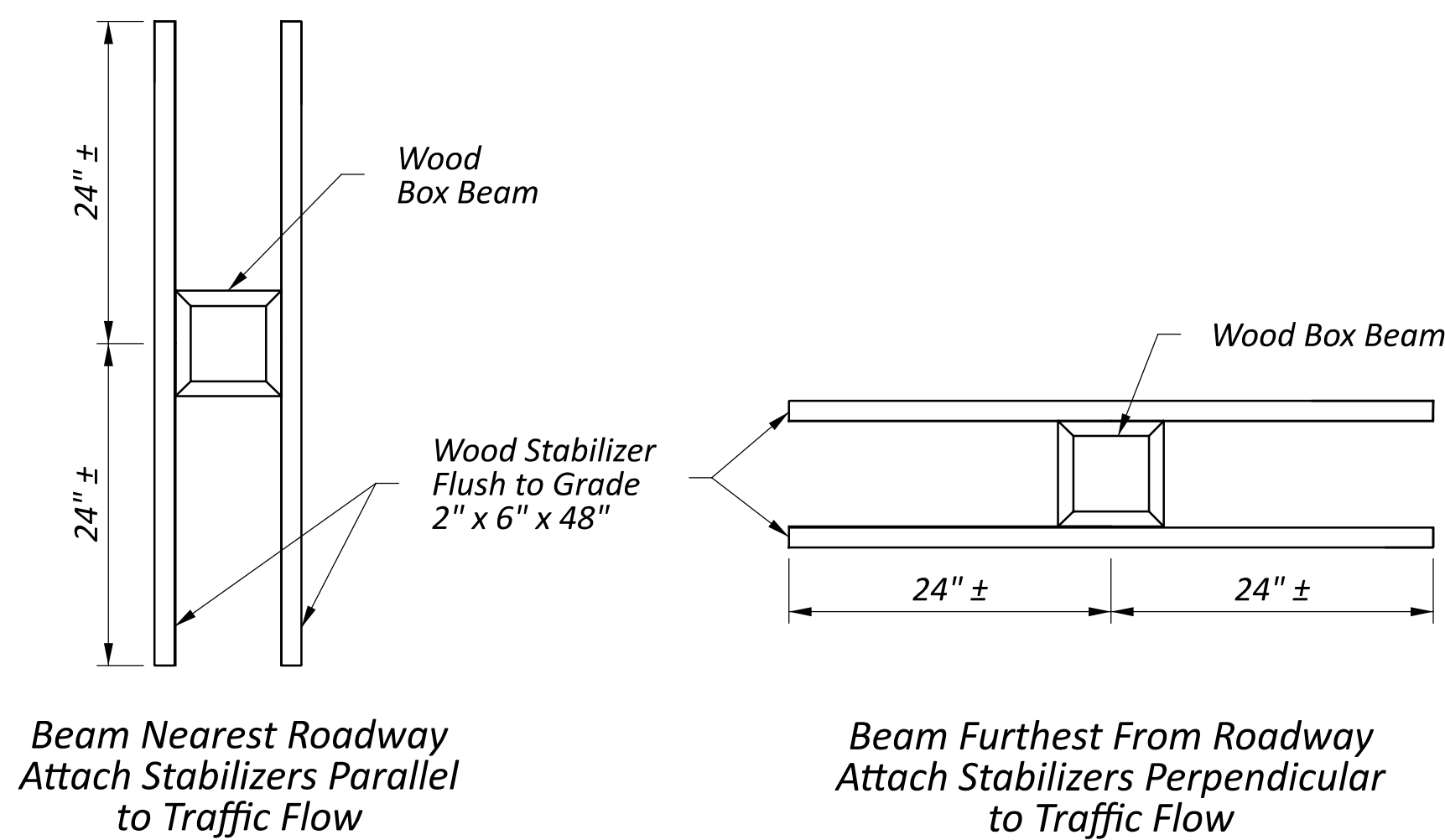
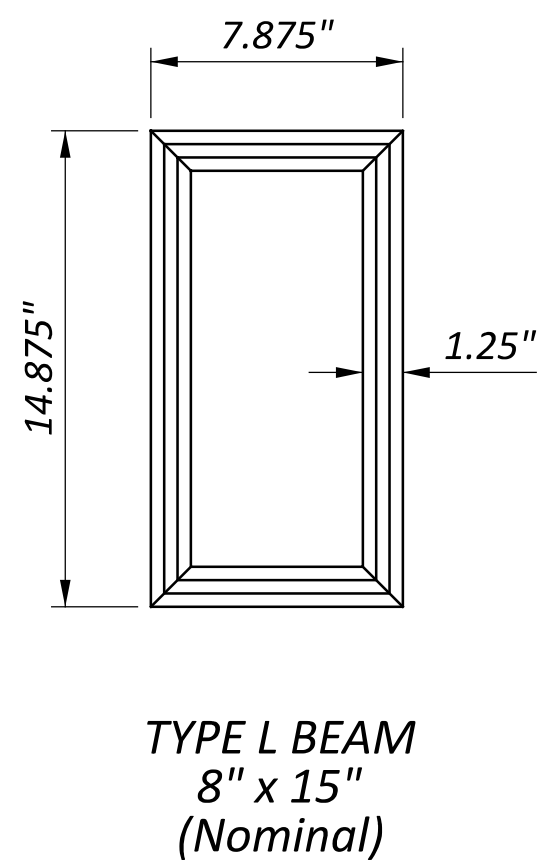


DETAIL "A"

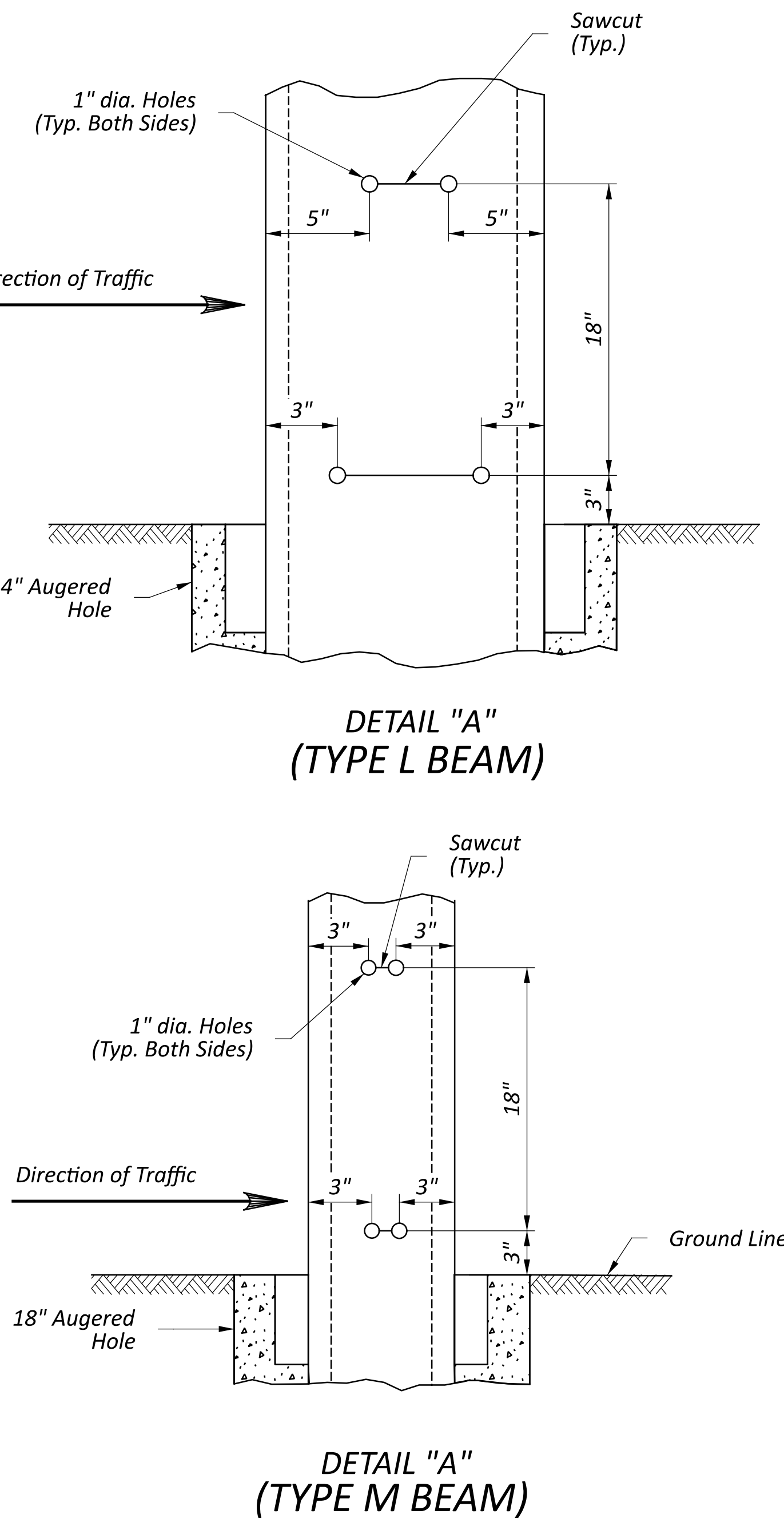
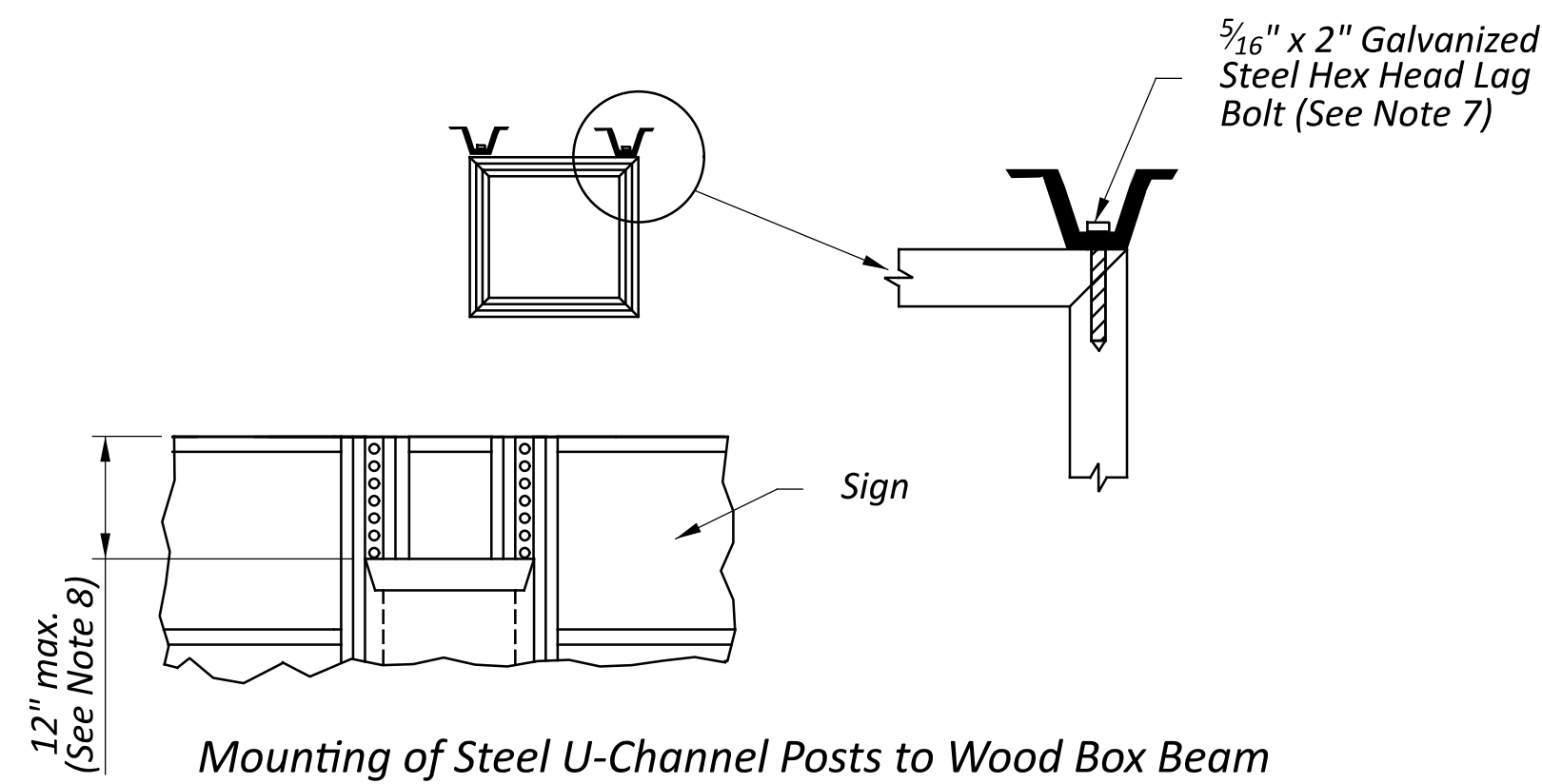


ELEVATION (REAR VIEW)

SIDE VIEW

WOOD STABILIZERS
(See Note 4)

PLACEMENT OF BOX BEAMS

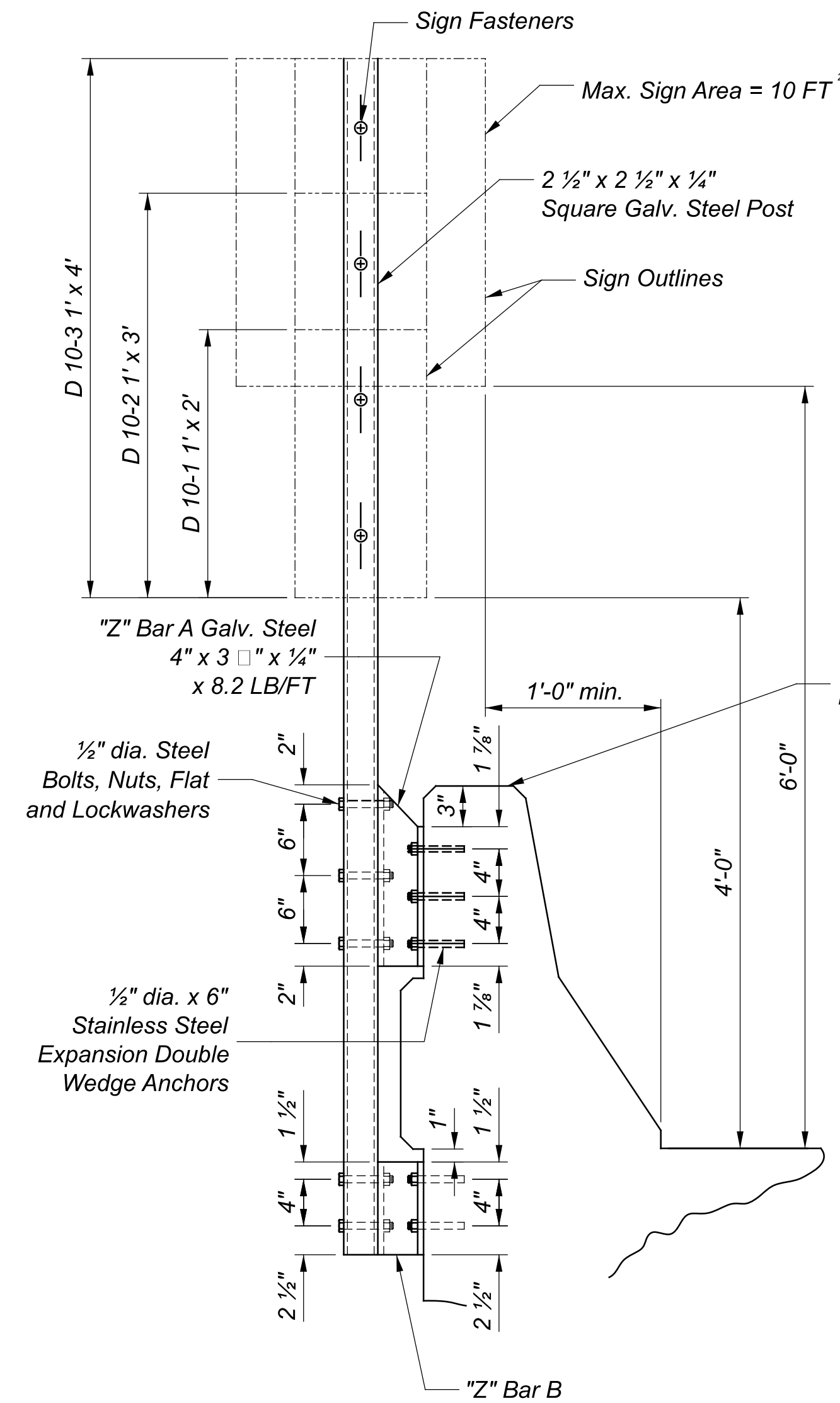
DETAIL "A"
(TYPE M BEAM)DETAIL "A"
(TYPE L BEAM)

DETAIL "B"

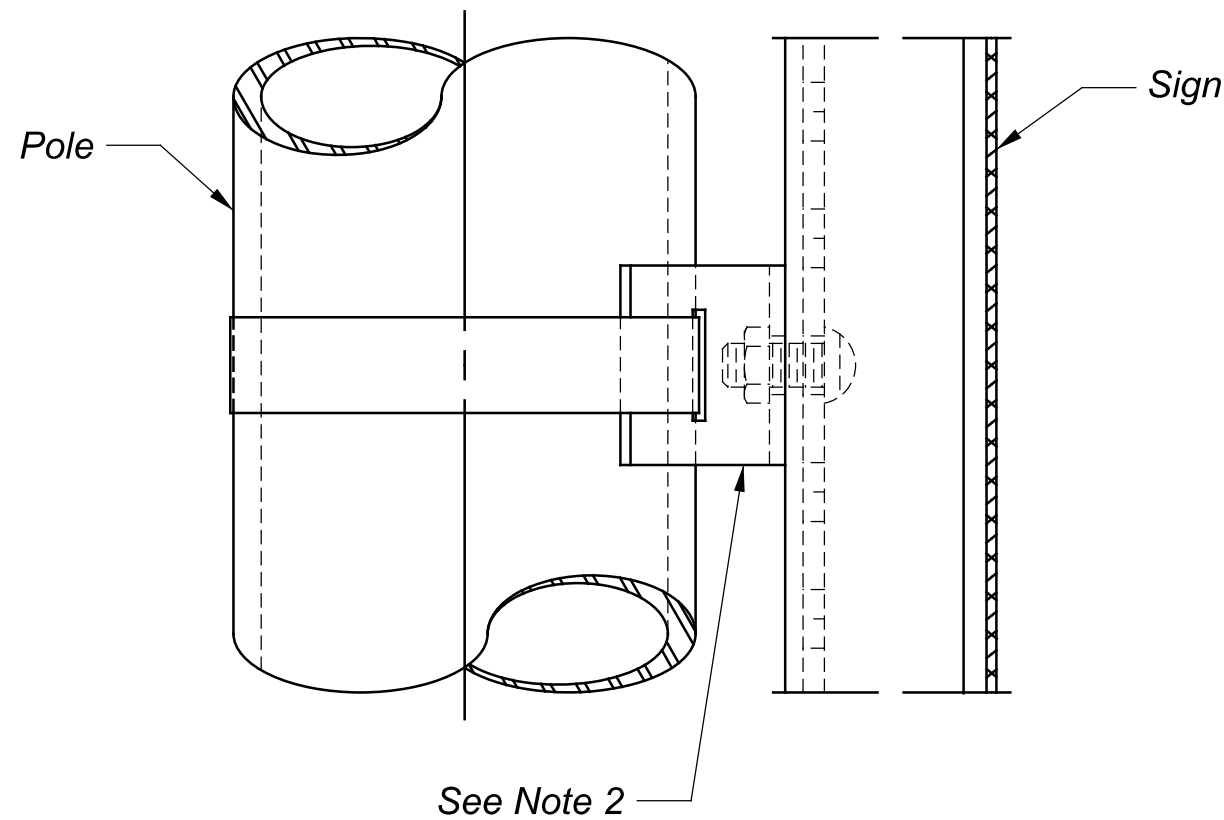
NOTES:

1. Auger holes to required depth using 18" auger for the Type M and 24" auger for the Type L post.
2. Place 8" x 16" x 4" solid concrete block in the bottom of each augered hole.
3. Backfill with suitable material (normally soil removed from hole is suitable for backfilling). Backfill in 4" lifts and tamp the soil firmly around the beam with a hydraulic pole tamper after each lift.
4. For each beam, install two wood stabilizers flush to grade by carefully removing only the amount of soil necessary to achieve their proper installation. Attach each stabilizer to the beam with four 16d common nails. Replace and firmly tamp the soil around the stabilizers with a hydraulic pole tamper. For three beam installations, install wood stabilizers on the middle beam perpendicular to traffic flow.
5. Install breakaway feature on both sides of each beam (see detail "A") by drilling 1" diameter holes (total eight holes per beam), and connecting the holes with a reciprocating saw (total four saw cuts per beam).
6. Install a commercial quality 20 gauge galvanized steel sheet metal cap to the top of each beam. Wrap the cap around the four sides of the beam and securely fasten in place using hot-dipped galvanized nails.
7. Attach two No. 3 u-channel posts to each beam, equal to the height of the sign. Use 5/16" x 2" hex head lag bolts installed in drilled 3/16" pilot holes. Install one lag bolt within 3" of the bottom of the post, and one within 3" of the top of the beam. Install additional lag bolts along each post with a maximum spacing of 12".
8. U-channel posts may be extended above the top of the beam a maximum of 12" to achieve proper sign height and leveling of sign.
9. Attach extrusheet sign to outer flanges of the u-channel posts on each beam with mounting clips as shown on Standard Construction Drawings TC-51.11 and TC-51.12.

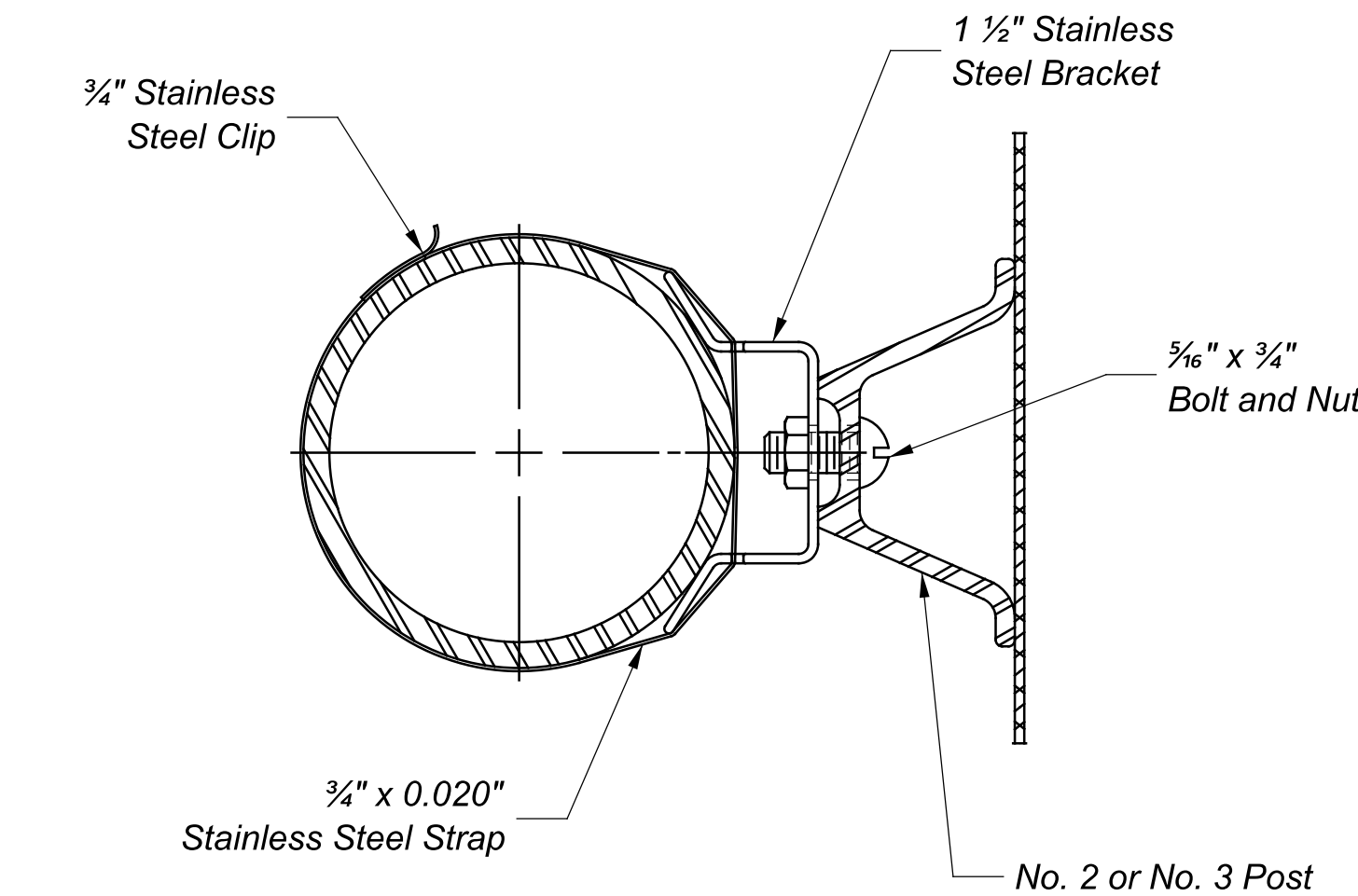




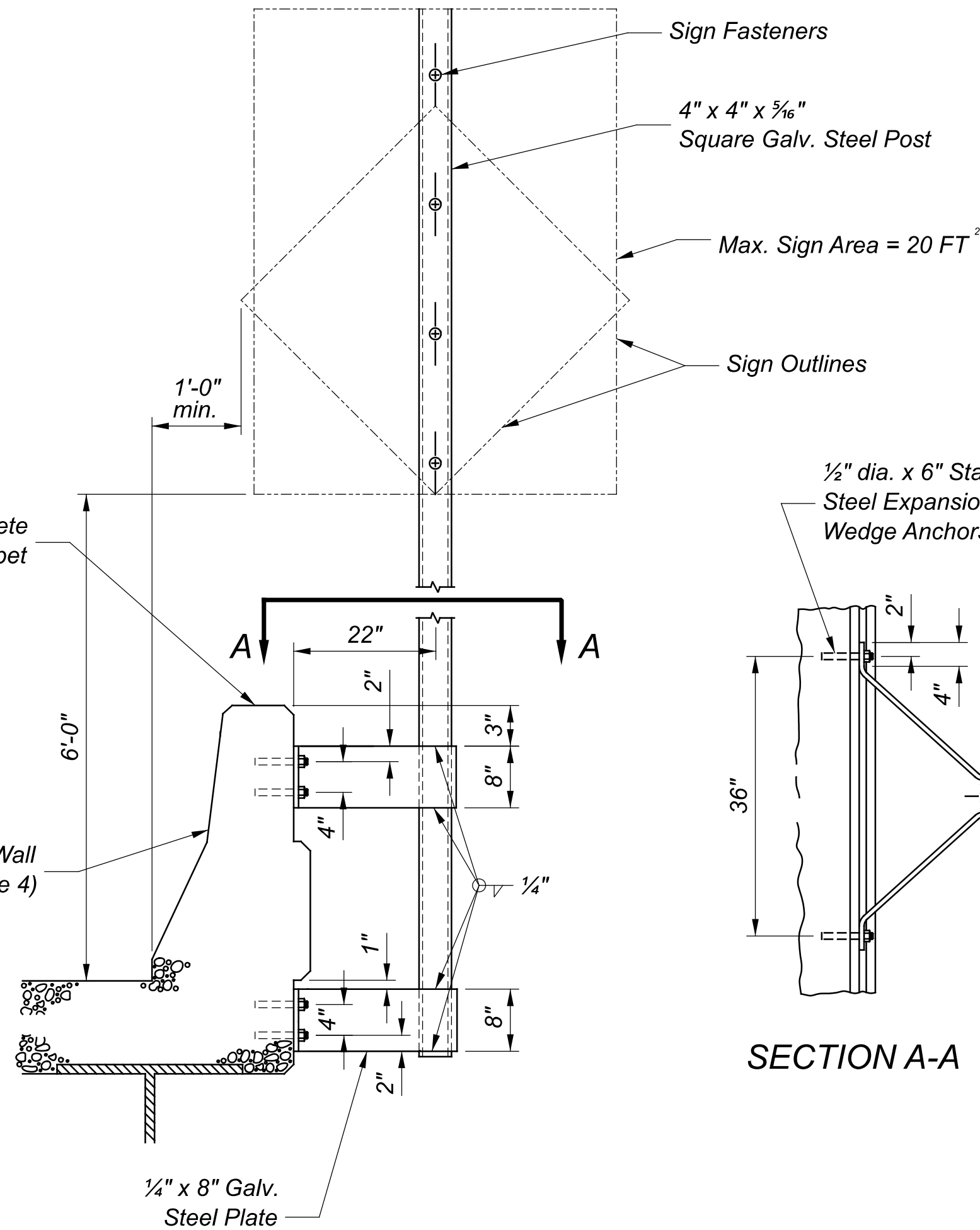
SIGN SUPPORT ASSEMBLY,
BRIDGE MOUNTED, TYPE 1



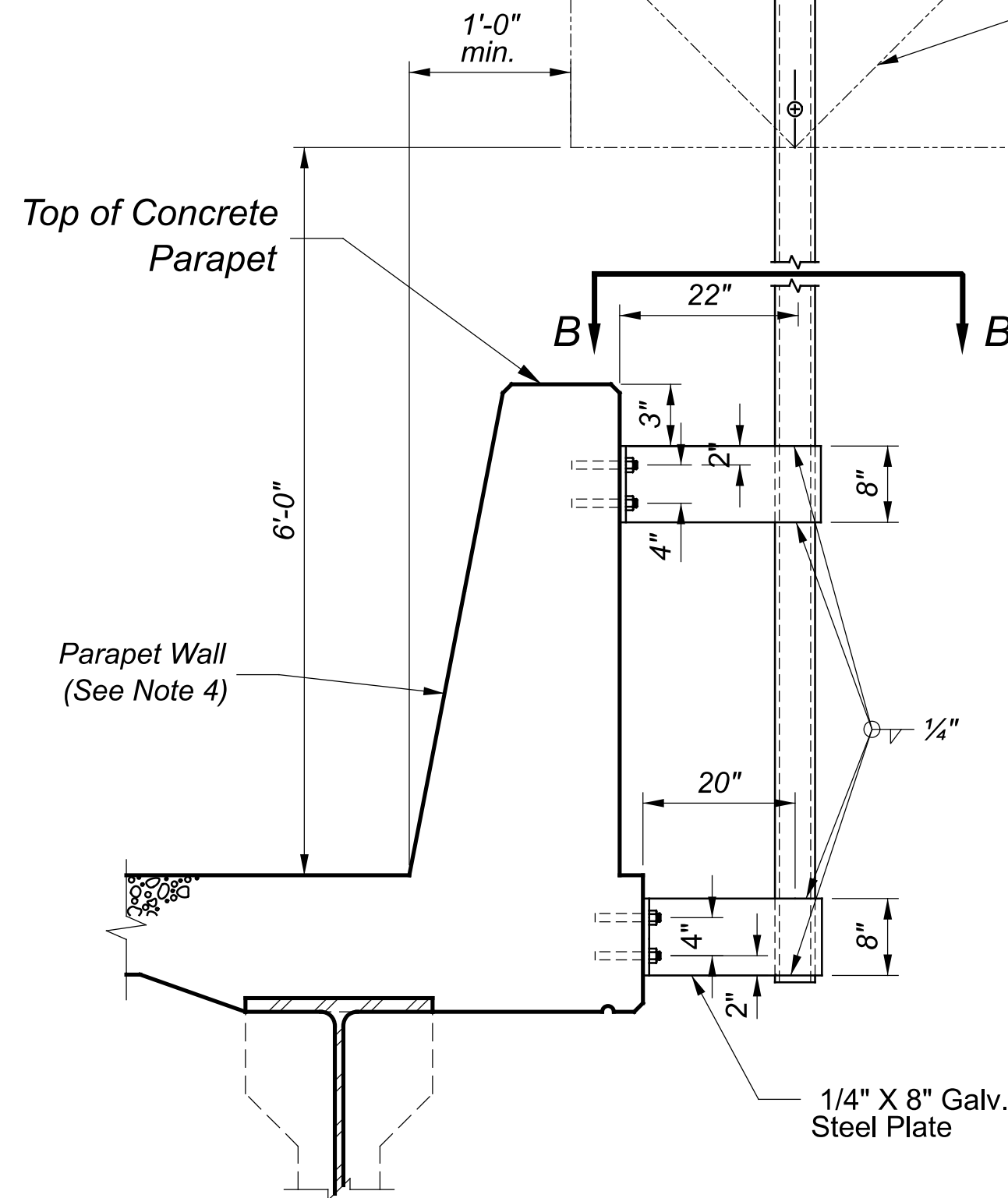
SIGN SUPPORT ASSEMBLY, POLE MOUNTED



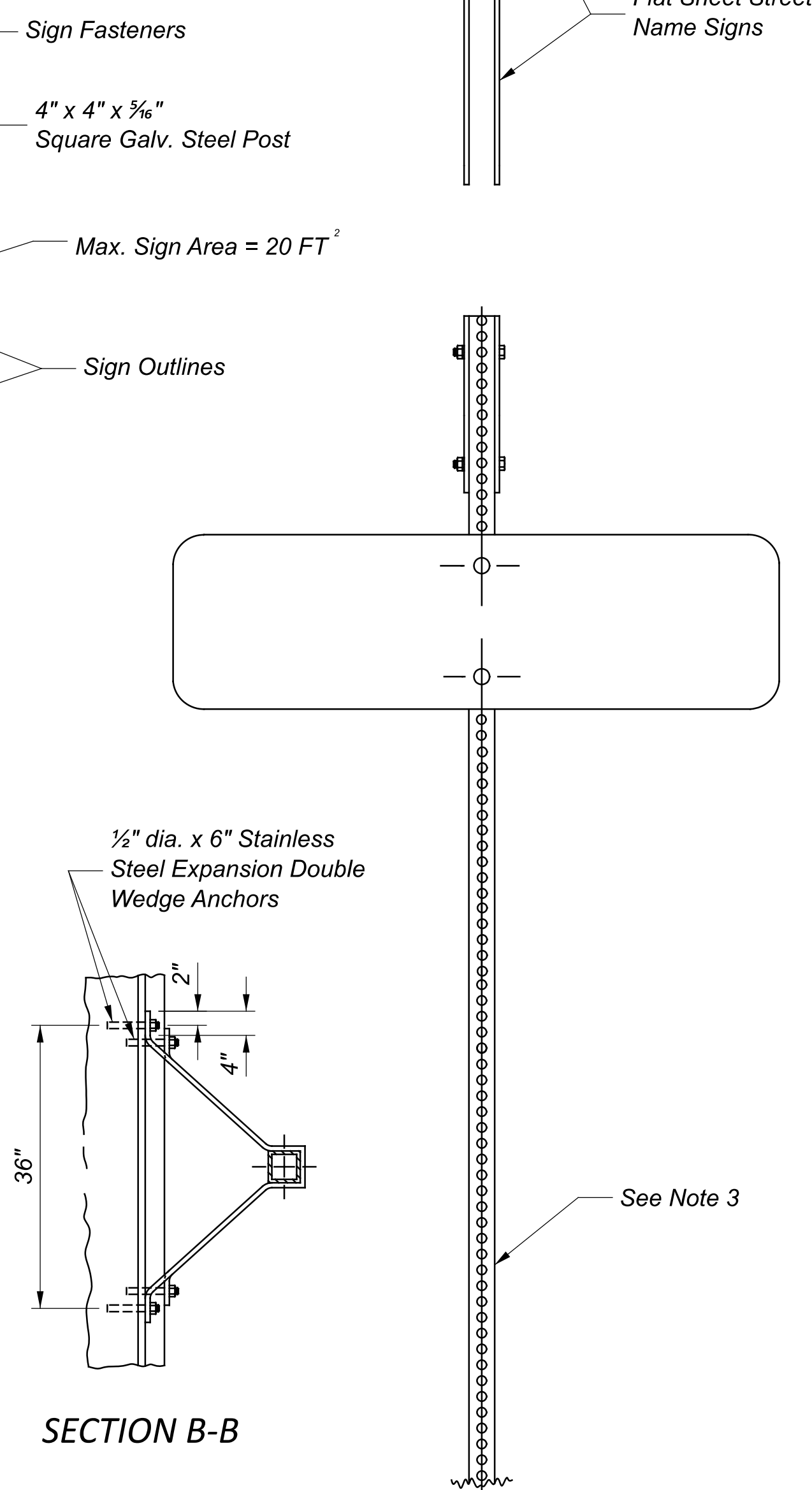
SIGN SUPPORT ASSEMBLY,
BRIDGE MOUNTED, TYPE 2



SECTION A-A



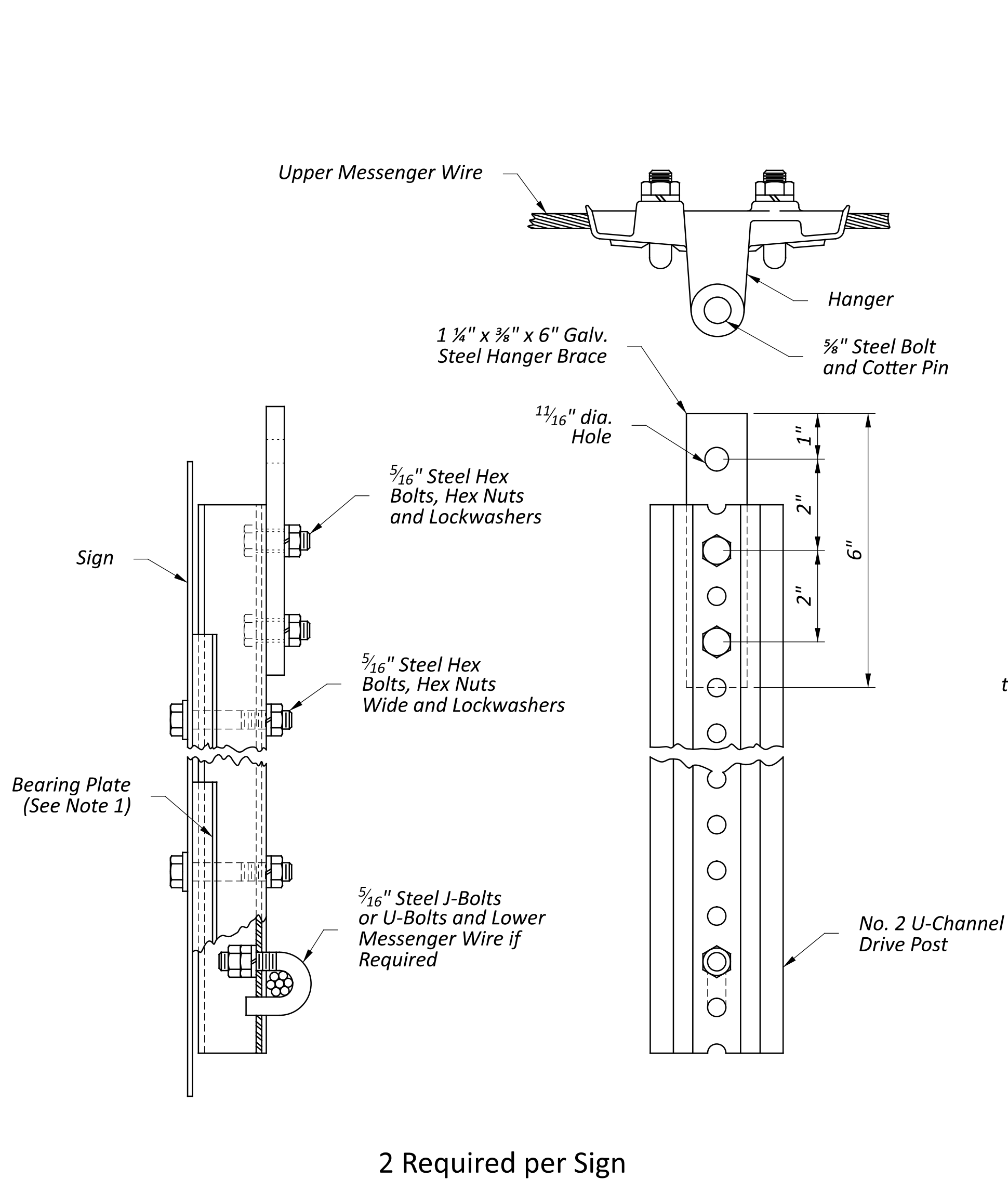
SIGN SUPPORT ASSEMBLY,
BRIDGE MOUNTED, TYPE 3



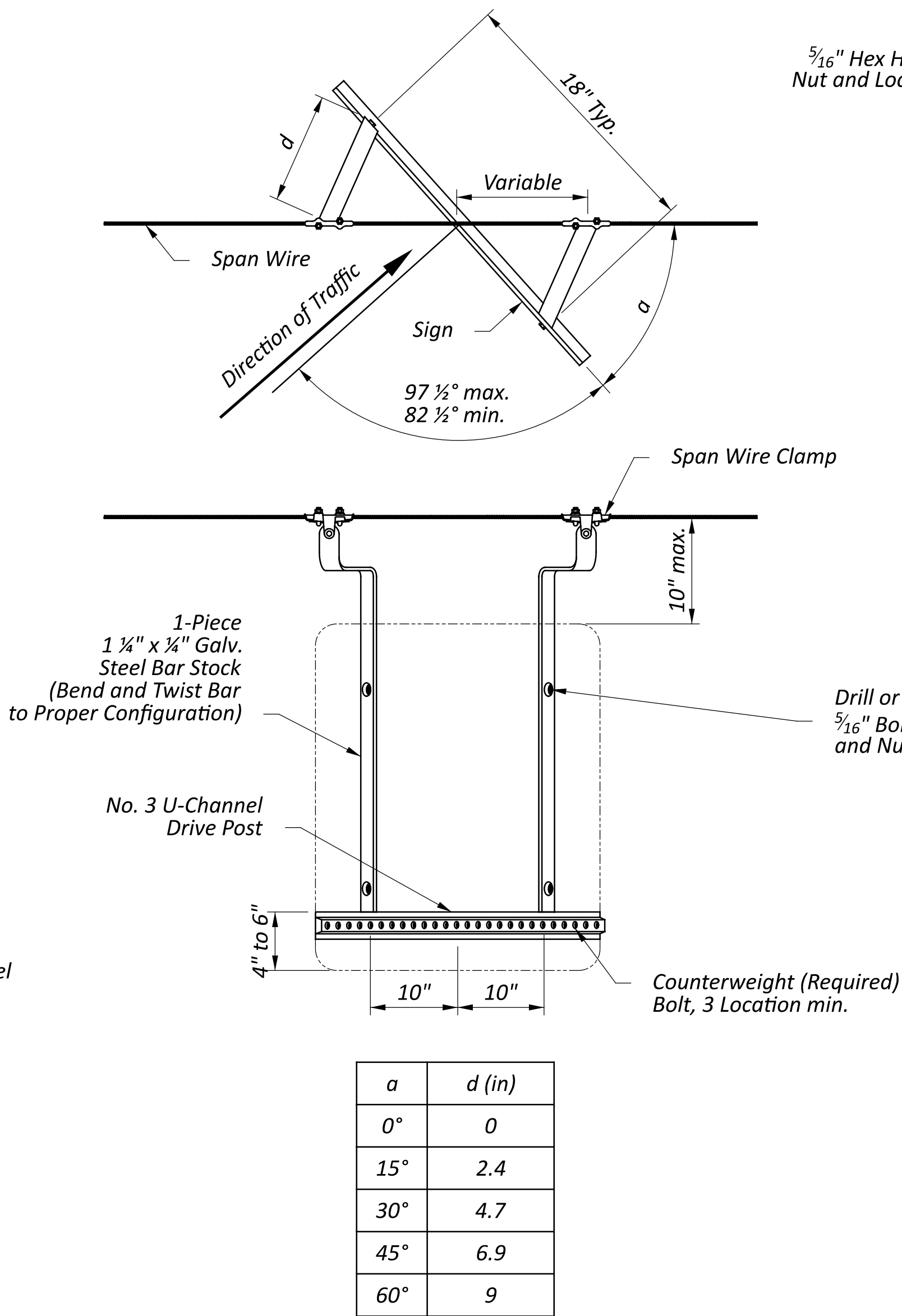
STREET NAME SIGN SUPPORT

NOTES

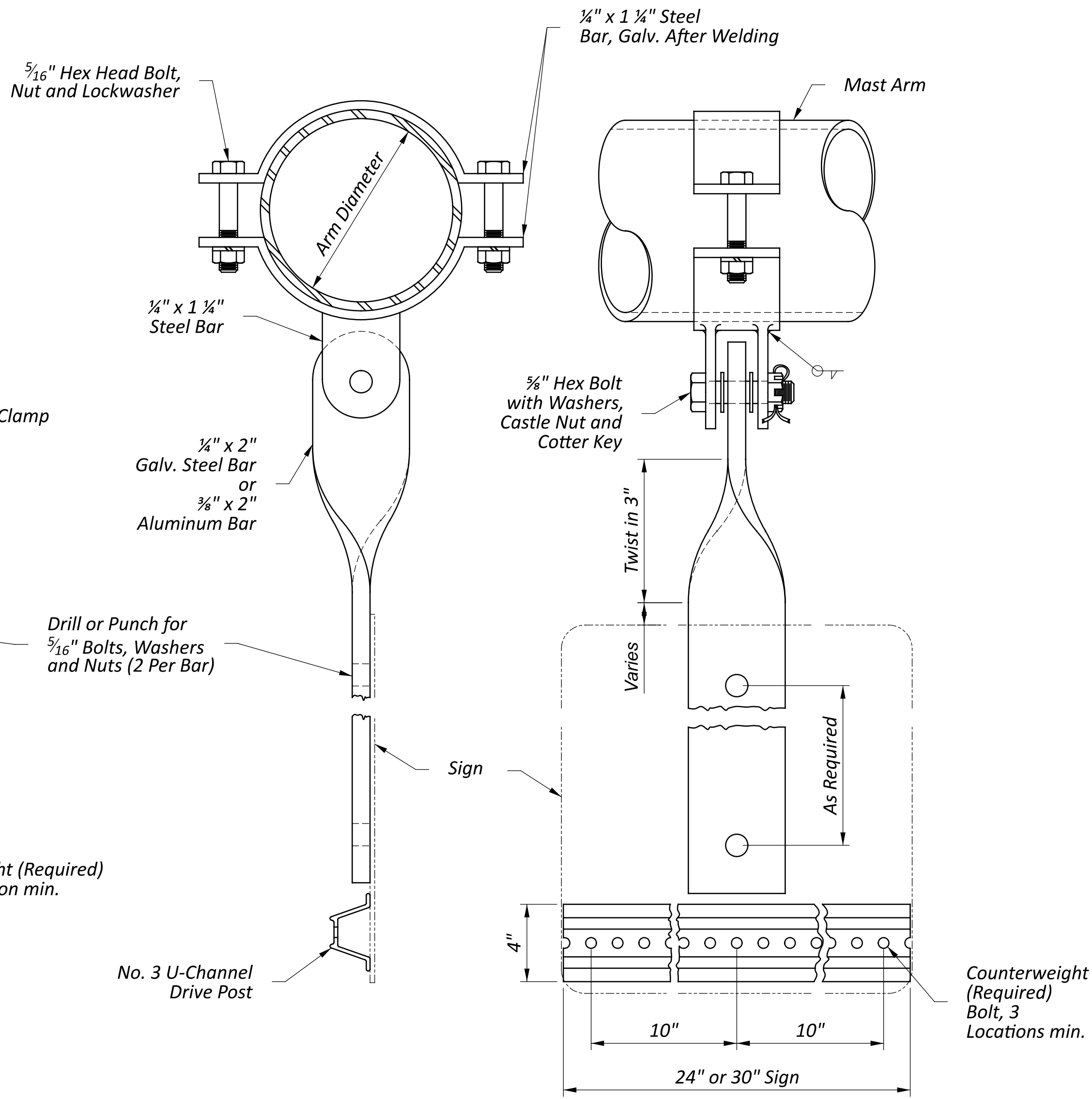
1. The Type 2 support is intended for use with concrete bridge railing parapet types shown on drawings BR-1, BR-2-98, and SBR-1-99. The Type 3 support is intended for use with concrete bridge railing parapet types shown on drawings SBR-1-13, BR-2-15, SBR-1-20, and SBR-3-20.
2. Use a minimum of 2 brackets (located 6" from top and bottom of sign) per installation with maximum spacing of 3'-0".
3. Street name sign supports shall be square tubular steel.
4. Parapet design may vary.



