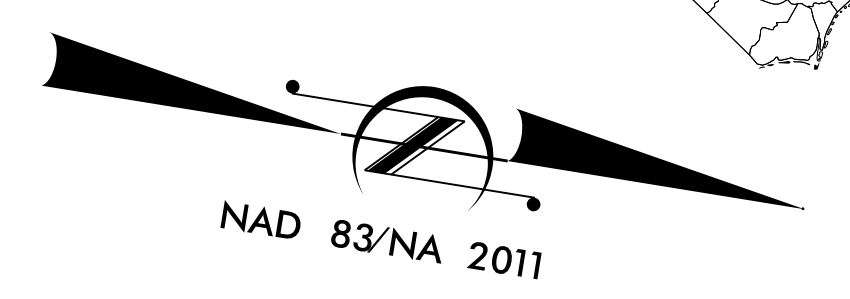
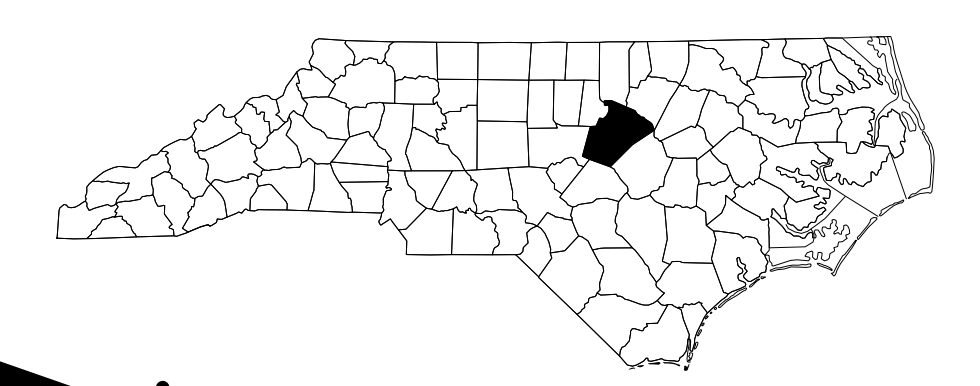


STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# WAKE COUNTY

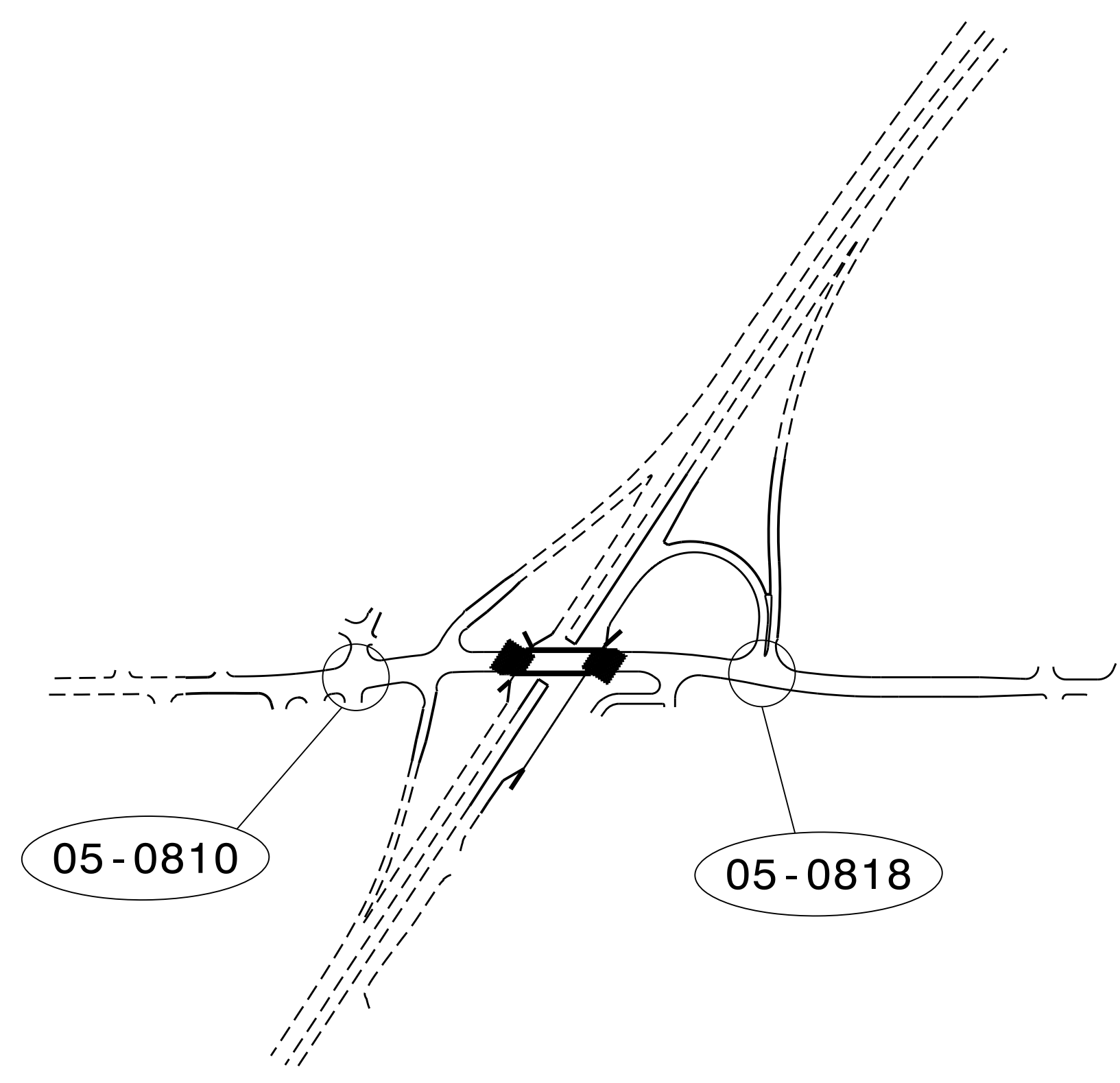
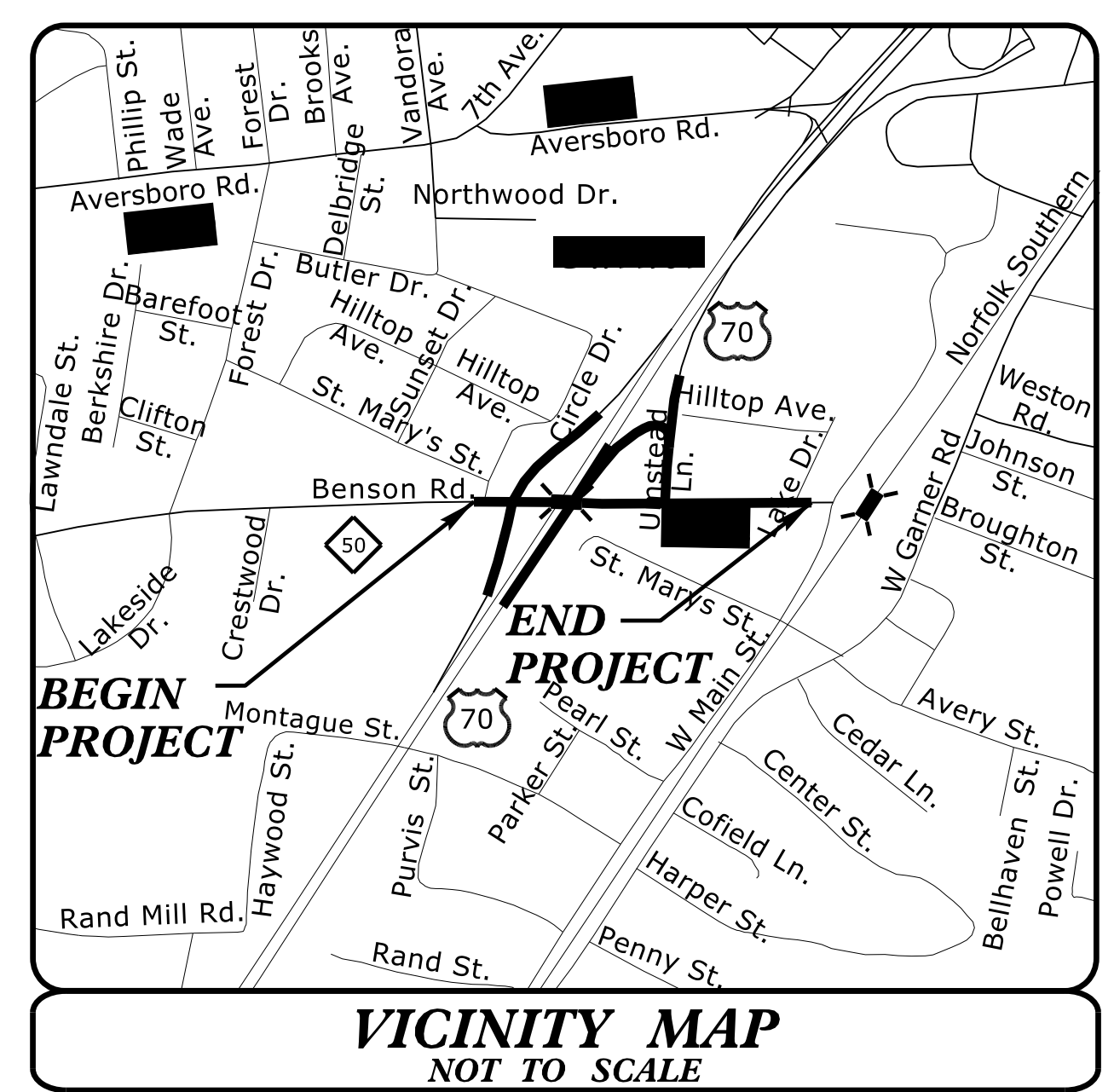
**LOCATION: REPLACE BRIDGE 69 OVER US 70 ON NC 50 (BENSON ROAD)**

**TYPE OF WORK: TRAFFIC SIGNALS AND SIGNAL COMMUNICATIONS**



**Project: B-4654**

**Contract: C204410**



Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.

Index of Plans		
Sheet #	Reference #	Location/Description
Sig. 1.0	N/A	Title Sheet
Sig. 2.0-5.3	05-0810	NC 50 (Benson Road) at US 70 Eastbound/NC 50 Southbound Ramps
Sig. 6.0-6.3	05-0818	NC 50 (Benson Road) at US 70 Westbound/NC 50 Northbound Ramps
Sig. MIA-M8	N/A	Metal Pole Standard Drawings
SCP 1-3	N/A	Signal Communications Plans

**TRANSPORTATION SYSTEMS  
MANAGEMENT & OPERATIONS UNIT**

Contacts:

**Robert J. Ziemia, PE, CPM - Central Region Signals Engineer**  
**Keith M. Mims, PE - Signal Equipment Design Engineer**  
**Gregory A. Green - Signal Communications Project Engineer**

Prepared for the Office of:  
DIVISION OF HIGHWAYS  
TRANSPORTATION MOBILITY AND SAFETY  
DIVISION

750 N. Greenfield Parkway, Garner, NC 27529

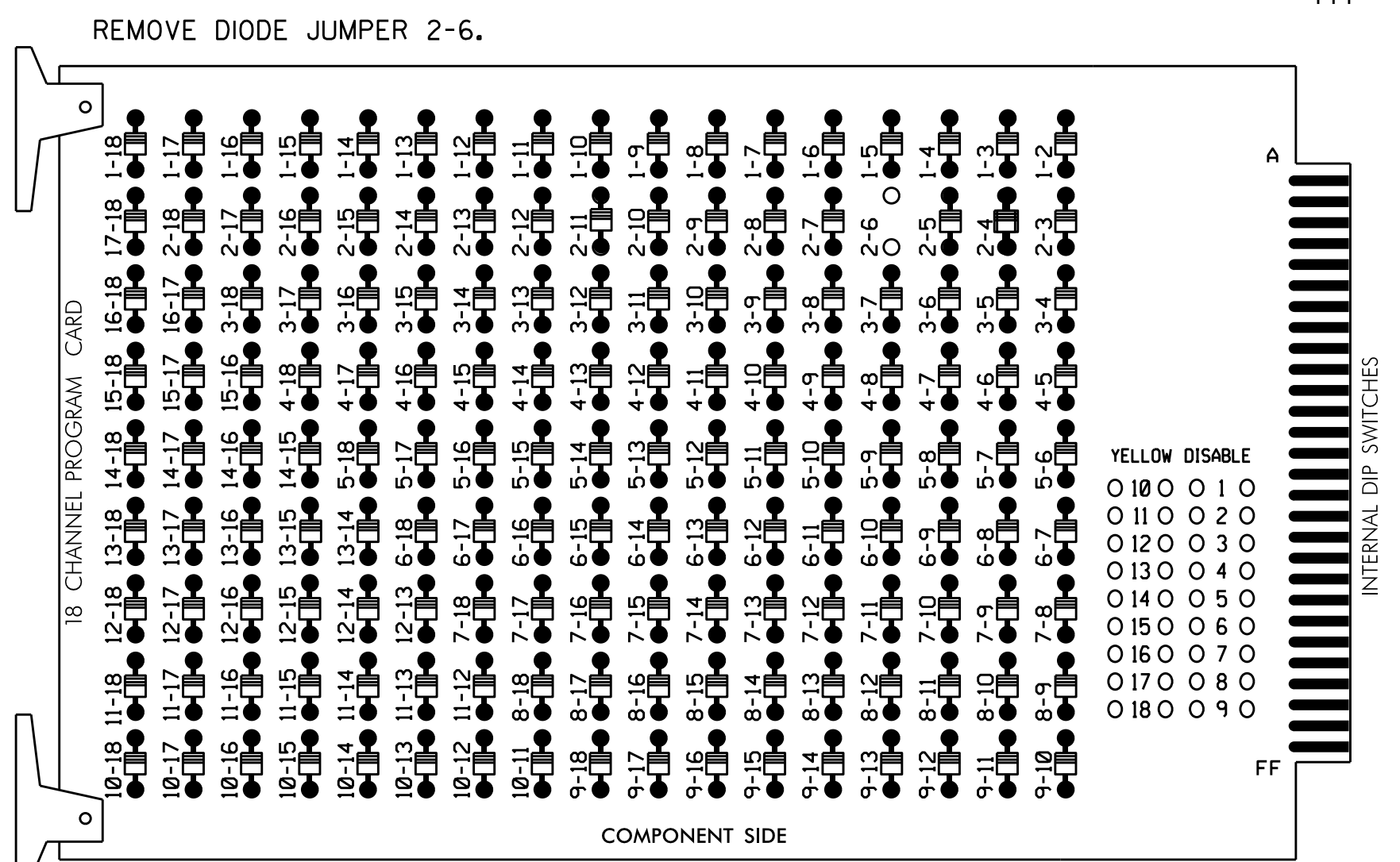
2:05-2023 11/16/23 5:15:58 PM S:\158830115\SIGNALS\Signal Design Section\Central Region\Div 5\B-4654\2023\_revisions\B4654\_SIG.tsh.dgn





**18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL**

(remove jumper and set switches as shown)



**NOTES:**

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

**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 plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the US 70 (Garner Signal System A) Signal System #: D05-10\_Garner.

**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.....S2, S5, S8  
 Phases Used.....2, 4, 6  
 Overlaps.....None

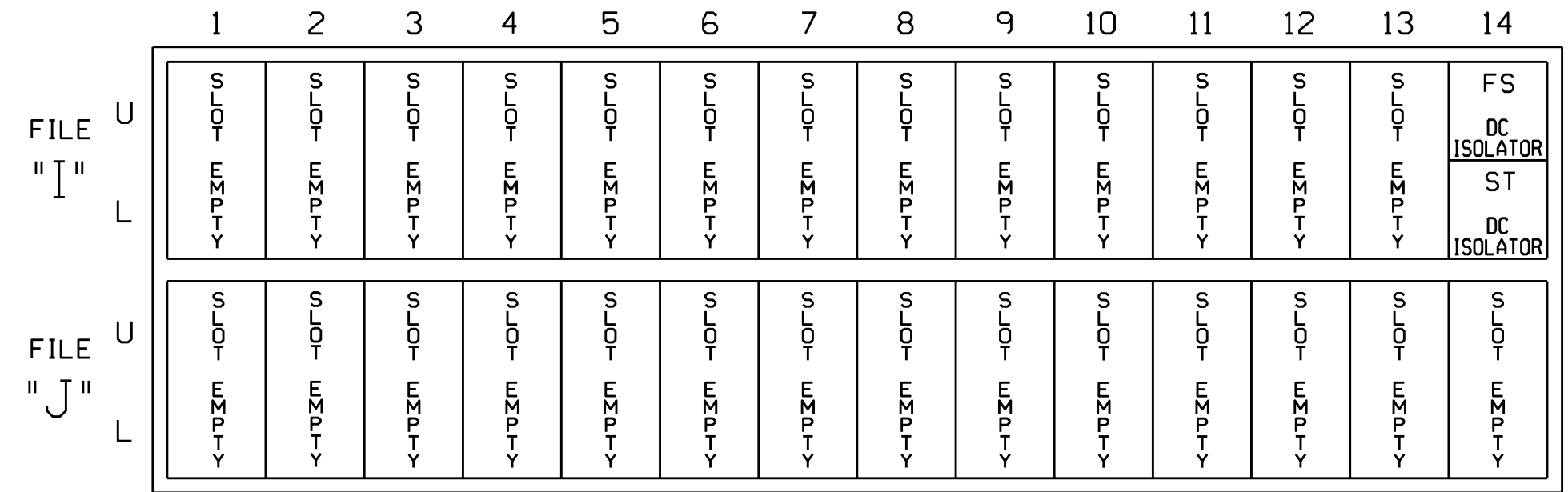
**SIGNAL HEAD HOOK-UP CHART**

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	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22	NU	NU	41, 42, 43	NU	NU	61	62	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128			101			134	134								
YELLOW		129	129			102			135	135								
GREEN			130			103				136								
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW		130								136								

NU = Not Used

**INPUT FILE POSITION LAYOUT**

(front view)



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

FS = FLASH SENSE  
 ST = STOP TIME

**SPECIAL DETECTOR NOTE**

Install a Multizone Microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0810T1  
 DESIGNED: May 2023  
 SEALED: 5/17/2023  
 REVISED: N/A

Electrical Detail - Temporary Design 1

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 50 (Benson Road) at US 70 Eastbound/ NC 50 Southbound Ramps

Division 5 Wake County Garner

PLAN DATE: May 2023 REVIEWED BY:

PREPARED BY: Zarrar Zafar REVIEWED BY:

REVISIONS	INIT.	DATE

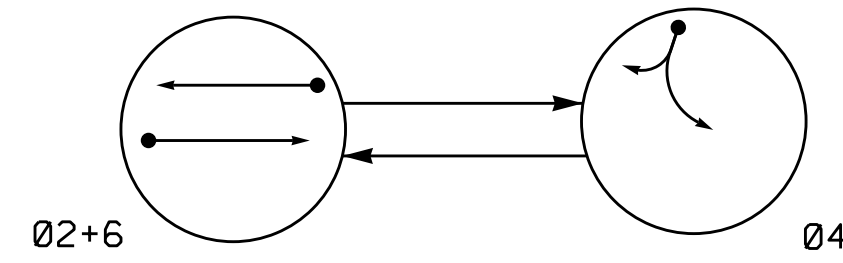
Seal: SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 031001 TODD JOYCE

Documented by: D. Todd Joyce 05/18/2023

SIG. INVENTORY NO. 05-0810T1

18-MAY-2023 09:40 S:\IT\SS\LINKS\SIGNAL\Workgroups\4519\_MonZofar\Plans\01\vision\_5\050810\_and\_050818\_exp\050818.dgn

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

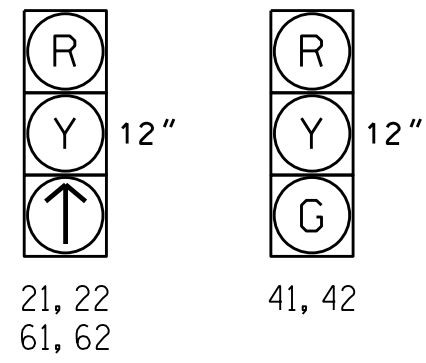
- ◄●► DETECTED MOVEMENT
- ◄◄◄ UNDETECTED MOVEMENT (OVERLAP)
- ◄---► UNSIGNALIZED MOVEMENT
- ◄- - - - ► PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	02+6	04	FLASH
21, 22	↑	R	Y
41, 42	R	G	R
61, 62	↑	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



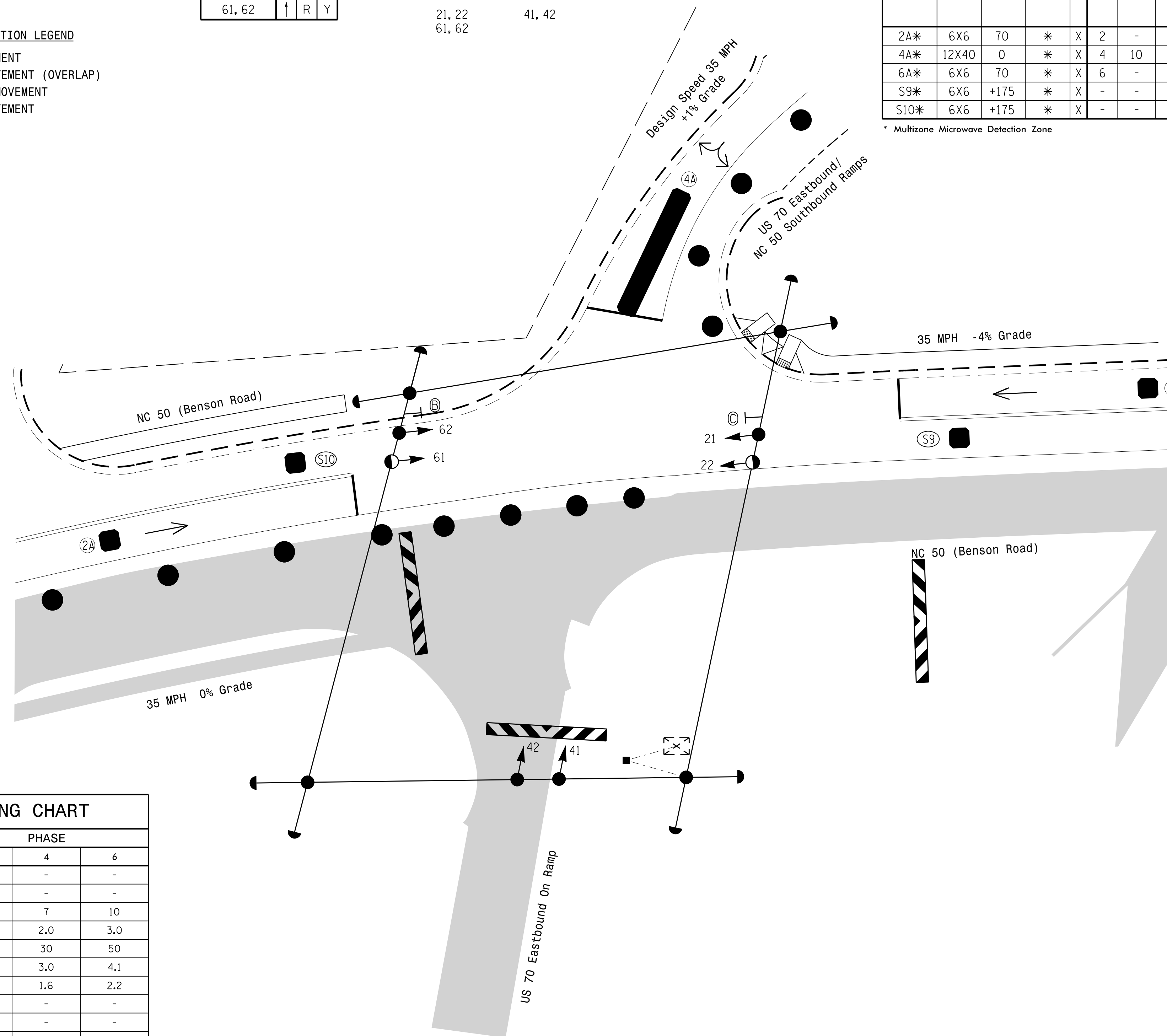
MAXTIME DETECTOR INSTALLATION CHART										
DETECTOR					PROGRAMMING					
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL DURING GREEN
2A*	6X6	70	*	X	2	-	-	X	-	X
4A*	12X40	0	*	X	4	10	-	X	-	X
6A*	6X6	70	*	X	6	-	-	X	-	X
S9*	6X6	+175	*	X	-	-	-	-	-	-
S10*	6X6	+175	*	X	-	-	-	-	-	-

\* Multizone Microwave Detection Zone

2 Phase Fully Actuated  
(US 70 (Garner Signal System A))  
Signal System #: D05-10\_Garner

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Reposition existing signs and signal heads numbered 21, 22, 41, 42, 61, and 62.
- Set all detector units to presence mode.
- This intersection uses multi-zone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



MAXTIME TIMING CHART

FEATURE	PHASE		
	2	4	6
Walk *	-	-	-
Ped Clear	-	-	-
Min Green *	10	7	10
Passage *	3.0	2.0	3.0
Max I *	50	30	50
Yellow Change	3.8	3.0	4.1
Red Clear	1.8	1.6	2.2
Added Initial *	-	-	-
Maximum Initial *	-	-	-
Time Before Reduction *	-	-	-
Time To Reduce *	-	-	-
Minimum Gap	-	-	-
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

- | PROPOSED |  | EXISTING |
|----------|--|----------|
| ○→       | Traffic Signal Head                            | ●→       |
| ●→       | Modified Signal Head                           | N/A      |
| ○→       | Sign   | N/A      |
| ○→       | 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                              | →        |
| ●        | Construction Zone Drums                        | ●        |
| ■        | Construction Zone                              | ■        |
| ■        | Microwave Detection Zone                       | ■        |
| Ⓟ        | No Right Turn Sign (R3-1)                      | Ⓟ        |
| Ⓠ        | No Left Turn Sign (R3-2)                       | Ⓠ        |

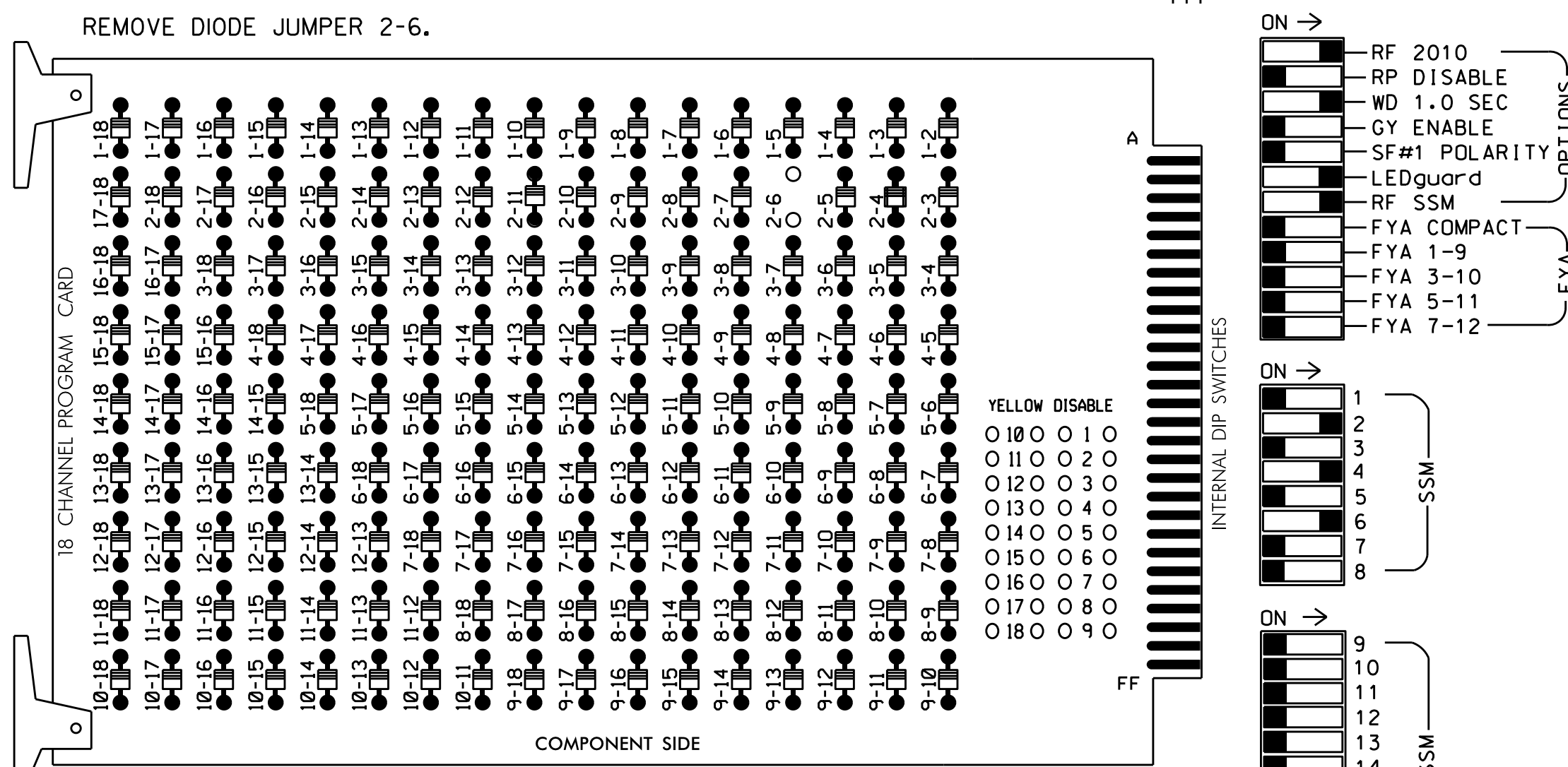
Signal Upgrade - Temporary Design 2 (TMP Phase III)

	<p>NC 50 (Benson Road) at US 70 Eastbound/ NC 50 Southbound Ramps</p>		<p>SEAL NORTH CAROLINA PROFESSIONAL ENGINEER ROBERT J. ZILKA 026486</p>
	<p>Division 5 Wake County Garner</p>	<p>PLAN DATE: May 2023 REVIEWED BY:</p>	
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>PREPARED BY: J.A. Lohr</p>	<p>REVIEWED BY:</p>	<p>SCALE: 1" = 20'</p>
<p>REVISIONS</p>	<p>INIT.</p>	<p>DATE</p>	<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p>



### 18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



NOTES:

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

■ = 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 plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the US 70 (Garner Signal System A) Signal System #: D05-10\_Garner.

