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09/08/99

See Sheet 1A For Index of Sheets

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

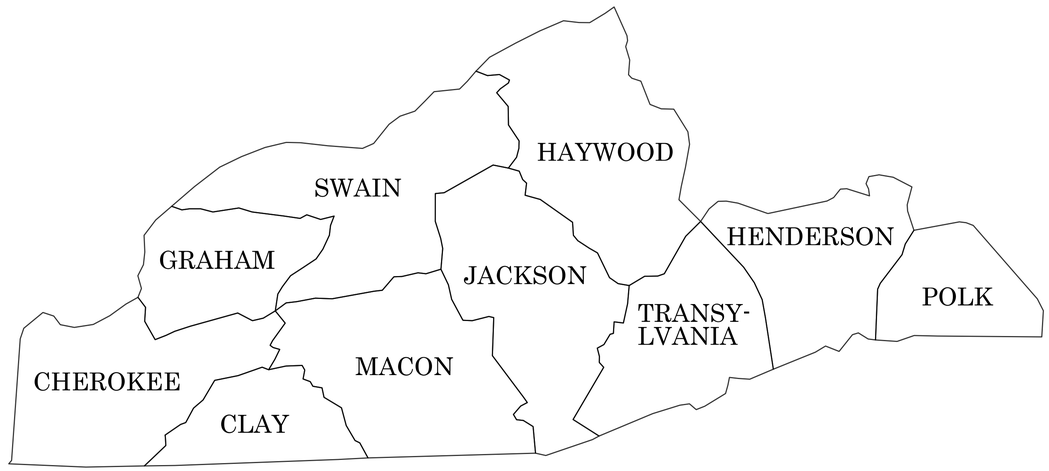
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	DN12031875	1	20

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
14.1020SM	TBD	

DIVISION 14

LOCATION: *VARIOUS LOCATIONS ACROSS DIVISION 14*

TYPE OF WORK: *ID/IQ ON-CALL SIGNALS REPAIR & MAINTENANCE SERVICES*



CONTRACT: DN12031875

Prepared in the Office of:
DIVISION OF HIGHWAYS
253 WEBSTER RD., SYLVA NC, 28779

2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: N/A

LETTING DATE: MAY 28, 2024

STEVEN BUCHANAN
PROJECT ENGINEER

GARRETT B HIGDON, P.E.
PROJECT DESIGN ENGINEER

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION ·

INDEX OF SHEETS

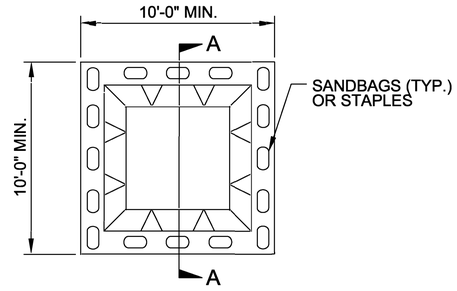
2024 ROADWAY ENGLISH STANDARD DRAWINGS

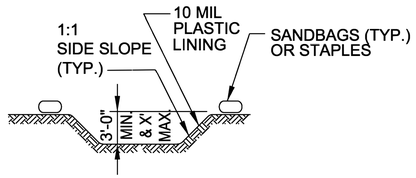
The following Roadway Standards as appear in "Roadway Standard Drawings" Highway Design Branch - N. C. Department of Transportation - Raleigh, N. C., Dated January, 2024 are applicable to this project and by reference hereby are considered a part of these plans:

STD.NO. TITLE
DIVISION 8 - INCIDENTALS
846.01 Concrete Curb, Gutter and Curb & Gutter
848.01 Concrete Sidewalk
848.06 Curb Ramp
850.01 Concrete Paved Ditches
DIVISION 11 - WORK ZONE TRAFFIC CONTROL
1101.01 WORK ZONE ADVANCE WARNING SIGNS
1101.02 TEMPORARY LANE CLOSURES
1101.03 TEMPORARY ROAD CLOSURES
1101.04 TEMPORARY SHOULDER CLOSURES
1101.05 WORK ZONE VEHICLE ACCESSES
1101.06 WARNING SIGNS FOR BLASTING ZONES
1101.11 TRAFFIC CONTROL DESIGN TABLES
1110.01 STATIONARY WORK ZONE SIGNS
1110.02 PORTABLE WORK ZONE SIGNS
1115.01 FLASHING ARROW BOARDS
1130.01 DRUMS
1135.01 CONES
1145.01 BARRICADES - TYPE III
1150.01 FLAGGERS
1160.01 TEMPORARY CRASH CUSHION - REFLECTIVE END TREATMENT
1165.01 TRUCK MOUNTED ATTENUATOR
1170.01 PORTABLE CONCRETE BARRIER
1180.01 SKINNY DRUMS
DIVISION 17 - SIGNALS AND TRAFFIC MANAGEMENT SYSTEMS
1700.01 ELECTRICAL SERVICE OPTIONS
1700.02 ELECTRICAL SERVICE GROUNDING
1705.01 SIGNAL HEADS - VEHICULAR SIGNAL HEADS
1705.02 SIGNAL HEADS - MOUNTING
1705.03 SIGNAL HEADS - WIRE COLOR CONVENTIONS
1705.04 SIGNAL HEADS - PEDESTRIAN PUSHBUTTON PLACEMENT
1715.01 UNDERGROUND CONDUIT - TRENCHING
1716.01 JUNCTION BOXES
1720.01 WOOD POLES
1721.01 GUY ASSEMBLIES
1725.01 INDUCTIVE DETECTION LOOPS
1730.01 FIBER-OPTIC CABLE - SPARE CABLE STORAGE
1736.01 SPREAD SPECTRUM RADIO
1743.01 PEDESTALS - PEDESTRIAN PUSHBUTTON POST (TYPE I)
1743.02 PEDESTALS - NORMAL DUTY (TYPE II)
1743.03 PEDESTALS - HEAVY DUTY (TYPE III)
1743.04 PEDESTALS - FOUNDATIONS
1751.01 CONTROLLER AND CABINETS - CABINET COMPONENT LAYOUT
1751.02 CONTROLLER AND CABINETS - POWER, GROUND, AND AUXULIARY

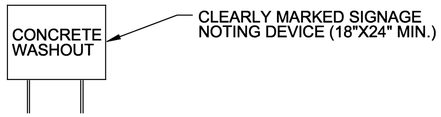
PROJECT REFERENCE NO.	SHEET NO.
DN12031875	EC-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

ONSITE CONCRETE WASHOUT STRUCTURE WITH LINER





SECTION A-A



PLAN

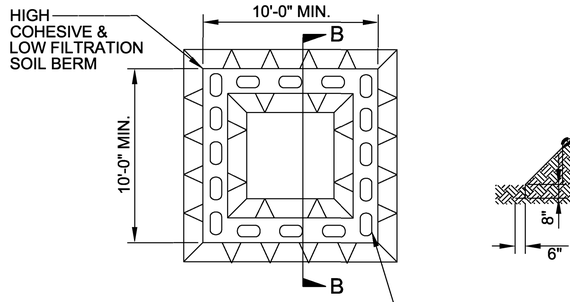
NOTES:
1. ACTUAL LOCATION DETERMINED IN FIELD

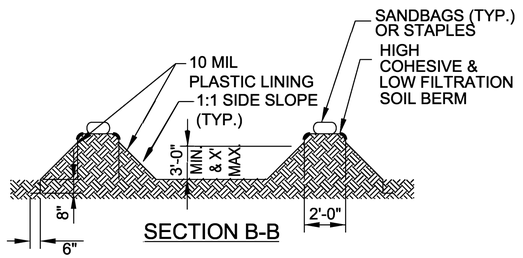
2. THE CONCRETE WASHOUT STRUCTURES SHALL BE MAINTAINED WHEN THE LIQUID AND/OR SOLID REACHES 75% OF THE STRUCTURES CAPACITY.

3.CONCRETE WASHOUT STRUCTURE NEEDS TO BE CLEARY MARKED WITH SIGNAGE NOTING DEVICE.

BELOW GRADE WASHOUT STRUCTURE

NOT TO SCALE





SECTION B-B

PLAN

NOTES:
1. ACTUAL LOCATION DETERMINED IN FIELD

2. THE CONCRETE WASHOUT STRUCTURES SHALL BE MAINTAINED WHEN THE LIQUID AND/OR SOLID REACHES 75% OF THE STRUCTURES CAPACITY TO PROVIDE ADEQUATE HOLDING CAPACITY WITH A MINIMUM 12 INCHES OF FREEBOARD.

3.CONCRETE WASHOUT STRUCTURE NEEDS TO BE CLEARY MARKED WITH SIGNAGE NOTING DEVICE.

ABOVE GRADE WASHOUT STRUCTURE

NOT TO SCALE

POLE STANDARDS

NCDOT METAL POLES

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PROJECT NO.	SHEET NO.
DN12031875	Sig.SP 1

STANDARD NOTES FOR METAL STRAIN POLES

GENERAL

1. THESE NOTES PROVIDE INFORMATION AND REQUIREMENTS FOR THE DESIGN, FABRICATION, AND INSTALLATION OF STANDARD METAL STRAIN POLES. THEY ARE TO BE USED BY DESIGN ENGINEERS, CONTRACTORS, AND POLE MANUFACTURERS IN THE SELECTION, FABRICATION, AND INSTALLATION OF METAL TRAFFIC SIGNAL SUPPORTS IN NORTH CAROLINA. THE NOTES ARE CATEGORIZED FOR EASE OF USE, AND ARE NUMBERED CHRONOLOGICALLY. NOTES THAT ARE SPECIFIC TO A PARTICULAR SITUATION, DESIGN DETAIL OR REQUIREMENT ARE SHOWN ON THE APPLICABLE PAGE TO CLARIFY INTENT AND UNDERSTANDING.
2. THE FOLLOWING STANDARD DESIGNS ARE BASED ON LIGHT AND HEAVY LOADING CASES. NO VARIATIONS, SUBSTITUTION OR RE-DESIGN OF THE SPECIFIED POLES AND FOUNDATIONS WILL BE PERMITTED UNLESS IT IS APPROVED BY THE ITS AND SIGNALS UNIT.
3. THESE METAL POLE STANDARDS MAKE REFERENCE TO THE NCDOT "ROADWAY STANDARD DRAWINGS" DATED JANUARY 2012 HEREINAFTER REFERRED TO AS THE STANDARD DRAWINGS AND TO THE NCDOT "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2012 HEREINAFTER REFERRED TO AS THE STANDARD SPECIFICATIONS. IF THERE IS A DISCREPANCY BETWEEN THE STANDARD DRAWINGS/SPECIFICATIONS AND THESE STANDARDS, THEN THESE DRAWINGS AND PROJECT SPECIAL SPECIFICATIONS SHALL GOVERN.
4. POLE CASES PREAPPROVED ON THE ITS & SIGNALS QUALIFIED PRODUCTS LIST (QPL) WILL NOT REQUIRE MANUFACTURER'S CALCULATIONS. HOWEVER, CERTIFICATION OF COMPLIANCE WITH THE MANUFACTURER'S PREAPPROVED SHOP DRAWING ON FILE WITH THE DEPARTMENT SHALL BE FURNISHED TO THE ENGINEER. IF POLE CASES ARE NOT ON THE QPL, OR VARIATIONS TO A CASE STANDARD HAS BEEN APPROVED, MANUFACTURER'S SHOP DRAWINGS SHALL BE REQUIRED.

DESIGN CRITERIA

1. THE METAL POLE DESIGN SHALL CONFORM TO THE "2013 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS" AND LATEST APPROVED INTERIM SPECIFICATIONS. DESIGN WIND PRESSURES AND APPLICATIONS ARE IN ACCORDANCE WITH SECTION 3.8 AND 3.9 OF THE 2013 AASHTO SPECIFICATIONS.
2. 2 PLY POLES ARE NOT ACCEPTABLE. EXCEPTIONS TO THIS DESIGN PARAMETER WILL BE DUE TO THE USE OF DECORATIVE POLES.
3. THESE STRAIN POLE STANDARDS ALLOW FOR SIGNAL HEADS TO BE PLACED ANYWHERE ALONG THE SPANWIRE. THE MOST CRITICAL LOCATIONS ARE SHOWN IN THE TYPICAL INTERSECTION LOADING CASES SHOWN ON DRAWING SP8-SP12 (LOAD CASE AND DESIGN DETAILS SHEET) OF THESE STANDARDS. FOR DESIGN PURPOSES, USE 4% SAG FOR THE SPANWIRE. ROADWAY DESIGN CLEARANCE RANGE FROM BOTTOM OF SIGNAL HEADS TO PAVEMENT IS 17 FEET.
4. PROVISIONS SHALL BE MADE FOR DRAINAGE OF WATER FROM INSIDE THE METAL POLE.

POLE MATERIALS

1. PROVIDE MATERIALS FOR STEEL METAL POLES THAT COMPLY WITH SECTION 1072 AND 1098 OF THE STANDARD SPECIFICATIONS AND PER THE LATEST PROJECT SPECIAL PROVISIONS.

   POLE MONOTUBE SHALL:
   - GALVANIZE ALL ITEMS OF THE SIGNAL SUPPORT STRUCTURE PER AASHTO M111.
   - USE ASTM A595 MATERIAL (55 KSI) OR EQUIVALENT AS APPROVED BY THE ENGINEER.
   - HAVE A LINEAR TAPER OF 0.14 IN/FT.

2. BASE PLATE SHALL:
   - CONFORM TO ASTM A572 GR 50 OR EQUIVALENT.
   - MECHANICALLY GALVANIZED IN ACCORDANCE WITH AASHTO M111.
3. ANCHOR BOLTS, NUTS, AND WASHER MATERIAL:
   - ANCHOR BOLTS - USE AASHTO M 314 GRADE 55 MATERIAL OR APPROVED EQUIVALENT.
   - NUTS - USE AASHTO M291 GRADE 2H, DH, OR DH3 MATERIAL OR APPROVED EQUIVALENT.
   - WASHERS - USE AASHTO M293 MATERIAL OR EQUIVALENT.
4. ALL ANCHOR BOLTS, NUTS, WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 OR M298.

POLE FABRICATION

1. ALL OTHER STEEL HARDWARE MATERIAL REQUIRED BUT NOT SPECIFIED ABOVE SHALL COMPLY WITH SECTIONS 1072 AND 1098 OF THE STANDARD SPECIFICATIONS.
2. POLE ASSEMBLIES SHALL BE PERMANENTLY TAGGED OR ENGRAVED WITH THE FOLLOWING:
   - POLE MANUFACTURERS NAME
   - MANUFACTURE DATE
   - POLE CASE NUMBER
   - THICKNESS AND GRADE OF STEEL
3. FOR MANUFACTURING THE METAL POLE THE FOLLOWING CRITERIA MUST BE ADHERED TO:
   - THE METAL POLES SHALL NOT BE SPLICED WITHIN 5 FEET FROM BASE NOR WITHIN 2 FEET FROM ANY CONNECTION.
   - ONLY ONE SPLICE PER UPRIGHT WILL BE PERMITTED.
   - THE QUALITY CONTROL AND WORKMANSHIP OF THE SPLICE WELDS ARE THE SOLE RESPONSIBILITY OF THE POLE MANUFACTURER.
   - CIRCUMFERENTIAL WELDING OF THE POLES IS NOT ALLOWED.
4. ALL WELDS SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF THE AWS D1.1 STRUCTURAL WELDING CODE-STEEL.
5. PROVIDE 2- 3" FACTORY DRILLED HOLES THROUGH THE POLE WALL FOR WIRE ENTRANCE ACCESS TO THE TERMINAL STRIP INSIDE THE TERMINAL COMPARTMENT. THE HOLES SHALL BE IN THE CENTER OF THE TERMINAL COMPARTMENT (0 DEGREES ON THE POLES RADIAL INDEX) LOCATED AT 26" AND 36" FROM THE BASE OF THE POLE. SEE DRAWING Sig.SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
6. THE METAL POLE SHALL BE FABRICATED WITH 3-2" THREADED HALF COUPLINGS AND 1-1" THREADED HALF COUPLING INSTALLED 9" FROM THE TOP OF THE POLE TO RECEIVE THE WEATHERHEADS FOR SIGNAL WIRE ENTRANCES TO THE POLE. THE HALF COUPLINGS SHALL BE WELDED AT NO LESS THAN A 45 DEGREE ANGLE FROM HORIZONTAL TO PROPERLY INSTALL THE WEATHERHEADS. THE 1" HALF COUPLING FOR ELECTRICAL SERVICE ENTRANCE SHALL BE LOCATED AT 0 DEGREES ON THE POLES RADIAL INDEX. ALL OTHER 2" HALF COUPLINGS SHALL BE LOCATED AT 90 DEGREE INCREMENTS. PROVIDE WEATHER TIGHT BUSHING CAPS FOR ALL HALF COUPLINGS. REFER TO DRAWING Sig.SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
7. PROVIDE A FACTORY STANDARD "C" HOOK FOR CABLE SUPPORT WELDED INSIDE THE TOP OF THE POLE AT 225 DEGREES ON THE POLES RADIAL INDEX. REFER TO DRAWING M3 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR DETAILS.
8. FOR ALL OTHER NON-STRUCTURAL DETAILS AND REQUIREMENTS, REFER TO APPLICABLE SECTIONS OF THESE STANDARDS, THE TRAFFIC SIGNAL PLANS AND SPECIFICATIONS.
9. AT THE TIME OF SHIPMENT FROM THE FACTORY, ENSURE THE POLE IS PACKAGED SO THAT WATER CAN NOT GET INSIDE THE POLE.
10. SHIP ALL POLE ACCESSORIES FOR EACH POLE IN A SEPARATE WATERTIGHT CONTAINER WITH A LABEL THAT IDENTIFIES THE SPECIFIC POLE AND DESCRIBES THE CONTENTS.

