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Project No.	Sheet No.
R–5023B	Sig. 1.0

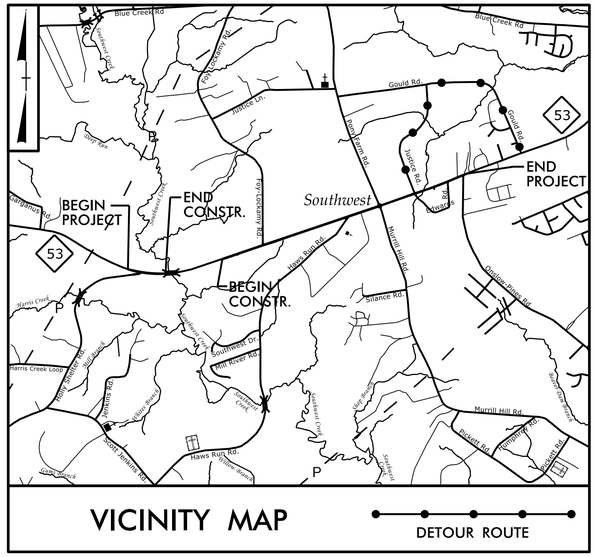
TIP Project: R–5023B

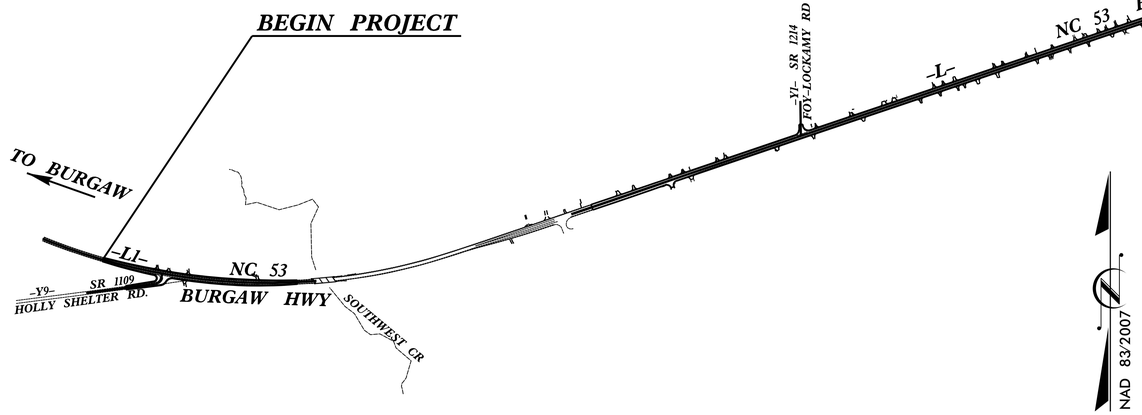
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ONSLOW COUNTY

LOCATION: *IMPROVEMENTS ALONG NC 53 FROM WEST OF SR 1109 (HOLLY SHELTER RD.) TO WEST OF BRIDGE OVER SOUTHWEST CREEK AND WEST OF SR 1214 (FOY–LOCKAMY RD.) TO EAST OF SR 1116 (ONSLOW PINES RD.)*

TYPE OF WORK: *TRAFFIC SIGNALS*





Refer to Roadway Standard Drawings NCDOT" dated January 2012 and Standard Specifications for Roads and Structures" dated January 2012.

Index of Plans

Sheet #	*Reference #*	*Location/Description*
Sig. 1.0	---------	*Title Sheet*
Sig. 2.0–2.5	*03–0172*	*NC 53 (Burgaw Highway) at SR 1212 (Pony Farm Rd) / SR 1113 (Murrill Hill Rd)*
Sig. M1–M8		*Metal Pole Standards*
Scp. 1–5		*Signal Communication Plans*

Transportation Mobility and Safety Division

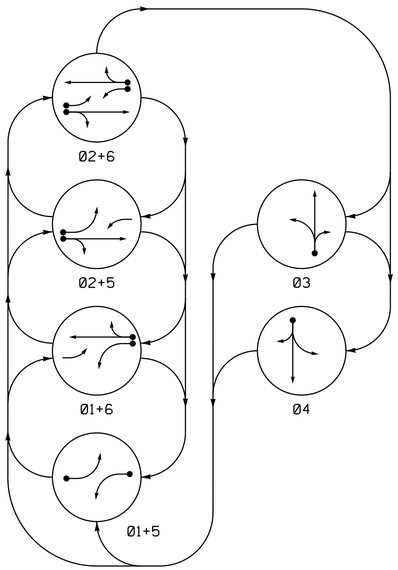
Contacts:

Greg Fuller, PE – ITS and Signals Engineer
Jason P. Galloway, PE – Eastern Region Signals Engineer
Keith M. Mims, PE – Signal Equipment Design Engineer

Prepared In the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway, Garner, NC 27529

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	Sig.2.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

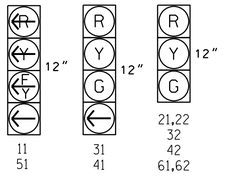
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE							
	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
11	←	←	F Y	F Y	~~R~~	~~R~~	~~Y~~
21,22	R	R	G	G	R	R	Y
31	R	R	R	R	G ←	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	R	G ←	R
42	R	R	R	R	R	G	R
51	←	F Y	←	F Y	~~R~~	~~R~~	~~Y~~
61,62	R	G	R	G	R	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



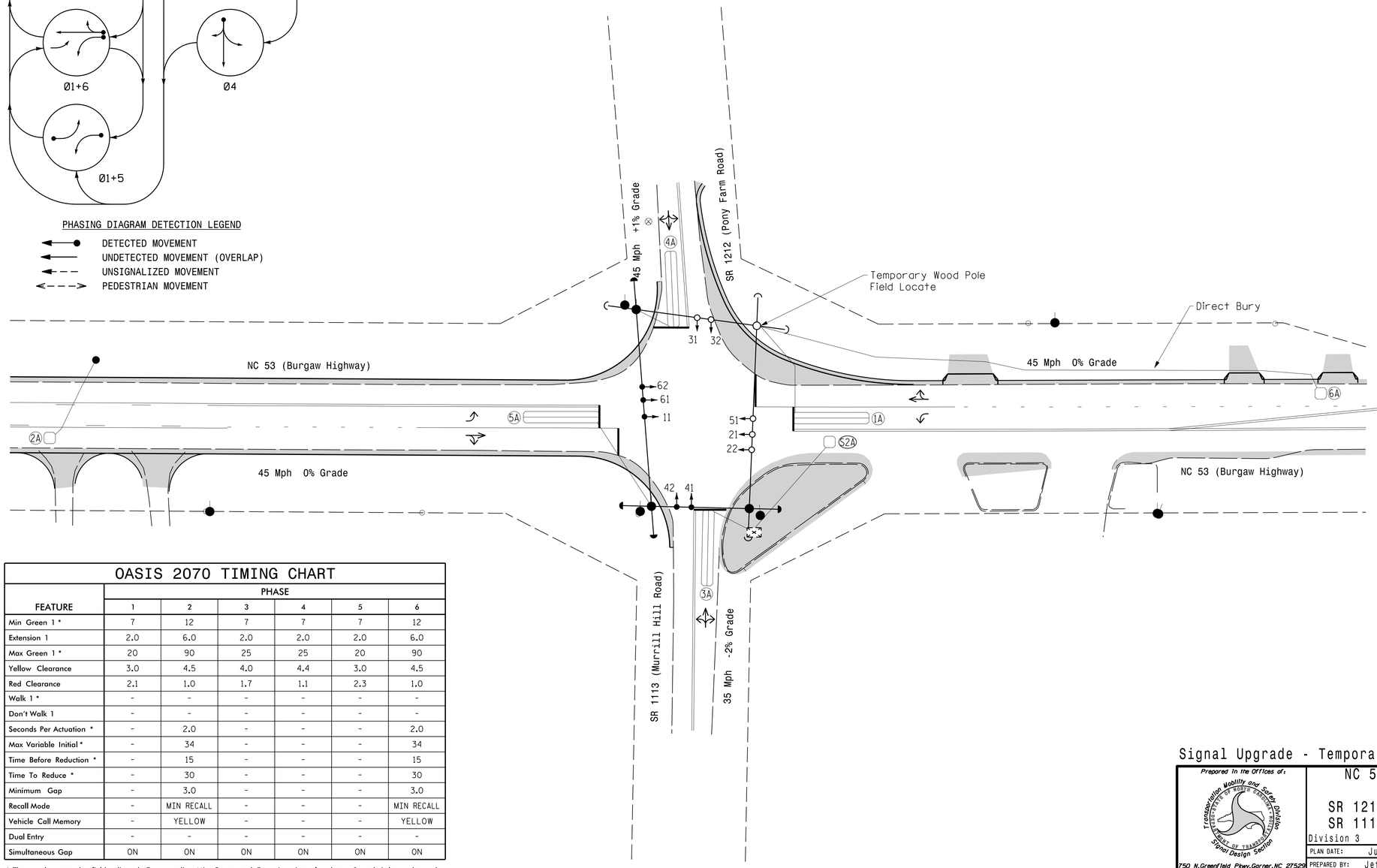
OASIS 2070 LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
2A	6X6	300	4	Y	2	Y	Y	-	-	-	-	-
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	10	-	-
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	300	4	Y	6	Y	Y	-	-	-	-	-
S2A	6X6	+108	4	Y	-	-	-	-	-	-	Y	-

6 Phase
Fully Actuated
Jacksonville Signal System

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	

OASIS 2070 TIMING CHART

FEATURE	PHASE					
	1	2	3	4	5	6
Min Green 1 *	7	12	7	7	7	12
Extension 1	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	20	90	25	25	20	90
Yellow Clearance	3.0	4.5	4.0	4.4	3.0	4.5
Red Clearance	2.1	1.0	1.7	1.1	2.3	1.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.0	-	-	-	2.0
Max Variable Initial *	-	34	-	-	-	34
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	30	-	-	-	30
Minimum Gap	-	3.0	-	-	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Signal Upgrade - Temporary 1

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 53 (Burgaw Highway)
at
SR 1212 (Pony Farm Road) /
SR 1113 (Murrill Hill Road)

Division 3 Onslow County Jacksonville

PLAN DATE:	July 2016	REVIEWED BY:	JPG
PREPARED BY:	Jeff Spence	REVIEWED BY:	

SCALE 0 30 1"=30'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason P. Galloway 8/29/2016
F700EA70481841D... DATE

SIG. INVENTORY NO. 03-01721

26-SEP-2016 12:58
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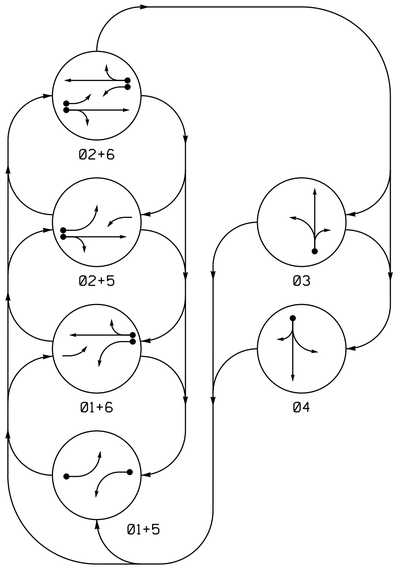
jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	Sig.2.1

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

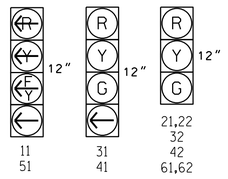
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03	04	FLASH
11	←	←	F Y	F Y	~~R~~	~~R~~	~~Y~~
21,22	R	R	G	G	R	R	Y
31	R	R	R	R	G ←	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	R	G ←	R
42	R	R	R	R	R	G	R
51	←	F Y	←	F Y	~~R~~	~~R~~	~~Y~~
61,62	R	G	R	G	R	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



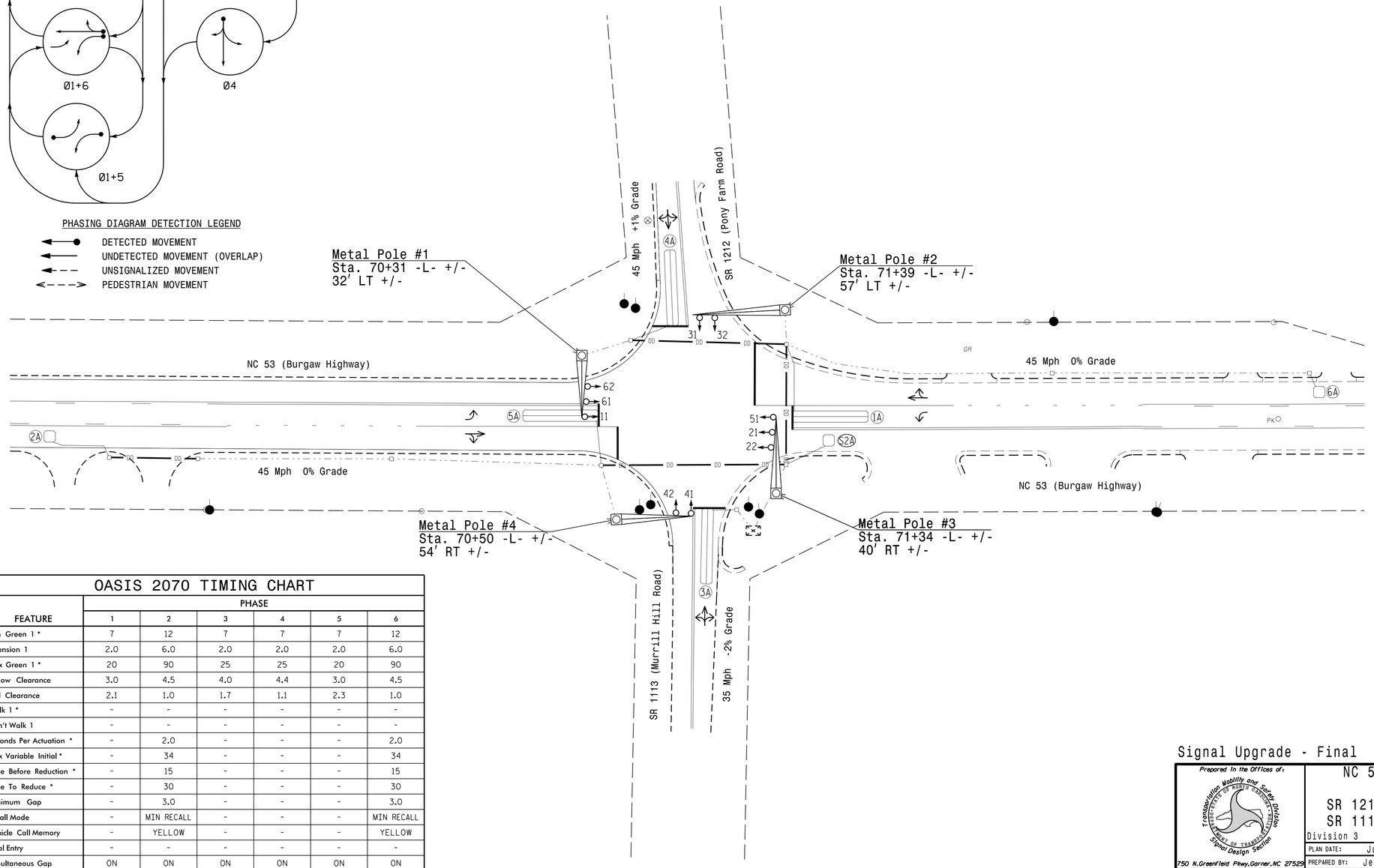
OASIS 2070 LOOP & DETECTOR INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
					6	Y	Y	Y	-	3	-	-
2A	6X6	300	4	Y	2	Y	Y	-	-	-	-	-
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	10	-	-
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	10	-	-
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	-
					2	Y	Y	Y	-	3	-	-
6A	6X6	300	4	Y	6	Y	Y	-	-	-	-	-
S2A	6X6	+108	4	Y	-	-	-	-	-	-	Y	-

6 Phase
Fully Actuated
Jacksonville Signal System

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	

OASIS 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6
Min Green 1 *	7	12	7	7	7	12
Extension 1	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	20	90	25	25	20	90
Yellow Clearance	3.0	4.5	4.0	4.4	3.0	4.5
Red Clearance	2.1	1.0	1.7	1.1	2.3	1.0
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	2.0	-	-	-	2.0
Max Variable Initial *	-	34	-	-	-	34
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	30	-	-	-	30
Minimum Gap	-	3.0	-	-	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Signal Upgrade - Final

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 53 (Burgaw Highway)
at
SR 1212 (Pony Farm Road) /
SR 1113 (Murrill Hill Road)

Division 3 Onslow County Jacksonville

PLAN DATE: July 2016 REVIEWED BY: JPG
PREPARED BY: Jeff Spence REVIEWED BY:

SCALE 0 30 1"=30'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason P. Galloway 8/29/2016
F700EA70481841D
DATE