SIGN HANGER ASSEMBLY, SPAN WIRE
TYPE 1
(Typ.)



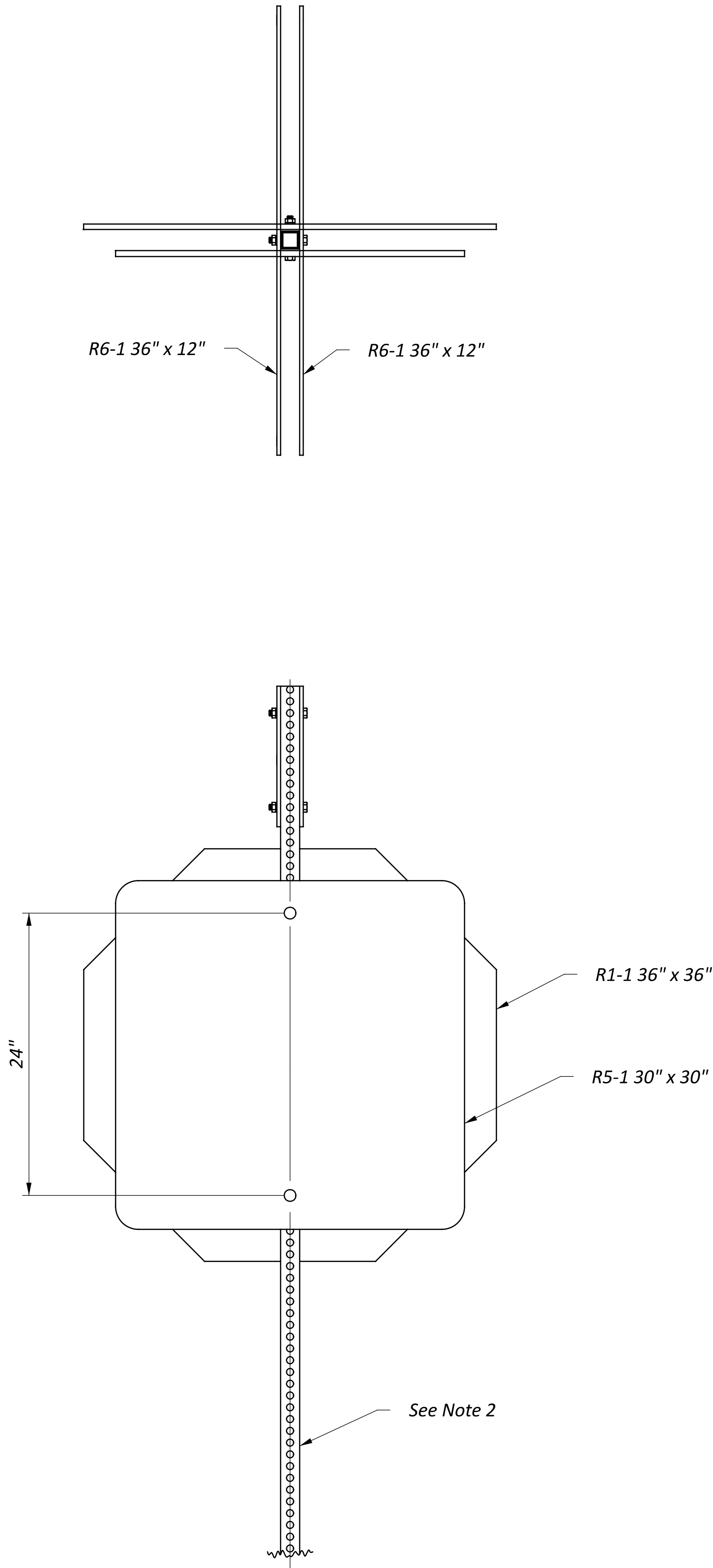
SIGN HANGER ASSEMBLY, SPAN WIRE
TYPE 2
(Typ.)



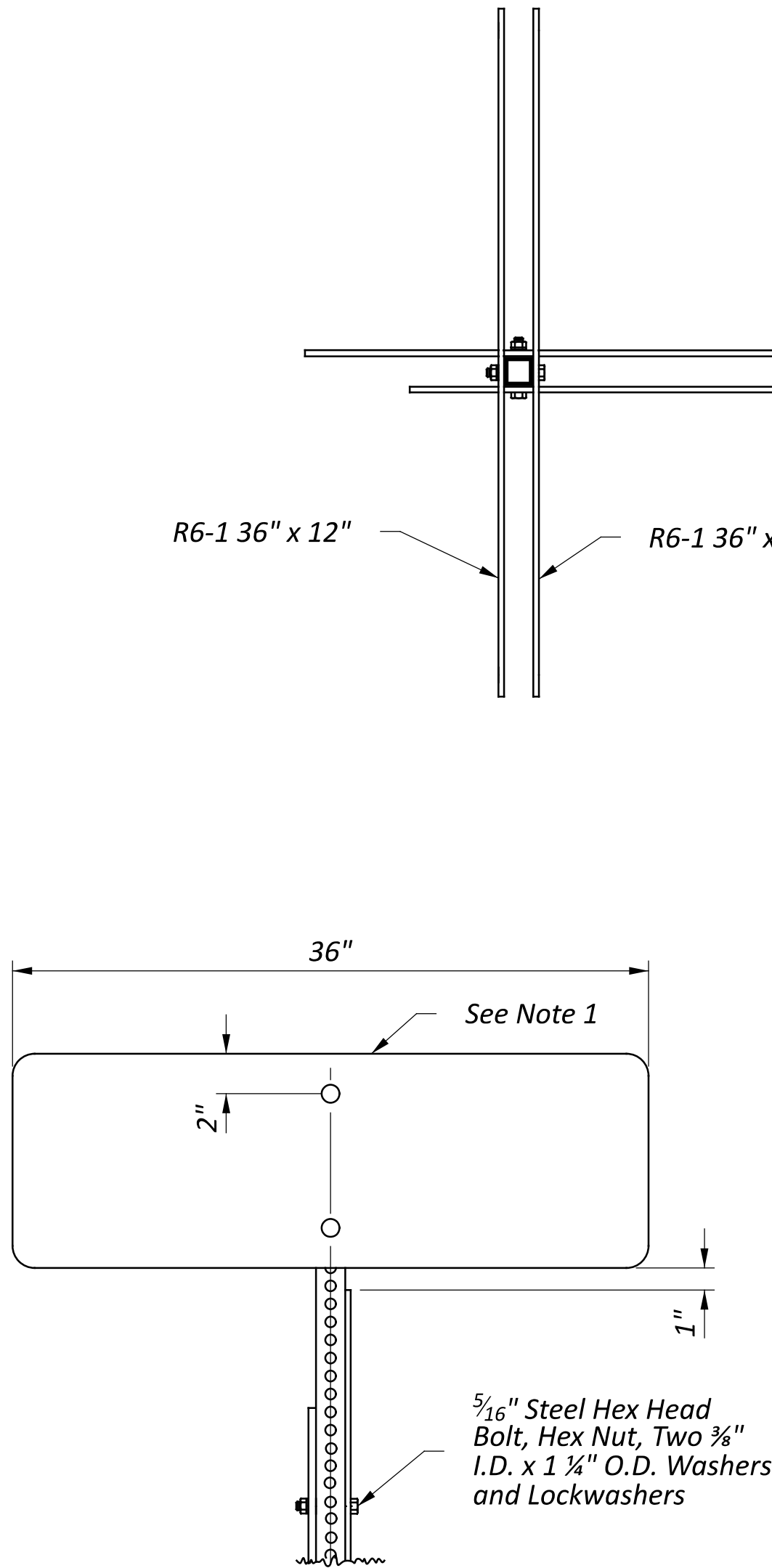
SIGN HANGER ASSEMBLY, MAST ARM
(Typ.)

NOTES:

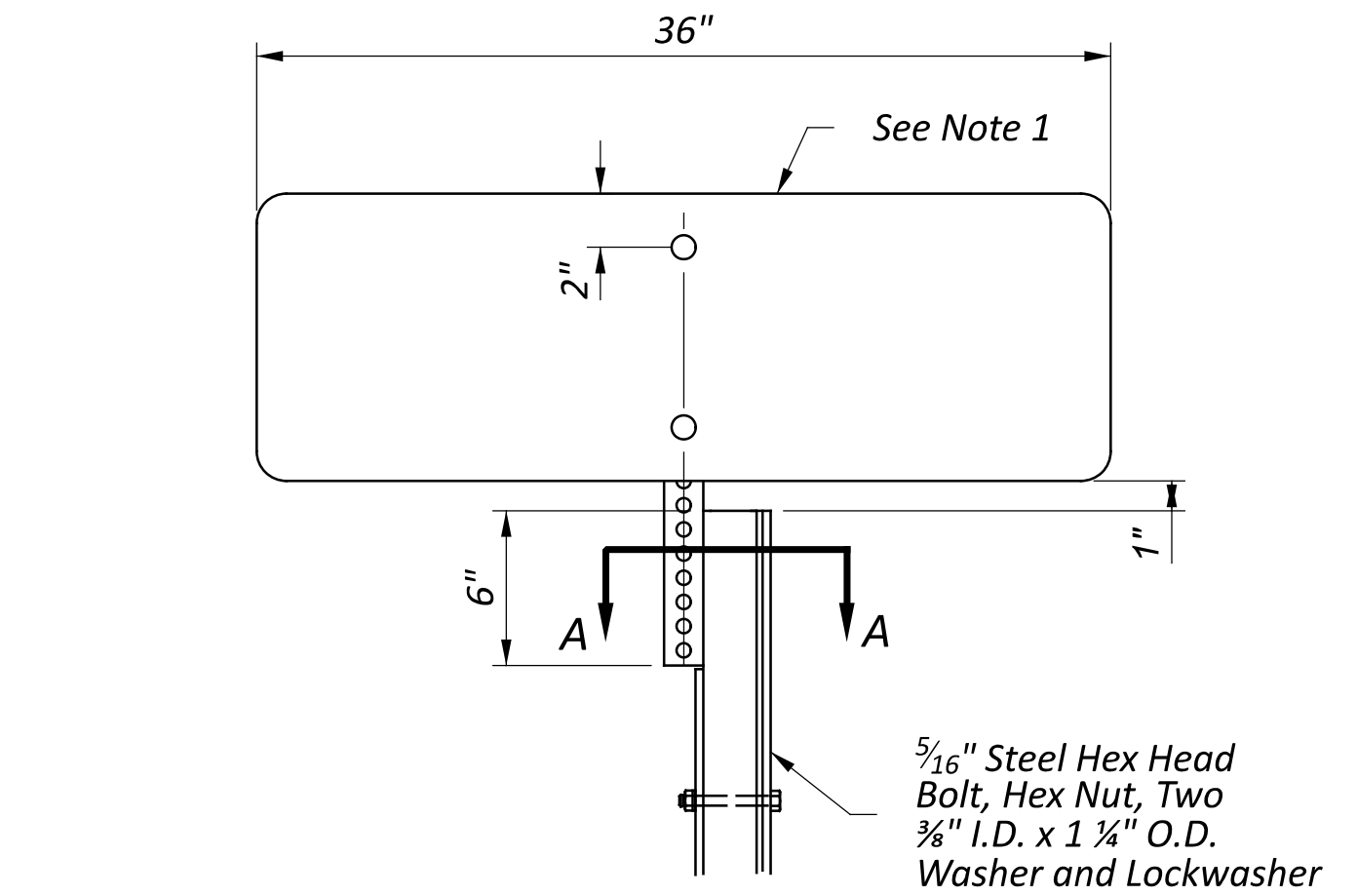
1. Use bearing plates conforming to details on Standard Construction Drawing TC-41.20.



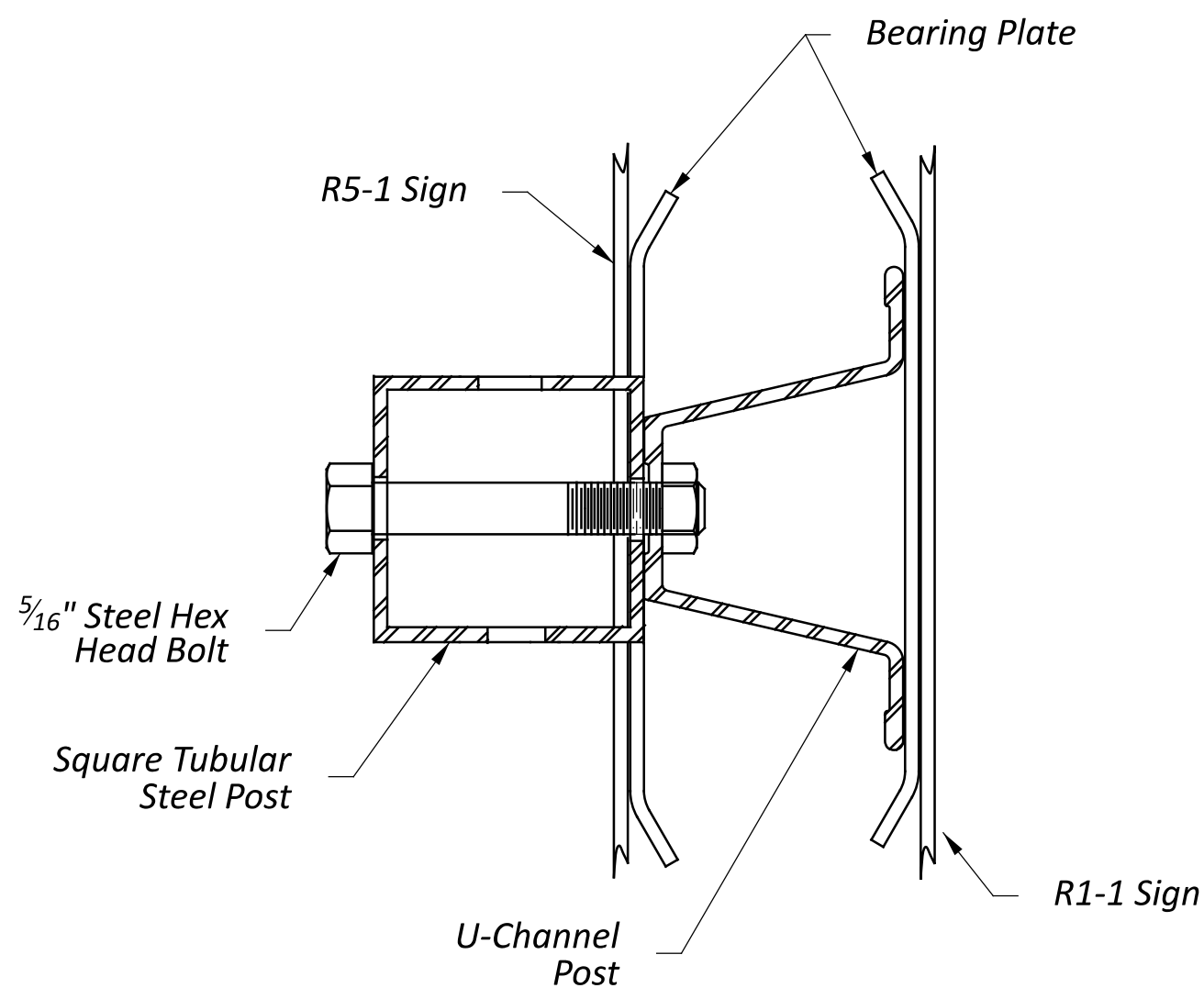
SINGLE POST



TWO POST



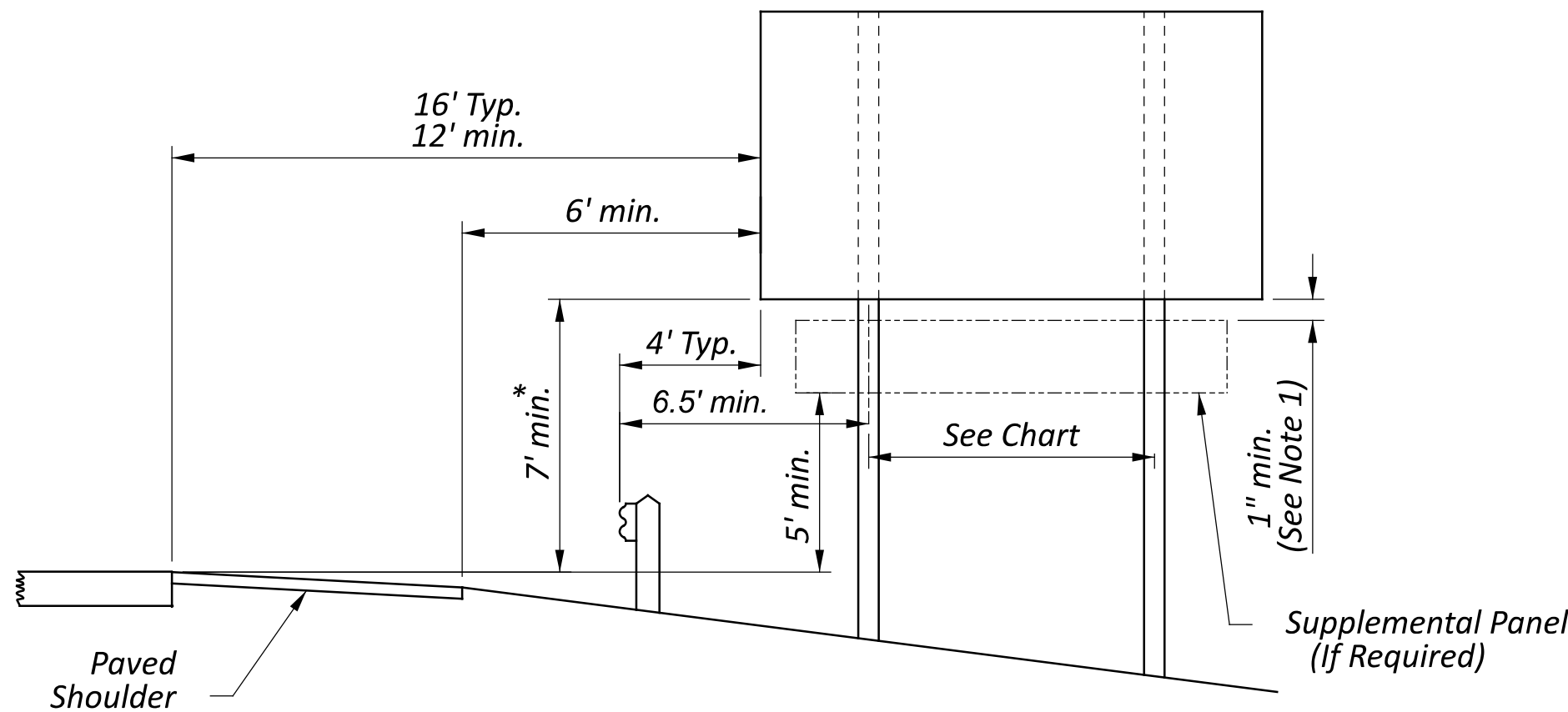
ALTERNATE ONE WAY
SIGN ATTACHMENT



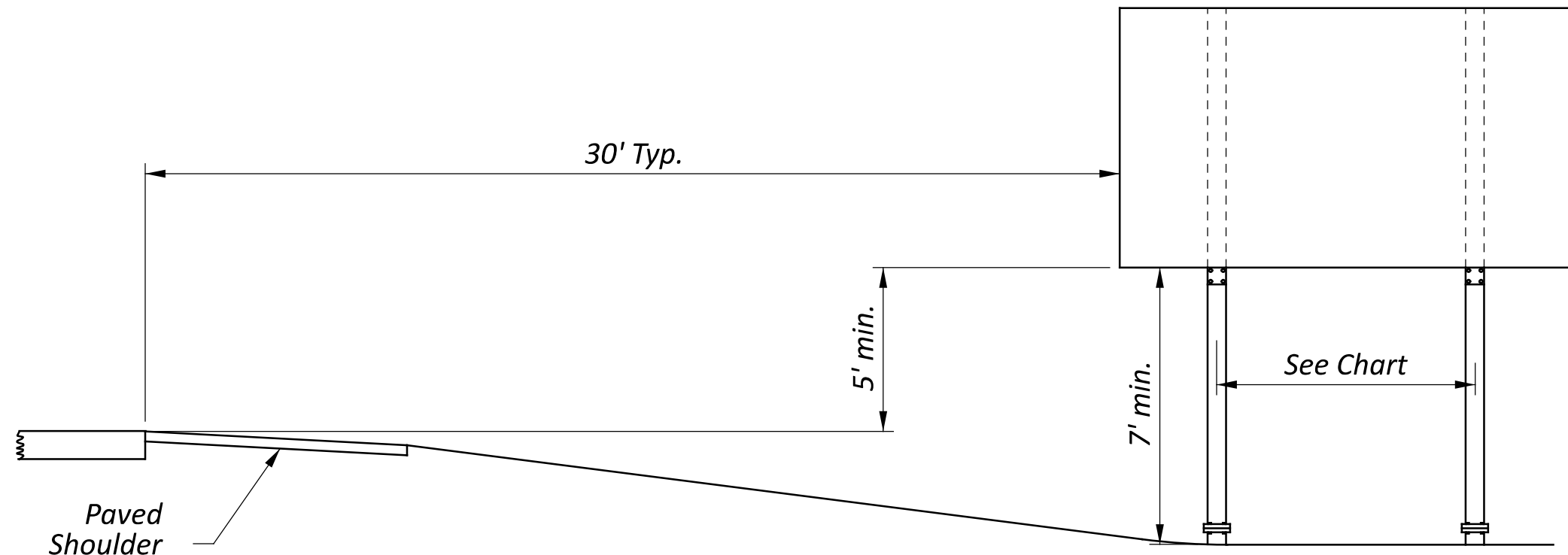
SECTION A-A

- NOTES:**
1. In special situations, a 54" x 18" R6-1 sign may be used in lieu of the 36" x 12" R6-1 sign.
 2. All supports shall be square tubular steel; however, in lieu of square tubular steel, u-channel supports may be used with the alternate ONE WAY sign attachment arrangement.
 3. For post(s) installation details, see Standard Construction Drawing TC-41.20.

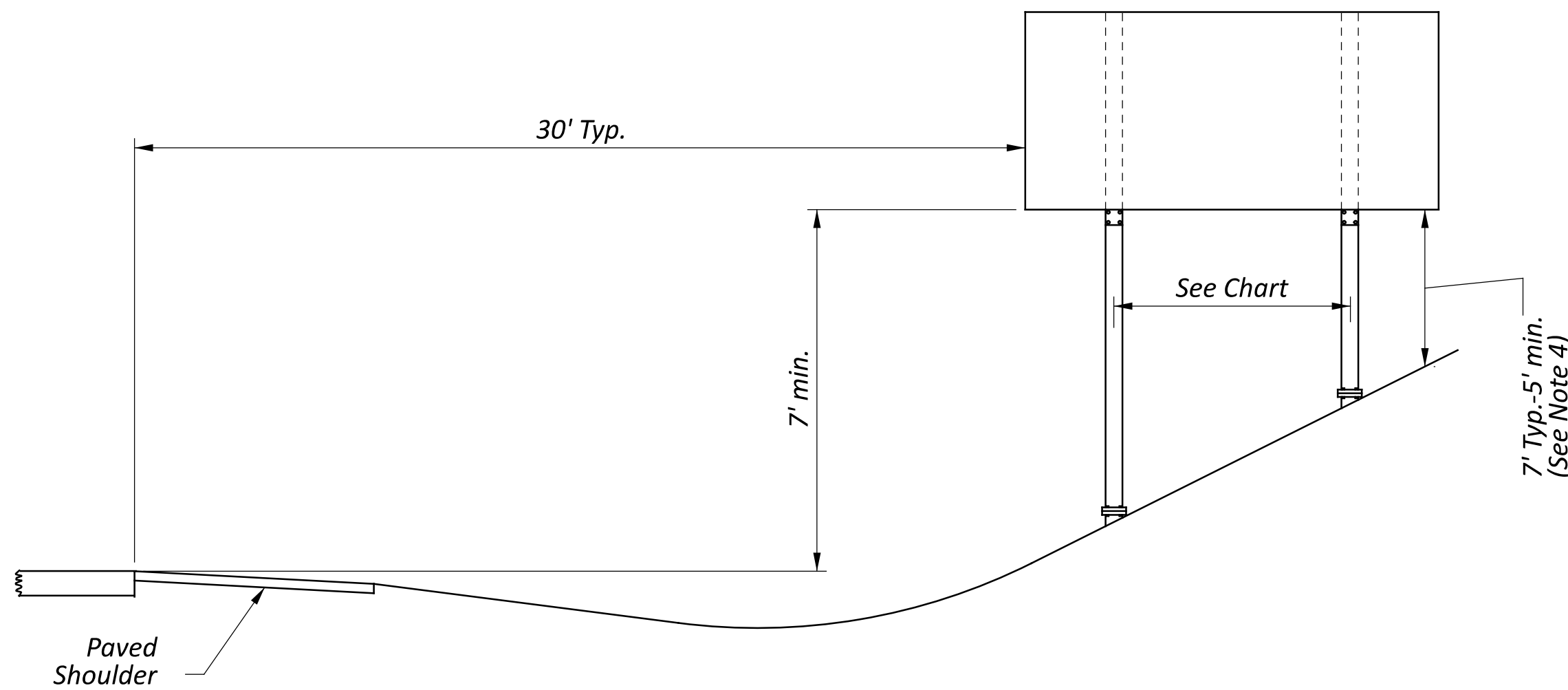
FREEWAYS AND EXPRESSWAYS



TYPICAL INSTALLATION WITH GUARDRAIL
* 8' min. with Supplemental Panel

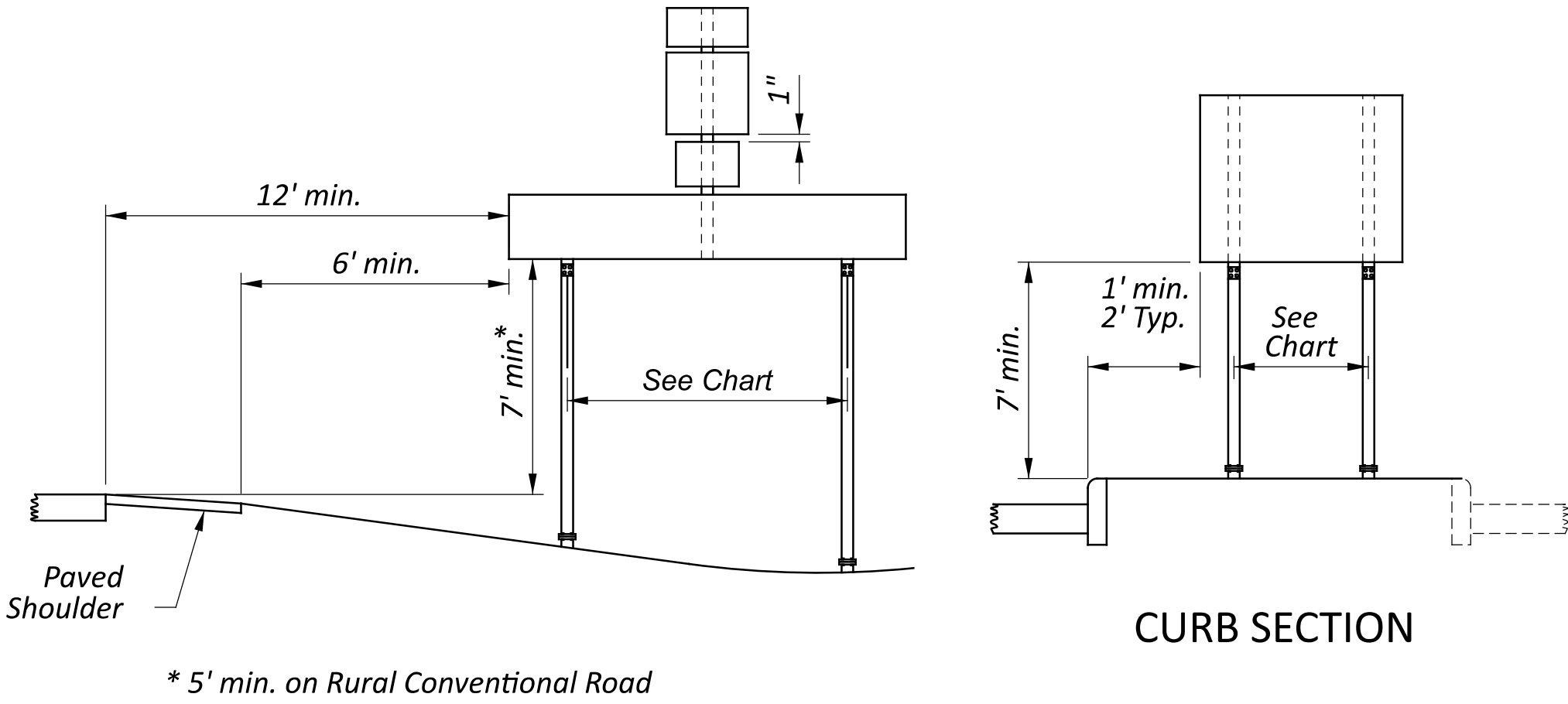


TYPICAL INSTALLATION, FILL SECTION, 30' OFFSET



TYPICAL INSTALLATION, CUT SECTION, 30' OFFEST

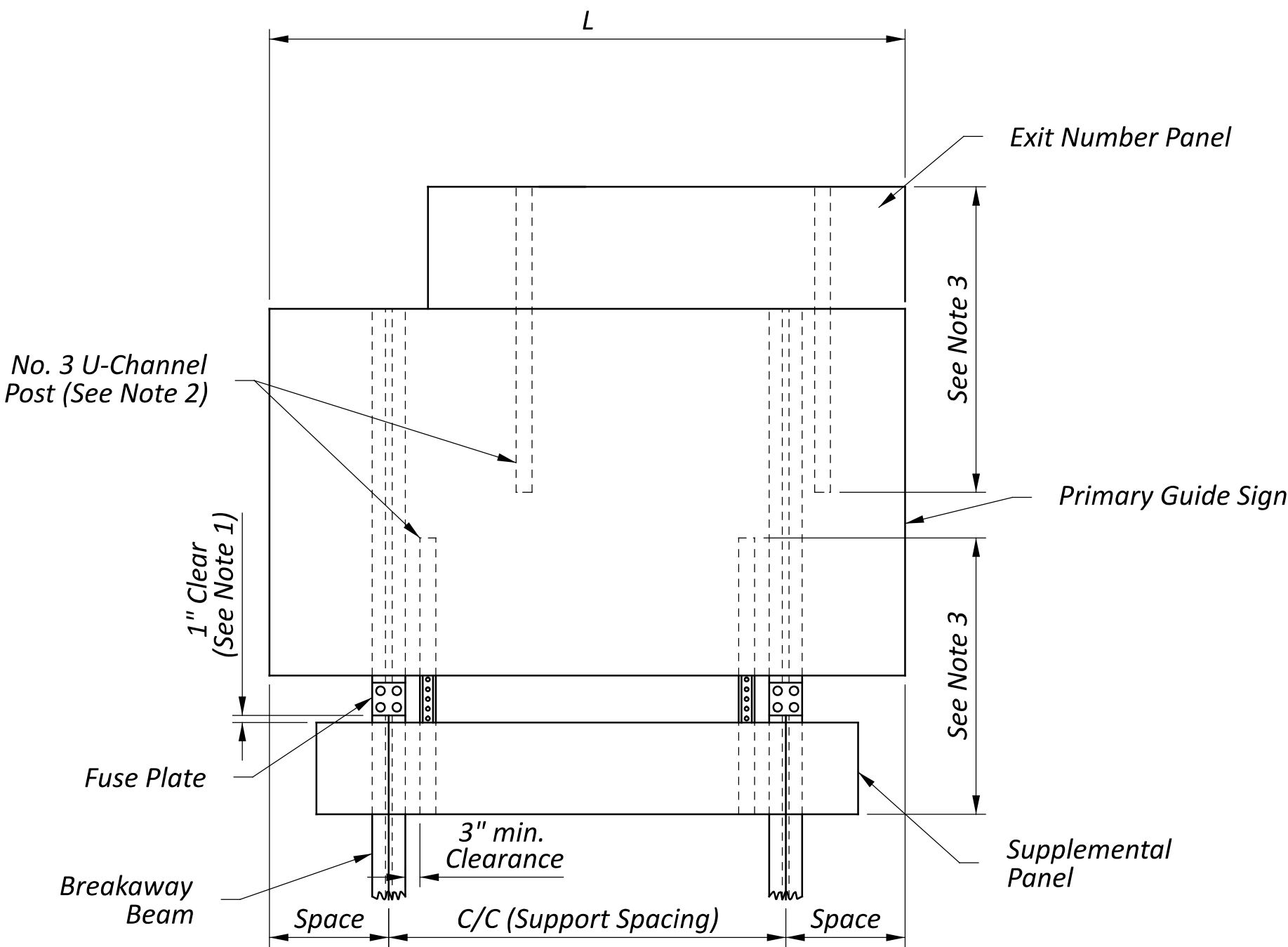
STREETS-RAMPS-HIGHWAYS



CURB SECTION

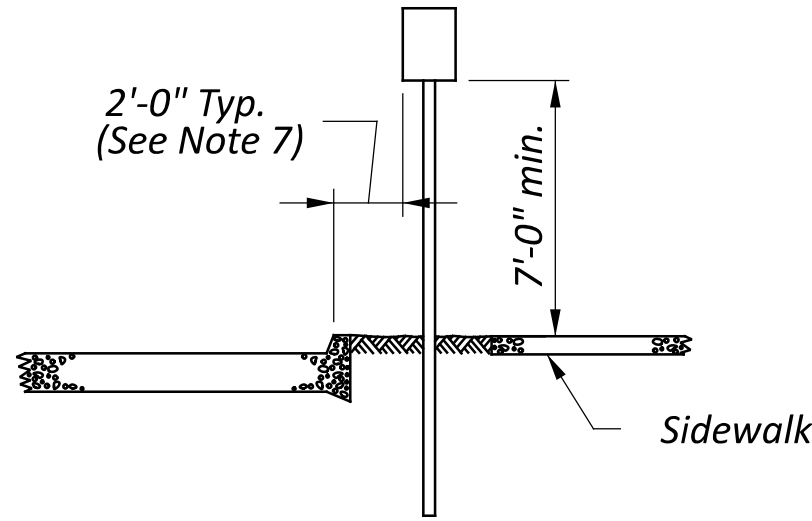
NOTES:

- Mount supplemental panels 1" below the fuse plate on breakaway beam installations and 1" minimum below the guide sign when the sign supports are rigid beams.
- Attach No. 3 U-channel drive post to both the guide sign and the exit number or other supplemental panels by mounting clips fastened alternately at each horizontal extrusion and both sides at the top and bottom of the post. Do not make any connections between the supplemental panel and breakaway beams.
- Length of post shall be 2.5 times the height of the supplemental panel. The post spacing shall be as per the support spacing chart.
- Use 5' minimum mounting height above ground ground if back slopes are greater than 3:1.
- Align the exit number panel with the right edge of the sign for right exits and with the left edge of the sign for left exits.

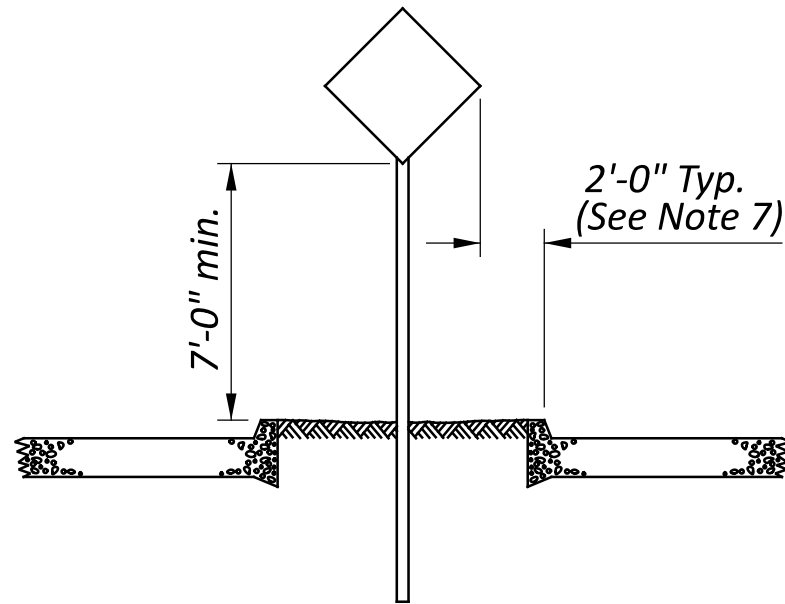


SUPPLEMENTAL PANEL ATTACHMENT

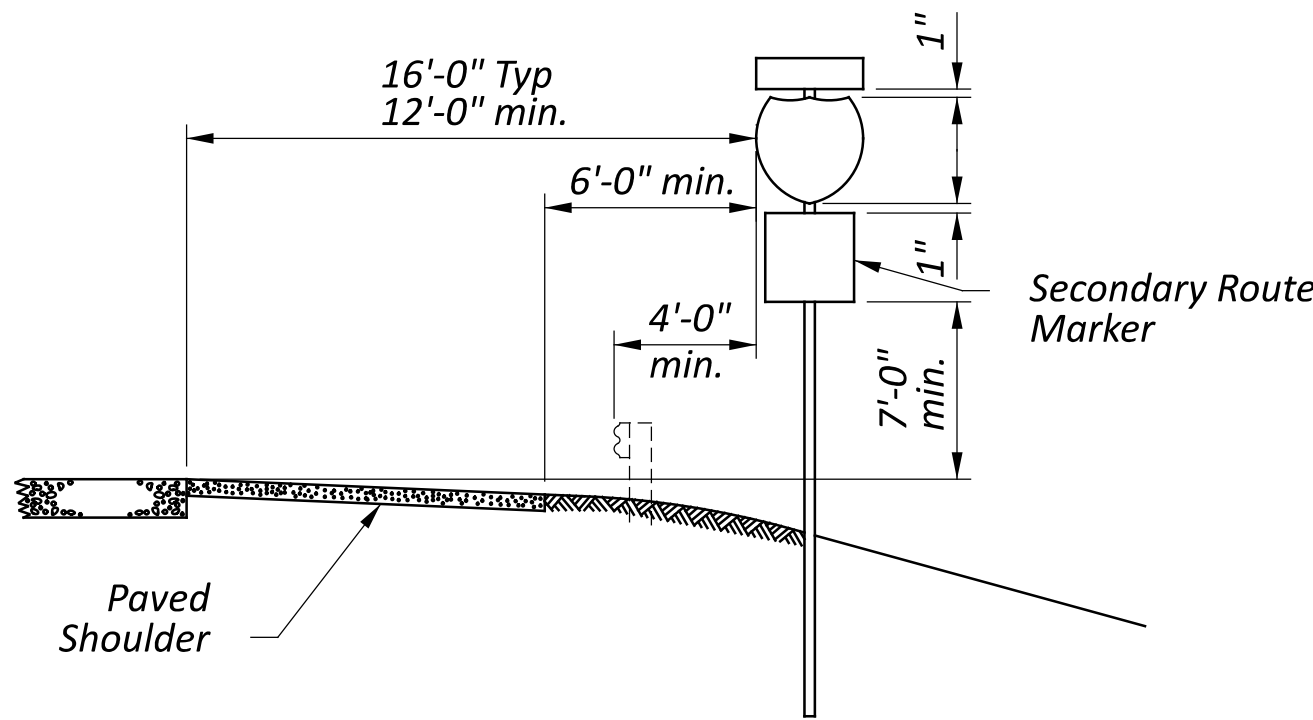
SUPPORT SPACING CHART								
2 SUPPORTS				3 SUPPORTS				
L (Feet)	SPACING (INCHES)			L (Feet)	SPACING (INCHES)			
	SPACE	c/c	SPACE		SPACE	c/c	SPACE	
4	9	30	9	20	24	96	96	24
5	12	36	12	21	30	96	96	30
6	12	48	12	22	36	96	96	36
7	12	60	12	23	30	108	108	30
8	12	72	12	24	36	108	108	36
9	12	84	12	25	42	108	108	42
10	12	96	12	26	36	120	120	36
11	18	96	18	27	42	120	120	42
12	24	96	24	28	48	120	120	48
13	30	96	30	29	42	132	132	42
14	36	96	36	30	48	132	132	48
15	36	108	36					
16	42	108	42					
17	42	120	42					
18	48	120	48					
19	48	132	48					