### 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.....S2, S5, S8  
 Phases Used.....2, 4, 6  
 Overlaps.....None

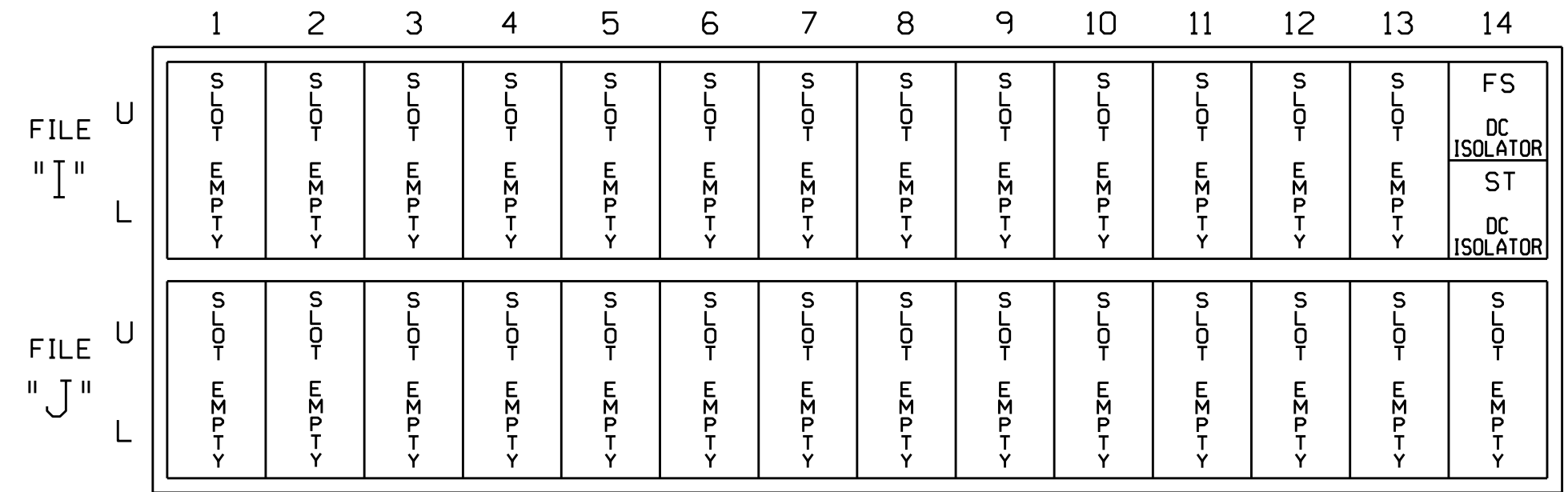
### SIGNAL HEAD HOOK-UP CHART

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	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW		129			102			135										
GREEN					103													
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW		130						136										

NU = Not Used

### INPUT FILE POSITION LAYOUT

(front view)



### SPECIAL DETECTOR NOTE

Install a Multizone Microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0810T2  
 DESIGNED: May 2023  
 SEALED: 5/17/2023  
 REVISED: N/A

18-MAY-2023 09:44 S:\ITS\GIS\UM\ITS\_Signals\Workgroups\4519\_MonZofar\Plans\01\vision\_5\050810\_and\_050818\_expnd\rev050810\_sml.eia\_2023rmd+12.dgn zzzofar

Electrical Detail - Temporary Design 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for the Offices of:  
  
 750 N. Greenfield Pkwy, Garner, NC 27529

NC 50 (Benson Road) at US 70 Eastbound/ NC 50 Southbound Ramps

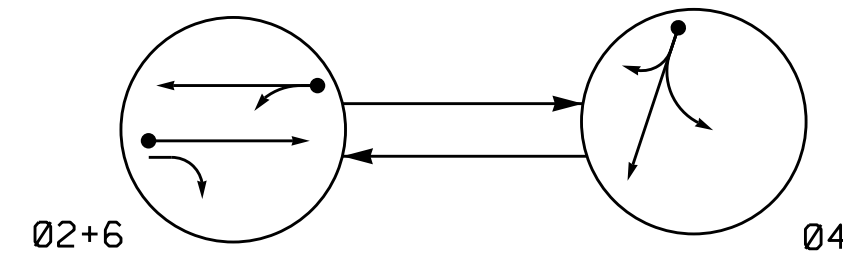
Division 5 Wake County Garner

PLAN DATE: May 2023 REVIEWED BY:  
 PREPARED BY: Zarrar Zafar REVIEWED BY:  
 REVISIONS INIT. DATE

Seal: SEAL 031001 ENGINEER TODD JOYCE

DocuSigned by: D. Todd Joyce 05/18/2023  
 200CADEF0B2410 DATE  
 SIG. INVENTORY NO. 05-0810T2

PHASING DIAGRAM

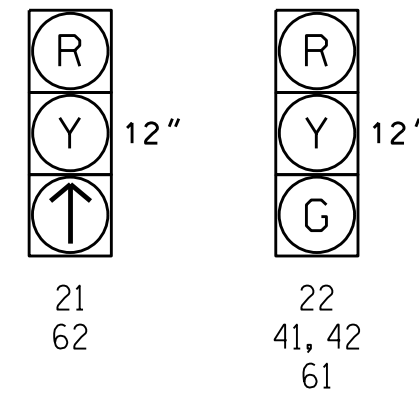


- PHASING DIAGRAM DETECTION LEGEND**
- ◄● DETECTED MOVEMENT
  - ◄ UNDETECTED MOVEMENT (OVERLAP)
  - ◄- - - UNSIGNALIZED MOVEMENT
  - ◄- - - PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE		
	02+6	04	FLASH
21	↑	R	Y
22	G	R	Y
41, 42	R	G	R
61	G	R	Y
62	↑	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



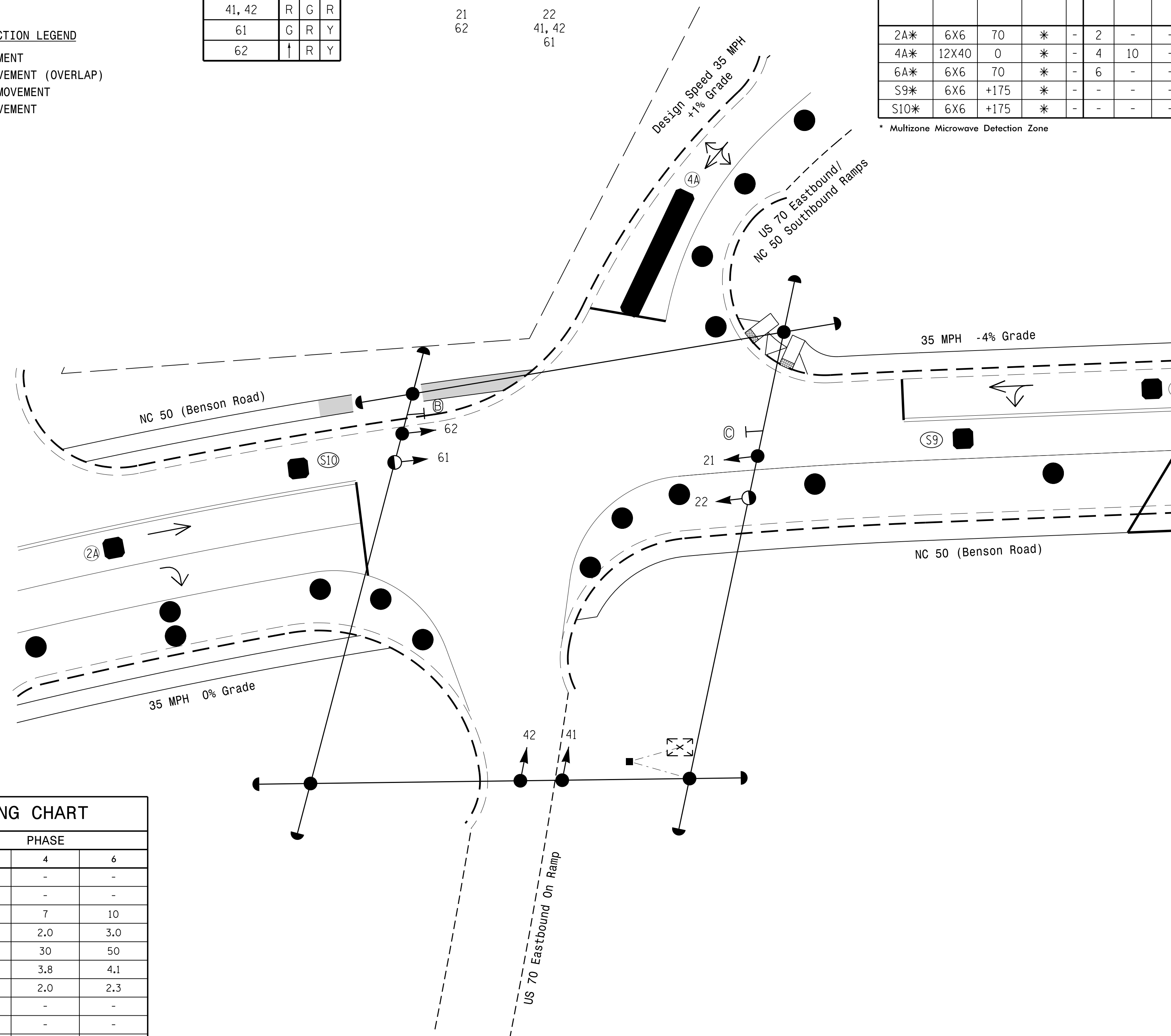
MAXTIME DETECTOR INSTALLATION CHART										
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING					
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL
2A*	6X6	70	*	-	2	-	-	X	X	-
4A*	12X40	0	*	-	4	10	-	X	X	-
6A*	6X6	70	*	-	6	-	-	X	X	-
S9*	6X6	+175	*	-	-	-	-	-	-	-
S10*	6X6	+175	*	-	-	-	-	-	-	-

\* Multizone Microwave Detection Zone

2 Phase Fully Actuated  
(US 70 (Garner Signal System A))  
Signal System #: D05-10\_Garner

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Reposition existing signal heads numbered 21 and 22.
- Set all detector units to presence mode.
- This intersection uses multi-zone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



FEATURE	PHASE		
	2	4	6
Walk *	-	-	-
Ped Clear	-	-	-
Min Green *	10	7	10
Passage *	3.0	2.0	3.0
Max I *	50	30	50
Yellow Change	3.8	3.8	4.1
Red Clear	1.7	2.0	2.3
Added Initial *	-	-	-
Maximum Initial *	-	-	-
Time Before Reduction *	-	-	-
Time To Reduce *	-	-	-
Minimum Gap	-	-	-
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.

PROPOSED		EXISTING	
○→	Traffic Signal Head	●→	N/A
●→	Modified Signal Head	■→	N/A
□→	Sign	□→	N/A
□→	Pedestrian Signal Head With Push Button & Sign	□→	N/A
○→	Signal Pole with Guy	○→	N/A
○→	Signal Pole with Sidewalk Guy	○→	N/A
□	Inductive Loop Detector	□	N/A
□	Controller & Cabinet	□	N/A
□	Junction Box	□	N/A
- - -	2-in Underground Conduit	- - -	N/A
- - -	Right of Way	- - -	N/A
→	Directional Arrow	→	N/A
■	Construction Zone Drums	■	N/A
■	Construction Zone	■	N/A
■	Microwave Detection Zone	■	N/A
Ⓟ	No Right Turn Sign (R3-1)	Ⓟ	N/A
Ⓞ	No Left Turn Sign (R3-2)	Ⓞ	N/A

Signal Upgrade - Temporary Design 3 (TMP Phases III & IV)

NC 50 (Benson Road) at US 70 Eastbound/NC 50 Southbound Ramps

Division 5 Wake County Garner

PLAN DATE: May 2023 REVIEWED BY: J.A. Lohr

PREPARED BY: J.A. Lohr REVIEWED BY: ROBERT J. ZIEMBA

DATE: 05/17/2023

SCALE: 1" = 20'

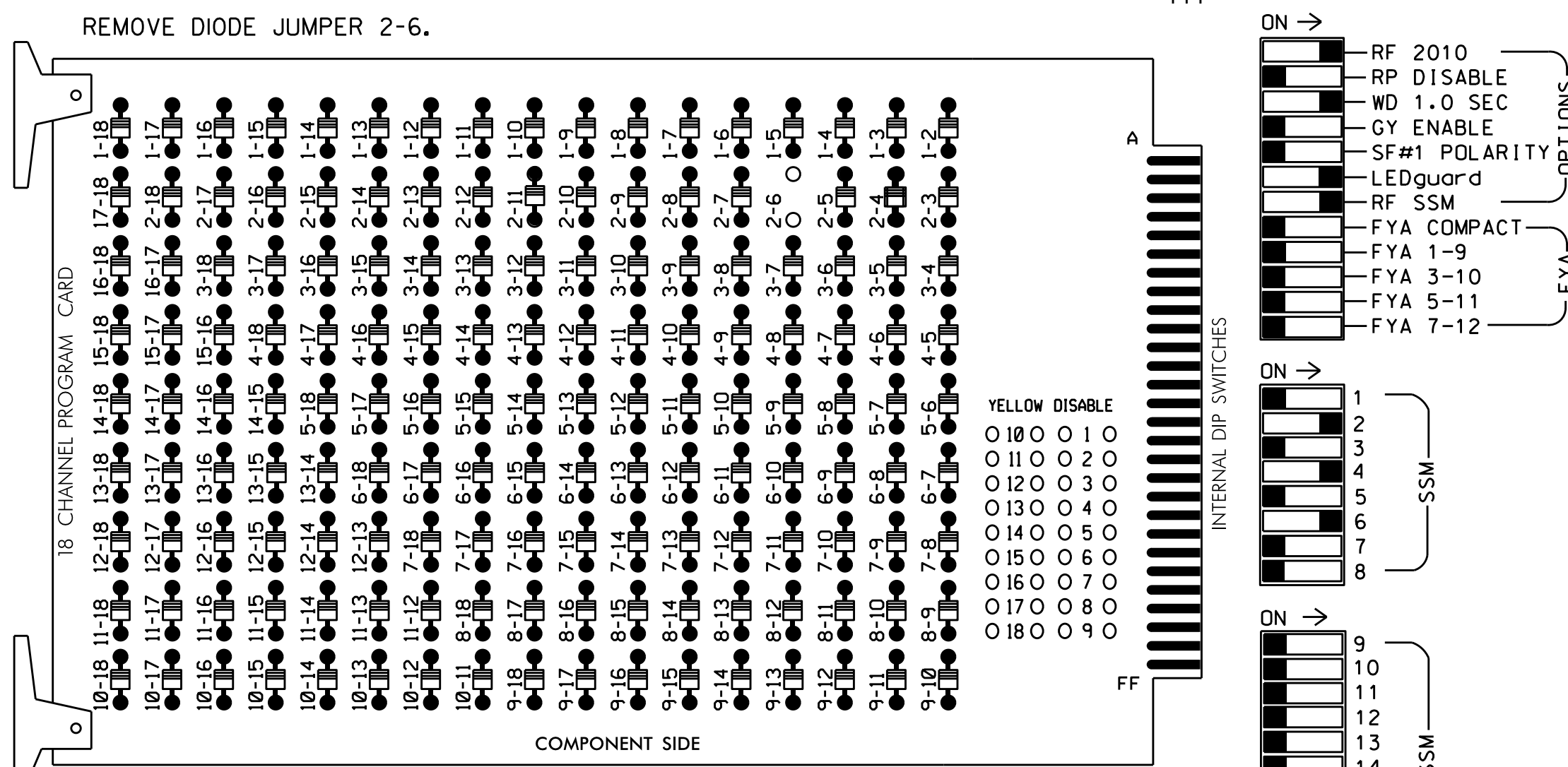
SIG. INVENTORY NO. 05-081013

20-DEC-2023 1:41:33 S:\IT\GIS\UM\15\SIGNAL\Signal\Design\Central\Region40\iv\_5\46-4654\MAXTIME\05081013...sig\_dsn\_20230517.dgn cz:lembo



### 18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



**NOTES:**

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

### 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 plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the US 70 (Garner Signal System A) Signal System #: D05-10\_Garner.

### 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.....S2, S5, S8  
 Phases Used.....2, 4, 6  
 Overlaps.....None

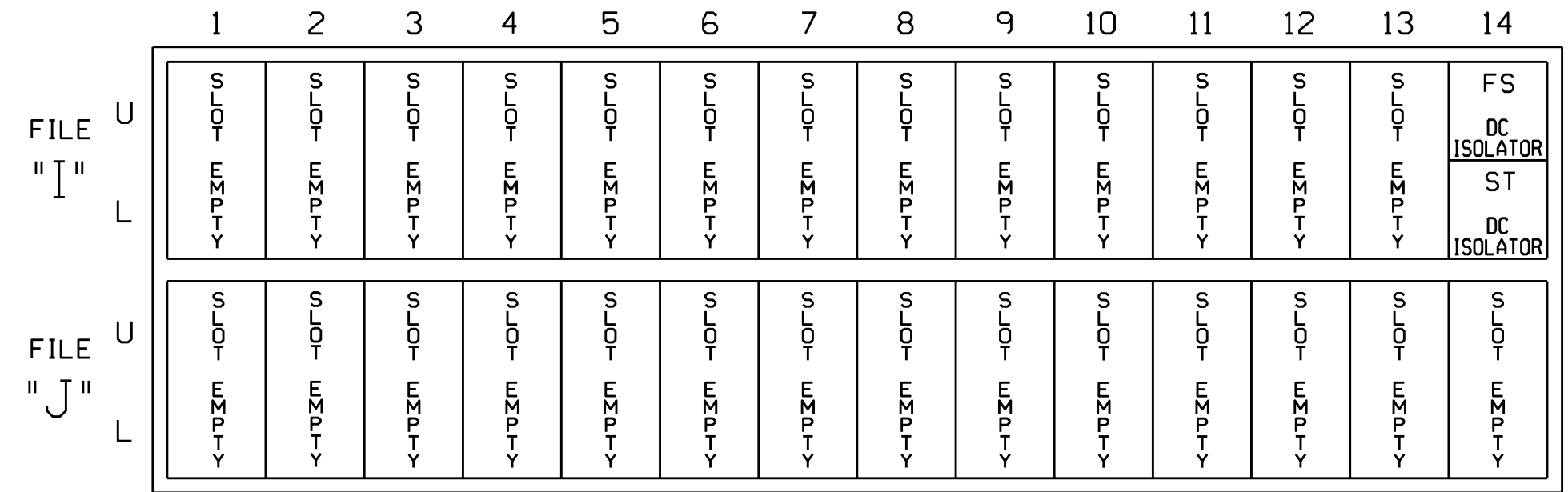
### SIGNAL HEAD HOOK-UP CHART

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	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22	NU	NU	41,42	NU	NU	61	62	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128			101			134	134								
YELLOW		129	129			102			135	135								
GREEN			130			103			136									
RED ARROW																		
YELLOW ARROW																		
FLASHING YELLOW ARROW																		
GREEN ARROW		130							136									

NU = Not Used

### INPUT FILE POSITION LAYOUT

(front view)



EX. : 1A, 2A, ETC. = LOOP NO.'S  
 FS = FLASH SENSE  
 ST = STOP TIME

### SPECIAL DETECTOR NOTE

Install a Multizone Microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0810T3  
 DESIGNED: May 2023  
 SEALED: 5/17/2023  
 REVISED: N/A

18-MAY-2023 09:51 S:\ITS\GIS\UMTS\Sigonal\Workgroups\4519\_MonZofar\Plans\01\vision\_5\050810\_and\_050818\_exp050818.dgn

Electrical Detail - Temporary Design 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for the Offices of:  
 Transportation Mobility and Safety Division  
 STATE OF NORTH CAROLINA  
 Department of Transportation  
 Signal Management Section  
 750 N. Greenfield Pkwy, Garner, NC 27529

NC 50 (Benson Road) at US 70 Eastbound/ NC 50 Southbound Ramps

Division 5 Wake County Garner

PLAN DATE: May 2023 REVIEWED BY:

PREPARED BY: Zarrar Zafar REVIEWED BY:

REVISIONS	INIT.	DATE

Seal: SEAL 031001 ENGINEER TODD JOYCE

Documented by: D. Todd Joyce 05/18/2023

SIG. INVENTORY NO. 05-0810T3

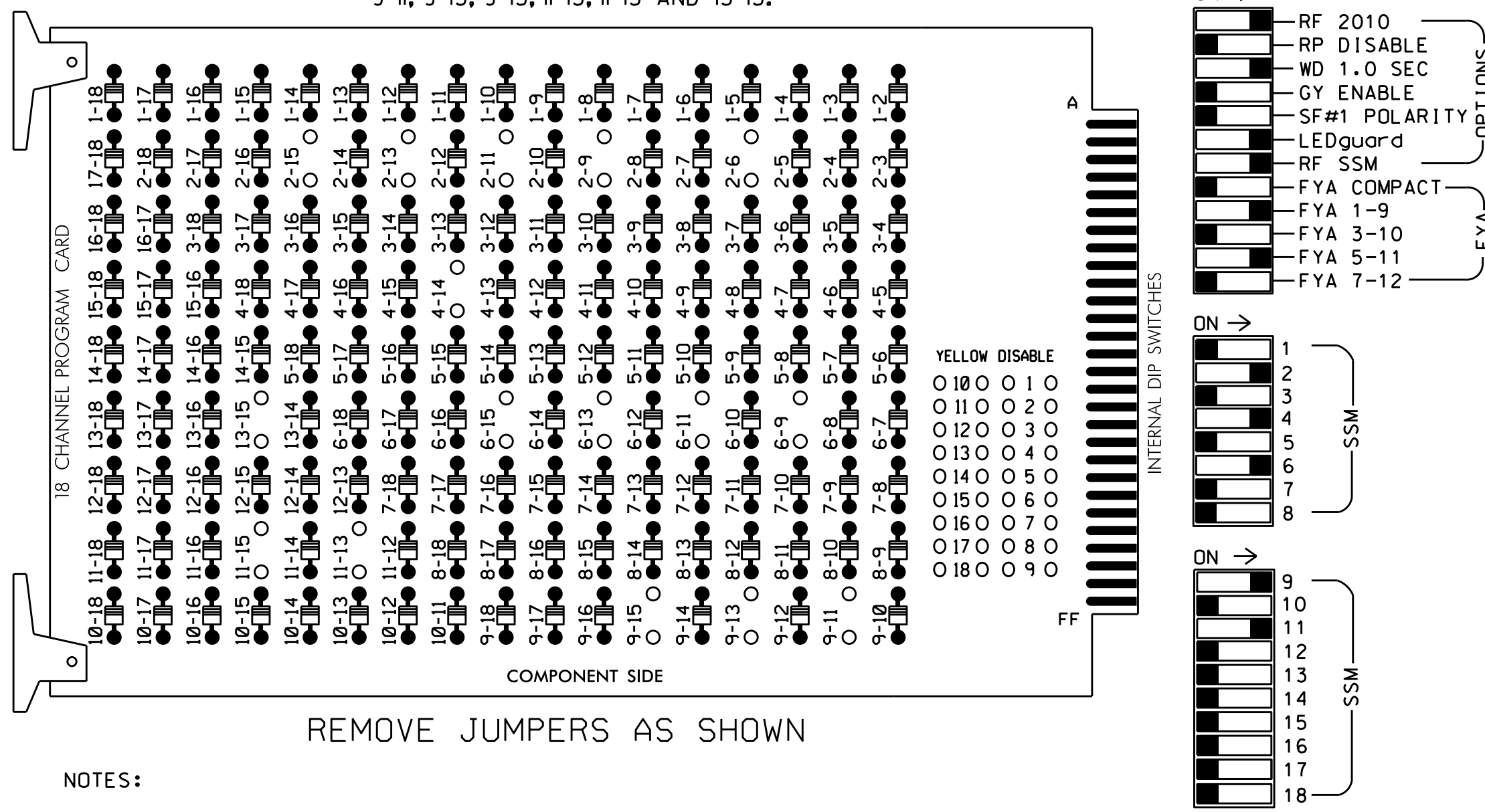




### 18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 2-15, 4-14, 6-9, 6-11, 6-13, 6-15, 9-11, 9-13, 9-15, 11-13, 11-15 AND 13-15.



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 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 6 Green No 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 US 70 (Garner Signal System A) Signal System #: D05-10\_Garner.

### 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.....S2, S3, S5, S6, S8, S9, AUX S1, AUX S4  
 Phases Used.....2, 2PED, 4, 4PED, 6, 6PED  
 Overlap "1".....\*  
 Overlap "2".....NOT USED  
 Overlap "3".....\*  
 Overlap "4".....NOT USED

\*See overlap programming detail on this sheet

### SIGNAL HEAD HOOK-UP CHART

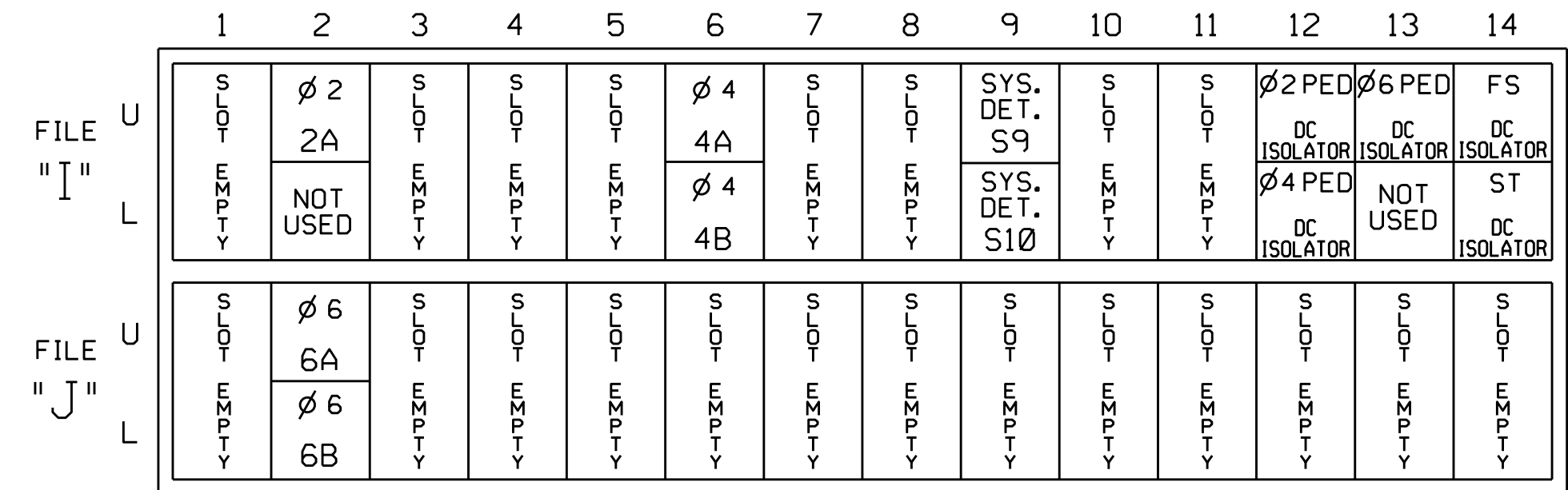
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	P21, P22	NU	41,42	P41, P42	NU	62,63	P61, P62	NU	NU	NU	61*	NU	NU	23*	NU	NU
RED		128			101			134										A114
YELLOW		129			102			135										
GREEN					103													
RED ARROW																		A121
YELLOW ARROW																		A122
FLASHING YELLOW ARROW																		A123
GREEN ARROW		130						136										A115
Hand			113			104		119										A116
Walker			115			106		121										

NU = Not Used

\* See pictorial of head wiring in detail below.

### INPUT FILE POSITION LAYOUT

(front view)



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

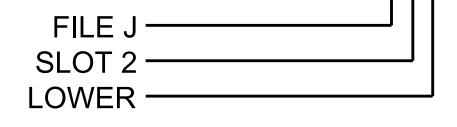
FS = FLASH SENSE  
 ST = STOP TIME

### 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	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
4B	TB4-11,12	I6L	45	7	9	4	15		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
6B	TB3-7,8	J2L	44	6	17	6			X		X	
*S9	TB6-9,10	I9U	60	22	13	SYS						
*S10	TB6-11,12	I9L	62	24	14	SYS						
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P41,P42	TB8-5,6	I12L	69	35	4	PED 4						
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

\*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L



NOTE:  
 INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

### OVERLAP PROGRAMMING

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

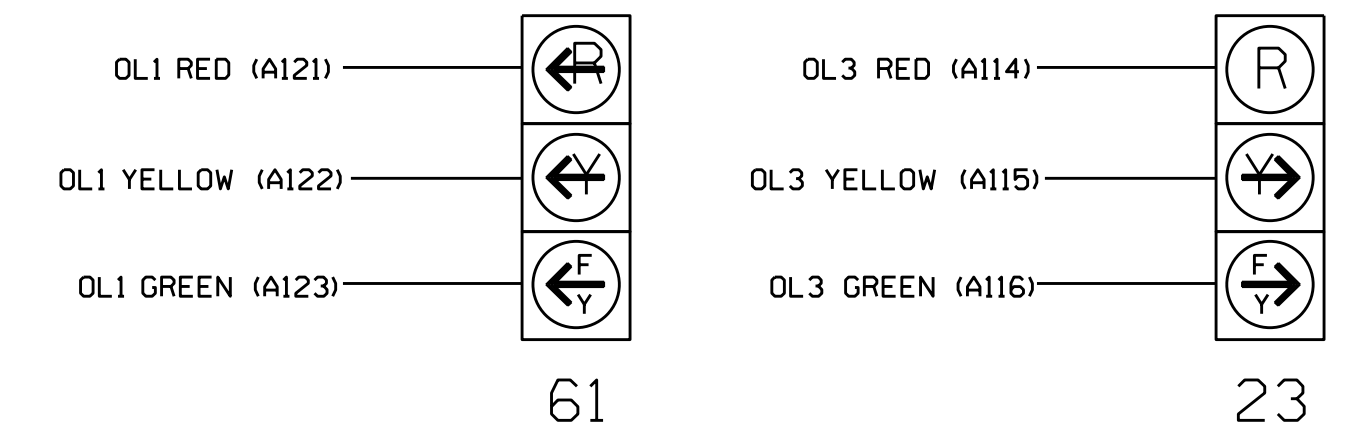
Web Interface  
 Home > Controller > Overlap Configuration > Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	2
Modifier Phases	-	-
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

### FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



### COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0810  
 DESIGNED: May 2023  
 SEALED: 5/17/2023  
 REVISED: N/A

Electrical Detail

ELECTRICAL AND PROGRAMMING DETAILS FOR:  
 Prepared for the Offices of:  
  
 750 N. Greenfield Pkwy, Garner, NC 27529

NC 50 (Benson Road) at US 70 Eastbound/ NC 50 Southbound Ramps  
 Division 5 Wake County Garner  
 PLAN DATE: May 2023 REVIEWED BY:  
 PREPARED BY: Zafar Zafar REVIEWED BY:  
 REVISIONS INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

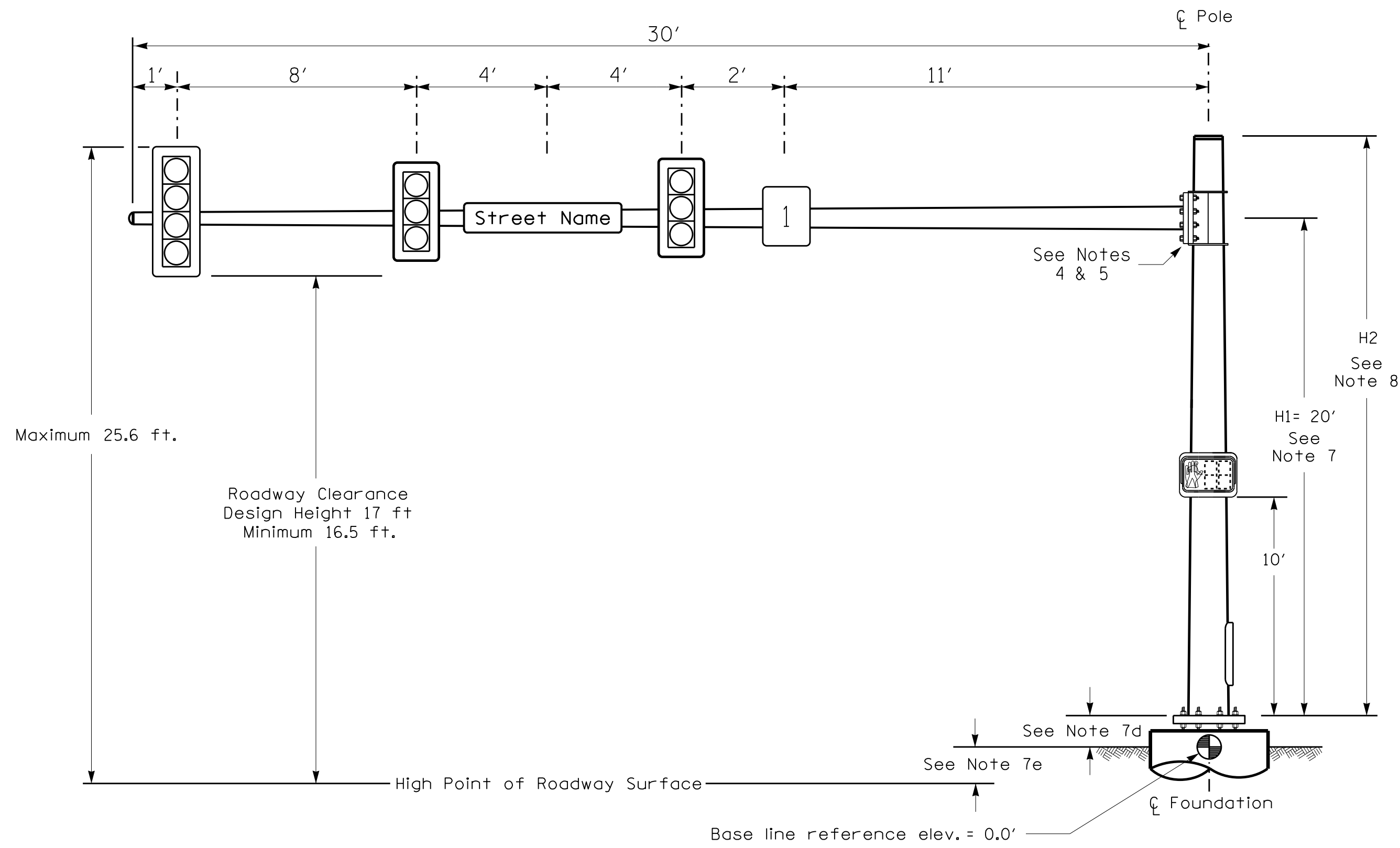
SEAL  
  
 SEAL 031001  
 ENGINEER TODD JOYCE  
 Documented by: D. Todd Joyce 05/18/2023  
 DATE  
 SIG. INVENTORY NO. 05-0810







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



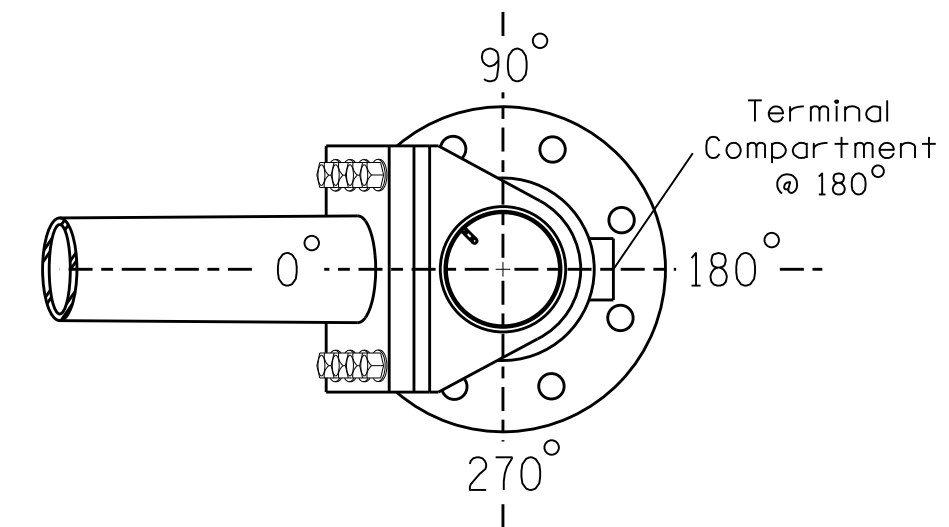
**Elevation View**

**SPECIAL NOTE**

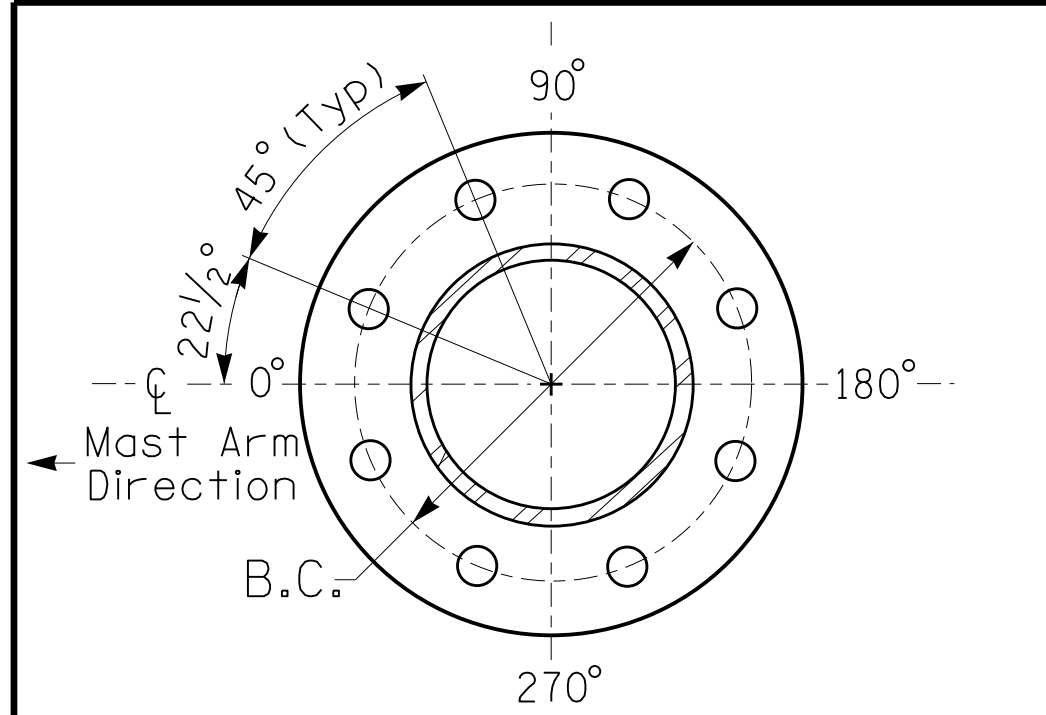
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:		Pole 3
Baseline reference point at $\phi$ Foundation @ ground level		0.0 ft.
Elevation difference at High point of roadway surface		+1.2 ft.
Elevation difference at Edge of travelway or face of curb		+1.2 ft.