SIG. INVENTORY NO. 03-0172

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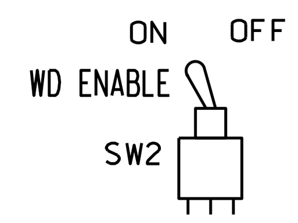
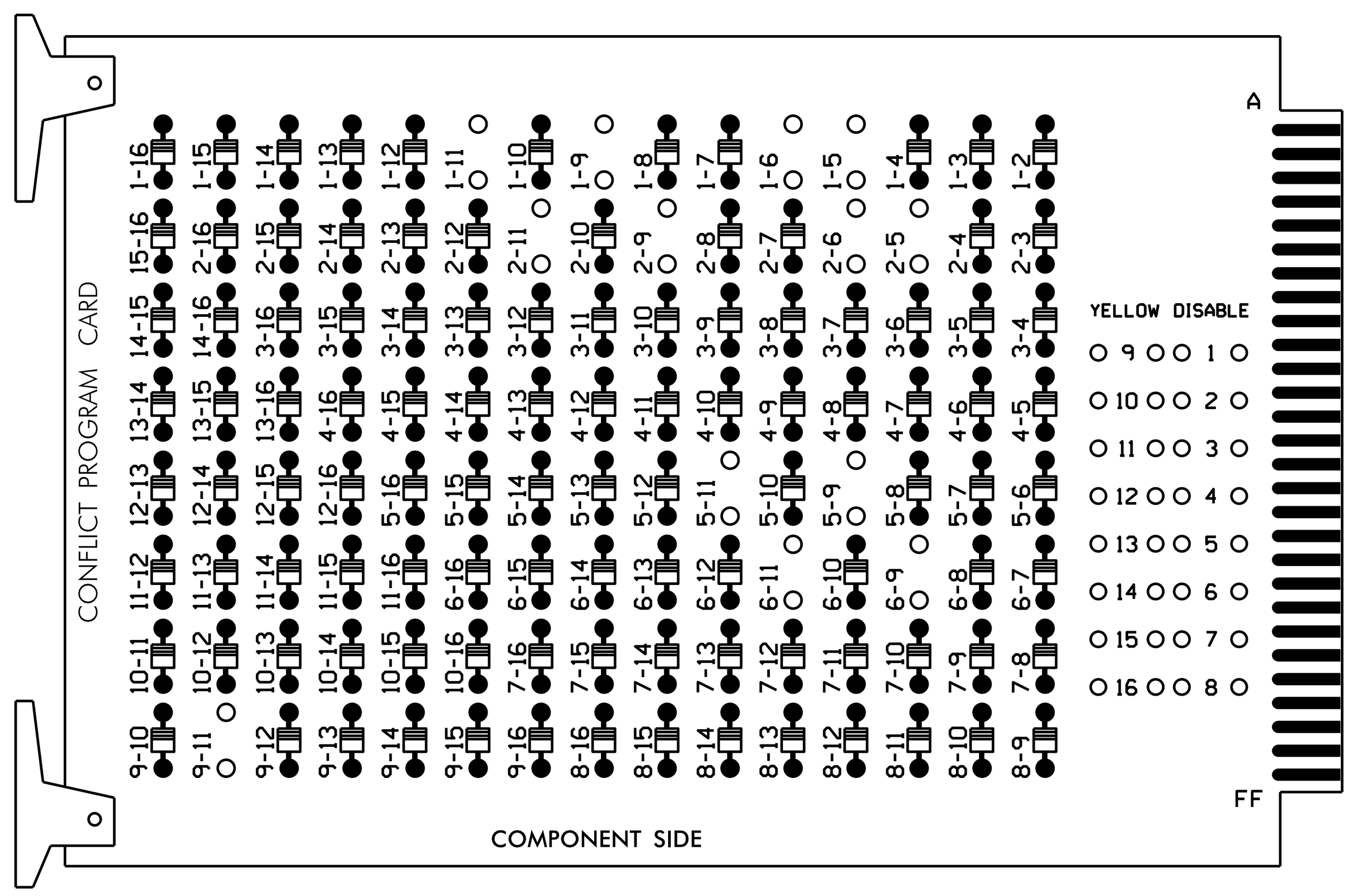
jgalloway

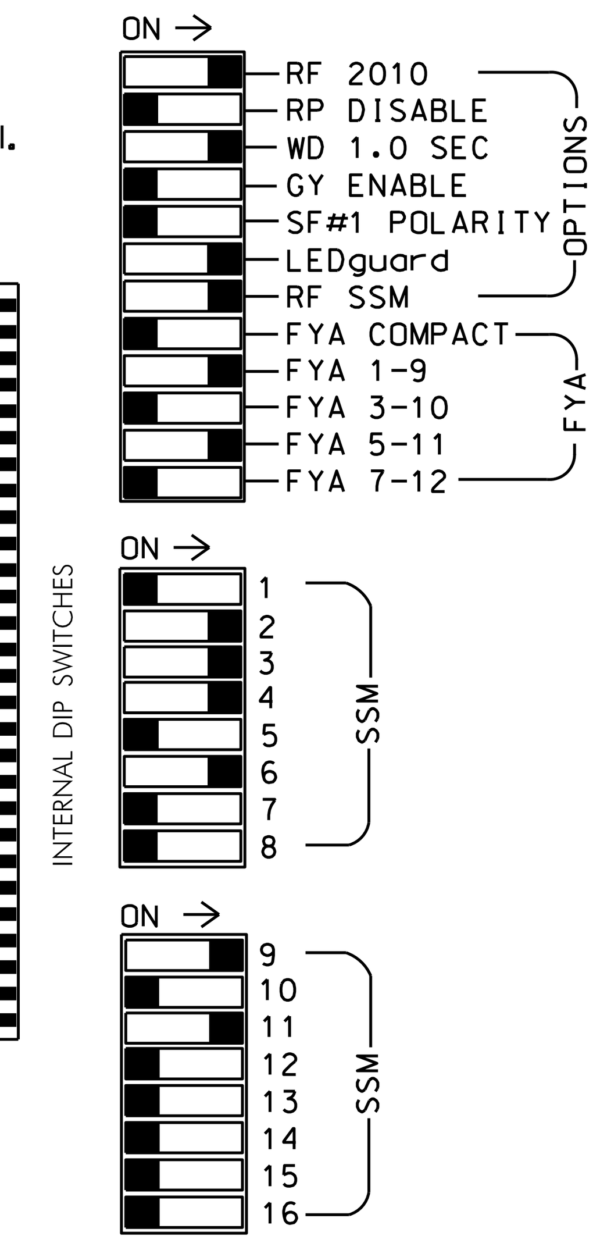
EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.





REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,5, 7,8,10,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Enable Simultaneous Gap-Out for all phases.
4. Program phases 2 and 6 for Variable Initial and Gap Reduction.
5. Program phases 2 and 6 for Start Up In Green.
6. Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.
7. The cabinet and controller are part of the Jacksonville Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3		S4		S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3		4		4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11★	21,22	NU	31	32	41	42	NU	51★	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		128		116	116	101	101			134										
YELLOW	✻	129		117	117	102	102		✻	135										
GREEN		130		118	118	103	103			136										
RED ARROW															A121			A114		
YELLOW ARROW															A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127			118		103			133											

NU = Not Used

✻ Denotes install load resistor. See load resistor installation detail this sheet.

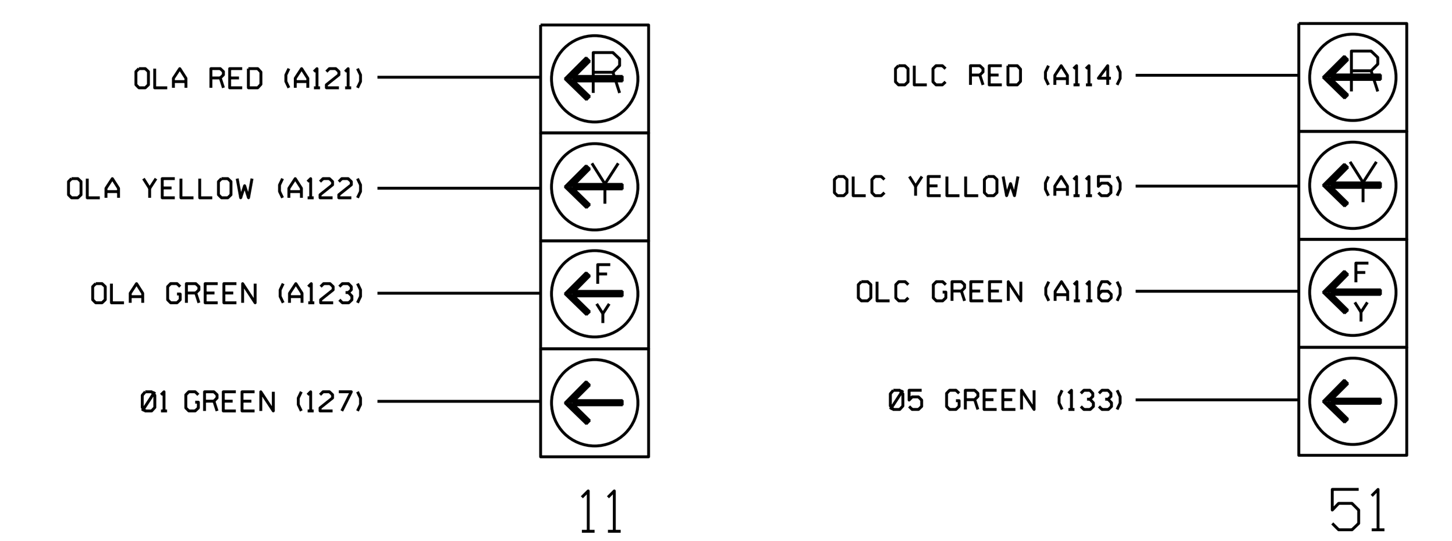
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER..............2070
CABINET.................332 W/ AUX
SOFTWARE................ECONOLITE OASIS
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED......S1,S2,S3,S4,S5,S6,S9,S12
PHASES USED.............1,2,3,4,5,6
OVERLAP "A".............1+2
OVERLAP "B".............NOT USED
OVERLAP "C".............5+6
OVERLAP "D".............NOT USED

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 for programming instructions.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1 1A	Ø 2 2A	SLOT EMPTY	WIRED INPUT ⊗	Ø 3 3A	Ø 4 4A	SLOT EMPTY	SLOT EMPTY	SYS. DET. S2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	NOT USED			NOT USED	NOT USED			NOT USED					ST DC ISOLATOR
FILE "J"	U	Ø 5 5A	Ø 6 6A	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED												

EX.: 1A, 2A, ETC. = LOOP NO.'S

⊗ Wired Input - Do not populate slot with detector card

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
3A	TB4-5,6	I5U	58	20	3	3	Y	Y			10
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			10
5A[2]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
✻S2A	TB6-9,10	I9U	60	22	11	SYS					

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

✻ System detector only. Remove the vehicle phase assigned to this detector in the default programming.

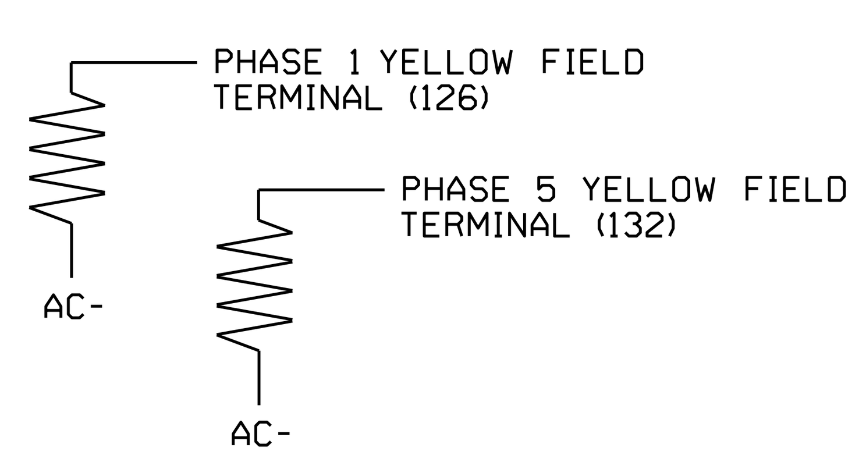
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGNS: 03-0172T1
03-0172
DESIGNED: July 2016
SEALED: 8/29/2016
REVISED: N/A

Electrical Detail - Temp 1 & Final - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 53 (Burgaw Highway)
at
SR 1212 (Pony Farm Road)/
SR 1113 (Murrill Hill Road)

Division 3 Onslow County Jacksonville

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

PLAN DATE: September 2016	REVIEWED BY: BAS
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036880 ENGINEER KEITH M. MIMS

DocuSigned by: Keith M. Mims 2F80786E8CD34A5... 9/29/2016 DATE

INVENTORY NO. 03-0172T1&FINAL

27-SEP-2016 08:10
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sarmstrong

LOGICAL I/O PROCESSOR PROGRAMMING DETAIL TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5 AND 6.

2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```
  LOGICAL I/O COMMAND #1  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON
AND RED CLEAR ON PHASE #1  IS ON

        SCROLL DOWN
THEN:
SET OUTPUT  ASSIGNMENT #50 ON
SET OUTPUT  ASSIGNMENT #51 OFF
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

PRESS '+'

```
  LOGICAL I/O COMMAND #2  (+/-COMMAND#)
IF  ACTIVE PHASE        #1  IS ON

        SCROLL DOWN
THEN:
SET OUTPUT  ASSIGNMENT #52 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

PRESS '+'

```
  LOGICAL I/O COMMAND #3  (+/-COMMAND#)
IF  YELLOW ON PHASE     #1  IS ON

        SCROLL DOWN
THEN:
SET OUTPUT  ASSIGNMENT #51 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

PRESS '+'

```
  LOGICAL I/O COMMAND #4  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON
AND RED CLEAR ON PHASE #5  IS ON

        SCROLL DOWN
THEN:
SET OUTPUT  ASSIGNMENT #42 ON
SET OUTPUT  ASSIGNMENT #43 OFF
```

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

PRESS '+'

```
  LOGICAL I/O COMMAND #5  (+/-COMMAND#)
IF  ACTIVE PHASE        #5  IS ON

        SCROLL DOWN
THEN:
SET OUTPUT  ASSIGNMENT #44 OFF
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

PRESS '+'

```
  LOGICAL I/O COMMAND #6  (+/-COMMAND#)
IF  YELLOW ON PHASE     #5  IS ON

        SCROLL DOWN
THEN:
SET OUTPUT  ASSIGNMENT #43 ON
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red
OUTPUT 43 = Overlap C Yellow
OUTPUT 44 = Overlap C Green
OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
 PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
 PHASE:         ¦12345678910111213141516
VEH OVL PARENTS:¦XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

