

PROJECT: U-4700CA

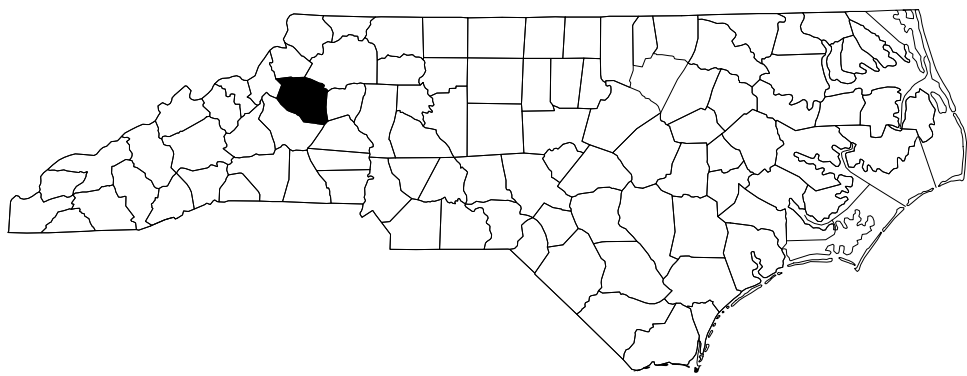
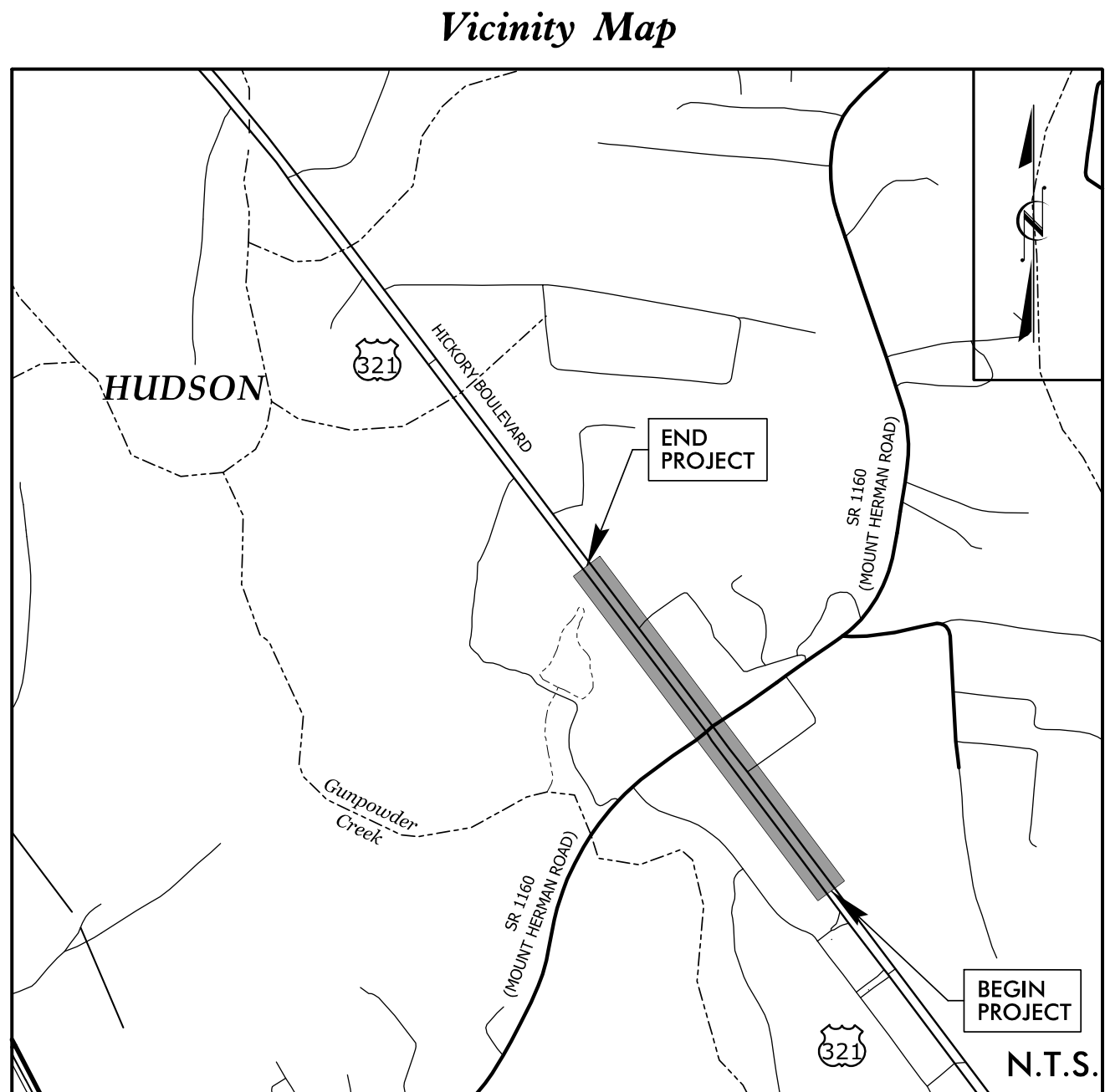
CONTRACT:

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

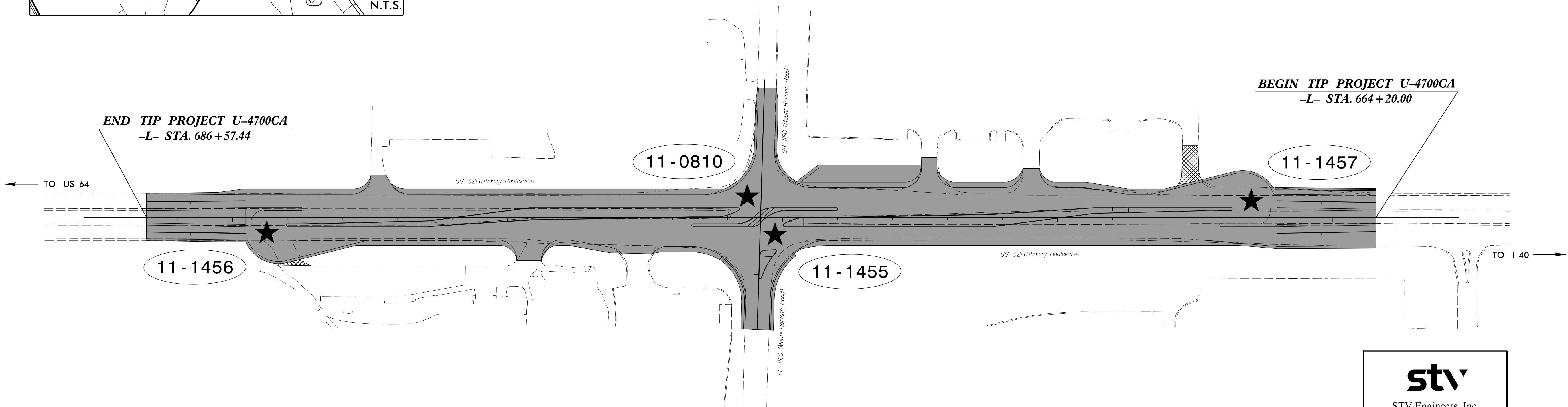
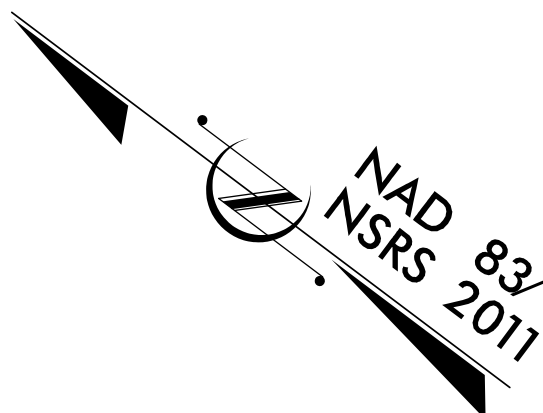
CALDWELL COUNTY

LOCATION: INTERSECTION OF US 321 (HICKORY BOULEVARD) AND
SR 1160 (MT HERMAN ROAD)

TYPE OF WORK: TRAFFIC SIGNALS AND TRAFFIC SIGNAL COMMUNICATIONS



★ PROPOSED SIGNAL
XX-XXXX SIGNAL ID NUMBER



stv

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

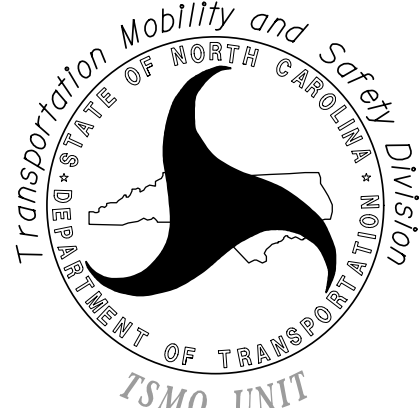
Refer to "Roadway Standard Drawings
NCDOT" dated January 2024 and
"Standard Specifications for Roads
and Structures" dated January 2024.

Sheet #	Reference #	Index of Plans	Location/Description
Sig. 1.0	-----	Title Sheet	
Sig. 2.0-2.2	11-1456	US 321 (Hickory Boulevard) SB at U-Turn Bulb-Out N. of SR 1160 (Mt Herman Road)	
Sig. 3.0-5.4	11-0810	US 321 (Hickory Boulevard) NB at SR 1160 (Mt Herman Road)	
Sig. 6.0-7.4	11-1455	US 321 (Hickory Boulevard) SB at SR 1160 (Mt Herman Road)	
Sig. 8.0-8.2	11-1457	US 321 (Hickory Boulevard) NB at U-Turn Bulb-Out S. of SR 1160 (Mt Herman Road)	
M1-M9	N/A	2024 Standard Metal Pole Sheets	
SCP-1	N/A	Signal Communication Plans	

NCDOT TRANSPORTATION SYSTEMS MANAGEMENT
& OPERATIONS UNIT
Contacts:
R. Nicholas Zinser, P.E. - Western Region Signals Engineer
Keith M. Mims, P.E. - Signal Equipment Design Engineer
Gregory A. Green - Signal Communications Project Engineer

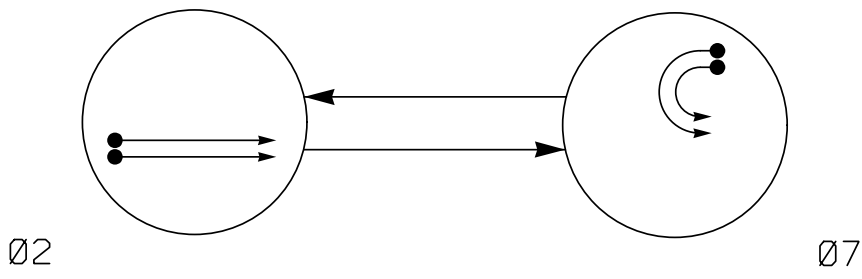
STV ENGINEERS, INC.
Contacts:
Trent M. Moody, P.E. - Senior Associate - Transportation Director
Donald J. Darity, P.E. - Senior Traffic Signal Manager

DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY
DIVISION



750 N. Greenfield Parkway, Garner, NC 27529

PHASING DIAGRAM



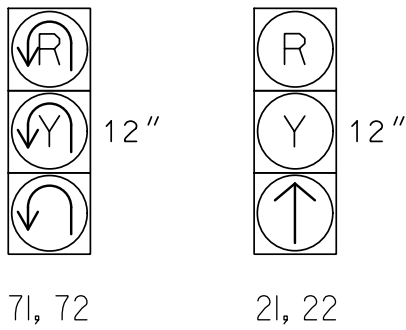
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE		
	Ø 2	Ø 7	FLASH
2L, 22	↑	R	R
7L, 72	↓	L	L

SIGNAL FACE I.D.

All Heads L.E.D.



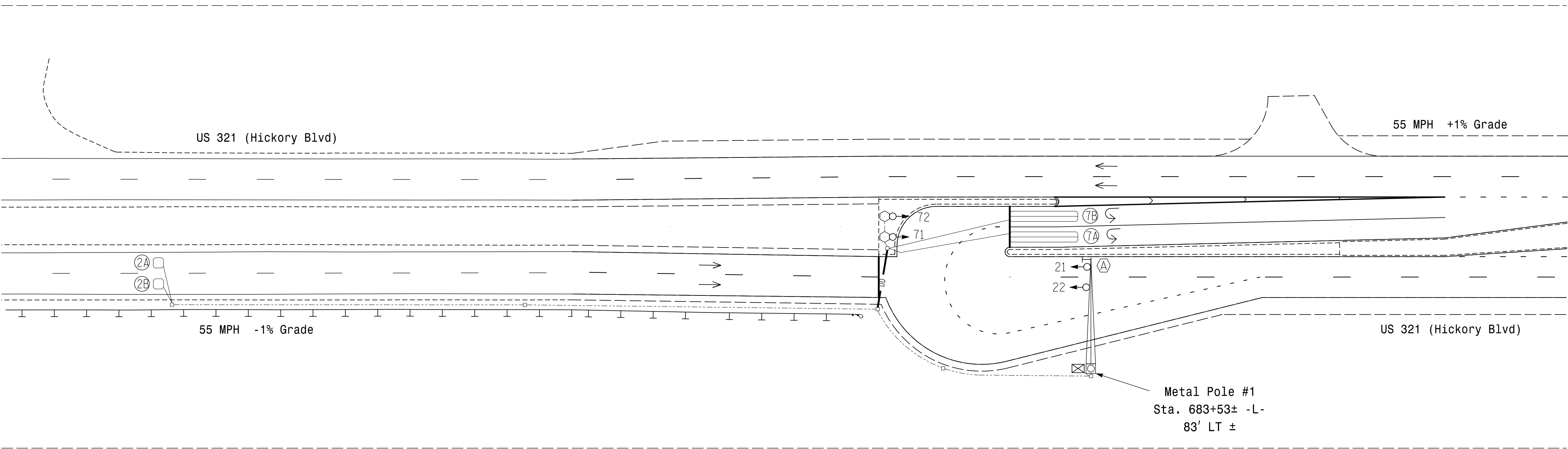
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	6X6	420	6	X	2	-	-	X	X	X	- X
2B	6X6	420	6	X	2	-	-	X	X	X	- X
7A	6X40	0	2-4-2	X	7	-	-	X	-	X	- X
7B	6X40	0	2-4-2	X	7	-	-	X	-	X	- X

2 Phase
Fully Actuated
US 321 Closed Loop System

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.
- 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.
- Pedestal mounted signal heads shall be mounted at a minimum of 8' above the high point of the roadway surface elevation.
- Refer to Roadway and/or Pavement Marking plans for stop bar locations.



MAXTIME TIMING CHART

FEATURE	PHASE	
	2	7
Walk *	-	-
Ped Clear	-	-
Min Green *	14	7
Passage *	6.0	2.0
Max 1 *	90	20
Yellow Change	5.3	3.0
Red Clear	1.0	4.8
Added Initial *	1.5	-
Maximum Initial *	46	-
Time Before Reduction *	15	-
Time To Reduce *	30	-
Minimum Gap	3.4	-
Advance Walk	-	-
Non Lock Detector	-	X
Vehicle Recall	MIN RECALL	-
Dual Entry	-	-

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

LEGEND

PROPOSED	EXISTING
Traffic Signal Head	N/A
Modified Signal Head	N/A
Sign	N/A
Pedestrian Signal Head	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
Metal Pole with Mastarm	N/A
Directional Drill	N/A
Type II Signal Pedestal	N/A
No Left Turn Sign (R3-2)	N/A

New Installation

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

Prepared for the Offices of:
Transportation Mobility and Safety
Department of Transportation
Signal Design Section

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE
0 40
1"=40'

US 321 (Hickory Boulevard) SB
at
U-Turn Bulb-Out North of
SR 1160 (Mt. Herman Road)
Division 11 Caldwell County Hudson

PLAN DATE: June 2024
REVIEWED BY: D.J. Darity

PREPARED BY: J.T. Grimm
REVIEWED BY: T.M. Woody

REVISIONS
INIT. DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

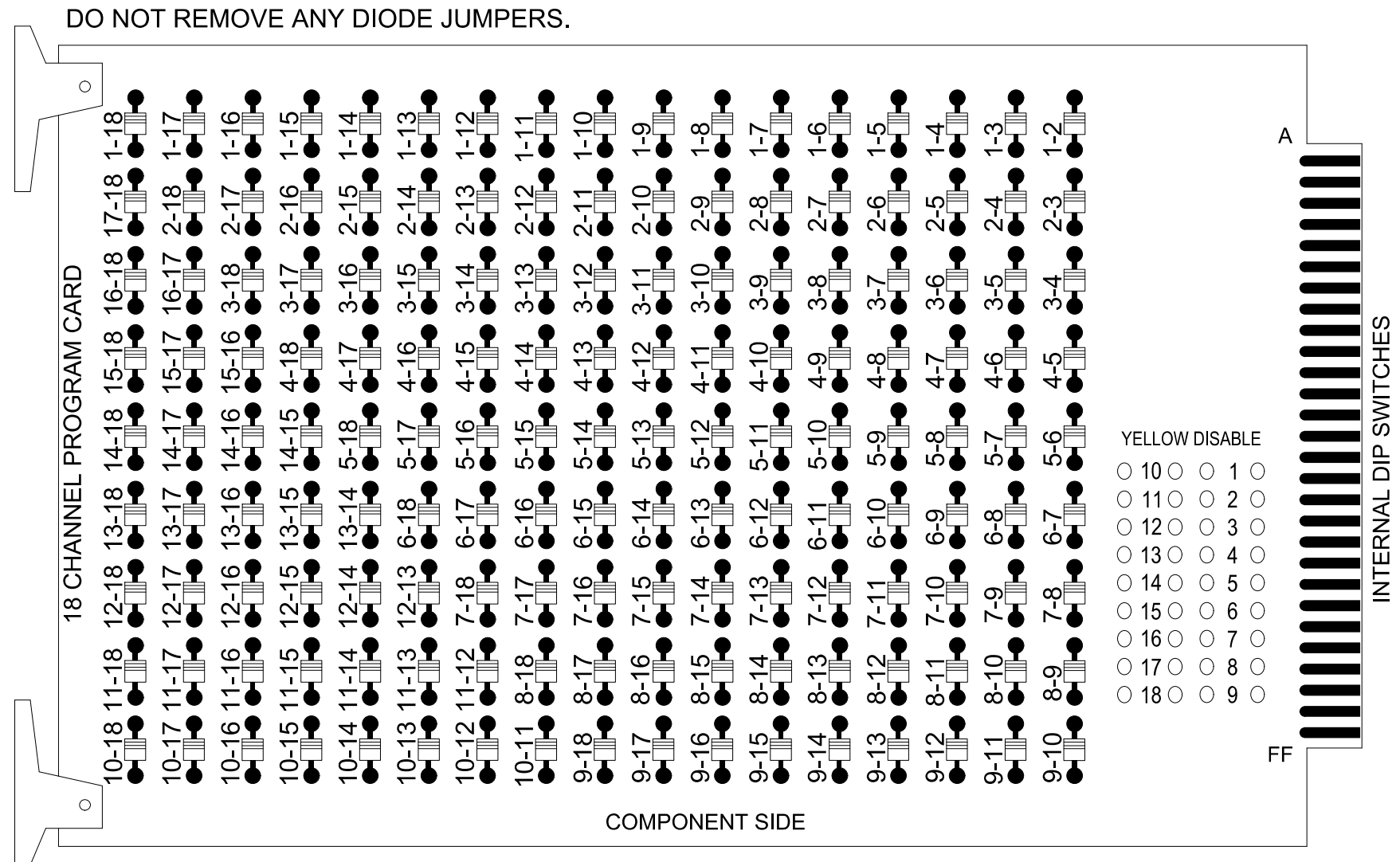
SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEER
040329
T.M. WOODY

DocuSigned by:
T.M. Woody
6/10/2024

SIG. INVENTORY NO. 11-1456

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(set switches 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.
- 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 321 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.....S2, S10
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 2.1

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	NU	NU	NU	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128																
YELLOW		129																
GREEN																		
RED ARROW											122							
YELLOW ARROW											123							
GREEN ARROW		130									124							

NU = Not Used

OUTPUT CHANNEL CONFIGURATION

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

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

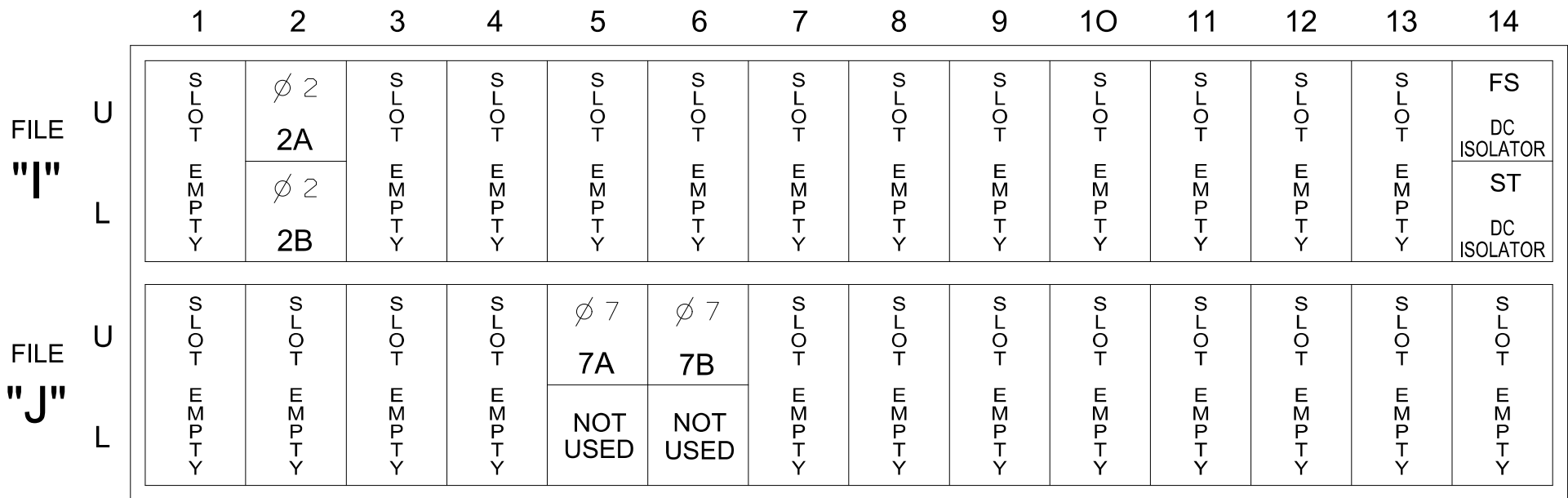
Channel Configuration

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	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		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

↑
NOTE: ALL RED FLASH

INPUT FILE POSITION LAYOUT

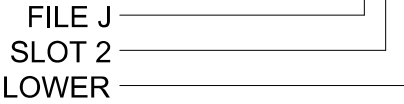
(front view)



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	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
7A	TB5-5,6	J5U	57	19	21	7			X		X	
7B	TB5-9,10	J6U	42	4	22	7			X		X	

INPUT FILE POSITION LEGEND: J2L



MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters

StartUp Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1456
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

stv

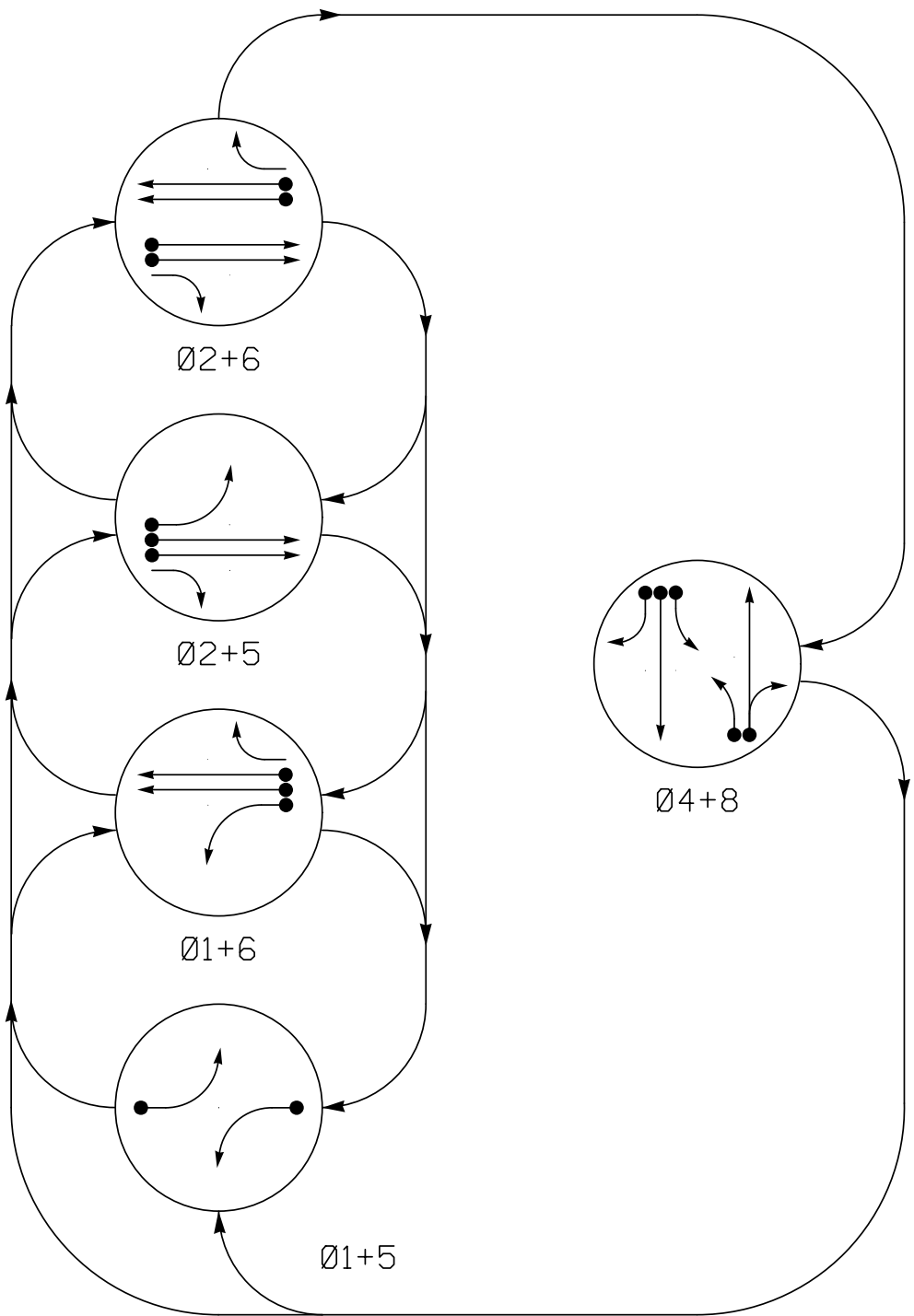
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

ELECTRICAL DETAIL SHEET 1 OF 1

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 321 (Hickory Boulevard) SB at U-Turn Bulb-Out North of SR 1160 (Mt Herman Road)	DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
Prepared For the Offices of: 	Division 11 PLAN DATE: June 2024 PREPARED BY: R.L. Aristondo REVIEWED BY: D.J. Darity REVIEWED BY: T.M. Woody	SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040329 T.M. MOODY DATE: 6/10/2024 SIC. INVENTORY NO. 11-1456

5/11/2024
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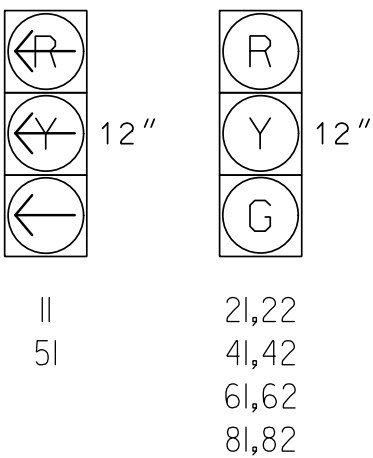
PHASING DIAGRAM



SIGNAL FACE	PHASE					
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 4 + 8	F L T S
II	←	←	←	←	←	←
2L,22	R	R	G	G	R	R
4L,42	R	R	R	R	G	R
5L	←	←	←	←	←	←
6L,62	R	G	R	G	R	R
8L,82	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
1A	6X40	0	*	X	1	-	-	X	-	X	-
2A,2B	6X6	420	*	X	2	-	2.2	X	-	X	-
2C,2D	6X6	110	*	X	2	-	-	X	-	X	-
4A	6X40	0	*	X	4	3.0	-	X	-	X	-
4B	6X40	0	*	X	4	3.0	-	X	-	X	-
4C	6X30	0	*	X	4	15.0	-	X	-	X	-
5A	6X40	0	*	X	5	-	-	X	-	X	-
6A,6B	6X6	420	*	X	6	-	2.2	X	-	X	-
6C,6D	6X6	110	*	X	6	-	-	X	-	X	-
8A	6X40	0	*	X	8	3.0	-	X	-	X	-
8B	6X40	0	*	X	8	10.0	-	X	-	X	-
8C	6X15	0	*	X	8	15.0	-	X	-	X	-

* Video Detection Zone

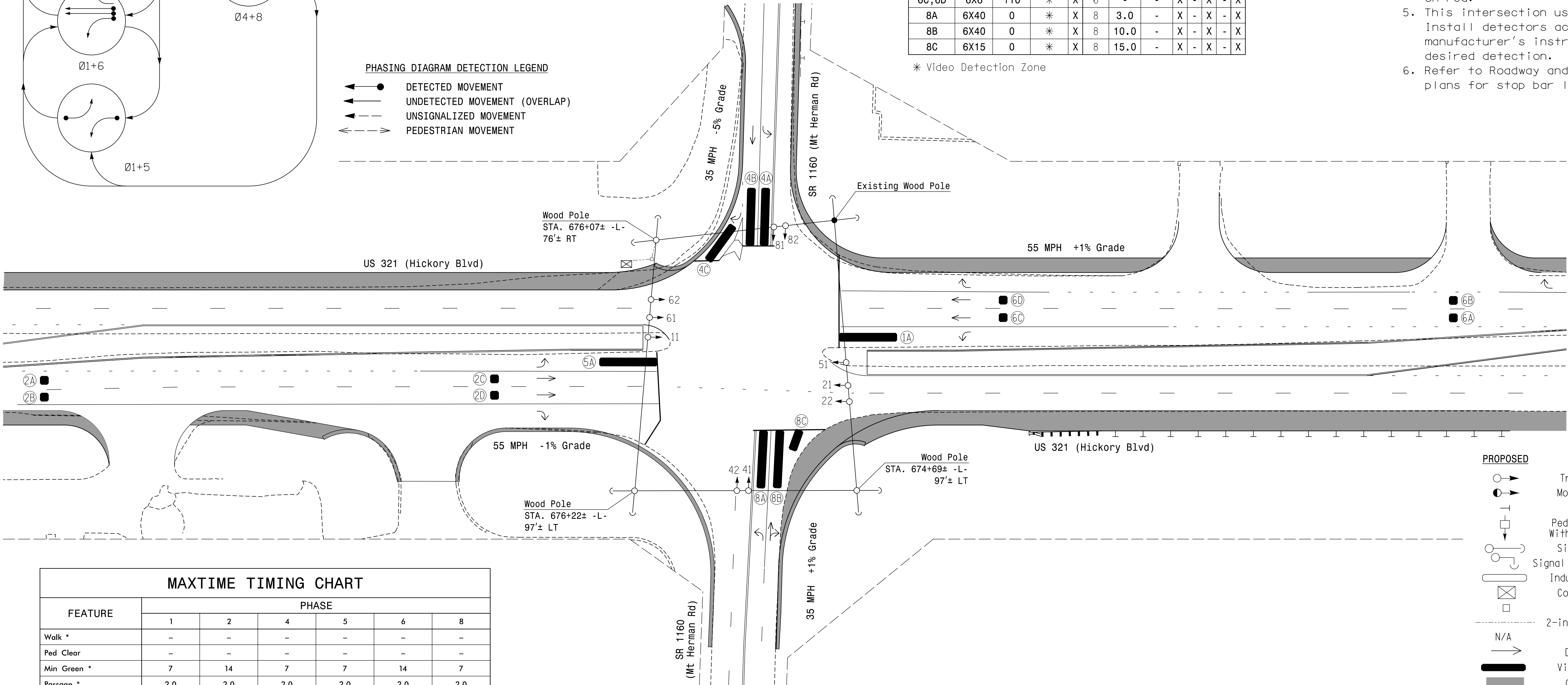
5 Phase
Fully Actuated
Isolated

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 1 and/or phase 5 may be lagged.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Refer to Roadway and/or Pavement Marking plans for stop bar locations.

PHASING DIAGRAM DETECTION LEGEND

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



FEATURE	PHASE					
	1	2	4	5	6	8
Walk *	-	-	-	-	-	-
Ped Clear	-	-	-	-	-	-
Min Green *	7	14	7	7	14	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	20	75	30	20	75	30
Yellow Change	3.0	5.3	4.2	3.0	5.1	3.8
Red Clear	3.4	1.5	2.8	3.5	1.4	2.4
Added Initial *	-	-	-	-	-	-
Maximum Initial *	-	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-	-
Time To Reduce *	-	-	-	-	-	-
Minimum Gap	-	-	-	-	-	-
Advance Walk	-	-	-	-	-	-
Non Lock Detector	X	-	X	X	-	X
Vehicle Recall	-	MIN RECALL	-	-	MIN RECALL	-
Dual Entry	-	-	X	-	-	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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 | → |
| 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 | → |
| Video Detection Area | --- |
| Construction Zone | N/A |
| Curb Ramp | N/A |
| Guardrail | --- |

Signal Upgrade
Temporary Design 1 - TMP Phase I

stv
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

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

US 321 (Hickory Boulevard)
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson

PLAN DATE: June 2024 REVIEWED BY: D.J. Darity

PREPARED BY: J.C. Grimm REVIEWED BY: T.M. Moody

REVISIONS INIT. DATE

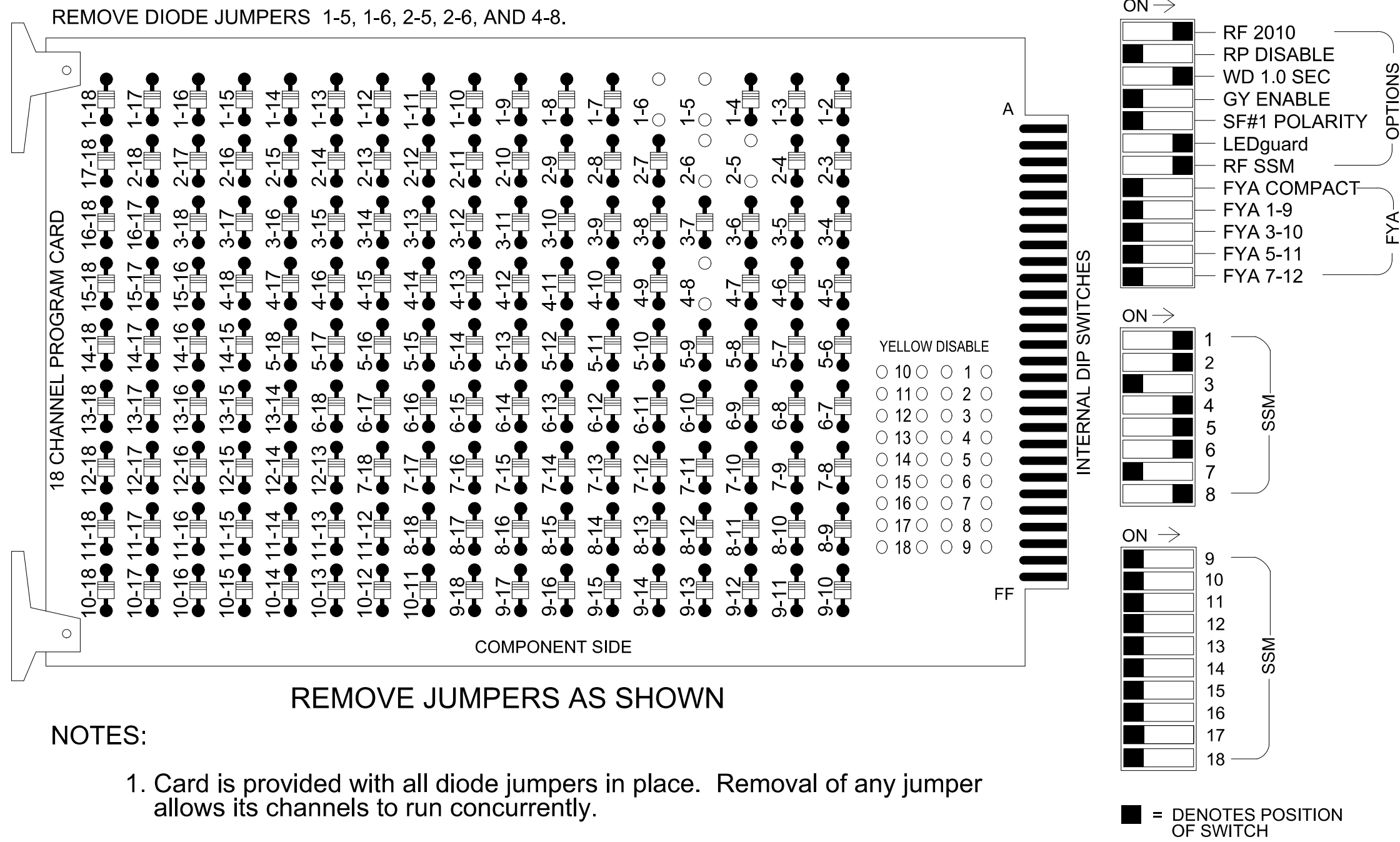
DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEER
SEAL
040329
T.M. MOODY
DocuSigned by:
T.M. Moody
6/10/2024
DATE
SIG. INVENTORY NO. II-0810T1

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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 phases 4 and 8 for Dual Entry.
- 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.