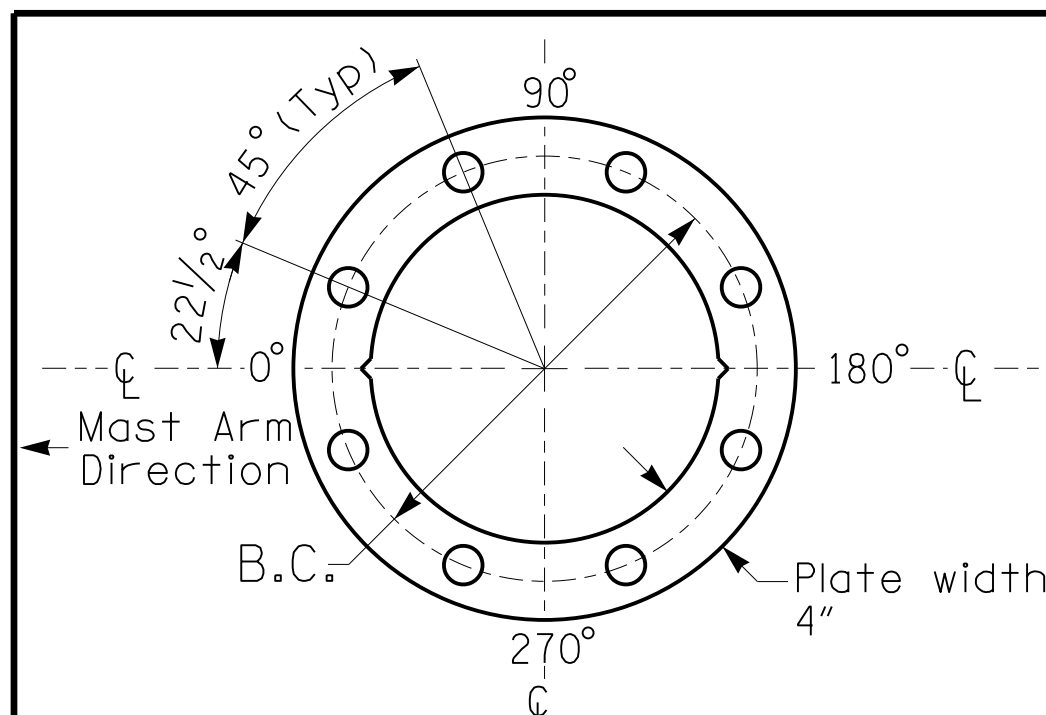


**POLE RADIAL ORIENTATION**



**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**

**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
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS
	SIGN RIGID MOUNTED	9.0 S.F.	36.0" W X 36.0" L	17 LBS

**NOTES**

**DESIGN REFERENCE MATERIAL**

- Design the traffic signal structure and foundation in accordance with:
  - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2024 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>

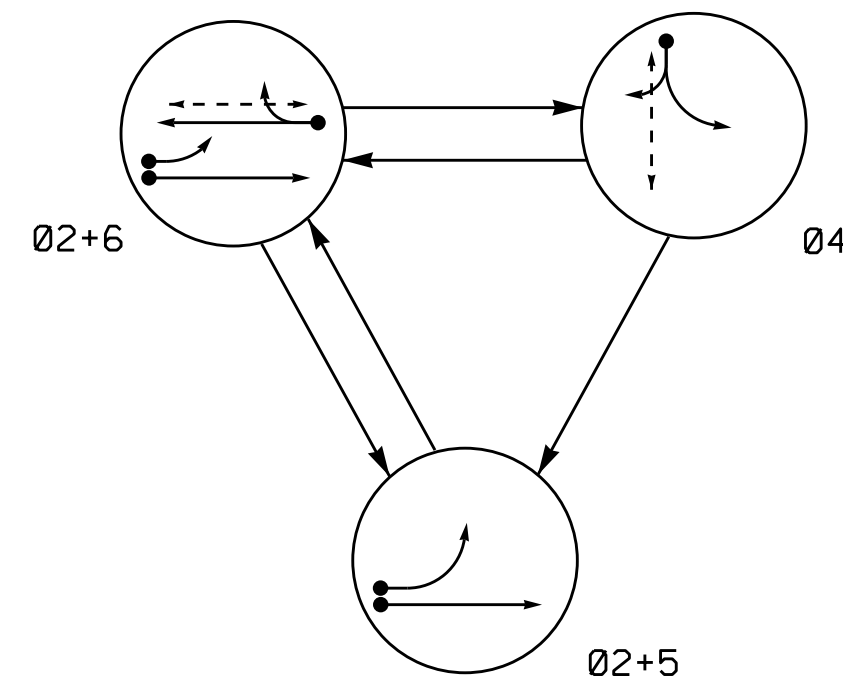
**DESIGN REQUIREMENTS**

- 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 force 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.

NCDOT Wind Zone 4 (90 mph)

<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Prepared For the Offices of:</p> <p><b>NC 50 (Benson Road)</b> at <b>US 70 Eastbound/ NC 50 Southbound Ramps</b></p> <p>Division 5 Wake County Garner</p> <p>PLAN DATE: December 2023 REVIEWED BY:</p> <p>PREPARED BY: J.A. Lohr REVIEWED BY:</p>	<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p> <p>SEAL</p> <p></p> <p>12/20/2023</p> <p>SIG. INVENTORY NO. 05-0810</p>
	<p>SCALE N/A</p> <p>0 N/A</p>	<p>REVISIONS</p> <p>INIT. DATE</p>

PHASING DIAGRAM



SIGNAL FACE	PHASE			
	02+5	02+6	04	FLASH
21, 22	G	G	R	Y
41	R	R	-	R
42, 43	R	R	F	R
51	-	F	R	Y
61, 62	R	G	R	Y
P41, P42	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK

PHASING DIAGRAM DETECTION LEGEND

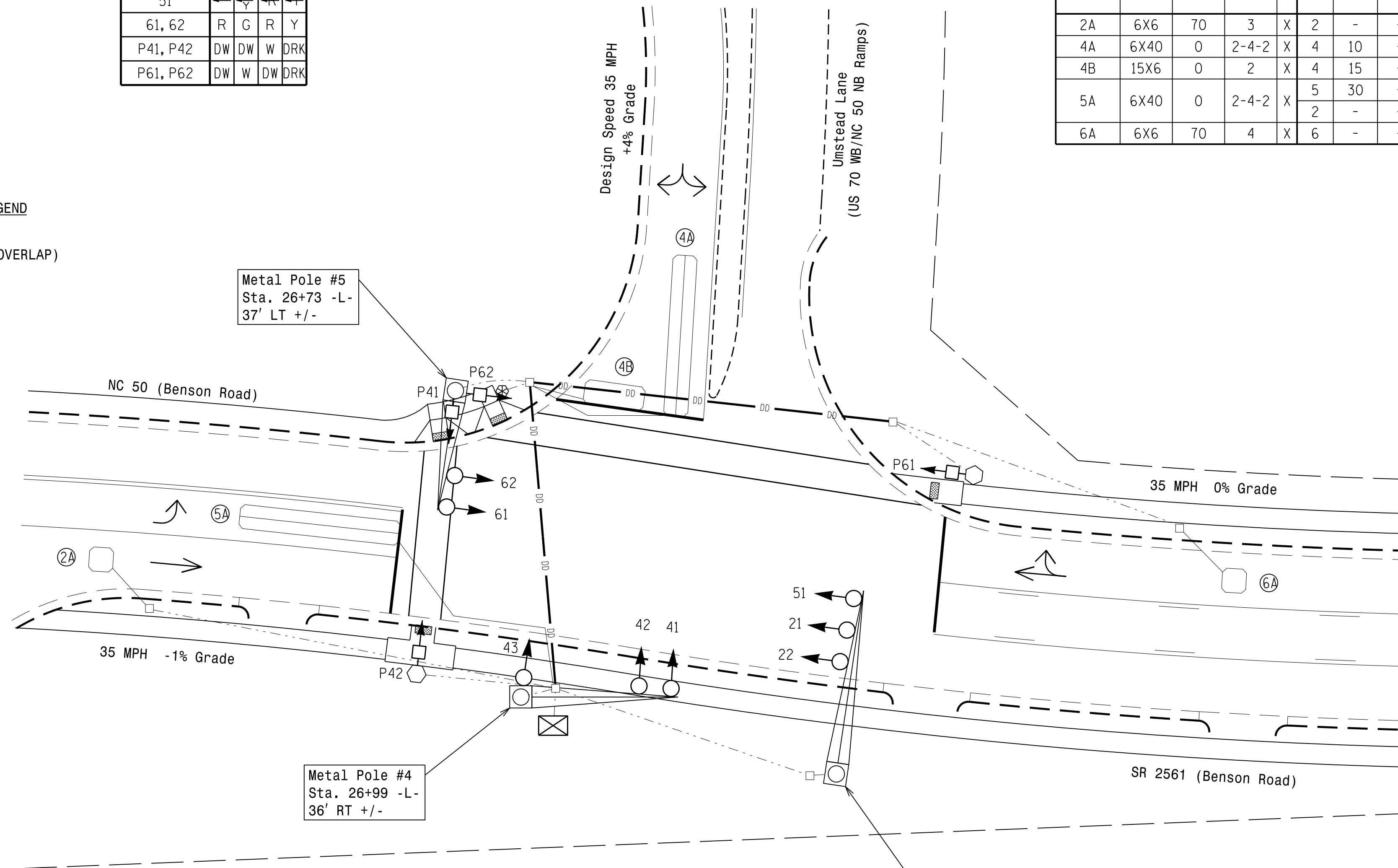
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

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	
2A	6X6	70	3	X	2	-	-	X	-	X	-	X
4A	6X40	0	2-4-2	X	4	10	-	X	-	X	-	X
4B	15X6	0	2	X	4	15	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	30	-	X	-	X	-	X
					2	-	-	X	-	X	-	X
6A	6X6	70	4	X	6	-	-	X	-	X	-	X

3 Phase Fully Actuated (US 70 (Garner Signal System A)) Signal System #: D05-10\_Garner

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 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.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



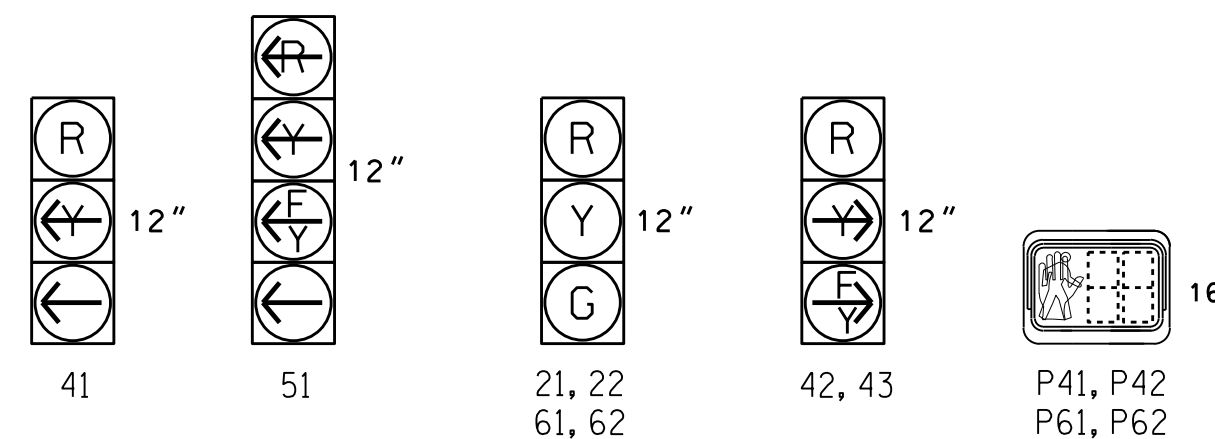
MAXTIME TIMING CHART

FEATURE	PHASE			
	2	4	5	6
Walk *	-	7	-	7
Ped Clear *	-	12	-	27
Min Green	10	7	7	10
Passage *	3.0	2.0	2.0	3.0
Max 1 *	50	30	20	50
Yellow Change	3.9	3.0	3.0	3.9
Red Clear	2.5	2.3	3.1	2.5
Added Initial *	-	-	-	-
Maximum Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Advance Walk	-	3	-	3
Non Lock Detector	-	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.

SIGNAL FACE I.D.

All Heads L.E.D.



LEGEND

- | PROPOSED   | EXISTING |
|--|----------|
| ○ Traffic Signal Head                            | ● N/A    |
| ○ Modified Signal Head                           | ○ N/A    |
| ⊥ Sign   | ⊥ N/A    |
| ⊥ Pedestrian Signal Head With Push Button & Sign | ⊥ N/A    |
| ○ Signal Pole with Guy                           | ○ N/A    |
| ○ Signal Pole with Sidewalk Guy                  | ○ N/A    |
| □ Inductive Loop Detector                        | □ N/A    |
| ⊗ Controller & Cabinet                           | ⊗ N/A    |
| □ Junction Box                                   | □ N/A    |
| --- 2-in Underground Conduit                     | --- N/A  |
| N/A Right of Way                                 | N/A      |
| → Directional Arrow                              | → N/A    |
| → Directional Drill                              | → N/A    |
| ○ Metal Pole with Mastarm                        | ○ N/A    |
| ⊗ Type I Pushbutton Post                         | ⊗ N/A    |
| ○ Type II Signal Pedestal                        | ○ N/A    |
| N/A Curb Ramp                                    | N/A      |

New Installation

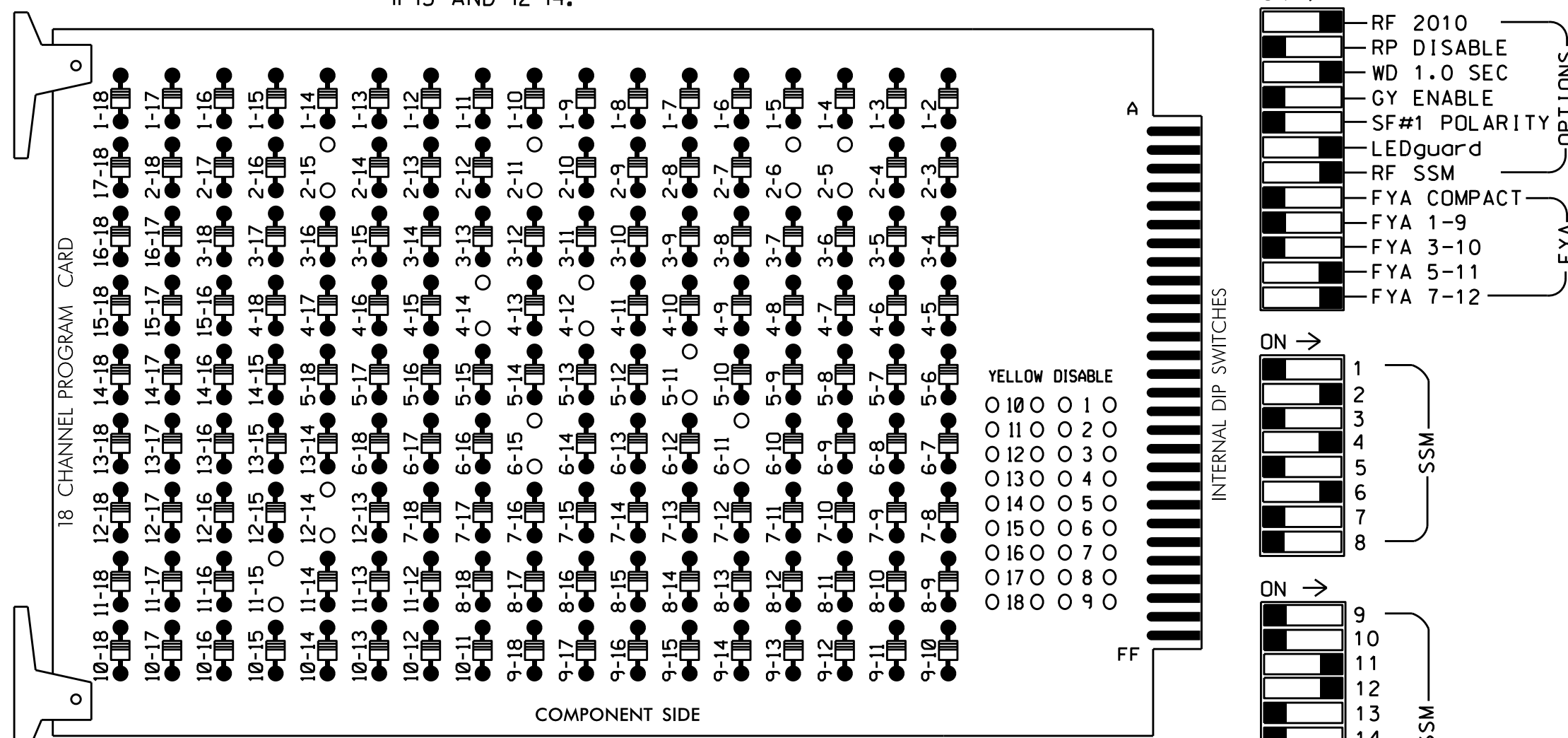
	NC 50/SR 2561 (Benson Road) at Umstead Lane (US 70 WB/NC 50 NB Ramps)		
	Division 5 Wake County Garner	PLAN DATE: May 2023	
PREPARED BY: J.A. Lohr	REVIEWED BY:	DATE: 05/17/2023	SIG. INVENTORY NO. 05-0818



### 18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5, 2-6, 2-11, 2-15, 4-12, 4-14, 5-11, 6-11, 6-15, 11-15 AND 12-14.



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 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 6 Green No 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 US 70 (Garner Signal System A) Signal System #: D05-10\_Garner.

### 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.....S2, S5, S6, S7, S8, S9, AUX S4, AUX S5  
 Phases Used.....2, 4, 4PED, 5, 6, 6PED  
 Overlap "1".....NOT USED  
 Overlap "2".....NOT USED  
 Overlap "3".....\*  
 Overlap "4".....\*

\*See overlap programming detail on this sheet

### 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	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41	P41, P42	51*	61,62	P61, P62	NU	NU	NU	NU	NU	NU	51*	42,43	NU
RED		128			101			134										A101
YELLOW		129					*	135										
GREEN		130						136										
RED ARROW																		A114
YELLOW ARROW						102												A115 A102
FLASHING YELLOW ARROW																		A116 A103
GREEN ARROW						103	133											
Hand							104		119									
Walker							106		121									

NU = Not Used

\* Denotes install load resistor. See load resistor installation detail this sheet.

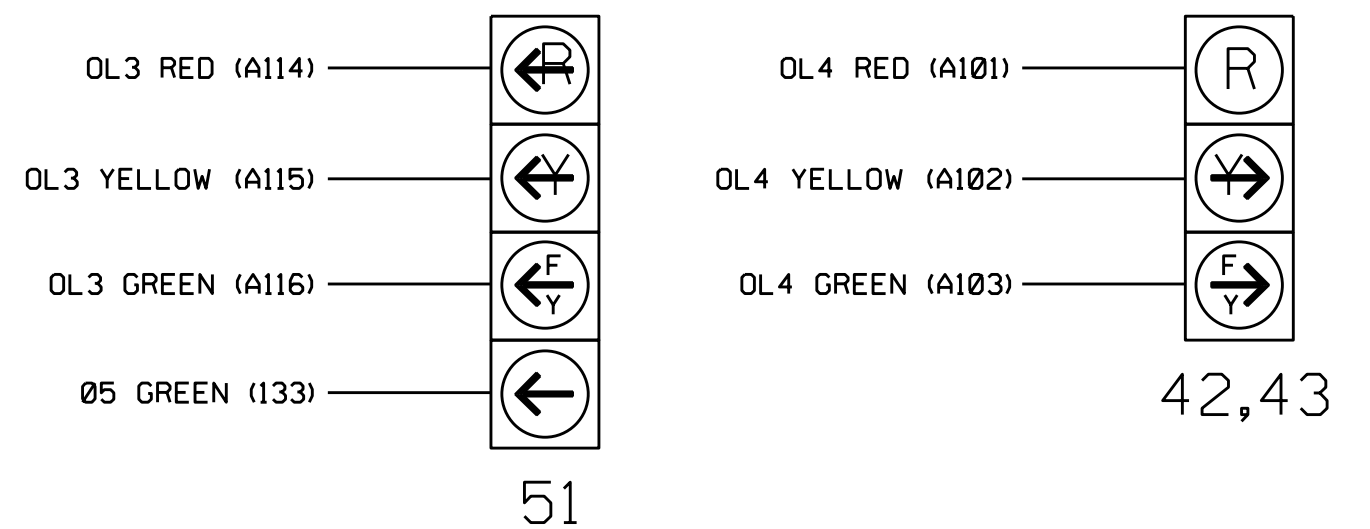
★ See pictorial of head wiring in detail below.

### COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

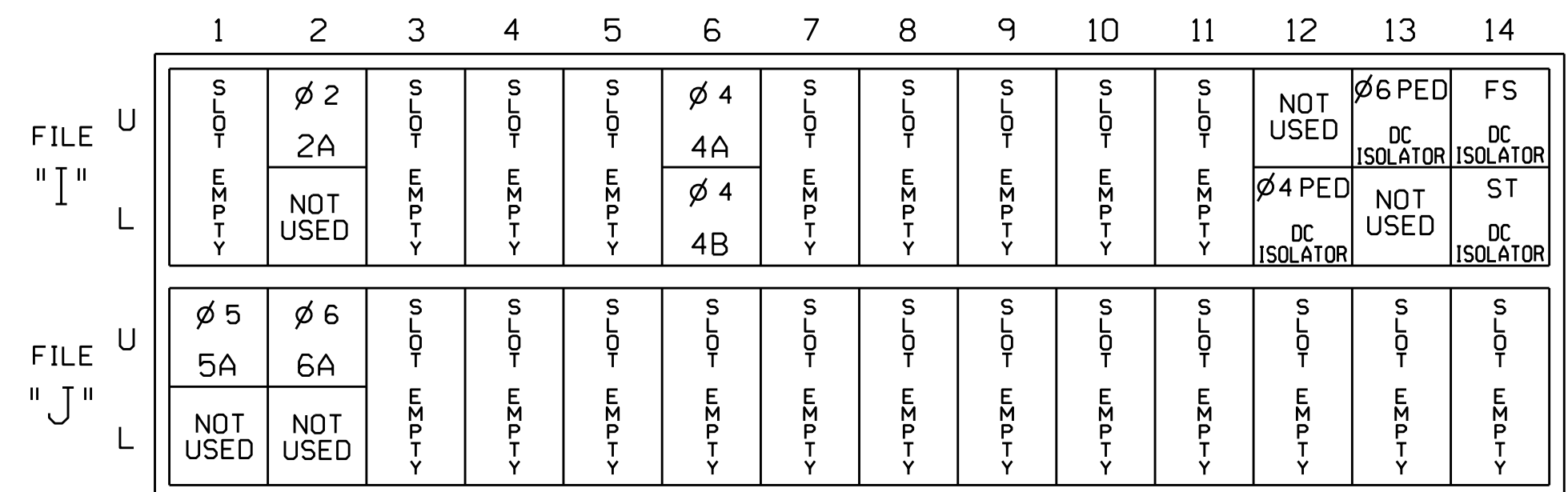
### FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



### INPUT FILE POSITION LAYOUT

(front view)



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

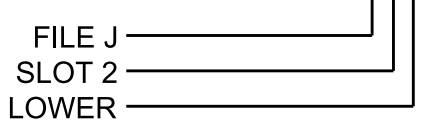
FS = FLASH SENSE  
 ST = STOP TIME

### 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	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4	10		X		X	
4B	TB4-11,12	I6L	45	7	9	4	15		X		X	
5A	TB3-1,2	J1U	55	17	15	5	30		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
PED PUSH BUTTONS												
P41,P42	TB8-5,6	I12L	69	35	4	PED 4						
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

### INPUT FILE POSITION LEGEND:



### OVERLAP PROGRAMMING

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

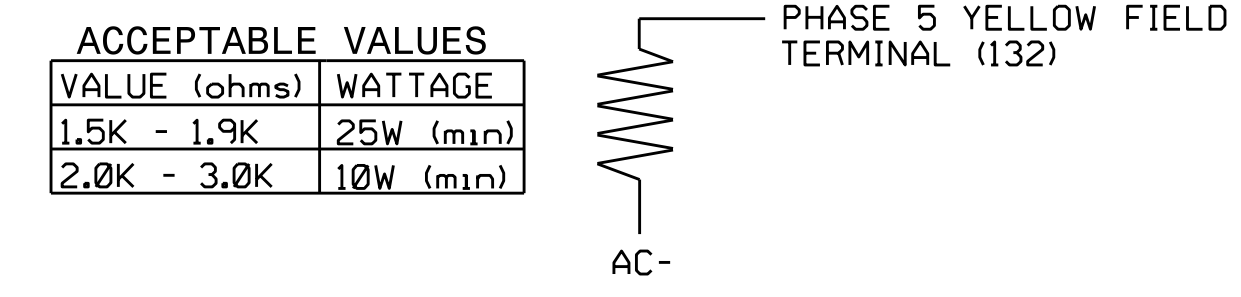
Web Interface  
 Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	3	4
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	6	4
Modifier Phases	5	-
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

### LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)



### Electrical Detail

Electrical and Programming Details For: NC 50/SR 2561 (Benson Road) at Umstead Lane (US 70 WB/NC 50 NB Ramps)

Division 5 Wake County Garner

Prepared for the Offices of: [Seal]

Plan Date: May 2023

Prepared by: Zarrar Zafar

Reviewed by: [Signature]

750 N. Greenfield Pkwy, Garner, NC 27529

Document Not Considered Final Unless All Signatures Completed

Seal: SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 031001 TODD JOYCE

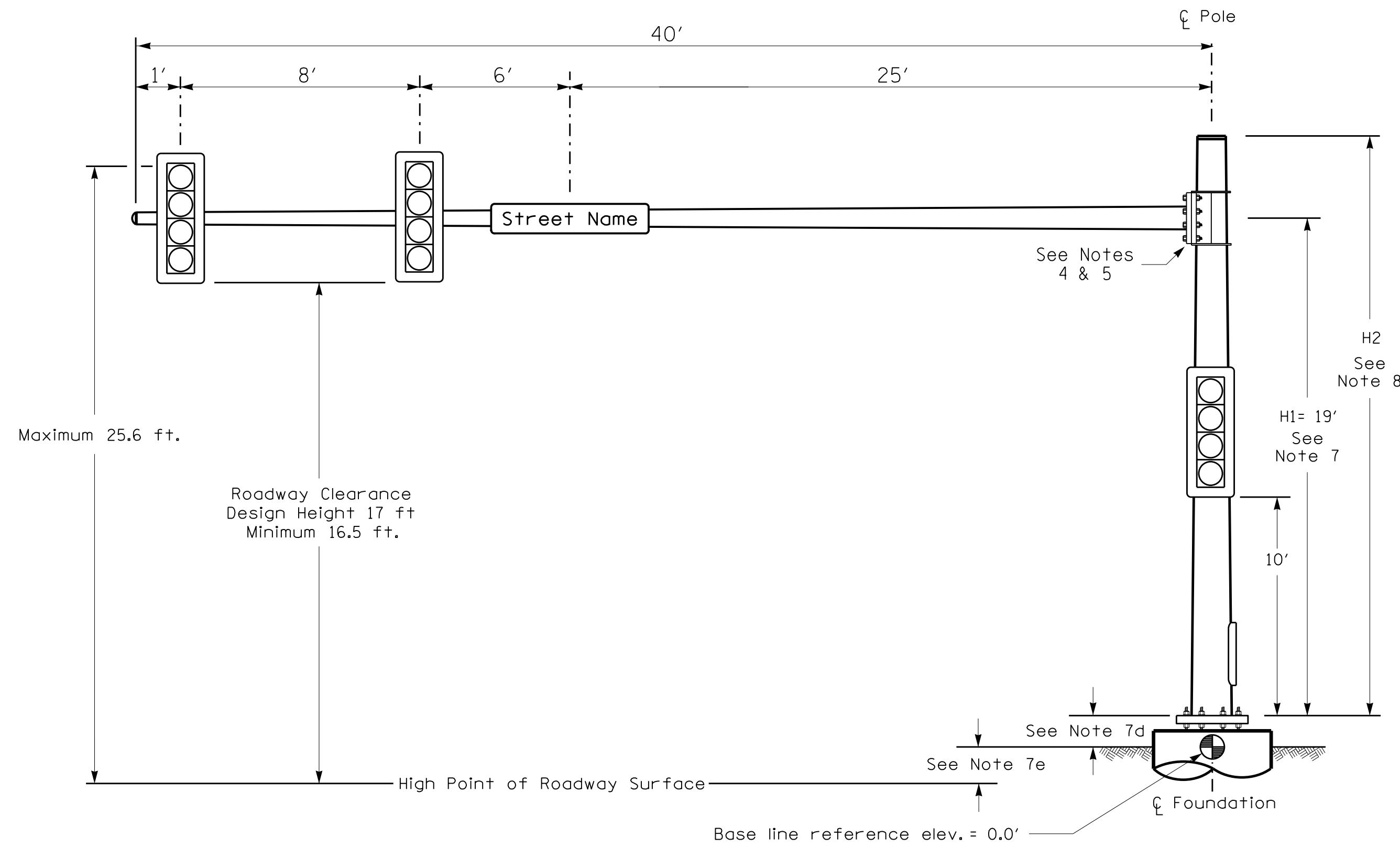
Discussed by: [Signature] 05/18/2023

SIG. INVENTORY NO. 05-0818

18-MAY-2023 12:17 S:\IT\SS\LINKS\Sig\050818\Workgroups\4519\_Mon\Zafar\Plans\01\vision\_5\050818\_sml.eia\_2023mdd-dgn zzzz

