

### OVERLAP PROGRAMMING

Front Panel  
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface  
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	Normal	Normal
Included Phases	6	4	4	5
Modifier Phases	4	5	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0
FYA Ped Delay	3.0	3.0	0.0	0.0

### OUTPUT CHANNEL CONFIGURATION

Front Panel  
Main Menu >Controller >More>Channels>Channels Config

Web Interface  
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Phase Vehicle	1	-	X	X	1
2	Phase Vehicle	2	X	-	-	2
3	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	X	-	7
8	Phase Vehicle	8	-	X	X	8
9	Overlap	1	X	-	X	9
10	Overlap	2	X	-	X	10
11	Overlap	3	X	-	-	11
12	Overlap	4	-	X	-	12
13	Phase Ped	2	-	-	-	13
14	Phase Ped	4	-	-	-	14
15	Phase Ped	6	-	-	-	15
16	Phase Ped	8	-	-	-	16
17	Overlap	5	-	X	X	17
18	Overlap	6	-	X	-	18

NOTICE OL7  
ASSIGNED TO CHANNEL 3 →

NOTICE OL8  
ASSIGNED TO CHANNEL 3 →

### FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 11-0944T3  
DESIGNED: May 2023  
SEALED: 5/26/2023  
REVISED: N/A



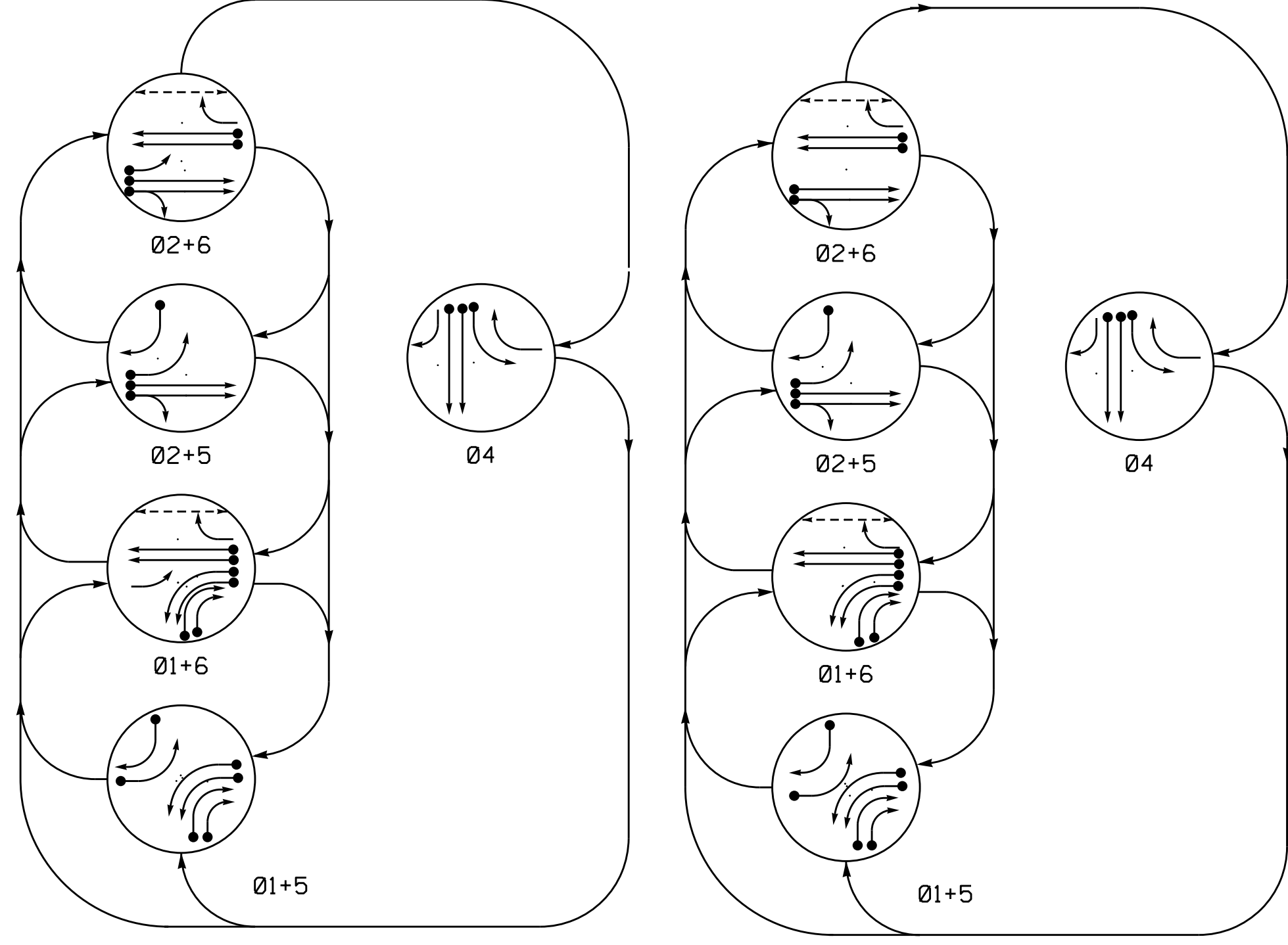
Temporary Installation - Electrical Detail 2 of 2 (Phase 3)

	<b>US 421</b> at <b>SR 1372 (Curtis Bridge Rd)</b>		
	Division 11 Wilkes County Wilkesboro		
PLAN DATE: May 2023 REVIEWED BY: M.L.Styles		PREPARED BY: S.R.Chiluka REVIEWED BY: J.Ma	
REVISIONS		INIT.	DATE
750 N. Greenfield Pkwy, Garner, NC 27529		Documented by: <i>M.L.Styles</i> 5/26/2023 DATE SIG. INVENTORY NO. 11-0944T3	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

**DEFAULT PHASING DIAGRAM**

**ALTERNATE PHASING DIAGRAM**



**DEFAULT PHASING TABLE OF OPERATION**

SIGNAL FACE	PHASE					FLASH
	01+5	01+6	02+5	02+6	04	
11,12	---	---	R	R	R	---
13,14,15	---	---	R	R	R	---
21,22	R	R	G	G	Y	---
41	R	R	R	R	---	R
42	R	R	R	R	G	R
43	---	R	---	R	F	Y
51	---	F	---	R	R	Y
61,62	R	G	R	G	R	Y
63	R	F	R	F	---	Y
P21,P22	DW	W	DW	W	DW	DRK

**DEFAULT PHASING TABLE OF OPERATION**

SIGNAL FACE	PHASE					FLASH
	01+5	01+6	02+5	02+6	04	
11,12	---	---	R	R	R	---
13,14,15	---	---	R	R	R	---
21,22	R	R	G	G	Y	---
41	R	R	R	R	---	R
42	R	R	R	R	G	R
43	---	R	---	R	F	Y
51	---	R	---	R	R	Y
61,62	R	G	R	G	R	Y
63	R	F	R	F	---	Y
P21,P22	DW	W	DW	W	DW	DRK

**MAXTIME DETECTOR INSTALLATION CHART**

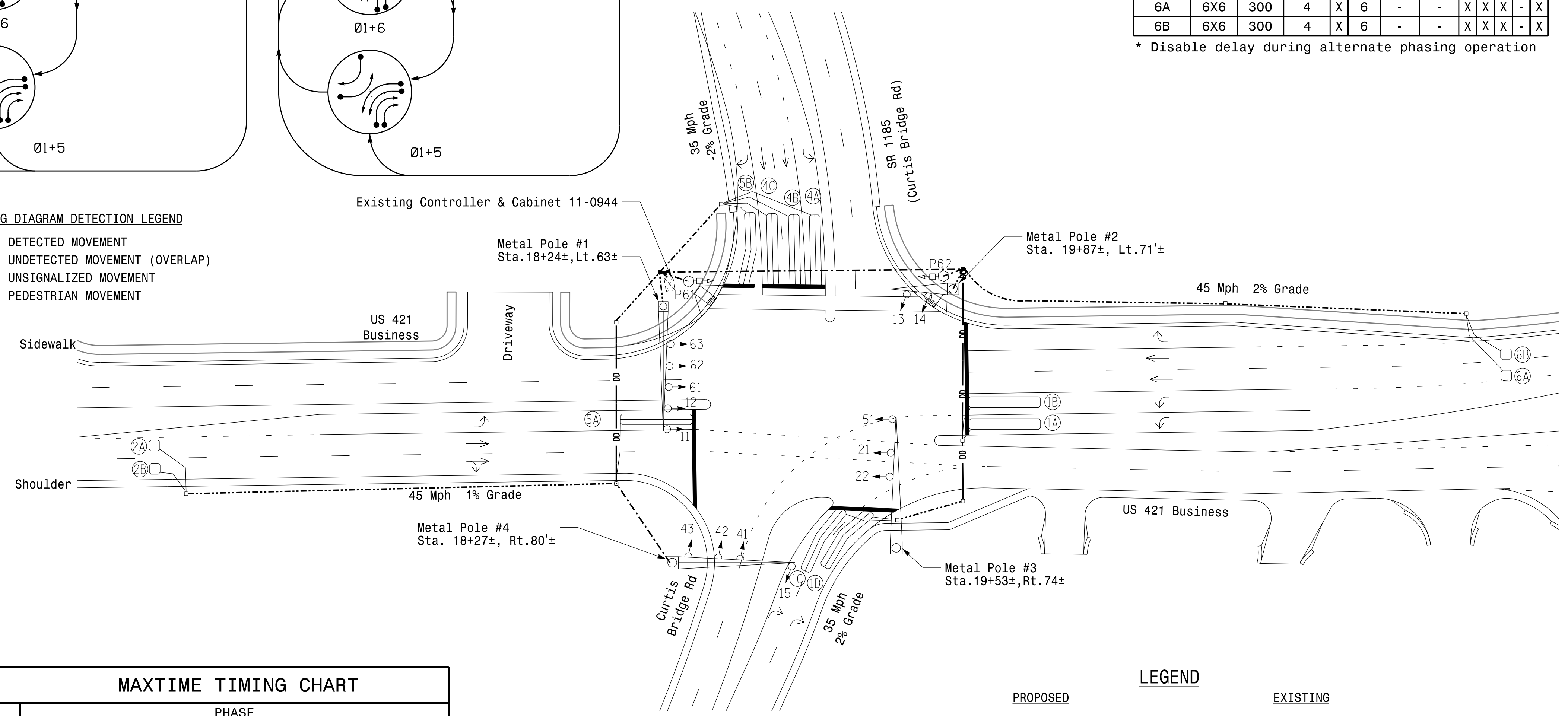
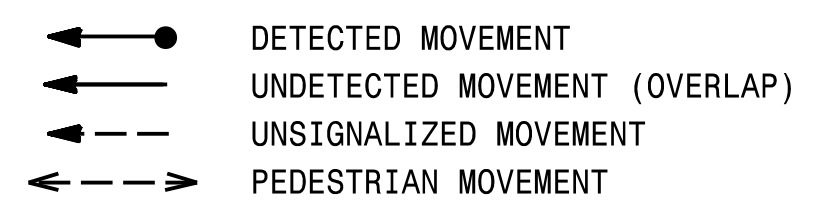
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND ADDED INITIAL	CALL DELAY DURING GREEN	NEW CARD		
1A	6X40	0	2-4-2	X	1	-	-	X	X	X	-	X
1B	6X40	0	2-4-2	X	1	-	-	X	X	X	-	X
1C	6X40	0	2-4-2	X	1	15.0	-	X	X	X	-	X
1D	6X40	0	2-4-2	X	1	15.0	-	X	X	X	-	X
2A	6X6	300	3	X	2	-	-	X	X	X	-	X
2B	6X6	300	3	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	Y	4	-	-	X	X	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	X	X	-	X
4C	6X40	0	2-4-2	X	4	-	-	X	X	X	-	X
5A	6X40	0	2-4-2	X	5	-	-	X	X	X	-	X
5B	6X40	0	2-4-2	X	5	15.0	-	X	X	X	-	X
6A	6X6	300	4	X	6	-	-	X	X	X	-	X
6B	6X6	300	4	X	6	-	-	X	X	X	-	X

\* Disable delay during alternate phasing operation

**5 Phase Fully Actuated W/ Alternate Phasing Operation Wilkesboro Closed Loop System NOTES**

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or 5 may be lagged.
- Set all detector units to presence mode.
- Omit "Walk" and flashing "Don't Walk" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- To provide a leading pedestrian interval on phase 2, program FYA heads 63 to delay for 3 seconds after the start of the phase 6 walk interval. See electrical details.
- The Division Traffic Engineer will determine the hours of use for each phasing plan.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Maintain a minimum of 10 foot clearance between the overhead utility wires and the signal pole.
- Refer to Pavement Marking Plans for proposed stop bar locations.

**PHASING DIAGRAM DETECTION LEGEND**



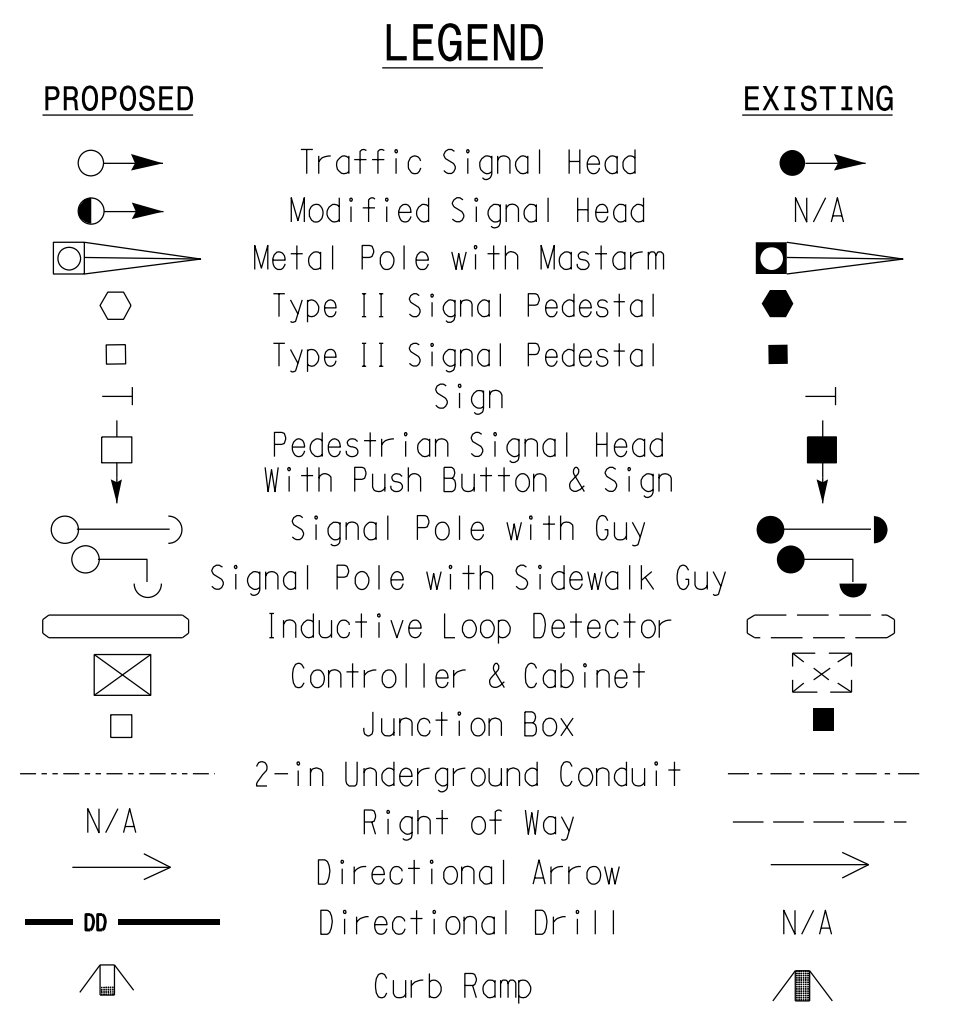
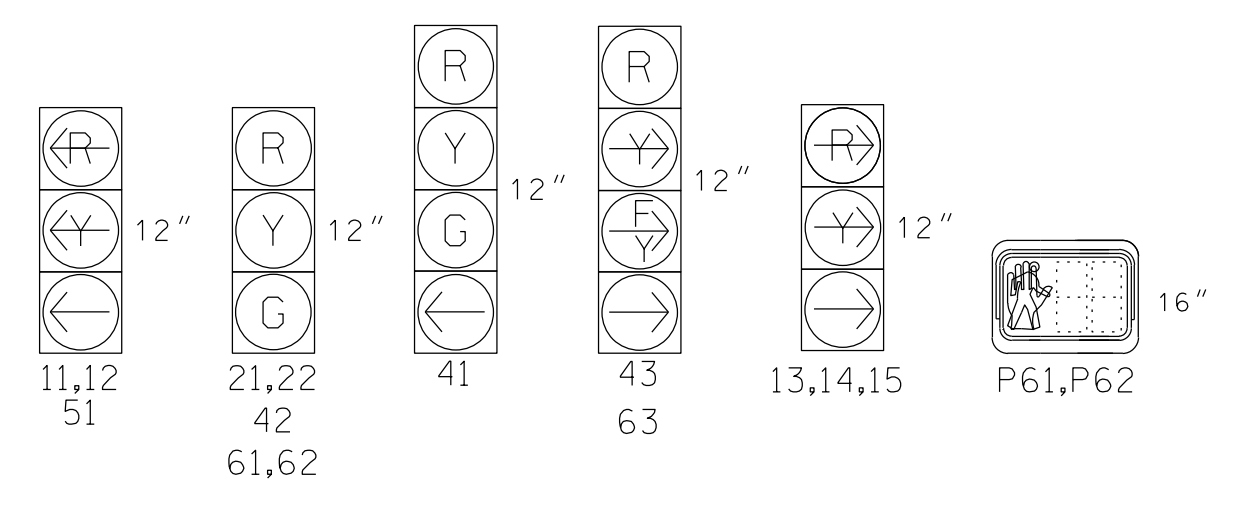
**MAXTIME TIMING CHART**

FEATURE	PHASE						
	1	2	4	5	6	7	
Walk *	-	-	-	-	7	-	
Ped Clear *	-	-	-	-	32	-	
Min Green	7	12	7	7	12	7	
Passage *	2.0	6.0	2.0	2.0	6.0	2.0	
Max 1 *	30	60	30	30	60	30	
Yellow Change	3.0	4.4	3.8	3.0	4.3	3.0	
Red Clear	3.4	1.5	2.2	3.5	1.8	3.2	
Added Initial *	-	1.5	-	-	1.5	-	
Maximum Initial *	-	34	-	-	34	-	
Time Before Reduction *	-	15	-	-	15	-	
Time To Reduce *	-	30	-	-	30	-	
Minimum Gap	-	3.4	-	-	3.4	-	
Advance Walk	-	-	-	-	**	-	
Non Lock Detector	X	-	X	X	-	X	
Vehicle Recall	-	MIN RECALL	-	-	MIN RECALL	-	
Dual Entry	-	-	-	-	-	-	

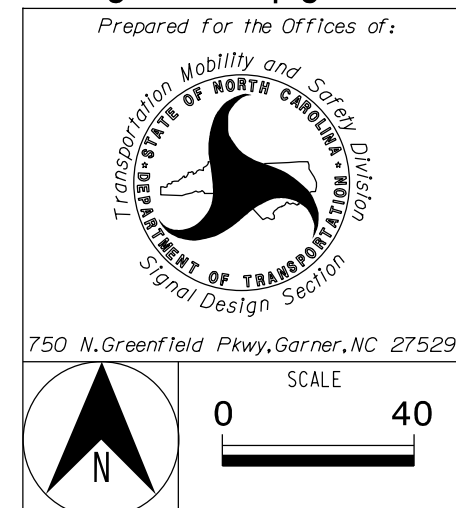
\* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.  
 \*\* See note 7

**SIGNAL FACE I.D.**

All Heads L.E.D.



**Signal Upgrade - Final Design**



**US 421 Business at SR 1372 (Curtis Bridge Rd)**

Division 11 Wilkes County Wilkesboro

PLAN DATE: May 2023 REVIEWED BY: M. Stygles

PREPARED BY: S.R. Chiluka REVIEWED BY: J. Ma

REVISIONS	INIT.	DATE



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

**S. R. CHILUKA**  
 PROFESSIONAL ENGINEER  
 No. 047250

DATE: 5/26/2023

SIG. INVENTORY NO. 11-0944

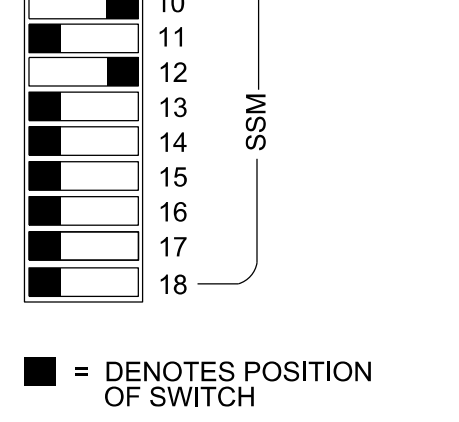
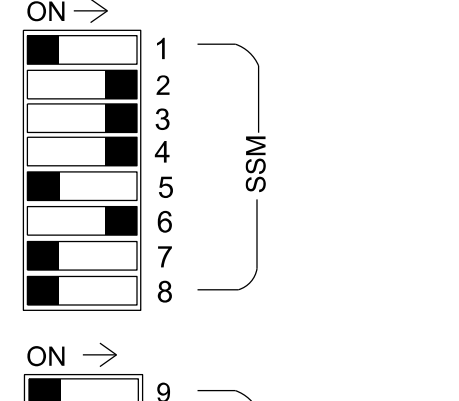
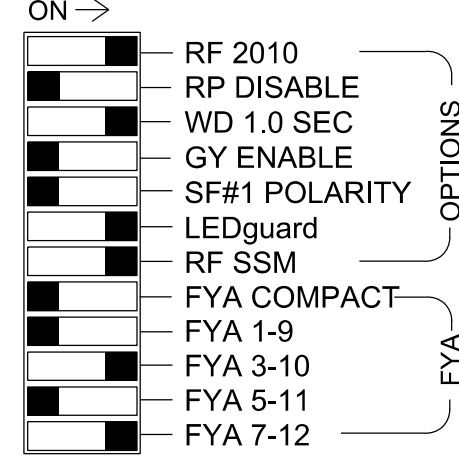
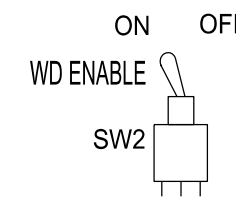
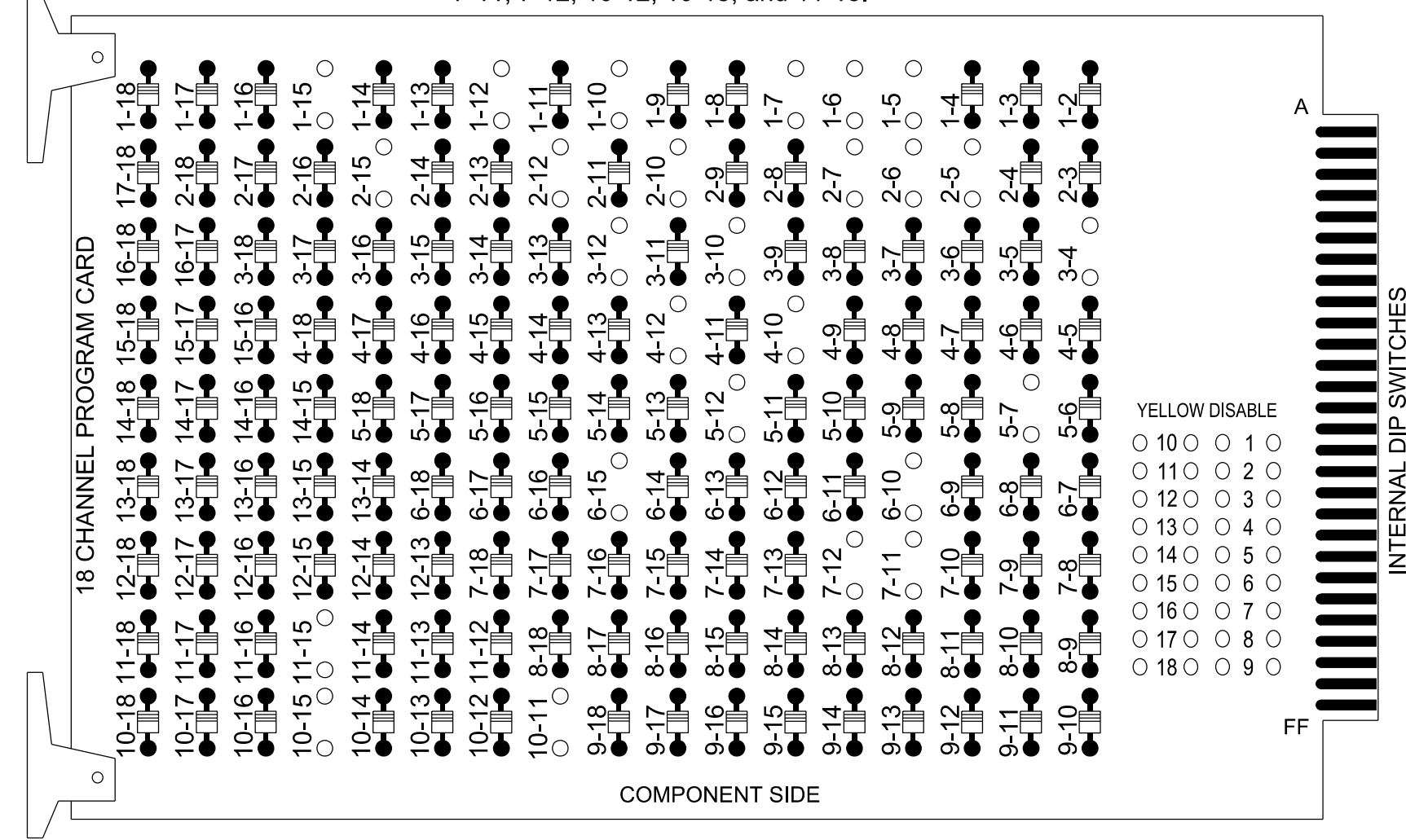
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### 18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-7, 1-10, 1-12, 1-15, 2-5, 2-6, 2-7, 2-10, 2-12, 2-15, 3-4, 3-10, 3-12, 4-10, 4-12, 5-7, 5-12, 6-10, 6-15, 7-11, 7-12, 10-12, 10-15, and 11-15.



■ = DENOTES POSITION OF SWITCH

#### REMOVE JUMPERS AS SHOWN

#### NOTES:

- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
- Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
- Ensure that the Red Enable is active at all times during normal operation.
- Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

### NOTES

- 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 plan.
- Program controller to start up in phase 2 Green No Walk and phase 6 Walk.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
- The cabinet and controller are part of the Wilkesboro closed loop system.

### EQUIPMENT INFORMATION

Controller.....2070LX  
 Cabinet.....332 w/ Aux  
 Software.....Q-Free MAXTIME  
 Cabinet Mount.....Base  
 Output File Positions.....18 With Aux. Output File  
 Load Switches Used.....S1,S2,S4,S5,S7,S8,S9,S10,AUXS2, AUXS5  
 Phases Used.....1,2,4,5,6,6PED  
 Overlap "1".....NOT USED  
 Overlap "2".....\*  
 Overlap "3".....\*  
 Overlap "4".....\*  
 Overlap "7".....\*  
 Overlap "8".....\*

\*See overlap programming detail on sheet 2.

### SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11,12, 13,14	21,22	NU	63	41	42,43	NU	51	61,62	P61, P62	44	NU	NU	NU	63	NU	NU	44
RED		128			101	101			134						A124			A101
YELLOW		129		*	102	102			135		*							
GREEN		130			103	103			136									
RED ARROW	125							131										
YELLOW ARROW	126							132							A125			A102
FLASHING YELLOW ARROW															A126			A103
GREEN ARROW	127			118	103		133			124								
Hand icon										119								
Walking person icon										121								

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail this sheet.  
 ★ See pictorial of head wiring in detail this sheet.

### INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1	∅ 2	∅ 2	∅ 2	∅ 5	∅ 4	∅ 4	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5
L	1A	1B	1D	2B	4A	4C	4B	5A	5B	6A	6B	6C	6D	6E
U	NOT USED	∅ 2	∅ 2	NOT USED	∅ 4	NOT USED	NOT USED	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5
L	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR

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

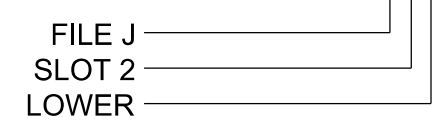
FS = FLASH SENSE  
 ST = STOP TIME

### INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	QUEUE	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1			X			X	
1B	TB2-5,6	I2U	39	1	2	1			X			X	
1C	TB2-7,8	I2L	43	5	3	1			X			X	
1D	TB2-9,10	I3U	63	29	4	1			X			X	
2A	TB2-11,12	I3L	76	42	5	2			X	X		X	
2B	TB4-1,2	I4U	47	9	6	2			X	X		X	
4A	TB4-9,10	I6U	41	3	8	4			X			X	
4B	TB4-11,12	I6L	45	7	9	4			X			X	
4C	TB6-1,2	I7U	65	31	10	4			X			X	
4D	TB6-3,4	I7L	78	44	11	4			X			X	
5A	TB3-1,2	J1U	55	17	15	5			X			X	
5B	TB3-5,6	J2U	40	2	16	5	3		X			X	X
6A	TB3-9,10	J3U	64	30	18	6			X	X		X	
6B	TB3-11,12	J3L	77	43	19	6			X	X		X	
P61,P62	TB8-7,9	I13U	68	34	6	6							

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

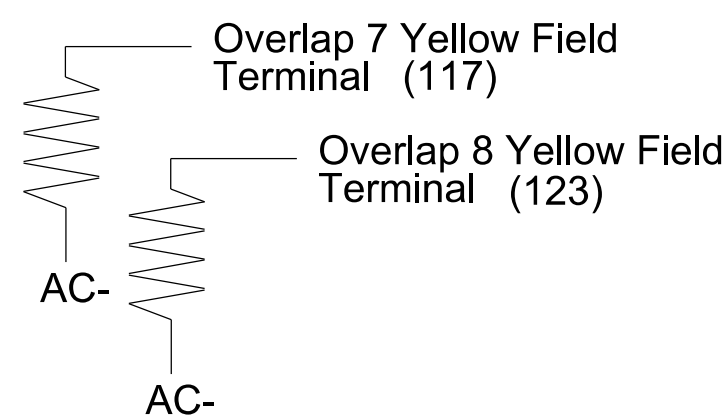
#### INPUT FILE POSITION LEGEND: J2L



### LOAD RESISTOR INSTALLATION DETAIL

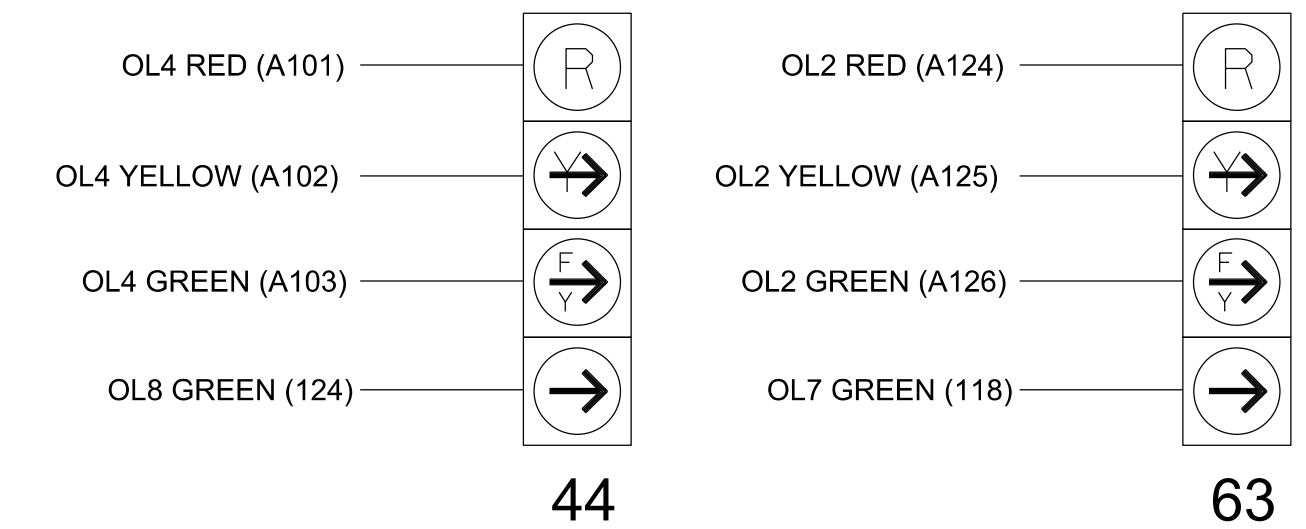
(install resistors as shown)

ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



### FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

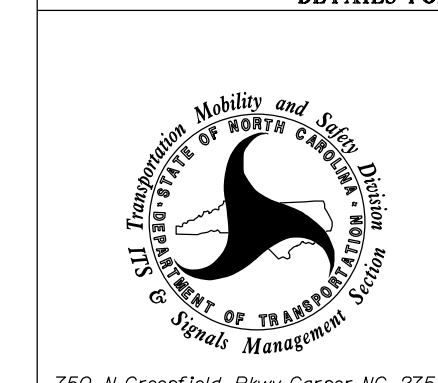


THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0944  
 DESIGNED: May 2023  
 SEALED: 5/26/2023  
 REVISED: N/A



Electrical Detail-Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:



750 N. Greenfield Pkwy, Garner, NC 27529

US 421 Business at SR 1185 (Curtis Bridge Rd)	
Division 14	Henderson County Hendersonville
PLAN DATE: May 2023	REVIEWED BY: M.L. Stygles
PREPARED BY: J. Ma	REVIEWED BY:
REVISIONS	INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL	
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046057 MATTHEW L. STYGLES	
DocuSigned by: Matthew L. Stygles	5/26/2023
394B81E6465748C	DATE
SIG. INVENTORY NO. 11-0944	

### MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel  
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface  
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	Normal	Normal
Included Phases	6	4	4	5
Modifier Phases	-	-	-	-
Modifier Overlap	7	8	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0
FYA Ped Delay	3.0	0.0	0.0	0.0

### MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel  
Main Menu >Controller >Coordination >Patterns

Web Interface  
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

\* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

### MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel  
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface  
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	Normal	Normal
Included Phases	6	4	4	5
Modifier Phases	-	-	-	-
Modifier Overlap	7	8	-	-
Trail Green	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0

← NOTICE INCLUDED PHASE

### MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 5A

Front Panel  
Main Menu >Controller >Detector >Veh Det Plans

Web Interface  
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

5A

Detector	Call Phase	Delay
15	5	3
31	0	3

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0944  
DESIGNED: May 2023  
SEALED: 5/26/2023  
REVISED: N/A

Electrical Detail-Sheet 2 of 3

ELECTRICAL AND PROGRAMMING  
DETAILS FOR:



US 421 Business  
at  
SR 1185 (Curtis Bridge Rd)

Division 14 Henderson County Hendersonville

PLAN DATE: May 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

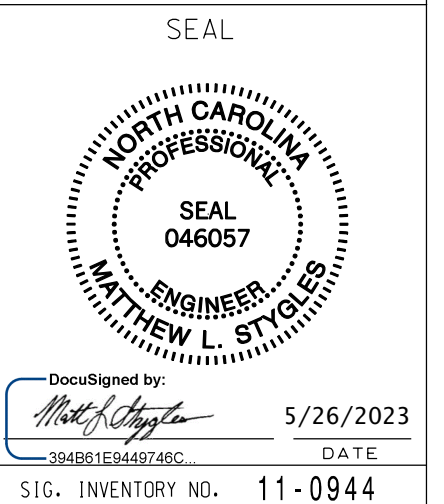
REVISIONS	INIT.	DATE

Drawn/Checked by: *M.L. Stygles* 5/26/2023

SIG. INVENTORY NO. 11-0944



DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED





### OUTPUT CHANNEL CONFIGURATION

Front Panel  
Main Menu > Controller > More > Channels > Channels Config

Web Interface  
Home > Controller > Advanced IO > Channels > Channels Configuration

#### Channel Configuration

NOTICE OL7  
ASSIGNED TO CHANNEL 3 →

NOTICE OL8  
ASSIGNED TO CHANNEL 7 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Phase Vehicle	1	-	X	X	1
2	Phase Vehicle	2	X	-	-	2
3	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	X	-	7
8	Phase Vehicle	8	-	X	X	8
9	Overlap	1	X	-	X	9
10	Overlap	2	X	-	X	10
11	Overlap	3	X	-	-	11
12	Overlap	4	-	X	-	12
13	Phase Ped	2	-	-	-	13
14	Phase Ped	4	-	-	-	14
15	Phase Ped	6	-	-	-	15
16	Phase Ped	8	-	-	-	16
17	Overlap	5	-	X	X	17
18	Overlap	6	-	X	-	18

### MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2. A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

#### ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for head 51 to run protected turns only.

VEH DET PLAN 2: Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

### FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0944  
DESIGNED: May 2023  
SEALED: 5/26/2023  
REVISED: N/A



Electrical Detail-Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 421 Business at SR 1185 (Curtis Bridge Rd)

Division 14 Henderson County Hendersonville

PLAN DATE: May 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

REVISIONS	INIT.	DATE

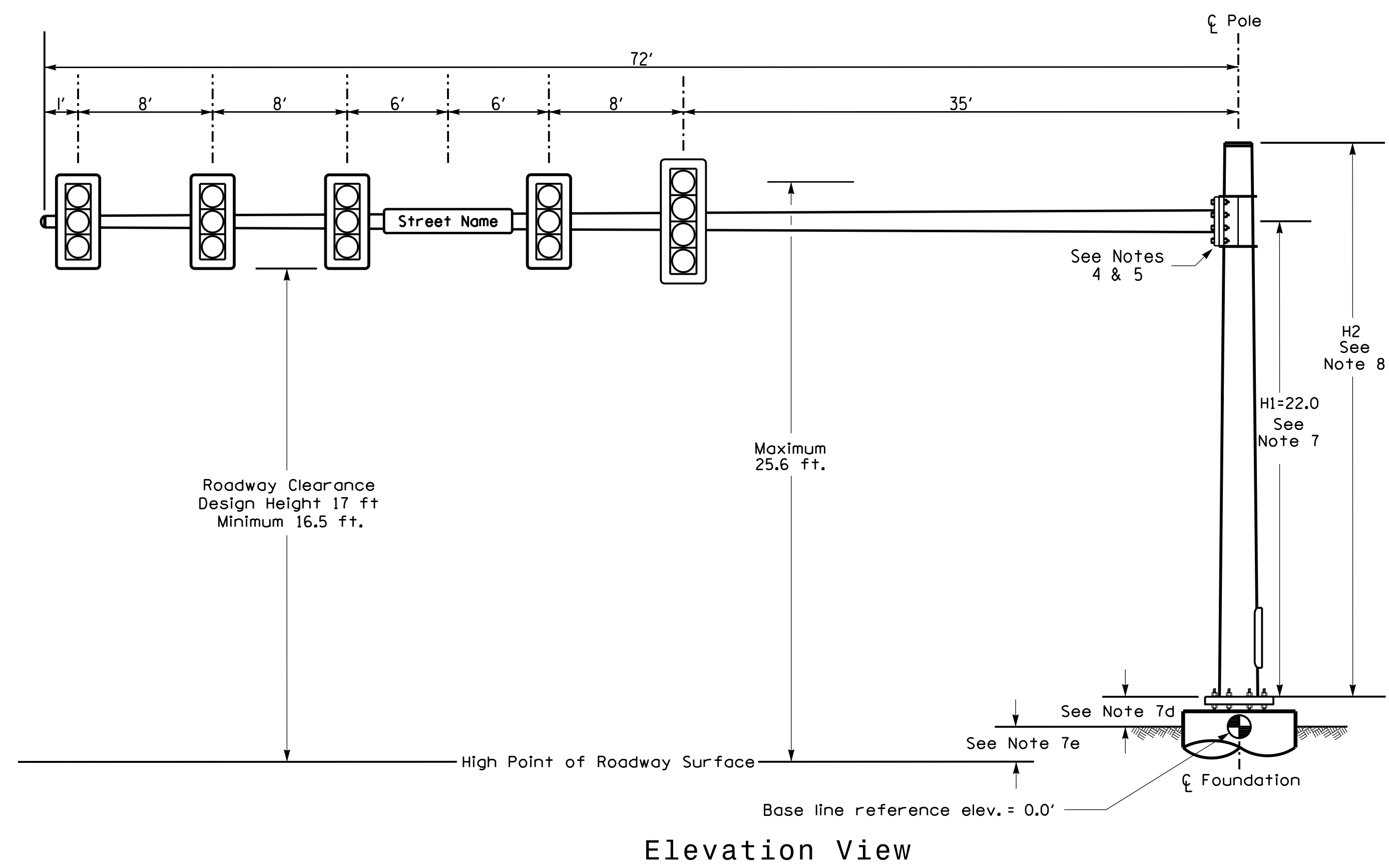
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SEAL

DocuSigned by: M.L. Stygles 5/26/2023

SIG. INVENTORY NO. 11-0944

**Design Loading for METAL POLE NO. 1**



**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 $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.4 ft.	+1.92 ft.
Elevation difference at Edge of travelway or face of curb	+0.6 ft.	+1.02 ft.

**METAL POLE No. 1 and 2**

**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 SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

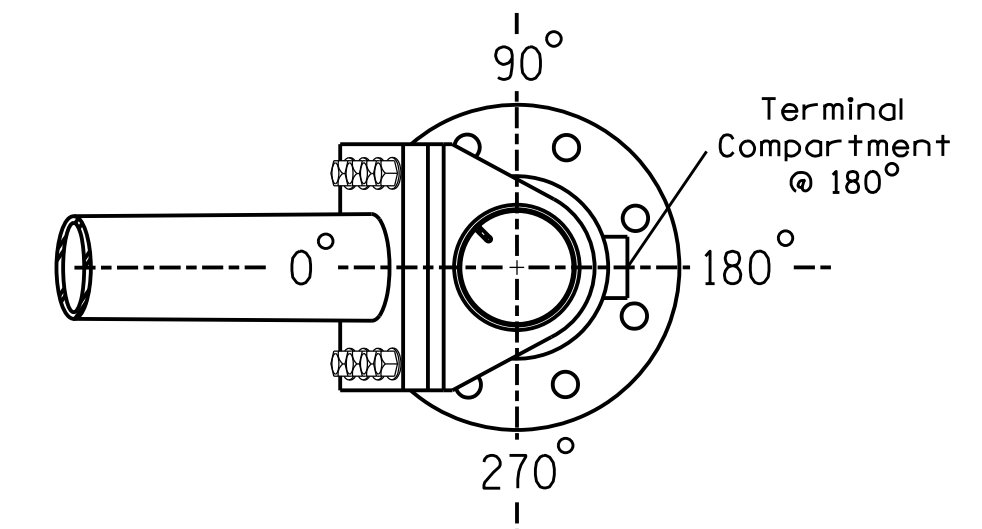
**NOTES**

**DESIGN REFERENCE MATERIAL**

- Design the traffic signal structure and foundation in accordance with:
  - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2018 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>

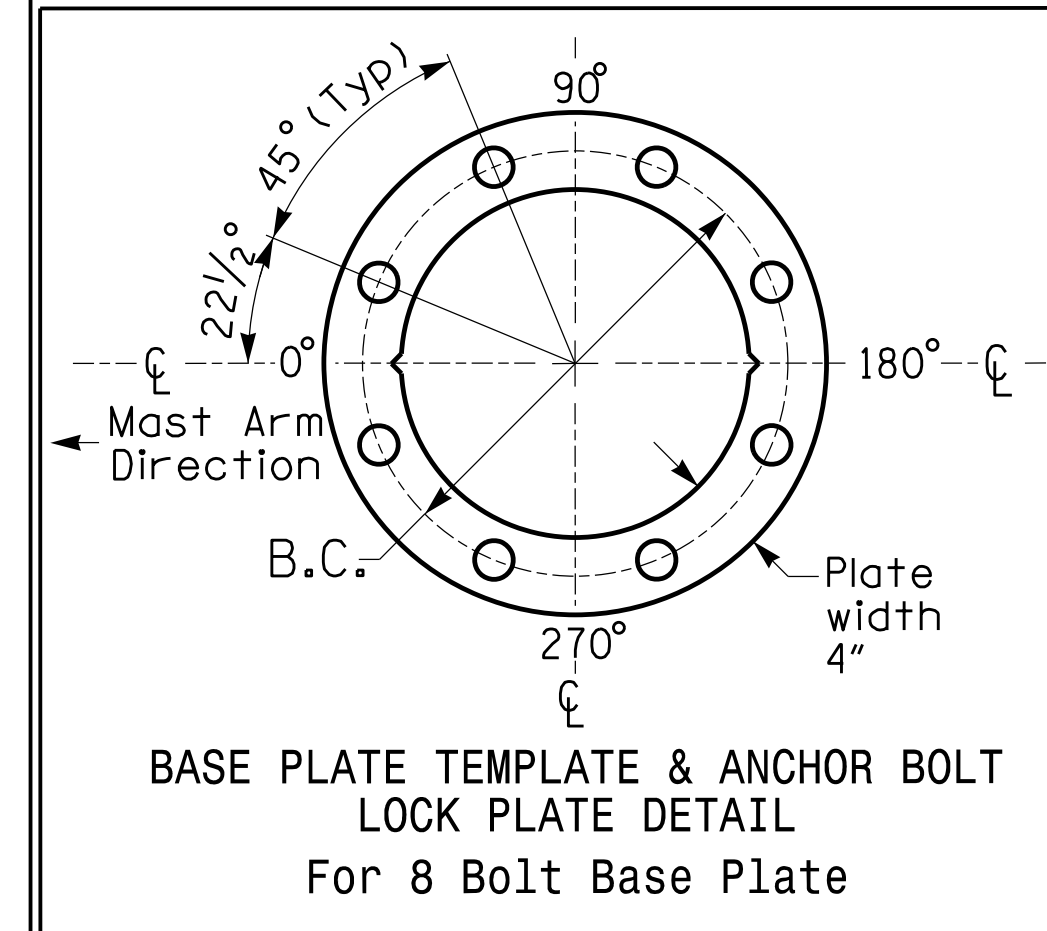
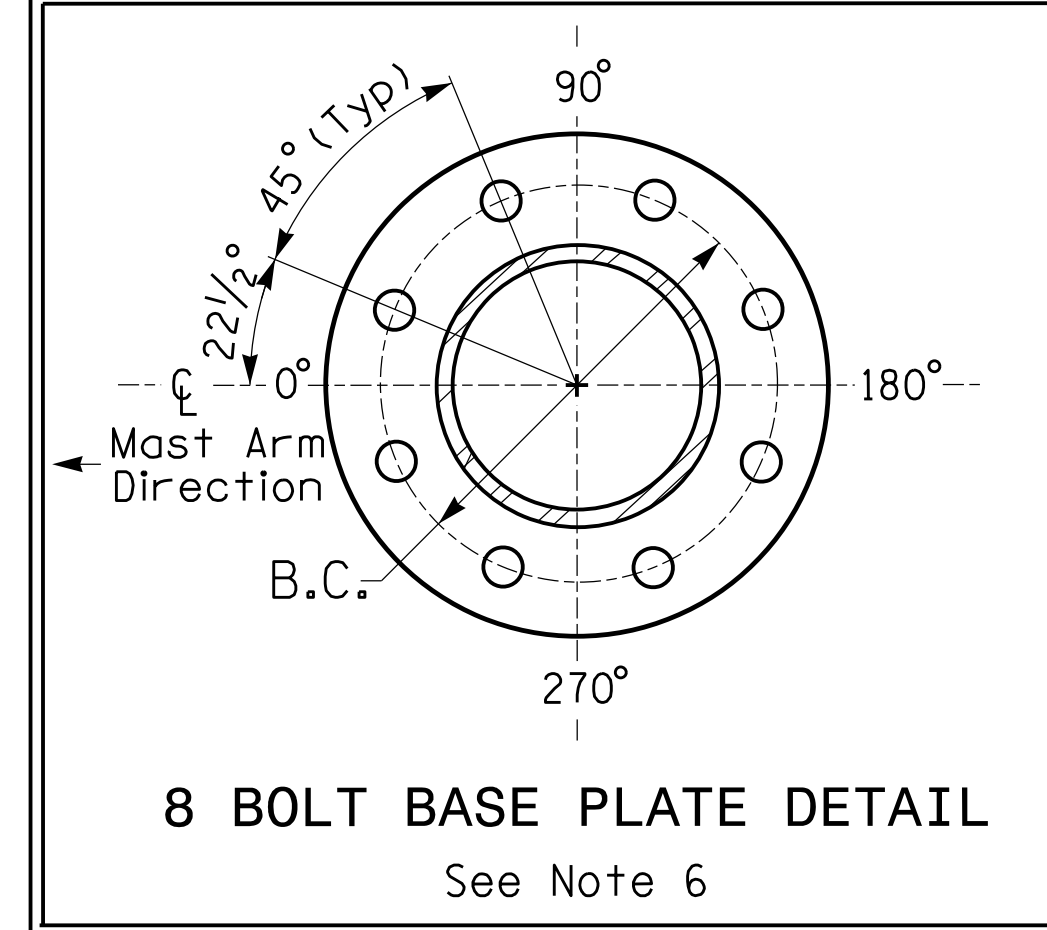
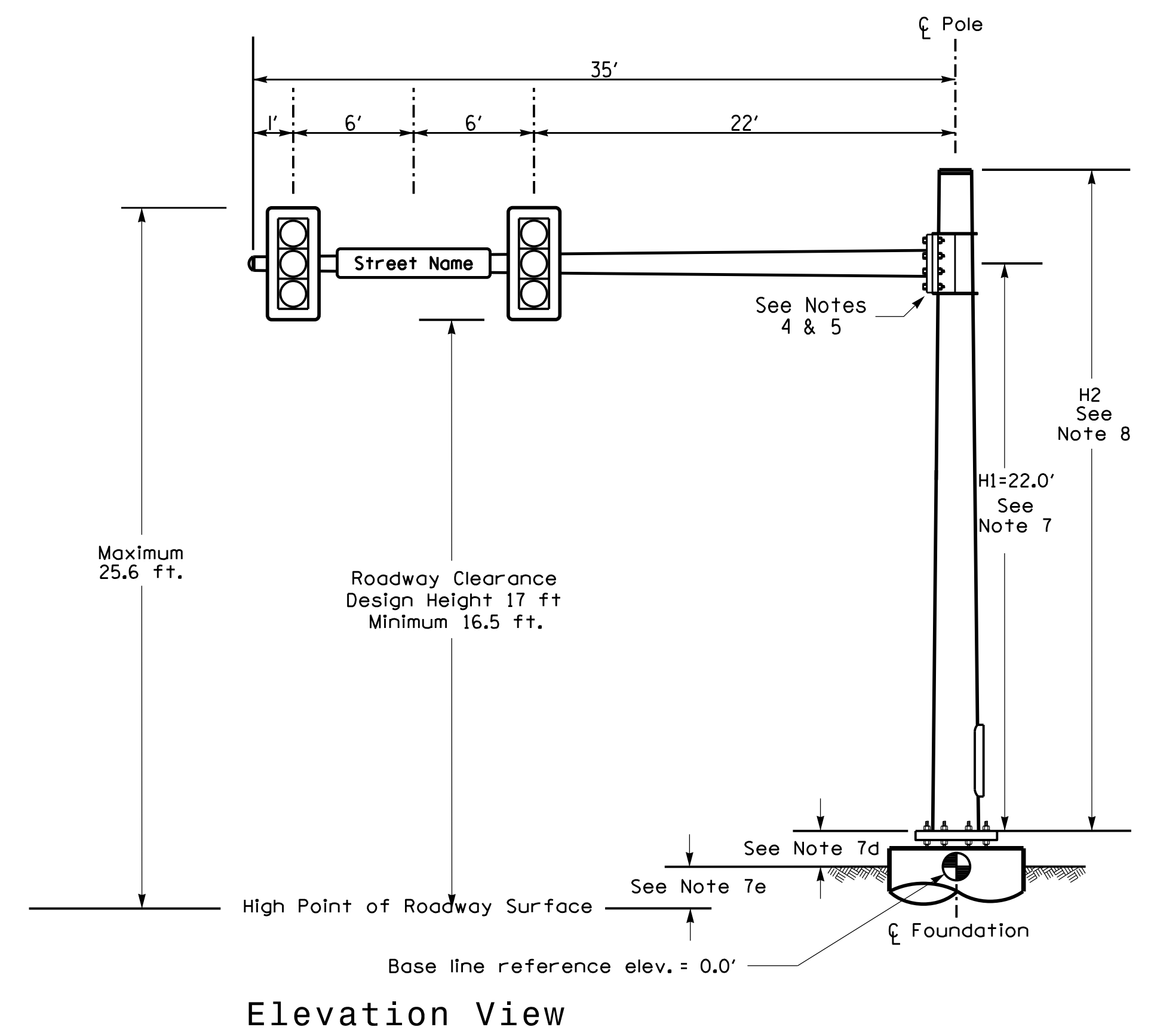
**DESIGN REQUIREMENTS**

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
  - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
  - Signal heads are rigidly mounted and vertically centered on the mast arm.
  - The roadway clearance height for design is as shown in the elevation views.
  - The top of the pole base plate is 0.75 feet above the ground elevation.
  - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
- 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.
- 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) 814-5000.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.



**POLE RADIAL ORIENTATION**

**Design Loading for METAL POLE NO. 2**



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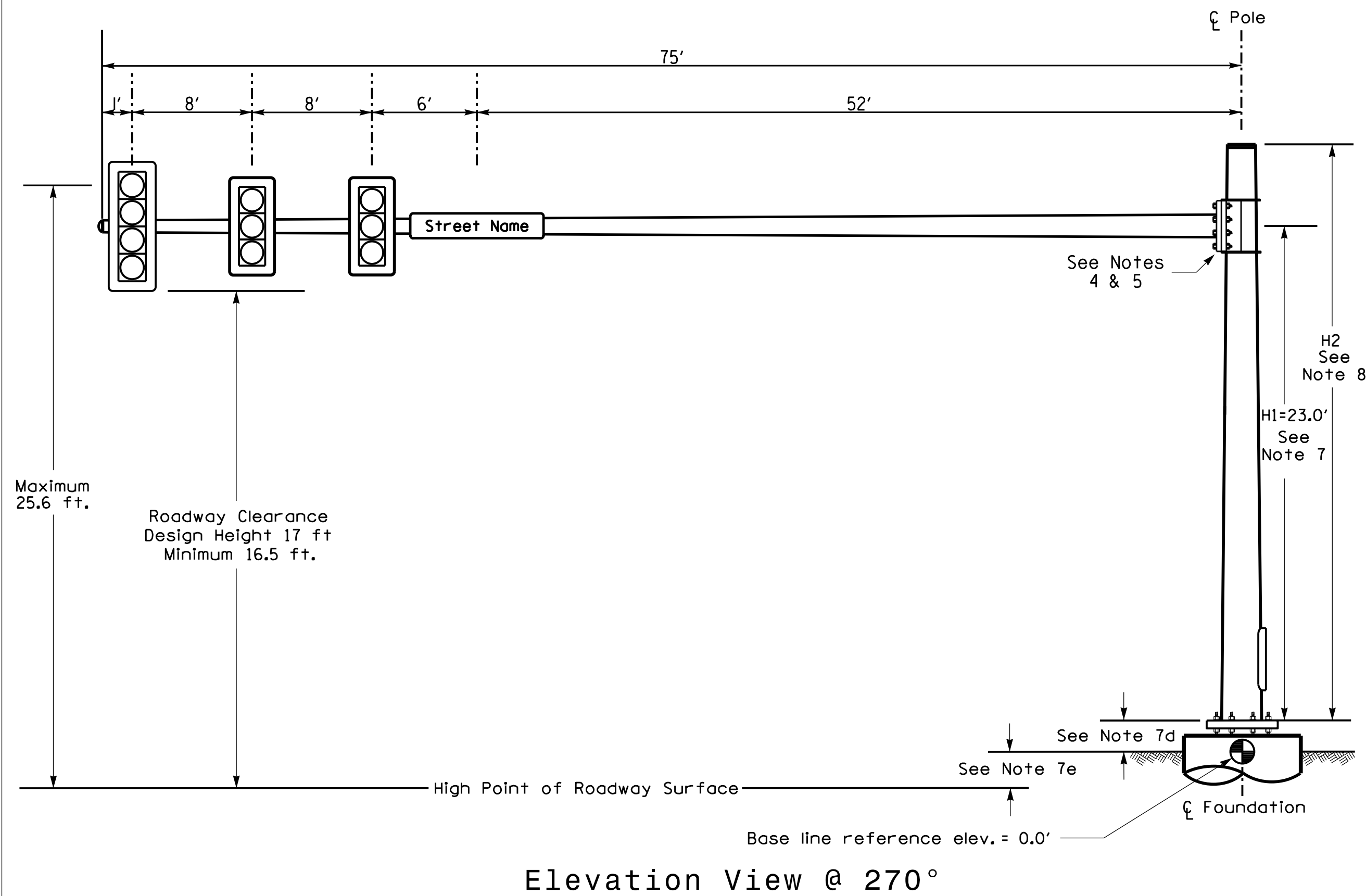
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NCDOT Wind Zone 4 (90 mph)

	<b>US 421 Business at SR 1372 (Curtis Bridge Rd)</b>		
	Division 11 Wilkes County Wilkesboro PLAN DATE: May 2023 REVIEWED BY: M. Stygles PREPARED BY: S.R. Chiluka REVIEWED BY: J. Ma	SCALE: 0 N/A REVISIONS: _____ INIT. DATE: _____	
Signature:  DATE: 5/24/2023			SIG. INVENTORY NO. 11-0944

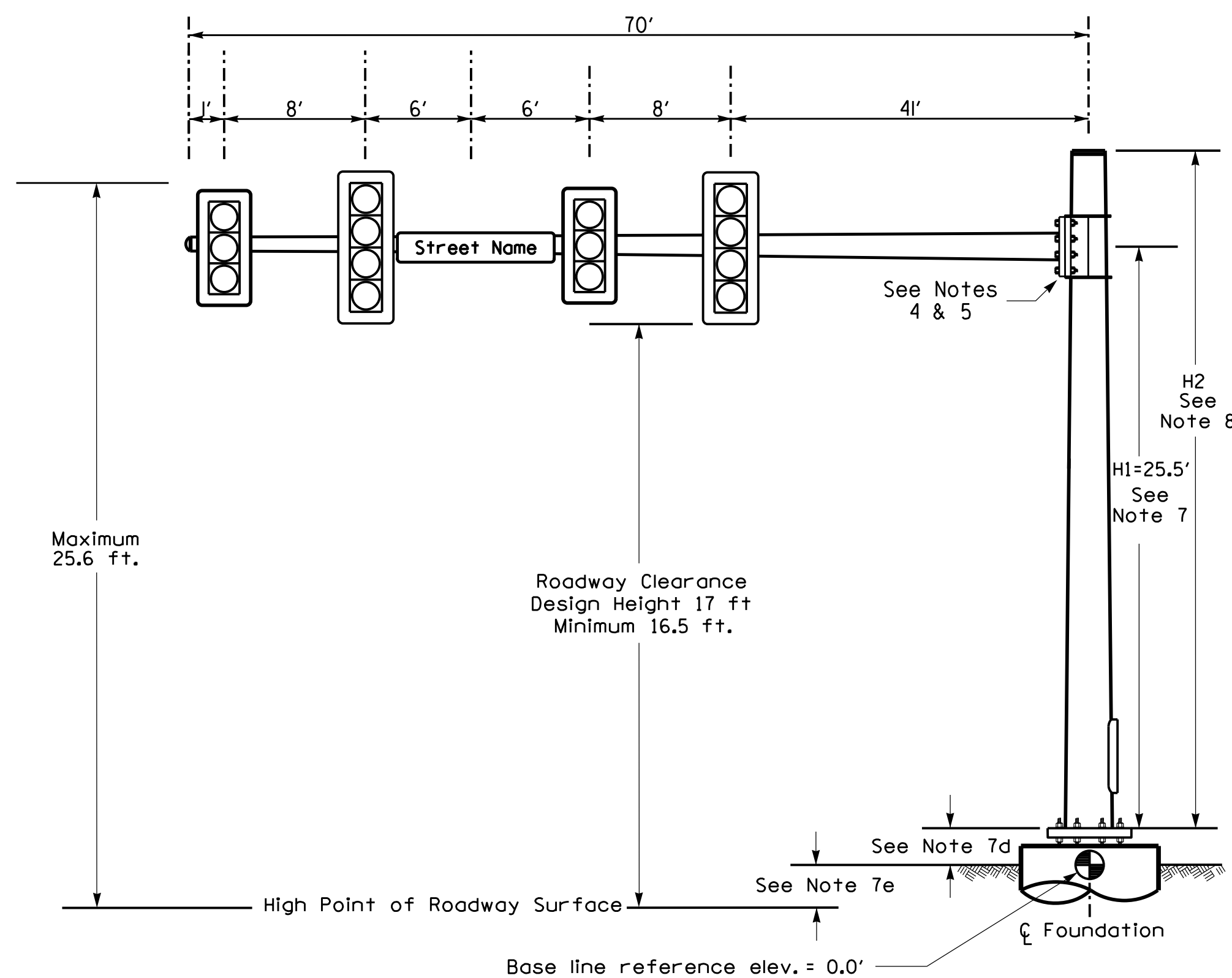


**Design Loading for METAL POLE NO. 3**



Elevation View @ 270°

**Design Loading for METAL POLE NO. 4**



Elevation View @ 0°

**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:	Arm A	Arm B
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.4 ft.	+0.0 ft.
Elevation difference at Edge of travelway or face of curb	+2.2 ft.	+0.0 ft.

