T.I.P.: HE-0016

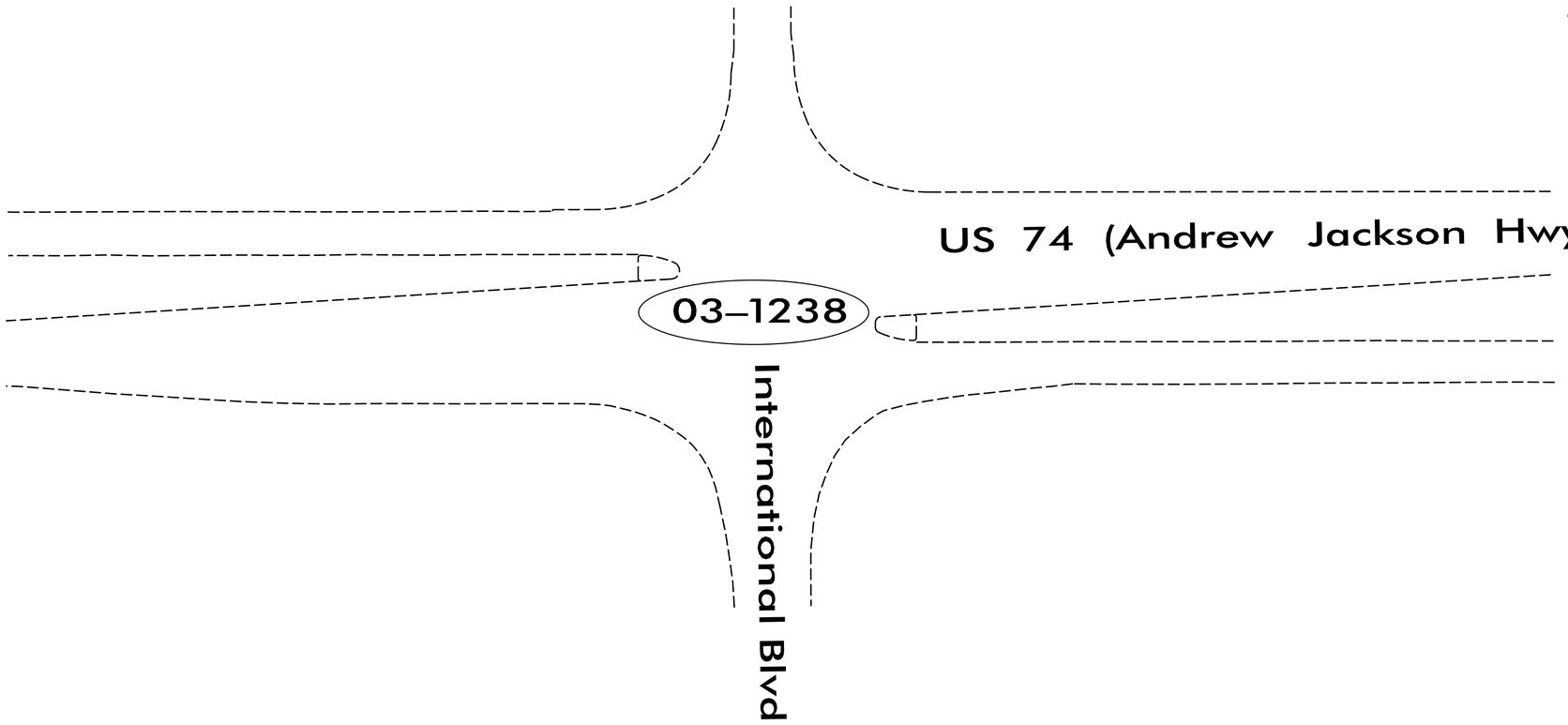
TIP NO.	SHEET NO.
HE-0016	Sig-1A.0

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL PLANS
BRUNSWICK COUNTY

LOCATION: US 74 (ANDREW JACKSON HIGHWAY) AT INTERNATIONAL BOULEVARD

NAD 83/NSRS 2007



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

INDEX OF PLANS

SHEET NUMBER	SIGNAL INV. NUMBER	LOCATION / DESCRIPTION
Sig-1.0 - Sig-1.8	03-1238	US 74 (Andrew Jackson Highway) at International Boulevard
M1A - M9	-	NCDOT 2024 Metal Pole Standard Drawing Sheets

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton 2B10B56596274A3...

SIGNATURE

03/18/2026

DATE

PLANS PREPARED BY :

EXULT ENGINEERING

NC License #C-4445

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NCDOT CONTACTS:

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750 Greenfield Parkway, Garner, NC 27529
PH. (919) 814–5000

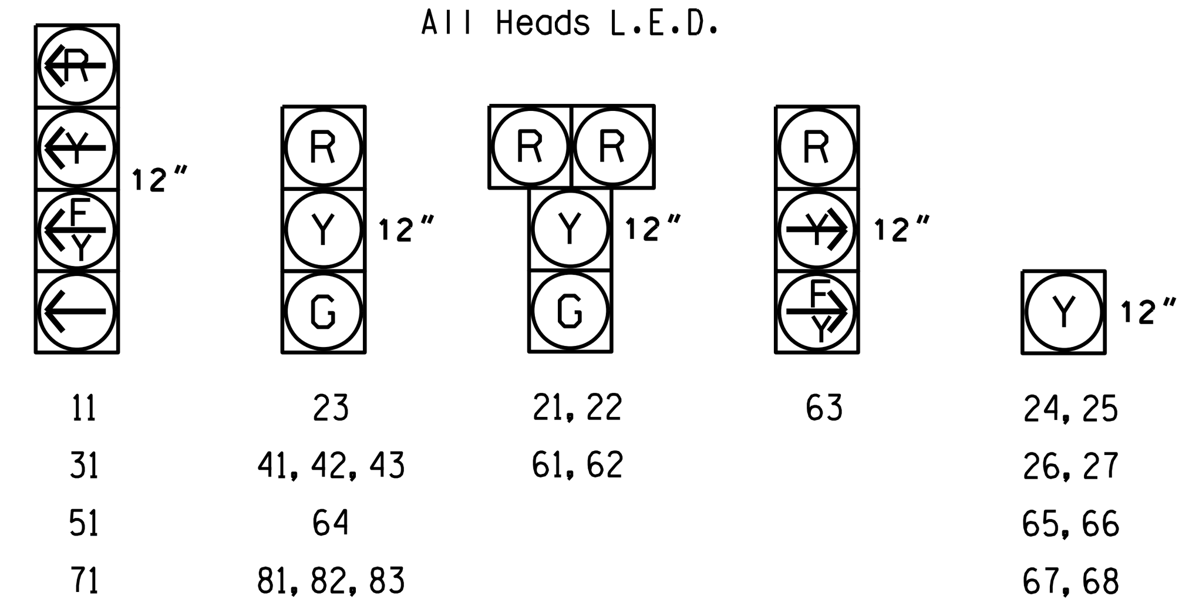
LONG VEHICLE OVERSPEED DETECTION SYSTEM
LOOP & DETECTION INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR UNITS								
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	SYSTEM NUMBER	LANE NO.	DETECTOR NUMBER	CHANNEL	NEMA PHASE	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN?
LV1	6'X6'	4	1015'	X		① EASTBOUND APPROACH	1	1	1	2*	NONE	- SEC.	2	NO
LV2	6'X6'	4	999'	X			1		2		NONE	- SEC.	2	NO
LV3	6'X6'	4	1015'	X			2	2	1	2*	NONE	- SEC.	2	NO
LV4	6'X6'	4	999'	X			2		2		NONE	- SEC.	2	NO
LV5	6'X6'	4	1015'	X		② WESTBOUND APPROACH	1	1	1	6*	NONE	- SEC.	6	NO
LV6	6'X6'	4	999'	X			1		2		NONE	- SEC.	6	NO
LV7	6'X6'	4	1015'	X			2	2	1	6*	NONE	- SEC.	6	NO
LV8	6'X6'	4	999'	X			2		2		NONE	- SEC.	6	NO
LVODS THRESHOLD SPEED (MPH)	55									2 / 6				
SET LENGTH (FT)	22									2 / 6				
LVODS EXTEND TIME	12 SEC.									2 / 6				

*Phase hold output to controller

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

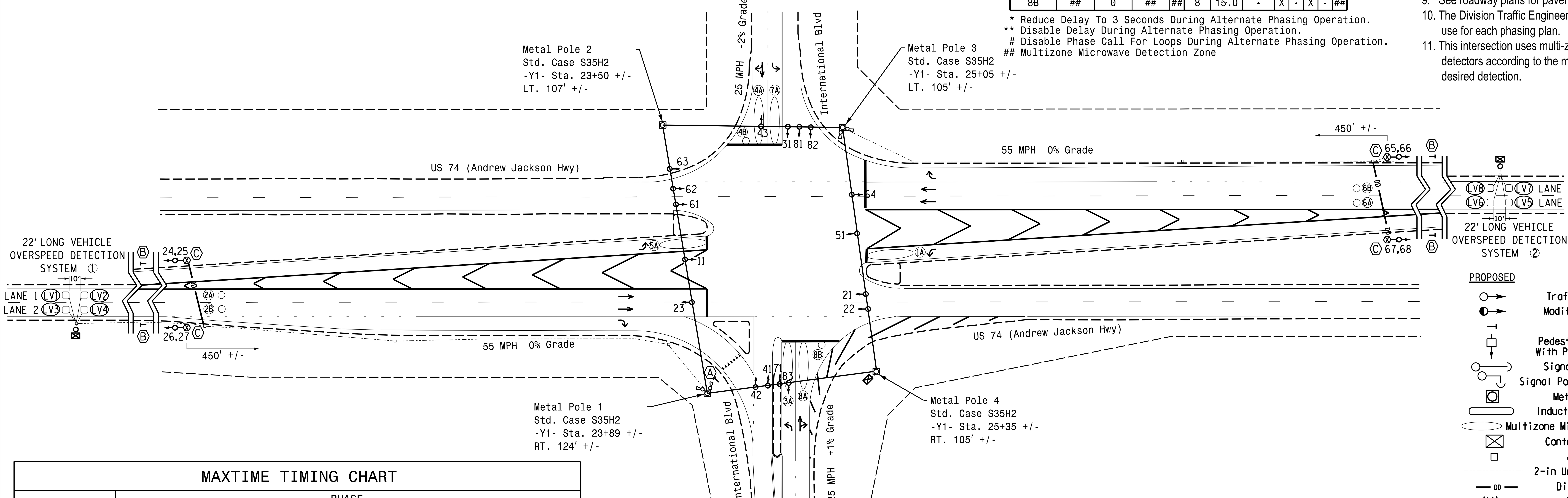
DETECTOR					PROGRAMMING							
LOOP/ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	##	0	##	##	1	15.0**	-	X	-	X	-	##
					6 #	3.0	-	X	-	X	X	##
2A	##	420	##	##	2	-	-	X	X	X	-	##
2B	##	420	##	##	2	-	-	X	X	X	-	##
3A	##	0	##	##	3	15.0*	-	X	-	X	-	##
					8 #	3.0	-	X	-	X	-	##
4A	##	0	##	##	4	10.0	-	X	-	X	-	##
4B	##	0	##	##	4	15.0	-	X	-	X	-	##
5A	##	0	##	##	5	15.0**	-	X	-	X	-	##
					2 #	3.0	-	X	-	X	X	##
6A	##	420	##	##	6	-	-	X	X	X	-	##
6B	##	420	##	##	6	-	-	X	X	X	-	##
7A	##	0	##	##	7	15.0*	-	X	-	X	-	##
					4 #	3.0	-	X	-	X	-	##
8A	##	0	##	##	8	10.0	-	X	-	X	-	##
8B	##	0	##	##	8	15.0	-	X	-	X	-	##

* Reduce Delay To 3 Seconds During Alternate Phasing Operation.
** Disable Delay During Alternate Phasing Operation.
\# Disable Phase Call For Loops During Alternate Phasing Operation.
\## Multizone Microwave Detection Zone

8 Phase
Fully Actuated
w/ Alternate Phasing
Isolated

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. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Activate beacons 24, 25, 26, and 27 to flash three seconds prior to the end of phase 2. These beacons shall remain flashing until the beginning of the succeeding phase 2 green.
8. Activate beacons 65, 66, 67, and 68 to flash three seconds prior to the end of phase 6. These beacons shall remain flashing until the beginning of the succeeding phase 6 green.
9. See roadway plans for pavement marking details.
10. The Division Traffic Engineer will determine the hours of use for each phasing plan.
11. This intersection uses multi-zone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.



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	
	Metal Strain Pole	
	Inductive Loop Detector	
	Multizone Microwave Detection Zone	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
DD	Directional Drill	N/A
N/A	Right of Way	
	Directional Arrow	
	Type III Signal Pedestal	
	Multizone Microwave Detector	
Ⓐ	"YIELD" Sign (R1-2)	Ⓐ
Ⓑ	Signal Ahead Sign (W3-3)	Ⓑ
Ⓒ	"BE PREPARED TO STOP" "WHEN FLASHING" Signs (See Figure 1)	Ⓒ

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	–	–	–	–	–	–	–
Ped Clear	–	–	–	–	–	–	–	–
Min Green *	7	14	7	7	7	14	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	25	90	25	30	25	90	25	30
Yellow Change	3.0	5.2	3.0	3.3	3.0	5.2	3.0	3.3
Red Clear	3.3	1.9	3.9	3.8	3.2	1.9	4.1	3.8
Added Initial *	–	1.5	–	–	–	1.5	–	–
Maximum Initial *	–	4.6	–	–	–	4.6	–	–
Time Before Reduction *	–	15	–	–	–	15	–	–
Time To Reduce *	–	30	–	–	–	30	–	–
Minimum Gap	–	3.0	–	–	–	3.0	–	–
Advance Walk	–	–	–	–	–	–	–	–
Non Lock Detector	X	–	X	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 phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

TABLE OF OPERATION

SIGNAL FACE	INTERVAL 1	INTERVAL 2
24,26	ON	OFF
25,27	OFF	ON
65,67	ON	OFF
66,68	OFF	ON

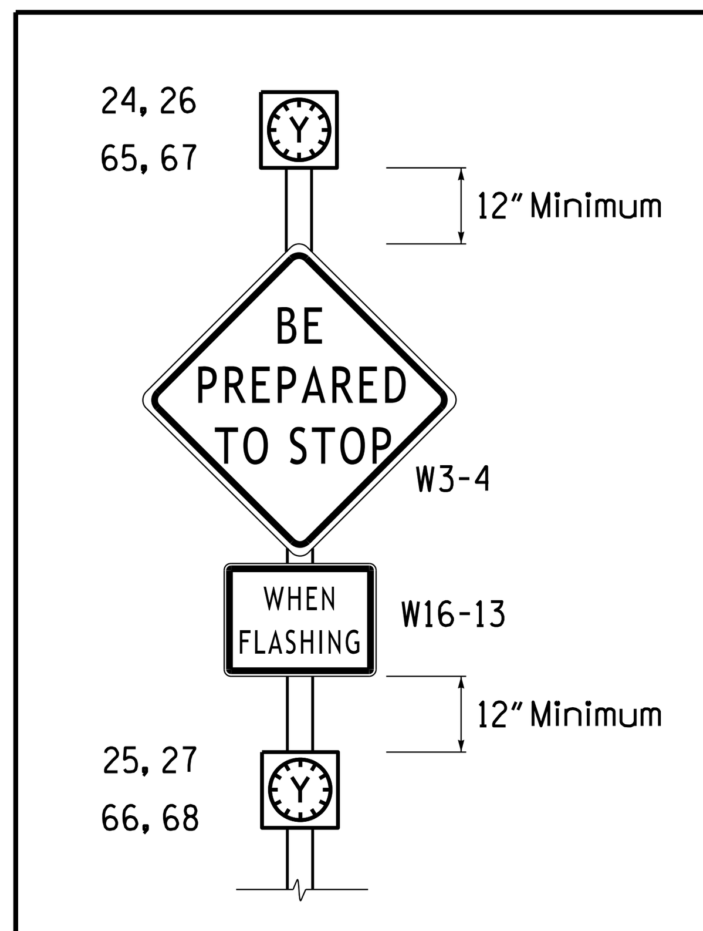


FIGURE 1

This plan supersedes the plan sealed on 08/30/2024.

New Installation - Sheet 1 of 2

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984.500.5426
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Prepared for: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

US 74 (Andrew Jackson Hwy) at International Blvd

Division 3	Brunswick County	Northwest
PLAN DATE: February 2025	EXULT PROJ. NO: 143001	
PREPARED BY: SD Wilder	REVIEWED BY: WJ Hamilton	

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

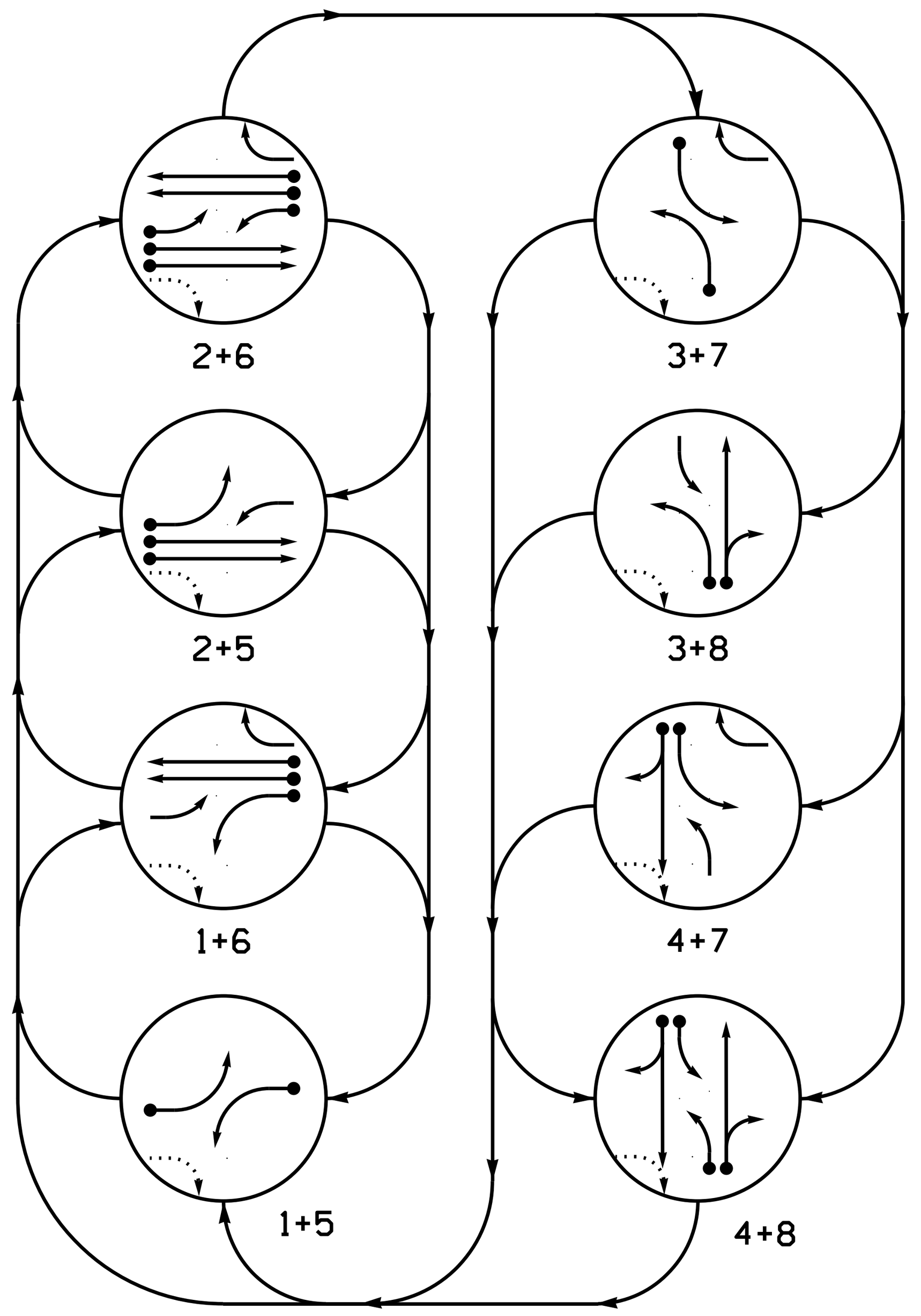
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 032396
WILLIAM J. HAMILTON