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, S5, S7, S8, S11
Phases Used.....1, 2, 4, 5, 6, 8
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 3.1

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.	11	21,22	NU	NU	41,42	NU	51	61,62	NU	NU	81,82	NU	NU	NU	NU	NU	NU	NU
RED		128			101			134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW	125						131											
YELLOW ARROW	126						132											
GREEN ARROW	127						133											

NU = Not Used

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	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		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

↑
NOTE: ALL RED FLASH

MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters

StartUp Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-0810T1
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

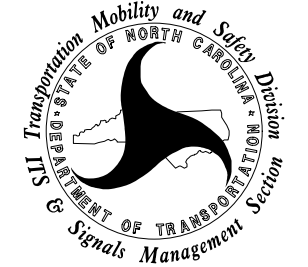
stv

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

ELECTRICAL DETAIL

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared for the Offices of:



750 N.Greenfield Pkwy, Garner, NC 27529

US 321 (Hickory Boulevard)
at
SR 1160 (Mt. Herman Road)

Division 11 Caldwell County Hudson

PLAN DATE: June 2024 REVIEWED BY: D.J. Darity

PREPARED BY: R.L. Aristondo REVIEWED BY: T.M. Woody

REVISIONS INIT. DATE

INIT. DATE

INIT. DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL



DocuSigned by:

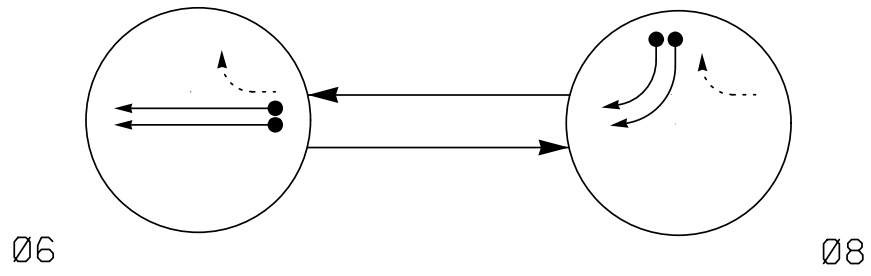
Trent Moody

6/10/2024

DATE

SIG. INVENTORY NO. 11-0810T1

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

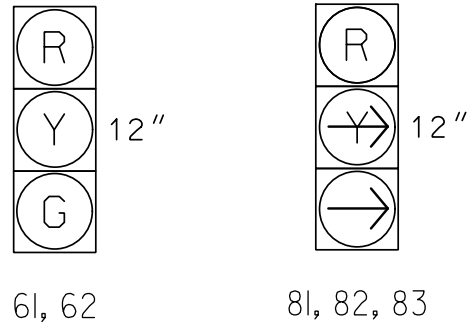
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	Ø 6	Ø 8	FLIGHT
61, 62	G	R	R
81, 82, 83	R	→	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

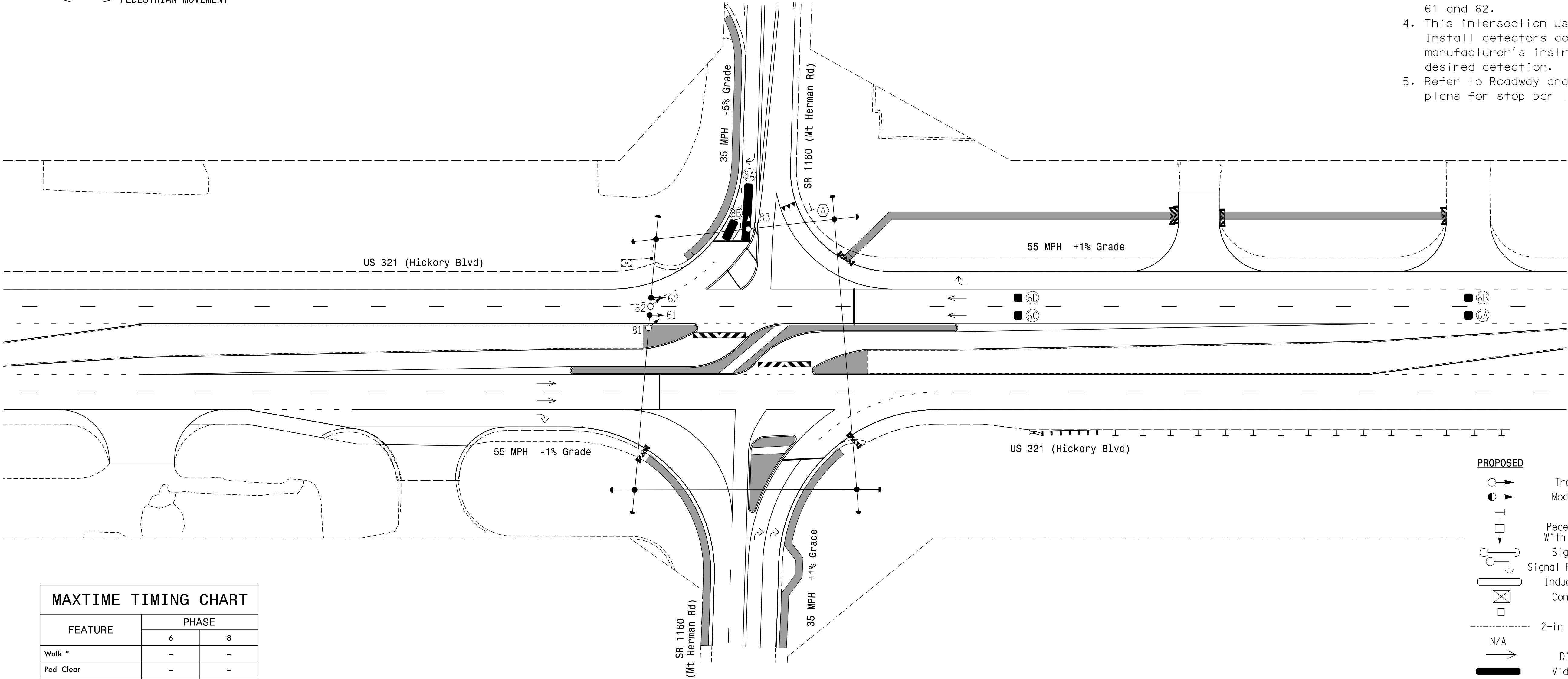
DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
6A, 6B	6X6	420	*	X	6	-	2.0	X	-	X	-
6C, 6D	6X6	110	*	X	6	-	-	X	-	X	-
8A	6X40	0	*	X	8	-	-	X	-	X	-
8B	6X15	0	*	X	8	-	-	X	-	X	-

* Video Detection Zone

2 Phase
Fully Actuated
Isolated

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 61 and 62.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Refer to Roadway and/or Pavement Marking plans for stop bar locations.



MAXTIME TIMING CHART

FEATURE	PHASE	
	6	8
Walk *	-	-
Ped Clear	-	-
Min Green *	14	7
Passage *	2.0	2.0
Max 1 *	90	20
Yellow Change	5.1	3.1
Red Clear	1.4	3.3
Added Initial *	-	-
Maximum Initial *	-	-
Time Before Reduction *	-	-
Time To Reduce *	-	-
Minimum Gap	-	-
Advance Walk	-	-
Non Lock Detector	-	X
Vehicle Recall	MIN RECALL	-
Dual Entry	-	-

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

LEGEND

PROPOSED	EXISTING

Signal Upgrade
Temporary Design 2 - TMP Phase II

stv
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

Prepared for the Offices of:

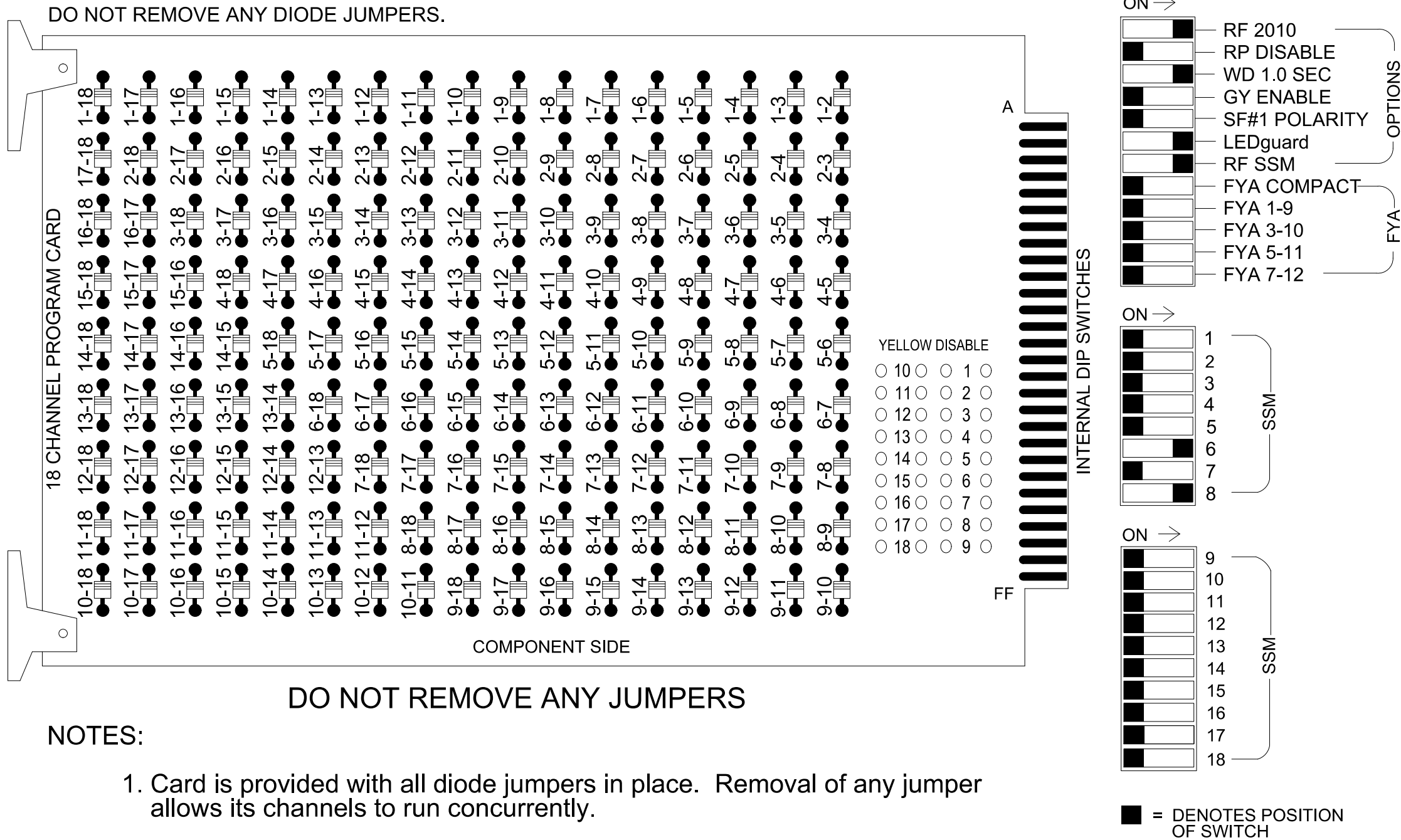
750 N. Greenfield Pkwy, Garner, NC 27529
SCALE
0 40
1"=40'

US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt Herman Road)
Division 11 Caldwell County Hudson
PLAN DATE: June 2024 REVIEWED BY: D.J. Darity
PREPARED BY: J.C. Grimm REVIEWED BY: T.M. Woody
REVISIONS INIT. DATE
DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED
SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEER
SEAL 040329
TRENT M. MOODY
DocuSigned by:
Trent Moody
6/10/2024
DATE
SIC. INVENTORY NO. II-0810T2

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(do not remove any jumpers and set switches as shown)



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 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.

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.....S8, S11
Phases Used.....6, 8
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

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	NU	NU	NU	NU	NU	NU	61,62	NU	NU	81,82 83	NU	NU	NU	NU	NU	NU	NU
RED								134			107							
YELLOW								135										
GREEN								136										
RED ARROW																		
YELLOW ARROW											108							
FLASHING YELLOW ARROW																		
GREEN ARROW											109							
Hand icon																		
Walking person icon																		

NU = Not Used

OUTPUT CHANNEL CONFIGURATION

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

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

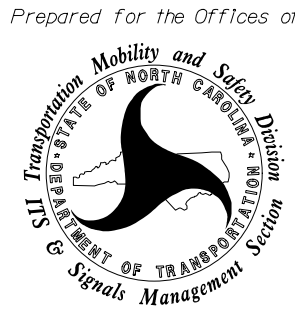
Channel Configuration

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	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		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

↑ ↑
NOTE: ALL RED FLASH

ELECTRICAL DETAIL

ELECTRICAL AND PROGRAMMING
DETAILS FOR:



750 N.Greenfield Pkwy, Garner, NC 27529

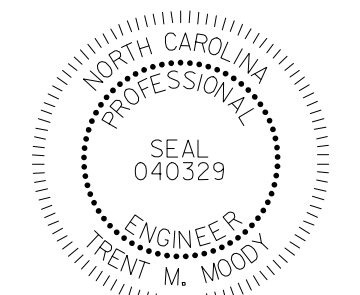
US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson
PLAN DATE: June 2024 REVIEWED BY: D.J. Darity
PREPARED BY: R.L. Aristondo REVIEWED BY: T.M. Woody

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL



DocuSigned by:
Trent Moody
6/10/2024
SIC. INVENTORY NO. 11-0810T2

INPUT FILE POSITION LAYOUT

(front view)

FILE	U	1	2	3	4	5	6	7	8	9	10	11	12	13	14
"I"		FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
"J"		FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS

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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a video 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.

MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters

StartUp Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-0810T2
DESIGNED: June 2024
SEALED:
REVISED: N/A

stv

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 5.0

2 Phase
Fully Actuated
US 321 Closed Loop System

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Pedestal mounted signal heads shall be mounted a minimum of 8' above the high point of the roadway surface elevation.
9. Refer to Roadway and/or Pavement Marking plans for stop bar locations.
10. Suppress FYA for signal heads 31, 32, and 63 for the first 5 seconds of phase 6 ped.

MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR						PROGRAMMING					
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
3A	6X40	0	2-4-2	X	3	*15.0	-	X	-	X	-
6A	6X6	420	5	X	6	-	-	X	X	X	-
6B	6X6	420	5	X	6	-	-	X	X	X	-
8A	6X40	0	2-4-2	X	8	15.0	-	X	-	X	-
8B	6X20	0	2-4-2	X	8	15.0	-	X	-	X	-

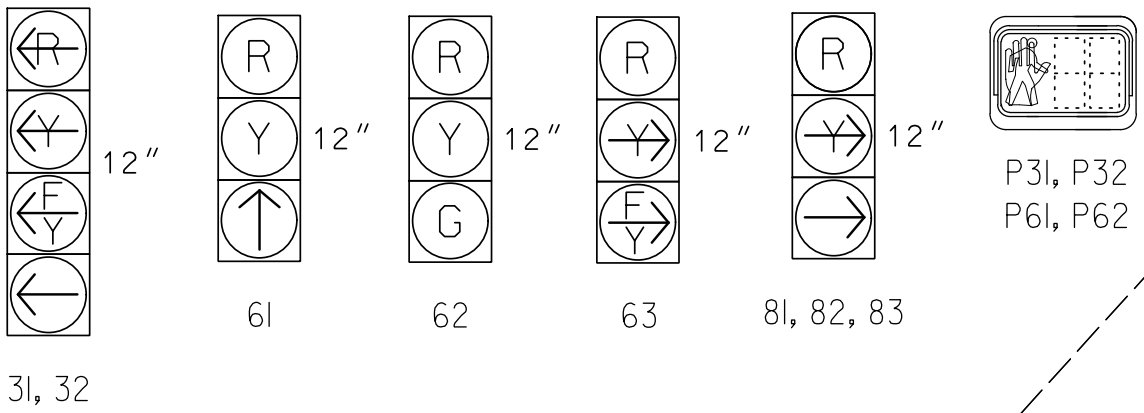
* Disable Delay During Alternate Phasing Operation.

SIGNAL FACE	PHASE		
	Ø 6	Ø 3 + 8	F L T H O D
3l, 32	←	←	←
6l	↑	R	R
62	G	R	R
63	←	R	R
8l, 82, 83	R	→	R
P3l, P32	DW	W	DRK
P6l, P62	W	DW	DRK

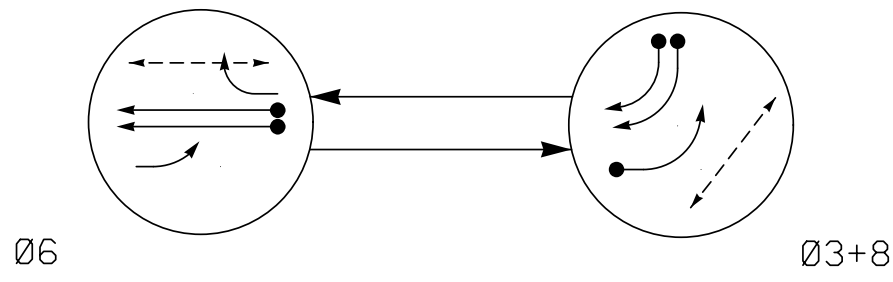
SIGNAL FACE	PHASE		
	Ø 6	Ø 3 + 8	F L T H O D
3l, 32	←	←	←
6l	↑	R	R
62	G	R	R
63	←	R	R
8l, 82, 83	R	→	R
P3l, P32	DW	W	DRK
P6l, P62	W	DW	DRK

SIGNAL FACE I.D.

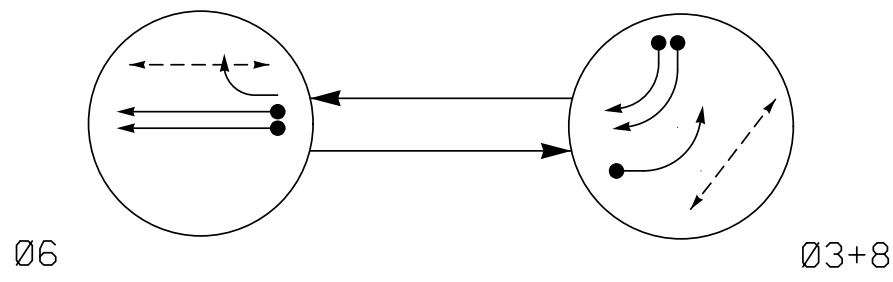
All Heads L.E.D.



DEFAULT PHASING DIAGRAM

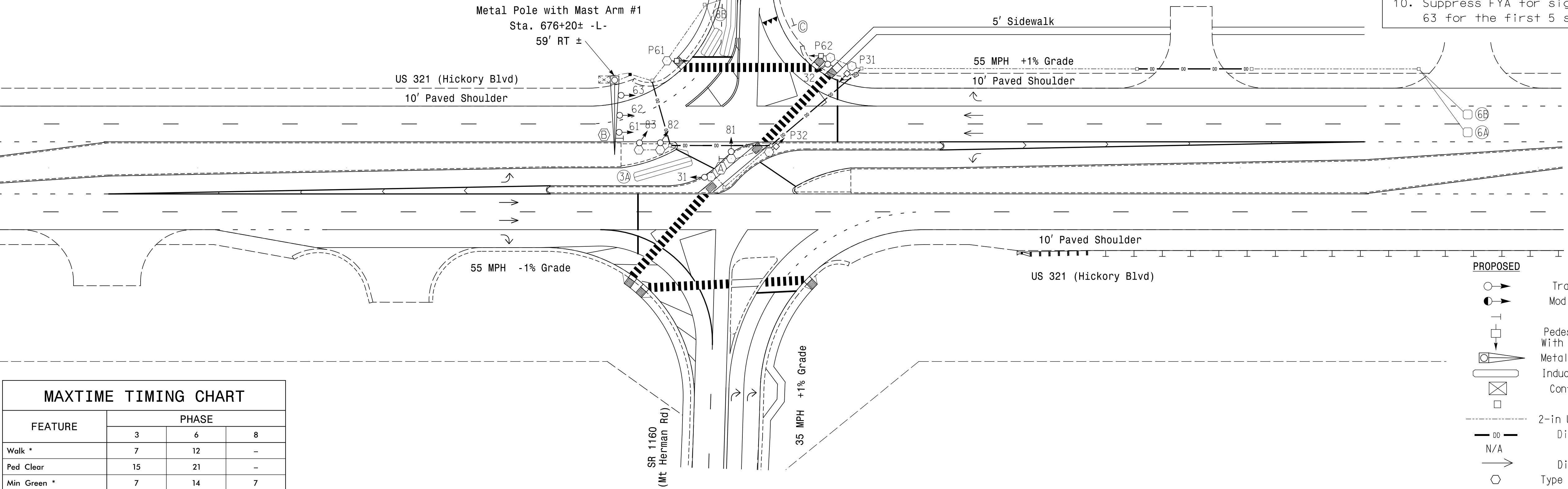


ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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



MAXTIME TIMING CHART

FEATURE	PHASE		
	3	6	8
Walk *	7	12	-
Ped Clear	15	21	-
Min Green *	7	14	7
Passage *	2.0	6.0	2.0
Max 1 *	30	90	20
Yellow Change	3.0	5.1	3.1
Red Clear	2.4	1.4	2.3
Added Initial *	-	1.5	-
Maximum Initial *	-	46	-
Time Before Reduction *	-	15	-
Time To Reduce *	-	30	-
Minimum Gap	-	3.4	-
Advance Walk	-	-	-
Non Lock Detector	X	-	X
Vehicle Recall	-	MIN RECALL	-
Dual Entry	X	-	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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	N/A
Modified Signal Head	N/A
Sign	N/A
Pedestrian Signal Head With Push Button & Sign	N/A
Metal Pole with Mastarm	N/A
Inductive Loop Detector	N/A
Controller & Cabinet	N/A
Junction Box	N/A
2-in Underground Conduit	N/A
Directional Drill	N/A
Right of Way	N/A
Directional Arrow	N/A
Type II Signal Pedestal	N/A
Curb Ramp	N/A
No U-Turn Sign (R3-4)	N/A
No Left Turn Sign (R3-2)	N/A
"YIELD" Sign (R1-2)	N/A

Signal Upgrade - Final Design

stv
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

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

US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson
PLAN DATE: June 2024 REVIEWED BY: D.J. Darity
PREPARED BY: J.T. Grimm REVIEWED BY: T.M. Woody

REVISIONS	INIT.	DATE

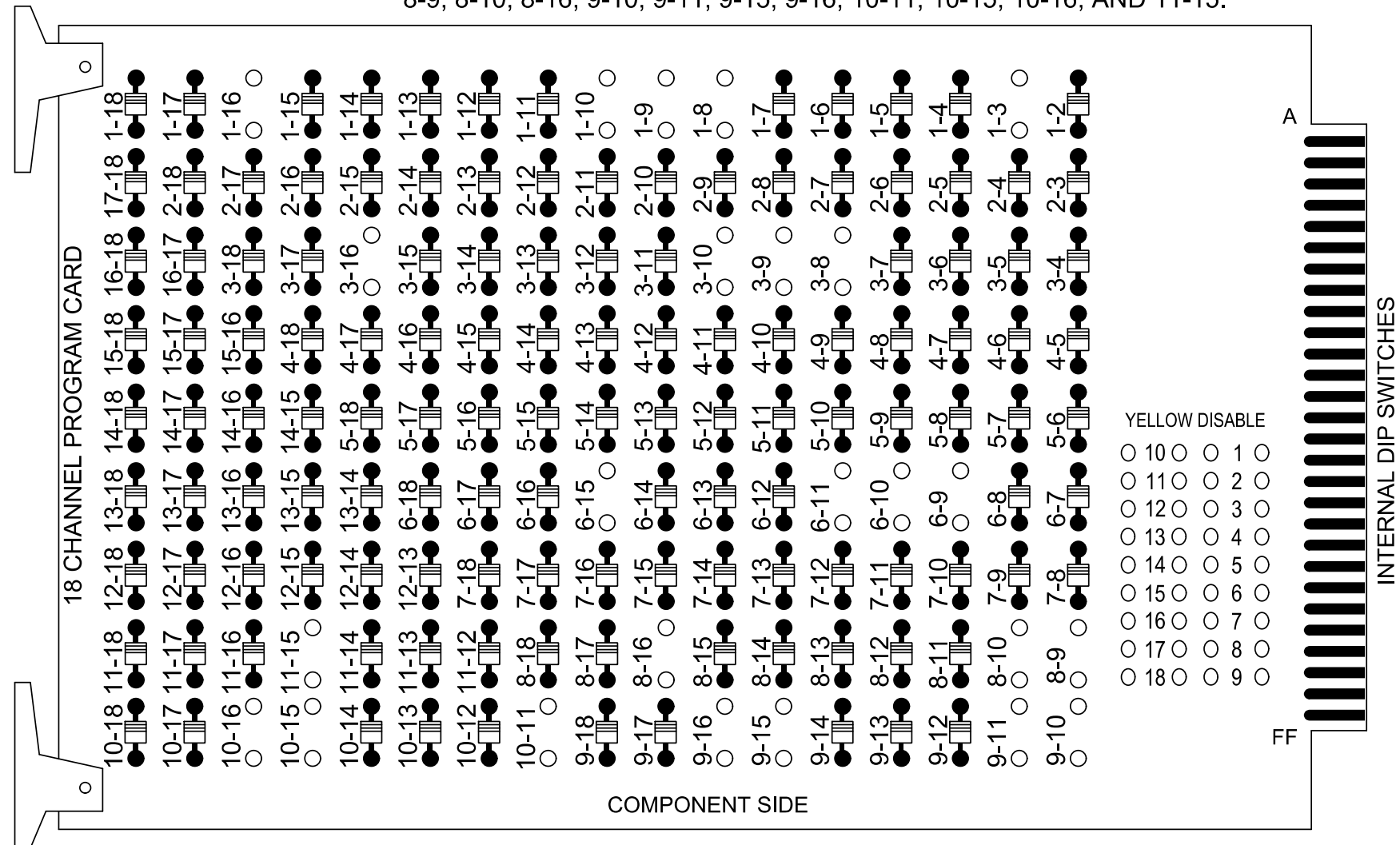
DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
040329
ENGINEER
TRENT M. WOODY
DocuSigned by:
Trent M. Woody
6/10/2024
DATE
SIC. INVENTORY NO. 11-0810

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

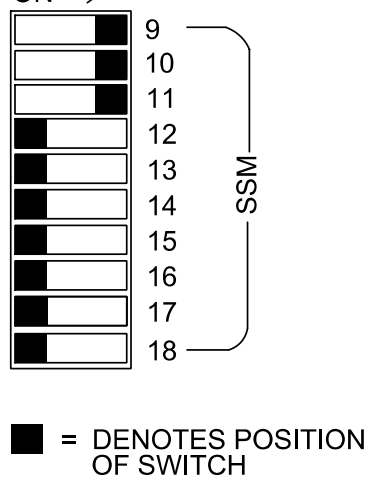
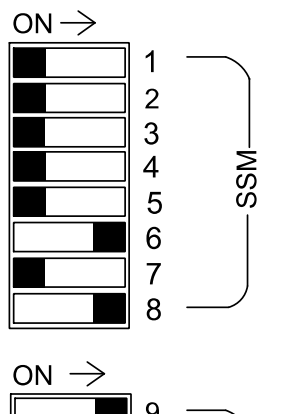
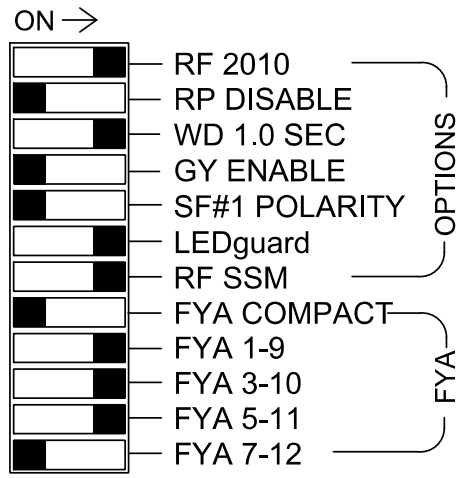
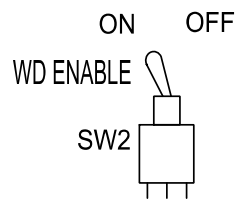
REMOVE DIODE JUMPERS 1-3, 1-8, 1-9, 1-10, 1-16, 3-8, 3-9, 3-10, 3-16, 6-9, 6-10, 6-11, 6-15,
8-9, 8-10, 8-16, 9-10, 9-11, 9-15, 9-16, 10-11, 10-15, 10-16, AND 11-15.



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 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 phases 3 and 8 for Dual Entry.
- Program controller to start up in phase 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 321 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, S4, S8, S9, S11, S12, AUX S1, AUX S2, AUX S4.
Phases Used.....3, 3PED, 6, 6PED, 8
Overlap "1".....*
Overlap "2".....*
Overlap "3".....*
Overlap "4".....NOT USED
Overlap "7".....*

*See overlap programming detail on sheet 2

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 5.1

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	OL7	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	3 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	32★	NU	NU	31★	NU	NU	NU	61	62	P61, P62	NU	81, 82, 83	P31, P32	32★	31★	NU	63★	NU
RED								134	134			107					A114	
YELLOW	*			*				135	135									
GREEN								136										
RED ARROW													A121	A124				
YELLOW ARROW											108		A122	A125		A115		
FLASHING YELLOW ARROW													A123	A126		A116		
GREEN ARROW	127			118				136			109							
Hand icon										119		110						
Walking person icon										121		112						

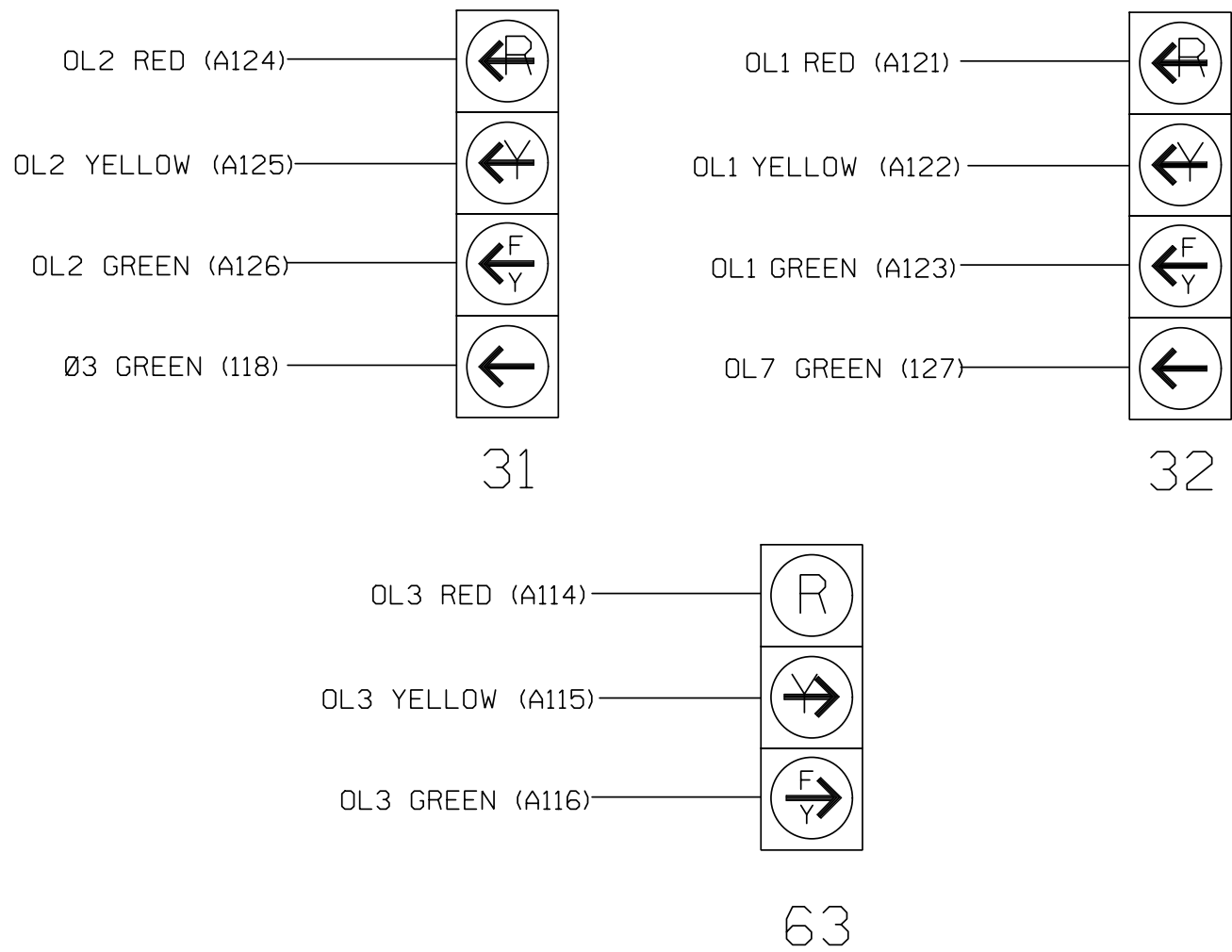
NU = Not Used

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

★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	10-18	11-17	12-16	13-15	14-14	15-13	16-12	17-11	18-10	19-9	20-8	21-7	22-6	23-5
L	10-18	11-17	12-16	13-15	14-14	15-13	16-12	17-11	18-10	19-9	20-8	21-7	22-6	23-5
U	10-18	11-17	12-16	13-15	14-14	15-13	16-12	17-11	18-10	19-9	20-8	21-7	22-6	23-5
L	10-18	11-17	12-16	13-15	14-14	15-13	16-12	17-11	18-10	19-9	20-8	21-7	22-6	23-5

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

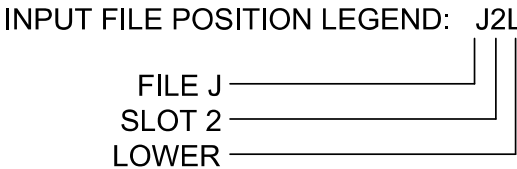
FS = FLASH SENSE
ST = STOP TIME

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
3A	TB4-5,6	I6U	58	20	7★	3	15.0		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
8A	TB5-9,10	J6U	42	4	22	8	15.0		X		X	
8B	TB5-11,12	J6L	46	8	23	8	15.0		X		X	
PED PUSH BUTTONS												
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						
P31,P32	TB8-8,9	I13L	70	36	8	PED 3						

NOTE:
INSTALL DC ISOLATORS
IN INPUT FILE SLOT I13.

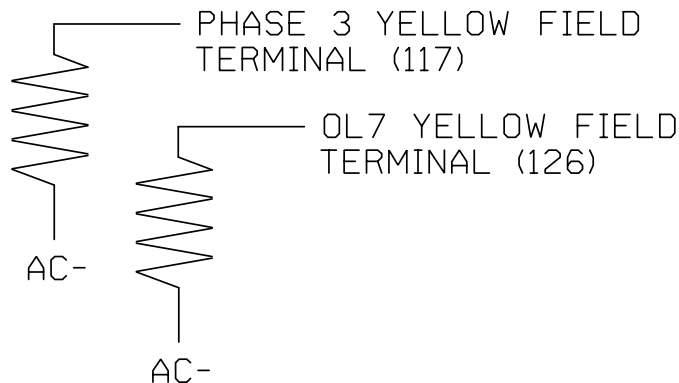
* For the detectors to work as shown on the signal plan, see the Vehicle Detector Setup Programming Detail for Alternate Phasing on sheet 3.



LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

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



ELECTRICAL DETAIL SHEET 1 OF 3

ELECTRICAL AND PROGRAMMING
DETAILS FOR:



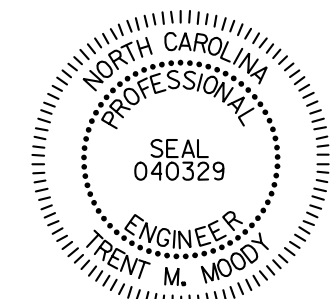
US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson
PLAN DATE: June 2024 REVIEWED BY: D.J. Darity
PREPARED BY: R.L. Aristondo REVIEWED BY: T.M. Woody

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL



DocuSigned by:
T.M. Woody
6/10/2024
DATE
SIC. INVENTORY NO. 11-0810

PED 3 PROGRAMMING DETAIL

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

Web Interface
Home >Controller >Detector Configuration >Pedestrian Detector

Plan 1

Detector	Description	Call Phase	Call Overlap
2		2	0
4		4	0
6	P61, P62	6	0
8	P31, P32	3	0

NOTICE PHASE 3 PED
ASSIGNED TO
DETECTOR 8 PED

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	Overlap	7		X	X	1
2	Phase Vehicle	2		X		2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		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	3				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

NOTE OL7
ASSIGNED TO
CHANNEL 1

NOTICE PHASE 3 PED
ASSIGNED TO CHANNEL 16

NOTE: ALL RED FLASH

MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters

StartUp Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

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	1	2	3	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4-Section	Normal
Included Phases	6	6	6	3
Modifier Phases	-	3	-	-
Modifier Overlaps	7	-	-	-
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	5.0	5.0	5.0	0.0

NOTICE OL7

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	1	2	3	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	-	-	6	3
Modifier Phases	-	3	-	-
Modifier Overlaps	7	-	-	-
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	0.0	0.0	5.0	0.0

NOTICE INCLUDED PHASES
ON OL1 AND OL2

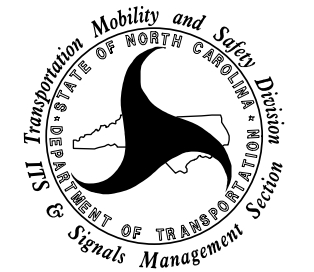
NOTICE FYA Ped
Delay times

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-0810
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

ELECTRICAL DETAIL SHEET 2 OF 3

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared for the Offices of:



US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson

PLAN DATE: June 2024 REVIEWED BY: D.J. Darity

PREPARED BY: R.L. Aristondo REVIEWED BY: T.M. Woody

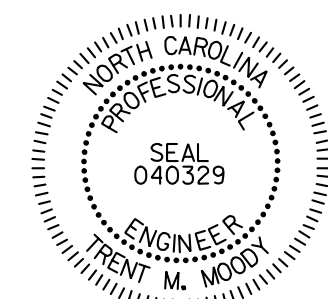
REVISIONS INIT. DATE

DocuSigned by: Trent M. Moody 6/10/2024

SIG. INVENTORY NO. 11-0810

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL



DocuSigned by: Trent M. Moody 6/10/2024

SIG. INVENTORY NO. 11-0810

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 OVERLAPS 1 AND 2, AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 31 and 32 to run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 3A and reduces delay time for phase 3 call on loop 3A to 0 seconds.

MAXTIME DETECTOR PROGRAMMING DETAIL
FOR ALTERNATE PHASING LOOP 3A

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.

3A

PLAN 2		
Detector	Call Phase	Delay
7	3	0

MAXTIME ALTERNATE PHASING PATTERN
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

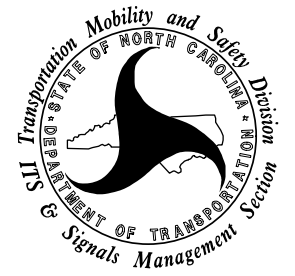
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-0810
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

ELECTRICAL DETAIL SHEET 3 OF 3



STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

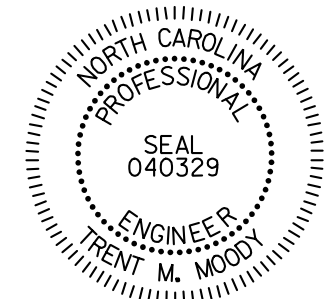
Prepared for the Offices of:

750 N.Greenfield Pkwy, Garner, NC 27529

US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt Herman Road)

Division 11	Caldwell County	Hudson
PLAN DATE: June 2024	REVIEWED BY: D.J. Darity	
PREPARED BY: R.L. Aristondo	REVIEWED BY: T.M. Woody	
REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL



SEAL
040329
Trent M. Woody
ENGINEER

DocuSigned by:


Trent M. Woody

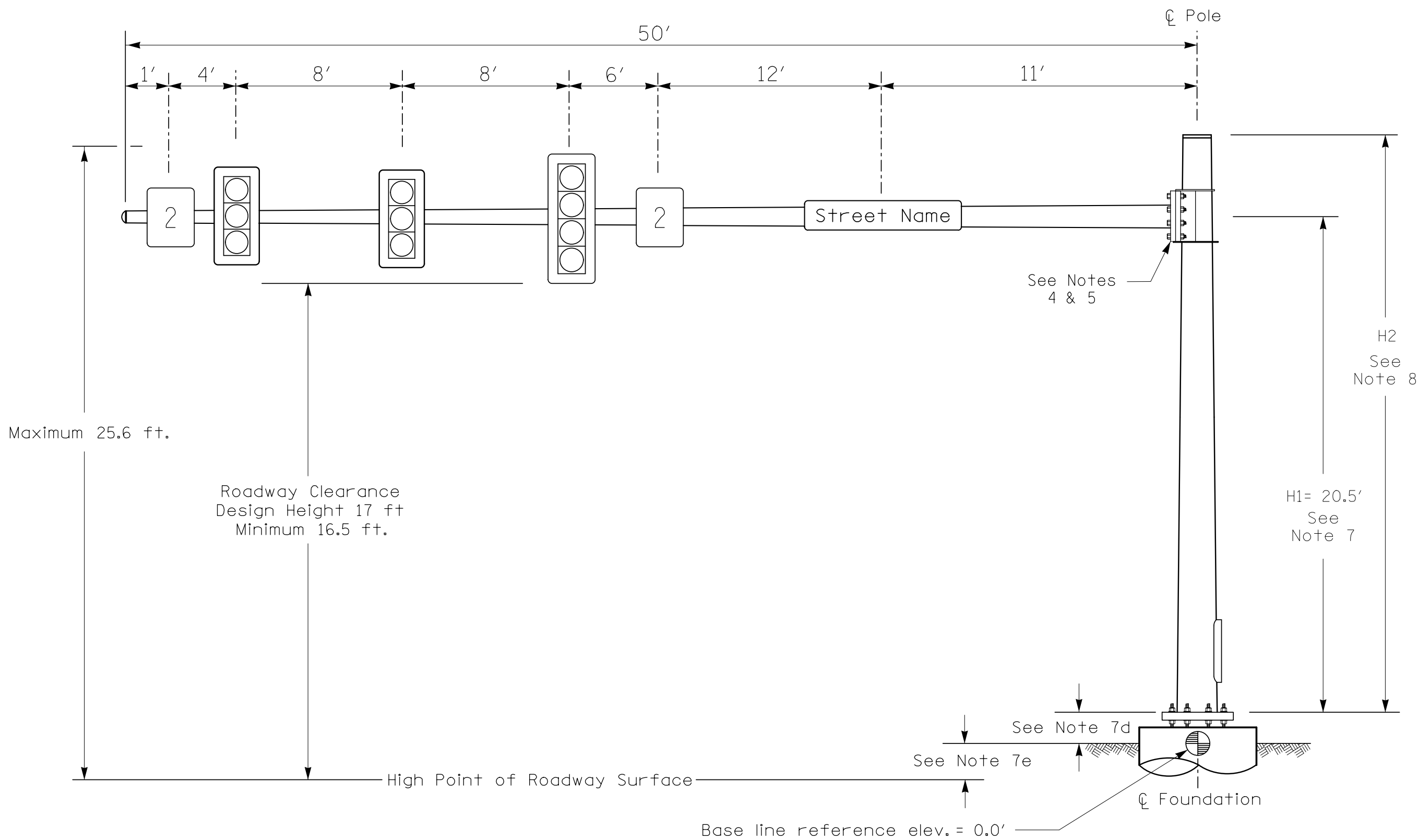
6/10/2024

SIGNATURE

DATE

SIG. INVENTORY NO. 11-0810

Design Loading for METAL POLE NO. 1



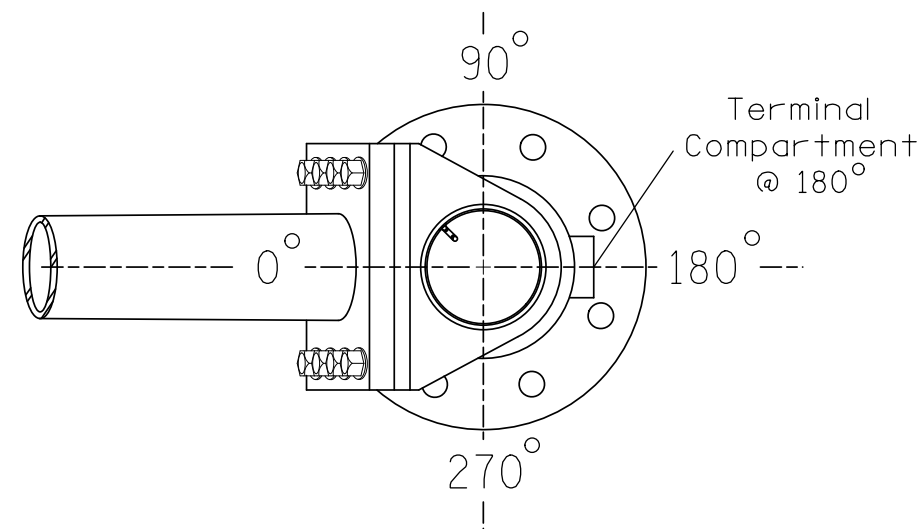
Elevation View @ 270°

SPECIAL NOTE

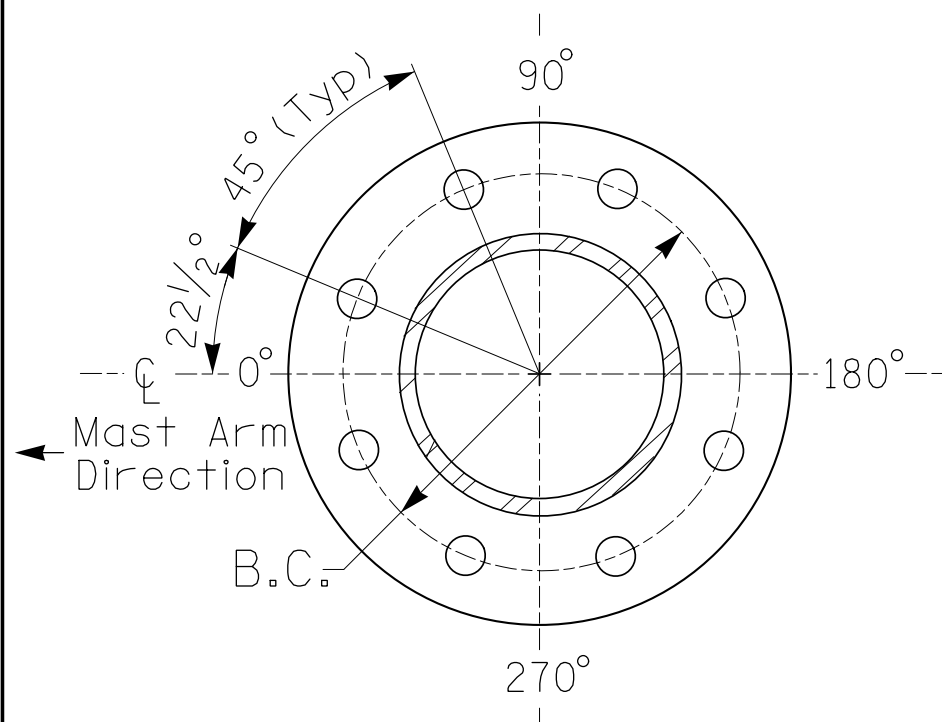
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	N/A
Baseline reference point at @ Foundation @ ground level 	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.5 ft.	0.0 ft.
Elevation difference at Edge of travelway or face of curb	+0.33 ft.	0.0 ft.

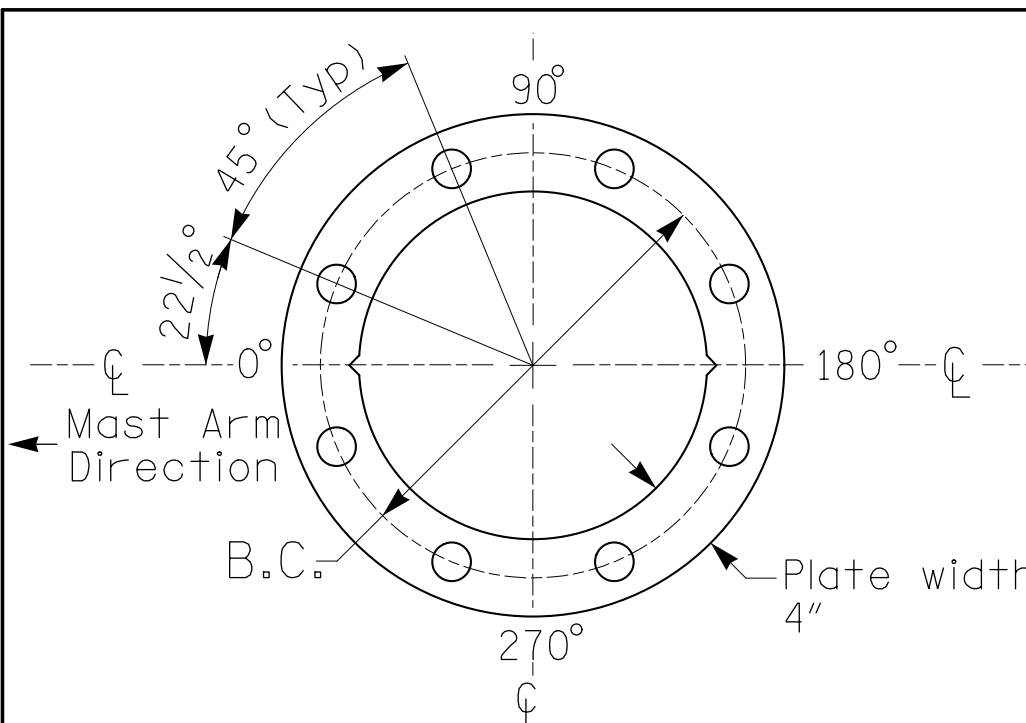


POLE RADIAL ORIENTATION



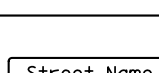
8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1

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
	SIGN RIGID MOUNTED	9.0 S.F.	36.0" W X 36.0" L	17 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

11. 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 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

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
 3. Design all signal supports using stress ratios that do not exceed 0.9.
 4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
 5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
 6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
 7. The mast arm attachment height (H1) shown is based on the following design assumptions:
 - a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
 - b. Signal heads are rigidly mounted and vertically centered on the mast arm.
 - c. The roadway clearance height for design is as shown in the elevation views.
 - d. The top of the pole base plate is 0.75 feet above the ground elevation.
 - e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
 8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
 9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
 10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
 11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.
- 
STV Engineers, Inc.



DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

NCDOT Wind Zone 5 (120 mph)

US 321 (Hickory Boulevard) NB
at
SR 1160 (Mt. Herman Road)

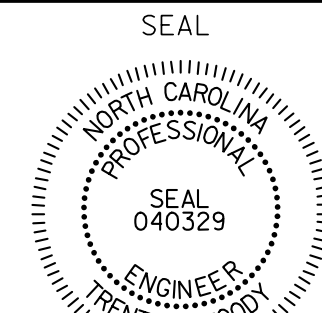
Division 11 Caldwell County Hudson

PLAN DATE: June 2024	REVIEWED BY: D.J. Darity
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PREPARED BY: J.T. Grimm	REVIEWED BY: T.M. Moody
-------------------------	-------------------------

REVISIONS	INIT.	DATE

[illegible]

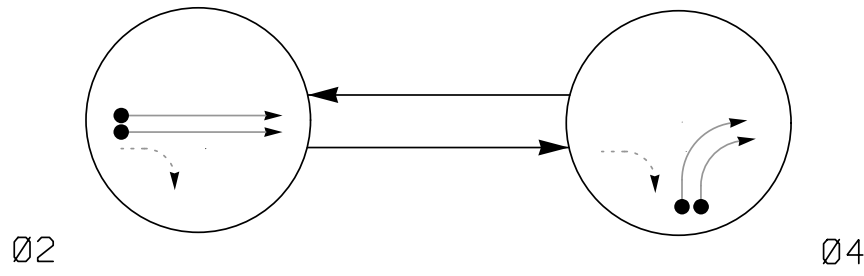


DocuSigned by:  6/19/2024

rent Moody 6/10/2024
45FATT083870MED

SIG.	INVENTORY NO.	11-0810
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PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

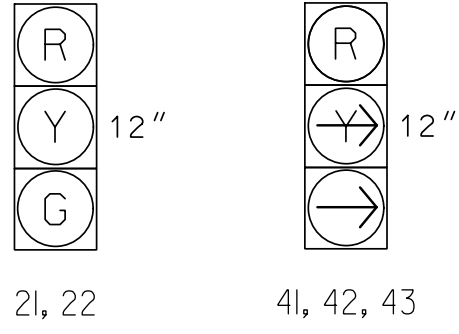
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	Ø 2	Ø 4	FLASH
2L, 22	G	R	R
4L, 42, 43	R	→	R

SIGNAL FACE I.D.

All Heads L.E.D.



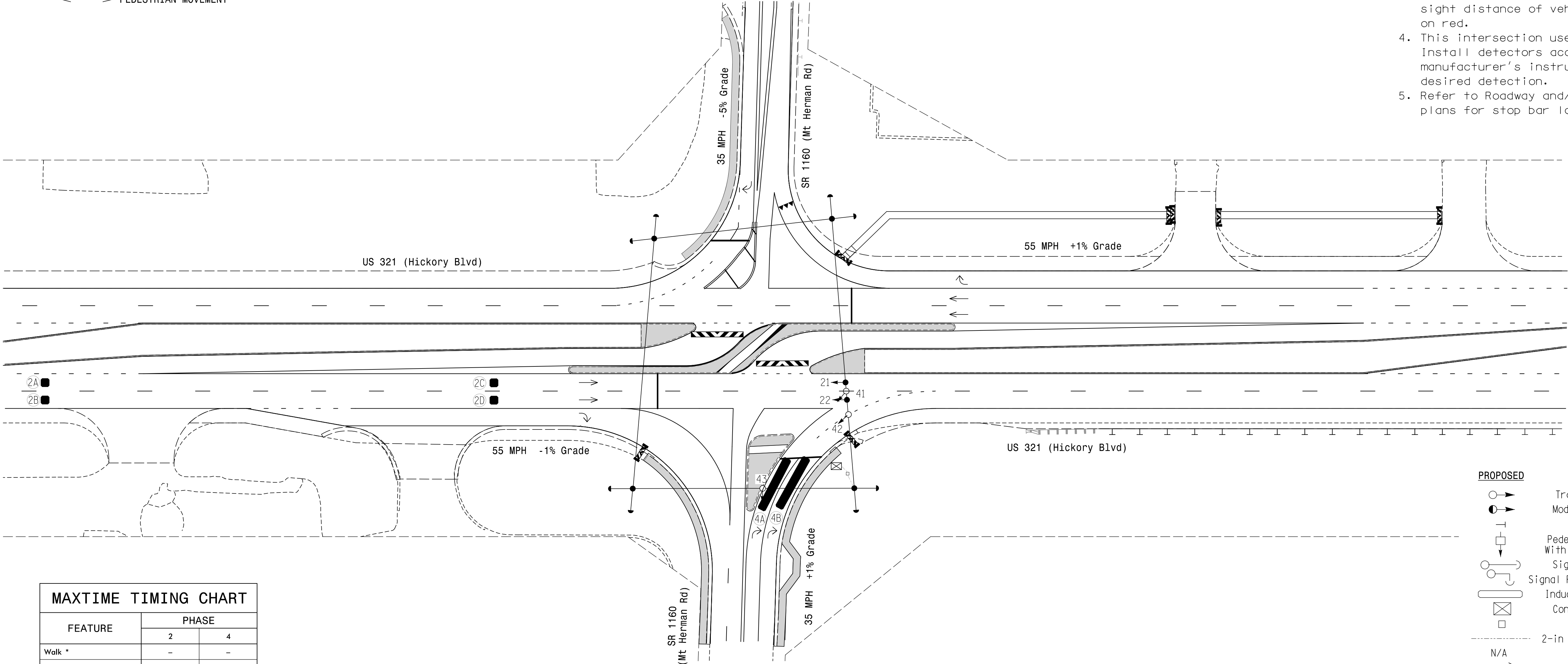
MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
2A, 2B	6X6	420	*	X	2	-	2.0	X	-	X	-
2C, 2D	6X6	110	*	X	2	-	-	X	-	X	-
4A	6X40	0	*	X	4	-	-	X	-	X	-
4B	6X40	0	*	X	4	-	-	X	-	X	-

* Video Detection Zone

2 Phase
Fully Actuated
Isolated

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.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Refer to Roadway and/or Pavement Marking plans for stop bar locations.



MAXTIME TIMING CHART		
FEATURE	PHASE	
	2	4
Walk *	-	-
Ped Clear	-	-
Min Green *	14	7
Passage *	2.0	2.0
Max 1 *	90	20
Yellow Change	5.3	3.0
Red Clear	1.5	3.6
Added Initial *	-	-
Maximum Initial *	-	-
Time Before Reduction *	-	-
Time To Reduce *	-	-
Minimum Gap	-	-
Advance Walk	-	-
Non Lock Detector	-	X
Vehicle Recall	MIN RECALL	-
Dual Entry	-	-

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

LEGEND

PROPOSED	EXISTING

Signal Upgrade
Temporary Design 1 - TMP Phase II

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

Prepared For the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson

PLAN DATE: June 2024 REVIEWED BY: D.J. Darity

PREPARED BY: J.C. Grimm REVIEWED BY: T.M. Woody

REVISIONS INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

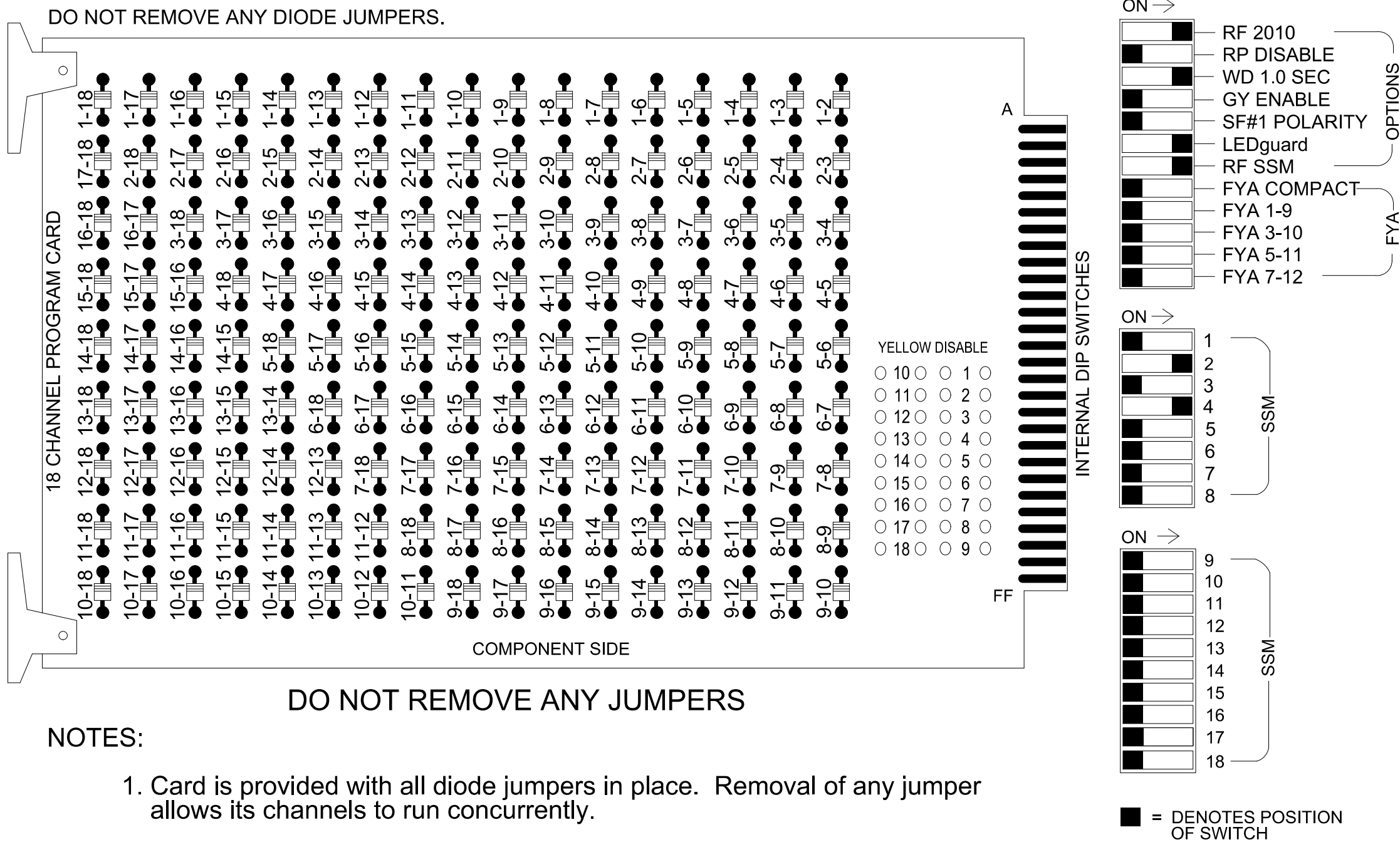
SEAL

DocuSigned by: Trent M. Woody 6/10/2024

SIG. INVENTORY NO. 11-14551

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(do not remove any jumpers and set switches as shown)



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.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

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
Phases Used.....2, 4
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 6.1

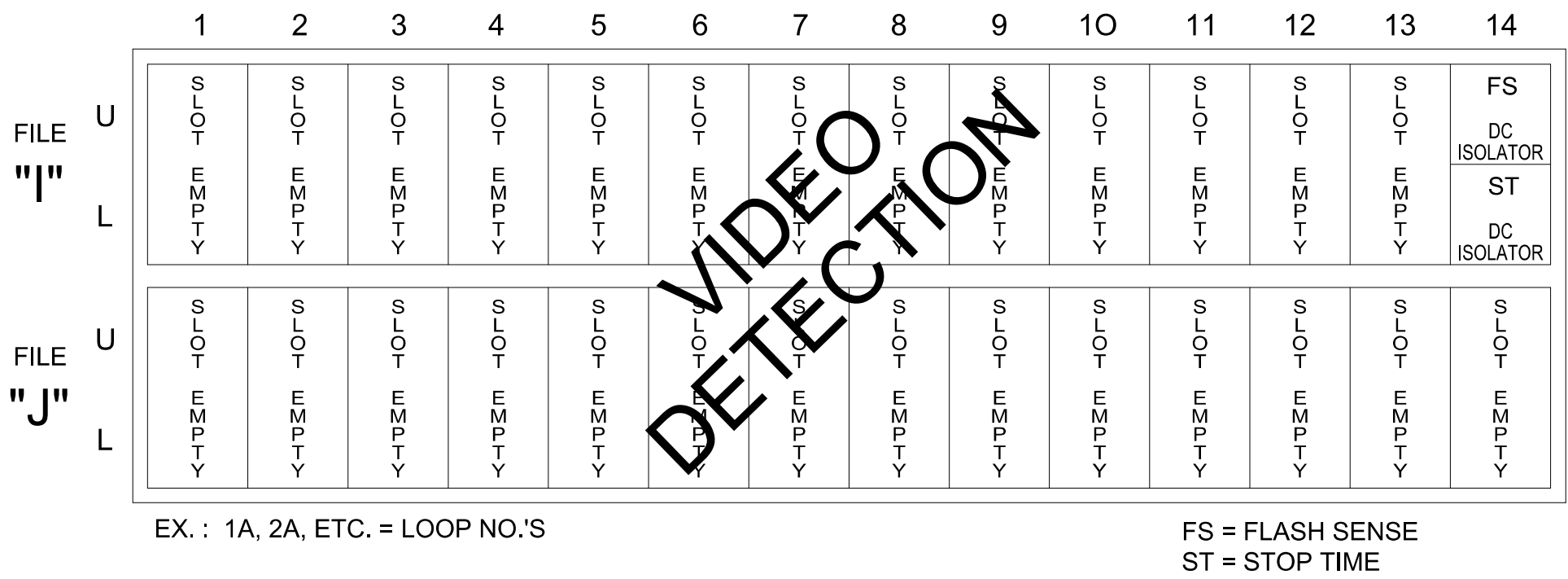
SIGNAL HEAD HOOK-UP CHART

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	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101													
YELLOW		129																
GREEN		130																
RED ARROW																		
YELLOW ARROW					102													
FLASHING YELLOW ARROW																		
GREEN ARROW					103													
Hand icon																		
Walking person icon																		

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



SPECIAL DETECTOR NOTE

Install a video 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.

MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters	Unit Flash Parameters
StartUp Clearance Hold	All Red Flash Exit Time
6	6

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	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		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

↑ ↑
NOTE: ALL RED FLASH

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1455T
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A



ELECTRICAL DETAIL

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared For the Offices of:

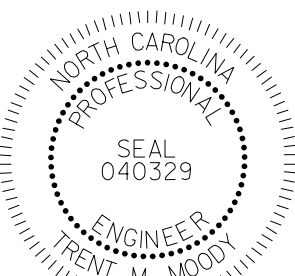


US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt Herman Road)

Division 11	Caldwell County	Hudson
PLAN DATE: June 2024	REVIEWED BY: D.J. Darity	
PREPARED BY: R.L. Aristondo	REVIEWED BY: T.M. Woody	
REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL



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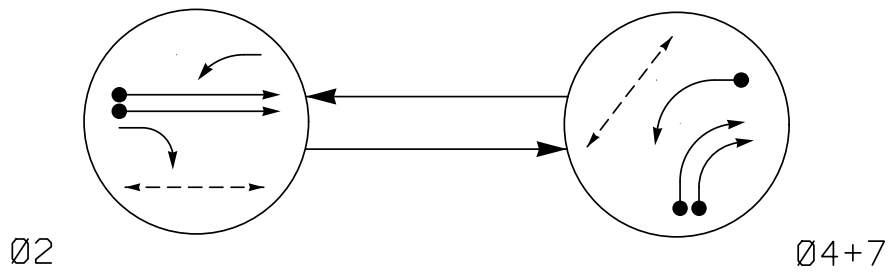
Trent Moody

6/10/2024

DATE

SIG. INVENTORY NO. 11-1455T

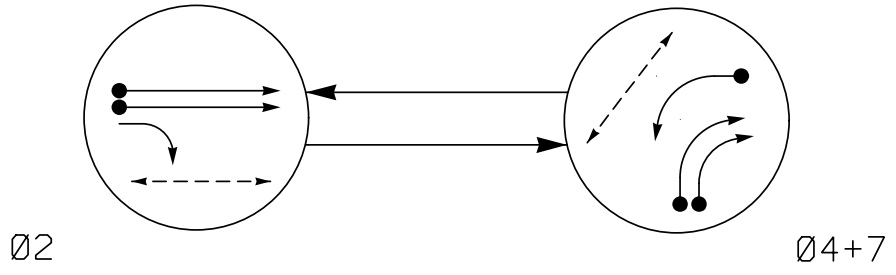
DEFAULT PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION				
SIGNAL FACE	PHASE			
	Ø 2	Ø 4 + 7	F L A S H	
21	↑	R	R	
22	G	R	R	
23	↙	R	R	
41, 42, 43	R	→	R	
71, 72	↙	←	↘	
P21, P22	W	DW	DRK	
P71, P72	DW	W	DRK	

ALTERNATE PHASING TABLE OF OPERATION				
SIGNAL FACE	PHASE			
	Ø 2	Ø 4 + 7	F L A S H	
21	↑	R	R	
22	G	R	R	
23	↙	R	R	
41, 42, 43	R	→	R	
71, 72	↘	←	↙	
P21, P22	W	DW	DRK	
P71, P72	DW	W	DRK	

ALTERNATE PHASING DIAGRAM

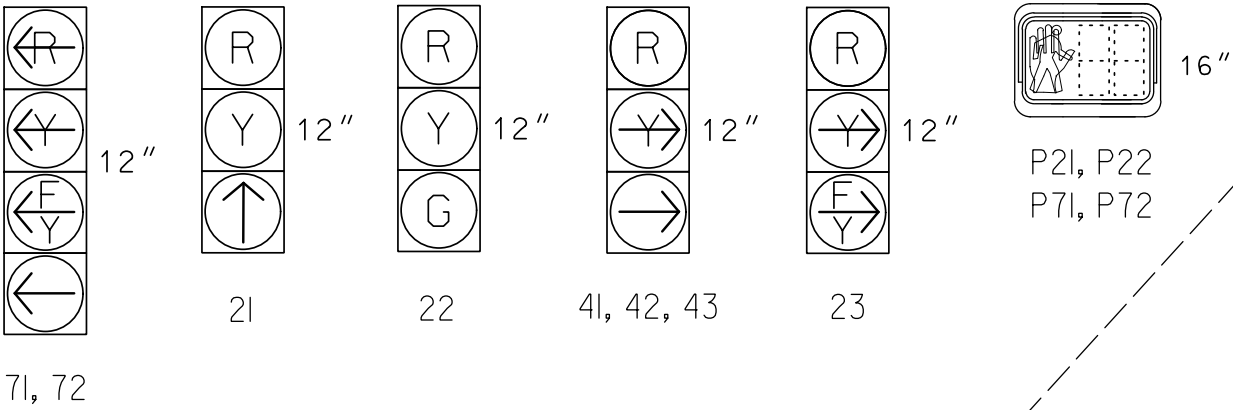


PHASING DIAGRAM DETECTION LEGEND

- ←●→ DETECTED MOVEMENT
- ←→ UNDETECTED MOVEMENT (OVERLAP)
- ←- - - UNSIGNALIZED MOVEMENT
- ←- - - PEDESTRIAN MOVEMENT

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR							PROGRAMMING					
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	420	5	X	2	-	-	X	X	X	-	X
2B	6X6	420	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	15.0	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	15.0	-	X	-	X	-	X
7A	6X40	0	2-4-2	X	7	*15.0	-	X	-	X	-	X

* Disable Delay During Alternate Phasing Operation.

2 Phase
Fully Actuated with Alternate Phasing Operation
US 321 Closed Loop System

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.
- 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.
- 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.
- Pedestal mounted signal heads shall be mounted a minimum of 8' above the high point of the roadway surface elevation.
- Refer to Roadway and/or Pavement Marking plans for stop bar locations.
- Suppress FYA for signal heads 71, 72, and 23 for the first 7 seconds of phase 2 ped.