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Prepared In the Offices of:

Transportation Mobility and Safety Division · STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION · ITS and Signals Unit

750 N.Greenfield Pkwy.
Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by:
Debesh C Sarkar
SIGNATURE
8/2/2016
DATE

POLE STANDARDS

NCDOT METAL POLE STANDARDS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PROJECT NO.	SHEET NO.
DN12031875	Sig.SP 2

STANDARD NOTES FOR METAL STRAIN POLES

SOIL TESTING AND STANDARD POLE FOUNDATIONS

1. THE FOUNDATION SIZE FOR POLES IN THESE METAL POLE STANDARDS IS DETERMINED BY CONDUCTING A SUBSURFACE SOIL INVESTIGATION. FOR DETAILS OF THE SUBSURFACE INVESTIGATION, AND PROPER SELECTION/DETERMINATION OF THE METAL POLE FOUNDATIONS, REFER TO AND COMPLY WITH THE "METAL POLE STANDARD FOUNDATIONS" SPECIAL PROVISION WHICH IS TO BE CONSIDERED AN INTEGRAL PART OF THESE METAL POLE STANDARDS.
2. TO DETERMINE THE CORRECT STANDARD STRAIN POLE FOUNDATION DEPTH, PLEASE ADHERE TO THE FOLLOWING REQUIREMENTS IN CONJUNCTION WITH THE STANDARD M8 DRAWING.
   a.- USING THE STATEWIDE COUNTY WIND ZONE CHART DERIVE LOAD CASE AND DESIGN DETAILS, MAKE SURE YOU HAVE THE APPROPRIATE WIND ZONE SELECTED.
   b.- SELECT THE SOIL TYPE THAT BEST DESCRIBES THE SOIL CHARACTERISTICS (EITHER CLAY OR SAND)
   c.- PERFORM A STANDARD PENETRATION TEST AT EACH PROPOSED FOUNDATION SITE TO DETERMINE "N" VALUE. (NUMBER OF BLOWS PER FOOT FROM STANDARD PENETRATION TEST).
   d.- GET THE APPROPRIATE POLE CASE LOAD NUMBER FROM THE PLANS OR FROM THE DIVISION TRAFFIC ENGINEER.
   e.- USING THE PREVIOUSLY DETERMINED SOIL TYPE AND "N" VALUE, SELECT THE APPROPRIATE COLUMN IN THE CHART. SELECT THE APPROPRIATE LINE THAT THE POLE LOAD CASE IS SHOWN ON IN THE CHART. THE CORRECT DEPTH OF THE FOUNDATION IS THE VALUE THAT IS SHOWN WHERE THE COLUMN AND THE LINE INTERSECT.
   f.- FILL OUT AND SUBMIT FOR APPROVAL TO THE DIVISION THE "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION LOCATION.
3. THE "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION IS REQUIRED TO BE SUBMITTED AND APPROVED PRIOR TO ANY DRILLING IN THE FIELD. THIS FORM AS WELL AS THE STANDARD FOUNDATION SPECIAL PROVISIONS CAN BE OBTAINED AT THE FOLLOWING WEBSITE:

   https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20POLES%20-%20Standard%20Foundation%20Selection.pdf
4. COMPLY WITH THE PROVISIONS OF SECTION 1742 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
5. REFER TO STANDARD DRAWING 1742.01 FOR FOUNDATION INSTALLATION DETAILS.
6. REINFORCING STEEL SHALL BE DEFORMED AND CONFORM TO ASTM A615 GRADE 60. TIES MAY BE DEFORMED OR PLAIN.
7. CIRCULAR TIE REINFORCING RINGS MAY BE VERTICALLY ADJUSTED BY +/- 3" AT A DEPTH BETWEEN 2'-0" AND 3'-0" TO FACILLITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING IN THE CAGE.
8. THE CONCRETE SHALL BE AIR-ENTRAINED DRILL PIER CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS IN ACCORDANCE WITH SECTION 1000 OF THE NORTH CAROLINA STANDARD SPECIFICATIONS. FOR DETAILS, SEE SPECIAL PROVISIONS.
9. THE TRAFFIC SIGNAL SUPPORT STRUCTURE SHALL NOT BE ERECTED BEFORE THE CONCRETE IN THE FOUNDATION HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
10. EACH FOUNDATION REQUIRES A FOUNDATION IDENTIFICATION TAG. FOR DETAILS SEE THE STANDARD M7 DRAWINGS.
11. FOR OTHER DETAILS REGARDING CONSTRUCTION OF CONCRETE FOUNDATION, SEE PROJECT SPECIAL PROVISIONS AND M7 DRAWINGS.
12. COMPLY WITH THE PROVISIONS OF SECTION 1072 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
13. REFER TO STANDARD DRAWING 1742.01 FOR POLE AND HARDWARE INSTALLATION DETAILS.
14. WHEN ATTACHING POLE TO FOUNDATION, THE DISTANCE BETWEEN THE BOTTOM OF THE LEVELING NUT TO THE TOP OF THE CONCRETE FOUNDATION SHOULD NOT BE GREATER THEN ONE ANCHOR NUT HEIGHT. THE TOP OF EACH ANCHOR BOLT SHOULD NOT EXTEND MORE THAN ONE ANCHOR NUT HEIGHT ABOVE TOP NUT TO FACILITATE THE INSTALLATION OF A THREADED NUT COVER.
15. STRAP ALL SIGNAL CABLES TO THE SIDE OF THE POLE WHEN THE DISTANCE BETWEEN THE SPANWIRE ATTACHMENT CLAMP ON THE POLE AND THE WEATHERHEADS EXCEEDS 36". USE ¾" STAINLESS STEEL STRAPS TO LASH WIRE TO THE POLE. SEE DRAWING Sig.M6 (POLE FABRICATION DETAILS) OF THESE STANDARDS FOR DETAILS.
16. FOR OTHER DETAILS REGARDING METAL POLE INSTALLATION, SEE LATEST PROJECT SPECIAL PROVISIONS.

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

STATEWIDE COUNTY WIND ZONES

TABLE OF STATEWIDE COUNTY WIND ZONES

ZONE 1 140 mph /63 m/s	ZONE 2 130 mph /58 m/s	ZONE 3 110 mph /49 m/s	ZONE 4 90 mph /40 m/s	ZONE 5 120 mph /58 m/s
CURRITUCK (1)	BERTIE (1)	EDGECOMBE (4)	DURHAM (5)	ASHE (11)
DARE (1)	CAMDEN (1)	HALIFAX (4)	FRANKLIN (5)	AVERY (11)
HYDE (1)	CHOWAN (1)	JOHNSON (4)	GRANVILLE (5)	WATAUGA (11)
	CURRITUCK (1)	WAYNE (4)	PERSON (5)	MADISON (13)
	DARE (1)	WILSON (4)	VANCE (5)	MITCHELL (13)
	GATES (1)	BLADEN (6)	WARREN (5)	YANCEY (13)
	HERTFORD (1)	COLUMBUS (6)	WAKE (5)	CHEROKEE (14)
	HYDE (1)	CUMBERLAND (6)	ALAMANCE (7)	GRAHAM (14)
	PASQUOTANK (1)	HARNETT (6)	CASWELL (7)	HAYWOOD (14)
	NORTHAMPTON (1)	ROBESON (6)	GUILFORD (7)	SWAIN (14)
	MARTIN (1)		ORANGE (7)	
	PERQUIMANS (1)		ROCKINGHAM (7)	
	TYRELL (1)		SCOTLAND (7)	
	WASHINGTON (1)		CHATHAM (8)	
	BEAUFORD (2)		HOKE (8)	
	CARTERET (2)		LEE (8)	
	CRAVEN (2)		MONTGOMERY (8)	
	GREEN (2)		MOORE (8)	
	JONES (2)		RANDOLPH (8)	
	LENOIR (2)		RICHMOND (8)	
	PAMLICO (2)		DAVIDSON (9)	
	PITT (2)		DAVIE (9)	
	BRUNSWICK (3)		FORSYTH (9)	
	DUPLIN (3)		ROWAN (9)	
	ONSLOW (3)		STOKES (9)	
	NEW HANOVER (3)		ANSON (10)	
	PENDER (3)		CABARRUS (10)	
	SAMPSON (3)		MECKLENBURG (10)	
			STANLY (10)	
			UNION (10)	
			ALLEGHANY (11)	
			CALDWELL (11)	
			SURRY (11)	
			WILKES (11)	
			YADKIN (11)	
			ALEXANDER (12)	
			CATAWBA (12)	
			CLEVELAND (12)	
			GASTON (12)	
			IREDELL (12)	
			LINCOLN (12)	
			BUNCOMBE (13)	
			BURKE (13)	
			McDOWELL (13)	
			RUTHERFORD (13)	
			CLAY (14)	
			HENDERSON (14)	
			JACKSON (14)	
			MACON 914)	
			POLK (14)	
			TRANSYLVANIA (14)	

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DocuSigned by:
Debesh C Sarkar
SIGNATURE
8/2/2016
DATE
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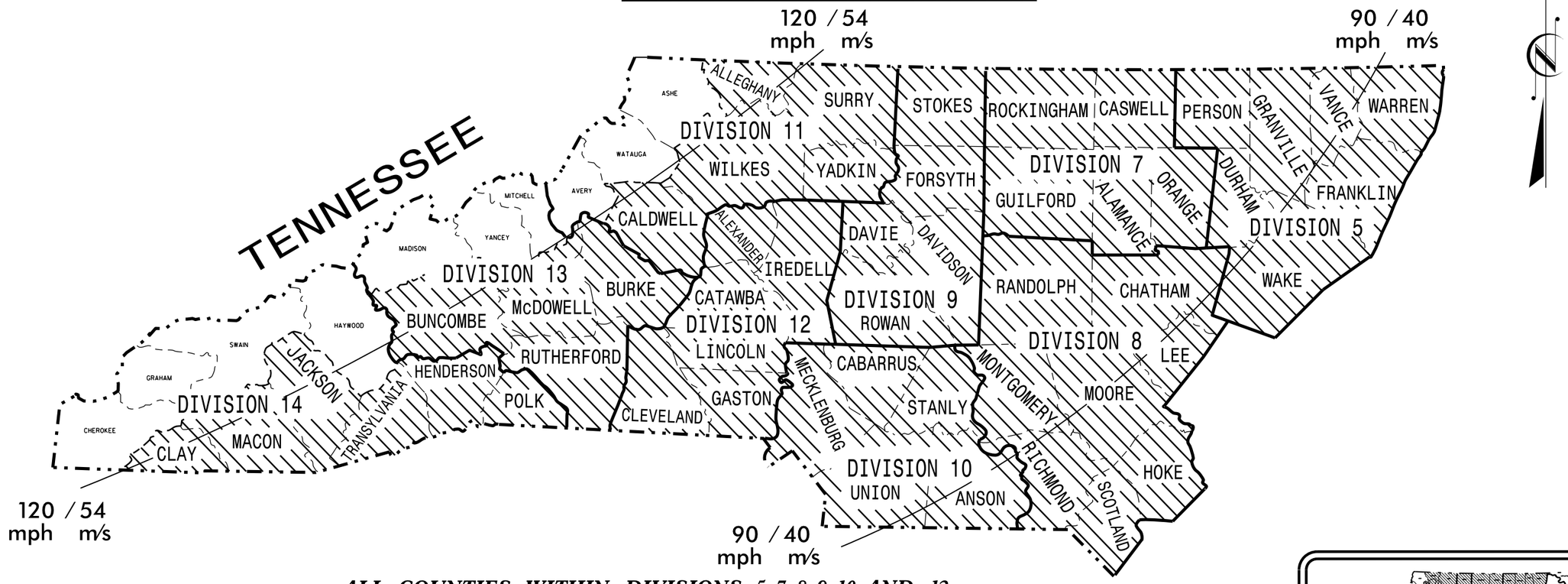
NCDOT METAL POLE STANDARDS

PROJECT ID. NO.	SHEET NO.
DN12031875	Sig.SP6

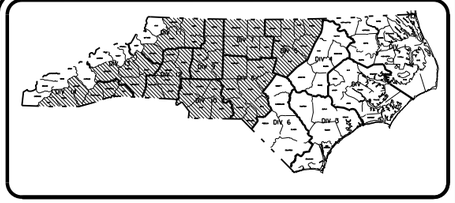
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES
ZONE 4 – 90 mph (40 m/s)



ALL COUNTIES WITHIN DIVISIONS 5, 7, 8, 9, 10, AND 12.
ALLEGHANY, CALDWELL, SURRY, WILKES, AND YADKIN COUNTIES IN DIVISION 11.
BUNCOMBE, BURKE, McDOWELL, AND RUTHERFORD COUNTIES IN DIVISION 13.
CLAY, HENDERSON, JACKSON, MACON, POLK, RUTHERFORD, AND TRANSYLVANIA COUNTIES IN DIVISION 14.

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx



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750 N.Greenfield Pkwy.
Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	DESCRIPTION
Sig.SP 1–2	Standard Strain Pole Notes
Sig.SP 3–7	Statewide Wind Zones
Sig.SP 8	ZONE 1 140 MPH
Sig.SP 9	ZONE 2 130 MPH
Sig.SP 10	ZONE 3 110 MPH
Sig.SP 11	ZONE 4 90 MPH
Sig.SP 12	ZONE 5 120 MPH

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

G. A. FULLER, P.E. – STATE ITS AND SIGNALS ENGINEER

G. G. MURR, JR., P.E. – STATE SIGNALS ENGINEER

D. C. SARKAR, P.E. – ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER

C. F. ANDREWS –ITS AND SIGNALS JOURNEY STRUCTURAL ENGINEER

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by:
Debesh C Sarkar
SIGNATURE
8/2/2016
DATE
44E8E82E447E484...

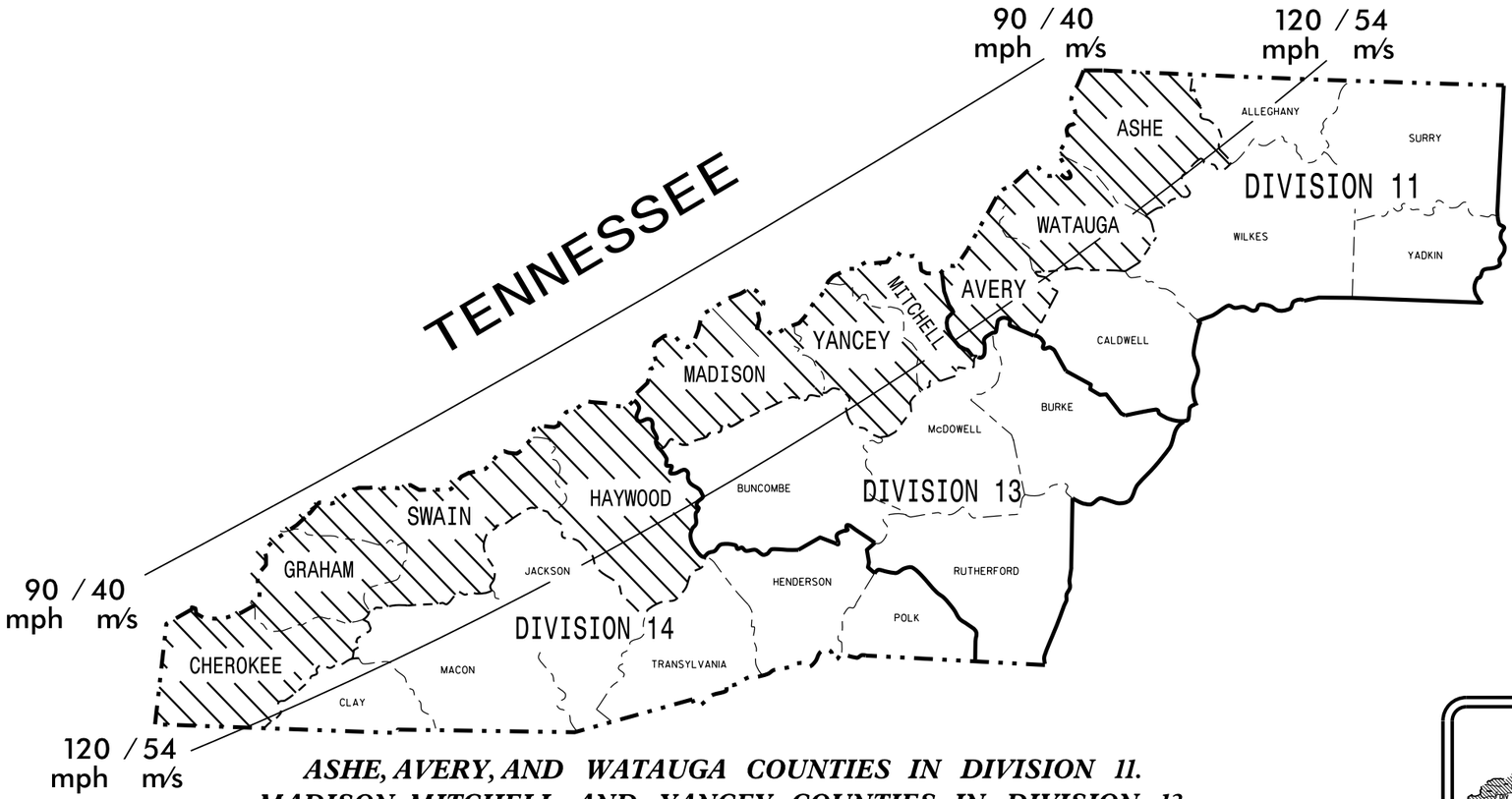
POLE STANDARDS

NCDOT METAL POLES

PROJECT ID. NO.	SHEET NO.
DN12031875	Sig.SP7

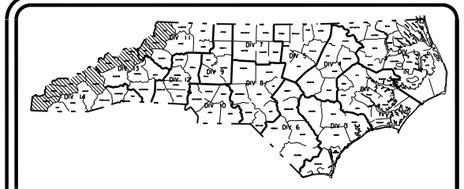
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES
ZONE 5 – 120 mph (54 m/s) SPECIAL WIND REGION



ASHE, AVERY, AND WATAUGA COUNTIES IN DIVISION 11.
MADISON, MITCHELL, AND YANCEY COUNTIES IN DIVISION 13.
CHEROKEE, GRAHAM, HAYWOOD, AND SWAIN COUNTIES IN DIVISION 14.