William J. Hamilton
02/04/2025
SIGNATURE DATE

SIG. INVENTORY NO. 03-1238

PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1.1

DEFAULT PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

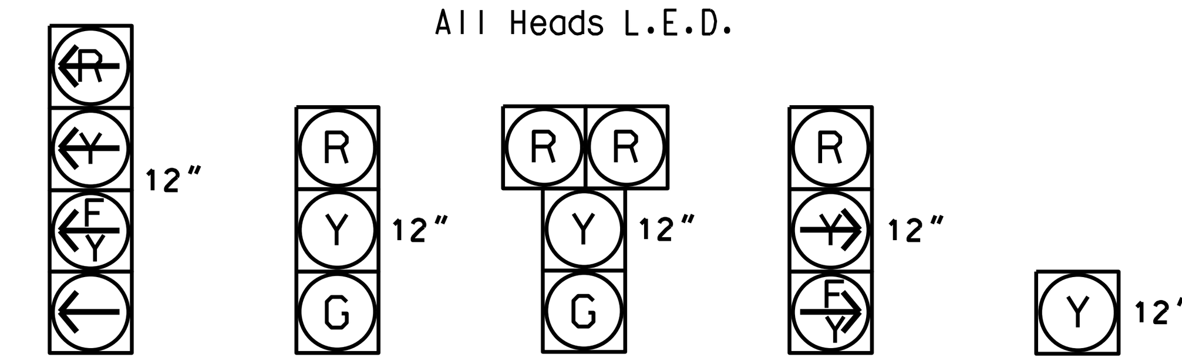
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	3+7	3+8	4+7	4+8	FLASH
11	←	←	←F/Y	←F/Y	←R	←R	←R	←R	←R
21, 22	R	R	G	G	R	R	R	R	R
23	R	R	G	G	R	R	R	R	R
31	←R	←R	←R	←R	←	←	←F/Y	←F/Y	←R
41,42,43	R	R	R	R	R	R	G	G	R
51	←	←F/Y	←	←F/Y	←R	←R	←R	←R	←R
61,62	R	G	R	G	R	R	R	R	R
63	R	F/Y→	R	F/Y→	F/Y→	R	F/Y→	R	R
64	R	G	R	G	R	R	R	R	R
71	←R	←R	←R	←R	←	←F/Y	←	←F/Y	←R
81,82,83	R	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



11	23	21, 22	63	24, 25
31	41, 42, 43	61, 62		26, 27
51	64			65, 66
71	81, 82, 83			67, 68

8 Phase
Fully Actuated
w/ Alternate Phasing
Isolated

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. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
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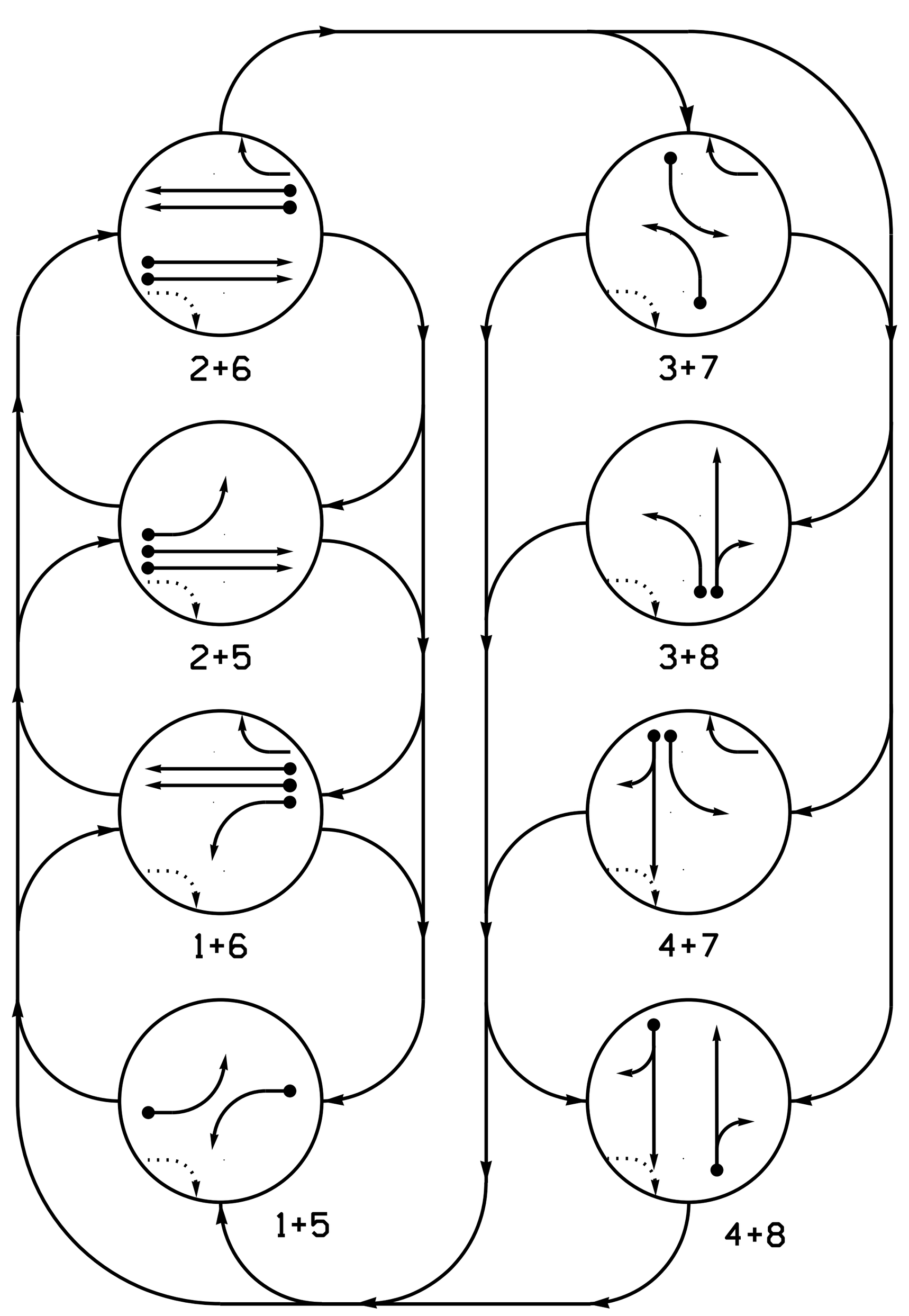
8. Activate beacons 65, 66, 67, and 68 to flash three seconds prior to the end of phase 6. These beacons shall remain flashing until the beginning of the succeeding phase 6 green.
9. See roadway plans for pavement marking details.
10. The Division Traffic Engineer will determine the hours of use for each phasing plan.
11. This intersection uses multi-zone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.

ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 1+5	1+6	2+5	2+6	3+7	3+8	4+7	4+8	FLASH
11	←	←	←R	←R	←R	←R	←R	←R	←R
21, 22	R	R	G	G	R	R	R	R	R
23	R	R	G	G	R	R	R	R	R
31	←R	←R	←R	←R	←	←	←R	←R	←R
41,42,43	R	R	R	R	R	R	G	G	R
51	←	←R	←	←R	←R	←R	←R	←R	←R
61,62	R	G	R	G	R	R	R	R	R
63	R	F/Y→	R	F/Y→	F/Y→	R	F/Y→	R	R
64	R	G	R	G	R	R	R	R	R
71	←R	←R	←R	←R	←	←R	←	←R	←R
81,82,83	R	R	R	R	R	G	R	G	R

This plan supersedes the plan sealed on 08/30/2024.

New Installation - Sheet 2 of 2

EXULT ENGINEERING

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Prepared for: Transportation Mobility and Safety Division, Signal Design Section, NC Department of Transportation

750 N.Greenfield Pkwy, Garner, NC 27529

SCALE 0 50
1"=50'

US 74 (Andrew Jackson Hwy)
at
International Blvd

Division 3 | Brunswick County | Northwest

PLAN DATE: February 2025 | EXULT PROJ. NO: 143001

PREPARED BY: SD Wilder | REVIEWED BY: WJ Hamilton

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton

02/04/2025

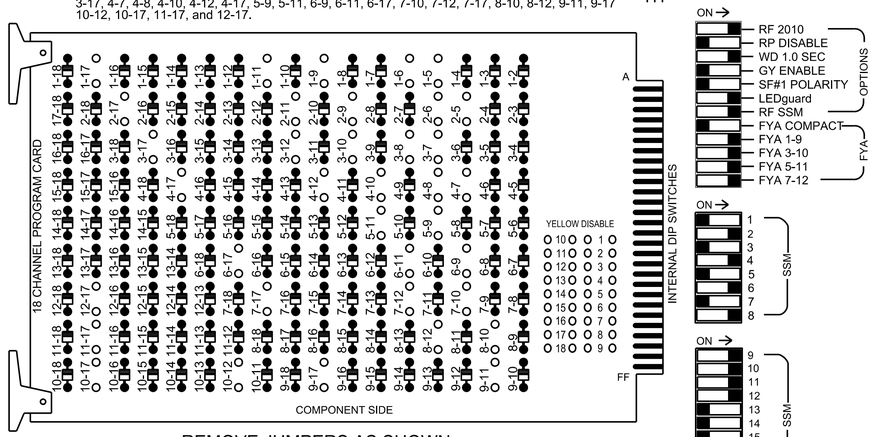
SIGNATURE | DATE

SIG. INVENTORY NO. 03-1238

18 CHANNEL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-17, 2-5, 2-6, 2-9, 2-11, 2-17, 3-7, 3-8, 3-10, 3-12, 3-17, 4-7, 4-8, 4-10, 4-12, 4-17, 5-9, 5-11, 6-9, 6-11, 6-17, 7-10, 7-12, 7-17, 8-10, 8-12, 9-11, 9-17 10-12, 10-17, 11-17, and 12-17.



REMOVE JUMPERS AS SHOWN

NOTES:

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

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 2 HOLD AC ISOLATOR
	L														Ø 6 HOLD AC ISOLATOR

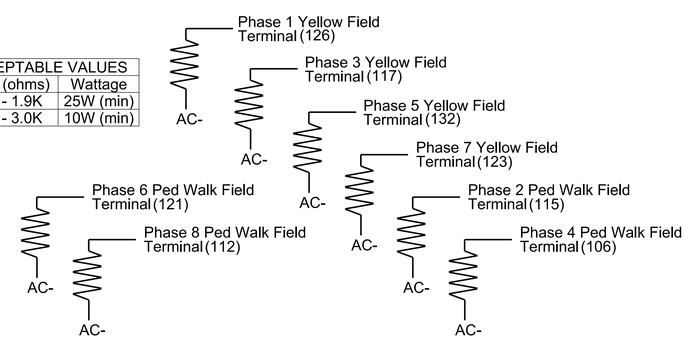
EX. : 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

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



NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. Program phases 2 and 6 for Advanced Warning.
5. Program phases 2 and 6 for 3.0 seconds Pre Clearance.
6. 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, **S3, S4, S5, **S6, S7, S8, **S9, S10, S11, **S12, AUX S1, AUX S2, AUX S3, AUX S4, AUX S5
Phases Used.....1, 2, 3, 4, 5, 6, 7, 8
Overlap "1".....*
Overlap "2".....*
Overlap "3".....*
Overlap "4".....*
Overlap "5".....*

*See overlap programming detail on sheet 2.
**Used for Advance Beacons only.

SPECIAL DETECTOR NOTE

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

This plan supersedes the plan sealed on 08/30/2024.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

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PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1,2

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	ADVANCE BEACON	3	4	4 PED	ADVANCE BEACON	5	6		6 PED	ADVANCE BEACON	7	8	8 PED	ADVANCE BEACON	OL1	OL2	OL5	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	21,22	23	NU	24,26	31★	41,42 43	NU	65,67	51★	61,62	64	NU	25,27	71★	81,82 83	NU	66,68	11★	31★	63	51★	71★	NU
RED		128	128				101				134	134				107					A111			
YELLOW	★	129	129			★	102			★	135	135			★	108								
GREEN		130	130				103				136	136				109								
RED ARROW																			A121	A124		A114	A101	
YELLOW ARROW																			A122	A125	A112	A115	A102	
FLASHING YELLOW ARROW																			A123	A126	A113	A116	A103	
GREEN ARROW	127					118				133					124									
✋	·	·	·	·		·		·	·	·	·	·		·	·	·	·	·	·	·	·	·	·	
PED YELLOW					** 114				** 105					** 120				** 111						
🚶	·	·	·	★		·		★	·	·	·	·	★	·	·	·	★	·	·	·	·	·	·	

NU = Not Used
★ Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.
** Outputs have been reassigned for Advanced Beacons. See sheet 3 for reassignment, programming and wiring details.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

Electrical Detail - Sheet 1 of 7

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 74 (Andrew Jackson Hwy) at International Blvd

Division 3 Brunswick County Northwest

PLAN DATE: February 2025 EXULT PROJ. NO: 143001
PREPARED BY: SD Wilder REVIEWED BY: WJ Hamilton

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton
2B10B5695E274A3
SIGNATURE 02/04/2025 DATE

SIG. INVENTORY NO. 03-1238

NCDOT Transportation Mobility and Safety Division, Traffic Engineering Branch, Signals Management Section
750 N.Greenfield Pkwy.Garner,NC 27529

PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1.3

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	4	5
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section
Included Phases	2	4	6	8	6;7
Modifier Phases	1	3	5	7	-
Trail Green	0	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0	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	1	2	3	4	5
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section
Included Phases	-	-	-	-	6;7
Modifier Phases	1	3	5	7	-
Trail Green	0	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0	0.0

← NOTICE INCLUDED PHASE

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 1A, 3A, 5A & 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.

Plan 2

1A

Detector	Call Phase	Delay
1	1	-
29	0	-

3A

Detector	Call Phase	Delay
7	3	3.0
30	0	-

5A

Detector	Call Phase	Delay
15	5	-
31	0	-

7A

Detector	Call Phase	Delay
21	7	3.0
32	0	-

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

FLASHER CIRCUIT MODIFICATION DETAIL

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

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

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

This plan supersedes the plan sealed on 08/30/2024.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

Electrical Detail - Sheet 2 of 7

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304-F W. Millbrook Rd
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984.500.5426
www.exultengineering.com

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 74 (Andrew Jackson Hwy) at International Blvd

Division 3 Brunswick County Northwest

PLAN DATE: February 2025 EXULT PROJ. NO: 143001

PREPARED BY: SD Wilder REVIEWED BY: WJ Hamilton

REVISIONS	INIT.	DATE

NCDOT Traffic Engineering Branch - Traffic Mobility and Safety Division - Traffic Signals Management Section

750 N.Greenfield Pkwy.Garner,NC 27529

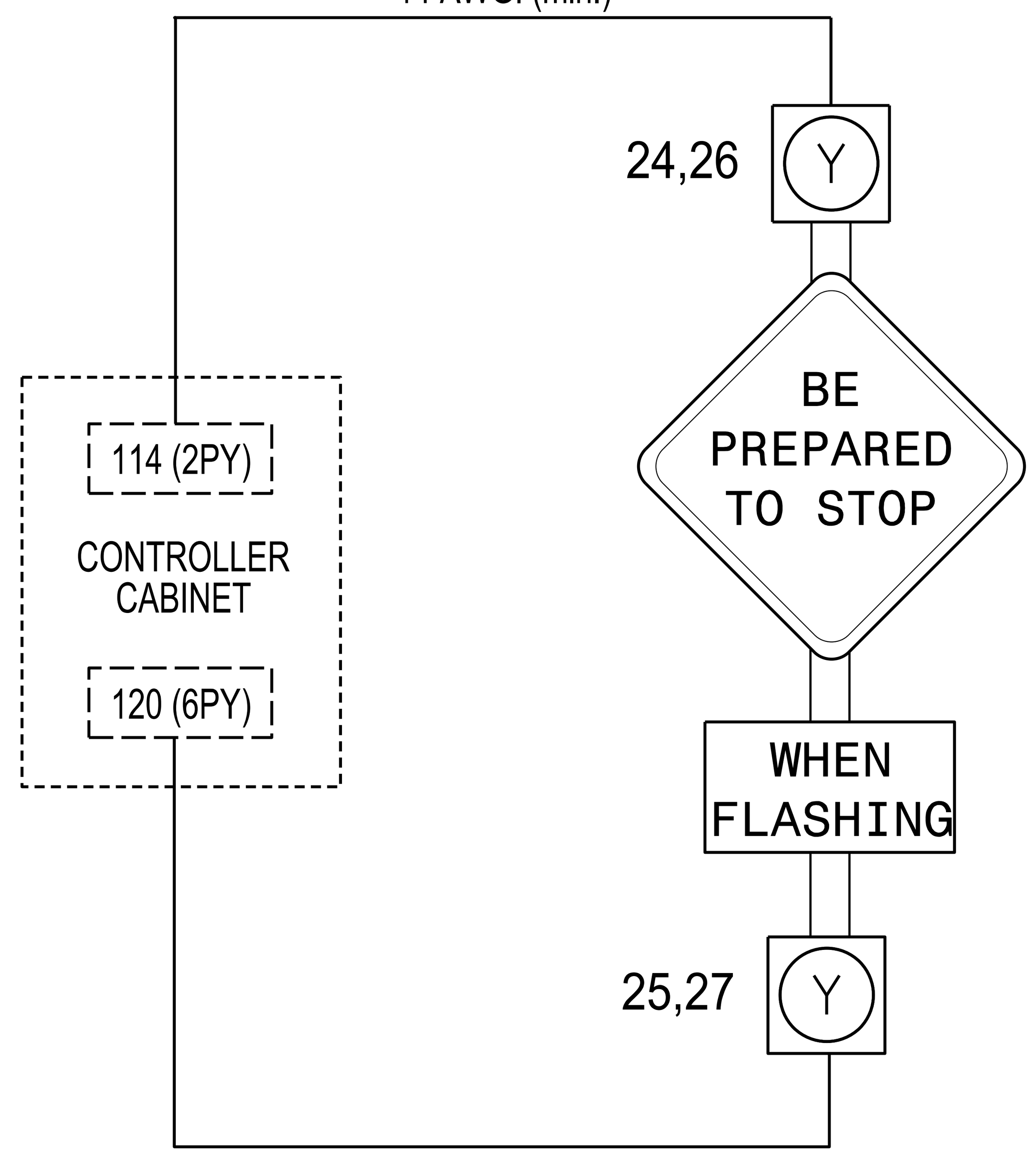
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton 2B10B5650E274A3...
02/04/2025
SIGNATURE DATE

SIG. INVENTORY NO. 03-1238

ADVANCE BEACON WIRING DETAIL FOR PHASE 2 APPROACH

(wire flashers as shown below)

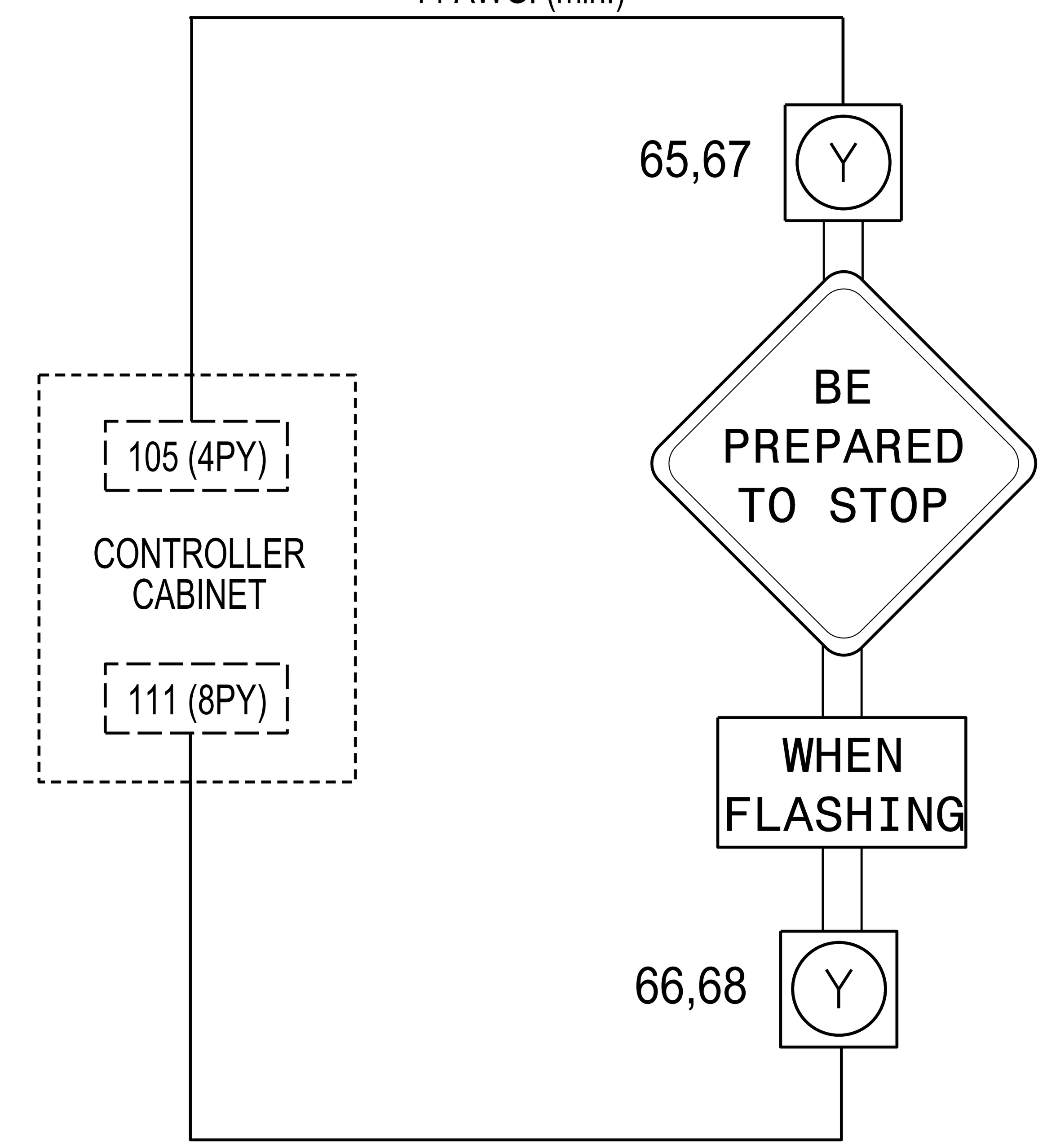


IMPORTANT

1. IF CONNECTED REMOVE, TAPE AND LABEL CONFLICT MONITOR WIRE ATTACHED TO THE REAR OF TERMINAL 114 (2PY) AND TERMINAL 120 (6PY).
2. INSERT LOADSWITCH FOR S3 AND S9.
3. MAKE SURE LOAD RESISTORS ARE IN PLACE AS SHOWN IN LOAD RESISTOR INSTALLATION DETAIL ON SHEET 2.
4. TO ACTIVATE SIGN OPERATION AS INDICATED ON THE SIGNAL PLANS, REASSIGN OUTPUTS 33 AND 34 AS SHOWN ON THIS SHEET.