LEGEND

- | PROPOSED | EXISTING |
|--|----------|
| ○→ Traffic Signal Head | ●→ N/A |
| ●→ Modified Signal Head | N/A |
| ⊥ Sign | ⊥ |
| ⊥ Pedestrian Signal Head With Push Button & Sign | ⊥ |
| ⊥ Metal Pole with Mastarm | ⊥ |
| ⊥ Inductive Loop Detector | ⊥ |
| ⊥ Controller & Cabinet | ⊥ |
| ⊥ Junction Box | ⊥ |
| ⊥ 2-in Underground Conduit | ⊥ |
| ⊥ Directional Drill | N/A |
| ⊥ Right of Way | ⊥ |
| → Directional Arrow | → |
| ⊥ Pedestrian Pushbutton | ⊥ |
| ○ Type II Signal Pedestal | ● |
| N/A Curb Ramp | ⊥ |
| ⊥ No U-Turn Sign (R3-4) | ⊥ |
| ⊥ No Left Turn Sign (R3-2) | ⊥ |

MAXTIME TIMING CHART				
FEATURE	PHASE			
	2	4	7	
Walk *	14	-	7	
Ped Clear	27	-	18	
Min Green *	14	7	7	
Passage *	6.0	2.0	2.0	
Max 1 *	90	20	30	
Yellow Change	5.3	3.0	3.0	
Red Clear	1.8	2.8	2.6	
Added Initial *	1.5	-	-	
Maximum Initial *	46	-	-	
Time Before Reduction *	15	-	-	
Time To Reduce *	30	-	-	
Minimum Gap	3.4	-	-	
Advance Walk	-	-	-	
Non Lock Detector	-	X	X	
Vehicle Recall	MIN RECALL	-	-	
Dual Entry	-	X	X	

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

Signal Upgrade - Final Design

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STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N. Greenfield Pkwy, Garner, NC 27529
SCALE
0 40
1"=40'

US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt Herman Road)

Division 11 Caldwell County Hudson

PLAN DATE: June 2024 REVIEWED BY: D.J. Darity

PREPARED BY: J.T. Grimm REVIEWED BY: T.M. Woody

REVISIONS INIT. DATE

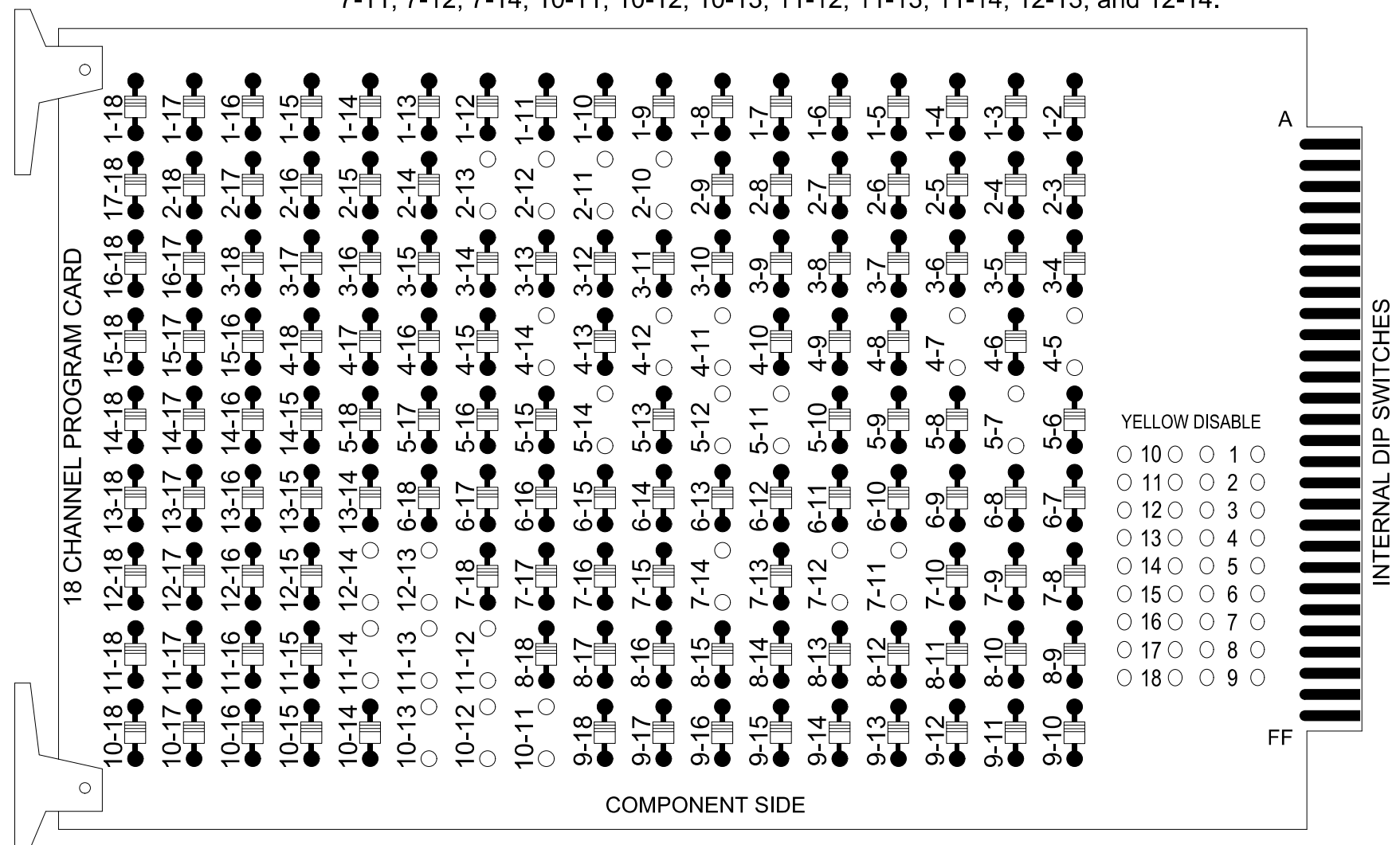
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NORTH CAROLINA
PROFESSIONAL
SEAL 040329
ENGINEER
TRENT M. MOODY
DocuSigned by:
Trent Moody
6/10/2024
SIC. INVENTORY NO. 11-1455

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

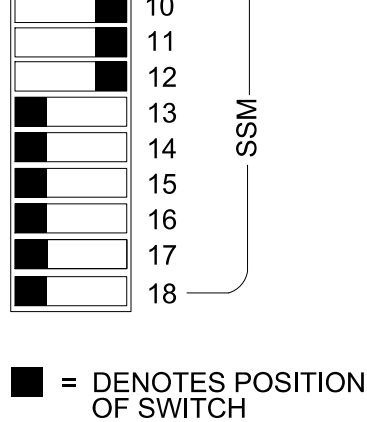
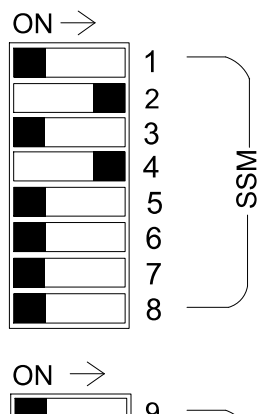
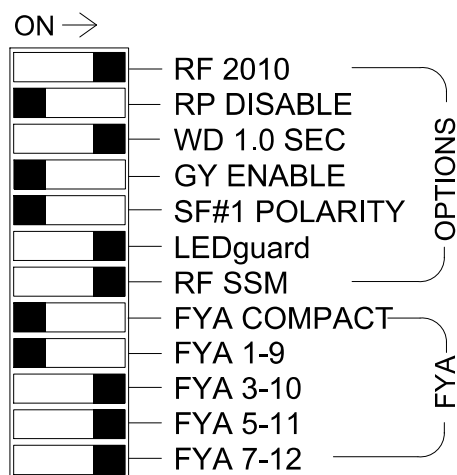
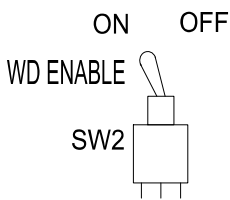
REMOVE DIODE JUMPERS: 2-10, 2-11, 2-12, 2-13, 4-5, 4-7, 4-11, 4-12, 4-14, 5-7, 5-11, 5-12, 5-14,
7-11, 7-12, 7-14, 10-11, 10-12, 10-13, 11-12, 11-13, 11-14, 12-13, and 12-14.



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 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.



■ = DENOTES POSITION OF SWITCH

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 phases 4 and 7 for Dual Entry.
- Program controller to start up in phase 2 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 321 Closed Loop Signal 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.....S2, S3, S5, S6, S7, S10,
AUX S2, AUX S4, AUX S5
Phases Used.....2, 2PED, 4, 7, 7PED
Overlap "1".....NOT USED
Overlap "2".....*
Overlap "3".....*
Overlap "4".....*
Overlap "7".....*

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

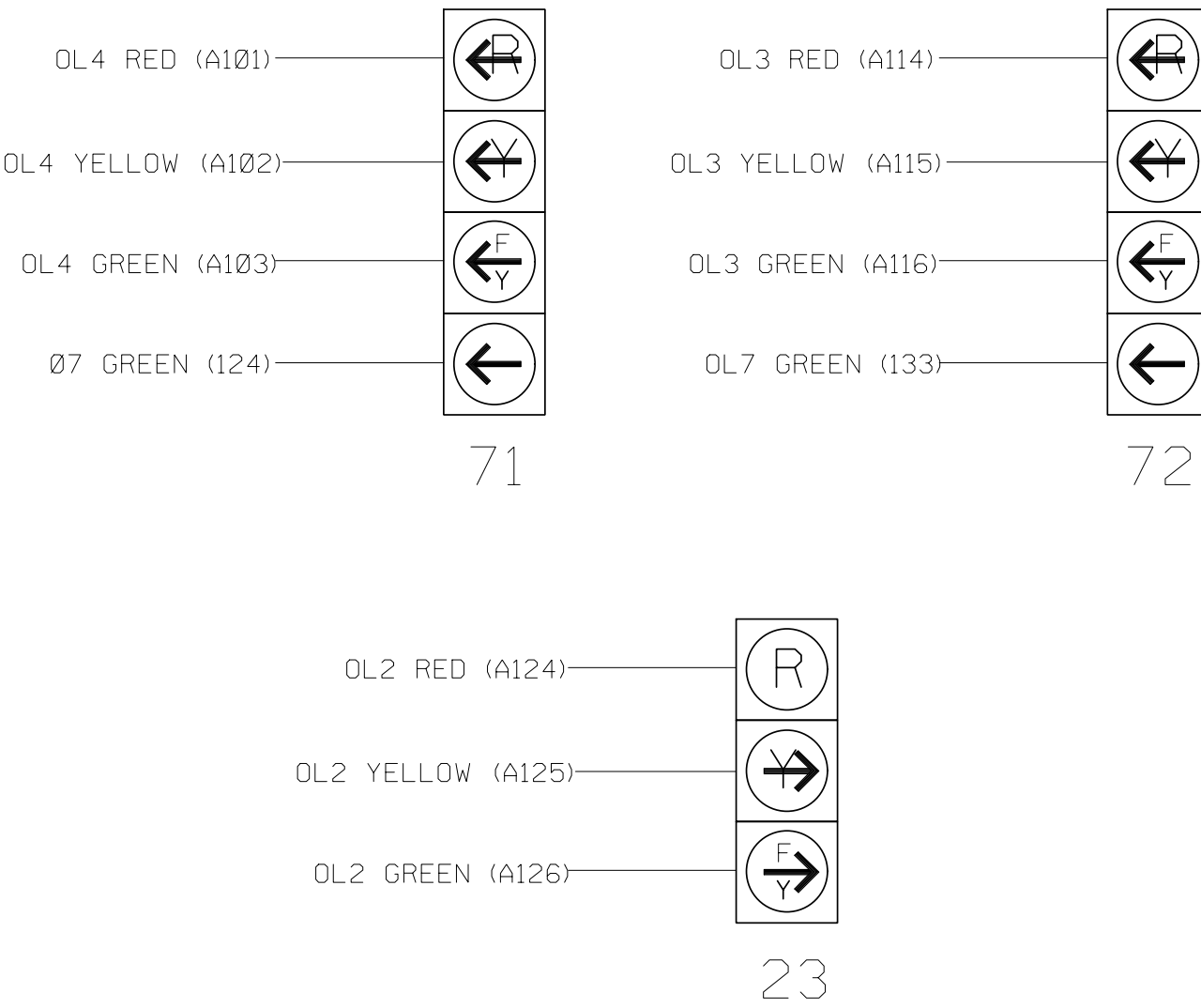
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6	
CMU CHANNEL NO.	1	2		13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2		2 PED	3	4	7 PED	OL7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22	P21, P22	NU	41, 42, 43	P71, P72	72★	NU	NU	71★	NU	NU	NU	23★	NU	72★	71★	NU
RED		128	128			101									A124				
YELLOW		129	129					★			★								
GREEN			130																
RED ARROW																	A114	A101	
YELLOW ARROW						102								A125			A115	A102	
FLASHING YELLOW ARROW														A126			A116	A103	
GREEN ARROW		130				103		133			124								
				113			104												
				115			106												

NU = Not Used

* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

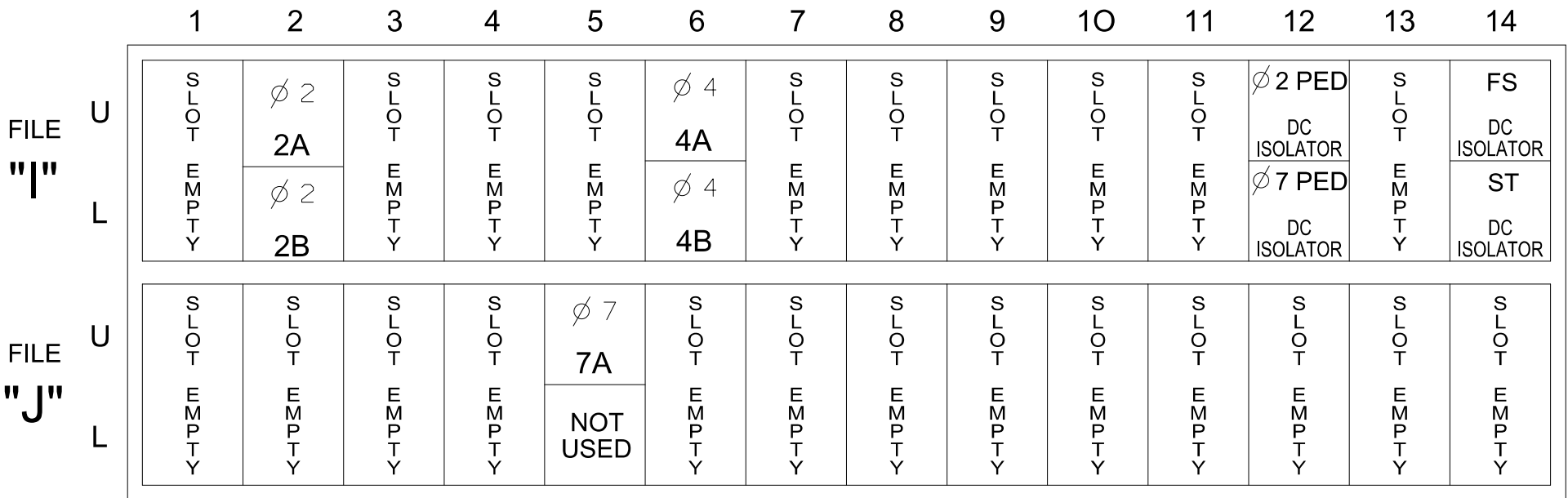
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

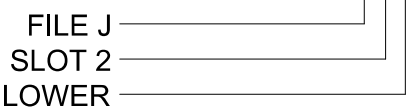
FS = FLASH SENSE
ST = STOP TIME

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	X
2B	TB2-7.8	I2L	43	5	3	2				X	X	X
4A	TB4-9,10	I6U	41	3	8	4	15.0			X		X
4B	TB4-11,12	I6L	45	7	9	4	15.0			X		X
7A	TB5-5.6	J5U	57	19	21	★	7	15.0		X		X
PED PUSH BUTTONS												
P21,P22	TB8-4.6	I12U	67	33	2	PED 2						
P71,P72	TB8-5.6	I12L	69	35	4	PED 7						

★ For the detectors to work as shown on the signal plan, see the Vehicle Detector Setup Programming Detail for Alternate Phasing on sheet 3.

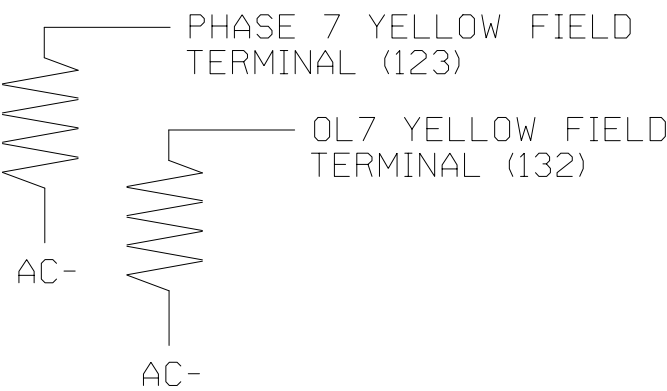
INPUT FILE POSITION LEGEND: J2L



LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

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



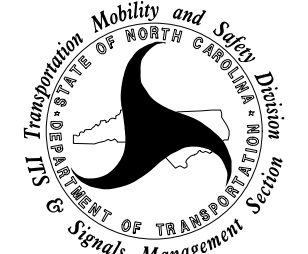
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900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

ELECTRICAL DETAIL SHEET 1 OF 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:



750 N.Greenfield Pkwy, Garner, NC 27529

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1455
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt Herman Road)

Division 11	Caldwell County	Hudson
PLAN DATE: June 2024	REVIEWED BY: D.J. Darity	
PREPARED BY: R.L. Aristondo	REVIEWED BY: T.M. Woody	
REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
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SIGNATURES COMPLETED

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DocuSigned by:
Trent Moody
6/10/2024
SIC. INVENTORY NO. 11-1455

PED 7 PROGRAMMING DETAIL AND
OUTPUT CHANNEL CONFIGURATION

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

Web Interface
Home >Controller >Detector Configuration >Pedestrian Detector

Plan 1

Detector	Description	Call Phase	Call Overlap
2	P21,P22	2	0
4	P71,P72	7	0
6		6	0
8		8	0

NOTICE PHASE 7 PED
ASSIGNED TO
DETECTOR 4 PED →

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	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Overlap	7		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		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	7				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

NOTE OL7 ASSIGNED
TO CHANNEL 5 →

NOTICE PHASE 7 PED
ASSIGNED TO CHANNEL 14 →

↑ ↑
NOTE: ALL RED FLASH

MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Unit

Web Interface
Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters

StartUp Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

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	3	4	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	2	2	2	7
Modifier Phases	-	-	7	-
Modifier Overlaps	-	7	-	-
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	7.0	7.0	7.0	0.0

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	3	4	7
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal
Included Phases	2	-	-	7
Modifier Phases	-	-	7	-
Modifier Overlaps	-	7	-	-
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	7.0	0.0	0.0	0.0

← NOTICE INCLUDED PHASES
ON OL3 AND OL4

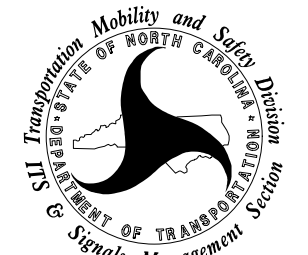
← NOTICE FYA Ped
Delay times

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1455
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

ELECTRICAL DETAIL SHEET 2 OF 3

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared for the Offices of:



750 N.Greenfield Pkwy, Garner, NC 27529

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900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt Herman Road)

Division 11	Caldwell County	Hudson
PLAN DATE: June 2024	REVIEWED BY: D.J. Darity	
PREPARED BY: R.L. Aristondo	REVIEWED BY: T.M. Woody	
REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
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SIGNATURES COMPLETED

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DocuSigned by:

Trent Moody

6/10/2024

DATE

SIG. INVENTORY NO. 11-1455

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 7.3

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 OVERLAPS 3 AND 4, AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 71 and 72 to run protected turns only.

VEH DET PLAN 2: Disables phase 2 call on loop 7A and reduces delay time for phase 7 call on loop 7A to 0 seconds.

MAXTIME DETECTOR PROGRAMMING DETAIL
FOR ALTERNATE PHASING LOOP 7A

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.

7A	PLAN 2		
	Detector	Call Phase	Delay
	21	7	0

MAXTIME ALTERNATE PHASING PATTERN
PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

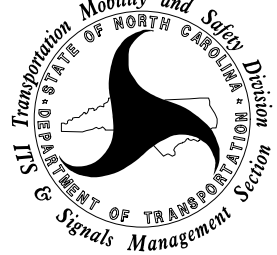
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1455
DESIGNED: June 2024
SEALED:
REVISED: N/A

ELECTRICAL DETAIL SHEET 3 OF 3

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Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared for the Offices of:

750 N.Greenfield Pkwy, Garner, NC 27529

US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt Herman Road)

Division 11Caldwell CountyHudson

PLAN DATE: June 2024REVIEWED BY: D.J. Darity

PREPARED BY: R.L. AristondoREVIEWED BY: T.M. Woody

REVISIONSINIT.DATE

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6/10/2024

SIG. INVENTORY NO. 11-1455

Technical drawing of a traffic signal pole layout. The drawing shows a side view of the pole and its components, including signal heads, a street name sign, and a base. Dimensions are provided for the spacing of the signal heads and the overall length of the pole. The drawing also indicates the height of the pole and the clearance requirements for the roadway.

Dimensions and Spacing:

- Signal head spacing: 1', 4', 8', 8', 4', 10', 20'
- Total pole length: 55'

Components and Labels:

- Signal heads (indicated by circles with 'X' marks)
- Street Name sign
- Pole (indicated by a vertical line)
- Foundation (indicated by a shaded area at the base)

Clearance and Height Requirements:

- Roadway Clearance Design Height 17 ft
- Minimum 16.5 ft.
- Base line reference elev. = 0.0'
- High Point of Roadway Surface
- H1 = 21.0' See Note 7
- H2 See Note 8

Notes:

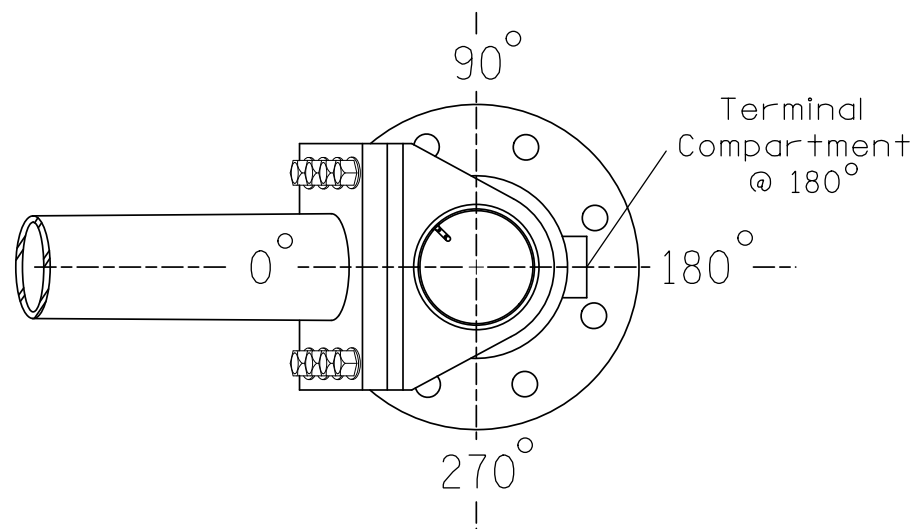
- See Notes 4 & 5
- See Note 7d
- See Note 7e

SPECIAL NOTE

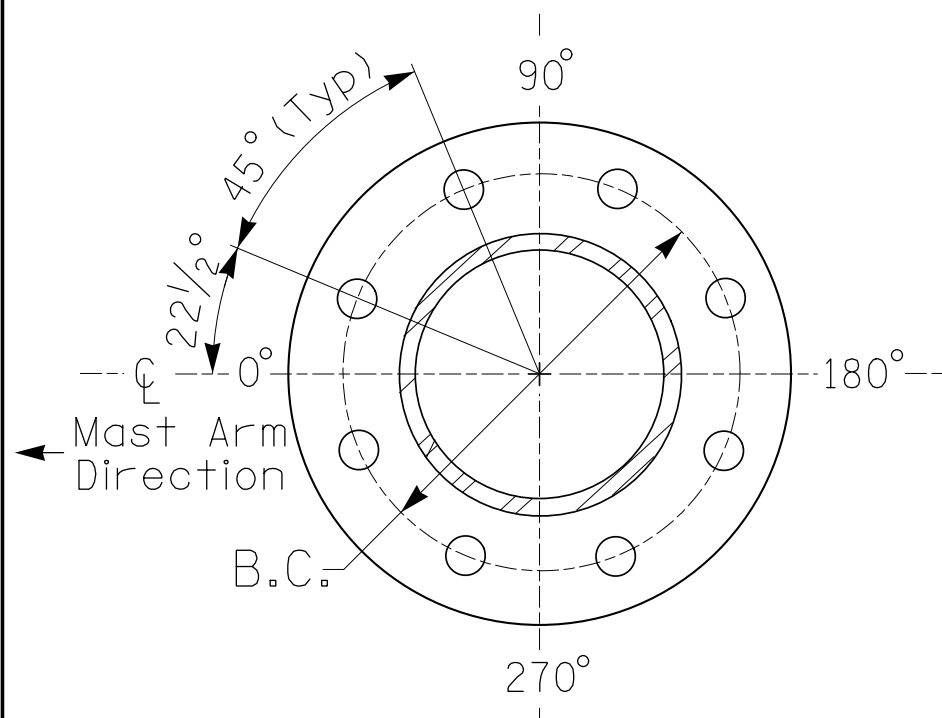
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	N/A
Baseline reference point at @ Foundation @ ground level 	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.8 ft.	0.0 ft.
Elevation difference at Edge of travelway or face of curb	+0.72 ft.	0.0 ft.

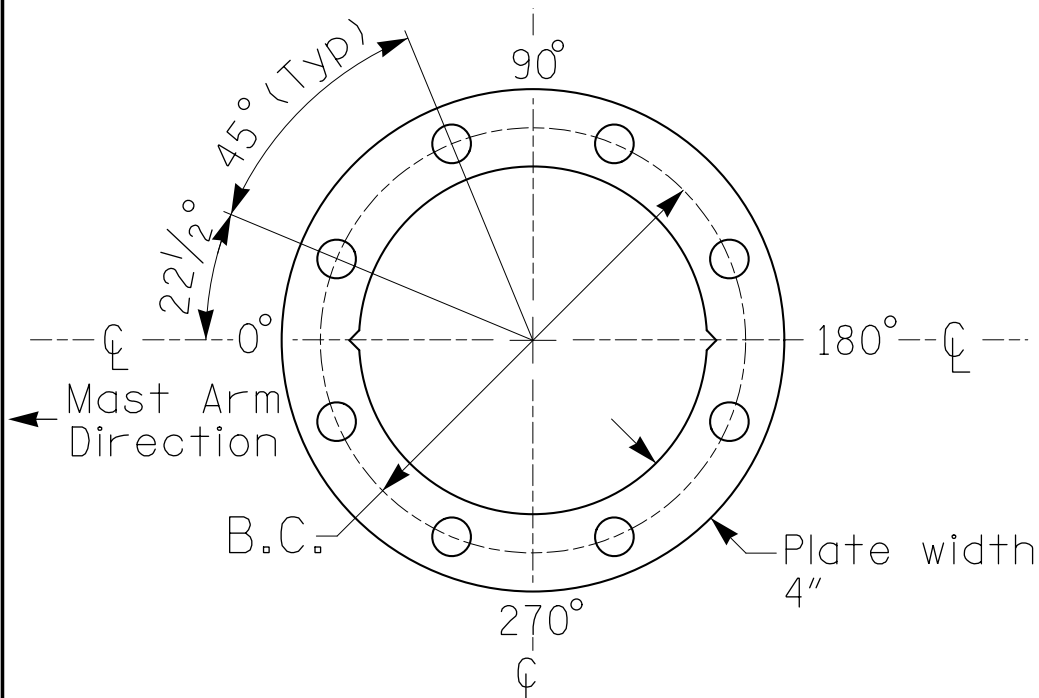


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
U-4700 CA	Sig. 7.4

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
	SIGN RIGID MOUNTED	9.0 S.F.	36.0" W X 36.0" L	17 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. 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 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

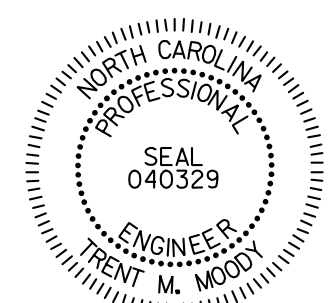
2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
 - a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
 - b. Signal heads are rigidly mounted and vertically centered on the mast arm.
 - c. The roadway clearance height for design is as shown in the elevation views.
 - d. The top of the pole base plate is 0.75 feet above the ground elevation.
 - e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.



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100 West Trade St., Suite 715
Charlotte, NC 28202
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DocuSigned by:

SIG. INVENTORY NO.

-1455

NCDOT Wind Zone 5 (120 mph)

US 321 (Hickory Boulevard) SB
at
SR 1160 (Mt. Herman Road)

Division 11 Caldwell County Hudson

PLAN DATE: June 2024	REVIEWED BY: D.J. Darity
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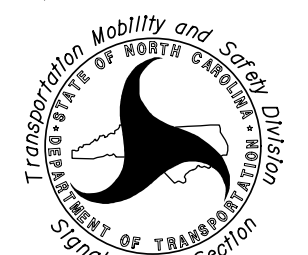
PREPARED BY: J.T. Grimm	REVIEWED BY: T.M. Moody
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REVISIONS	INIT.	DATE

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Prepared for the Offices of:



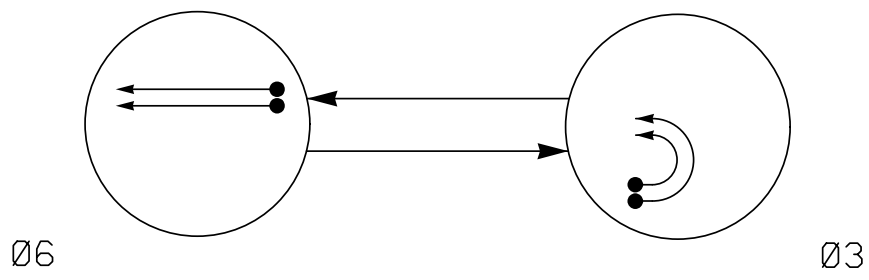
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE

0	N/A
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70	70
71	71
72	72
73	73
74	74
75	75
76	76
77	77
78	78
79	79
80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

■ / ■

PHASING DIAGRAM



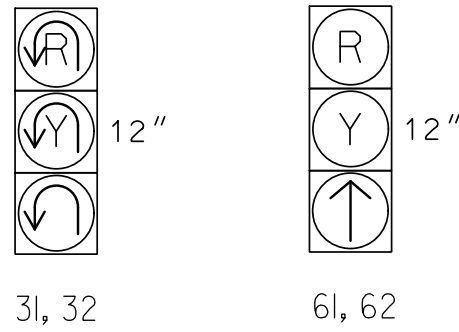
PHASING DIAGRAM DETECTION LEGEND

- ←● DETECTED MOVEMENT
- ← UNDETECTED MOVEMENT (OVERLAP)
- ←- UN SIGNALIZED MOVEMENT
- ←- - - PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE		
	Ø 6	Ø 3	FLASH
31, 32	R	R	R
61, 62	↑	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



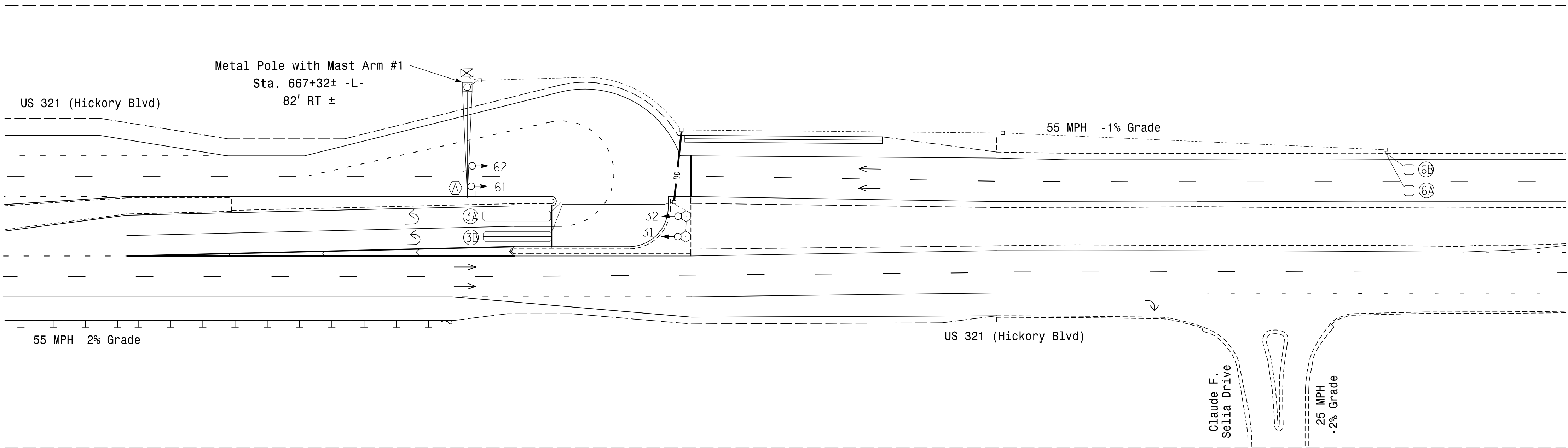
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR				PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL DELAY DURING GREEN
3A	6X40	0	2-4-2	X	3	-	-	X	-	X
3B	6X40	0	2-4-2	X	3	-	-	X	-	X
6A	6X6	420	6	X	6	-	-	X	X	X
6B	6X6	420	6	X	6	-	-	X	X	X

2 Phase
Fully Actuated
US 321 Closed Loop System

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.
- 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.
- Pedestal mounted signal heads shall be mounted at a minimum of 8' above the high point of the roadway surface elevation.
- Refer to Roadway and/or Pavement Marking plans for stop bar locations.



