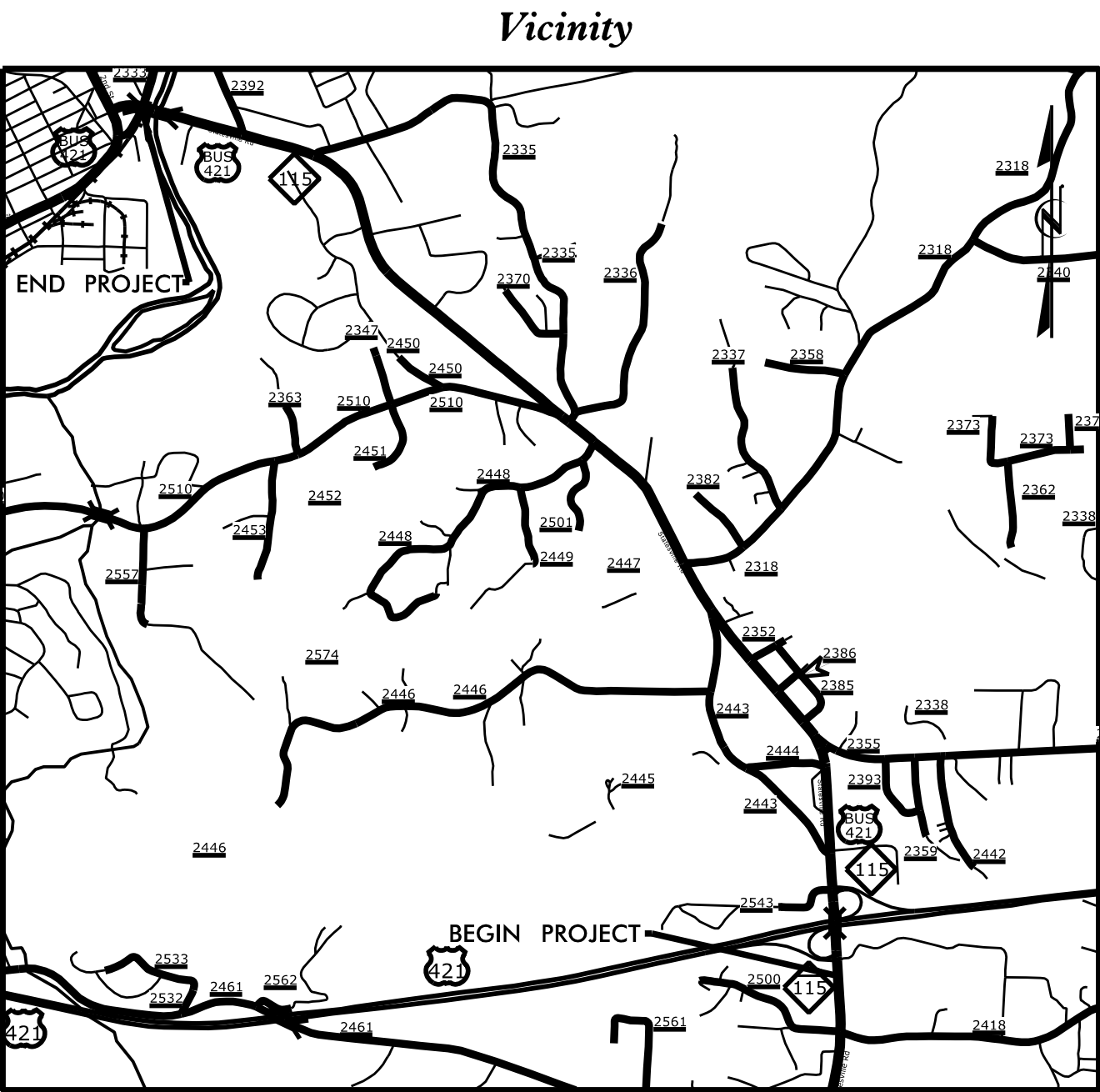


Project: R-5759

Contract: C204976

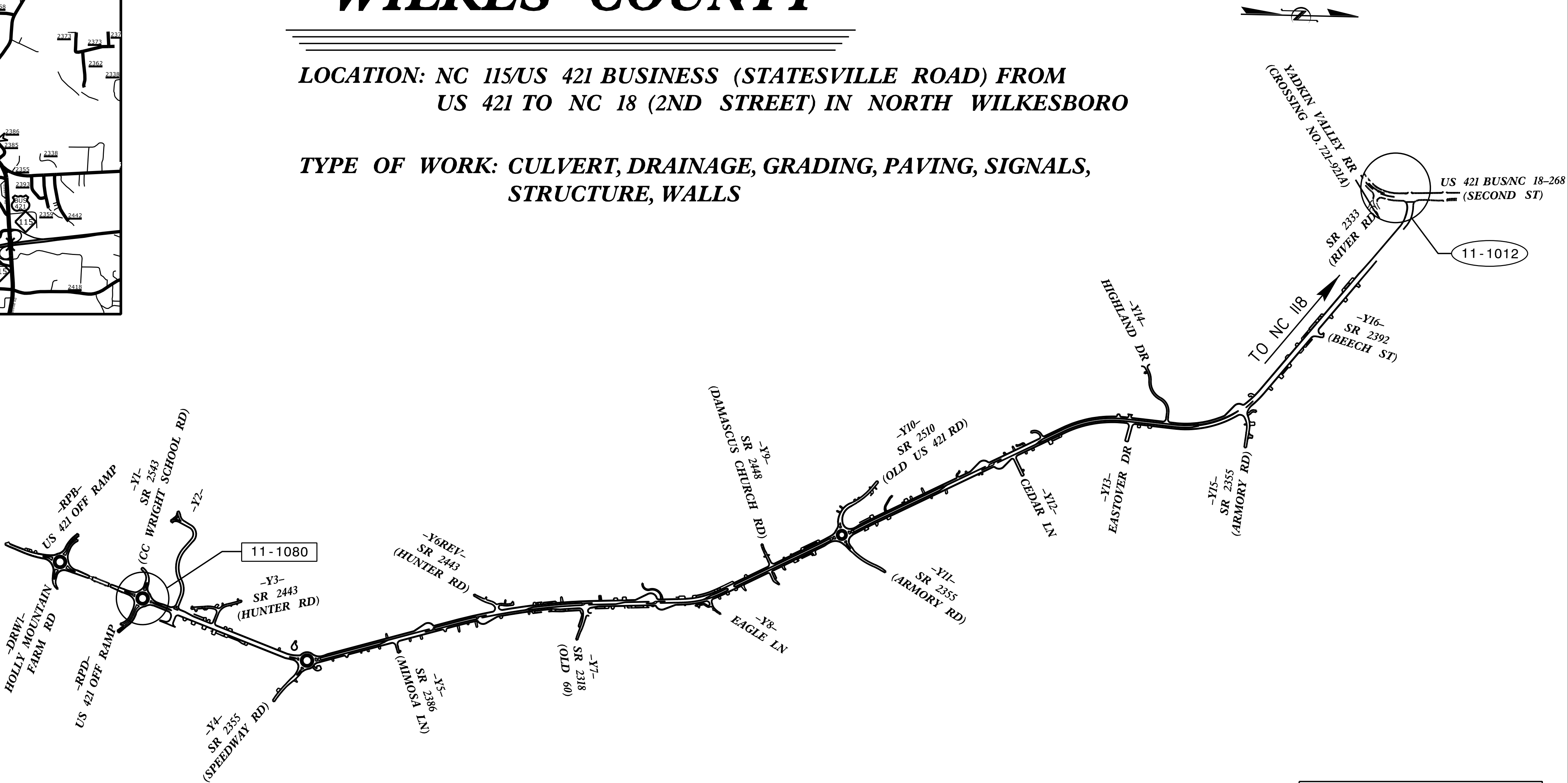


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WILKES COUNTY

LOCATION: NC 115/US 421 BUSINESS (STATESVILLE ROAD) FROM
US 421 TO NC 18 (2ND STREET) IN NORTH WILKESBORO

TYPE OF WORK: CULVERT, DRAINAGE, GRADING, PAVING, SIGNALS,
STRUCTURE, WALLS



KEY	
11-XXXX	New or Upgraded Signal
11-XXXX	Signal Removal

PLANS PREPARED BY:
HNTB
HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

Natasha R. Simmons, P.E., PTOE – Project Engineer
Nicole K. Vlanich, P.E. – Design Engineer
Emily E. Tiller – Design Engineer

Index of Plans		
Sheet #	Reference #	Location/Description
Sig. 1	-----	Title Sheet
Sig. 2.0-3.2	11-1080	NC 115 at US 421 Northbound Ramps/SR 2534 (CC Wright School Road)
Sig. 4.0-5.2	11-1012	US 421 Business-NC 18-268 (Second Street) at US 421 Business-NC 115 (Statesville Road) and SR 2333 (River Road)
Sig. M1A-M9	-----	Standard Drawings for Metal Poles

LEGEND
SIGNAL INVENTORY NUMBER

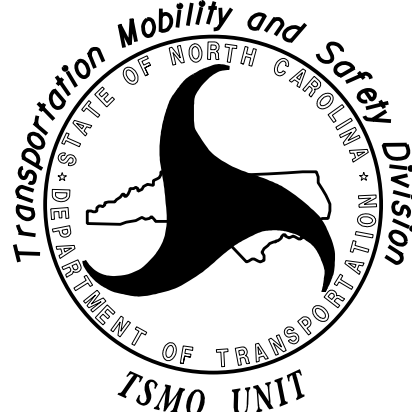
TRANSPORTATION SYSTEMS
MANAGEMENT & OPERATIONS
Contacts:

R. Nicholas Zinser, PE – Western Region Signals Engineer
Todd Joyce, PE – Signal Equipment Design Engineer

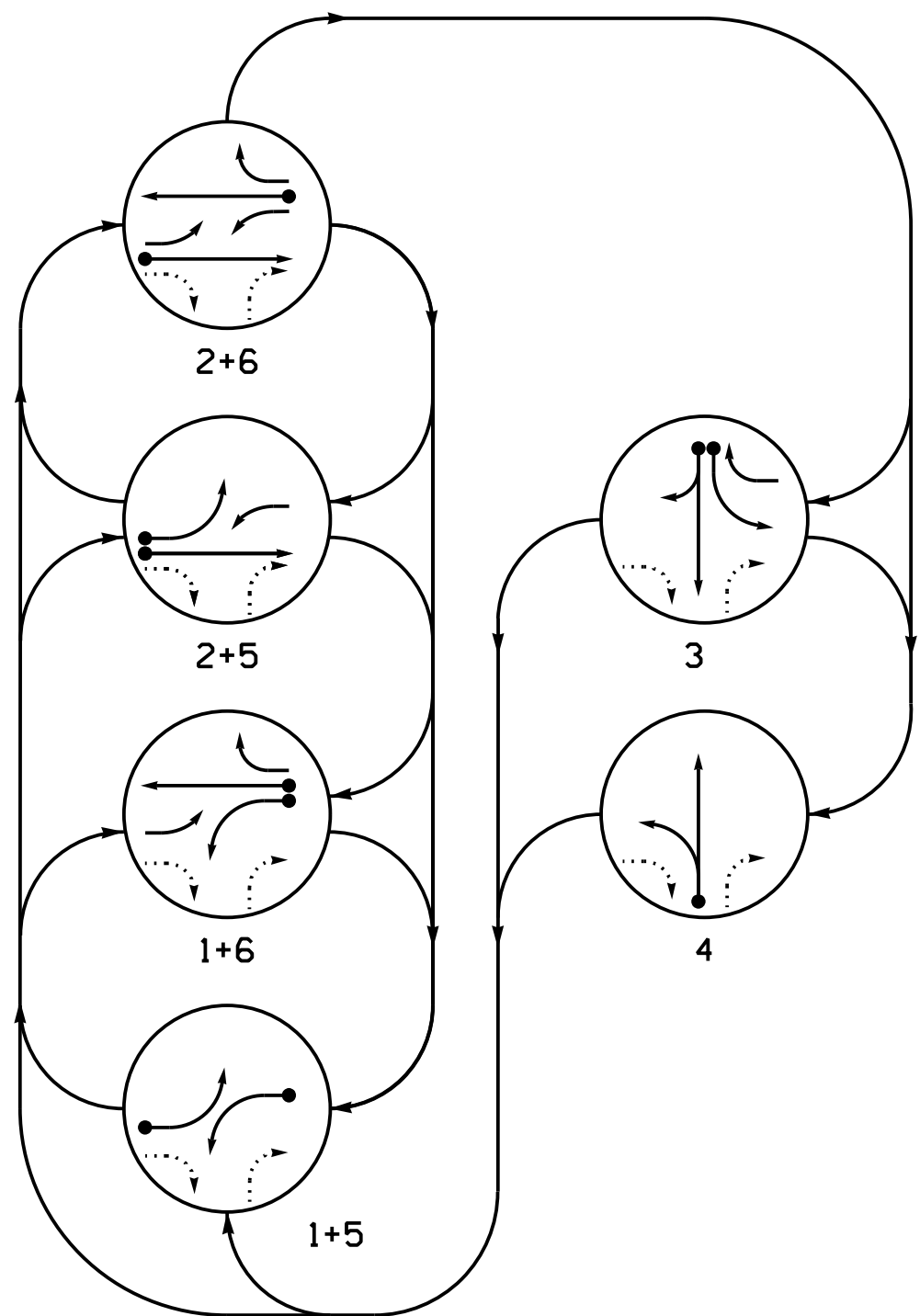
NCDOT – DIVISION 11
Contacts:
Chris Brown – Division Traffic Engineering Supervisor
Randy D. Steskal, PE, PLS – Regional Traffic Engineer

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

Prepared In the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY & SAFETY DIVISION



PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

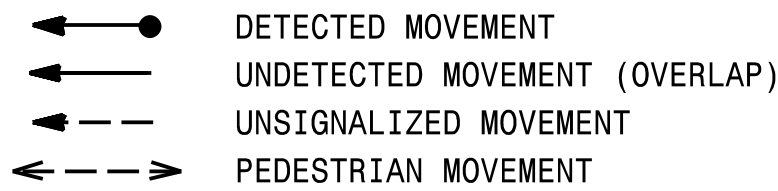
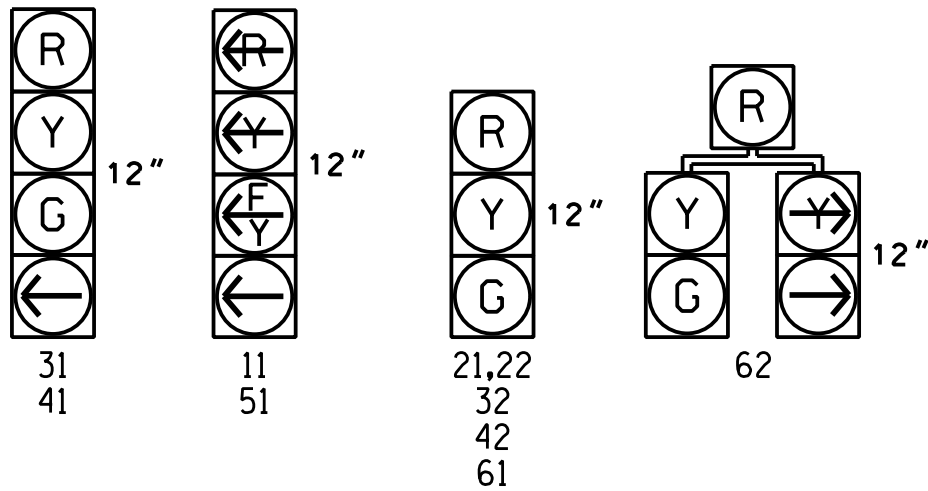