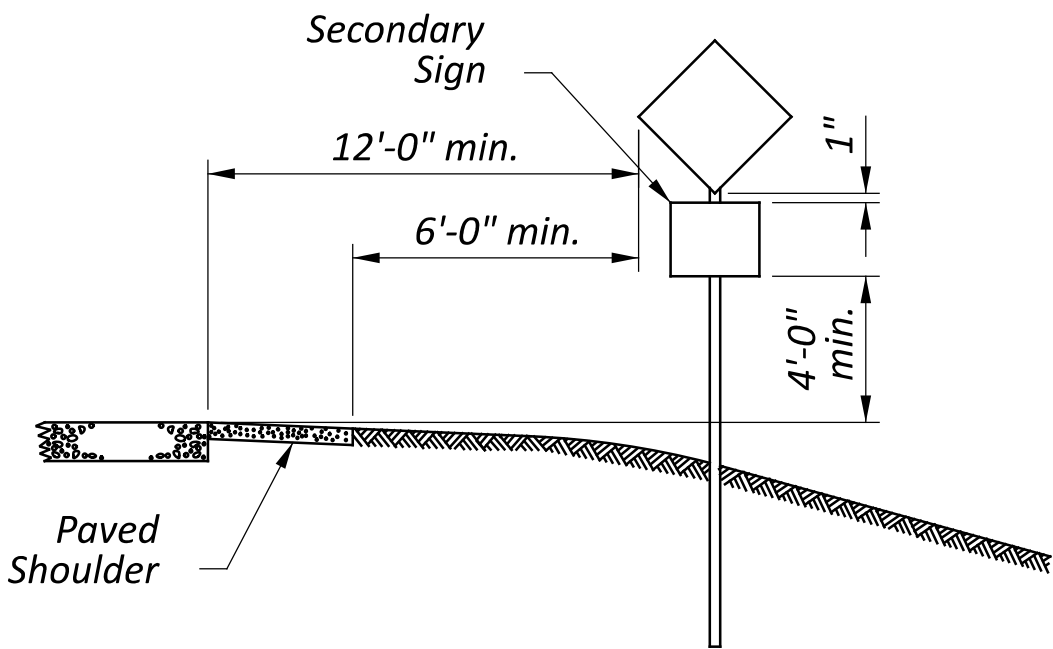
URBAN-RESIDENTIAL AND BUSINESS
AND ALL AREAS WITH SIDEWALKS



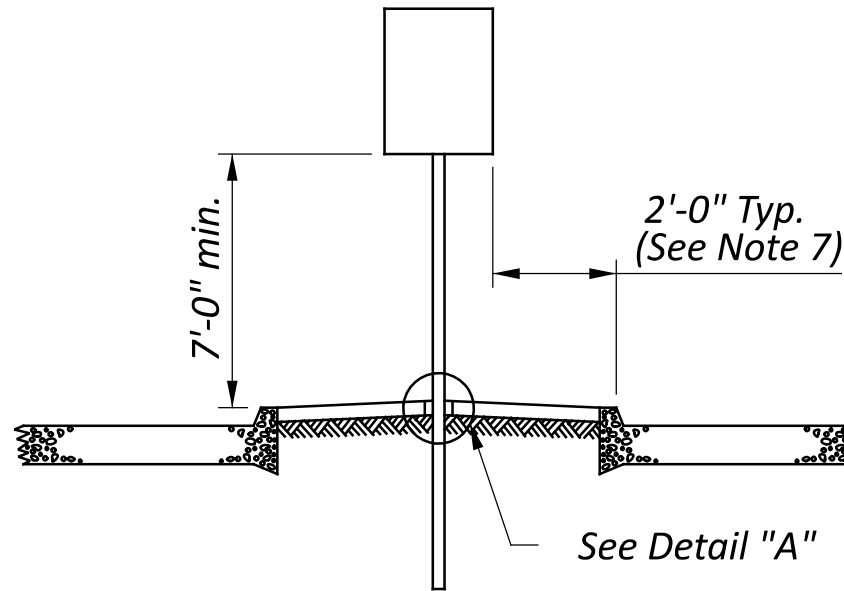
MEDIAN



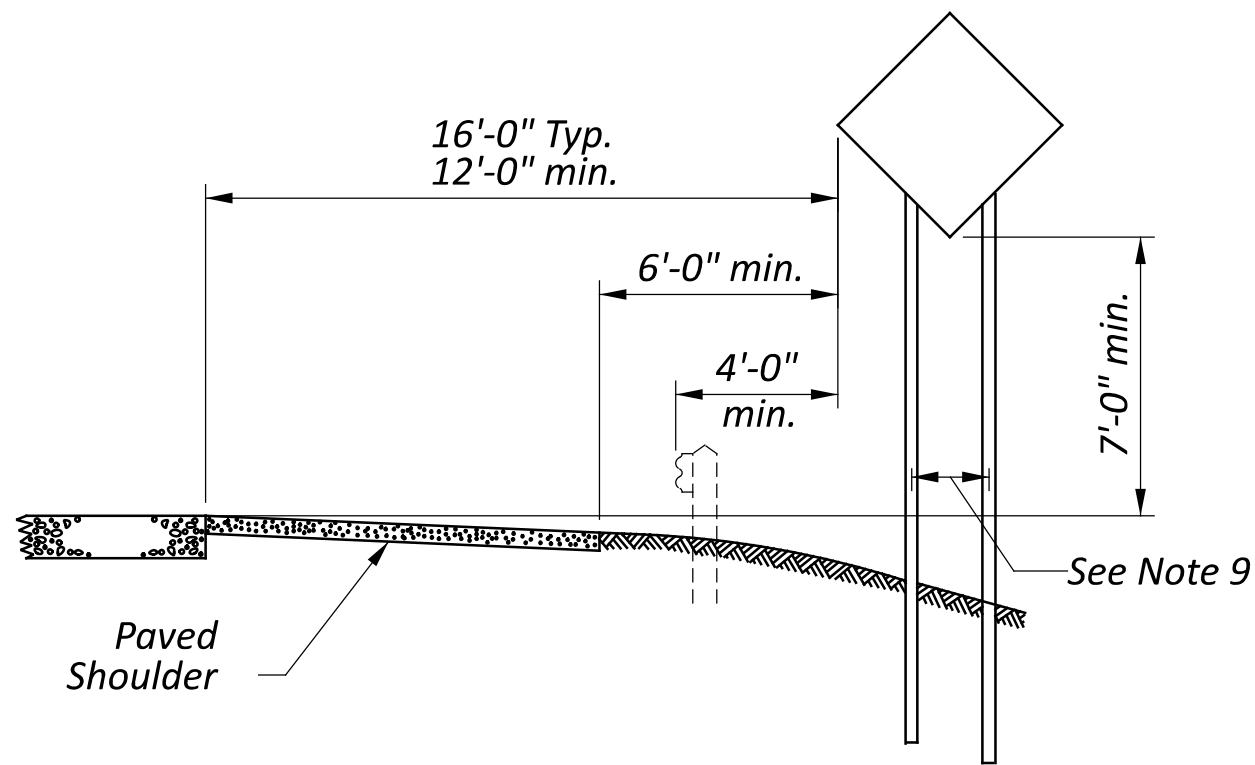
EXPRESSWAY OR FREEWAY
WITH SECONDARY SIGN



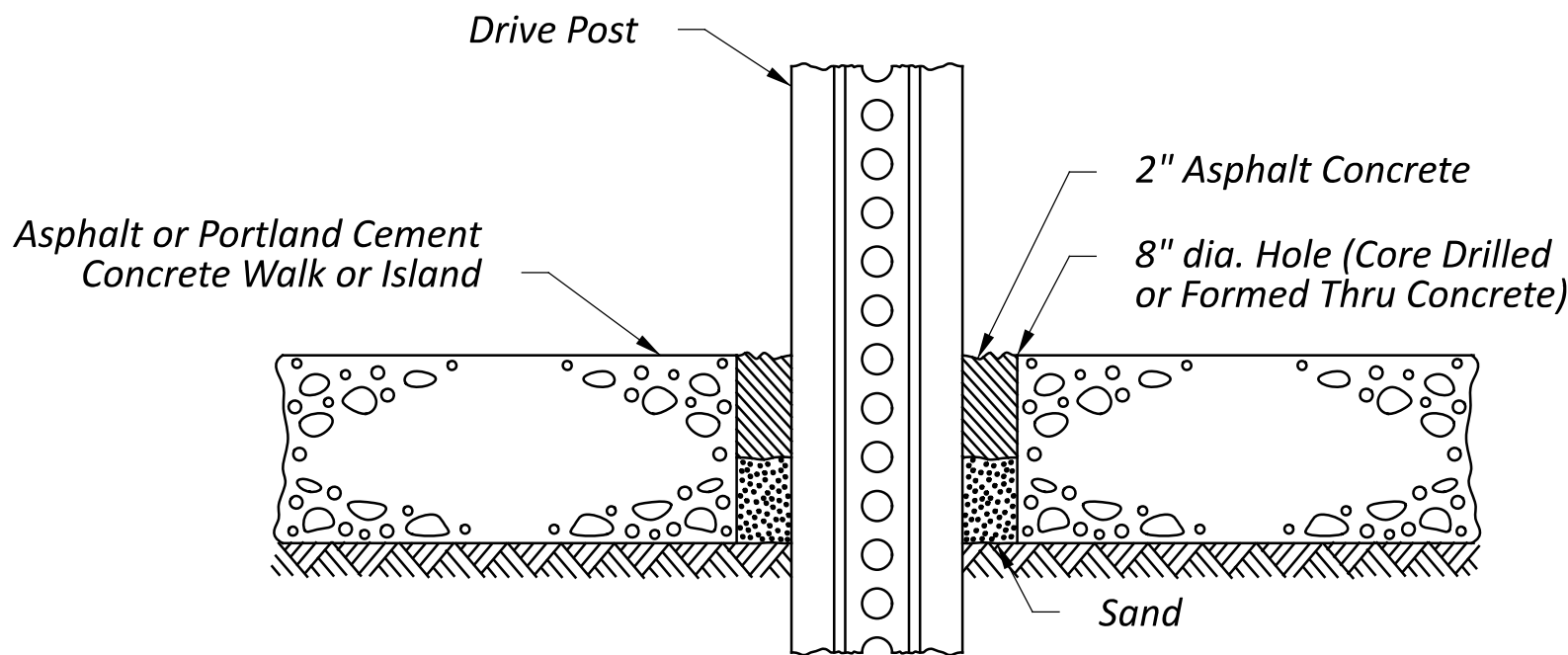
RURAL
WITH SECONDARY SIGN



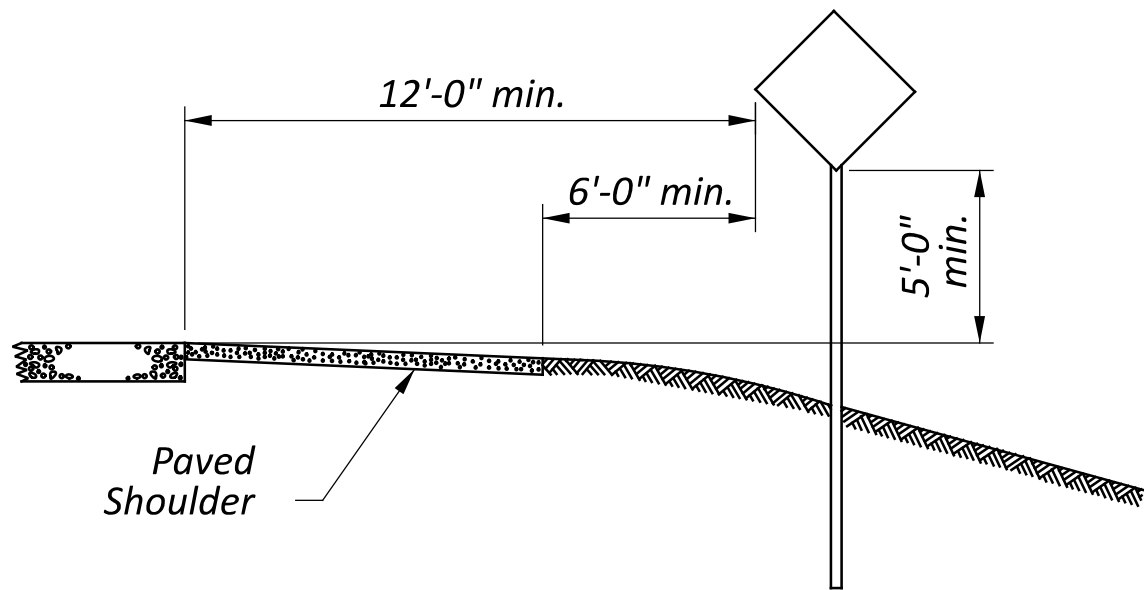
PAVED MEDIAN



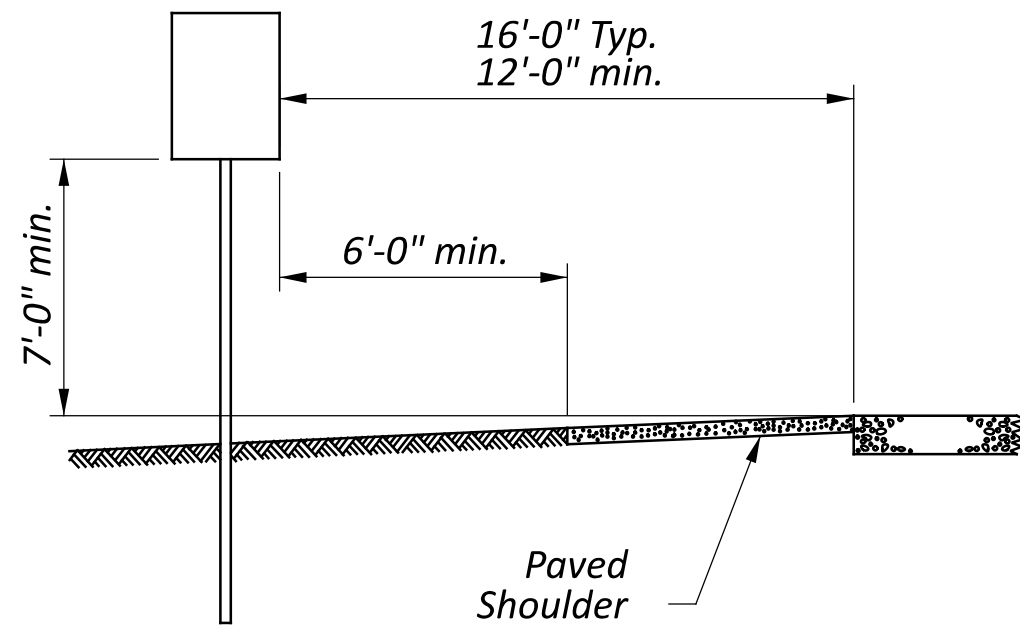
EXPRESSWAY OR FREEWAY



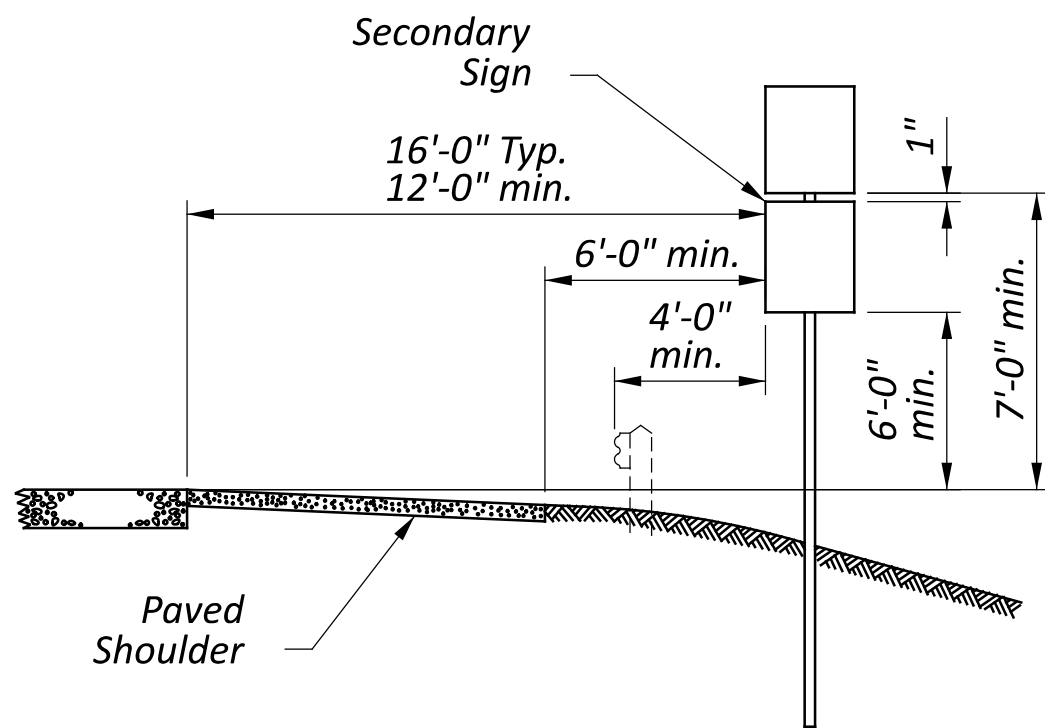
DETAIL "A"



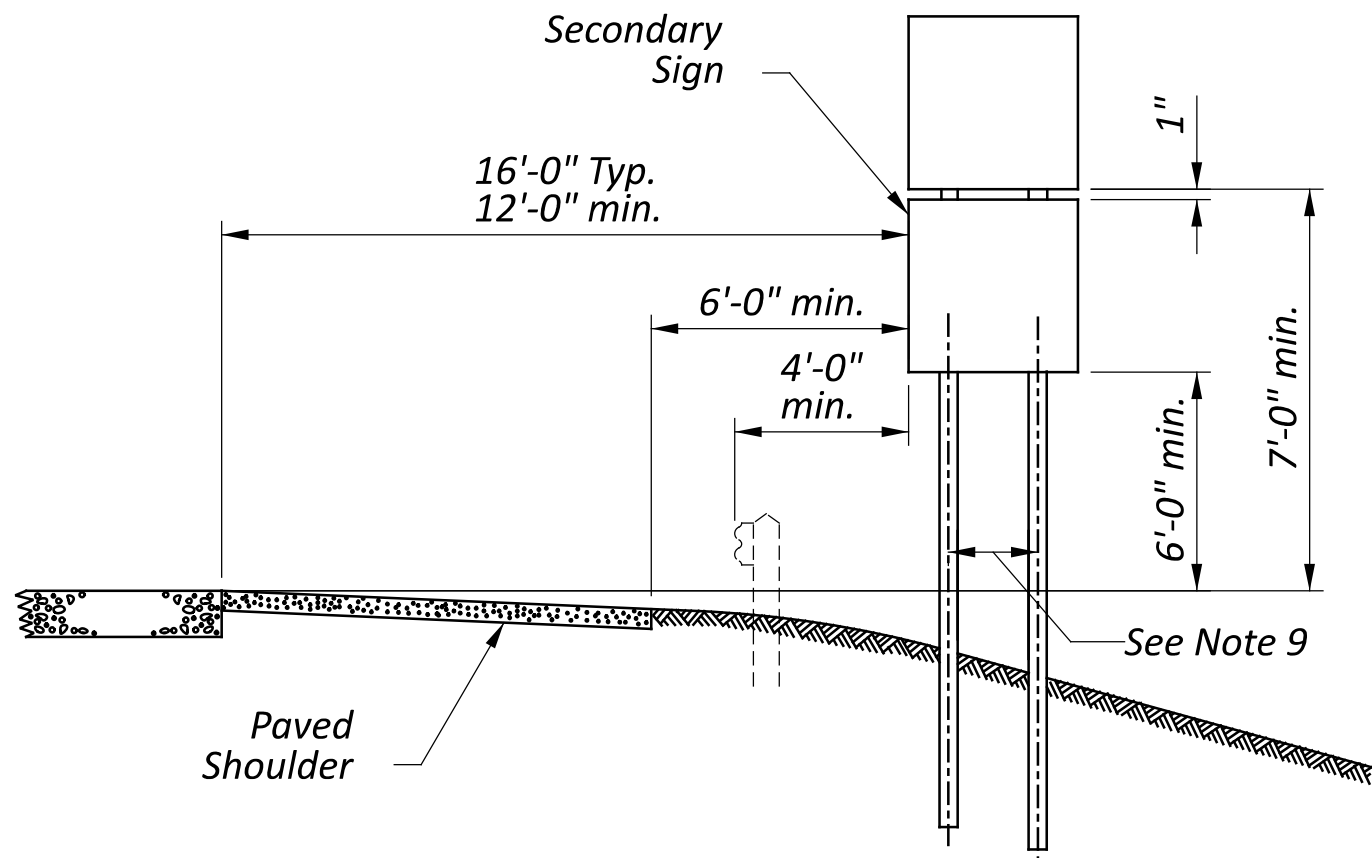
RURAL



MEDIAN - EXPRESSWAY OR FREEWAY



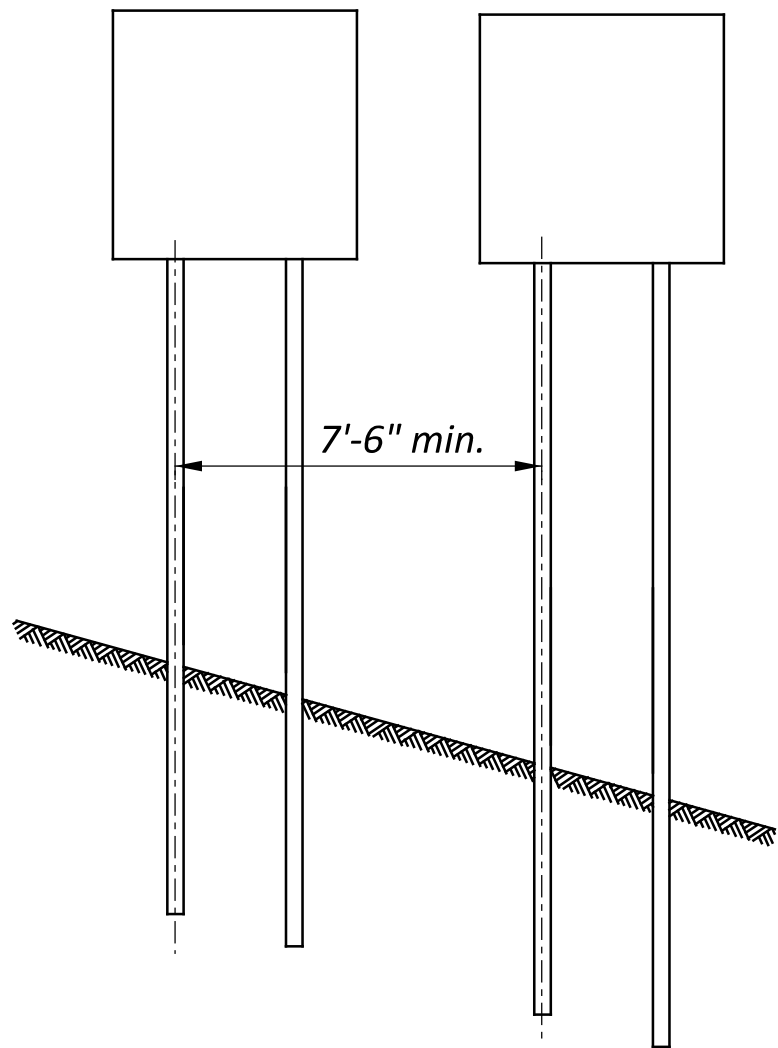
EXPRESSWAY OR FREEWAY
WITH SECONDARY SIGN



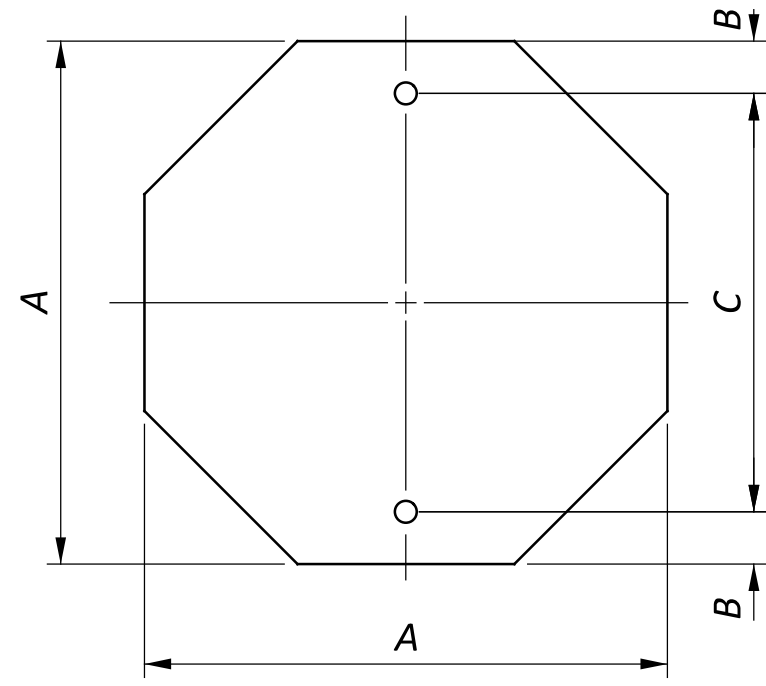
EXPRESSWAY OR FREEWAY
WITH SECONDARY SIGN

NOTES:

1. See Standard Construction Drawing (SCD) TC-41.20 for details on yielding supports.
2. All signs shall be placed 90° to the roadway, except as described in notes 3 and 4 below.
3. Install chevron alignment and one-direction large arrow signs on the outside of a turn or curve in line with and at approximately 90° to approaching traffic flow.
4. Install parking signs with arrows at an angle of not less than 30° nor more than 45° with the line of traffic flow.
5. Install chevron alignment signs at a minimum mounting height of 4' above the near edge of the traveled way.
6. Install object markers at a minimum mounting height of 4' above the near edge of the traveled way for obstructions 8' or less from the edge of shoulder or curb. Install object markers at a minimum mounting height of 4' above the ground for obstructions more than 8' from the edge of the shoulder or curb.
7. Install signs with a minimum lateral offset of 1' from the face of curb where sidewalk width is limited or where existing poles are close to the curb.
8. On conventional roads where it is impractical to locate a sign with the lateral offsets shown, install signs with a minimum lateral offset of 2'.
9. See SCDs TC-52.10 and TC-52.20 for dimensions between supports.

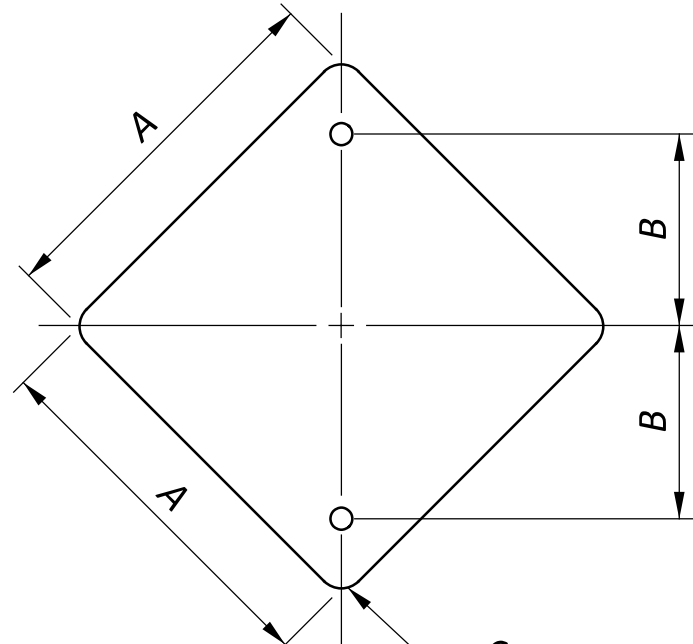


ADJACENT SIGN INSTALLATION
FOR NO. 2 AND NO. 3 YIELDING POST
SUPPORTS IN EXPOSED LOCATIONS



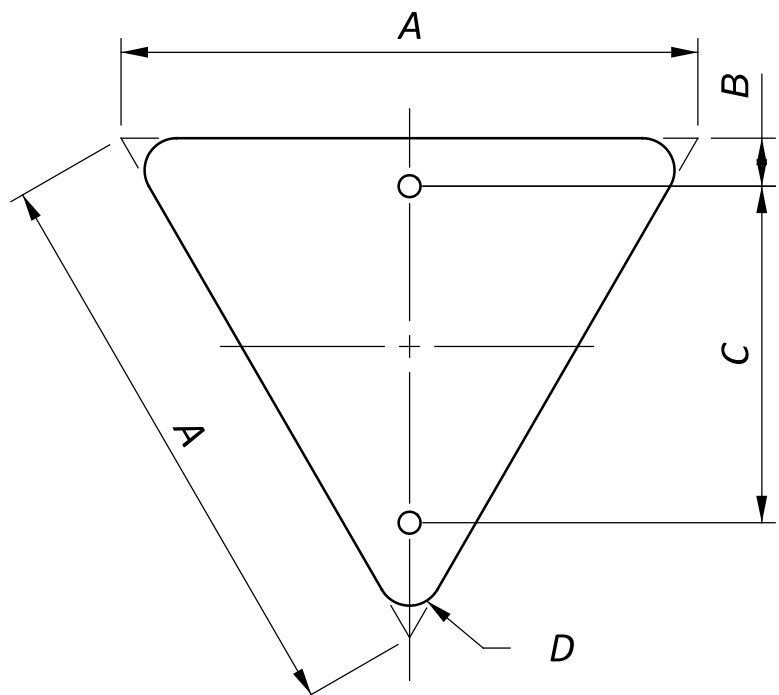
OCTA-1-2

A	B	C	THICKNESS	AREA (SQ FT)
18	3	12	0.080	2.25
24	3	18	0.080	4.00
30	3	24	0.080	6.25
36	3	30	0.080	9.00



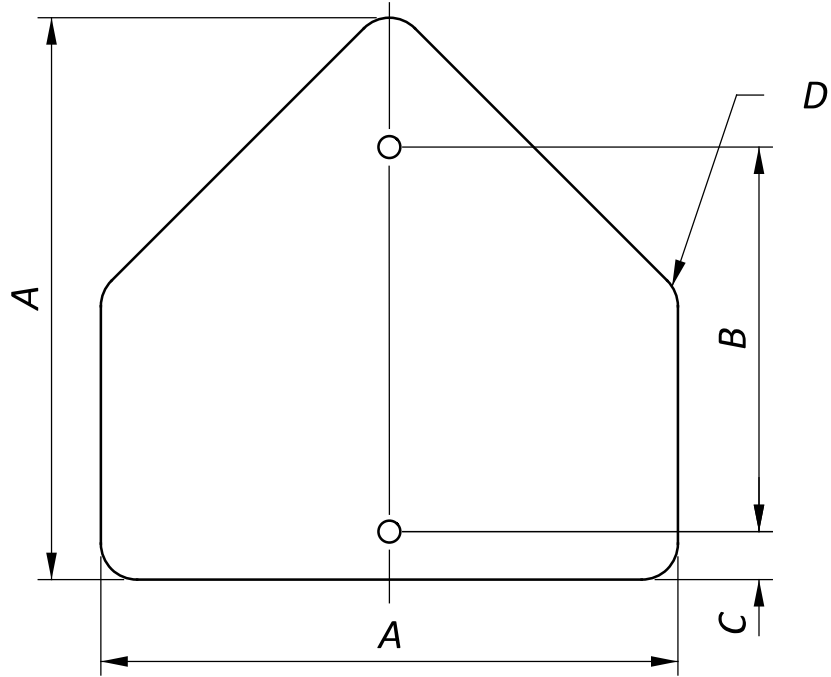
DIA-1-2

A	B	C	THICKNESS	AREA (SQ FT)
18	9	1.5	0.080	2.25
24	12	1.5	0.080	4.00
30	15	1.875	0.080	6.25
36	18	2.25	0.080	9.00



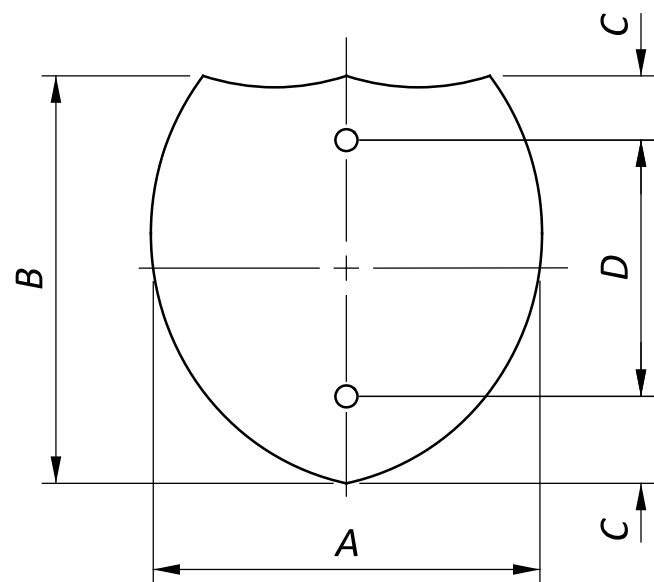
TRI-1-2

A	B	C	D	THICKNESS	AREA (SQ FT)
24	2	14	1.5	0.080	1.73
30	3	18	1.5	0.080	2.71
36	3	21	2	0.080	3.90



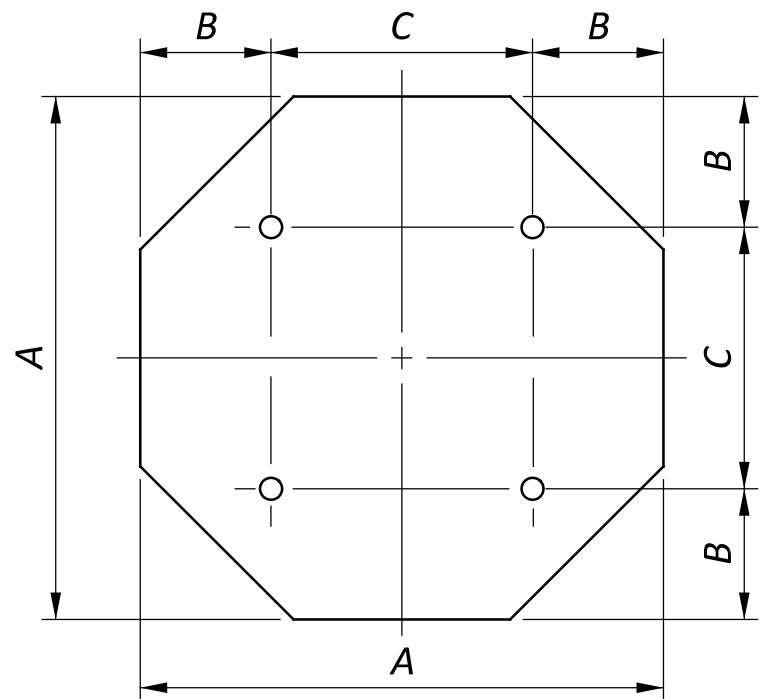
PENT-1-2

A	B	C	D	THICKNESS	AREA (SQ FT)
30	21	3	1.875	0.080	6.25
36	24	3	2.25	0.080	9.00



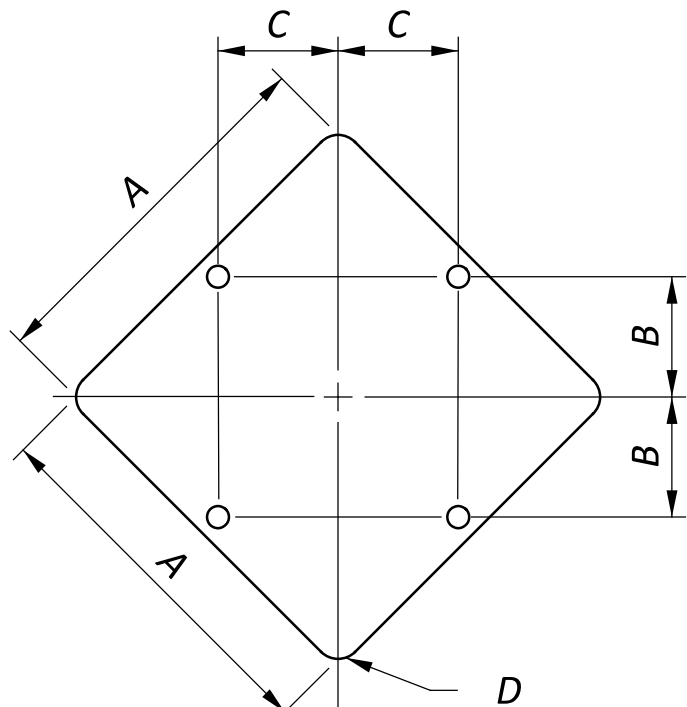
I.S.-1-2

A	B	C	D	THICKNESS	AREA (SQ FT)
24	24	3	18	0.080	4.00
24	30	3	18	0.080	5.00
30	30	3	24	0.080	6.25
37.5	30	3	24	0.080	7.81
36	36	6	24	0.080	9.00
45	36	6	24	0.080	11.25



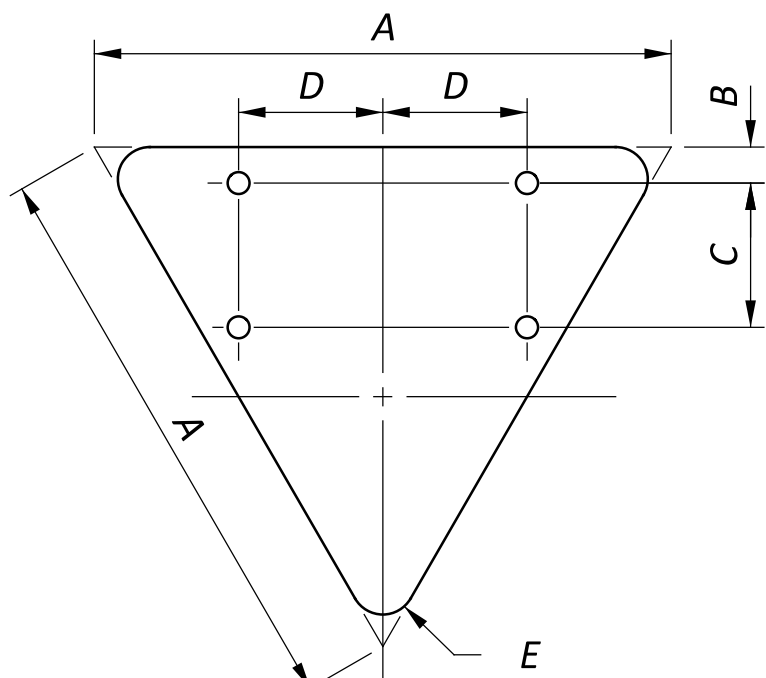
OCTA-2-4

A	B	C	THICKNESS	AREA (SQ FT)
48	9	30	0.100	16.00



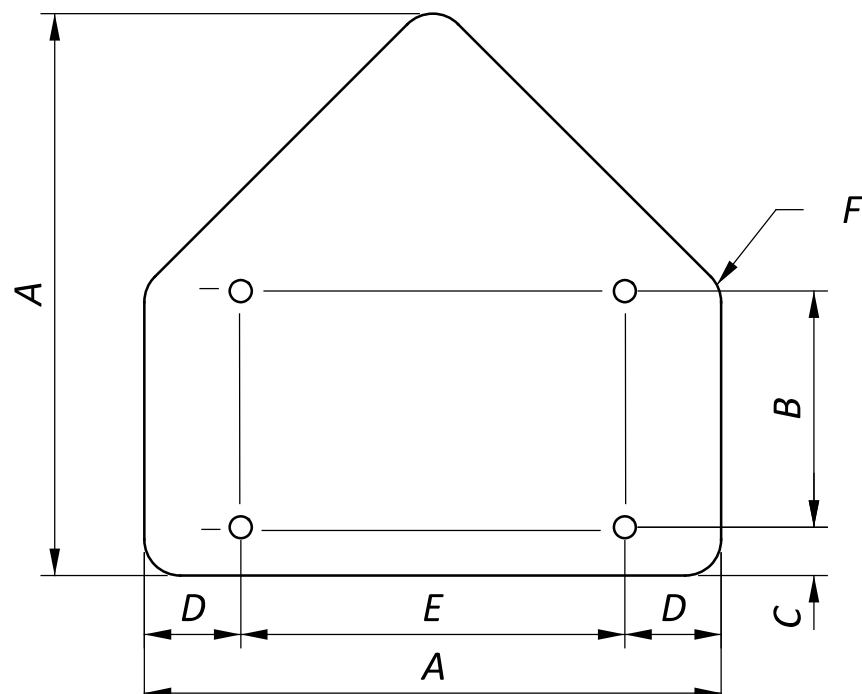
DIA-2-4

A	B	C	D	THICKNESS	AREA (SQ FT)
48	15	15	3	0.100	16.00
60	18	18	3.75	0.100	25.00



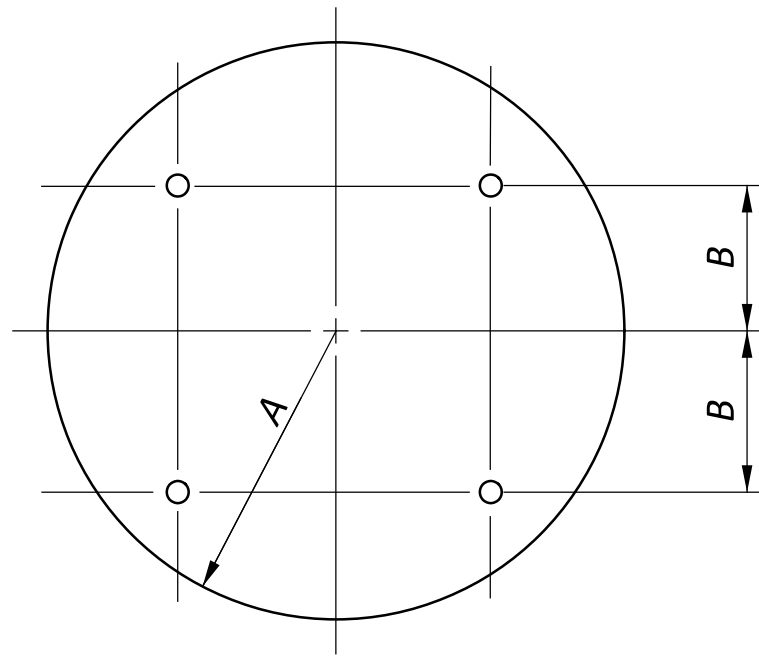
TRI-2-4

A	B	C	D	E	THICKNESS	AREA (SQ FT)
48	3	12	12	3	0.100	6.93
60	3	18	15	4	0.100	10.83



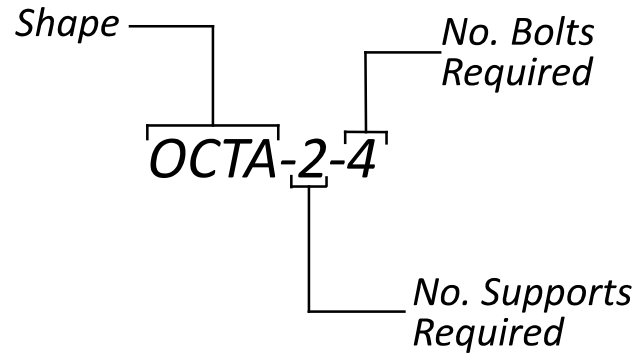
PENT-2-4

A	B	C	D	E	F	THICKNESS	AREA (SQ FT)
48	18	6	9	30	3	0.100	16.00



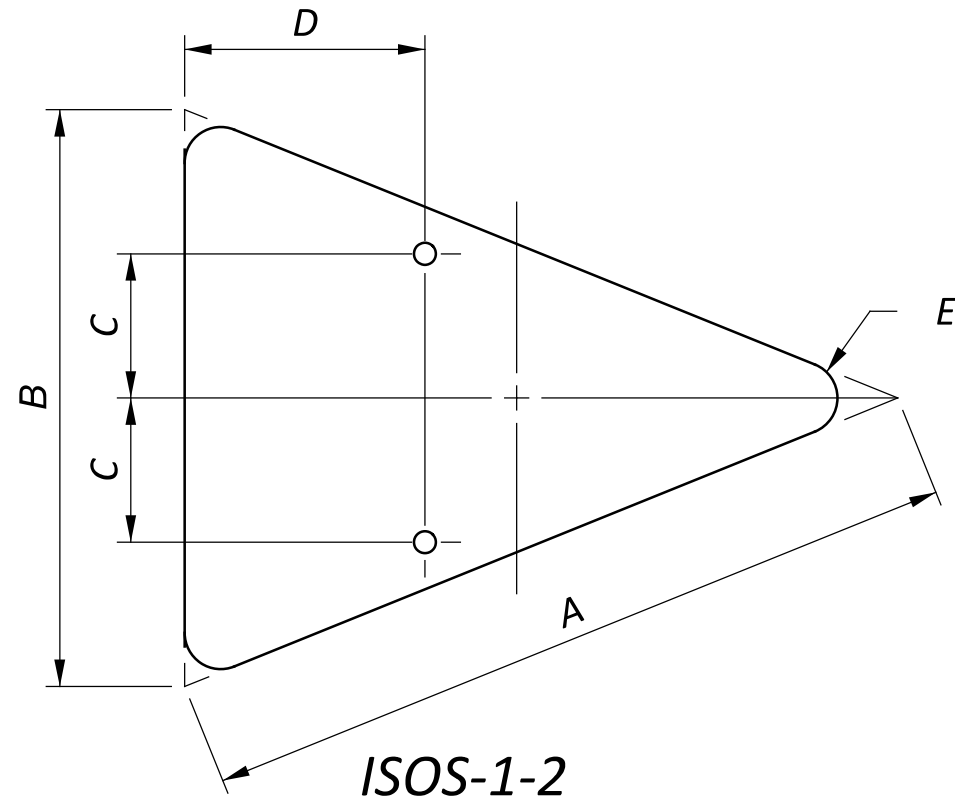
CIR-2-4

A	B	THICKNESS	AREA (SQ FT)
24	15	0.100	16.00



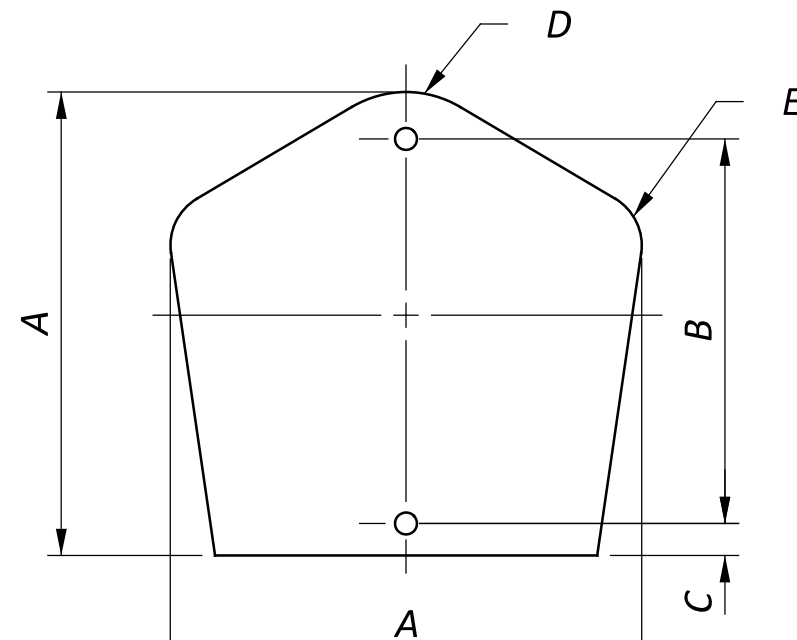
NOTES:

- All bolt holes shall be 3/8" in diameter, and may be drilled or punched to finished size.
- Dimensions between bolt holes shall be to tolerance of $\pm \frac{1}{32}$ ".
- All route shields shall be 0.080" thick and attached to extrusheet signs with aluminum blind rivets.
- For back-to-back mounting of STOP (R1-1) and DO NOT ENTER (R5-1) sign, follow details shown on Standard Construction Drawing TC-41.50.