MAXTIME TIMING CHART

FEATURE	PHASE	
	3	6
Walk *	-	-
Ped Clear	-	-
Min Green *	7	14
Passage *	2.0	6.0
Max 1 *	20	90
Yellow Change	3.0	5.3
Red Clear	5.2	1.0
Added Initial *	-	1.5
Maximum Initial *	-	46
Time Before Reduction *	-	15
Time To Reduce *	-	30
Minimum Gap	-	3.4
Advance Walk	-	-
Non Lock Detector	X	-
Vehicle Recall	-	MIN RECALL
Dual Entry	-	-

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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 | ●→ N/A |
| ●→ Modified Signal Head | N/A |
| ⊥ Sign | ⊥ |
| ⊥ Pedestrian Signal Head | ⊥ |
| ○→ Signal Pole with Guy | ●→ |
| ○→ Signal Pole with Sidewalk Guy | ●→ |
| ⊥ Inductive Loop Detector | ⊥ |
| ⊥ Controller & Cabinet | ⊥ |
| ⊥ Junction Box | ⊥ |
| ⊥ 2-in Underground Conduit | ⊥ |
| N/A Right of Way | ⊥ |
| → Directional Arrow | → |
| ○→ Metal Pole with Mastarm | ○→ N/A |
| ○→ Directional Drill | N/A |
| ○ Type II Signal Pedestal | ● |
| ⊥ No Left Turn Sign (R3-2) | ⊥ |

New Installation

stv
STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

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

US 321 (Hickory Boulevard) NB
at
U-Turn Bulb-Out South of
SR 1160 (Mt Herman Road)
Division 11 Caldwell County Hudson
PLAN DATE: June 2024 REVIEWED BY: D.J. Darity
PREPARED BY: J.T. Grimm REVIEWED BY: T.M. Woody

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

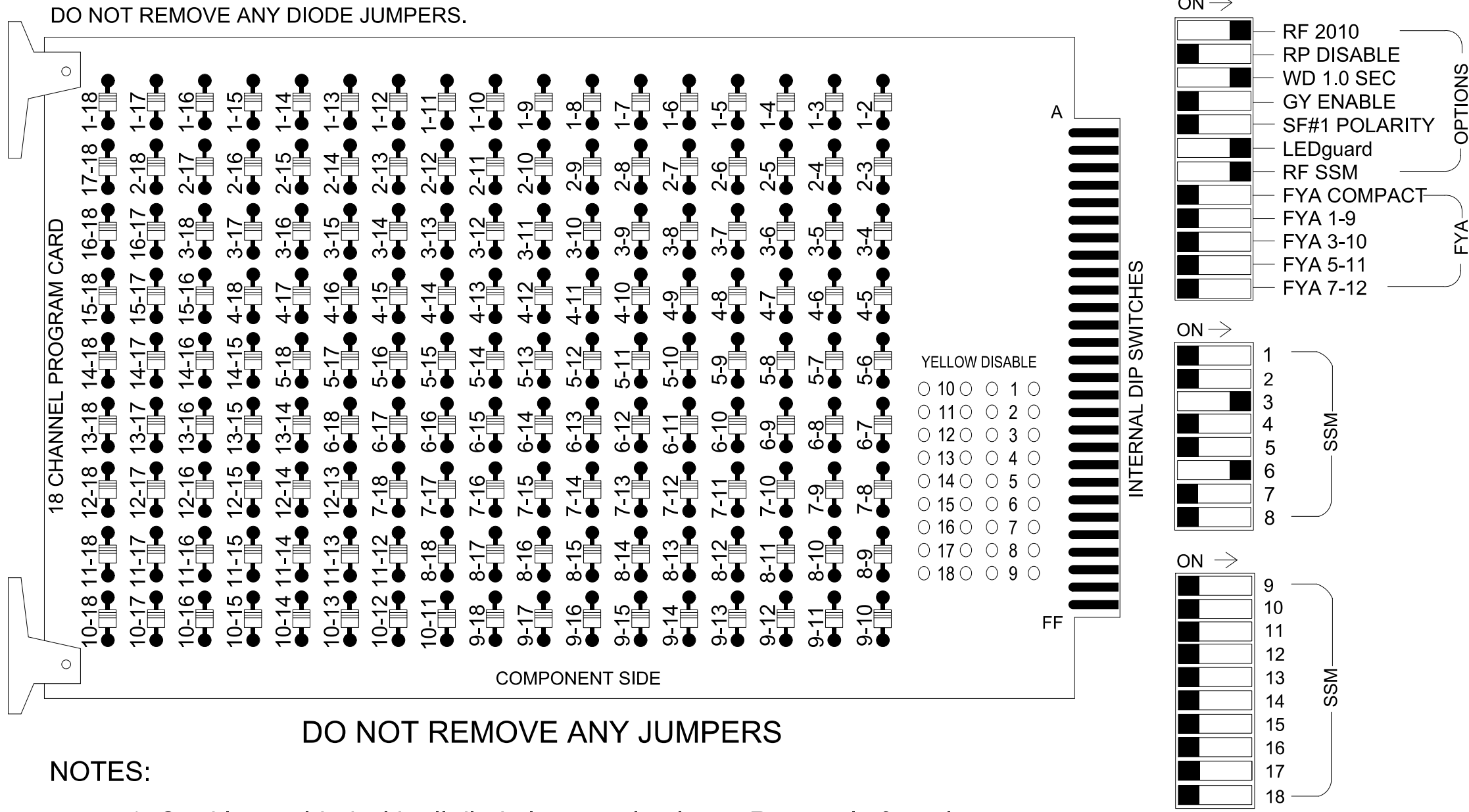
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
040329
ENGINEER
TRENT M. MOODY

DocuSigned by:
Trent Moody
6/10/2024

SIG. INVENTORY NO. 11-1457

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(set switches as shown)



DO NOT REMOVE ANY JUMPERS

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 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 321 Closed Loop Signal 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.....S4, S8
Phases Used.....3, 6
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

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	NU	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED								134										
YELLOW								135										
GREEN																		
RED ARROW				116														
YELLOW ARROW				117														
GREEN ARROW				118				136										

NU = Not Used

OUTPUT CHANNEL CONFIGURATION

Front Panel

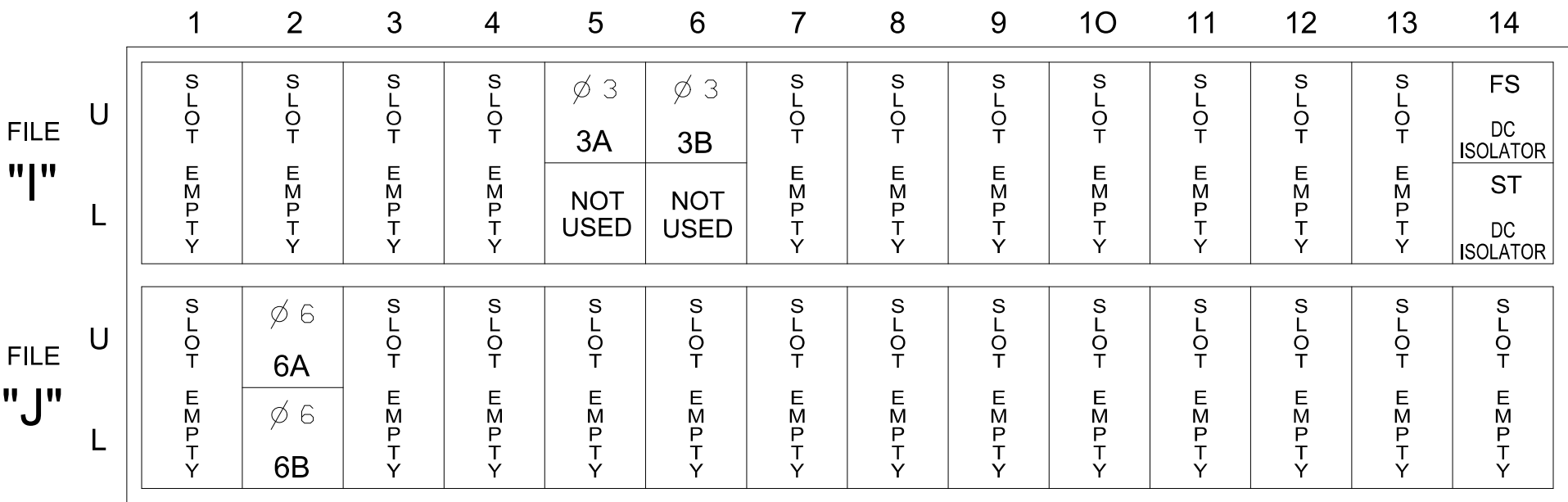
Main Menu >Controller >More>Channels>Channels Config

Web Interface

Home >Controller >Advanced IO>Channels>Channels Configuration

INPUT FILE POSITION LAYOUT

(front view)



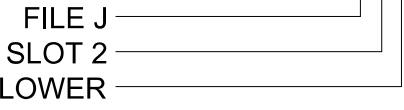
EX. : 1A, 2A, ETC. = LOOP NO.'S

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
3A	TB4-5,6	I5U	58	20	7	3			X		X	
3B	TB4-9,10	I6U	41	3	8	3			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	

INPUT FILE POSITION LEGEND: J2L



MAXTIME STARTUP AND SOFTWARE FLASH
PROGRAMMING DETAIL

Front Panel

Main Menu >Controller >Unit

Web Interface

Home >Controller >Unit

Modify parameters as shown below and save changes.

Start Up Parameters

StartUp Clearance Hold
6

Unit Flash Parameters

All Red Flash Exit Time
6

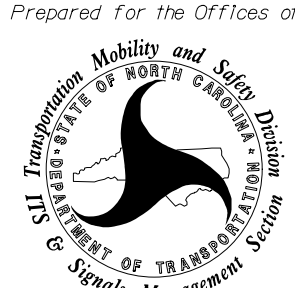
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1457
DESIGNED: June 2024
SEALED: 6/10/2024
REVISED: N/A

stv

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

ELECTRICAL DETAIL

ELECTRICAL AND PROGRAMMING
DETAILS FOR:



US 321 (Hickory Boulevard) NB at U-Turn Bulb-Out South of SR 1160 (Mt. Herman Road)			
Division 11	Caldwell County	Hudson	
PLAN DATE: June 2024	REVIEWED BY: D.J. Darity		
PREPARED BY: R.L. Aristondo	REVIEWED BY: T.M. Woody		
REVISIONS	INIT.	DATE	

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL

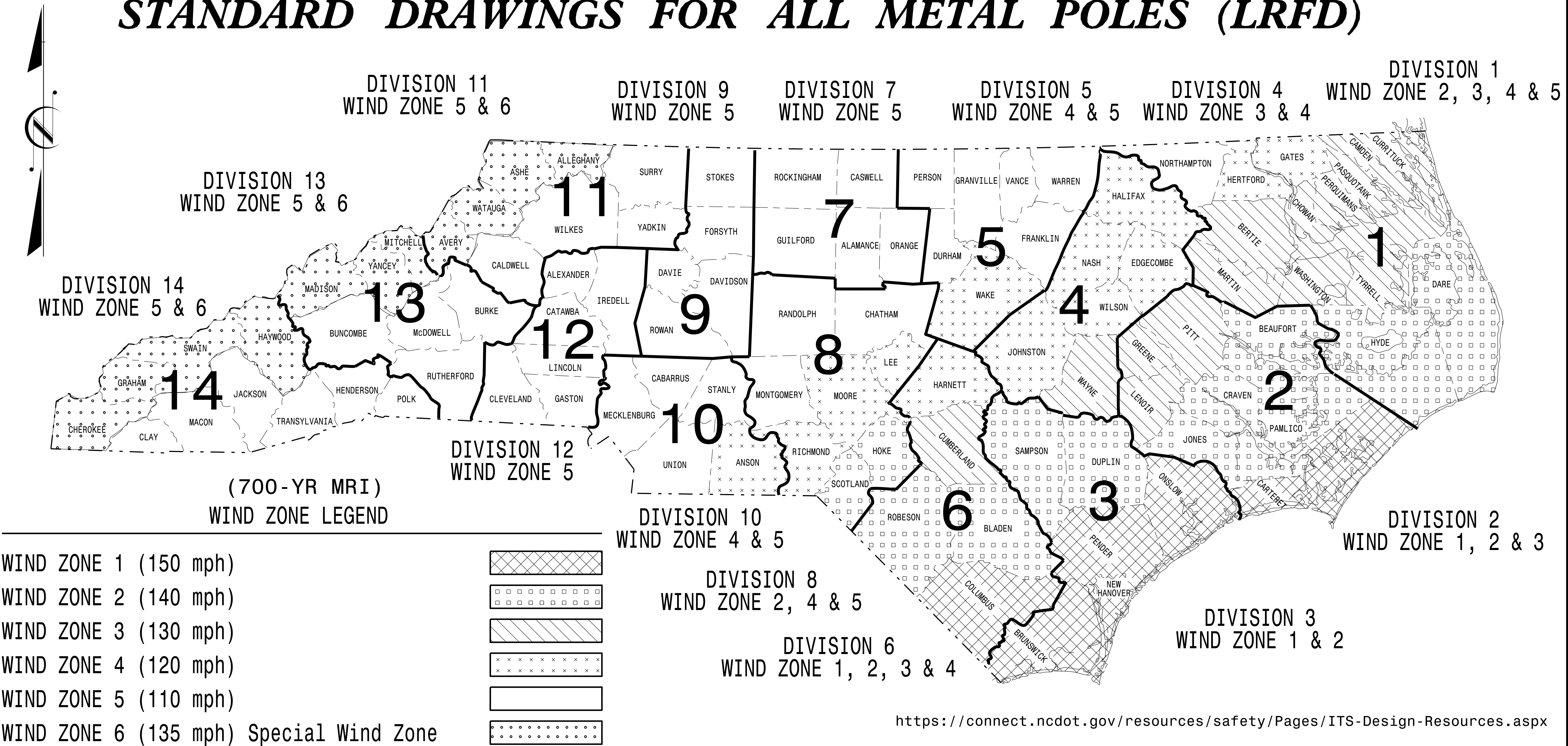


DocuSigned by:
Trent M. Woody
6/10/2024
SIC. INVENTORY NO. 11-1457

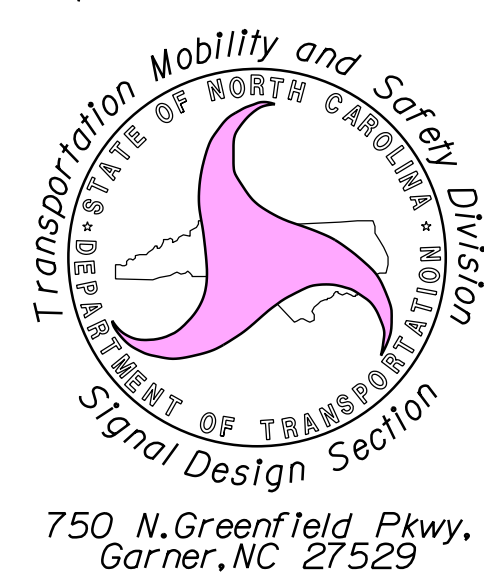
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PROJECT I.D. NO.	SHEET NO.
U-4700 CA	Sig.M1A

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



Prepared in the Offices of:



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

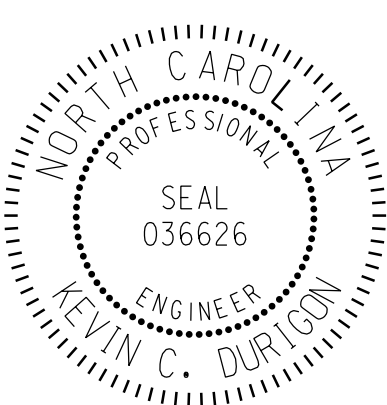
MOBILITY AND SAFETY DIVISION -
TRANSPORTATION SYSTEMS MANAGEMENT
AND OPERATIONS UNIT

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

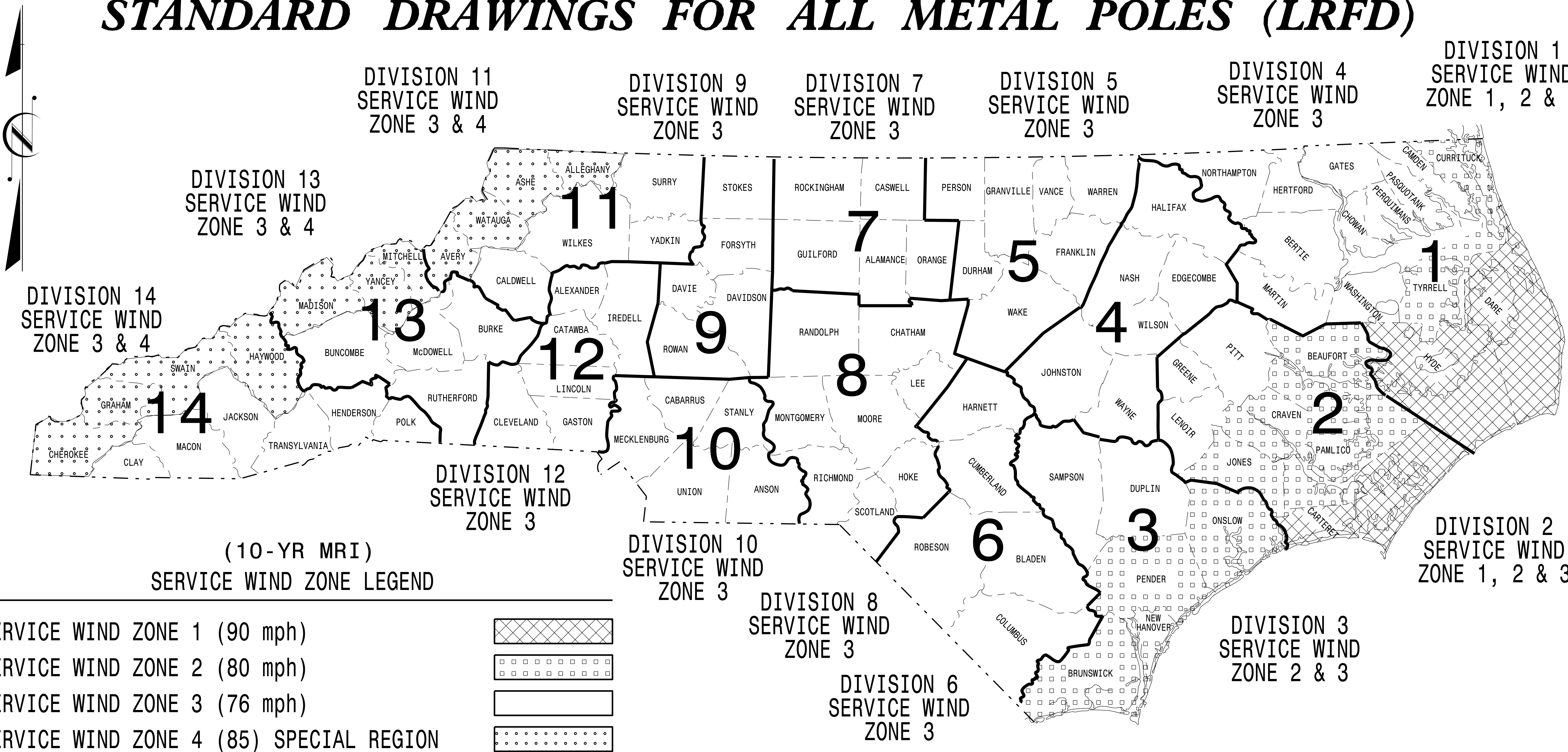
4B23DC79B3784DA

09/21/2023
DATE

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

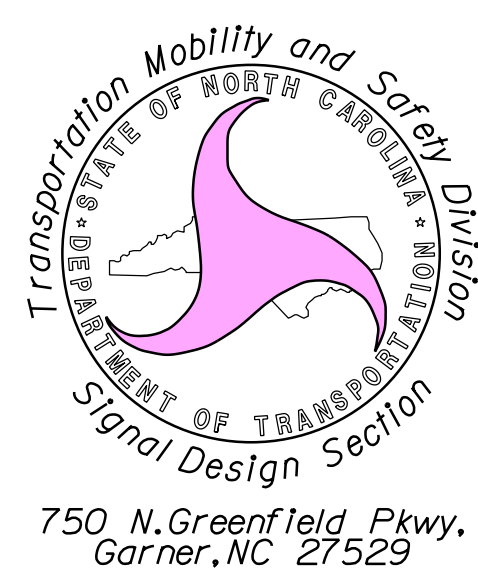
PROJECT I.D. NO.	SHEET NO.
U-4700 CA	Sig.M1B

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



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

Prepared in the Offices of:



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
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Sig. M 1A	Statewide Wind Zone Map (700-yr MRI)
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Sig. M 7	Construction Details-Foundations
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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:

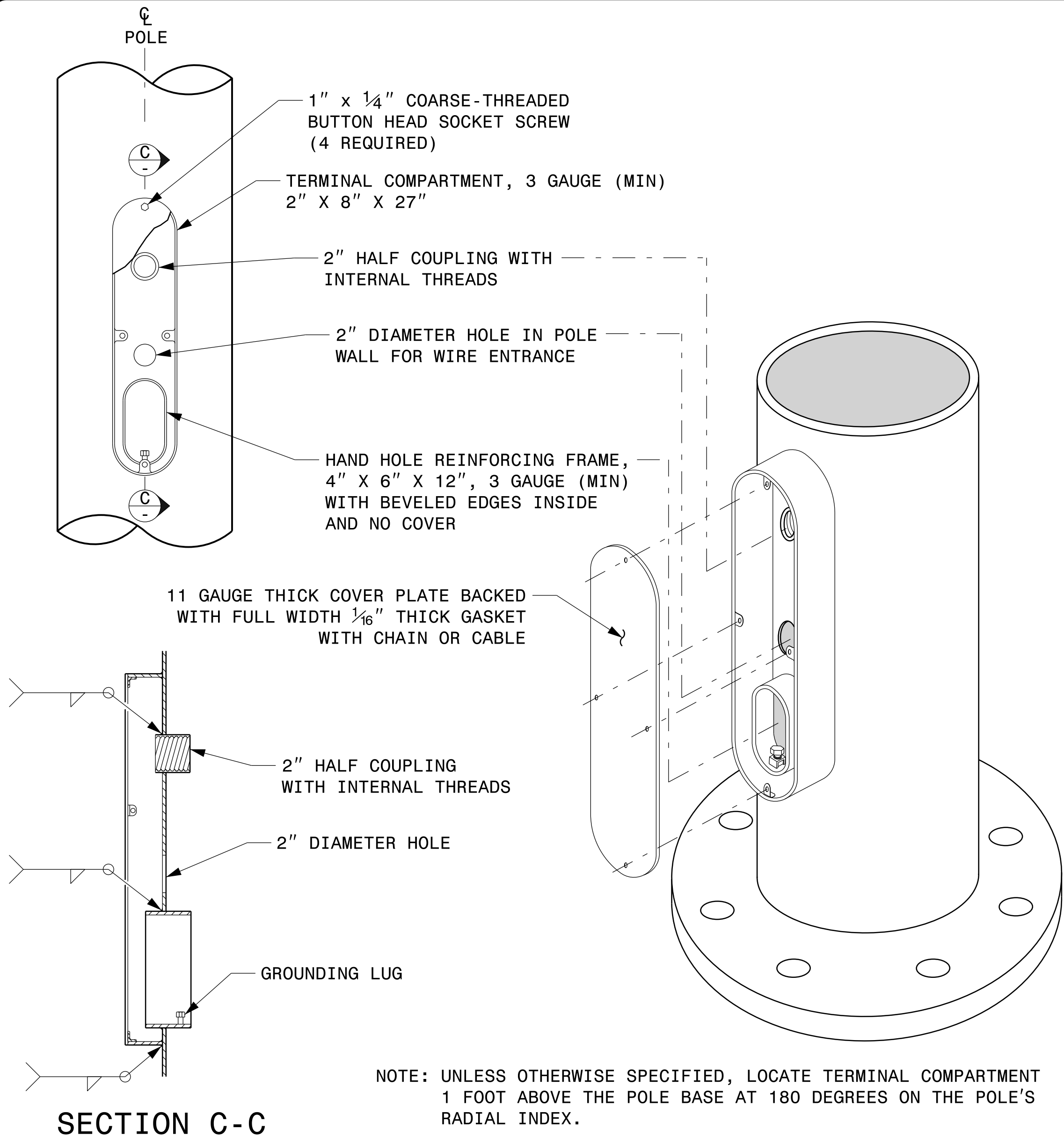
Kevin Durigon

SIGNATURE

09/21/2023

DATE

4B23DC70B3784DA



SECTION C-C

TERMINAL COMPARTMENT DETAIL

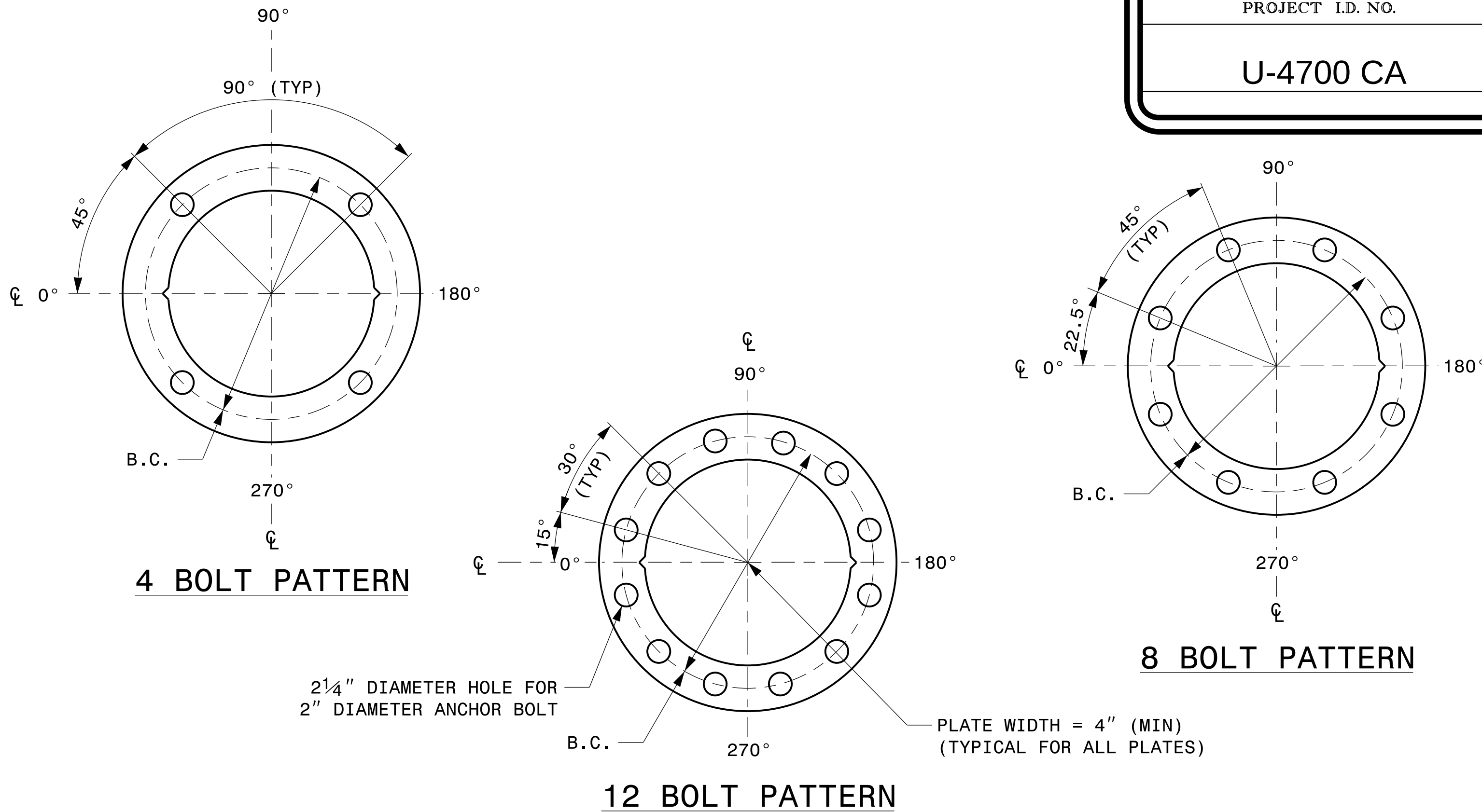
MFG _____	MFG. DATE: MM/YY _____
SHAFT D/T/L/Y _____	_____
ARM-A D/T/L/Y _____	_____
ARM-B D/T/L/Y _____	_____
A.B. DIA./B.C./L/Y _____	_____
NCDOT SIG. INV. NO. _____	_____
NCDOT POLE NO. _____	_____

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

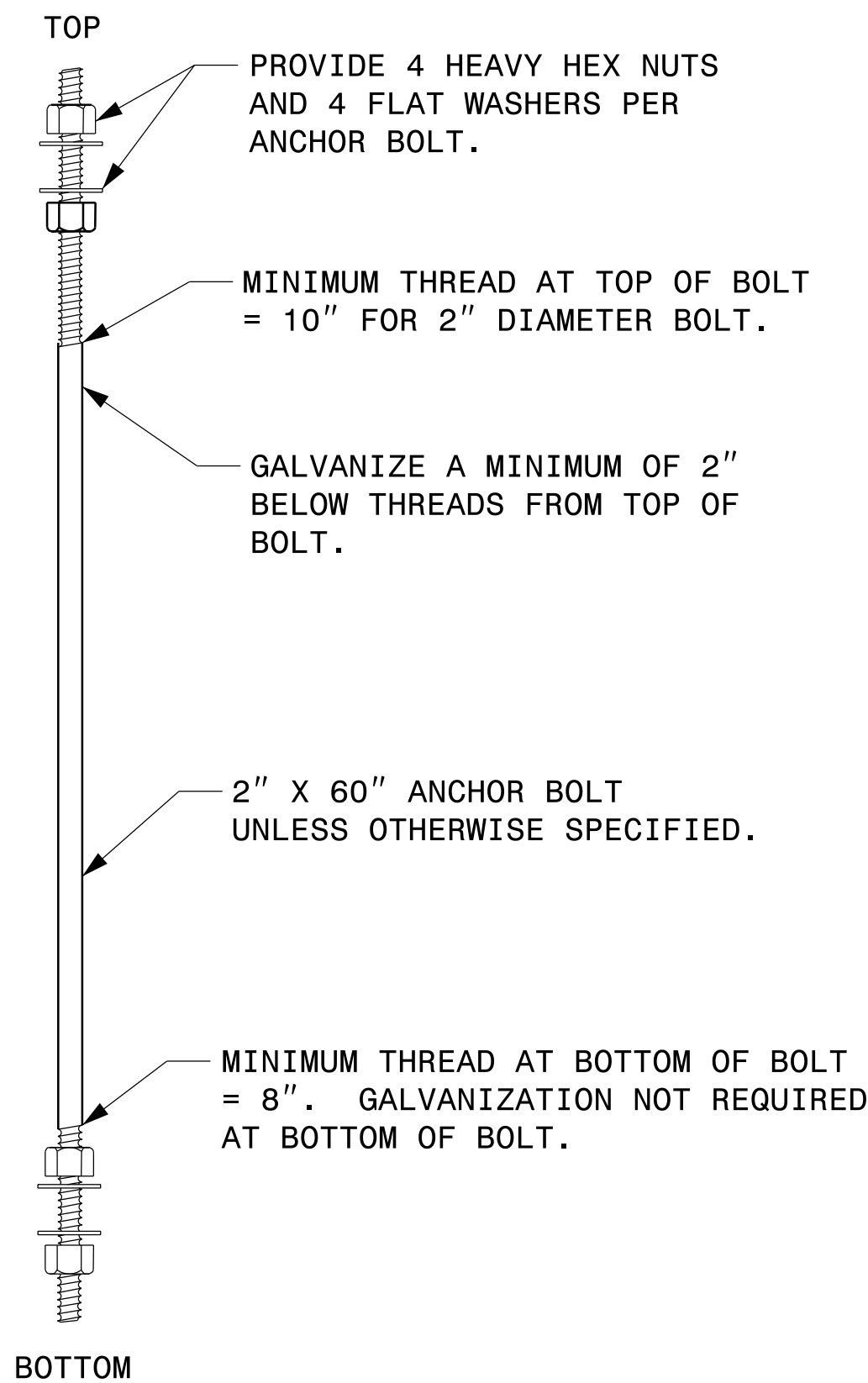
NOTES:

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

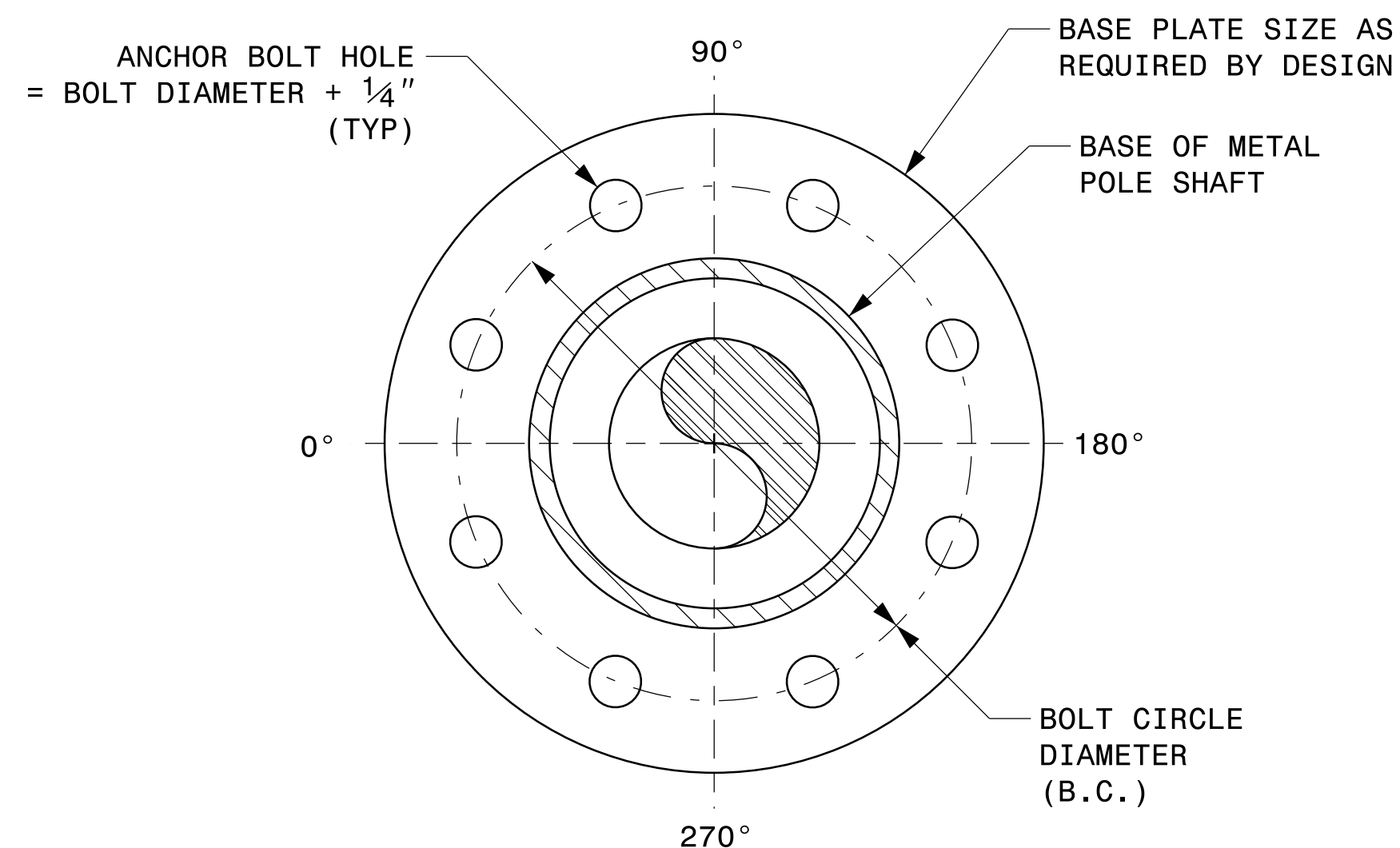
IDENTIFICATION TAG DETAILS



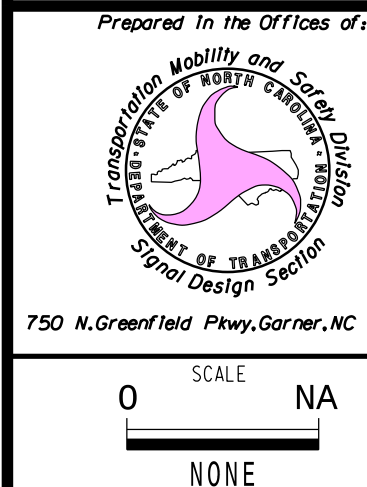
CONSTRUCT TEMPLATES AND PLATES FROM 1/4" (MIN) THICK STEEL. GALVANIZING IS NOT REQUIRED.
BASE PLATE TEMPLATE AND ANCHOR BOLT LOCK PLATE DETAILS



ANCHOR BOLT DETAIL

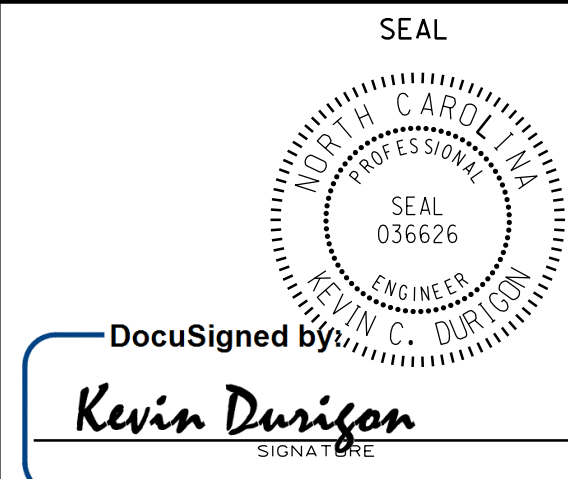


TYPICAL BASE PLATE DETAIL



Typical Fabrication Details
For
All Metal Poles

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



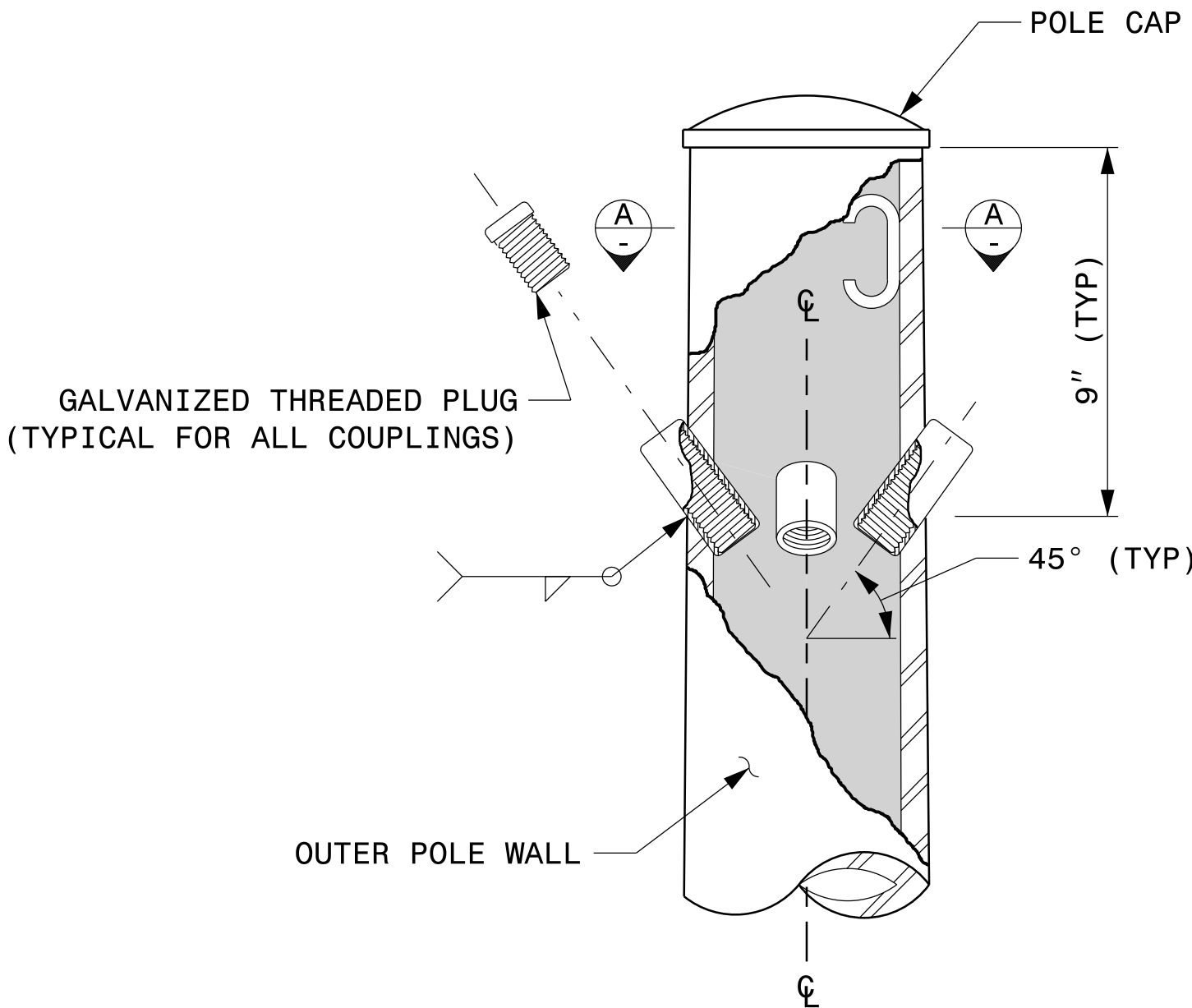
DocuSigned by:

Kevin Durigon

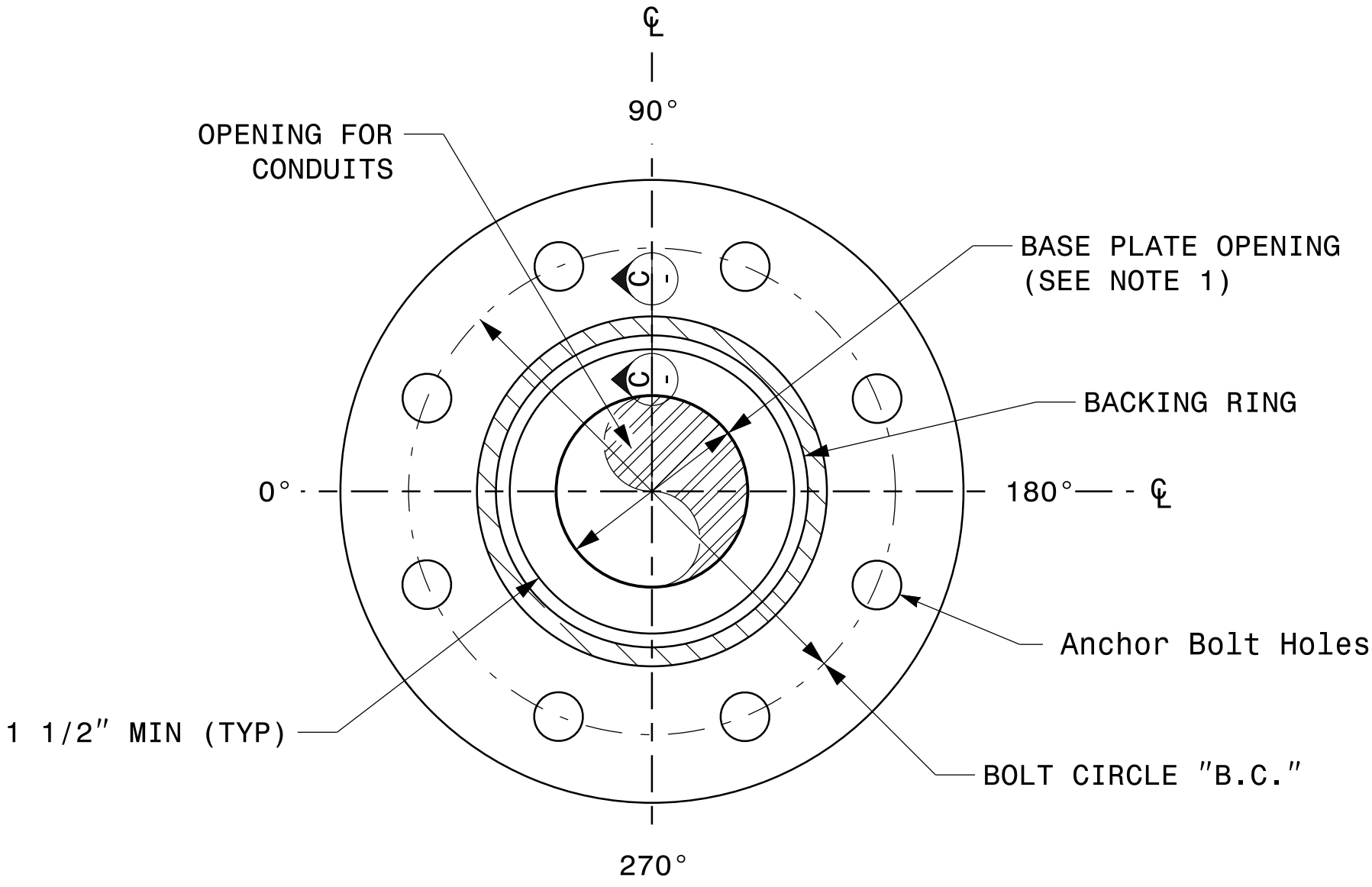
09/21/2023
DATE

NOTE:

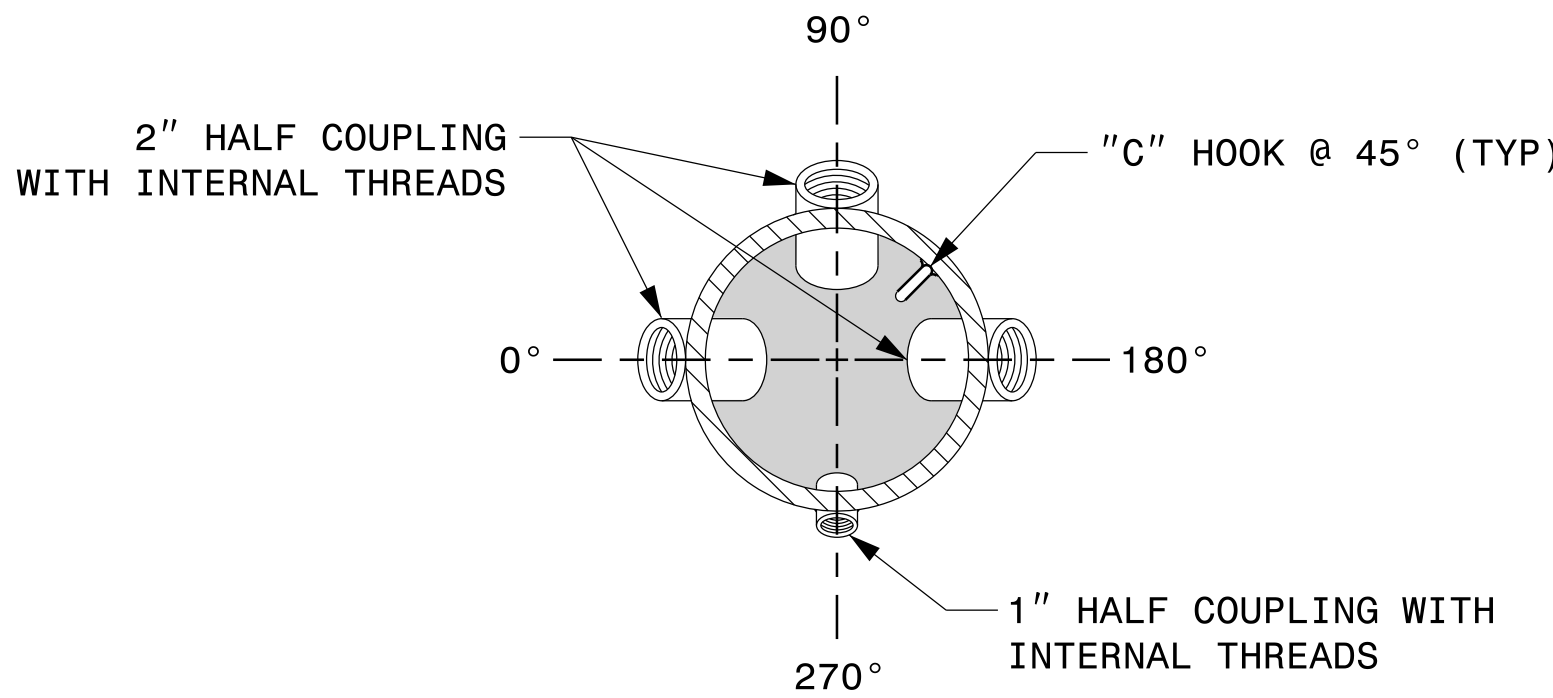
1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS $3\frac{1}{2}$ " BUT SHALL NOT BE LESS THAN $8\frac{1}{2}$ ".



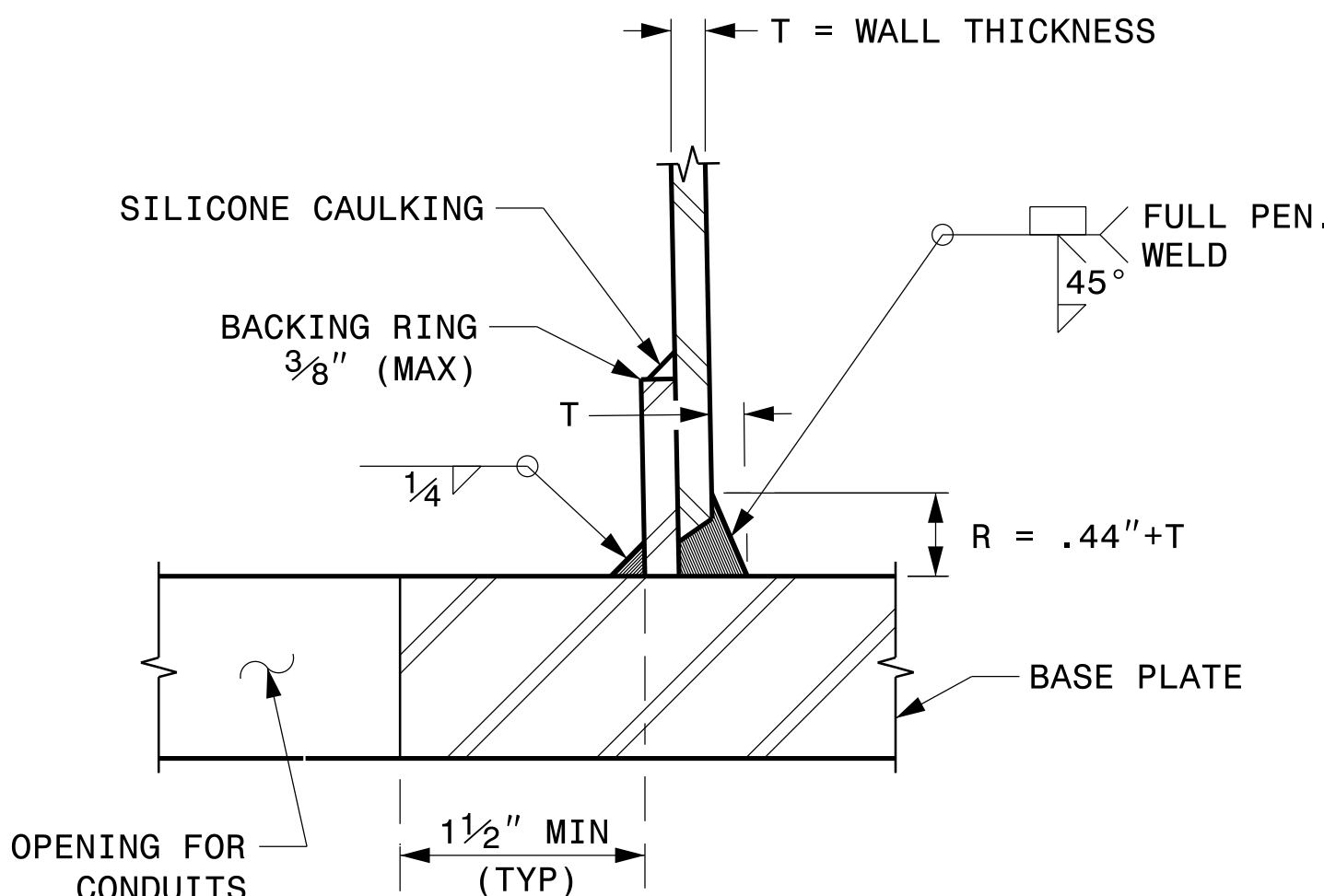
CABLE ENTRANCES AT TOP OF POLE



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

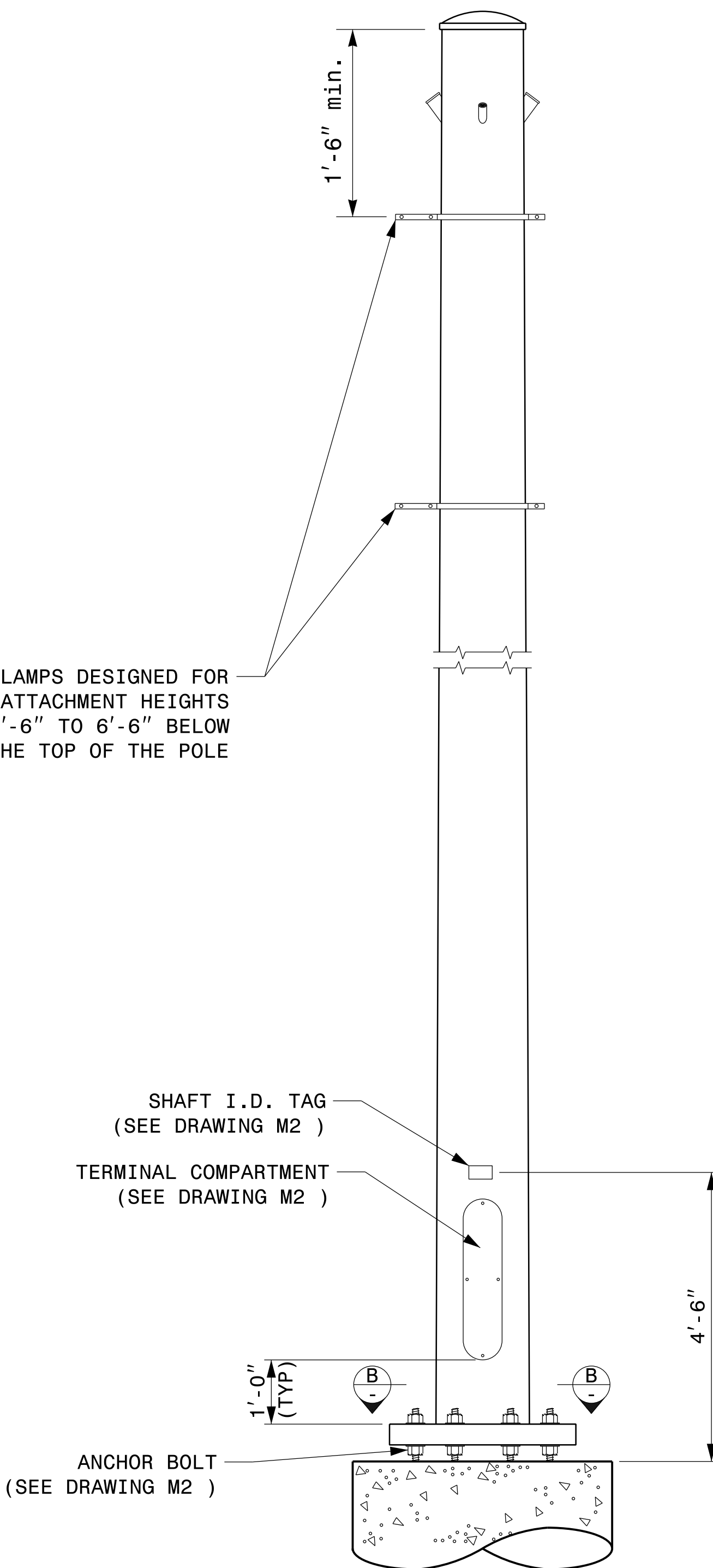


SECTION A-A
RADIAL ORIENTATION OF FACTORY INSTALLED
ACCESSORIES AT TOP OF POLE



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

2 CABLE CLAMPS DESIGNED FOR
VARIABLE ATTACHMENT HEIGHTS
FROM 1'-6" TO 6'-6" BELOW
THE TOP OF THE POLE

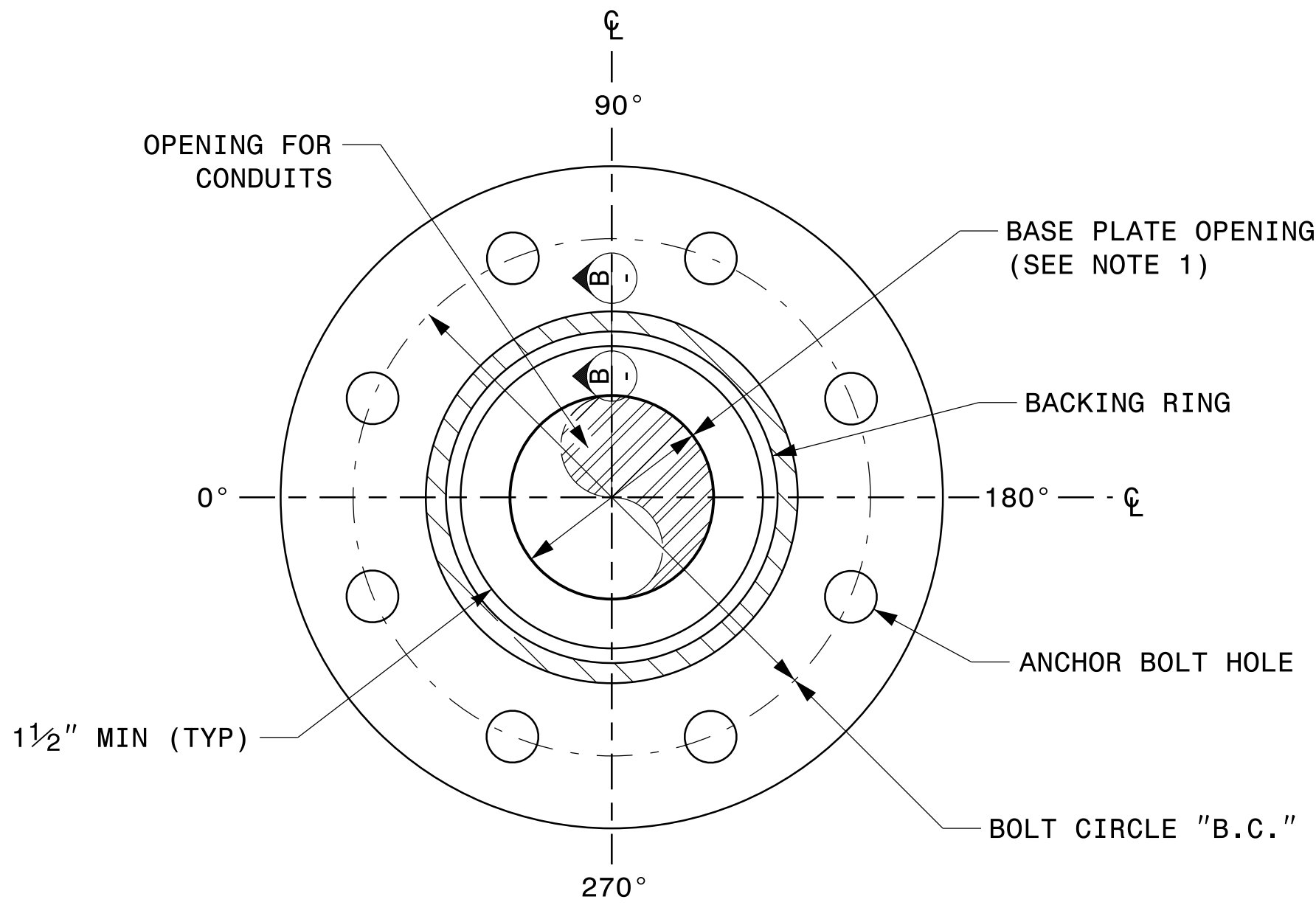


MONOTUBE STRAIN POLE

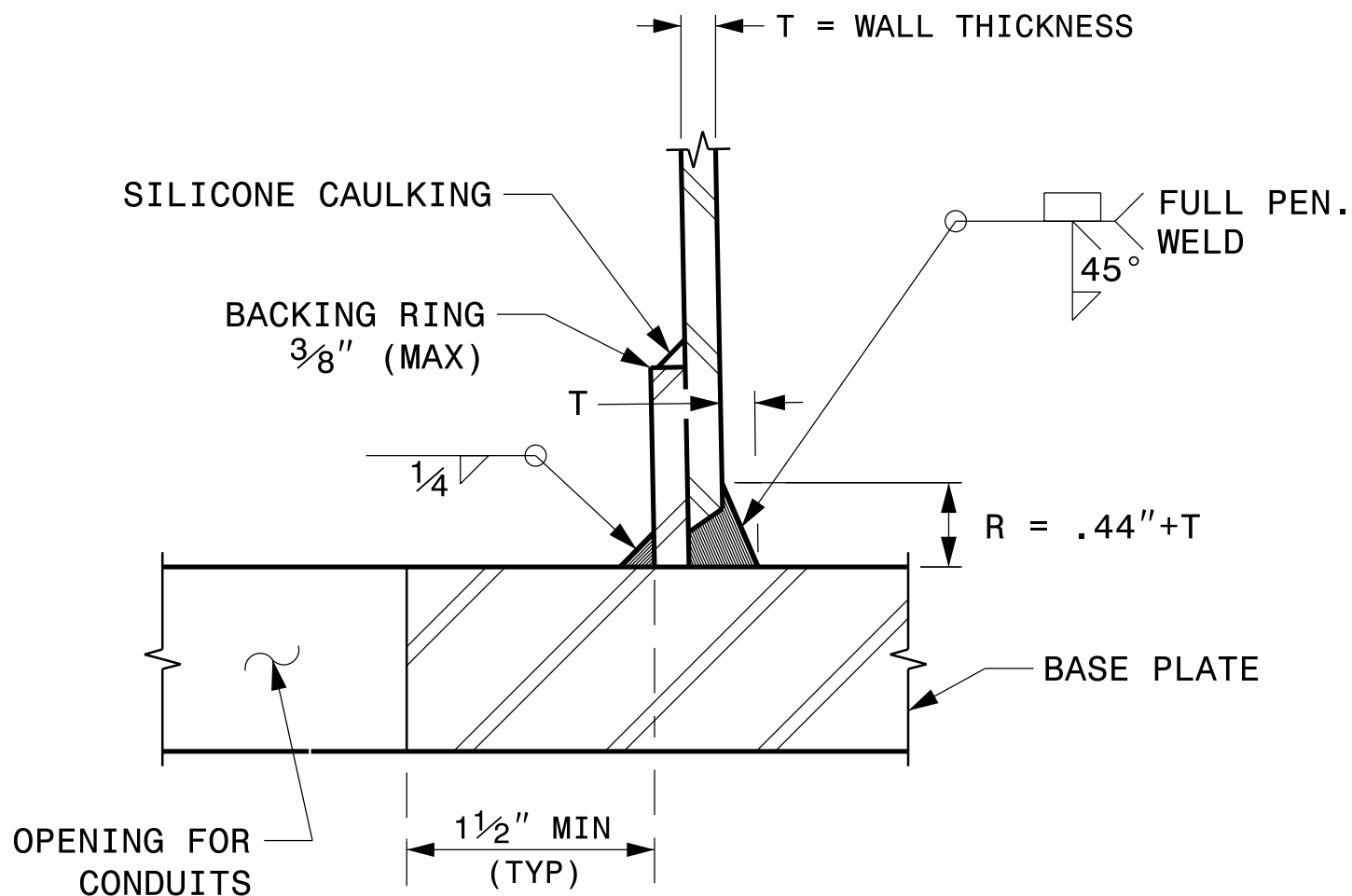
	Typical Fabrication Details For Strain Poles		
	PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR	DESIGNED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR INIT. DATE	

NOTE:

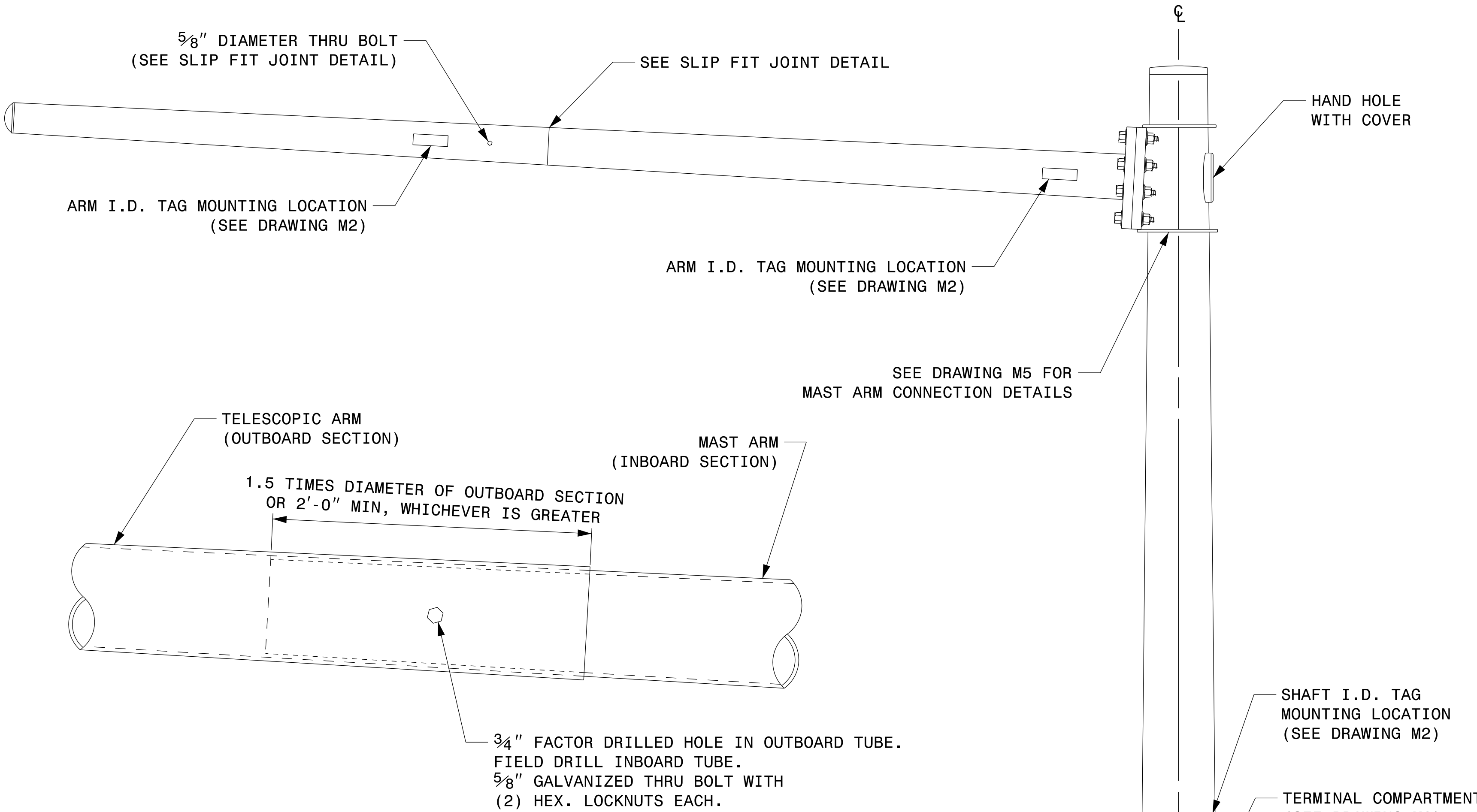
1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS 3 1/2" BUT SHALL NOT BE LESS THAN 8 1/2".



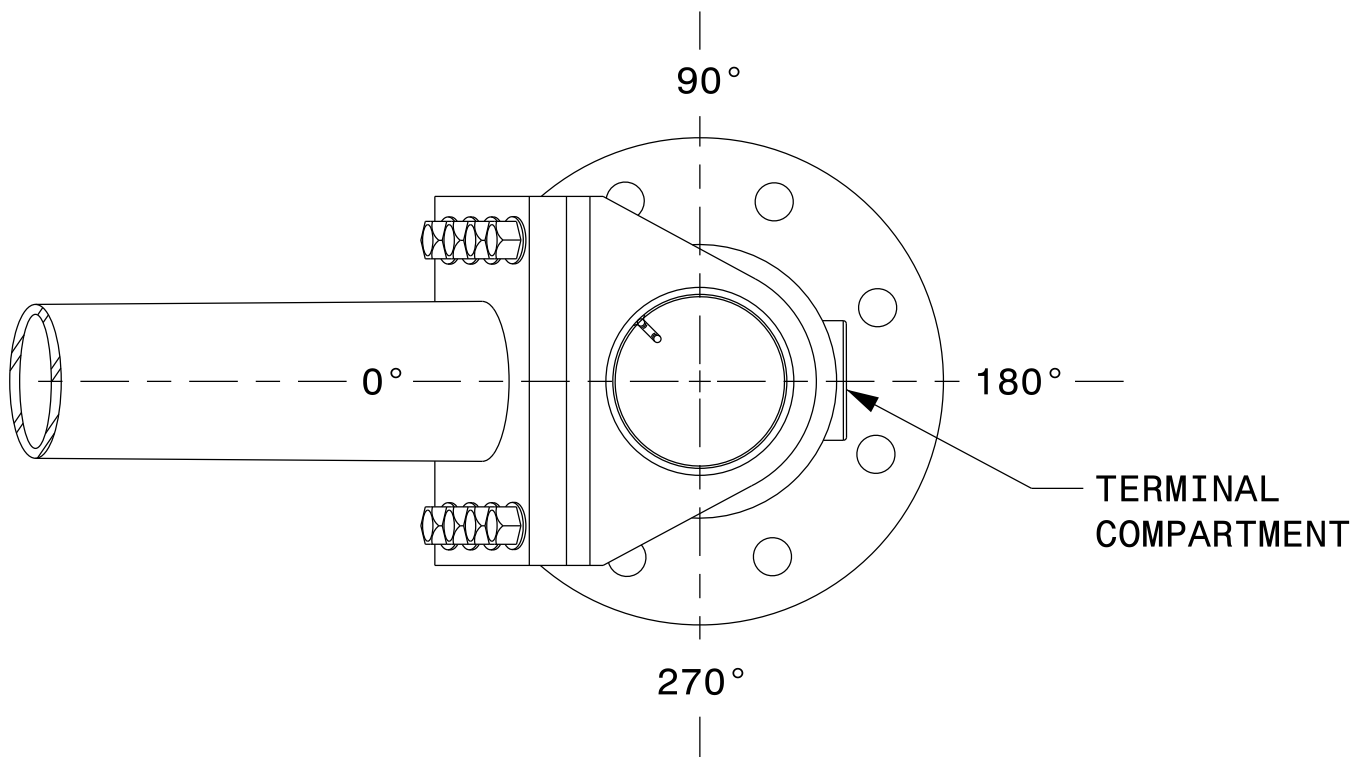
SECTION A-A
POLE BASE PLATE DETAILS



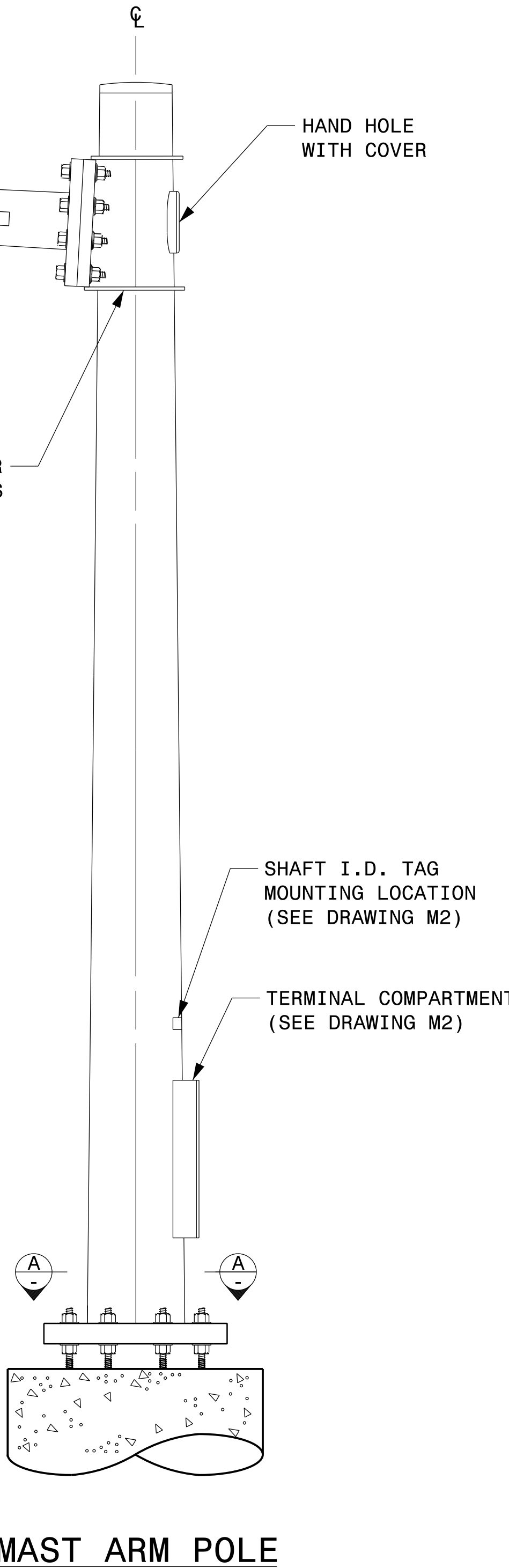
SECTION B-B
(POLE ATTACHMENT TO BASE PLATE)
FULL-PENETRATION
GROOVE WELD DETAIL



SLIP FIT JOINT DETAIL FOR MAST ARM



MAST ARM RADIAL ORIENTATION



Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

Typical Fabrication Details
For
Mast Arm Poles

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

REVISIONS INIT. DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEER
KEVIN C. DURIGON
036626

DocuSigned by:
Kevin Durigon
09/21/2023
DATE

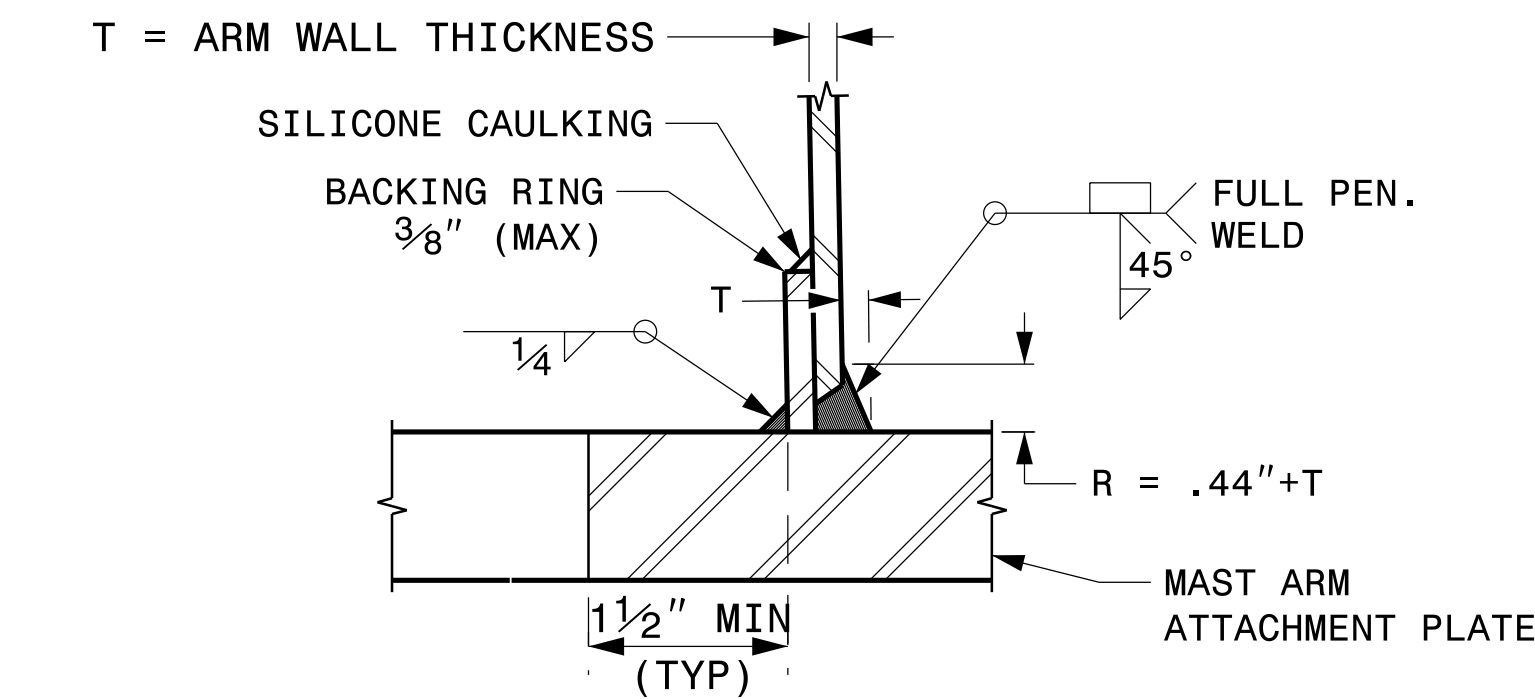
WELDED RING STIFFENED MAST ARM CONNECTION

PROJECT I.D. NO.