ADVANCE BEACON WIRING DETAIL FOR PHASE 6 APPROACH

(wire flashers as shown below)



IMPORTANT

1. IF CONNECTED REMOVE, TAPE AND LABEL CONFLICT MONITOR WIRE ATTACHED TO THE REAR OF TERMINAL 105 (4PY) AND TERMINAL 111 (8PY).
2. INSERT LOADSWITCH FOR S6 AND S12.
3. MAKE SURE LOAD RESISTORS ARE IN PLACE AS SHOWN IN LOAD RESISTOR INSTALLATION DETAIL ON SHEET 2.
4. TO ACTIVATE SIGN OPERATION AS INDICATED ON THE SIGNAL PLANS, REASSIGN OUTPUTS 35 AND 36 AS SHOWN ON THIS SHEET.

OUTPUT CHANNEL CONFIGURATION

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

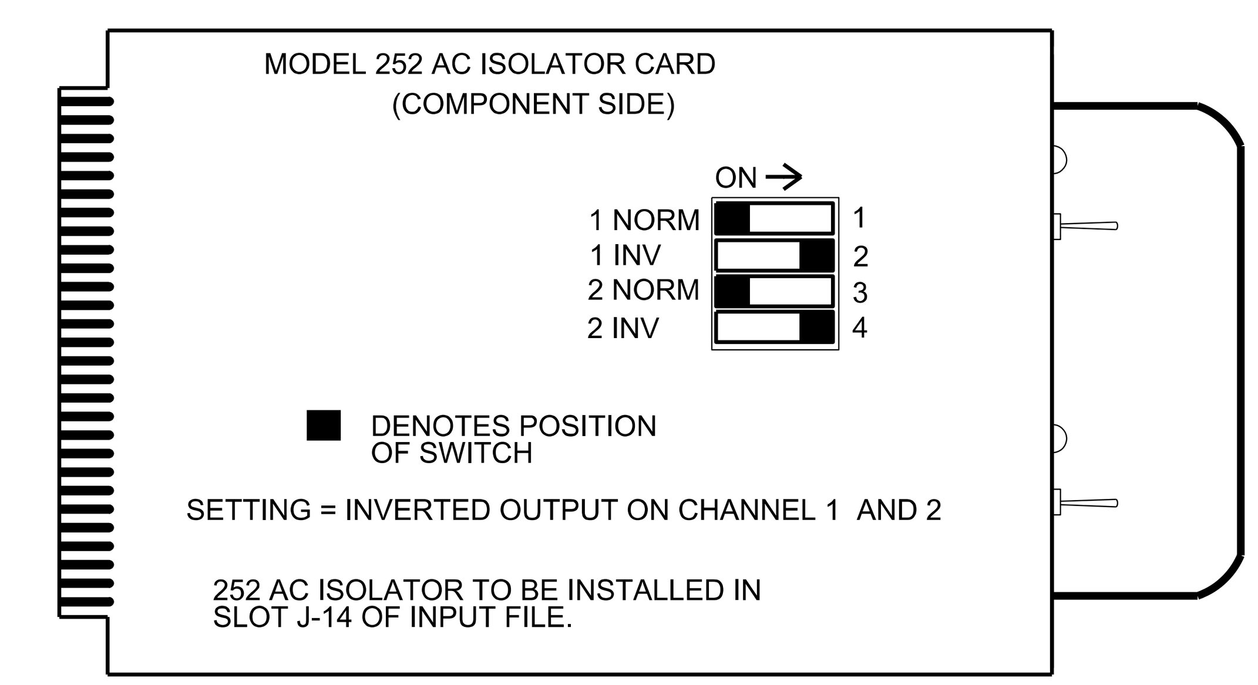
Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

Note	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1	·	X	X	1
NOTE RED FLASH →	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
NOTE RED FLASH →	6	Phase Vehicle	6	·	X	X	6
	7	Phase Vehicle	7	·	X	·	7
	8	Phase Vehicle	8	·	X	X	8
NOTE RED FLASH →	9	Overlap	1	·	X	X	9
	10	Overlap	2	·	X	X	10
NOTE RED FLASH →	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
NOTE RED FLASH →	17	Overlap	5	·	X	X	17
	18	Overlap	6	·	X	·	18
PROGRAM CHANNEL 19 AS ADV. WARNING FLASHER →	19	Adv. Warning Flasher	2	·	·	·	19
PROGRAM CHANNEL 20 AS ADV. WARNING FLASHER →	20	Adv. Warning Flasher	6				20

PHASE HOLD AC ISOLATOR (MODEL 252) OUTPUT PROGRAMMING DETAIL

(set DIP switches as shown below)



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

OUTPUT POINTS PROGRAMMING

Front Panel
Main Menu >Controller >More >Advance IO >Output Points

Web Interface
Home >Advanced IO >Cabinet Configuration >Output Points

Modify IO Module 1 as shown below and save changes.

IO Module 1

Output Point	Description	Output Control Type	Index
33	C1-35	Channel Green Walk Driver	19
34	C1-36	Channel Red Do Not Walk Driver	19
35	C1-37	Channel Green Walk Driver	20
36	C1-38	Channel Red Do Not Walk Driver	20

This plan supersedes the plan sealed on 08/30/2024.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

Electrical Detail - Sheet 3 of 7

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Transportation Mobility and Safety Division — ITS & Signals Management Section — State of North Carolina Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

US 74 (Andrew Jackson Hwy)
at
International Blvd

Division 3 Brunswick County Northwest

PLAN DATE: February 2025	EXULT PROJ. NO: 143001
PREPARED BY: SD Wilder	REVIEWED BY: WJ Hamilton

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032396 WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton
2B10B5659E274A3...
SIGNATURE: William J. Hamilton DATE: 02/04/2025

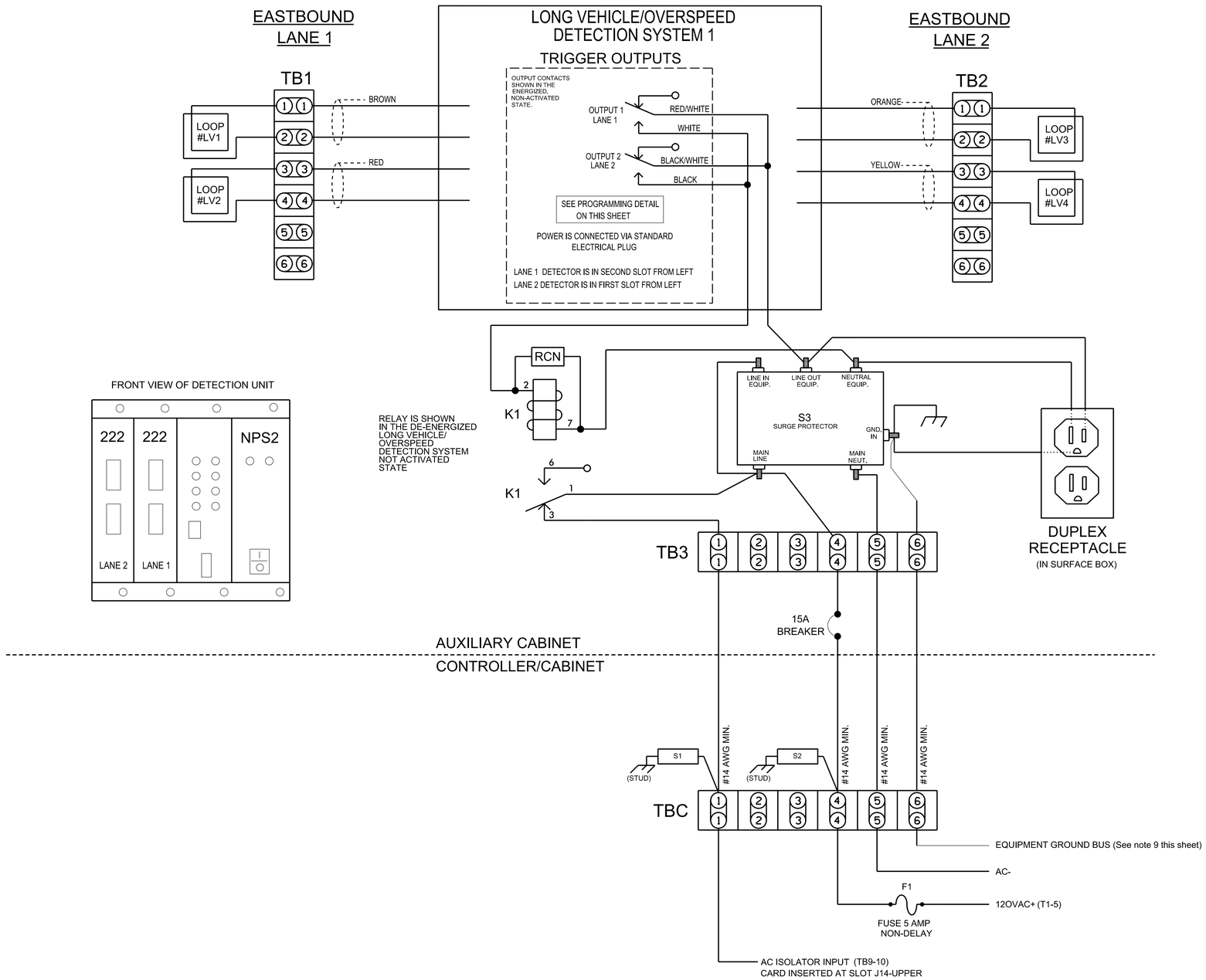
SIG. INVENTORY NO. 03-1238

PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1.5

WIRING DETAIL FOR LONG VEHICLE/OVERSPEED DETECTION - SYSTEM NO. 1

EASTBOUND - PHASE 2 APPROACH

(wire unit as shown below)



NOTES

1. Loop spacing is critical to the proper operation of this overspeed detection system. Make sure loop spacing is correctly programmed in overspeed detection system.
2. Overspeed vehicle detection unit shall be located in an auxiliary cabinet adjacent to the long vehicle system loops.
3. Relay 'K1' is an enclosed SPDT general purpose relay with a 120VAC coil, 10A contacts, and octal style plug.
4. The RC Network across the coil of 'K1' is a .1 micro farad, 100 ohm.
5. 'S1' and 'S2' are surge protectors for 120VAC interconnect circuits.
6. 'S3' is an AC service surge protector.
7. Terminal strips TB1, TB2, TB3, TBC & TBD to be added by installer.
8. Do not install ground rods at auxiliary cabinet.
9. Install equipment ground from controller cabinet to auxiliary cabinet if not already present.
10. Install disconnect if there is no disconnect present at auxiliary cabinet.
11. IMPORTANT! A jumper must be installed between input file terminals J14-E and J14-K.
12. IMPORTANT! For proper operation of the long vehicle overspeed detection system, tie TB9-12 to AC neutral.
13. IMPORTANT! Make sure both channels of the AC Isolator card inserted in Input File slot J14 are set for INVERTED operation. See sheet 2 of this electrical detail.

LONG VEHICLE/OVERSPEED DETECTION SYSTEM PROGRAMMING DETAIL

(program unit as shown)

NOTE: Unit must be programmed using a PC and a terminal emulator porgram. For connection to the terminal emulator, refer to the Long Vehicle/Overspeed Detection Unit operation manual.

PROGRAM LONG VEHICLE/OVERSPEED DETECTION UNIT BY TYPING THE FOLLOWING COMMANDS

1. SET SPEED=55
2. SET LENGTH=22'
3. SET ALARM TIME=12
4. SET SEPARATION=16' (LEADING EDGE TO LEADING EDGE) (THIS VALUE MAY VARY, PROGRAM ACTUAL MEASURED SEPARATION)
5. SET LOOP LENGTH=6' (THIS VALUE MAY VARY, PROGRAM ACTUAL MEASURED LOOP LENGTH)
6. SAVE

This plan supersedes the plan sealed on 08/30/2024.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

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Electrical Detail - Sheet 4 of 7

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 74 (Andrew Jackson Hwy) at International Blvd

Division 3 Brunswick County Northwest

PLAN DATE:	February 2025	EXULT PROJ. NO:	143001
PREPARED BY:	SD Wilder	REVIEWED BY:	WJ Hamilton

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton 2B10B5655E274A3...
SIGNATURE 02/04/2025 DATE

SIG. INVENTORY NO. 03-1238

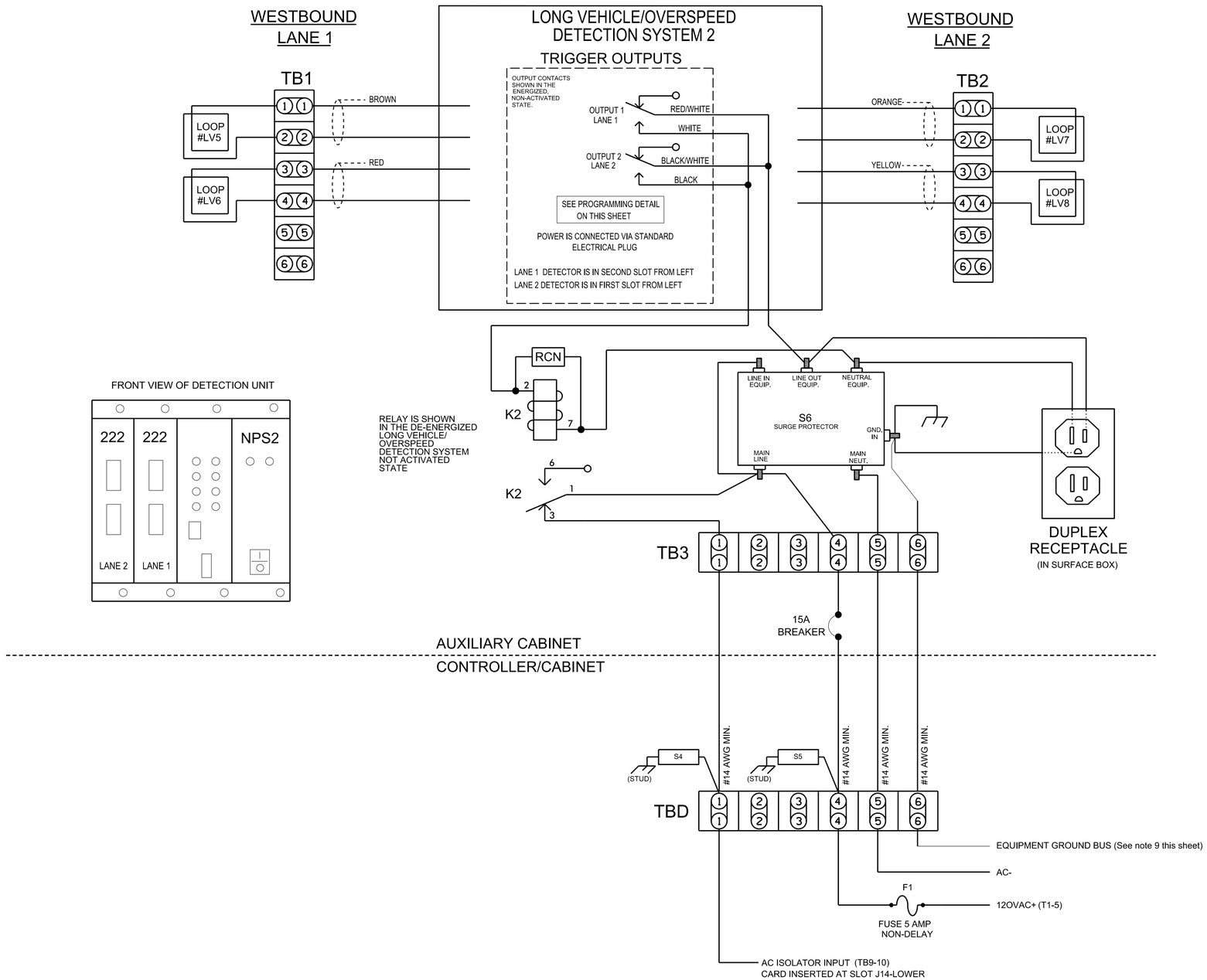
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Engineering Branch
Traffic Signals Management Section
750 N.Greenfield Pkwy.Garner,NC 27529

PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1.6

WIRING DETAIL FOR LONG VEHICLE/OVERSPEED DETECTION - SYSTEM NO. 2

WESTBOUND - PHASE 6 APPROACH

(wire unit as shown below)



NOTES

1. Loop spacing is critical to the proper operation of this overspeed detection system. Make sure loop spacing is correctly programmed in overspeed detection system.
2. Overspeed vehicle detection unit shall be located in an auxiliary cabinet adjacent to the long vehicle system loops.
3. Relay 'K2' is an enclosed SPDT general purpose relay with a 120VAC coil, 10A contacts, and octal style plug.
4. The RC Network across the coil of 'K2' is a .1 micro farad, 100 ohm.
5. 'S1' and 'S2' are surge protectors for 120VAC interconnect circuits.
6. 'S3' is an AC service surge protector.
7. Terminal strips TB1, TB2, TB3, TBC & TBD to be added by installer.
8. Do not install ground rods at auxiliary cabinet.
9. Install equipment ground from controller cabinet to auxiliary cabinet if not already present.
10. Install disconnect if there is no disconnect present at auxiliary cabinet.
11. IMPORTANT! A jumper must be installed between input file terminals J14-E and J14-K.
12. IMPORTANT! For proper operation of the long vehicle overspeed detection system, tie TB9-12 to AC neutral.
13. IMPORTANT! Make sure both channels of the AC Isolator card inserted in Input File slot J14 are set for INVERTED operation. See sheet 2 of this electrical detail.