TABLE OF OPERATION

SIGNAL FACE	PHASE					
	1 + 5	1 + 6	2 + 5	2 + 6	3	4
11	←	←	←	←	←	←
21,22	R	R	G	G	R	R
31	R	R	R	R	G	R
32	R	R	R	R	G	R
41	R	R	R	R	G	R
42	R	R	R	R	G	R
51	←	←	←	←	←	←
61	R	G	R	G	R	R
62	R	G	R	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR						PROGRAMMING						
ZONE	SIZE (FT)	DISTANCE FROM STOP LINE (FT)	TURN	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	RELAY DURING GREEN	SEE CARD
1A*	6X40	0	*	*	1	15.0	-	X	-	X	-	*
2A*	6X6	300	*	*	6	3.0	-	X	-	X	X	*
2B*	6X40	0	*	*	2	-	-	X	-	-	-	*
3A*	6X40	0	*	*	2	5.0	2.0	X	-	X	X	*
3B*	6X40	0	*	*	3	3.0	-	X	-	X	-	*
3B*	6X40	0	*	*	3	10.0	-	X	-	X	-	*
4A*	6X40	0	*	*	4	-	-	X	-	X	-	*
5A*	6X40	0	*	*	5	15.0	-	X	-	X	-	*
6A*	6X6	300	*	*	6	-	-	X	-	X	X	*
6B*	6X40	0	*	*	6	5.0	2.0	X	-	X	X	*

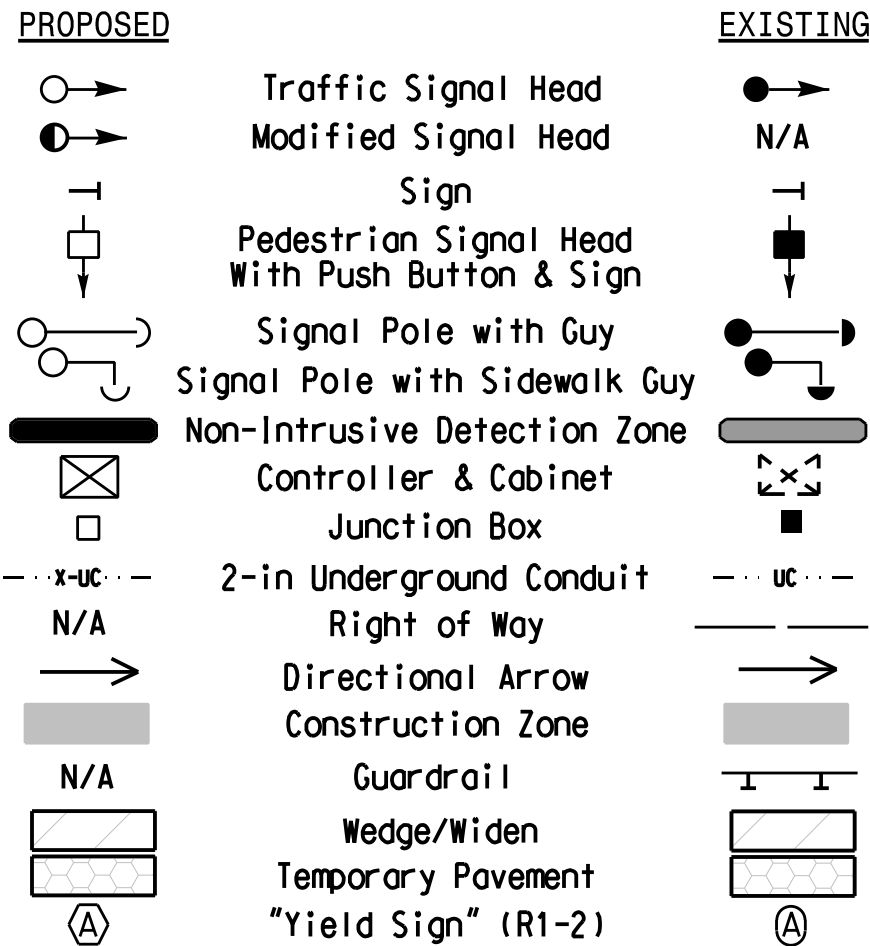
* Video Detection

6 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 5 may be lagged.
- The order of phase 3 and 4 may be reversed.
- Set all detector units to presence mode.
- 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.
- See R-5759 TMP Phase 1 for pavement markings.

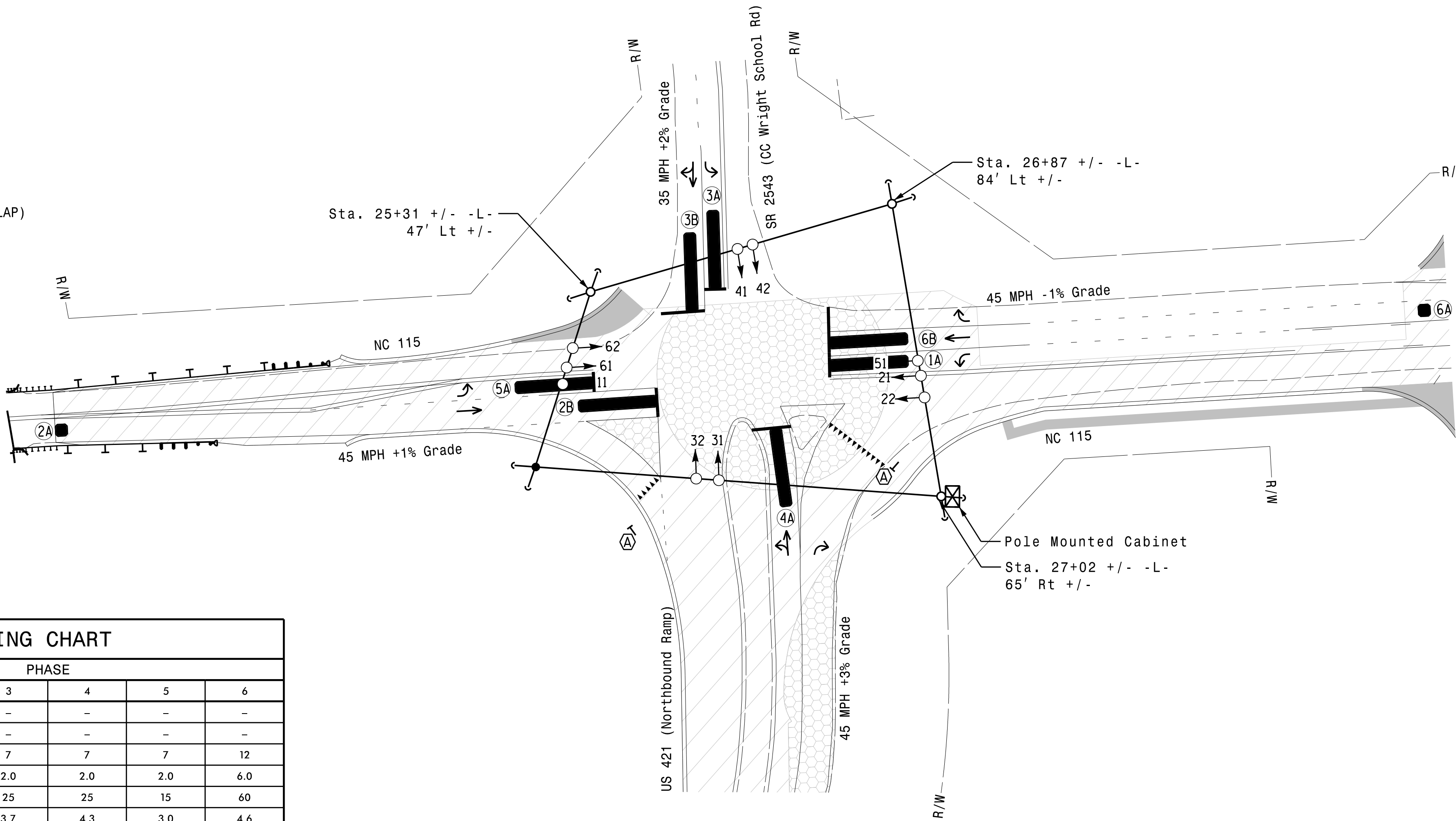
LEGEND



MAXTIME TIMING CHART

FEATURE	PHASE					
	1	2	3	4	5	6
Walk *	-	-	-	-	-	-
Ped Clear	-	-	-	-	-	-
Min Green *	7	12	7	7	7	12
Passage *	2.0	6.0	2.0	2.0	2.0	6.0
Max I *	15	60	25	25	15	60
Yellow Change	3.0	4.6	3.7	4.3	3.0	4.6
Red Clear	2.3	1.4	1.4	1.1	2.8	1.4
Added Initial *	-	-	-	-	-	-
Maximum Initial *	-	-	-	-	-	-
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	-
Vehicle Recall	-	MIN RECALL	-	-	-	MIN RECALL
Dual Entry	-	-	-	-	-	-

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



Signal Upgrade -
Temporary Design 1
(Construction Phase 1)

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

HNTB

HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
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Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

 750 N. Greenfield Pkwy, Garner, NC 27529	NC 115 at US 421 Northbound Ramps/SR 2543 (CC Wright School Road)		
	Division 11 Wilkes County Wilkesboro		
	PLAN DATE: November 2023	REVIEWED BY: N.K. Vianich	
	PREPARED BY: E.E. Tiller	REVIEWED BY: N.R. Simmons	
REVISIONS		INIT.	DATE
SIGNATURE		DATE	
SIC. INVENTORY NO.		II-108011	

MAXTIME OVERLAP PROGRAMMING DETAIL

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
Type	FYA 4 - Section	-	FYA 4 - Section	-
Included Phases	2	-	6	-
Modifier Phases	1	-	5	-
Modifier Overlaps	-	-	-	-
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

OUTPUT POINT REMAPPING FOR SIGNAL HEADS 11 AND 51

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

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

IO Module 1

Output Point	Description	Output Control Type	Index
33	C1-35	Phase Green	1
34	C1-36	Phase Green	5

OUTPUT CHANNEL CONFIGURATION

PROJECT REFERENCE NO.	SHEET NO.
R-5759	Sig. 2.2

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	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	3		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

NOTICE OVERLAP 1
ASSIGNED TO CHANNEL 1 ➡

NOTICE OVERLAP 3
ASSIGNED TO CHANNEL 5 ➡

SDLC NON-INTRUSIVE DETECTION CHART

Input Point	Detector Rack #3		Detector Rack #4	
	Det # (Index)	Detector Zone	Det # (Index)	Detector Zone
1	33	1A	49	NU
2	34	3A	50	3B
3	35	5A	51	NU
4	36	NU	52	NU
5	37	NU	53	NU
6	38	2A	54	6A
7	39	2B	55	6B
8	40	NU	56	NU
9	41	NU	57	NU
10	42	NU	58	NU
11	43	NU	59	NU
12	44	4A	60	NU
13	45	NU	61	NU
14	46	NU	62	NU
15	47	NU	63	NU
16	48	NU	64	NU

NU = Not Used

SPECIAL DETECTION IO MODULE PROGRAMMING

The Enhanced Out of Pavement Detection requires adjustments to the IO Modules in use. Follow the programming instructions below to ensure desired operation.

Front Panel
Main Menu >Controller >More >Advanced IO >IO Modules

Web Interface
Home >Controller >Advanced IO >Cabinet Configuration >IO Modules

IO Module	Type	Fault Response
1	Caltrans 332	Default
2	TS2 DR3 BIU	Default
3	TS2 DR4 BIU	Default
4	TS2 MMU	Default

Advanced Cabinet Options

☒ Disable TS2 Cabinet Alarms

PED YELLOW CONFLICT MONITOR WIRING DETAIL

(make cabinet wiring changes as shown below)

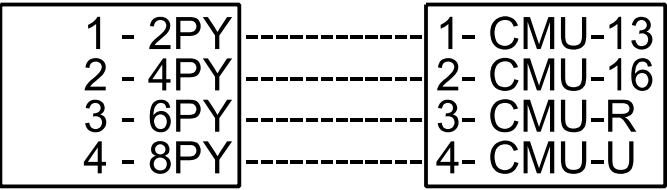
In order to use FYA COMPACT mode with the 16 or 18 Channel Monitor, the cabinet must be wired such that the (unused) Ped Yellow load switch outputs are wired to the conflict monitor as follows: From 2 PY (field term. 114) to chan. 9 green (monitor pin 13) and from 6 PY (field term. 120) to chan. 10 green (monitor pin R).

Follow the instructions below to make appropriate connections:

- STEP 1: Fold down rear panel of output file.
- STEP 2: Find unused wiring harness from conflict monitor card edge connector (which should be tied and bundled together).
- STEP 3: Find the connector that correspond to the following conflict monitor card edge pins and solder wire the appropriate terminal on the rear of the output file shown below:

CMU-13 -----2PY (term. 114)
CMU-R -----6PY (term. 120)

NOTE: Some cabinet manufacturers use keyed connectors to accomplish this wiring configuration. If connectors are used, fold down the rear panel of the output file and find the set of 3 keyed connectors and connect them as shown below:



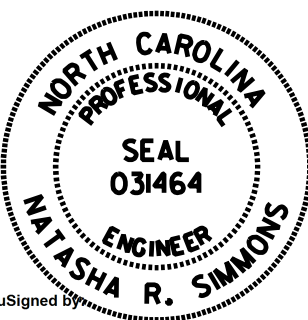
Signal Upgrade
Temporary Design 1
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1080T1
DESIGNED: NOVEMBER 2023
SEALED: 08/05/2026
REVISED:



HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

Electrical and Programming Details For: Prepared for the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	NC 115 at US 421 Northbound Ramps/SR 2543 (CC Wright School Road)		SEAL  DocuSigned by <i>Natasha R. Simmons</i> FIDAB8DF3AD445A 8/5/2026 SIGNATURE DATE SIG. INVENTORY NO. 11-1080T1
	Division 11Wilkes CountyWilkesboro		
	PLAN DATE: November 2023	REVIEWED BY: N.K. Vlanich	
	PREPARED BY: E.E. Tiller	REVIEWED BY: N.R. Simmons	
	REVISIONS		
INIT. DATE			

The diagram shows three nodes arranged in a triangle, connected by double-headed arrows. Each node contains a diagram of a 2D surface with a marked point and a path. The nodes are labeled 2+6, 1+6, and 2+6. The top-left node (2+6) shows a surface with a marked point and a path that loops around it. The top-right node (2+6) shows a surface with a marked point and a path that loops around it. The bottom node (1+6) shows a surface with a marked point and a path that loops around it.