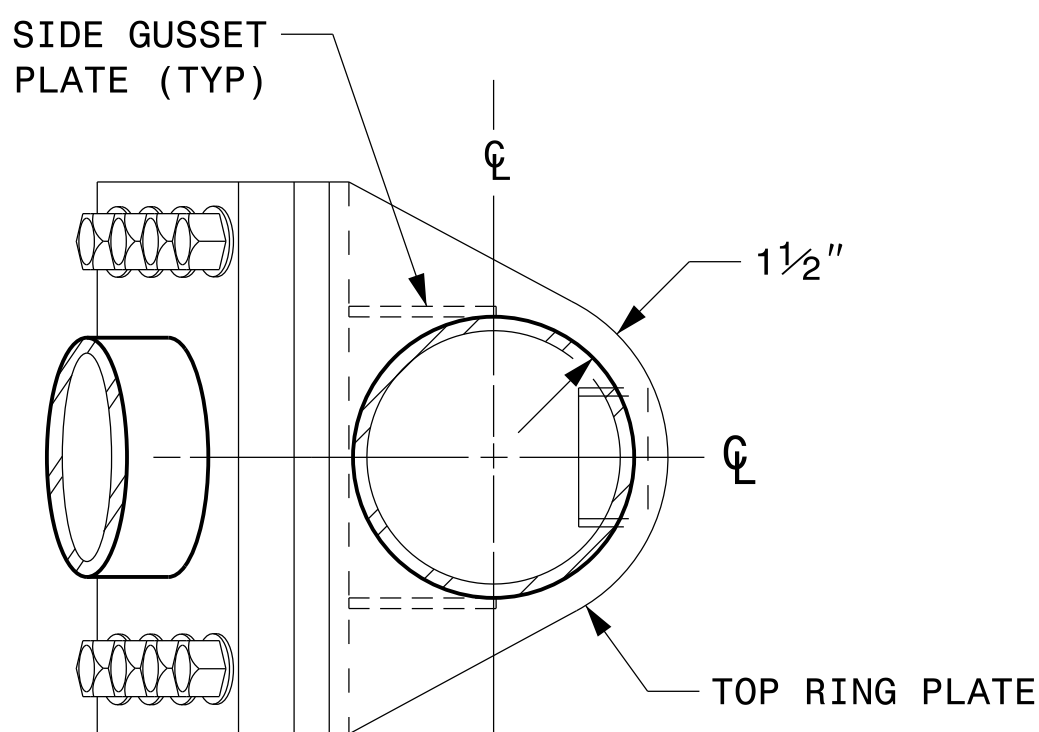
SHEET NO.

U-4700 CA

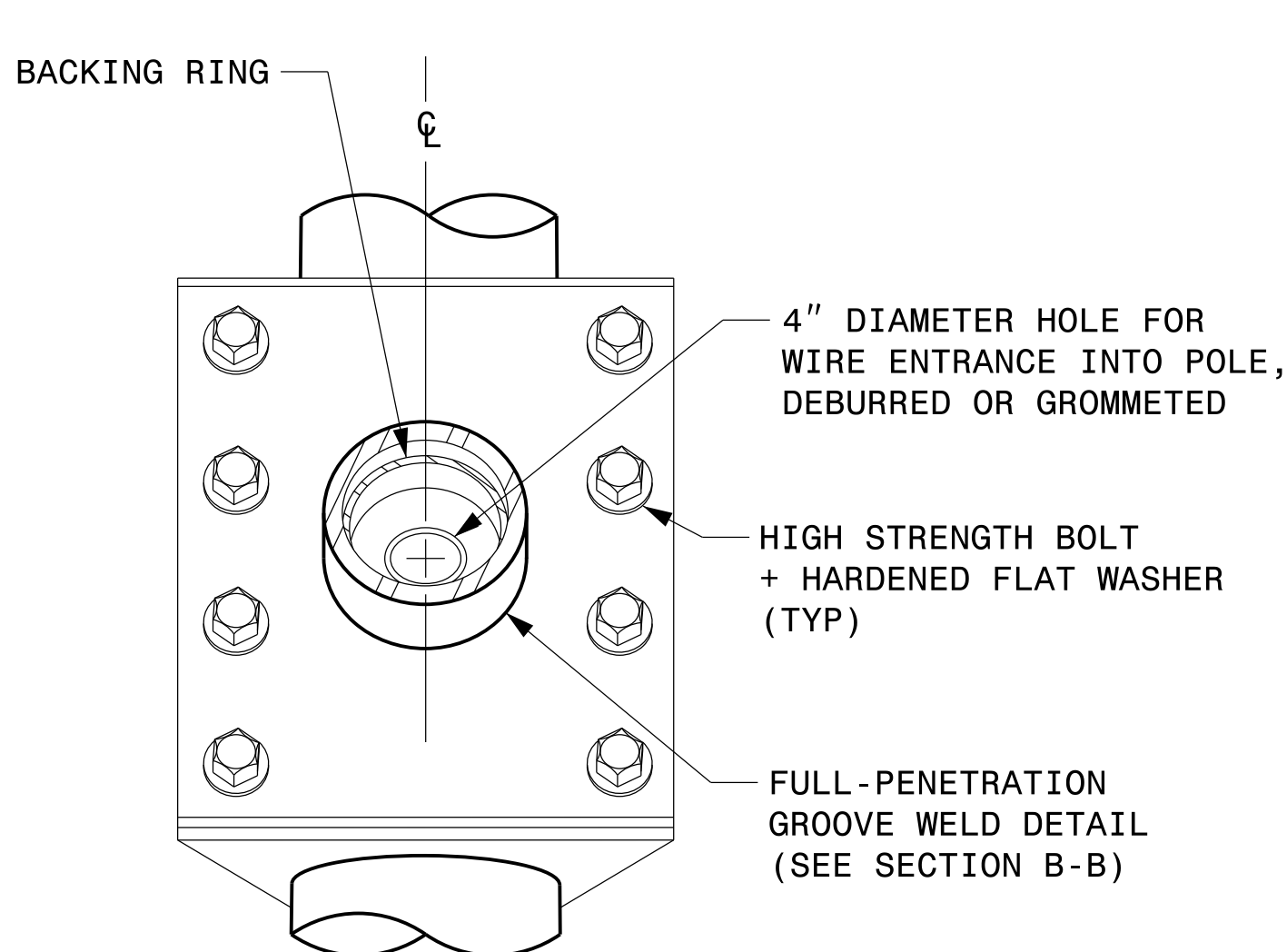
Sig.M5



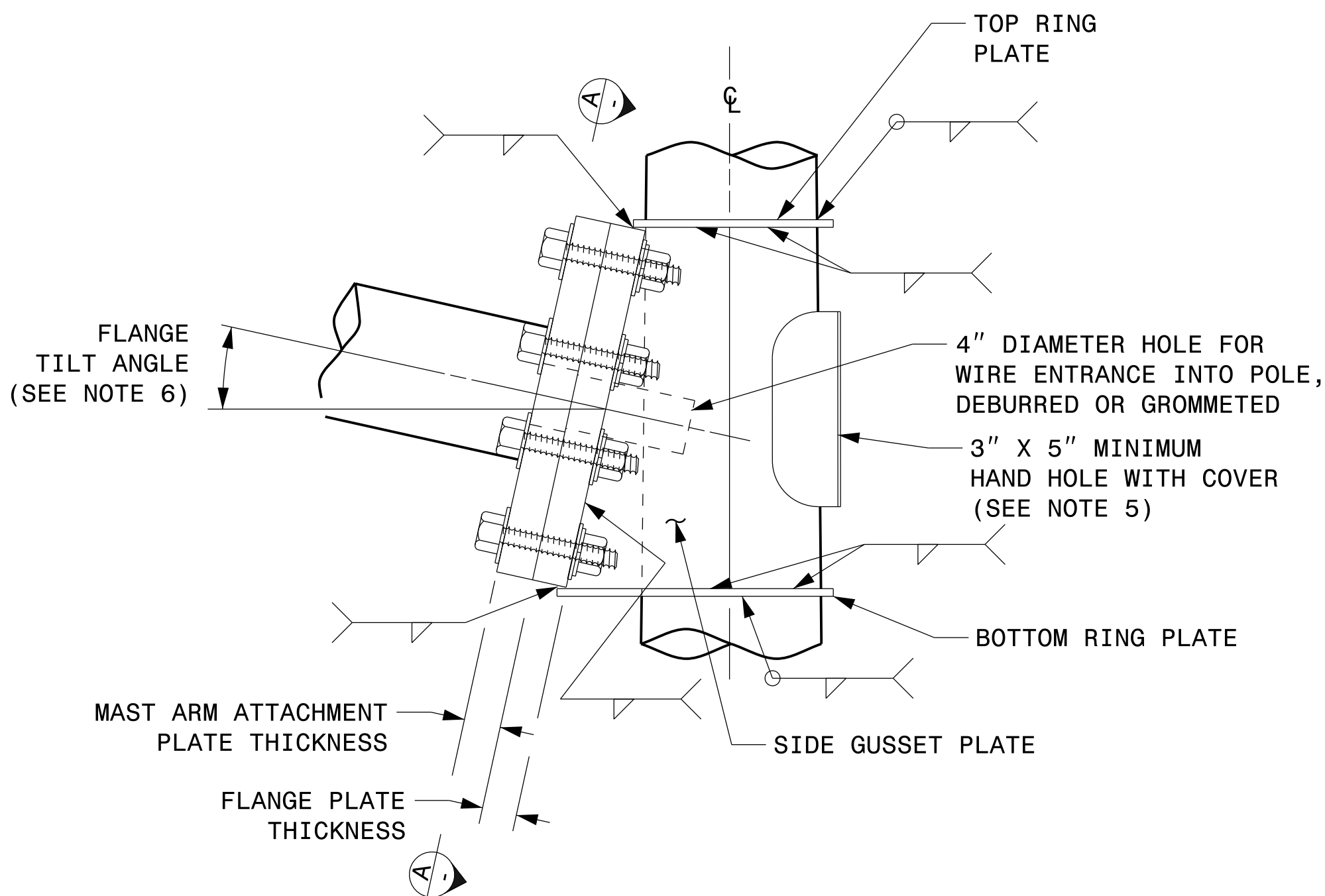
SECTION B-B
FULL-PENETRATION GROOVE WELD DETAIL



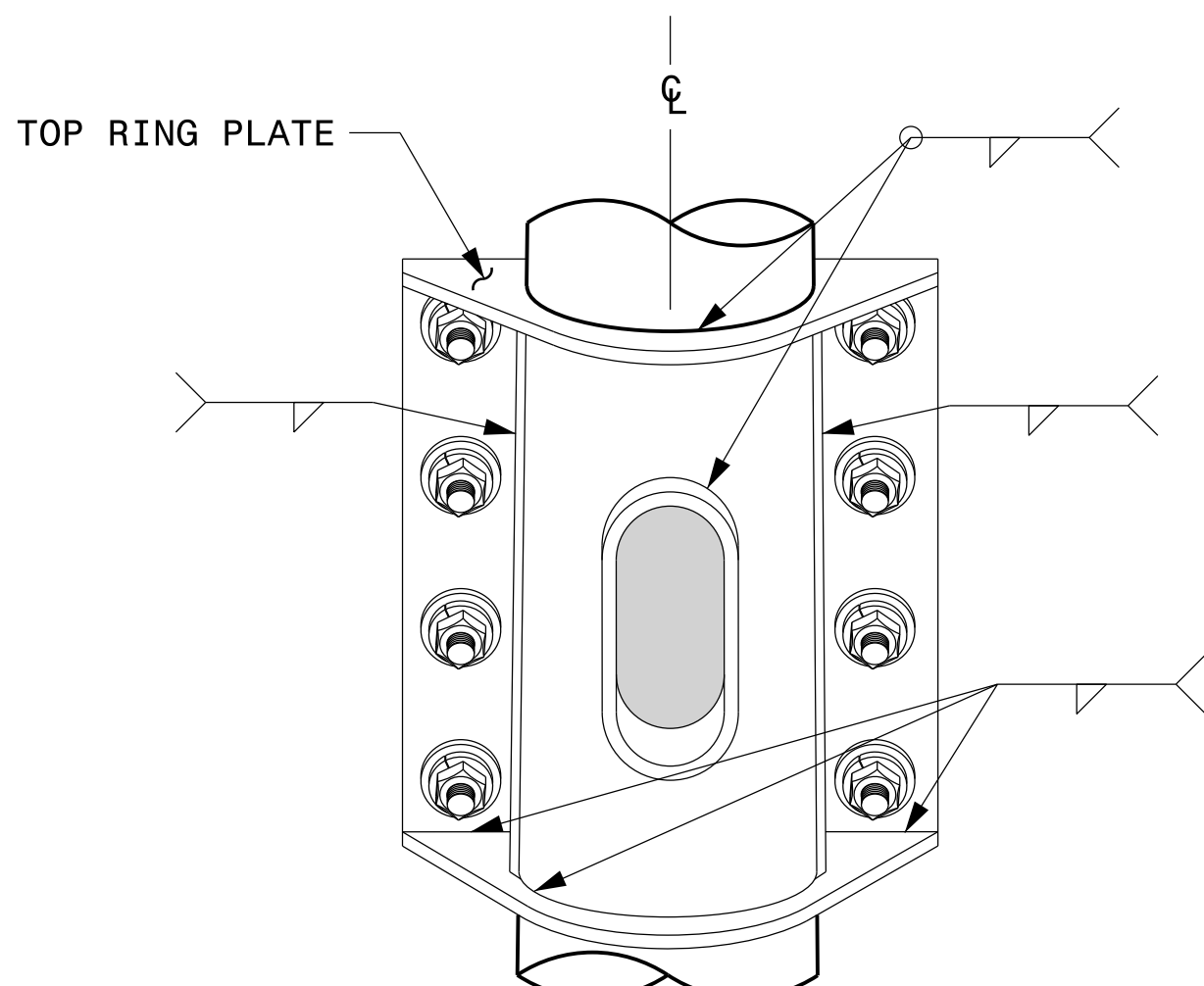
PLAN VIEW



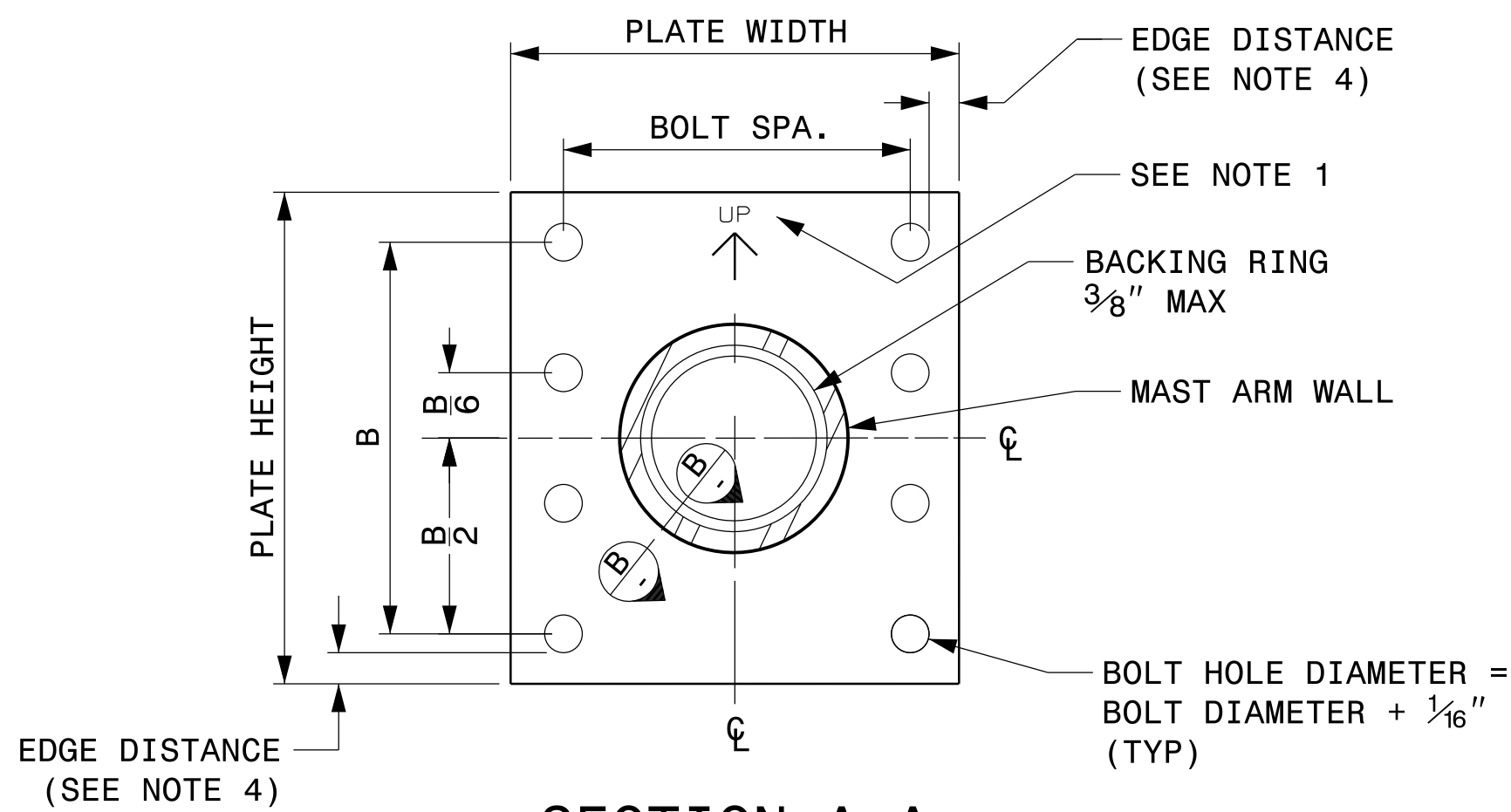
FRONT ELEVATION VIEW



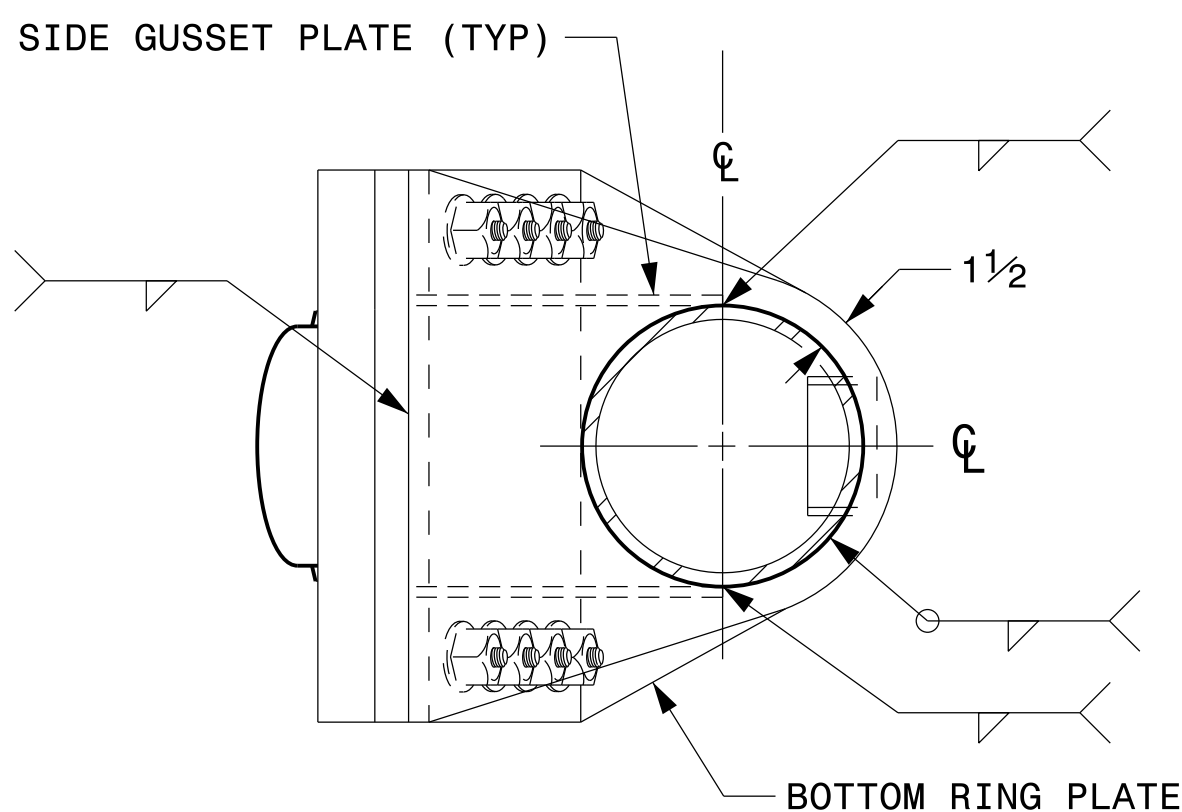
SIDE ELEVATION VIEW



BACK ELEVATION VIEW



SECTION A-A
MAST ARM ATTACHMENT PLATE



BOTTOM VIEW

NOTES:

1. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ABOVE THE MAST ARM TO INDICATE PROPER ATTACHMENT ORIENTATION OF THE MAST ARM.
2. DESIGNER WILL DETERMINE THE SIZE OF ALL STRUCTURAL COMPONENTS, PLATES, FASTENERS, AND WELDS SHOWN UNLESS THEY ARE ALREADY SPECIFIED.
3. FABRICATOR IS RESPONSIBLE FOR PROVIDING APPROPRIATE HOLES AT DRAINAGE POINTS TO DRAIN GALVANIZING MATERIALS.
4. FOR MINIMUM EDGE DISTANCE 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.

21-SEP-2023 08:01
S:\TSS\115 Signal\Signal Design Section\Structures\Drawings\2024 Metal Pole Std Drawings for U-4700 CA Sig.M5 Std. Connection Fabrication Details-Mast Arm Poles.dgn
Kadur Ram

Fabrication Details – Mast Arm Connection

Prepared in the Offices of:

Transmission Utility and Signal Division
NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: NA
NONE

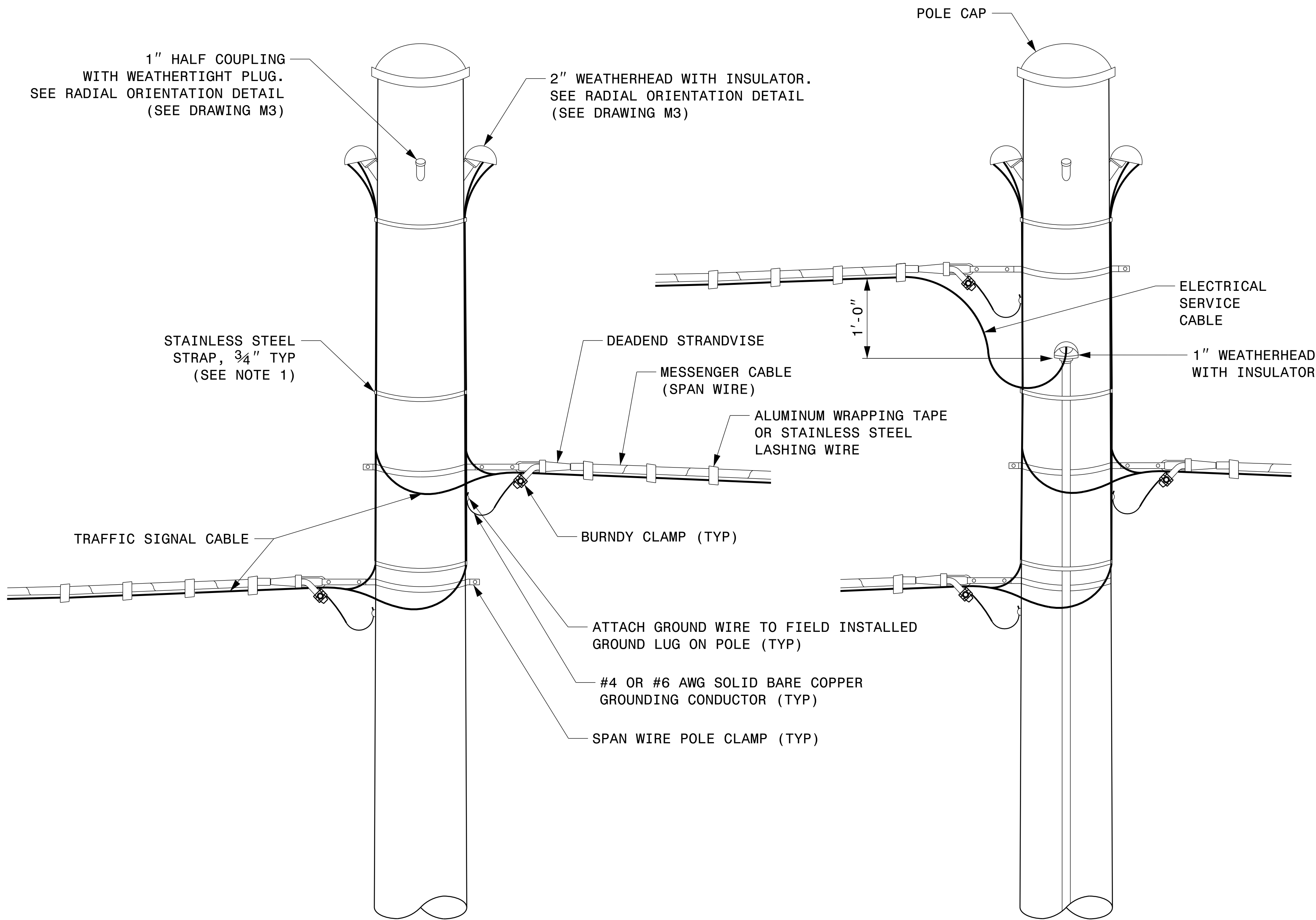
Typical Fabrication Details
For
Mast Arm Connection To Pole

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

REVISIONS	INIT.	DATE

SEAL

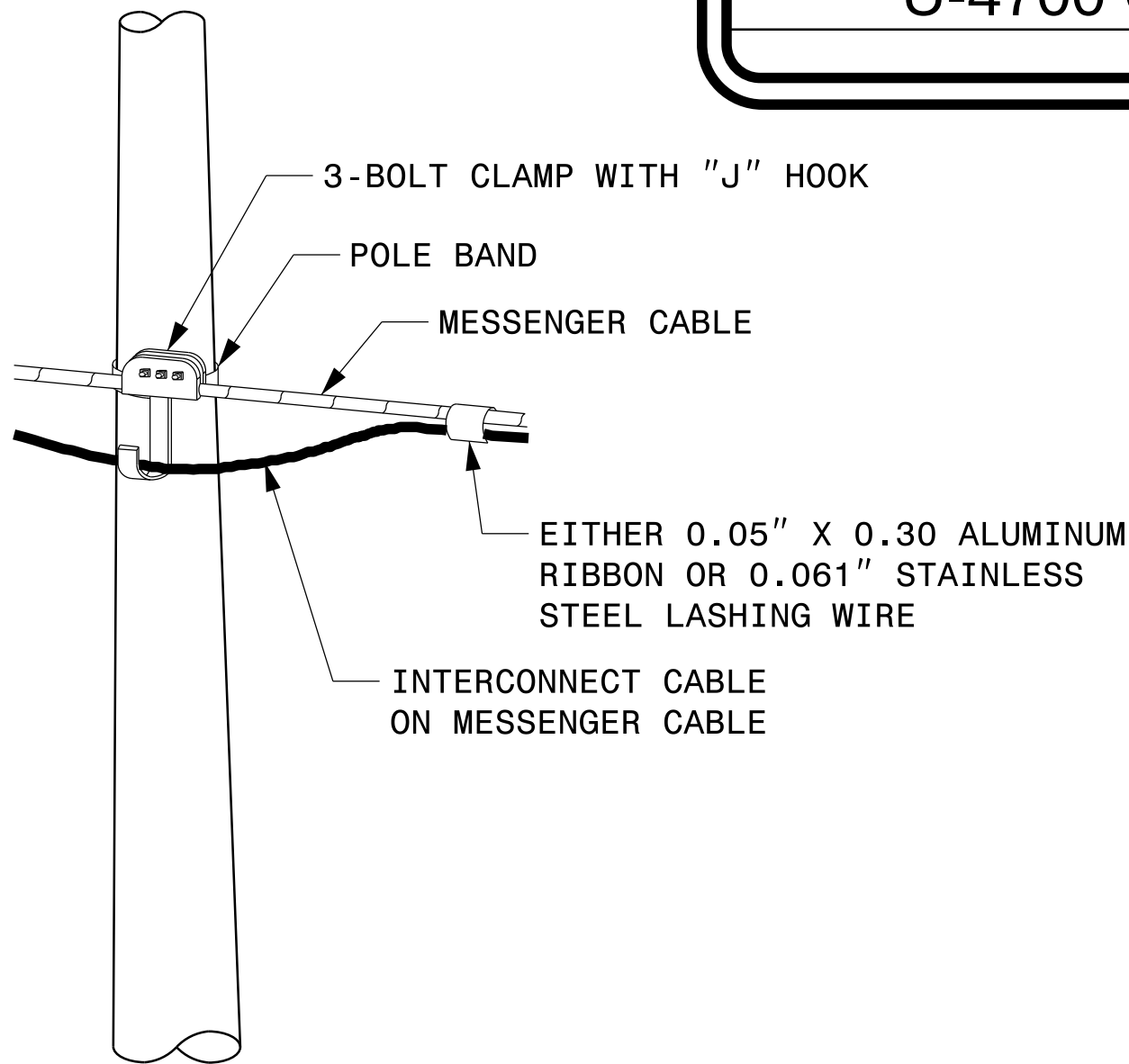
DocuSigned by:
Kevin Durigon
09/21/2023
DATE



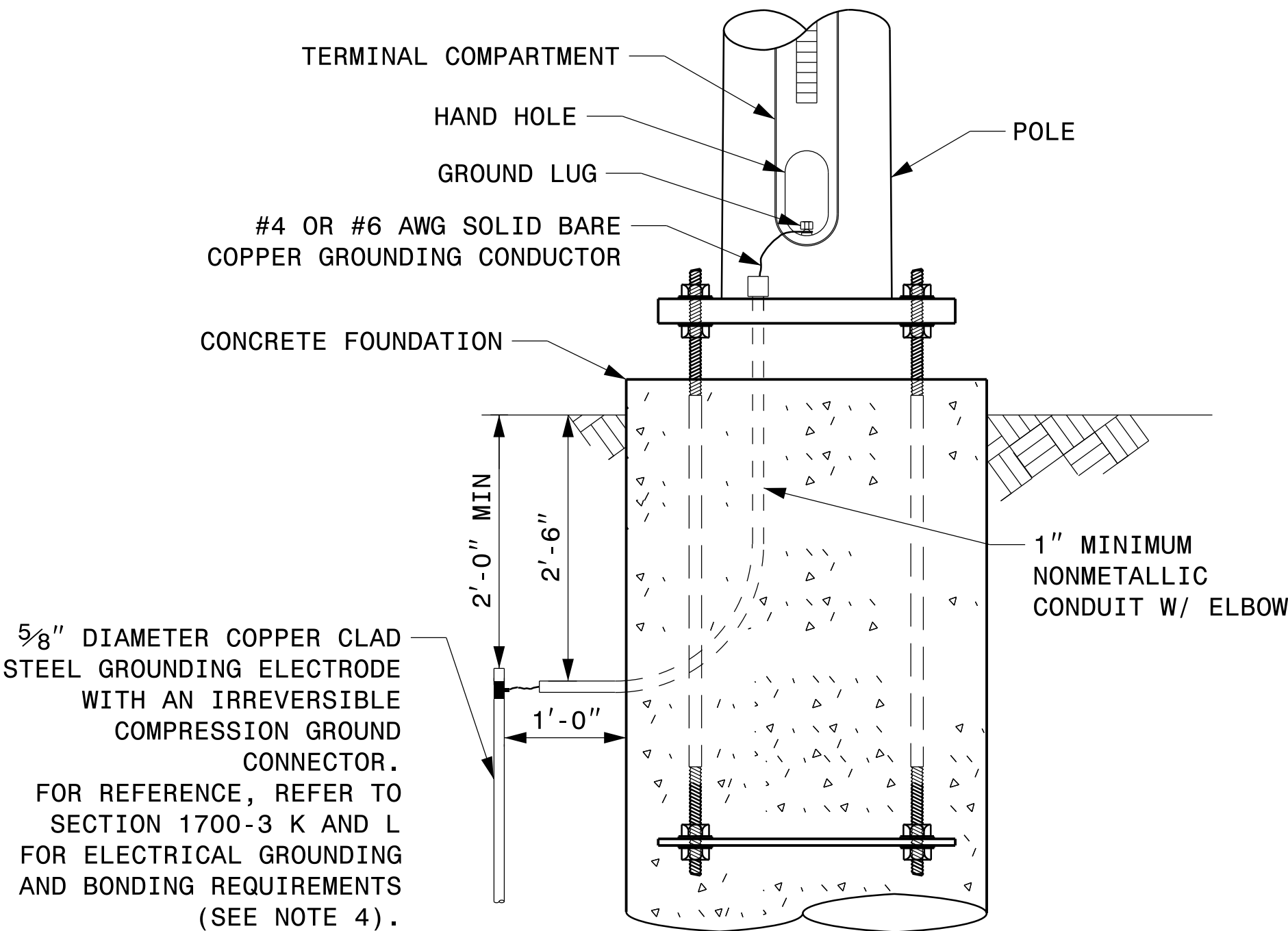
STRAIN POLE ATTACHMENTS

NOTES:

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



ATTACHMENT OF CABLE TO INTERMEDIATE METAL POLE



METAL POLE GROUNDING DETAIL FOR STRAIN POLE AND MAST ARM

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: NA
NONE

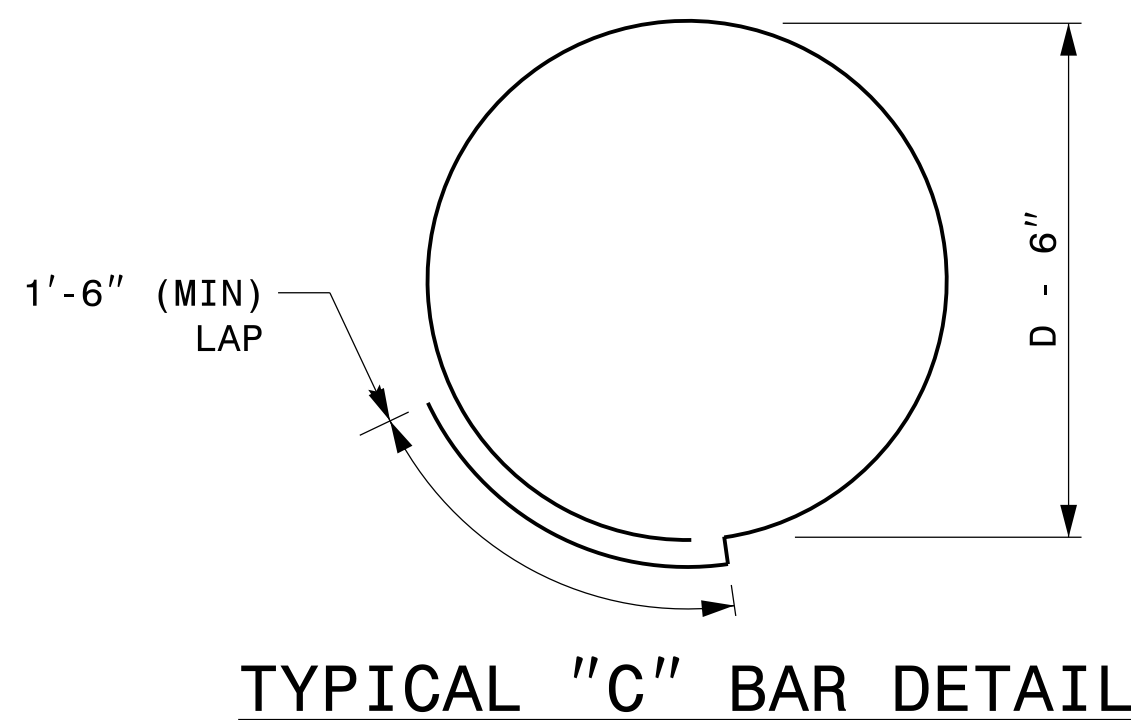
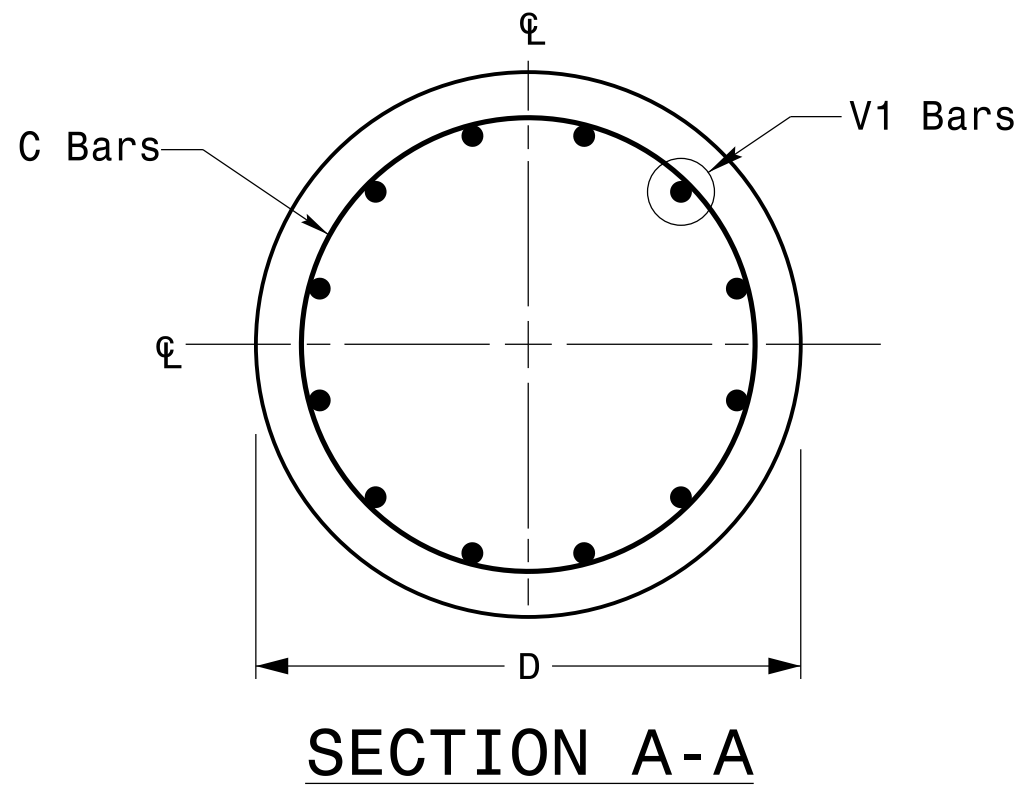
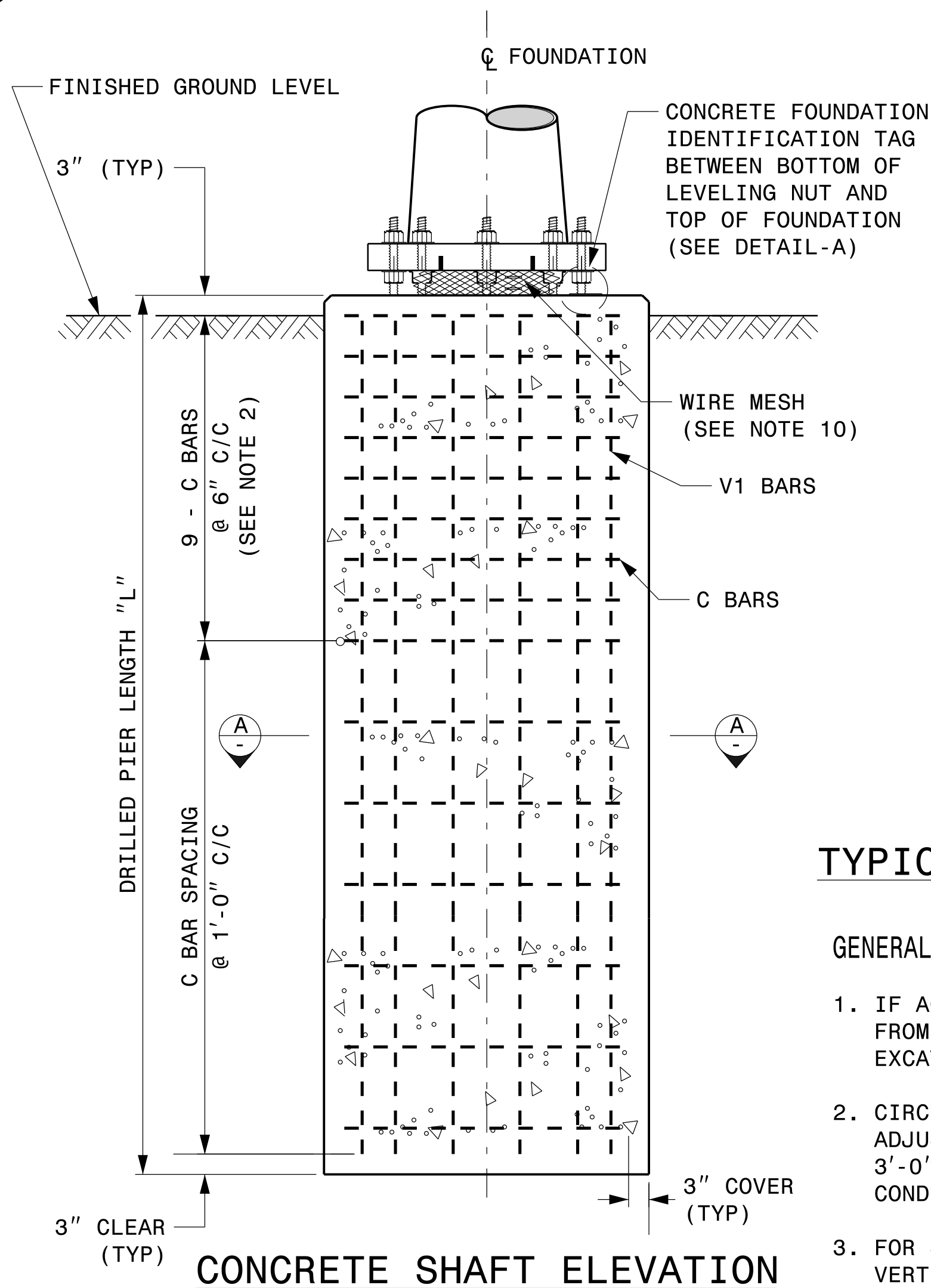
Typical Fabrication Details For Strain Pole Attachments

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

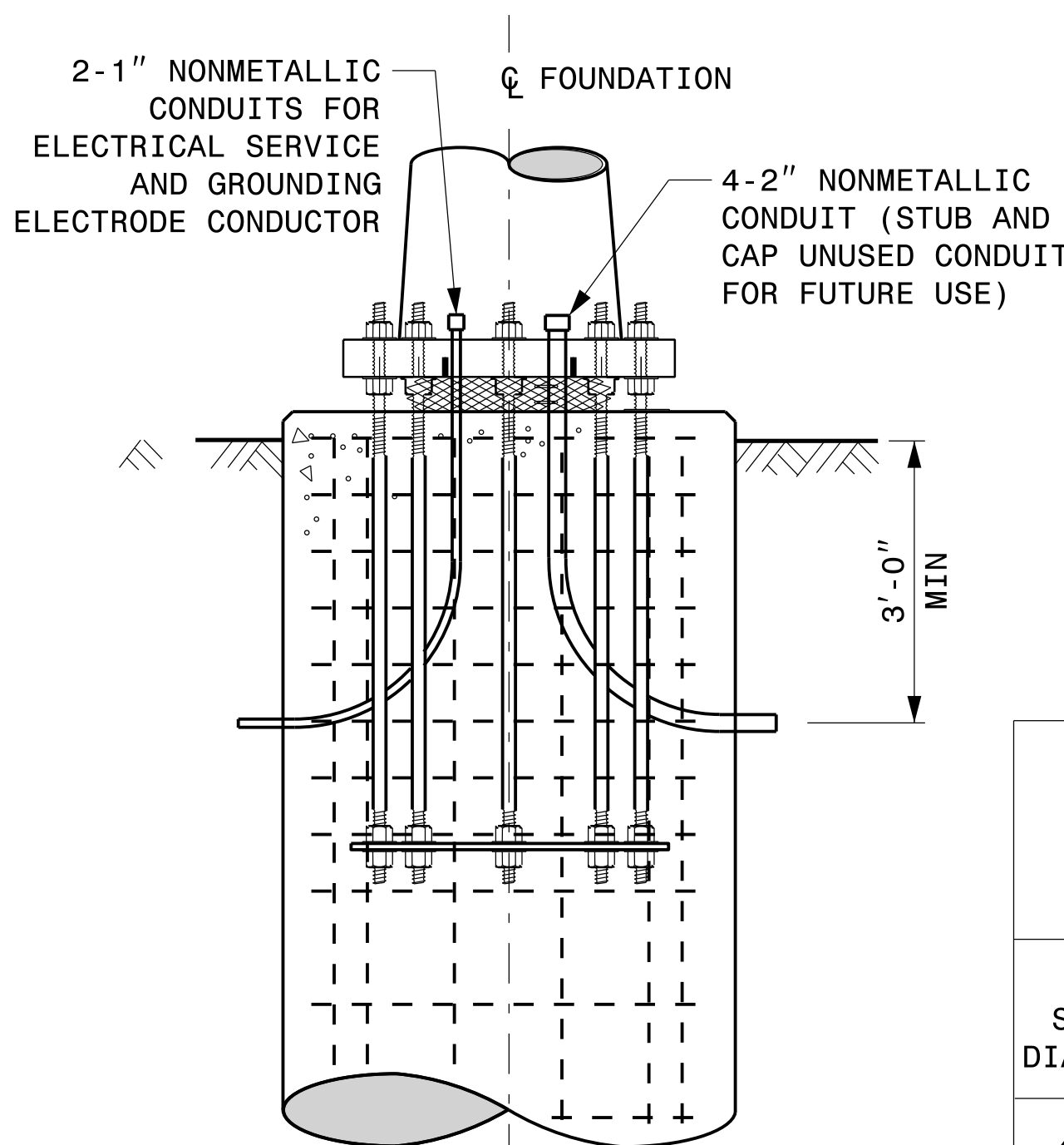
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TYPICAL FOUNDATION CONDUIT DETAILS

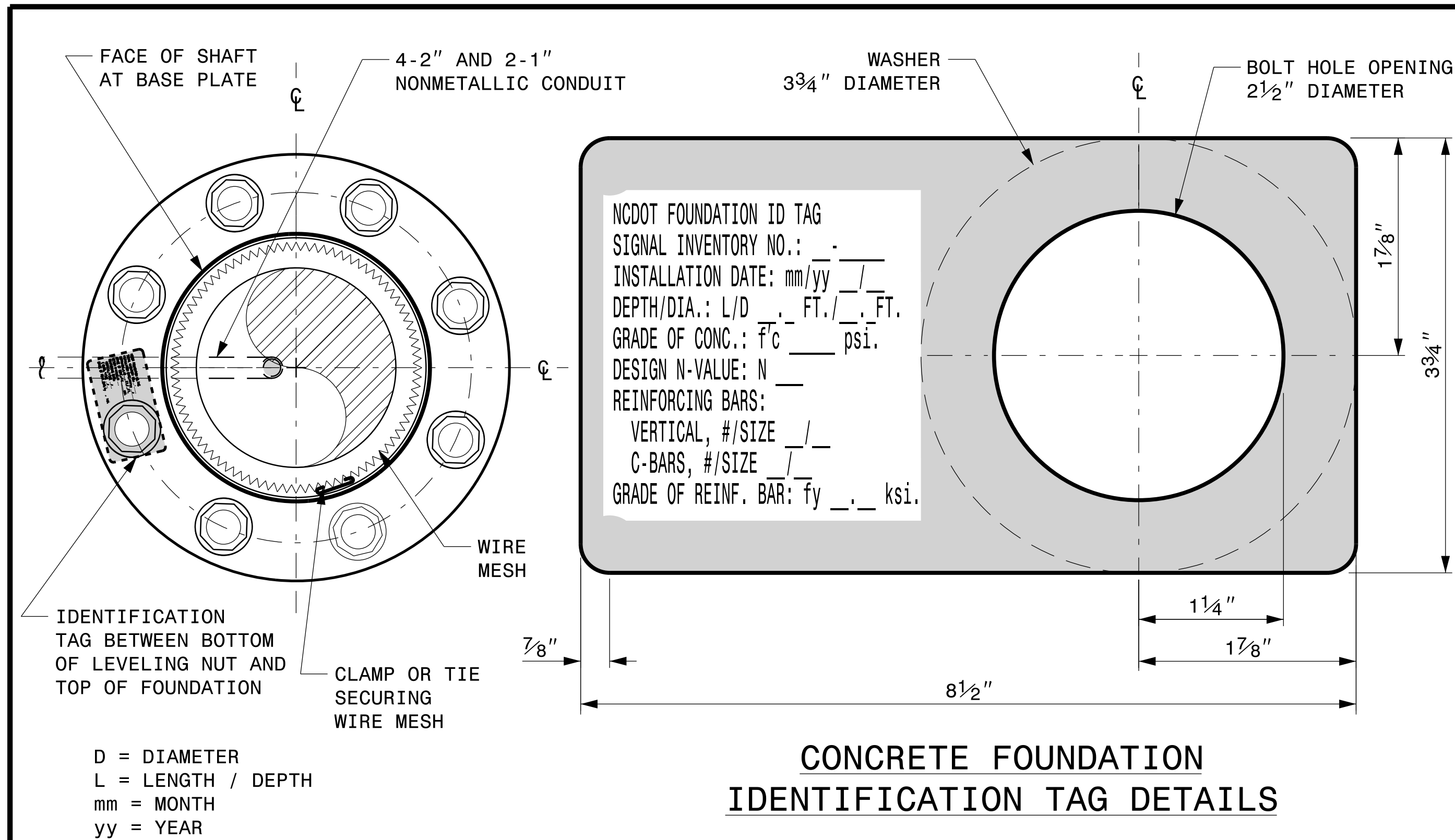
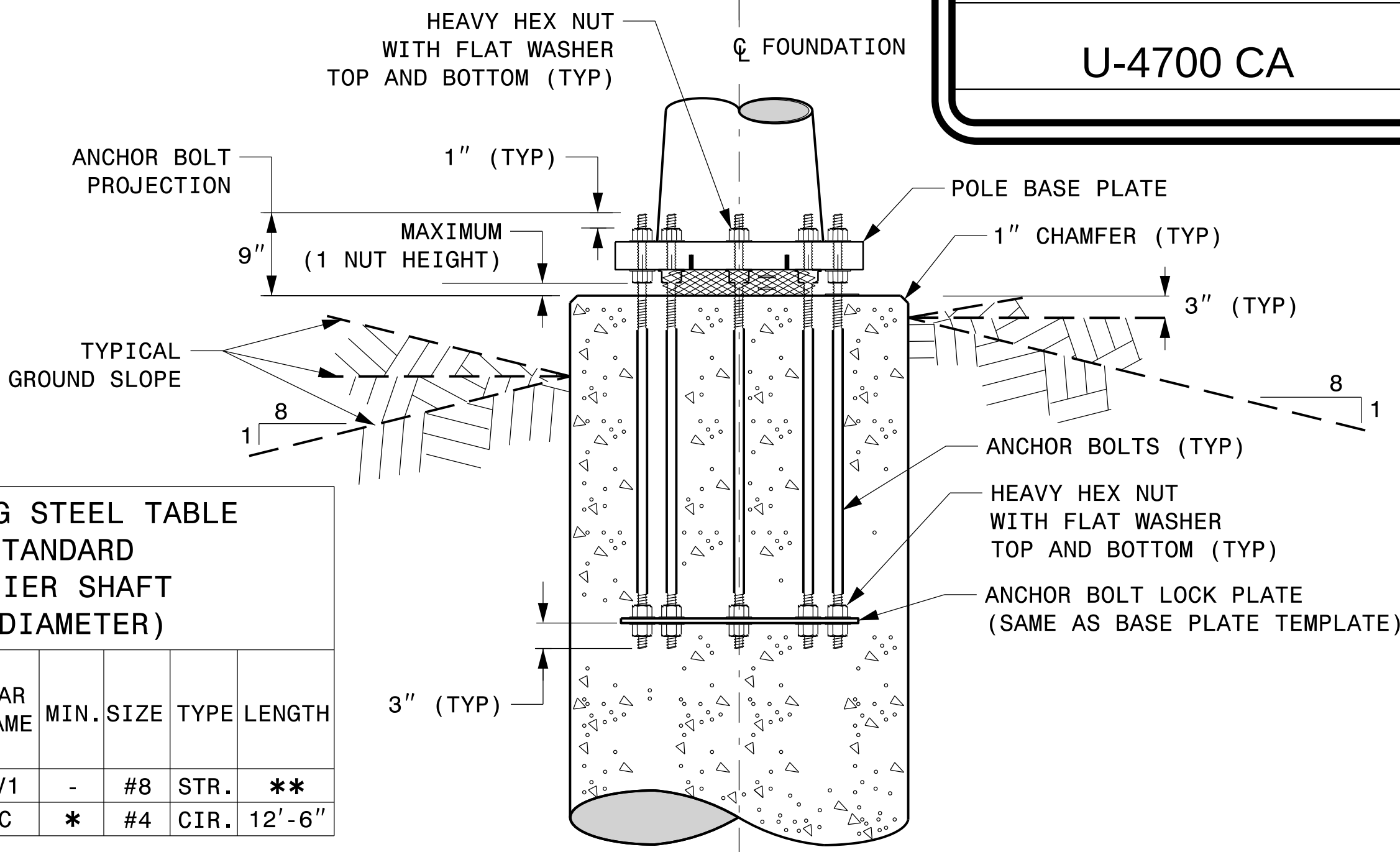
GENERAL NOTES:

- 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)
- 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.

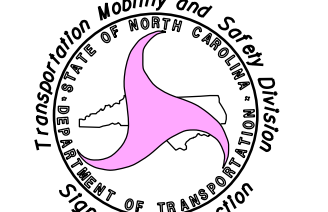


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4'-0" DIAMETER)						
"D" SHAFT DIAMETER	CONCRETE VOLUME (CU. YDS)	BAR NAME	MIN. SIZE	TYPE	LENGTH	
4'-0"	.465 X L	V1	-	#8	STR.	**
		C	*	#4	CIR.	12'-6"

* SEE NOTE 2
** SEE NOTE 3



DETAIL-A

Prepared in the Offices of:  TRANSPORTATION MOBILITY AND SAFETY DIVISION DIVISION OF TRANSPORTATION Signal Design Section 750 N. Greenfield Pkwy, Garner, NC 27529 0 SCALE NA NONE	Construction Details For Foundations PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR REVISIONS INIT. DATE	SEAL  KEVIN C. DURIGON ENGINEER 036626 DocuSigned by: Kevin Durigon 400000700070404... 09/21/2023 DATE
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Kedar Koon

SOIL CONDITION

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

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

PROJECT I.D. NO.	SHEET NO.
U-4700 CA	Sig.M8

GENERAL NOTES:

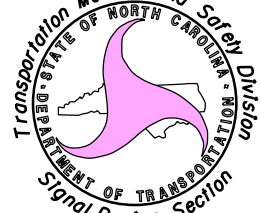
- VALUES SHOWN IN THE "REACTIONS AT THE POLE BASE" COLUMN REPRESENT THE MINIMUM ACCEPTABLE CAPACITY ALLOWED FOR DESIGN USING A COMBINED FORCE RATIO (CFR) OF 1.00.
- USE CHAIRS AND SPACERS TO MAINTAIN PROPER CLEARANCE.
- FOR FOUNDATION, ALWAYS USE AIR-ENTRAINED CONCRETE MIX.

FOUNDATION SELECTION:

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

Standard Strain Pole Foundation – All Soil Conditions

Prepared in the Offices of:



TRANSPORTATION MOBILITY AND SAFETY SOLUTIONS, INC.
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: NA
NONE

Standard Strain Pole Foundation for All Soil Conditions

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

REVISIONS: INIT. DATE

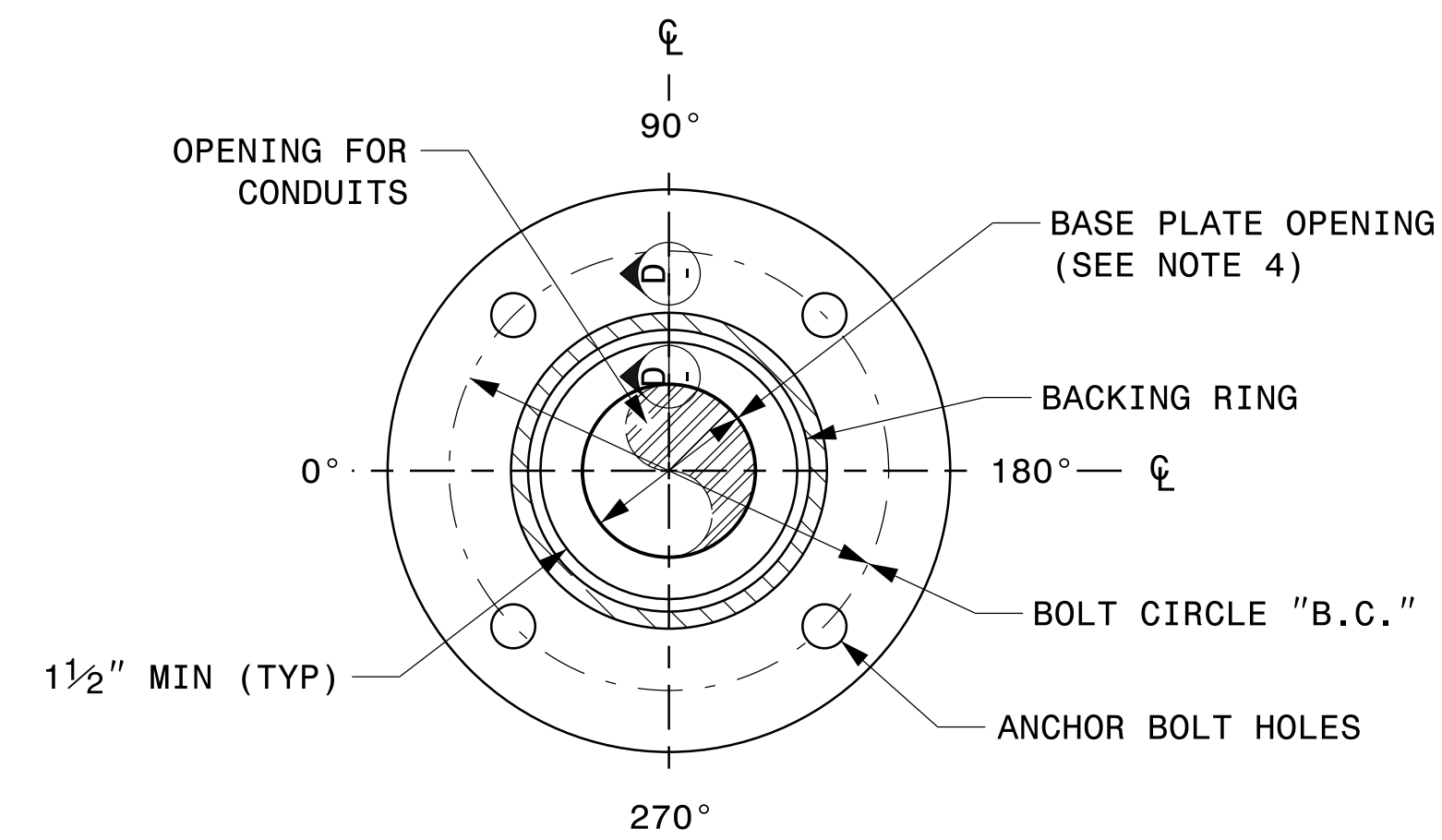
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 036626
KEVIN C. DURIGON

DocuSigned by:

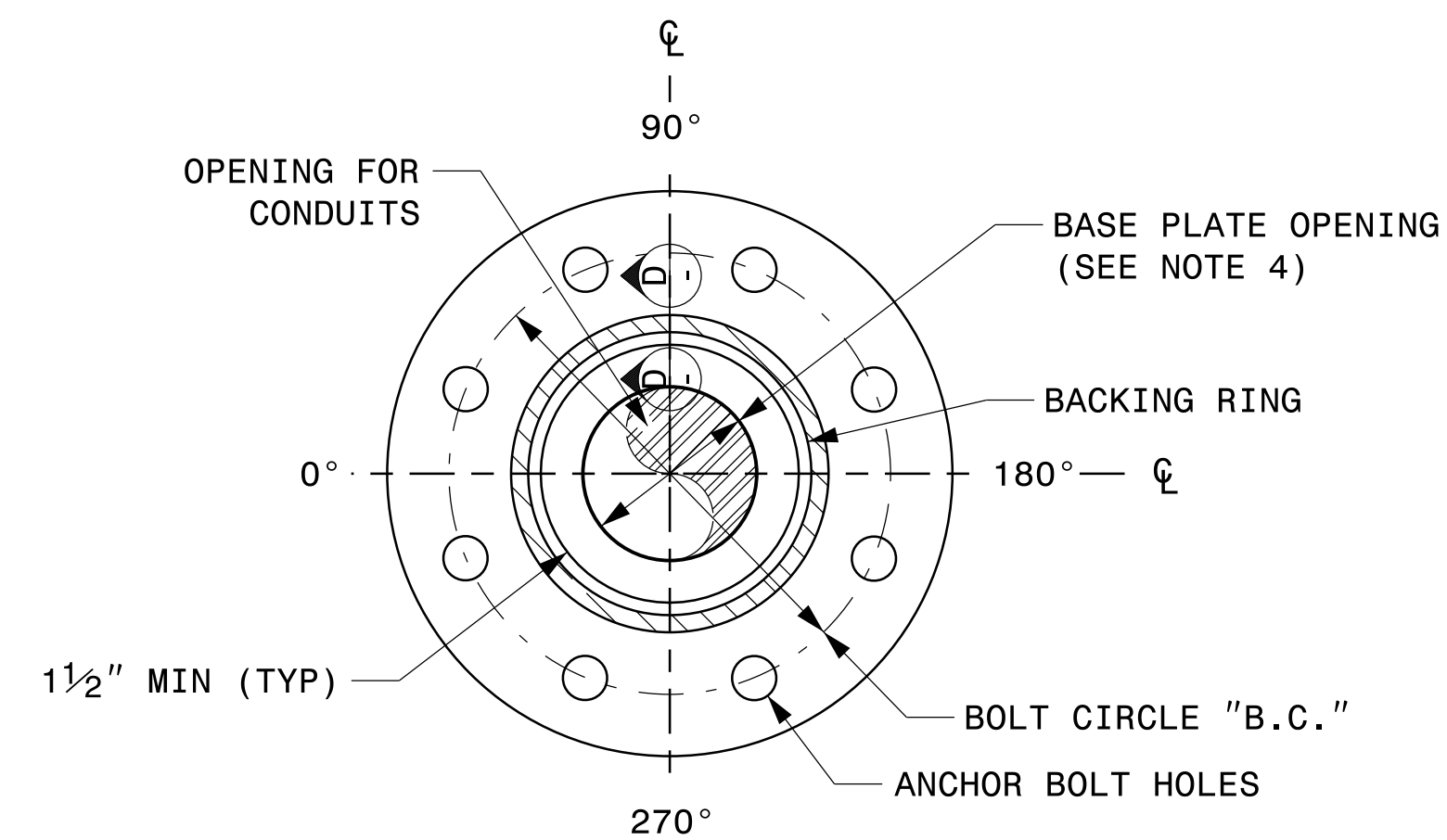
09/21/2023

Diagram illustrating a vertical pipe section with a handhole and coupling details:

- A vertical pipe section is shown with a handhole opening.
- The height of the pipe section above the handhole is dimensioned as **5'-0" MIN**.
- The handhole opening is labeled **4" x 8" REINFORCED HANDHOLE**.
- A coupling is shown below the handhole, labeled **2" HALF COUPLING WITH INTERNAL THREADS (SEE DRAWING M3)**.



4 BOLT PATTERN
FOR POLES UP TO 40'



8 BOLT PATTERN
FOR POLES TALLER THAN 40'

4'-6"

1'-0" (TYP)

SHAFT I.D. TAG
(SEE STANDARD
DRAWING M2)

TERMINAL COMPARTMENT
(SEE NOTE 3)

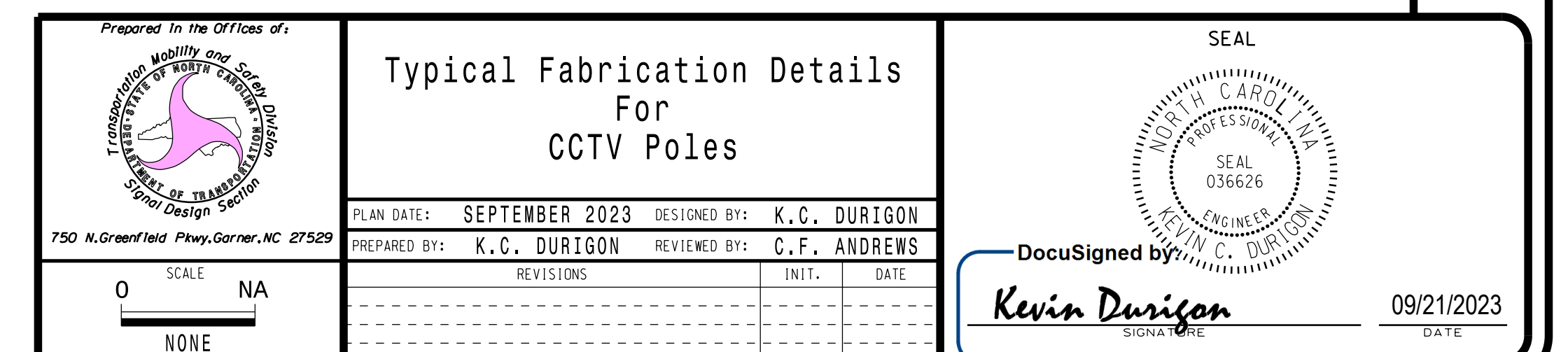
ANCHOR BOLT
(SEE STANDARD
DRAWING M2)

This technical drawing shows a cross-section of a shaft terminal compartment. The shaft is a vertical cylinder on the left. The terminal compartment is a rectangular structure on the right. A dimension line indicates a total height of 4'-6" for the compartment section shown. Another dimension line indicates a typical height of 1'-0" for the upper part of the compartment. The shaft is labeled 'SHAFT I.D. TAG (SEE STANDARD DRAWING M2)'. The terminal compartment is labeled 'TERMINAL COMPARTMENT (SEE NOTE 3)'. At the base of the compartment, there are four anchor bolts labeled 'ANCHOR BOLT (SEE STANDARD DRAWING M2)'. The compartment is filled with a material represented by a stippled pattern.

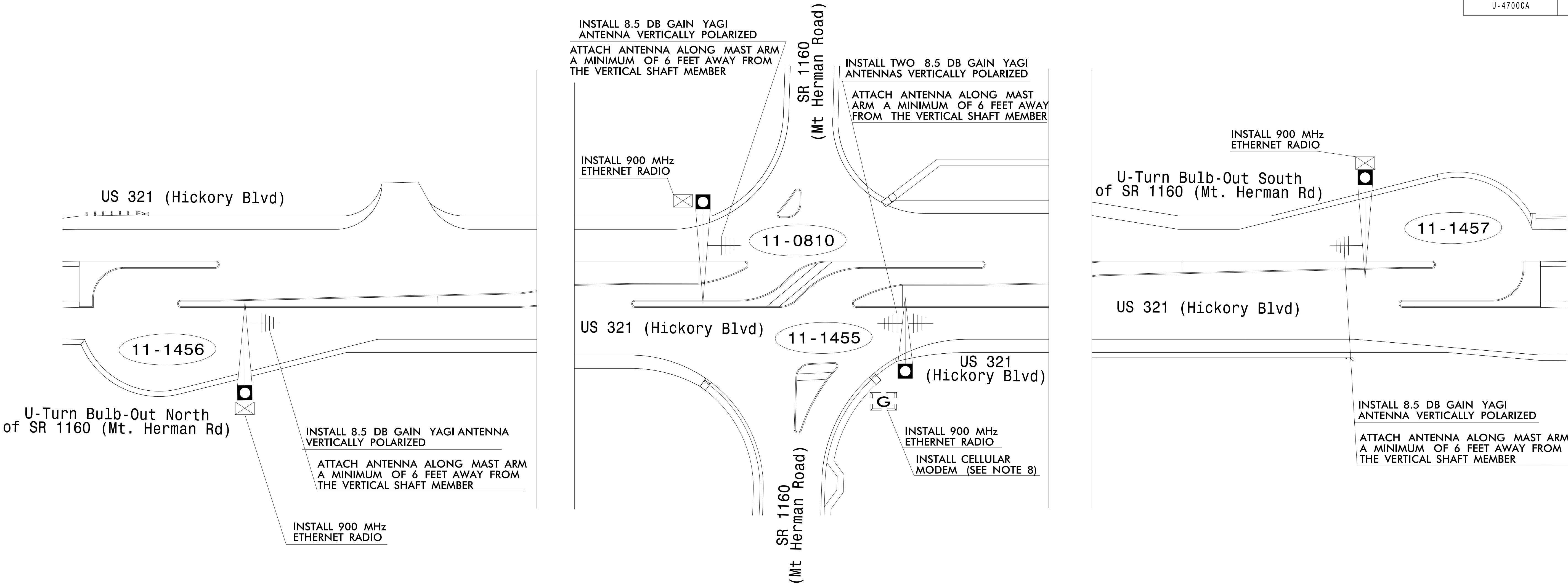
Technical drawing showing a cross-section of a vertical pipe penetration through a base plate. The drawing includes the following labels and dimensions:

- T = WALL THICKNESS**: Dimension for the wall thickness of the pipe.
- SILICONE CAULKING**: Indicated by an arrow pointing to the sealant at the top of the penetration.
- BACKING RING $3\frac{3}{8}"$ (MAX)**: Dimension for the backing ring.
- FULL PEN. WELD 45°** : Dimension for the full penetration weld angle.
- R = $.44" + T$** : Dimension for the radius of the fillet weld.
- BASE PLATE**: The horizontal plate through which the pipe penetrates.
- OPENING FOR CONDUITS**: Indicated by an arrow pointing to the opening in the base plate.
- $1\frac{1}{2}"$ MIN (TYP)**: Dimension for the minimum distance from the opening to the centerline of the pipe.
- $\frac{1}{4}"$** : Dimension for the thickness of the base plate.

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



PROJECT REFERENCE NO.	SHEET NO.
U-4700CA	SCP-1



NOTES FOR WIRELESS COMMUNICATIONS:

- FIVE (5) DAYS PRIOR TO BEGINNING WORK ON THE SIGNAL SYSTEM, CONTACT THE DIVISION 11 TRAFFIC ENGINEER AT (336) 903-9122. NOTIFY THE DIVISION TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL WIRELESS CIRCUITS ARE FUNCTIONING PROPERLY. WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.
- INSTALL COAXIAL CABLE:
 - ON WOOD POLES, REQUIRING A NEW RIGID GALVANIZED STEEL RISER, INSTALL A 2" RISER WITH WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
 - 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.
 - ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
 - 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".
- IF AN EXISTING 2" SPARE RIGID GALVANIZED STEEL RISER IS AVAILABLE, INSTALL THE COAXIAL CABLE IN THE SPARE RISER WITH 2" WEATHERHEAD.
- INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN.
(NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
- INSTALL WIRELESS RADIO 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).
- MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
- REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS" IN THE 2024 NCDOT ROADWAY STANDARD DRAWINGS.
- CELL MODEMS TO BE SUPPLIED BY THE DEPARTMENT. CONTACT THE DIVISION 11 TRAFFIC ENGINEER AT (336) 903-9122 AND ALLOW EIGHT (8) WEEKS LEAD TIME BEFORE ANTICIPATED DEPLOYMENT.

LEGEND	
	YAGI ANTENNA (DOUBLE) FOR REPEATER OPERATION
	YAGI ANTENNA (SINGLE)
	OMNI ANTENNA
	EXISTING CONTROLLER AND CABINET
	GATEWAY RADIO LOCATION
	SIGNAL INVENTORY NUMBER
	NEW METAL POLE W/MAST ARM
	EXISTING METAL POLE W/MAST ARM
	EXISTING WOOD POLE
	NEW METAL POLE
	SIGNAL POLE
	EXISTING METAL POLE
	NEW OVERSIZED JUNCTION BOX
	EXISTING OVERSIZED JUNCTION BOX
	EXISTING CONDUIT
	NEW CONDUIT
	EXISTING COMMUNICATIONS CABLE

FINAL COMMUNICATIONS PLAN

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

Prepared for the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE

0 40

1" = 40'

Signal System D11-16_Hudson Wireless Communication Plans			
Division 11 Caldwell Co. Hudson			
PLAN DATE: June 2024	REVIEWED BY: D.J. Darity		
PREPARED BY: W. Felts	REVIEWED BY: T.M. Moody		
REVISIONS	INIT.	DATE	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

DocuSigned by: *Trent Moody* 6/10/2024

DATE

CADD FILE NAME: U-4700CA SCP