**METAL POLE No. 3**

**MAST ARM LOADING SCHEDULE**

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

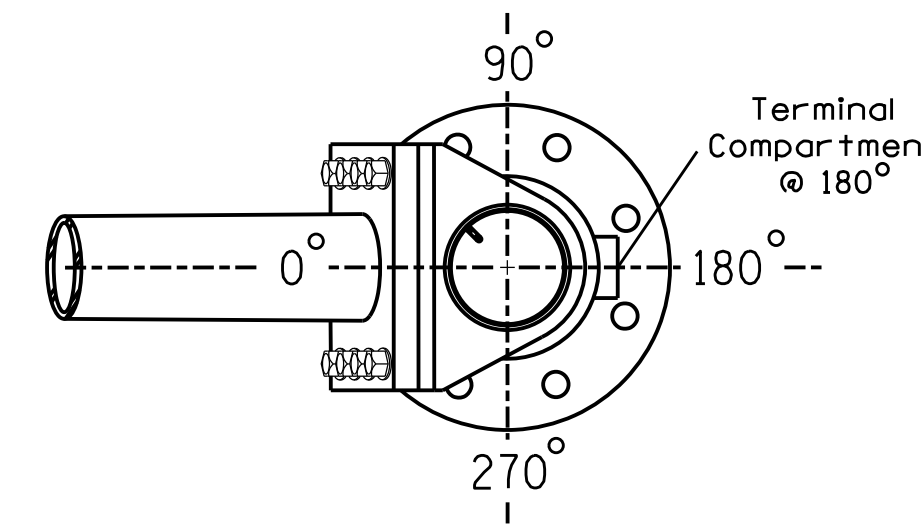
**NOTES**

**DESIGN REFERENCE MATERIAL**

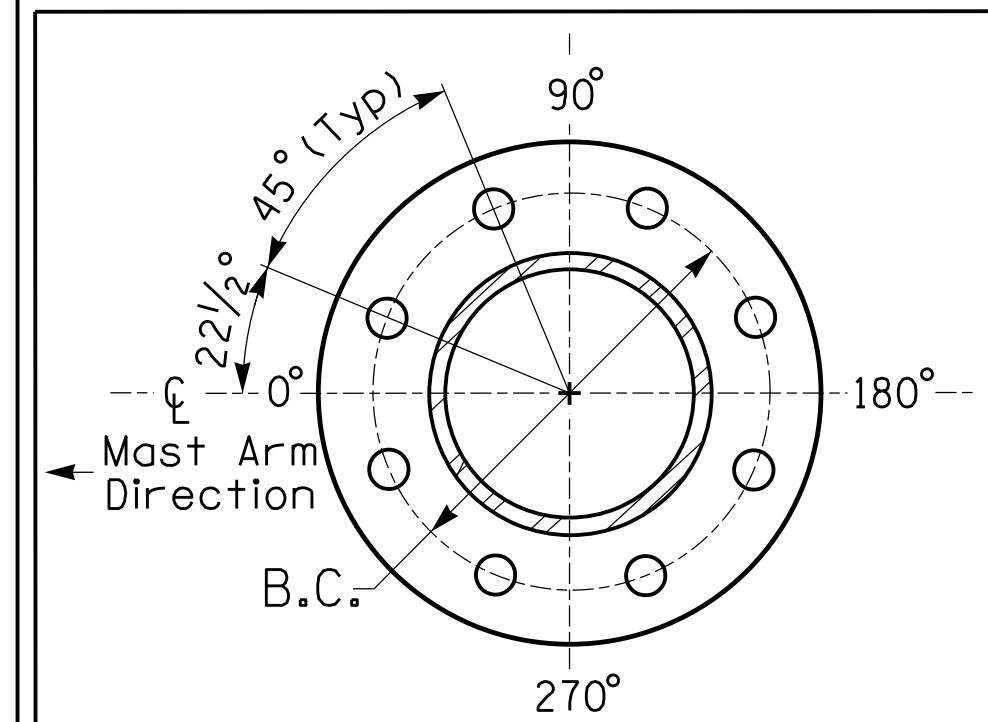
- Design the traffic signal structure and foundation in accordance with:
  - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2018 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**

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
  - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
  - Signal heads are rigidly mounted and vertically centered on the mast arm.
  - The roadway clearance height for design is as shown in the elevation views.
  - The top of the pole base plate is 0.75 feet above the ground elevation.
  - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
- 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.
- 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) 814-5000.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

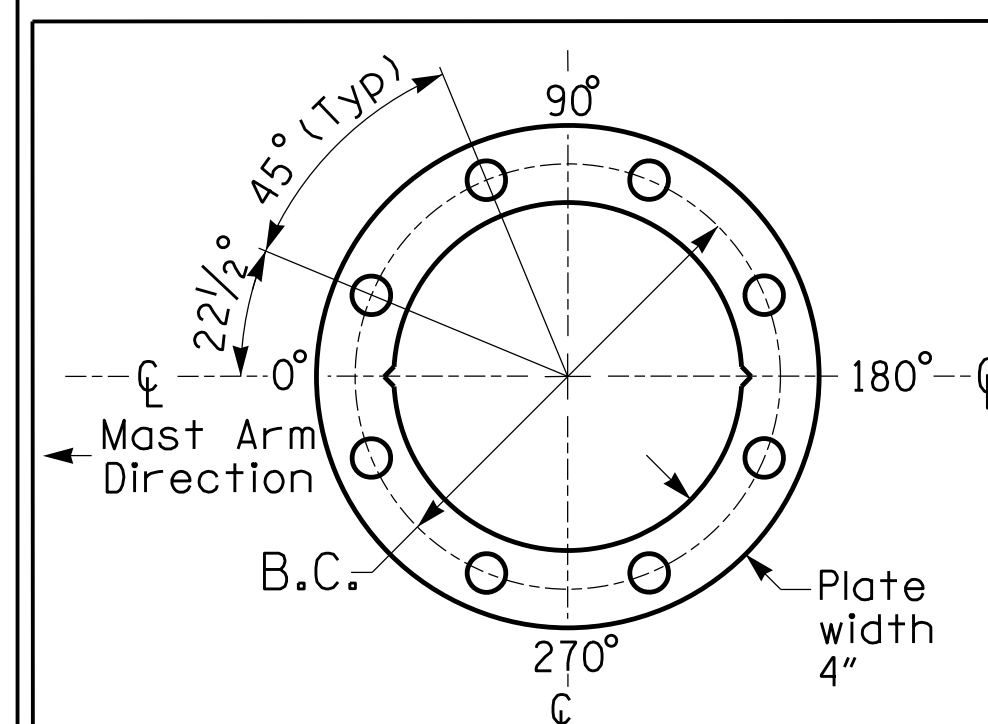


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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



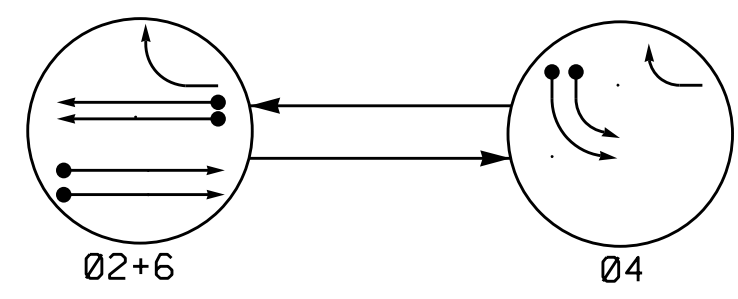
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NCDOT Wind Zone 4 (90 mph)

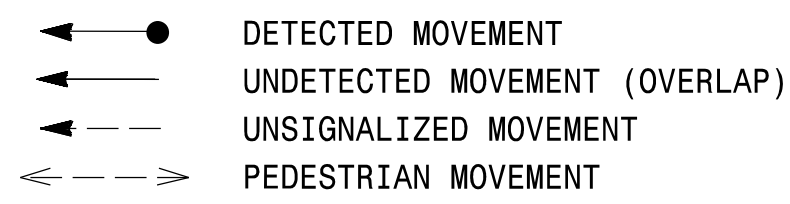
	<b>US 421 Business at SR 1372 (Curtis Bridge Rd)</b>		
	Division 11 Wilkes County Wilkesboro PLAN DATE: May 2023 REVIEWED BY: M. Stygles PREPARED BY: S.R. Chiluka REVIEWED BY: J. Ma	SCALE: 0 N/A REVISIONS: _____ INIT. DATE: _____	
750 N. Greenfield Pkwy, Garner, NC 27529			5/24/2023 SIGNATURE: _____ DATE: _____ SIG. INVENTORY NO. 11-0944



PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND



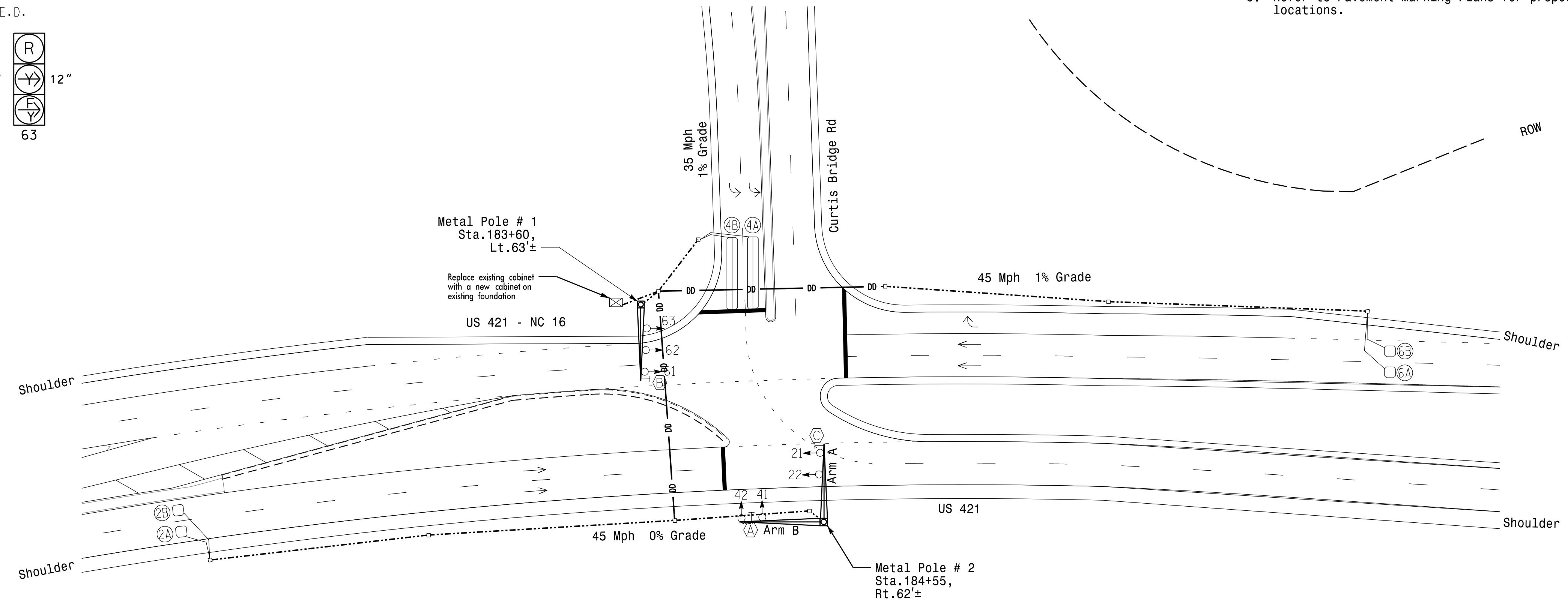
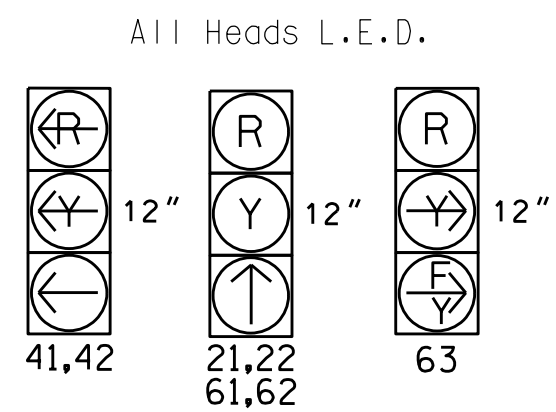
SIGNAL FACE	PHASE		
	2	4	6
21,22	↑	R	Y
41,42	←	—	←
61,62	↑	R	Y
63	←	←	←

MAXTIME DETECTOR INSTALLATION CHART												
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND INITIAL	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X

2 Phase Fully Actuated Wilkesboro Closed Loop System NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Refer to Pavement Marking Plans for proposed stop bar locations.

SIGNAL FACE I.D.

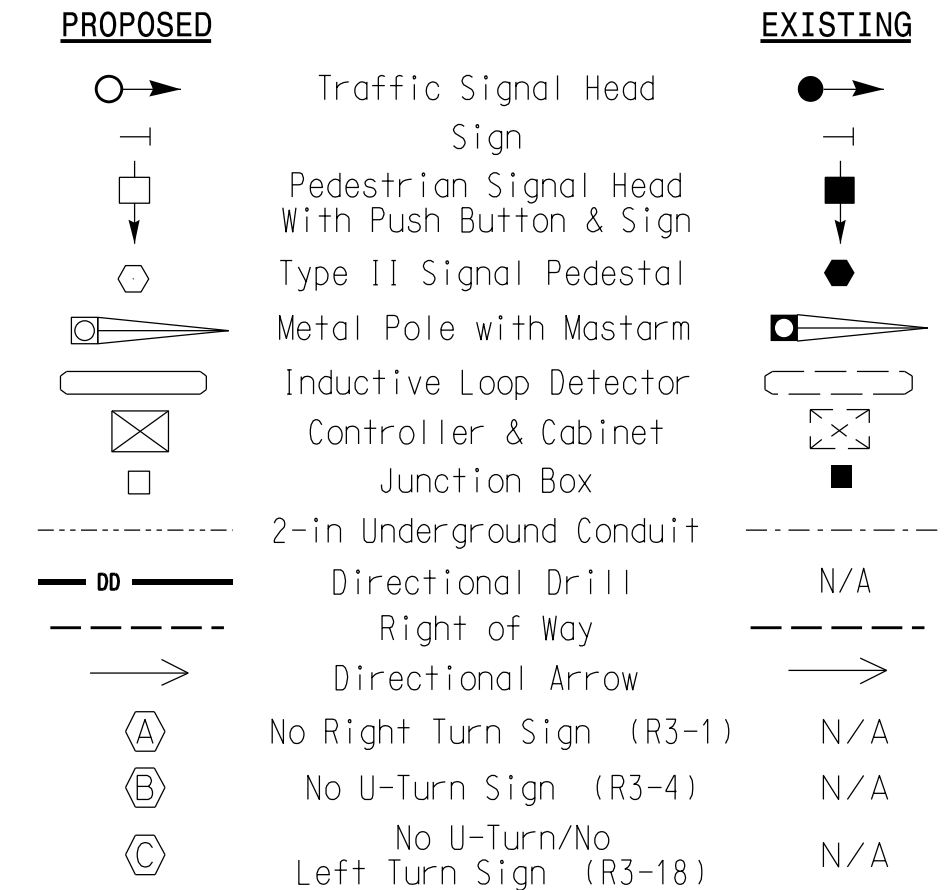


MAXTIME TIMING CHART

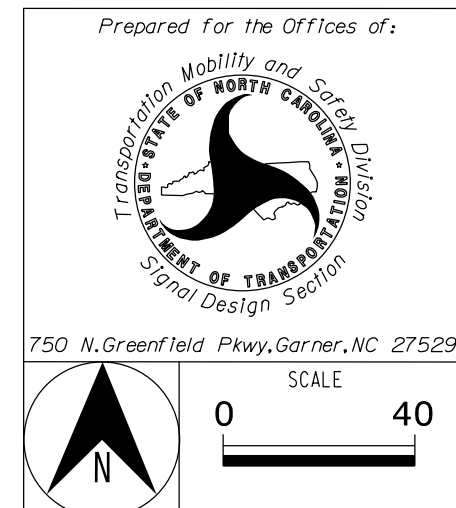
FEATURE	PHASE		
	2	4	6
Walk *	0	0	0
Ped Clear *	0	0	0
Min Green	12	7	12
Passage *	6.0	2.0	6.0
Max 1 *	60	30	60
Yellow Change	4.5	4.5	4.4
Red Clear	1.0	1.0	1.1
Added Initial *	1.5	-	1.5
Maximum Initial *	34	-	34
Time Before Reduction *	15	-	15
Time To Reduce *	30	-	30
Minimum Gap	3.4	-	3.4
Advance Walk	-	-	-
Non Lock Detector	-	X	-
Vehicle Recall	MIN RECALL	-	MIN RECALL
Dual Entry	-	-	-

\* 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.

LEGEND



New Installation



US 421 - NC 16 at SR 1372 (Curtis Bridge Rd)	
Division 11 Wilkes County Wilkesboro	
PLAN DATE: May 2023	REVIEWED BY: M. Stygles
PREPARED BY: S.R. Chiluka	REVIEWED BY: J. Ma
REVISIONS	INIT. DATE



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

DATE: 5/24/2023

SIGNATURE: S. R. Chiluka

DATE: J. Ma

SIG. INVENTORY NO. 11-1466

5/18/2023 10:56:10 AM R:\Traffic\Signals\Design\11466\11466\_sig\_dsn\_202305.dgn schiluka







METAL POLE No. 1

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
	SIGN RIGID MOUNTED	9.0 S.F.	36.0"W X 36.0"L	20 LBS

**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
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+4.2 ft.
Elevation difference at Edge of travelway or face of curb	+4.1 ft.

NOTES

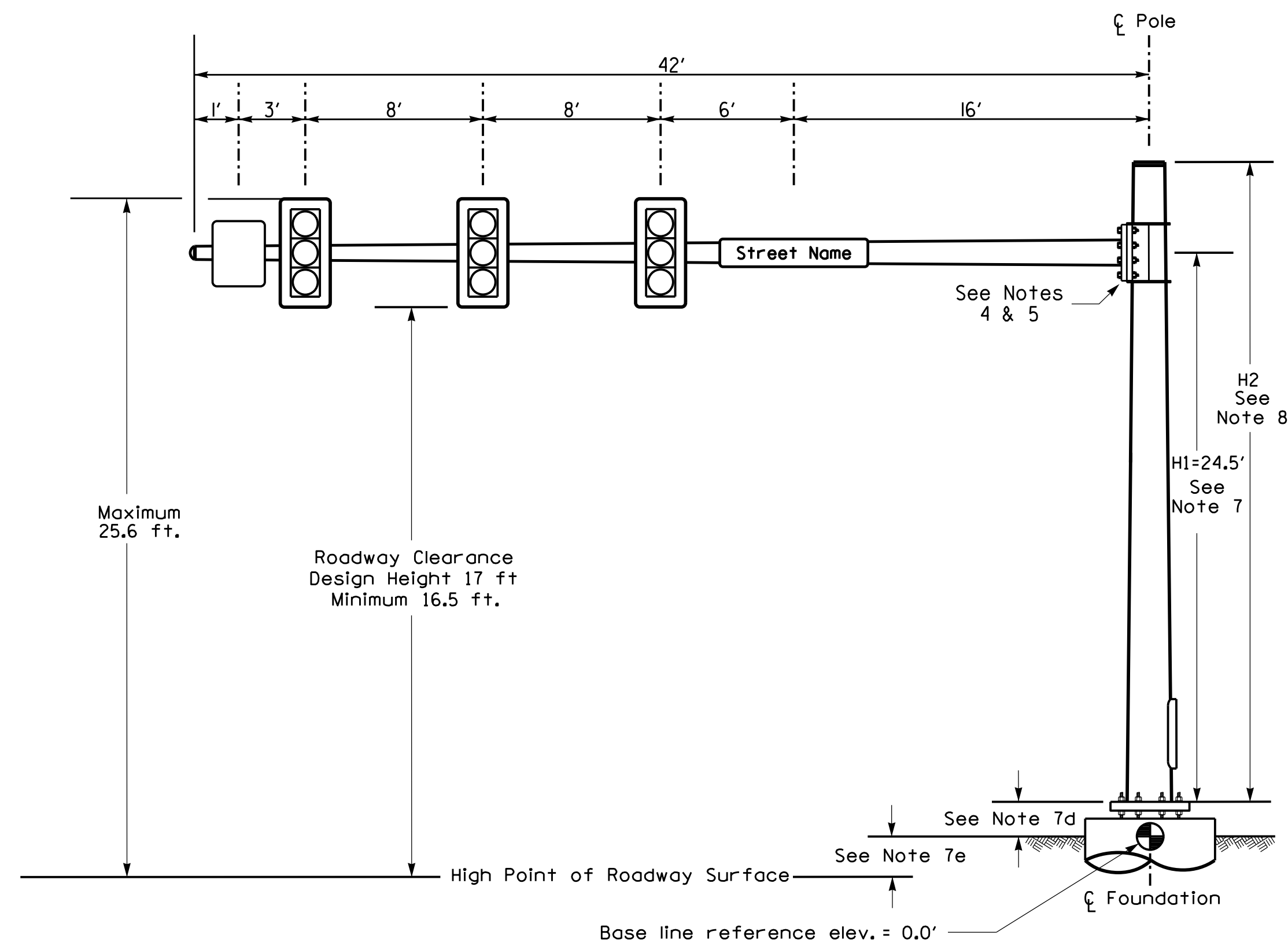
DESIGN REFERENCE MATERIAL

- Design the traffic signal structure and foundation in accordance with:
  - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2018 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>

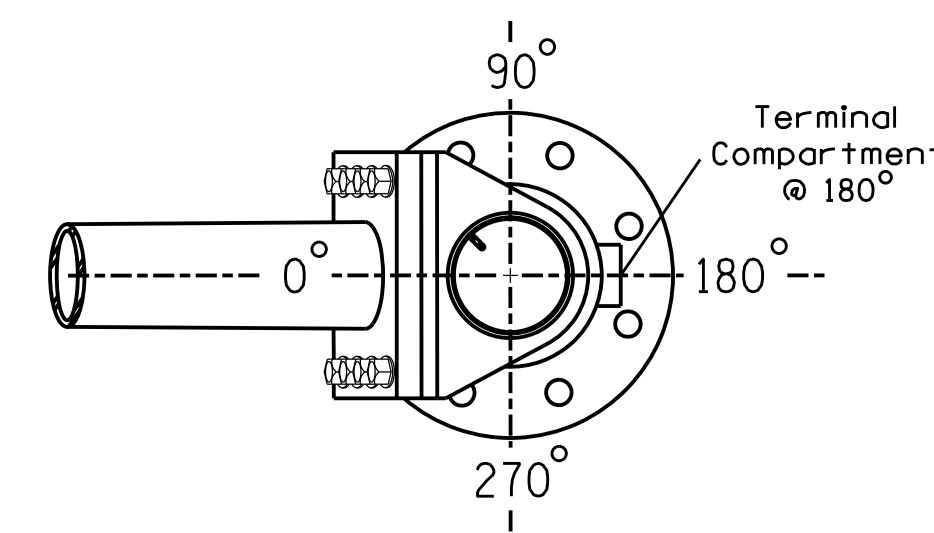
DESIGN REQUIREMENTS

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
  - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
  - Signalheads are rigidly mounted and vertically centered on the mast arm.
  - The roadway clearance height for design is as shown in the elevation views.
  - The top of the pole base plate is 0.75 feet above the ground elevation.
  - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
- 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.
- 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) 814-5000.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signalheads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