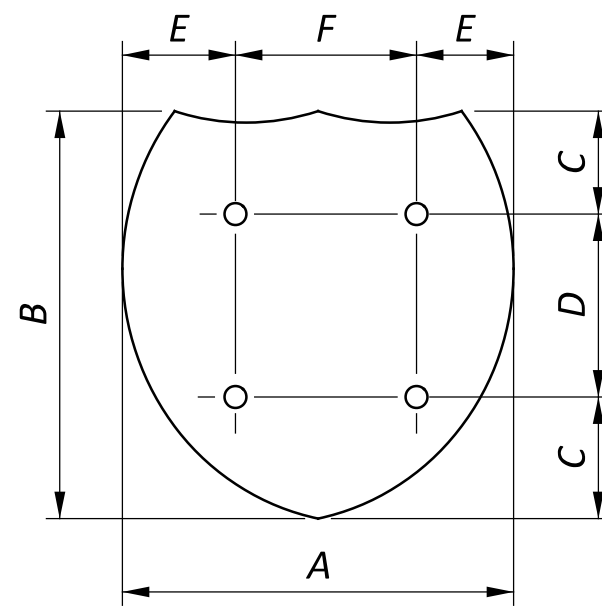
ISOS-1-2

A	B	C	D	E	THICKNESS	AREA (SQ FT)
40	30	7.5	12	1.875	0.080	3.86
48	36	9	15	2.25	0.100	5.56



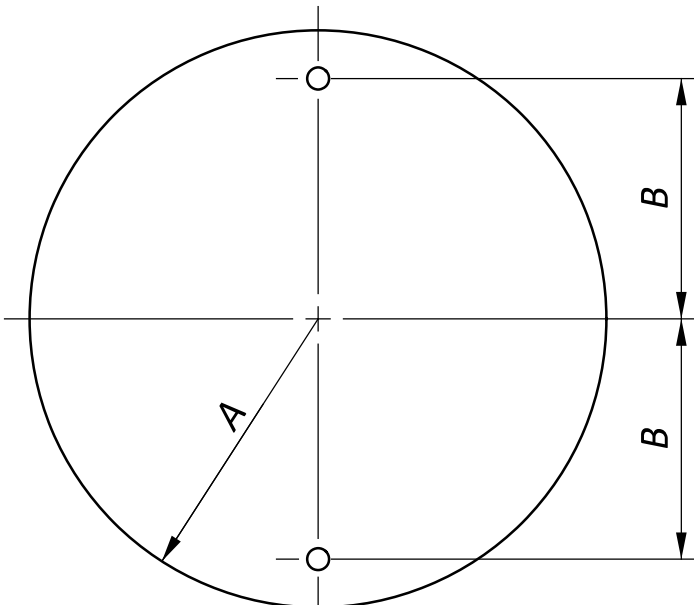
CO-1-2

A	B	C	D	E	THICKNESS	AREA (SQ FT)
18	15	1	5	2	0.080	2.25
24	18	2	5.313	2.688	0.080	4.00
30	24	2	6.625	3.375	0.080	6.25



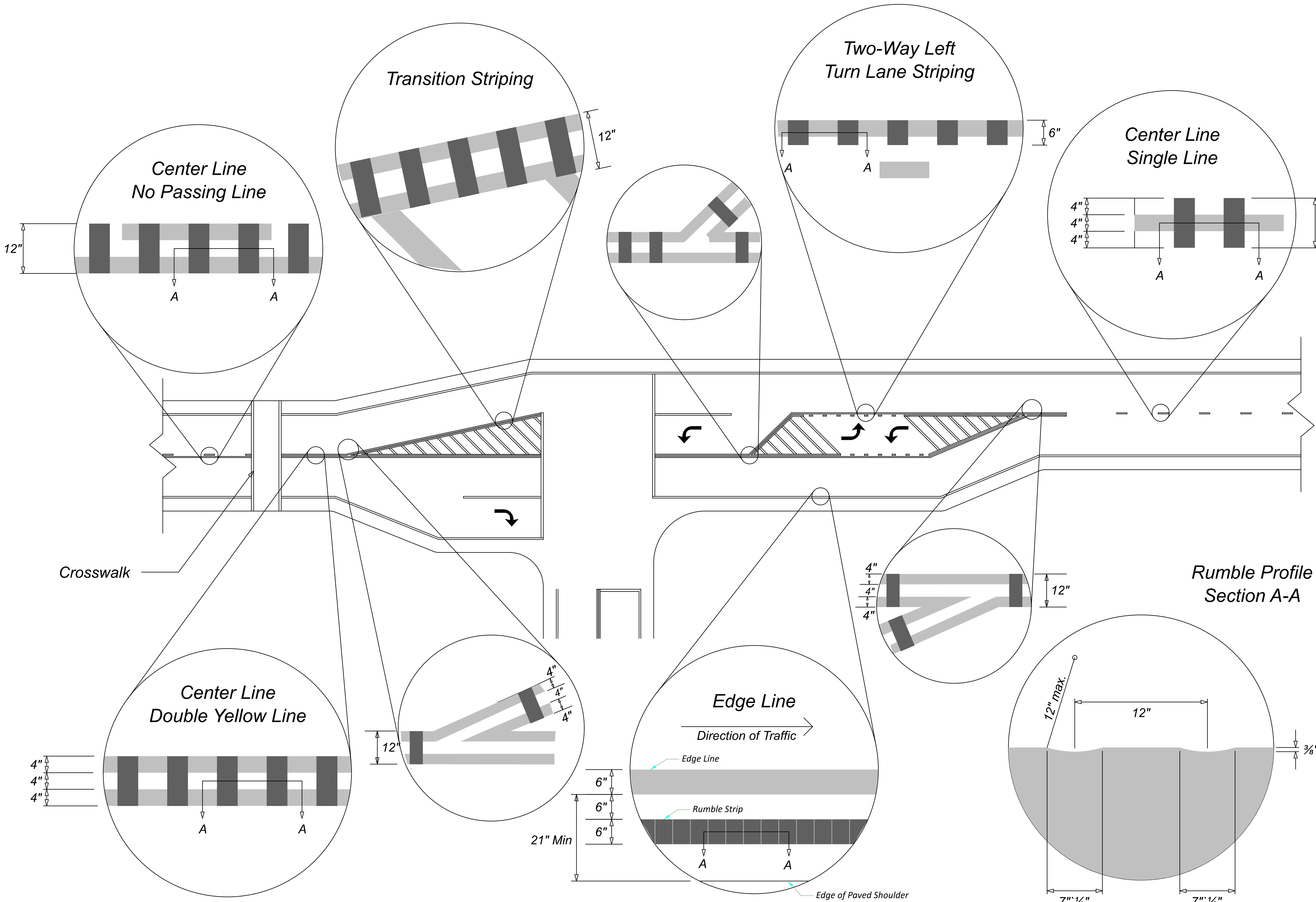
I.S.-2-4

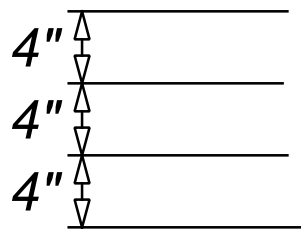
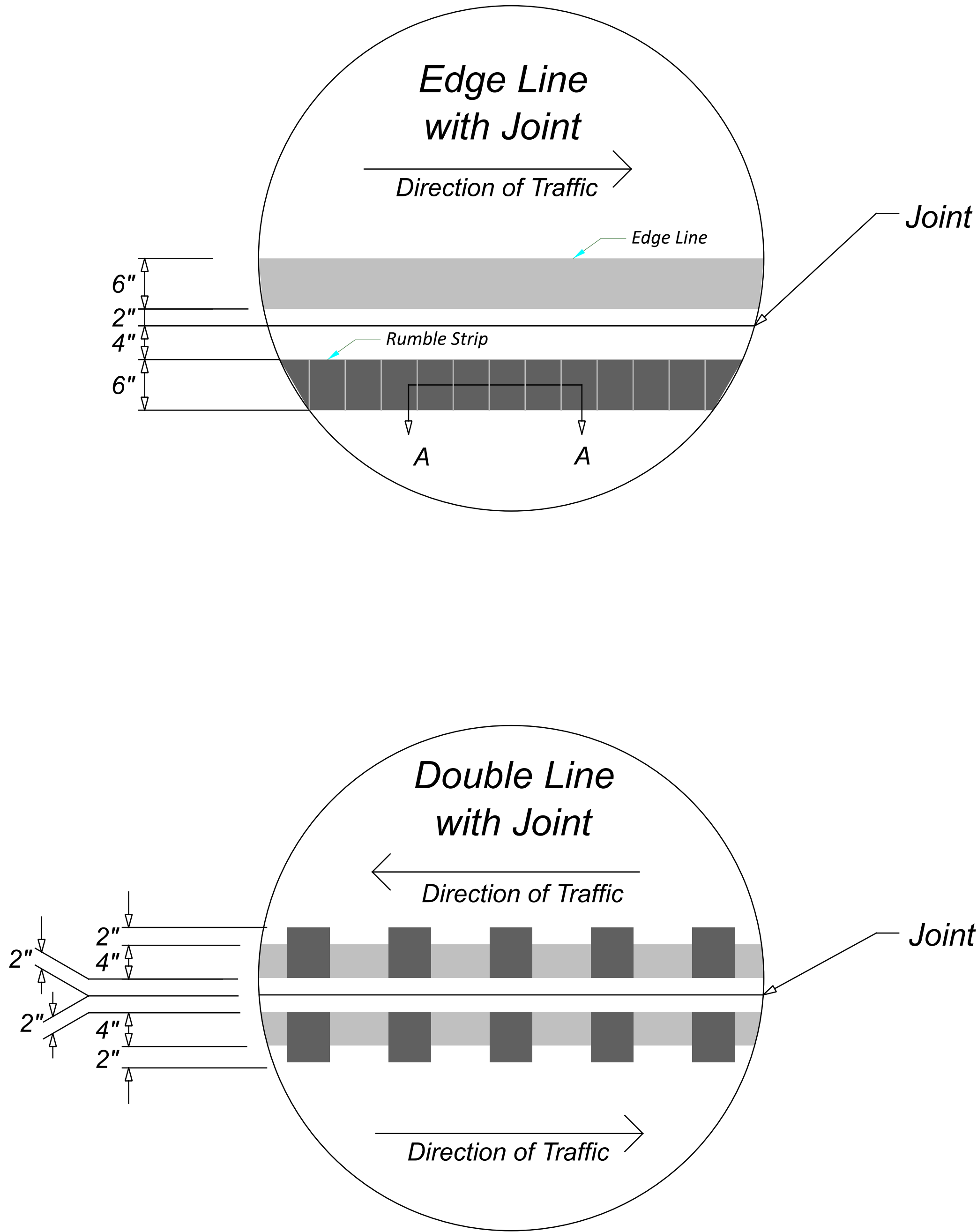
A	B	C	D	E	F	THICKNESS	AREA (SQ FT)
48	48	9	30	9	30	0.100	16.00
60	48	9	30	12	36	0.100	20.00



CIR-1-2

A	B	THICKNESS	AREA (SQ FT)
9	6	0.080	2.25
12	9	0.080	4.00
15	12	0.080	6.25
18	15	0.080	9.00



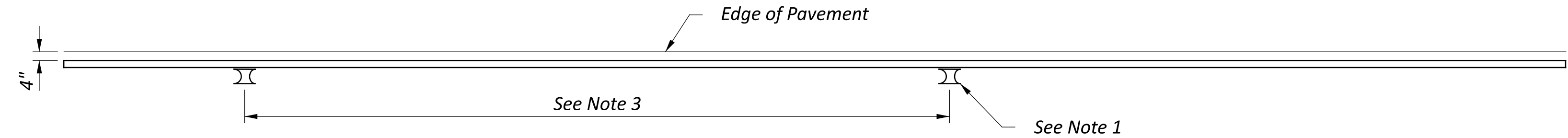


NOTES:

- Rumble stripes are defined as milled longitudinal rumble strips supplemented by the related longitudinal pavement markings. Center line rumble stripes are applied in the same location as the center line marking such that the pavement marking material conforms to the grooved contours of the milled rumble strip. Edge line rumble stripes are offset by 6 inches to the outside of the edge line marking.
- Edge line rumble stripes require a paved shoulder width of 2 feet or greater.
- Except where interrupted as described in Note 4, install the milled portion of the center line rumble stripe in a continuous longitudinal line and install the milled portion of the edge line rumble stripe in a 60-foot cycle (48' long rumble strip - 12' gap).
- Interrupt the milled portion of the center line or edge line rumble stripe for any of the following.
 - skip 2 mills for each raised pavement marker.
 - 20 feet upstream and downstream of radii of intersecting roads and major driveways.
 - 20 feet upstream and downstream of transverse markings (e.g., crosswalk lines, stop lines, yield lines, etc).
- Discontinue milled portion 650 feet in advance of and departing from built-up areas, including municipal corporation limits and urban area boundaries unless otherwise shown in the plans or approved by the Engineer.
- Thermoplastic pavement markings (C&MS Item 644), Preformed pavement markings (C&MS Item 645) and heat-fused preformed thermoplastic (C&MS Item 647) shall not be used for center line rumble stripes.
- Apply pavement marking material after milling in the rumble strip.
- Coat both sides of the center line rumble profile with specified marking material. This may require striping operations to move at no more than 8 miles per hour.
- Do not install rumble stripes on bridges unless otherwise shown in the plans or approved by the Engineer.
- Pay Item: Milled rumble strips shall be paid for in accordance with C&MS Item 618. Pavement marking material shall be paid for in accordance with C&MS Item 641.

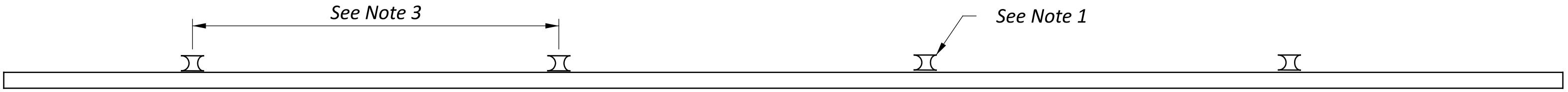
EDGE LINE

1-Way (White) with Right Edge Line or
2-Way (Yellow/Red) with Left Edge Line on Ramps,
Yellow Side Facing Traffic



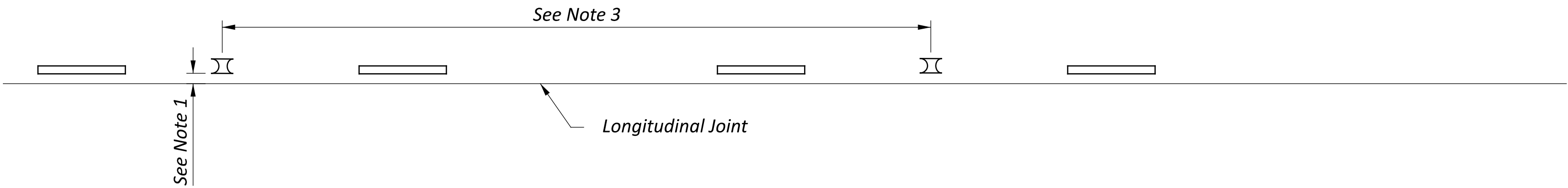
CHANNELIZING LINE

2-Way (White/Red),
White Side Facing Traffic



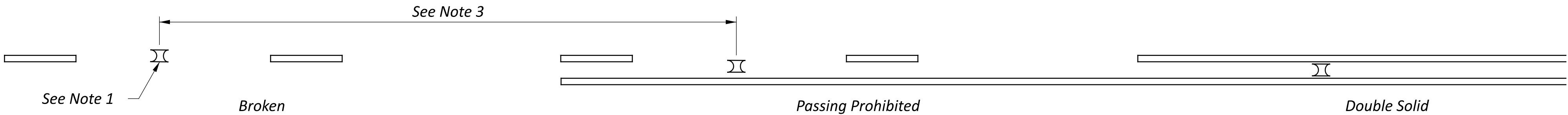
LANE LINE

1-Way (White) or
2-Way (White/Red),
White Side Facing Traffic



CENTER LINE

2-Way (Yellow/Yellow)

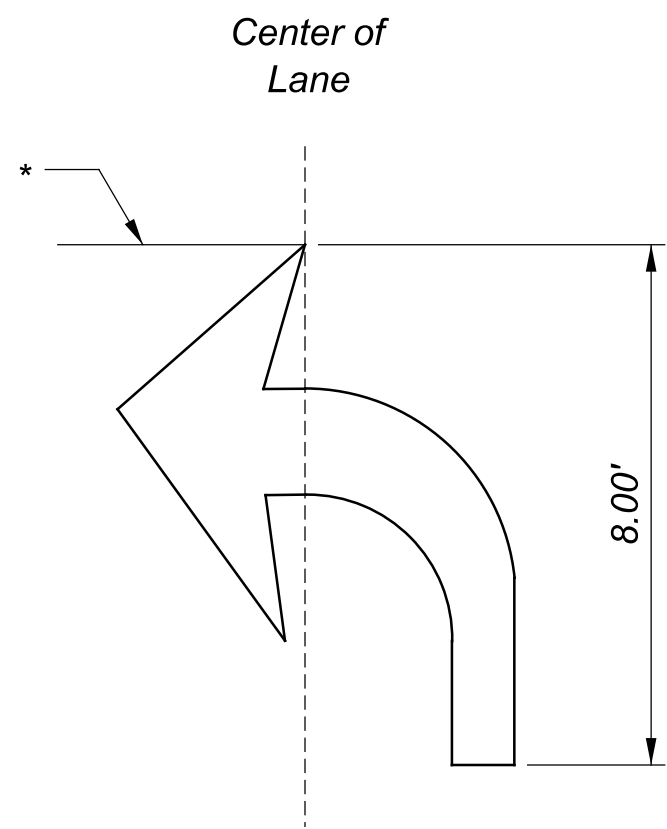


NOTES:

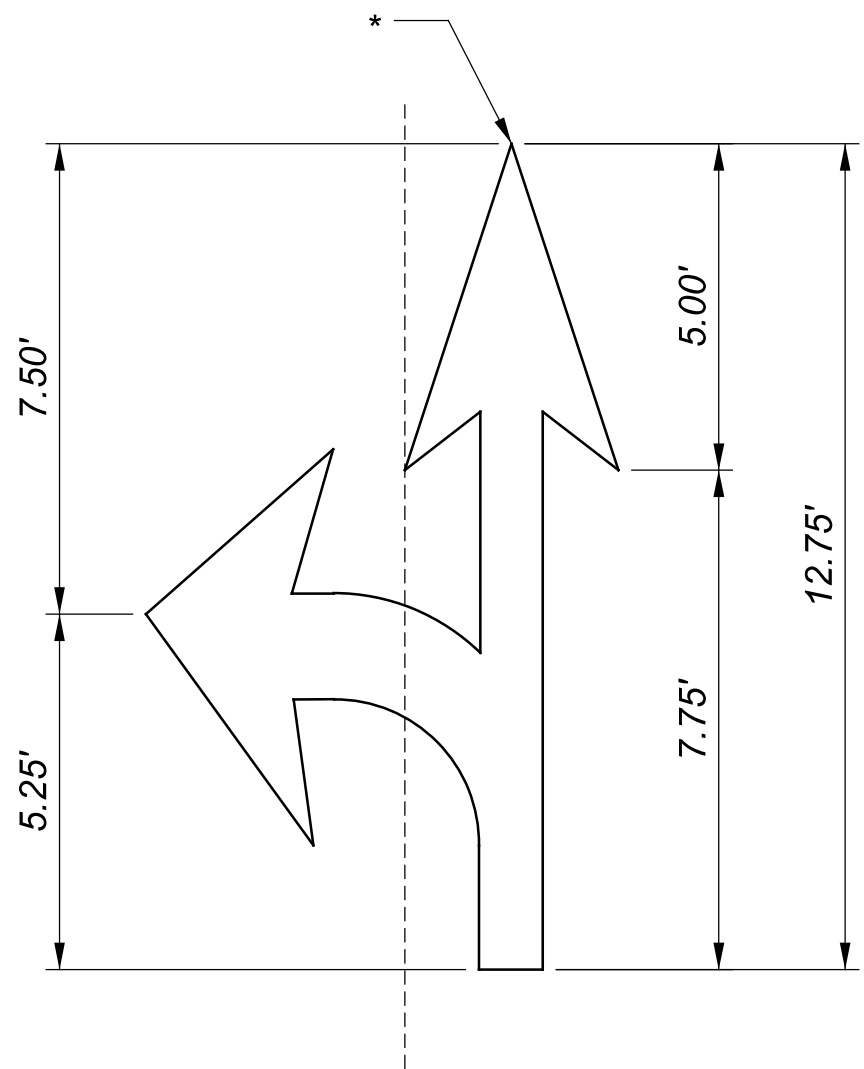
- Center line markers shall be placed between the lines when single or double solid lines are used. Markers installed along an edge line or channelizing line shall be placed so that the casting is no more than 1" from the near edge of the line. Markers installed along a lane line or dashed yellow center line shall be placed between and in line with the dashes. However, despite these provisions, the markers shall also be placed a minimum of 2" away from a longitudinal or transverse joint.

If approved by the Engineer, markers may be placed on the lines where the lines deviate visibly from their correct alignment or the construction joint will be within 2" of the marker.
- To facilitate the cutting of the two parallel slots and intervening concaved surface simultaneously, it is recommended that an arbor and saw blade assembly be used. For additional details and tolerances of the casting and arbor-saw assembly, contact the casting manufacturer.
- See Standard Construction Drawing TC-65.11 for spacing details.

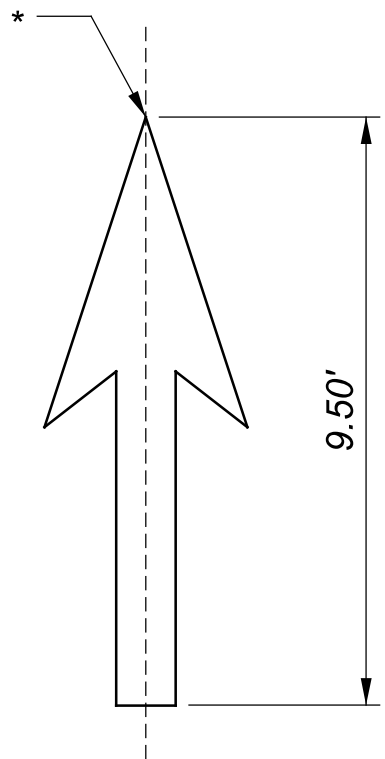




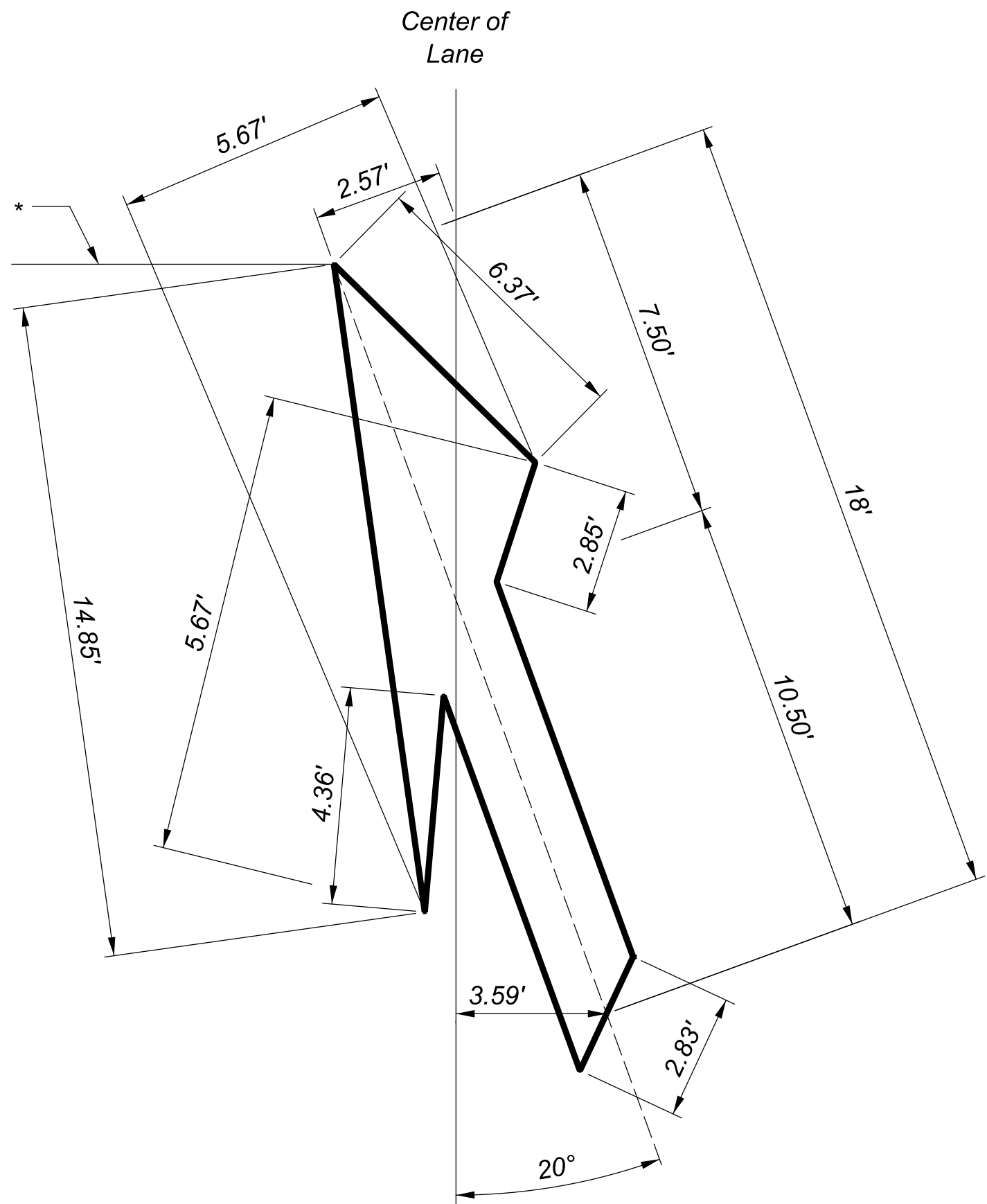
TURN ARROW
(Right Arrow Opposite)



TURN AND THROUGH ARROW
(Three-Headed Directional Arrows Can be Achieved by the Combination of Turn Arrows.)



THROUGH ARROW

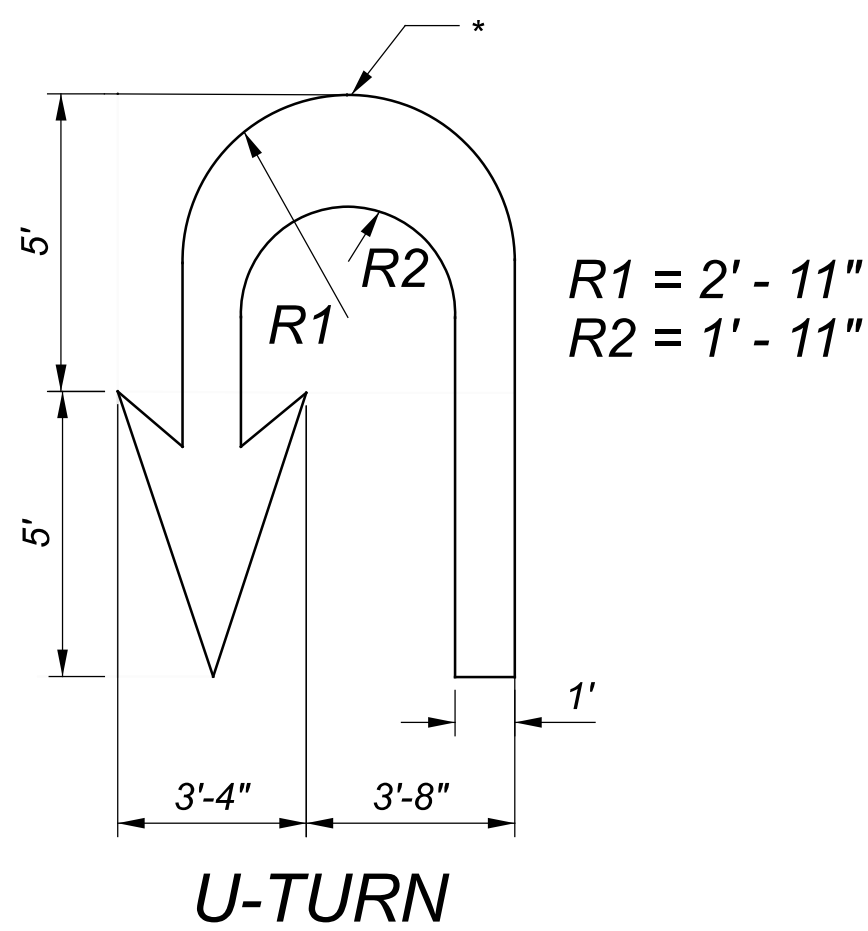


LANE-REDUCTION ARROW (RIGHT)
(For Left Lane, Use Mirror Image)

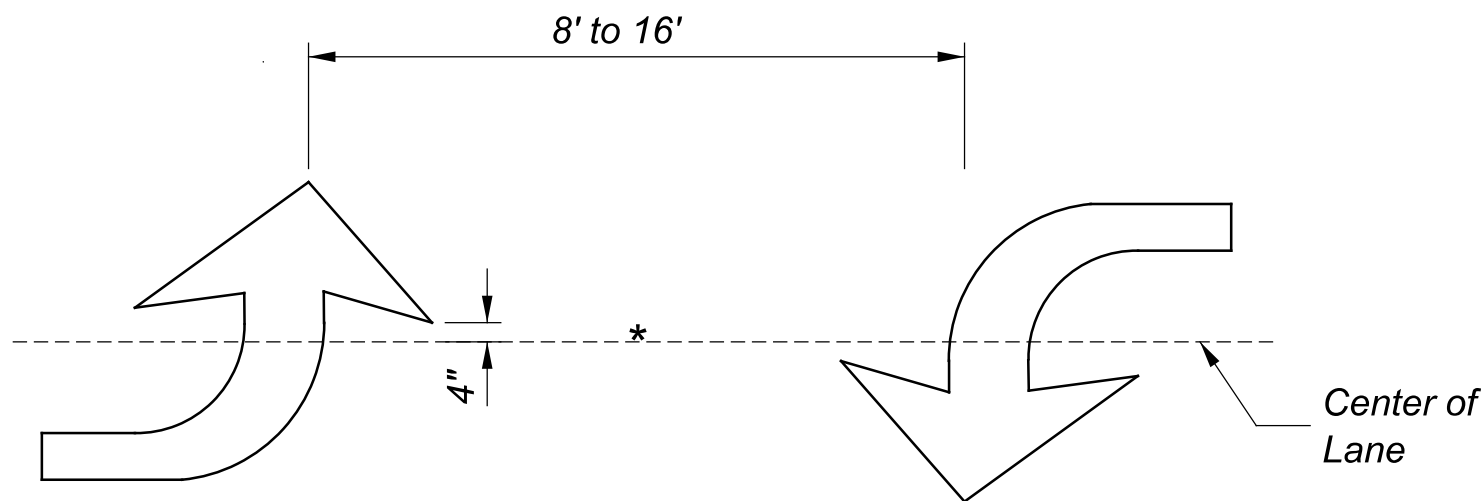
TABLE 1 - LANE-USE ARROWS

ARROW TYPE	SIZE (FT)	AREA (SQ FT)
Turn Arrow	8.00	17
Through Arrow	9.50	13
Turn and Through Arrow	12.75	28
Lane-Reduction Arrow	18.00	46

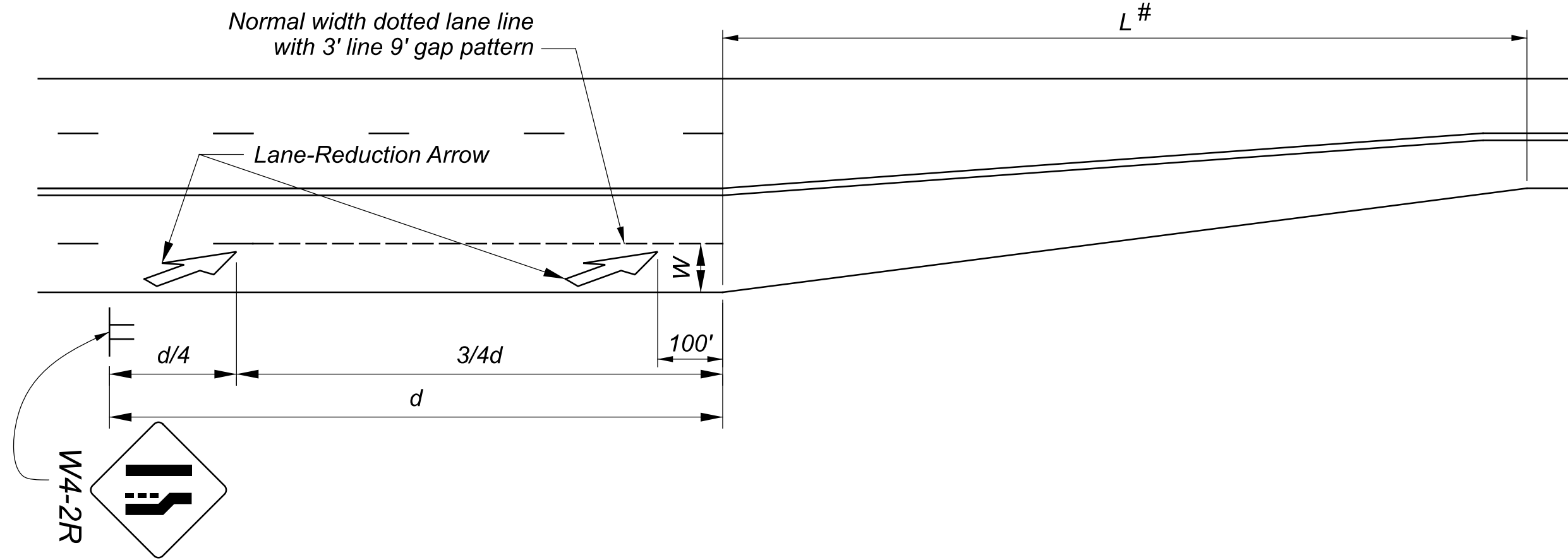
* - Indicates Station Reference Point



U-TURN



TWO-WAY LEFT-TURN ARROWS
(See Note 6)

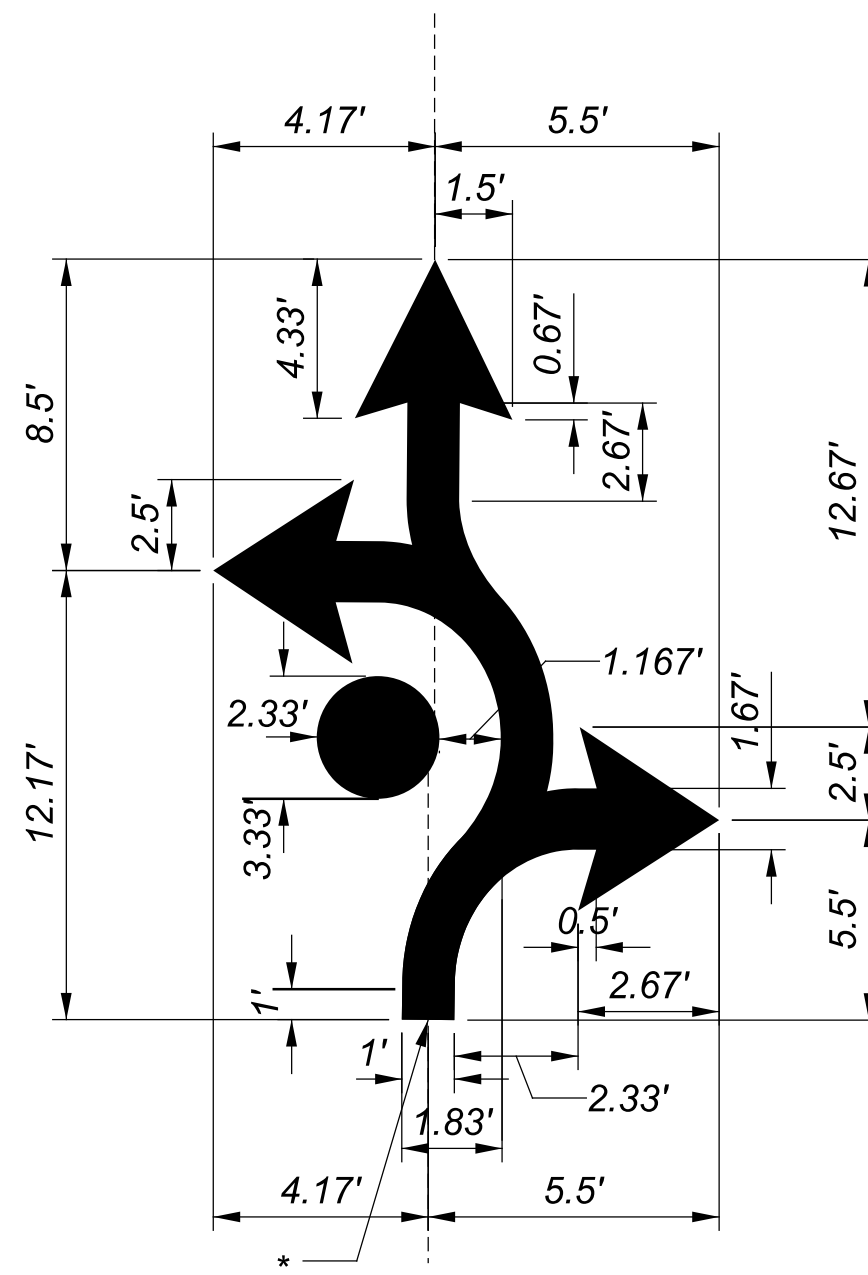


Speed (S) (MPH)	Lane Width (W) (FT)	Taper Length (L) # (FT)	Advance Warning Distance (d) (FT)
25	12	125	325
30	12	180	460
35	12	245	565
40	12	320	670
45	12	540	775
50	12	600	885
55	12	660	990
60	12	720	1100
65	12	780	1200
70	12	840	1250

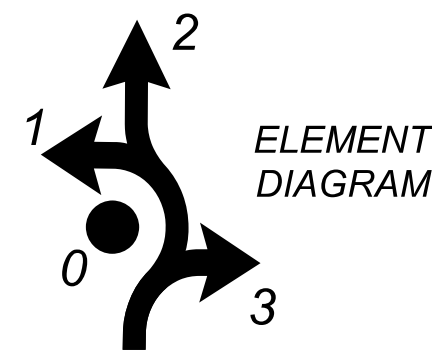
LANE-REDUCTION ARROW MARKING DETAIL
(See Note 8)

Taper Length (L) shown is for 12 foot lane width (W).
Use formula for other lane widths.

S - Posted, 85th-percentile or statutory speed, in MPH
W - Lane width or offset, in feet
L - Taper length in feet for Speed < 45 MPH = $WS^2/60$
L - Taper length in feet for Speed > 45 MPH = WS
d - Advance Warning Distance, in feet



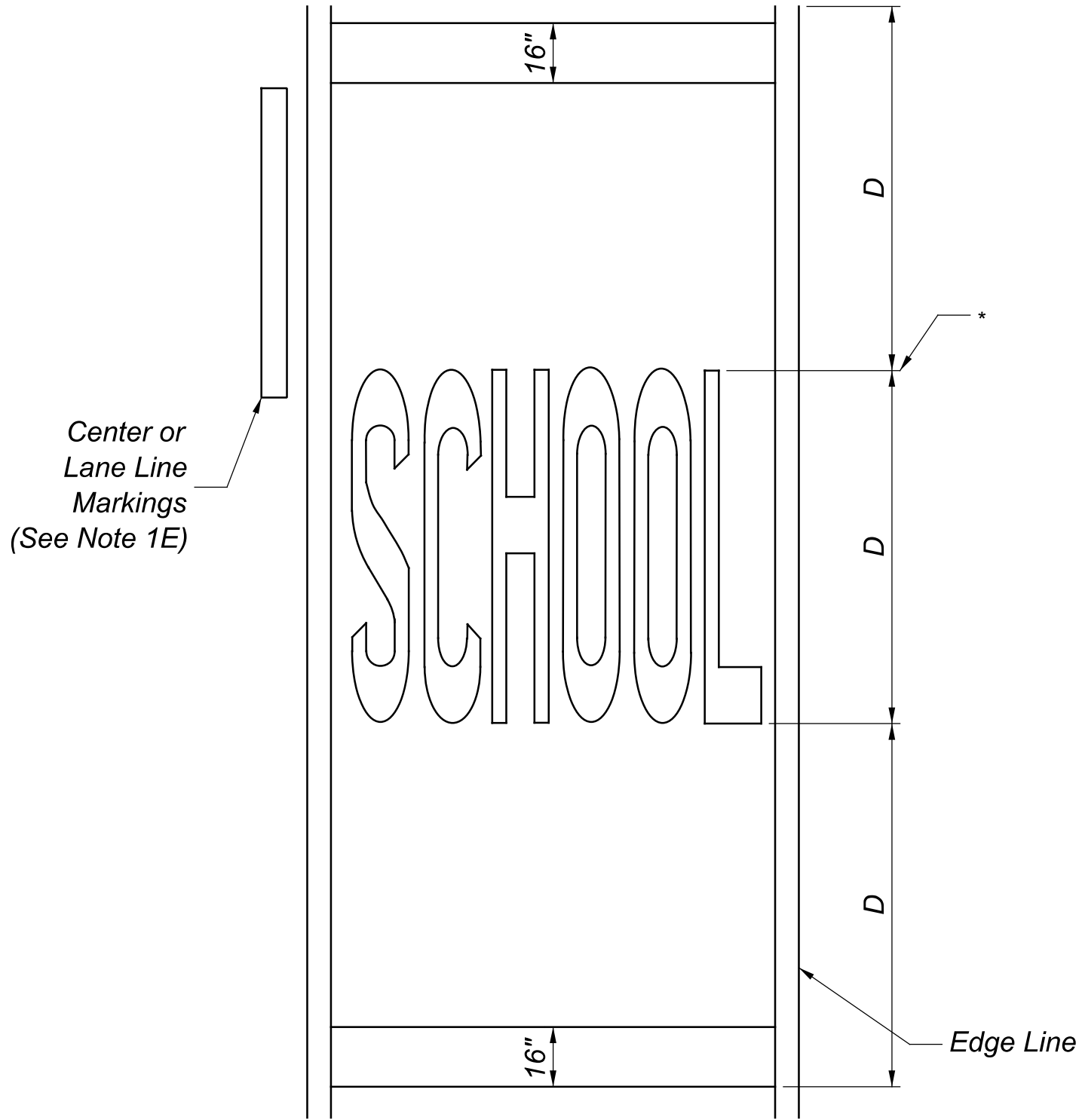
FISH-HOOK ARROW (ROUNDBABOUTS)



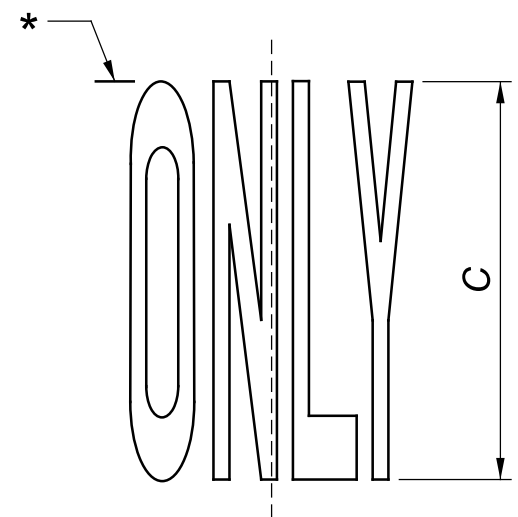
OVERALL DIMENSIONS		
ELEMENTS INCLUDED	OVERALL WIDTH	OVERALL HEIGHT
1	6.5'	14.67'
1 & 2	6.5'	20.67'
1 & 3	9.67'	14.67'
1, 2 & 3	9.67'	20.67'
0 & 2*	4.5'	20.67'
0, 2 & 3*	7.67'	20.67'
2	3.833'	20.67'
2 & 3	7.0'	20.67'
3	6.0'	8.0'

* THE DOT (ELEMENT 0) IS ONLY USED IN SYMBOLS FOR THE LEFTMOST LANE.