PRESS '+' TWICE

```
 PAGE 1: VEHICLE OVERLAP 'C' SETTINGS
 PHASE:         ¦12345678910111213141516
VEH OVL PARENTS:¦    XX
VEH OVL NOT VEH:¦
VEH OVL NOT PED:¦
VEH OVL GRN EXT:¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  X GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

BACKUP PROTECTION NOTE

(program controller as shown below)

From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Program phases 2 and 6 for 'Backup Protect'. Make sure the Red Revert times shown on the Signal Design Plans are programmed in the 'Phase Timing' menu.

DELETE THIS PROGRAMMING IF IT IS PRESENT IN THE CONTROLLER.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGNS: 03-0172T1
03-0172
DESIGNED: July 2016
SEALED: 8/29/2016
REVISED: N/A

Electrical Detail - Temp 1 & Final - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 53 (Burgaw Highway)
at
SR 1212 (Pony Farm Road)/
SR 1113 (Murrill Hill Road)

Division 3 Onslow County Jacksonville

PLAN DATE: September 2016	REVIEWED BY: BAS
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

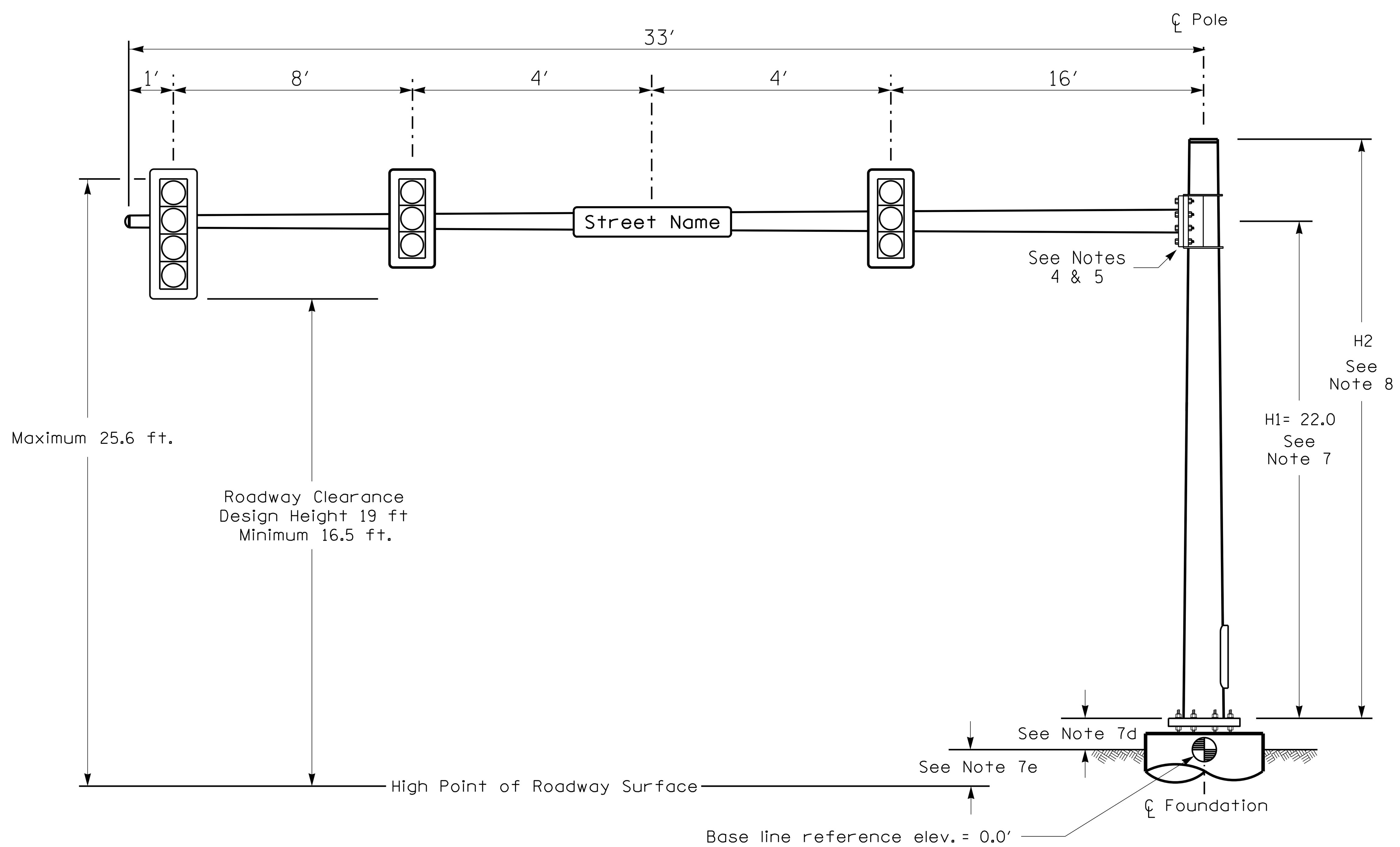
Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section, 750 N.Greenfield Pkwy,Garner,NC 27529

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036880 KEITH M. MIMS

DocuSigned by: Keith M. Mims 9/29/2016
2F80786E8CD34A5... DATE

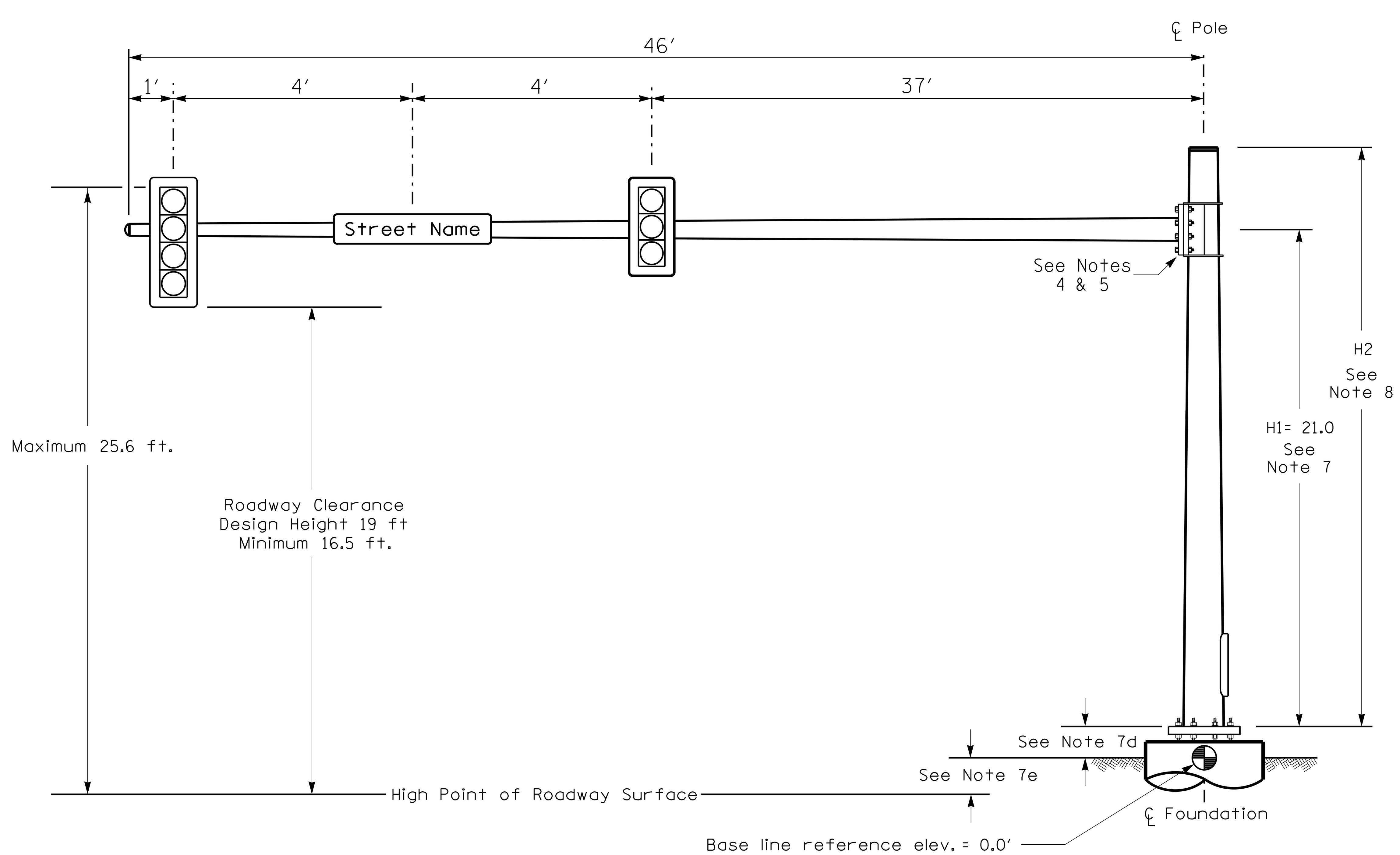
INVENTORY NO. 03-0172T1&FINAL

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



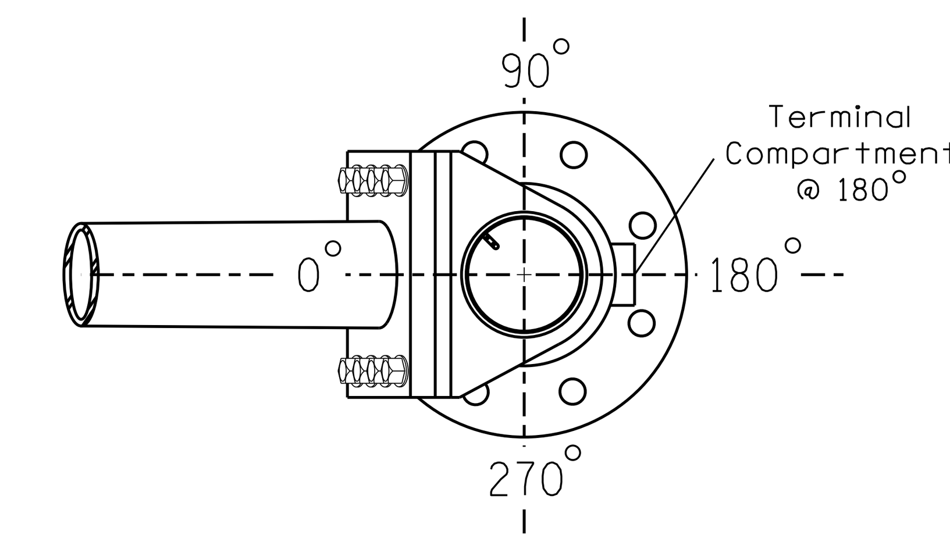
Elevation View

SPECIAL NOTE

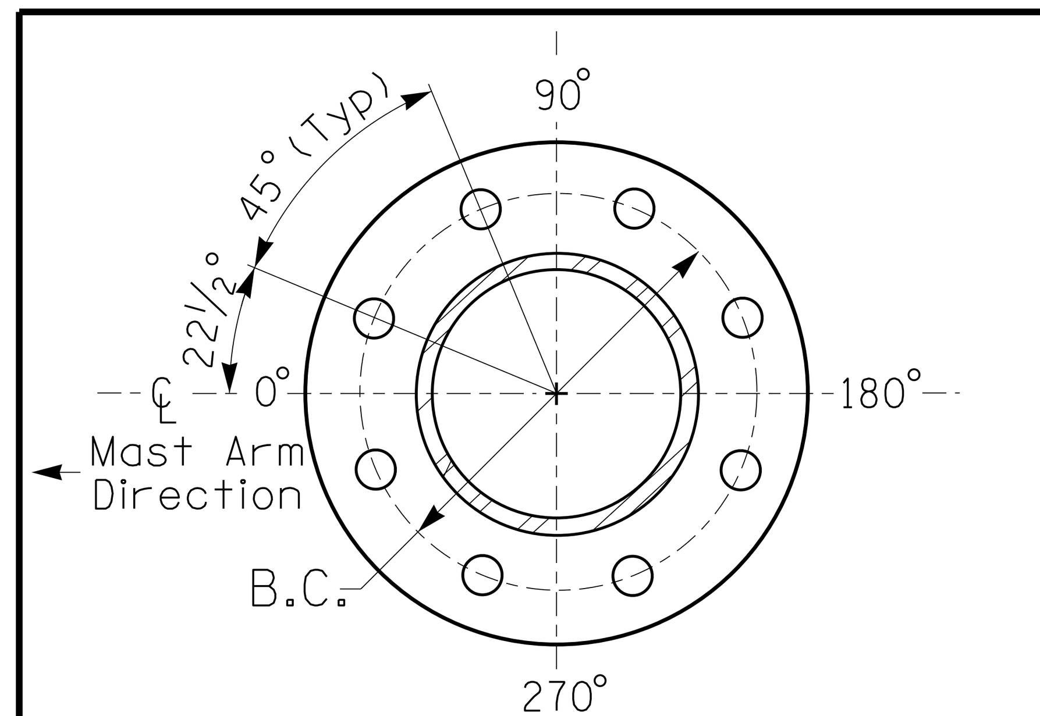
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.8 ft.	-0.4 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

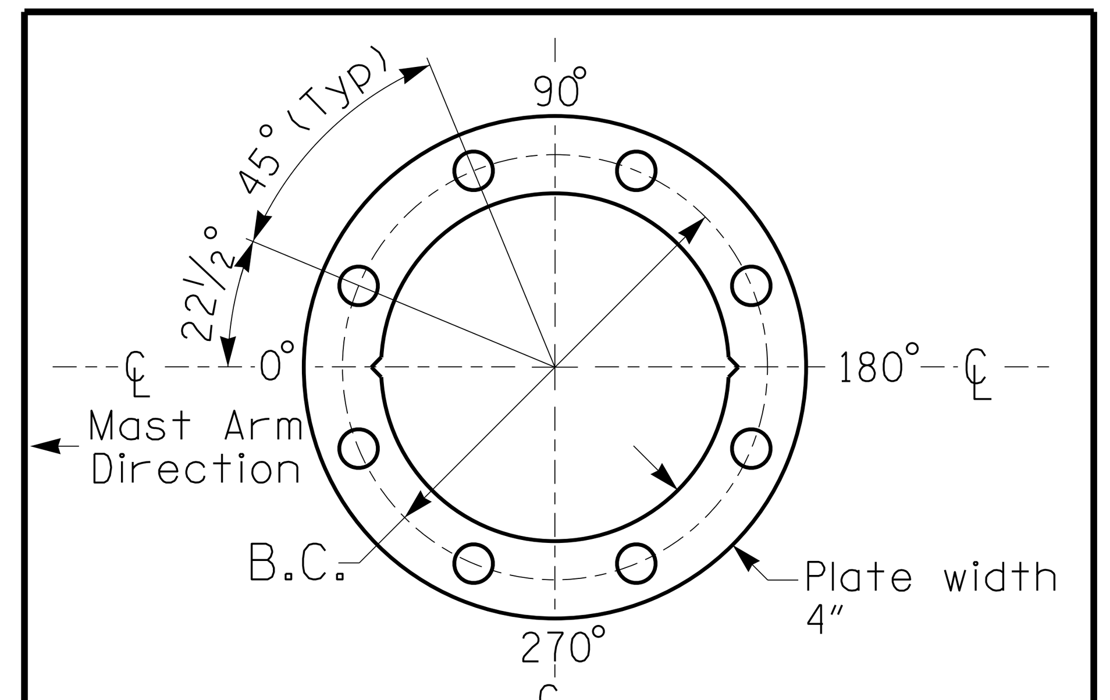


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 5th Edition 2009 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2012 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 2 (130 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 53 (Burgaw Highway) at SR 1212 (Pony Farm Road) / SR 1113 (Murrill Hill Road)

Division 3 Onslow County Jacksonville

PLAN DATE:	January 2016	REVIEWED BY:	JG
PREPARED BY:	pla	REVIEWED BY:	

SCALE: 0 N/A — N/A

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 029904 JASON P. GALLOWAY

DocuSigned by: Jason P. Galloway F700EA70481841D... DATE 9/29/2016

SIG. INVENTORY NO. 03-0172

29-SEP-2016 13:53
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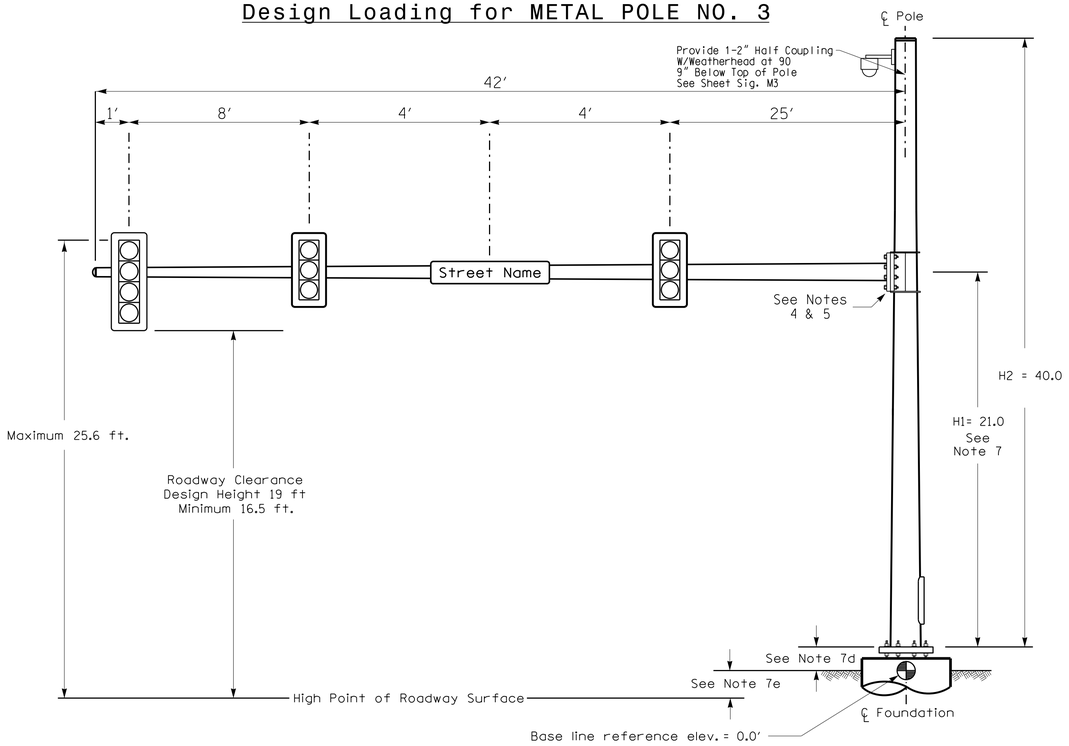
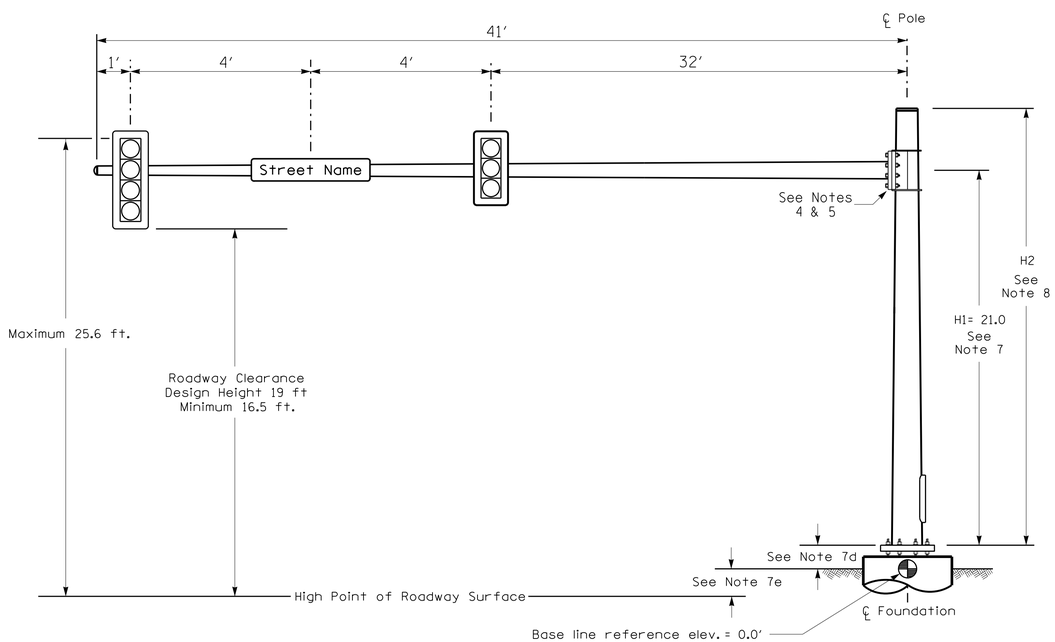
jrspence

Design Loading for METAL POLE NO. 3



Elevation View

Design Loading for METAL POLE NO. 2



Elevation View

29-SEP-2016 13:55
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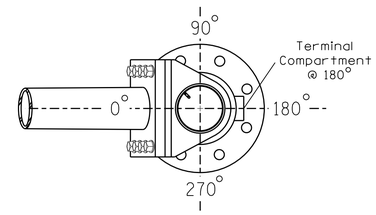
jrspence

SPECIAL NOTE

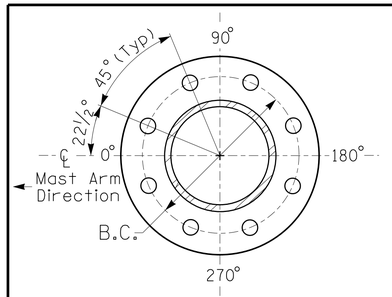
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at ⊕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-0.1 ft.	+0.4 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

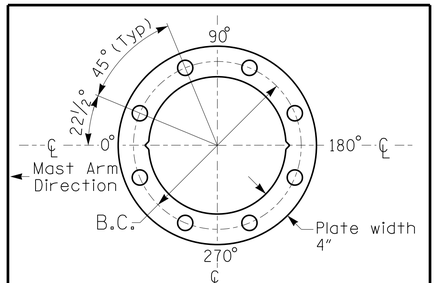


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

METAL POLE No. 3 and 4

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	Sig.2.5

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
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   - The 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
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   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
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   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 2 (130 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 53 (Burgaw Highway) at SR 1212 (Pony Farm Road)/ SR 1113 (Murrill Hill Road)

Division 3 Onslow County Jacksonville

PLAN DATE: January 2016 REVIEWED BY: JG

PREPARED BY: pla REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason P. Galloway 9/29/2016
F70DEA7D4618415D... DATE

SIG. INVENTORY NO. 03-0172

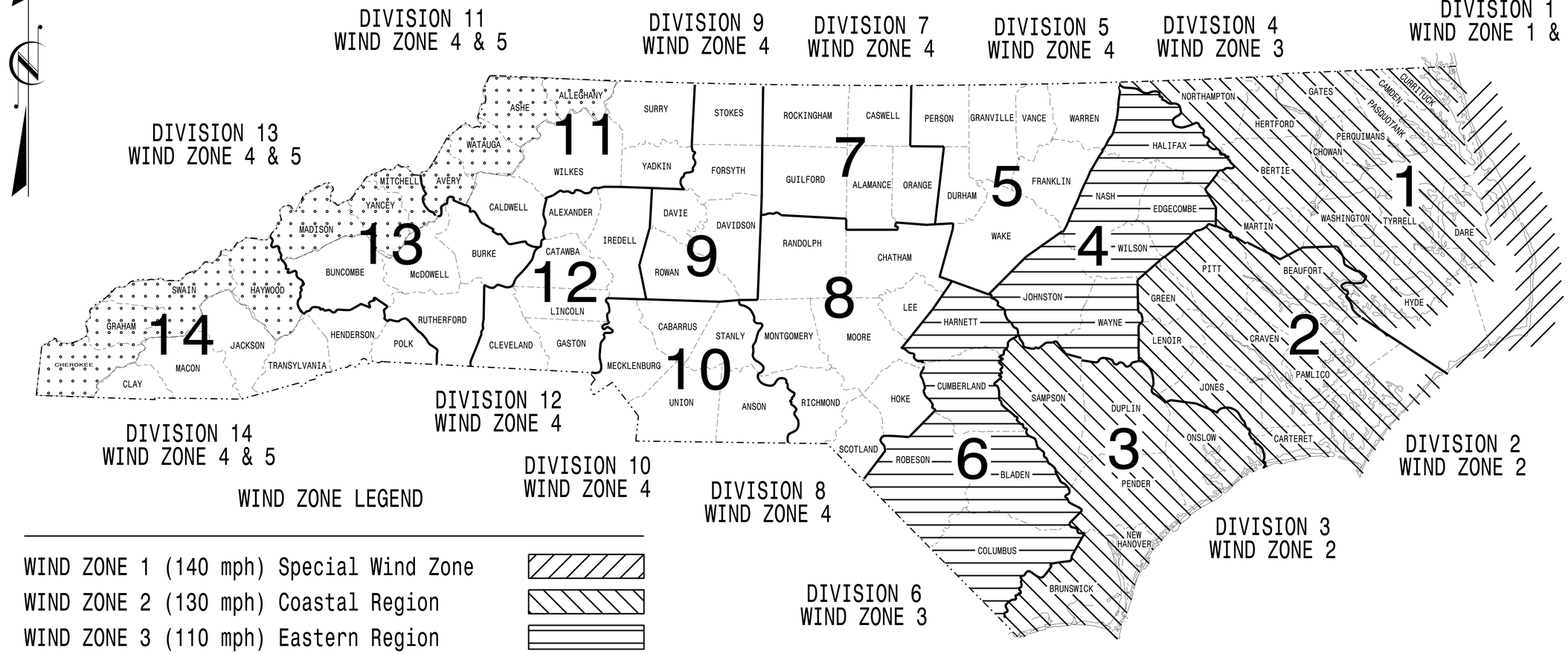
PROJECT I.D. NO.	SHEET NO.
R-5023B	Sig.M1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES

POLE STANDARDS

NCDOT METAL P



WIND ZONE LEGEND

WIND ZONE 1 (140 mph) Special Wind Zone	
WIND ZONE 2 (130 mph) Coastal Region	
WIND ZONE 3 (110 mph) Eastern Region	
WIND ZONE 4 (90 mph) Central & Mtn. Region	
WIND ZONE 5 (120 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
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

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

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

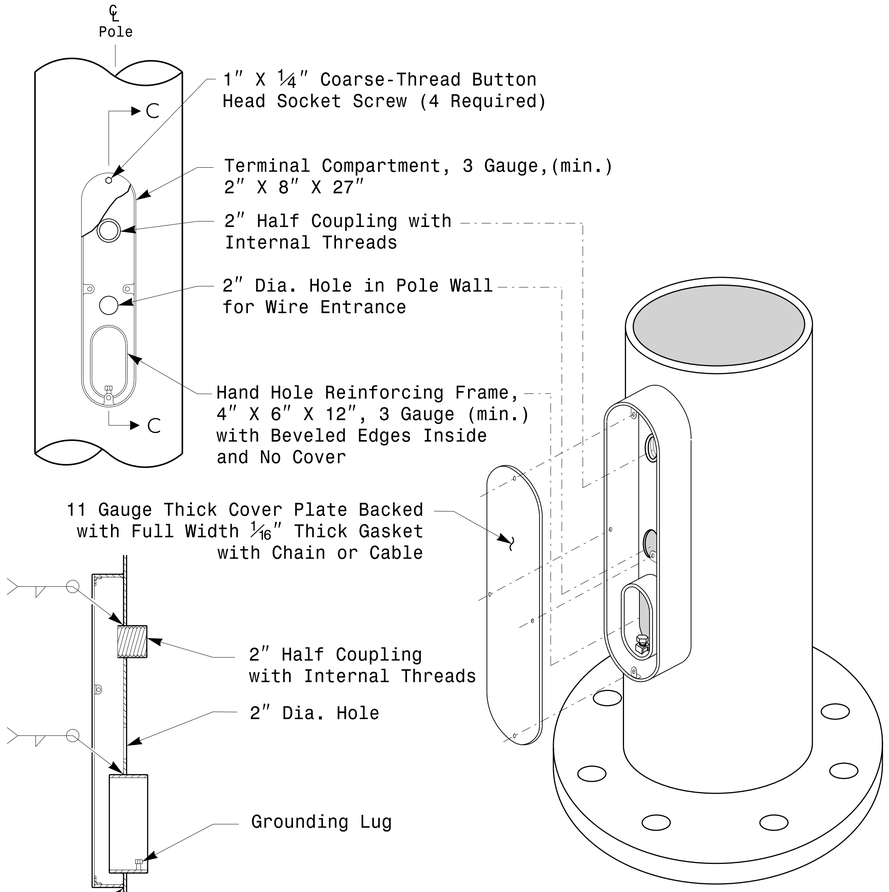
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar 44E8E32E7A764C4... SIGNATURE

2/17/2016 DATE

PROJECT ID. NO.	SHEET NO.
R-5023B	Sig.M2

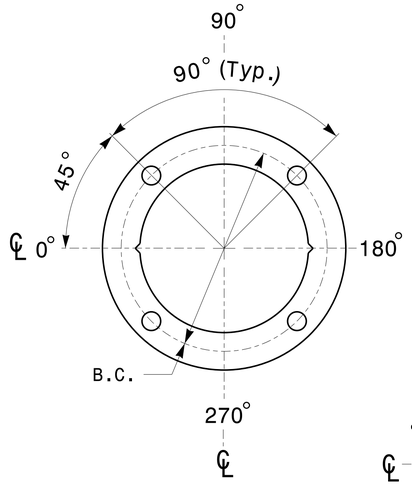
Fabrication Details – All Metal Poles



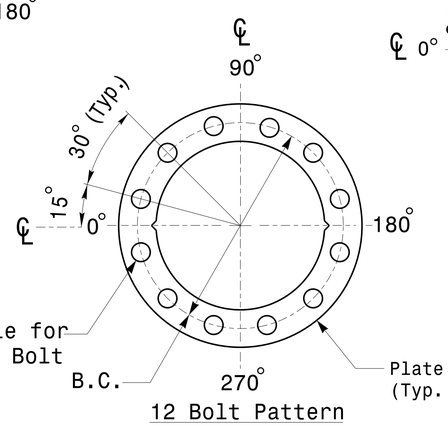
Section C-C

Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail

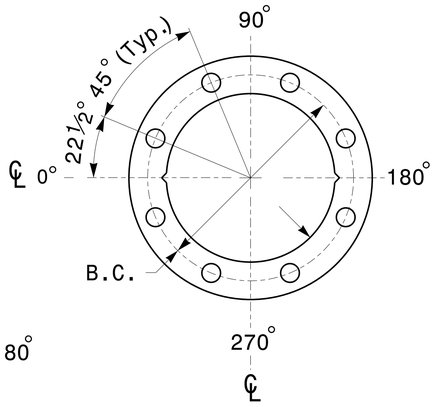


4 Bolt Pattern



2¼"" dia. hole for 2"dia. Anchor Bolt

12 Bolt Pattern



8 Bolt Pattern

Plate Width = 4″ min. (Typ. for all plates)

Construct Templates and Plates from ¼″ 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.	_ _ _ _ _ _ _ _

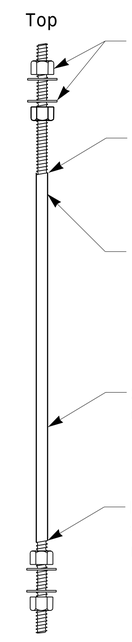
Shaft I.D. Tag
(Provide on Shaft of Strain Poles and Mast Arm Poles Shaft)

MFG _____ MFG. DATE: MM/YY	
SECTION D/T/L/Y	----/----/----/----
NCDOT SIG. INV. NO.	_ _ _ _ _ _ _ _
NCDOT POLE NO.	_ _ _ _ _ _ _ _

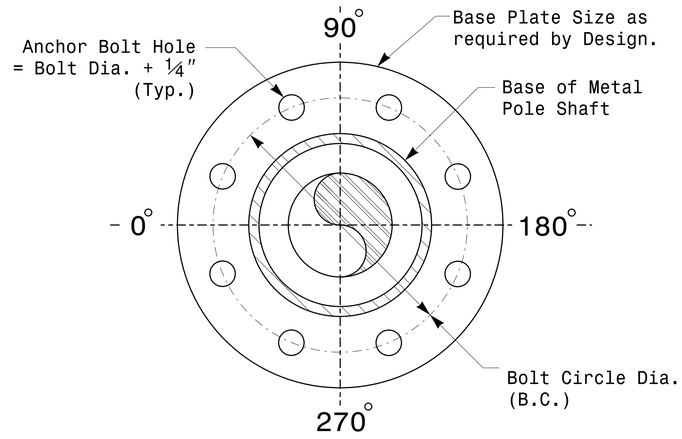
Arm I.D. Tag
(Provide on each section of a multi-section mast arm.)

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 Custom Design, use "NCDOT STANDARD" line for Signal Inv. Number and pole I.D. number
5) 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, North Carolina Department of Transportation, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE: 0 NA — NONE

Typical Fabrication Details For All Metal Poles

PLAN DATE: FEBRUARY 2016	DESIGNED BY: C.F.ANDREWS
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR

REVISIONS	INIT.	DATE

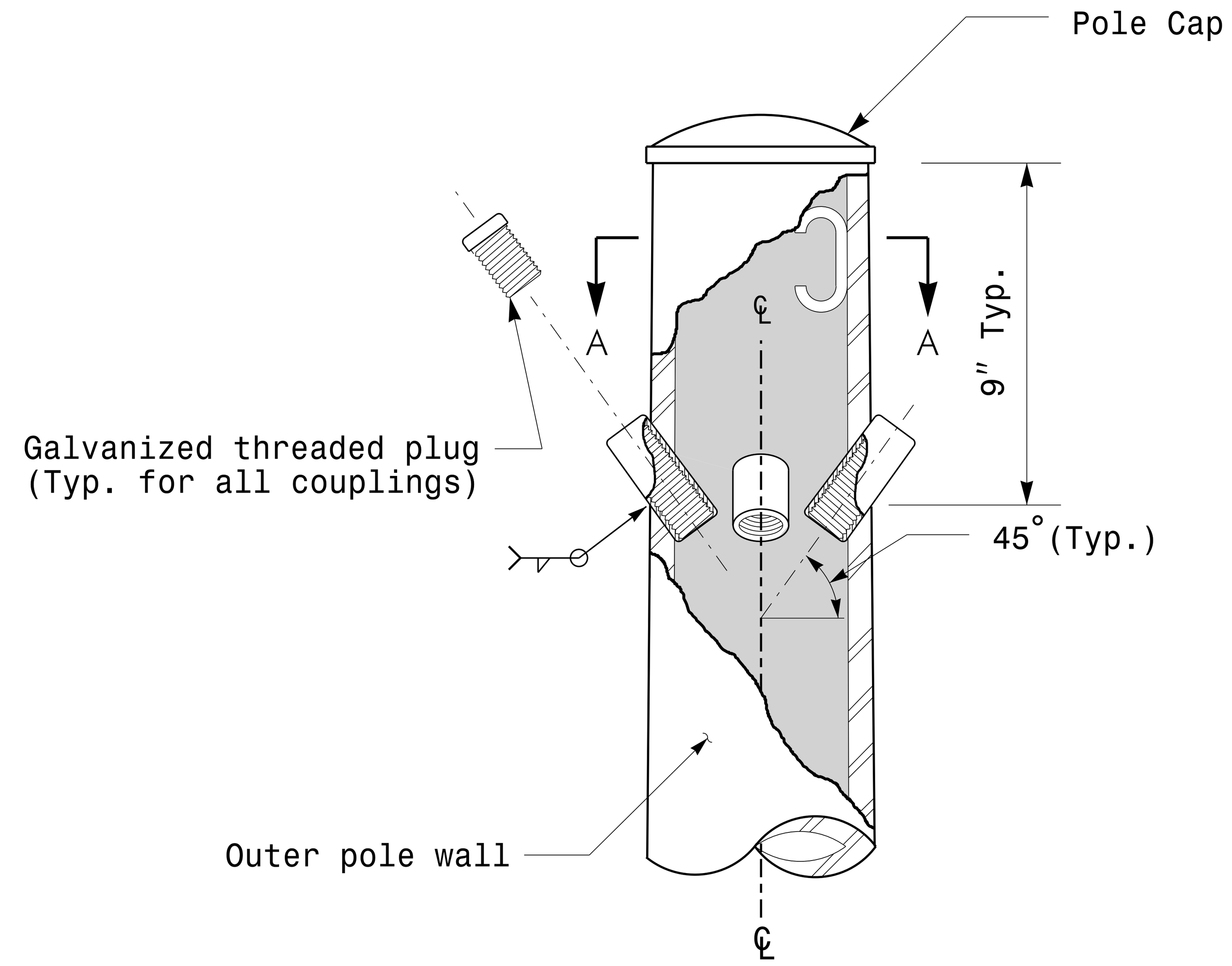
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar
SIGNATURE 44E8E32E147E4C4...
2/17/2016
DATE

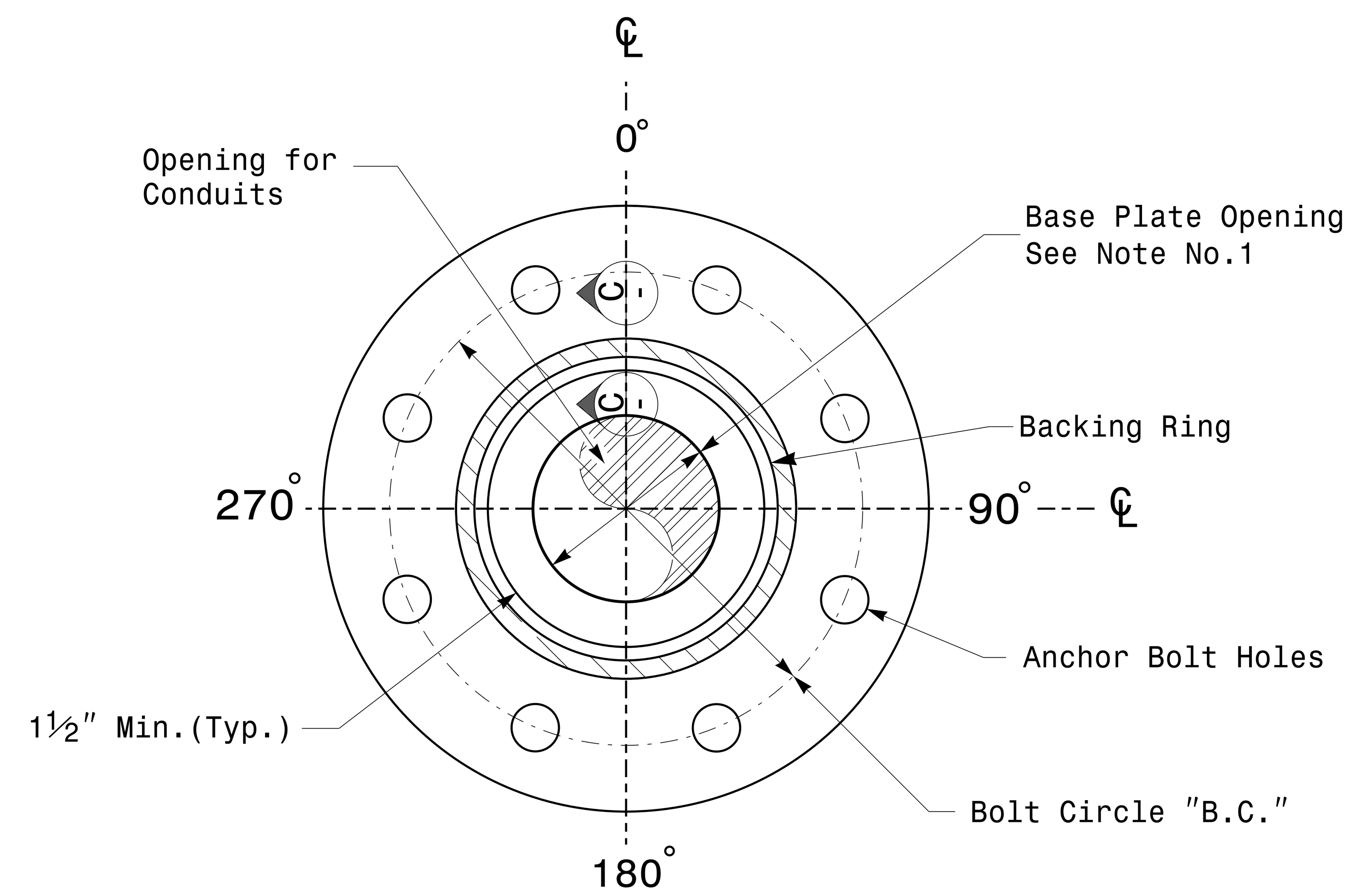
17-FEB-2016 16:02
S:\NITSASW\ITS Signals\Signal Design Section\Eastern Region\MM Sheets\2016\2014 Sig.M2 Std. Fabrication Details-All Poles..dgn
jgallaway

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″.

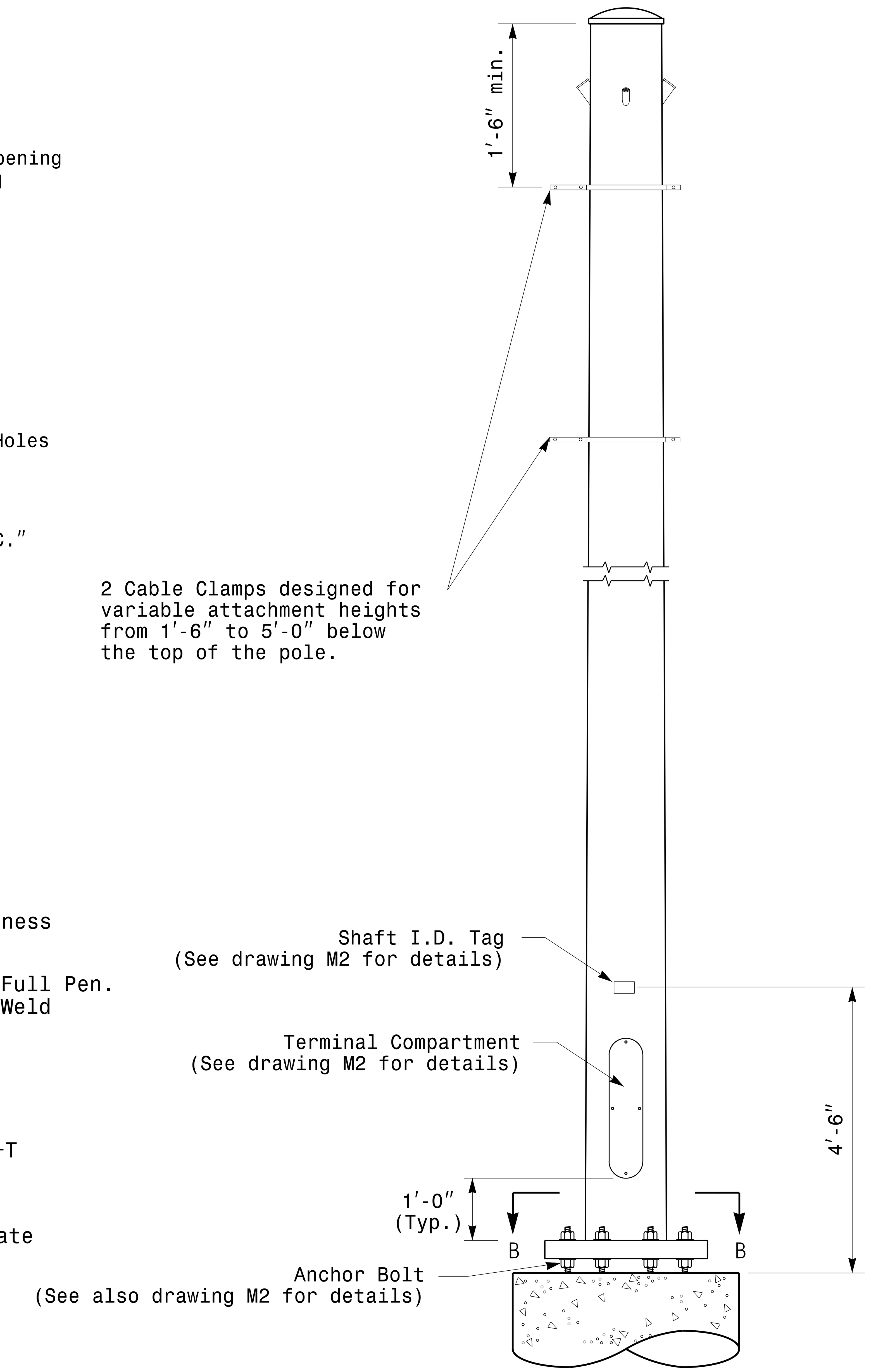


Cable Entrances at Top of Pole

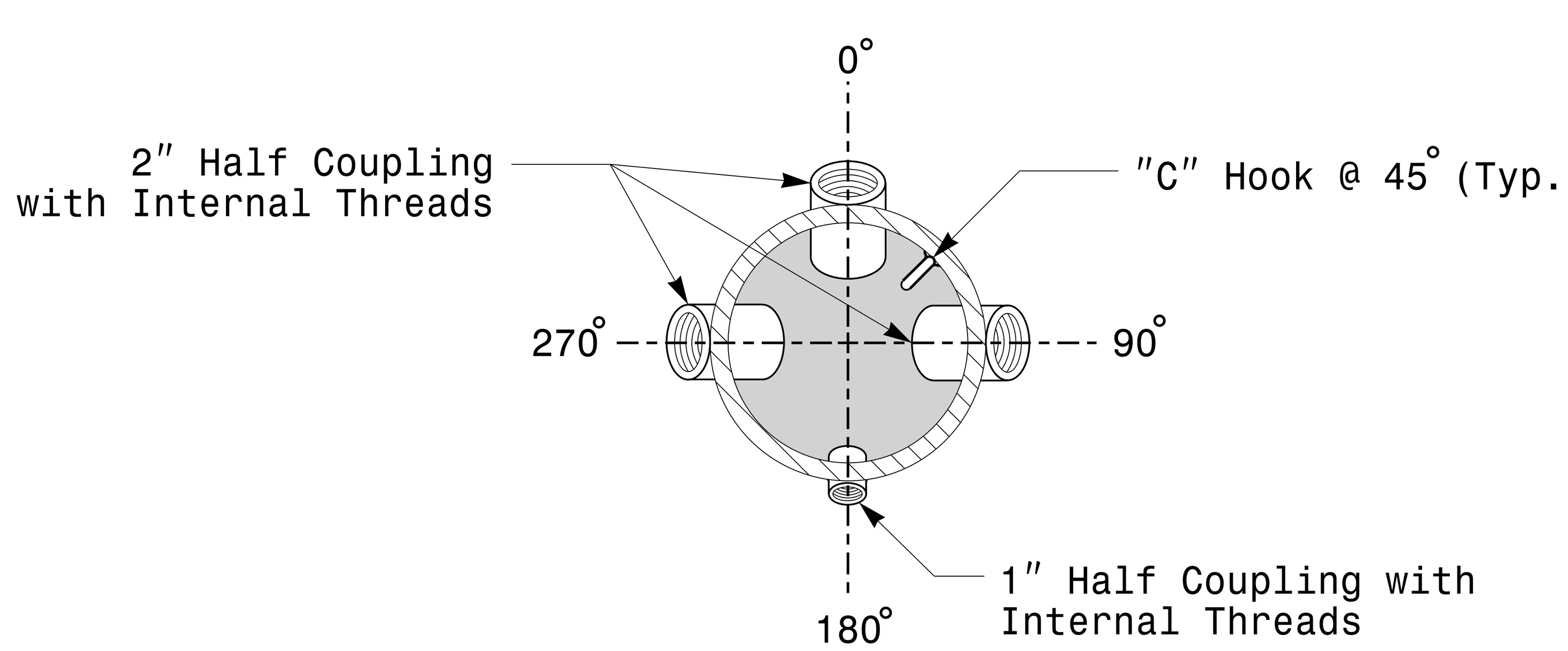


Section B-B

Pole Base Plate Details
(8 and 12 Bolt Pattern)

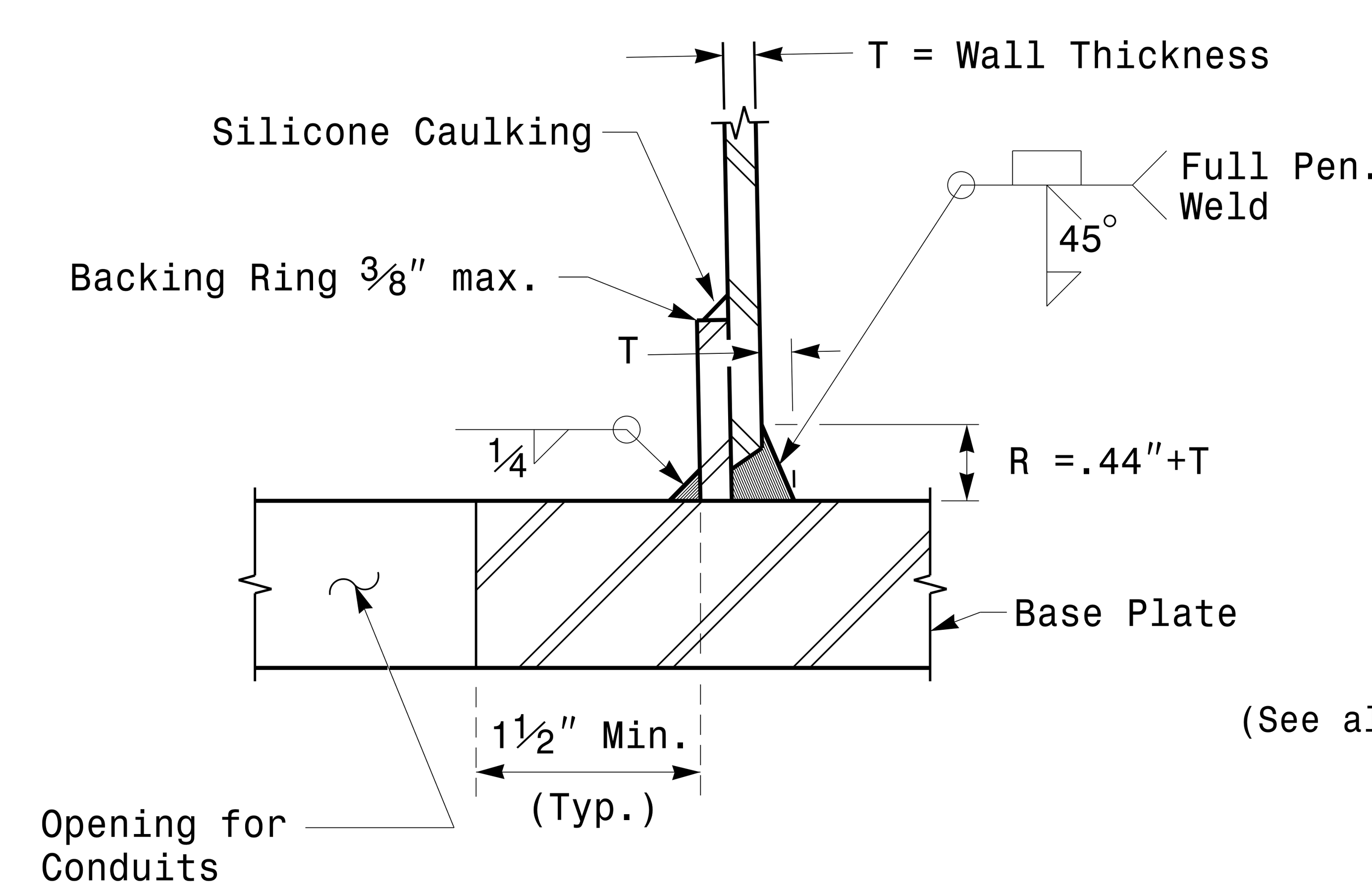


Monotube Strain Pole



Section A-A

Radial Orientation for 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:	FEBRUARY 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

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Debesh C. Sarkar
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2/17/2016
DATE

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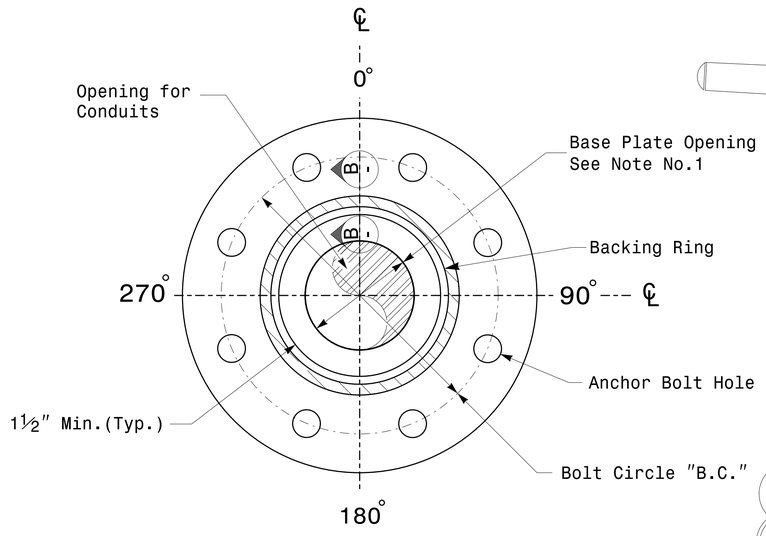
jgalloway

PROJECT ID. NO.	SHEET NO.
R-5023B	Sig.M4

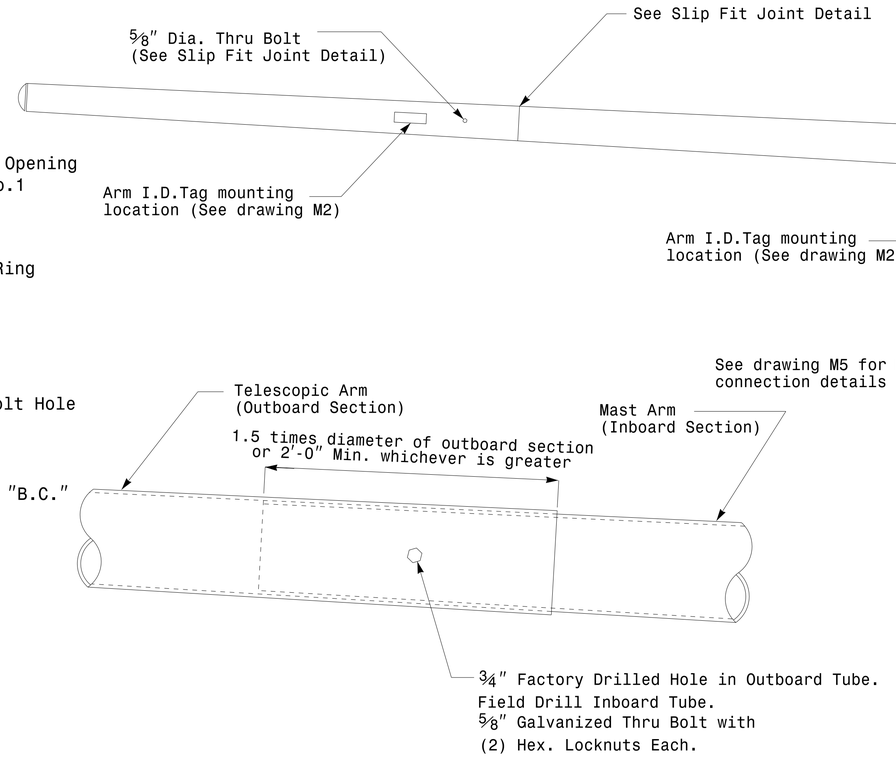
Fabrication Details – Mast Arm Poles

Note:
1. Opening in pole base plate shall be equal to pole base inside diameter minus 3½" but shall not be less than 8½".



Section A-A

Pole Base Plate Details

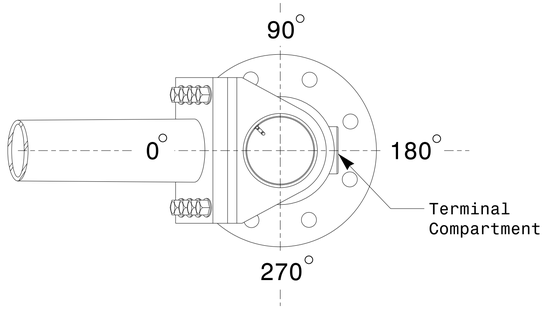


Slip Fit Joint Detail for Mast Arm

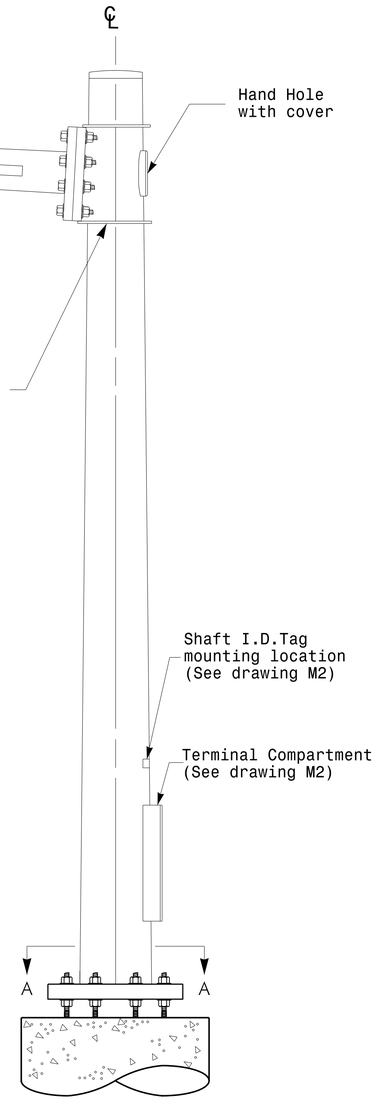
Section B-B

(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail



Mast Arm Radial Orientation



Mast Arm Pole

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:	FEBRUARY 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

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2/17/2016
DATE

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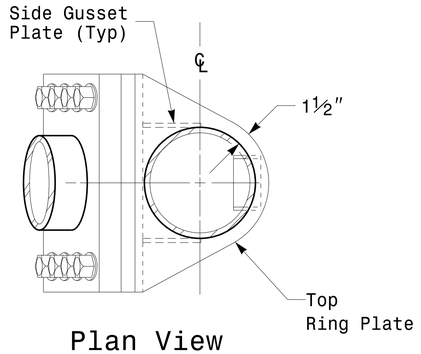
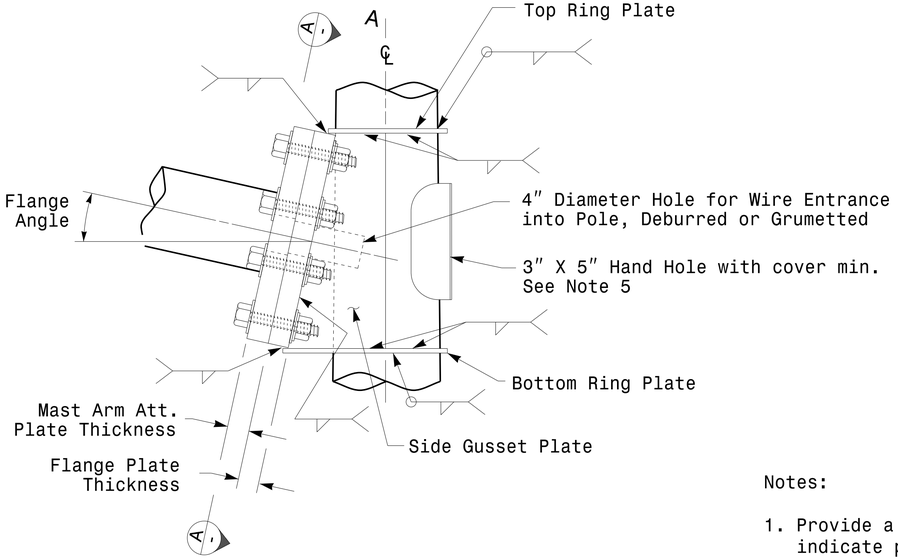
jgulloney

Welded Ring Stiffened Mast Arm Connection

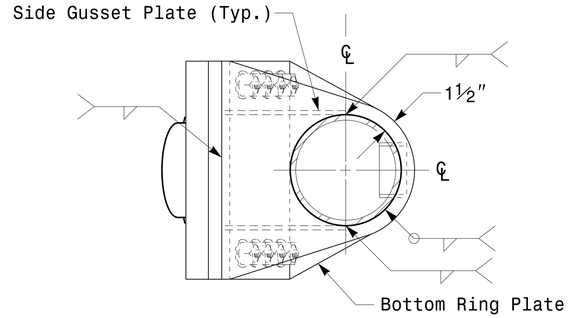
PROJECT ID. NO.	SHEET NO.
R-5023B	Sig.M5



Plan View