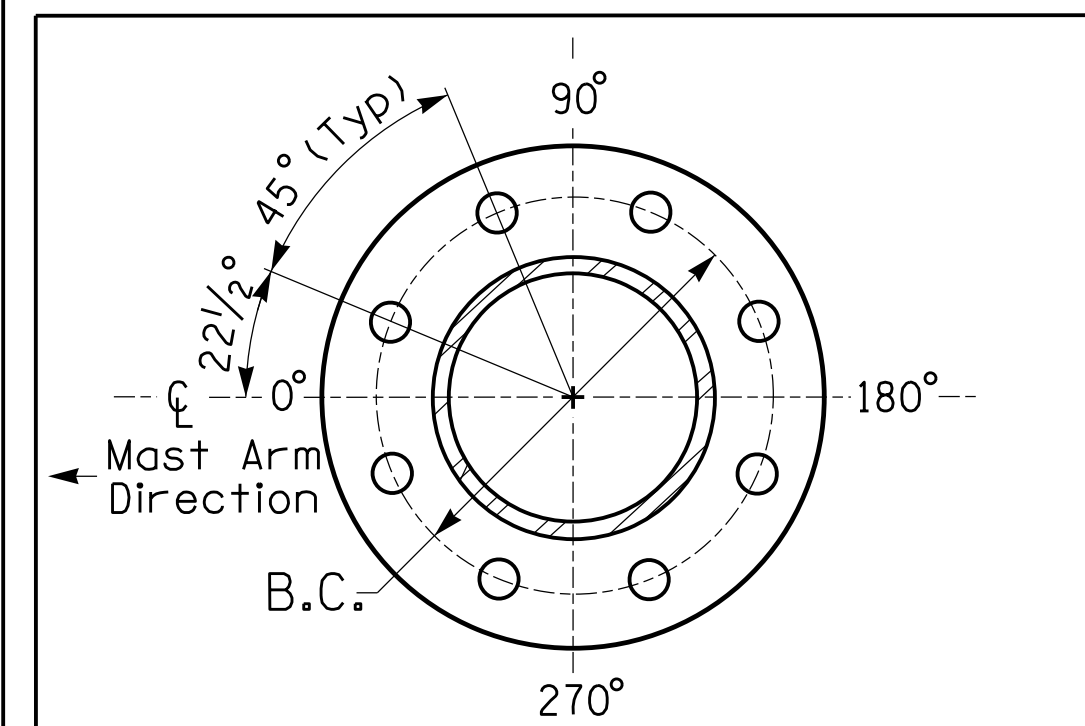
Design Loading for METAL POLE NO. 1



Elevation View

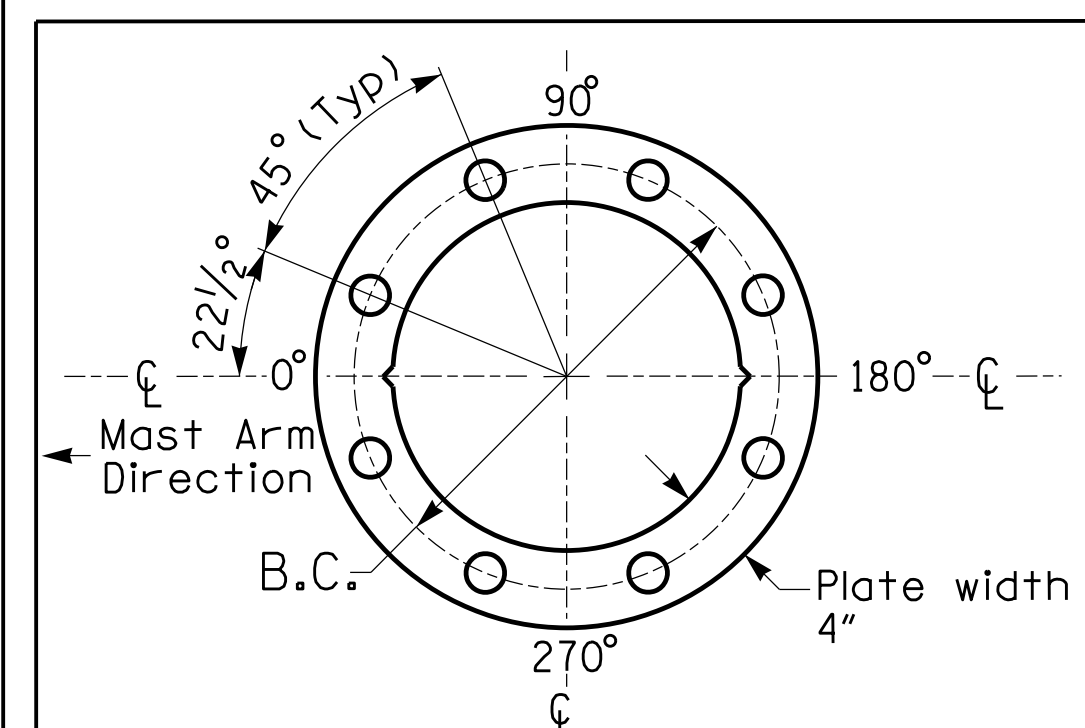


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6

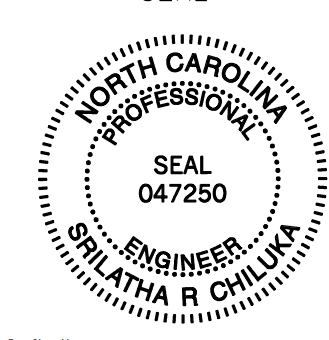


BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL  
For 8 Bolt Base Plate



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

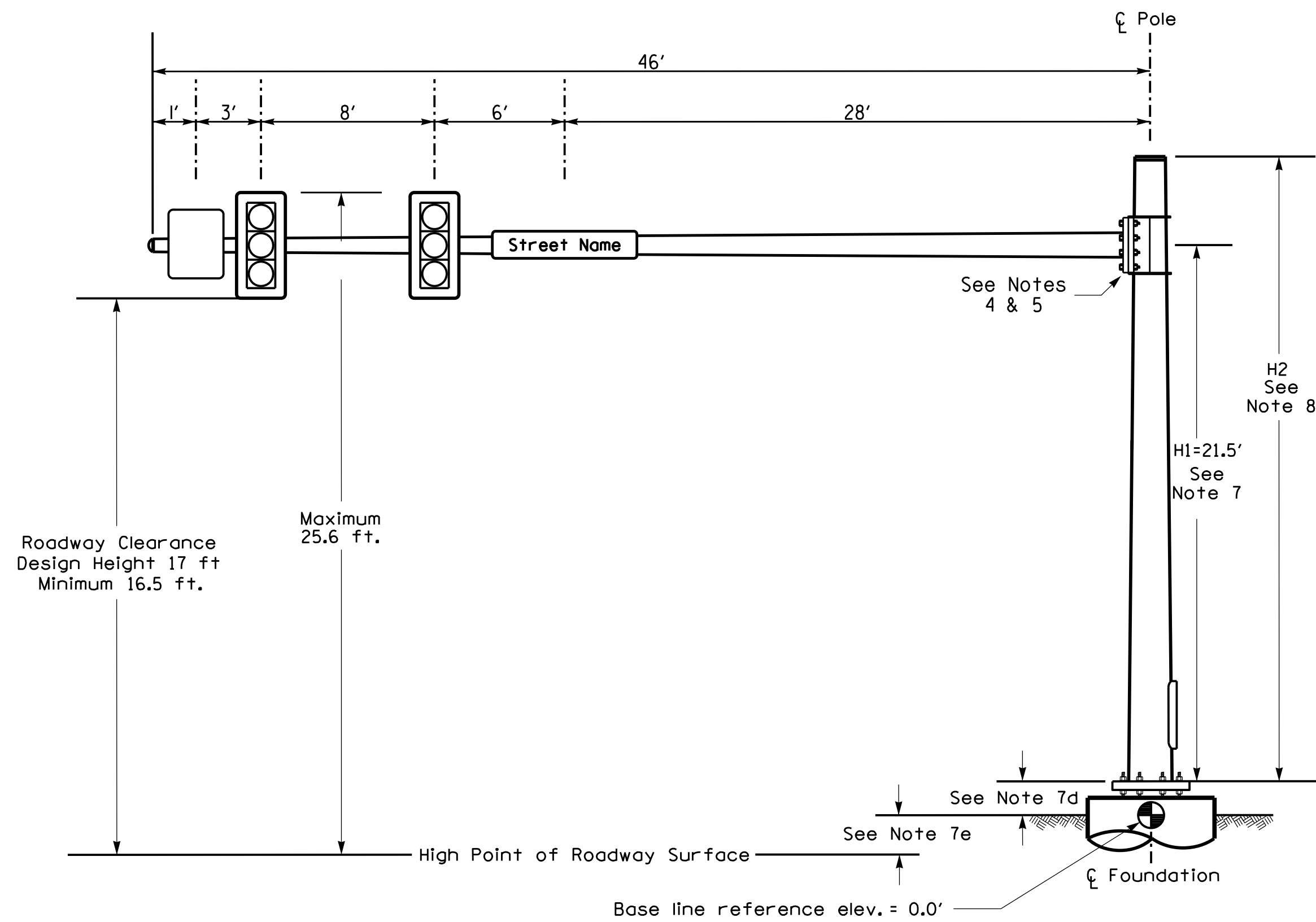


NCDOT Wind Zone 4 (90 mph)

 Prepared for the Offices of: Transportation Mobility and Safety Division STATE OF NORTH CAROLINA SIGNAL DESIGN SECTION 750 N. Greenfield Pkwy, Garner, NC 27529	US 421 - NC 16 at SR 1372 (Curtis Bridge Rd)		SEAL  S. R. CHILUKA ENGINEER License No. 047250
	Division 11 Wilkes County Wilkesboro PLAN DATE: May 2023 REVIEWED BY: M. Stygles PREPARED BY: S.R. Chiluka REVIEWED BY: J. Ma	SCALE 0 40 REVISIONS INIT. DATE	
SIGNATURE:  DATE: 5/24/2023		SIG. INVENTORY NO. 11-1466	



**Design Loading for METAL POLE NO. 2 (Arm A)**



**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:	Arm A	Arm B
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.5 ft.	+0.5 ft.
Elevation difference at Edge of travelway or face of curb	+1.3 ft.	+1.3 ft.

**METAL POLE No. 2**

**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
	STREET NAME SIGN RIGID MOUNTED	9.0 S.F.	36.0" W X 36.0" L	20 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

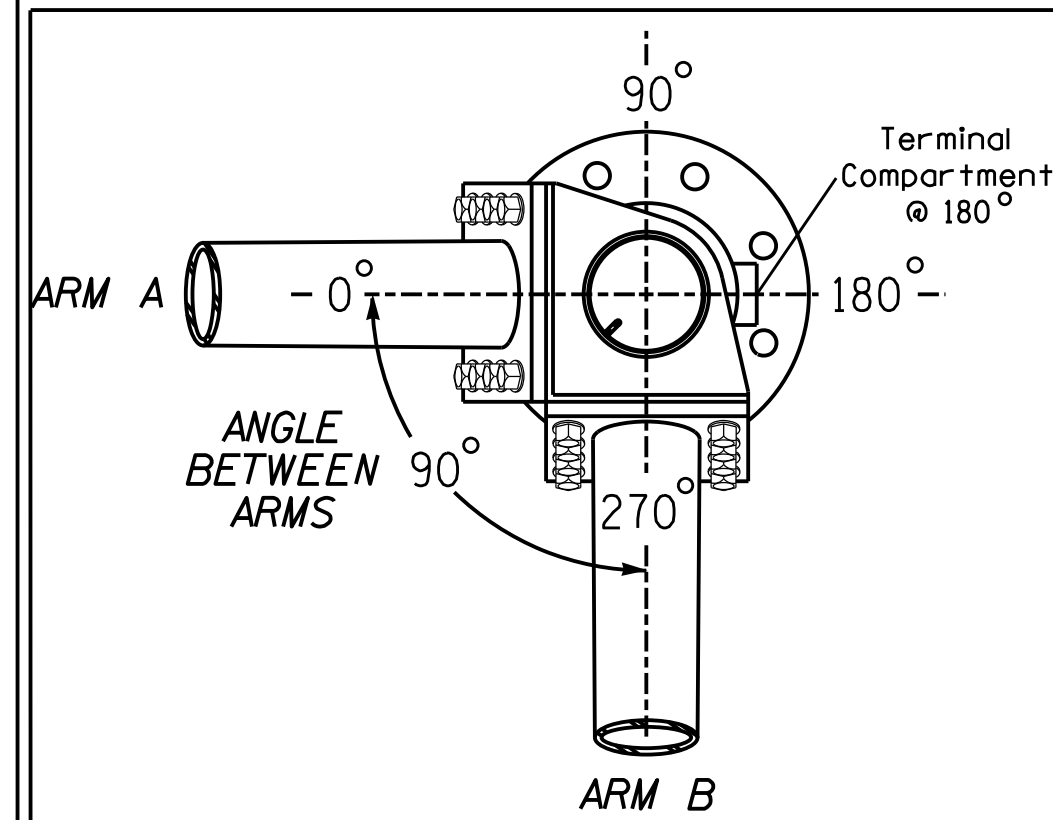
**NOTES**

**DESIGN REFERENCE MATERIAL**

- Design the traffic signal structure and foundation in accordance with:
  - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2018 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>

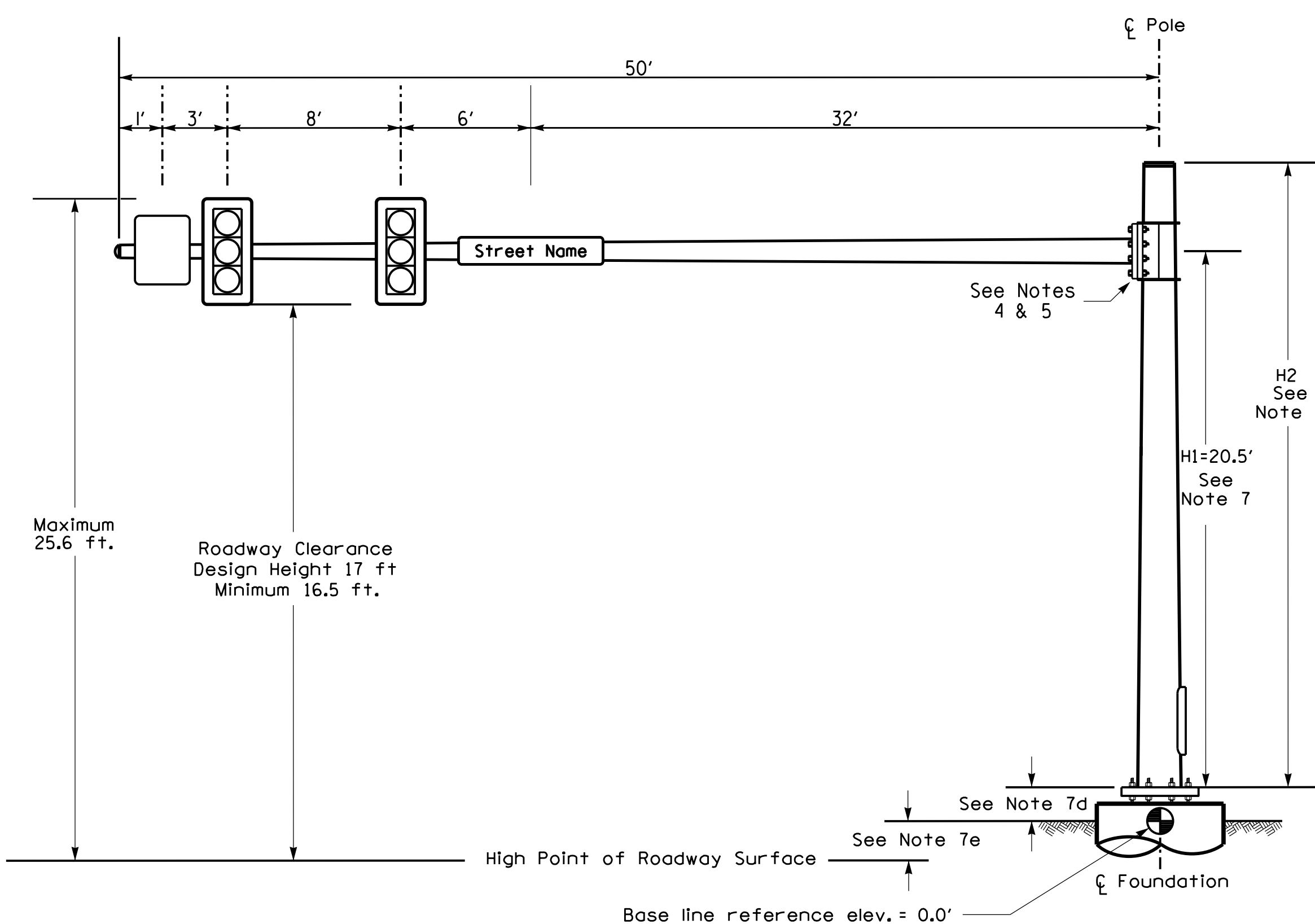
**DESIGN REQUIREMENTS**

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
  - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
  - Signal heads are rigidly mounted and vertically centered on the mast arm.
  - The roadway clearance height for design is as shown in the elevation views.
  - The top of the pole base plate is 0.75 feet above the ground elevation.
  - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
- 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.
- 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) 814-5000.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

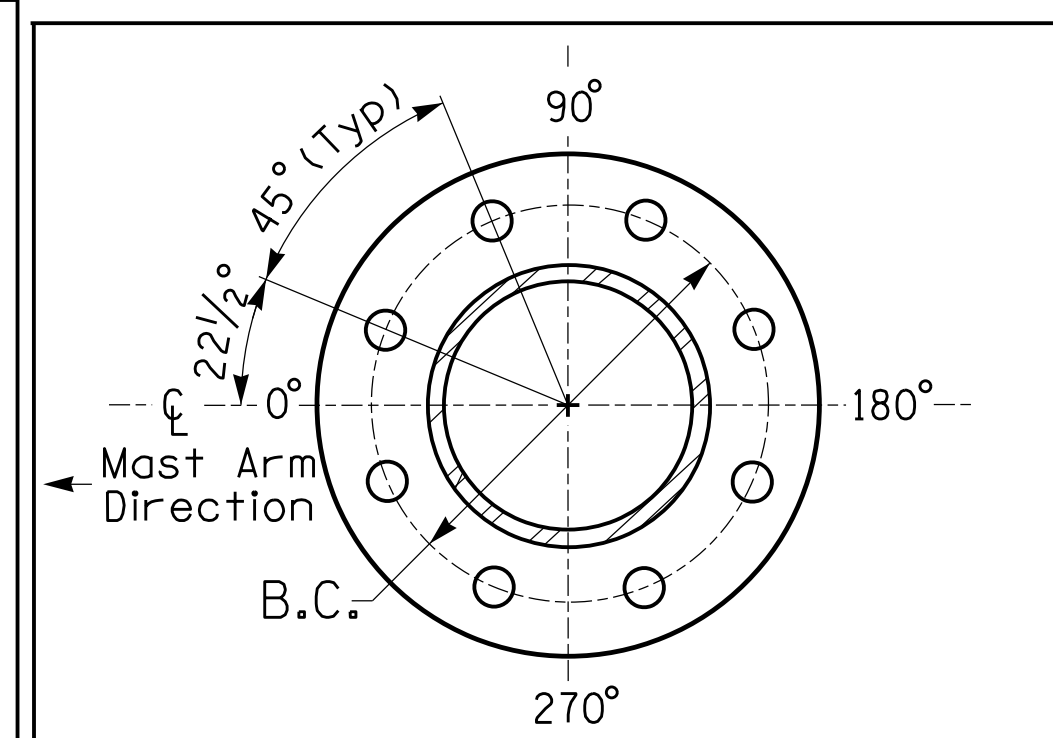


**POLE RADIAL ORIENTATION**

**Design Loading for METAL POLE NO. 2 (Arm B)**

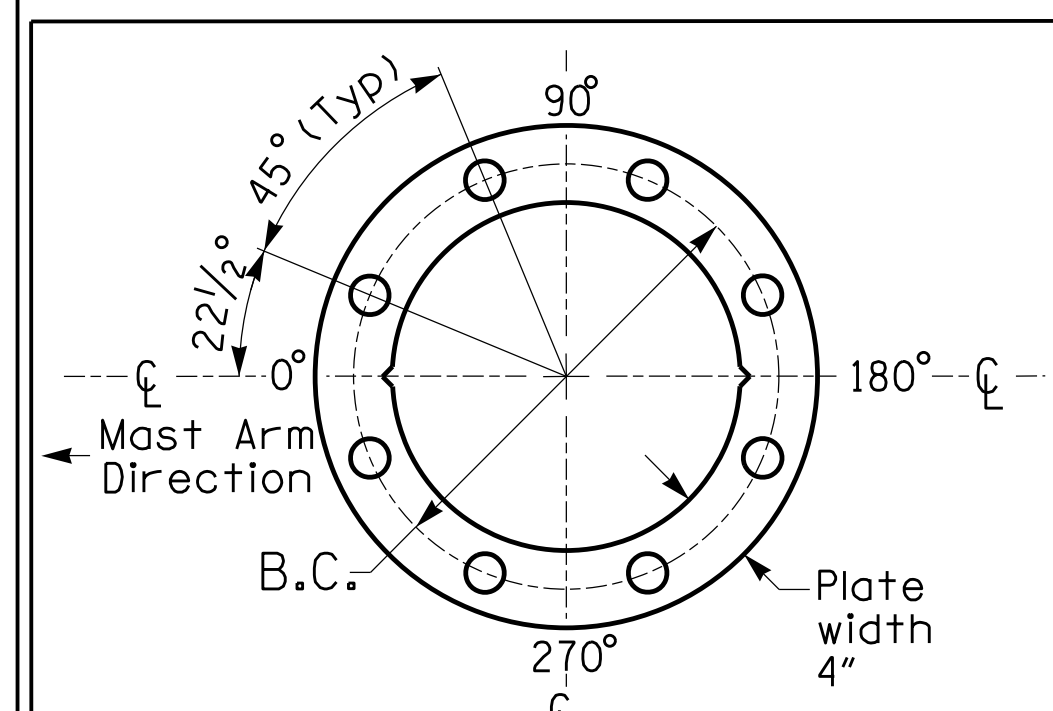


**Elevation View**



**8 BOLT BASE PLATE DETAIL**

See Note 6



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

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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NCDOT Wind Zone 4 (90 mph)

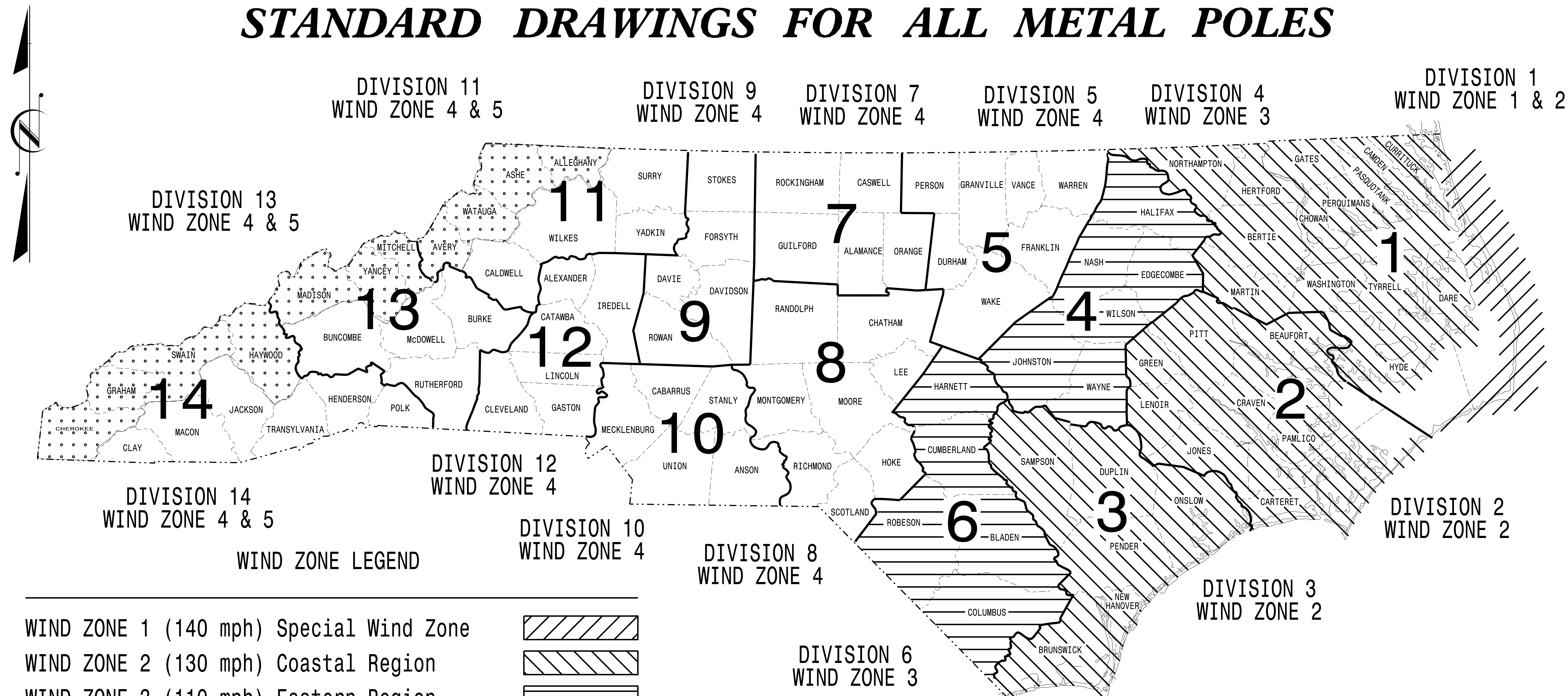
	<p>US 421 - NC 16 at SR 1372 (Curtis Bridge Rd)</p>		
	<p>Division 11 Wilkes County Wilkesboro</p> <p>PLAN DATE: May 2023 REVIEWED BY: M. Stygles</p> <p>PREPARED BY: S.R. Chiluka REVIEWED BY: J. Ma</p>	<p>SCALE: N/A</p> <p>REVISIONS:</p> <p>INIT. DATE</p>	



# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

PROJECT I.D. NO.	SHEET NO.
	Sig.M1

## STANDARD DRAWINGS FOR ALL METAL POLES



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:

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

DRAWING NUMBER	DESCRIPTION
Sig. M 1	Statewide Wind Zone Map
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