LONG VEHICLE/OVERSPEED DETECTION SYSTEM PROGRAMMING DETAIL

(program unit as shown)

NOTE: Unit must be programmed using a PC and a terminal emulator porgram. For connection to the terminal emulator, refer to the Long Vehicle/Overspeed Detection Unit operation manual.

PROGRAM LONG VEHICLE/OVERSPEED DETECTION UNIT BY TYPING THE FOLLOWING COMMANDS

1. SET SPEED=55
2. SET LENGTH=22'
3. SET ALARM TIME=12
4. SET SEPARATION=16' (LEADING EDGE TO LEADING EDGE) (THIS VALUE MAY VARY, PROGRAM ACTUAL MEASURED SEPARATION)
5. SET LOOP LENGTH=6' (THIS VALUE MAY VARY, PROGRAM ACTUAL MEASURED LOOP LENGTH)
6. SAVE

This plan supersedes the plan sealed on 08/30/2024.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

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Electrical Detail - Sheet 5 of 7

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 74 (Andrew Jackson Hwy) at International Blvd

Division 3 Brunswick County Northwest

PLAN DATE:	February 2025	EXULT PROJ. NO:	143001
PREPARED BY:	SD Wilder	REVIEWED BY:	WJ Hamilton

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON

DocuSigned by: William J. Hamilton 02/04/2025
SIGNATURE DATE

SIG. INVENTORY NO. 03-1238

NC Department of Transportation Mobility and Safety Division Traffic Engineering Branch Traffic Signals Management Section
750 N.Greenfield Pkwy.Garner,NC 27529

PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1.7

LOGIC PROCESSOR PROGRAMMING

In order for the Long Vehicle Overspeed Detection System to function as designed, it is necessary for the cabinet to have a 4G modem and the intersection to be configured in the central ATMS software.

Front Panel
Main Menu >Controller >More >User Programs >Definition

Web Interface
Home >Controller >User Programs Configuration >User Programs Definition

Modify Programs 1 and 2 as shown below and save changes.

Program 1

Statement	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Ext
59	-	-	Run Program A	Number	2	-	-	0.0	0.0
60	-	-	Run Program A	Number	3	-	-	0.0	0.0

LOGIC STATEMENT DESCRIPTION

Statement 59 Description: Turns on Program 2 to monitor Phase 2 LVOD system.
Statement 60 Description: Turns on Program 3 to monitor Phase 6 LVOD system.

Program 2

Statement	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Ext
1	Local Variable	1	Is Module A input B ON	Number	1	Number	13	0.0	0.0
2	Local Variable	2	Result=(A if B)	Number	1	Local Variable	1	240.0	0.0
3	Phase Hold	2	Result=(A XOR B)	Local Variable	1	Local Variable	2	0.0	0.0
4	Custom Alarm	12	Result=A	Local Variable	2	-	-	0.0	0.0

LOGIC STATEMENT DESCRIPTION

Statement 1 Description: Reads LVOD system input on Phase 2 approach.

Statement 2 Description: Reads LVOD system input on Phase 2 approach and turns on if the input is on continuously for 240 seconds.

Statement 3 Description: Sets Phase 2 Hold "On" when the LVOD system input is active, but turns off if 240 seconds has elapsed.

Statement 4 Description: When LVOD system input for phase 2 is active continuously for 240 seconds, turns on Custom Alarm 12.

Program 3

Statement	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Ext
1	Local Variable	1	Is Module A input B ON	Number	1	Number	14	0.0	0.0
2	Local Variable	2	Result=(A if B)	Number	1	Local Variable	1	240.0	0.0
3	Phase Hold	6	Result=(A XOR B)	Local Variable	1	Local Variable	2	0.0	0.0
4	Custom Alarm	13	Result=A	Local Variable	2	-	-	0.0	0.0

LOGIC STATEMENT DESCRIPTION

Statement 1 Description: Reads LVOD system input on Phase 6 approach.

Statement 2 Description: Reads LVOD system input on Phase 6 approach and turns on if the input is on continuously for 240 seconds.

Statement 3 Description: Sets Phase 6 Hold "On" when the LVOD system input is active, but turns off if 240 seconds has elapsed.

Statement 4 Description: When LVOD system input for phase 6 is active continuously for 240 seconds, turns on Custom Alarm 13.

LOGIC PROGRAM DESCRIPTION

Program 1: This program includes logic specific to the general operation of this signal. It also includes logic to enable the other logic programs that control the Long Vehicle Overspeed Detection (LVOD) system operation.

Program 2: This program places a hold on phase 2 when phase 2 LVOD input is active. It will also disable phase 2 LVOD operations and send an alarm through the ATMS software system if the LVOD input is continuously active for more than 240 seconds (Custom Alarm 12).

Program 3: This program places a hold on phase 6 when phase 6 LVOD input is active. It will also disable phase 6 LVOD operations and send an alarm through the ATMS software system if the LVOD input is continuously active for more than 240 seconds (Custom Alarm 13).

INPUT REMAPPING ASSIGNMENT
PROGRAMING DETAIL FOR LVOD SYSTEM

Front Panel
Main Menu >Controller >More>Advanced IO >Input Points

Web Interface
Home >Controller >Advanced IO >Cabinet Configuration >Input Points

IO Module 1

Input Point	Descripton	Input Control Type	Index
13	C1-51	Not Active	0
14	C1-52	Not Active	0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

This plan supersedes the plan sealed on 08/30/2024.

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Electrical Detail - Sheet 6 of 7

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 74 (Andrew Jackson Hwy)
at
International Blvd

Division 3 Brunswick County Northwest

PLAN DATE: February 2025 EXULT PROJ. NO: 143001
PREPARED BY: SD Wilder REVIEWED BY: WJ Hamilton

REVISIONS	INIT.	DATE

750 N.Greenfield Pkwy.Garner,NC 27529

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NORTH CAROLINA PROFESSIONAL SEAL 032396 ENGINEER WILLIAM J. HAMILTON
DocuSigned by: William J. Hamilton 2B10B5659E274A3...
02/04/2025
SIGNATURE DATE
SIG. INVENTORY NO. 03-1238

PROJECT REFERENCE NO.	SHEET NO.
HE-0016	Sig-1.8

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

OVERLAP PLAN 2: Modifies overlap included phases for heads 11, 31, 51, and 71 to run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 0 seconds.

Disables phase 8 call on loop 3A and reduces delay time for phase 3 call on loop 3A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 0 seconds.

Disables phase 4 call on loop 7A and reduces delay time for phase 7 call on loop 7A to 3 seconds.

This plan supersedes the plan sealed on 08/30/2024.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-1238
DESIGNED: Feb 2025
SEALED: 02/04/2025
REVISED: N/A

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Electrical Detail - Sheet 7 of 7

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NCDOT Transportation Mobility and Safety Division Traffic Engineering Branch Traffic Signals Management Section

750 N.Greenfield Pkwy.Garner,NC 27529

US 74 (Andrew Jackson Hwy)
at
International Blvd

Division 3 Brunswick County Northwest

PLAN DATE: February 2025 EXULT PROJ. NO: 143001
PREPARED BY: SD Wilder REVIEWED BY: WJ Hamilton

REVISIONS	INIT.	DATE

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02/04/2025
SIGNATURE DATE

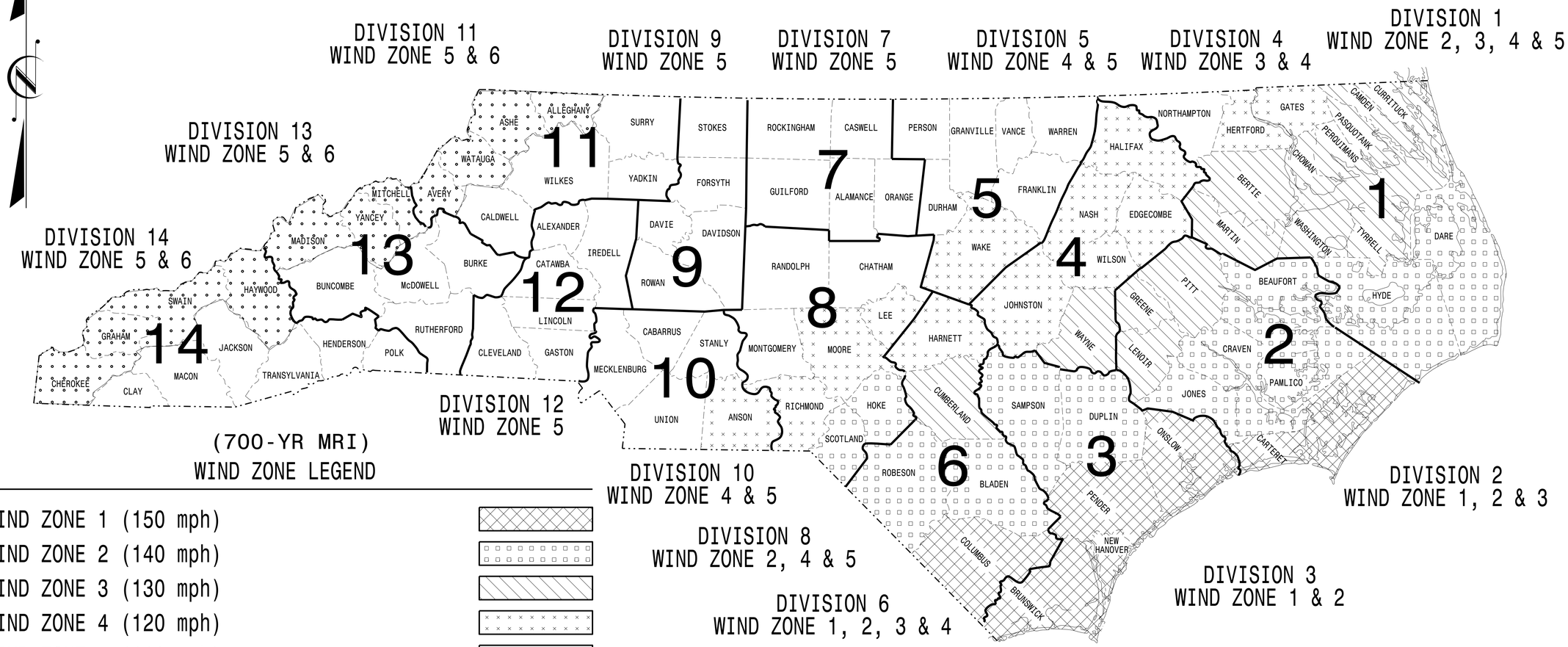
SIG. INVENTORY NO. 03-1238

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

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)

NCDOT METAL POLE STANDARDS



(700-YR MRI)
WIND ZONE LEGEND

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

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

Prepared in the Offices of:

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

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

AASHTO LRFD

Standard Specifications for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

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

MOBILITY AND SAFETY DIVISION – TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS UNIT

D.Y. ISHAK – STATE SIGNALS ENGINEER

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

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

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

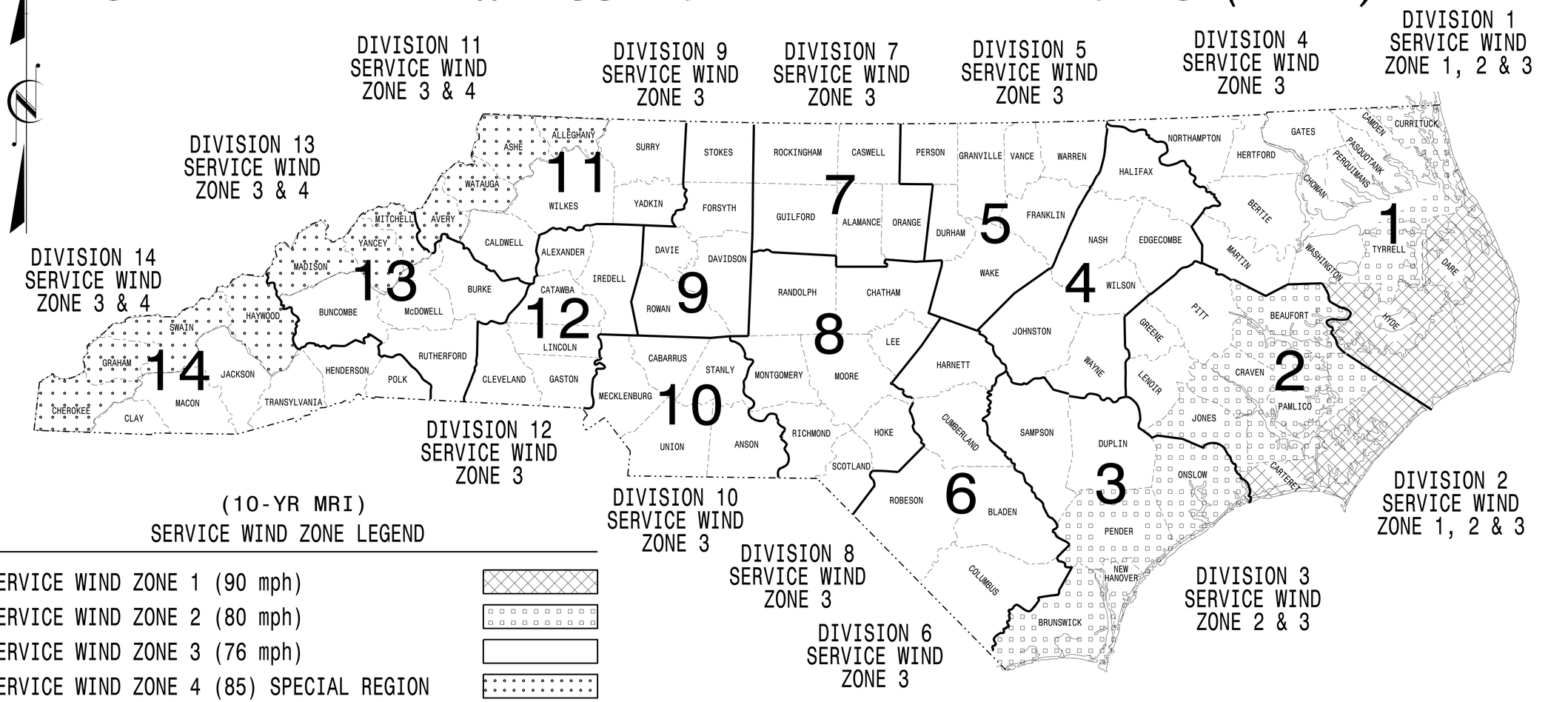
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

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

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)

NCDOT METAL POLE STANDARDS



(10-YR MRI)
SERVICE WIND ZONE LEGEND

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

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

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Garner, NC 27529

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Standard Specifications for Highway Signs, Luminaires, and Traffic Signals

INDEX OF PLANS

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

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS UNIT

D.Y. ISHAK – STATE SIGNALS ENGINEER

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

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

SEAL

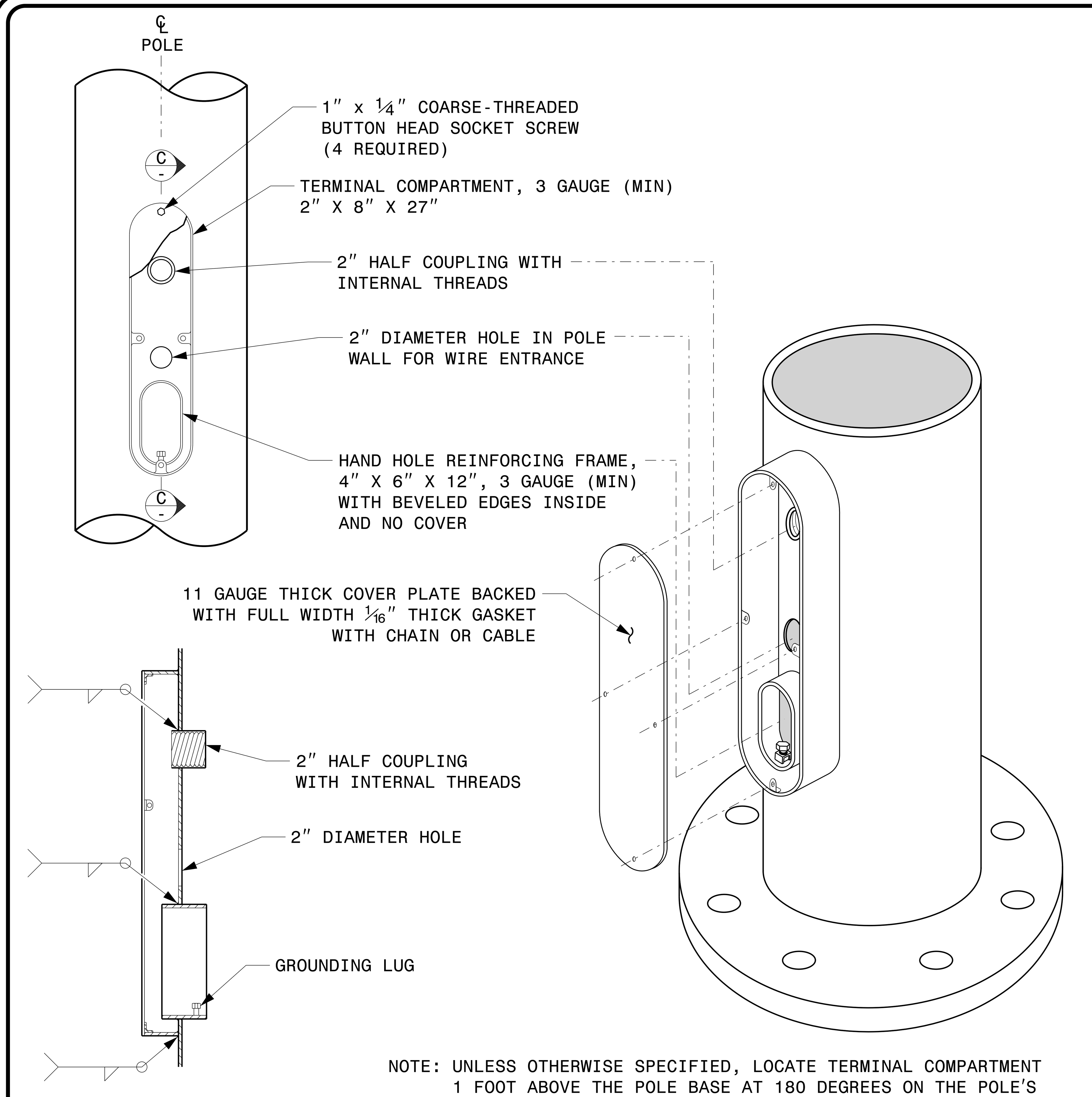
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

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

03-OCT-2023 12:21
S:\TSSGU\ITS Signals\Signal Design Section\Structures\Drawings\2024 Metal Pole Std Drawings for LRFD\2024 Sig. M1B Standard All Metal Pole (10-yr MRI).dgn
kcdurigon