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx



Prepared In the Offices of:

Transportation Mobility and Safety Division
DEPARTMENT OF TRANSPORTATION · STATE OF NORTH CAROLINA ·
ITS and Signals Unit

750 N.Greenfield Pkwy.
Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	DESCRIPTION
Sig.SP 1–2	Standard Strain Pole Notes
Sig.SP 3–7	Statewide Wind Zones
Sig.SP 8	ZONE 1 140 MPH
Sig.SP 9	ZONE 2 130 MPH
Sig.SP 10	ZONE 3 110 MPH
Sig.SP 11	ZONE 4 90 MPH
Sig.SP 12	ZONE 5 120 MPH

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

G. A. FULLER, P.E. – STATE ITS AND SIGNALS ENGINEER

G. G. MURR, JR., P.E. – STATE SIGNALS ENGINEER

D. C. SARKAR, P.E. – ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER

C. F. ANDREWS –ITS AND SIGNALS JOURNEY STRUCTURAL ENGINEER

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by:
Debesh C Sarkar
SIGNATURE
8/2/2016
DATE

ZONE 4 (90 MPH)

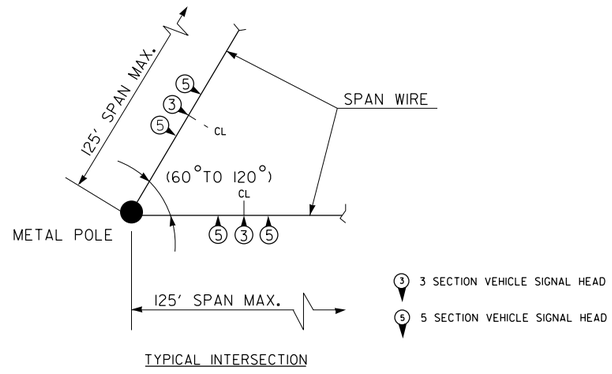
PROJECT ID. NO.	SHEET NO.
DN12031875	Sig.SP 11

LIGHT LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE		BASE PLATES			ANCHOR BOLTS		CONCRETE FOOTING		
		WALL THICKNESS TH GAGE,(IN)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	NO. OF BOLTS	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)
S26L1	26	0.3125	15	28	22	2	8	2 X 60	48	*	*
S30L1	30	0.3125	16	28	22	2	8	2 X 60	48	*	*
S35L1	35	0.375	15	28	22	2	8	2 X 60	48	*	*

*SEE NOTE 1 AND 2 "SOIL TESTING AND STANDARD SOIL FOUNDATIONS" ON SHEET Sig.SP2 OF THE STANDARD NOTES.



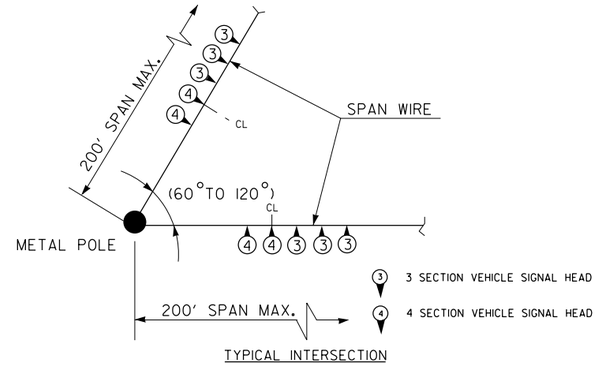
TYPICAL INTERSECTION

HEAVY LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE		BASE PLATES			ANCHOR BOLTS		CONCRETE FOOTING		
		WALL THICKNESS TH GAGE, (IN.)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	NO. OF BOLTS	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)
S30H1	30	0.3125	19	31	25	2	12	2 X 60	48	*	*
S35H1	35	0.375	18	31	25	2	12	2 X 60	48	*	*

*SEE NOTE 1 AND 2 "SOIL TESTING AND STANDARD SOIL FOUNDATIONS" ON SHEET Sig.SP2 OF THE STANDARD NOTES.



TYPICAL INTERSECTION

METAL STRAIN POLES

COUNTY WIND ZONE 4

90 mph /40 m/s

DURHAM	CHATHAM	CABARRUS	IREDELL
FRANKLIN	HOKE	MECKLENBURG	LINCOLN
GRANVILLE	LEE	STANLY	BUNCOMBE
PERSON	MONTGOMERY	UNION	BURKE
VANCE	MOORE	ALLEGHANY	McDOWELL
WARREN	RANDOLPH	CALDWELL	RUTHERFORD
WAKE	RICHMOND	SURRY	CLAY
ALAMANCE	DAVIDSON	WILKES	HENDERSON
CASWELL	DAVIE	YADKIN	JACKSON
GUILFORD	FORSYTH	ALEXANDER	MACON
ORANGE	ROWAN	CATAWBA	POLK
ROCKINGHAM	STOKES	CLEVELAND	TRANSYLVANIA
SCOTLAND	ANSON	GASTON	

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS and Signals Unit
750 N.Greenfield Pkwy.Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013
AASHTO
Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

WIND ZONE 4
LOAD CASE AND DESIGN DETAILS

PLAN DATE:	JUNE 2016	DESIGNED BY:	K.C.DURIGON
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by:
Debesh C Sarkar
SIGNATURE
8/2/2016
DATE

19-JUL-2016 16:10
S:\TIS&S\ue\ITS Signals\Workgroups\Structures\Drawings\2016 NEW Statewide Standards-ALL METAL POLES\2016-STD STRAIN POLE, Sig. SP 1-12\2016 Sig.SP 11 STD Strain Pole WZ 4.dgn
rbitting

ZONE 5 (120 MPH) SPECIAL WIND ZONE

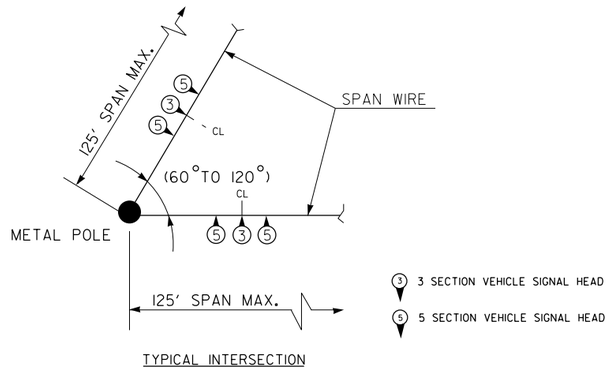
PROJECT ID. NO.	SHEET NO.
DN12031875	Sig.SP 12

LIGHT LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE		BASE PLATES			ANCHOR BOLTS		CONCRETE FOOTING		
		WALL THICKNESS TH GAGE,(IN)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	NO. OF BOLTS	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)
S26L2	26	0.3125	16	29	23	2	8	2 X 60	48	*	*
S30L2	30	0.3125	17	29	23	2	8	2 X 60	48	*	*
S35L2	35	0.375	17	29	23	2	8	2 X 60	48	*	*

*SEE NOTE 1 AND 2 "SOIL TESTING AND STANDARD SOIL FOUNDATIONS" ON SHEET Sig.SP2 OF THE STANDARD NOTES.



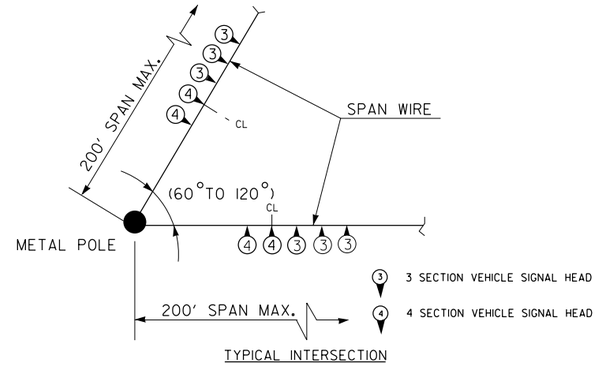
TYPICAL INTERSECTION

HEAVY LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE		BASE PLATES			ANCHOR BOLTS		CONCRETE FOOTING		
		WALL THICKNESS TH GAGE, (IN.)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	NO. OF BOLTS	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)
S30H2	30	0.3125	21	35	29	2	12	2 X 60	48	*	*
S35H2	35	0.375	21	35	29	2	12	2 X 60	48	*	*

*SEE NOTE 1 AND 2 "SOIL TESTING AND STANDARD SOIL FOUNDATIONS" ON SHEET Sig.SP2 OF THE STANDARD NOTES.



TYPICAL INTERSECTION

METAL STRAIN POLES

COUNTY WIND ZONE 5

120 mph /58 m/s

ASHE
AVERY
WATAUGA
MADISON
MITCHELL
YANCEY
CHEROKEE
GRAHAM
HAYWOOD
SWAIN

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS and Signals Unit
750 N.Greenfield Pkwy.Garner,NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013 ***AASHTO*** *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*

WIND ZONE 5
LOAD CASE AND DESIGN
DETAILS

PLAN DATE:	JUNE 2016	DESIGNED BY:	K.C.DURIGON
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by:
Debesh C Sarkar
SIGNATURE
8/2/2016
DATE

19-JUL-2016 16:12
S:\ITS&Sig\ITS Signals\Workgroups\Structures\Drawings\2016 NEW Statewide Standards-ALL METAL POLES\2016-STD STRAIN POLE, Sig. SP 1-12\2016 Sig.SP 12 STD Strain Pole WZ 5.dgn
rbitting

PROJECT I.D.NO.	SHEET NO.
	Sig.M1A

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)

NCDOT METAL POLE STANDARDS

DIVISION 11
WIND ZONE 5 & 6

DIVISION 9
WIND ZONE 5

DIVISION 7
WIND ZONE 5

DIVISION 5
WIND ZONE 4 & 5

DIVISION 4
WIND ZONE 3 & 4

DIVISION 1
WIND ZONE 2, 3, 4 & 5

DIVISION 13
WIND ZONE 5 & 6

DIVISION 14
WIND ZONE 5 & 6

DIVISION 12
WIND ZONE 5

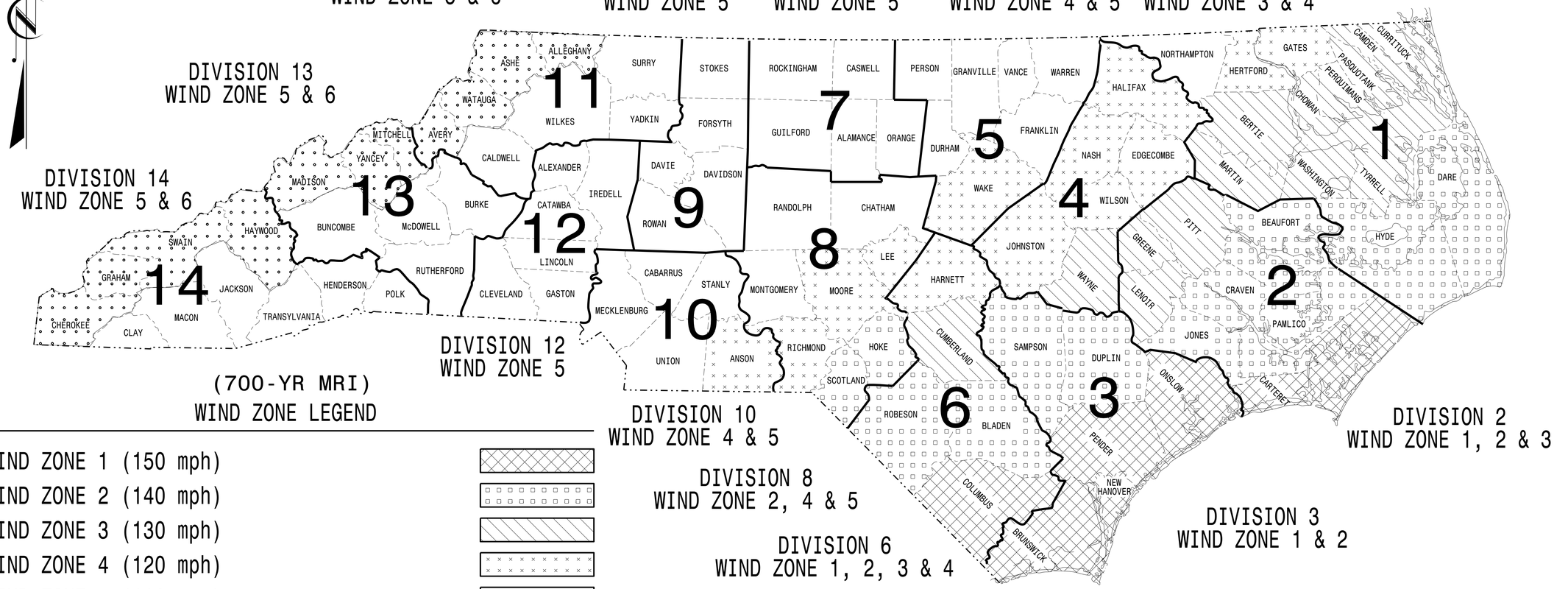
DIVISION 10
WIND ZONE 4 & 5

DIVISION 8
WIND ZONE 2, 4 & 5

DIVISION 6
WIND ZONE 1, 2, 3 & 4

DIVISION 2
WIND ZONE 1, 2 & 3

DIVISION 3
WIND ZONE 1 & 2



(700-YR MRI)
WIND ZONE LEGEND

WIND ZONE 1 (150 mph)	
WIND ZONE 2 (140 mph)	
WIND ZONE 3 (130 mph)	
WIND ZONE 4 (120 mph)	
WIND ZONE 5 (110 mph)	
WIND ZONE 6 (135 mph) Special Wind Zone	

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Prepared in the Offices of:

Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.
Garner, NC 27529

Designed in conformance with the latest 2020 Interim to the 1st Edition 2015

AASHTO LRFD

Standard Specifications for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	DESCRIPTION
Sig. M 1A	Statewide Wind Zone Map (700–yr MRI)
Sig. M 1B	Statewide Wind Zone Map (10–yr MRI)
Sig. M 2	Typical Fabrication Details–All Metal Poles
Sig. M 3	Typical Fabrication Details–Strain Poles
Sig. M 4	Typical Fabrication Details–Mast Arm Poles
Sig. M 5	Typical Fabrication Details–Mast Arm Connection
Sig. M 6	Typical Fabrication Details–Strain Pole Attachments
Sig. M 7	Construction Details–Foundations
Sig. M 8	Standard Strain Pole Foundation–All Soil Conditions
Sig. M 9	Typical Fabrication Details–CCTV Camera Poles

MOBILITY AND SAFETY DIVISION – TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS UNIT

D.Y. ISHAK – STATE SIGNALS ENGINEER

K. DURIGON, P.E. – ITS AND SIGNALS STRUCTURAL ENGINEER

B. WALKER, P.E. – ITS AND SIGNALS STRUCTURAL ENGINEER

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

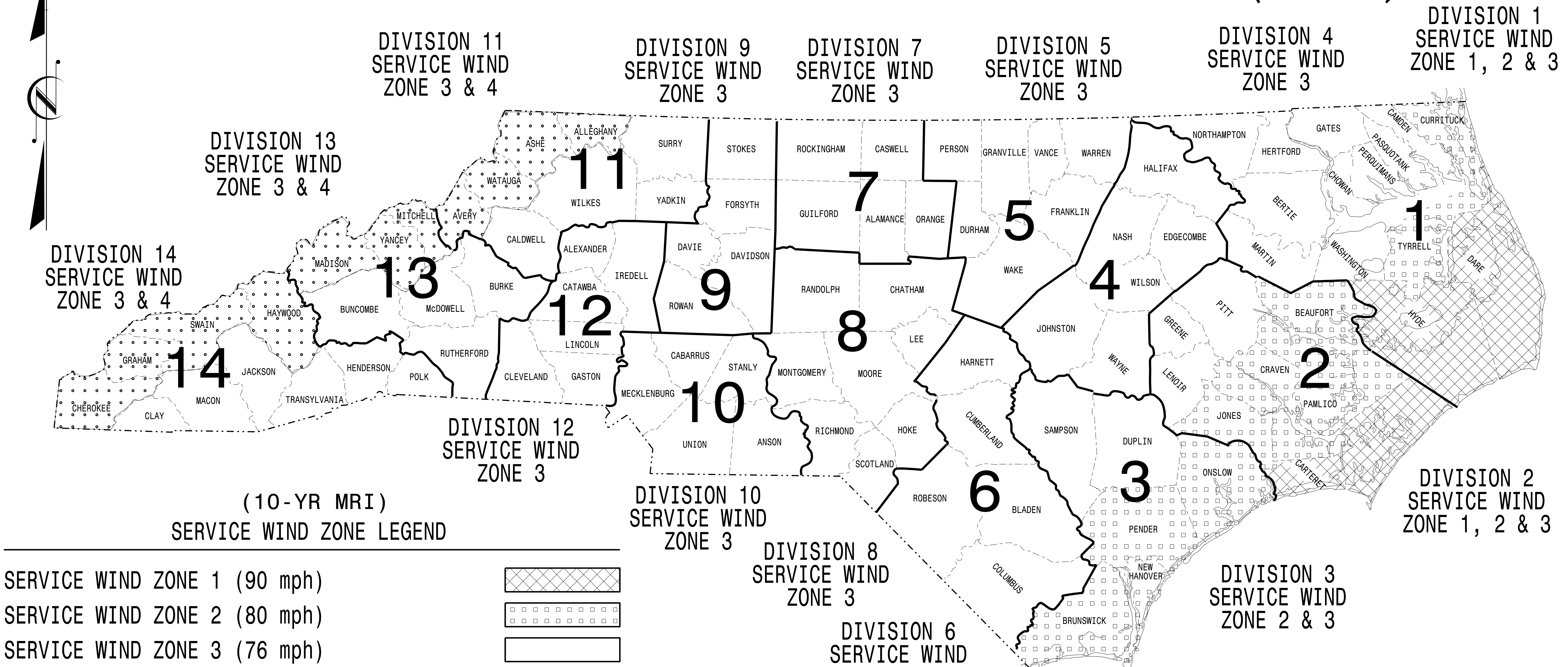
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

NCDOT METAL POLE STANDARDS

PROJECT I.D. NO.	SHEET NO.
	Sig.M1B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



(10-YR MRI)
SERVICE WIND ZONE LEGEND

- SERVICE WIND ZONE 1 (90 mph)
- SERVICE WIND ZONE 2 (80 mph)
- SERVICE WIND ZONE 3 (76 mph)
- SERVICE WIND ZONE 4 (85) SPECIAL REGION

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Prepared In the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.
Garner,NC 27529

Designed in conformance with the latest 2020 Interim to the 1st Edition 2015

AASHTO LRFD

Standard Specifications for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

DRAWING NUMBER	DESCRIPTION
Sig. M 1A	Statewide Wind Zone Map (700-yr MRI)
Sig. M 1B	Statewide Wind Zone Map (10-yr MRI)
Sig. M 2	Typical Fabrication Details-All Metal Poles
Sig. M 3	Typical Fabrication Details-Strain Poles
Sig. M 4	Typical Fabrication Details-Mast Arm Poles
Sig. M 5	Typical Fabrication Details-Mast Arm Connection
Sig. M 6	Typical Fabrication Details-Strain Pole Attachments
Sig. M 7	Construction Details-Foundations
Sig. M 8	Standard Strain Pole Foundation-All Soil Conditions
Sig. M 9	Typical Fabrication Details-CCTV Camera Poles

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION - TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS UNIT