**NCDOT CONTACTS:**

**MOBILITY AND SAFETY DIVISION - ITS AND SIGNALS UNIT**

---

**M.M. MC DIARMID, P.E. - STATE ITS AND SIGNALS ENGINEER**

**J.P. GALLOWAY, P.E. - STATE SIGNALS ENGINEER**

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

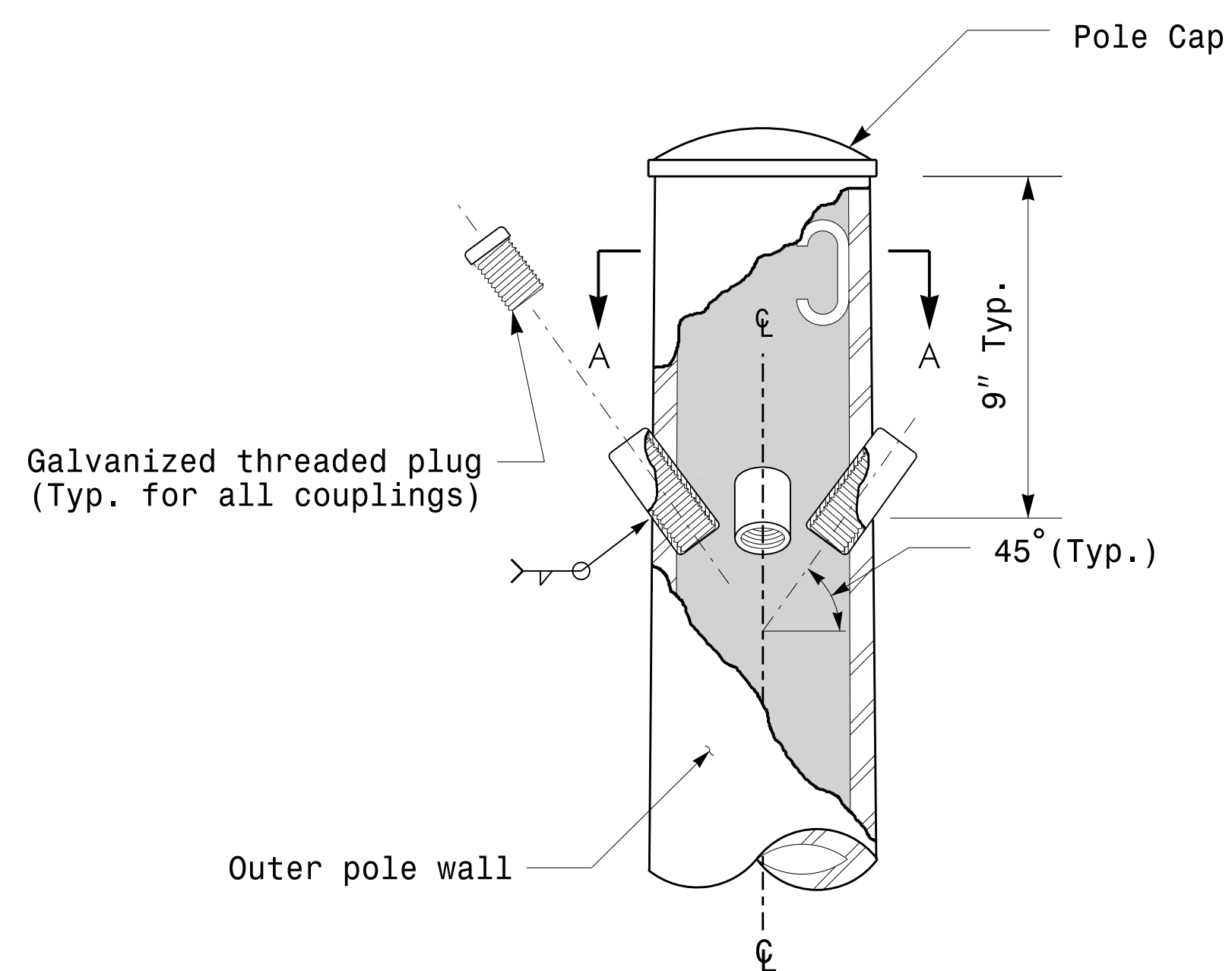
SEAL

DocuSigned by:  
*Debesh C. Sarkar*  
DATE: 10/11/2017

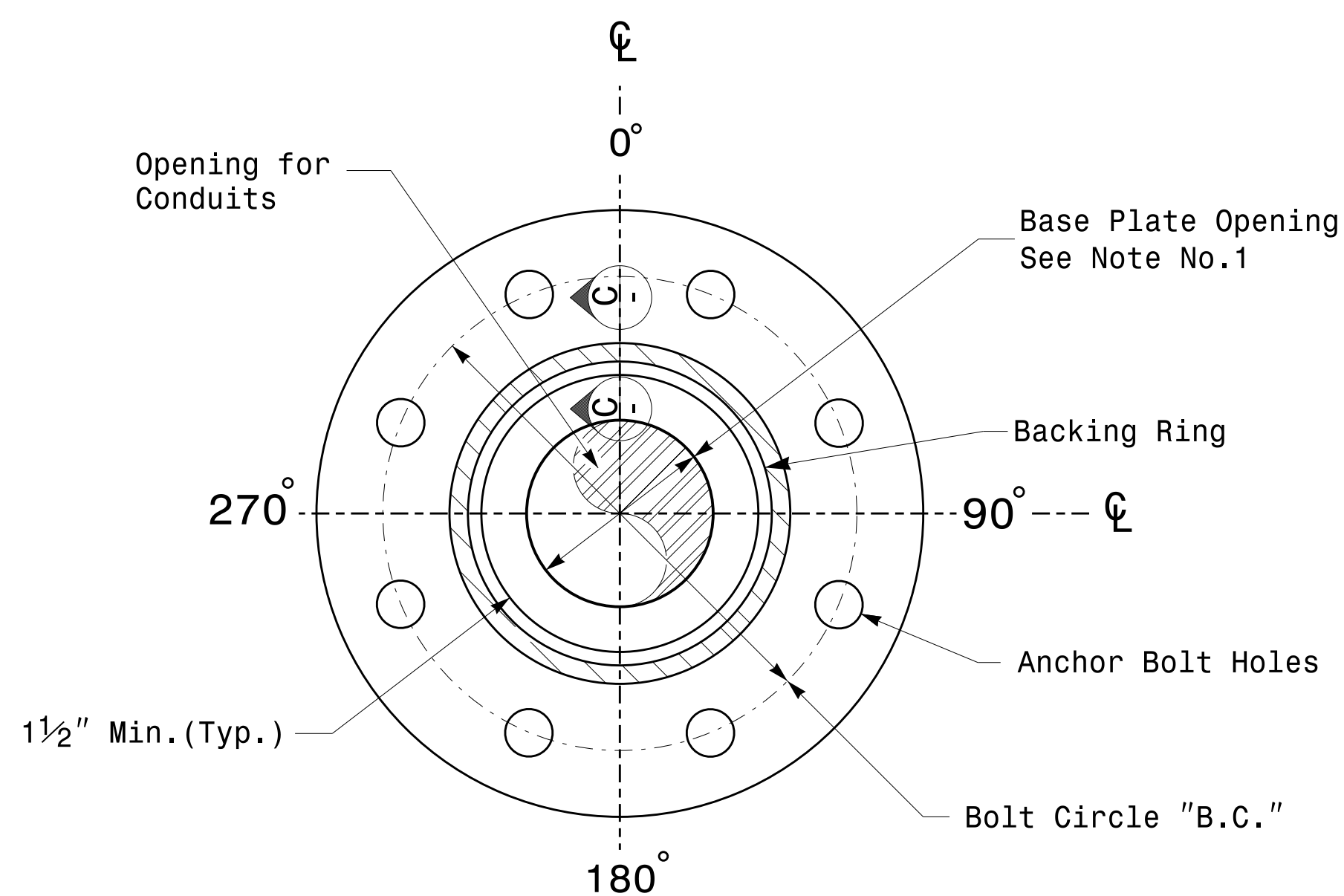




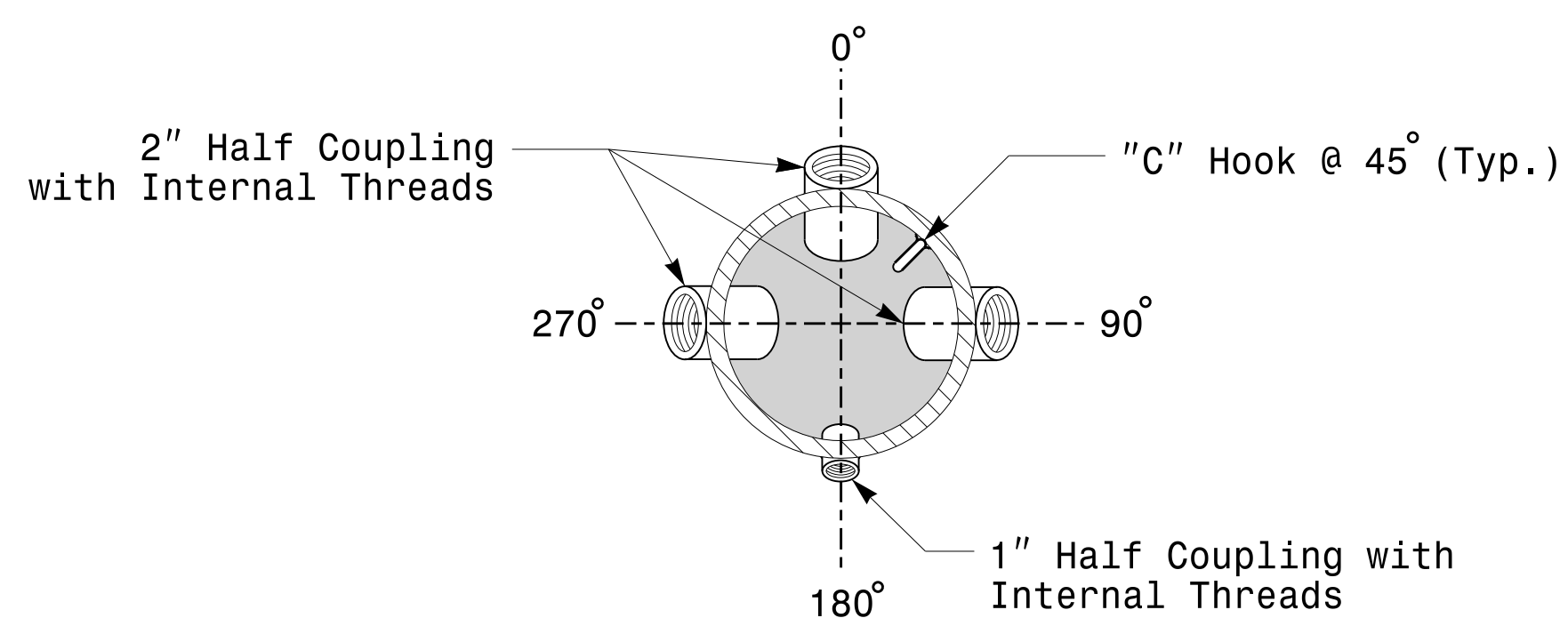
Note:  
 1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



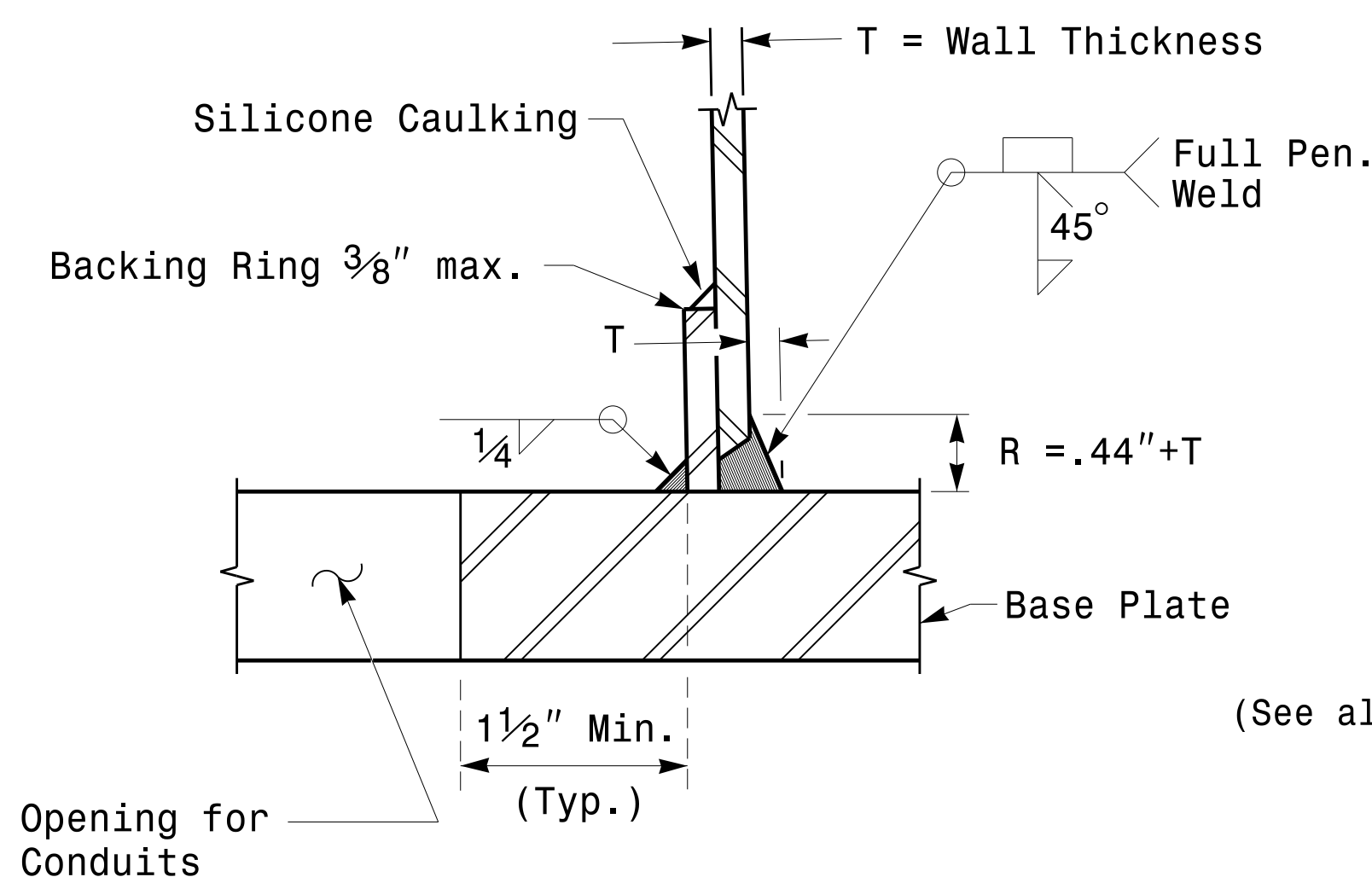
Cable Entrances at Top of Pole



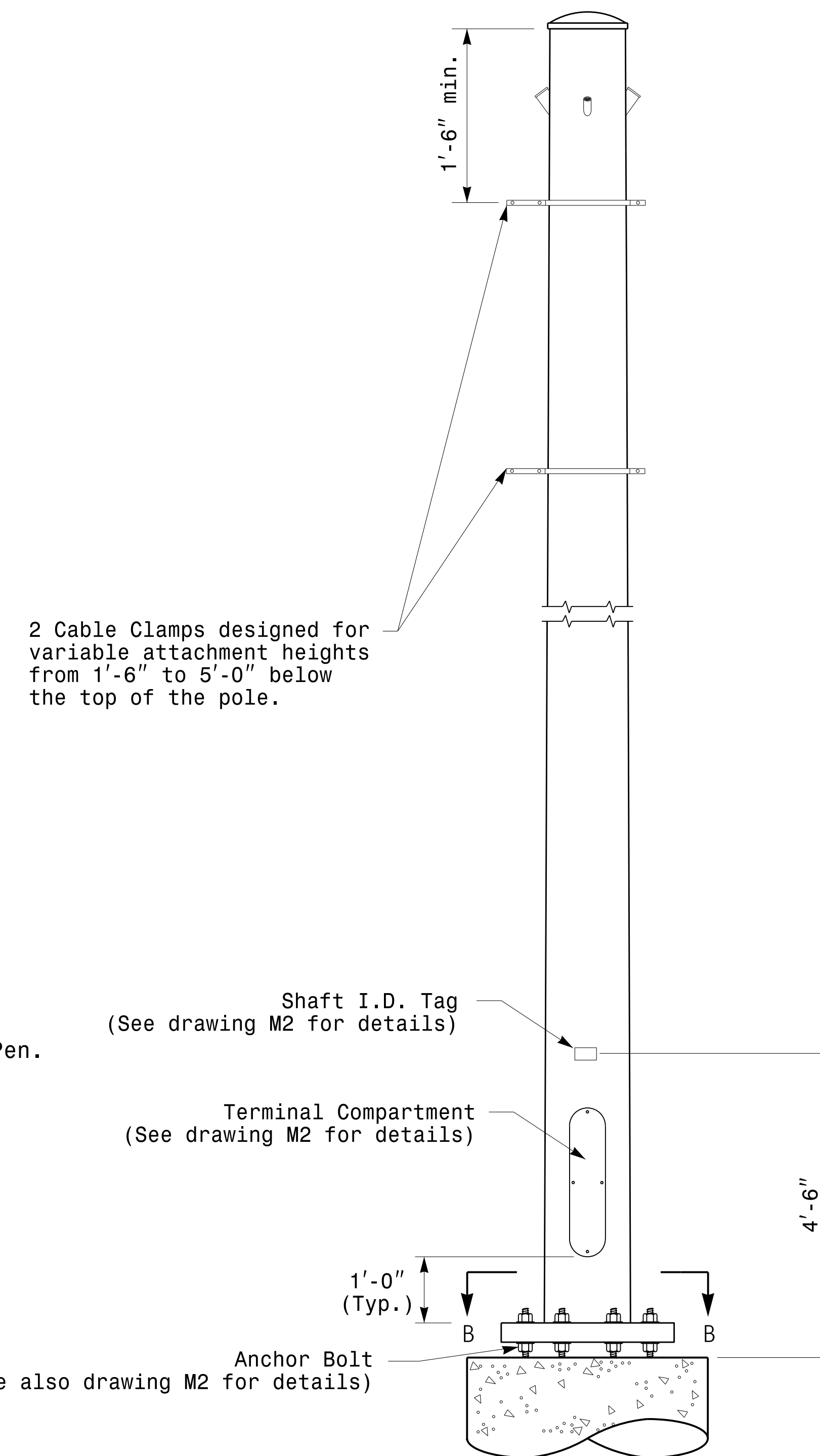
Section B-B  
Pole Base Plate Details  
(8 and 12 Bolt Pattern)



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



Monotube Strain Pole

Prepared in the Offices of:  
  
 750 N. Greenleaf Pkwy, Garner, NC 27529

Typical Fabrication Details For Strain Poles

PLAN DATE: OCTOBER 2017	DESIGNED BY: K.C. DURIGON
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

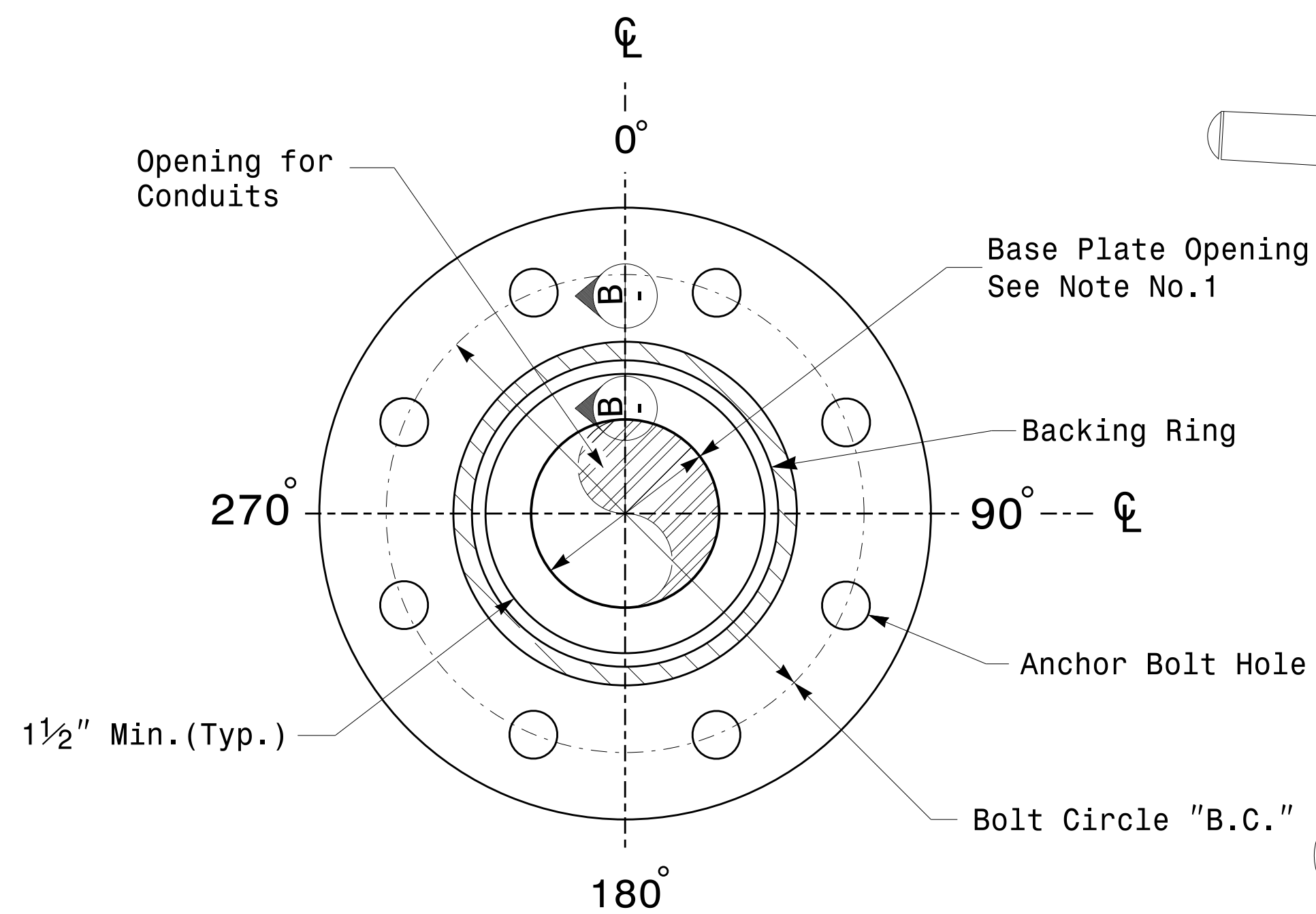
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 DocuSigned by: *Dibesh C. Sarkar*  
 44EB87816FA4F49E  
 10/11/2017  
 DATE

Fabrication Details – Strain Poles

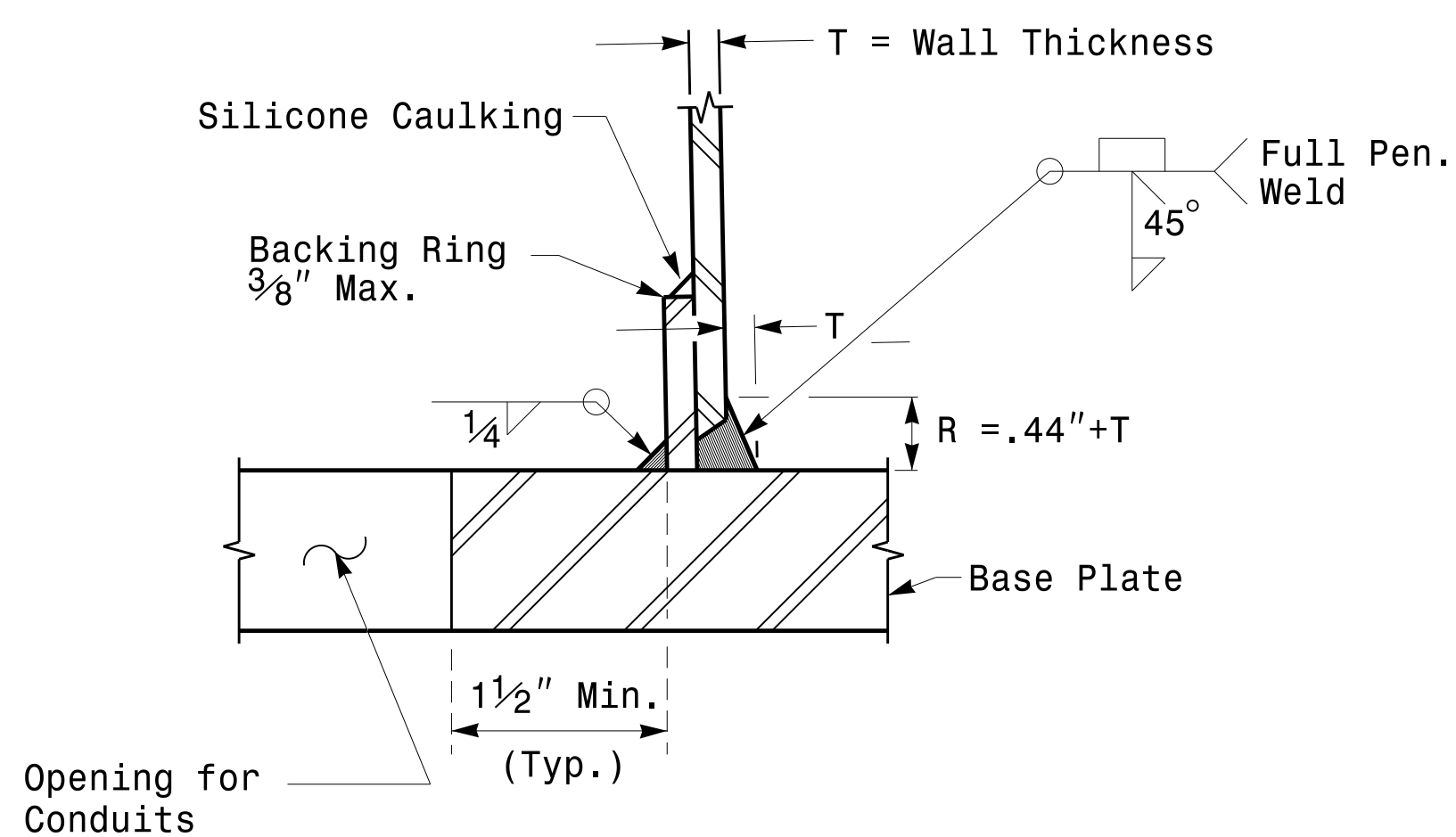
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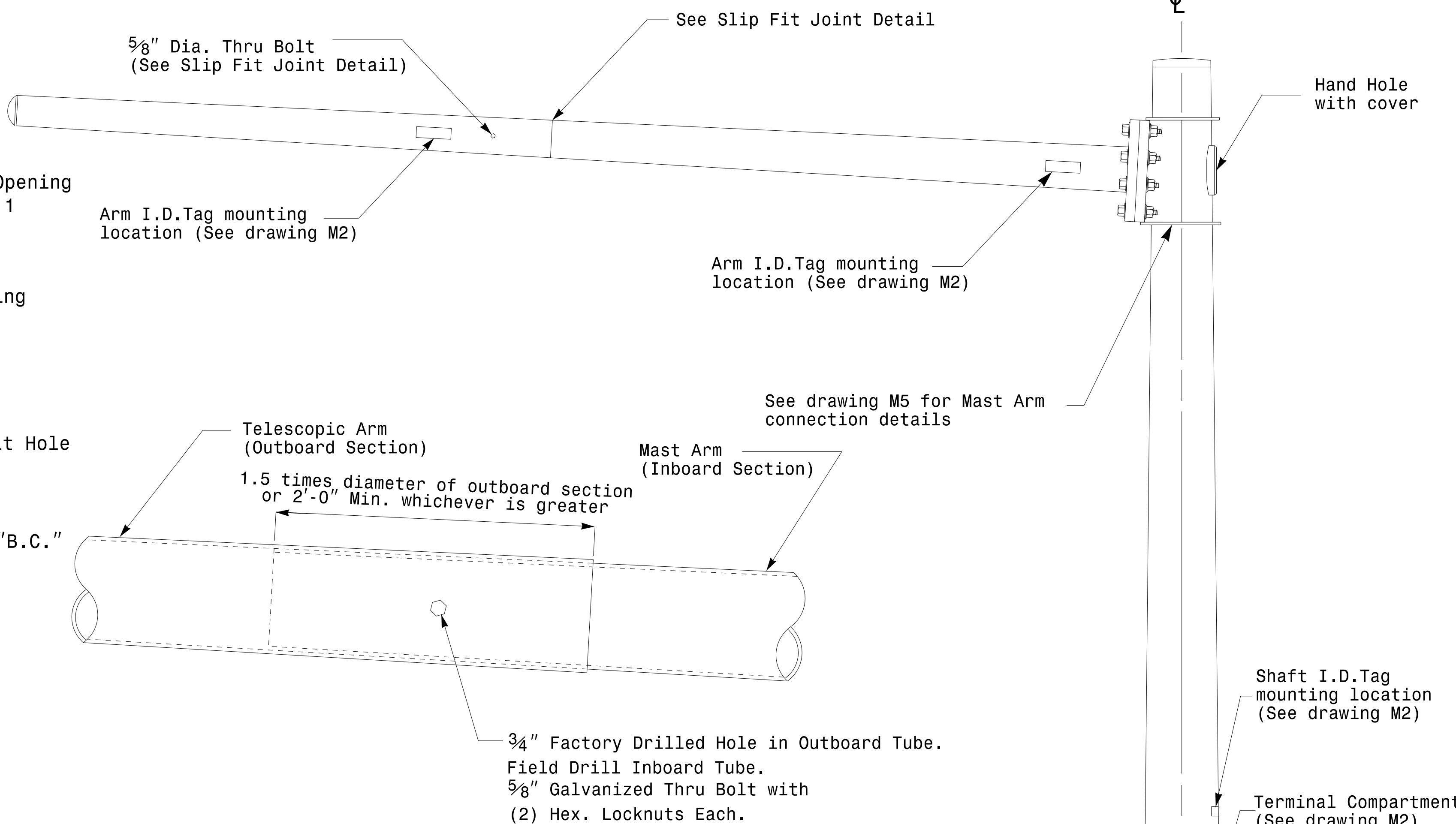
Note:  
1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



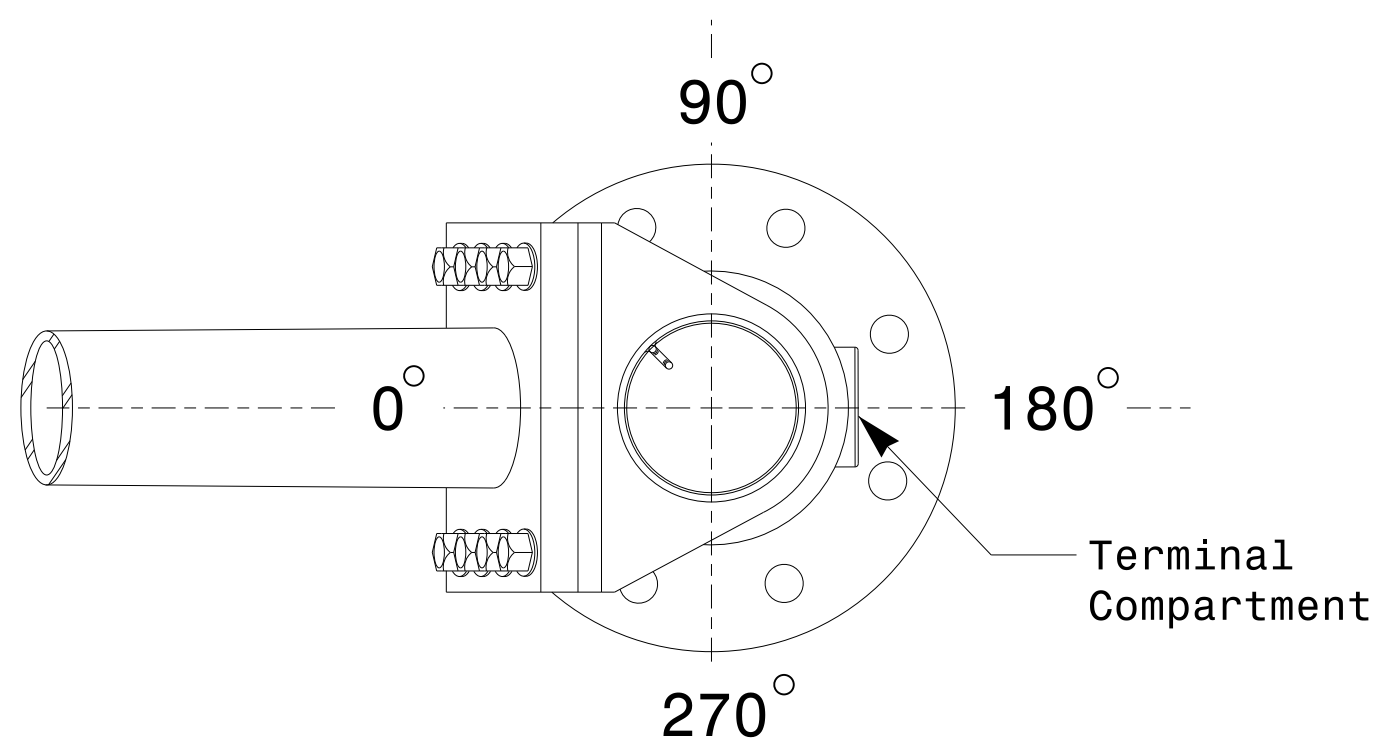
Section A-A  
Pole Base Plate Details



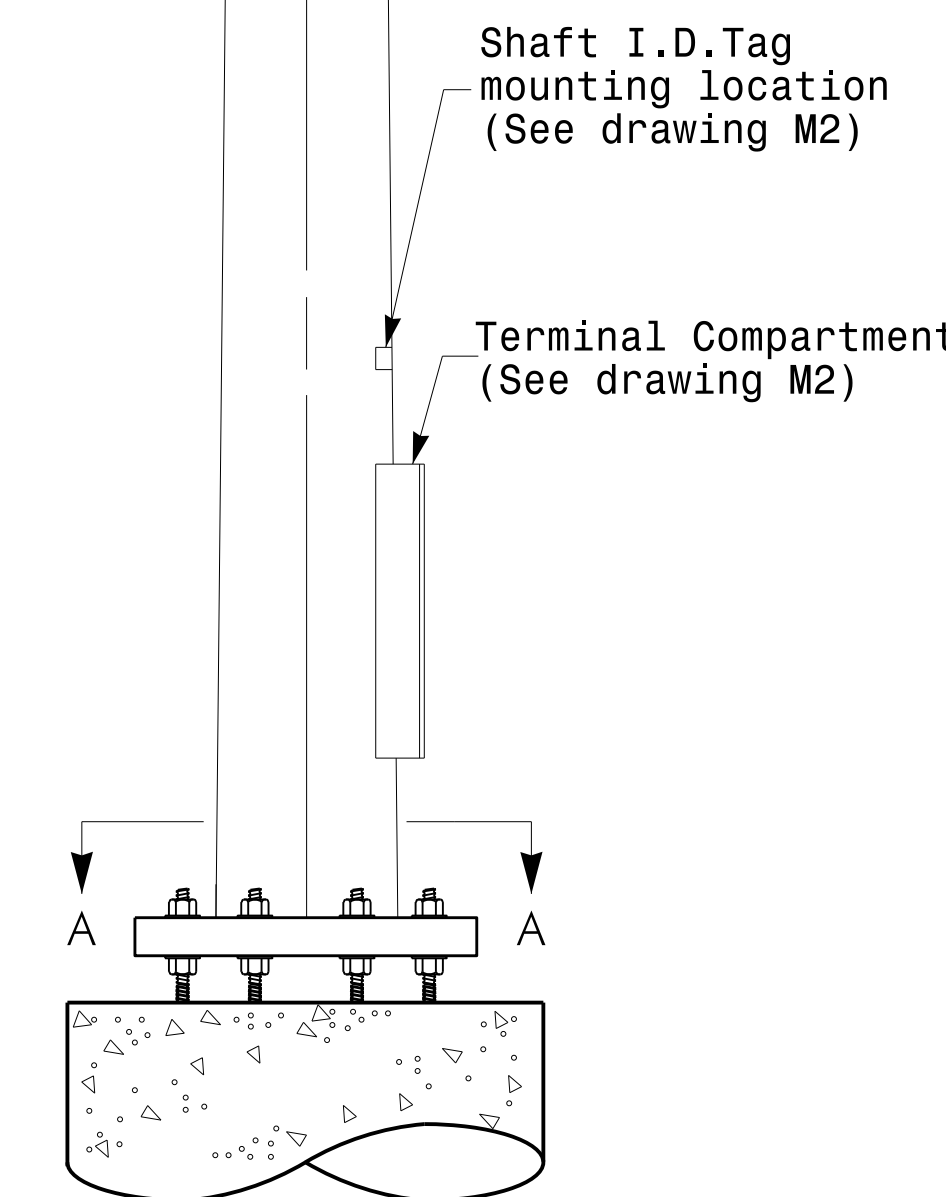
Section B-B  
(Pole Attachment to Base Plate)  
Full-Penetration Groove Weld Detail