SIGNAL FACE	PHASE			
	1 + 6	2 + 6	4	F L A S H
11	—	$\overline{E}$	$\overline{R}$	$\overline{R}$
21,22	R	G	R	R
41,43	$\overline{R}$	$\overline{R}$	—	$\overline{R}$
42	—	R	—	R
61,62	G	G	R	R

DETECTOR					PROGRAMMING						
ZONE	SIZE (FT)	DISTANCE FROM STOP LINE (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A*	6X40	0	*	*	1 6	15.0 -	-	X X	- X	X X	- -
2A*	6X6	300	*	*	2	-	-	X	-	X	-
2B*	6X40	0	*	*	2	5.0	2.0	X	-	X	X
4A*	6X40	0	*	*	4	-	-	X	-	X	-
4B*	6X40	0	*	*	4	15.0	-	X	-	X	-
6A*	6X6	300	*	*	6	-	-	X	-	X	-
6B*	6X40	0	*	*	6	5.0	2.0	X	-	X	X

3 Phase
Fully Actuated
(Isolated)

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 may be lagged.
4. Reposition existing signal heads numbered 11,21,22, and 61.
5. Set all detector units to presence mode.
6. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
7. See R-5759 TMP Phase 2 for pavement markings.

	DETECTED MOVEMENT
	UNDETECTED MOVEMENT (OVERLAP)
	UNSIGNALIZED MOVEMENT
	PEDESTRIAN MOVEMENT

MAXTIME TIMING CHART				
FEATURE	PHASE			
	1	2	4	6
Walk *	–	–	–	–
Ped Clear	–	–	–	–
Min Green *	7	12	7	12
Passage *	2.0	6.0	2.0	6.0
Max 1 *	15	60	25	60
Yellow Change	3.0	4.5	3.0	4.5
Red Clear	2.3	1.5	2.9	1.5
Added Initial *	–	–	–	–
Maximum Initial *	–	–	–	–
Time Before Reduction *	–	15	–	15
Time To Reduce *	–	30	–	30
Minimum Gap	–	3.0	–	3.0
Advance Walk	–	–	–	–
Non Lock Detector	X	–	X	–
Vehicle Recall	–	MIN RECALL	–	MIN RECALL
Dual Entry	–	–	–	–

Signal Upgrade -
Temporary Design 2
(Construction Phase 2)

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	
	Non-Intrusive Detection Zone	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Construction Zone	
	Construction Zone Drums	
N/A	Guardrail	
	Pavement Removal	
	"Yield Sign" (R1-2)	
	No Right Turn Sign (R3-1)	
	No Left Turn Sign (R3-2)	

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4000 Center at North Hills St
Suite 500
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Prepared For:

Transportation Mobility and Safety
DEPARTMENT OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N. Greenfield Pkwy. Garner.

0
1" = 4'

[illegible]

SEAL



A circular professional engineer seal for the state of North Carolina. The outer ring contains the text "NORTH CAROLINA" at the top and "NATASHA R. SIMMONS" at the bottom. Inside the ring, the words "PROFESSIONAL" and "ENGINEER" are positioned on the left and right sides respectively. In the center of the seal, it reads "SEAL 031464".

DocuSigned by:
Natasha R. Simmons

8/5/2026

FEDABA8DF3AD445A	
SIGNATURE	DATE
SIG. INVENTORY NO. 11-108012	

MAXTIME OVERLAP PROGRAMMING DETAIL

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
Type	FYA 4 - Section	-	-	Normal
Included Phases	2	-	-	1,4
Modifier Phases	1	-	-	-
Modifier Overlaps	-	-	-	-
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

OUTPUT POINT REMAPPING FOR SIGNAL HEAD 11

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

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

IO Module 1

Output Point	Description	Output Control Type	Index
33	C1-35	Phase Green	1

OUTPUT CHANNEL CONFIGURATION

PROJECT REFERENCE NO.	SHEET NO.
R-5759	Sig. 3.2

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	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	Overlap	4		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1		X	X	9
10	Overlap	2		X	X	10
11	Overlap	3		X		11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

NOTICE OVERLAP 1
ASSIGNED TO CHANNEL 1 ➡

NOTICE OVERLAP 4
ASSIGNED TO CHANNEL 7 ➡

SDLC NON-INTRUSIVE DETECTION CHART

	Detector Rack #3		Detector Rack #4	
Input Point	Det # (Index)	Detector Zone	Det # (Index)	Detector Zone
1	33	1A	49	NU
2	34	NU	50	NU
3	35	NU	51	NU
4	36	NU	52	NU
5	37	NU	53	NU
6	38	2A	54	6A
7	39	2B	55	6B
8	40	NU	56	NU
9	41	NU	57	NU
10	42	NU	58	NU
11	43	NU	59	NU
12	44	4A	60	NU
13	45	4B	61	NU
14	46	NU	62	NU
15	47	NU	63	NU
16	48	NU	64	NU

NU = Not Used

SPECIAL DETECTION IO MODULE PROGRAMMING

The Enhanced Out of Pavement Detection requires adjustments to the IO Modules in use. Follow the programming instructions below to ensure desired operation.

Front Panel
Main Menu >Controller >More >Advanced IO >IO Modules

Web Interface
Home >Controller >Advanced IO >Cabinet Configuration >IO Modules

IO Module	Type	Fault Response
1	Caltrans 332	Default
2	TS2 DR3 BIU	Default
3	TS2 DR4 BIU	Default
4	TS2 MMU	Default

Advanced Cabinet Options

☒ Disable TS2 Cabinet Alarms

PED YELLOW CONFLICT MONITOR WIRING DETAIL

(make cabinet wiring changes as shown below)

In order to use FYA COMPACT mode with the 16 or 18 Channel Monitor, the cabinet must be wired such that the (unused) Ped Yellow load switch outputs are wired to the conflict monitor as follows: From 2 PY (field term. 114) to chan. 9 green (monitor pin 13).

Follow the instructions below to make appropriate connections:

- STEP 1: Fold down rear panel of output file.
STEP 2: Find unused wiring harness from conflict monitor card edge connector (which should be tied and bundled together).
STEP 3: Find the connector that correspond to the following conflict monitor card edge pins and solder wire the appropriate terminal on the rear of the output file shown below:

CMU-13 -----2PY (term. 114)

NOTE: Some cabinet manufacturers use keyed connectors to accomplish this wiring configuration. If connectors are used, fold down the rear panel of the output file and find the set of 3 keyed connectors and connect them as shown below:

1 - 2PY	-----	1- CMU-13
2 - 4PY	-----	2- CMU-16
3 - 6PY	-----	3- CMU-R
4 - 8PY	-----	4- CMU-U

LOGIC PROCESSOR PROGRAMMING

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

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

Program 1

Statement	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Ext
1	Veh Detector Call	125	Is Module A Input B ON	Number	2	Number	1	0.0	0.0

LOGIC STATEMENT DESCRIPTION

Statement 1 Description: Mirrors vehicle detector 33 to vehicle detector 125.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1080T2
DESIGNED: NOVEMBER 2023
SEALED: 08/05/2026
REVISED:

HNTB
HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

Signal Upgrade
Temporary Design 2
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:		NC 115 at US 421 Northbound Ramps/SR 2543 (CC Wright School Road)		SEAL	
Prepared for the Offices of:		Division 11Wilkes CountyWilkesboro			
		PLAN DATE: November 2023REVIEWED BY: N.K. Vlanich			
750 N. Greenfield Pkwy, Garner, NC 27529		PREPARED BY: E.E. TillierREVIEWED BY: N.R. Simmons			
REVISIONS		INIT.	DATE	8/5/2026	
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The diagram illustrates a four-state regulatory network for the TOL system. The states are represented by rounded rectangles and labeled as follows:

- 2+6**: Top-left state, containing two sets of three horizontal lines with dots at their right ends, representing a complex of 2 *lacZ* and 6 *lacY* molecules.
- TOL**: Top-right state, containing two horizontal lines with dots at their right ends, representing a complex of 2 *lacZ* molecules.
- 1+6**: Bottom-left state, containing one set of three horizontal lines with dots at their right ends and one dot with a curved arrow, representing a complex of 1 *lacZ* and 6 *lacY* molecules.
- 4**: Bottom-right state, containing two dots with curved arrows, representing 4 *lacY* molecules.

Transitions between states are indicated by arrows:

- A curved arrow points from **2+6** to **TOL**.
- A curved arrow points from **TOL** to **4**.
- A curved arrow points from **4** to **1+6**.
- A curved arrow points from **1+6** to **2+6**.

	DETECTED MOVEMENT
	UNDETECTED MOVEMENT (OVERLAP)
	UNSIGNALIZED MOVEMENT
	PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE				
	1 + 6	2 + 6	T O L	4	F L A S H
11	→	→	→	→	→
13	↘ _G	G	R	R	R
21,22	R	G	R	R	R
23	R	G	G	R	R
24	R	G	G	R _F ↘	
41,42	R	R	R	G	R
43,44	→	→	→	→	→
45	→	→	→	→	→
61,62	G	G	R	R	R

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOP LINE (FT)	TURNS	LOOP NEW	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND INITIAL	CALL ADDED	NEW DELAY DURING RECORD	
1A	6X40	0	2-4-2	X	1	-	-	X	-	X	
1B	6X60	+5	2-4-2	-	DISCONNECT & ABANDON						
1C	6X60	0	2-4-2	-	1	15.0	-	X	-	X	
					6	-	-	X	-	X	
1D	6X40	0	2-4-2	X	1	15.0	-	X	-	X	
2A	6X6	70	3	-	2	-	-	X	-	X	
2B	6X6	70	3	-	2	-	-	X	-	X	
2C	6X6	70	3	X	2	-	-	X	-	X	
2D	6X6	70	3	X	2	-	-	X	-	X	
4A	6X40	0	2-4-2	-	4	3.0	-	X	-	X	
4B	6X40	0	2-4-2	-	4	15.0	-	X	-	X	
4C	6X40	0	2-4-2	X	4	3.0	-	X	-	X	
4D	6X40	0	2-4-2	X	4	-	-	X	-	X	
6A	6X6	70	3	X	6	-	-	X	-	X	
6B	6X6	70	3	X	6	-	-	X	-	X	

NOTES

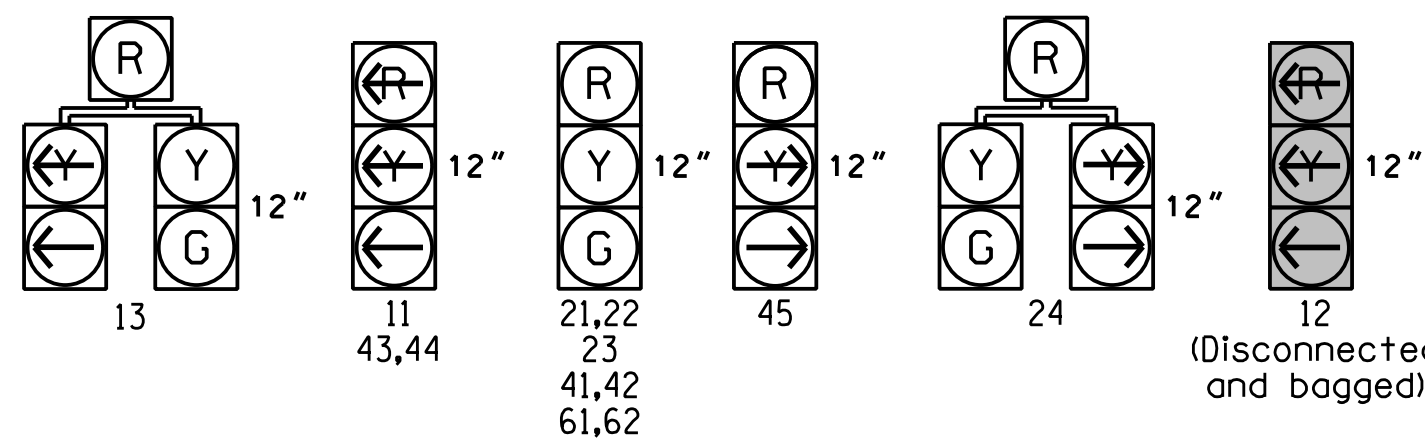
1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Enable Backup Prevent to allow the controller to clear from phase 2 to phase 1 by progressing through phase 4.
4. Disconnect and bag signal head numbered 12.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Set all detector units to presence mode.
7. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
8. See R-5759 TMP Phase 1 for pavement markings.

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	
	Directional Drill	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
N/A	Guardrail	
	Construction Zone Drums	
	Type II Signal Pedestal	
N/A	Curb Ramp	
N/A	Railroad Tracks	
	"STOP" Sign (R1-1)	

FEATURE	PHASE				
	1	2	4	6	TOL
Walk *	–	–	–	–	
Ped Clear	–	–	–	–	
Min Green *	7	10	7	10	7
Passage *	1.0	3.0	1.0	3.0	
Max I *	20	45	25	45	
Yellow Change	3.3	4.5	3.0	4.5	3.5
Red Clear	2.6	2.0	3.1	2.0	4.2
Added Initial *	–	–	–	–	
Maximum Initial *	–	–	–	–	
Time Before Reduction *	–	–	–	–	
Time To Reduce *	–	–	–	–	
Minimum Gap	–	–	–	–	
Advance Walk	–	–	–	–	
Non Lock Detector	X	–	X	–	
Vehicle Recall	–	MIN RECALL	–	MIN RECALL	
Dual Entry	–	–	–	–	

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

All Heads L.E.D.



HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

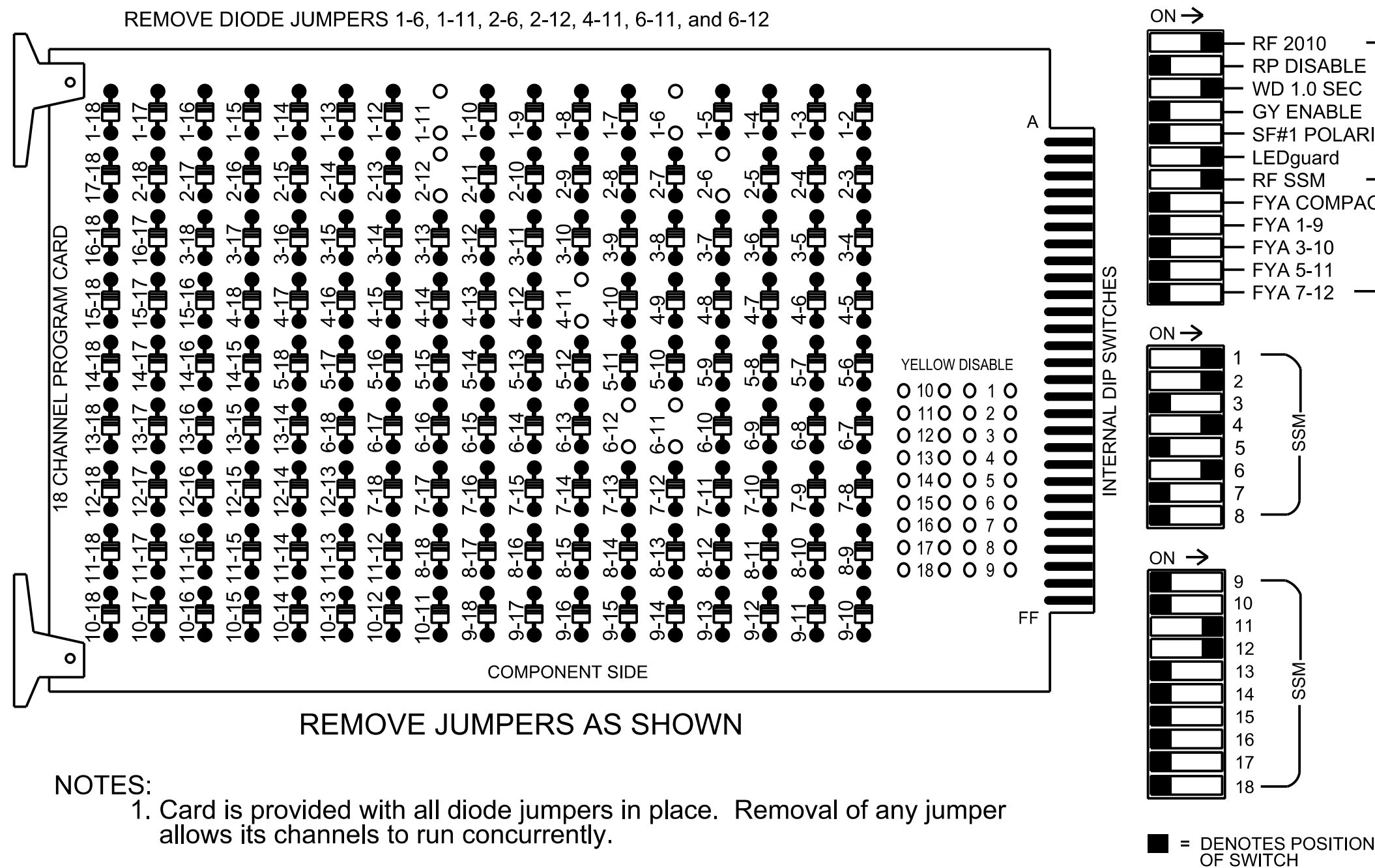
Signal Upgrade
Temporary Design 1
(Construction Phase 1)

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

Prepared for: 	US 421 Bus-NC 18-268 (Second St) at US 421 Bus-NC 115 (Statesville Rd) "D" Street and SR 2333 (River Rd) Division 11 Wilkes County Wilkesboro	SEAL 																																	
750 N. Greenfield Pkwy, Garner, NC 27529	PLAN DATE: November 2023 REVIEWED BY: N.K. Vlanich PREPARED BY: E.E. Tiller REVIEWED BY: N.R. Simmons	Docs Signed By: <i>Natasha R. Simmons</i> -FEDASB02F3AD46A-																																	
 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">REVISIONS</th> <th style="width: 33%;">INIT.</th> <th style="width: 33%;">DATE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>		REVISIONS	INIT.	DATE																														
REVISIONS	INIT.	DATE																																	
	8/5/2026 SIGNATURE _____ DATE _____ SIG. INVENTORY NO. II-1012.TI																																		

(remove jumpers and set switches as shown)

(remove jumpers and set switches as shown)



NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plans.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

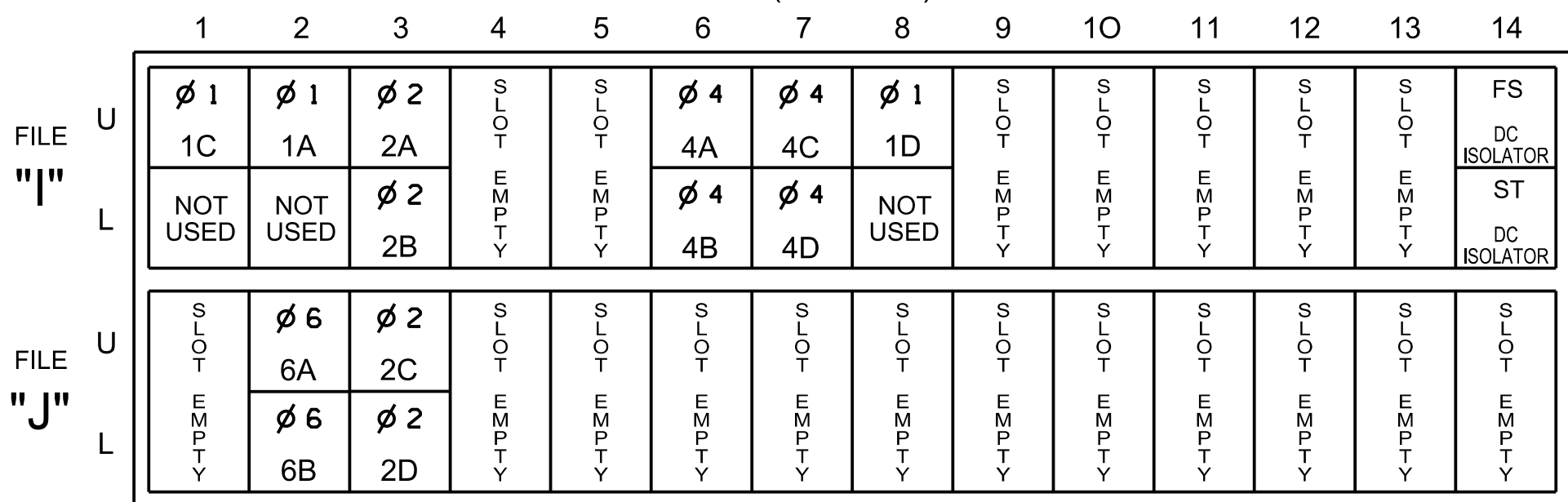
EQUIPMENT INFORMATION

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,S8,AUX S4,AUX S5
Phases Used.....	1,2,4,6
Overlap "1".....	NOT USED
Overlap "2".....	NOT USED
Overlap "3".....	*
Overlap "4".....	*

*See overlap programming detail on sheet 2.

INPUT FILE POSITION LAYOUT

(front view)



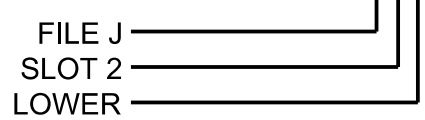
EX. : 1A, 2A, ETC. = LOOP NO.'S

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
1C	TB2-1.2	I1U	56	18	1	1	15.0		X		X	
	-	I1U	56	-	29	6			X		X	
1A	TB2-5.6	I2U	39	1	2	1			X		X	
2A	TB2-9,10	I3U	63	29	4	2			X		X	
2B	TB2-11,12	I3L	76	42	5	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4	3.0		X		X	
4B	TB4-11,12	I6L	45	7	9	4	15.0		X		X	
4C	TB6-1.2	I7U	65	31	10	4	3.0		X		X	
4D	TB6-3.4	I7L	78	44	11	4			X		X	
1D	TB6-5.6	I8U	49	11	12	1	15.0		X		X	
6A	TB3-5.6	J2U	40	2	16	6			X		X	
6B	TB3-7.8	J2L	44	6	17	6			X		X	
2C	TB3-9,10	J3U	64	30	18	2			X		X	
2D	TB3-11,12	J3L	77	43	19	2			X		X	

INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1012T1
DESIGNED: NOVEMBER 2023
SEALED: 08/05/2026
REVISED:

HNTB

HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

SIGNAL HEAD HOOK-UP CHART

[illegible]

NU = Not Used

Signal Upgrade
Temporary Design 1
Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared for the Offices of:

Seal of the State of North Carolina
Department of Transportation
& Signal Management Systems

US 421 Bus-NC 18-268 (Second St)
at
US 421 Bus-NC 115 (Statesville Rd)
/"D" Street and SR 2333 (River Rd)
Division 11 Wilkes County Wilkesboro

PLAN DATE: November 2023

REVIEWED BY: N.K. Vlanich

PREPARED BY: E.E. Tiller

REVIEWED BY: N.R. Simmons

REVISIONS

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Overlap	1	2	3	4
Type	-	-	Normal	Normal
Included Phases	-	-	1,4	2
Modifier Phases	-	-	-	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	7
Trail Yellow	0.0	0.0	0.0	3.5
Trail Red	0.0	0.0	0.0	4.2

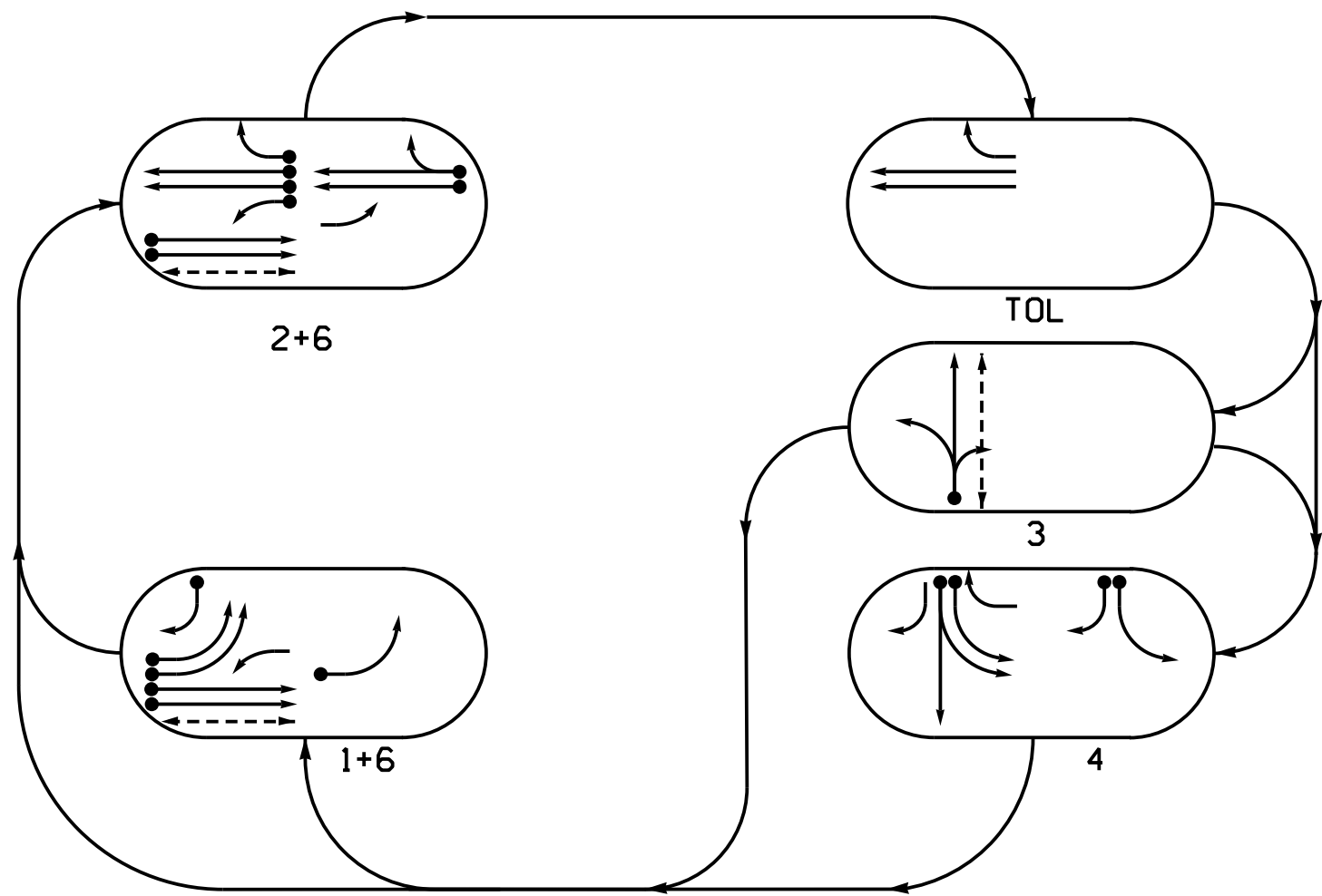
Serve Phase	Backup Call Phase
1	-
2	4
3	-
4	-
5	-
6	-
7	-
8	-

No Backup Phase	1	2	3	4	5	6	7	8
Serve Phase 1	-	-	-	-	-	-	-	-
Serve Phase 2	X	-	-	-	-	-	-	-
Serve Phase 3	-	-	-	-	-	-	-	-
Serve Phase 4	-	-	-	-	-	-	-	-
Serve Phase 5	-	-	-	-	-	-	-	-
Serve Phase 6	-	-	-	-	-	-	-	-
Serve Phase 7	-	-	-	-	-	-	-	-
Serve Phase 8	-	-	-	-	-	-	-	-

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 421 Bus-NC 18-268 (Second St) at US 421 Bus-NC 115 (Statesville Rd) /"D" Street and SR 2333 (River Rd) Division 11 Wilkes County Wilkesboro	SEAL 																																	
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REVISONS	INT.	DATE																																	

750 N. Greenfield Pkwy, Garner, NC 27529

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE					FLASH
	1 + 6	2 + 6	TOL	3	4	
11,12	←	←	←	←	←	←
13	←	←	←	←	←	←
21,22	R	G	R	R	R	R
23	←	←	←	←	←	←
24	R	G	R	R	R	R
25	R	G	G	R	R	R
31	R	R	R	G	R	R
32	R	R	R	G	R	R
41,43,44	←	←	←	←	←	←
42	R	R	R	←	R	←
45	←	←	←	←	G	←
46	←	←	R	R	G	←
61,62	G	G	R	R	R	G
P31,P32	DW	DW	DW	W	DW	DRK
P61,P62	W	W	DW	DW	DW	DRK

MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR						PROGRAMMING						
LOOP/ZONE	SIZE (FT)	DISTANCE FROM STOP LINE (FT)	TURN	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	INITIAL	ADDED	CALL	RELAY DURING GREEN
1A	6X40	0	2-4-2	-	1	-	-	-	X	-	X	-
1B	6X40	0	2-4-2	X	1	-	-	-	X	-	X	-
1C	6X60	0	2-4-2	-	1	15.0	-	-	X	-	X	-
1D	6X40	0	2-4-2	-	1	15.0	-	-	X	-	X	-
2A	6X6	70	3	-	2	-	-	-	X	-	X	-
2B	6X6	70	3	-	2	-	-	-	X	-	X	-
2C	6X6	70	3	-	2	-	-	-	X	-	X	-
2D	6X6	70	3	-	2	-	-	-	X	-	X	-
2E	6X40	0	2-4-2	X	2	-	-	-	X	-	X	-
3A*	6X40	0	*	*	3	3.0	-	-	X	-	X	*
4A	6X40	0	2-4-2	-	4	3.0	-	-	X	-	X	-
4B	6X40	0	2-4-2	-	4	15.0	-	-	X	-	X	-
4C	6X40	0	2-4-2	-	4	3.0	-	-	X	-	X	-
4D	6X40	0	2-4-2	-	4	-	-	-	X	-	X	-
6A	6X6	70	3	-	6	-	-	-	X	-	X	-
6B	6X6	70	3	-	6	-	-	-	X	-	X	-

* Video Detection

4 Phase
w/ Timed Overlap
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.
- Enable Backup Prevent to allow the controller to clear from phase 2 to phase 1 by progressing through phase 4.
- The order of phase 3 and phase 4 may be reversed.
- Set all detector units to presence mode.
- In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown when the flashing "Don't Walk" time only.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Suppress FYA for signal head numbered 23 during the first 6 seconds of the phase 6 ped.
- See R-5759 pavement marking plans for existing and proposed pavement markings.