D.Y. ISHAK - STATE SIGNALS ENGINEER

K. DURIGON, P.E. - ITS AND SIGNALS STRUCTURAL ENGINEER

B. WALKER, P.E. - ITS AND SIGNALS STRUCTURAL ENGINEER

SEAL

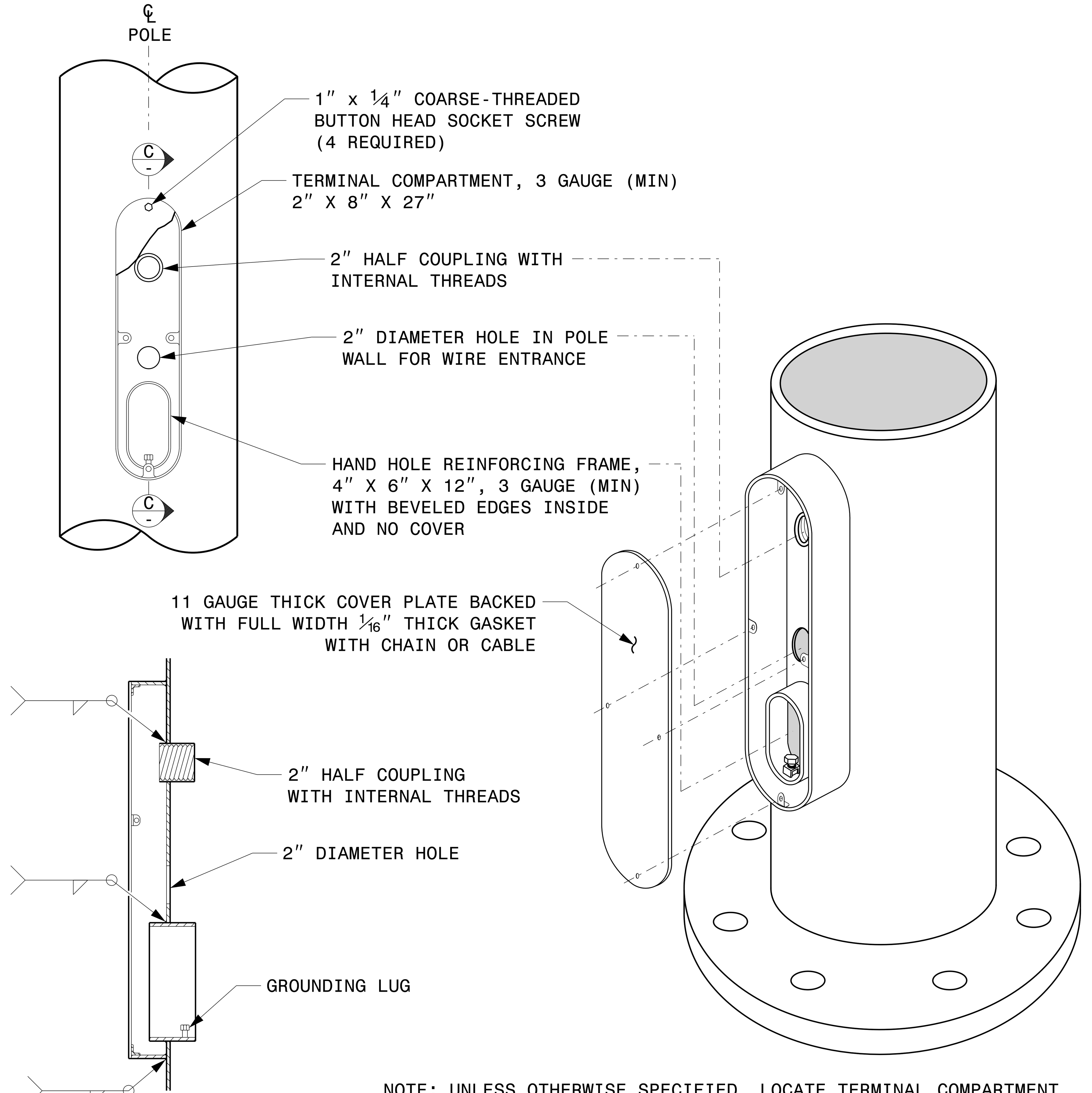
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

DocuSigned by:
Kevin Durigon
4B23DC79B3784DA...
SIGNATURE

09/21/2023
DATE

PROJECT I.D. NO.	SHEET NO.
	Sig.M2

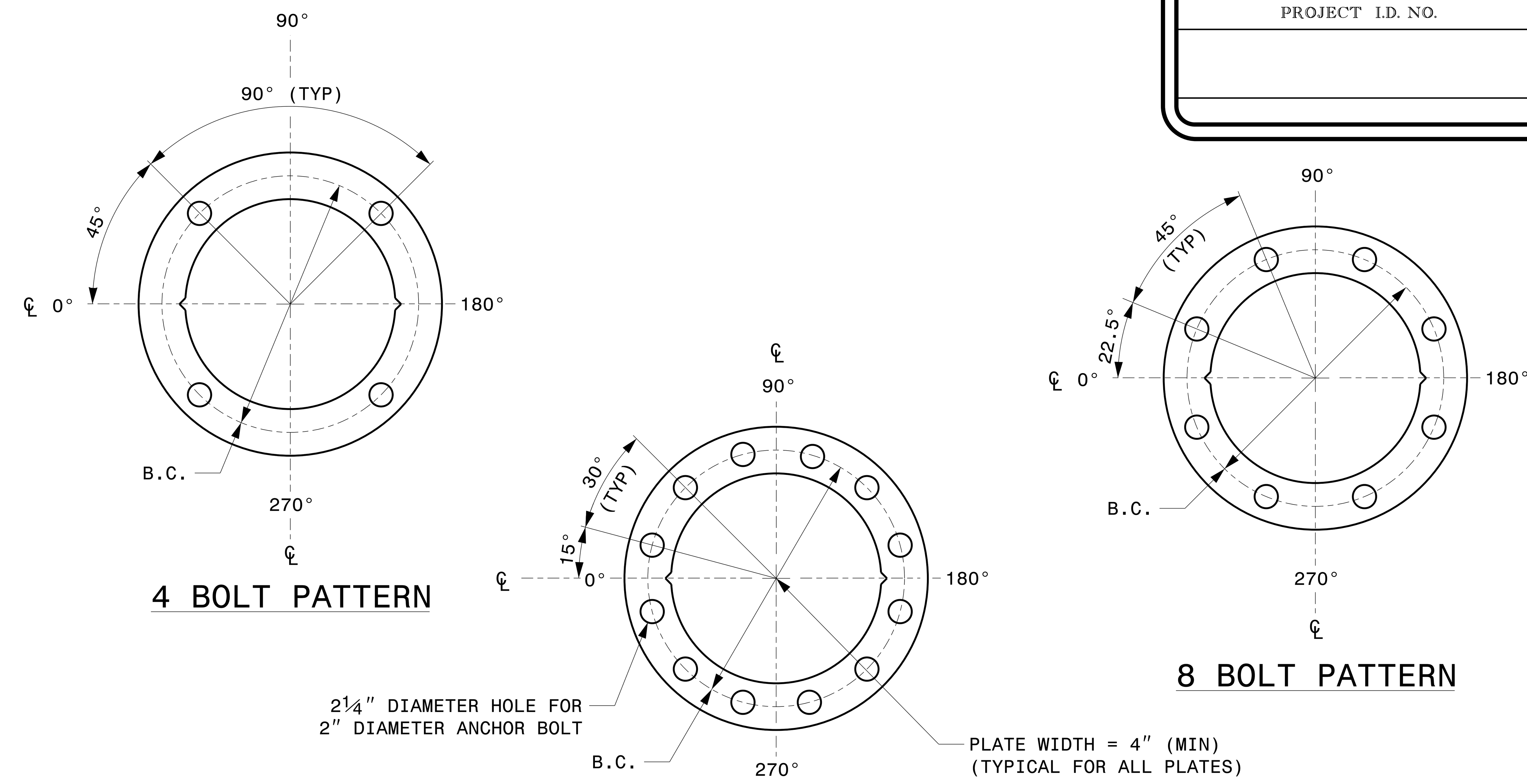
Fabrication Details – All Metal Poles



SECTION C-C

NOTE: UNLESS OTHERWISE SPECIFIED, LOCATE TERMINAL COMPARTMENT 1 FOOT ABOVE THE POLE BASE AT 180 DEGREES ON THE POLE'S RADIAL INDEX.

TERMINAL COMPARTMENT DETAIL



CONSTRUCT TEMPLATES AND PLATES FROM 1/4" (MIN) THICK STEEL. GALVANIZING IS NOT REQUIRED.

BASE PLATE TEMPLATE AND ANCHOR BOLT LOCK PLATE DETAILS

MFG ________ MFG. DATE: MM/YY	
SHAFT D/T/L/Y	___/___/___/___
ARM-A D/T/L/Y	___/___/___/___
	___/___/___/___
ARM-B D/T/L/Y	___/___/___/___
	___/___/___/___
A.B. DIA./B.C./L/Y	___/___/___/___
NCDOT SIG. INV. NO.	________
NCDOT POLE NO.	________

SHAFT I.D. TAG
(PROVIDE ON SHAFT OF STRAIN POLES AND MAST ARM POLE SHAFT)

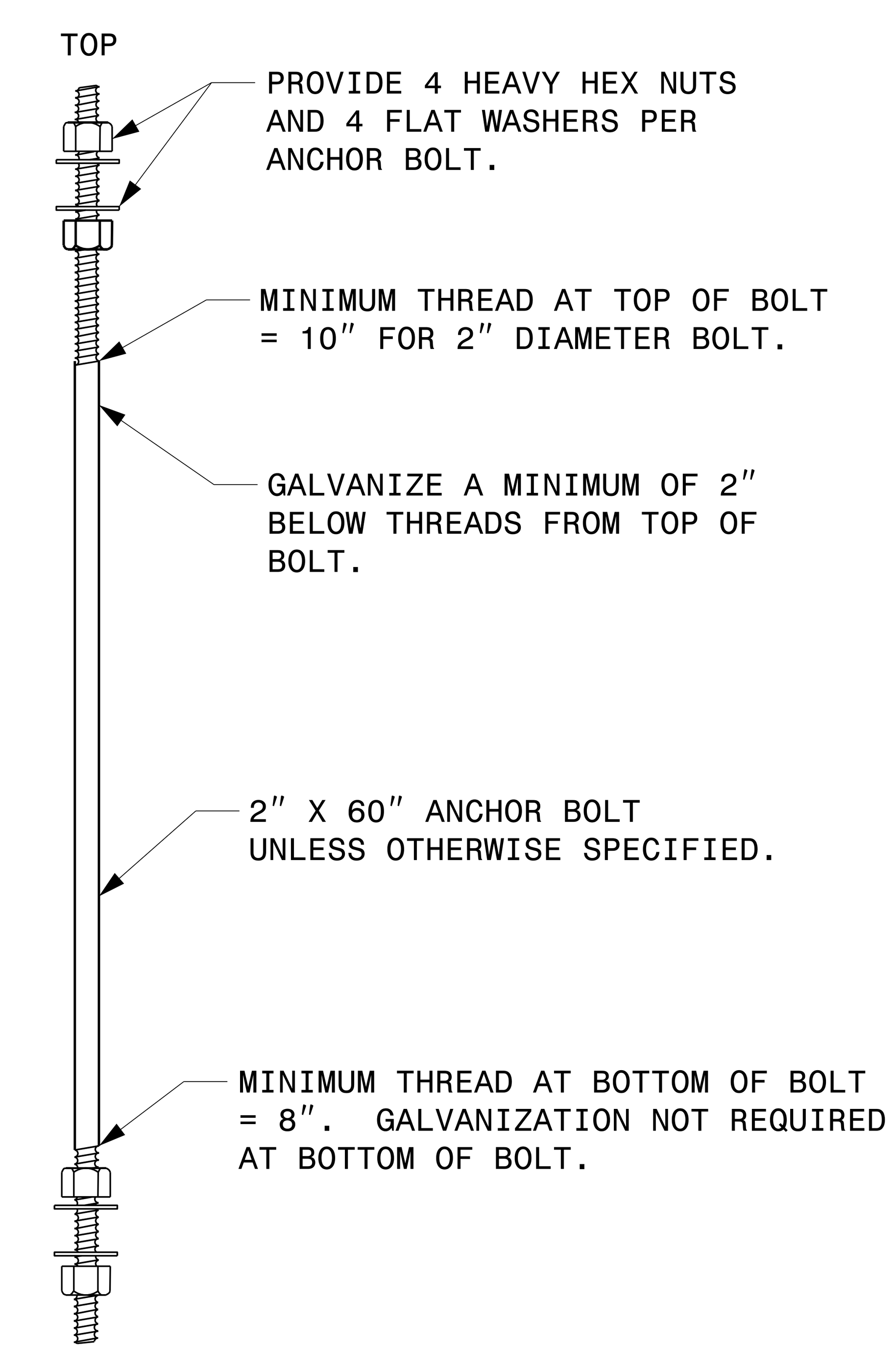
MFG ________ MFG. DATE: MM/YY	
SECTION D/T/L/Y	___/___/___/___
NCDOT SIG. INV. NO.	________
NCDOT POLE NO.	________

ARM I.D. TAG
(PROVIDE ON EACH SECTION OF A MULTI-SECTION MAST ARM)

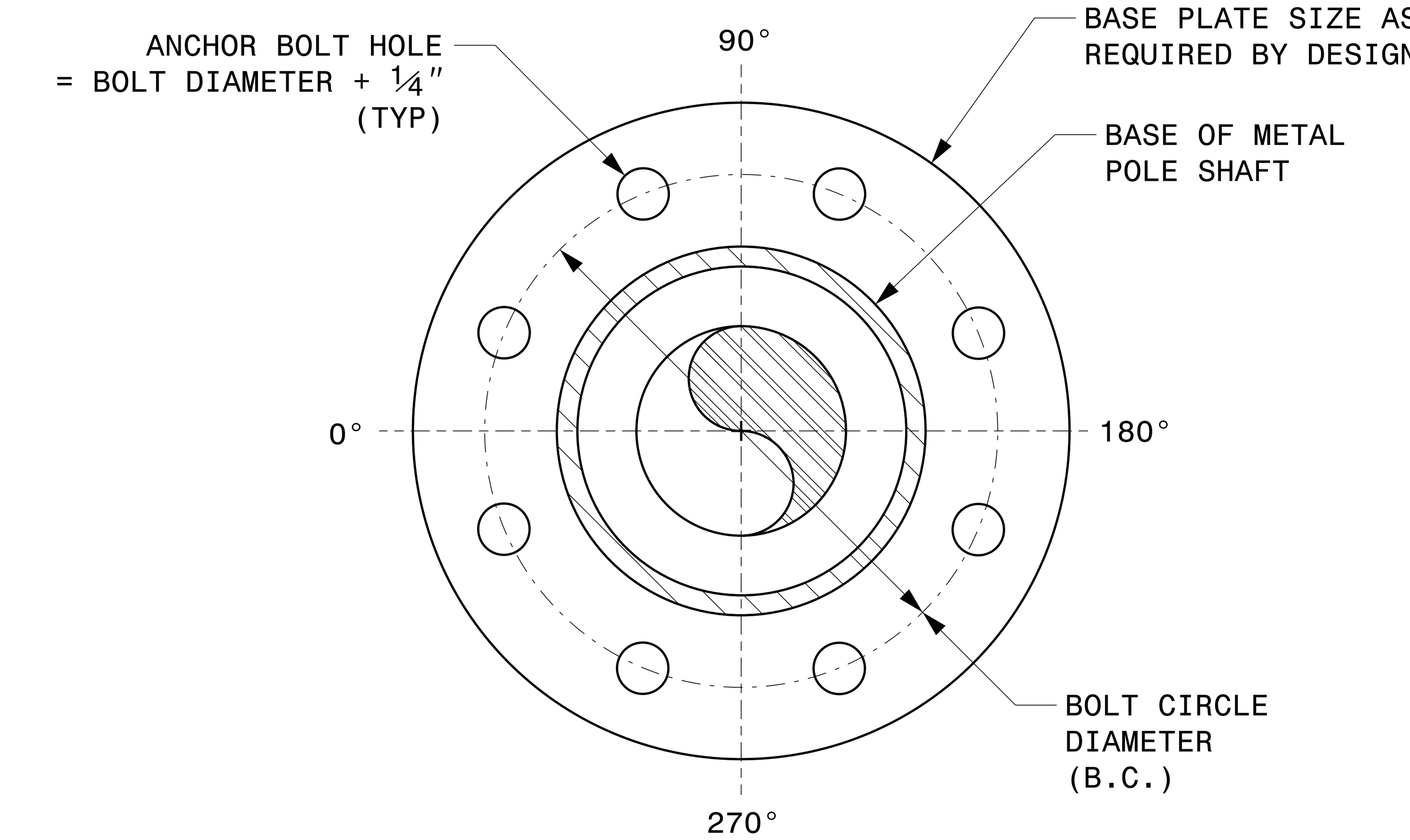
NOTES:

1. D = DIAMETER, T = THICKNESS, L = LENGTH, Y = YIELD STRENGTH
2. A.B. = ANCHOR BOLT
3. B.C. = BOLT CIRCLE OF ANCHOR BOLTS
4. IF STANDARD DESIGN, INCLUDE CASE NUMBER IN ADDITION TO POLE NUMBER ON "NCDOT POLE NO." LINE.
5. SIGNAL INV. NUMBER AND POLE I.D. NUMBER. SEE DRAWING M3 AND M4 FOR MOUNTING POSITIONS OF I.D. TAGS.

IDENTIFICATION TAG DETAILS



ANCHOR BOLT DETAIL



NOTE: BASE PLATE MAY BE CIRCULAR, OCTAGONAL, SQUARE OR RECTANGULAR IN SHAPE.