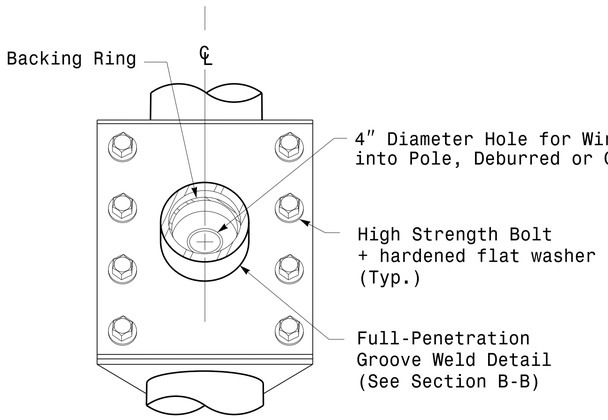
Side Elevation View



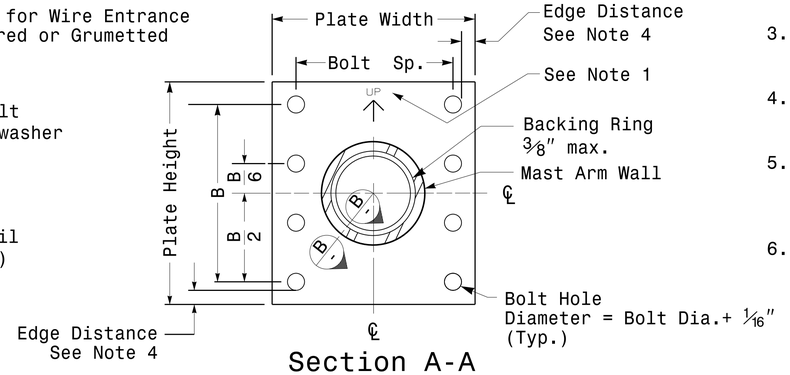
Bottom View

Notes:

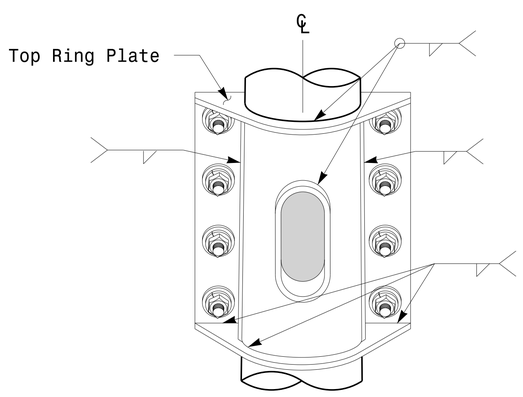
1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
3. Fabricator is responsible for providing appropriate holes at drainage points to drain galvanizing materials.
4. For minimum edge distance follow AISC Table J3.4 and J3.5. For nominal bolt hole size use Table J3.3.
5. Provide upper handhole as necessary when shaft extensions are reguired 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.



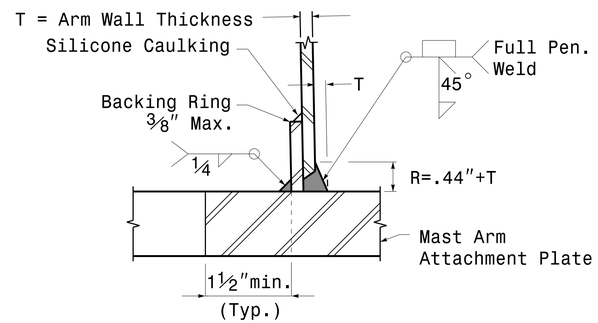
Front Elevation View



Section A-A
Mast Arm Attachment Plate



Back Elevation View



Section B-B
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

Typical Fabrication Details For Mast Arm Connection To Pole

PLAN DATE:	FEBRUARY 2016	DESIGNED BY:	C.F.ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE 0 NA NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

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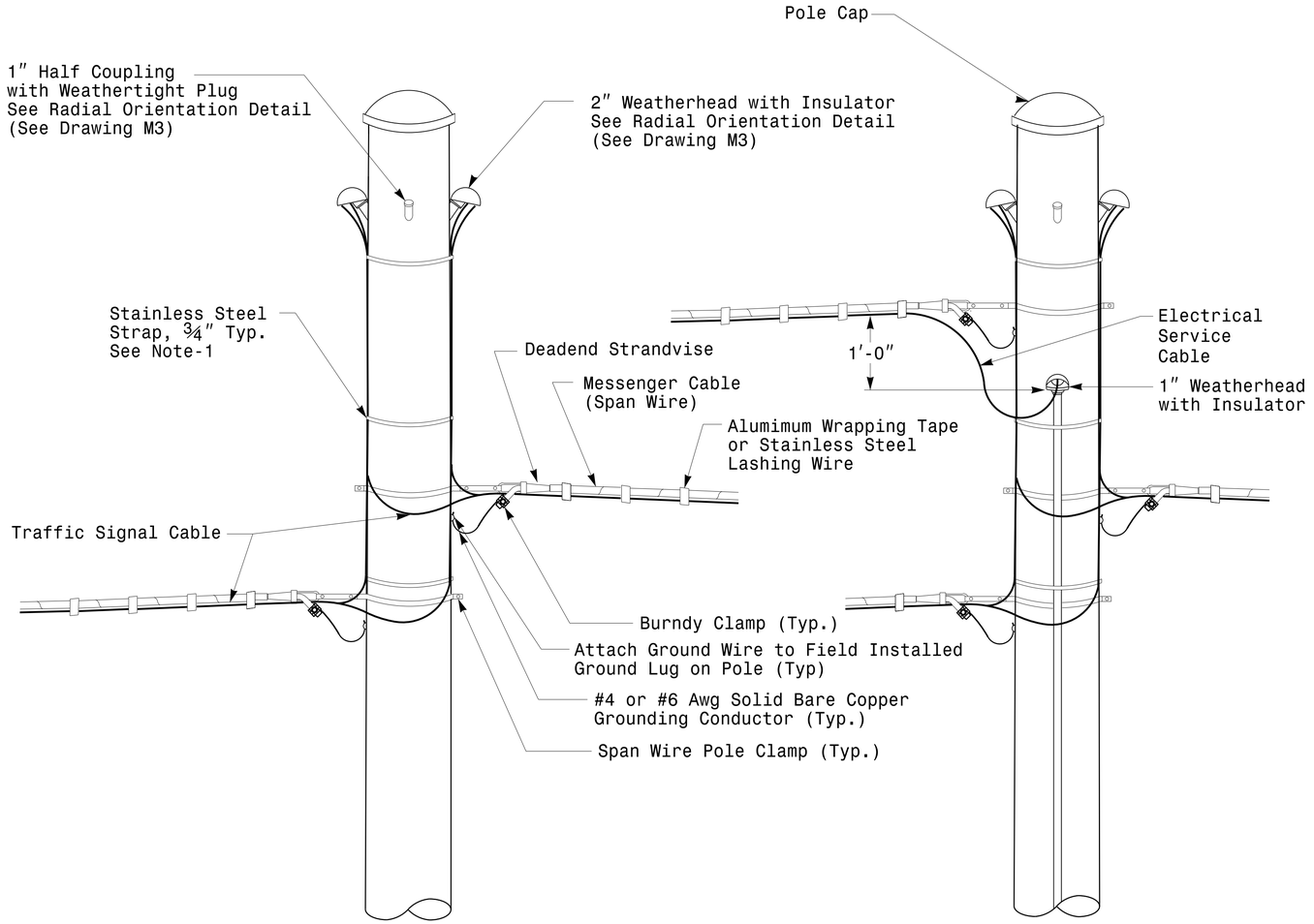
DATE

Fabrication Details — Mast Arm Connection

PROJECT ID. NO.	SHEET NO.
R-5023B	Sig.M6

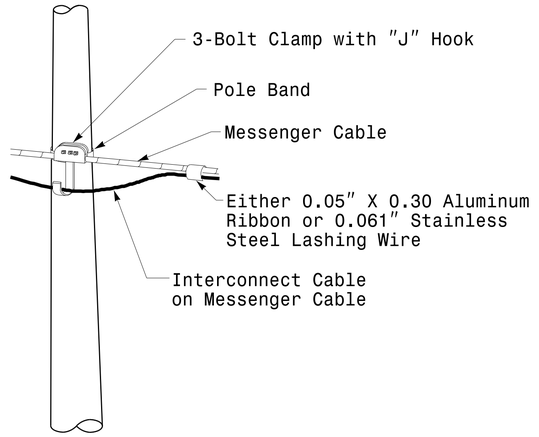
Fabrication Details – Strain Pole Attachments



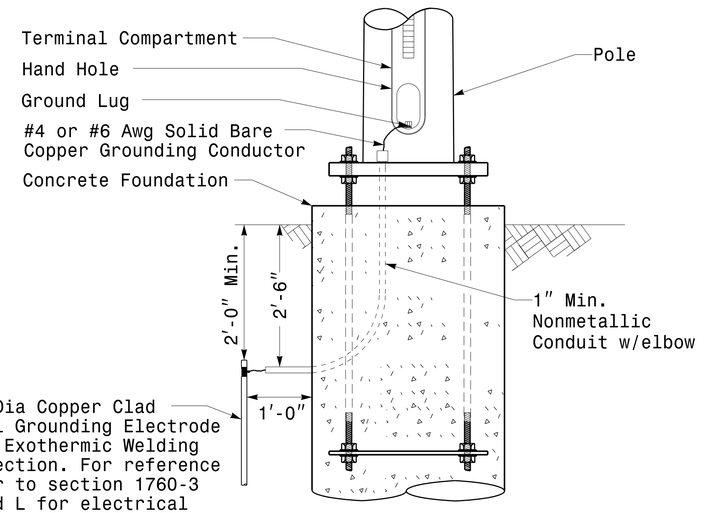
Strain Pole Attachments

NOTE:

1. Strap all signal cables to the side of the pole with ¾″ stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 3′-0″.
2. Provide minimum two spanwire 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 2012.



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:	FEBRUARY 2016	DESIGNED BY:	C.F.ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

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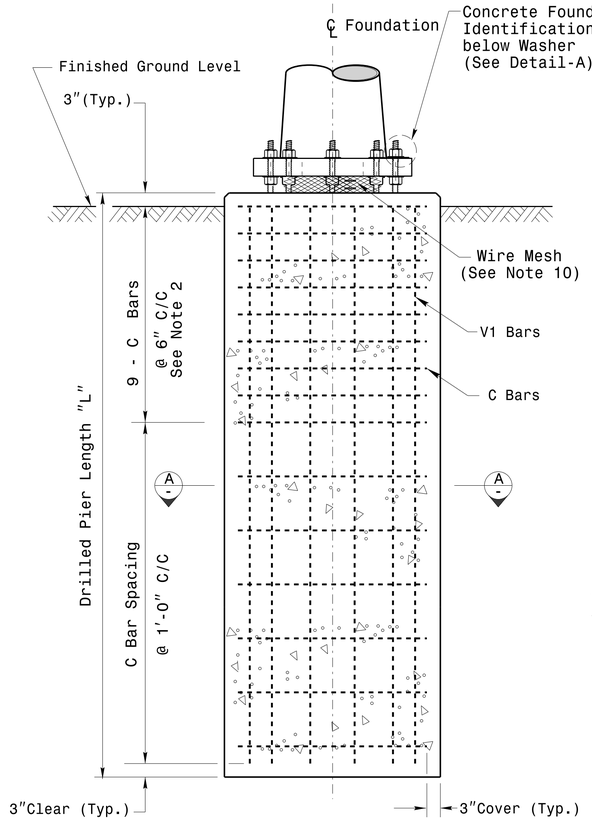
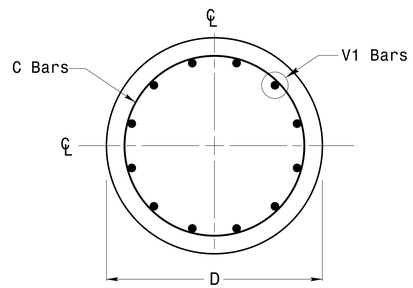
PROJECT ID. NO.	SHEET NO.
R-5023B	Sig.M7

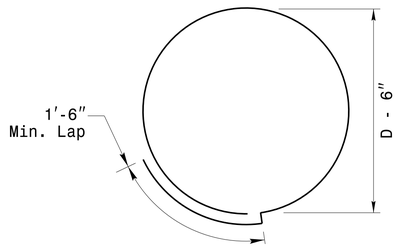
Construction Details – Foundations



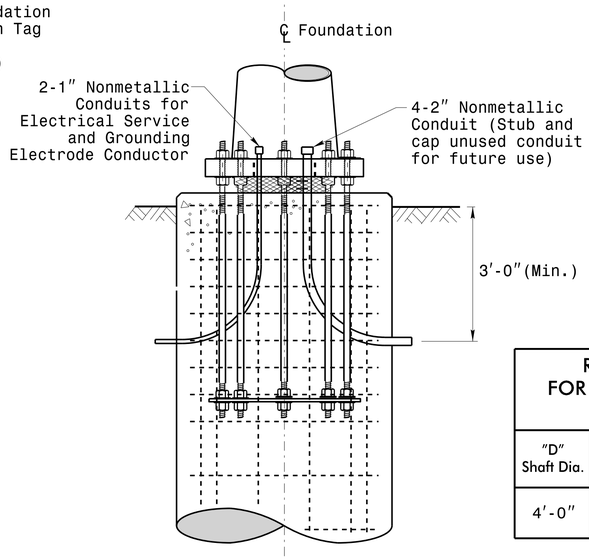
Concrete Shaft Elevation



Section A-A



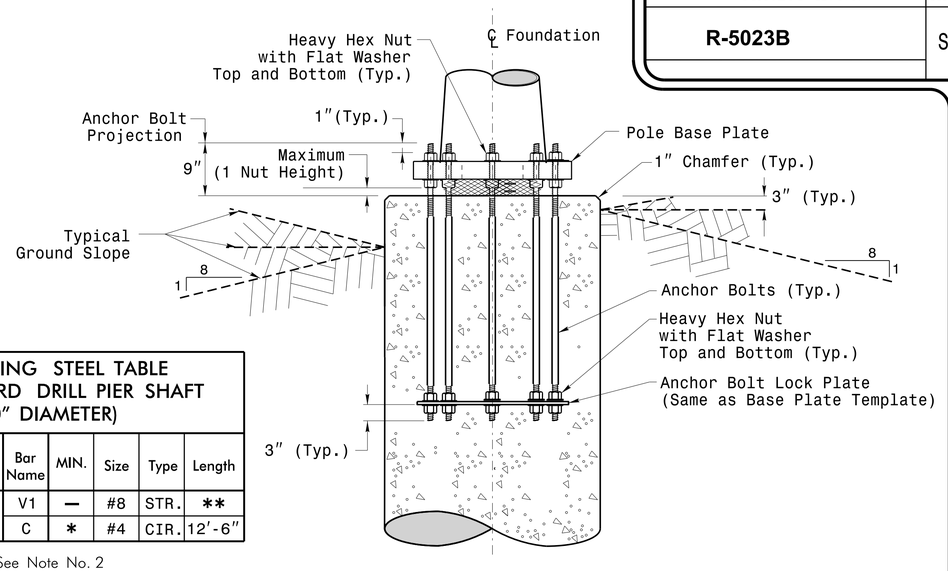
Typical "C" Bar Detail



Typical Foundation Conduit Details

REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4′–0″ DIAMETER)						
"D" Shaft Dia.	Conc. Volume (cu. yds.)	Bar Name	MIN.	Size	Type	Length
4′-0″	.465 x L	V1	—	#8	STR.	**
		C	*	#4	CIR.	12′-6″

* See Note No. 2
** See Note No. 3



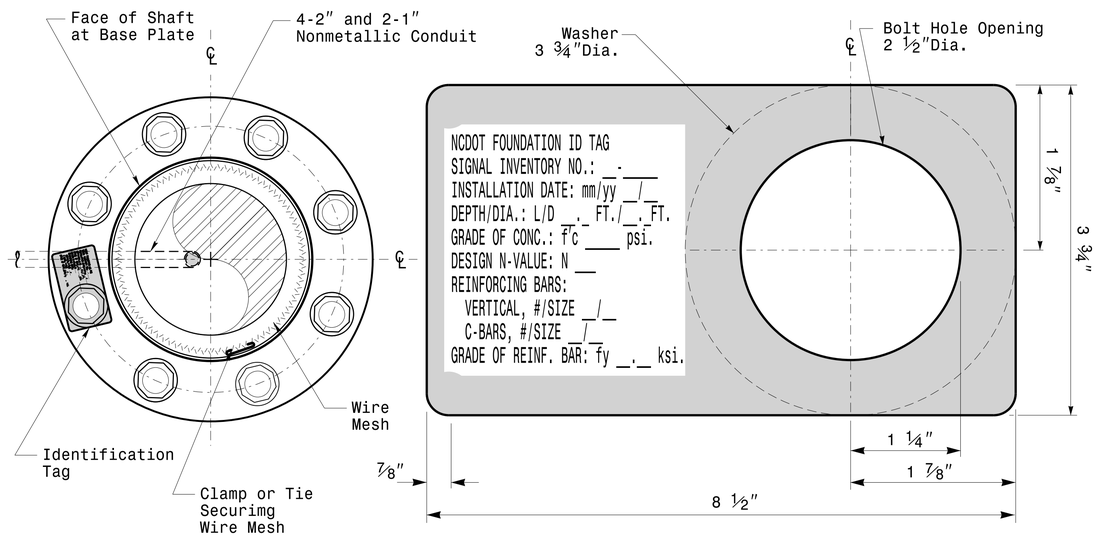
Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)

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 2012 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 the Identification Tag on the top of the base plate, directly above the conduit's entry point.
10. Provide two layers of galvanized welded 23 gauge (0.25) 6″ wide 4 mesh wire 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

Construction Details For Foundations

PLAN DATE:	FEBRUARY 2016	DESIGNED BY:	C.B.COGDELL
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REV. NO.	COMMENTS	INIT.	DATE
1	Revised Foundation Tag Details	N.B.	5/11/2015

SCALE: 0 NA — NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

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Debesh C. Sarkar
SIGNATURE 44E8E32E147E4C4...
2/17/2016
DATE

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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.)
WIND ZONE 1	LIGHT	S26L3	26	25	2	11	270	19	13	10	8	17	14.5	12.5	8	12	4	12
		S30L3	30	25	2	11	300	19.5	13.5	10	8	17.5	15	13	8	14	4	12
		S35L3	35	25	3	11	320	20	13.5	10.5	8	17.5	15	13	8	14	4	12
	HEAVY	S30H3	30	29	3	16	450	24.5	16	12	9	21	17.5	15	8	16	4	6
		S35H3	35	29	4	16	515	26	17	12.5	9.5	22	18.5	16	8	16	4	6
WIND ZONE 2	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
WIND ZONE 3	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
WIND ZONE 4	LIGHT	S26L1	26	22	2	8	190	16	11.5	8.5	8	15	12.5	11	8	12	4	12
		S30L1	30	22	2	8	205	16.5	11.5	9	8	15	13	11.5	8	12	4	12
		S35L1	35	22	3	8	230	17	12	9	8	15.5	13.5	11.5	8	12	4	12
	HEAVY	S30H1	30	25	3	12	320	20.5	13.5	10.5	8	18	15	13.5	8	16	4	6
		S35H1	35	25	4	12	350	21	14	10.5	8.5	18.5	15.5	13.5	8	16	4	6