Slip Fit Joint Detail for Mast Arm



Mast Arm Radial Orientation



Mast Arm Pole

<p>Prepared in the Offices of:</p> <p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details For Mast Arm Poles</p>		<p>SEAL</p>
	<p>PLAN DATE: OCTOBER 2017</p>	<p>DESIGNED BY: K.C. DURIGON</p>	
<p>SCALE: 0 NA NONE</p>	<p>PREPARED BY: N. BITTING</p>	<p>REVIEWED BY: D.C. SARKAR</p>	<p>10/11/2017</p>
<p>REVISIONS</p>	<p>INIT.</p>	<p>DATE</p>	<p>DATE</p>

11-OCT-2017 08:33 136560115 Signal&Signal Design Section Eastern Region\m4 Sheets\2016\2014 Sig.M4 Std. Fabrication Detail - Mast Arm Poles.dgn

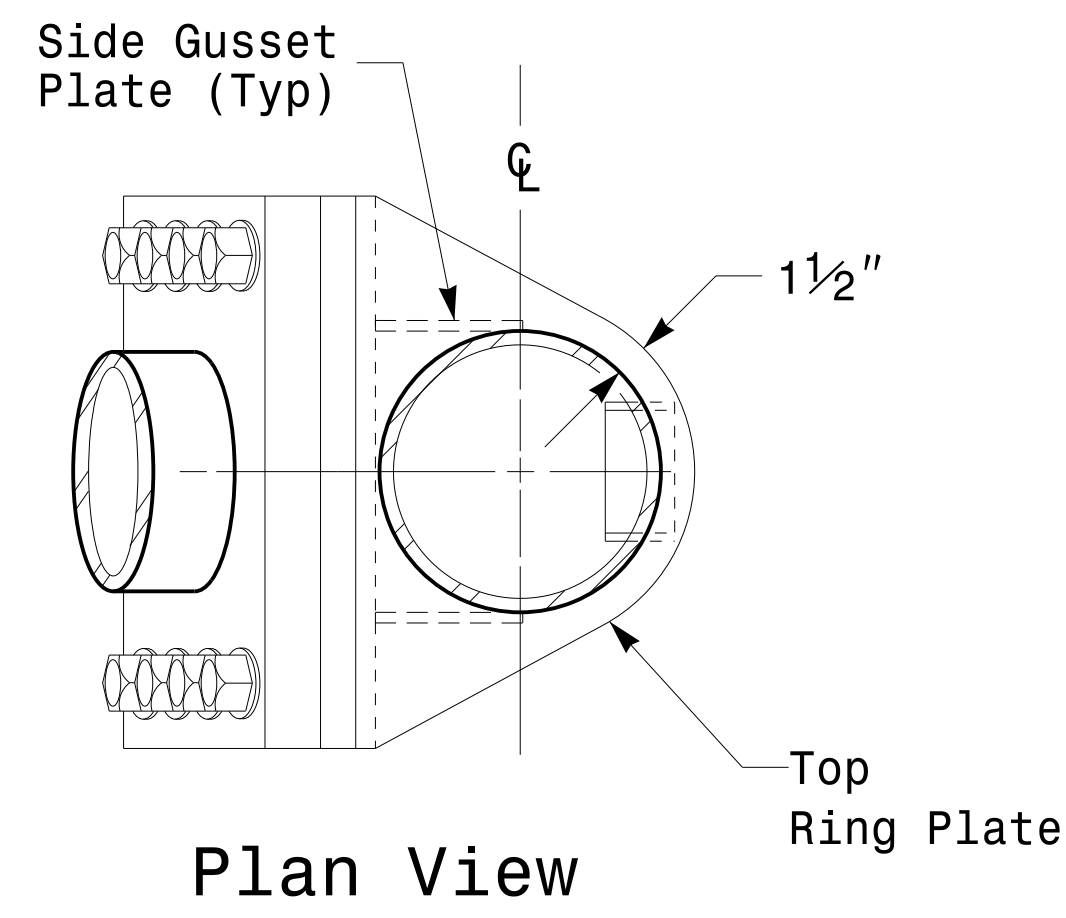
Fabrication Details - Mast Arm Poles

# Welded Ring Stiffened Mast Arm Connection

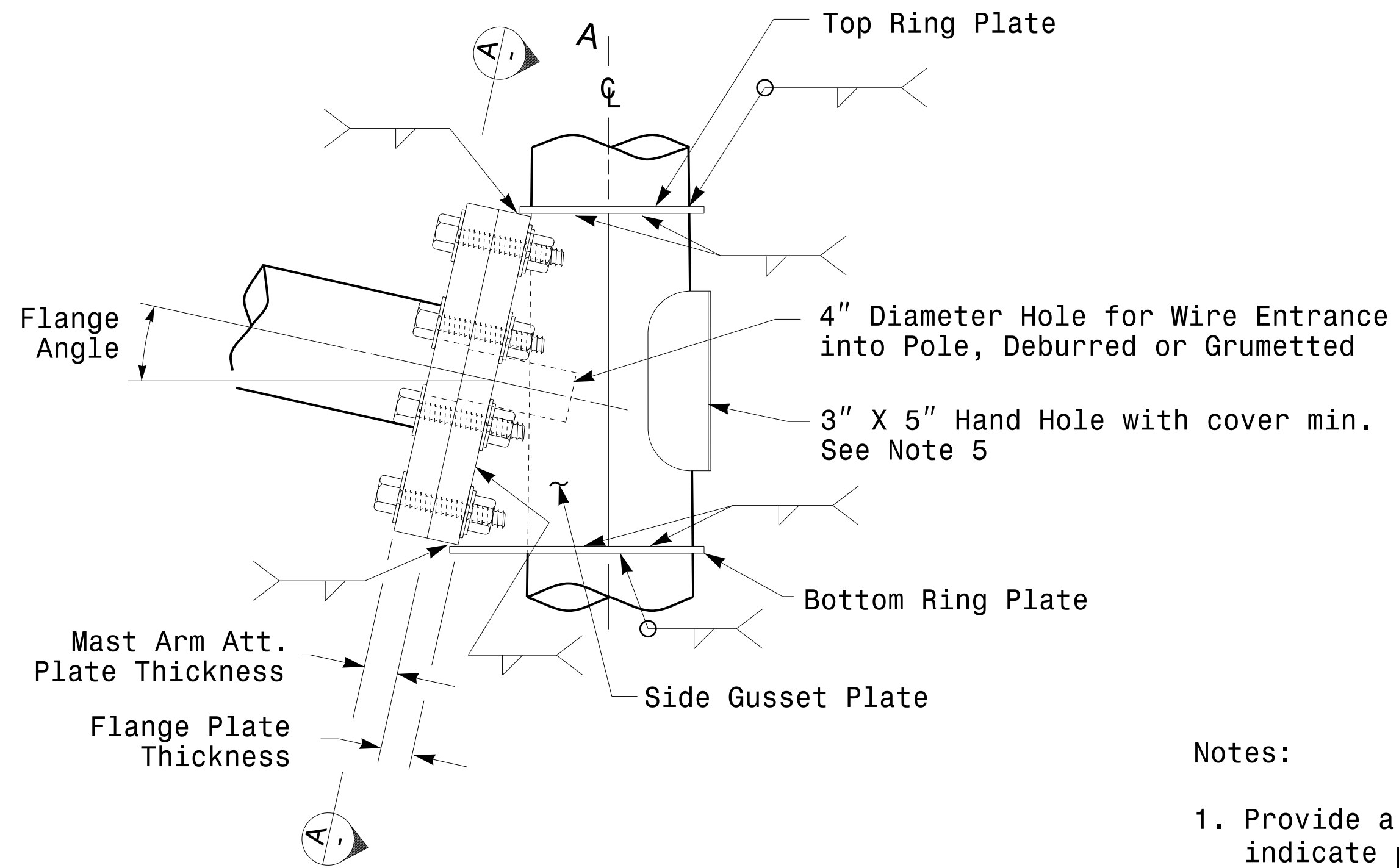
PROJECT ID. NO.

SHEET NO.

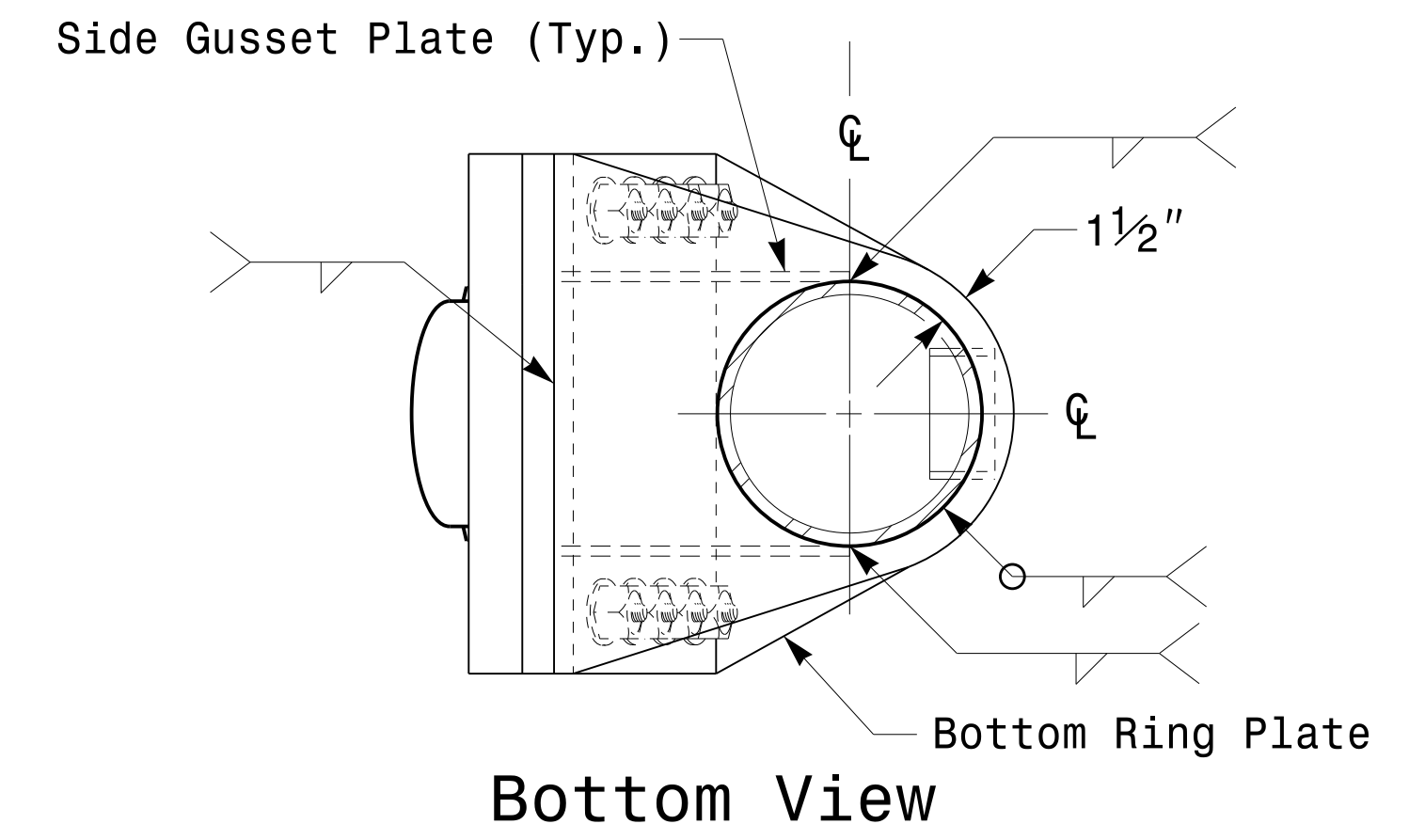
Sig.M5



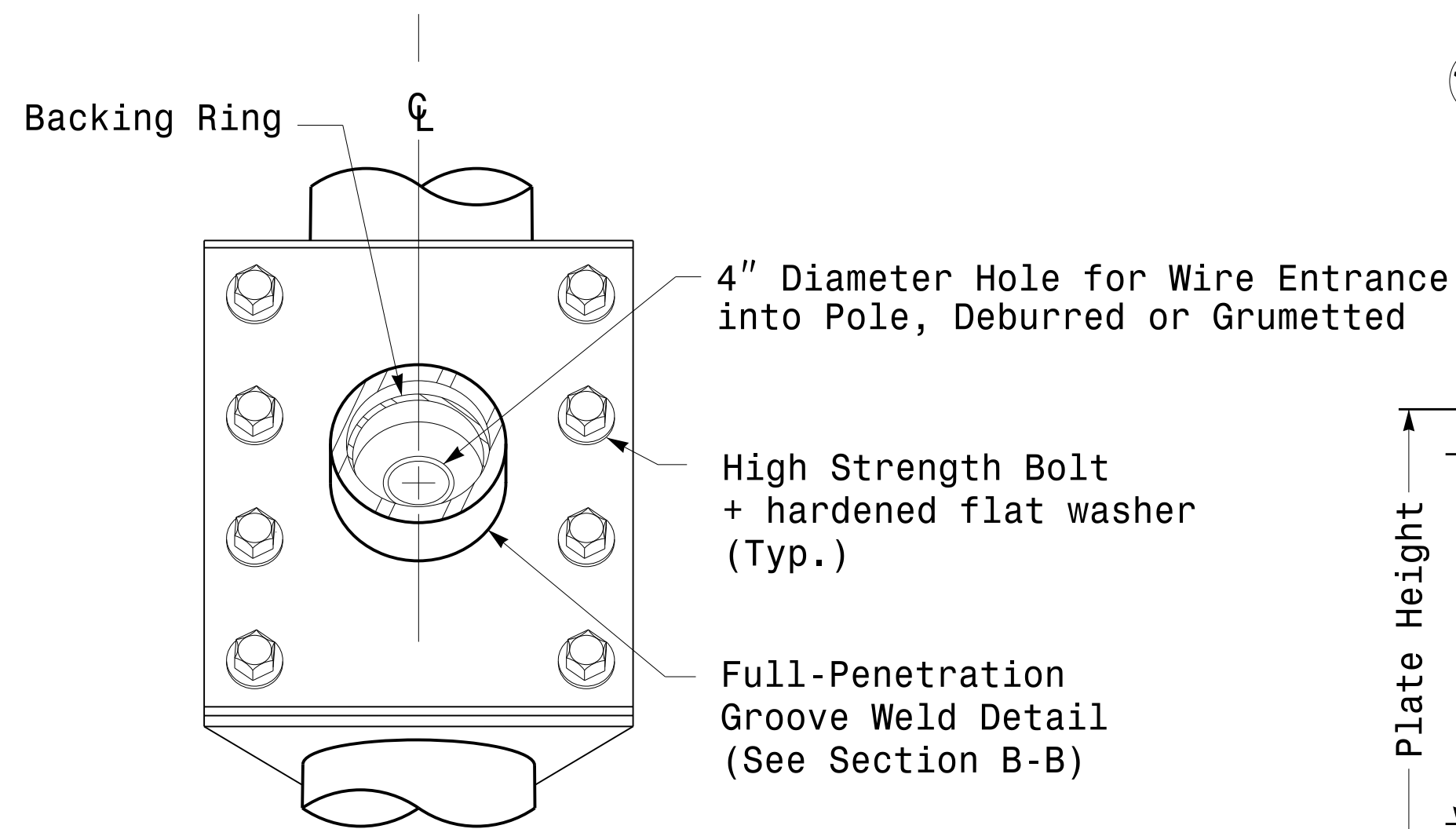
Plan View



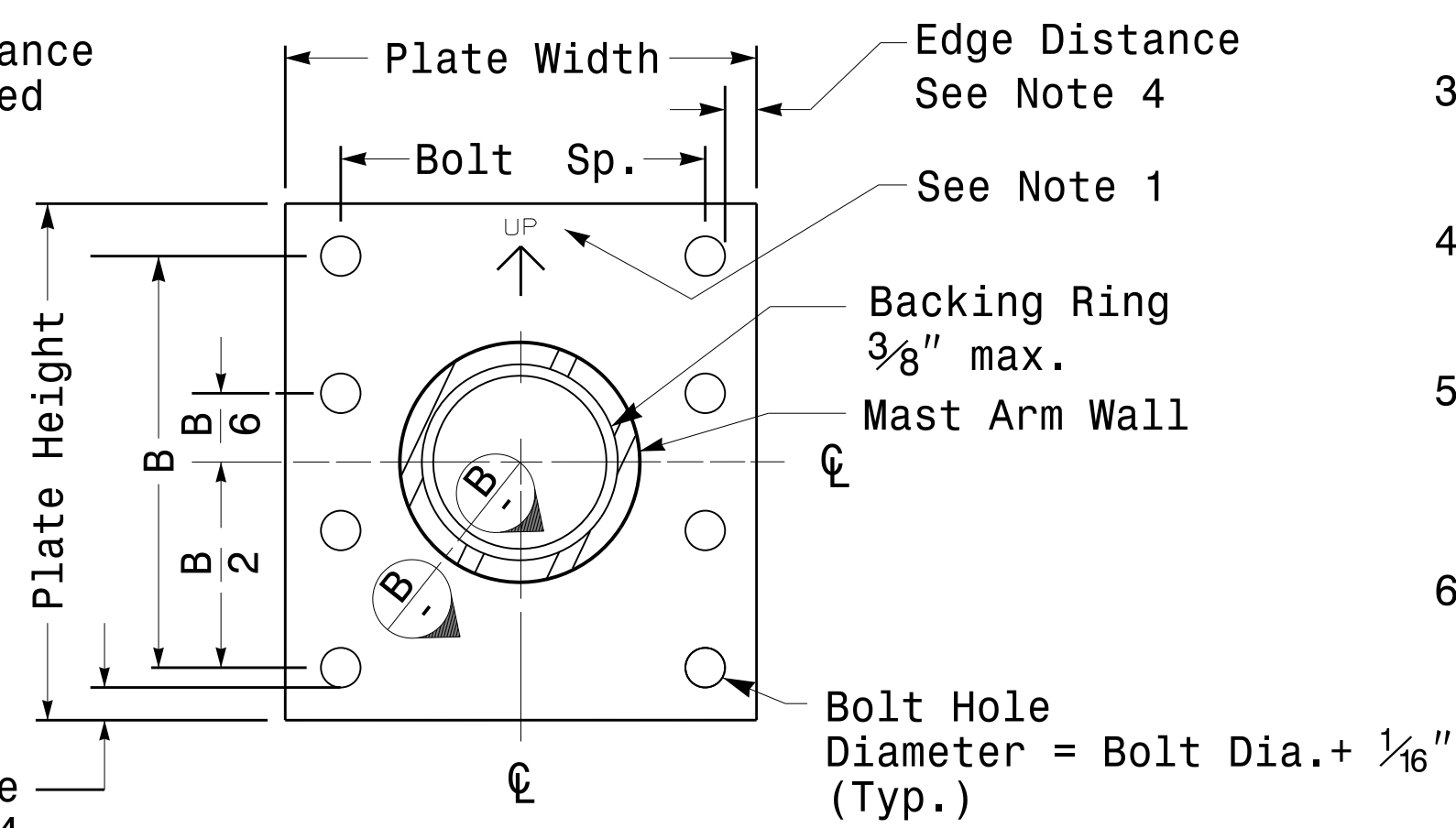
Side Elevation View



Bottom View



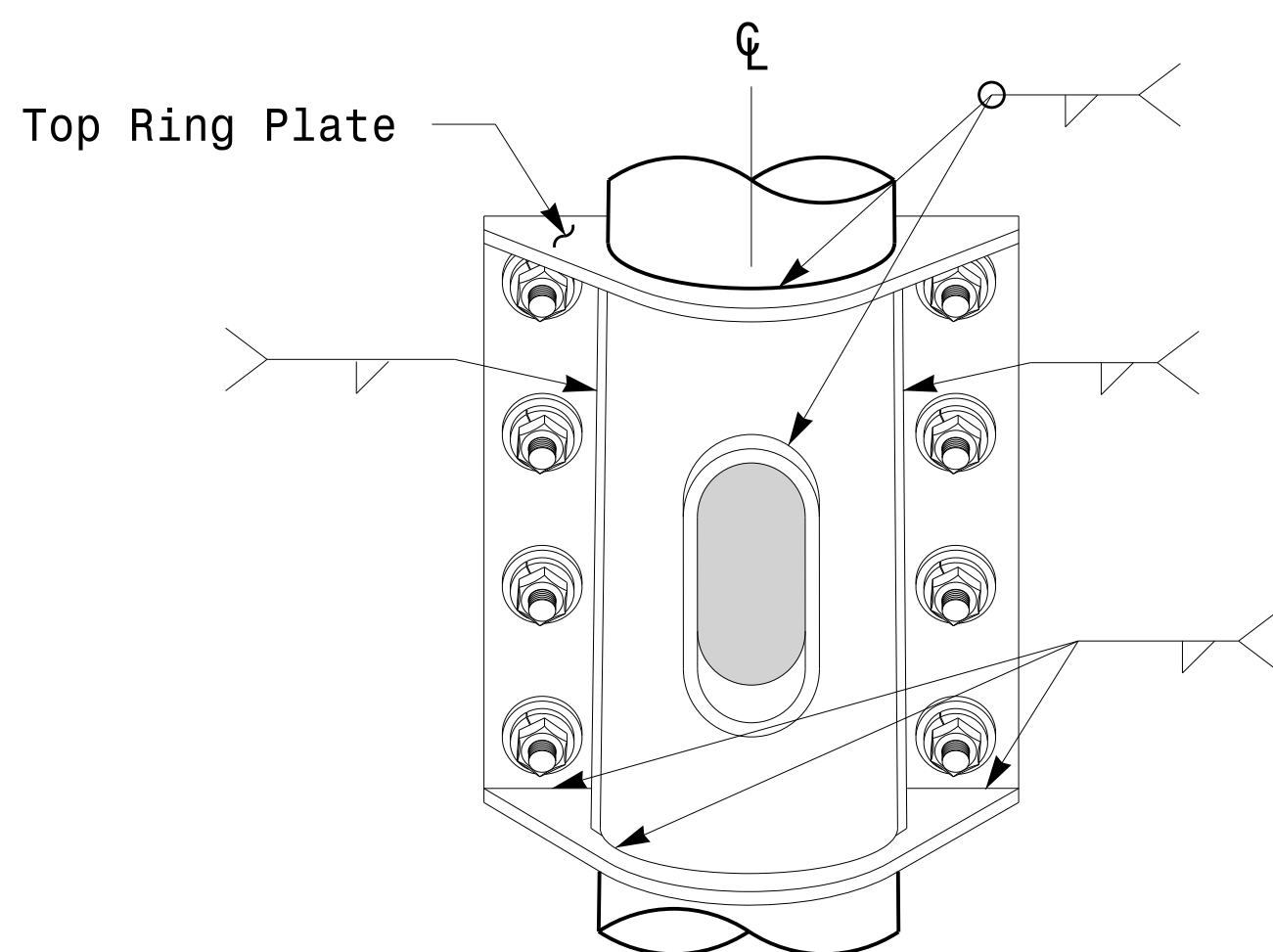
Front Elevation View



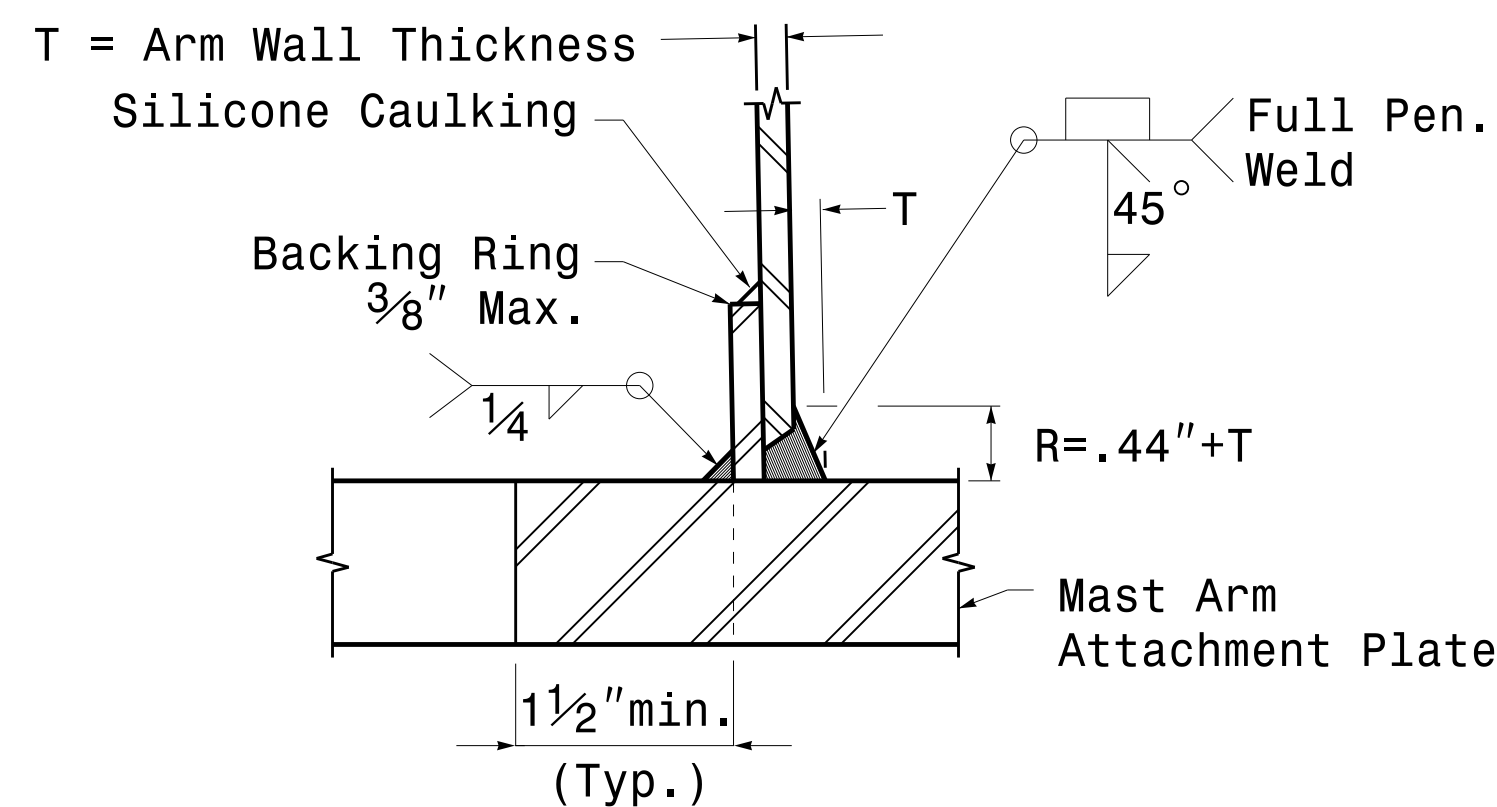
Section A-A  
Mast Arm Attachment Plate

Notes:

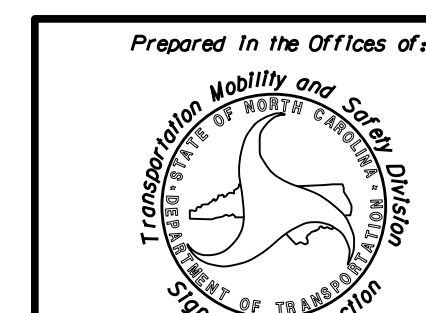
1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
3. Fabricator is responsible for providing 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 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.