TYPICAL BASE PLATE DETAIL

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy, Garner, NC 27529

Typical Fabrication Details
For
All Metal Poles

PLAN DATE:	SEPTEMBER 2023	DESIGNED BY:	C.F.ANDREWS
PREPARED BY:	K.C. DURIGON	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE
0 NA
NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

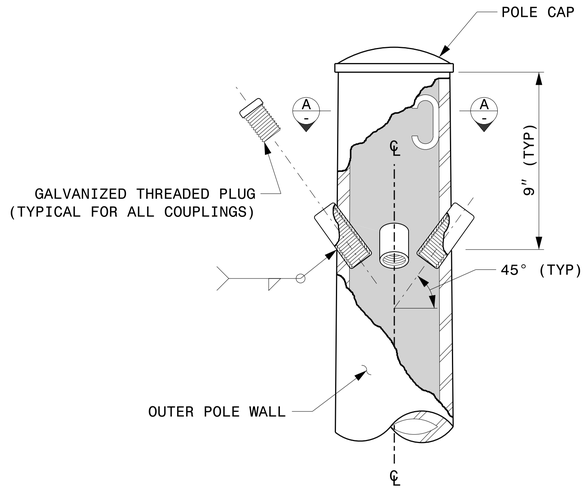
DocuSigned by:
Kevin Durigon
4B23DC79B3784DA...
SIGNATURE
09/21/2023
DATE

PROJECT I.D. NO.	SHEET NO.
	Sig.M3

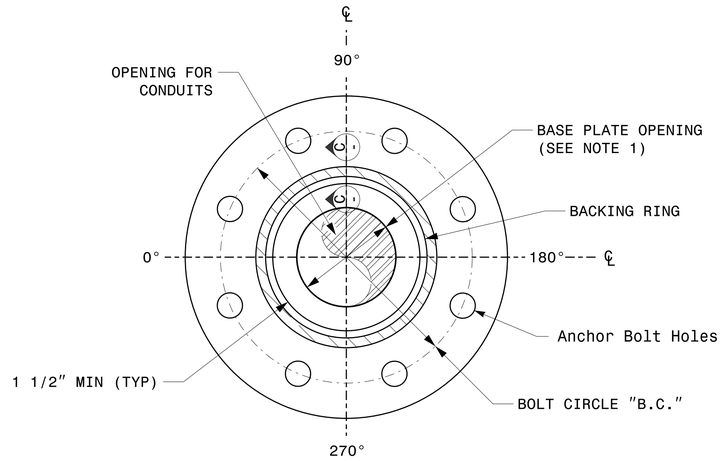
Fabrication Details – Strain Poles

NOTE:

1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS 3½" BUT SHALL NOT BE LESS THAN 8½".

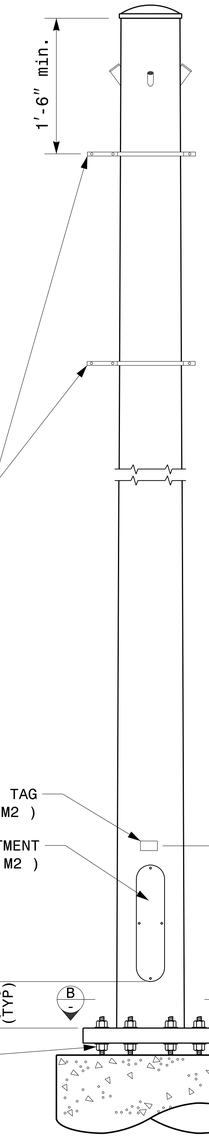


CABLE ENTRANCES AT TOP OF POLE

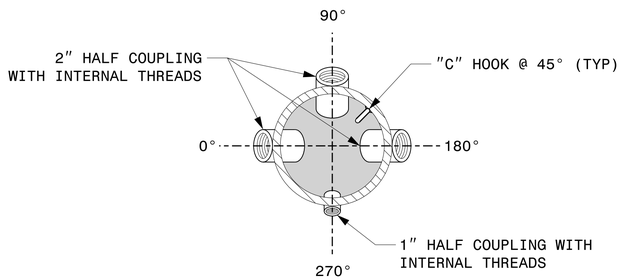


SECTION B-B

POLE BASE PLATE DETAILS
(8 AND 12 BOLT PATTERN)

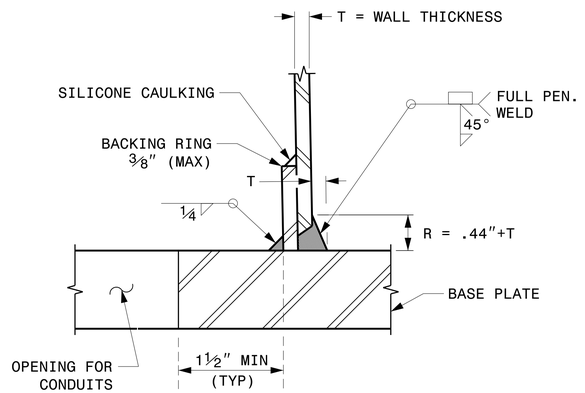


MONOTUBE STRAIN POLE



SECTION A-A

RADIAL ORIENTATION OF FACTORY INSTALLED ACCESSORIES AT TOP OF POLE



SECTION C-C

(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION GROOVE WELD DETAIL

Prepared In the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE
0 NA
NONE

Typical Fabrication Details
For
Strain Poles

PLAN DATE:	SEPTEMBER 2023	DESIGNED BY:	K.C. DURIGON
PREPARED BY:	K.C. DURIGON	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

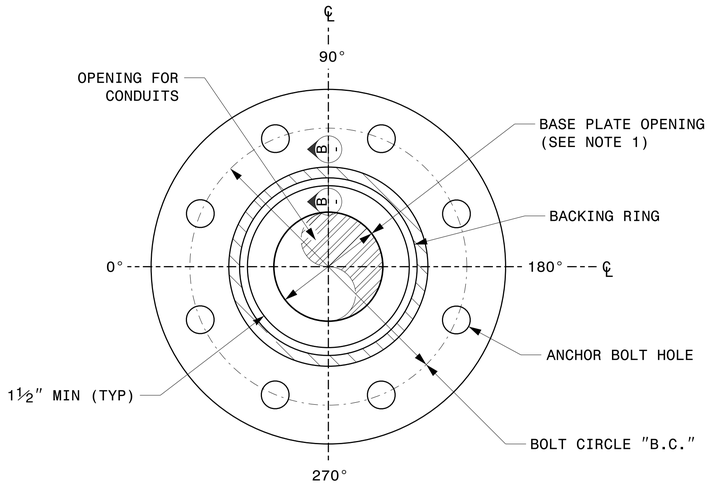
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
036626
ENGINEER
KEVIN C. DURIGON

DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

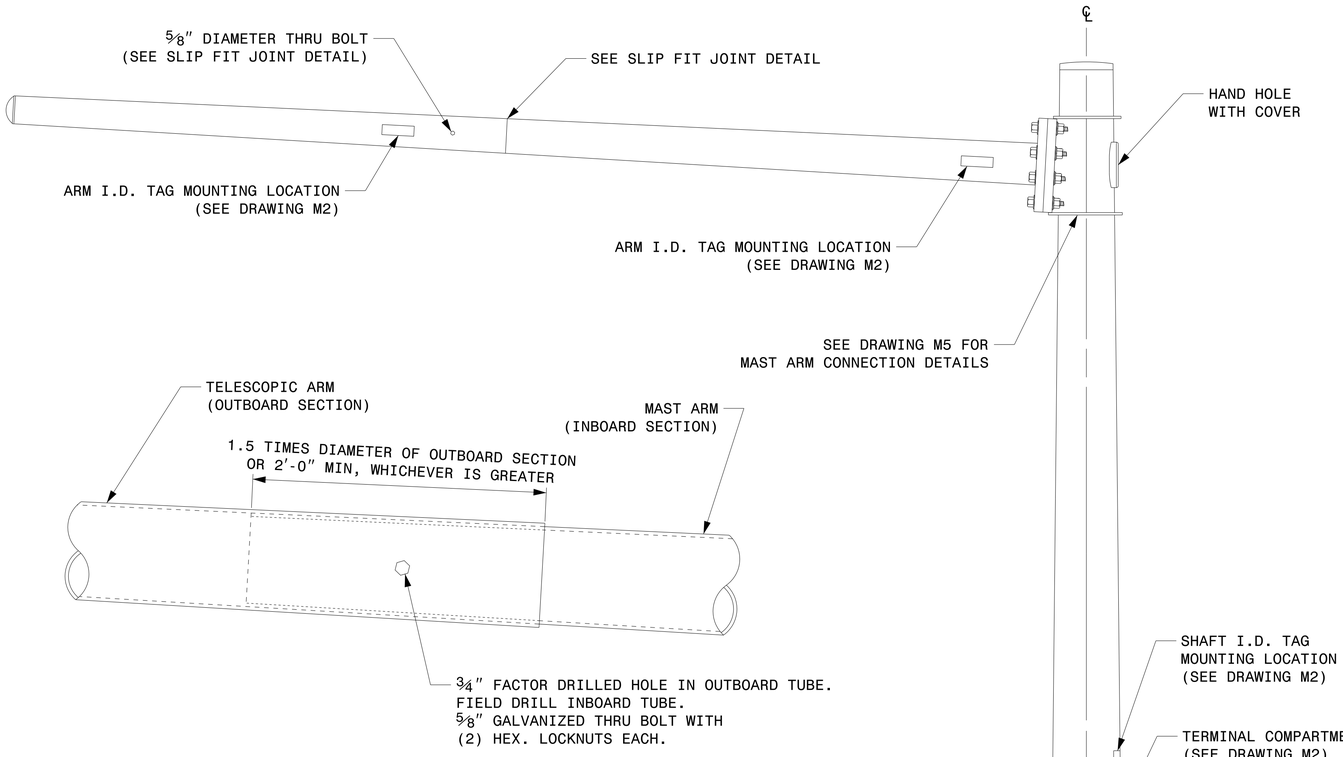
PROJECT I.D. NO.	SHEET NO.
	Sig.M4

NOTE:

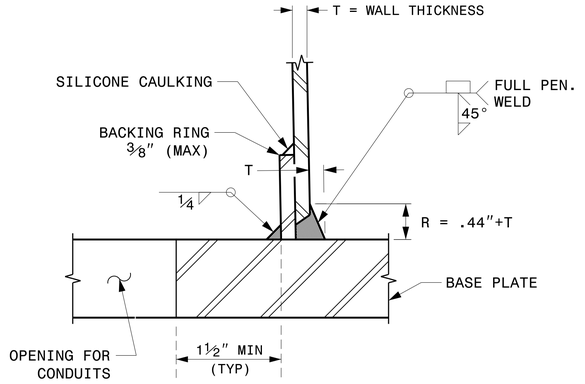
1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS 3½" BUT SHALL NOT BE LESS THAN 8½".



SECTION A-A
POLE BASE PLATE DETAILS

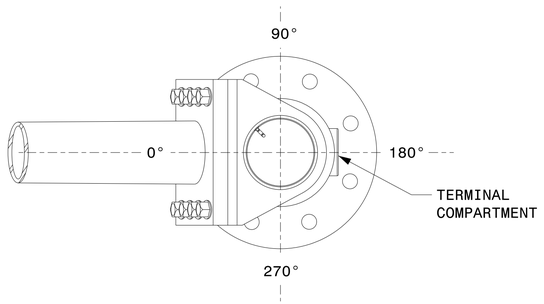


SLIP FIT JOINT DETAIL FOR MAST ARM



SECTION B-B
(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION GROOVE WELD DETAIL



MAST ARM RADIAL ORIENTATION

MAST ARM POLE

Fabrication Details – Mast Arm Poles

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 NA NONE

Typical Fabrication Details For Mast Arm Poles

PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON
PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR

REVISIONS	INIT.	DATE

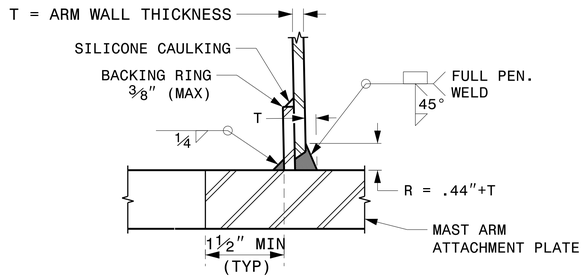
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

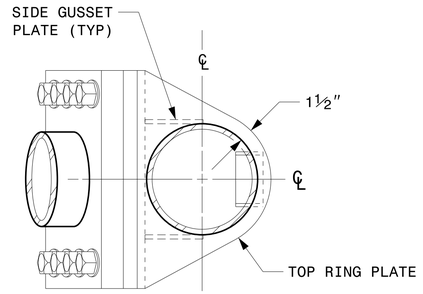
03-OCT-2023 12:25
S:*ITS\SIG\M*ITS\Signals\Signal Design Section\Structures\Drawings*2024 Metal Pole Std Drawings for LRFD*2024 Sig.M4 Std. Fabrication Details-Mast Arm Poles.dgn
kcdurigon

WELDED RING STIFFENED MAST ARM CONNECTION

PROJECT I.D. NO.	SHEET NO.
	Sig.M5



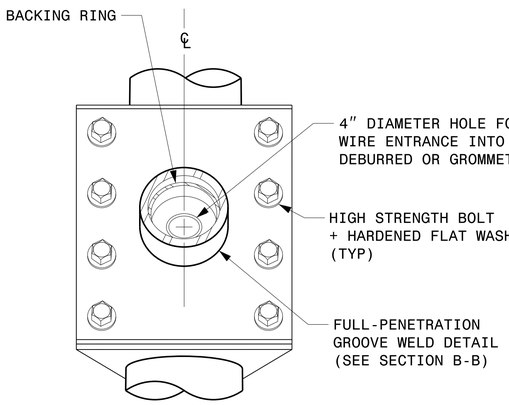
SECTION B-B
FULL-PENETRATION GROOVE WELD DETAIL



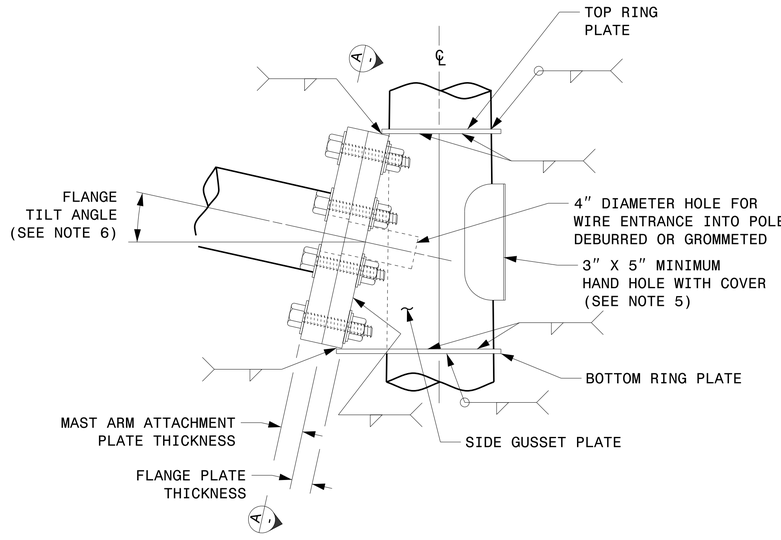
PLAN VIEW

NOTES:

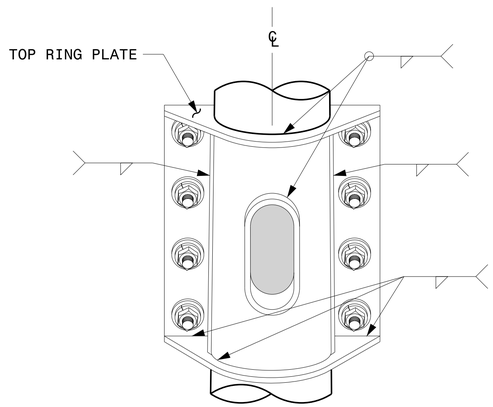
1. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ABOVE THE MAST ARM TO INDICATE PROPER ATTACHMENT ORIENTATION OF THE MAST ARM.
2. DESIGNER WILL DETERMINE THE SIZE OF ALL STRUCTURAL COMPONENTS, PLATES, FASTENERS, AND WELDS SHOWN UNLESS THEY ARE ALREADY SPECIFIED.
3. FABRICATOR IS RESPONSIBLE FOR PROVIDING APPROPRIATE HOLES AT DRAINAGE POINTS TO DRAIN GALVANIZING MATERIALS.
4. FOR MINIMUM EDGE DISTANCE AND NOMINAL BOLT HOLE SIZE, FOLLOW THE LATEST AISC STEEL CONSTRUCTION MANUAL.
5. PROVIDE UPPER HANDHOLE AS NECESSARY WHEN SHAFT EXTENSIONS ARE REQUIRED FOR LUMINAIRE ARMS OR CAMERA. FOR POLES WITHOUT LUMINAIRES/CAMERA, WIRING CAN BE DONE THROUGH THE TOP OF POLE.
6. ALLOWABLE RANGE OF FLANGE TILT ANGLE WILL VARY FROM 0° TO AS REQUIRED.