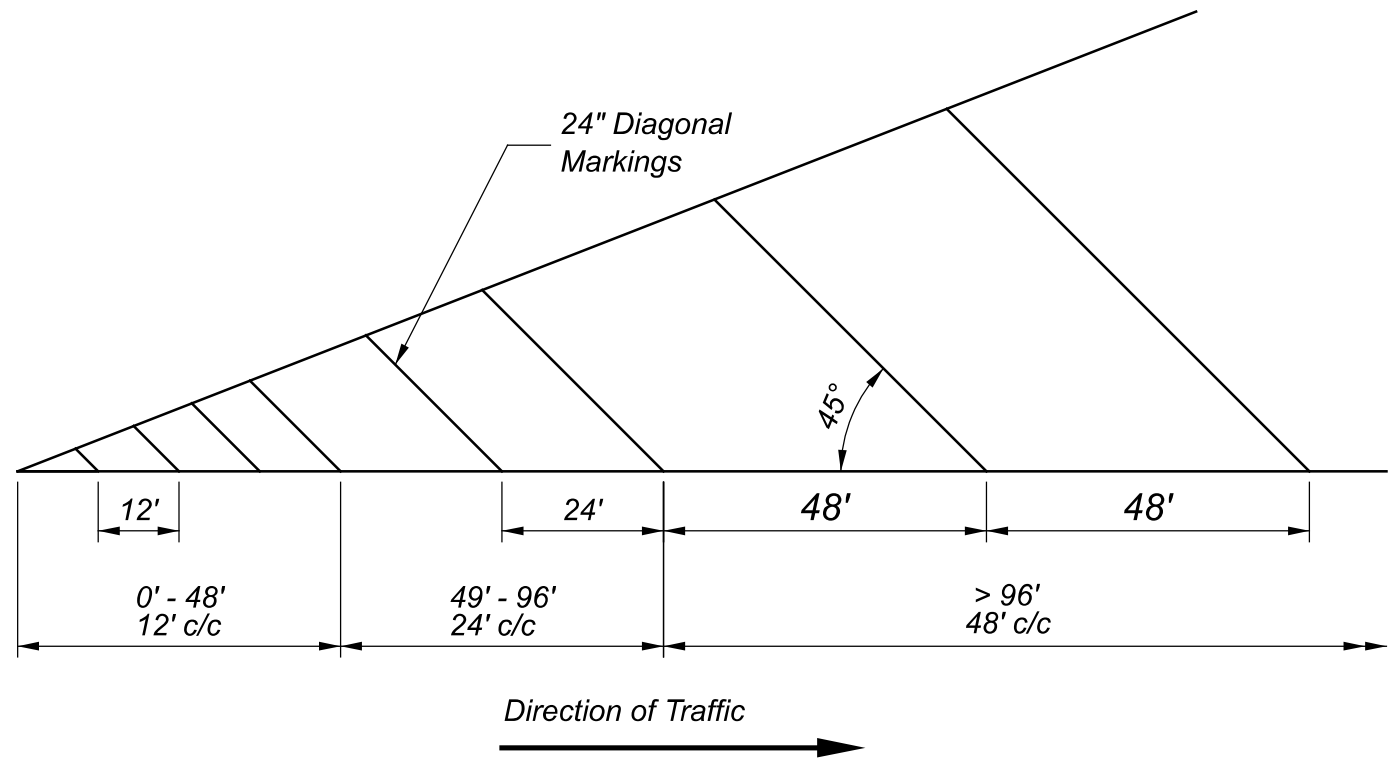
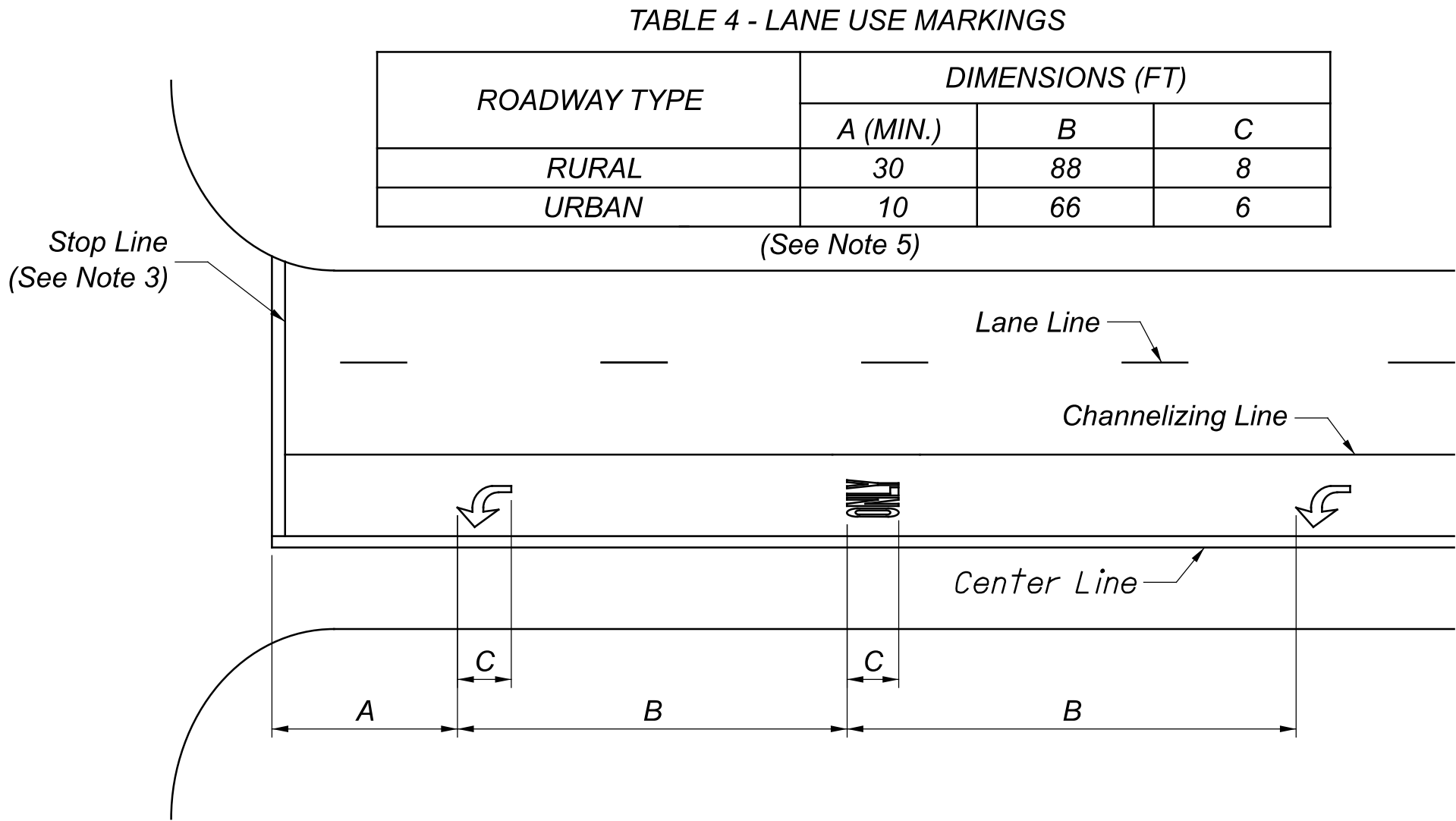


SCHOOL WORD MARKING
(See Note 1)



ONLY WORD MARKING
(See Note 4)

WORD	HEIGHT (C, D)		
	URBAN 6'	RURAL 8'	MULTI-LANE 10'
ONLY (C)	17	23	N/A
SCHOOL (D)	27	37	90



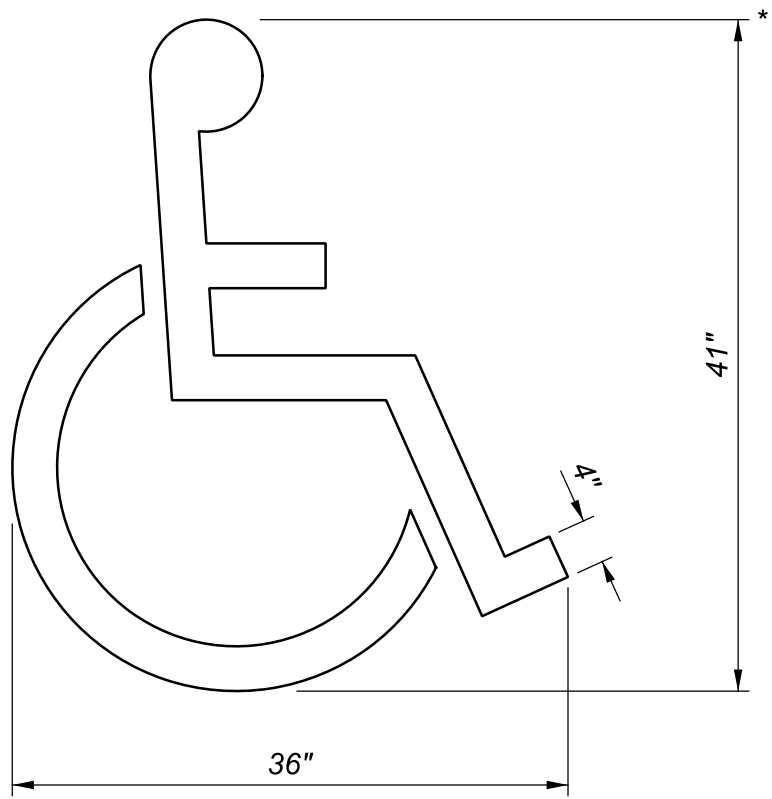
TYPICAL SPACING DETAIL FOR 24" DIAGONAL MARKINGS

(Chevron Markings, Including a Spacing Table, are Shown on SCD TC-72.20.)

* - Indicates Station Reference Point

TABLE 2 - HANDICAP, BIKE & CHEVRON MARKINGS

SYMBOL	HEIGHT (IN)	WIDTH (IN)	AREA (SQ FT)
HANDICAP	41	36	2.7
BIKE	72	40	16
CHEVRON	40	40	3.3 (.83 x 4)



HANDICAP SYMBOL MARKING

SHARED-USE PATH AND BIKEWAY MARKINGS

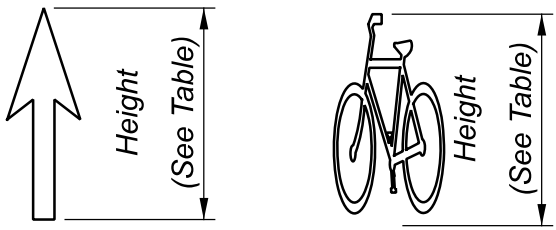
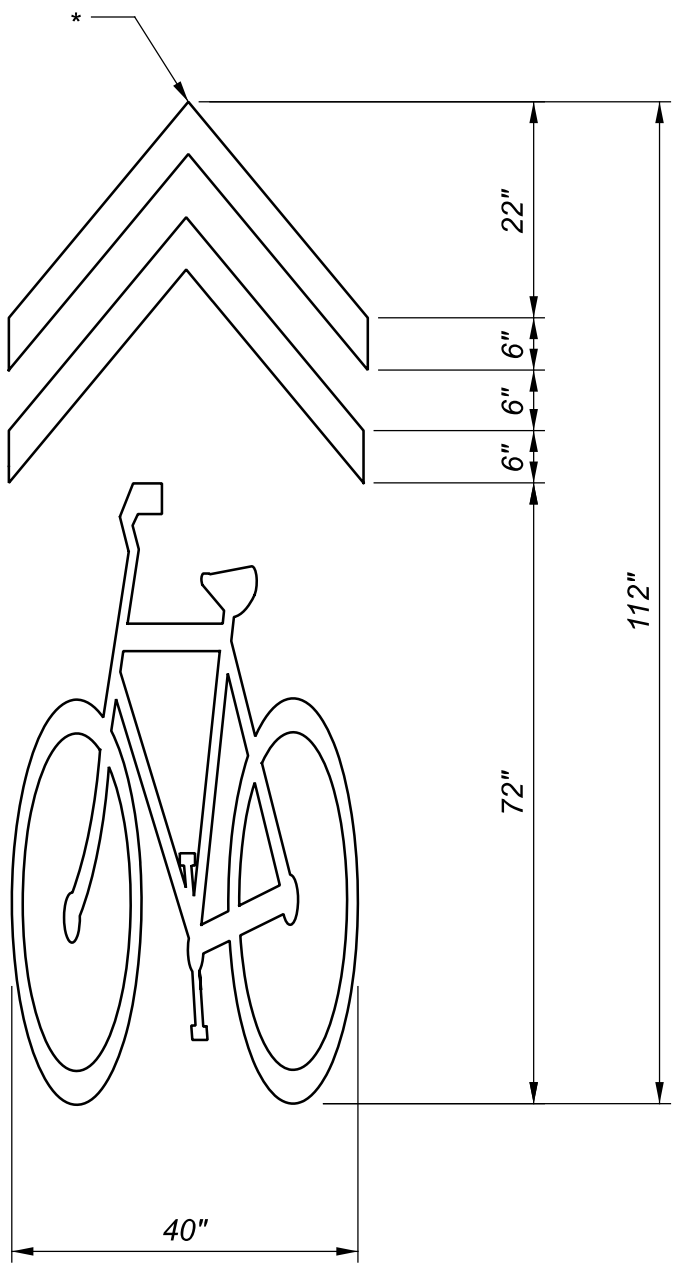


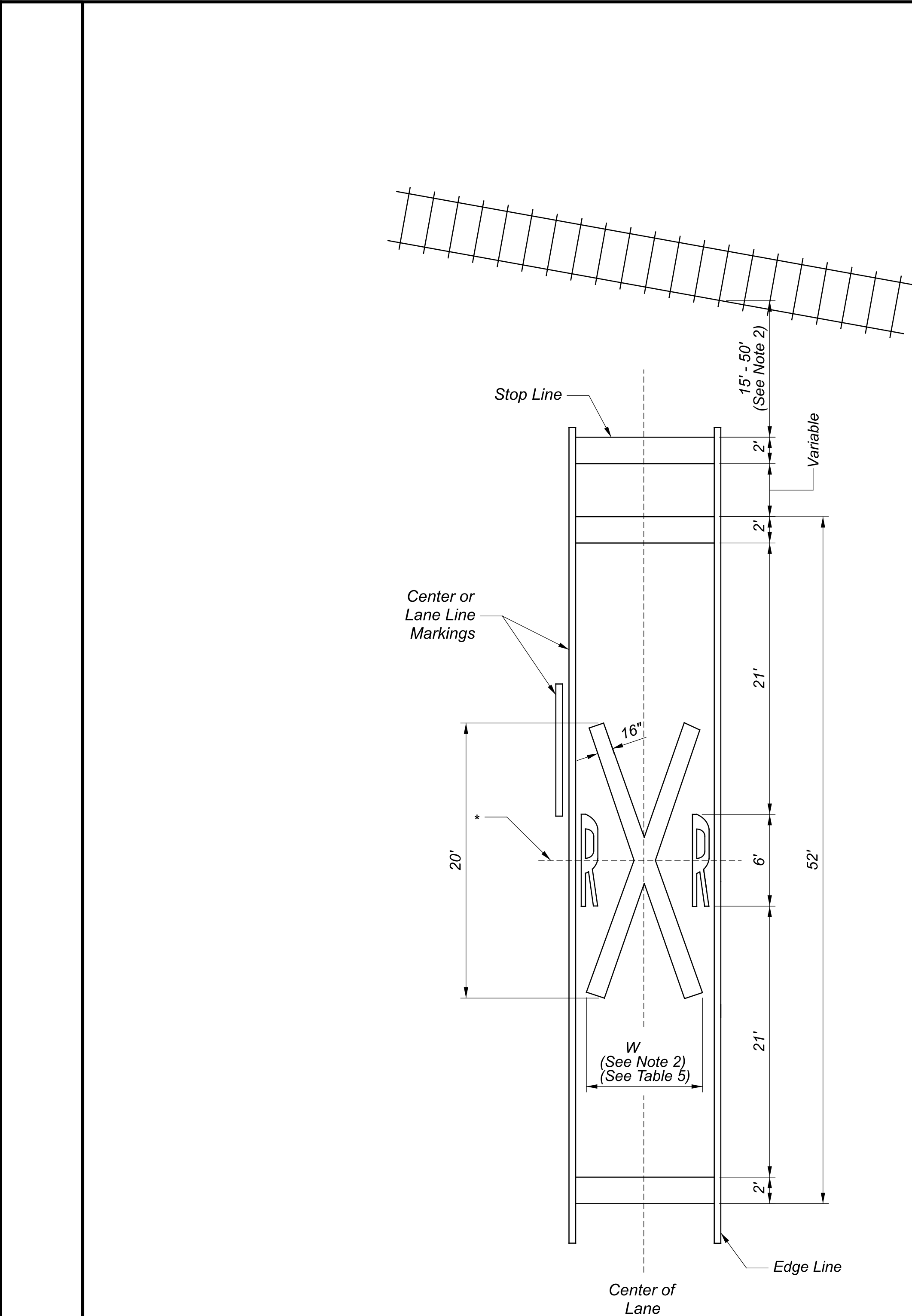
TABLE 1 - BIKEWAY MARKINGS

FACILITY TYPE	HEIGHT (FEET)	STRAIGHT ARROW	AREA (SQUARE FEET)			
			BIKE SYMBOL	HWY	XING	RXR SYMBOL
SHARED USE PATH	4	----	----	5	6	----
	10	----	----	----	----	16
BICYCLE LANE	6	6	5	----	16	----
ROADWAY-URBAN	6	5	5	----	16	----
ROADWAY-RURAL	8	7	7	----	21	----



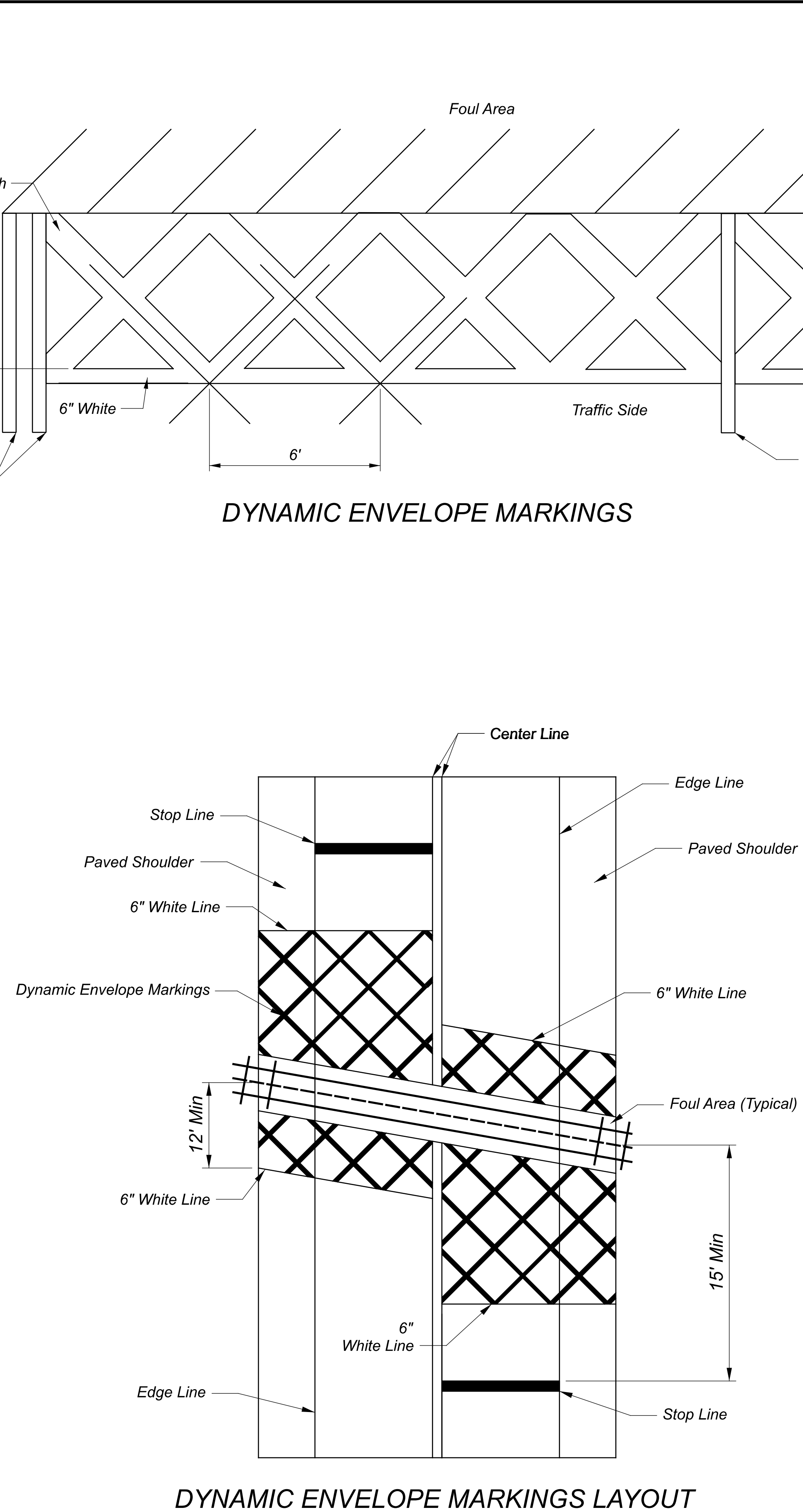
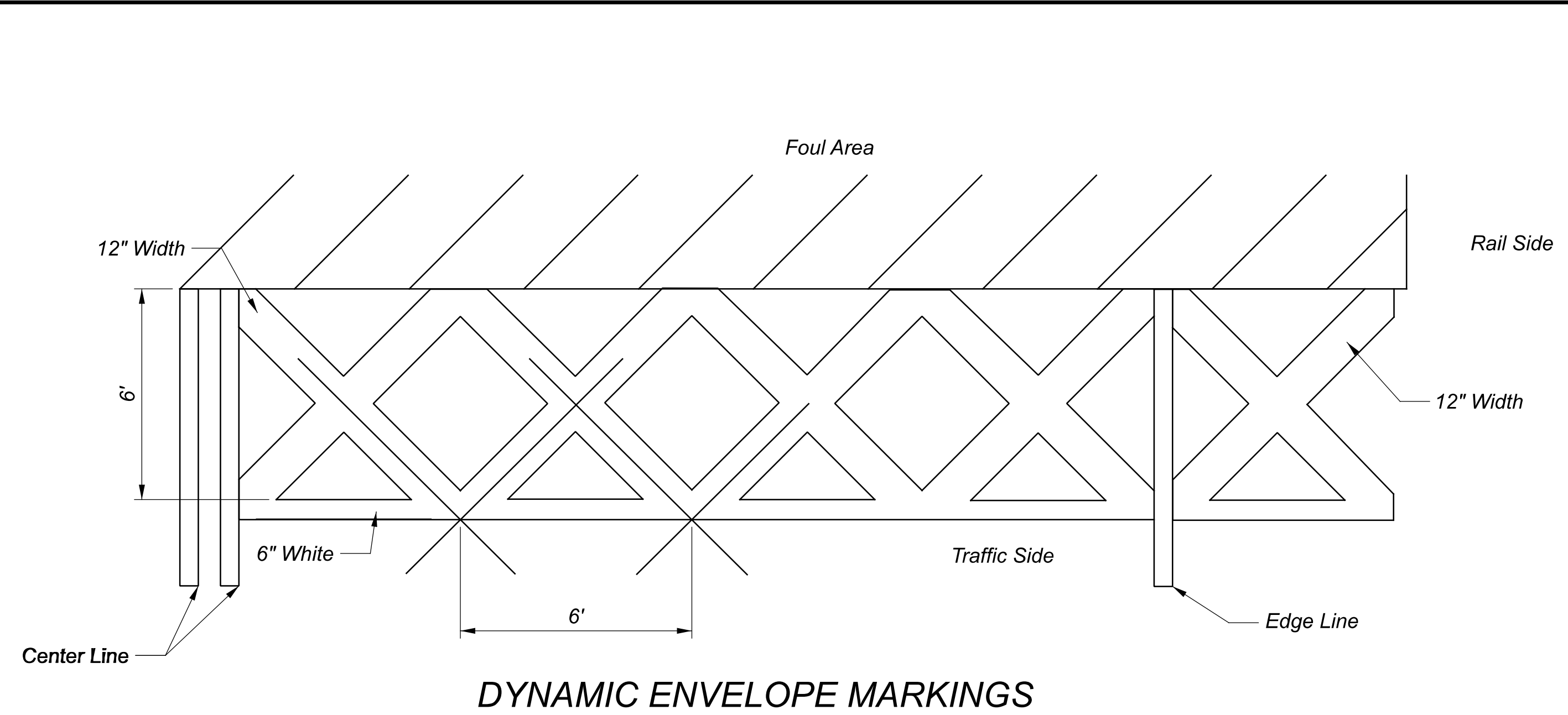
SHARED LANE MARKING
(See Note 7)





The diagram illustrates the dimensions and layout of a railroad symbol marking on a road surface. Key features include:

- Stop Line:** Indicated by a horizontal line at the top of the marking area.
- Center or Lane Line Markings:** Indicated by a vertical dashed line through the center of the marking.
- Edge Line:** Indicated by a horizontal line at the bottom of the marking area.
- Dimensions:**
 - 20':** Total width of the marking area.
 - 16":** Width of the central 'X' symbol.
 - 6':** Distance from the center line to the inner edge of the 'X' symbol.
 - 21':** Distance from the center line to the outer edge of the 'X' symbol.
 - 21':** Distance from the center line to the edge line.
 - 2':** Distance from the stop line to the center line.
 - 2':** Distance from the center line to the edge line.
 - 15' - 50' (See Note 2):** Variable distance from the edge line to the next marking.
 - Variable:** Indicated by a dimension line for the distance between the stop line and the center line.
- W (See Note 2) (See Table 5):** Variable width of the marking area.

[illegible]

REVISIONS

01-16-2026	
07-18-2025	
04-21-2023	
07-15-2022	
07-16-2021	
01-19-2018	
01-20-2017	
07-15-2016...	

STDS ENGINEER
Soisson

STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR

Adam Koenig



SCD NUMBER	TC-71.10
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SHEET	TOTAL
3	4

NOTES:

SCHOOL Marking

- 1A.

The SCHOOL markings shall be installed on all paved approaches in advance of all School Zones.
- 1B.

The SCHOOL markings should be placed at least 100' in advance of the School Zone. The preferred placement of the SCHOOL marking is adjacent to the School Zone Advance sign.
- 1C.

On two-way, two-lane highways the following shall apply:

1.)

When the approach lane to the School Zone is 11' or more in width -

a.)

The SCHOOL word marking and transverse lines shall be contained in, and centered in, the lane.

b.)

The character height shall be 6' for urban areas and 8' for rural areas.

2.)

When the approach lane to the School Zone is less than 11' in width -

a.)

One installation of the SCHOOL word marking and transverse lines shall extend across both lanes of traffic.

b.)

The characters shall be 10' in height.

1D.

On multi-lane approaches the following shall apply -

1.)

When the approach lanes to the School Zone are 11' or more in width -

a.)

The SCHOOL word marking and transverse lines shall be contained in, and centered in, each lane.

b.)

The character height shall be 6' for urban areas and 8' for rural areas.

2.)

When the approach lanes to the School Zone are less than 11' in width -

a.)

One installation of the SCHOOL word marking shall extend to the width of two approach lanes.

b.)

Transverse lines shall extend across all approach lanes of traffic.

c.)

The characters shall be 10' in height.

1E.

Center or lane lines shall not pass through the SCHOOL word marking.

1F.

6' and 8' high SCHOOL word marking shall be marked with 4" strokes.

10' high SCHOOL word marking shall be marked with 8" strokes.

1G.

The area of the transverse lines varies with the width of the pavement; therefore, the area must be added to the value in Table 3 (sheet 2).

Railroad Crossing Markings

2A.

On multi-lane approaches, markings shall be as follows -

a.)

The RXR symbol shall be placed in each approach lane.

b.)

Transverse lines used with the railroad symbols shall extend across all approach lanes.

2B.

The railroad symbol should be located so that the Railroad Advance Warning (W10-1) sign is within the two transverse boundary lines of the railroad symbol.

2C.

The stop line shall be located for best sight distance between 15' - 50' of the near edge of the tracks.

2D.

The stop line shall be approximately 8' from a gate (if present).

2E.

Width (W) of the "X" will vary according to the lane width.

2F.

The height of the "R" shall be 6'.

2G.

The area of the transverse lines and stop lines varies with the width of the pavement; therefore the area must be added to the value in Table 5 (sheet 3).

2H.

Dynamic Envelope Markings consist of a 6-inch white channelizing line placed a minimum of 6-feet away and parallel to the nearest outside edge of rail at a highway-rail grade crossing. The Dynamic Envelope Markings also consists of 12-inch white diagonal markings arranged at 6-foot centers in a 6-foot by 6-foot "X" layout (sheet 3).

Stop Line Marking

3A.

Except as specified in Notes 3B and 3C, the stop line should be placed as follows:

a.)

The stop line should be placed where cross-corner vision is maximum.

b.)

In no case shall the stop line be placed more than 30' or less than 4' from the nearest edge of the intersecting roadway.

c.)

For normal intersections the maximum distance should be 10'.

3B.

If a marked crosswalk is present the stop lineshould be placed 4' in advance of, and parallel to, the nearest crosswalk line.

3C.

For signalized intersections the stop line should be placed at a minimum distance of 40' from the nearest signal head.

ONLY Word Marking

4A.

The ONLY word marking is optional.

4B.

Where used, the spacing between ONLY and arrow markings should be based on Table 4 (sheet 2).

4C.

When lane-use arrow markings are used and the ONLY marking is not, an additional lane-use arrow should be used in its place to retain the spacing as shown in Table 4 (sheet 2).

Lane-Use Arrow Markings

5A.

Lane-use arrow markings are optional except where a through traffic lane(s) approaching an intersection becomes a mandatory turn lane(s).

5B.

Where used, the spacing between markings should be based on Table 4 (sheet 2). However, based on the turn lane length, the spacing between the markings may be adjusted.

Two-Way Left-Turn Only (TWLTO) Arrows

6A.

Arrow sets should be longitudinally spaced at intervals of:

a.)

500' - 1000' for speeds less than or equal to 40 mph,

b.)

1000' - 1500' for speeds over 40 mph

6B.

In addition, an arrow set should be placed:

a.)

100' - 200' from the near edge of an intersecting roadway, or

b.)

Inside both ends of TWLTO lanes.

Shared Lane Marking

7A.

When chevron markings are used, its area must be added to the value of the bike symbol markings (see Table 2 on sheet 1).

7B.

When used, the shared lane marking should be placed immediately after an intersection and spaced at intervals not greater than 250' thereafter.

Lane-Reduction Arrow Markings

8A.

Lane-reduction arrow markings should be placed where a lane reduction transition occurs on a roadway as follows:

a.)

Lane-reduction arrow markings may be placed for speeds of less than 45 mph, if determined to be appropriate based on engineering judgement.

b.)

Lane-reduction arrow markings should be placed for speeds of 45 mph or over.

c.)

Lane-reduction arrow markings may be placed in long acceleration lanes.

d.)

Where lane-reduction arrows are used, they should be placed as follows:

i.)

First lane-reduction arrow 100' in advance of the 'Begin Taper' point.

ii.)

Second lane-reduction arrow placed at the 3/4d point.

Handicap Symbol Markings

9A.

For the handicap symbol marking, a blue background and white border shall not be used.

OFFICE OF ROADWAY ENGINEERING

REVISIONS
01-16-2026
07-18-2025
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01-19-2018
01-20-2017
07-15-2016...

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Adam Koenig

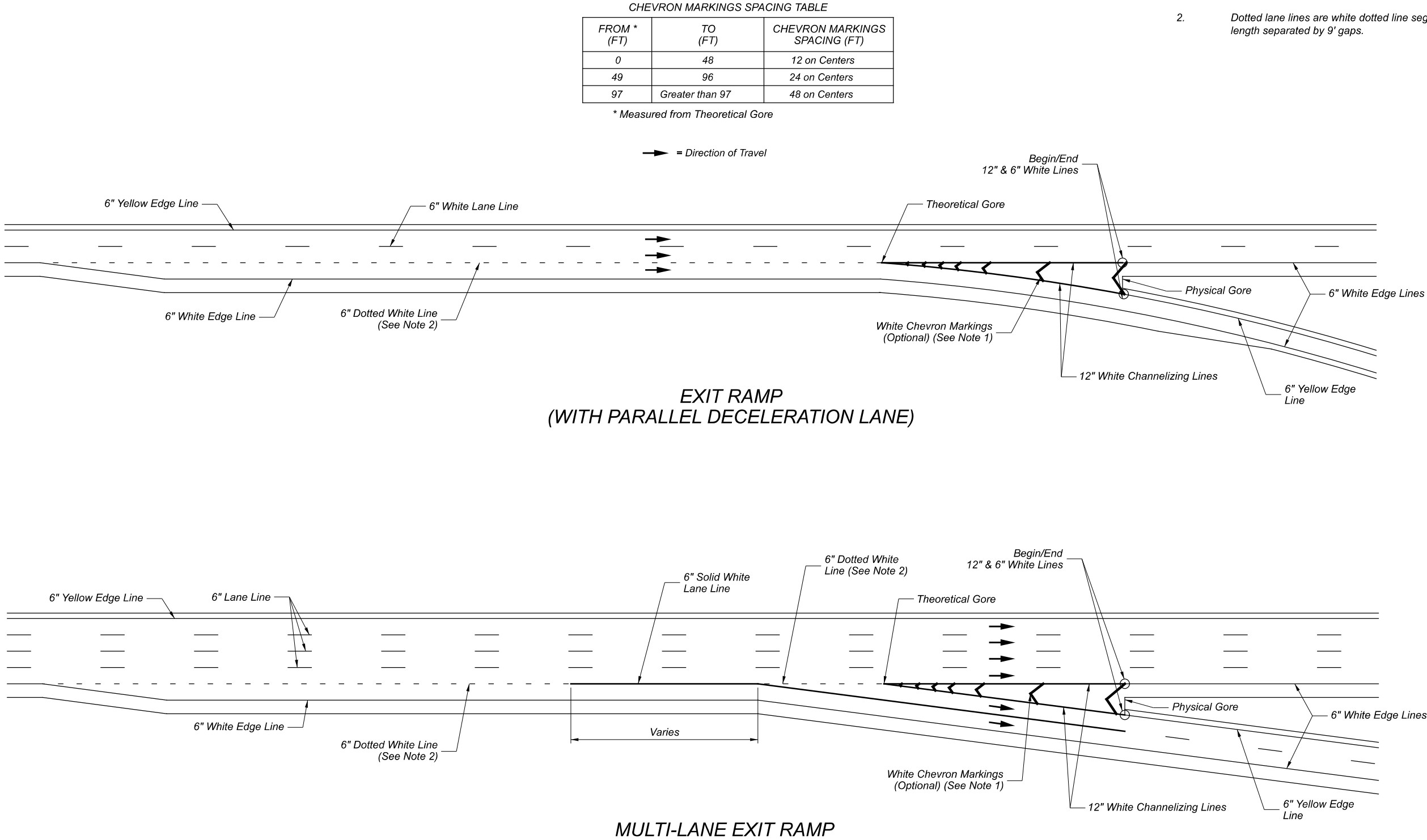
WORD AND SYMBOL PAVEMENT MARKINGS

DESIGN AGENCY

SCD NUMBER
TC-71.10

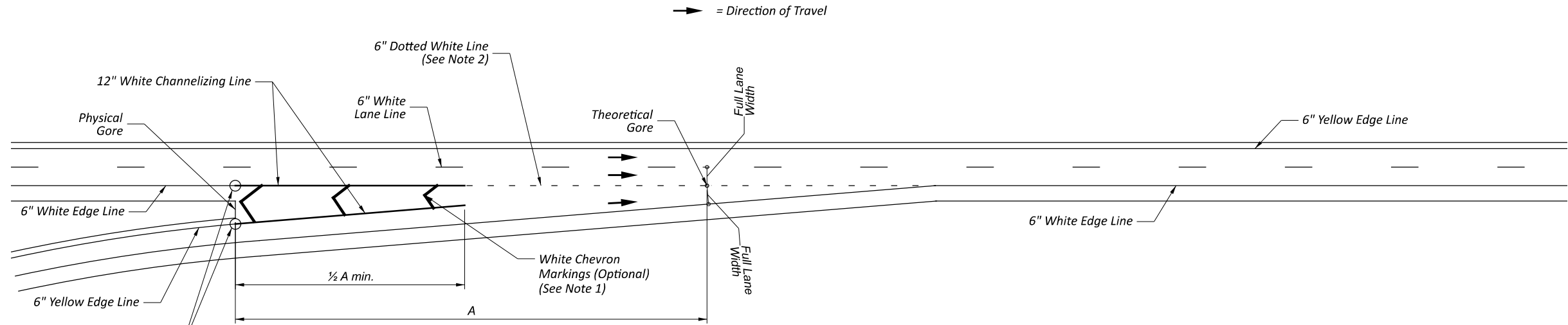
SHEET
4

TOTAL
4

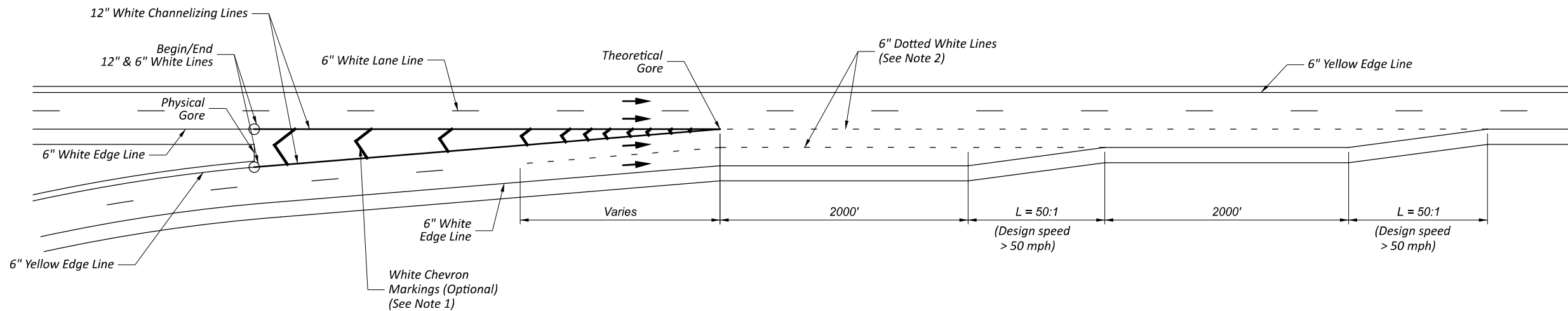


NOTES:

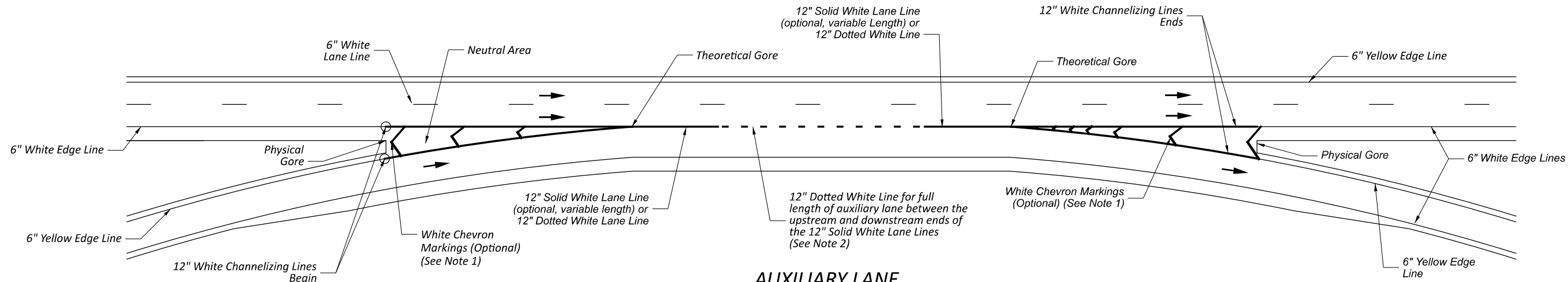
- Chevron markings, when used in neutral areas of exit and entrance ramps, are 24" wide lines and are placed at the spacing shown in the Chevron Markings Spacing Table.
- Dotted lane lines are white dotted line segments 3' in length separated by 9' gaps.



**ENTRANCE RAMP
(WITH TAPERED ACCELERATION LANE)**

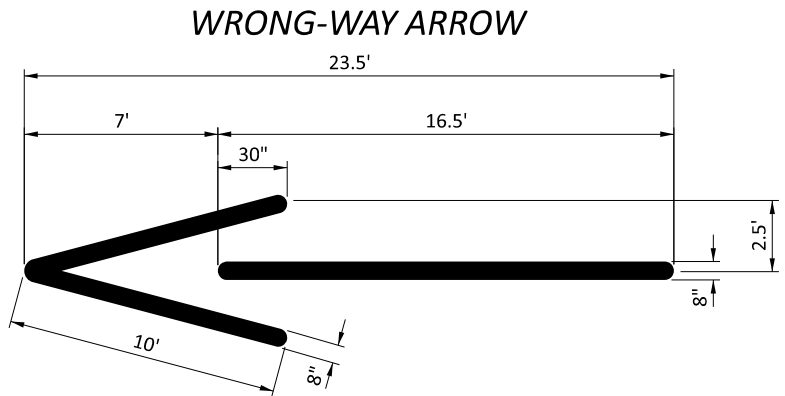


MULTI-LANE ENTRANCE RAMP

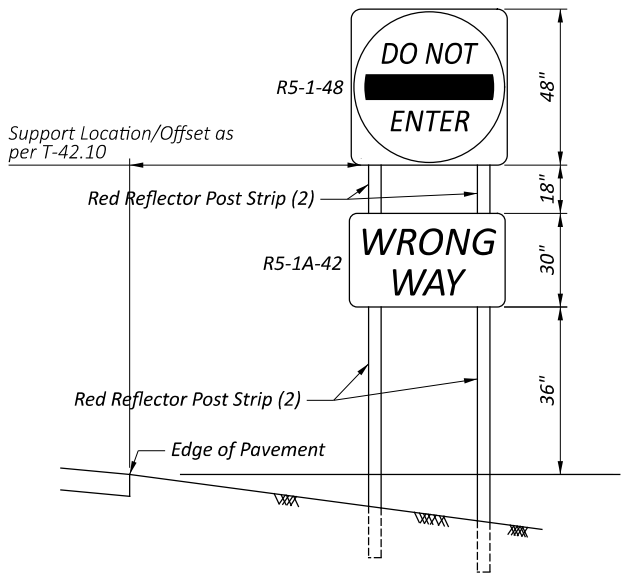


**AUXILIARY LANE
(CLOVERLEAF OR CLOSELY SPACED INTERCHANGES)**

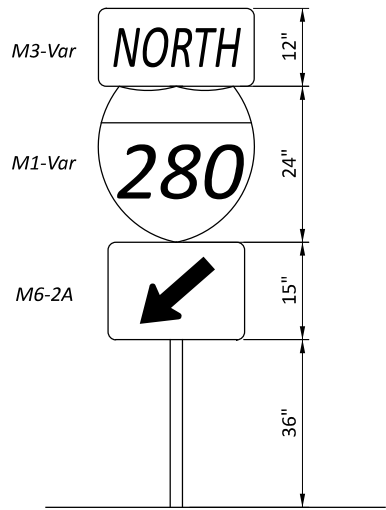




WRONG-WAY SIGN MOUNTING DETAILS



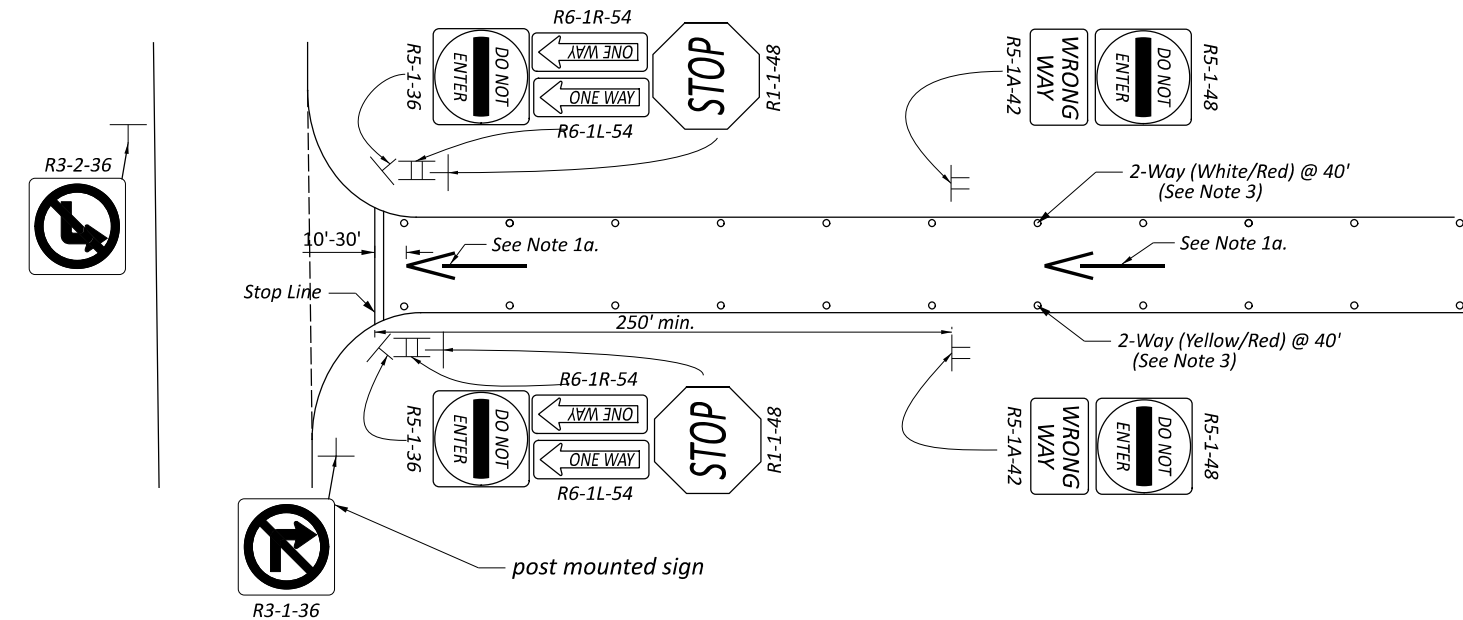
ENTRANCE RAMP DIRECTIONAL SIGN ASSEMBLY (OPTIONAL)



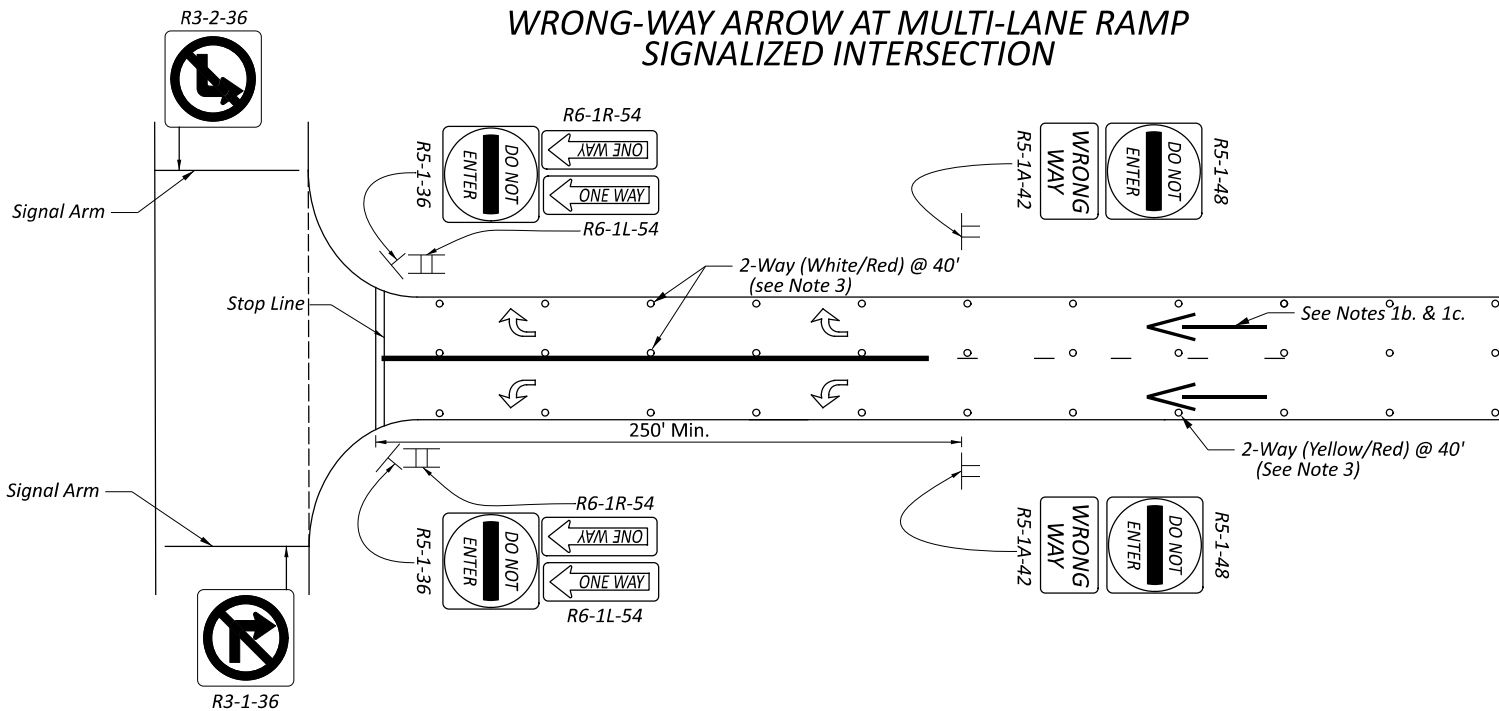
LEGEND

- Wrong Way Arrow
- 2-Way RPM Reflectors

WRONG-WAY ARROW AT SINGLE-LANE RAMP



WRONG-WAY ARROW AT MULTI-LANE RAMP SIGNALIZED INTERSECTION



NOTES:

- Wrong-way arrow markings are placed on the ramps as follows:
 - On ramps where lane-use arrows are not used, place the first wrong-way arrow 10 to 30 feet in advance of stop line. Place the second wrong-way arrow according to engineering judgment.
 - On ramps where lane-use arrows are used, place the wrong-way arrow in advance of the first lane-use arrow at a spacing equal to or greater than the spacing between the lane-use arrows.
 - On multi-lane ramps, a wrong-way arrow should be placed in each lane, side by side.