WIND ZONE 5	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6

48" Dia. Foundations 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 design CSR of 1.00.
2. Use chairs and spacers to maintain proper clearance.
3. For foundation, always use air-entrain 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 M 1 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 for Reference Drilled Shafts.

PROJECT ID. NO.	SHEET NO.
R-5023B	Sig.M8

Standard Strain Pole Foundation–All Soil Condition

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

Standard Strain Pole Foundation for All Soil Conditions

PLAN DATE:	FEBRUARY 2016	DESIGNED BY:	C.B. COGDELL
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE
Changed "Foundation Depth" to "Drilled Pier Length"in Conc. Eqn.	N.B.	7/12/2015

SCALE: 0 NA NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

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DATE

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jgallaway

PROJECT REFERENCE NO.	SHEET NO.
R-5023B	SCP 1

1. INSTALL SMFO CABLE
2. INSTALL FIBER OPTIC DROP CABLE
3. INSTALL TRACER WIRE
4. REUSE EXISTING SMFO CABLE
5. INSTALL PLENUM RATED SMFO CABLE
6. INSTALL LOOP LEAD–IN CABLE
7. INSTALL ETHERNET CABLE BETWEEN ETHERNET SWITCH AND CONTROLLER

1. INSTALL PVC CONDUIT
2. INSTALL POLYETHYLENE CONDUIT
3. INSTALL RIGID, GALVANIZED STEEL CONDUIT
4. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
5. INSTALL RIGID, GALVANIZED STEEL RISER WITH HEAT SHRINK TUBING
6. TRENCH CONDUIT
7. DIRECTIONAL DRILL CONDUIT
8. BORE AND JACK CONDUIT
9. INSTALL CABLE(S) IN EXISTING CONDUIT
10. INSTALL CABLE(S) IN NEW CONDUIT
11. INSTALL CABLE(S) IN EXISTING RISER
12. INSTALL CABLE(S) IN NEW RISER
13. INSTALL NEW CABLE(S) IN EXISTING CONDUIT STUBOUTS
14. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUBOUTS WHERE AVAILABLE)
15. INSTALL NEW RISER INTO POLE MOUNTED CABINET
16. REPLACE EXISTING WEATHERHEAD WITH HEAT SHRINK TUBING
17. INSTALL RIGID METAL CONDUIT INTO POLE MOUNTED CABINET

1. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS, AND FUSION SPLICE CABLE IN CABINET
2. INSTALL UNDERGROUND SPLICE ENCLOSURE
3. INSTALL AERIAL SPLICE ENCLOSURE
4. MODIFY EXISTING SPLICE ENCLOSURE OR INTERCONNECT CENTER
5. INSTALL TERMINAL SPLICE BOX

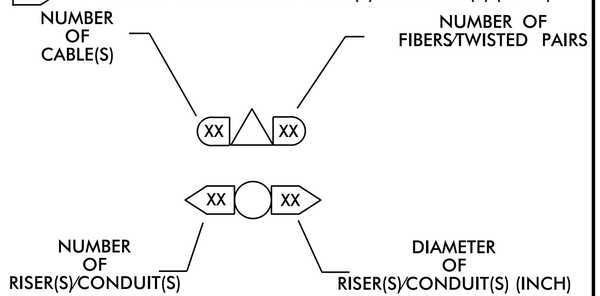
1. INSTALL CABINET FOUNDATION
2. REMOVE EXISTING CABINET FOUNDATION
3. MODIFY EXISTING CABINET FOUNDATION
4. REMOVE EXISTING CONTROLLER AND CABINET
5. INSTALL NEW CONTROLLER
6. INSTALL NEW 332 BASE MOUNTED CABINET
7. INSTALL NEW 336S BASE MOUNTED CABINET
8. INSTALL NEW 336S POLE MOUNTED CABINET
9. INSTALL BASE ADAPTER
10. INSTALL PRE–FORMED CABINET FOUNDATION PAD
11. INSTALL STANDARD JUNCTION BOX
12. INSTALL OVERSIZED HEAVY–DUTY JUNCTION BOX
13. INSTALL SPECIAL OVERSIZED HEAVY–DUTY JUNCTION BOX
14. INSTALL WOOD POLE
15. REMOVE EXISTING WOOD POLE
16. INSTALL AERIAL GUY ASSEMBLY
17. INSTALL STANDARD GUY ASSEMBLY
18. INSTALL SIDEWALK GUY ASSEMBLY
19. INSTALL MESSENGER CABLE
20. REMOVE EXISTING COMMUNICATIONS CABLE AND MESSENGER CABLE
21. REMOVE EXISTING COMMUNICATIONS CABLE
22. LASH CABLE(S) TO EXISTING SIGNAL/ COMMUNICATIONS CABLE
23. LASH CABLE(S) TO EXISTING MESSENGER CABLE
24. LASH CABLE(S) TO NEW MESSENGER CABLE
25. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF EACH CABLE
26. STORE 30 FEET OF EACH COMMUNICATIONS CABLE
27. STORE 100 FEET OF EACH COMMUNICATIONS CABLE
28. INSTALL FIBER OPTIC DELINEATOR MARKER
29. BOND MESSENGER CABLE TO POLE GROUND
30. MODIFY EXISTING ELECTRICAL SERVICE
31. INSTALL NEW ELECTRICAL SERVICE
32. INSTALL FEEDER CIRCUITRY
33. INSTALL GENERATOR ANCHOR IN FOUNDATION
34. RECONNECT EMERGENCY VEHICLE PREEMPTION EQUIPMENT
35. RECONNECT GENERATOR POWER INLET BOX
36. INSTALL HD CCTV CAMERA ASSEMBLY
37. INSTALL SMALL DMS ASSEMBLY
38. INSTALL LARGE DMS ASSEMBLY
39. INSTALL PEDESTAL STRUCTURE FOR SMALL DMS
40. INSTALL PEDESTAL STRUCTURE FOR LARGE DMS
41. INSTALL ETHERNET SWITCH
42. INSTALL VIDEO CODEC UNIT
43. REMOVE EXISTING FIBER OPTIC TRANSCEIVER
44. INSTALL CELLULAR MODEM