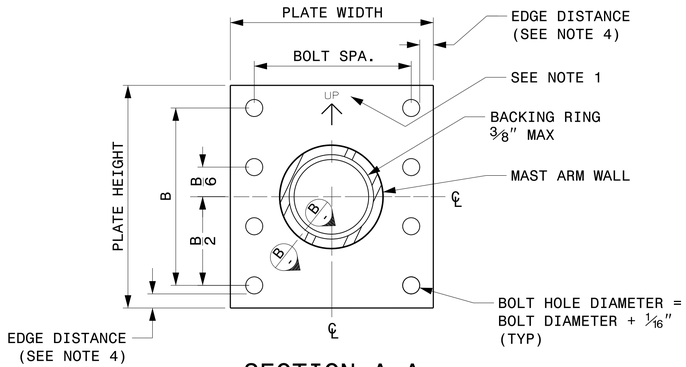
FRONT ELEVATION VIEW



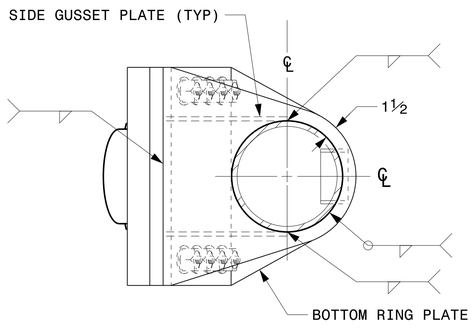
SIDE ELEVATION VIEW



BACK ELEVATION VIEW



SECTION A-A
MAST ARM ATTACHMENT PLATE



BOTTOM VIEW

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE
0 NA
NONE

Typical Fabrication Details
For
Mast Arm Connection To Pole

PLAN DATE:	SEPTEMBER 2023	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	K.C. DURIGON	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

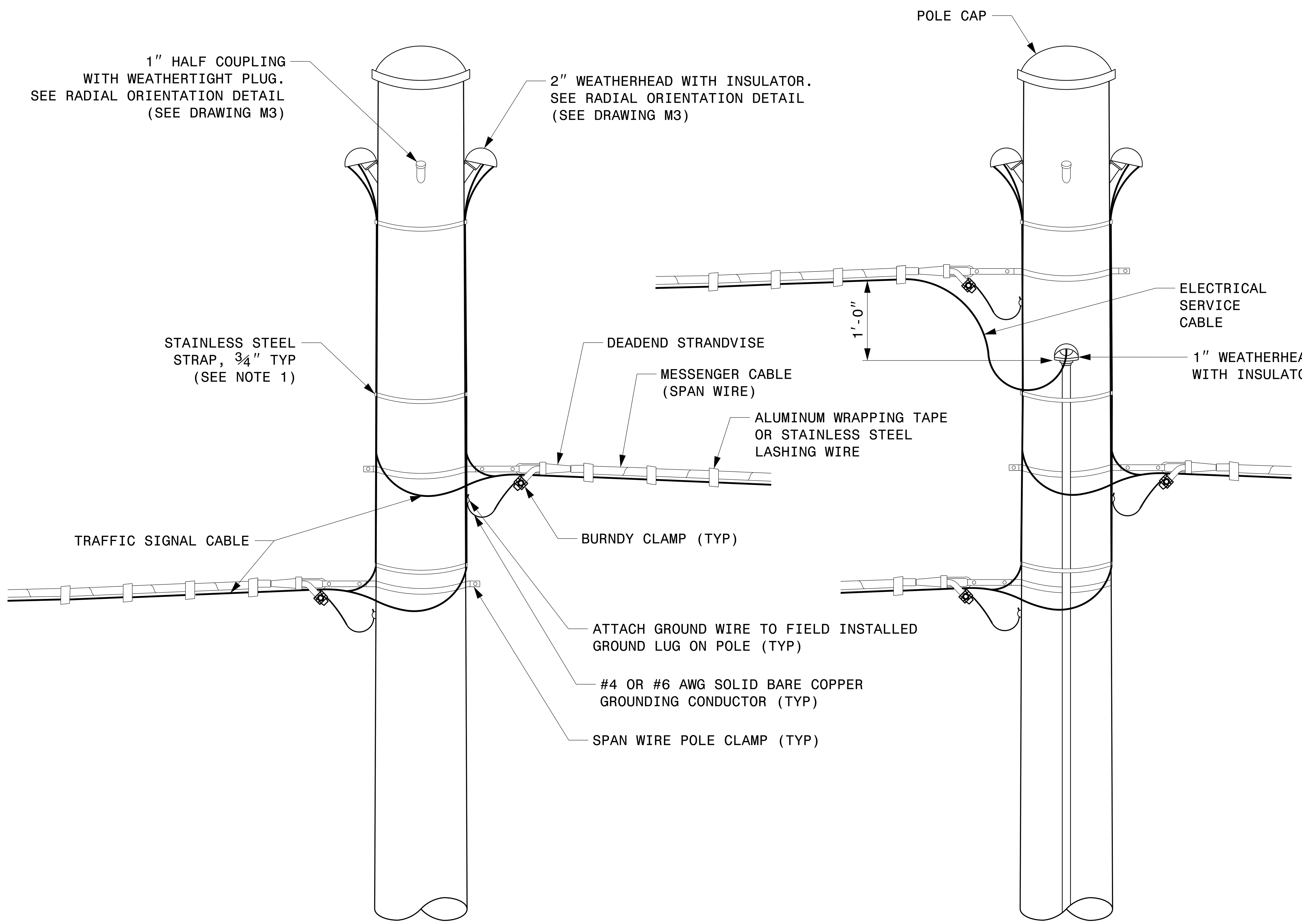
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
036626
ENGINEER
KEVIN C. DURIGON

DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

Fabrication Details – Mast Arm Connection

PROJECT I.D. NO.	SHEET NO.
	Sig.M6

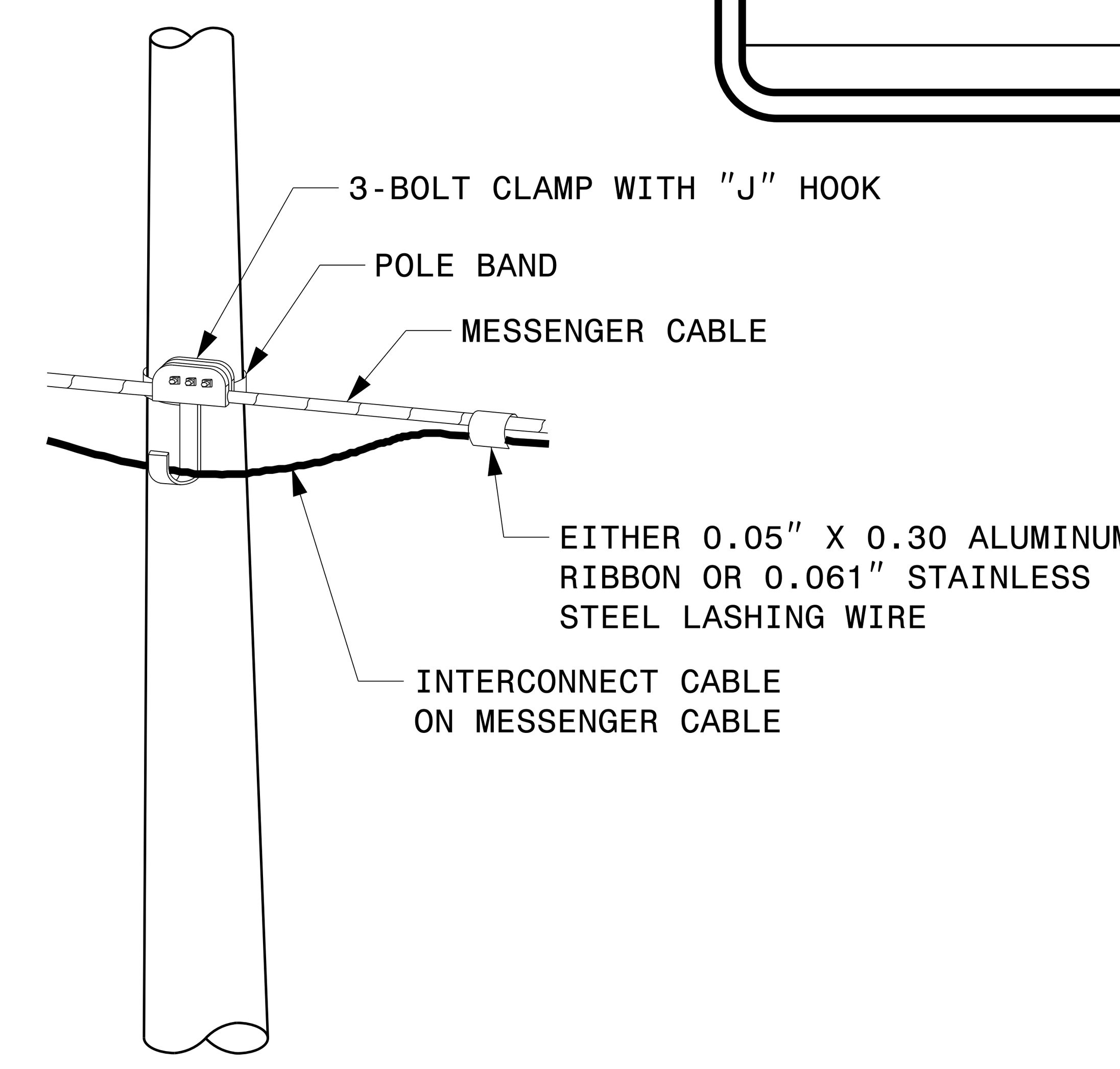
Fabrication Details – Strain Pole Attachments



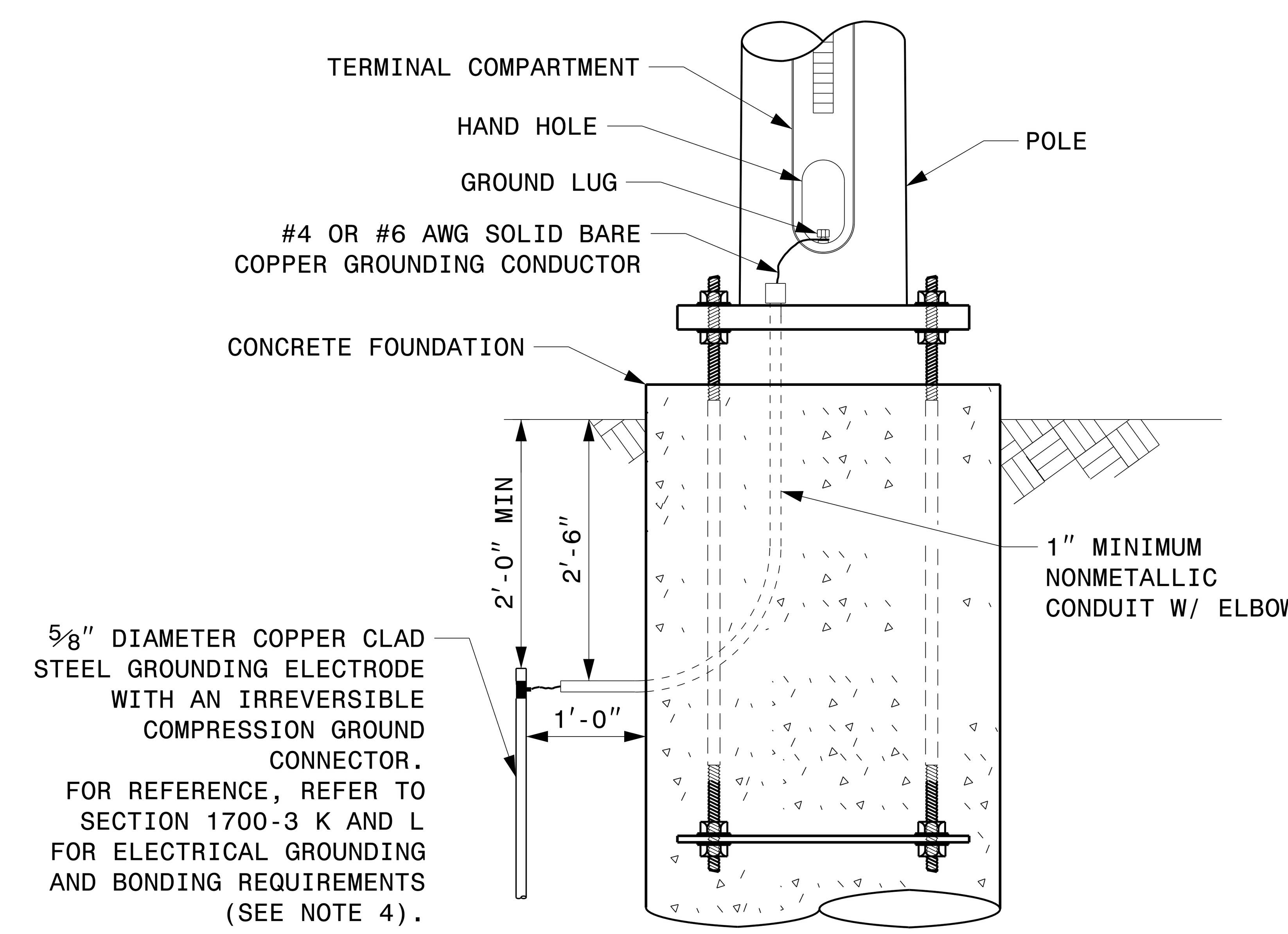
STRAIN POLE ATTACHMENTS

NOTES:

1. STRAP ALL SIGNAL CABLES TO THE SIDE OF THE POLE WITH 3/4" STAINLESS STEEL STRAPS WHEN THE DISTANCE BETWEEN SPAN WIRE ATTACHMENT CLAMP AND WEATHERHEADS EXCEEDS 3'-0".
2. PROVIDE MINIMUM TWO SPAN WIRE POLE CLAMPS PER POLE.
3. IT IS PROHIBITED TO ATTACH TWO SPAN WIRES AT ONE POLE CLAMP.
4. FOR GENERAL REQUIREMENTS, REFER TO NCDOT STANDARD SPECIFICATIONS FOR ROADWAY AND STRUCTURES, JANUARY 2024.



ATTACHMENT OF CABLE TO INTERMEDIATE METAL POLE



METAL POLE GROUNDING DETAIL FOR STRAIN POLE AND MAST ARM

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section

750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 NA

NONE

Typical Fabrication Details For Strain Pole Attachments

PLAN DATE:	SEPTEMBER 2023	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	K.C. DURIGON	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

DocuSigned by: Kevin Durigon

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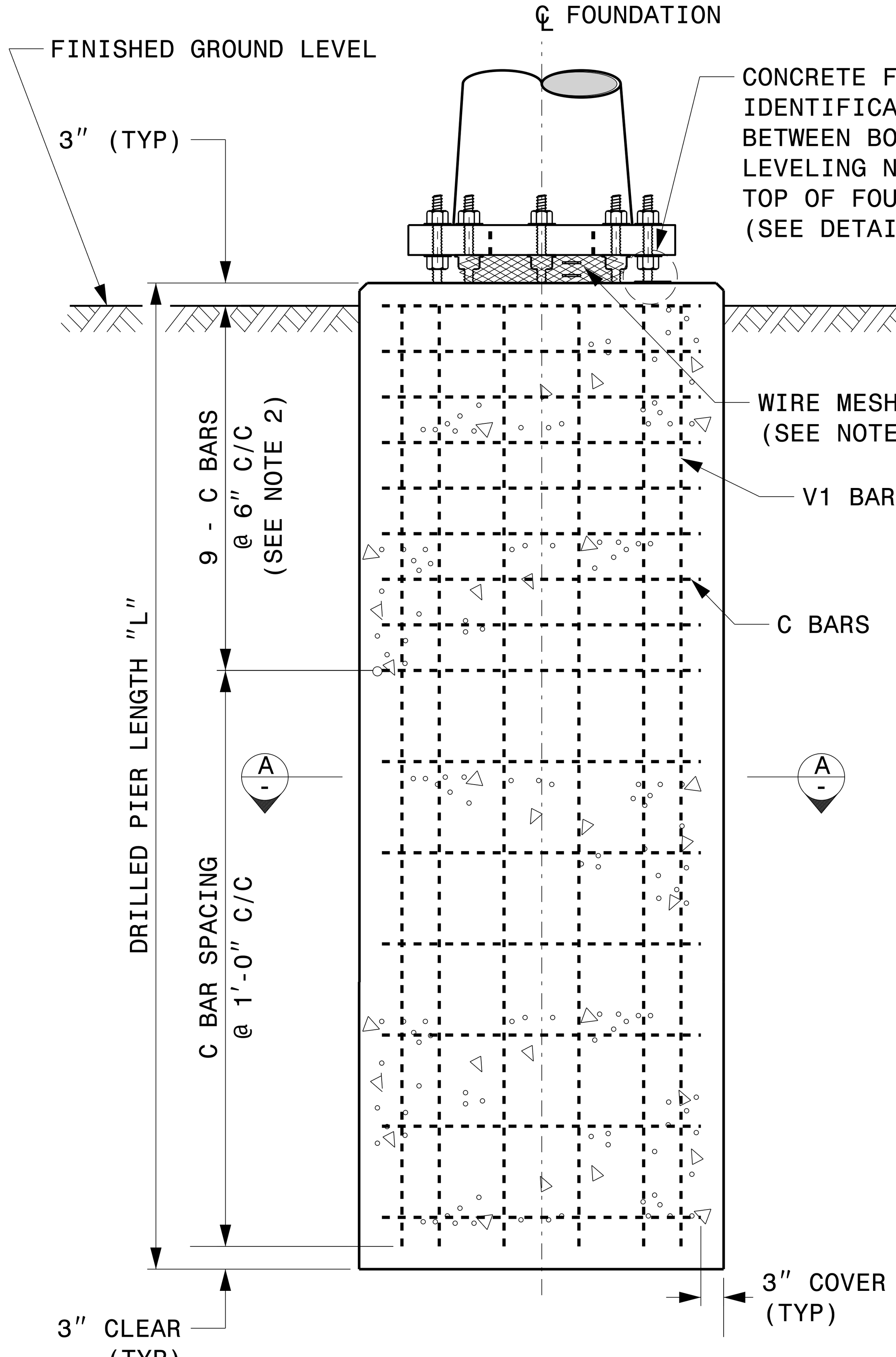
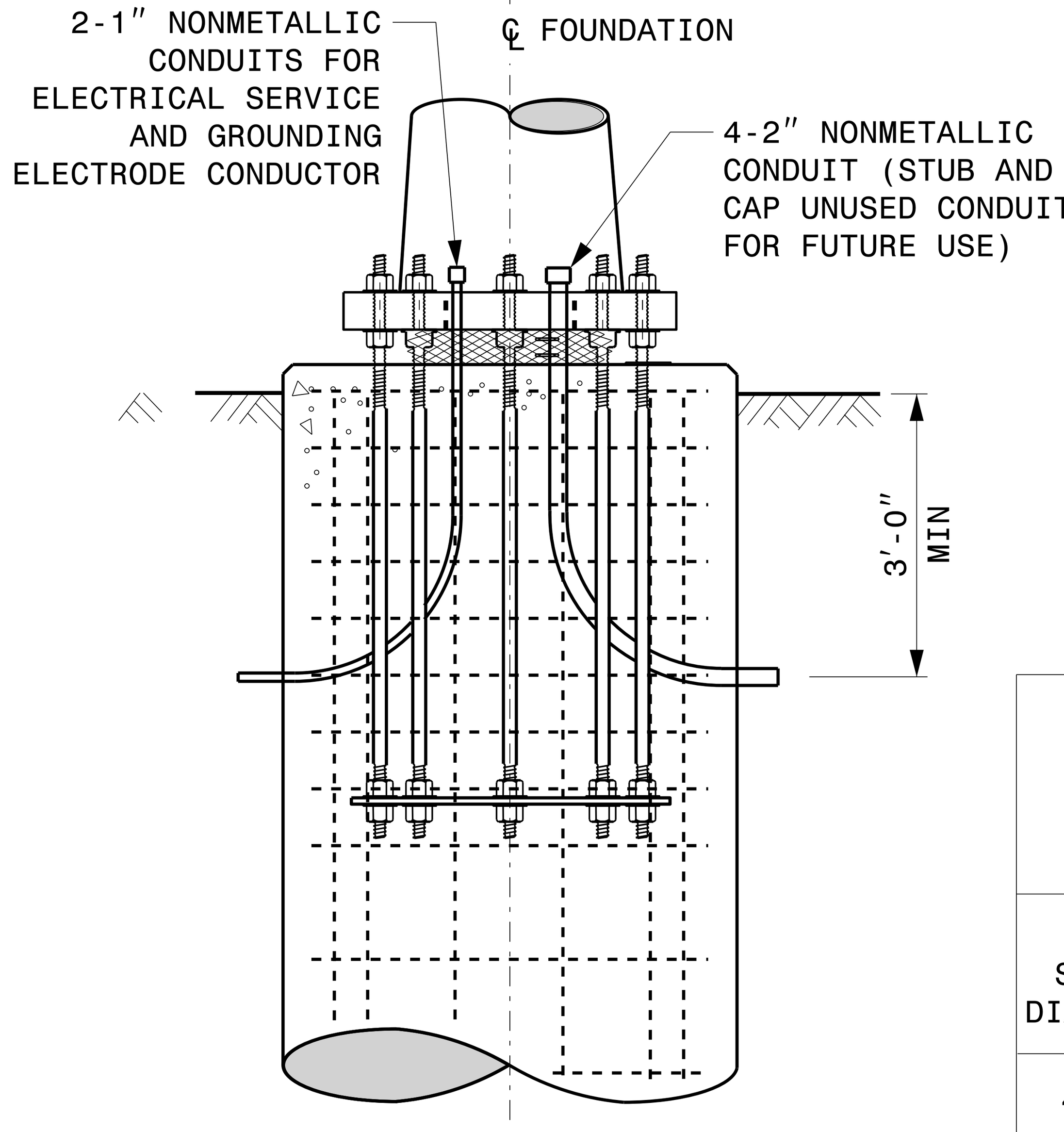
SIGNATURE 09/21/2023 DATE