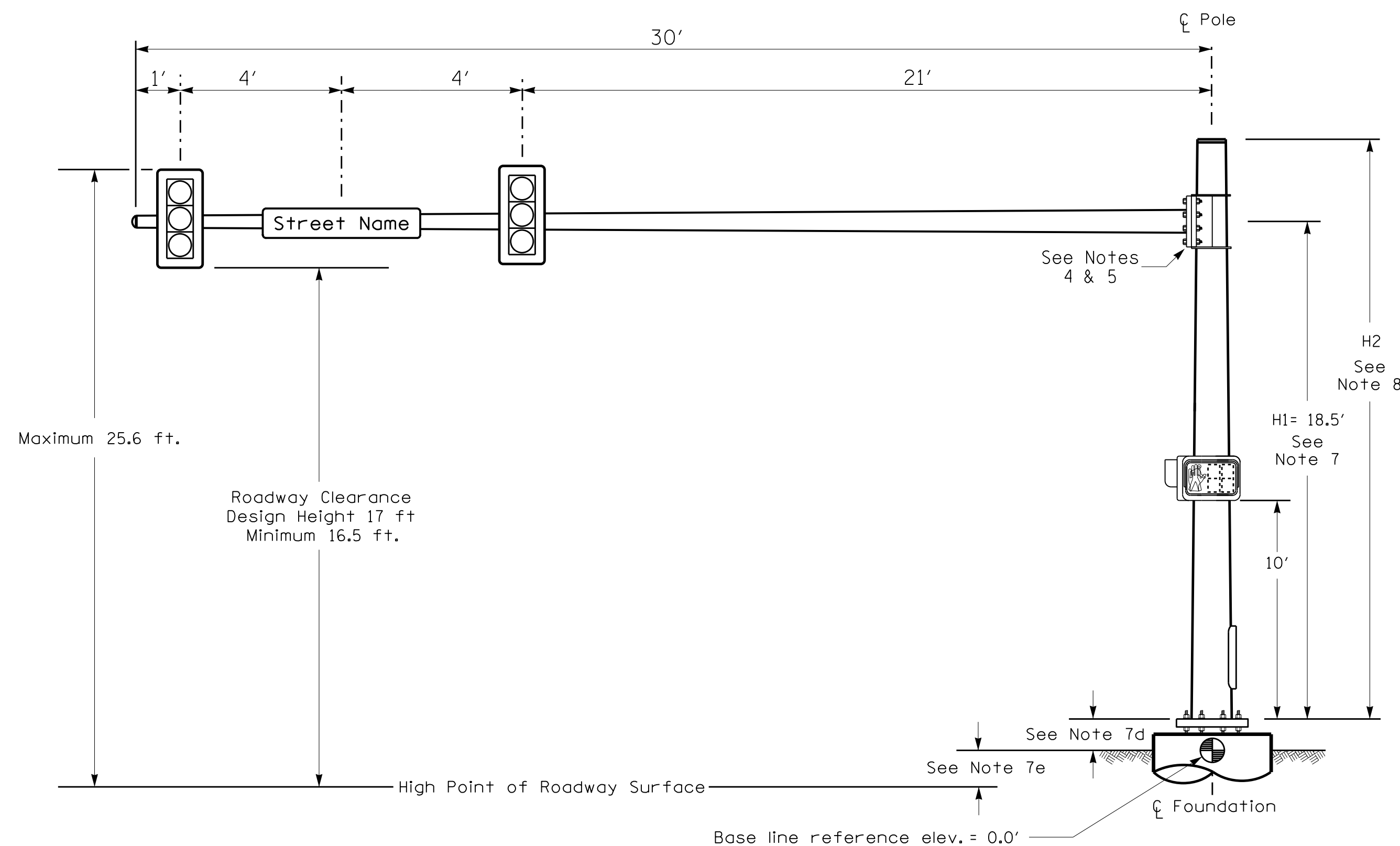


**Design Loading for METAL POLE NO. 4**



Elevation View

**Design Loading for METAL POLE NO. 5**



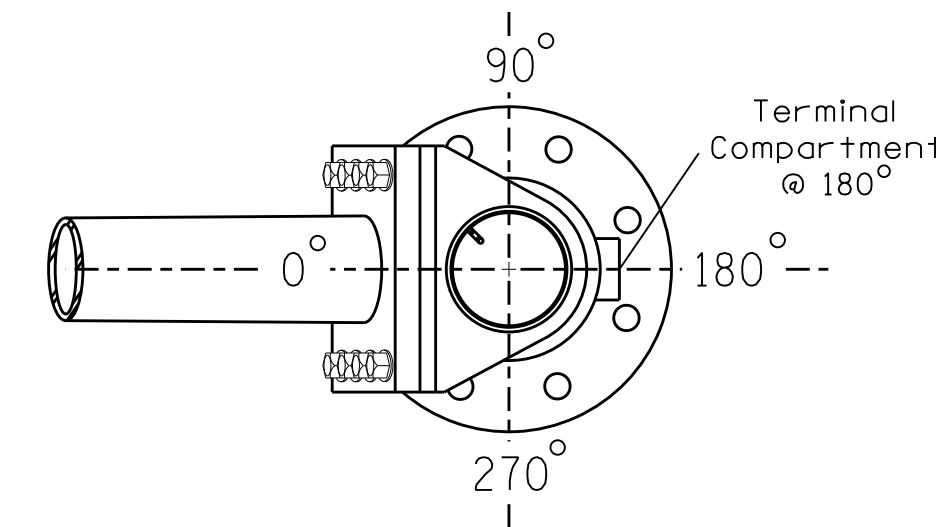
Elevation View

**SPECIAL NOTE**

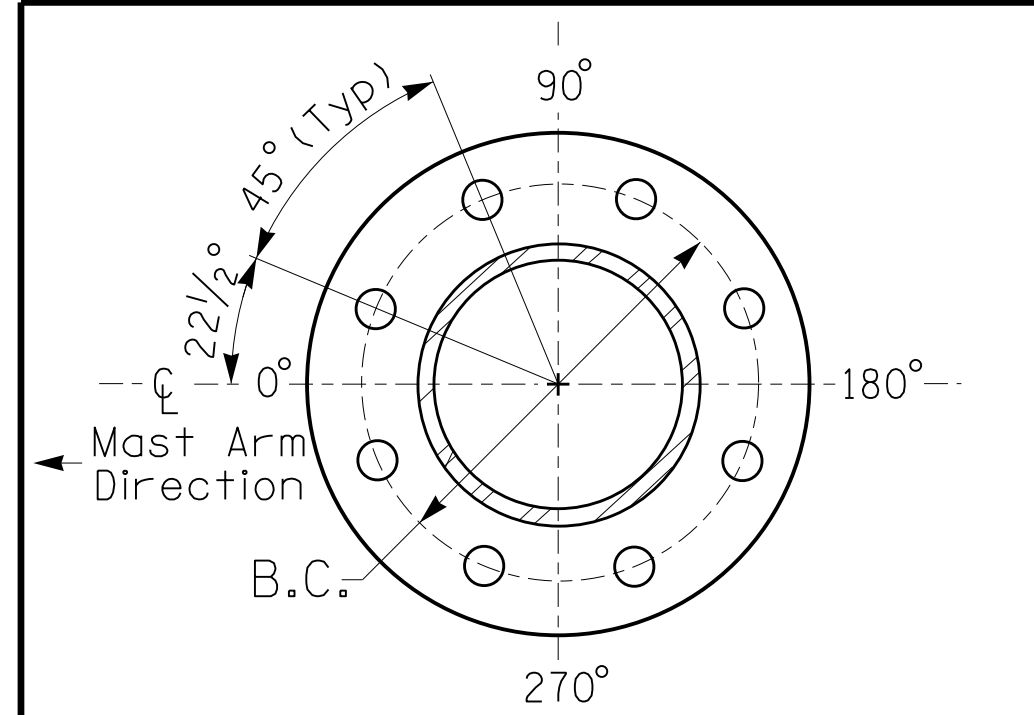
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:	Pole 4	Pole 5
Baseline reference point at Pole Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.3 ft.	+4.2 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+3.1 ft.

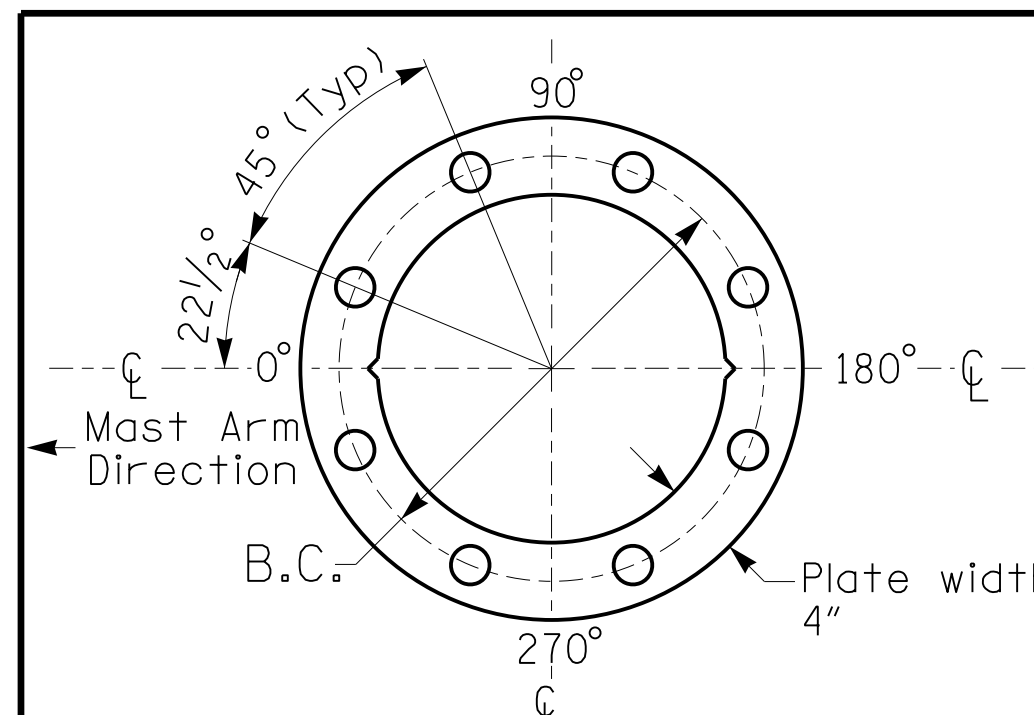


POLE RADIAL ORIENTATION



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 SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

**NOTES**

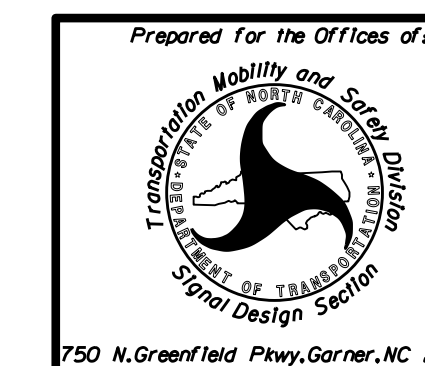
**DESIGN REFERENCE MATERIAL**

- Design the traffic signal structure and foundation in accordance with:
  - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2024 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 force 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.

NCDOT Wind Zone 4 (90 mph)

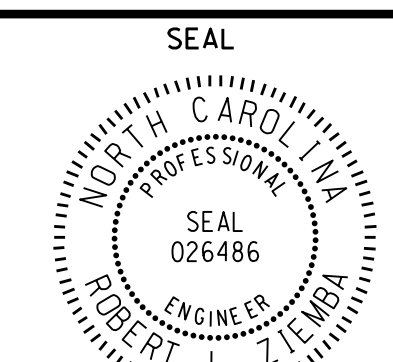


Prepared for the Offices of:  
**NC 50/SR 2561 (Benson Road)**  
 at  
**Umstead Lane**  
 (US 70 WB/NC 50 NB Ramps)  
 Division 5 Wake County Garner

PLAN DATE: December 2023 REVIEWED BY:  
 PREPARED BY: J.A. Lohr REVIEWED BY:

750 N. Greenfield Pkwy, Garner, NC 27529  
 SCALE: 0 N/A  
 N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

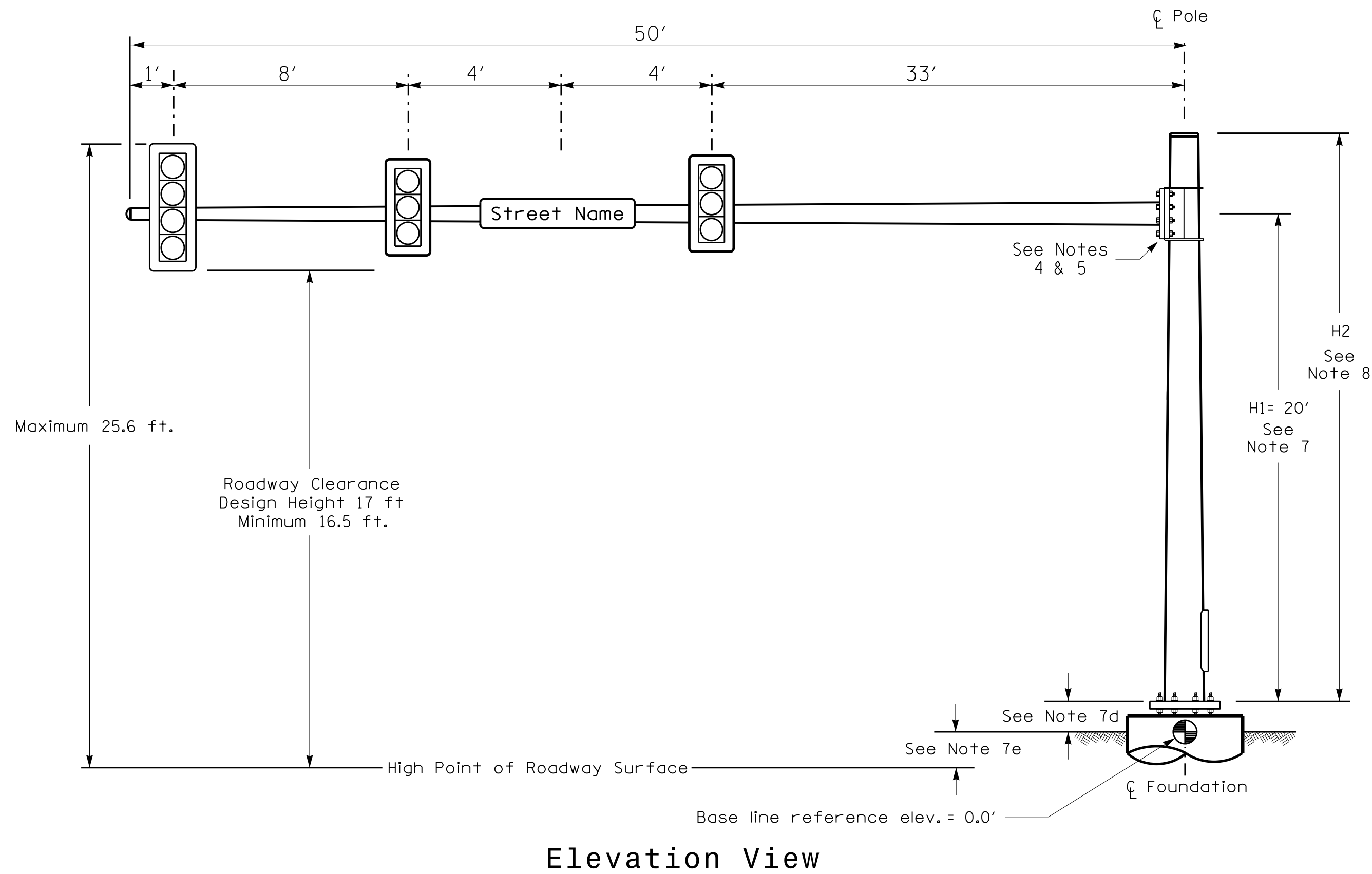


12/20/2023  
 DATE  
 SIG. INVENTORY NO. 05-0818

20-085-2023 16542  
 S:\MITSUBISHI\SIGNAL DESIGN\Section\Central Region\04iv 946-4654\MAXTIME\ME\050818.sia.mpl\_20231220.dgn  
 RZ1:erbo



**Design Loading for METAL POLE NO. 6**



**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 6
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+0.5 ft.
Elevation difference at Edge of travelway or face of curb	+0.4 ft.

**METAL POLE No. 6**

PROJECT REFERENCE NO.	SHEET NO.
B-4654	Fig. 6.3

**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

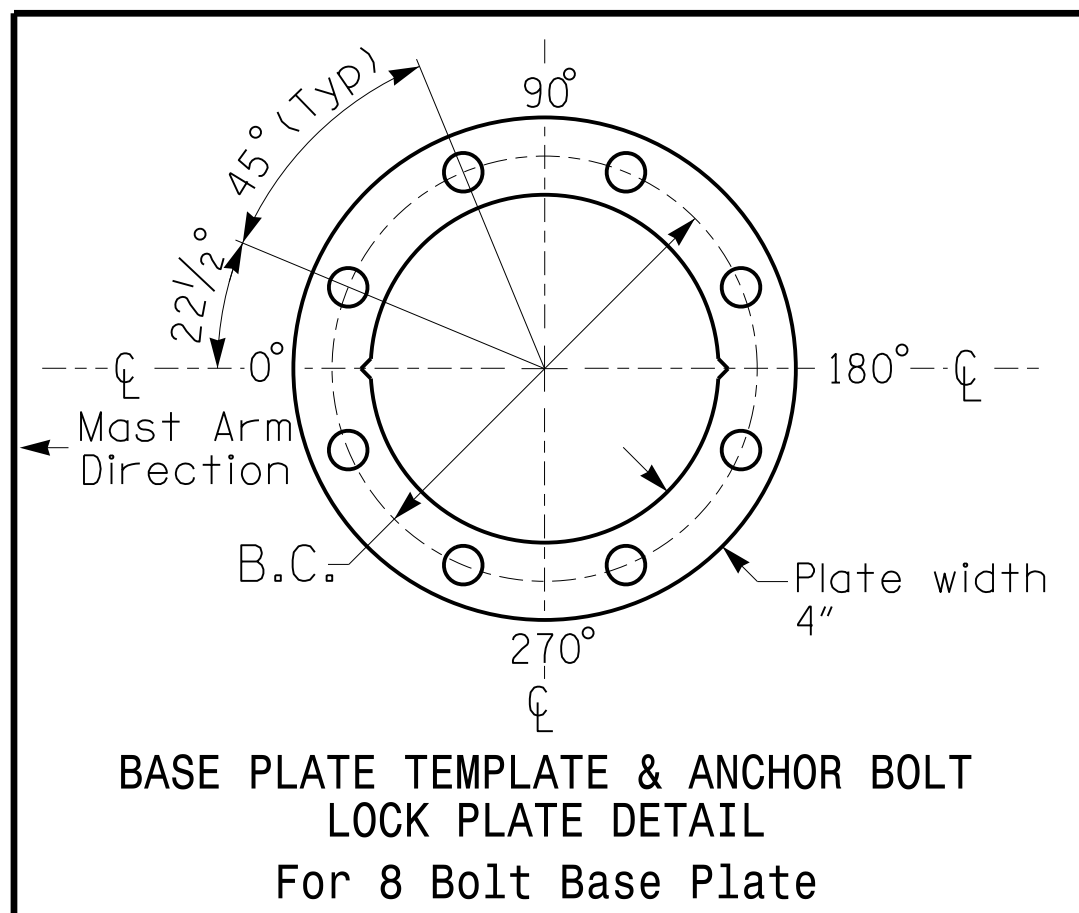
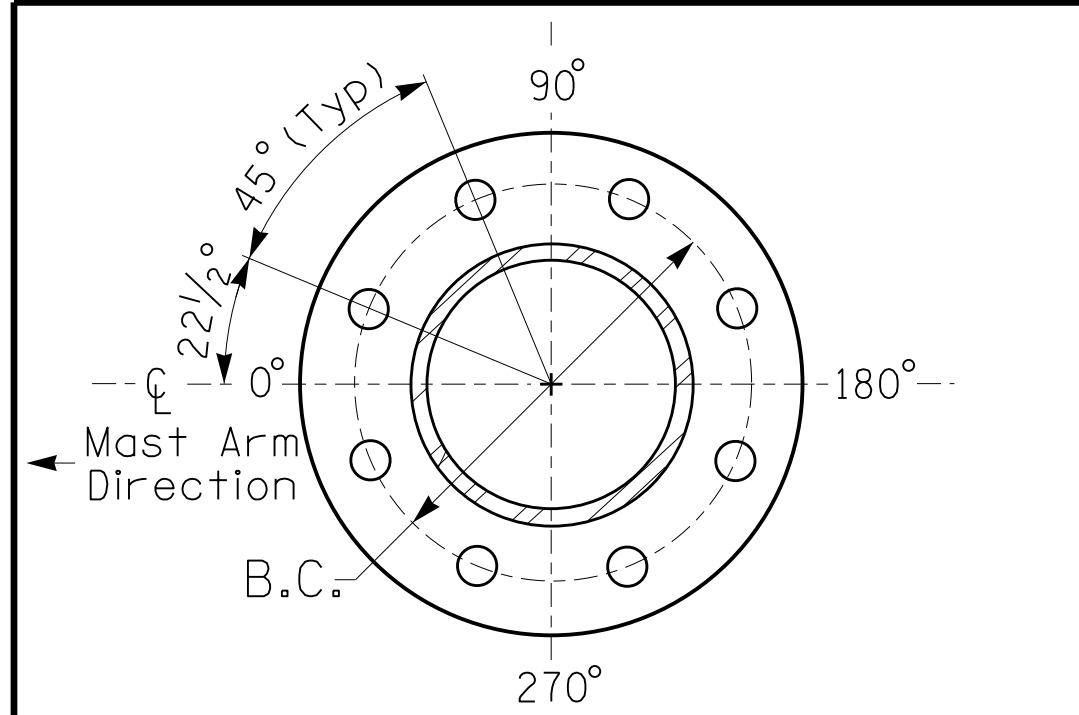
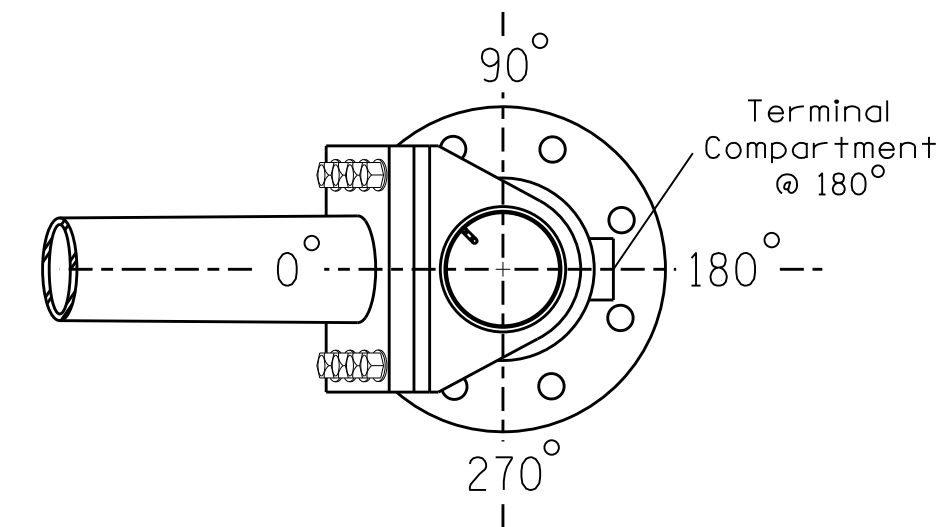
**NOTES**

**DESIGN REFERENCE MATERIAL**

- Design the traffic signal structure and foundation in accordance with:
  - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2024 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 force 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.



NCDOT Wind Zone 4 (90 mph)

Prepared for the Offices of:

**NC 50/SR 2561 (Benson Road) at Umstead Lane (US 70 WB/NC 50 NB Ramps)**

Division 5 Wake County Garner

PLAN DATE: December 2023 REVIEWED BY:

PREPARED BY: J.A. Lohr REVIEWED BY:

REVISIONS INIT. DATE

SCALE: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

**ROBERT J. ZIEMBY**  
PROFESSIONAL ENGINEER  
026486

12/20/2023

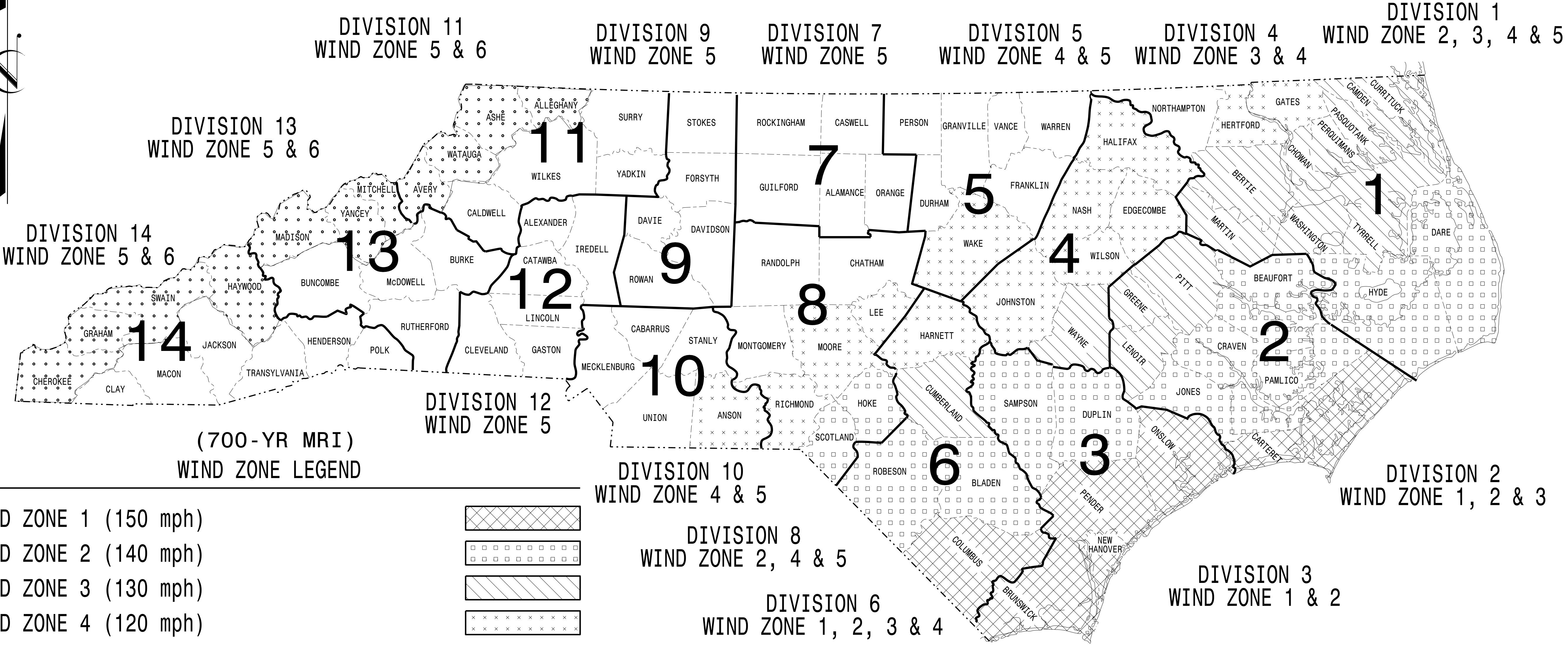
SIG. INVENTORY NO. 05-0818

20-065-2023 16:57  
 S:\ITS\SUP\ITS\_S\Signal\Signal Design\Section\Central\_Region\01\4-65-MAXI\ME-050818\_s1q.mpl\_20231220.dgn  
 PZ1:erbo



# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

## STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



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

**NC DOT METAL POLE STANDARDS**



Designed in conformance  
with the latest  
2020 Interim to the  
1st Edition 2015  
**AASHTO  
LRFD**  
Standard Specifications for  
Highway Signs, Luminaires,  
and Traffic Signals

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

**MOBILITY AND SAFETY DIVISION -  
TRANSPORTATION SYSTEMS MANAGEMENT  
AND OPERATIONS UNIT**

---

**D.Y. ISHAK - STATE SIGNALS ENGINEER**  
**K. DURIGON, P.E. - ITS AND SIGNALS STRUCTURAL ENGINEER**  
**B. WALKER, P.E. - ITS AND SIGNALS STRUCTURAL ENGINEER**

SEAL

DocuSigned by:  
**Kevin Durigon**  
SIGNATURE  
4B23DC79B3764DA

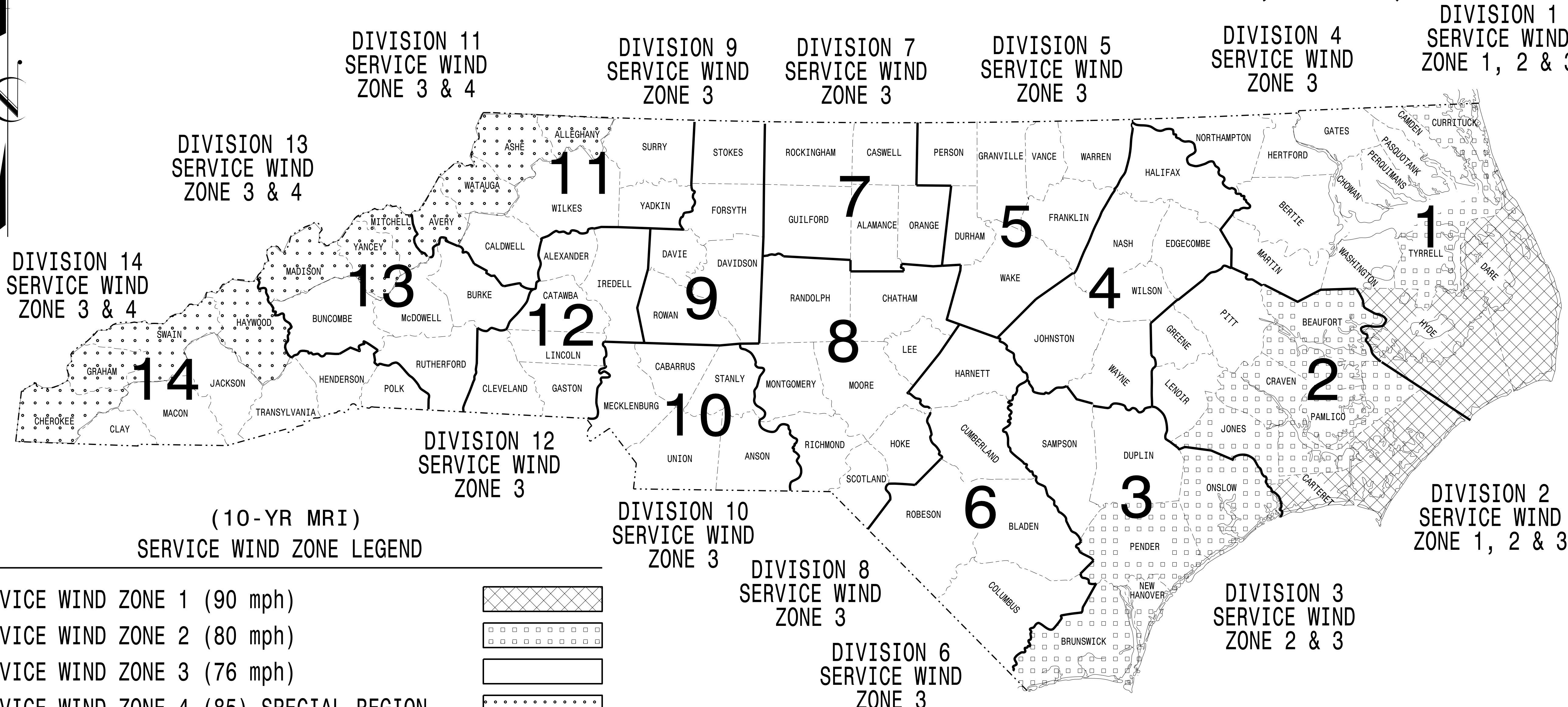
09/21/2023  
DATE

03-001-2023 1P-07  
S:\IT\AS\11\115\Sig\Drawings\Drawings\2024\Metal Pole Standard 411\Metal Pole (700-yr MRI).cdm  
Kdurigon



# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

## STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



(10-YR MRI)  
SERVICE WIND ZONE LEGEND

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

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

**NC DOT METAL POLE STANDARDS**

03-OCT-2023 10:21 S:\IT\AS\11\15\Sig\Drawings\Drawings\2024\_Metal\_Pole\_Standards\10-yr\_MRI\_1.dgn

Prepared in the Offices of:

750 N. Greenfield Pkwy.  
Garner, NC 27529

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

### AASHTO LRFD

Standard Specifications for Highway Signs, Luminaires, and Traffic Signals

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

**NCDOT CONTACTS:**  
MOBILITY AND SAFETY DIVISION -  
TRANSPORTATION SYSTEMS MANAGEMENT  
AND OPERATIONS UNIT

---

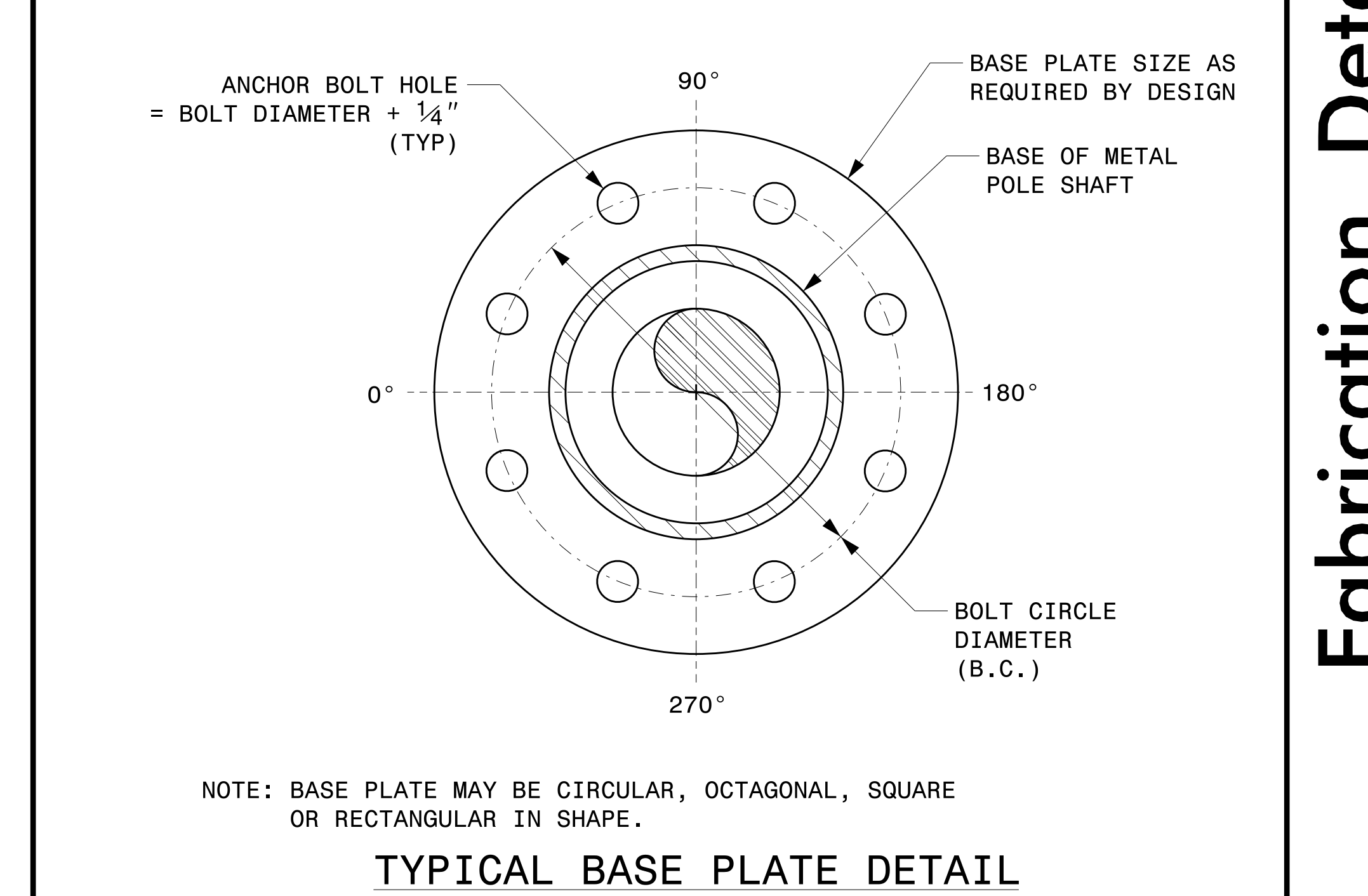
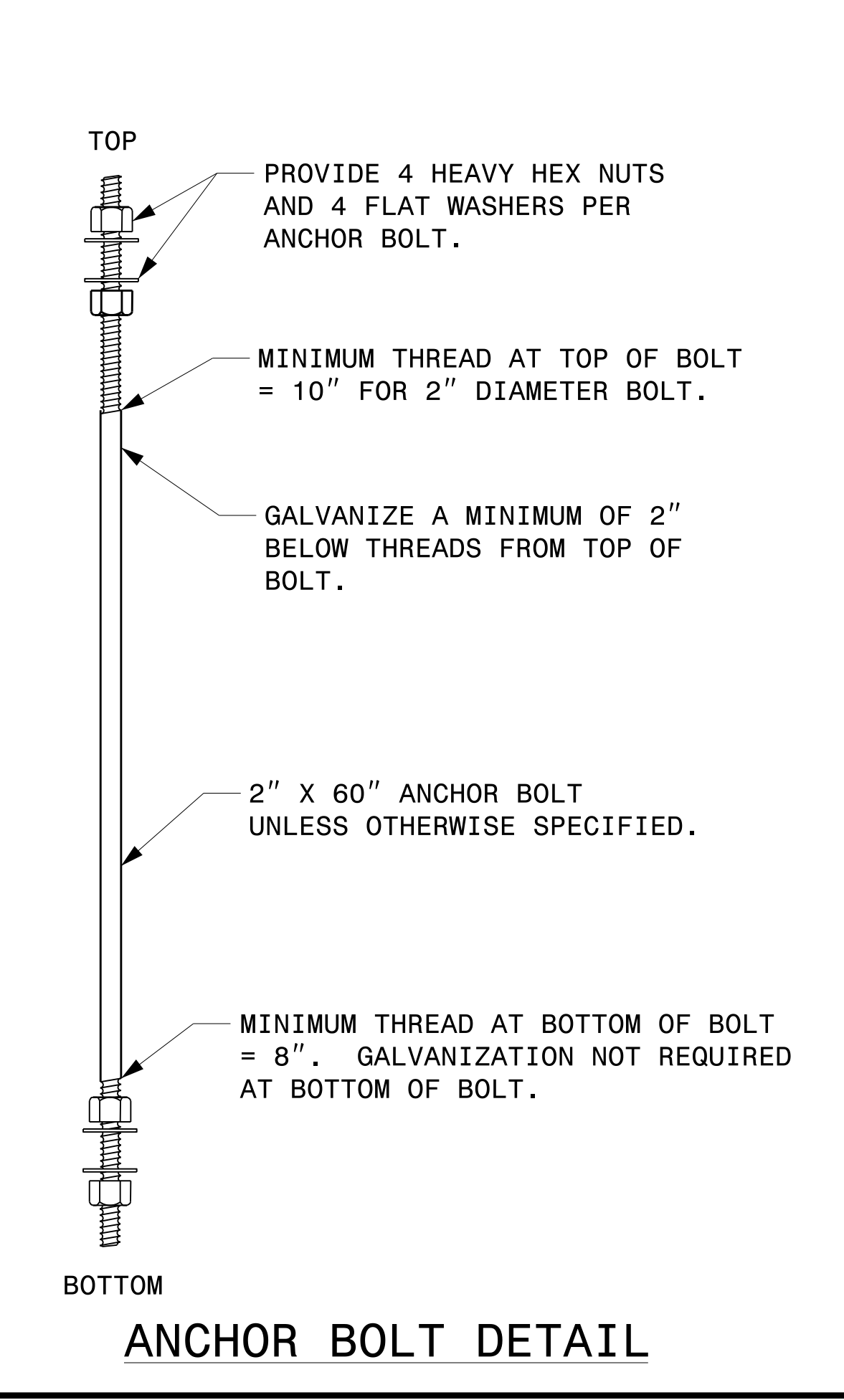
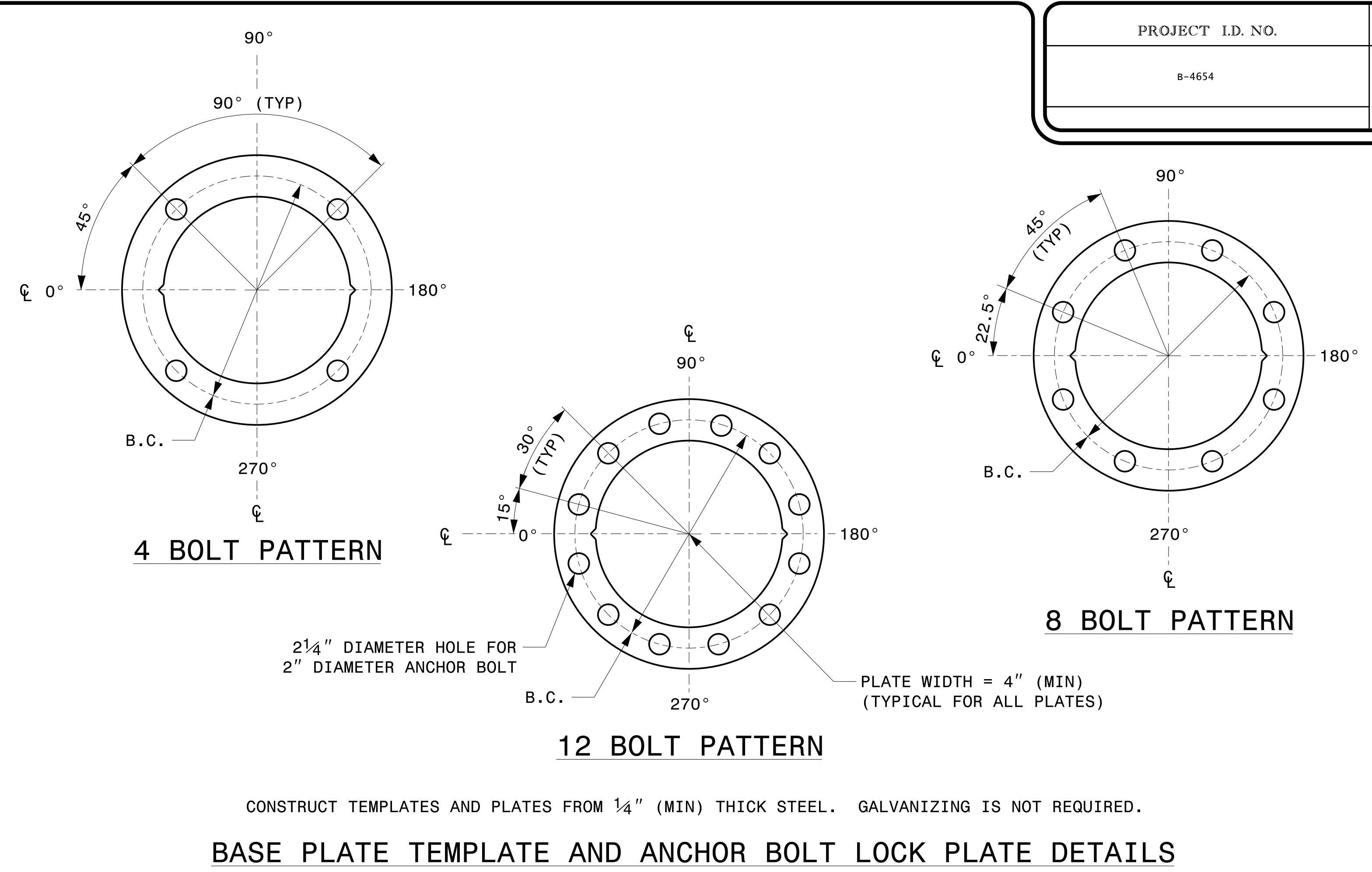
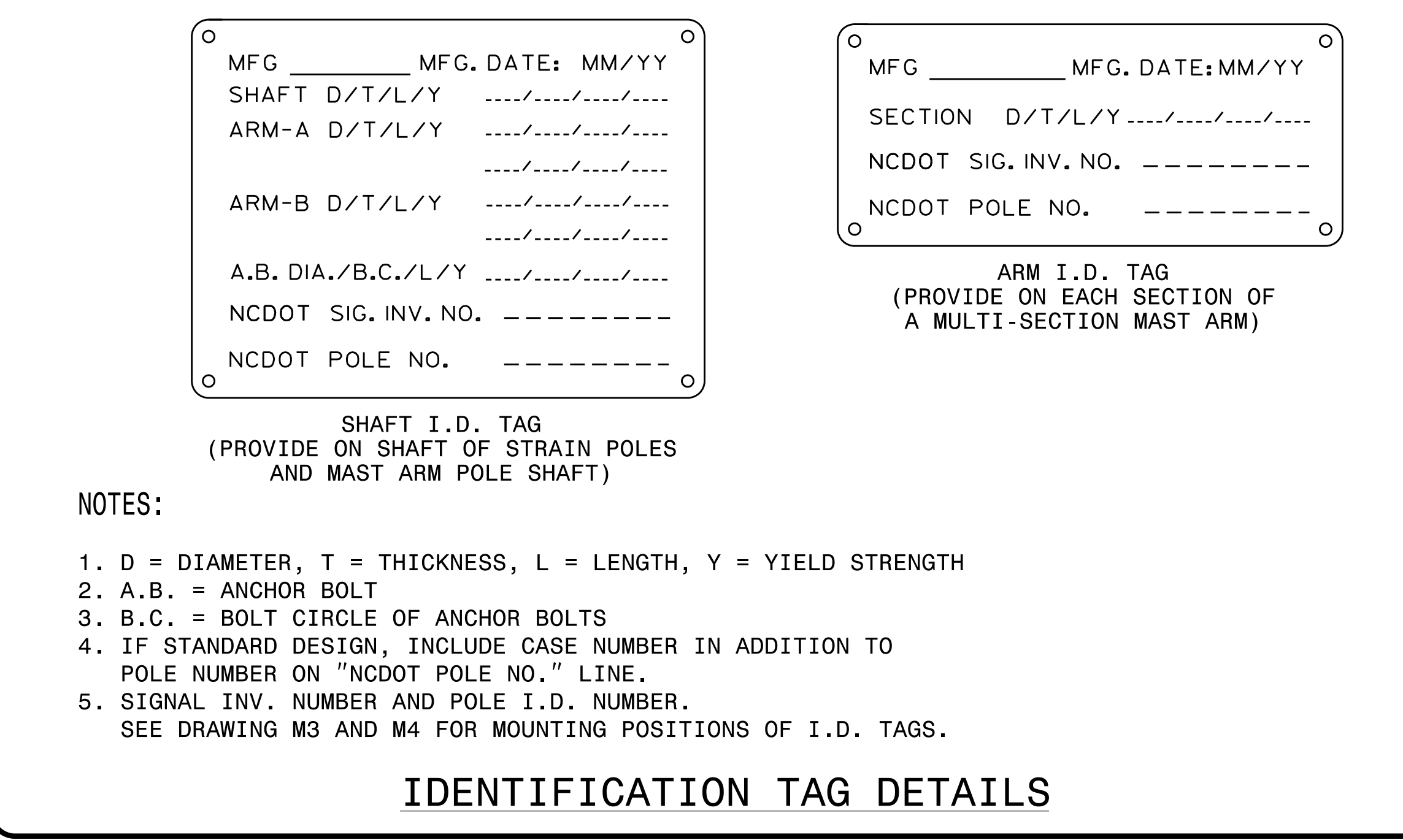
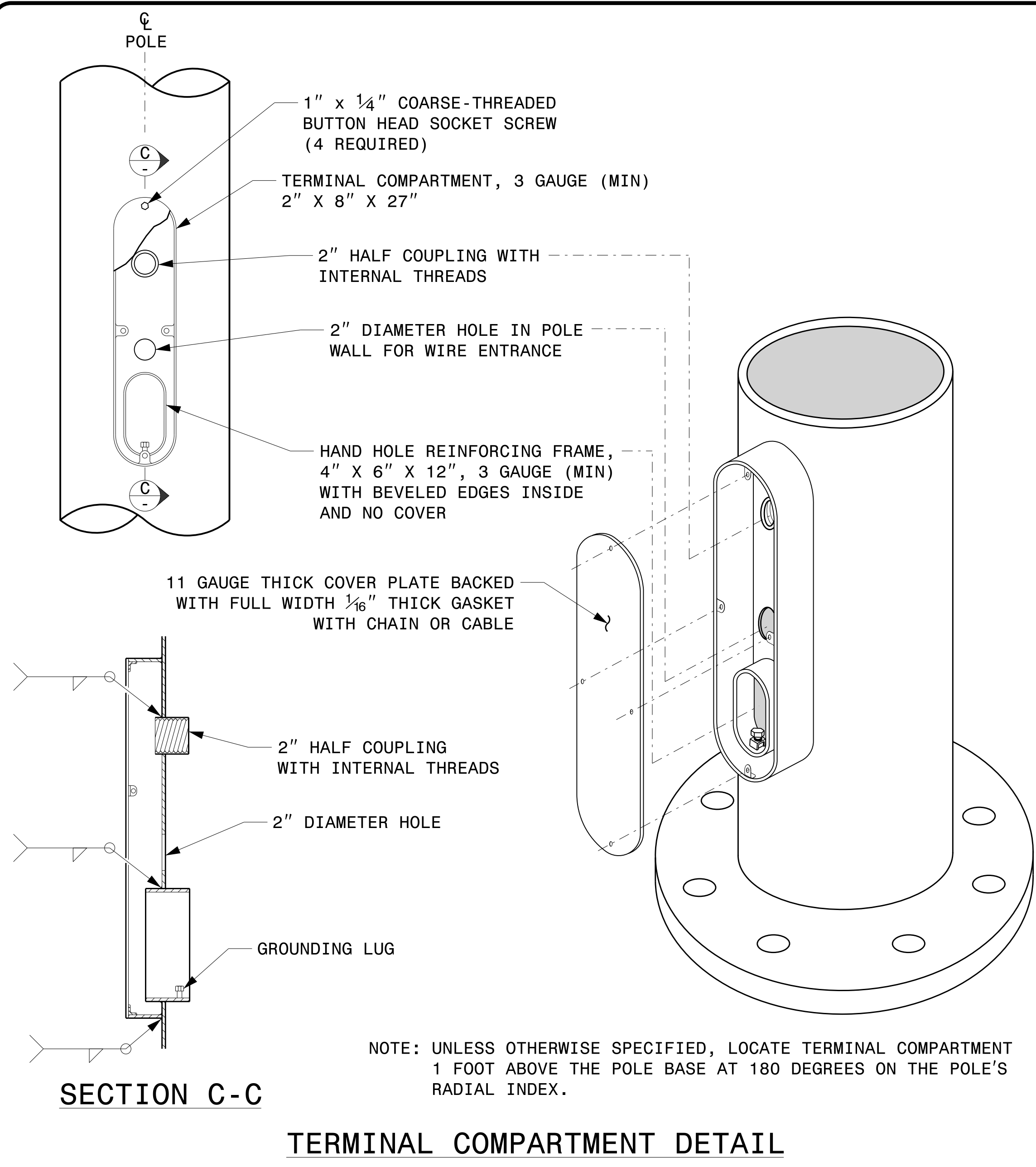
**D.Y. ISHAK** - STATE SIGNALS ENGINEER  
**K. DURIGON, P.E.** - ITS AND SIGNALS STRUCTURAL ENGINEER  
**B. WALKER, P.E.** - ITS AND SIGNALS STRUCTURAL ENGINEER

SEAL

DocuSigned by:  
**Kevin Durigon**  
SIGNATURE  
4B23DC78B3784DA...

09/21/2023  
DATE





<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details For All Metal Poles</p>		<p>SEAL</p> <p>DocuSigned by: <b>Kevin Durigon</b> 4P23DC79B3784DA</p>				
	<p>PLAN DATE: SEPTEMBER 2023 DESIGNED BY: C.F. ANDREWS</p> <p>PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR</p>	<p>REVISIONS</p> <table border="1"> <tr> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> </tr> </table>		INIT.	DATE		
INIT.	DATE						

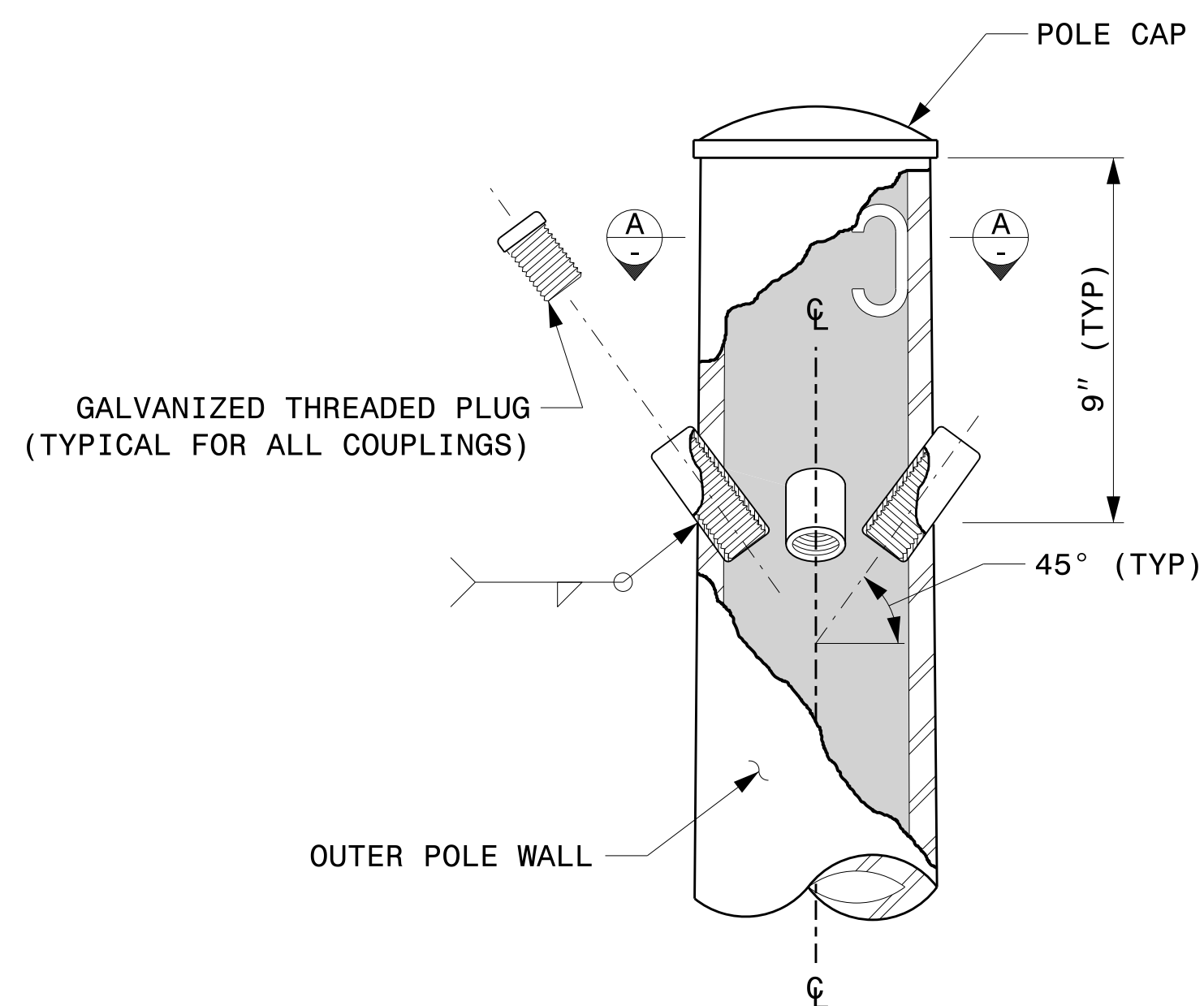
**Fabrication Details – All Metal Poles**

04\_dpt\_2023\_10.dwg  
S:\15545\15545\Sigs\Signal Design Section\Structures\Drawings\2024 Metal Pole Sigs\2024 Sig.M2 Std. Fabrication Details-411 Poles-.dgn  
Kedar Fagan

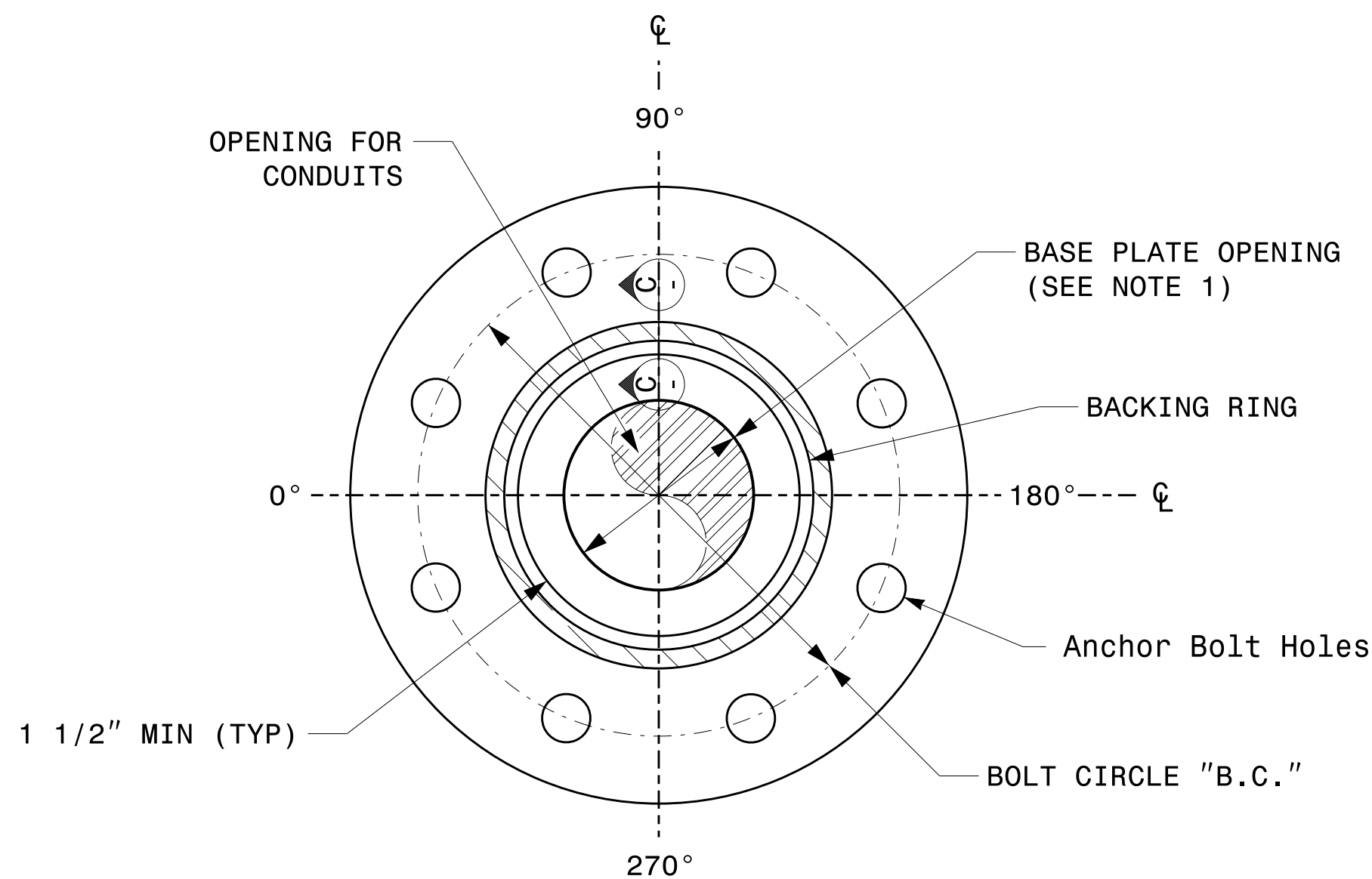


NOTE:

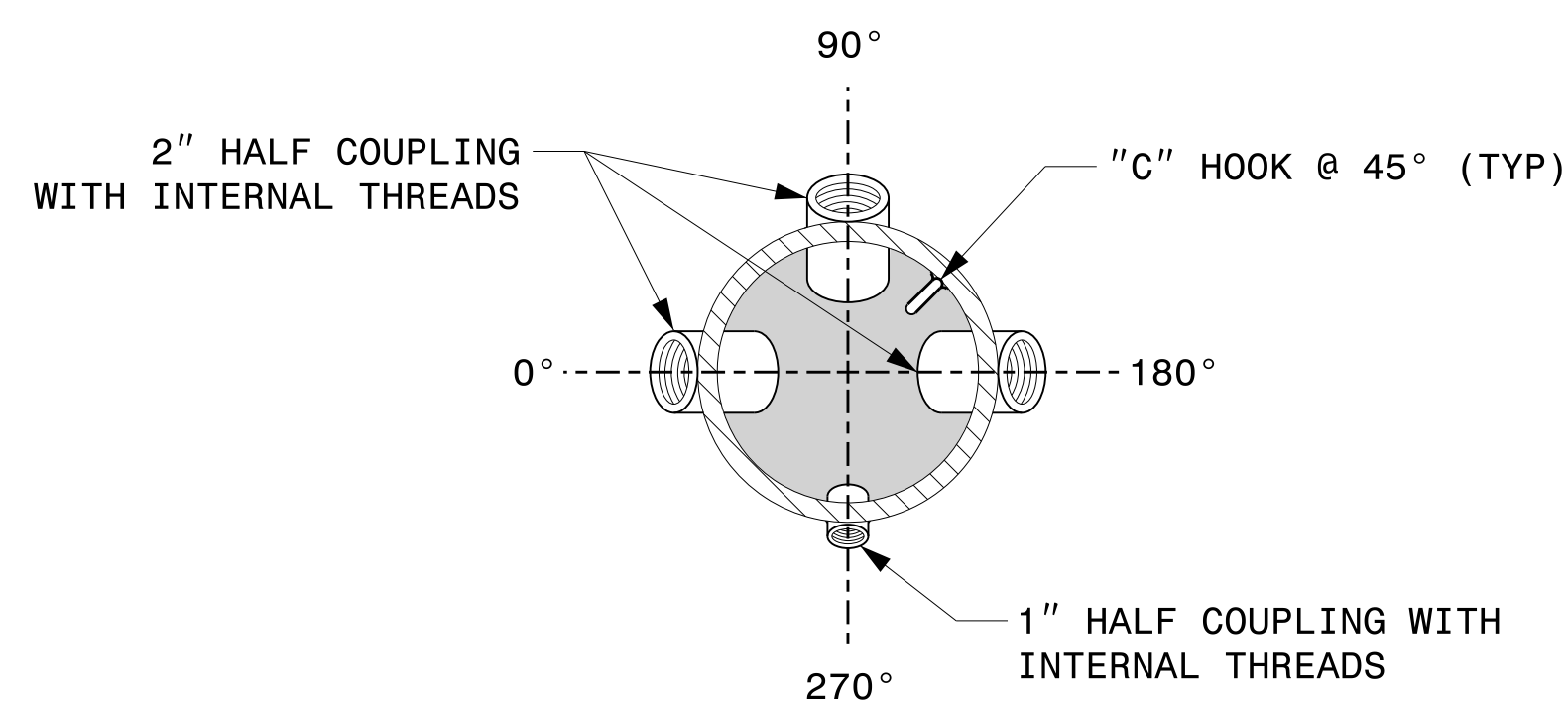
- 1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS  $3\frac{1}{2}$ " BUT SHALL NOT BE LESS THAN  $8\frac{1}{2}$ ".