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

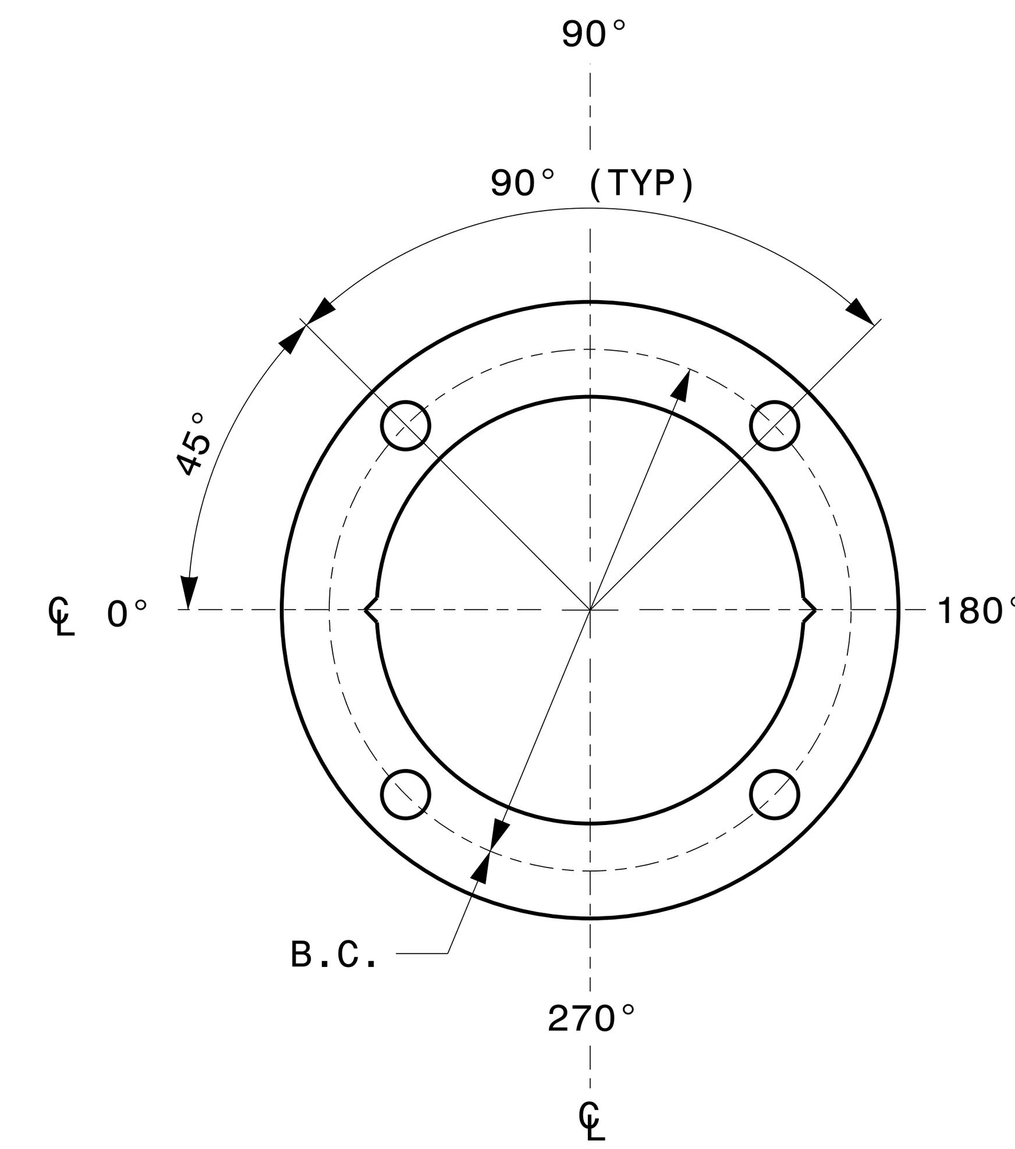
Fabrication Details – All Metal Poles



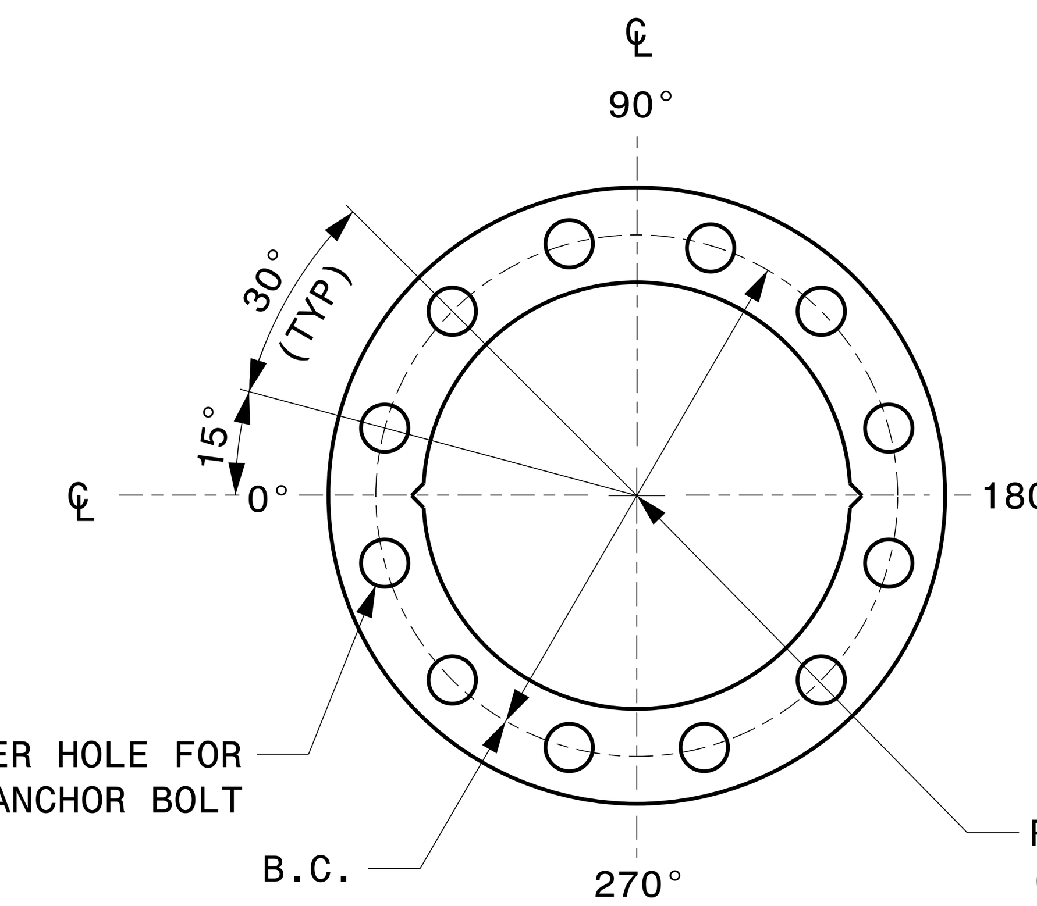
SECTION C-C

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

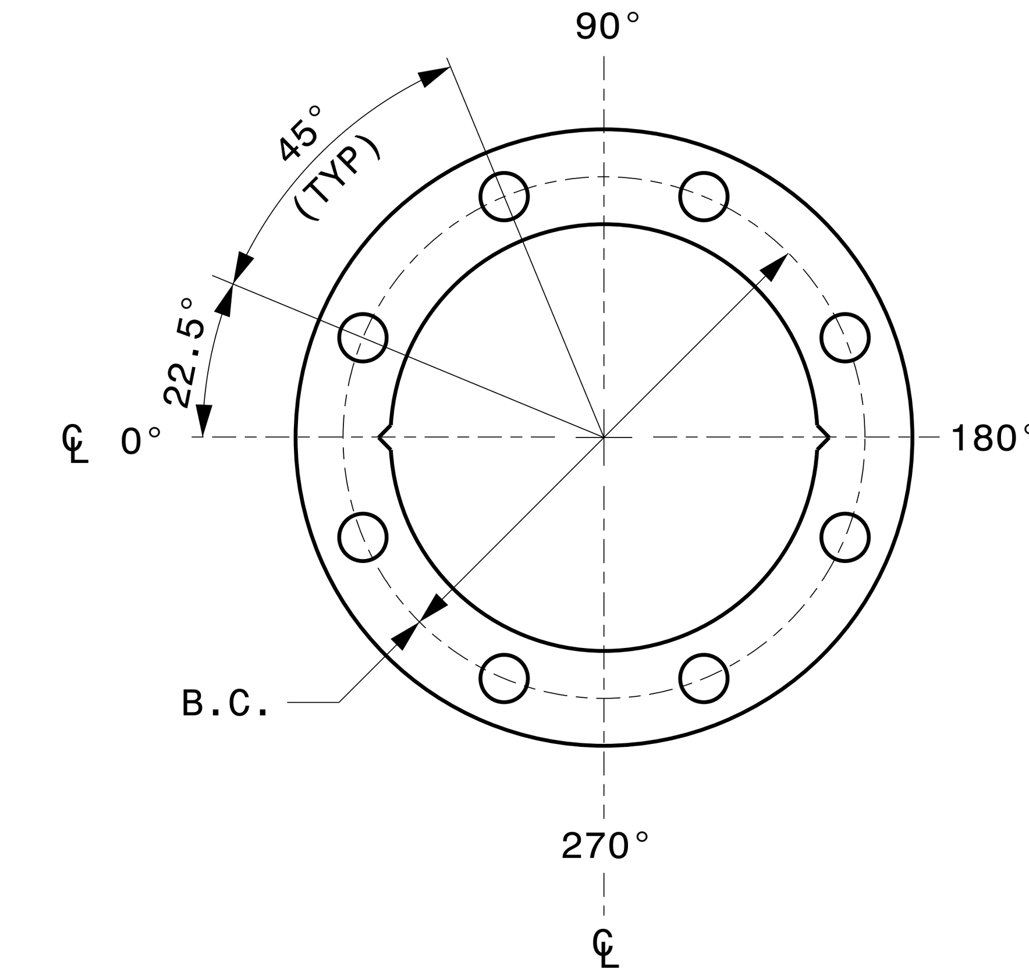
TERMINAL COMPARTMENT DETAIL



4 BOLT PATTERN



12 BOLT PATTERN



8 BOLT PATTERN

CONSTRUCT TEMPLATES AND PLATES FROM ¼" (MIN) THICK STEEL. GALVANIZING IS NOT REQUIRED.

BASE PLATE TEMPLATE AND ANCHOR BOLT LOCK PLATE DETAILS

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

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

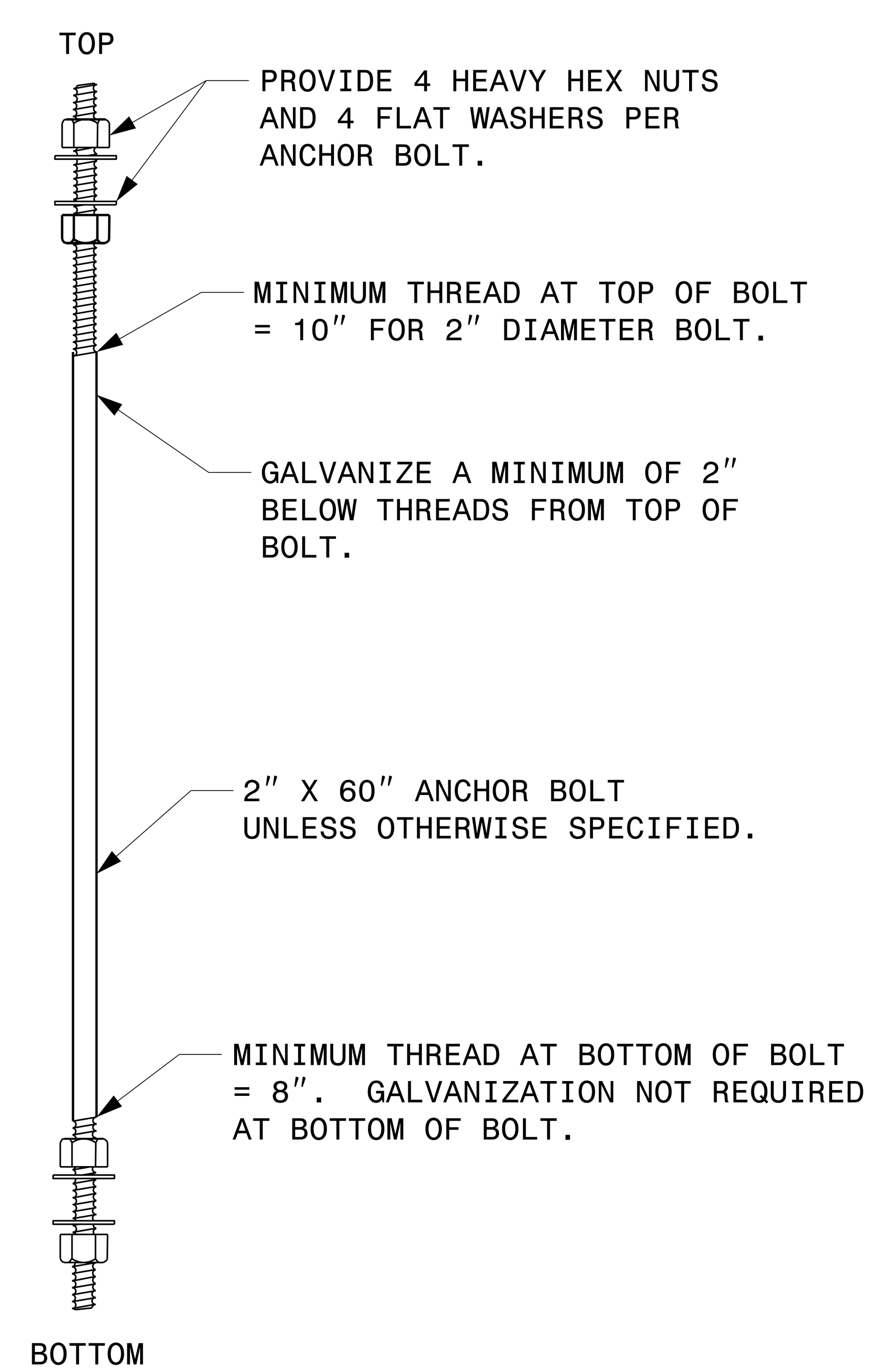
MFG ________	MFG. DATE: MM/YY
SECTION D/T/L/Y	___/___/___/___
NCDOT SIG. INV. NO.	________
NCDOT POLE NO.	________

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

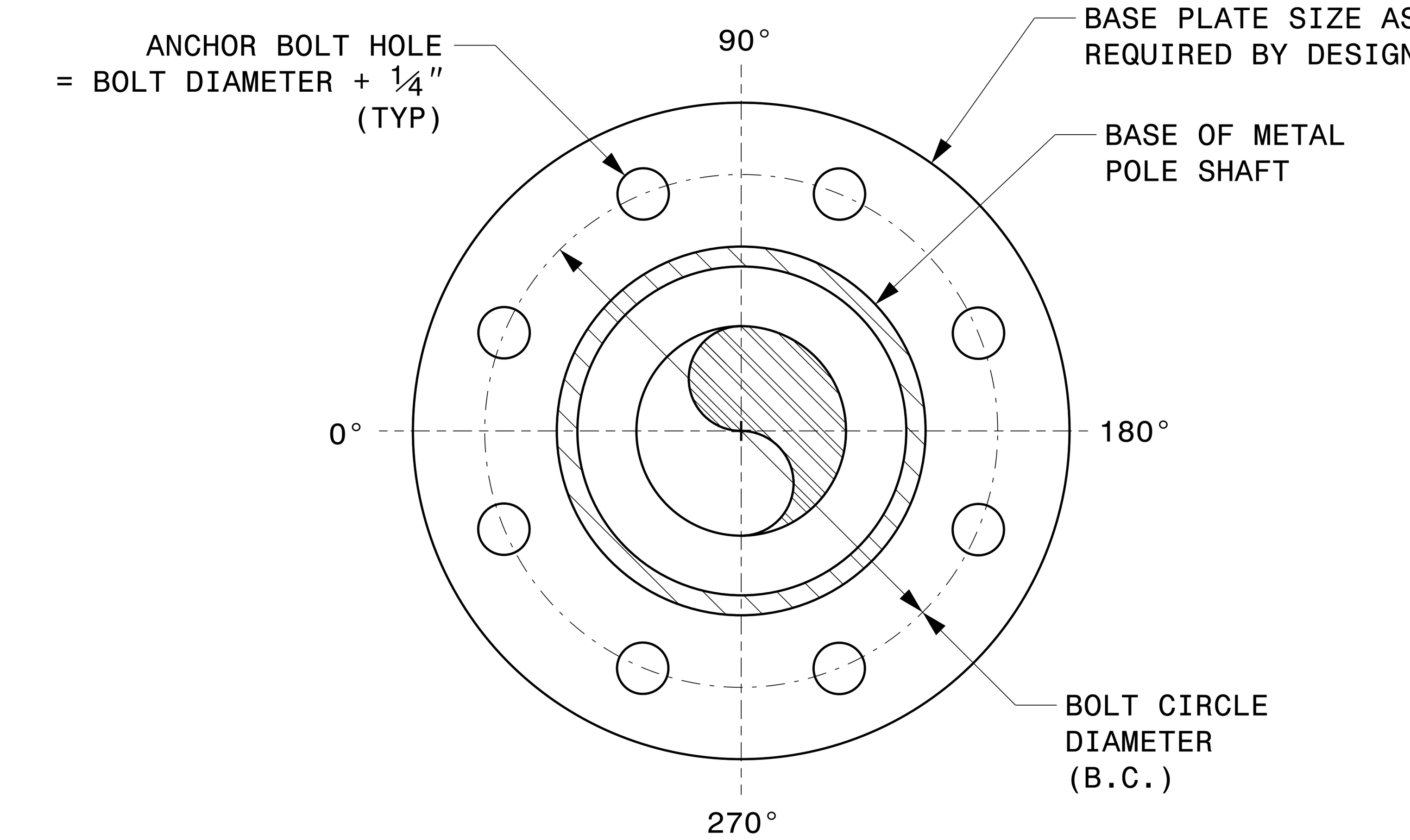
NOTES:

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

IDENTIFICATION TAG DETAILS



ANCHOR BOLT DETAIL



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

TYPICAL BASE PLATE DETAIL

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

Typical Fabrication Details
For
All Metal Poles

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

SCALE: 0 NA — NONE

REVISIONS	INIT.	DATE

SEAL

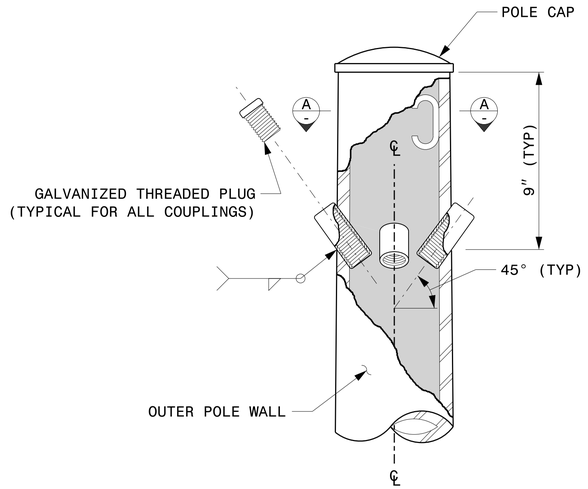
DocuSigned by:
Kevin Durigon
4B23DC79B3784DA...
SIGNATURE
09/21/2023
DATE

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

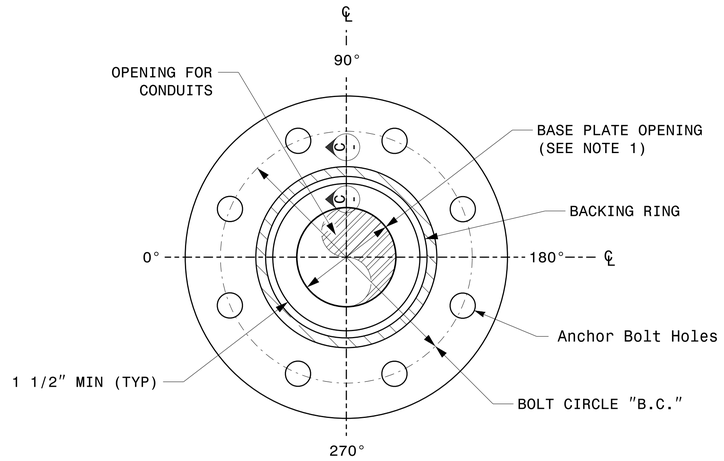
Fabrication Details – Strain Poles

NOTE:

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

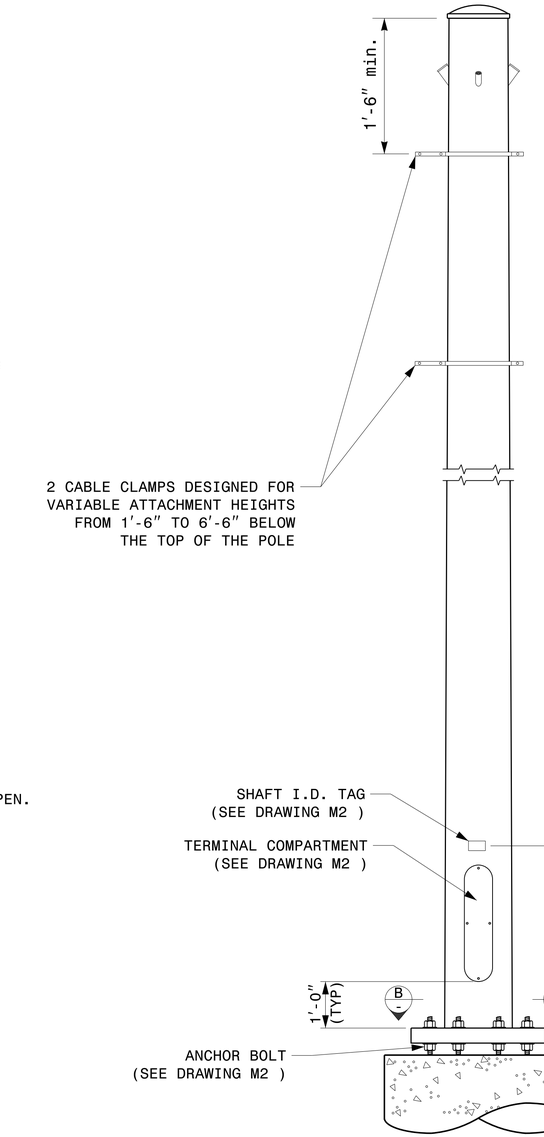


CABLE ENTRANCES AT TOP OF POLE

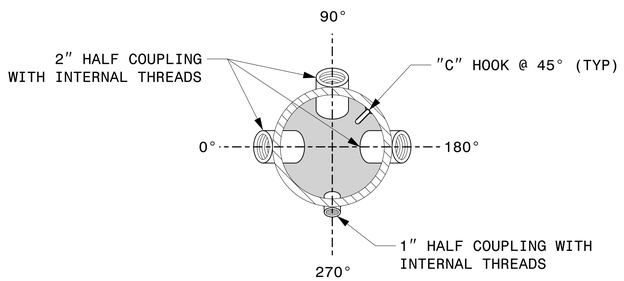


SECTION B-B

POLE BASE PLATE DETAILS
(8 AND 12 BOLT PATTERN)

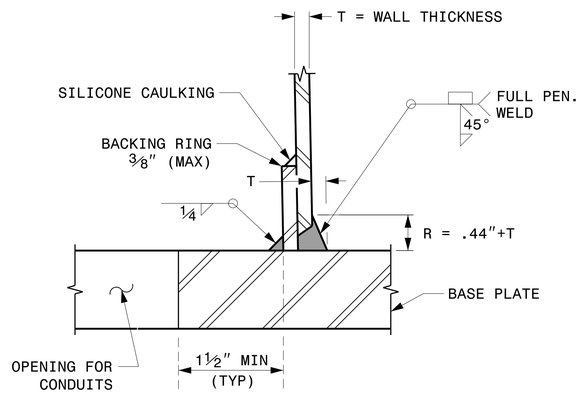


MONOTUBE STRAIN POLE



SECTION A-A

RADIAL ORIENTATION OF FACTORY INSTALLED ACCESSORIES AT TOP OF POLE



SECTION C-C

(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION GROOVE WELD DETAIL

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

SCALE
0 NA
NONE

Typical Fabrication Details
For
Strain Poles

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

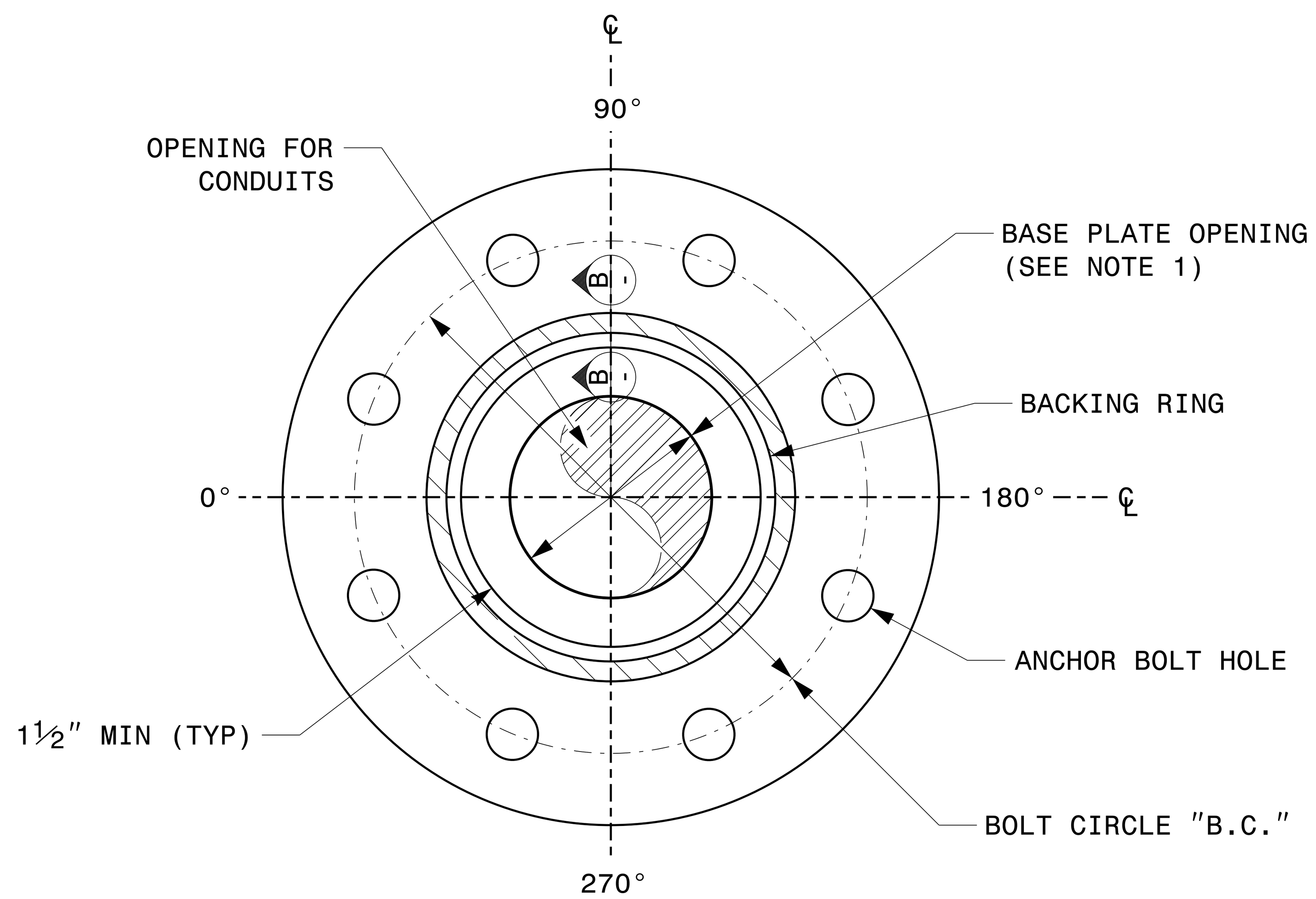
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
036626
ENGINEER
KEVIN C. DURIGON

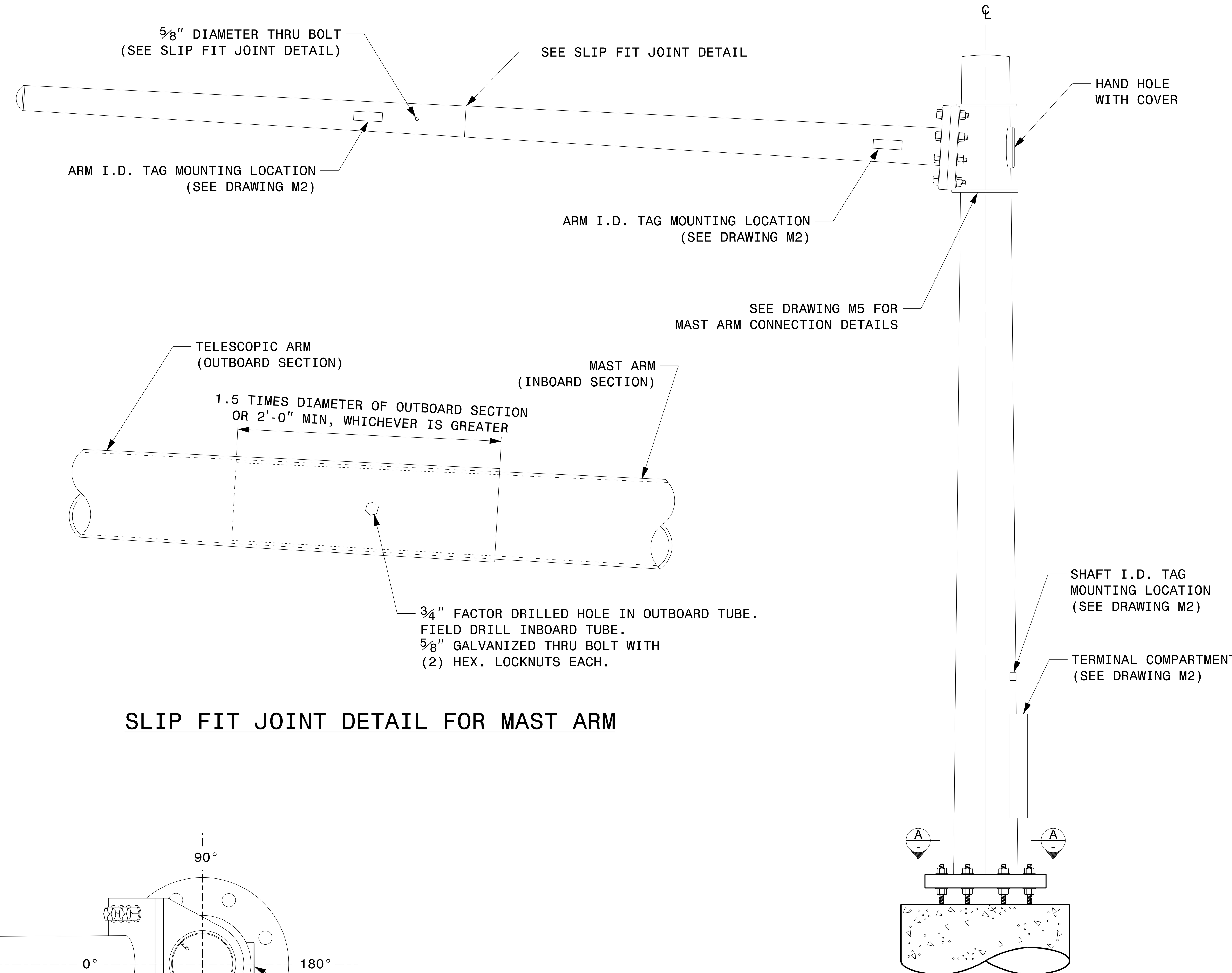
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

NOTE:

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

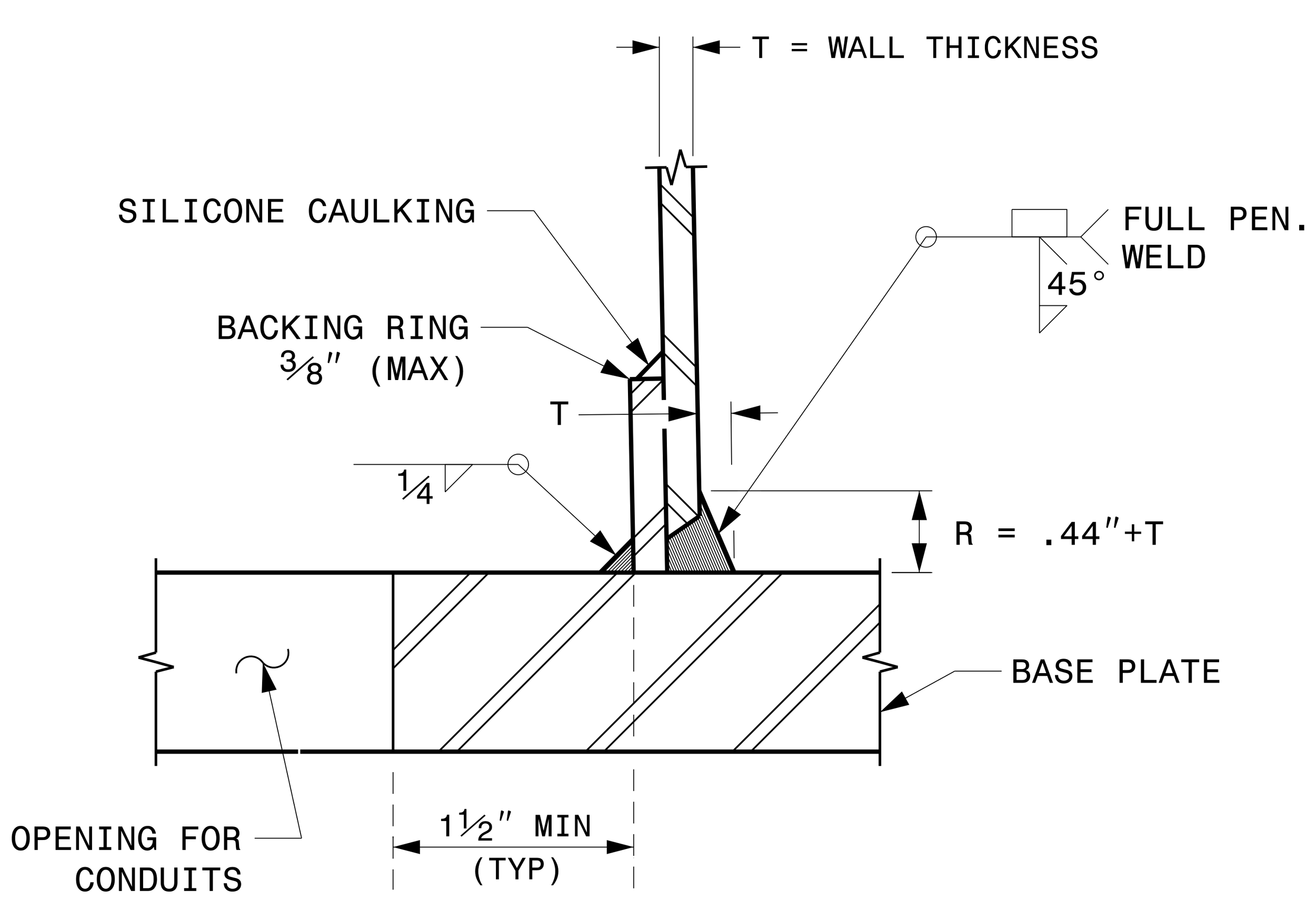


SECTION A-A
POLE BASE PLATE DETAILS



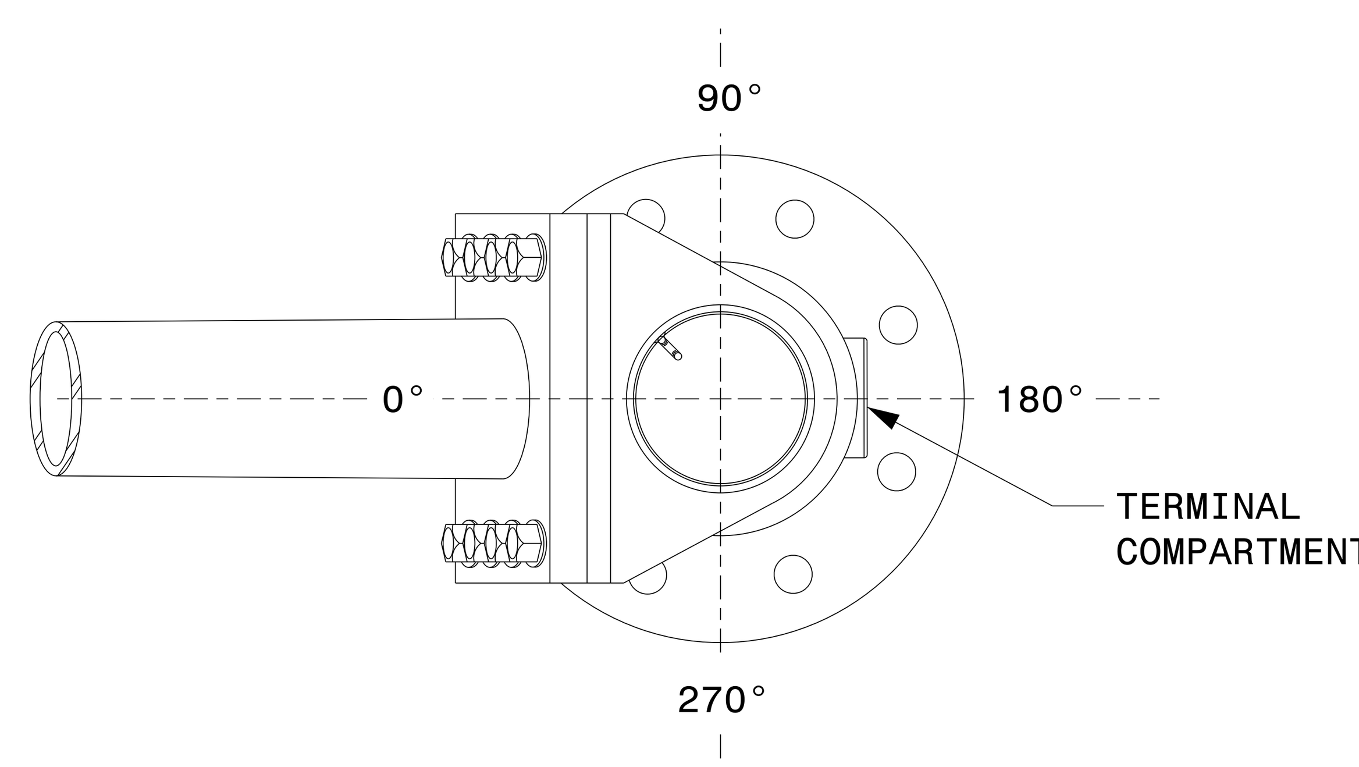
MAST ARM POLE

SLIP FIT JOINT DETAIL FOR MAST ARM



SECTION B-B
(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION
GROOVE WELD DETAIL



MAST ARM RADIAL ORIENTATION

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

Fabrication Details – Mast Arm Poles

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

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

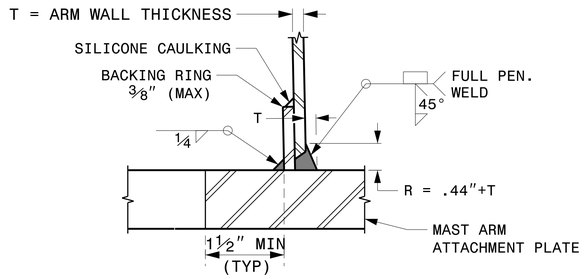
SCALE 0 NA
NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

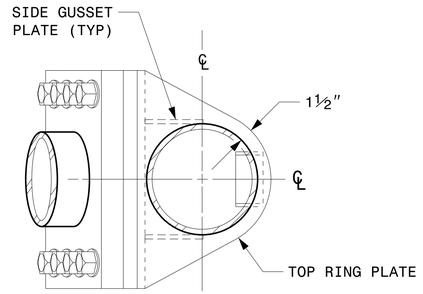
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

WELDED RING STIFFENED MAST ARM CONNECTION

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



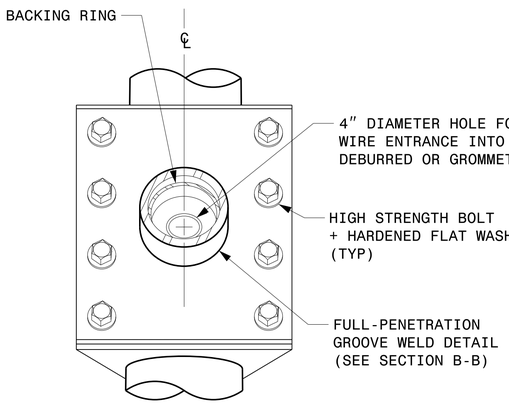
SECTION B-B
FULL-PENETRATION GROOVE WELD DETAIL



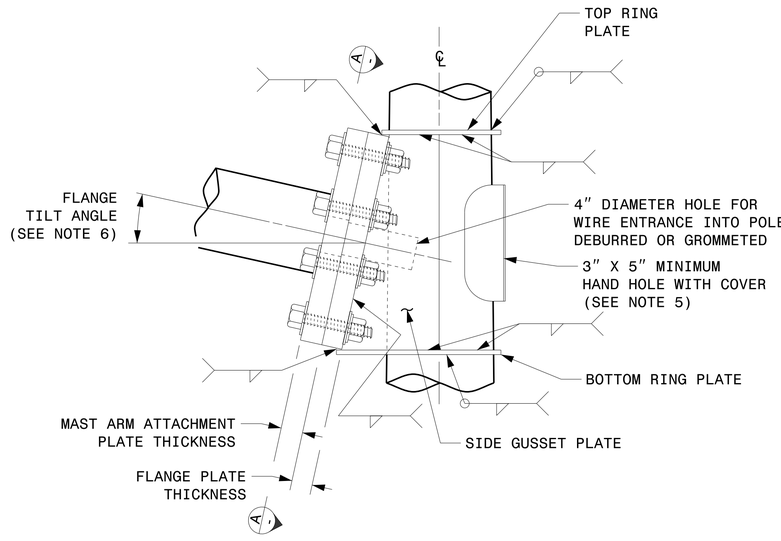
PLAN VIEW

NOTES:

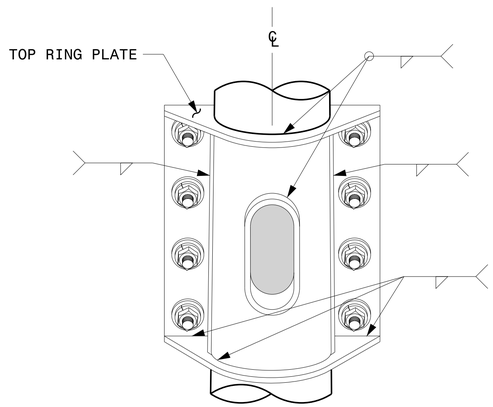
1. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ABOVE THE MAST ARM TO INDICATE PROPER ATTACHMENT ORIENTATION OF THE MAST ARM.
2. DESIGNER WILL DETERMINE THE SIZE OF ALL STRUCTURAL COMPONENTS, PLATES, FASTENERS, AND WELDS SHOWN UNLESS THEY ARE ALREADY SPECIFIED.
3. FABRICATOR IS RESPONSIBLE FOR PROVIDING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



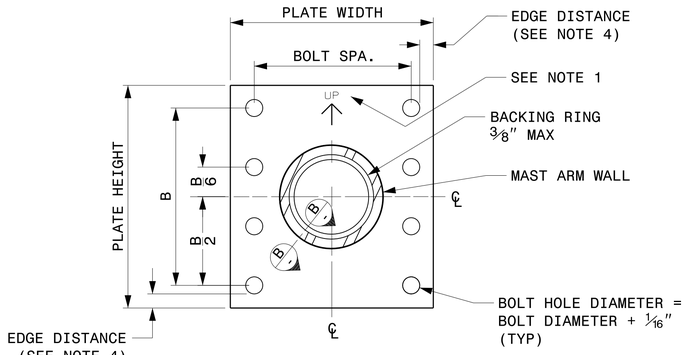
FRONT ELEVATION VIEW



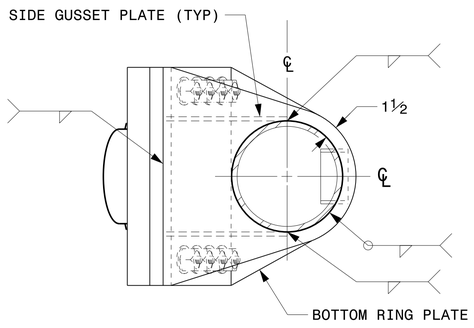
SIDE ELEVATION VIEW



BACK ELEVATION VIEW



SECTION A-A
MAST ARM ATTACHMENT PLATE



BOTTOM VIEW

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

SCALE
0 NA
NONE

Typical Fabrication Details
For
Mast Arm Connection To Pole

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

REVISIONS	INIT.	DATE

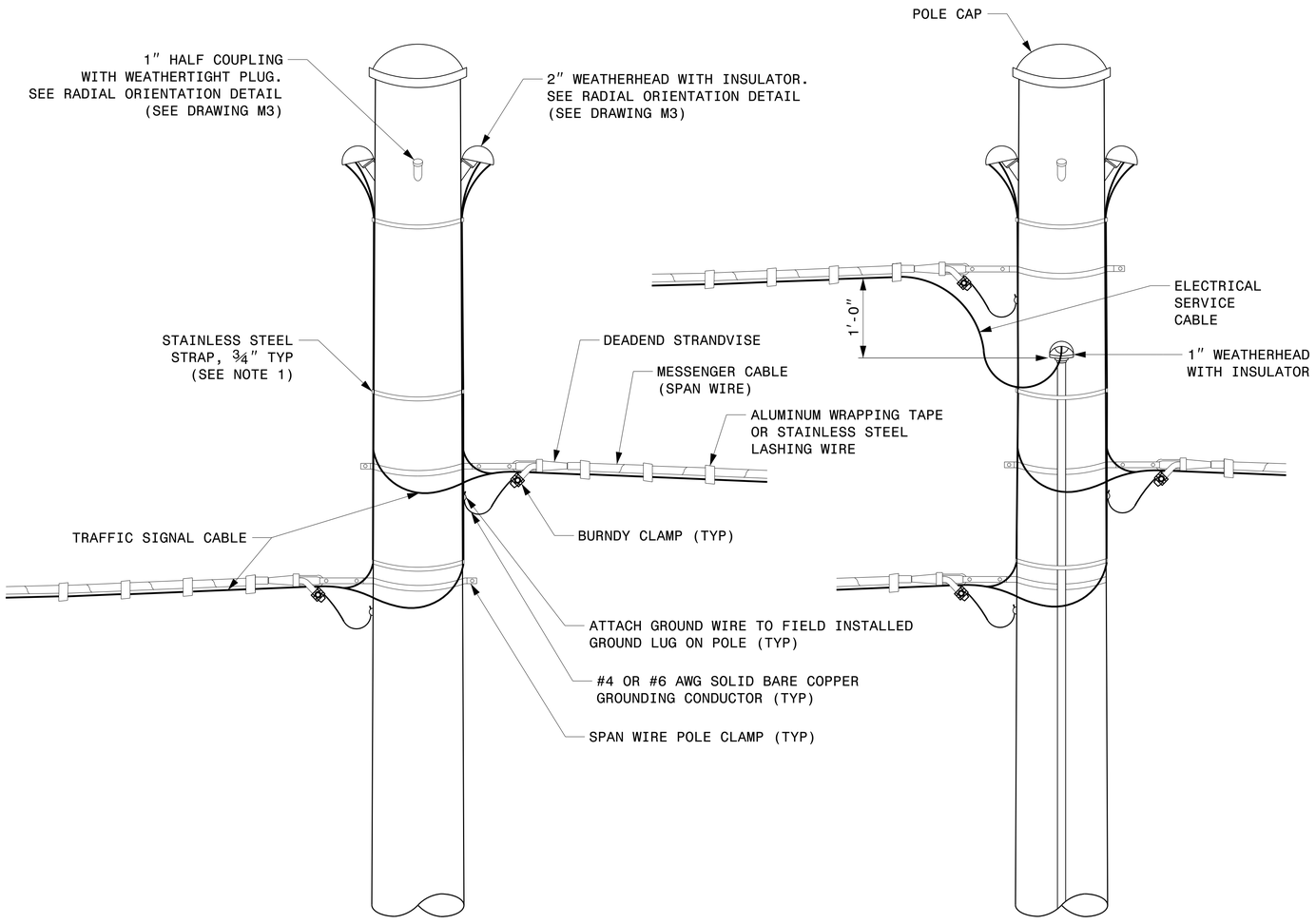
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
036626
ENGINEER
KEVIN C. DURIGON

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

Fabrication Details – Mast Arm Connection

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

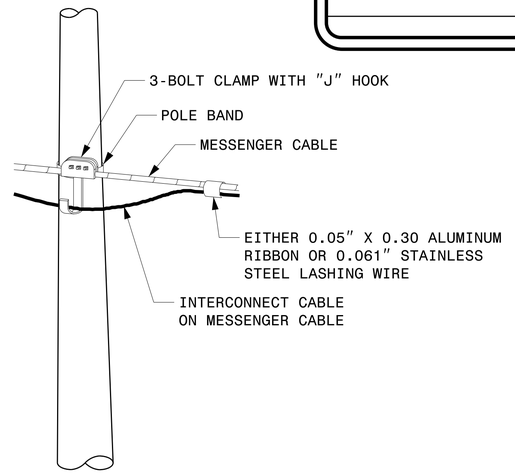
Fabrication Details – Strain Pole Attachments



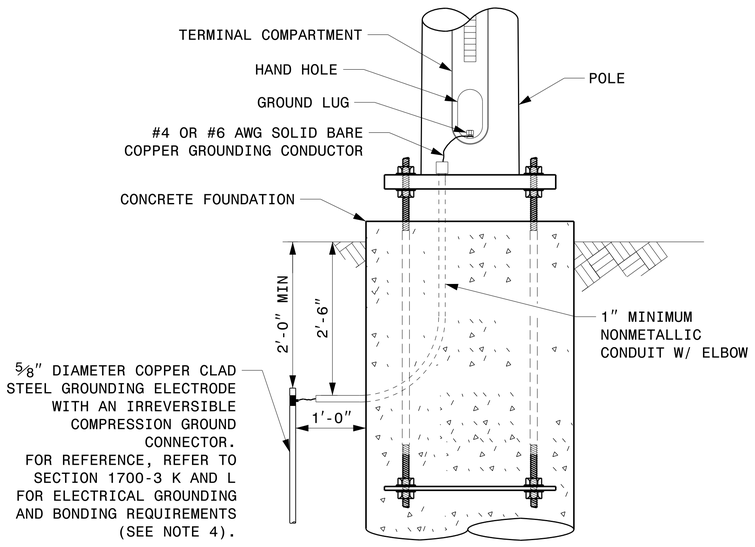
STRAIN POLE ATTACHMENTS

NOTES:

1. STRAP ALL SIGNAL CABLES TO THE SIDE OF THE POLE WITH ¾″ STAINLESS STEEL STRAPS WHEN THE DISTANCE BETWEEN SPAN WIRE ATTACHMENT CLAMP AND WEATHERHEADS EXCEEDS 3′-0″.
2. PROVIDE MINIMUM TWO SPAN WIRE POLE CLAMPS PER POLE.
3. IT IS PROHIBITED TO ATTACH TWO SPAN WIRES AT ONE POLE CLAMP.
4. FOR GENERAL REQUIREMENTS, REFER TO NCDOT STANDARD SPECIFICATIONS FOR ROADWAY AND STRUCTURES, JANUARY 2024.



ATTACHMENT OF CABLE TO INTERMEDIATE METAL POLE



METAL POLE GROUNDING DETAIL FOR STRAIN POLE AND MAST ARM

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

SCALE
0 NA
NONE

Typical Fabrication Details
For
Strain Pole Attachments

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

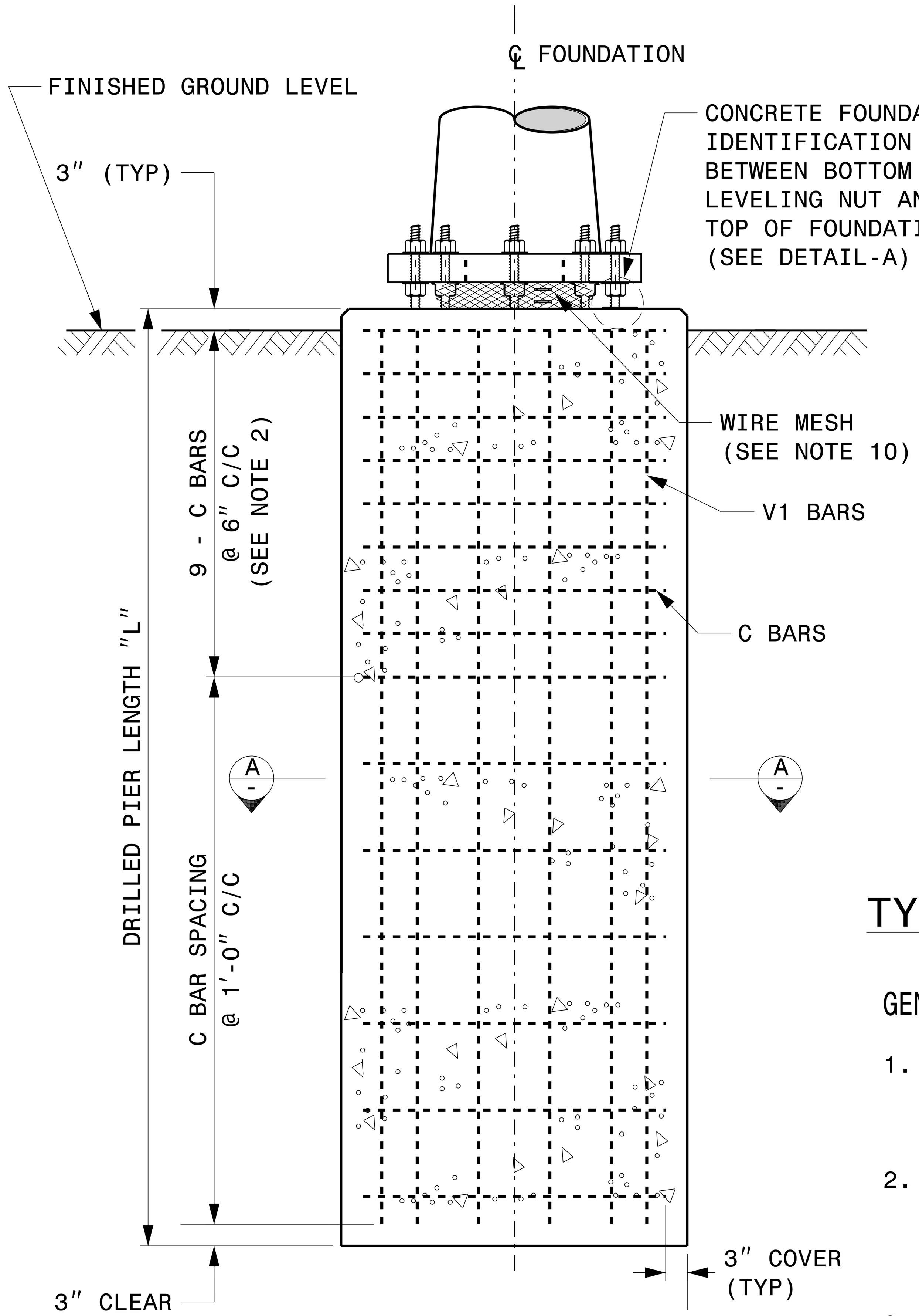
REVISIONS	INIT.	DATE

SEAL

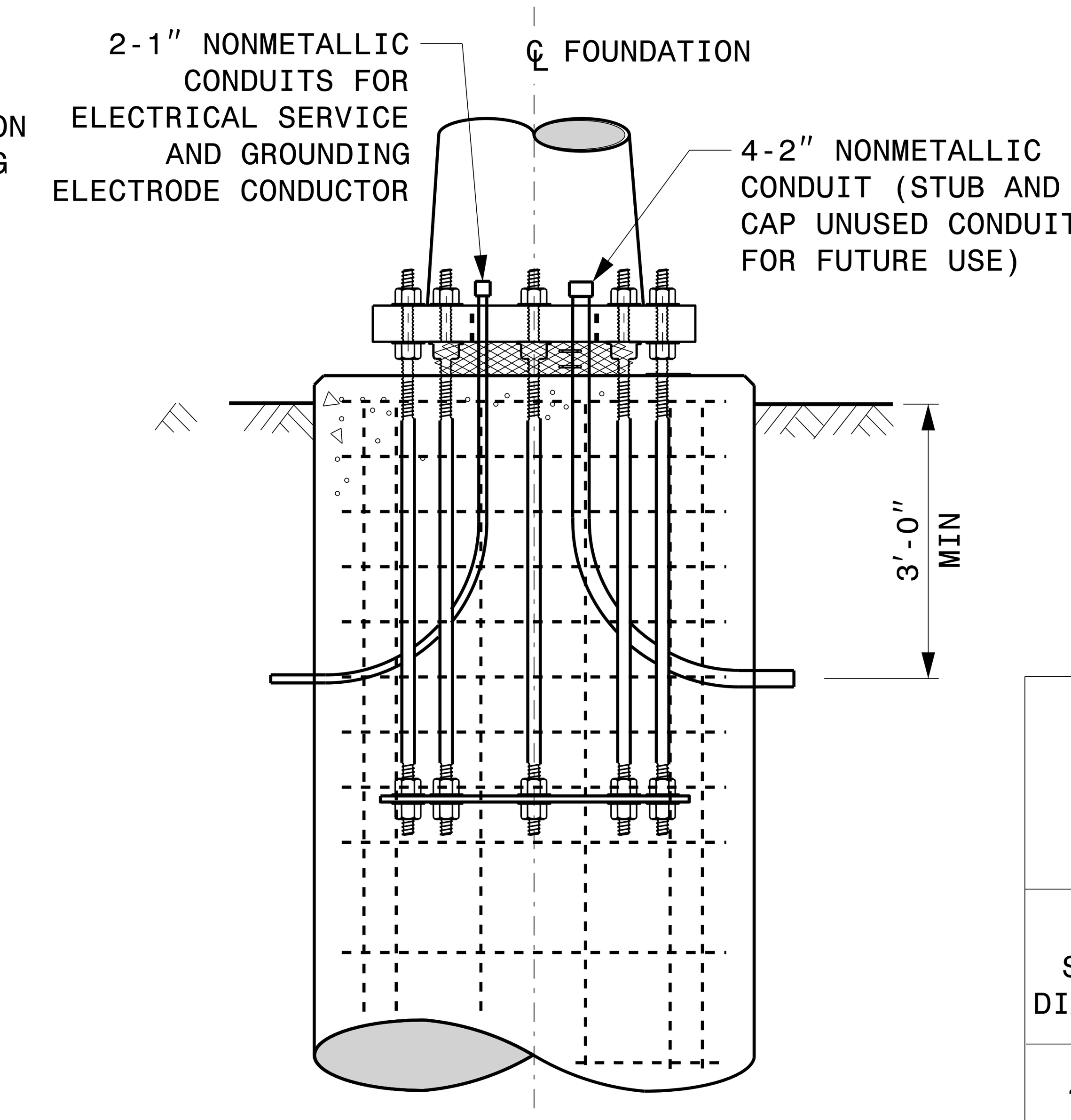
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