LEGEND

PROPOSED	EXISTING

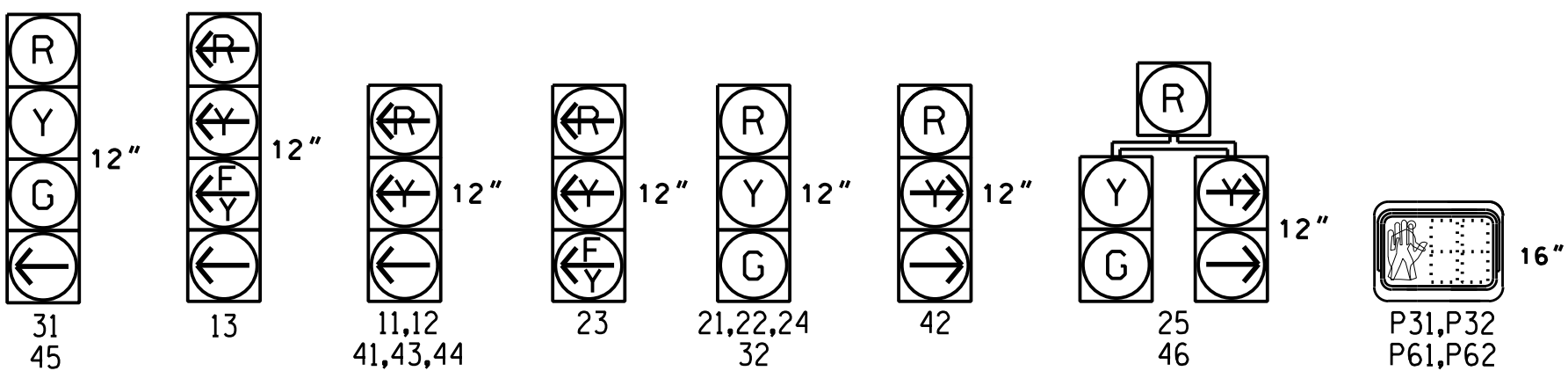
MAXTIME TIMING CHART

FEATURE	PHASE					
	1	2	3	4	6	TOL
Walk *	-	-	14	-	13	
Ped Clear	-	-	24	-	7	
Min Green *	7	10	7	7	10	7
Passage *	1.0	3.0	1.0	1.0	3.0	
Max I *	20	45	25	25	45	
Yellow Change	3.3	4.5	3.0	3.9	4.5	3.5
Red Clear	2.9	2.1	3.8	2.4	2.1	4.2
Added Initial *	-	-	-	-	-	
Maximum Initial *	-	-	-	-	-	
Time Before Reduction *	-	-	-	-	-	
Time To Reduce *	-	-	-	-	-	
Minimum Gap	-	-	-	-	-	
Advance Walk	-	-	7	-	-	
Non Lock Detector	X	-	X	X	-	
Vehicle Recall	-	MIN RECALL	-	-	MIN RECALL	
Dual Entry	-	-	-	-	-	

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

SIGNAL FACE I.D.

All Heads L.E.D.



Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

	US 421 Bus-NC 18-268 (Second St) at US 421 Bus-NC 115 (Statesville Rd) /"D" Street and SR 2333 (River Rd)		
	Division 11 Wilkes County Wilkesboro		
	PLAN DATE: November 2023	REVIEWED BY: N.K. Vianich	
	PREPARED BY: E.E. Tiller	REVIEWED BY: N.R. Simmons	
REVISIONS		INIT.	DATE
0			
1"=40'			

HNTB
HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

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.

MAXTIME OVERLAP PROGRAMMING DETAIL

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
Type	FYA - 4 Section	Normal	FYA - 4 Section	Normal
Included Phases	2	1	6	2
Modifier Phases	1	-	-	-
Modifier Overlaps	-	-	-	-
Trail Green	0	0	0	7
Trail Yellow	0.0	0.0	0.0	3.5
Trail Red	0.0	0.0	0.0	4.2
FYA Ped Delay	0.0	0.0	6.0	0.0

SDLC NON - INTRUSIVE
DETECTION CHART

Detector Rack #3		
Input Point	Det # (Index)	Detector Zone
1	33	NU
2	34	3A
3	35	NU
4	36	NU
5	37	NU
6	38	NU
7	39	NU
8	40	NU
9	41	NU
10	42	NU
11	43	NU
12	44	NU
13	45	NU
14	46	NU
15	47	NU
16	48	NU

NU = Not Used

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

BACKUP CALL PHASE PROGRAMMING

Front Panel
Main Menu >Controller >Sequence & Phs Config>Backup Prevention > Backup Call Phase Plans

Web Interface
Home >Controller >Backup Prevention >Backup Calls Phase Plans >

Sequence 1

Serve Phase	Backup Call Phase
1	-
2	4
3	-
4	-
5	-
6	-
7	-
8	-

SPECIAL DETECTION IO MODULE PROGRAMMING

The Enhanced Out of Pavement Detection requires adjustments to the IO Modules in use. Follow the programming instructions below to ensure desired operation.

Front Panel
Main Menu >Controller >More >Advanced IO >IO Modules

Web Interface
Home >Controller >Advanced IO >Cabinet Configuration >IO Modules

IO Module	Type	Fault Response
1	Caltrans 332	Default
2	TS2 DR3 BIU	Default
3	TS2 MMU	Default

Advanced Cabinet Options

☒ Disable TS2 Cabinet Alarms

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	3				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

NOTICE PHASE 3 PED
ASSIGNED TO CHANNEL 16 →

BACKUP PREVENTION PROGRAMMING

Front Panel
Main Menu >Controller >Sequence & Phs Config >Backup Prevention > Backup Protection Plan

Web Interface
Home >Controller> Backup Prevention >Backup Protection Plan

Sequence 1

No Backup Phase	1	2	3	4	5	6	7	8
Serve Phase 1	-	-	-	-	-	-	-	-
Serve Phase 2	X	-	-	-	-	-	-	-
Serve Phase 3	-	-	-	-	-	-	-	-
Serve Phase 4	-	-	-	-	-	-	-	-
Serve Phase 5	-	-	-	-	-	-	-	-
Serve Phase 6	-	-	-	-	-	-	-	-
Serve Phase 7	-	-	-	-	-	-	-	-
Serve Phase 8	-	-	-	-	-	-	-	-

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 11-1012
DESIGNED: NOVEMBER 2023
SEALED: 08/05/2026
REVISED:

HNTB

HNTB NORTH CAROLINA, P.C.
4000 Center at North Hills St
Suite 500
Raleigh, North Carolina 27609
NC License No: C-1554
(919) 546-8997

PED 3 PROGRAMMING DETAIL

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

Web Interface
Home >Controller >Detector Configuration >Pedestrian Detector

Plan 1

Detector	Descripton	Call Phase	Call Overlap
2		2	0
4		4	0
6		6	0
8		3	0

NOTICE PHASE 3 PED
ASSIGNED TO
DETECTOR 8 PED →

Signal Upgrade
Electrical Detail - Sheet 2 of 2

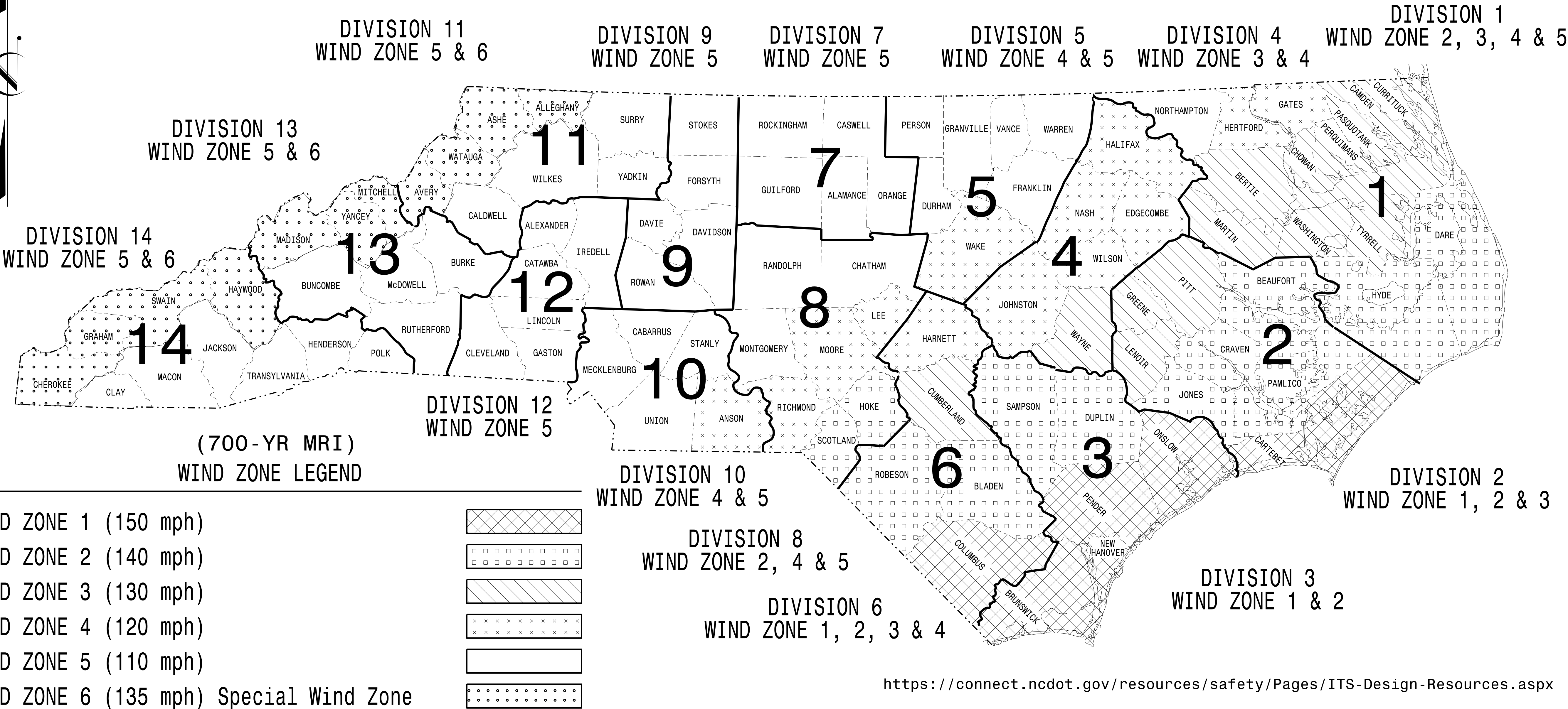
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR: US 421 Bus-NC 18-268 (Second St) at US 421 Bus-NC 115 (Statesville Rd) /"D" Street and SR 2333 (River Rd) Division 11 Wilkes County Wilkesboro		SEAL  Wilkesha R. Simmons
PLAN DATE: November 2023 PREPARED BY: E.E. Tillier		REVIEWED BY: N.K. Vlanich REVIEWED BY: N.R. Simmons
REVISIONS		INIT. DATE
750 N. Greenfield Pkwy, Garner, NC 27529		FID0880F3AD44A 8/5/2026 SIGNATURE DATE SIG. INVENTORY NO. 11-1012

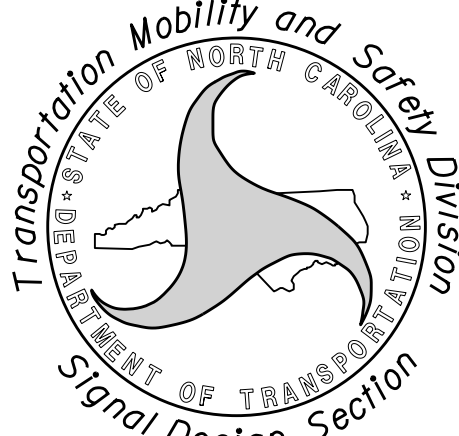
STATE OF NORTH CAROLINA

DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



Prepared In the Offices of:



750 N.Greenfield Pkwy.
Garner, NC 27529

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

AASHTO
LRFD

Standard Specifications for
Highway Signs, Luminaires,
and Traffic Signals

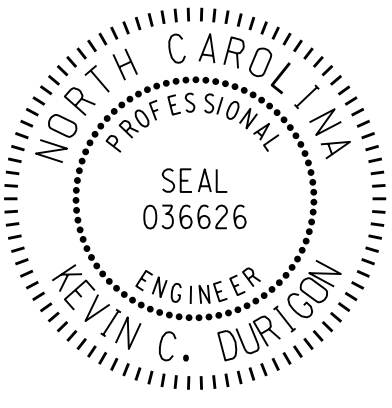
**DRAWING
NUMBER**

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

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

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

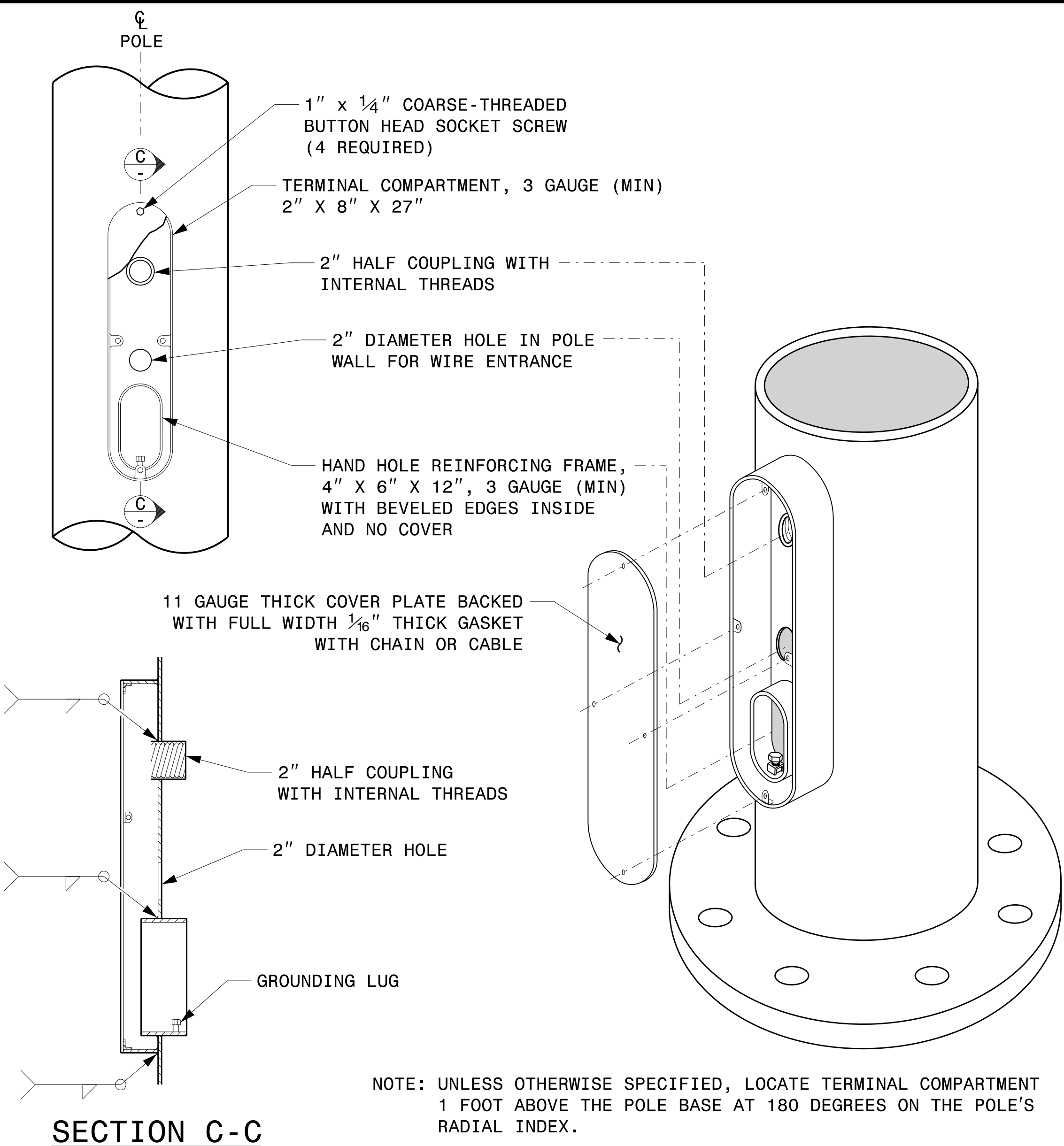
SEAL



DocuSigned by:

Kevin Durigon
SIGNATURE
4B23DC79B3764DA

09/21/2023
DATE



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)

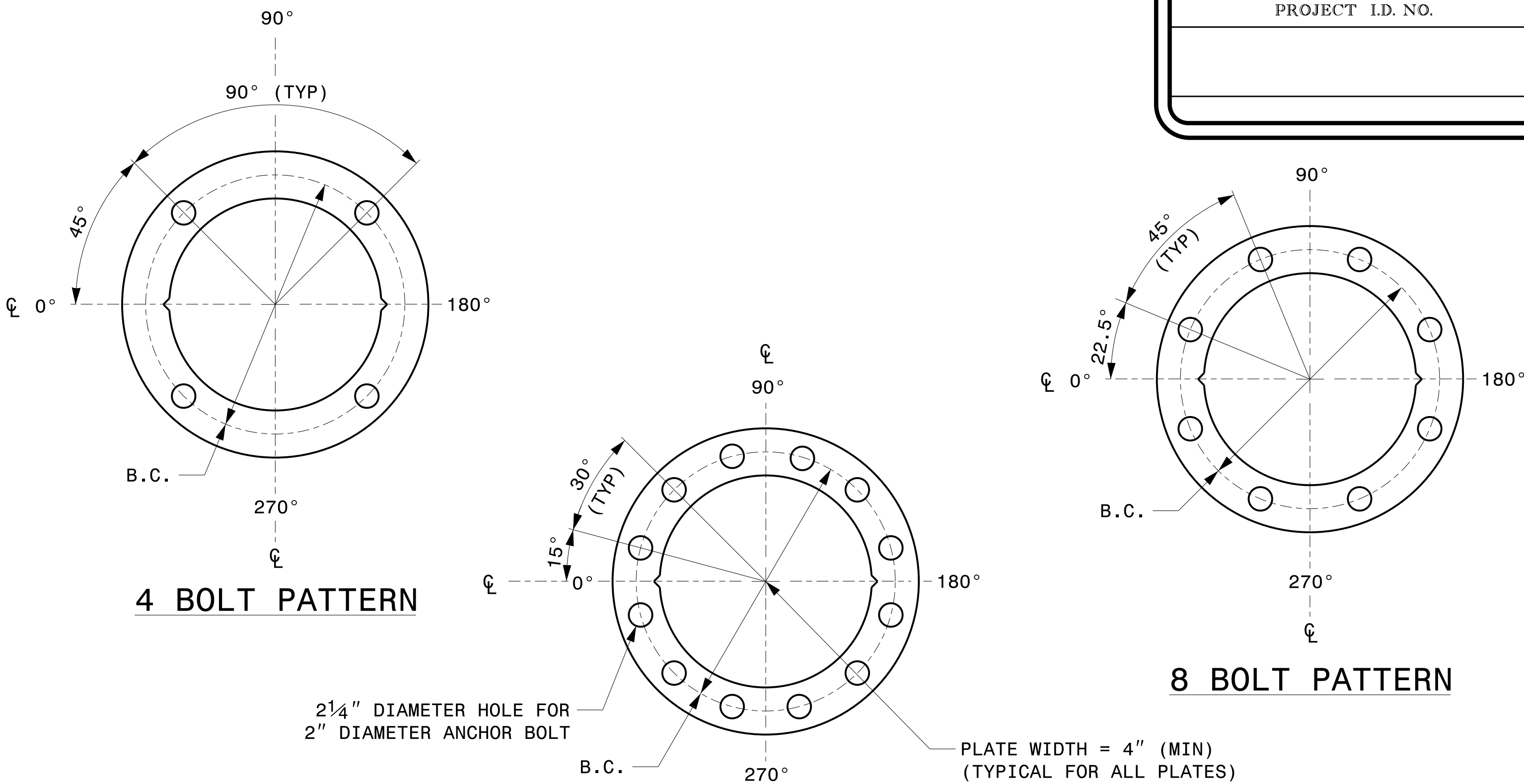
MFG _____	MFG. DATE: MM/YY _____
SECTION D/T/L/Y _____	_____
NCDOT SIG. INV. NO. _____	_____
NCDOT POLE NO. _____	_____

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

NOTES:

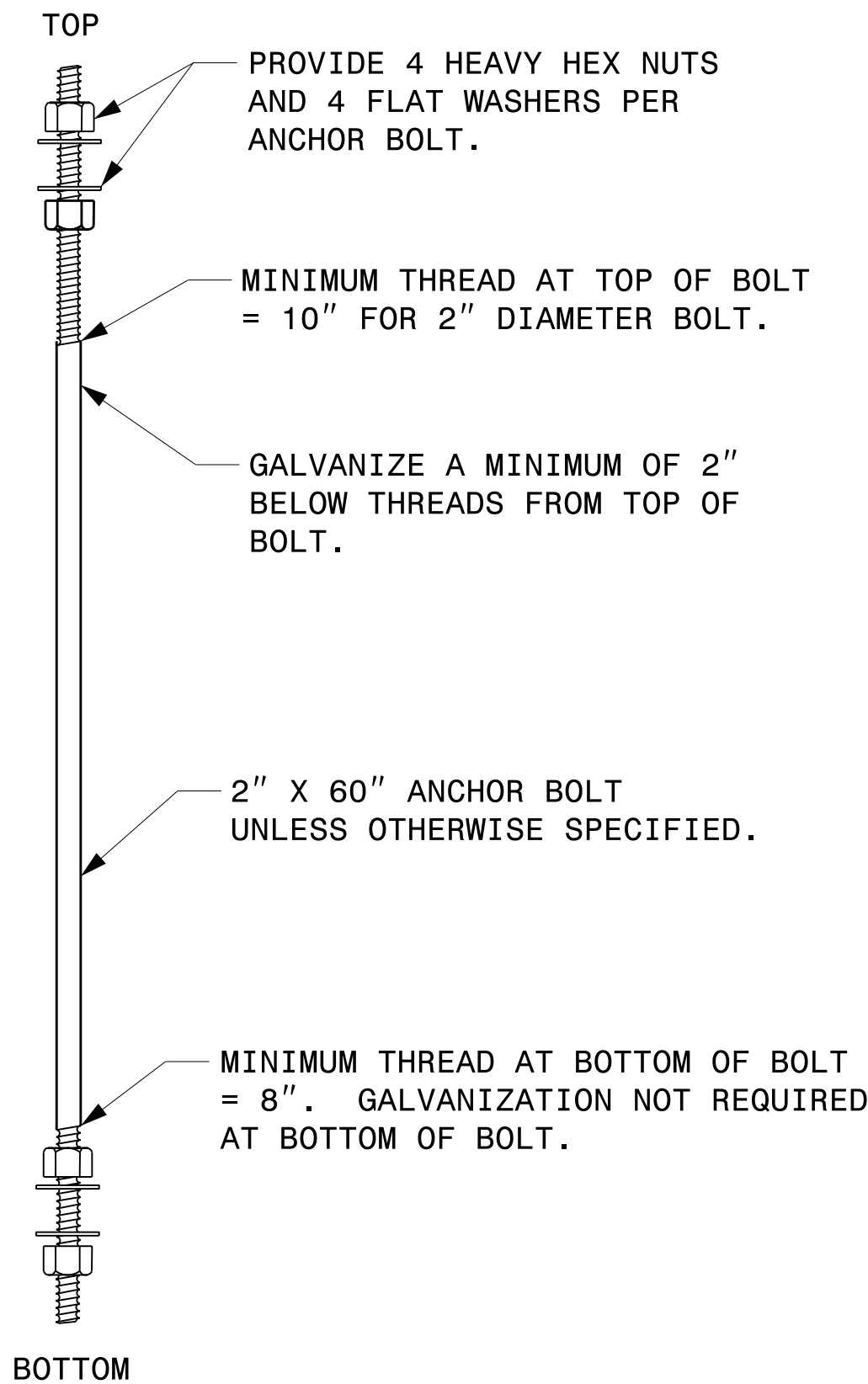
- D = DIAMETER, T = THICKNESS, L = LENGTH, Y = YIELD STRENGTH
- A.B. = ANCHOR BOLT
- B.C. = BOLT CIRCLE OF ANCHOR BOLTS
- IF STANDARD DESIGN, INCLUDE CASE NUMBER IN ADDITION TO POLE NUMBER ON "NCDOT POLE NO." LINE.
- SIGNAL INV. NUMBER AND POLE I.D. NUMBER.
SEE DRAWING M3 AND M4 FOR MOUNTING POSITIONS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

IDENTIFICATION TAG DETAILS

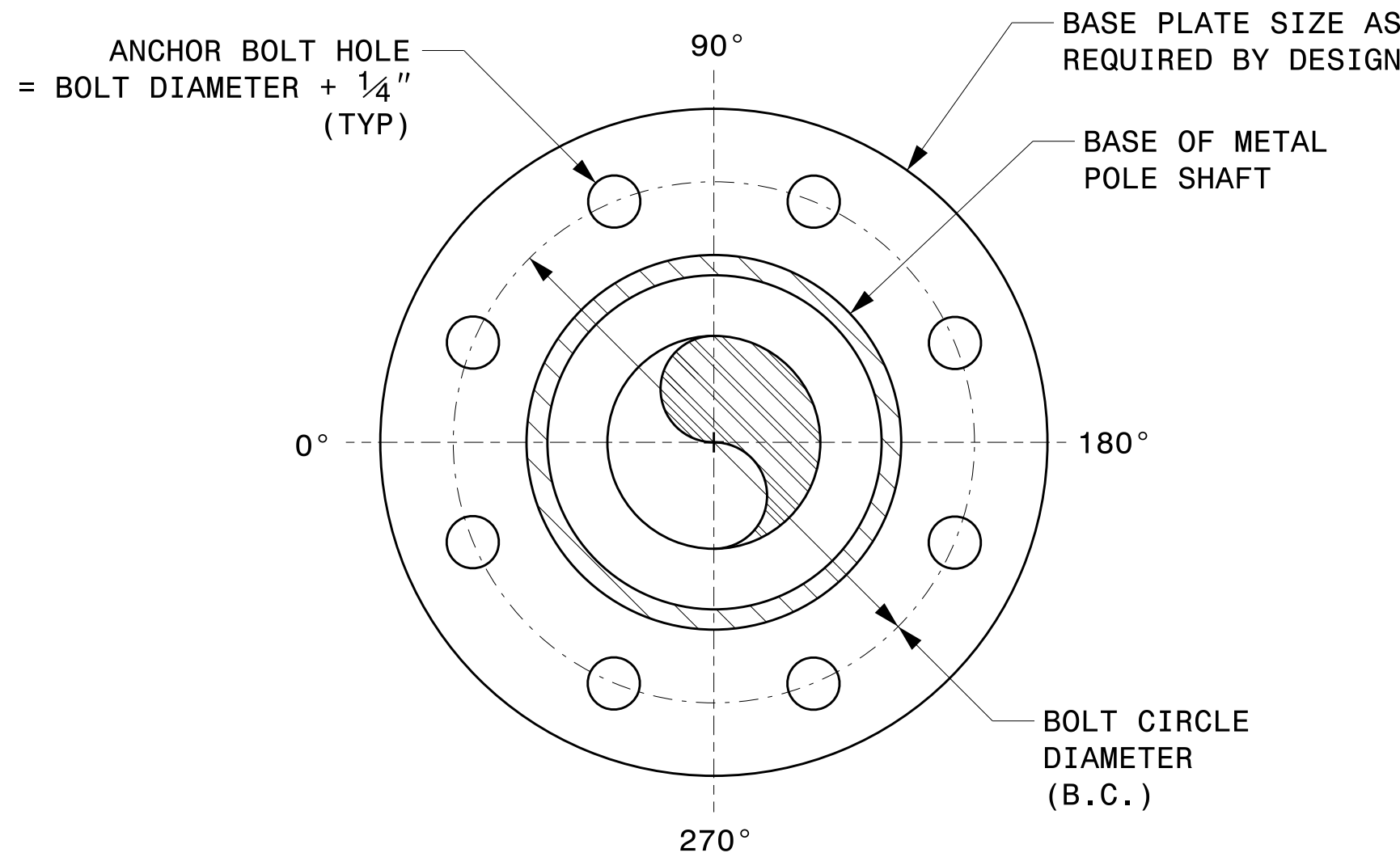


CONSTRUCT TEMPLATES AND PLATES FROM 1/4" (MIN) THICK STEEL. GALVANIZING IS NOT REQUIRED.