2. Traffic control signs are placed as follows:

- Place the DO NOT ENTER and WRONG WAY sign combination 250' min. in advance of the stop line. The height of the WRONG WAY sign should be 3' above the nearest edge of the pavement.

On partial cloverleaf interchanges, the WRONG WAY signs between the on and off ramps should be angled 45° towards the off ramp (wrong-way traffic).

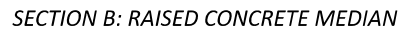
A second set of WRONG WAY signs may be placed on the ramp according to engineering judgment.

On partial cloverleaf interchanges, the optional entrance ramp directional sign assembly should be angled 45° toward the left turning traffic.

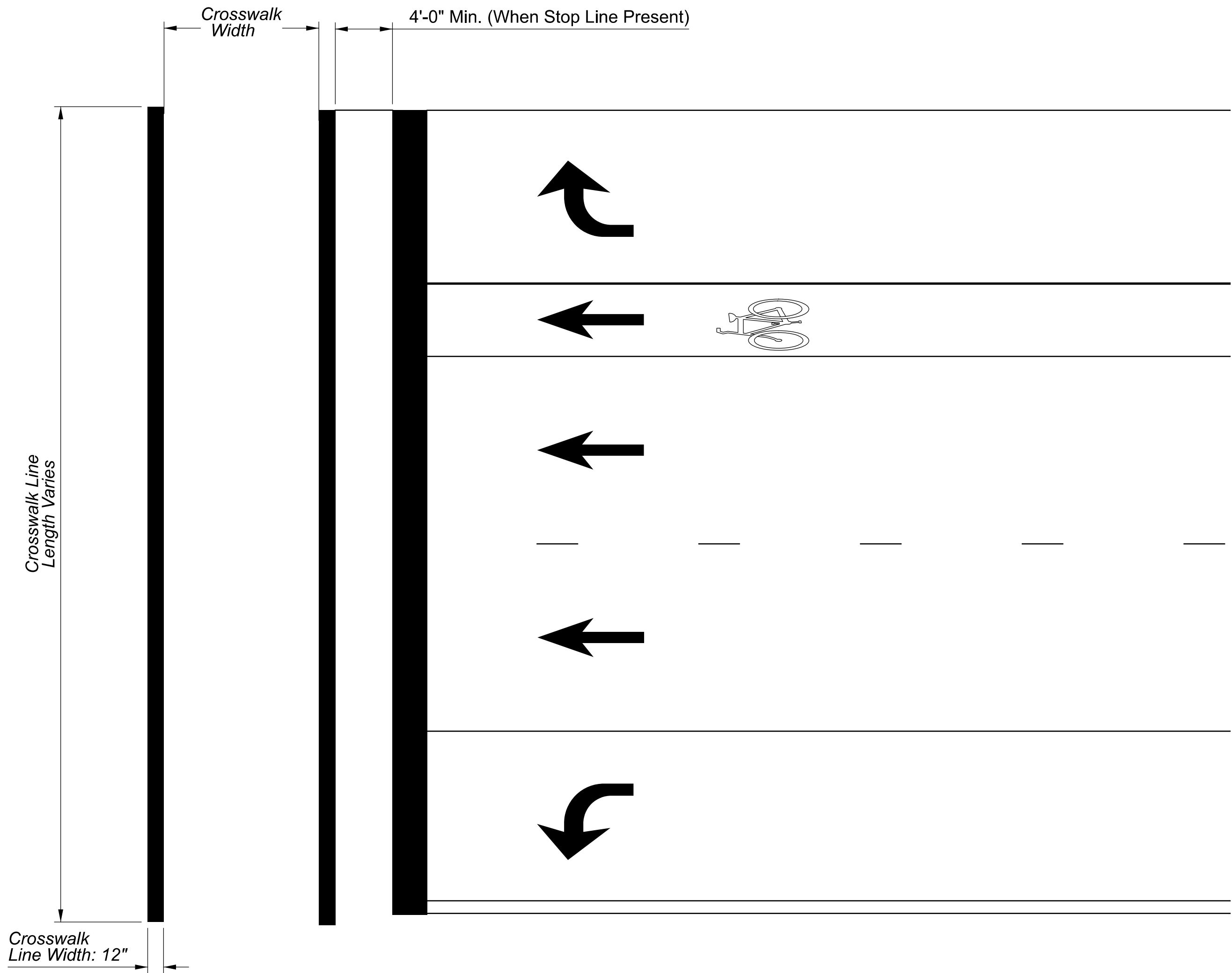
- The red sign post reflectors shall be added to the STOP sign, DO NOT ENTER sign, and WRONG WAY sign assembly.
- The DO NOT ENTER sign (R5-1) may be angled up to 45° toward left and right turning traffic.
- Actuated LED units may be used to enhance conspicuity of the DO NOT ENTER and WRONG WAY signs in accordance with MUTCD Section 2A.12.

3. Raised pavement markers (RPMs) are placed as follows:

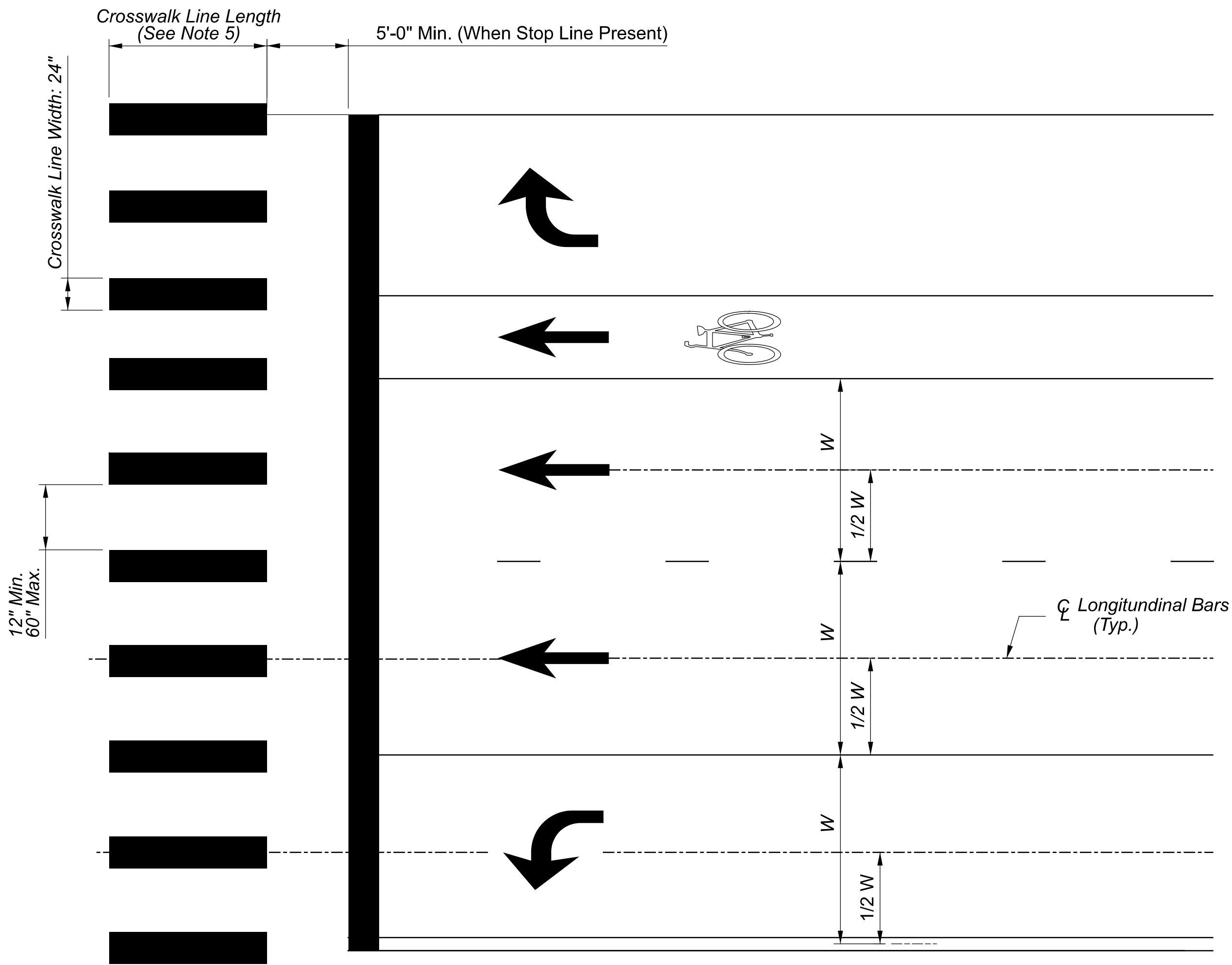
- RPMs on the edge line -
 - Shall be two-way white/red on white edge line
 - Shall be two-way yellow/red on yellow edge line
- Eleven (11) RPMs shall be spaced 40' apart in advance of the stop line; the rest shall be installed per SCD TC-65.11.
- RPMs on the channelizing line/lane line -
 - Shall be two-way white/red, spaced 40' apart
 - Eleven (11) RPMs shall be spaced 40' apart in advance of the stop line; the rest shall be installed per SCD TC-65.11.



STANDARD CROSSWALK DETAILS



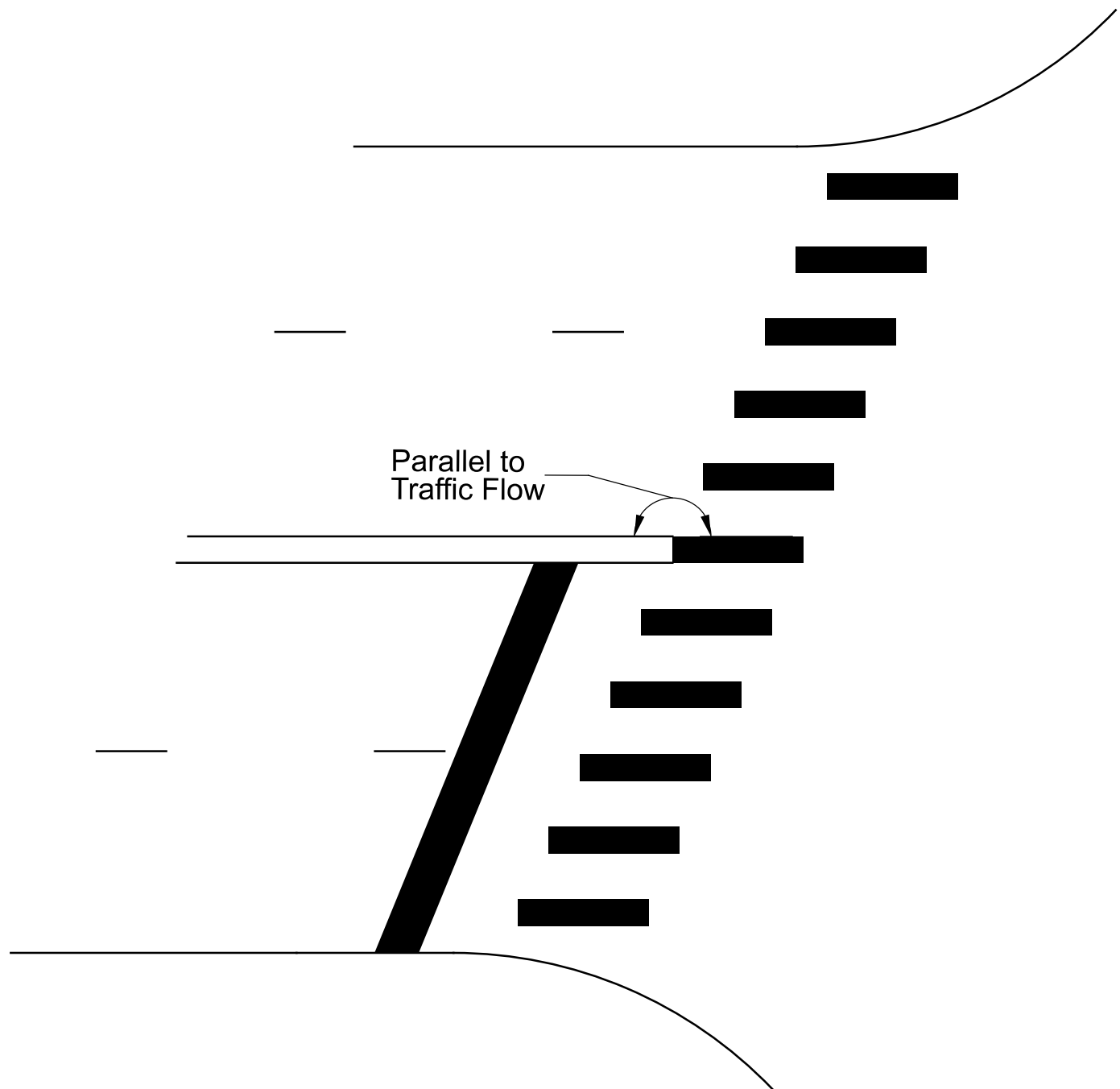
HIGH VISIBILITY CROSSWALK DETAILS (LONGITUDINAL BARS)



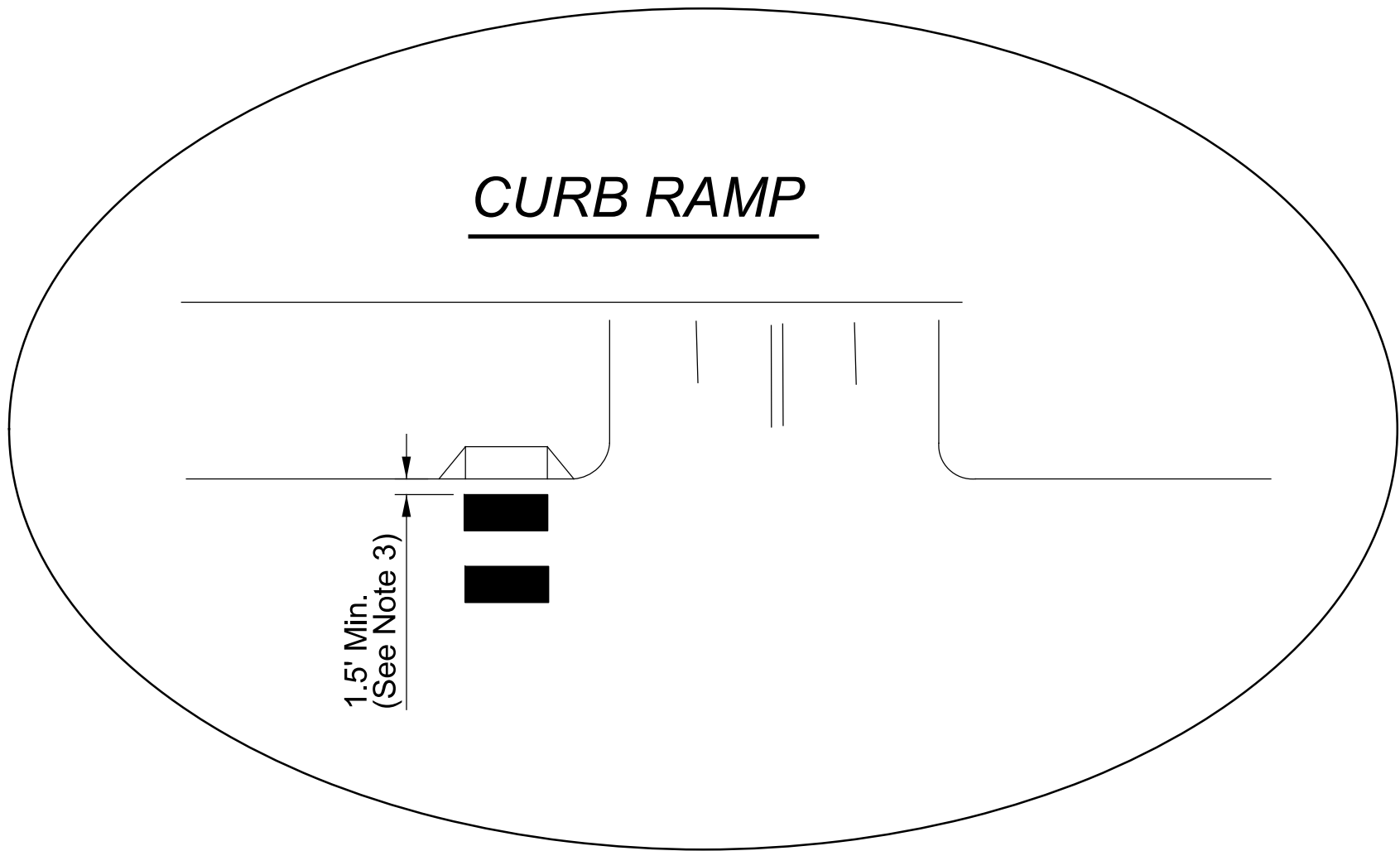
NOTES:

- Longitudinal crosswalk lines should avoid the wheel paths if possible by locating them near the center of the travel lane and near the same path as other existing longitudinal pavement markings such as edge, lane and center lines.
- Gaps between longitudinal crosswalk lines should be as uniform as possible and should not exceed 2.5 times the width of the longitudinal lines.
- A minimum of 1.5' clear distance shall be left adjacent to the curb face or, in the absence of a curb, the edge of pavement. If last painted area falls into this distance it must be omitted.
- For divided roadways, adjustments in spacing of the longitudinal bars should be made in the median so that the longitudinal bars are maintained in their proper location across the traveled portion of the roadway.
- The longitudinal bars at intersections shall be a minimum of 6' long and at least as long as the truncated domes. For fanned truncated domes the longitudinal bars shall be at least as long as the approaching sidewalk or shared-use path. The longitudinal bars shall be a minimum of 10' long at midblock crosswalks.
- When the High Visibility Crosswalk is not perpendicular to the lane lines, make the longitudinal markings parallel to the lane lines.

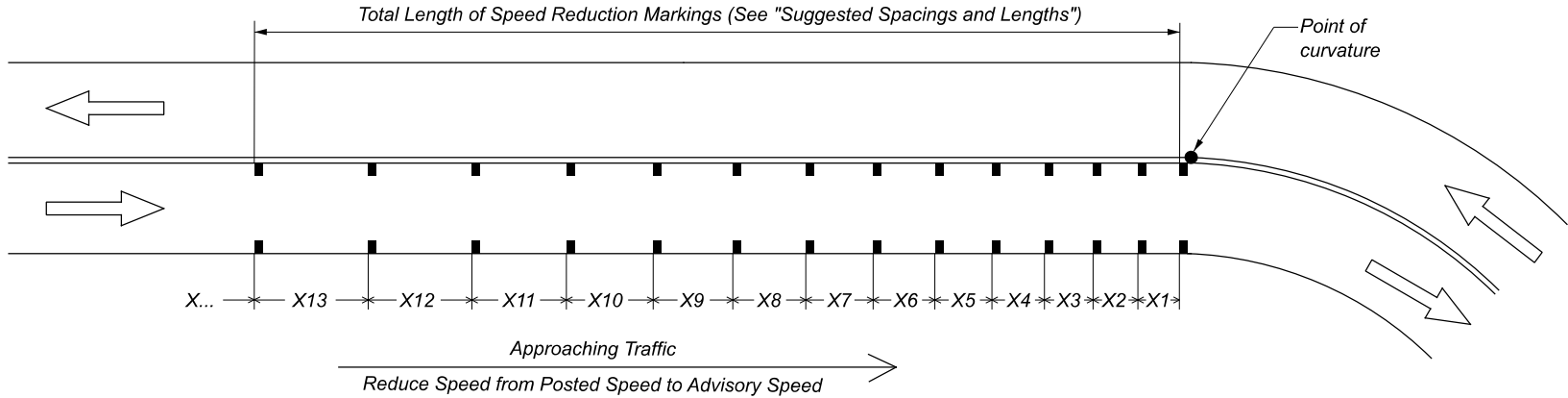
SKEWED HIGH VISIBILITY CROSSWALK DETAILS (LONGITUDINAL BARS)



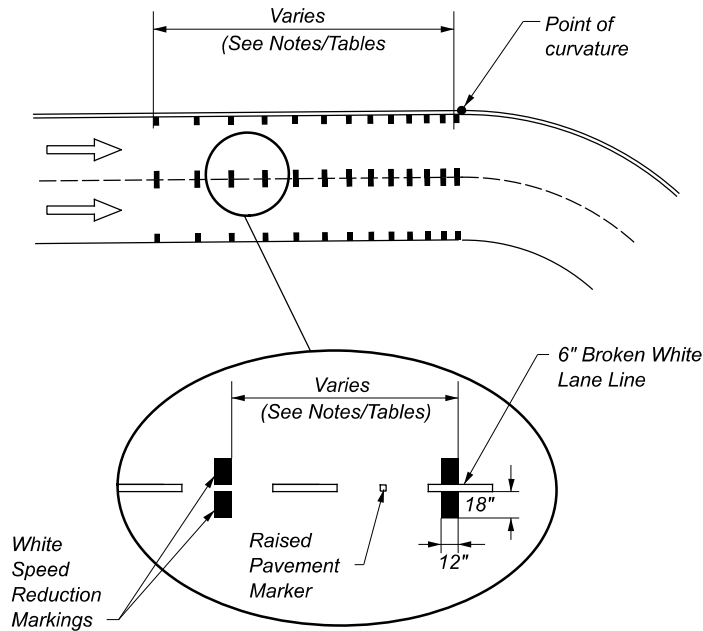
CURB RAMP



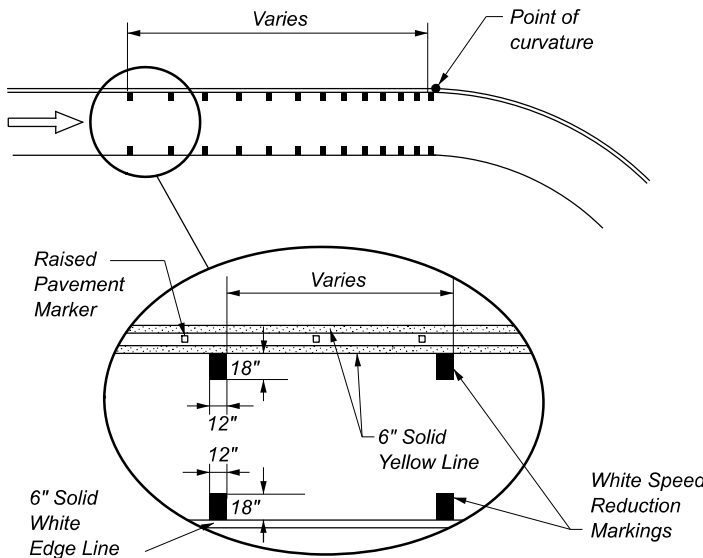
SPEED REDUCTION MARKINGS - EXAMPLE PLACEMENT



TYPICAL INSTALLATION
MULTI-LANE APPROACH



TYPICAL INSTALLATION
ONE-LANE APPROACH



SUGGESTED SPACING AND LENGTHS

ODOT assumes a vehicle deceleration rate of 6.7 ft/s/s when determining approximate spacing for the following table. The Engineer should determine an appropriate vehicle deceleration rate based on project specific needs. 4 bars per second shall be used to determine the total number of bars in a Speed Reduction Marking layout.

ADVISORY SPEED (MPH)		APPROACH SPEED (MPH)			APPROACH SPEED (MPH)			APPROACH SPEED (MPH)		
40		60			65			70		
		NUMBER OF BAR SPACINGS			NUMBER OF BAR SPACINGS			NUMBER OF BAR SPACINGS		
		18			22			27		
BAR (1ST BAR AT 0)	SPACE ID (REVERSE IN PLAN)	SPACING (FEET)	SPEED (MPH)	CUMULATIVE DISTANCE (FT)	SPACING (FEET)	SPEED (MPH)	CUMULATIVE DISTANCE (FT)	SPACING (FEET)	SPEED (MPH)	CUMULATIVE DISTANCE (FT)
0	X1	22.0	60.0	22.0	23.8	65.0	23.8	25.7	70.0	25.7
1	X2	21.6	58.9	43.6	23.4	63.9	47.3	25.3	68.9	50.9
2	X3	21.2	57.7	64.8	23.0	62.7	70.3	24.8	67.7	75.8
3	X4	20.7	56.6	85.5	22.6	61.6	92.8	24.4	66.6	100.2
4	X5	20.3	55.4	105.8	22.2	60.4	115.0	24.0	65.4	124.2
5	X6	19.9	54.3	125.7	21.7	59.3	136.8	23.6	64.3	147.8
6	X7	19.5	53.1	145.2	21.3	58.1	158.1	23.2	63.1	170.9
7	X8	19.1	52.0	164.3	20.9	57.0	179.0	22.7	62.0	193.7
8	X9	18.7	50.9	183.0	20.5	55.9	199.5	22.3	60.9	216.0
9	X10	18.2	49.7	201.2	20.1	54.7	219.5	21.9	59.7	237.9
10	X11	17.8	48.6	219.0	19.7	53.6	239.2	21.5	58.6	259.4
11	X12	17.4	47.4	236.4	19.2	52.4	258.4	21.1	57.4	280.4
12	X13	17.0	46.3	253.4	18.8	51.3	277.2	20.6	56.3	301.1
13	X14	16.6	45.2	270.0	18.4	50.2	295.6	20.2	55.2	321.3
14	X15	16.1	44.0	286.1	18.0	49.0	313.6	19.8	54.0	341.1
15	X16	15.7	42.9	301.8	17.6	47.9	331.2	19.4	52.9	360.5
16	X17	15.3	41.7	317.1	17.1	46.7	348.3	19.0	51.7	379.5
17	X18	14.9	40.6	332.0	16.7	45.6	365.0	18.6	50.6	398.0
18	X19	14.5	39.4	346.5	16.3	44.4	381.3	18.1	49.4	416.2
19	X20	--	--	--	15.9	43.3	397.2	17.7	48.3	433.9
20	X21	--	--	--	15.5	42.2	412.7	17.3	47.2	451.2
21	X22	--	--	--	15.0	41.0	427.7	16.9	46.0	468.1
22	X23	--	--	--	14.6	39.9	442.3	16.5	44.9	484.5
23	X24	--	--	--	--	--	--	16.0	43.7	500.6
24	X25	--	--	--	--	--	--	15.6	42.6	516.2
25	X26	--	--	--	--	--	--	15.2	41.5	531.4
26	X27	--	--	--	--	--	--	14.8	40.3	546.2
27	X28	--	--	--	--	--	--	14.4	39.2	560.5

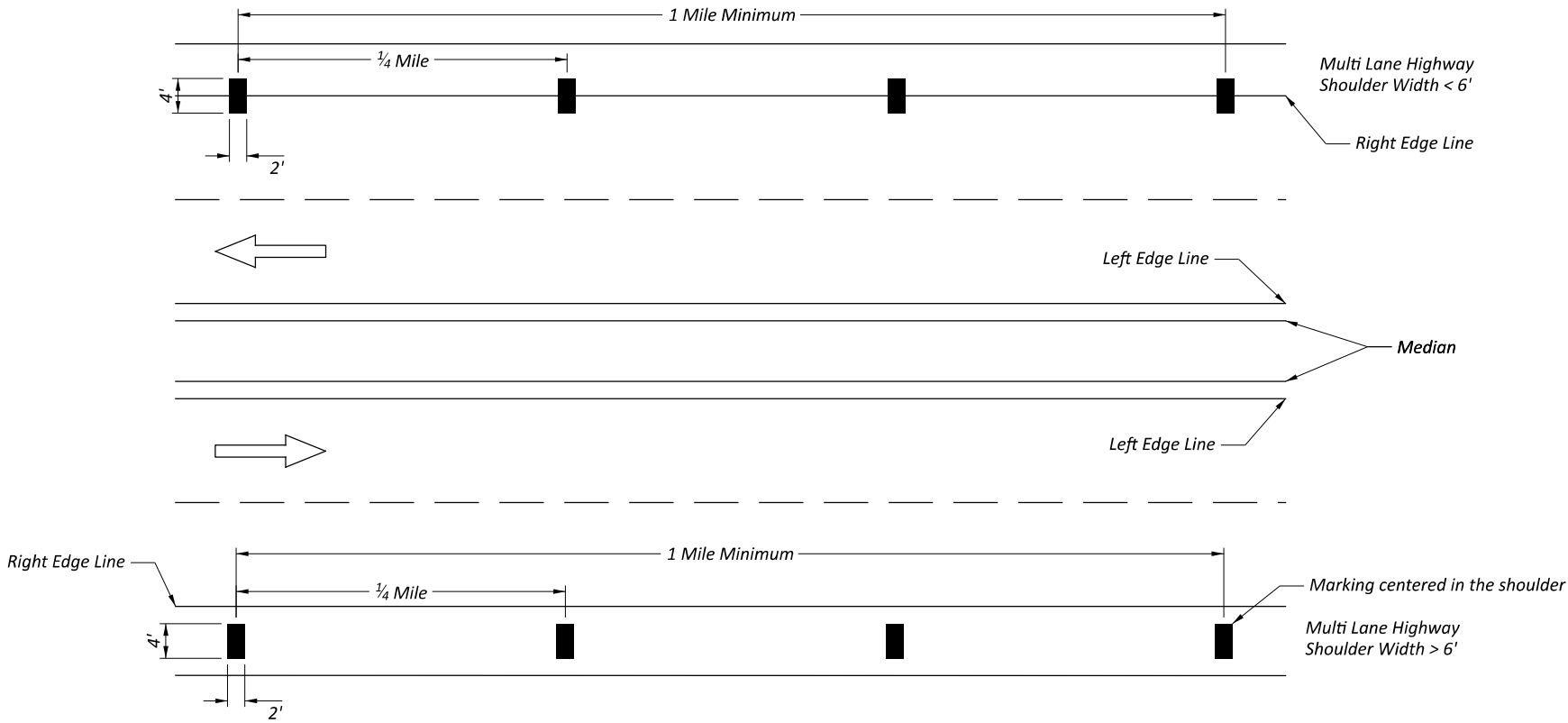
NOTES:

- Speed Reduction Markings may be placed in advance of an unexpectedly severe horizontal or vertical curve or other roadway feature where drivers need to decelerate prior to reaching the feature and where the desired reduction in speeds has not been achieved by the installation of warning signs and/or other traffic control devices.
- Speed Reduction Markings shall only be used in lanes that have a longitudinal line on both sides of the lane.
- Speed Reduction Markings may complement, but not replace warning signs and/or other traffic control devices.
- Speed Reduction Markings should only be used where the posted speed is 45 mph and higher, and where the speed difference with the advisory speed is equal to or exceeds 20 mph.
- Lane width, wheel path, and other applicable site conditions should be considered when determining speed reduction marking extension into the lane.
- Payment will be for each pair of 12-inch-wide by 18-inch-long marking and shall include the pavement marking material used. The following quantity has been carried to the General Summary to be used as Directed by the Engineer:

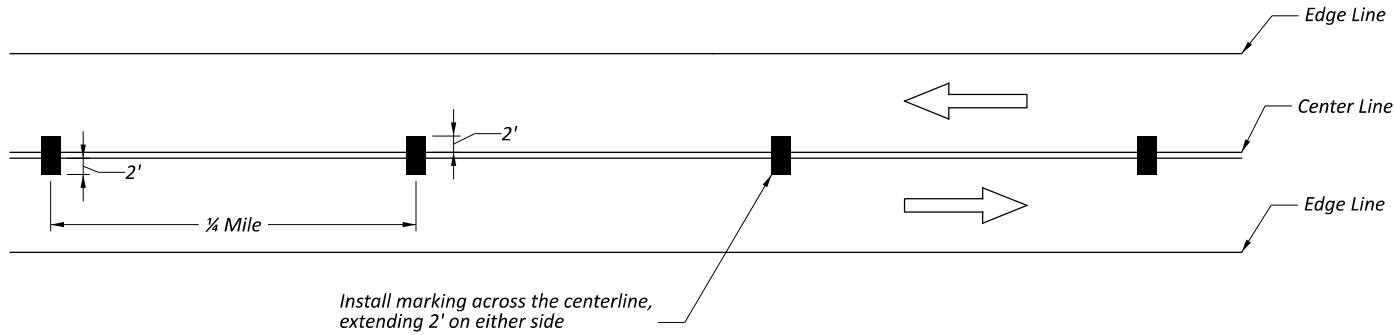
Item ____ Speed Reduction Marking ____ EACH

Approximate Length (ft) of Speed Reduction Markings Segment in Advance of Curve							
		Approach Speed (MPH)					
		45	50	55	60	65	70
Curve Speed (MPH)	15	300	385	470	565	670	785
	20	275	350	440	535	640	755
	25	235	315	405	500	600	720
	30	---	270	360	450	560	670
	35	---	---	300	400	500	620
	40	---	---	---	335	440	555
	45	---	---	---	---	370	480
	50	---	---	---	---	---	405

SPEED MEASUREMENT MARKINGS
EXAMPLE PLACEMENT - MULTILANE HIGHWAYS



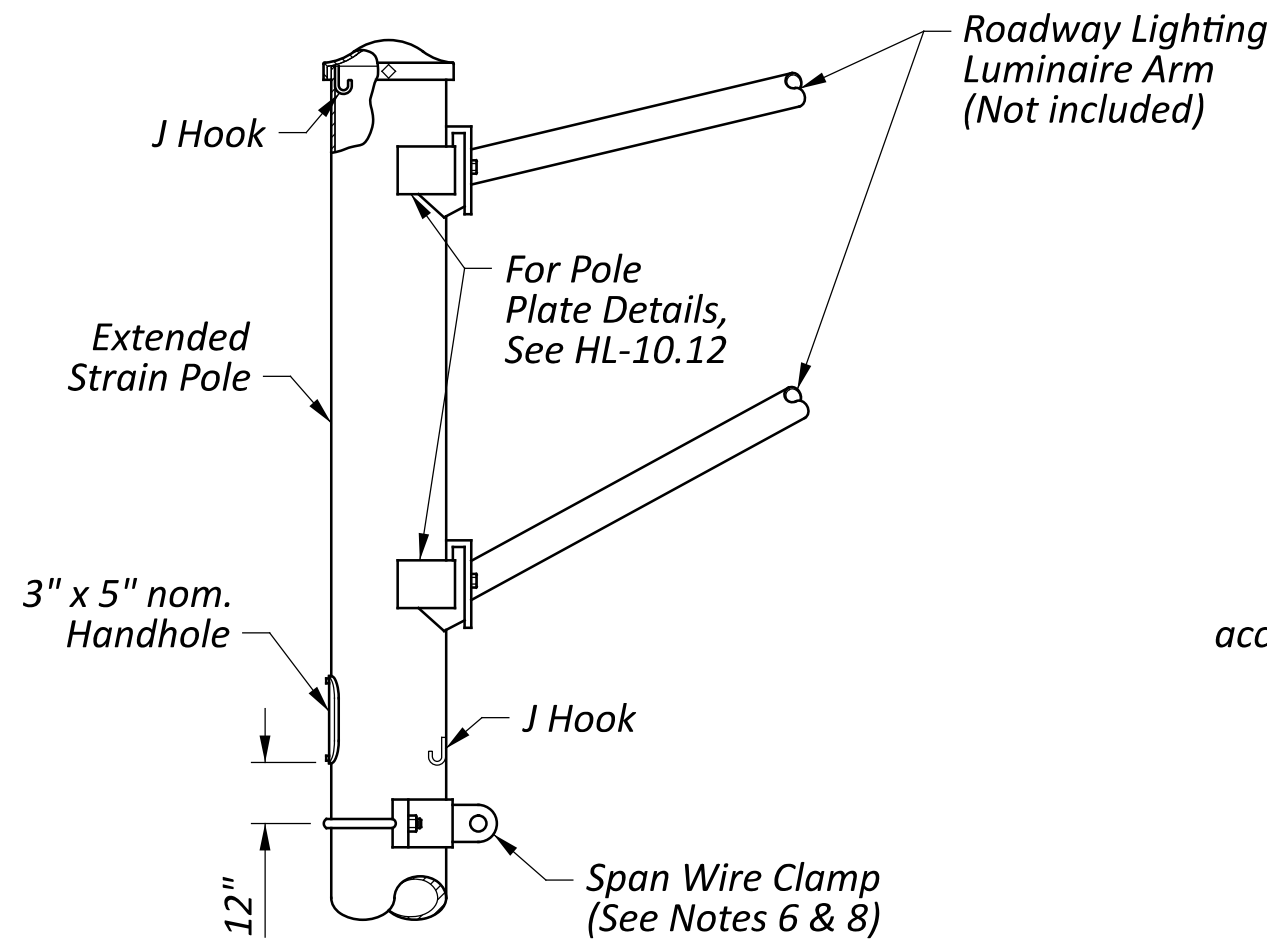
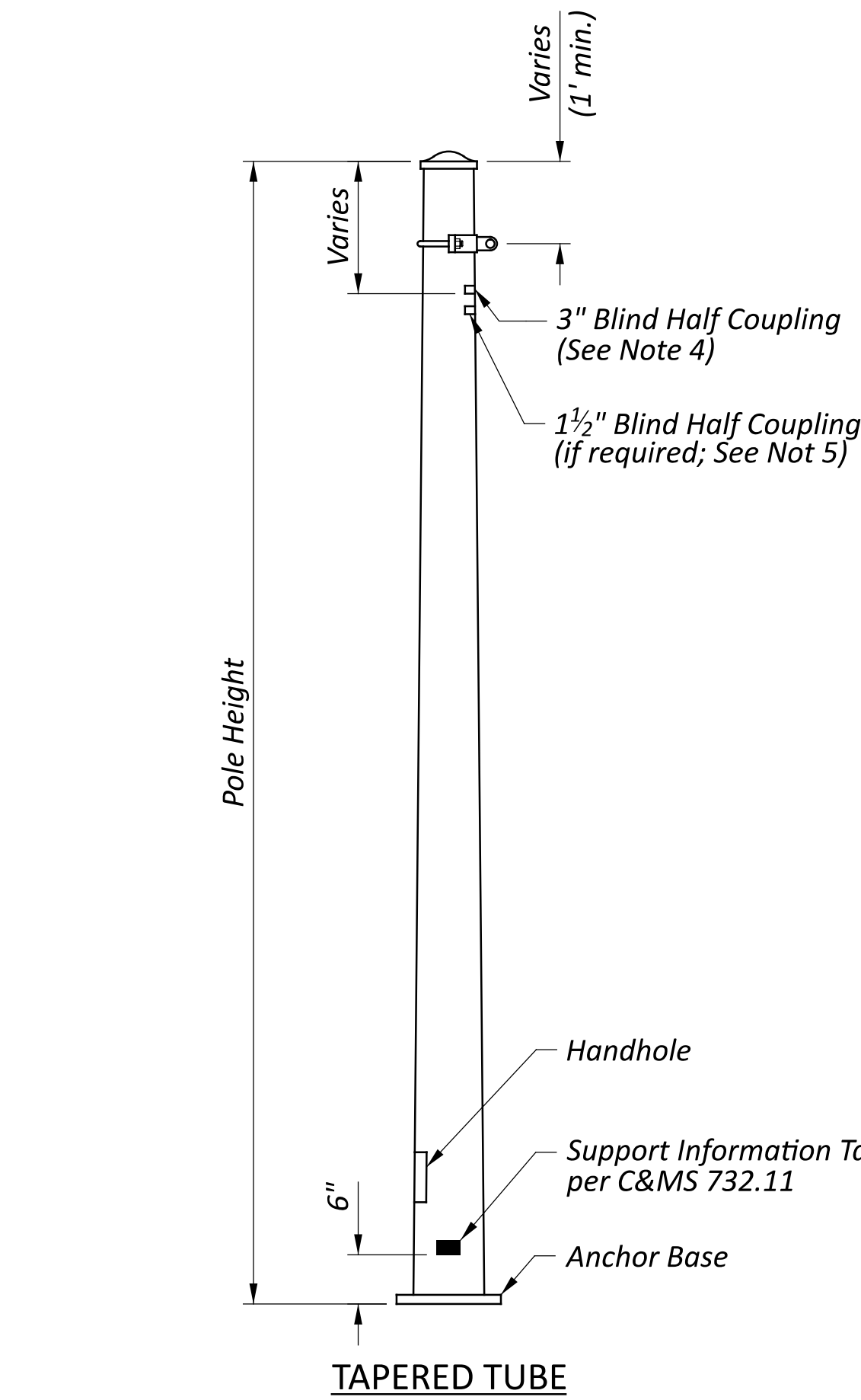
SPEED MEASUREMENT MARKINGS
EXAMPLE PLACEMENT - TWO-LANE ROADWAYS