Back Elevation View



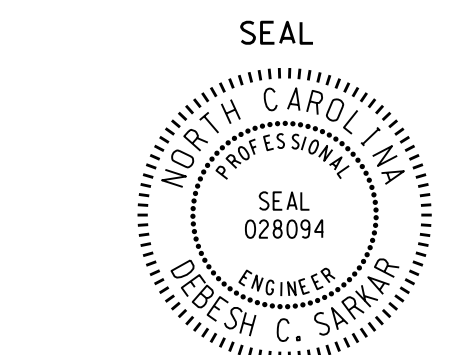
Section B-B  
Full-Penetration Groove Weld Detail



Typical Fabrication Details For Mast Arm Connection To Pole










PLAN DATE: OCTOBER 2017 DESIGNED BY: C.F. ANDREWS  
PREPARED BY: N. BITTING REVIEWED BY: D.C. SARKAR

REVISIONS	INIT.	DATE



Discussed by: D.C. SARKAR  
DATE: 10/11/2017



LEGEND	
	YAGI ANTENNA (SINGLE)
	OMNI ANTENNA
	EXISTING CONTROLLER AND CABINET
	GATEWAY RADIO LOCATION
	SIGNAL INVENTORY NUMBER
	METAL POLE W/MAST ARM
	PROPOSED STANDARD SIZED JUNCTION BOX
SP	SIGNAL POLE
	DIRECTIONAL DRILL 2" CONDUIT FOR COAXIAL CABLE INSTALLATION
	2" UNDERGOURND CONDUIT FOR COAXIAL CABLE INSTALLATIONS

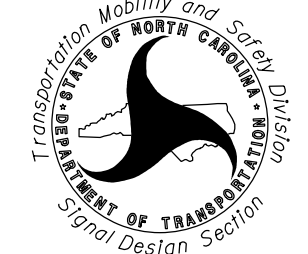

**NOTES FOR WIRELESS COMMUNICATIONS:**

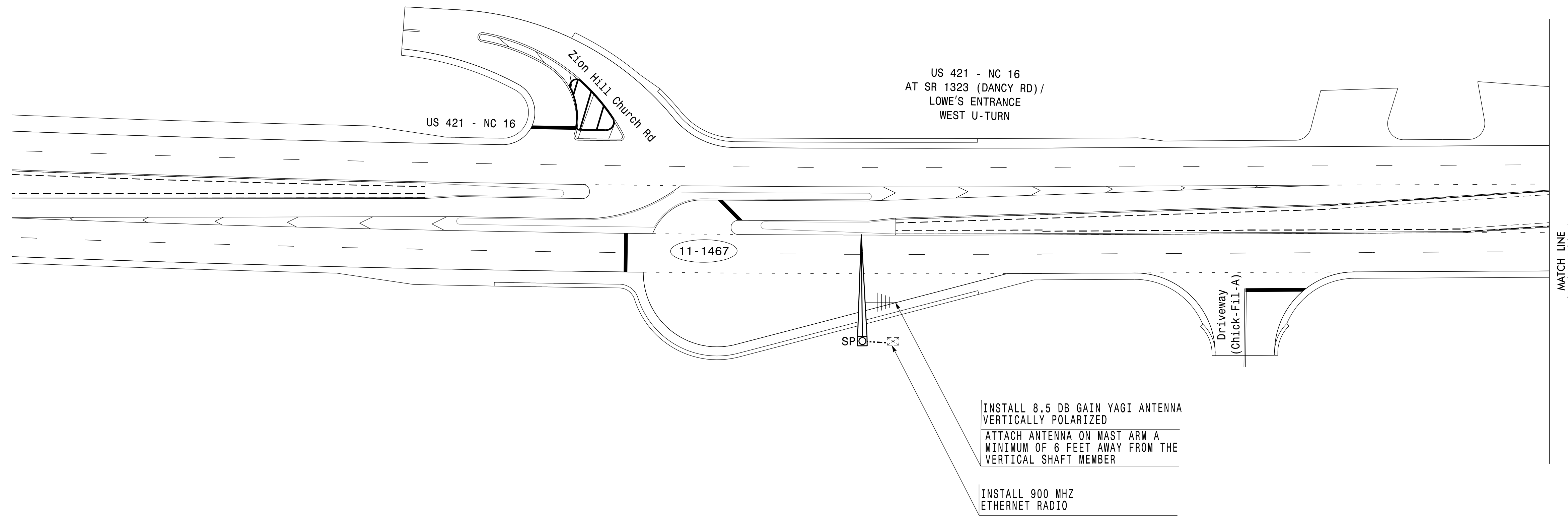
1. INSTALL COAXIAL CABLE:
  - A. ON WOOD POLES, REQUIRING A NEW RIGID GALVANIZED STEEL RISER, INSTALL A 2" RISER WITH WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
  - B. ON METAL POLES WITH MAST ARMS, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL A 1/2" HOLE UP THROUGH THE BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
  - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
  - D. BETWEEN THE POINT OF EXITING THE RISER, METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
2. IF AN EXISTING 2" SPARE RIGID GALVANIZED STEEL RISER IS AVAILABLE, INSTALL THE COAXIAL CABLE IN THE SPARE RISER.
3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN.  
(NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRIC SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET.  
(NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."
7. CELL MODEM TO BE SUPPLIED BY THE DEPARTMENT. CONTACT THE DEPUTY DIVISION TRAFFIC ENGINEER AT (336) 903-9132 TO REQUEST THE THE CELL MODEM. ALLOW 8 WEEKS LEAD TIME BEFORE ANTICIPATED DEPLOYMENT.
8. REFER TO 2018 STANDARD SPECIFICATIONS FOR ROAD AND STRUCTURES SECTIONS 1098-18 AND 1736 FOR THE 900 MHz SERIAL/ETHERNET SPREADSPECTRUM RADIO SYSTEMS.

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 Prepared for the Offices of: Transportation, Mobility and Safety Division DEPARTMENT OF TRANSPORTATION Signal Design Section 750 N. Greenfield Pkwy, Garner, NC 27529	<b>Signal System_Wilkesboro Wireless Communications Plan</b>		 SEAL 047250 S. R. CHILUKA											
	Division 11    Wilkes County    Wilkesboro PLAN DATE:    May 2023    REVIEWED BY:    J. Ma PREPARED BY:    S.R. Chiluka    REVIEWED BY:    M. Stygles	<table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		REVISIONS	INIT.	DATE								
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**NOTES**

1. FIVE (5) DAYS PRIOR TO BEGINNING WORK ON THE SIGNAL SYSTEM, CONTACT THE DIVISION TRAFFIC ENGINEER AT (336)903-9132. NOTIFY THE DIVISION TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL WIRELESS CIRCUITS ARE FUNCTIONING PROPERLY. WORK IS NOT COMPLETE UNTIL ALL SIGNALS ARE COMMUNICATING WITH THE CENTRAL SYSTEM.
2. THE ANTENNAS SHALL BE INSTALLED ON THE MAST ARM.

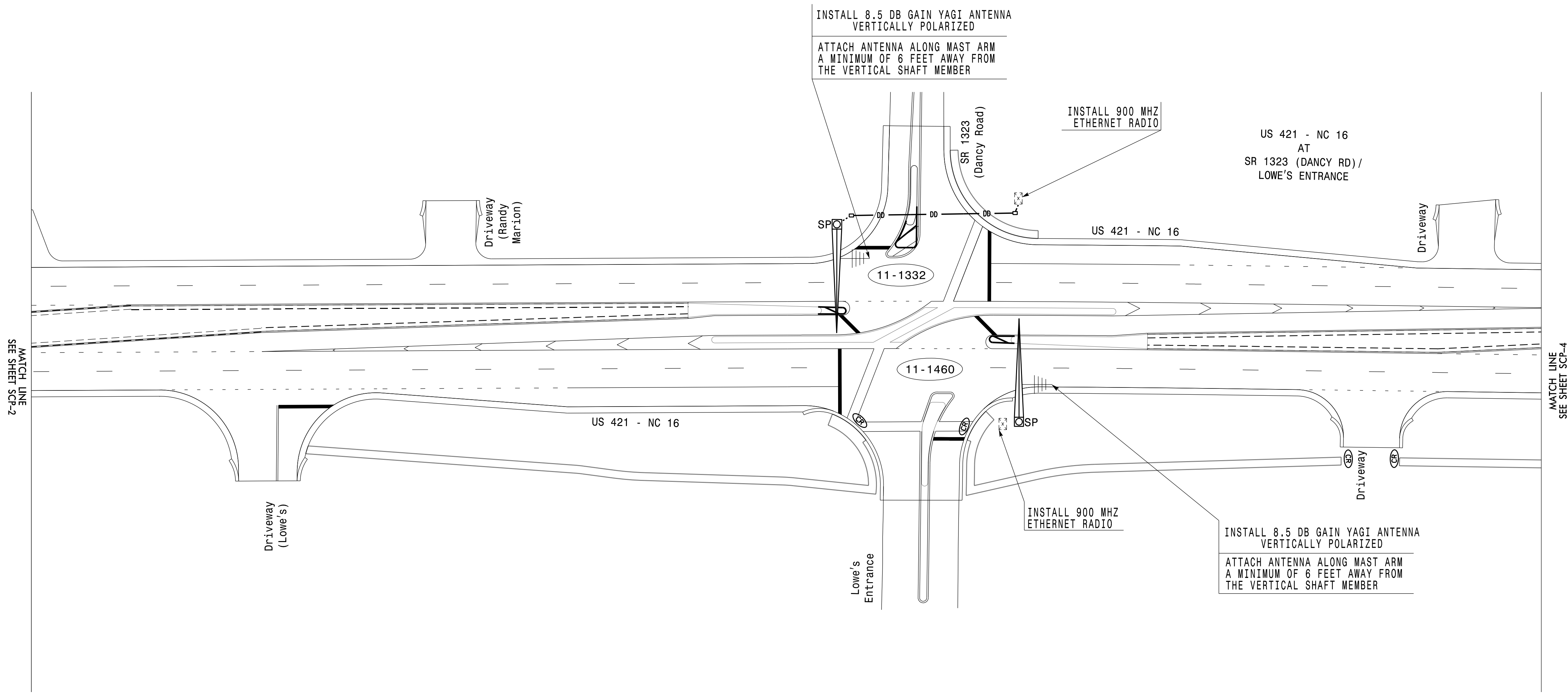


DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

	<b>Signal System Wilkesboro Wireless Communications Plan</b>		
	Division 11    Wilkes County    Wilkesboro		
PLAN DATE:    May 2023    REVIEWED BY:    J. Ma			5/24/2023
PREPARED BY:    S.R. Chiluka    REVIEWED BY:    M. Stygles			
REVISIONS    INIT.    DATE			SIGNATURE    DATE
			SIG. INVENTORY NO.    11-1467

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**NOTES**

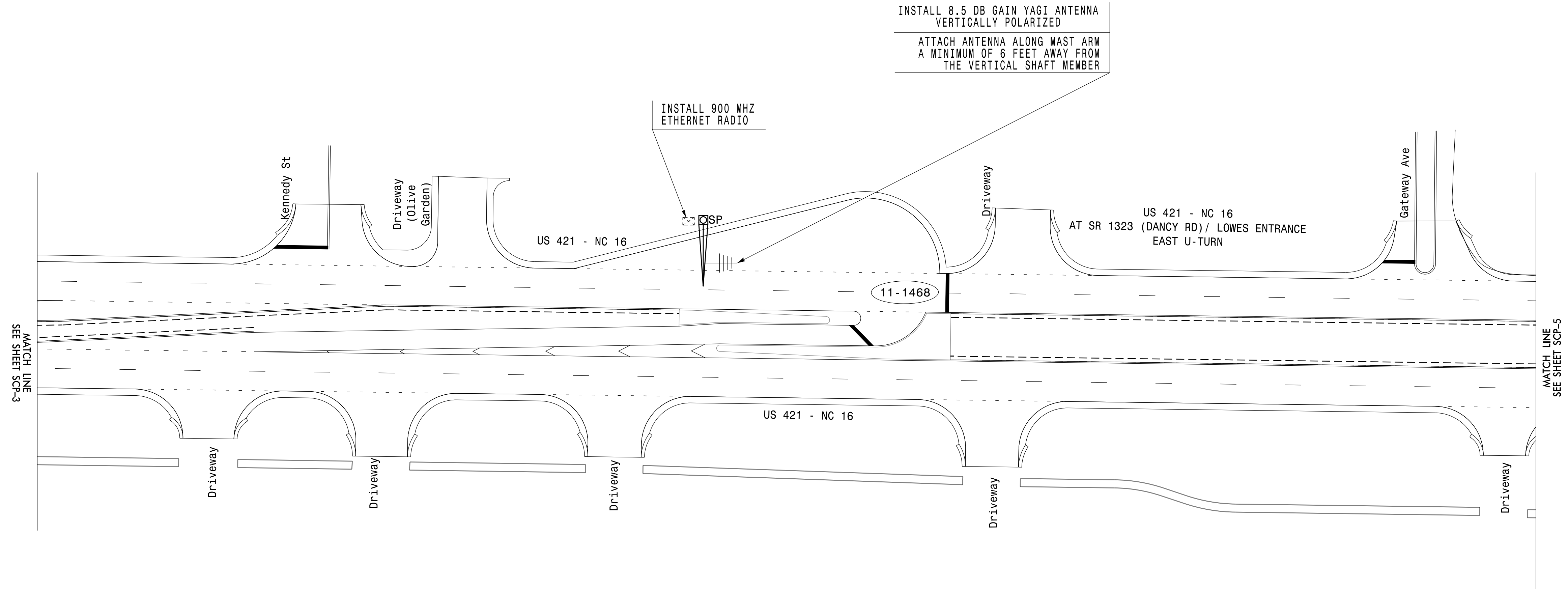
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2. THE ANTENNAS SHALL BE INSTALLED ON THE MAST ARM.

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 Prepared For the Offices of: Transportation Mobility and Safety Division STATE OF NORTH CAROLINA SIGNAL DESIGN SECTION 750 N. Greenfield Pkwy, Garner, NC 27529	<b>Signal System Wilkesboro Wireless Communications Plan</b>		SEAL  S. R. CHILUKA
	Division 11    Wilkes County    Wilkesboro PLAN DATE: May 2023    REVIEWED BY: J. Ma PREPARED BY: S.R. Chiluka    REVIEWED BY: M. Stygles	REVISIONS    INIT.    DATE _____ _____ _____	
		SIGNATURE    DATE _____    5/24/2023 _____	









**NOTES**

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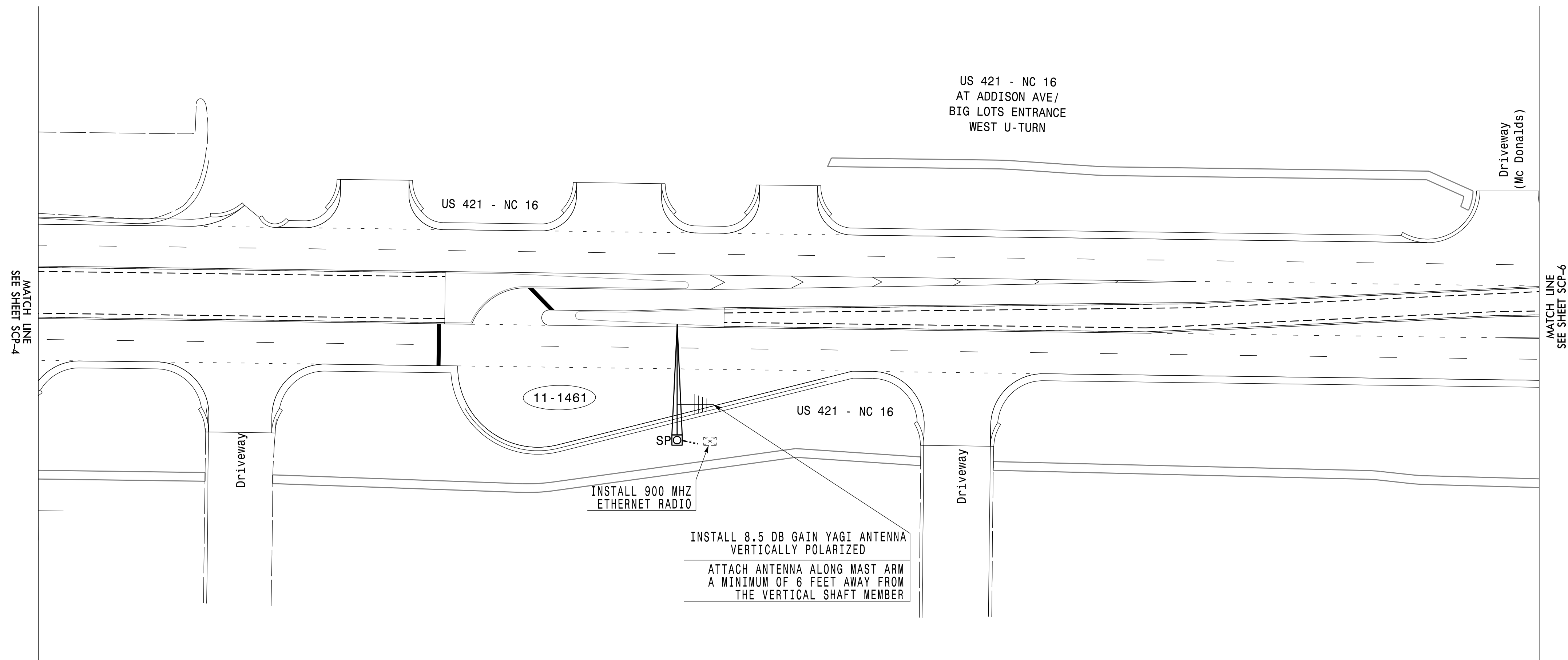


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 Prepared For the Offices of: Transportation Mobility and Safety Division STATE OF NORTH CAROLINA SIGNAL DESIGN SECTION 750 N. Greenfield Pkwy, Garner, NC 27529	<b>Signal System Wilkesboro Wireless Communications Plan</b>										
	Division 11 Wilkes County Wilkesboro PLAN DATE: May 2023 REVIEWED BY: J. Ma PREPARED BY: S.R. Chiluka REVIEWED BY: M. Stygles	<table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		REVISIONS	INIT.	DATE					
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SIGNATURE	DATE										
	5/24/2023										

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**NOTES**

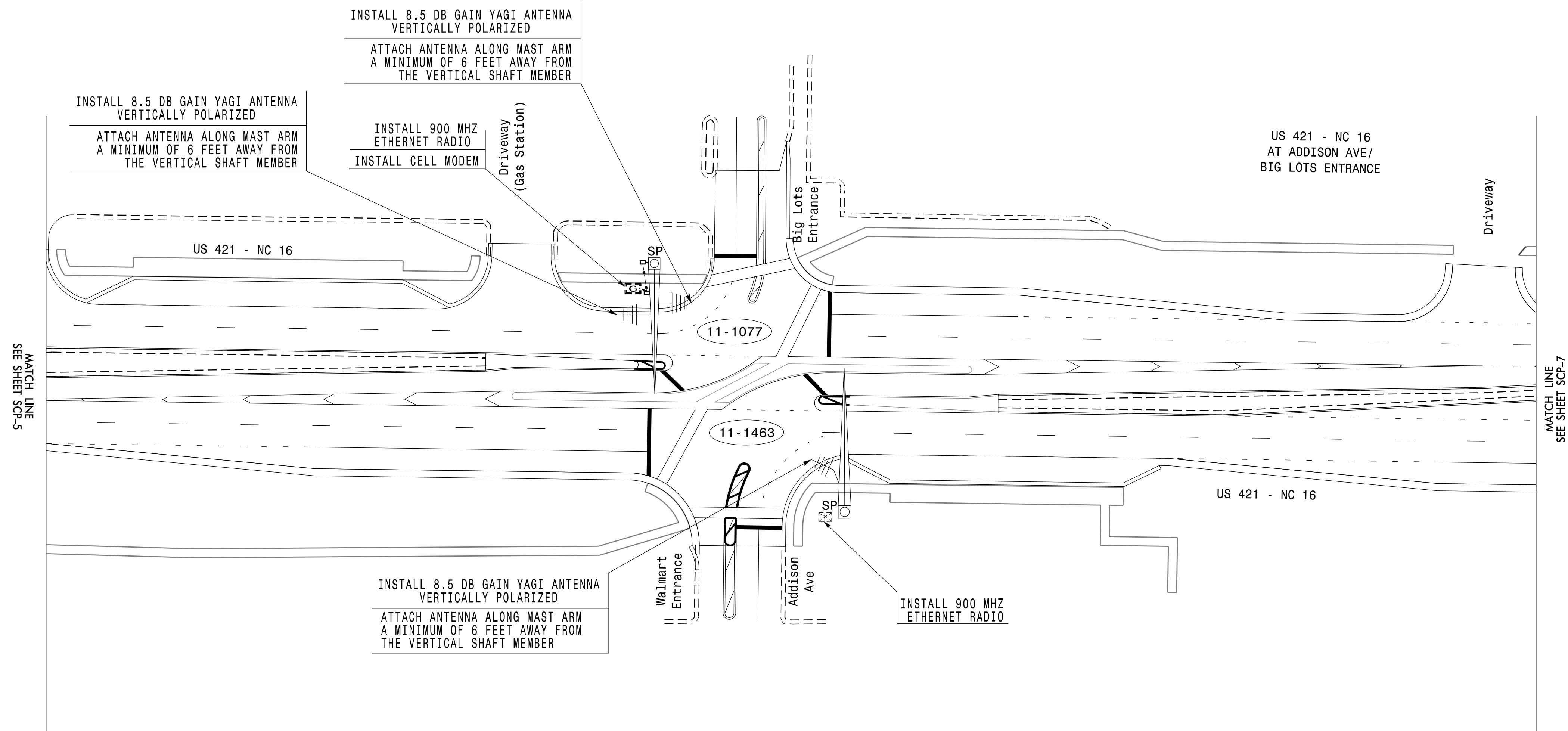
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2. THE ANTENNAS SHALL BE INSTALLED ON THE MAST ARM.

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	<b>Signal System Wilkesboro Wireless Communications Plan</b>		
	Division 11    Wilkes County    Wilkesboro		
PLAN DATE: <b>May 2023</b>	REVIEWED BY: <b>J. Ma</b>		
PREPARED BY: <b>S.R. Chiluka</b>	REVIEWED BY: <b>M. Stygles</b>		
REVISIONS	INIT.	DATE	
SIGNATURE	DATE		
SIG. INVENTORY NO.	II-1461		



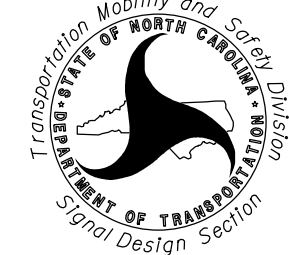


**NOTES**

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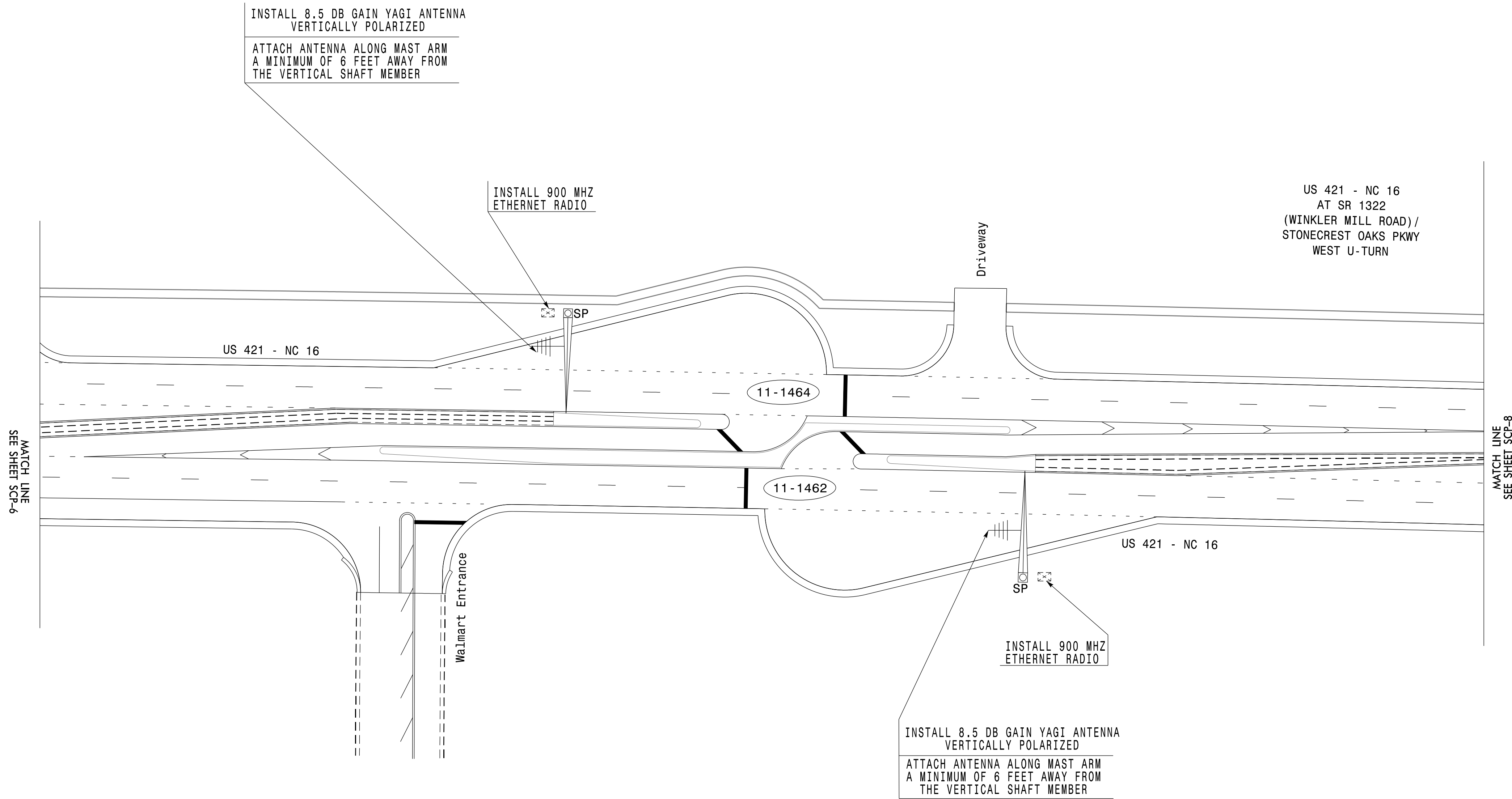
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**NOTES**

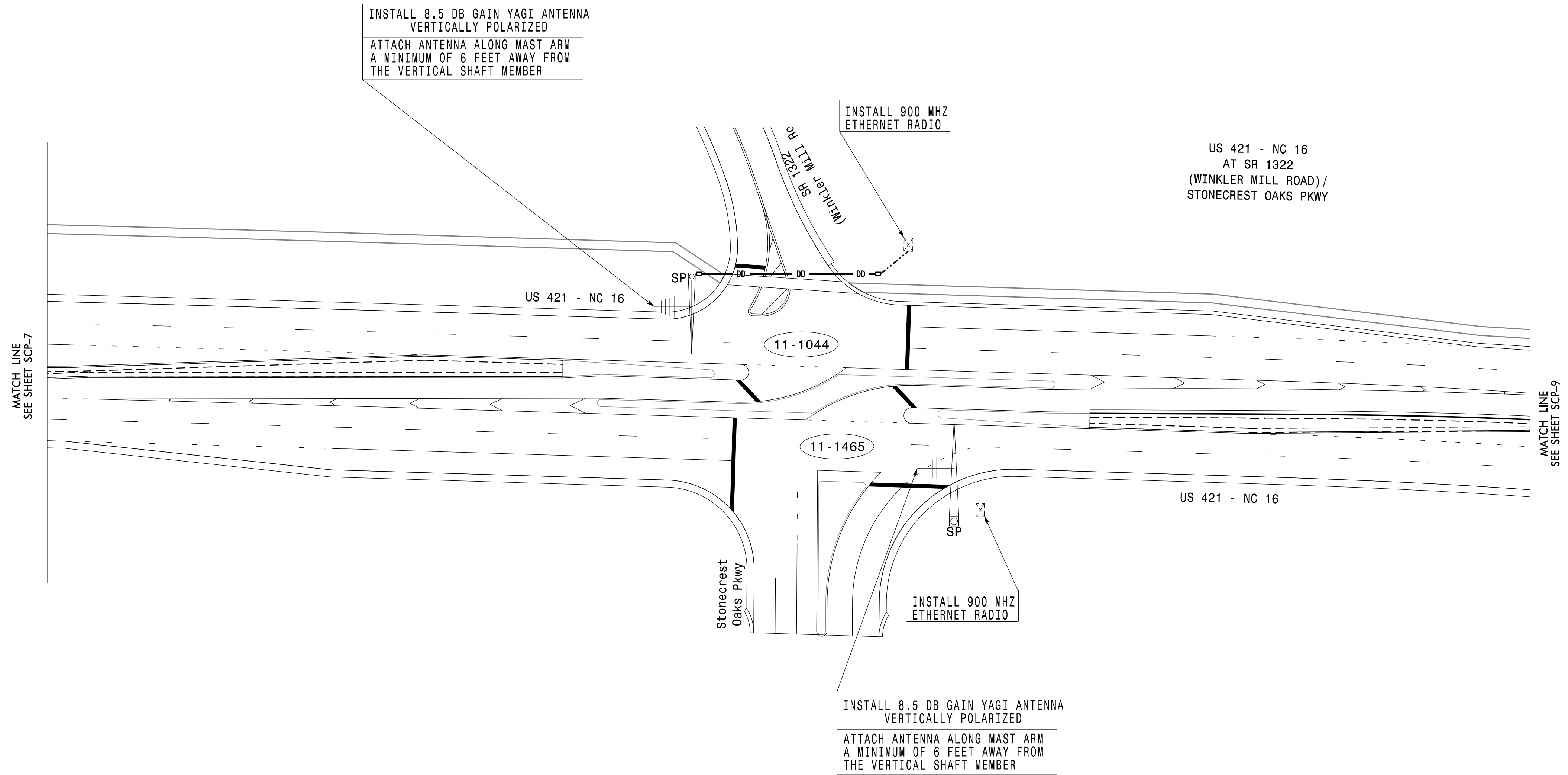
1. FIVE (5) DAYS PRIOR TO BEGINNING WORK ON THE SIGNAL SYSTEM, CONTACT THE DIVISION TRAFFIC ENGINEER AT (336)903-9132. NOTIFY THE DIVISION TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL WIRELESS CIRCUITS ARE FUNCTIONING PROPERLY. WORK IS NOT COMPLETE UNTIL ALL SIGNALS ARE COMMUNICATING WITH THE CENTRAL SYSTEM.
2. THE ANTENNAS SHALL BE INSTALLED ON THE MAST ARM.