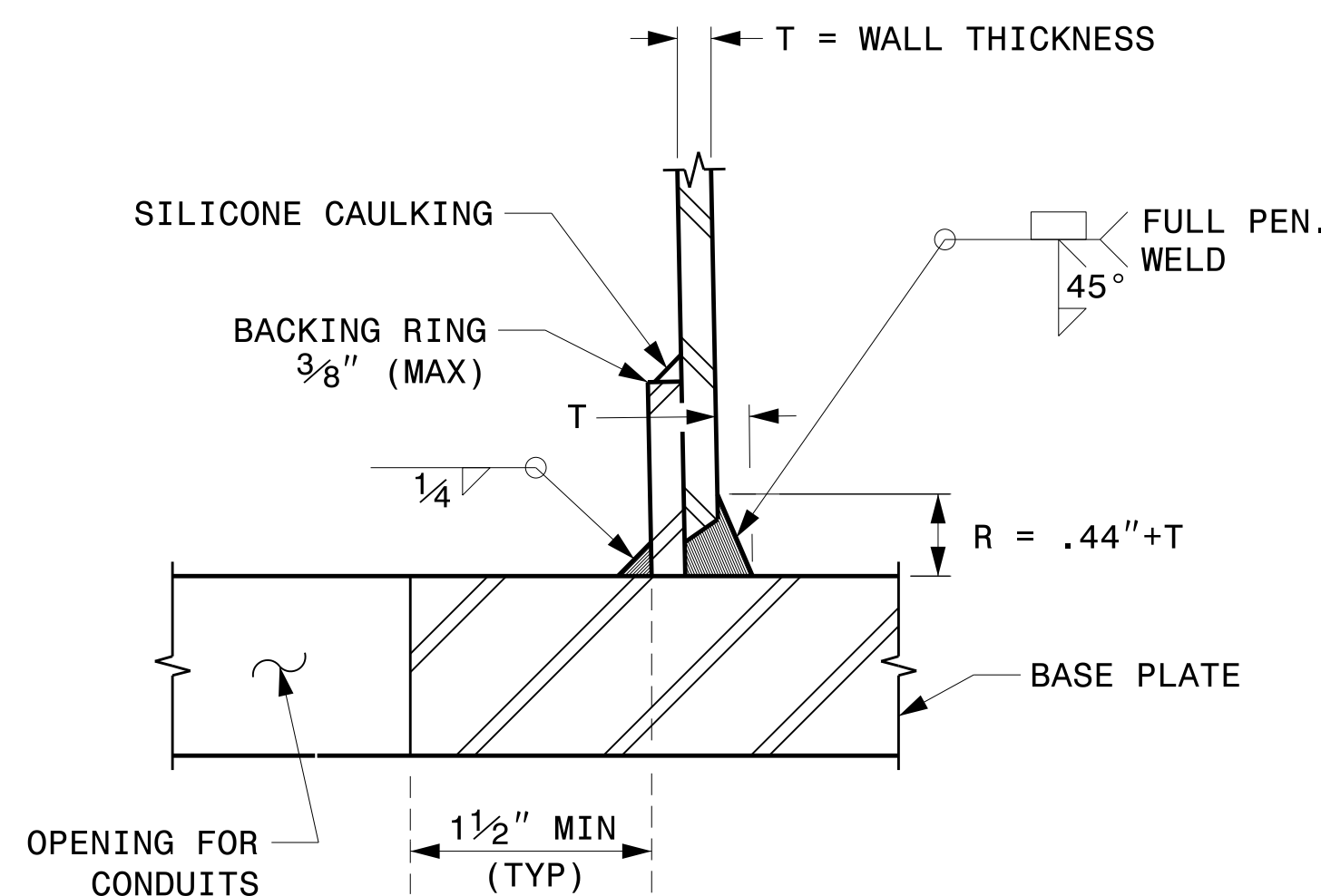
CABLE ENTRANCES AT TOP OF POLE



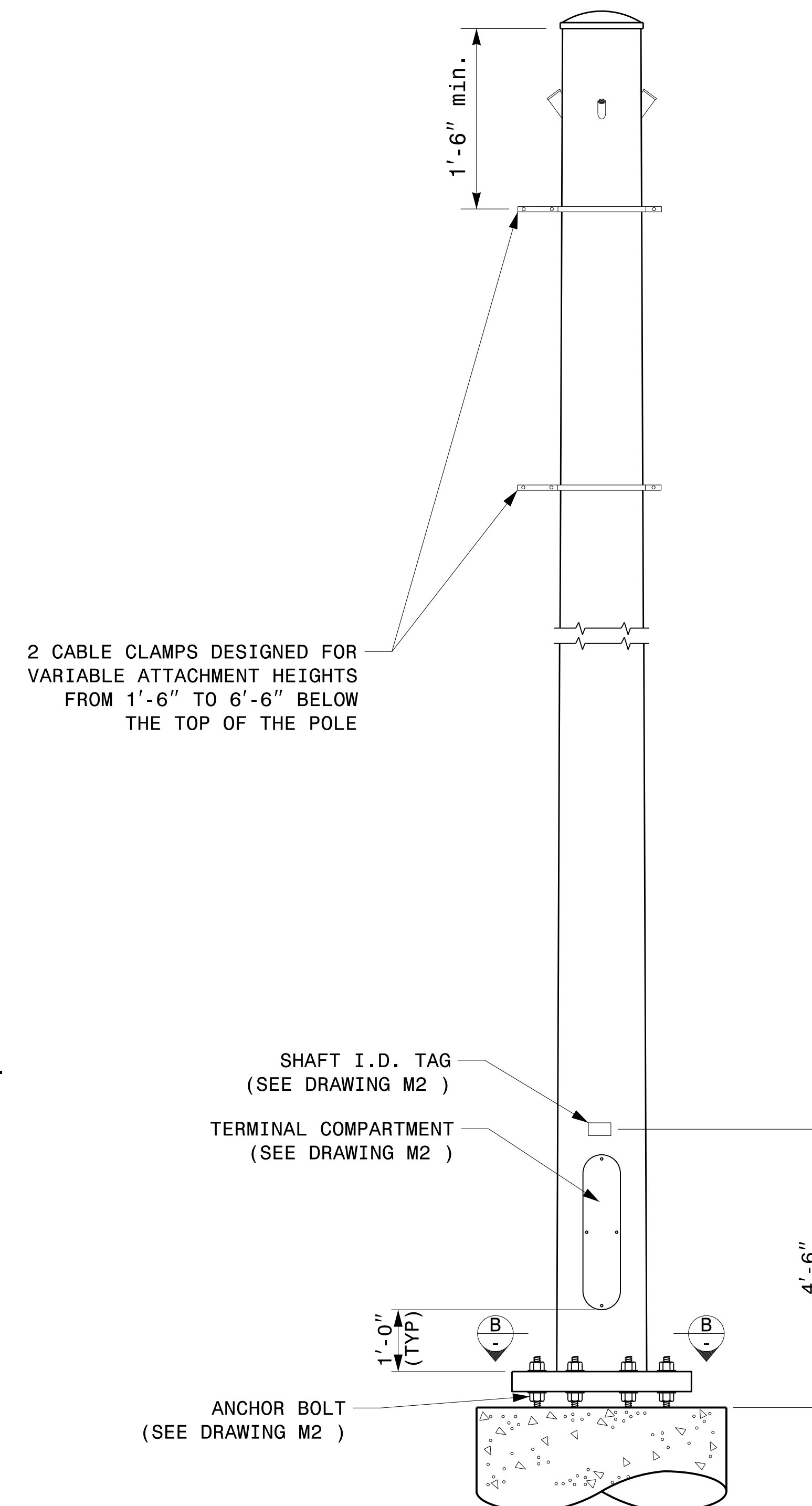
SECTION B-B  
POLE BASE PLATE DETAILS  
(8 AND 12 BOLT PATTERN)



SECTION A-A  
RADIAL ORIENTATION OF 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:

SCALE: 0 NA NONE

Typical Fabrication Details For Strain Poles	
PLAN DATE: SEPTEMBER 2023	DESIGNED BY: K.C. DURIGON
PREPARED BY: K.C. DURIGON	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

SEAL

DocuSigned by:  
**Kevin Durigon**  
SIGNATURE

09/23/2023  
DATE

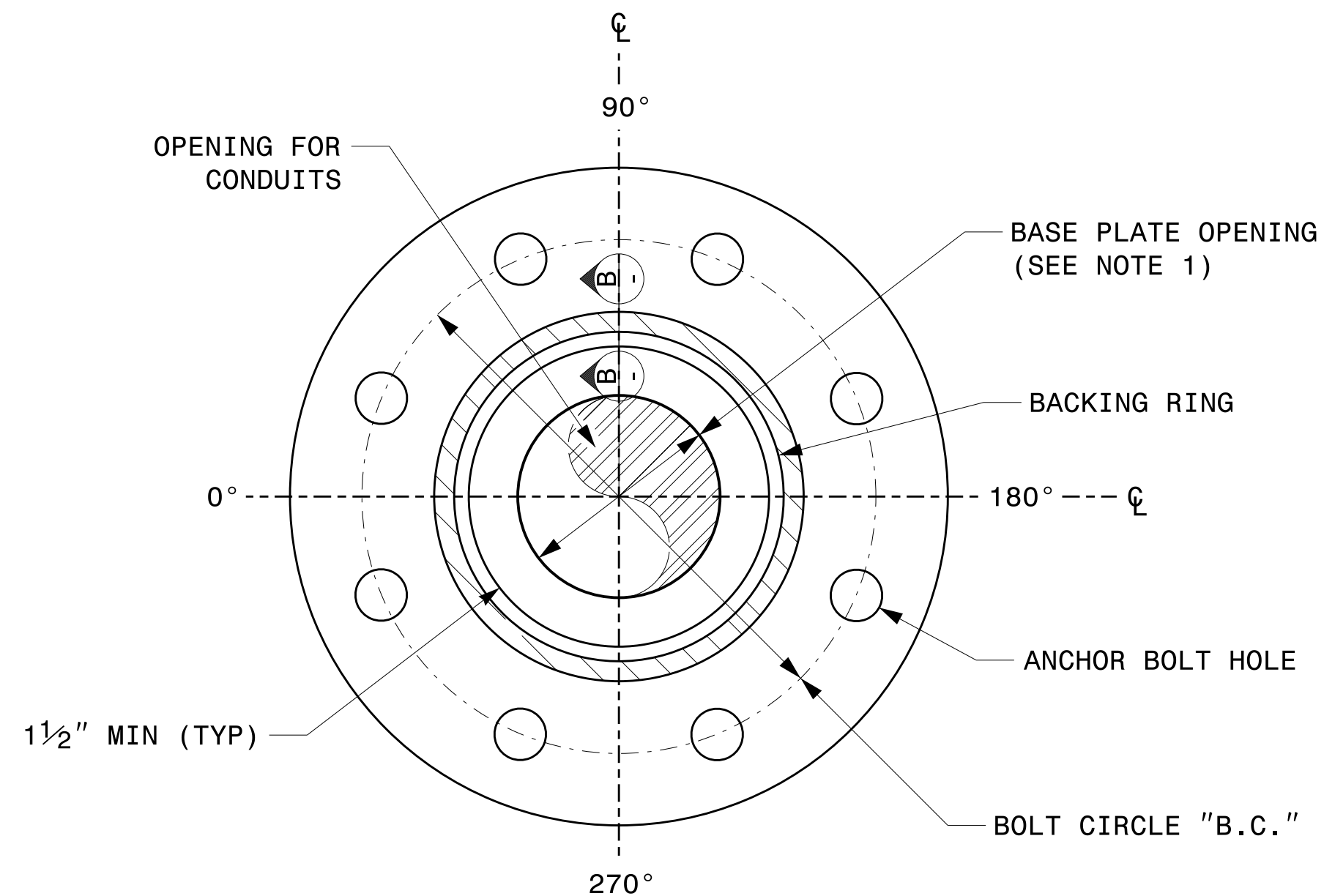
4B23DC79B3728ADA

08-dt-2023-10-31  
S:\ISSUES\15-SIGNAL\Signal Design Section\Structures\Drawings\2024\Monot Pole Str. Fabrication Details-Strain Poles.dgn  
Kedar Durigon

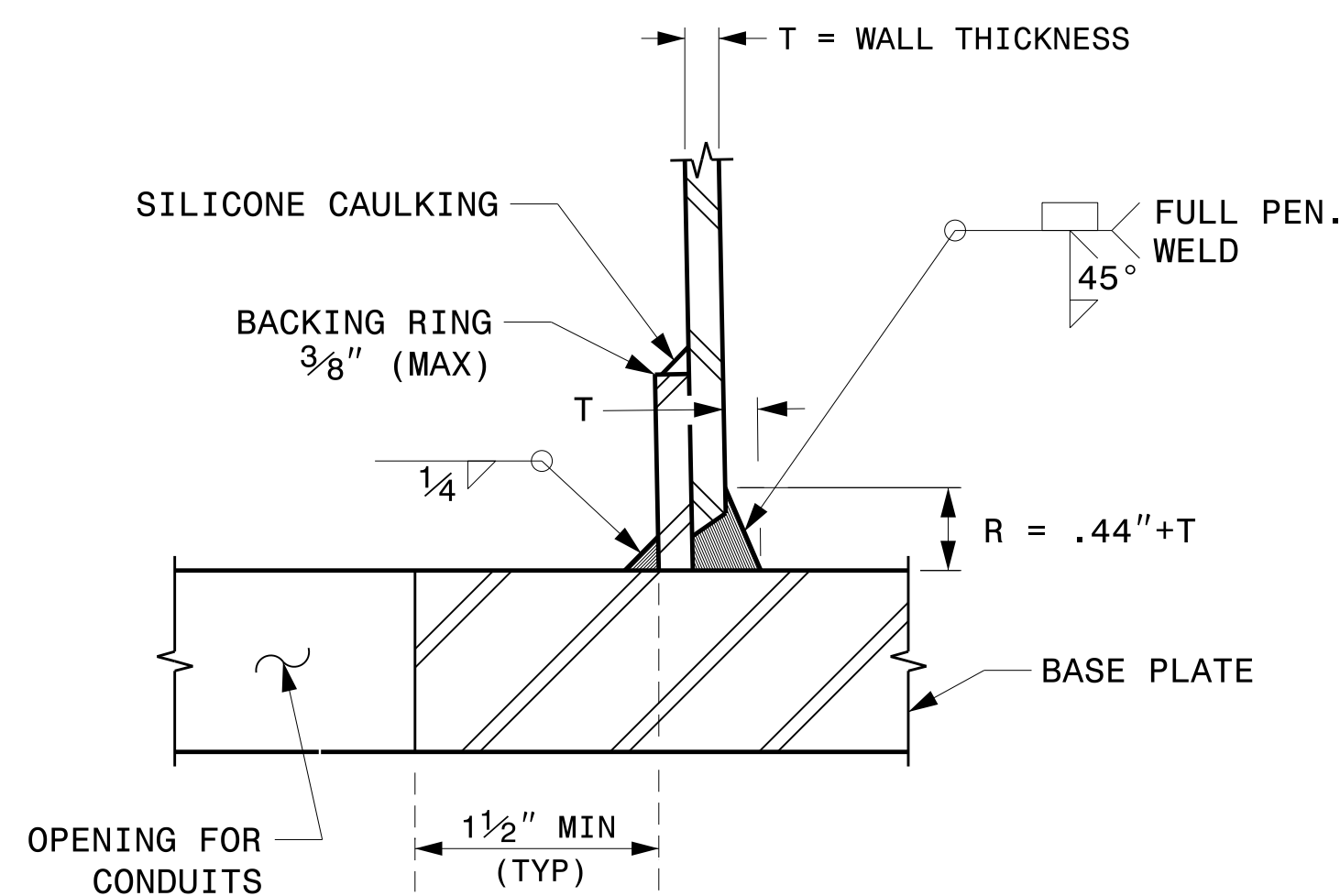
Fabrication Details – Strain Poles

NOTE:

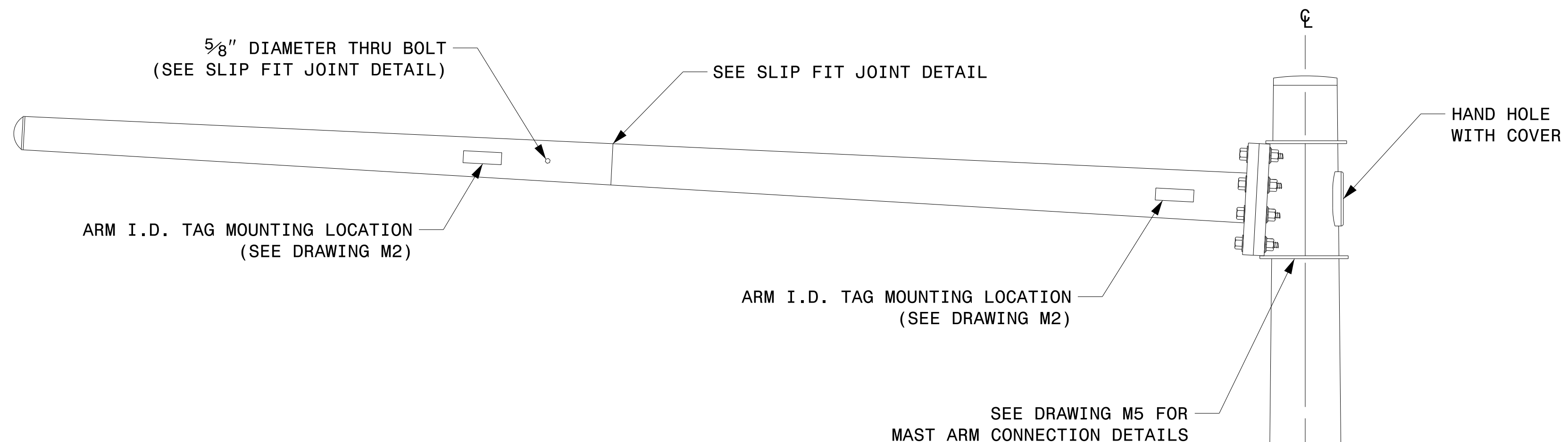
- 1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS 3 1/2" BUT SHALL NOT BE LESS THAN 8 1/2".



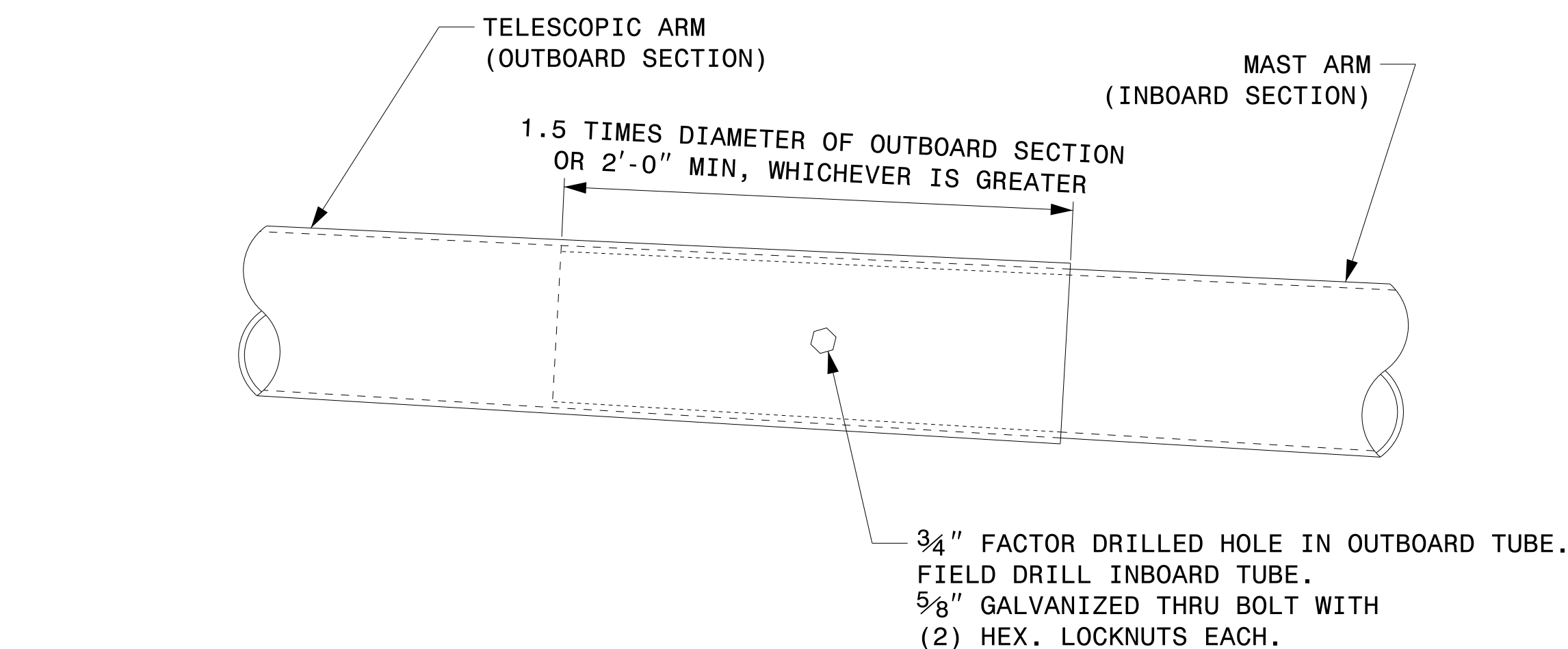
SECTION A-A  
POLE BASE PLATE DETAILS



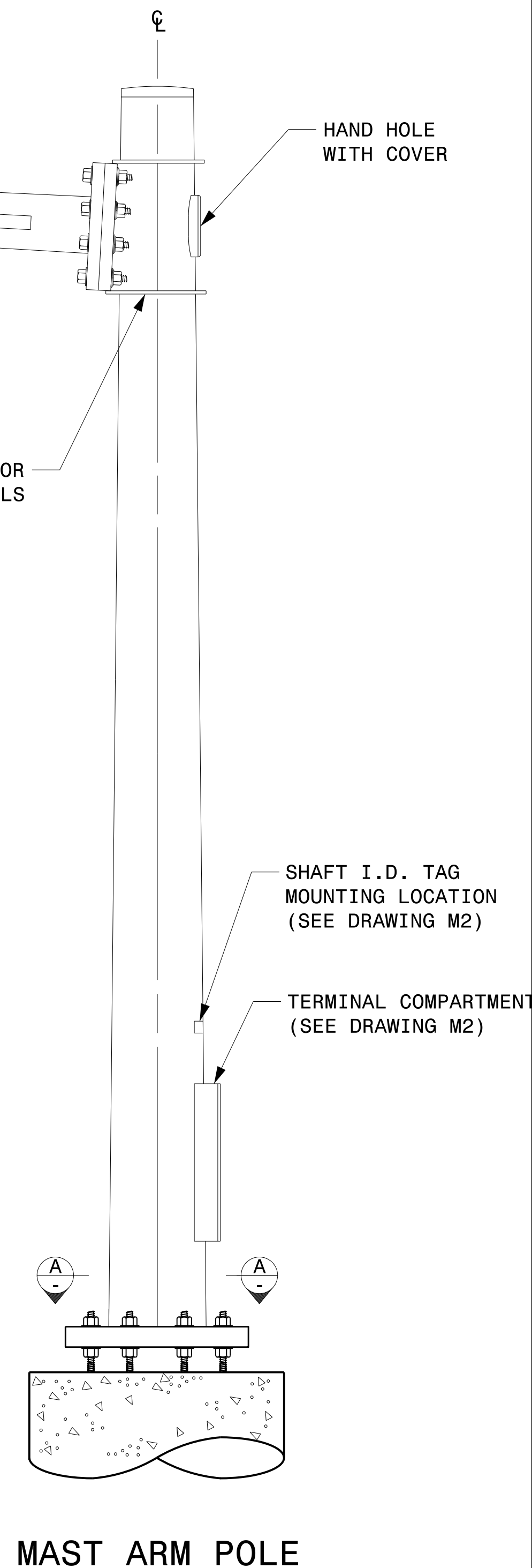
SECTION B-B  
(POLE ATTACHMENT TO BASE PLATE)  
FULL-PENETRATION  
GROOVE WELD DETAIL



SLIP FIT JOINT DETAIL FOR MAST ARM



MAST ARM RADIAL ORIENTATION



MAST ARM POLE

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: NA  
NONE

Typical Fabrication Details For Mast Arm Poles	
PLAN DATE: SEPTEMBER 2023	DESIGNED BY: K.C. DURIGON
PREPARED BY: K.C. DURIGON	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

SEAL

DocuSigned by:  
**Kevin Durigon**  
SIGNATURE

09/21/2023  
DATE

03-dt-2023-10-31  
S:\SSS\0415\Sig.M4\15\Sig.M4\15-Stru. Fabrication Details-Mast Arm Poles.dgn  
Kedar Durigon

Fabrication Details – Mast Arm Poles



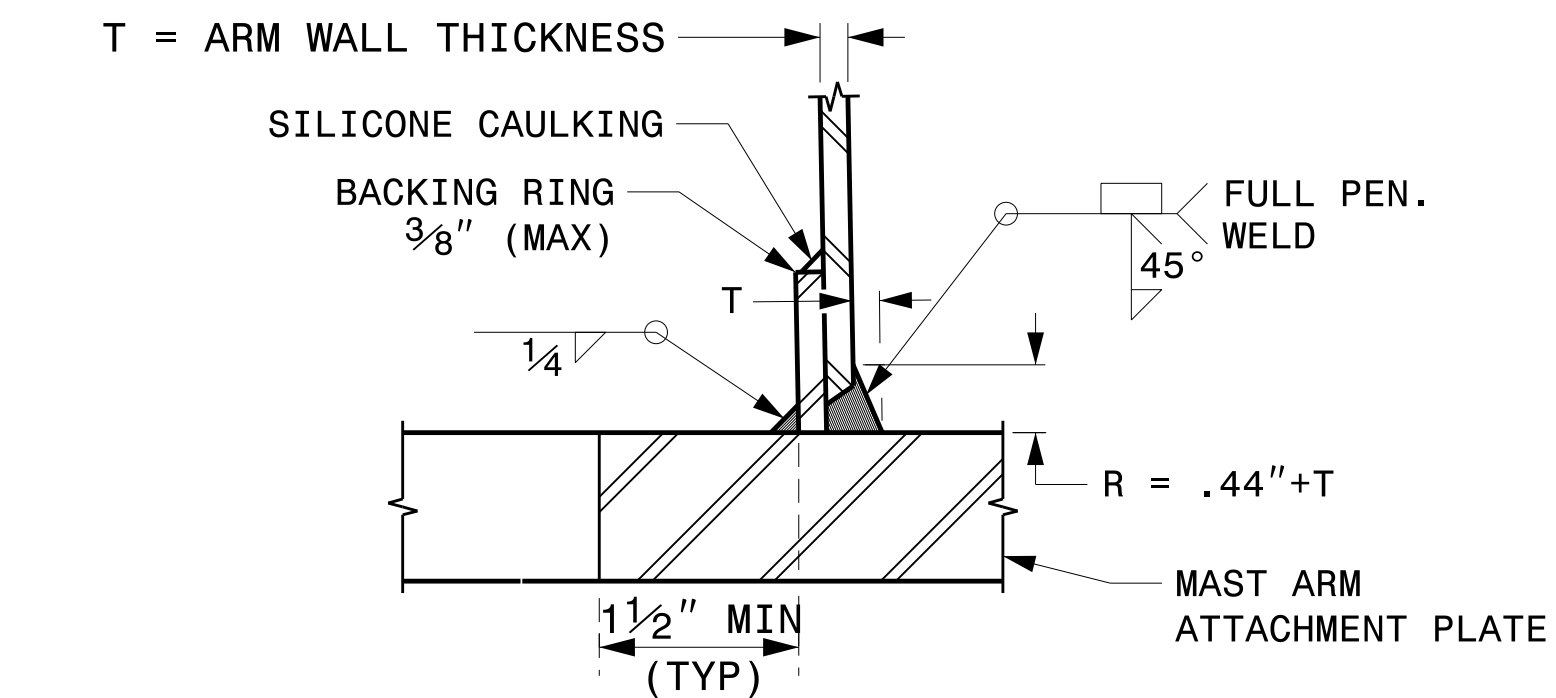
# WELDED RING STIFFENED MAST ARM CONNECTION

PROJECT I.D. NO.

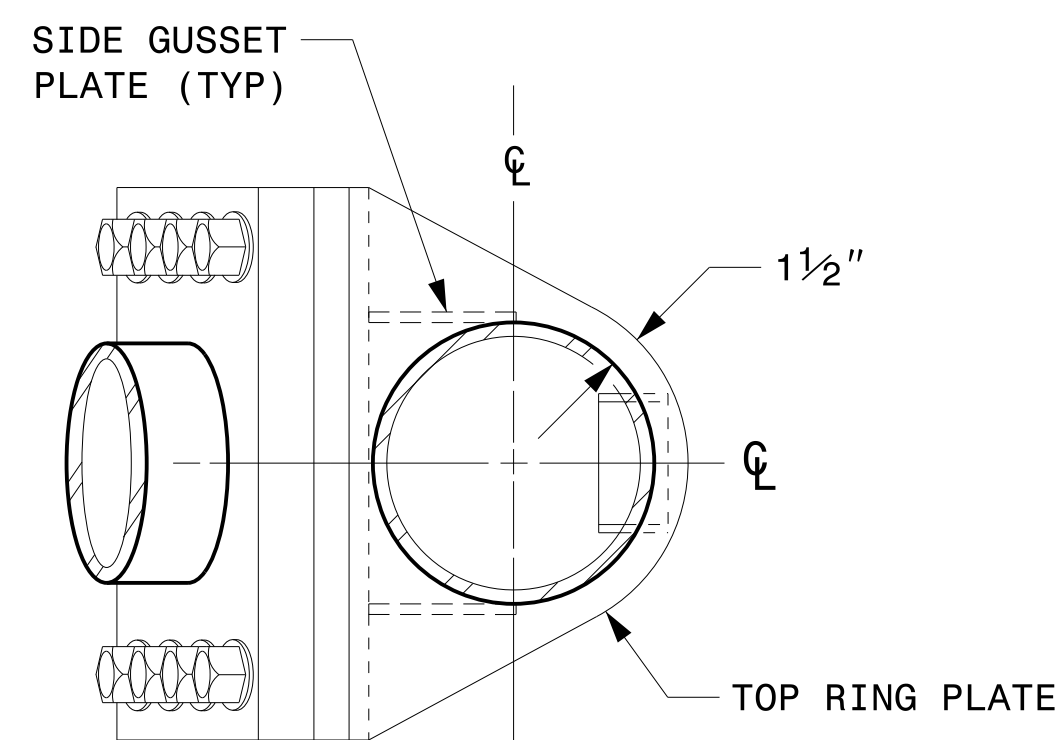
SHEET NO.