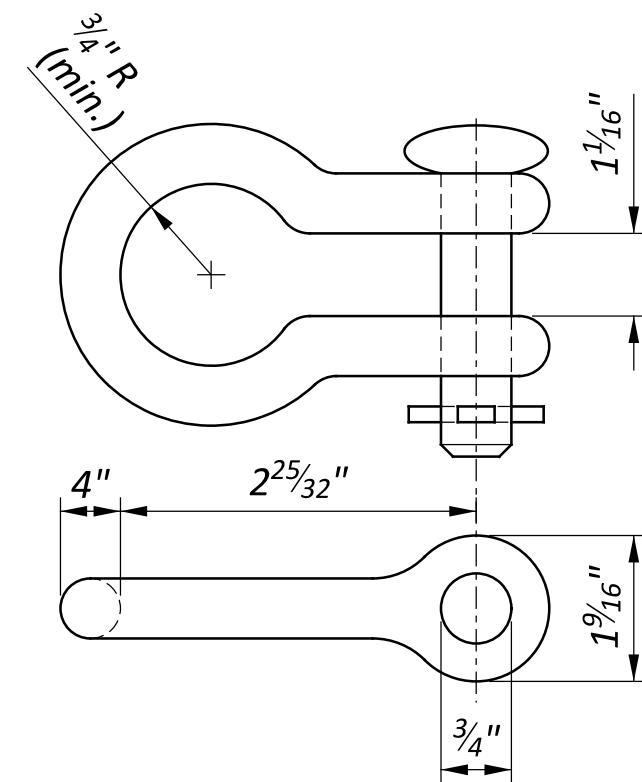
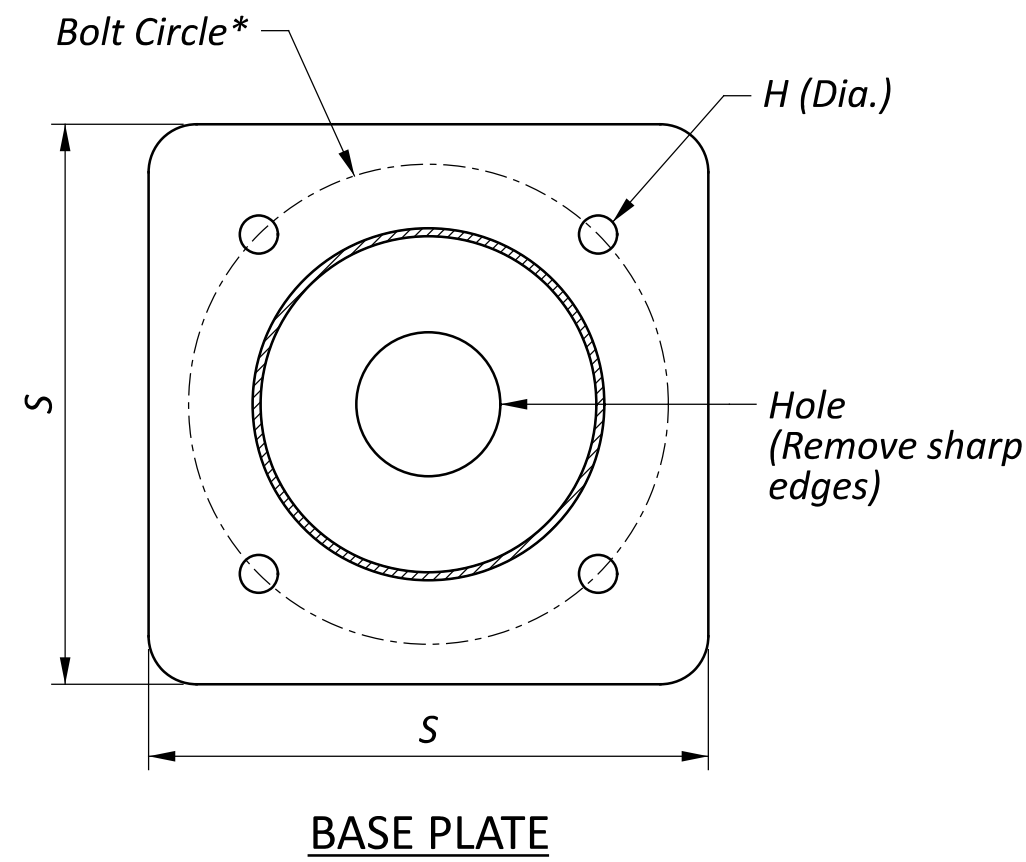
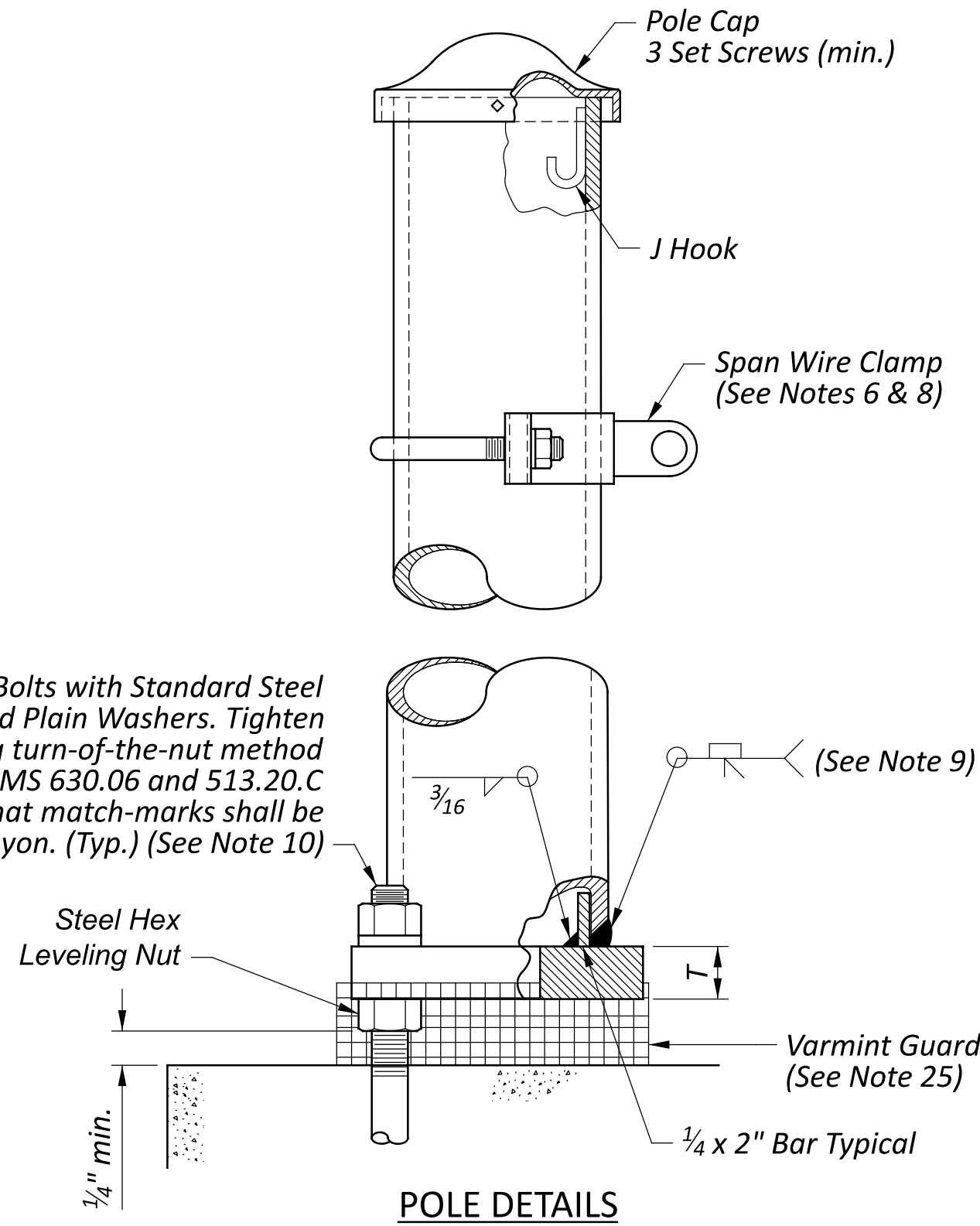
Notes:

- Speed Measurement Markings can be placed to assist in the enforcement of speed regulations. Speed Measurement Markings should avoid being located in the vicinity of a taper, entrance ramp or exit ramp.
- The markings shall be laid out by a registered surveyor. On sections with curves, the markings on the inside of the curve shall meet the required one-quarter mile intervals. Markings on the outside of the curve shall be directly across from the markings on the inside of the curve, not staggered. A record is to be kept and one original signed and sealed document is to be sent to the District Traffic Engineer and one copy is to be sent to the District Construction Engineer.
- To assure visibility of the markings and reduce parallax errors, for each direction utilizing an Air Speed Check Zone, a set of two markings (left and right side) shall be used at each one-quarter mile interval.
- Payment will be for each 24-inch-wide by 4 feet long marking and shall include the pavement marking material used and the surveying work. The following quantity has been carried to the General Summary to be used as Directed by the Engineer:

Item _____ Speed Measurement Marking _____ EACH



Anchor Bolts with Standard Steel Hex Nuts and Plain Washers. Tighten nuts using turn-of-the-nut method according to C&MS 630.06 and 513.20.C except that match-marks shall be paint not crayon. (Typ.) (See Note 10)



NOTES

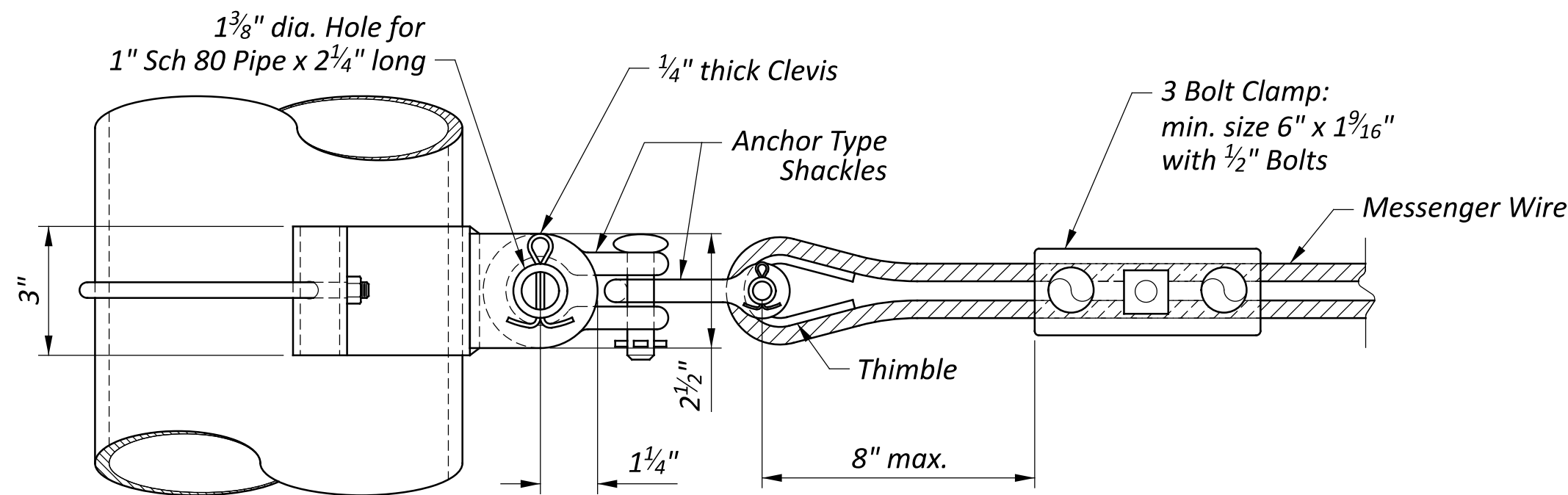
- The design of the Strain Poles presented on this drawing meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.
- Dimensions noted as required shall be as indicated on the drawing and shall not be altered.
- ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawing. Calculations are required for any modifications to the information shown on this drawing. Modifications shall meet the requirements of LRFDLTS-1 and the design criteria shown in Note 23. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.
- Signal cable entrance shall be a 3" blind half coupling provided in each pole.
- Service wire entrance shall be a 1 1/2" blind half coupling, when required by the plans. Orientation and height shall be as required by the plans.
- Span wire clamp shall be galvanized steel, capable of resisting a load of 12,500 pounds minimum without permanent distortion.
- For foundation details, including anchor bolt details, see SCD TC-21.21.
- Alternate messenger wire assemblies (wrapping) as shown on SCD TC-84.20 may be used in lieu of the span wire clamp if specified in the plans.
- The pole attachment to the base plate shall be welded using a full penetration weld.
- A minimum of one full bolt thread shall remain above the anchor nut.
- All unused couplings shall be provided with a removable galvanized cast iron plug.
- For construction details and location of handholes, see SCD TC-22.10.
- For pole and base plate dimensions, see Sheet 2.

LEGEND

* = Required dimension. See Note 2

(continued - see Sheet 2)

SPAN WIRE CLAMP



ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE NOTED

DESIGN NO.	POLE HEIGHT (FT)	MINIMUM FACTORED FLEXURAL RESISTANCE AT BASE (FT KIPS)	MIN. BASE DIAMETER	MINIMUM WALL THICKNESS	ANCHOR BASE				
					BOLT CIRCLE*	# ANCHOR BOLTS	S	T	H
8	30	206	16	.250	22	4	22	2	2.38
10	32	270	16	.3125	22	6	27	2	2.38
12	32	385	19	.3125	25	6	30	2	2.38
13	32	590	21	.375	27	8	32	2	2.38
14	32	900	22	.500	30	12	35	2	2.38

* = Required dimension, See Note 2

NOTES (continued from sheet 1)

14.

Tapered poles shall be one piece assemblies conforming to ASTM A595 Grade A (minimum Yield Strength of 55,000 psi) with a constant linear taper of 0.14 inch/ foot.
15.

All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A153 (Hot-dipped) (Not ASTM B695 Class 50)
16.

Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
17.

Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F436.
18.

Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.
19.

Anchor bolt nuts shall meet the requirements of ASTM A563 Grade DH or A194 Grade 2H.
20.

Anchor bolt washers shall meet the requirements of ASTM F436 Type 1 (Hot-dip galvanized) according to ASTM A153.
21.

Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match mis-aligned anchor bolts will not be permitted.
22.

All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.
23.

Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000
- Serviceability Parameters:
- Rake (Pole Tilt): H/180 (H = pole height)
- Horizontal Deflection at Top of Pole: maximum 1.5% of pole height

24.

Multi-sided vertical main tube (12 sides, min.) may be provided.

25.

Attach varmint guard with stainless steel band and minimum 2" overlap. Tie overlapping guard with stainless steel wire ties. Guard shall be solid sheet, welded wire mesh or expanded metal sheet, stainless steel or galvanized, with openings no larger than 3/8", or approved equal.

REVISIONS
01-16-2026
01-19-2024
01-20-2023
07-16-2021
07-17-2020
04-17-2020

STDS ENGINEER
Duemmel

STATE OF OHIO OFFICE OF ROADWAY ENGINEERING ADMINISTRATOR
Adam Koenig

STRAIN POLE DETAILS

DESIGN AGENCY



SCD NUMBER
TC-81.11

SHEET	TOTAL
P.2	2



1. *The design of the Single Arm Overhead Signal Support meets the requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition 2015 (LRFDLTS-1) and all interim releases prior to the bid date of the project.*
2. *Dimensions noted as required shall be as indicated on the drawing and shall not be altered.*
3. *ODOT permits modifications to accommodate minor variations in manufacturing processes and detailing between suppliers. Modifications shall not decrease the main tube section moduli as depicted in this drawing. Calculations are required for any modifications to the information shown on the drawings. Modifications shall meet the requirements of LRFDLTS-1 and the design criteria shown in Note 33. Calculations shall be stamped by a Professional Engineer registered in the State of Ohio and shall be submitted for review and acceptance with the shop drawings.*
4. *Arm plate hole diameter shall be bolt diameter plus 1/8". Pole plate tapped hole shall have threads with 75% (min.) full profile height. Threads may be retapped after galvanizing.*
5. *For sign mounting details, see Standard Construction Drawings (SCDs) TC-16.22 and TC-41.41.*
6. *For foundation details, see SCD TC-21.21.*
7. *The arm attachment plate and pole attachment to the base plate shall be welded using a full penetration weld.*
8. *For signal attachment details, see SCD TC-85.20. All signal heads shall be installed with the horizontal center of the entire head centered on the arm, $\pm 6"$.*
9. *For modification of pole to support roadway lighting, see SCD HL-10.12.*
10. *A minimum of one bolt thread shall remain above the anchor nut.*
11. *All unused couplings shall be provided with a removable galvanized cast iron plug.*
12. *For pole and base plate dimensions, see Sheet 2.*
13. *The wire entrance part of the signal head may be oriented in any direction to keep the cable drip loop from rubbing on the signal head. The signal head shall hang level and plumb.*
14. *For construction details and location of handholes, see SCD TC-22.10.*
15. *The design was based on Fatigue Category II. See Note 33 for additional design criteria.*
16. *Connection bolts shall be ASTM F3125 Grade A325. Washers shall be ASTM F959 compressible washer type Direct Tension Indicators (DTI). If necessary, I.D. of DTI washers shall be ground or reamed to properly fit over attachment bolts. Provide proper DTI feeler gage to Engineer. An ASTM F436 washer shall be used directly under the head of the bolt with all DTI washers. Ensure that the flat washer does not spin during bolt tightening with DTI washer.*
17. *Negative arm end slope is acceptable to achieve rise requirement.*

(continued - see Sheet 2)

LEGEND

* = Required dimension see Note 2

REVISIONS
01-16-2026
01-17-2025
07-21-2023
07-15-2022
07-16-2021
07-17-2020
04-17-2020

STDS ENGINEER
Duemmel

STATE OF OHIO OFFICE OF ROADWAY
ENGINEERING ADMINISTRATOR

Adam Koenig

SINGLE ARM OVERHEAD SIGNAL SUPPORT

DESIGN AGENCY



SCD NUMBER

TC-81.22

SHEET	TOTAL
P.1	2

- NOTES (continued from Sheet 1)*
18. On arms longer than 59 feet, install an effective supplemental damping device, supplied by or recommended by the support manufacturer. This device shall limit galloping fatigue stress below a threshold acceptable to the manufacturer for a nominal 50-year support service life. Install within 10% of the mast arm length from the end, but no closer than 1 foot from the end of the arm.

19. Ring-stiffened wrap-around horizontal plates are permitted as an alternative shown to the horizontal plates shown.

20. All backplates shall have louvers and 2" fluorescent yellow reflective border. Border shall not be applied over louvers. Louvers should be oriented to scoop air from the front side and oriented with the openings facing alternate directions by groups. Louver open area shall be at least 8 percent of the total backplate area.

21. 17' min. clearance to bottom of backplate. 19' is the maximum clearance height. However, clearances above this threshold can be accepted upon approval of the project engineer only if clearance heights conform to the requirements set forth in the Ohio Manual of Uniform Traffic Control Devices.

22. Actual pole height shall be calculated based off the critical pavement and foundation elevations, as outlined in Traffic Engineering Manual Section 440. Typical maximum arm attachment height is 24.5 feet. Typical pole height is 26 feet but extension for luminaires, antennas and cameras up to 10 feet is common but still subject to torsional moment criteria of the Table.

23. Tapered steel tubes for the poles and arms shall meet the requirements of ASTM A 595 Grade A or ASTM A572 Grade 55 or 65. Multi-sided poles (not arms) are permitted, minimum of 14 sides.

24. All material shall meet the requirements of C&MS 730 with the following limitations:

Steel hardware - Galvanizing - ASTM A 153 (Hot-dipped) (Not ASTM B 695 Class 50)

25. Nuts shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.

26. Flat washers shall meet the requirements of C&MS 730.08 and shall also meet the requirements of ASTM F 436.

27. Anchor bolts shall meet the requirements of C&MS 632, 711.02, 730.02 and 732.11 except that 730.02 shall be modified to require the galvanizing limits to be the full length of the anchor bolts not at least 2 inches beyond the threads.

28. Anchor bolt nuts shall meet the requirements of ASTM A 563 Grade DH or A 194 Grade 2H.

29. Anchor bolt washers shall meet the requirements of ASTM F 436 Type 1 (Hot-dip galvanized) according to ASTM A 153.

30. Holes for high-strength bolts and bearing bolts shall meet the requirements of C&MS 513.19. Modifications to the holes must be approved by the Engineer. Enlarging or slotting holes to match mis-aligned anchor bolts will not be permitted.

31. All welds shall be inspected according to the requirements of C&MS 630.06 and AWS D1.1 Structural Welding Code - Steel. A report of the welding inspection shall be submitted to the ODOT Office of Material Management Structural Welding and Materials Engineer.

32. If shown in the plans as supporting CCTV, Stop Bar or Advanced Video Detection, Emergency Vehicle Preemption, or similar pole-mounted appurtenances, the pole height above the arm centerline shall be increased to 5 feet from 1 foot 6 inches. If utility conflicts exist, then the typical 1 foot 6 inches shall apply.

33. Design Criteria:

Load Parameters:

Wind Load: 700-year MRI Basic Wind Speed Map, 115 mph Design Wind Speed

Service Life: Infinite per LRFDLTS-1 11.9.3

Service I Wind Velocity: 76 mph per LRFDLTS-1 Table 3.4.1 and Figure 3.8-4b

ADT: Greater than 10,000

Serviceability Parameters:

Deflection: maximum of L/150 under Service Load 1 (Dead Load + Wind) per ODOT

Permanent Camber: L/1000 per LRFDLTS-1 10.5

Rake (Pole Tilt): H/180 (H = pole height)

Horizontal Deflection at Top of Pole: maximum 1.5% of pole height

Slope at Top of Pole: maximum of 0.35 inch/foot (1.67 degrees) per LRFDLTS-1 10.4.2.1

Fatigue Parameters:

Fatigue Category: II

Natural Wind Gust: Include

Truck-Induced Gust: Include

Galloping: Do not include (since Mechanical Dampening device is required)

34. Support shall be manufactured to accommodate the maximum area and moment arm given in the Table or greater, even if the equivalent area and moment arm in the Plans are smaller.

35. Attach varmint guard with stainless steel band and minimum 2" overlap. Tie overlapping guard with stainless steel wire ties. Guard shall be solid sheet, welded wire mesh or expanded metal sheet, stainless steel or galvanized, with openings no larger than 3/8", or approved equal.

36. 1 1/2" half blind coupling for accessories, when required by the plans. Orientation and height shall be as required by the plans.

ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.
(NOTE B)

DESIGN NO.	MAXIMUM DESIGN AREA SQ. FT. (Note A) (Note 34)	DESIGN DISTANCE FROM CL (FT.) (Note 34)	POLE		ARM			TWO PIECE ARM		ARM ATTACHMENT									ANCHOR BASE					
			WALL THICK	SIZE	WALL THICK	SIZE	MAX LENGTH	WALL THICK	SIZE	A	B	C	D	E	F	G	K	P	BOLT CIRCLE*	S	J	T	H	L
4	42	37.5	.250	13 x 9.36 x **			38'	.239	10.32 x 7.84 x 17.71'	16.50	14.50	12.50	9.50	2.00	2.00	1.50	8.75	.375	18.00	18.50	12.75	2.00	2.38	11.25
								.179	8.50 x 5.36 x 22.42'															
12	42	47.5	.3125	14 x 10.36 x **			48'	.3125	11 x 8.52 x 17.71'	16.50	14.50	12.50	9.50	2.00	2.00	1.50	8.75	.375	20.00	20.50	14.13	2.00	2.38	8.75
								.179	9.19 x 4.64 x 32.51'															
13	40	59.5	.3125	16 x 12.36 x **			60'	.3125	13 x 8.83 x 29.82'	19.50	16.50	15.00	12.00	2.00	2.00	1.50	8.25	.375	22.00	23.00	15.56	2.00	2.38	9.50
								.239	9.62 x 5.28 x 32.44'															
14	38	69.5	.3125	17 x 13.36 x **			70'	.3125	14 x 8.81 x 37.10'	19.50	19.50	15.00	15.00	2.25	2.25	1.50	9.25	.375	22.00	23.00	15.56	2.00	2.38	9.75
								.239	9.6 x 4.68 x 35.16'															

NOTES

- A. Maximum design area is based on wind loads with a mean recurrence interval of 1700 years
- B. These designs use full penetration welds at the arm and base plate connections

* Required dimension, see Note 2
** See Note 22

OFFICE OF ROADWAY ENGINEERING

REVISIONS
01-16-2026
01-17-2025
07-21-2023
07-15-2022
07-16-2021
07-17-2020
04-17-2020

STDS ENGINEER
Duemmel

STATE OF OHIO OFFICE OF ROADWAY ENGINEERING ADMINISTRATOR
Adam Koenig

SINGLE ARM OVERHEAD SIGNAL SUPPORT

DESIGN AGENCY

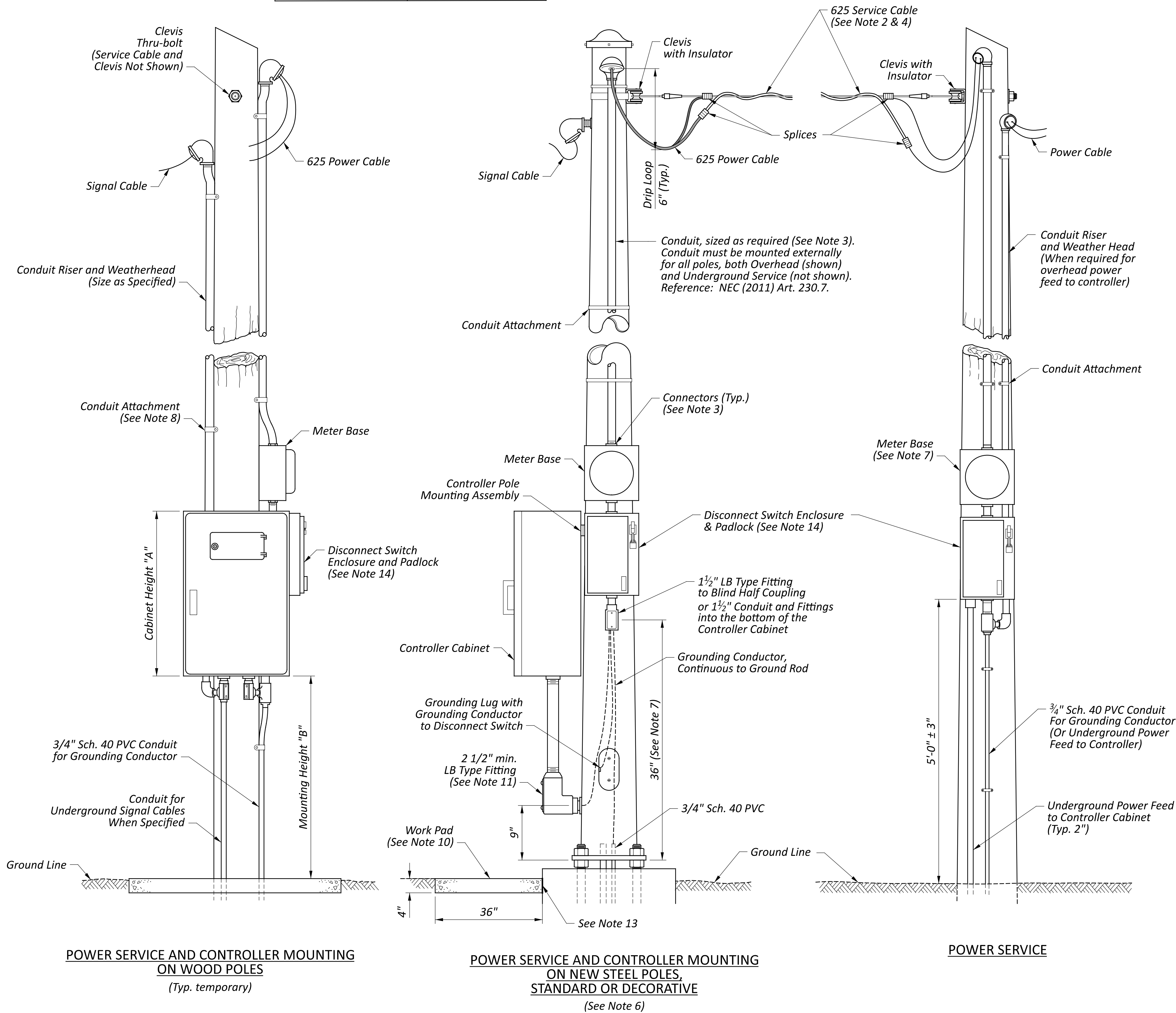


SCD NUMBER
TC-81.22

SHEET
P.2

TOTAL
2

CABINET HEIGHT "A"	MOUNTING HEIGHT "B"
LESS THAN 36"	30" ± 3"
36" AND OVER	23" ± 3"

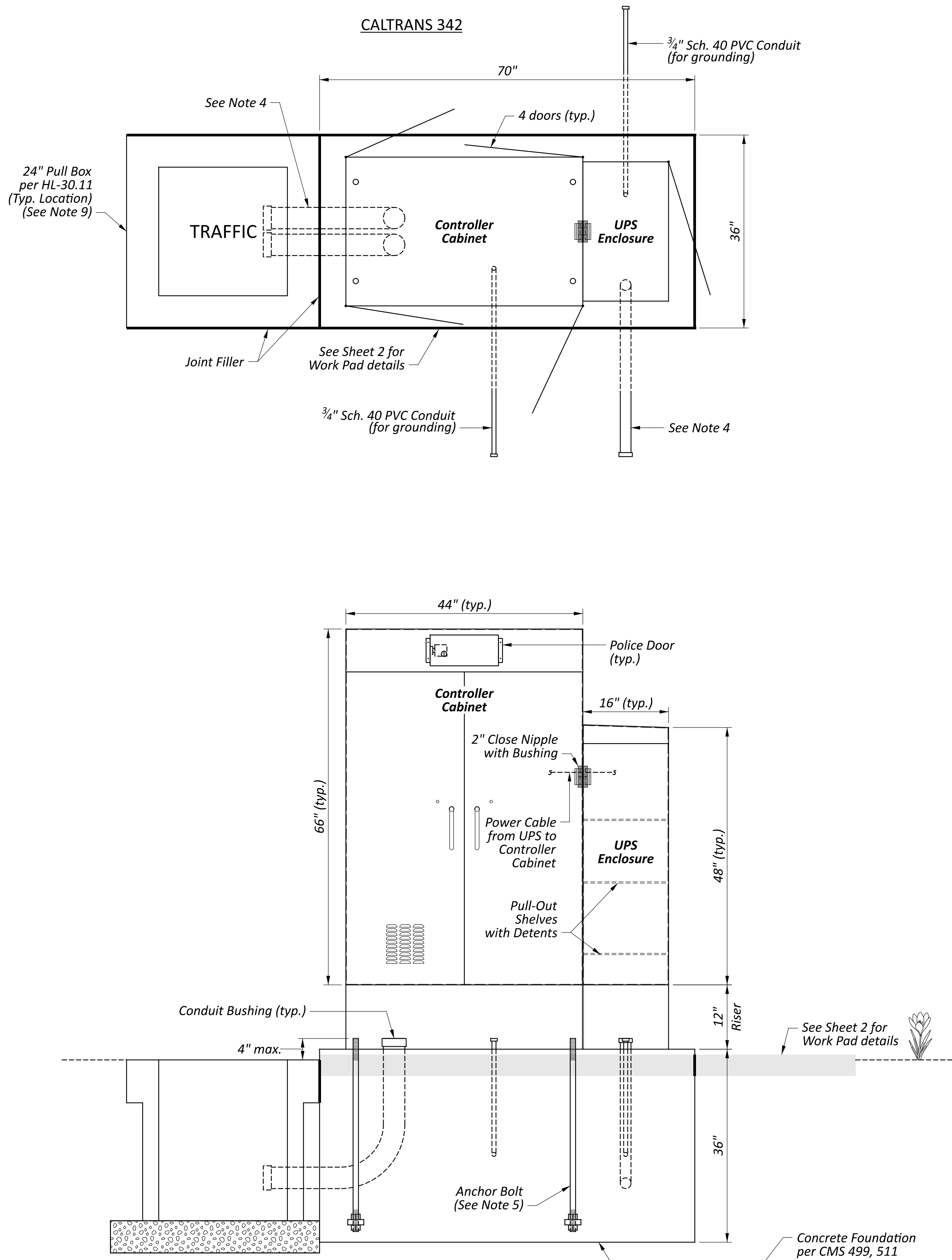
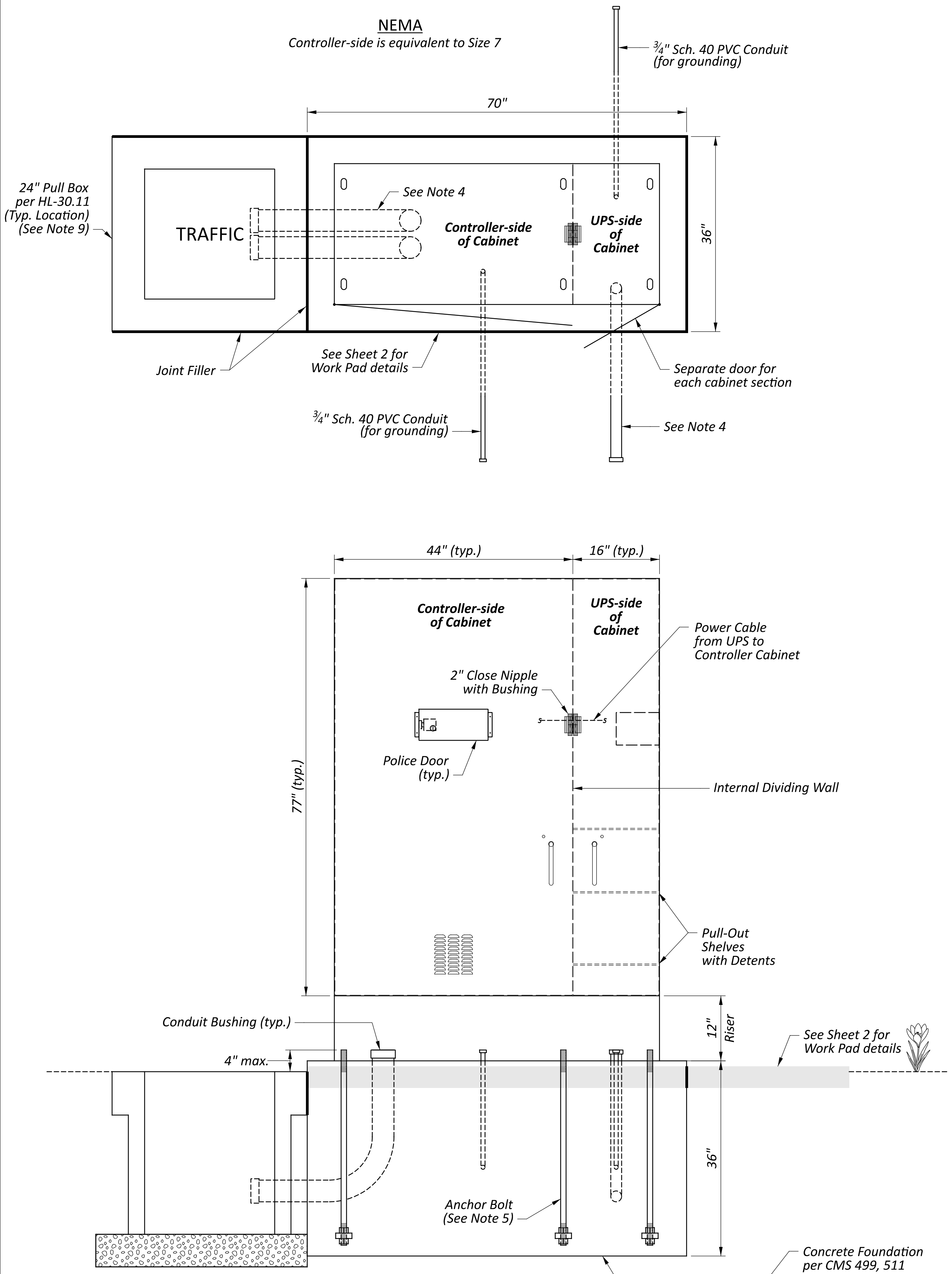
**NOTES**

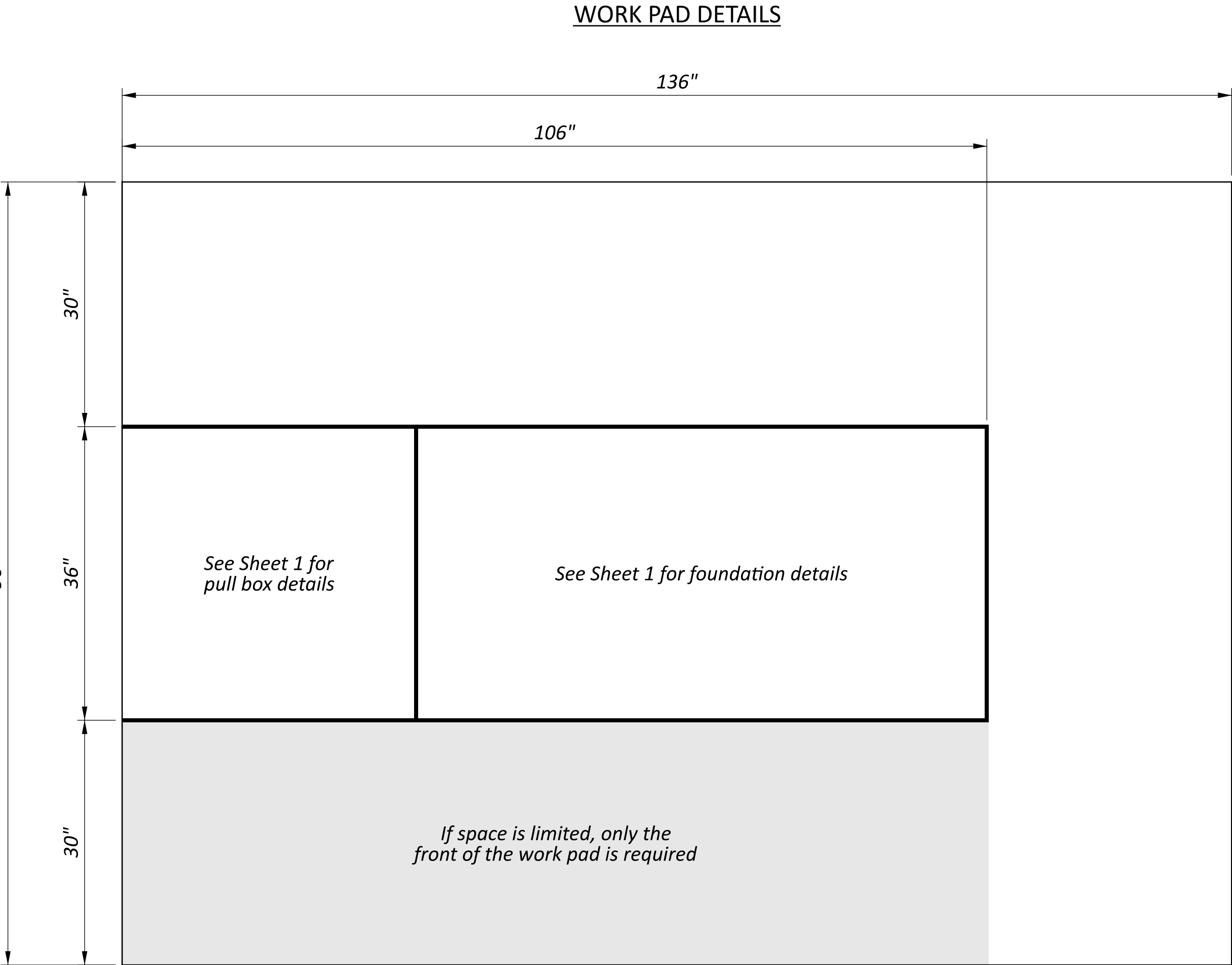
- All conduit fitting entries for controllers and power service equipment in proposed steel poles shall be attached by a blind half coupling welded into the pole prior to galvanizing.
- Service cable attachment on wood poles shall be by a 5/8" thru-bolt and clevis and on steel poles by a banded clevis.
- If both the meter and disconnect switch are not required on a steel pole, the power cable shall enter the controller through a conduit riser, external to the pole. For underground power service, install the meter base and disconnect on a strut frame (SCD HL-40.20), as directed in the plans.
- Only 120/ 240V power services may be pole mounted. The service cable and cable splices to the power cable for the incoming power supply shall be installed by the Power Supplying Agency unless otherwise specified. The pole attachment hardware shall be furnished and installed by the Contractor.
- Orientation of the cabinet, meter and disconnect switch enclosure shall be arranged to minimize exposure to the street side and also minimize encroachment on sidewalks, unless otherwise shown on the plans.
- Power and controller service for metal poles shall be similar to that shown for the wood pole with the exception of the attachment hardware.
- The top of the meter base shall not exceed 6' above the ground. The mounting height of the LB type fitting may be decreased in order to accommodate a larger meter base.
- Conduit attachment shall be by means of two hole conduit straps with a maximum spacing of 5'. Minimum fastener requirements are as follows:

Wood Poles - 1/4" x 3" long lag screws, No. 14 x 3" long round head screws, or 20d spikes

Steel Poles - 1/4" screws, self tapping or with drilled and tapped hole. In lieu of conduit clamps, 3/4" wide passivated stainless steel banding may be used on steel poles.

- Conduit connections at the top and bottom of the disconnect switch enclosure and meter base shall be watertight and shall use the hubs listed on the enclosure and meter base U.L. labels. Conduit shall be bent to allow the conduit to enter straight into the enclosure or meter base, and to provide space for the weatherhead when the riser is pulled tight against the pole.
- A 48" x 36" x 4" work pad shall be located below each pole-mounted controller cabinet unless located in an otherwise paved area. When required, this item shall be paid for under Item 633, Controller Work Pad. In level areas, the top of the pad shall be 1" above the ground line. In steeply sloped areas, the pad's location shall be adjusted to provide access and drainage while complying with the required controller cabinet mounting height.
- The horizontal orientation of the handhole relative to the 2 1/2" blind half coupling for the controller shall be as required by the plans except that they shall not be closer than 90°. Install the LB fitting before erecting the pole.
- When conduit risers are required to be attached to a utility company's wood poles, and the utility company's policy requires non-metallic conduit, the conduit risers shall conform with NEMA Standards publication No. TC-2 for PVC conduit type EPC-40.
- 1/2" preformed joint filler as per CMS 705.05 shall be used between foundations and adjacent paved areas.
- Provide separate disconnects and conduits for intersection lighting and ITS. Do not route Lighting or ITS circuits through the controller cabinet.