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	<b>Signal System Wilkesboro Wireless Communications Plan</b>		
	Division 11    Wilkes County    Wilkesboro		
PLAN DATE: <b>May 2023</b>	REVIEWED BY: <b>J. Ma</b>		
PREPARED BY: <b>S.R. Chiluka</b>	REVIEWED BY: <b>M. Stygles</b>		
REVISIONS	INIT.	DATE	
SIGNATURE	DATE		
750 N. Greenfield Pkwy, Garner, NC 27529		5/24/2023	
		SIG. INVENTORY NO. 11-1462/1464	



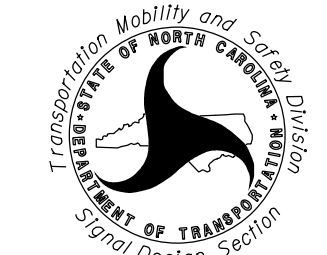
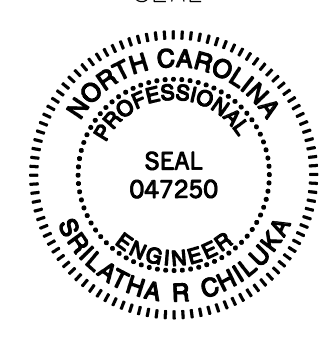

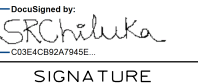
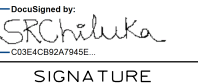
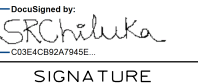
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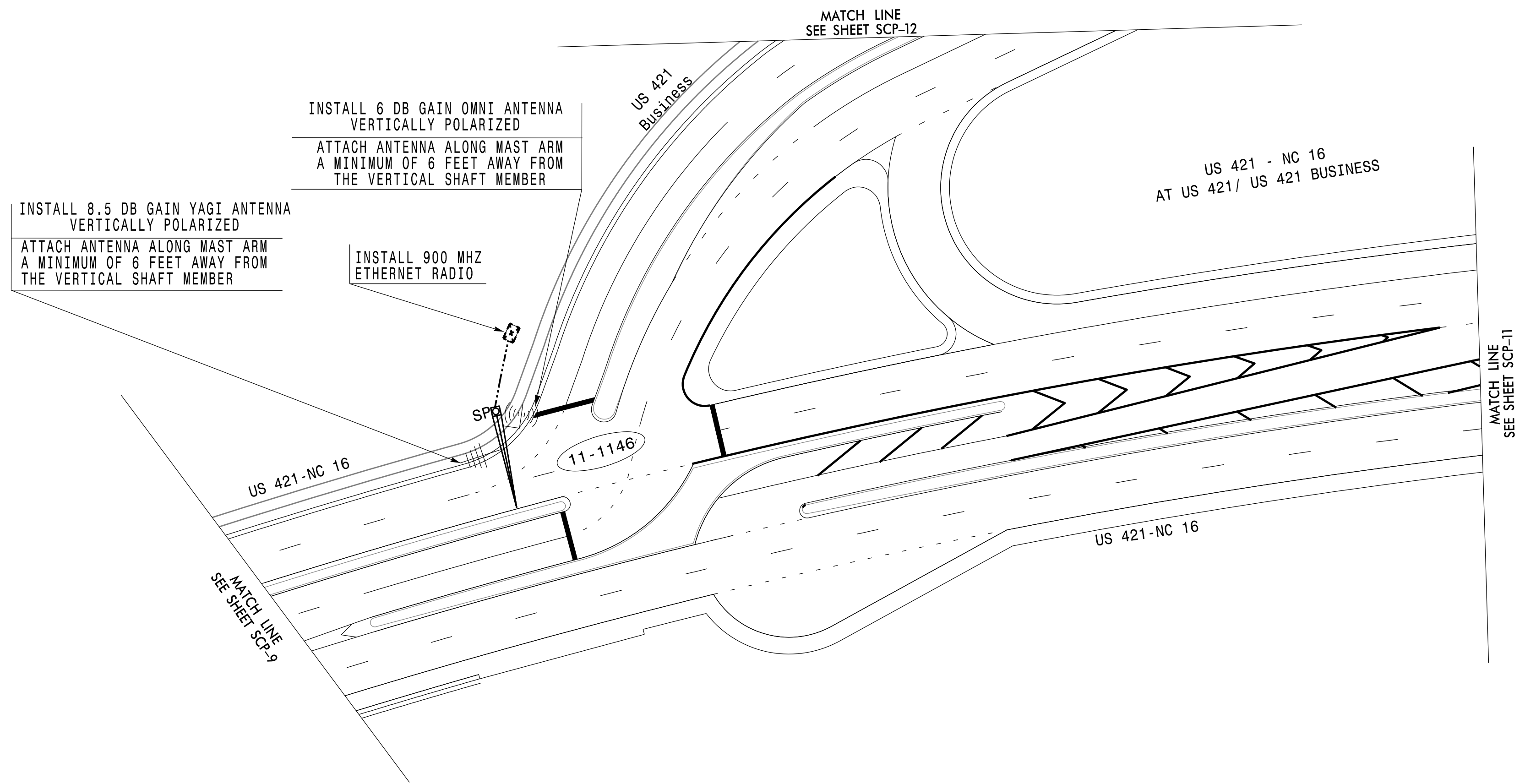


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 Prepared For the Offices of: TRANSPORTATION MOBILITY AND SAFETY DIVISION STATE OF NORTH CAROLINA SIGNAL DESIGN SECTION 750 N. Greenfield Pkwy, Garner, NC 27529	<b>Signal System Wilkesboro Wireless Communications Plan</b>										
	Division 11    Wilkes County    Wilkesboro PLAN DATE: May 2023    REVIEWED BY: J. Ma PREPARED BY: S.R. Chiluka    REVIEWED BY: M. Stygles	<table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		REVISIONS	INIT.	DATE					
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	<table border="1"> <tr> <td>SIGNATURE</td> <td>DATE</td> </tr> <tr> <td></td> <td>5/24/2023</td> </tr> </table>		SIGNATURE	DATE		5/24/2023	SEAL NORTH CAROLINA PROFESSIONAL ENGINEER S. R. CHILUKA 047250 5/24/2023 SIG. INVENTORY NO. 11-1044/1465				
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**NOTES**

1. FIVE (5) DAYS PRIOR TO BEGINNING WORK ON THE SIGNAL SYSTEM, CONTACT THE DIVISION TRAFFIC ENGINEER AT (336)903-9132. NOTIFY THE DIVISION TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL WIRELESS CIRCUITS ARE FUNCTIONING PROPERLY. WORK IS NOT COMPLETE UNTIL ALL SIGNALS ARE COMMUNICATING WITH THE CENTRAL SYSTEM.
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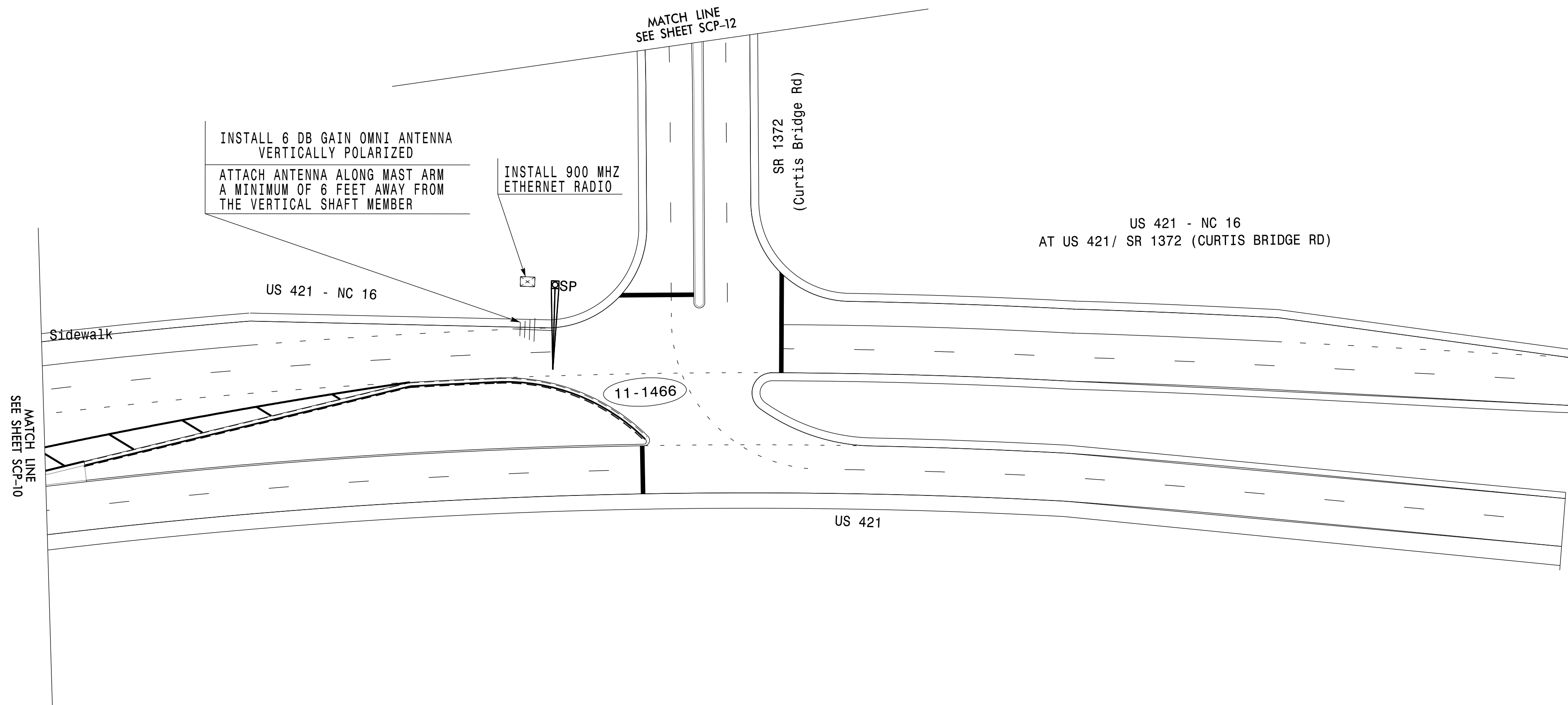
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	<b>Signal System Wilkesboro Wireless Communications Plan</b>		
	Division 11    Wilkes County    Wilkesboro		
PLAN DATE:    May 2023    REVIEWED BY:    J. Ma			5/24/2023
PREPARED BY:    S.R. Chiluka    REVIEWED BY:    M. Stygles			
REVISIONS	INIT.	DATE	
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SIGNATURE:		DATE:	
SIG. INVENTORY NO.		11-1146	





**NOTES**

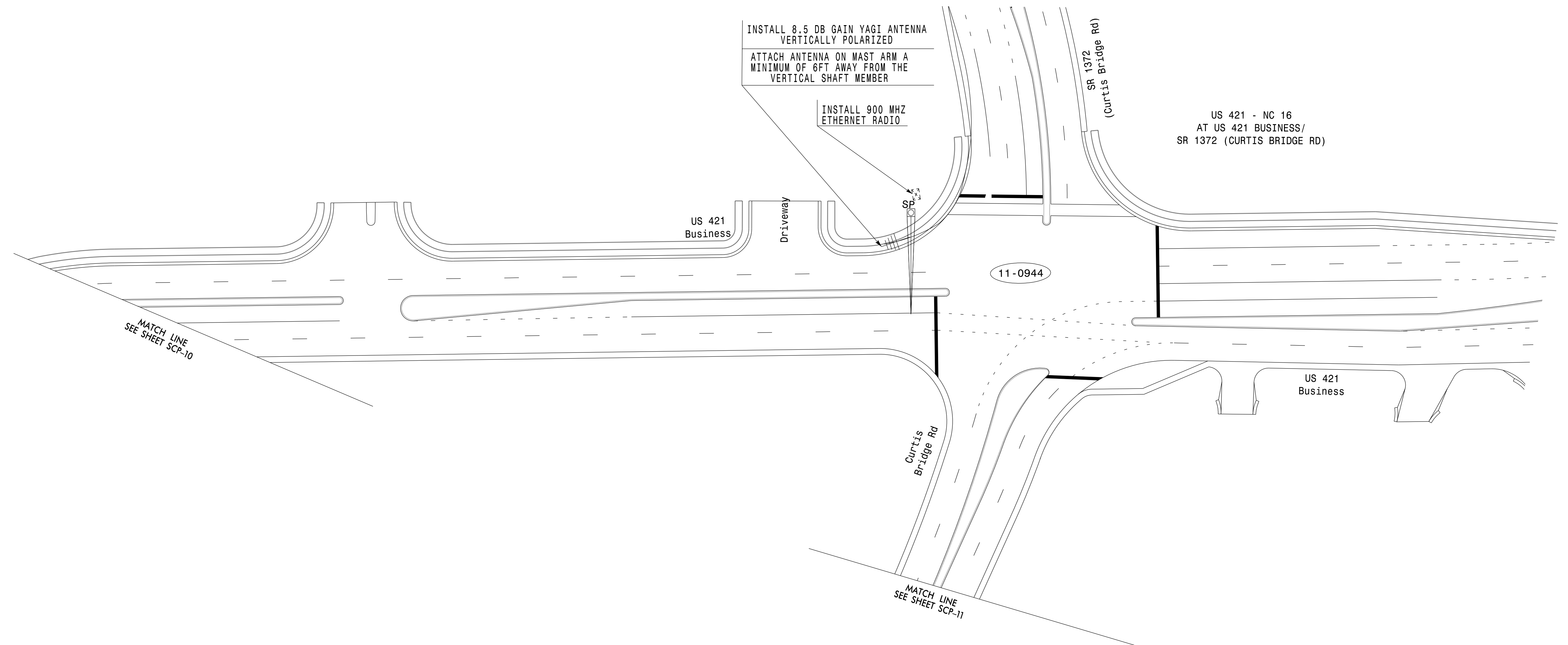
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	<b>Signal System Wilkesboro Wireless Communications Plan</b>		
	Division 11    Wilkes County    Wilkesboro		
PLAN DATE: <b>May 2023</b>	REVIEWED BY: <b>J. Ma</b>		
PREPARED BY: <b>S.R. Chiluka</b>	REVIEWED BY: <b>M. Stygles</b>		
REVISIONS	INIT.	DATE	
SIGNATURE	DATE		
SIG. INVENTORY NO.	II-1146		



**NOTES**

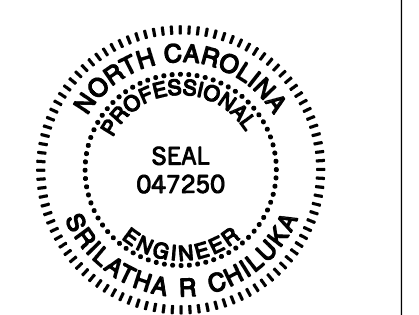
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2. THE ANTENNAS SHALL BE INSTALLED ON THE MAST ARM.
3. THE EXISTING FIBER OPTIC CABLE ENTERING EXISTING CABINET 11-0944 SHALL BE BACK PULLED AND STORED AT THE NEAREST AVAILABLE PULLBOX/SPLICE CENTER DURING THE NEW CABINET INSTALLATION. THE FIBER OPTIC CABLE SHALL BE REPULLED IN TO THE NEW CABINET AND ALL CONNECTIONS SHALL BE RESTORED TO ORIGINAL CONDITIONS. A CONNECTION SHALL BE MADE BETWEEN TRANSCEIVER AND NEW RADIO.



VHB Engineering NC, P.C. (C-3705)  
 940 Main Campus Drive, Suite 500  
 Raleigh, NC 27606  
 919.629.0328

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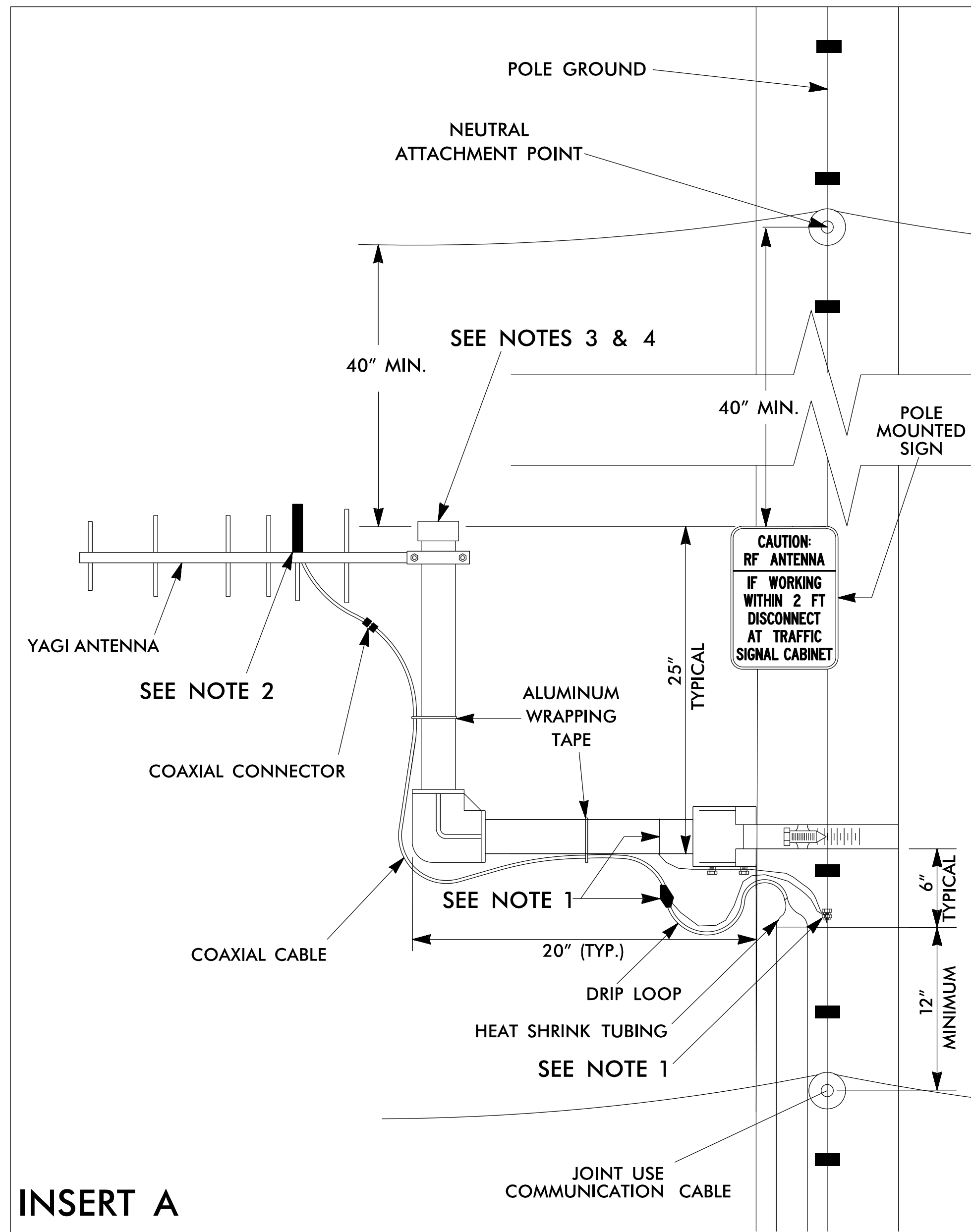


SIGNATURE: S.R. Chiluka  
 DATE: 5/24/2023  
 SIG. INVENTORY NO.: 11-0944

Prepared For the Offices of:		<b>Signal System Wilkesboro          Wireless Communications Plan</b>	
Division 11 Wilkes County Wilkesboro		PLAN DATE: May 2023	REVIEWED BY: J. Ma
750 N. Greenfield Pkwy, Garner, NC 27529		PREPARED BY: S.R. Chiluka	REVIEWED BY: M. Stygles
		REVISIONS	INIT. DATE

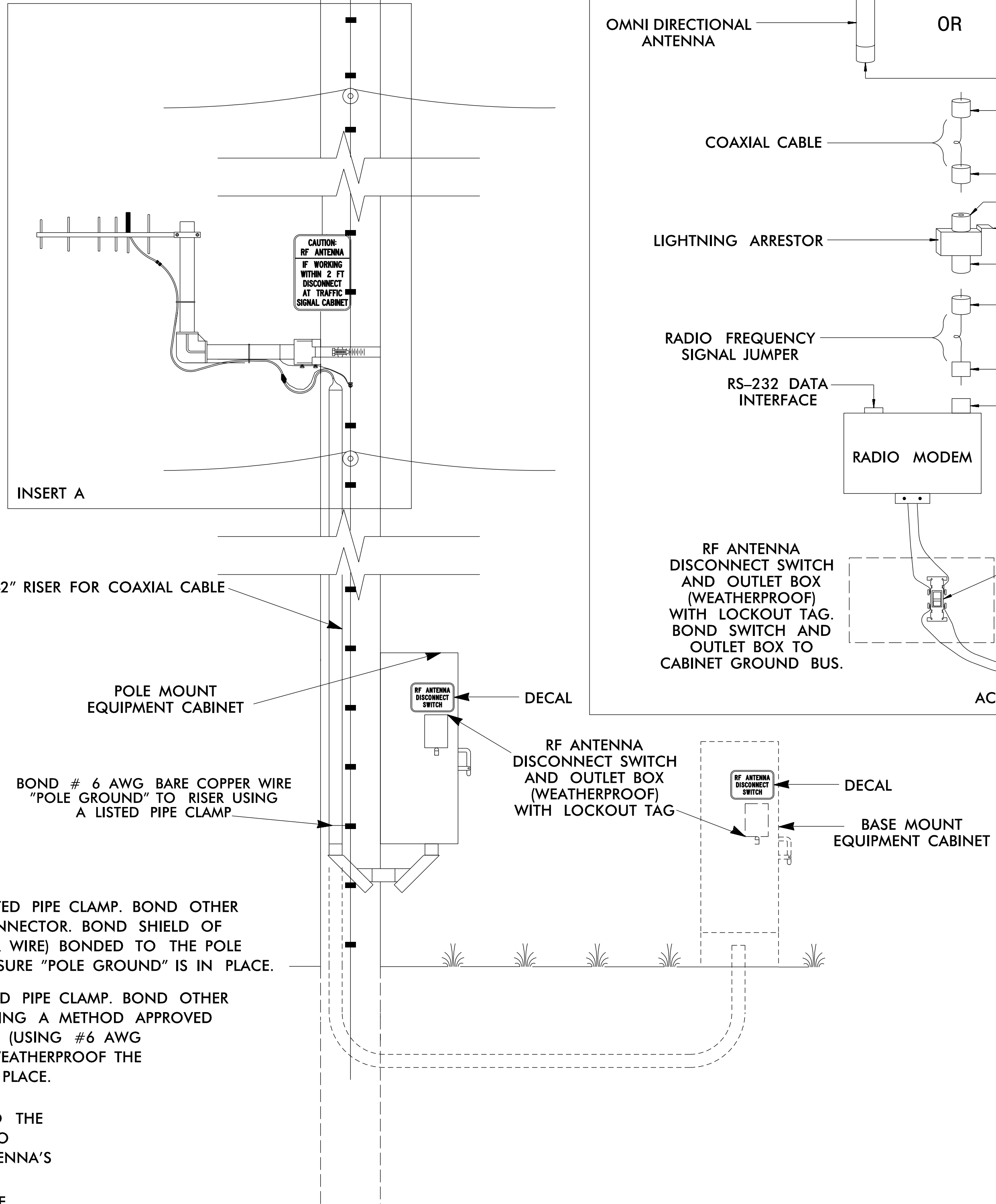
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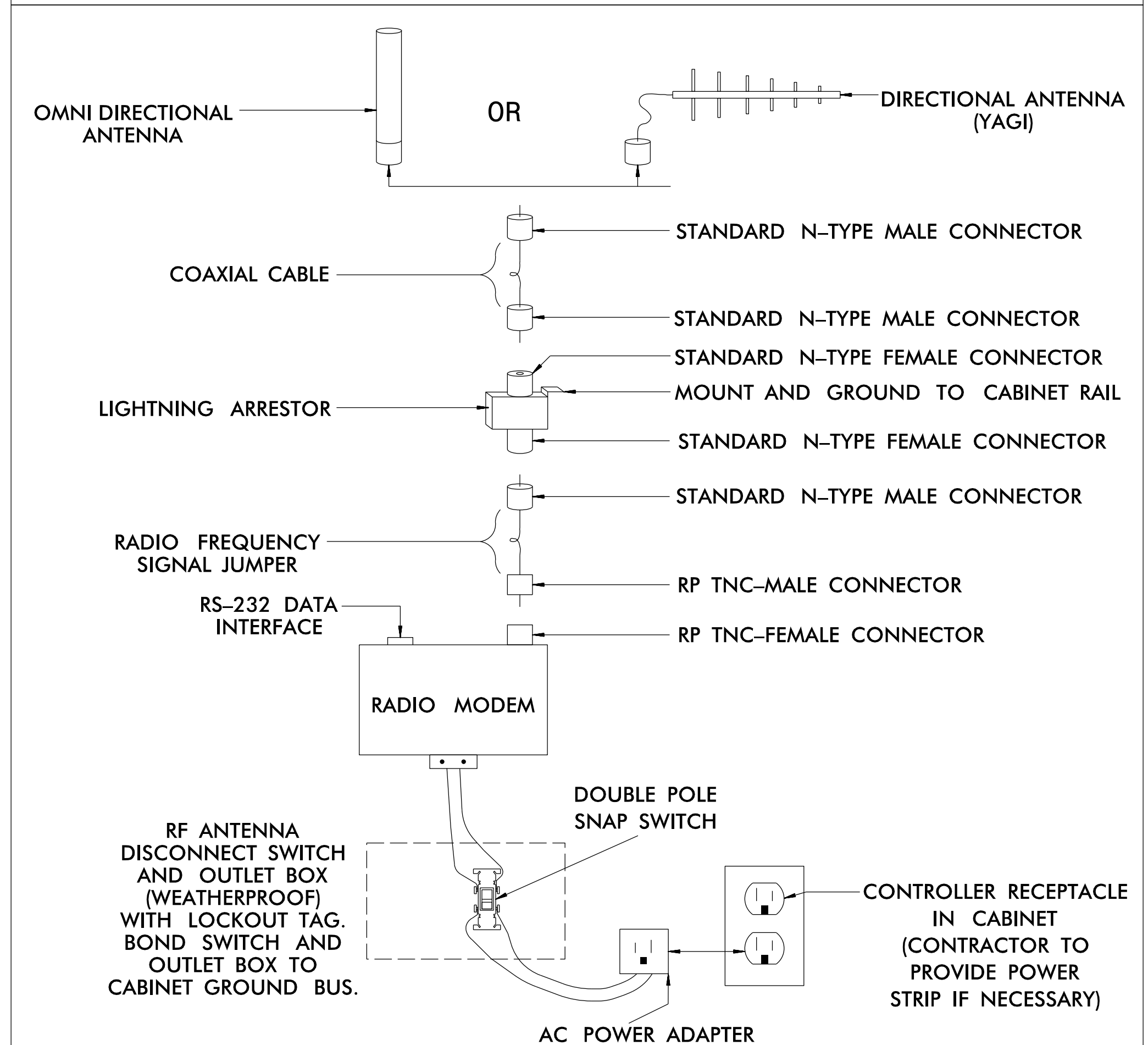


NOTES

- WOOD POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE OR EXISTING SYSTEM GROUND USING A METHOD APPROVED BY THE ENGINEER. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE GROUND. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "POLE GROUND" IS IN PLACE.  
 METAL POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE OR EXISTING SYSTEM GROUND USING A METHOD APPROVED BY THE ENGINEER. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE BY A METHOD APPROVED BY THE ENGINEER. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "SYSTEM GROUND" IS IN PLACE.
- TO CONSERVE VERTICAL SPACING ON THE POLE (JOINT-USE OR SIGNAL POLE) WITH REGARDS TO THE SURROUNDING UTILITIES, INSTALL THE ANTENNA MOUNTING HARDWARE USING ONE OF THE TWO METHODS LISTED BELOW: (ENSURE THAT THE MOUNTING METHOD DOES NOT DEGRADE THE ANTENNA'S SIGNAL INTEGRITY)
  - ROTATE THE VERTICAL SUPPORT ARM 90 DEGREES SUCH THAT THE ANTENNA IS AT THE SAME HEIGHT AS THE HORIZONTAL SUPPORT ARM.
  - ELIMINATE THE VERTICAL SUPPORT ARM AND MOUNT THE ANTENNA TO THE HORIZONTAL SUPPORT ARM.
  - ANTENNA, ANTENNA SUPPORT ARM, AND SIGN TO MAINTAIN A 40" SEPARATION FROM NEUTRAL /POWER AND 12" FROM OTHER UTILITIES.
- INSTALL AN END CAP TO SEAL THE EXPOSED END OF THE MOUNTING PIPE.



ANTENNA AND COAXIAL CABLE CONNECTION SCHEMATIC



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	<b>Wireless Radio Antenna Typical Details</b>		
	Division 11 Wilkes County Wilkesboro PLAN DATE: May 2023 REVIEWED BY: J. Ma PREPARED BY: S.R. Chiluka REVIEWED BY: M. Stygles	5/24/2023	
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