BASE PLATE TEMPLATE AND ANCHOR BOLT LOCK PLATE DETAILS



ANCHOR BOLT DETAIL



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

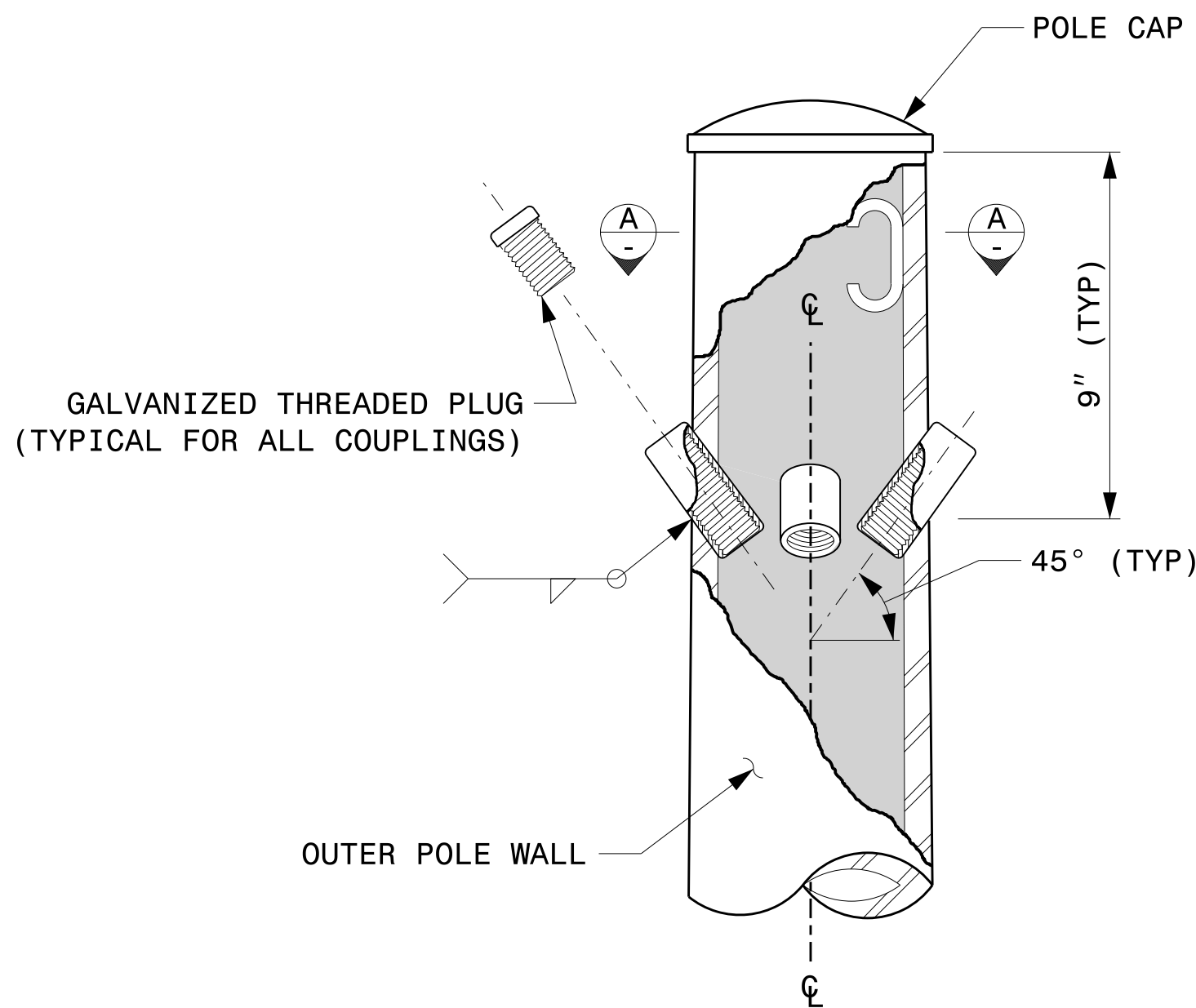
DocuSigned by:

4B23DC79B3784DA

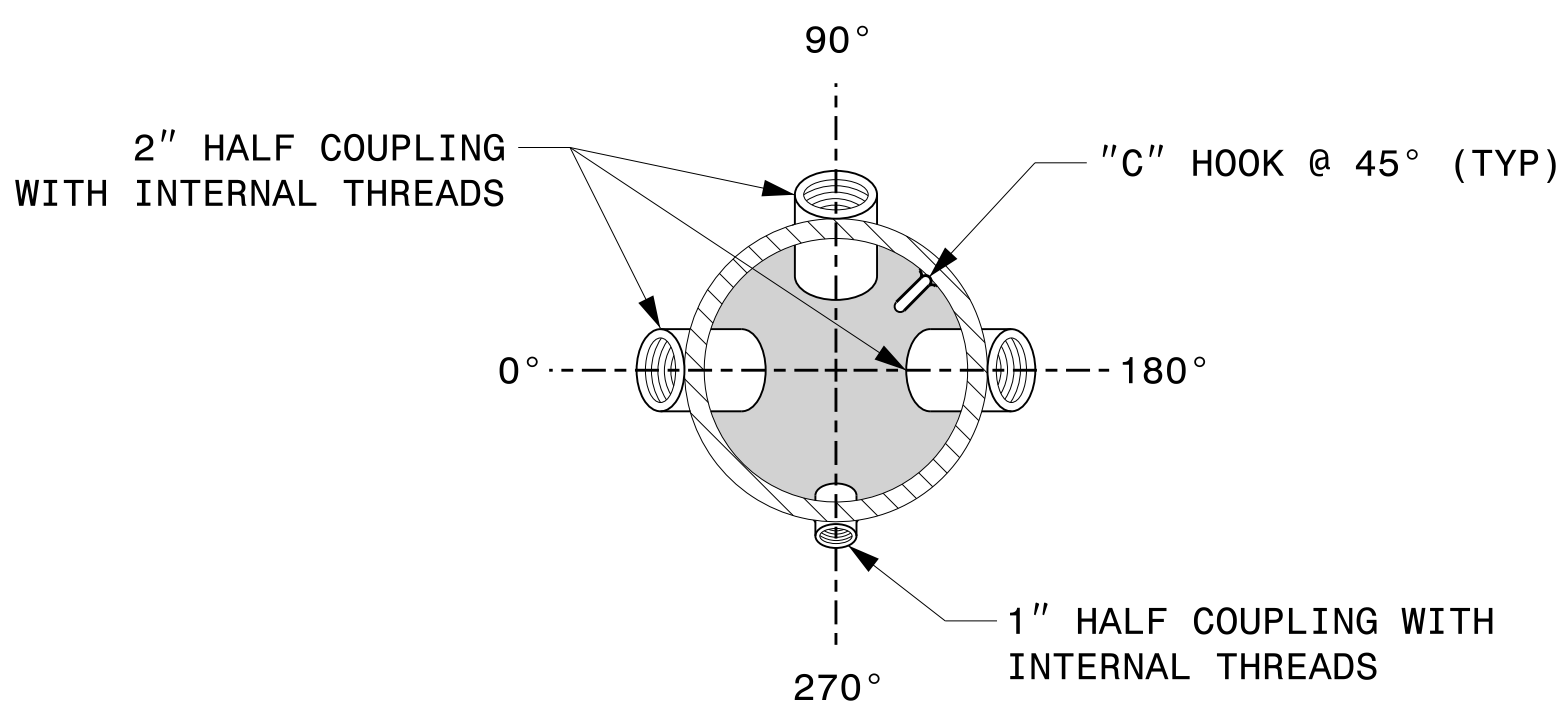
09/21/2023
DATE

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 $8\frac{1}{2}$ ".

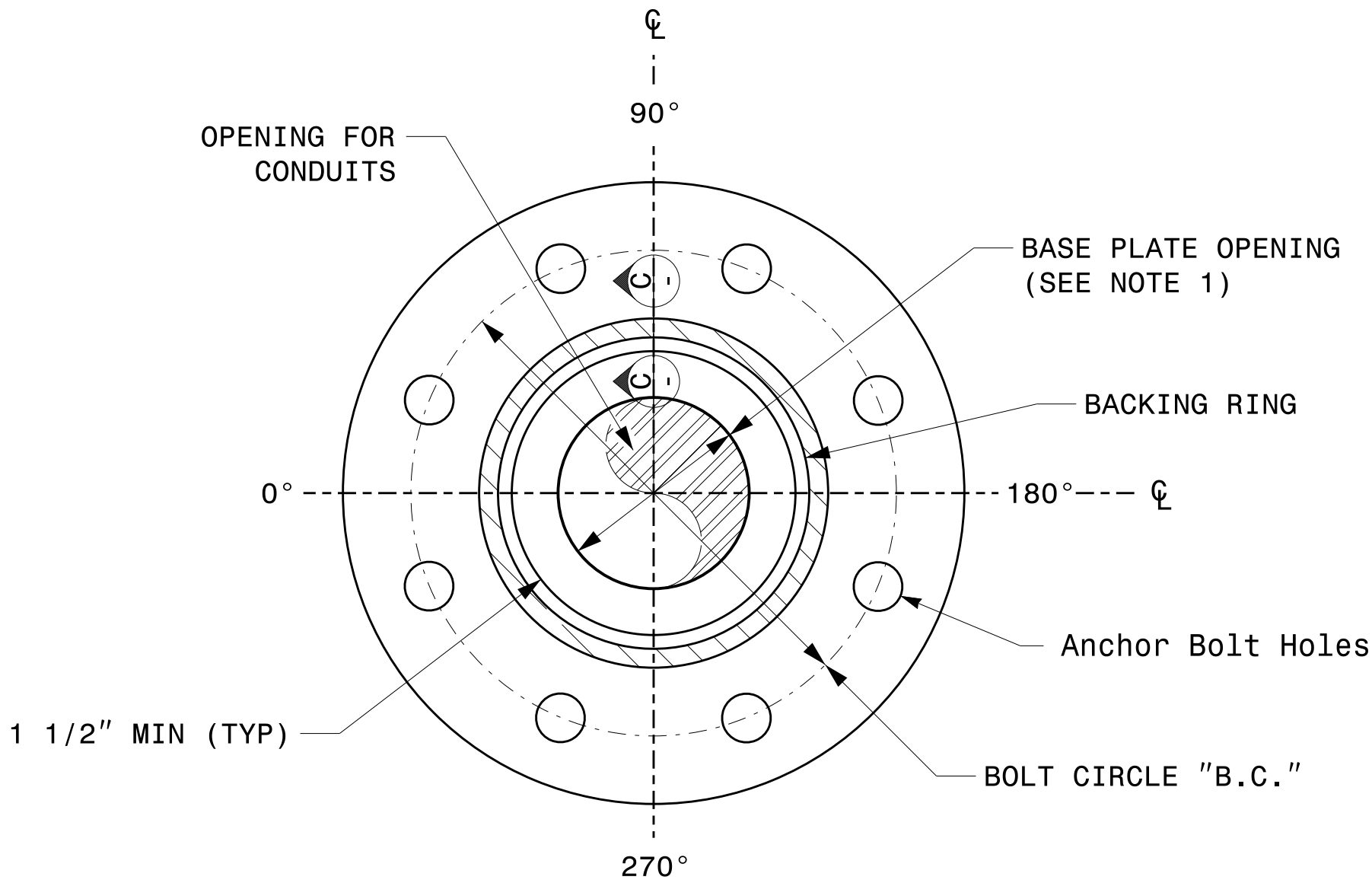


CABLE ENTRANCES AT TOP OF POLE



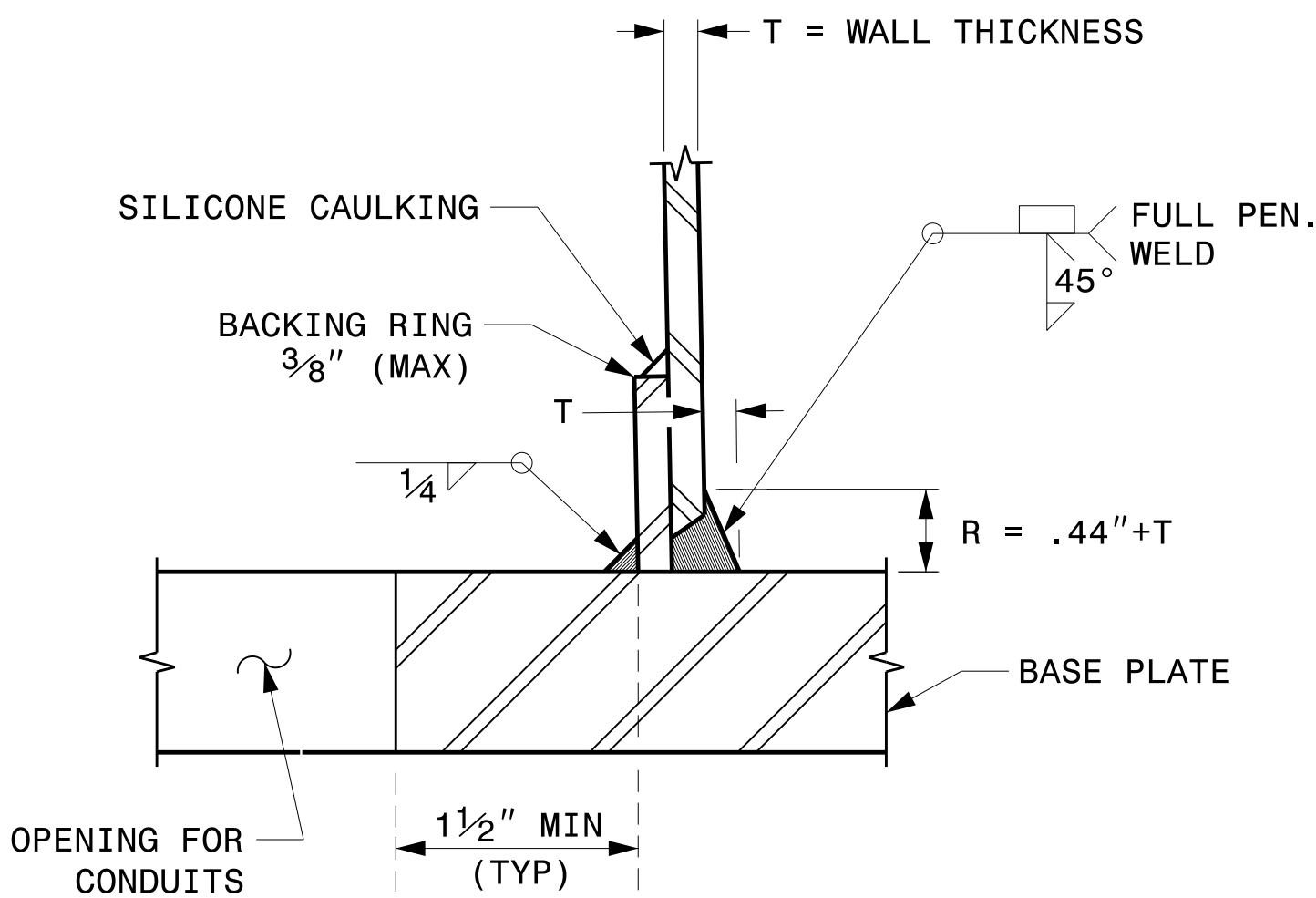
SECTION A-A

RADIAL ORIENTATION OF FACTORY INSTALLED ACCESSORIES AT TOP OF POLE



SECTION B-B

POLE BASE PLATE DETAILS
(8 AND 12 BOLT PATTERN)