45. INSTALL FIBER OPTIC TRANSCEIVER (CONTACT CLOSURE)
46. INSTALL 2.4/5.8 GHz RADIO TRANSCEIVER
47. INSTALL PANEL ANTENNA
48. INSTALL OMNI–DIRECTIONAL ANTENNA
49. REMOVE EXISTING WIRELESS HARDWARE
50. INSTALL NEW EMERGENCY VEHICLE PREEMPTION EQUIPMENT
51. INSTALL POE DRIVER FOR HD CCTV CAMERA
52. INSTALL HD CCTV POE ETHERNET CABLE
53. INSTALL ANTENNA CABLE
54. INSTALL DMS CONTROLLER
55. INSTALL SOLAR POWER ASSEMBLY
56. BOND RISER TO POLE GROUND
57. BOND TRACER WIRE TO EQUIPMENT GROUND BUS

LEGEND

- NEW FIBER OPTIC COMMUNICATIONS CABLE (FO)
- EXISTING COMMUNICATIONS CABLE (EXI)
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW DIRECTIONAL DRILLED CONDUIT (DD)
- NEW BORED AND JACKED CONDUIT (B&J)
- EXISTING GUARDRAIL
- NEW GUARDRAIL
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING WOOD POLE
- NEW SPLICE ENCLOSURE (S)
- EXISTING AERIAL SPLICE ENCLOSURE AND DROP CABLE (S)
- NEW METAL POLE
- EXISTING METAL POLE
- EXISTING MAST ARM METAL POLE
- NEW CCTV CAMERA ASSEMBLY
- EXISTING CCTV CAMERA ASSEMBLY
- NEW DYNAMIC MESSAGE SIGN (DMS)
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- NEW WIRELESS ANTENNA AND TRANSCEIVER
- NEW BASE MOUNTED EQUIPMENT CABINET
- EXISTING BASE MOUNTED EQUIPMENT CABINET
- NEW POLE MOUNTED EQUIPMENT CABINET
- EXISTING/RELOCATED POLE MOUNTED EQUIPMENT CABINET
- NEW SYSTEM DETECTOR
- EXISTING SYSTEM DETECTOR
- XX–XXXX SIGNAL INVENTORY NUMBER

CONSTRUCTION NOTE SYMBOLOGY KEY

- XX (circle) INDICATES NUMBER OF CABLES, LOOPS, ETC.
- XX (square) INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- XX (pentagon) INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- XX (hexagon) INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



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Prepared in the Offices of:

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION — Transportation Mobility and Road Utilities — Intermodal Transportation Systems Section

750 N. Greenfield Pkwy., Garner, NC 27529

CONSTRUCTION NOTES

DIVISION 03 ONSLOW CO. JACKSONVILLE

PLAN DATE: SEPTEMBER, 2016 REVIEWED BY:

PREPARED BY: I. N. AVERY REVIEWED BY: G. A. FULLER

SCALE 0

REVISIONS	INIT.	DATE

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DocuSigned by: Gregory A. Fuller 9/21/2016

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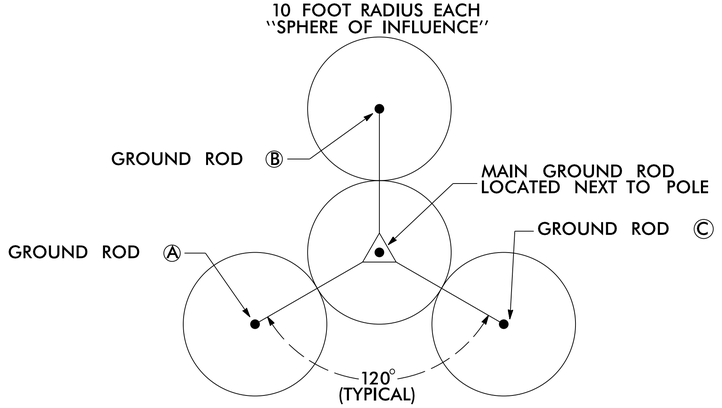
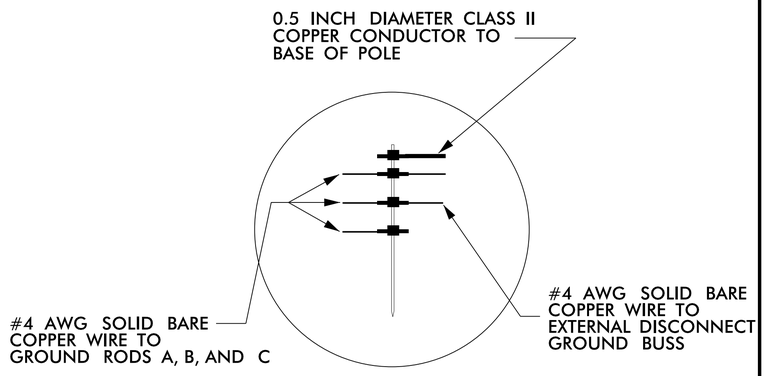
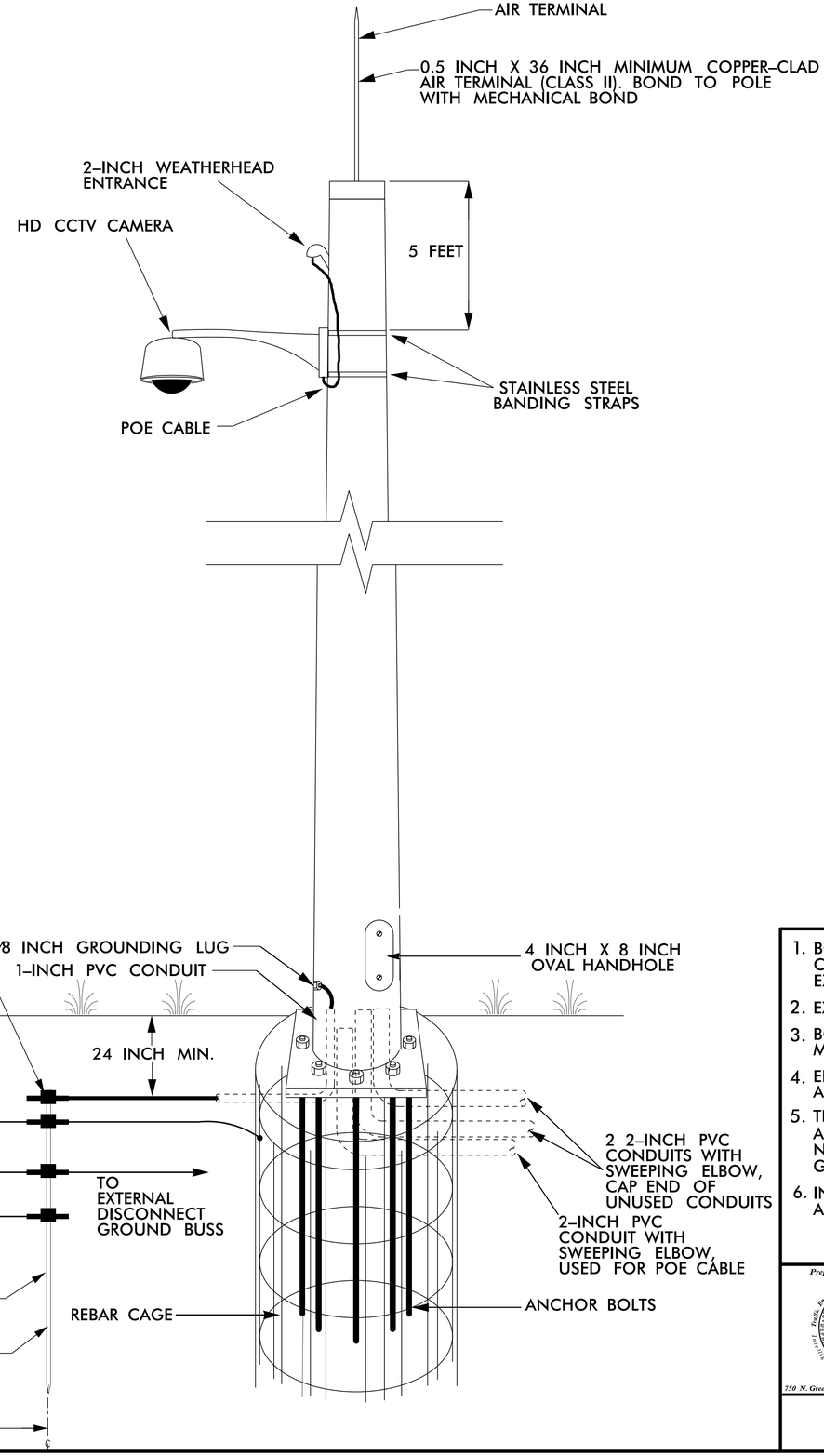
PROJECT REFERENCE NO.	SHEET NO.
R-5023B	SCP 2



GROUND ROD PLACEMENT DETAIL
(TYPICAL EACH POLE)



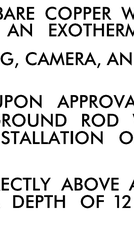
INSET `A'



SEE NOTE 5

ALTERNATE GROUNDING METHOD

IF SPACE IS NOT AVAILABLE TO DRIVE MULTIPLE RODS, DRIVE SECTIONAL GROUND RODS A MINIMUM OF 30 FEET.



JOIN SECTIONAL GROUND RODS BY EXOTHERMIC WELDING CONNECTION

NOTES

1. BOND 0.5 INCH DIAMETER, 28 STRAND (MINIMUM) CLASS II COPPER CONDUCTOR TO THE MAIN GROUND ROD BY AN EXOTHERMIC WELD METHOD.
2. EXOTHERMICALLY WELD ALL CONNECTIONS TO GROUND RODS.
3. BOND #4 AWG SOLID BARE COPPER WIRE TO REBAR CAGE AND THE MAIN GROUND ROD BY AN EXOTHERMIC WELD METHOD.
4. ENSURE CAMERA HOUSING, CAMERA, AND PAN–TILT UNIT ARE BONDED TO POLE.
5. THE CONTRACTOR MAY, UPON APPROVAL OF THE ENGINEER, INSTALL A 30–FOOT SECTIONAL GROUND ROD WHEN CONDITIONS WILL NOT ALLOW FOR THE INSTALLATION OF THE 3 – RADIAL GROUND RODS.
6. INSTALL MARKER TAPE DIRECTLY ABOVE ALL GROUNDING ELECTRODES AND CONDUCTORS AT A DEPTH OF 12 INCHES.

Prepared in the Offices of:
Public Transportation and Safety, Systems Planning
DEPARTMENT OF TRANSPORTATION
Intermodal Transportation Division
750 N. Greenfield Pkwy., Garner, NC 27529

HD CCTV CAMERA INSTALLATION FOR METAL POLE

TYPICAL DETAIL

PLAN DATE:	SEPTEMBER 2016	REVIEWED BY:	I. N. AVERY
PREPARED BY:	J. HOOKER	REVIEWED BY:	G. A. FULLER

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REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A FULLER

DocuSigned by:
Gregory A. Fuller 9/21/2016
DATE

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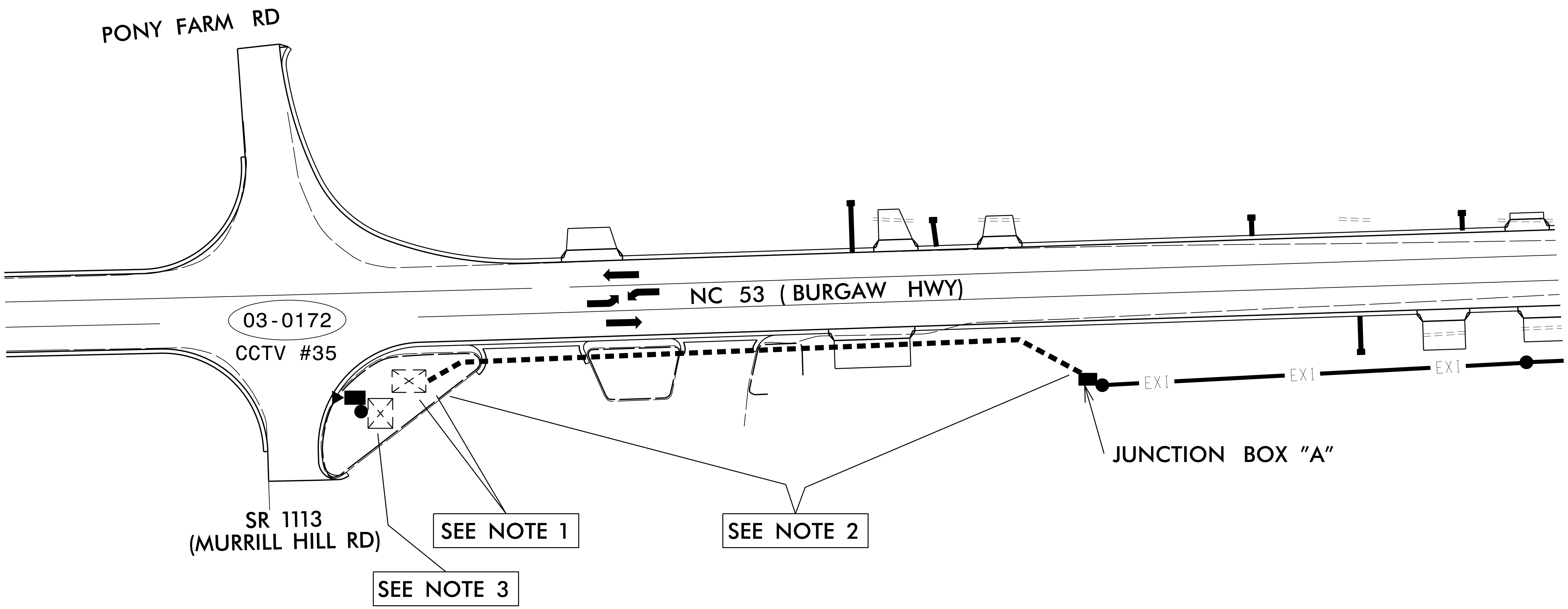
GENERAL NOTE:

NOTIFY THE CITY OF JACKSONVILLE TRANSPORTATION ENGINEER, ROBERT MYERS, AT (910) 938–5070 5 DAYS PRIOR TO BEGINNING WORK ON SIGNAL SYSTEMS COMMUNICATION CABLE. NOTIFY THE CITY TRANSPORTATION ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY.



1) CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT THE ENGINEER TO DETERMINE HOW TO PROCEED.

REMOVE ETHERNET SWITCH FROM THE CONTROLLER CABINET AND DELIVER TO THE ENGINEER.

2) BACK PULL FIBER OPTIC CABLE AND STORE 100 FEET OF CABLE IN EXISTING OVERSIZED JUNCTION BOX "A". ABANDON EXISTING CONDUIT SEGMENT IN PLACE.

3) IN THE PRESENCE OF THE ENGINEER, TEST THE EXISTING CCTV CAMERA ASSEMBLY FOR PROPER OPERATION. ONCE THE TEST IS COMPLETED AND ANY MALFUNCTIONS OR DEFICIENCIES ARE NOTED, REMOVE AND MAKE ARRANGEMENTS WITH THE ENGINEER TO DELIVER THE CAMERA, CAMERA MOUNTING HARDWARE, AND CCTV EQUIPMENT TO THE ENGINEER OR HIS DESIGNATED REPRESENTATIVE.

TMP FINAL (STEP 1)

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

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COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLANS

DIVISION 03	ONSLOW CO.	JACKSONVILLE
PLAN DATE: SEPTEMBER, 2016	REVIEWED BY:	
PREPARED BY: I. N. AVERY	REVIEWED BY: G. A. FULLER	

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 023919 GREGORY A. FULLER

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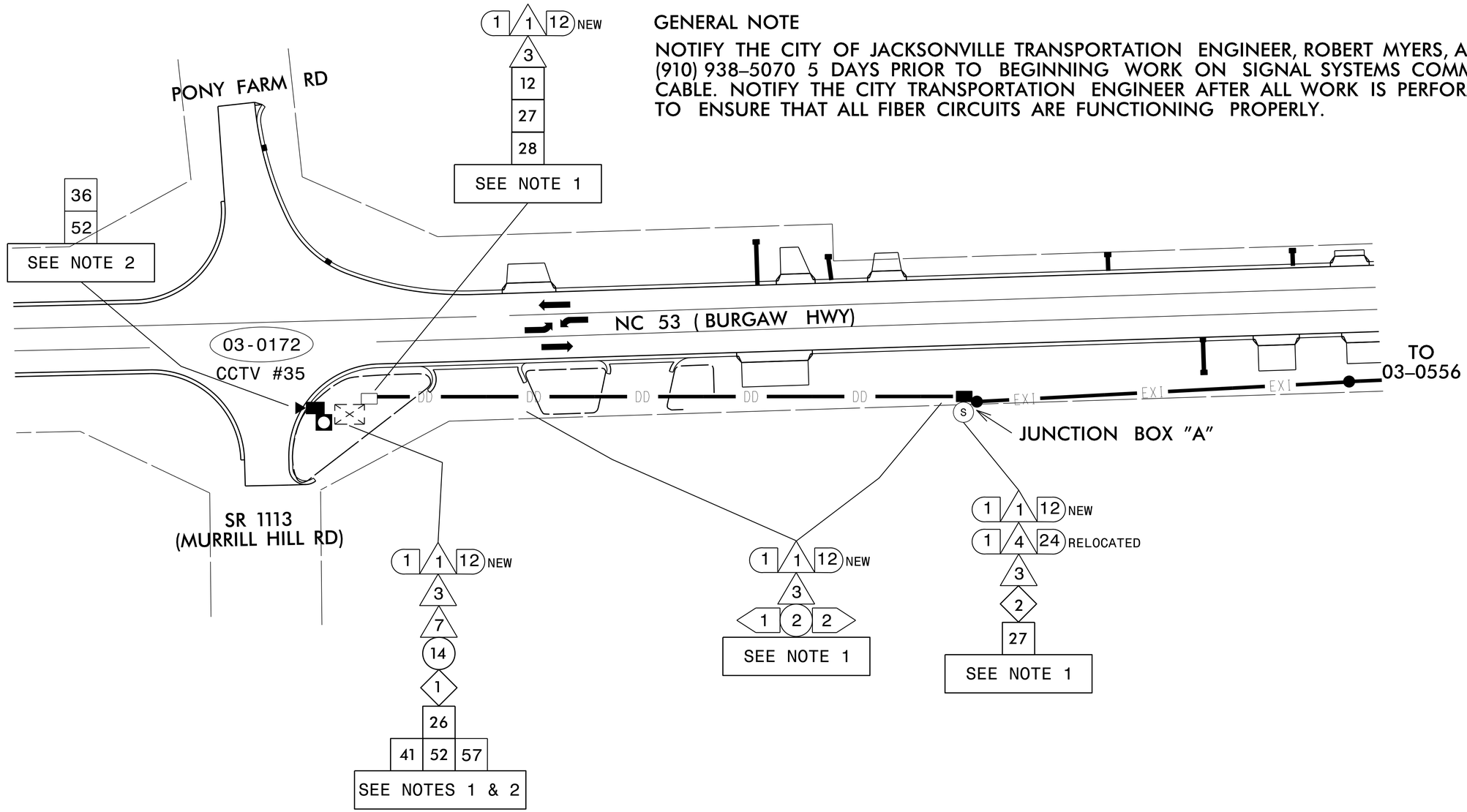

GENERAL NOTE

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1) INSTALL NEW UNDERGROUND SPLICE ENCLOSURE IN EXISTING JUNCTION BOX "A" AND PULL NEW FIBER TO THE RELOCATED SIGNAL CONTROLLER CABINET AS SHOWN.

2) INSTALL NEW HIGH DEFINITION CCTV CAMERA ON METAL SIGNAL POLE. INSTALL NEW POWER OVER ETHERNET CABLE THROUGH METAL POLE. USE 2" HALF COUPLING WITH INTERNAL THREADS LOCATED AT THE TOP OF THE POLE TO BRING THE POWER OVER ETHERNET CABLE OUT OF POLE WITH A 2" WEATHERHEAD.

TMP FINAL (STEP 2)

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Prepared in the Offices of:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Pkwy., Garner, NC 27529

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 03 ONSLOW CO. JACKSONVILLE

PLAN DATE: SEPTEMBER, 2016 REVIEWED BY:

PREPARED BY: I. N. AVERY REVIEWED BY: G. A. FULLER

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REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

DocuSigned by: Gregory A. Fuller 9/21/2016
DATE

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PROJECT REFERENCE NO.	SHEET NO.
R-5023B	SCP 5

LEGEND

COLOR CODE
TIA/EIA 598-A

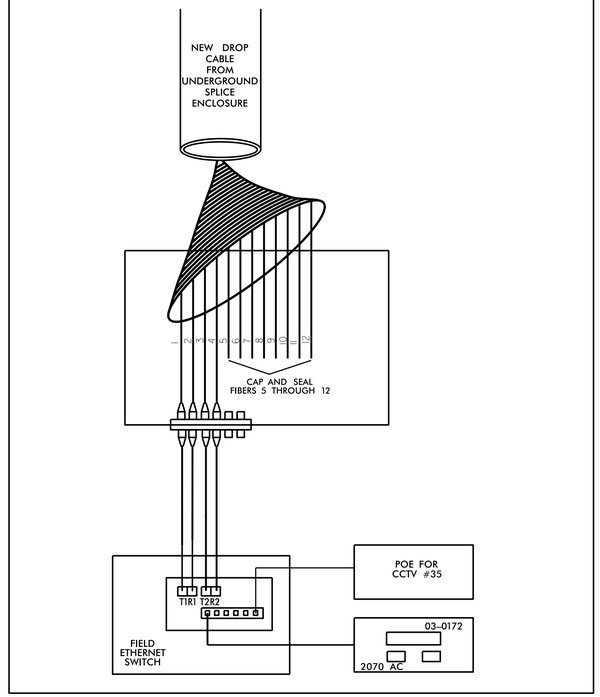
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING / ENSURING PROPER TERMINATION.

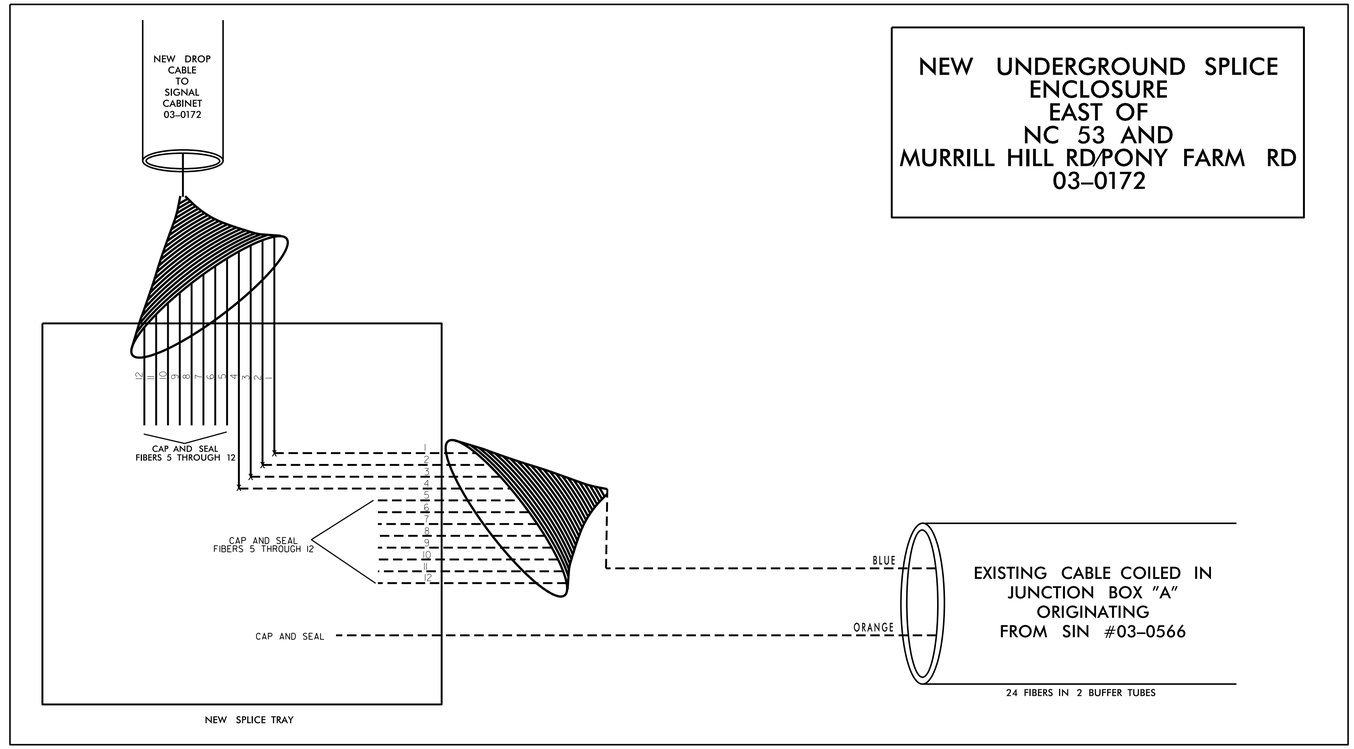
X - FUSION SPLICE INDIVIDUAL FIBER

BUFFER TUBE SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED

SIGNAL CABINET 03-0172



NEW UNDERGROUND SPLICE ENCLOSURE EAST OF NC 53 AND MURRILL HILL RD/PONY FARM RD 03-0172



NOTES:

1) NOTIFY THE CITY OF JACKSONVILLE TRANSPORTATION ENGINEER, ROBERT MYERS, AT (910) 938-5070 5 DAYS PRIOR TO BEGINNING WORK ON SIGNAL SYSTEMS COMMUNICATION CABLE. NOTIFY THE CITY TRANSPORTATION ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.

2) ETHERNET TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING PROPER TERMINATIONS.

3) INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING: REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

   1) SPLICE LOCATION
   2) DATE
   3) COMPANY NAME
   4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

   PRIOR TO INSTALLING THE COVER ON THE SPLICE TRAY TAKE A DIGITAL PHOTOGRAPH SHOWING THE SPLICE TRAY AND INFORMATION SHOWN ABOVE (1-4) AND SUBMIT PHOTOGRAPH ALONG WITH OTDR TEST RESULTS.

TMP FINAL (STEP 2)

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

SPLICE DETAILS

DIVISION 03 ONSLOW COUNTY JACKSONVILLE

PLAN DATE: SEPTEMBER, 2016 REVIEWED BY:

PREPARED BY: I. N. AVERY REVIEWED BY: G.A. FULLER

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REVISIONS	INIT.	DATE

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