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

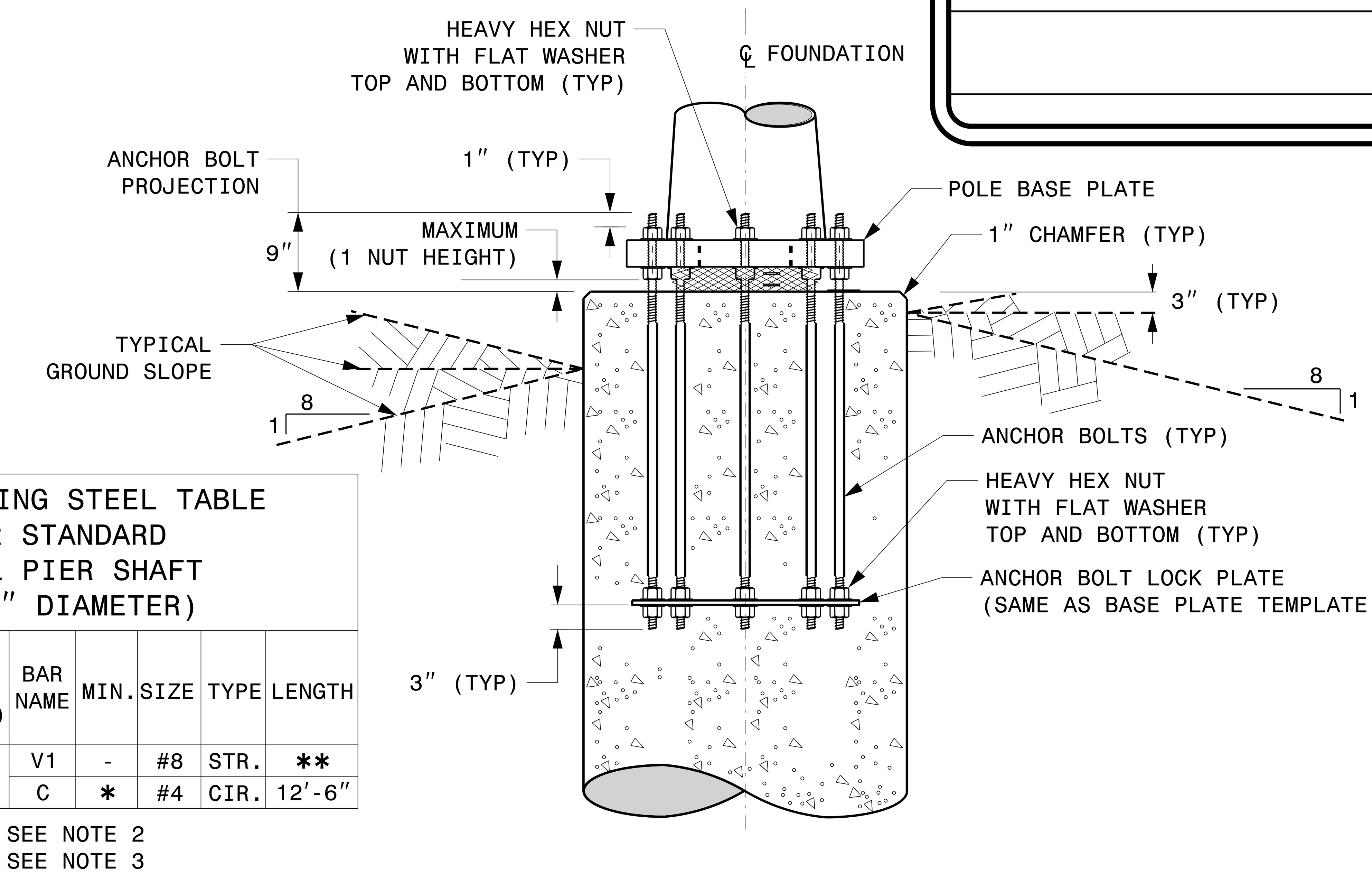
Construction Details – Foundations



CONCRETE SHAFT ELEVATION



TYPICAL FOUNDATION CONDUIT DETAILS



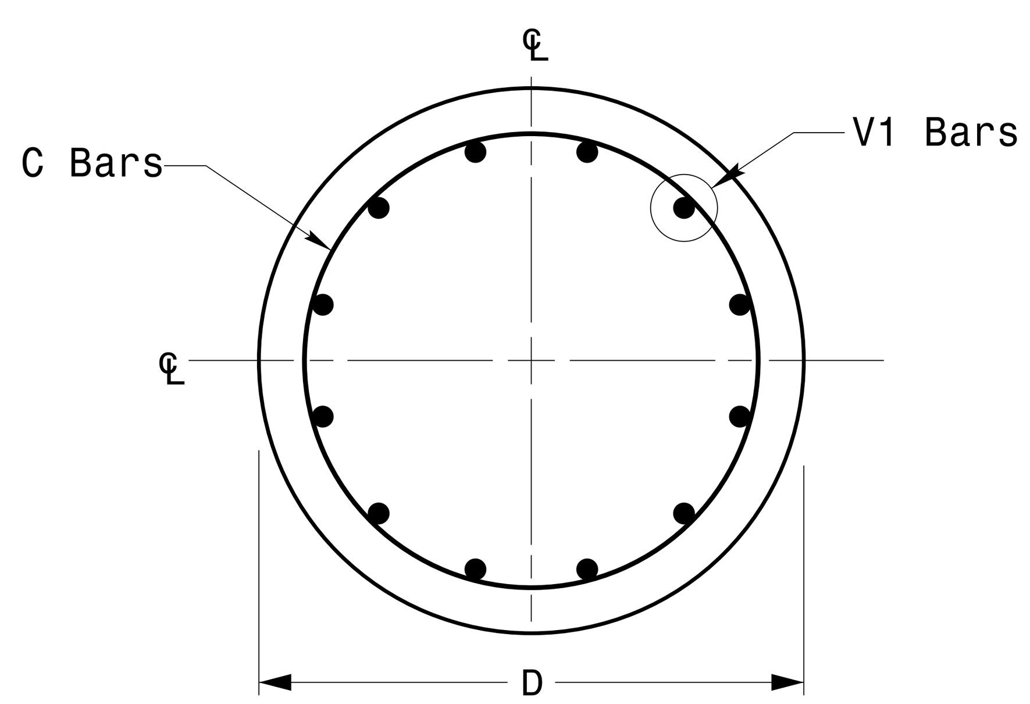
TYPICAL FOUNDATION ANCHOR BOLT DETAILS

(REINFORCING CAGE NOT SHOWN FOR CLARITY)

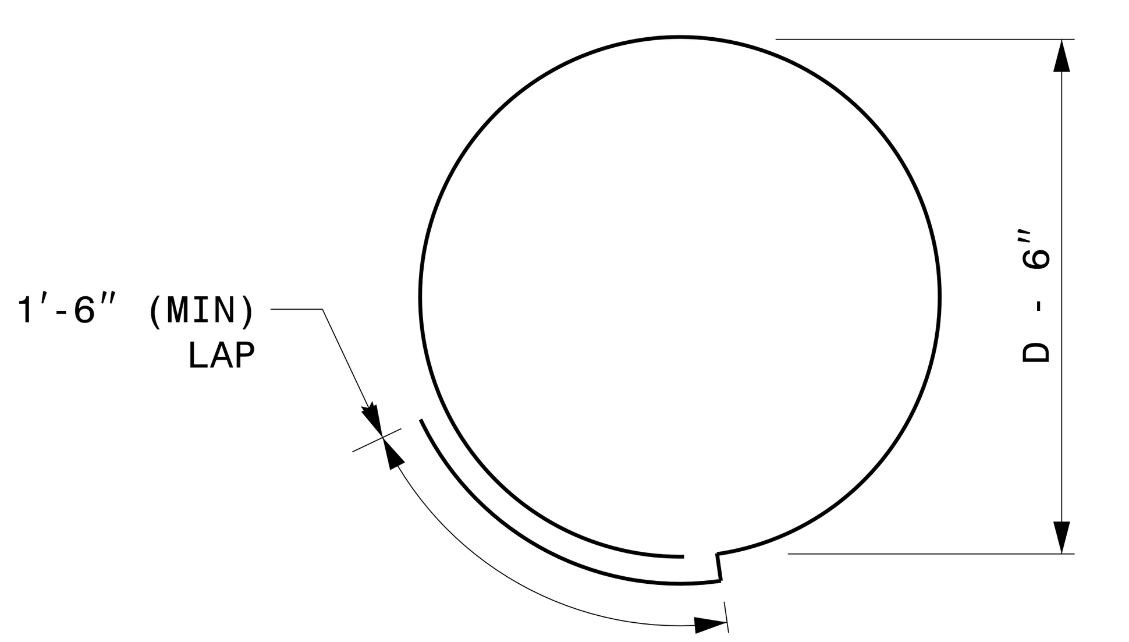
REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4′-0″ DIAMETER)

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

* SEE NOTE 2
** SEE NOTE 3



SECTION A-A

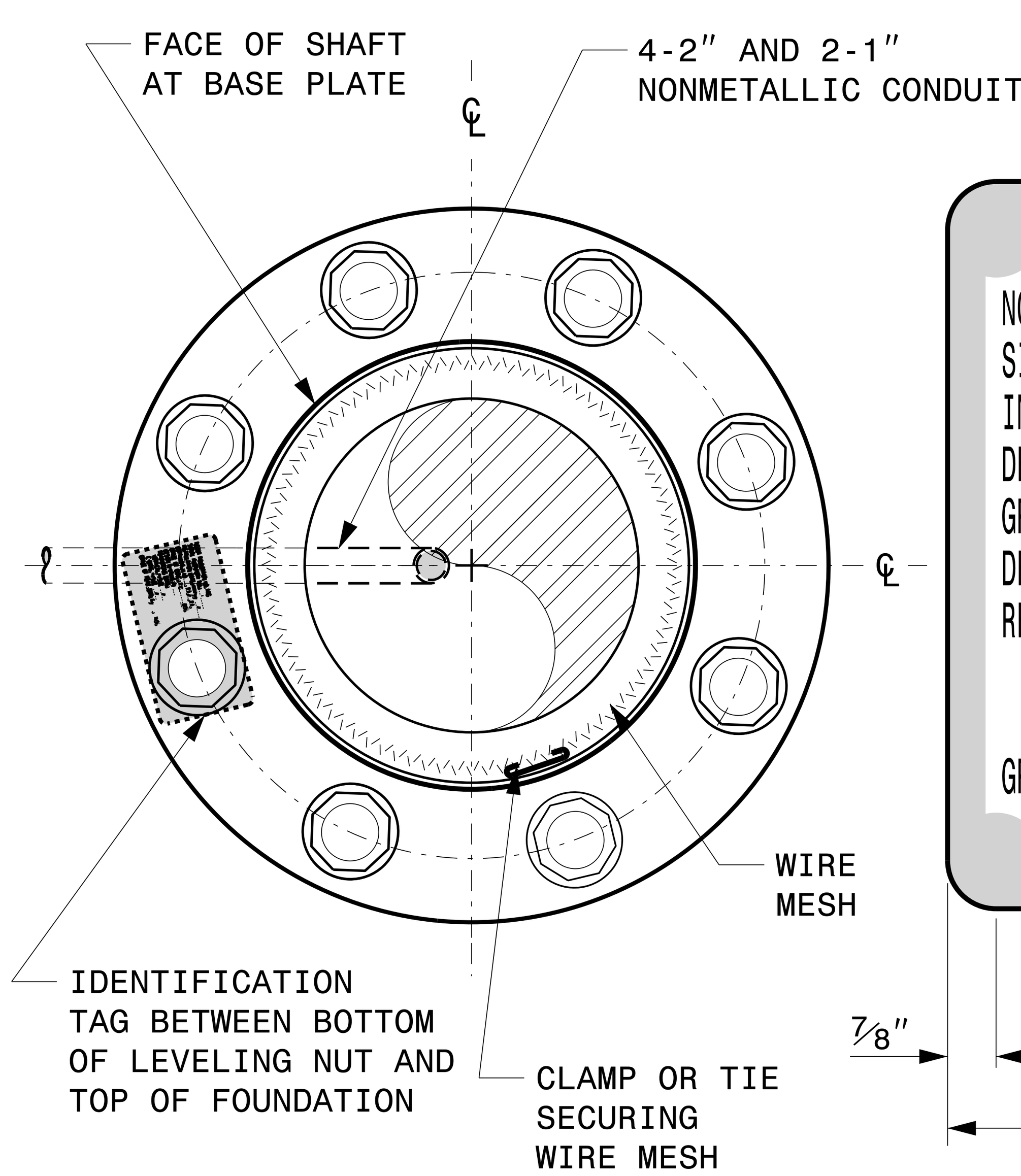


TYPICAL "C" BAR DETAIL

GENERAL NOTES:

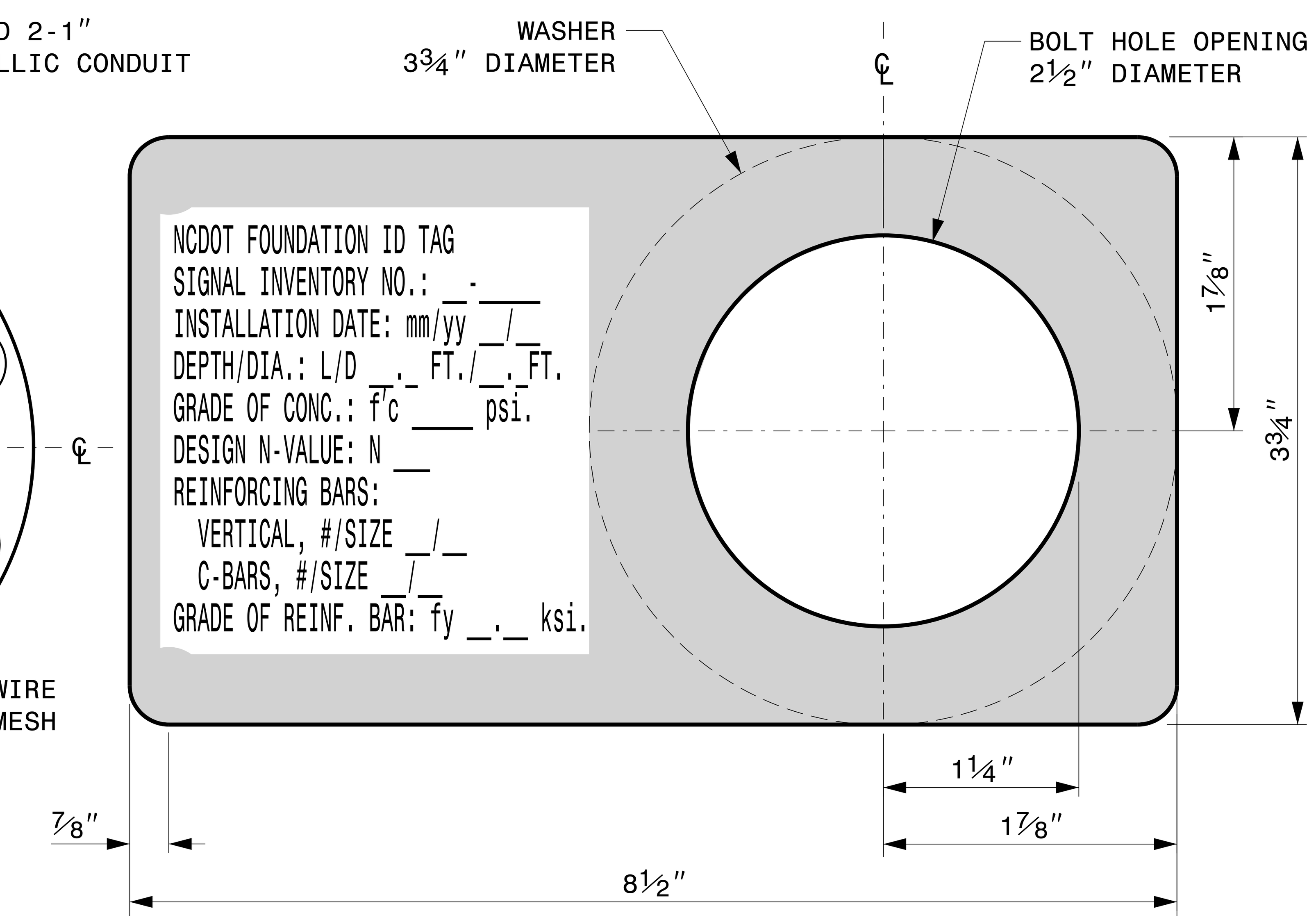
1. IF ACTUAL SUBSURFACE CONDITIONS DIFFER SIGNIFICANTLY FROM BORING DATA, CONTACT THE ENGINEER BEFORE EXCAVATING OR PLACING CONCRETE.
2. CIRCULAR TIE REINFORCING RINGS MAY BE VERTICALLY ADJUSTED BY +/-3″ AT A DEPTH BETWEEN 2′-0″ AND 3′-0″ TO FACILITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING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

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



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

DETAIL-A



CONCRETE FOUNDATION IDENTIFICATION TAG DETAILS

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

SCALE: 0 NA — NONE

Construction Details For Foundations

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

REVISIONS | INIT. | DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036626 KEVIN C. DURIGON

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

SOIL CONDITION

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

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

GENERAL NOTES:

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

FOUNDATION SELECTION:

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

PROJECT I.D. NO. | SHEET NO. Sig.M8

Standard Strain Pole Foundation – All Soil Conditions

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

SCALE 0 NA
NONE

Standard Strain Pole Foundation for All Soil Conditions

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

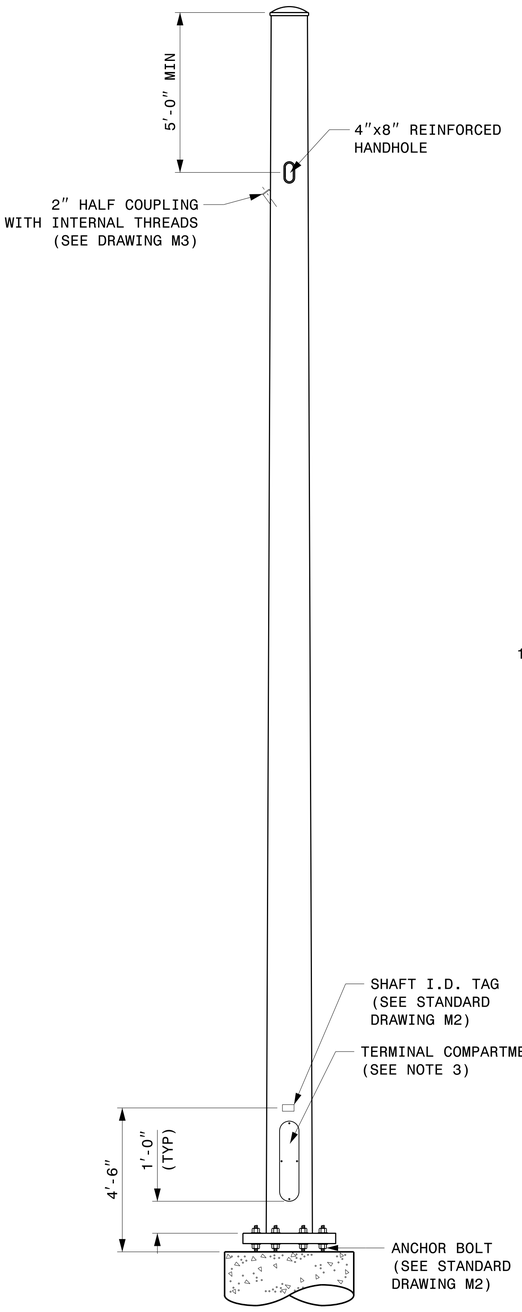
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

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

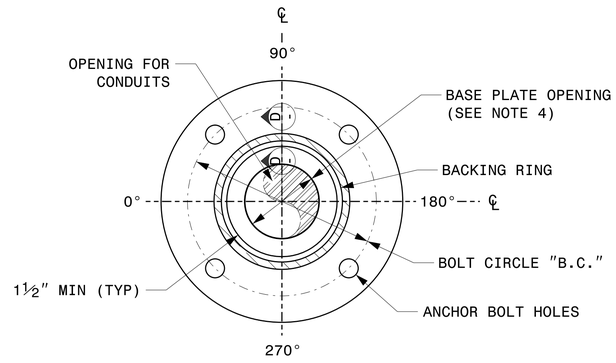
03-OCT-2023 12:48
S:\ITS&SU\ITS Signals\Signal Design Section\Structures\Drawings\2024 Metal Pole Std Drawings for LRFD\2024 Sig.M8 Std. Strain Pole Found.-Saturated Soil Condition.dgn
kcdurigon

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

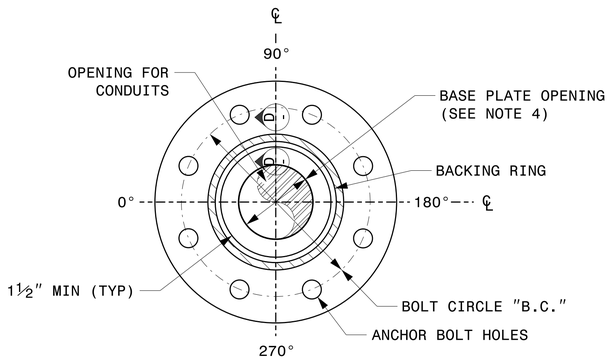
Fabrication Details – CCTV Camera Poles



CCTV CAMERA POLE
(NOT TO SCALE)

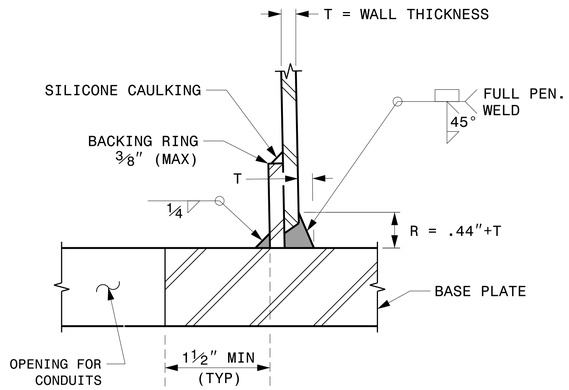


4 BOLT PATTERN
FOR POLES UP TO 40'



8 BOLT PATTERN
FOR POLES TALLER THAN 40'

BASE PLATE DETAILS



SECTION D-D
(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION
GROOVE WELD DETAIL

NOTES:

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

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

SCALE
0 NA
NONE

Typical Fabrication Details
For
CCTV Poles

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

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

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