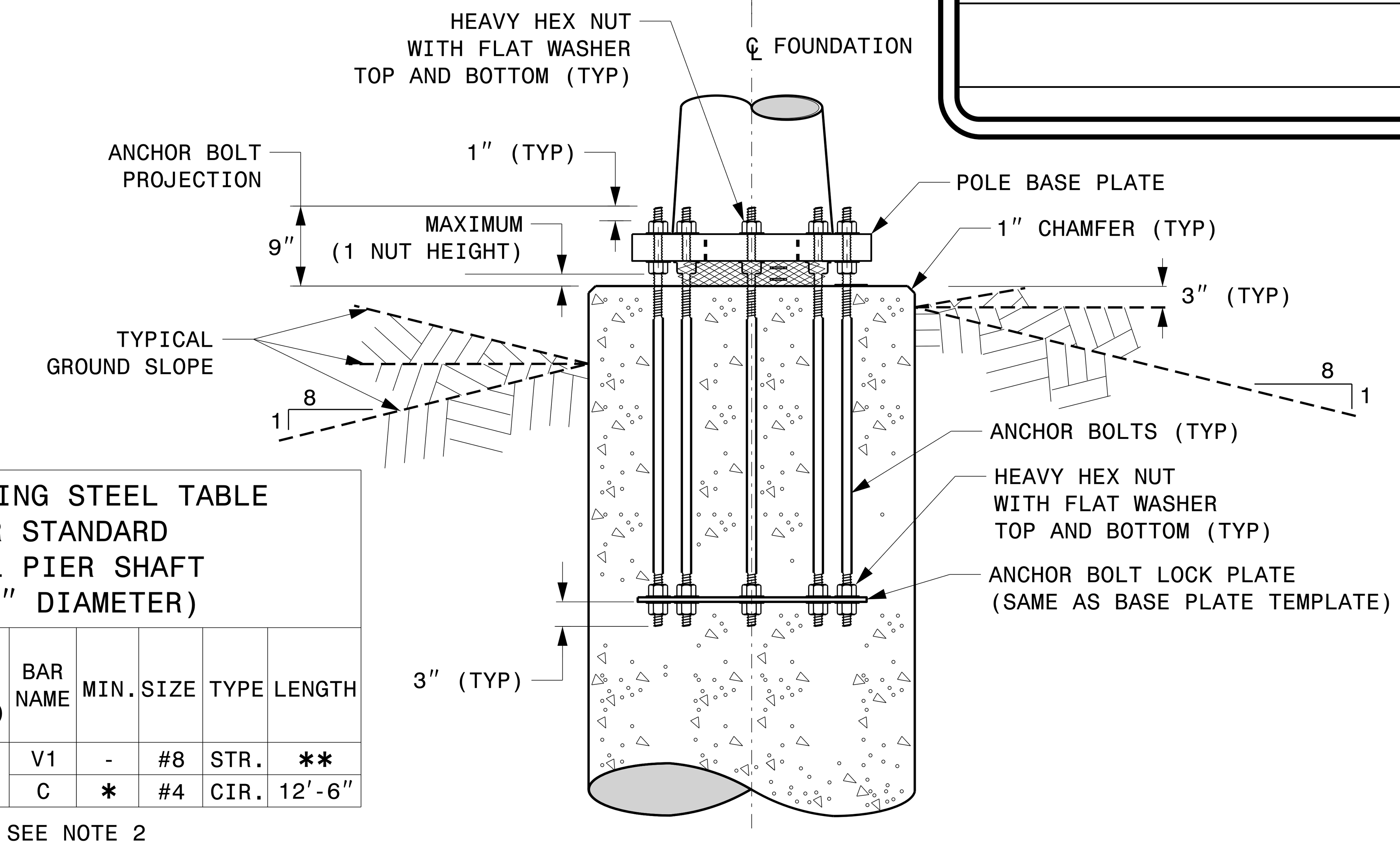
Construction Details – Foundations



CONCRETE SHAFT ELEVATION



TYPICAL FOUNDATION CONDUIT DETAILS



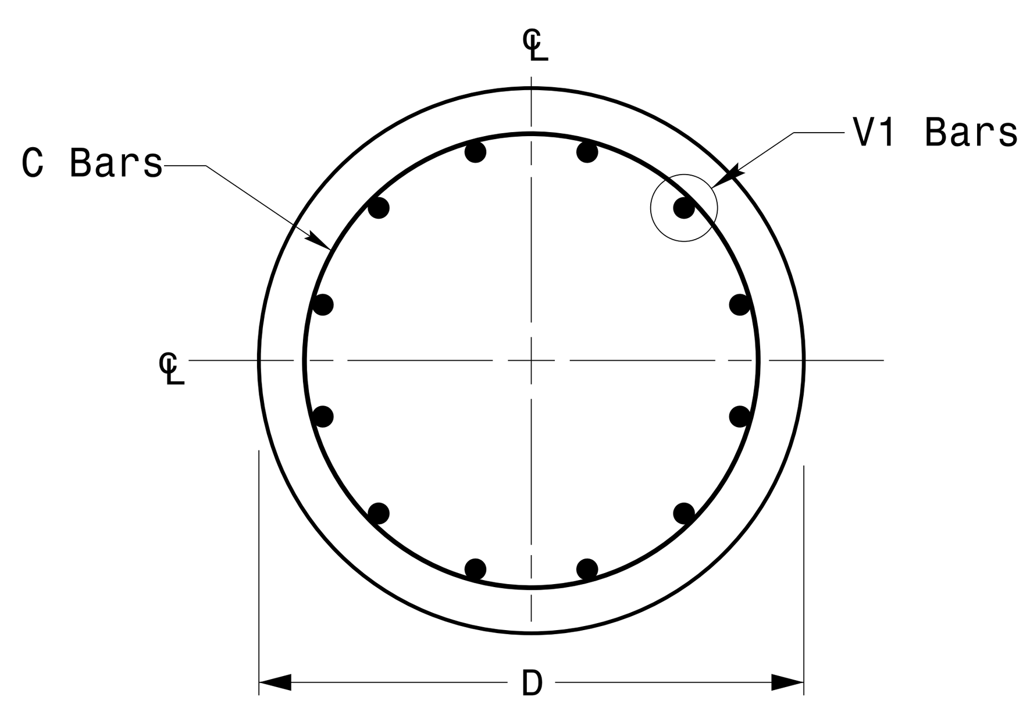
TYPICAL FOUNDATION ANCHOR BOLT DETAILS

(REINFORCING CAGE NOT SHOWN FOR CLARITY)

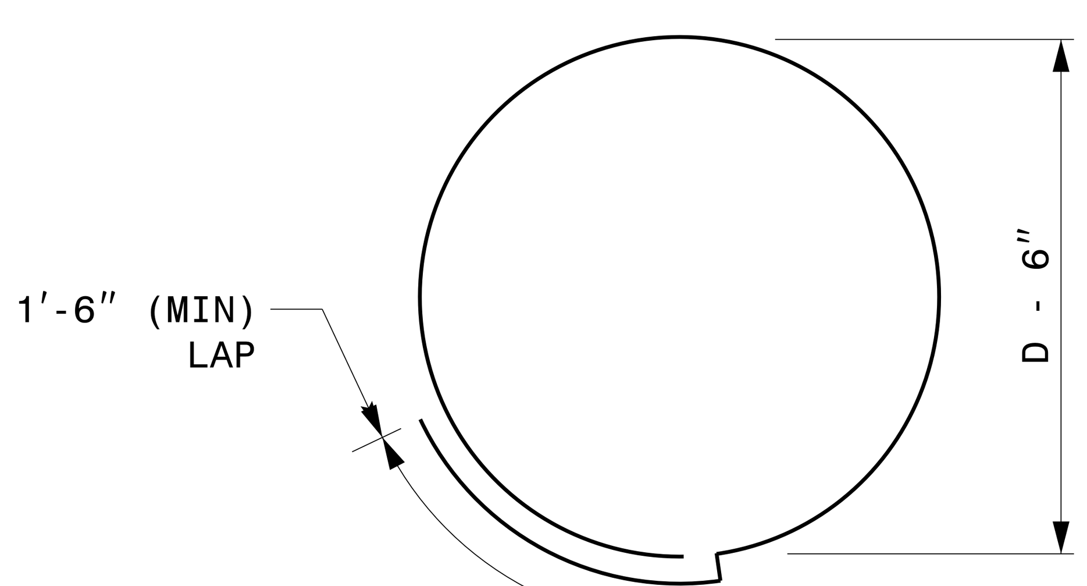
REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4′-0″ DIAMETER)

"D" SHAFT DIAMETER	CONCRETE VOLUME (CU. YDS)	BAR NAME	MIN.	SIZE	TYPE	LENGTH
4′-0″	.465 X L	V1	-	#8	STR.	**
		C	*	#4	CIR.	12′-6″

* SEE NOTE 2
** SEE NOTE 3



SECTION A-A

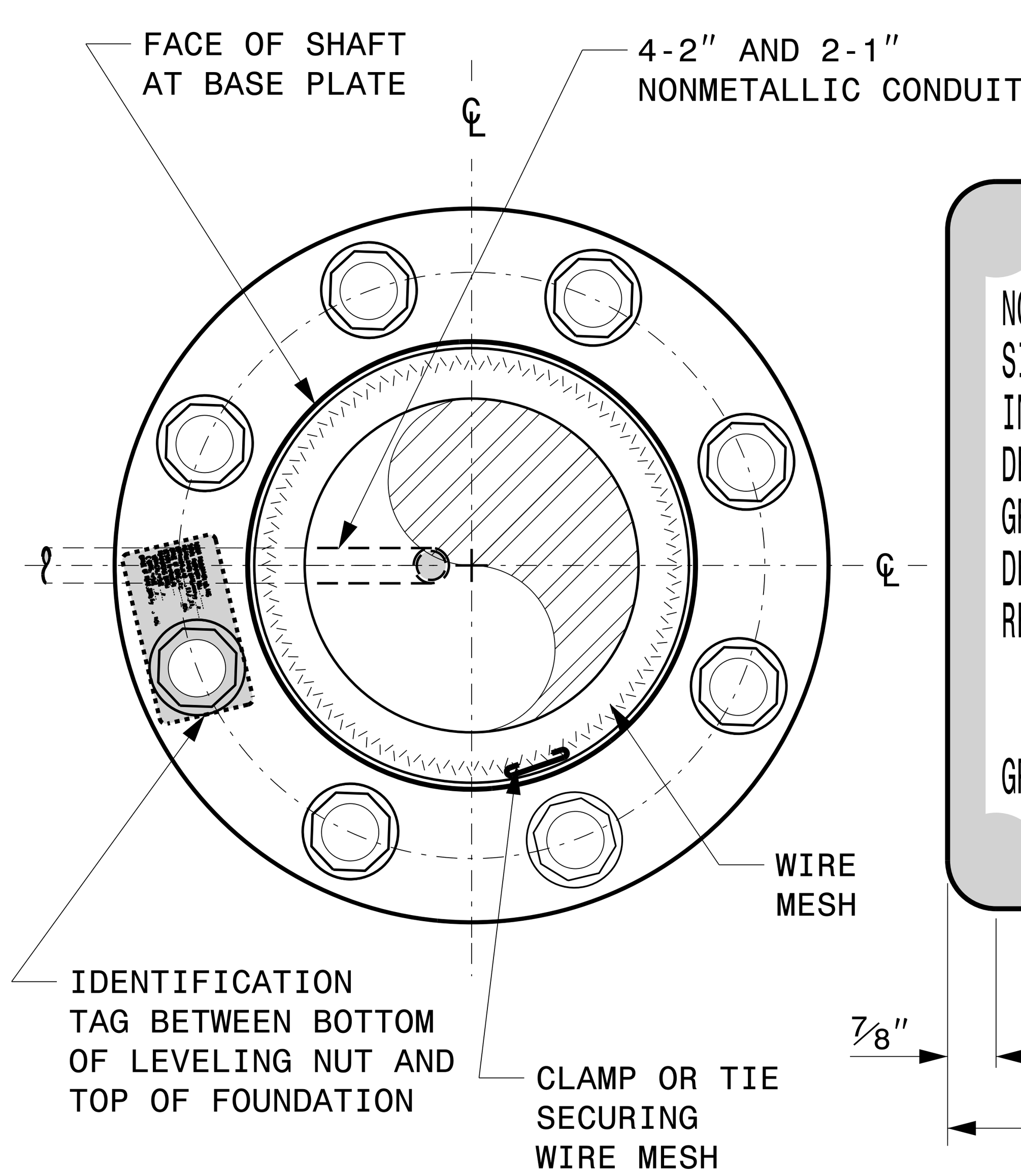


TYPICAL "C" BAR DETAIL

GENERAL NOTES:

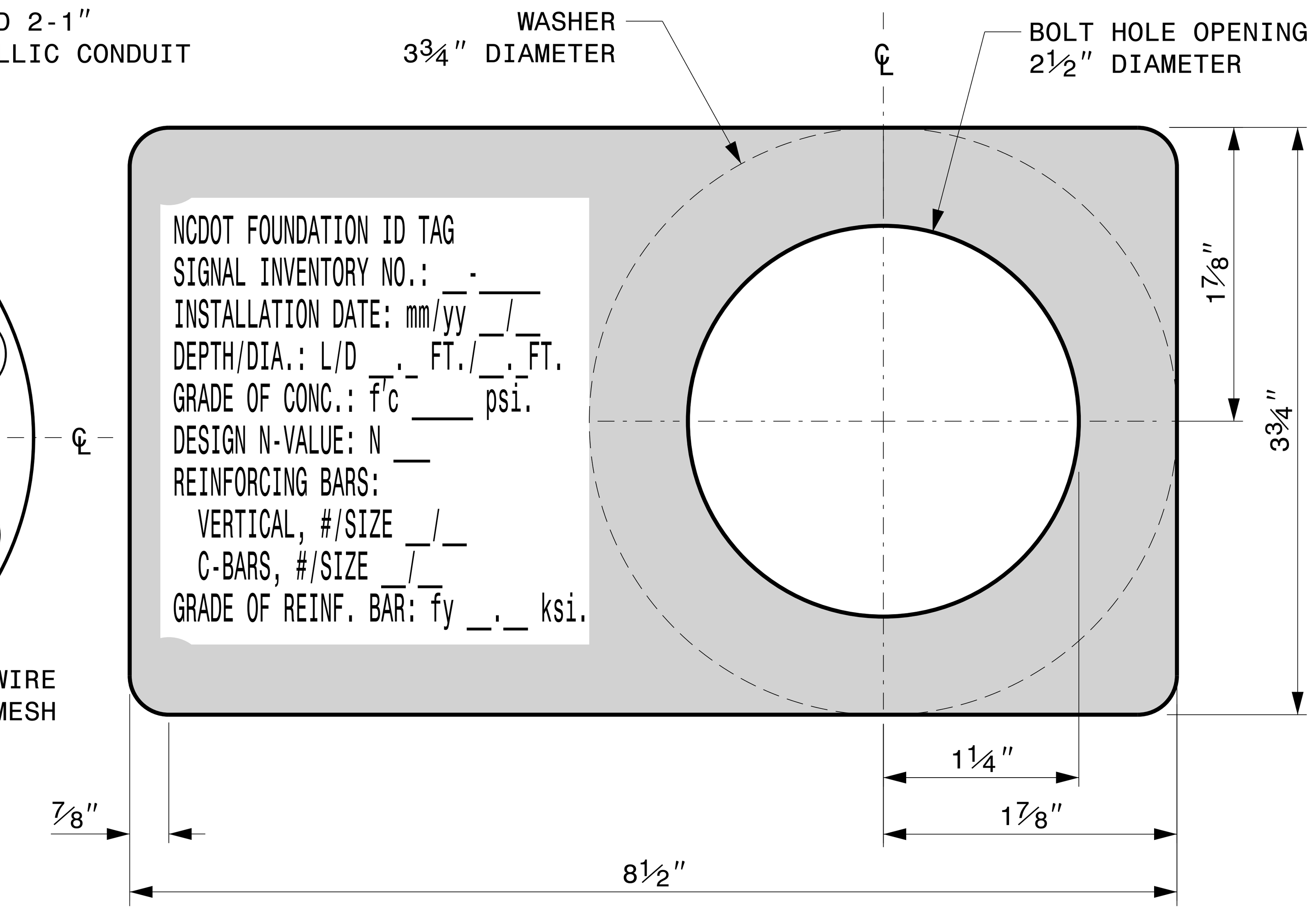
1. IF ACTUAL SUBSURFACE CONDITIONS DIFFER SIGNIFICANTLY FROM BORING DATA, CONTACT THE ENGINEER BEFORE EXCAVATING OR PLACING CONCRETE.
2. CIRCULAR TIE REINFORCING RINGS MAY BE VERTICALLY ADJUSTED BY +/-3″ AT A DEPTH BETWEEN 2′-0″ AND 3′-0″ TO FACILITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING IN THE CAGE.
3. FOR STANDARD FOUNDATIONS, SEE SHEET SIG. M8 FOR DETAILS. VERTICAL REINFORCING BARS (V1) MAY BE HORIZONTALLY ADJUSTED BY +/-3″ TO FACILITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING INTO THE CAGE.
4. PROVIDE 2″ TO 5″ FOUNDATION PROJECTION ABOVE GROUND LEVEL, DEPENDING ON THE GROUND SLOPE.
5. UNLESS OTHERWISE SHOWN, FOUNDATION DESIGNS ARE BASED ON NON-SLOPING LEVEL GROUND SURFACES WITH SLOPE RATIOS OF 8:1 (H:V) OR FLATTER. IF ACTUAL GROUND LINE SLOPES ARE STEEPER, CONTACT THE ENGINEER BEFORE EXCAVATING OR PLACING CONCRETE.
6. CONSTRUCT FOUNDATIONS IN ACCORDANCE WITH NCDOT STANDARD PROVISIONS SP09 R005- FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES. ALL APPLICABLE 2024 NCDOT STANDARD SPECIFICATIONS ARE REFERENCED IN THIS PROVISION. REFER TO THE NCDOT RESOURCES/SPECIFICATIONS PAGE LOCATED ON THE CONNECT NCDOT WEBSITE.

   https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx
7. USE AIR ENTRAINED AA CONCRETE MIX WITH A COMPRESSION STRENGTH OF f′c=4500 psi (MIN) AFTER 28 DAYS.
8. USE ASTM A615 GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL. MAINTAIN AT LEAST 3″ COVER ON ALL REINFORCEMENT.
9. LOCATE IDENTIFICATION TAG ON TOP OF THE FOUNDATION, DIRECTLY ABOVE THE CONDUIT'S ENTRY POINT.
10. PROVIDE TWO LAYERS OF 4 MESH GALVANIZED WELDED 23 GAUGE (0.025) 6″ WIDE AROUND PIPES UNDER THE BASE PLATE AND SECURE IT WITH TIES IF NECESSARY.
11. PREFERRED LOCATION FOR THE I.D. TAG IS AS SHOWN IN DETAIL-A: DIRECTLY ABOVE THE CONDUIT ENTERING THE FOUNDATION.