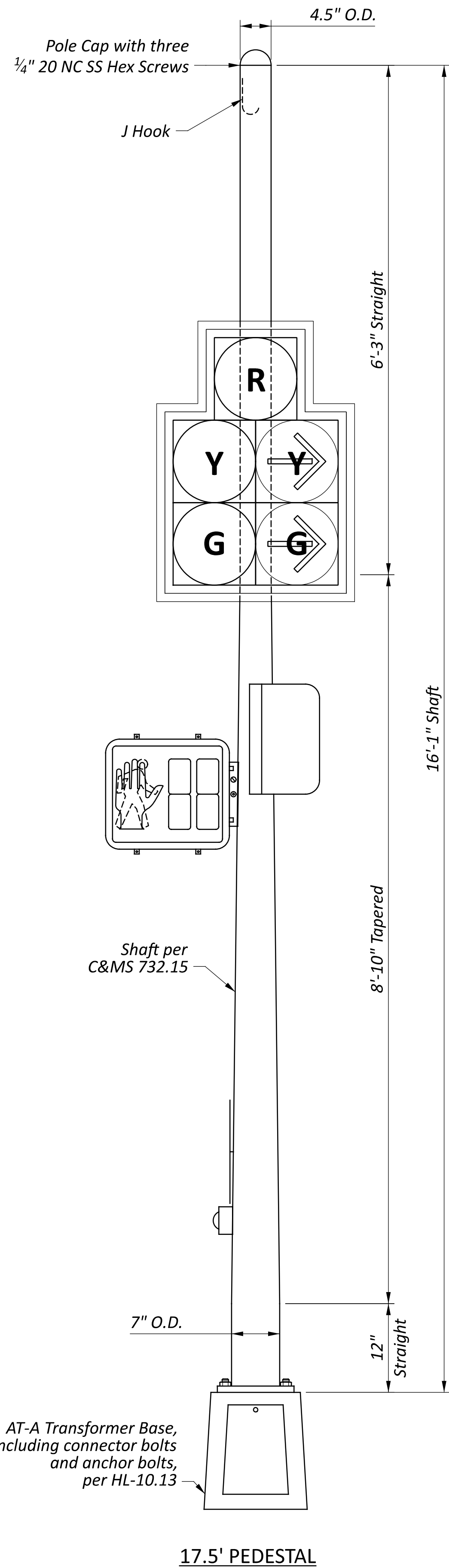
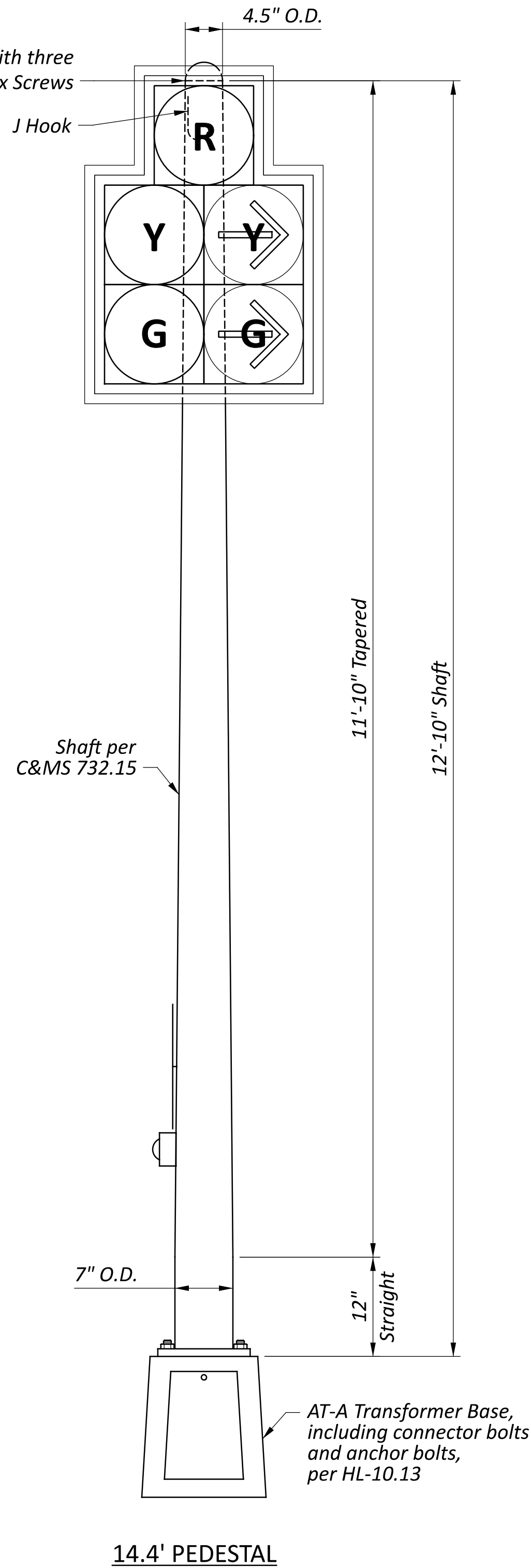
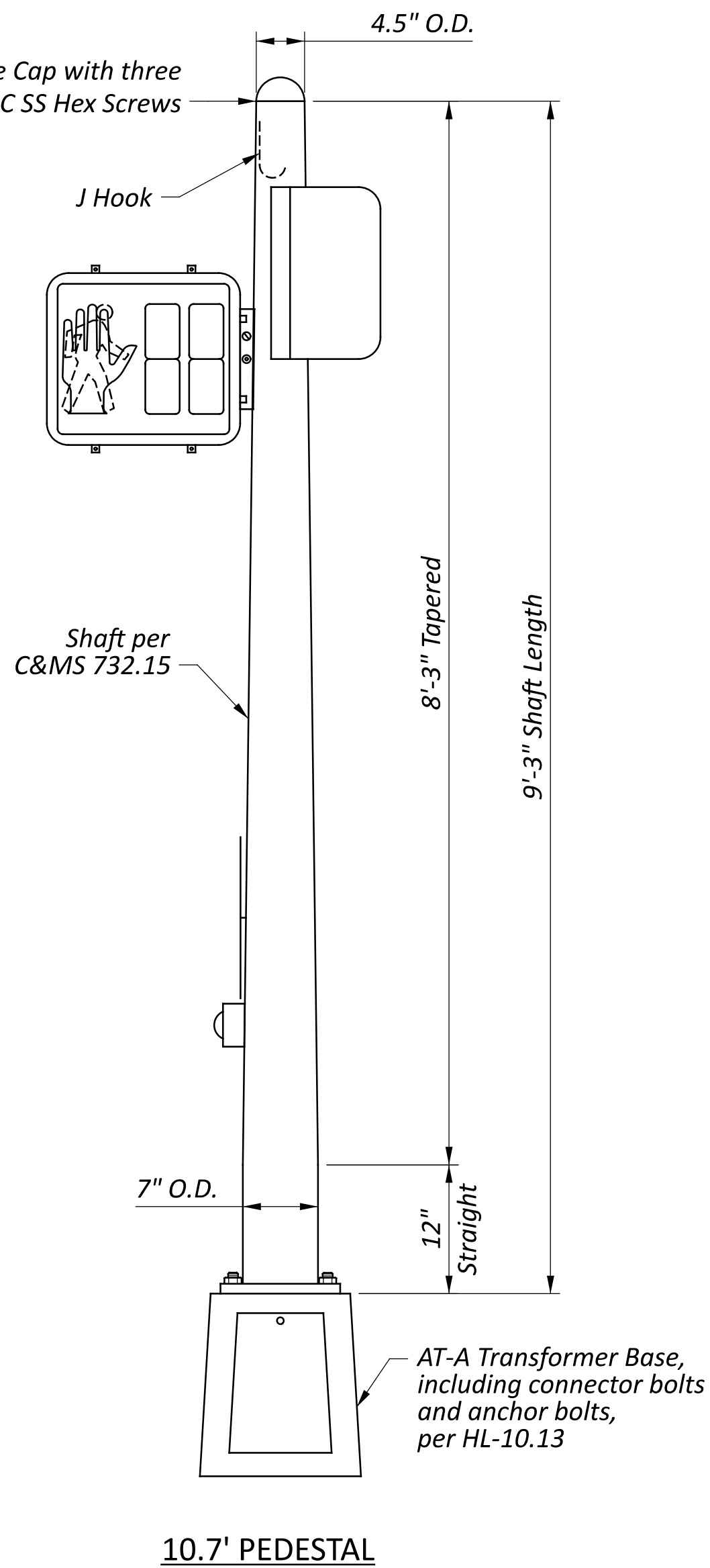
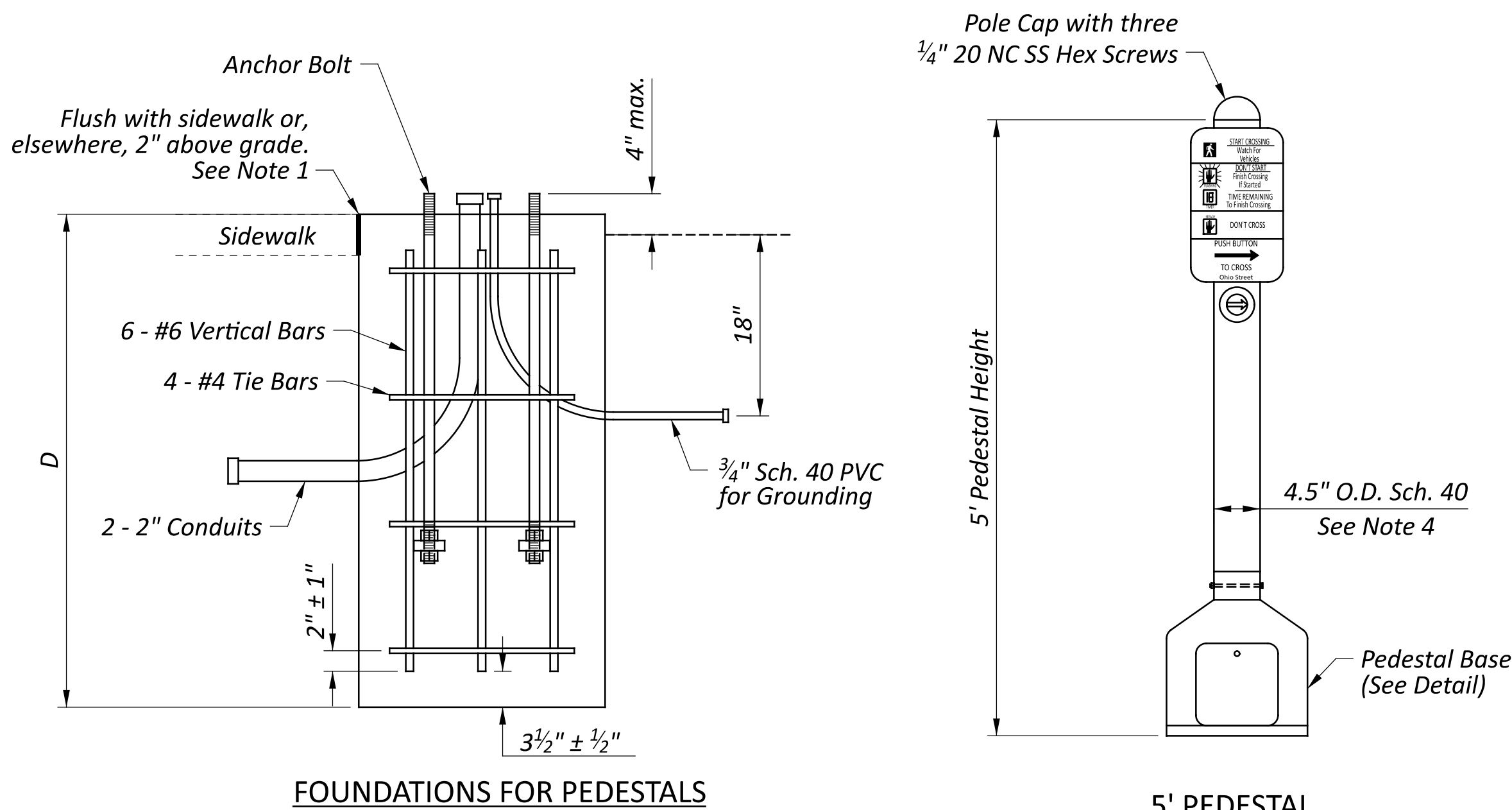
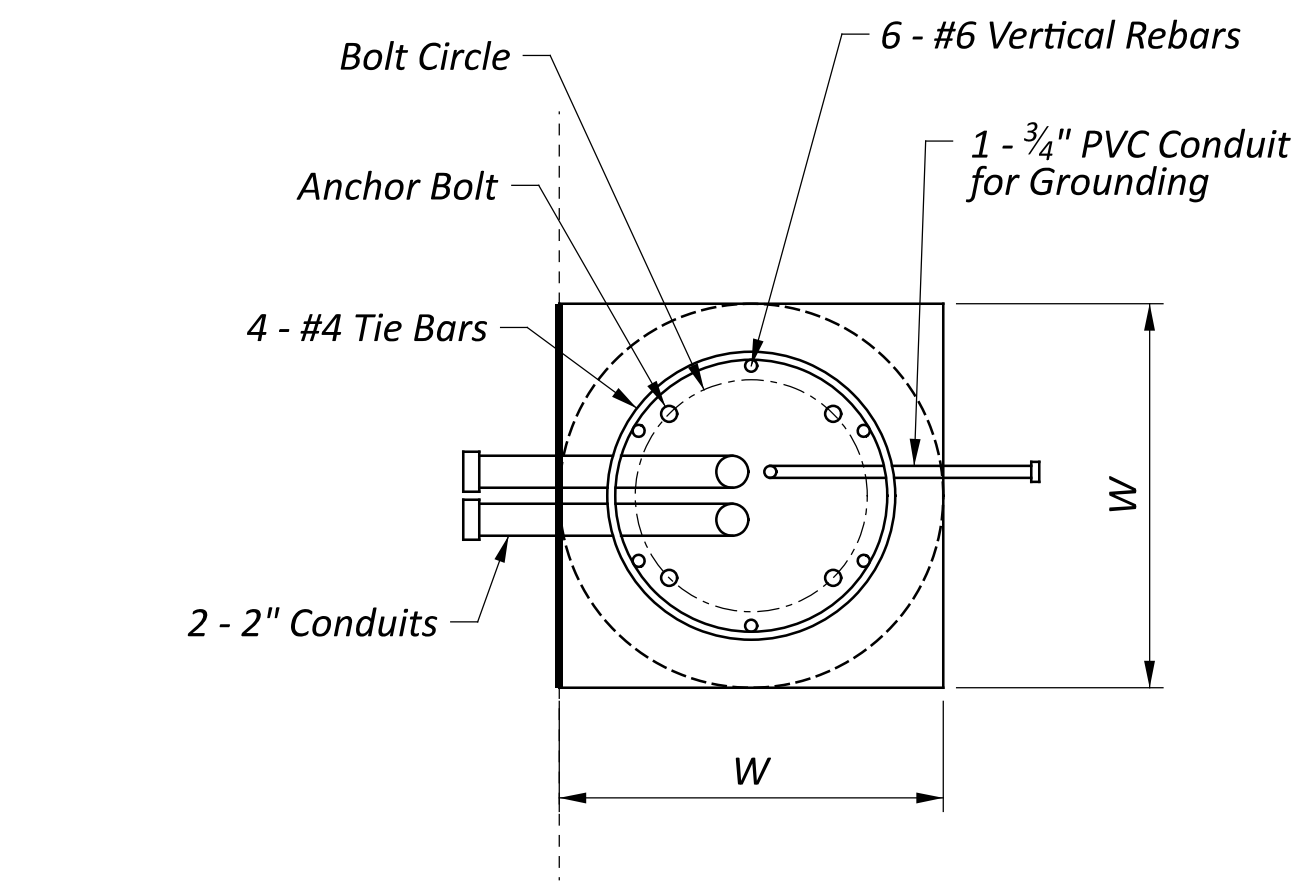
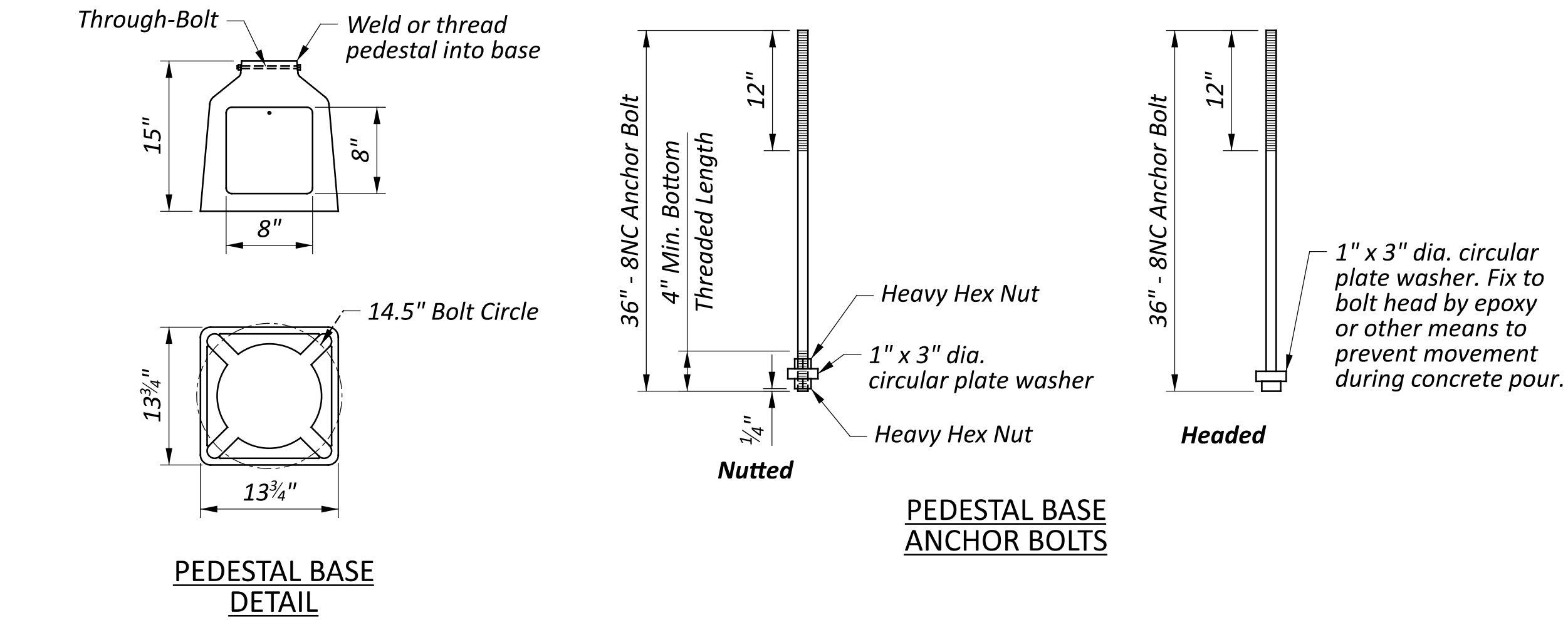


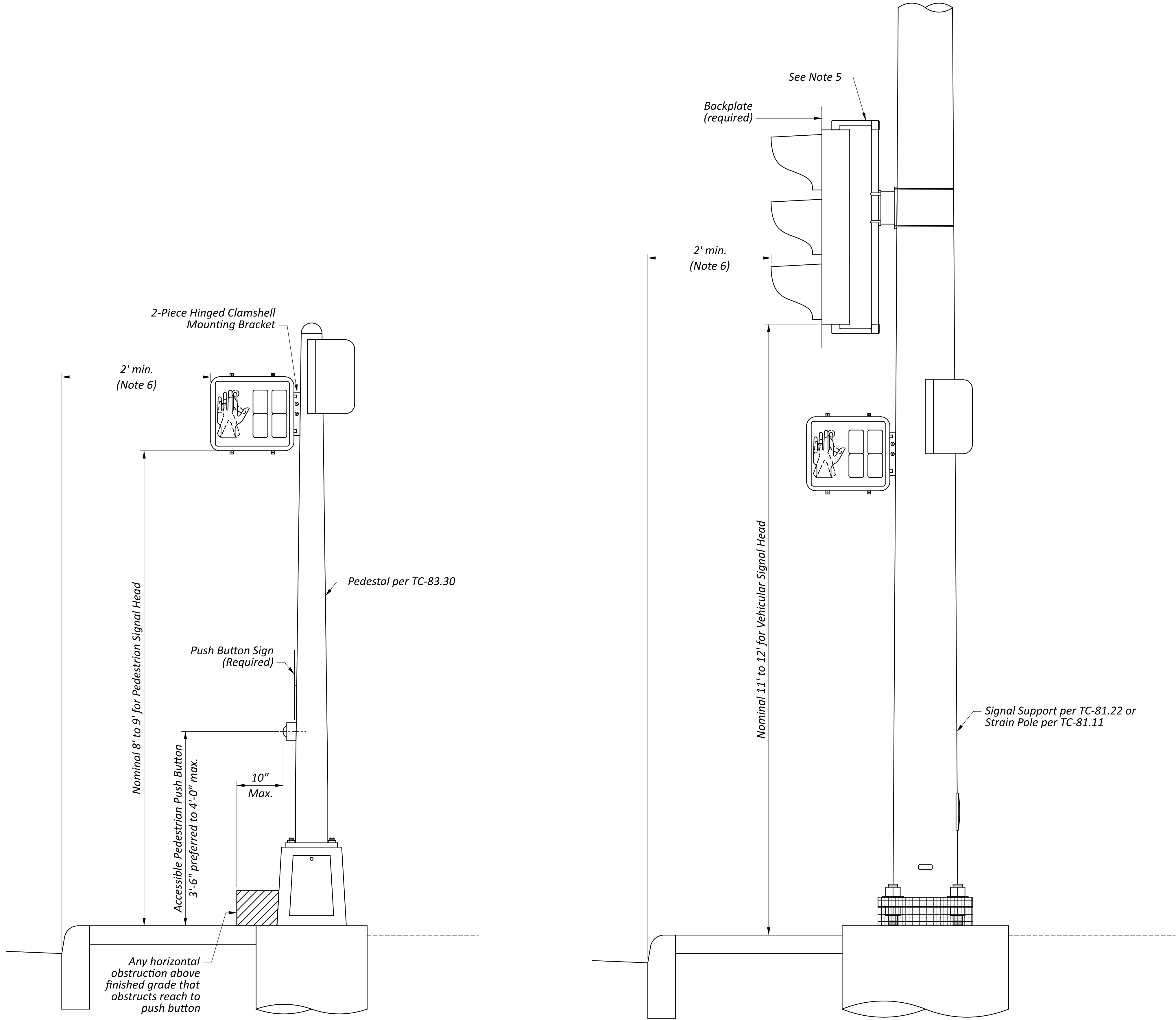


NOTES:

1. ½" preformed joint filler as per CMS 705.03 shall be used between foundations and adjacent paved areas.
2. Ground mounted controller cabinets shall be sealed to the foundation with a flexible weatherproof clear, silicone caulking compound.
3. When a separate UPS Enclosure is used, it shall be bolted flush to the Controller Cabinet and sealed with silicone.
4. Controller Cabinets require a minimum of two 4" conduits. The UPS Enclosure requires a minimum of one 2" conduit. Additionally, provide two ¾" conduits for grounding.
5. The size, number, and location of anchor bolts shall be in accordance with the Cabinet Manufacturer's recommendations. Hot-dip galvanized wedge anchors, 3/4x10, DeWalt 7741HD5-PWR or approved equal, may be used.
6. A 4" thick work pad shall be provided unless in an otherwise paved area. When required, this item shall be paid for under Item 633 Controller Work Pad. In level areas the top of the pad shall be 1" above the ground line. In steeply sloped areas the pad's location shall be adjusted to provide access and drainage.
7. The Contractor shall be responsible for providing the necessary power cable between the UPS unit and Controller Cabinet.
8. A 12" riser is incidental to each cabinet or enclosure.
9. Fiber optic cable must use a separate 32" ITS Pull Box.







NOTES

- Signal head conduit brackets and conduit fittings shall be galvanized and painted (except pole clamps or bands) to match the body of the signal head.
- The signal head bracket arms shall be attached to steel poles by hub plates attached to the pole with banding per C&MS 732.23 (two bands per hub plate)

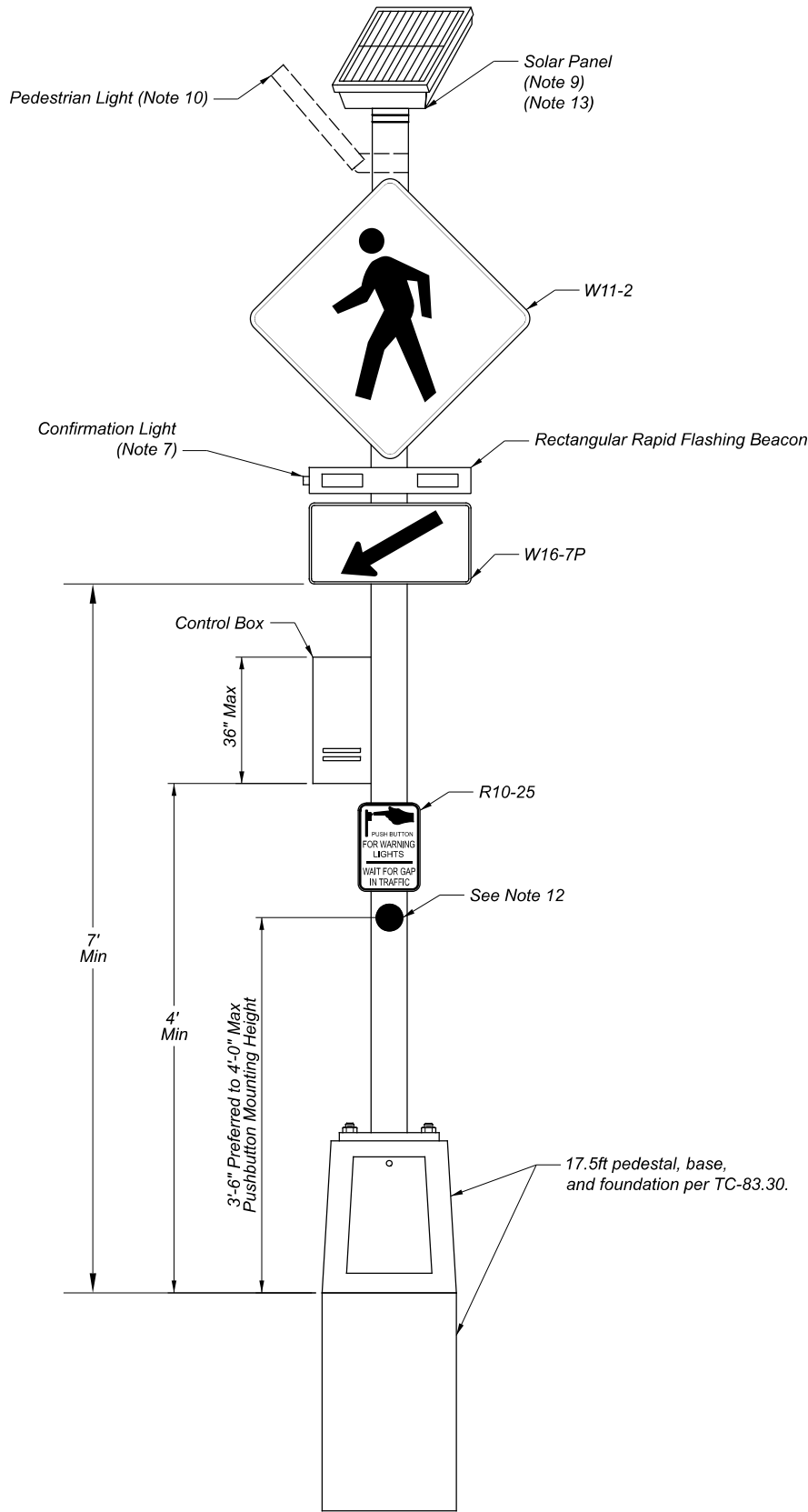
Field installation of the wiring holes for signal heads and accessible pedestrian push buttons will be permitted provided that the holes are drilled or hole sawn. No torch cutting or field welding will be permitted. Cut surfaces shall be filed smooth and covered with two coats of zinc rich paint. Grommets or wiring guides shall be installed in the holes.

- Vertical spacing between vehicular or pedestrian bracket fittings shall be determined by the Contractor, and shall be the dimension from centerline to centerline of the bracket arms necessary to accommodate the vertical height of the signal head plus not more than 10".
- The outer jacket of the pedestrian signal cable shall extend into the signal housing.
- The following minimum size fasteners shall be used for the attachment of the indicated hardware to steel poles:

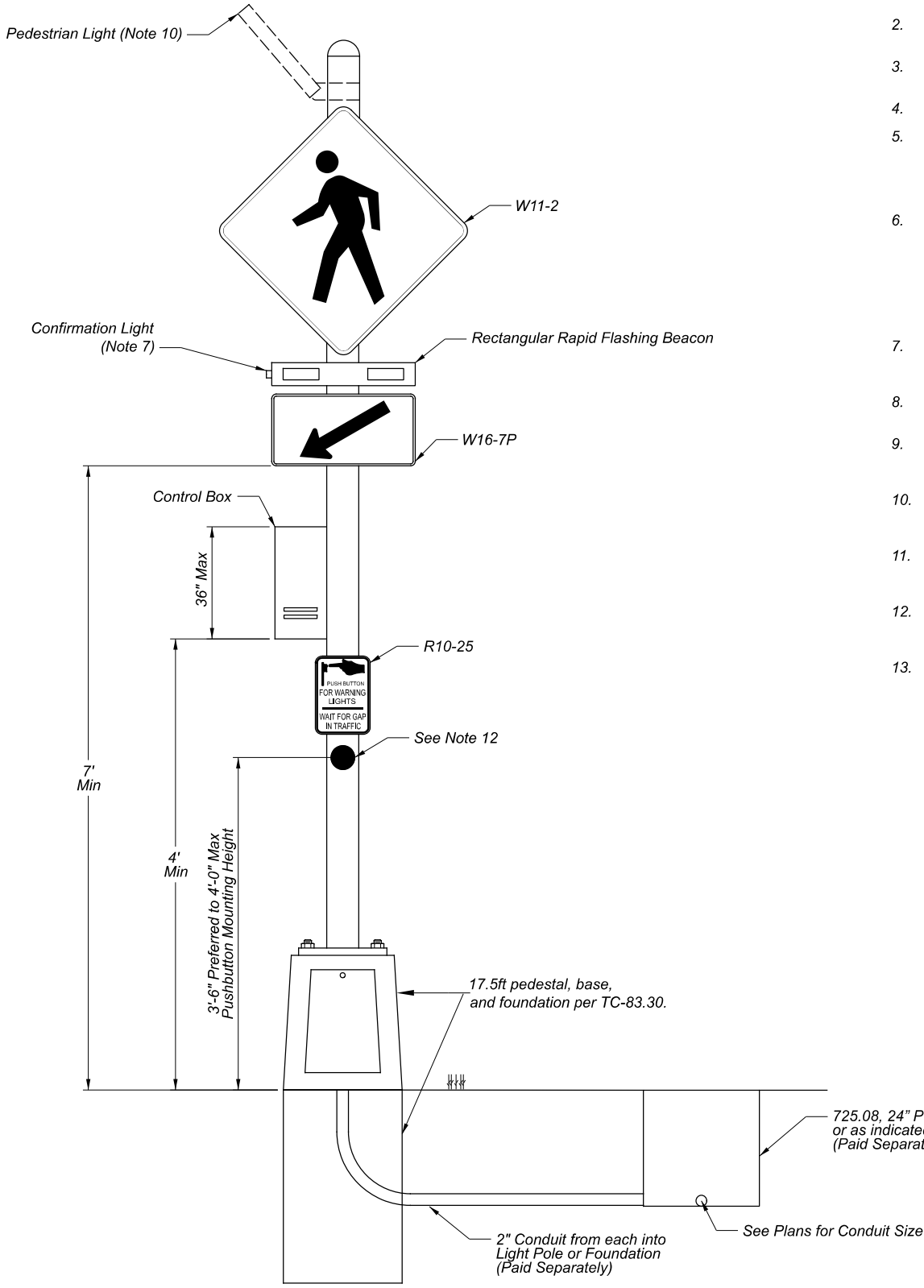
- Conduit Bracket Arm Hub Plates:** 3/4" wide passivated stainless steel band (two bands per hub plate).
- Conduit:** Two hole conduit straps with 1/4" dia. screws or 3/4" wide passivated stainless steel bands.
- Push Button Sign:** 3/8" dia. screws (two per sign).
- Accessible Pedestrian Push Button:** 3/4" dia. screws (two per push button).

The screws shall utilize a drilled and tapped hole or be the self-tapping type.

- The minimum clearance from face-of-curb shown is applicable to tangent segments. On curved segments (corners) the minimum clearance is greater. When clearance to curved curb face is less than 10', consult with the Engineer for possible alternate locations.



SOLAR POWERED RRFB



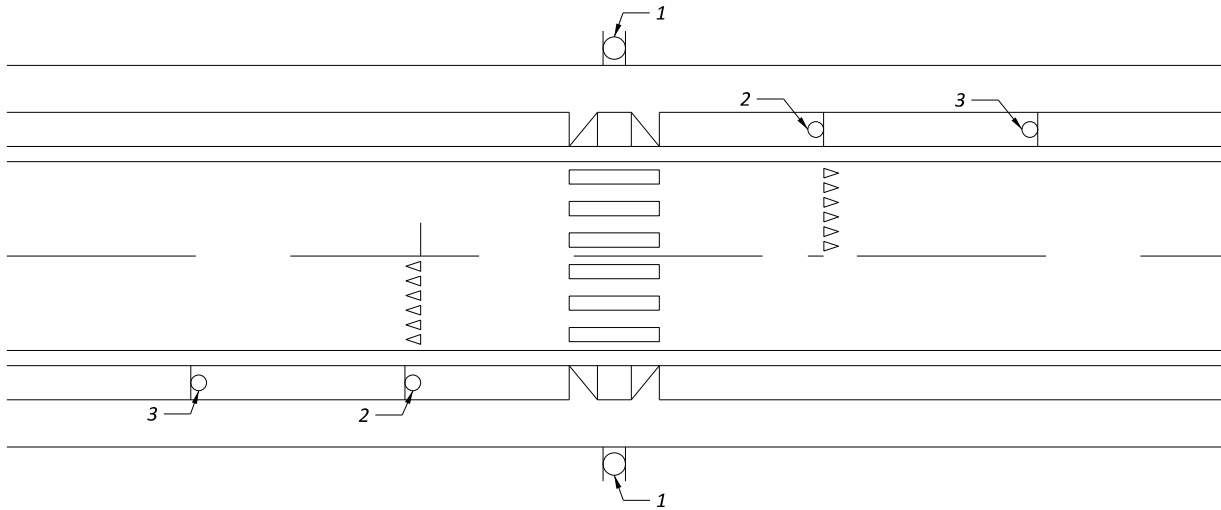
UTILITY POWERED RRFB

(One Power Service Intended to Energize RRFB's on both sides of the roadway)

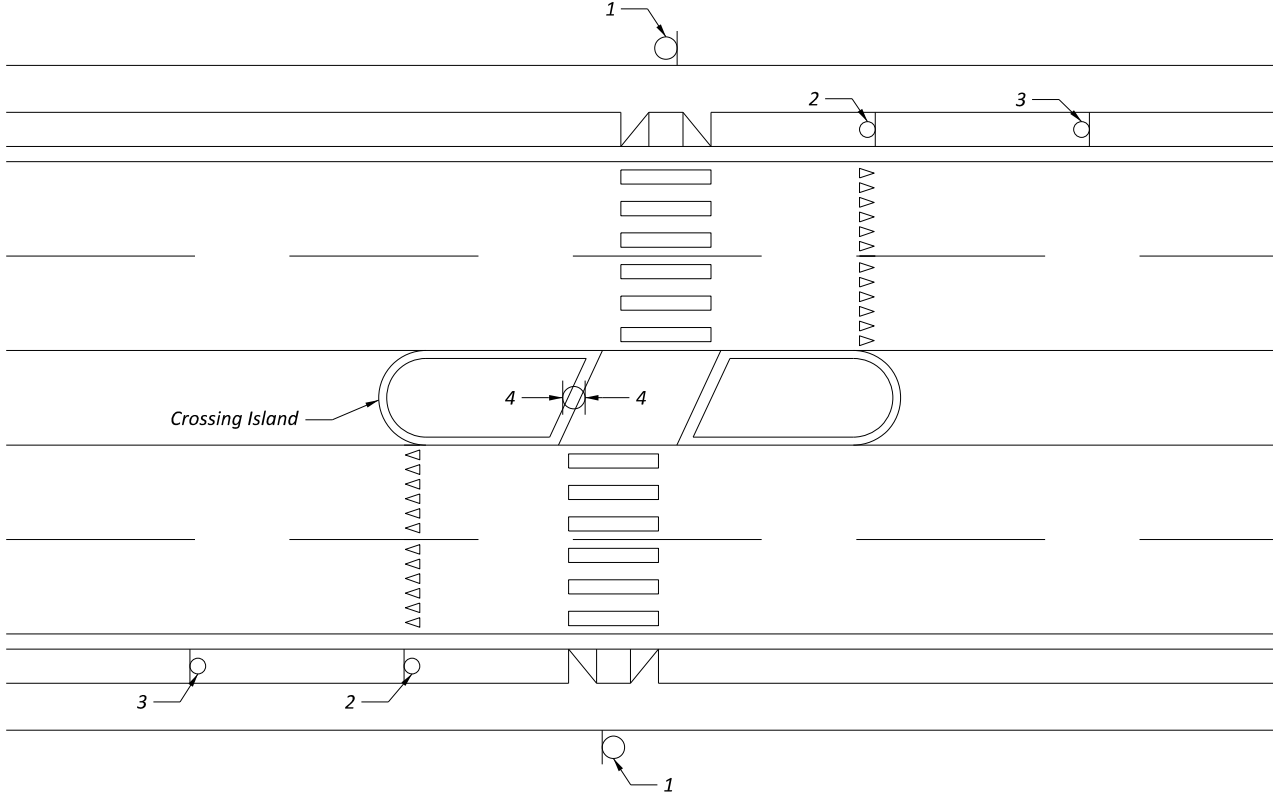
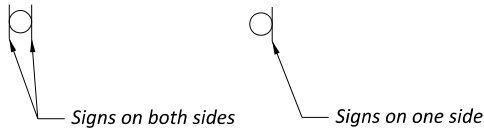
NOTES:

1. The RRFB application shall meet all requirements of MUTCD 11th Edition, Section 4L.01.
2. The RRFB design shall meet all requirements of MUTCD 11th Edition, Section 4L.02.
3. The RRFB operation shall meet all requirements of MUTCD 11th Edition, Section 4L.03.
4. Sign faces shall be Type XI retroreflective sheeting.
5. The sign unit shall be visible at a minimum of 1,000 feet during normal conditions. Minimum carryover time is 5 days unless specified by Plan Note. A 14-day carryover time is required for ODOT-maintained installations. The sign unit shall incorporate circuitry to adjust brightness during day or night.
6. The sign unit shall operate on a solar panel provided with the solar collector and batteries after batteries are fully charged prior to installation. The line voltage for initial charging of the batteries shall be 120-volt AC 60 Hertz with plus and minus 10% voltage fluctuation. The individual LED light sources shall be wired so that a catastrophic failure of one LED light source will not result in the loss of more than one LED light source in the sign unit.
7. A small light directed at and visible to pedestrians in the crosswalk shall be installed to the RRFB or pedestrian push button detector to give confirmation that the RRFB is in operation.
8. Detailed operation of solar-powered traffic control devices are specified by Plan Note.
9. Solar Panel/Battery may be integrated or separate, as specified by the owner in a Plan Note. Control box contains batteries, charge controllers, and is lockable/keyed per CM&S 631.06.
10. Solar-Powered crosswalk lighting, as specified by the owner in a Plan Note, shall be activated concurrently with flashing beacons.
11. On-Demand solar/utility-powered lighting, as specified by the owner in a Plan Note, shall be activated concurrently with flashing beacons.
12. The push button should include an audible information device that plays an audible speech message that says, "Warning lights are flashing". The audible message should be spoken twice.
13. Default elevation angle for the solar panel is 35 degrees above the horizon, facing south (+/- 10 degrees)

TYPICAL LAYOUTS



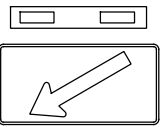
2 LANE UNDIVIDED



4 LANE DIVIDED OR
5 LANE WITH 2-WAY LEFT TURN LANE

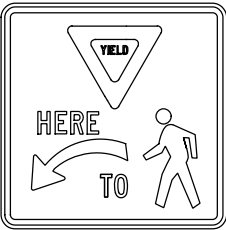


W11-2



W16-7P

2



R1-5

3



W11-2

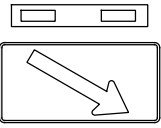


W16-9P

4

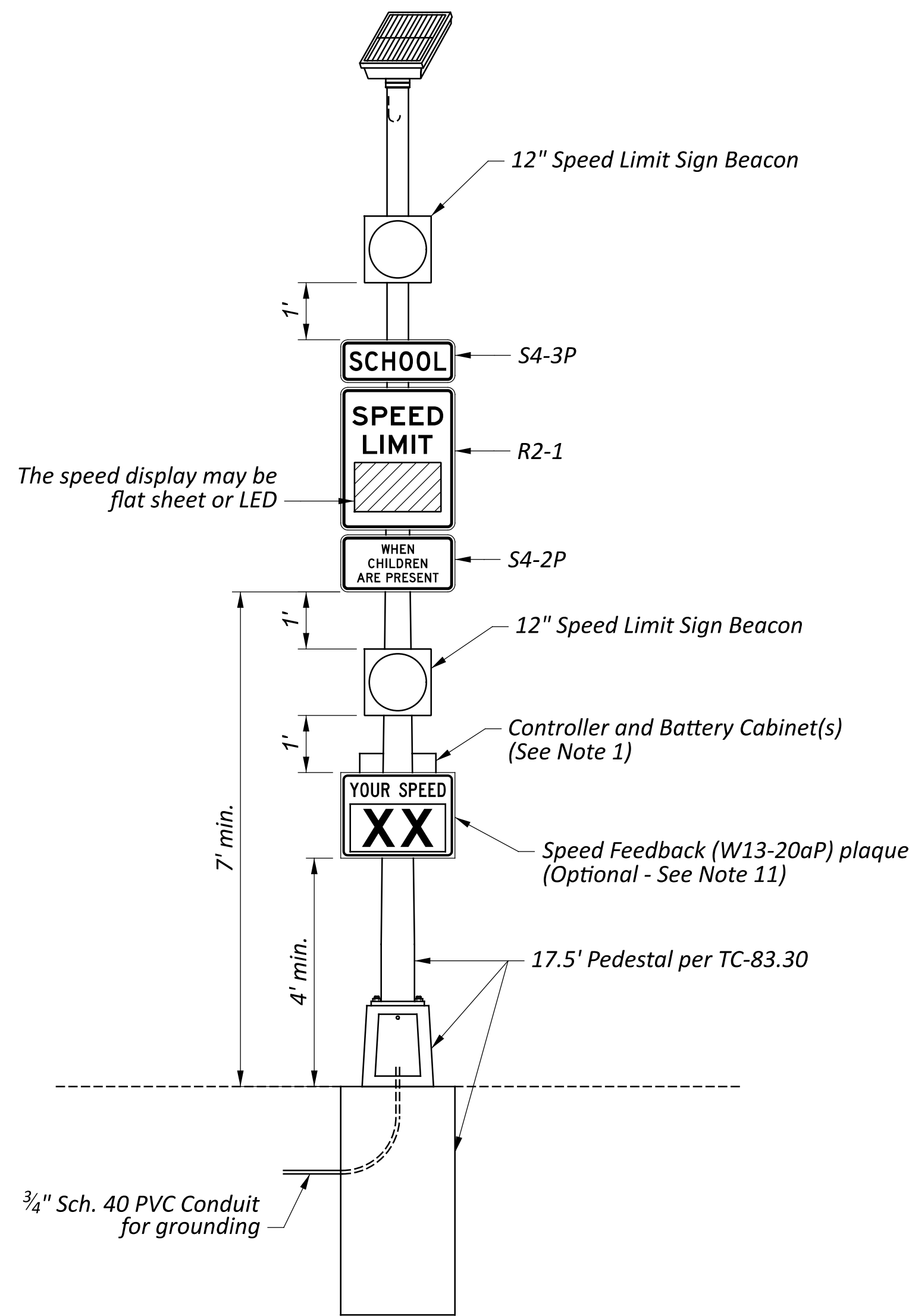


W11-2

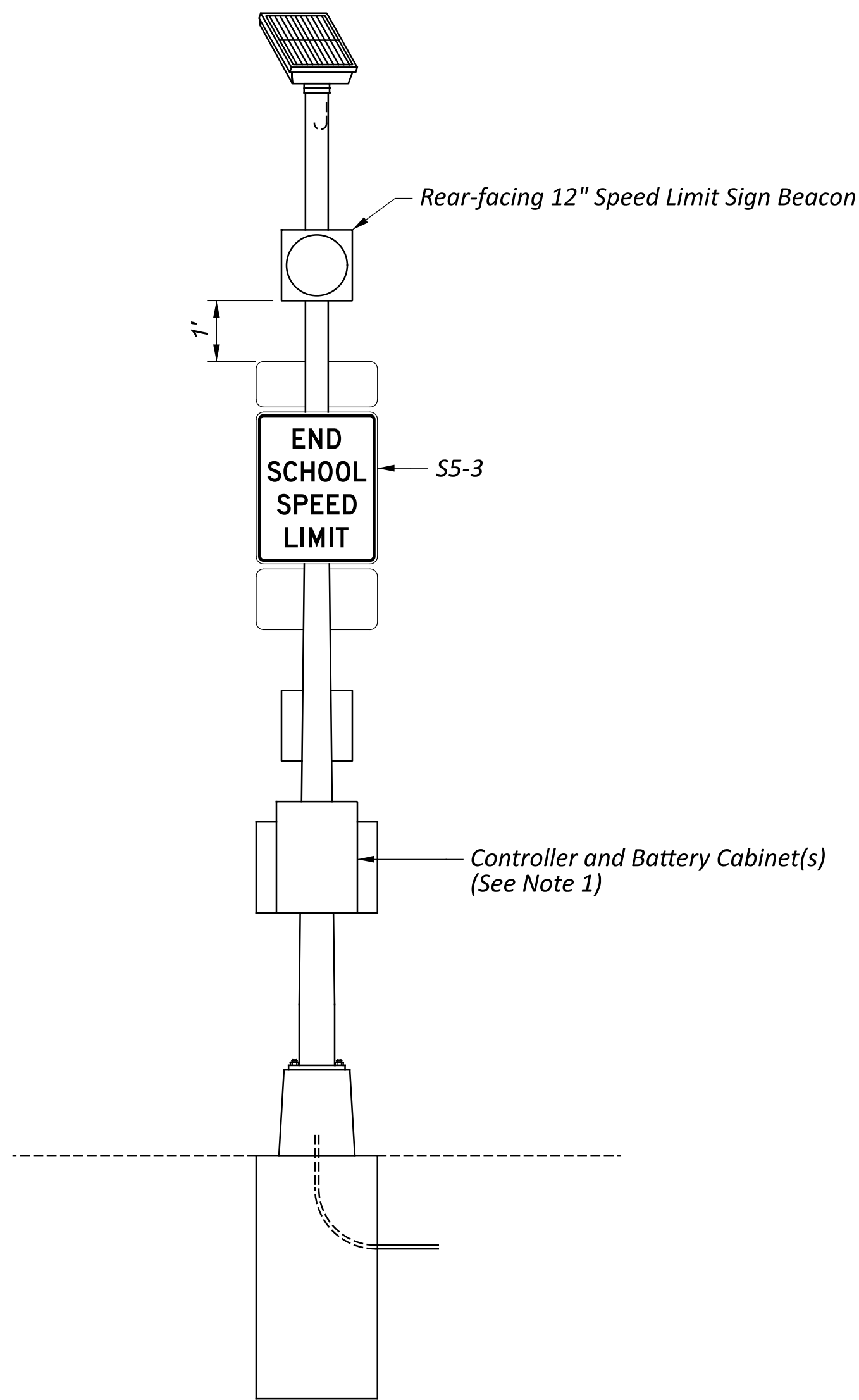


W16-7P





**SCHOOL SPEED LIMIT SIGN
WITH FLASHING BEACONS, SOLAR POWERED**
(front view)



**SCHOOL SPEED LIMIT SIGN
WITH FLASHING BEACONS, SOLAR POWERED**
(rear view)

NOTES

- 1) The flasher control and battery will be housed in one or more stainless steel or aluminum enclosures with a NEMA rating of at least 3X. Enclosure exterior surfaces shall be bare or powder coat aluminum or stainless steel. The enclosure interior surfaces shall be the same as the exterior.
- 2) If contained in a single enclosure, the control electronics and battery shall be separated in a manner to prevent damage to the control electronics if the battery envelope is compromised.
- 3) Speed limit sign beacons shall only operate when the school speed limit is in effect.
- 4) The vehicular signal lamps used for the speed limit sign beacons shall be listed on the Traffic Authorized Products List.
- 5) The Solar Panel and/ or Controller manufacturer will provide signed copies of calculations used to size the solar panel and batteries. Included in these calculations will be the insolation value used and its source, the solar panel efficiency, charger/ controller efficiency, inverter efficiency, proposed LED lamp load, and a figure representing anticipated miscellaneous losses.
- 6) The default elevation angle for the solar panel is $35^{\circ} \pm 10^{\circ}$ above the horizon, facing south.
- 7) The solar panel manufacturer must test the panel according to IEC61215 or an equivalent approved standard. Solar panel mounting must be rated for 90 mph design wind.
- 8) Run requirements are 4 hours per day for two weeks under continuous worst-case (minimum) insolation figures (usually December) for the proposed geographic location, using a panel elevation angle appropriate to the site latitude, at a sustained temperature of 25° F.
- 9) If voltages over 50V AC or DC are present, grounding and bonding requirements specified in CMS 625.16 must be followed.
- 10) Any timer included in the assembly must satisfy the requirements of CMS 731.10 and be listed on the Traffic Authorized Products List.
- 11) A Speed Feedback (W13-20aP) plaque is an optional treatment that must be specified by a plan note. A Speed Feedback plaque shall only operate when the school speed limit is in effect.