B-4654

Sig.M5



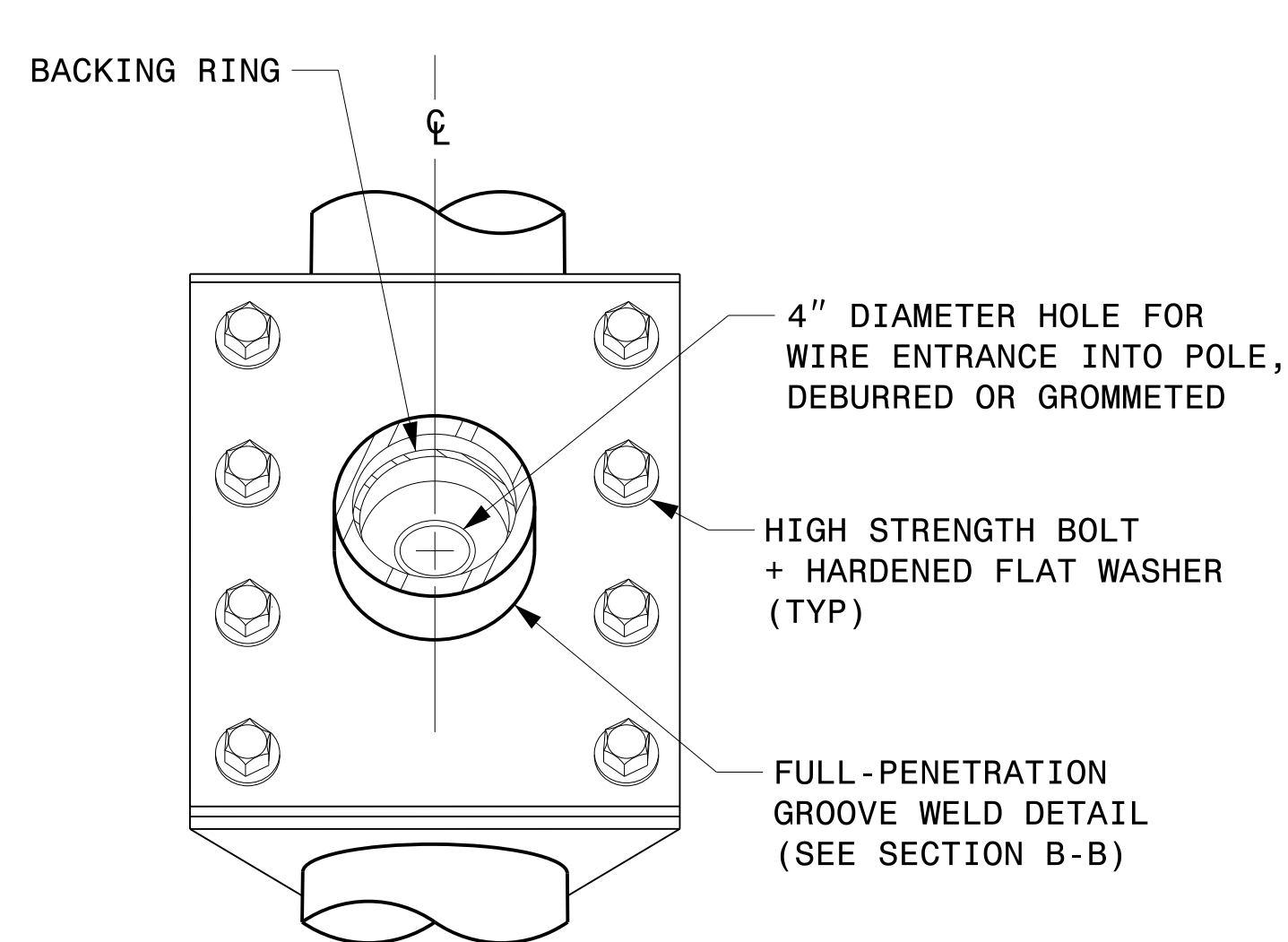
**SECTION B-B  
FULL-PENETRATION GROOVE WELD DETAIL**



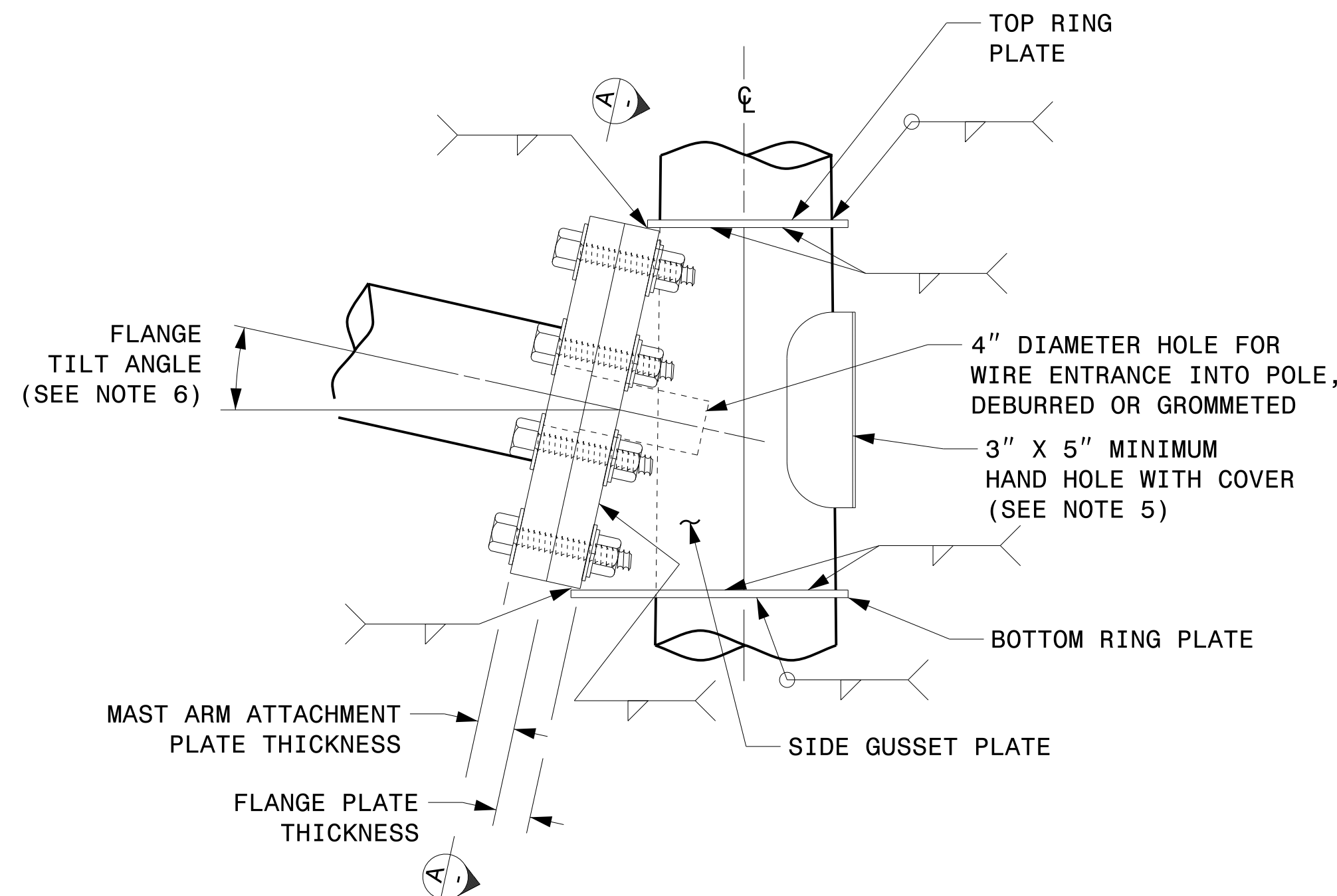
**PLAN VIEW**

**NOTES:**

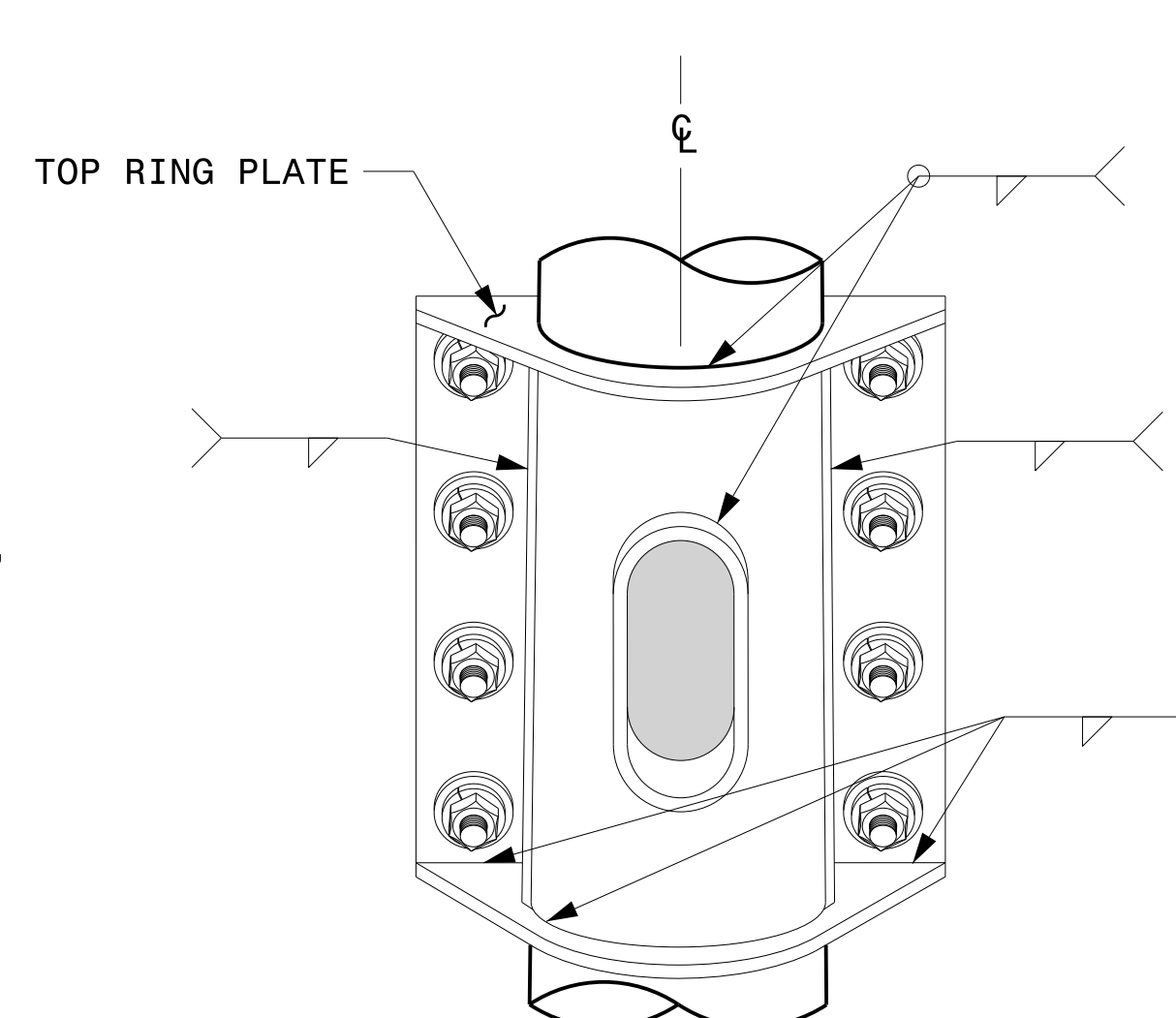
1. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ABOVE THE MAST ARM TO INDICATE PROPER ATTACHMENT ORIENTATION OF THE MAST ARM.
2. DESIGNER WILL DETERMINE THE SIZE OF ALL STRUCTURAL COMPONENTS, PLATES, FASTENERS, AND WELDS SHOWN UNLESS THEY ARE ALREADY SPECIFIED.
3. FABRICATOR IS RESPONSIBLE FOR PROVIDING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



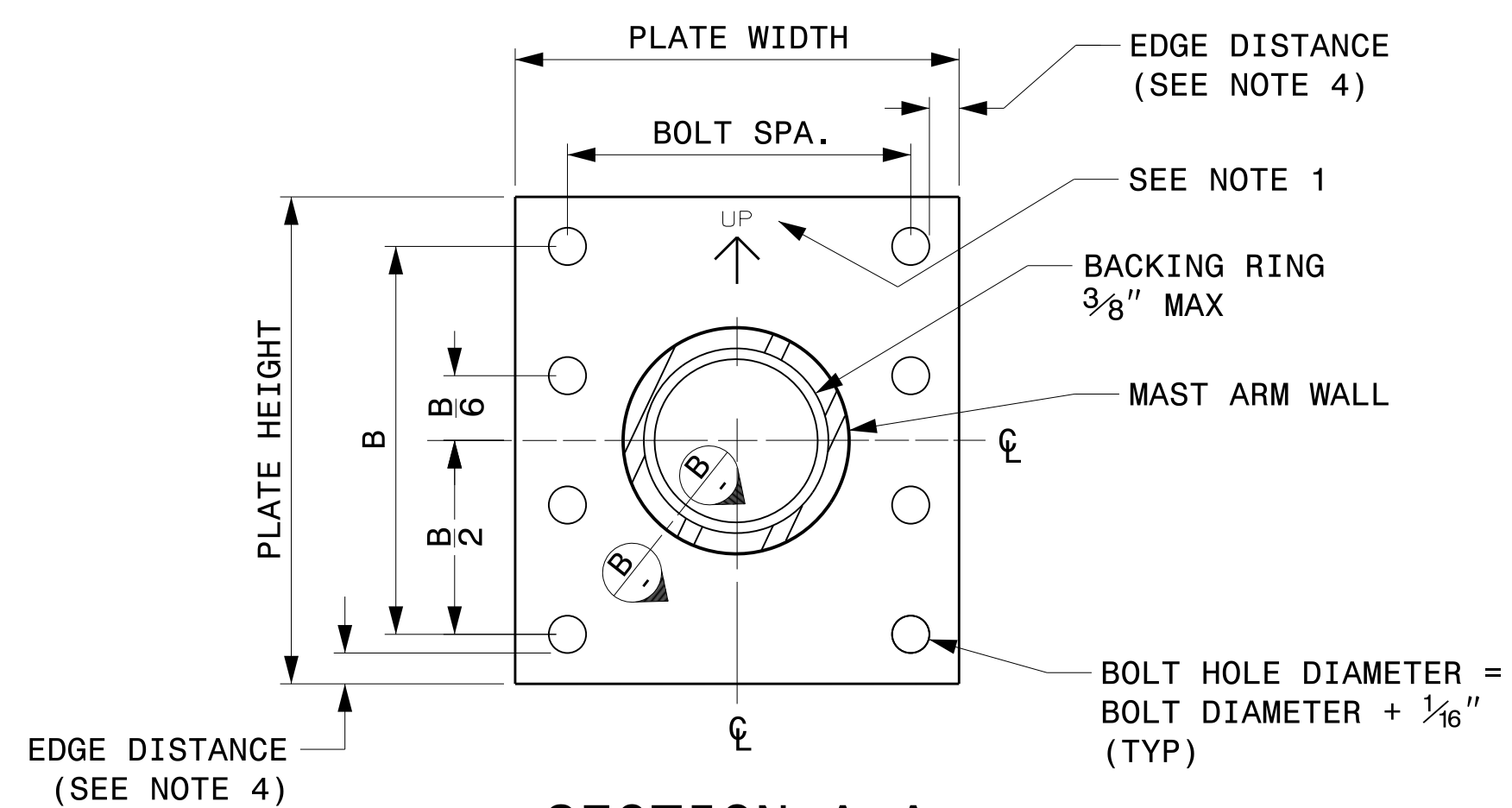
**FRONT ELEVATION VIEW**



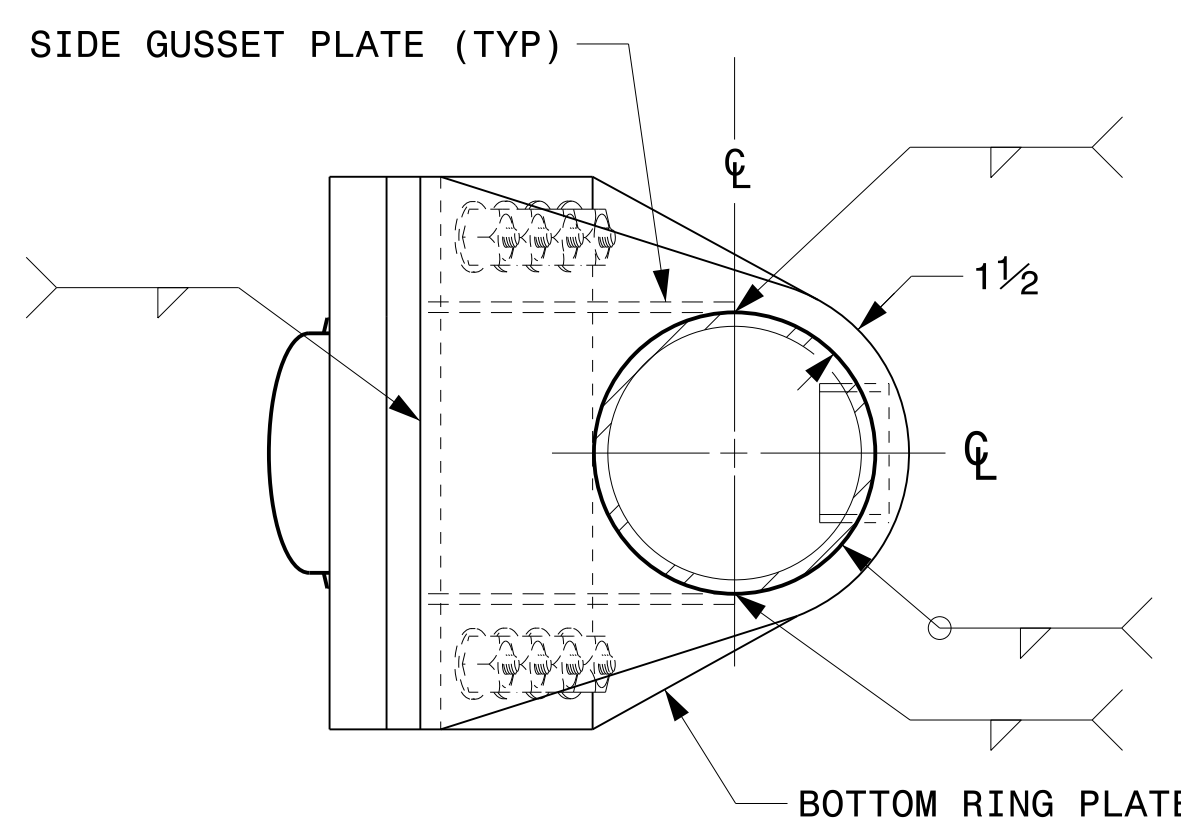
**SIDE ELEVATION VIEW**



**BACK ELEVATION VIEW**



**SECTION A-A  
MAST ARM ATTACHMENT PLATE**



**BOTTOM VIEW**

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: NA  
NONE

Typical Fabrication Details For Mast Arm Connection To Pole	
PLAN DATE: SEPTEMBER 2023	DESIGNED BY: C.F. ANDREWS
PREPARED BY: K.C. DURIGON	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

SEAL

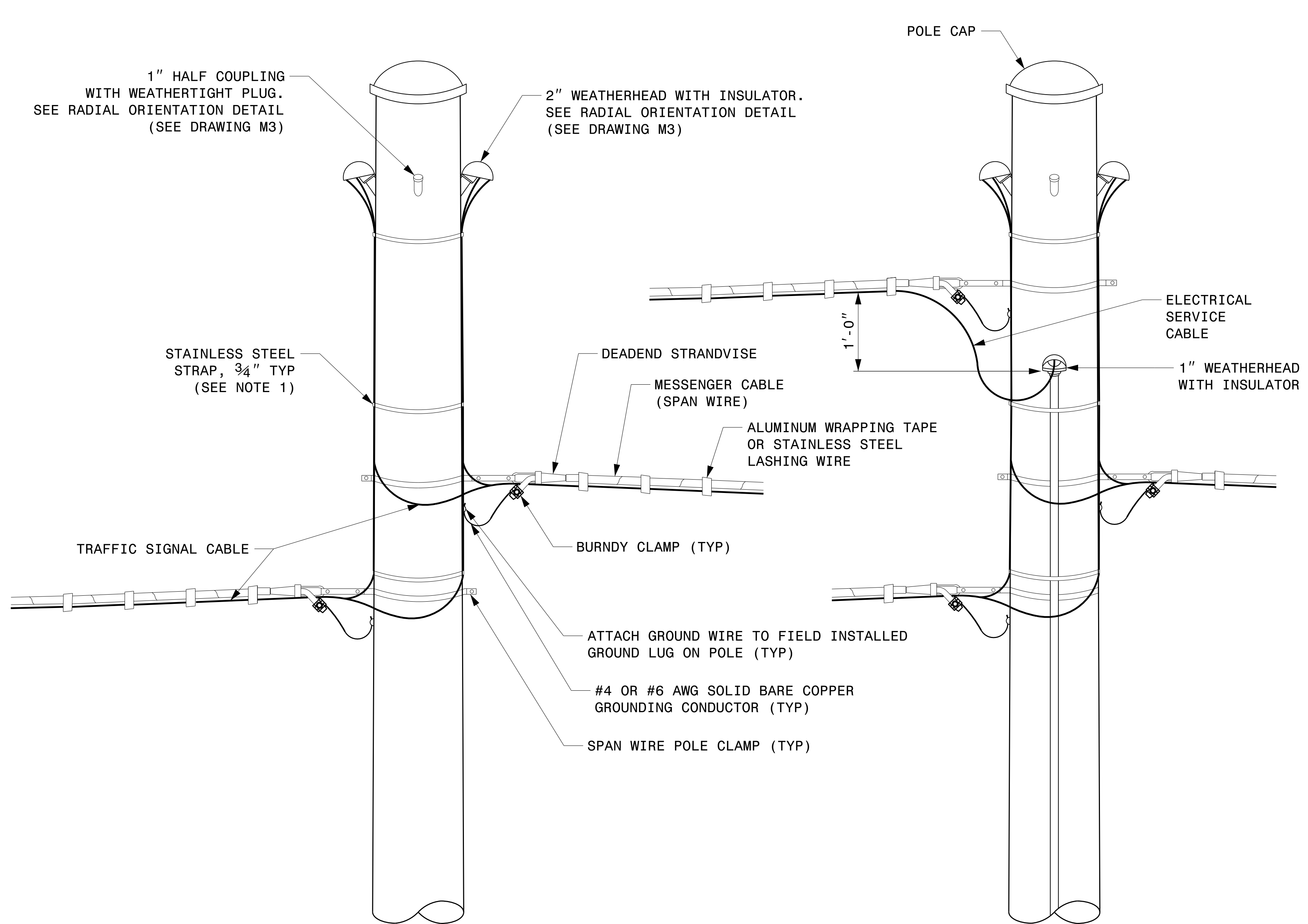
DocuSigned by:  
**Kevin Durigon**  
SIGNATURE

4B23DC79B3784DA

09/21/2023  
DATE

03-dt-2023-10-30  
S:\SSS\0415-Signal\Signal Design\Structures\Drawings\2024\Merlot\_Pole\_Srd Drawings for LRF02024\_Sig.M5 Str. Connection Fabrication Detail\1-Mast Arm Poles.dgn  
Kedar Tagon

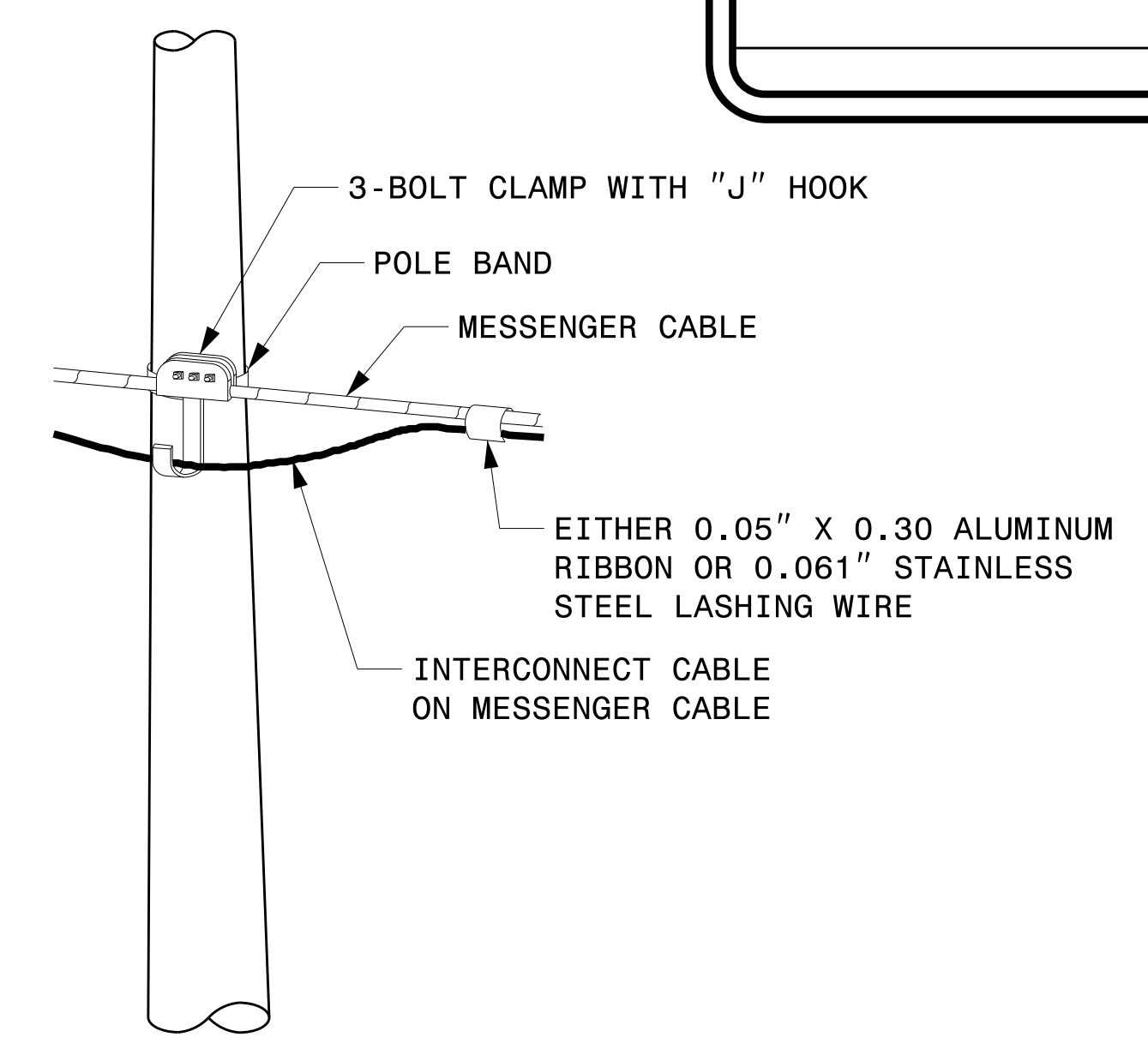
**Fabrication Details – Mast Arm Connection**



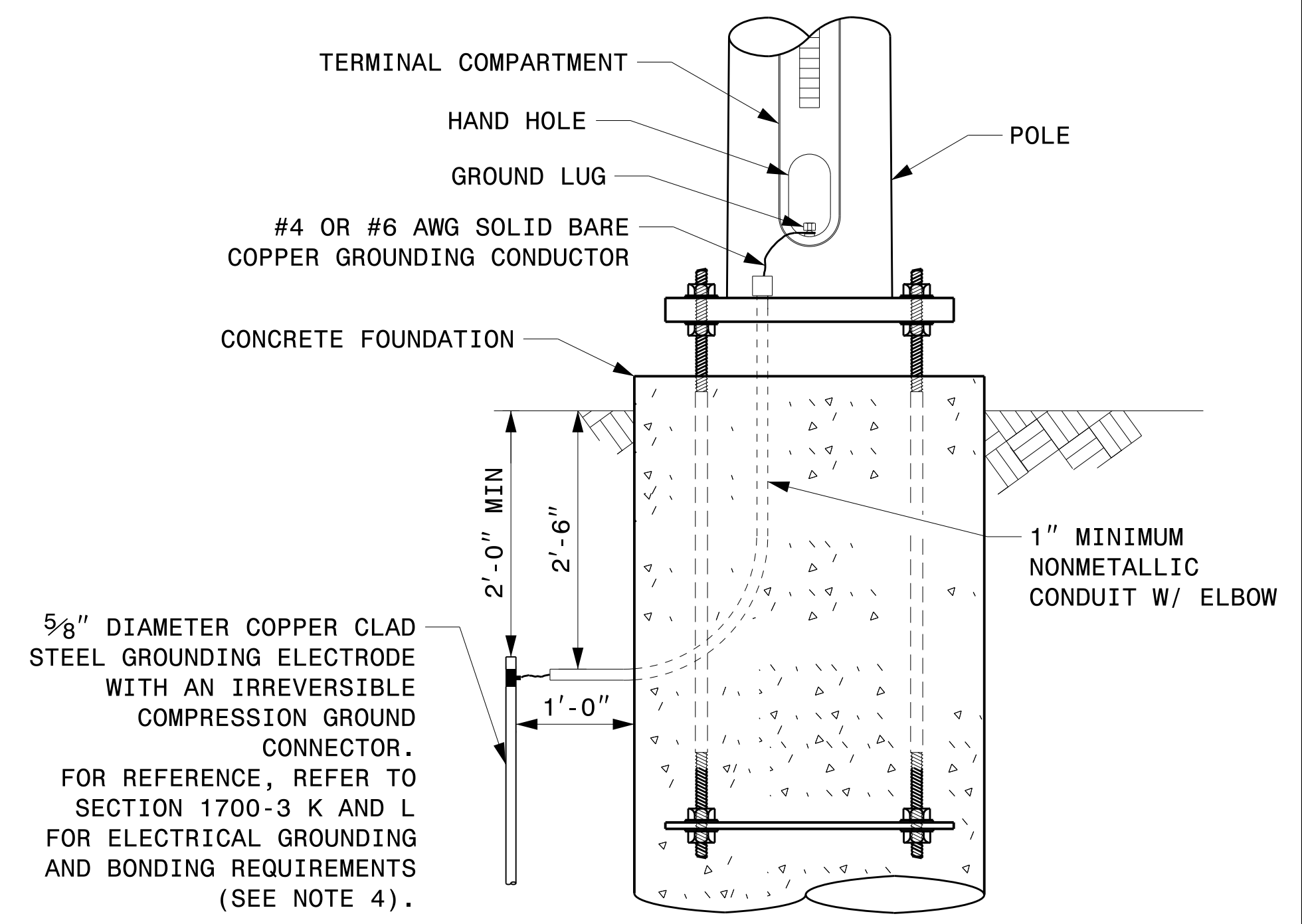
### STRAIN POLE ATTACHMENTS

#### NOTES:

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



### ATTACHMENT OF CABLE TO INTERMEDIATE METAL POLE



### METAL POLE GROUNDING DETAIL FOR STRAIN POLE AND MAST ARM

08-dpt-2023-10-41  
S:\ISSUES\15 Signal\Signal Design\Structures\Drawings\2024 Metal Pole Str. Fabrication Details-Strain Poles.dgn  
Kedar Tigon