D = DIAMETER
L = LENGTH / DEPTH
mm = MONTH
yy = YEAR

DETAIL-A



CONCRETE FOUNDATION IDENTIFICATION TAG DETAILS

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE: 0 NA — NONE

Construction Details For Foundations

PLAN DATE:	SEPTEMBER 2023	DESIGNED BY:	K.C. DURIGON
PREPARED BY:	K.C. DURIGON	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

DocuSigned by: Kevin Durigon
SIGNATURE 4B23DC79B3784DA
09/21/2023 DATE

03-OCT-2023 12:45
S:*ITS&SU*ITS Signals*Signal Design Section*Structures*Drawings*2024 Metal Pole Std Drawings for LRFD*2024 Sig.M7 Std. Construction Details-Strain Poles.dgn
kcdurigon

SOIL CONDITION

STANDARD STRAIN POLES						STANDARD FOUNDATIONS 48″ Diameter Drilled Pier Length (L) – Feet							Reinforcement			
			Reactions at the Pole Base			Clay				Sand			Longitudinal		Stirrups	
Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Axial (kip)	Shear (kip)	Moment (ft-kip)	Medium N-Value 4–8	Stiff N-Value 9–15	Very Stiff N-Value 16–30	Hard N-Value >30	Loose N-Value 4–10	Medium N-Value 11–30	Dense N-Value >30	Bar Size (#)	Quantity (ea.)	Bar Size (#)	Spacing (in.)
S26L1	26	22	2	9	210	19.5	12.5	9	6.5	15.5	14.5	13	8	12	4	12
S26L2	26	23	2	10	240	19.5	12	9	6.5	15.5	14.5	13	8	12	4	12
S26L3	26	25	2	11	260	20.5	12	10	8	16	15	13	8	12	4	12
S30L1	30	22	2	9	230	19	11	9	7	15.5	14	12.5	8	12	4	12
S30L2	30	23	2	10	270	20	12	10	8	16	14.5	13	8	12	4	12
S30L3	30	25	2	11	290	21	12	10	8	17	15	13.5	8	12	4	12
S30H1	30	25	3	13	355	23	13	11	9	18	16.5	14.5	8	12	4	12
S30H2	30	29	3	15	405	25	14	11	9	19	17.5	15.5	8	14	4	12
S30H3	30	29	3	16	430	26	15	12	9	20	18	16	8	14	4	6
S35L1	35	22	3	8	260	19.5	12	10	8	15.5	14.5	13	8	12	4	12
S35L2	35	23	3	10	300	21	12	10	8	16.5	15	13.5	8	12	4	12
S35L3	35	25	3	10	320	21.5	13	10	8	17	15.5	14	8	12	4	12
S35H1	35	25	3	12	390	23.5	14	11	9	18	17	15	8	14	4	12
S35H2	35	29	4	14	460	26	15	12	9	20	18	16	8	14	4	6
S35H3	35	29	4	16	495	28.5	15	13.5	10	21.5	19	17	8	14	4	6

48″ DIAMETER FOUNDATION CONCRETE VOLUME (CUBIC YARDS) = (0.465) x DRILLED PIER LENGTH

GENERAL NOTES:

1. VALUES SHOWN IN THE "REACTIONS AT THE POLE BASE" COLUMN REPRESENT THE MINIMUM ACCEPTABLE CAPACITY ALLOWED FOR DESIGN USING A COMBINED FORCE RATIO (CFR) OF 1.00.
2. USE CHAIRS AND SPACERS TO MAINTAIN PROPER CLEARANCE.
3. FOR FOUNDATION, ALWAYS USE AIR-ENTRAINED CONCRETE MIX.

FOUNDATION SELECTION:

1. PERFORM A STANDARD PENETRATION TEST AT EACH PROPOSED FOUNDATION SITE TO DETERMINE "N" VALUE.
2. SELECT THE APPROPRIATE WIND ZONE FROM M1 DRAWING.
3. SELECT THE SOIL TYPE (CLAY OR SAND) THAT BEST DESCRIBES THE SOIL CHARACTERISTICS.
4. GET THE APPROPRIATE STANDARD POLE CASE NUMBER FROM THE PLANS OR FROM THE ENGINEER.
5. SELECT THE APPROPRIATE COLUMN UNDER "STANDARD FOUNDATIONS" BASED ON SOIL TYPE AND "N" VALUE. SELECT THE APPROPRIATE ROW BASED ON THE POLE LOAD CASE.
6. THE FOUNDATION DEPTH IS THE VALUE SHOWN IN THE "STANDARD FOUNDATIONS" CATEGORY WHERE THE COLUMN AND THE ROW INTERSECT.
7. USE CONSTRUCTION PROCEDURES AND DESIGN METHODS PRESCRIBED BY FHWA-NHI-10-016 MANUAL FOR DRILLED SHAFTS.

Standard Strain Pole Foundation – All Soil Conditions

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section, 750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 NA NONE

Standard Strain Pole Foundation for All Soil Conditions

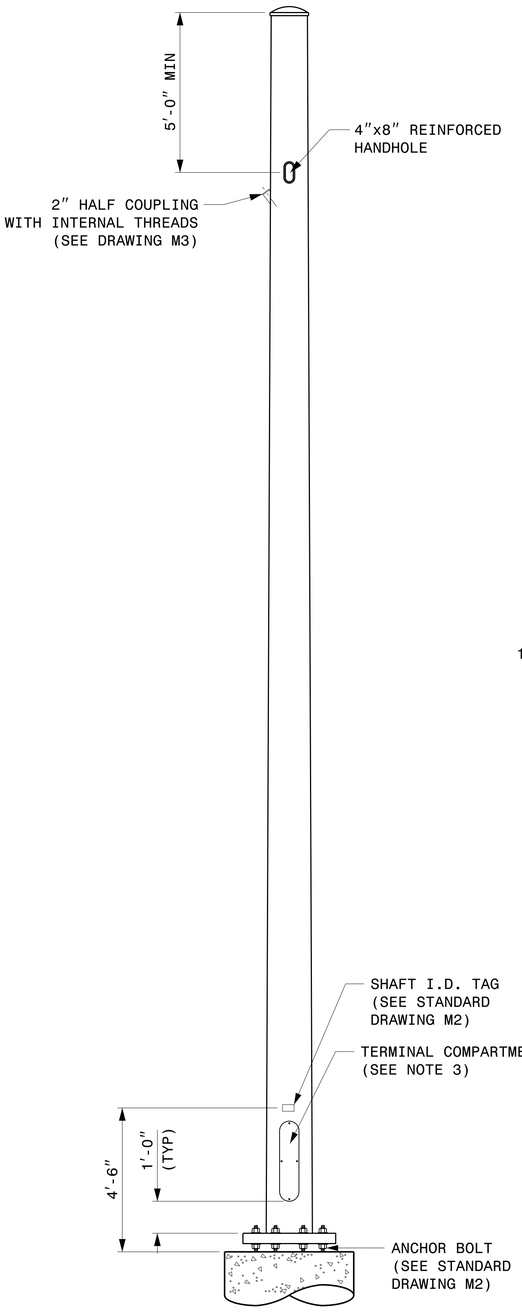
PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON
PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR
REVISIONS | INIT. | DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036626 KEVIN C. DURIGON

DocuSigned by: Kevin Durigon 4B23DC79B3784DA
SIGNATURE 09/21/2023 DATE

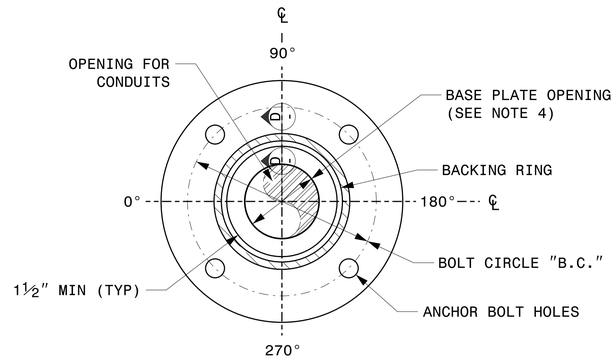
PROJECT I.D. NO.	SHEET NO.
	Sig.M9

Fabrication Details – CCTV Camera Poles

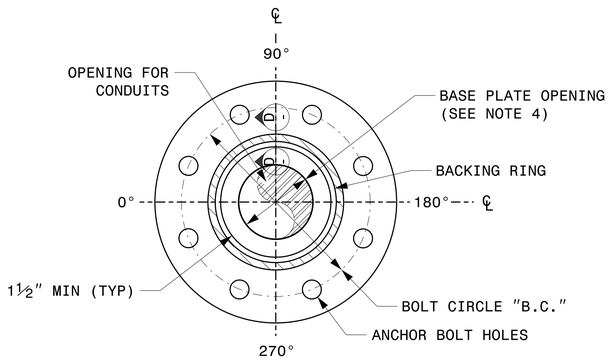


CCTV CAMERA POLE

(NOT TO SCALE)

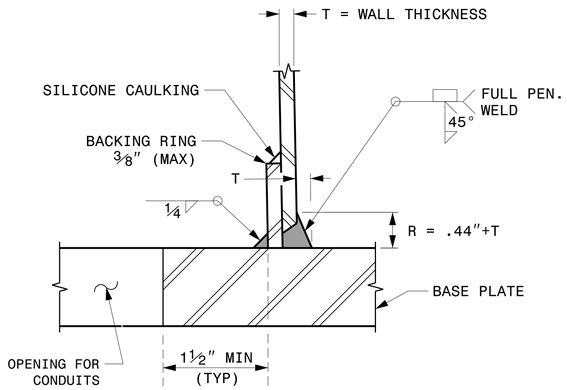


4 BOLT PATTERN
FOR POLES UP TO 40'



8 BOLT PATTERN
FOR POLES TALLER THAN 40'

BASE PLATE DETAILS



SECTION D-D

(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION GROOVE WELD DETAIL

NOTES:

1. THIS DRAWING PROVIDES BASIC DETAILS FOR CCTV POLES. PROJECT REQUIREMENTS MAY REQUIRE SPECIAL FACTORY PREPS THAT ARE NOT SHOWN ON THESE DETAILS.
2. DETAILS FOR INTERNAL CAMERA LOWERING SYSTEMS ARE NOT SHOWN.
3. POLE MOUNTED CABINETS MAY REQUIRE MODIFICATIONS TO THE LOWER HANDHOLE OPENING TO MOUNT CABINETS. 4" X 8" REINFORCED HANDHOLES ARE ACCEPTABLE OPTIONS, AND MAY BE PREFERRED.
4. OPENING IN POLE BASE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS 3½" BUT SHALL NOT BE LESS THAN 8½".
5. USE COMPACT SECTION CRITERIA D/T RATIO PER AASHTO LTS-LRFD 1ST EDITION SECTION 5.7.2.

Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE
0 NA
NONE

Typical Fabrication Details For CCTV Poles

PLAN DATE:	SEPTEMBER 2023	DESIGNED BY:	K.C. DURIGON
PREPARED BY:	K.C. DURIGON	REVIEWED BY:	C.F. ANDREWS

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

DocuSigned by:
Kevin Durigon
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09/21/2023
DATE

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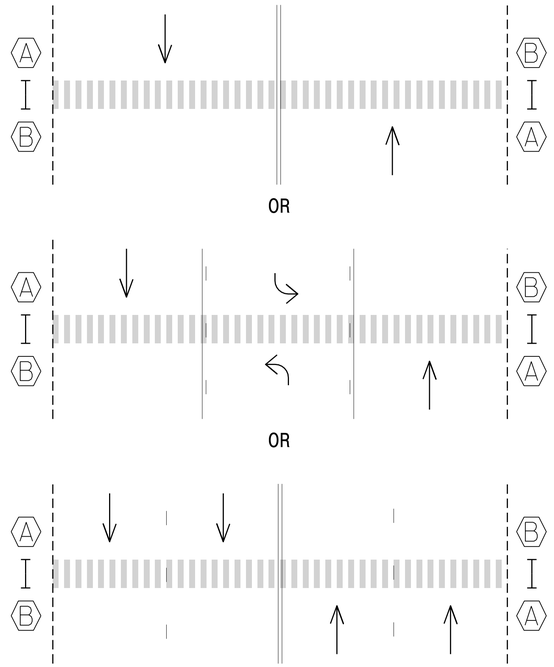
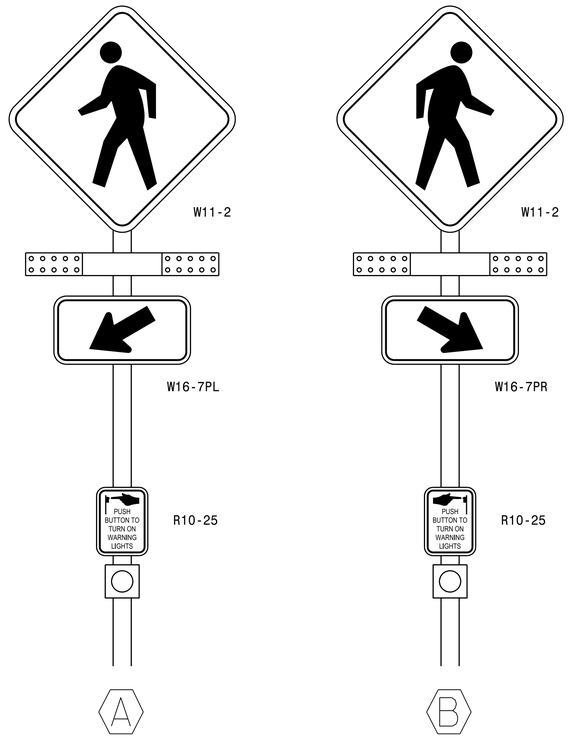
kcdurigon

PROJECT REFERENCE NO.	SHEET NO.

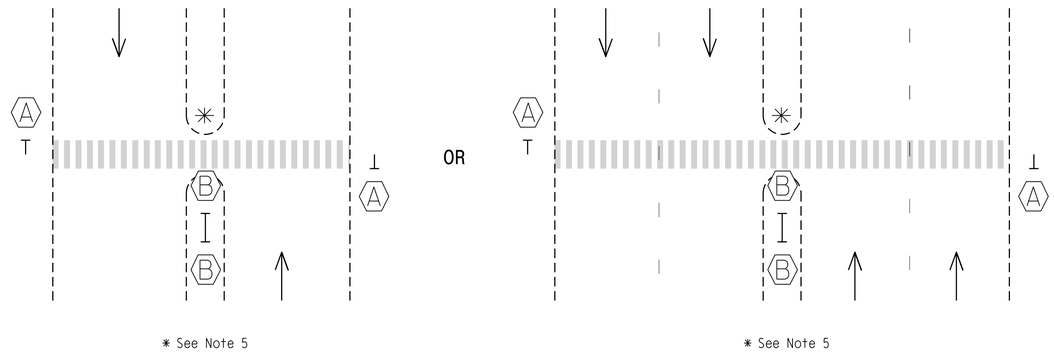
Two to Four Lanes, Undivided



RRFB Sign Detail



Two or Multi-Lanes, Divided



✳ See Note 5

✳ See Note 5

Notes

1. Design the RRFB in accordance with the 2009 MUTCD Interim Approval 21 -- Rectangular Rapid-Flashing Beacons at Crosswalks. The RRFB unit associated with a post-mounted sign and plaque should be located between the pedestrian crossing warning (W11-2) sign and the supplemental downward diagonal arrow plaque (W16-7p).
2. If sight distance approaching the crosswalk is deemed insufficient, a supplemental RRFB with an "AHEAD" (W16-9P) plaque may be installed on that approach in advance of the crosswalk.
3. When practical, the RRFB and mounting post on the right side of the road shall be mounted on the approach side of the crosswalk closest to approaching traffic.
4. When practical, the RRFB and mounting post on the left side of the road may be mounted on the back of the post for the opposing approach.
5. A RRFB on the left side of the roadway or in the median may be individually mounted on the approach side of the crosswalk closest to approaching traffic, or, when practical, may be mounted back to back on the same post and mounted on either side of the crosswalk in the median.
6. Locate push button sign (R10-25) and push button to face crosswalk, even if it is mounted on the back side of the sign.
7. All RRFB units associated with a given crosswalk (including those with an advance crossing sign) shall, when actuated, simultaneously commence operation of their rapid-flashing indications and shall cease operation simultaneously.

Timing of RRFBs

When actuated, the two yellow indications in each RRFB unit shall flash in a rapidly flashing sequence.

The RRFB shall flashing sequence shall provide enough time for pedestrians to cross from curb to curb. It is recommened to be a minimum of 7 seconds plus the crossing distance (D) divided by 3.5 feet/per sec., rounded up to the next whole second:

$$\text{Flash Time (sec.)} = 7 + D/3.5$$

RRFBs shall provide 75 flashing sequences per minute. During each 800-millisecond flashing sequence, the left and right RRFB indications shall operate using the following sequence:

- The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- Both RRFB indications shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- Both RRFB indications shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 250 milliseconds.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Standard Drawing for Rectangular Rapid Flashing Beacon

Prepared in the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION
Signal Design Section

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SEAL

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