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 NA NONE

Typical Fabrication Details For Strain Pole Attachments

PLAN DATE: SEPTEMBER 2023 DESIGNED BY: C.F. ANDREWS

PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL

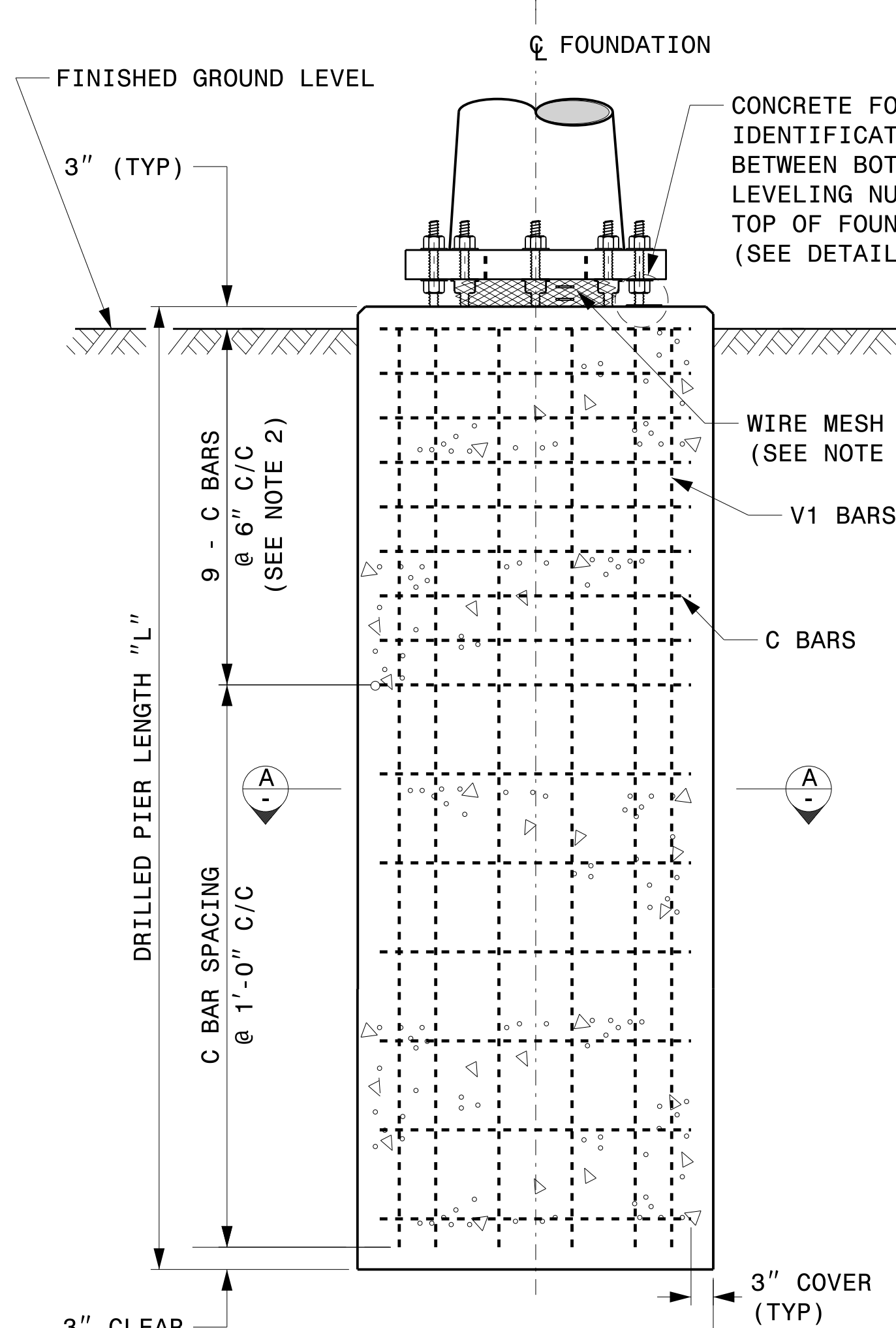
DocuSigned by: Kevin Durigon

4B23DC79B3784DA

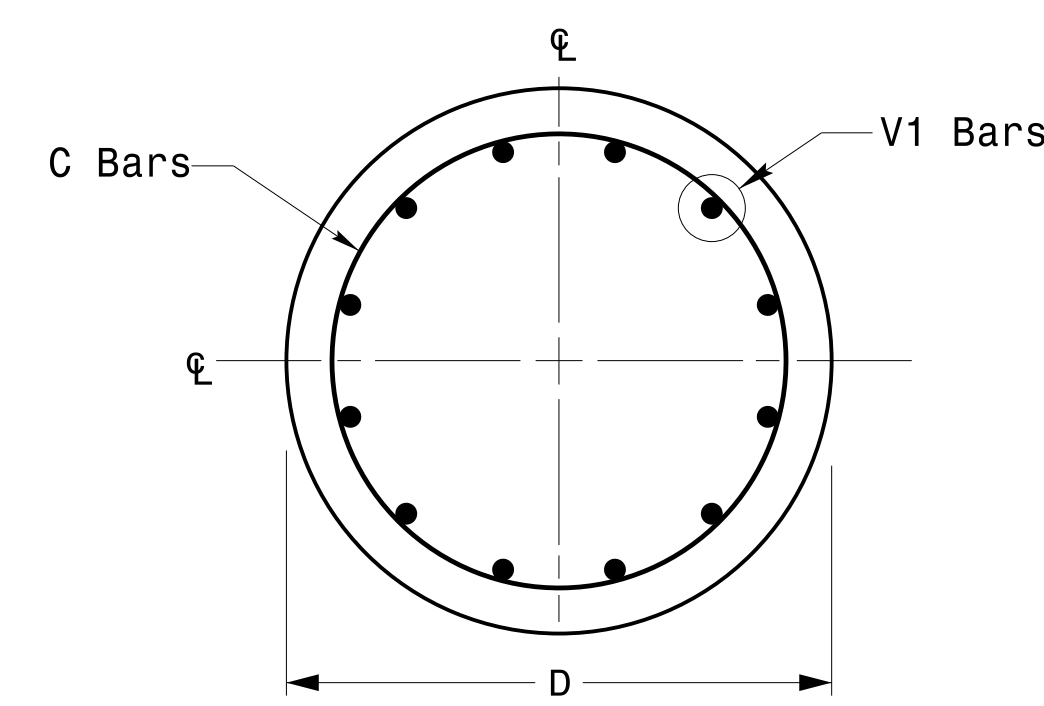
09/21/2023 DATE

Fabrication Details – Strain Pole Attachments

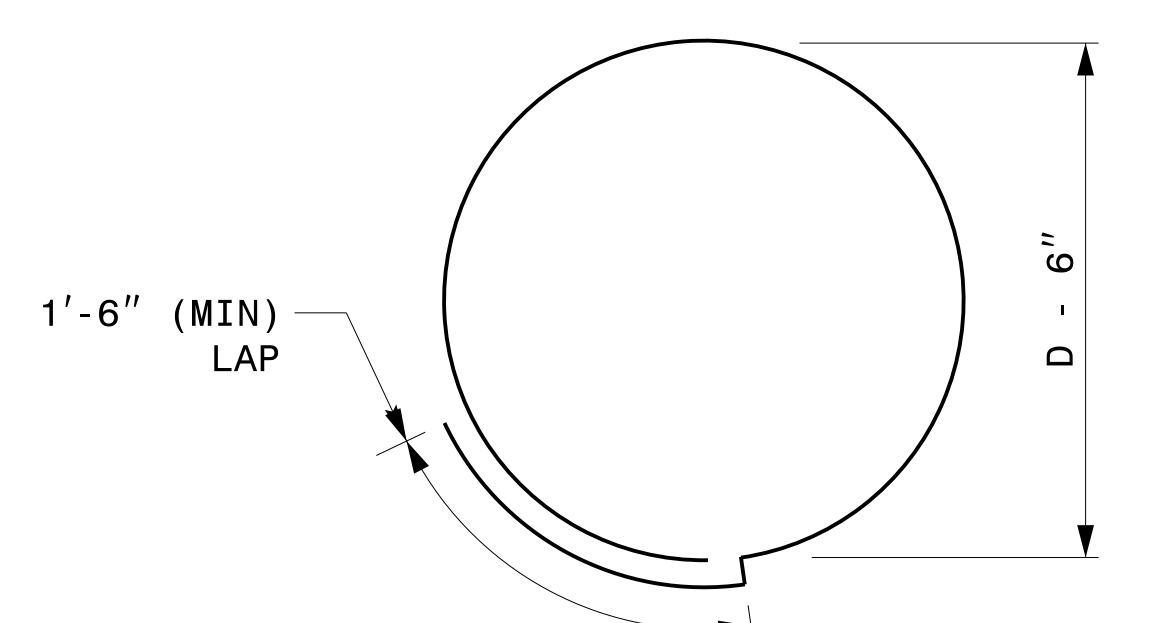




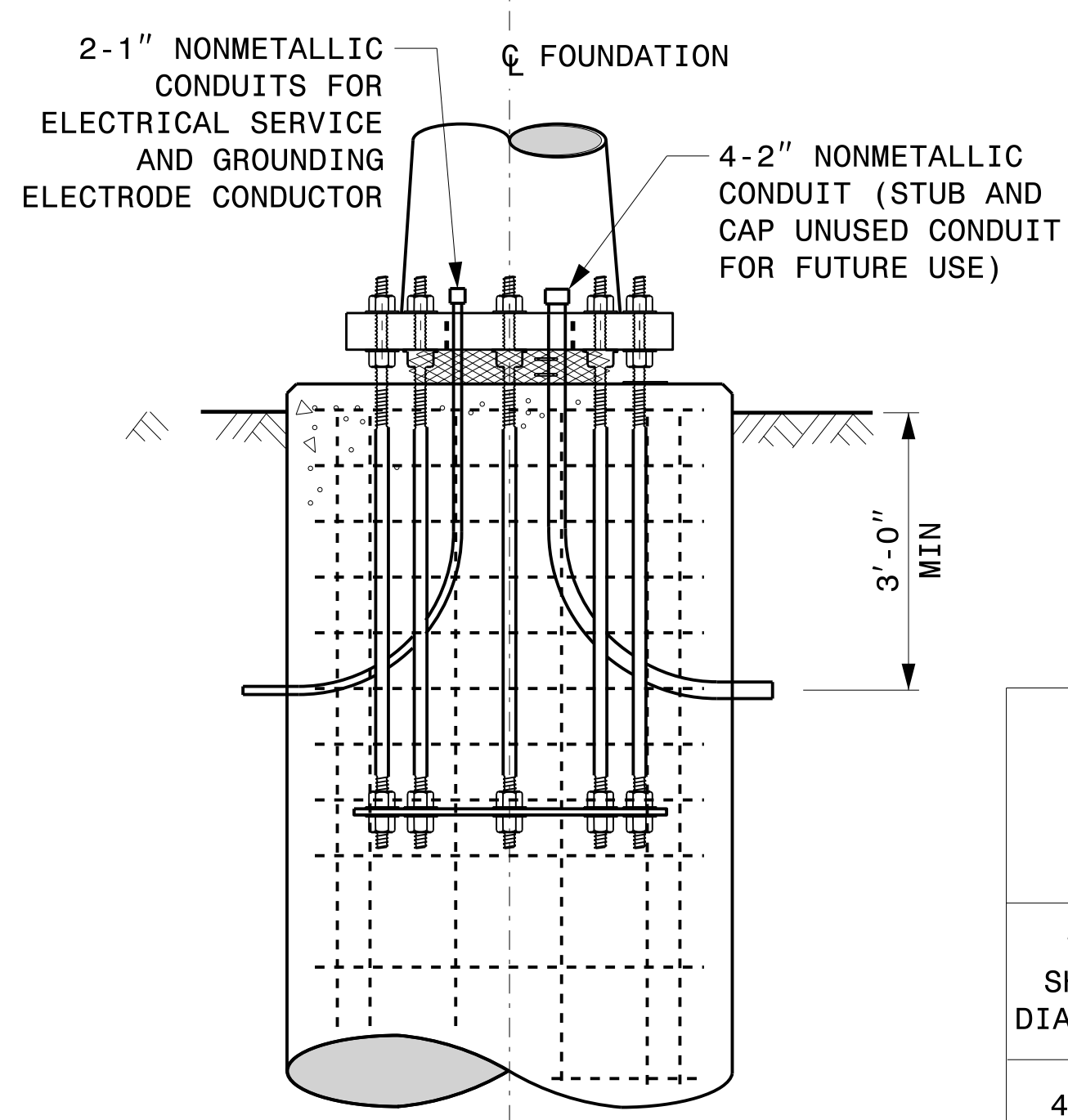
**CONCRETE SHAFT ELEVATION**



**SECTION A-A**



**TYPICAL "C" BAR DETAIL**



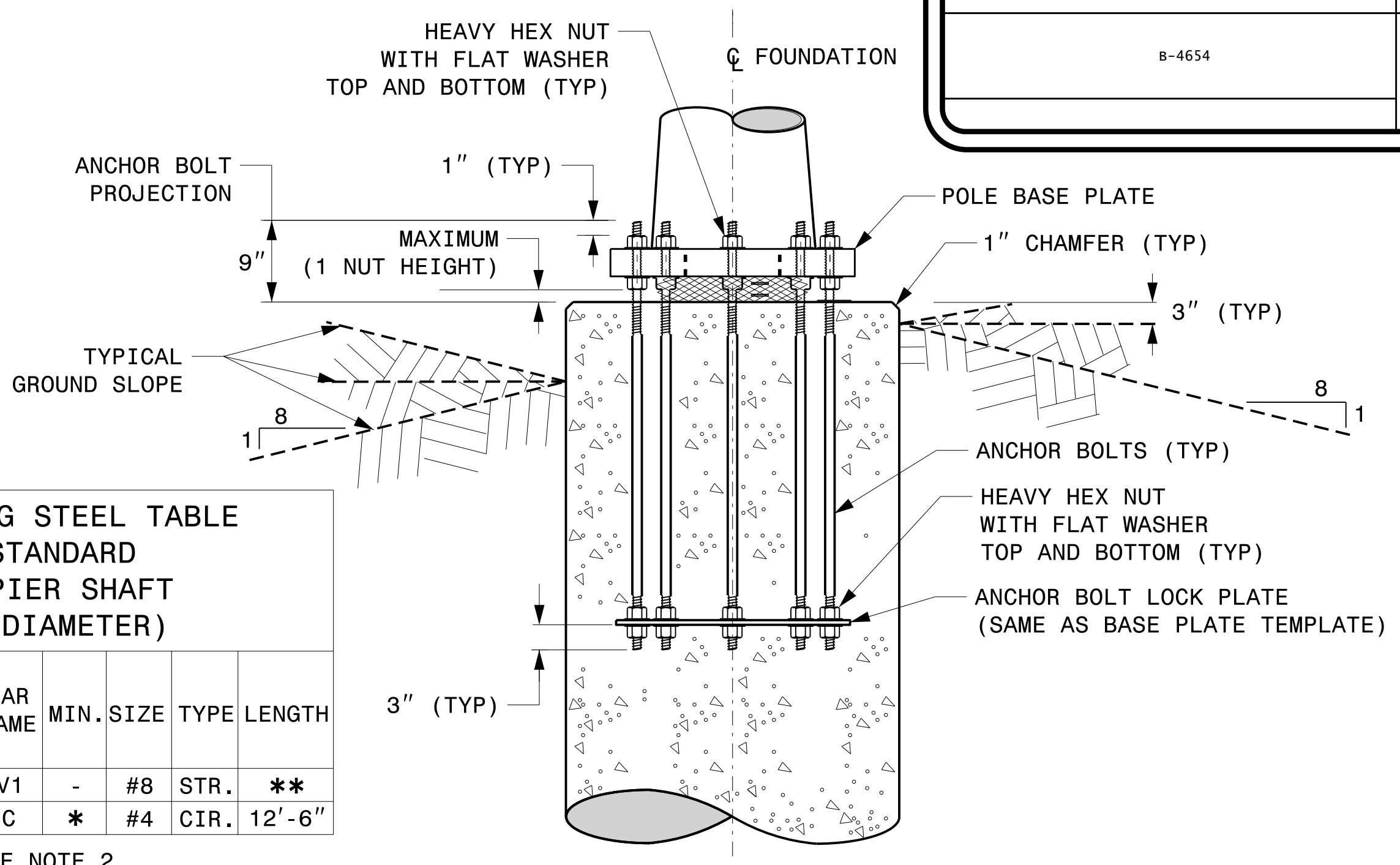
**TYPICAL FOUNDATION CONDUIT DETAILS**

- GENERAL NOTES:**
- IF ACTUAL SUBSURFACE CONDITIONS DIFFER SIGNIFICANTLY FROM BORING DATA, CONTACT THE ENGINEER BEFORE EXCAVATING OR PLACING CONCRETE.
  - 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.
  - 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.
  - PROVIDE 2" TO 5" FOUNDATION PROJECTION ABOVE GROUND LEVEL, DEPENDING ON THE GROUND SLOPE.
  - 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.
  - CONSTRUCT FOUNDATIONS IN ACCORDANCE WITH NCDOT STANDARD PROVISIONS SP09 R005- FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES. ALL APPLICABLE 2024 NCDOT STANDARD SPECIFICATIONS ARE REFERENCED IN THIS PROVISION. REFER TO THE NCDOT RESOURCES/SPECIFICATIONS PAGE LOCATED ON THE CONNECT NCDOT WEBSITE.  
[https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx](https://connect.ncdot.gov/resources/Specifications%20and%20Special%20Provisions.aspx)
  - USE AIR ENTRAINED AA CONCRETE MIX WITH A COMPRESSION STRENGTH OF  $f'c=4500$  psi (MIN) AFTER 28 DAYS.
  - USE ASTM A615 GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL. MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
  - LOCATE IDENTIFICATION TAG ON TOP OF THE FOUNDATION, DIRECTLY ABOVE THE CONDUIT'S ENTRY POINT.
  - PROVIDE TWO LAYERS OF 4 MESH GALVANIZED WELDED 23 GAUGE (0.025) 6" WIDE AROUND PIPES UNDER THE BASE PLATE AND SECURE IT WITH TIES IF NECESSARY.
  - PREFERRED LOCATION FOR THE I.D. TAG IS AS SHOWN IN DETAIL-A: DIRECTLY ABOVE THE CONDUIT ENTERING THE FOUNDATION.

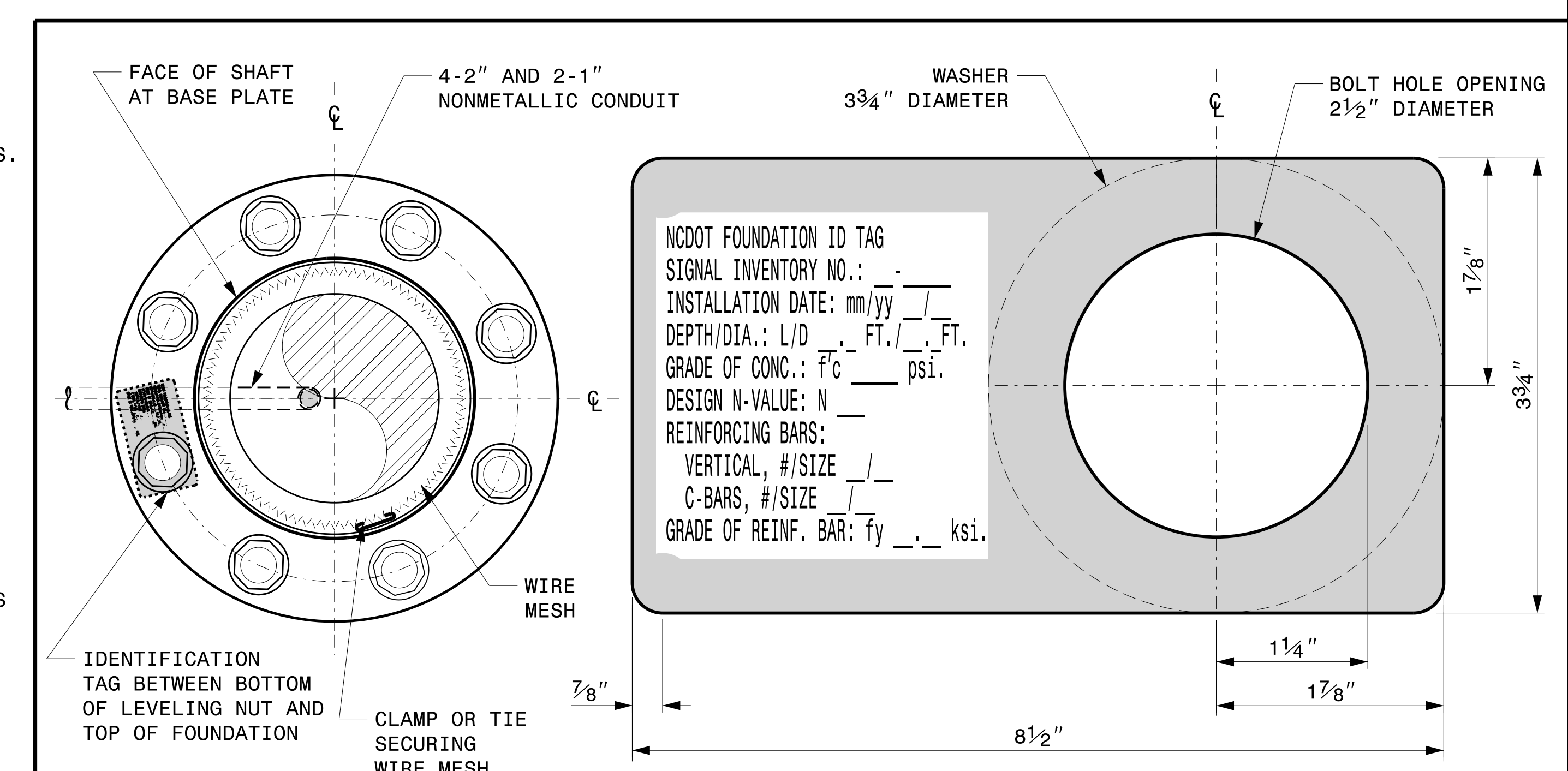
**REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4'-0" DIAMETER)**

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

\* SEE NOTE 2  
\*\* SEE NOTE 3



**TYPICAL FOUNDATION ANCHOR BOLT DETAILS**  
(REINFORCING CAGE NOT SHOWN FOR CLARITY)



**CONCRETE FOUNDATION IDENTIFICATION TAG DETAILS**

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

**DETAIL-A**

<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Construction Details For Foundations</p>		<p>SEAL</p> <p>DocuSigned by: <i>Kevin Durigon</i></p>					
	<p>PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON</p> <p>PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR</p>	<p>REVISIONS</p> <table border="1"> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		NO.	INIT.	DATE		
NO.	INIT.	DATE						

03-dt-2023-10-4f  
 S:\SS\0415\SIGNAL\Signal Design\Structures\Drawings\2024 Metal Pole Std Drawings for LRF\0204\_Sig.M7\_Std\_Construction\_Details\_Strain\_Poles.dgn  
 Kedar Tigon

**Construction Details - Foundations**



# SOIL CONDITION

PROJECT I.D. NO.

SHEET NO.

B-4654

Sig.M8

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

**GENERAL NOTES:**

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

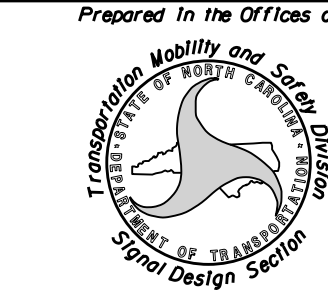
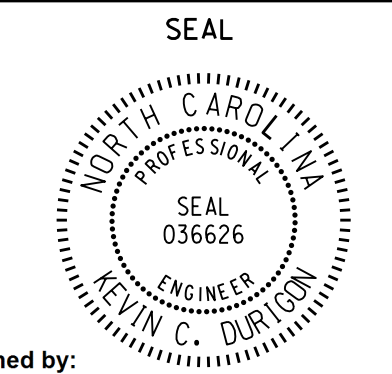

**FOUNDATION SELECTION:**

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

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

**Standard Strain Pole Foundation – All Soil Conditions**

09-21-2023 10:46 S:\SSS\415\Sig.M8\15\Sig.M8\Str. Strain Pole Found.-Saturated Soil Condition.dgn Kedar Tigon

 Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529	<b>Standard Strain Pole Foundation for All Soil Conditions</b>	SEAL 
SCALE: NONE	PLAN DATE: SEPTEMBER 2023    DESIGNED BY: K.C. DURIGON PREPARED BY: K.C. DURIGON    REVIEWED BY: D.C. SARKAR	DocuSigned by: 
	REVISIONS:    INIT.    DATE	09/21/2023 DATE



- 1 INSTALL REA, PE - 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 2 INSTALL REA, PE - 38, (FIGURE - 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 3 INSTALL #4 AWG, 3-WIRE COPPER FEEDER CONDUCTORS
- 4 INSTALL SMFO CABLE
- 5 EXISTING SMFO CABLE
- 6 INSTALL FIBER OPTIC DROP CABLE
- 7 INSTALL TRACER WIRE
- 8 TRENCH
- 9 INSTALL PVC CONDUIT
- 10 INSTALL RIGID, GALVANIZED STEEL CONDUIT
- 11 INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
- 12 INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
- 13 INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
- 14 INSTALL POLYETHYLENE CONDUIT
- 15 DIRECTIONAL DRILL CONDUIT
- 16 BORE AND JACK CONDUIT
- 17 INSTALL CABLE(S) IN EXISTING CONDUIT
- 18 INSTALL CABLE(S) IN NEW CONDUIT
- 19 INSTALL CABLE(S) IN EXISTING RISER
- 20 INSTALL CABLE(S) IN NEW RISER
- 21 INSTALL CABLE(S) IN EXISTING CONDUIT STUBOUTS
- 22 INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
- 23 INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
- 24 INSTALL NEW CONDUIT INTO POLE MOUNTED CABINET
- 25 INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
- 26 INSTALL NEW ETHERNET EDGE SWITCH
- 27 INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 28 INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS, AND FUSION SPLICE CABLE IN CABINET
- 29 INSTALL UNDERGROUND SPLICE ENCLOSURE
- 30 INSTALL AERIAL SPLICE ENCLOSURE
- 31 MODIFY EXISTING SPLICE ENCLOSURE
- 32 INSTALL BASE MOUNTED SPLICE CABINET
- 33 REMOVE EXISTING SPLICE CABINET
- 34 INSTALL CABINET FOUNDATION

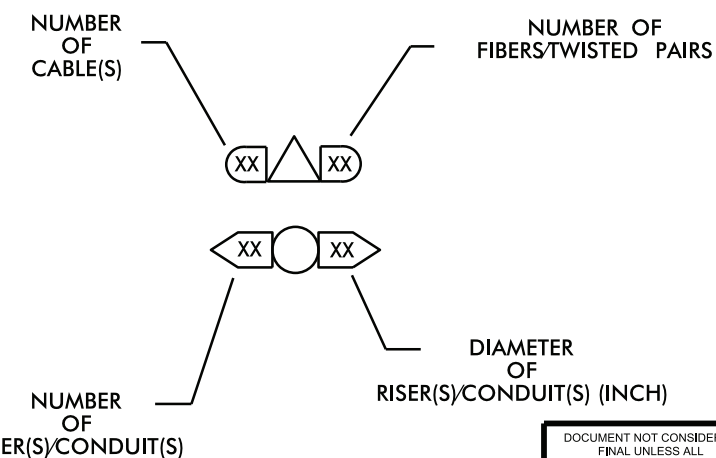
- 35 REMOVE EXISTING CABINET FOUNDATION
- 36 INSTALL CCTV CAMERA ASSEMBLY
- 37 INSTALL CCTV CAMERA WOOD POLE
- 38 INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
- 39 INSTALL JUNCTION BOX
- 40 INSTALL OVERSIZED JUNCTION BOX
- 40A INSTALL SPECIAL OVERSIZED JUNCTION BOX (36" x 24" x 24")
- 41 REMOVE EXISTING JUNCTION BOX
- 42 INSTALL WOOD POLE
- 43 REMOVE EXISTING WOOD POLE
- 44 INSTALL AERIAL GUY ASSEMBLY
- 45 INSTALL STANDARD GUY ASSEMBLY
- 46 INSTALL SIDEWALK GUY ASSEMBLY
- 47 INSTALL MESSENGER CABLE
- 48 REMOVE EXISTING COMMUNICATIONS CABLE AND MESSENGER CABLE
- 49 REMOVE EXISTING COMMUNICATIONS CABLE
- 50 INSTALL TELEPHONE SERVICE
- 51 INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
- 52 INSTALL DELINEATOR MARKER
- 53 STORE 20 FEET OF COMMUNICATIONS CABLE
- 54 LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
- 55 LASH CABLE(S) TO EXISTING MESSENGER CABLE
- 56 LASH CABLE(S) TO NEW MESSENGER CABLE
- 57 MODIFY EXISTING ELECTRICAL SERVICE
- 58 INSTALL NEW ELECTRICAL SERVICE
- 59 INSTALL EQUIPMENT CABINET DISCONNECT

**LEGEND**

- FD NEW FIBER OPTIC COMMUNICATIONS CABLE
- TWIST PR NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXI EXISTING COMMUNICATIONS CABLE
- REM EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- DD NEW DIRECTIONAL DRILLED CONDUIT
- BAJ NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING WOOD POLE
- NEW SPLICE ENCLOSURE
- EXISTING SPLICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV CAMERA ASSEMBLY
- EXISTING CCTV CAMERA ASSEMBLY
- NEW STANDARD GUY ASSEMBLY
- NEW STANDARD GUY USING EXISTING ANCHOR
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- SP SIGNAL POLE
- XX-XXXX SIGNAL INVENTORY NUMBER

**CONSTRUCTION NOTE SYMBOLOGY KEY**

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



THIS PLAN SET SUPERSEDES THE PLAN SET ORIGINALLY SEALED BY HEMANG SURTI ON 1/11/23

	<p><b>Construction Notes</b></p> <p>Division 5 Wake County Garner</p> <p>PLAN DATE: SEPTEMBER 2023 REVIEWED BY:</p> <p>PREPARED BY: G. GREEN REVIEWED BY:</p> <p>REVISIONS: _____ INIT. DATE</p>	<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p>
<p>750 N. Greenfield Pkwy., Garner, NC 27529</p> <p>SCALE: 0 NA N.T.S.</p>	<p>09/13/2023</p>	<p>CADD Filename:</p>

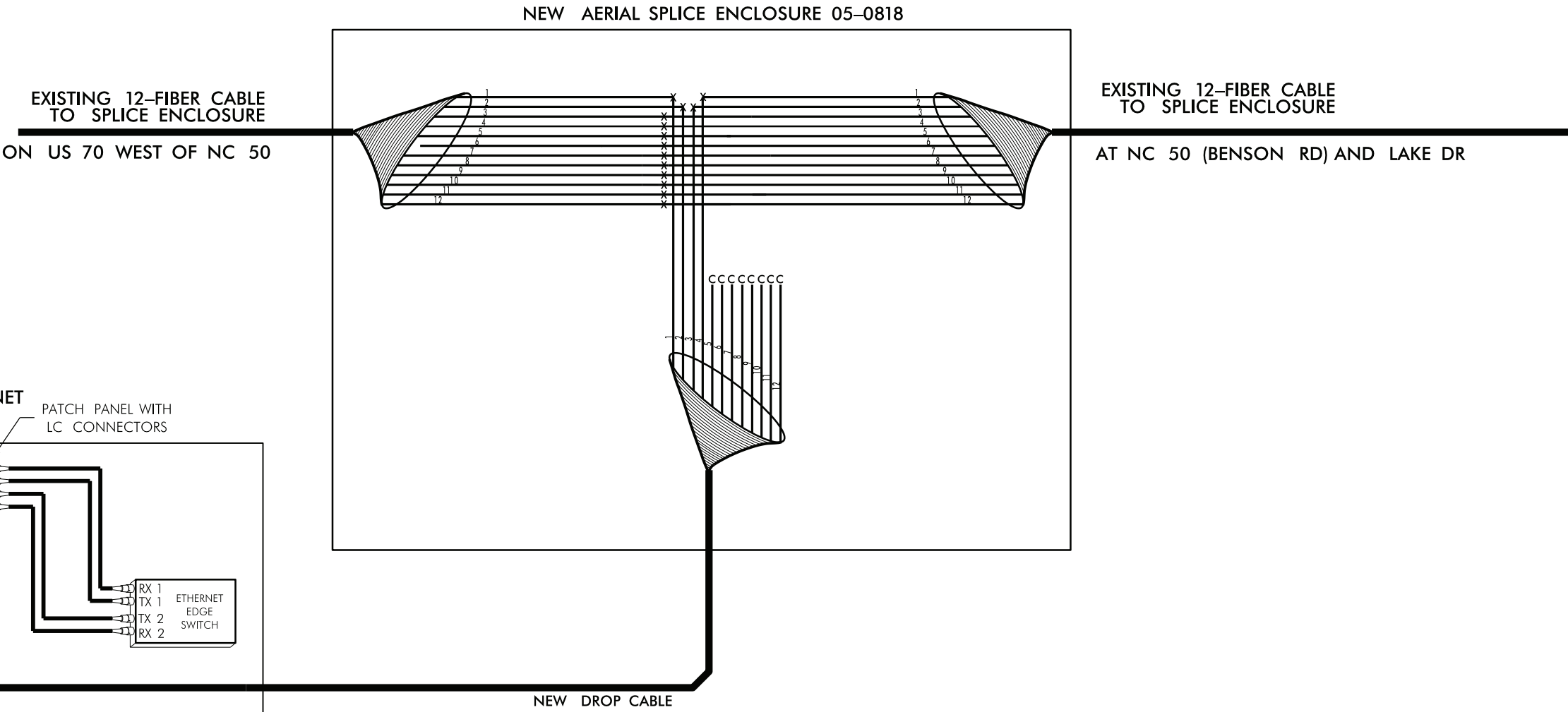




NEW AERIAL SPLICE ENCLOSURE  
AT NC 50 (BENSON RD) AND  
US 70 WB RAMPS  
SIG. INV. # 05-0818

COLOR CODE TIA/EIA 598-A		LEGEND	
(1) BLUE	(7) RED	X - NEW FUSION SPLICE INDIVIDUAL FIBER	
(2) ORANGE	(8) BLACK	C = CAP, COIL, AND SEAL	
(3) GREEN	(9) YELLOW		
(4) BROWN	(10) VIOLET		
(5) SLATE	(11) ROSE		
(6) WHITE	(12) AQUA		

Notes:  
Unused fibers left coiled and stored in splice tray.  
Unused Buffer Tubes left coiled and stored in splice tray.



- NOTES:
1. NOTIFY THE NCDOT DIVISION 5 TRAFFIC ENGINEER, AT (919) 220-4600, SEVEN (7) DAYS PRIOR TO BEGINNING WORK ON COMMUNICATIONS CABLE FOR SIGNAL COMMUNICATIONS. NOTIFY THE DIVISION 5 TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS OPERATIONAL.
  2. ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING /ENSURING PROPER TERMINATIONS AND SHALL PERFORM ALL SPLICING AND TERMINATIONS IN CONTROLLER CABINET.
  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.

THIS PLAN SET SUPERSEDES THE PLAN SET ORIGINALLY SEALED BY HEMANG SURTI ON 1/11/23

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

	Splice Detail	
	Division 5 Wake County	Garner
	PLAN DATE: SEPTEMBER 2023	REVIEWED BY:
250 N. Greenfield Place, Garner, NC 27529	PREPARED BY: G. GREEN	REVIEWED BY:
SCALE: 0 NA N.T.S.	REVISIONS	INIT. DATE

09/13/2023  
 CAD: FTI/and