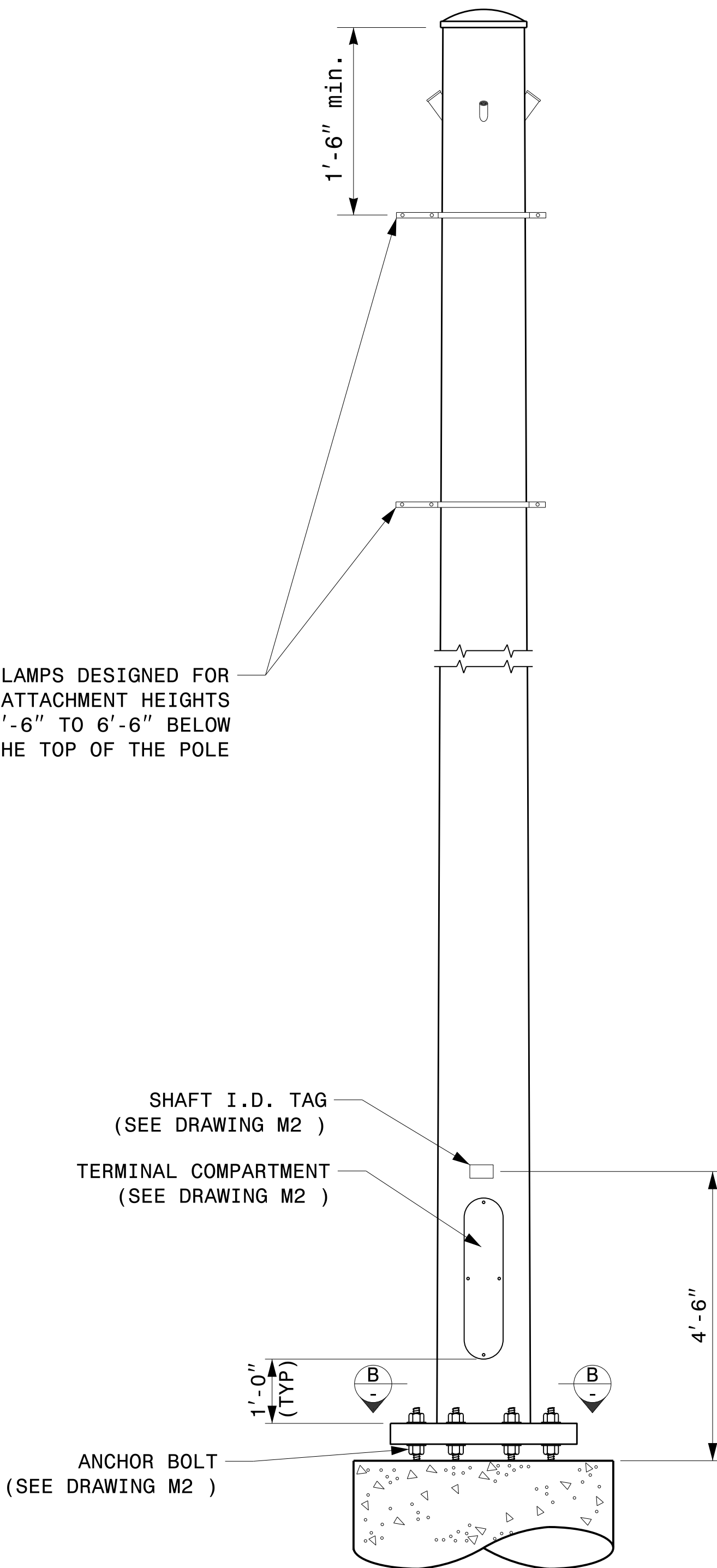


SECTION C-C

(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION GROOVE WELD DETAIL

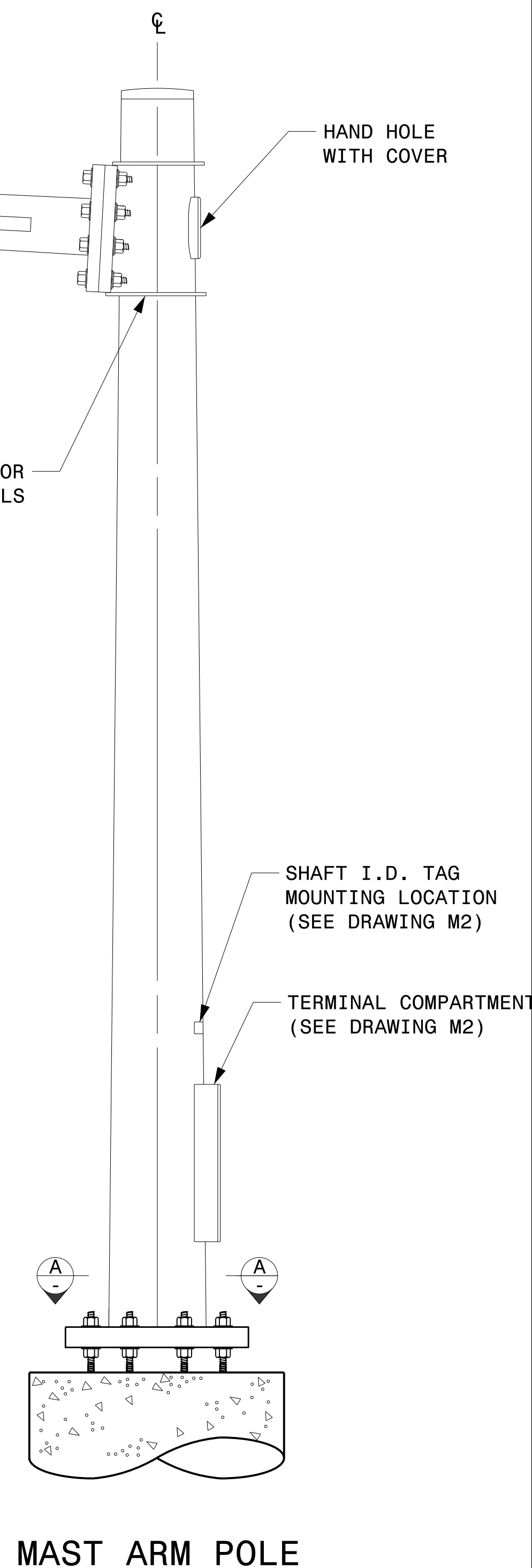
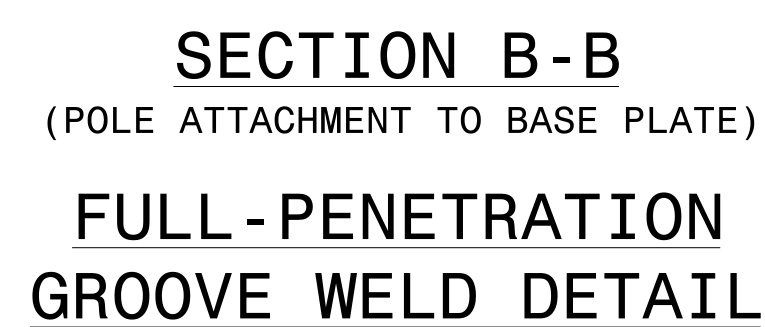
2 CABLE CLAMPS DESIGNED FOR VARIABLE ATTACHMENT HEIGHTS FROM 1'-6" TO 6'-6" BELOW THE TOP OF THE POLE



MONOTUBE STRAIN POLE

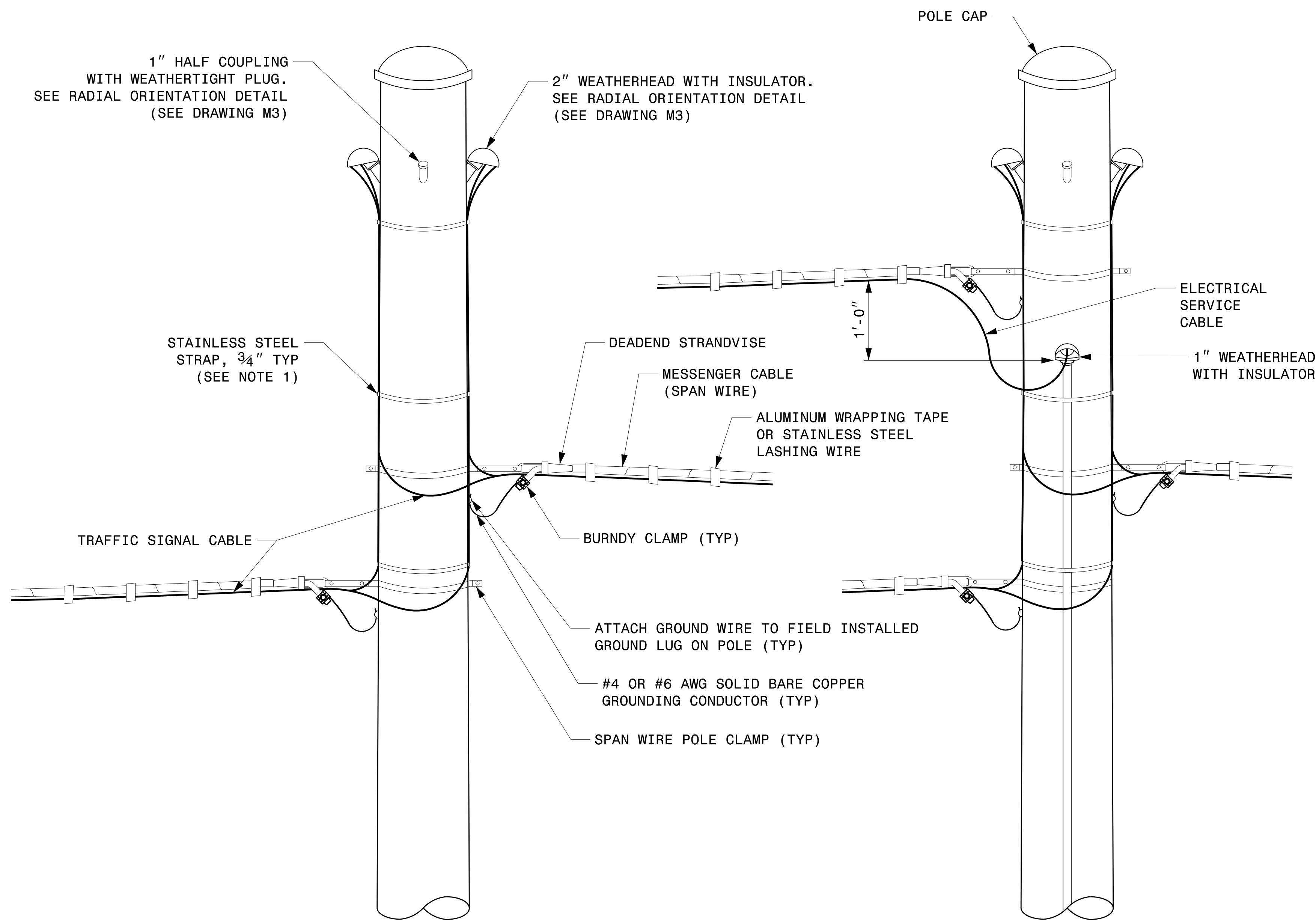
	Typical Fabrication Details For Strain Poles		
	PLAN DATE: SEPTEMBER 2023	DESIGNED BY: K.C. DURIGON	
	PREPARED BY: K.C. DURIGON	REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS	INIT.	DATE
DocuSigned by: Kevin Durigon		09/21/2023	

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 $8\frac{1}{2}$ ".



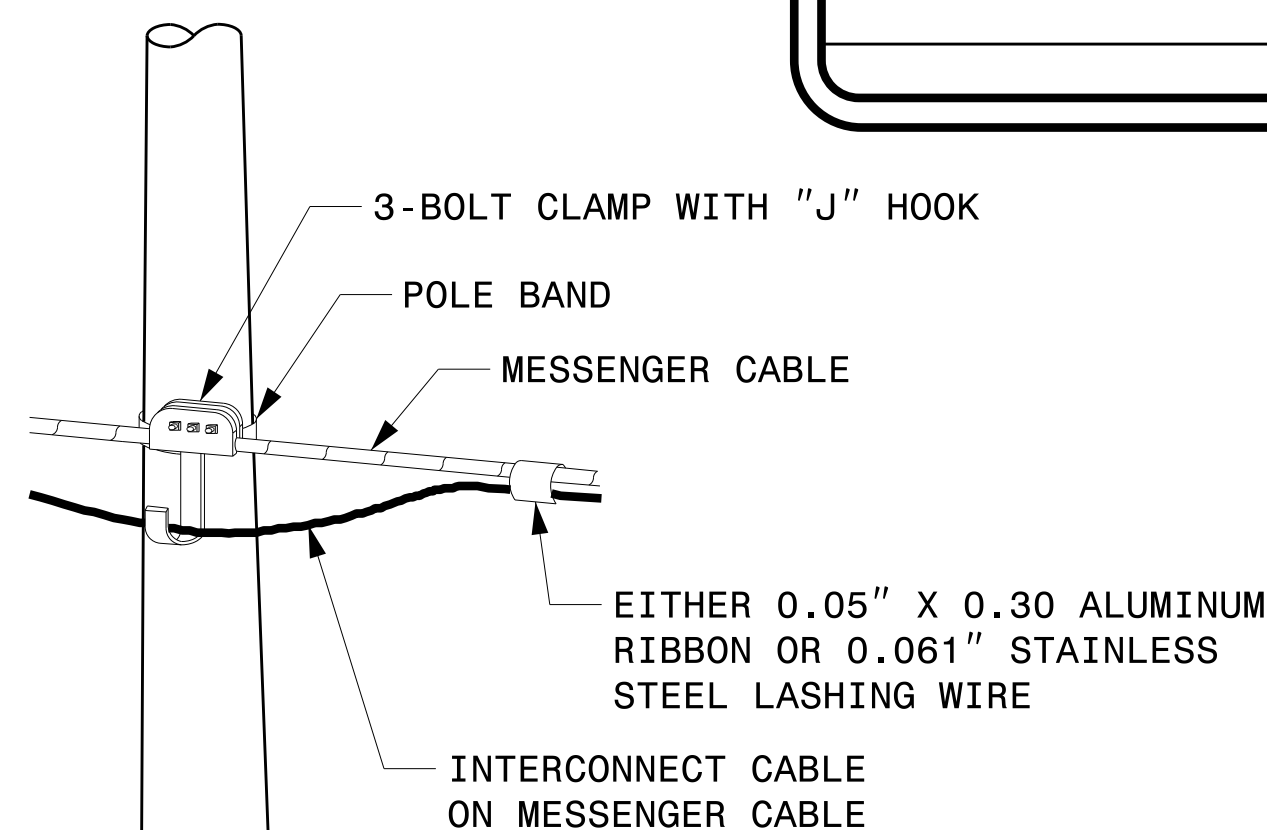


1. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ABOVE THE MAST ARM TO INDICATE PROPER ATTACHMENT ORIENTATION OF THE MAST ARM.
2. DESIGNER WILL DETERMINE THE SIZE OF ALL STRUCTURAL COMPONENTS, PLATES, FASTENERS, AND WELDS SHOWN UNLESS THEY ARE ALREADY SPECIFIED.
3. FABRICATOR IS RESPONSIBLE FOR PROVIDING 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.

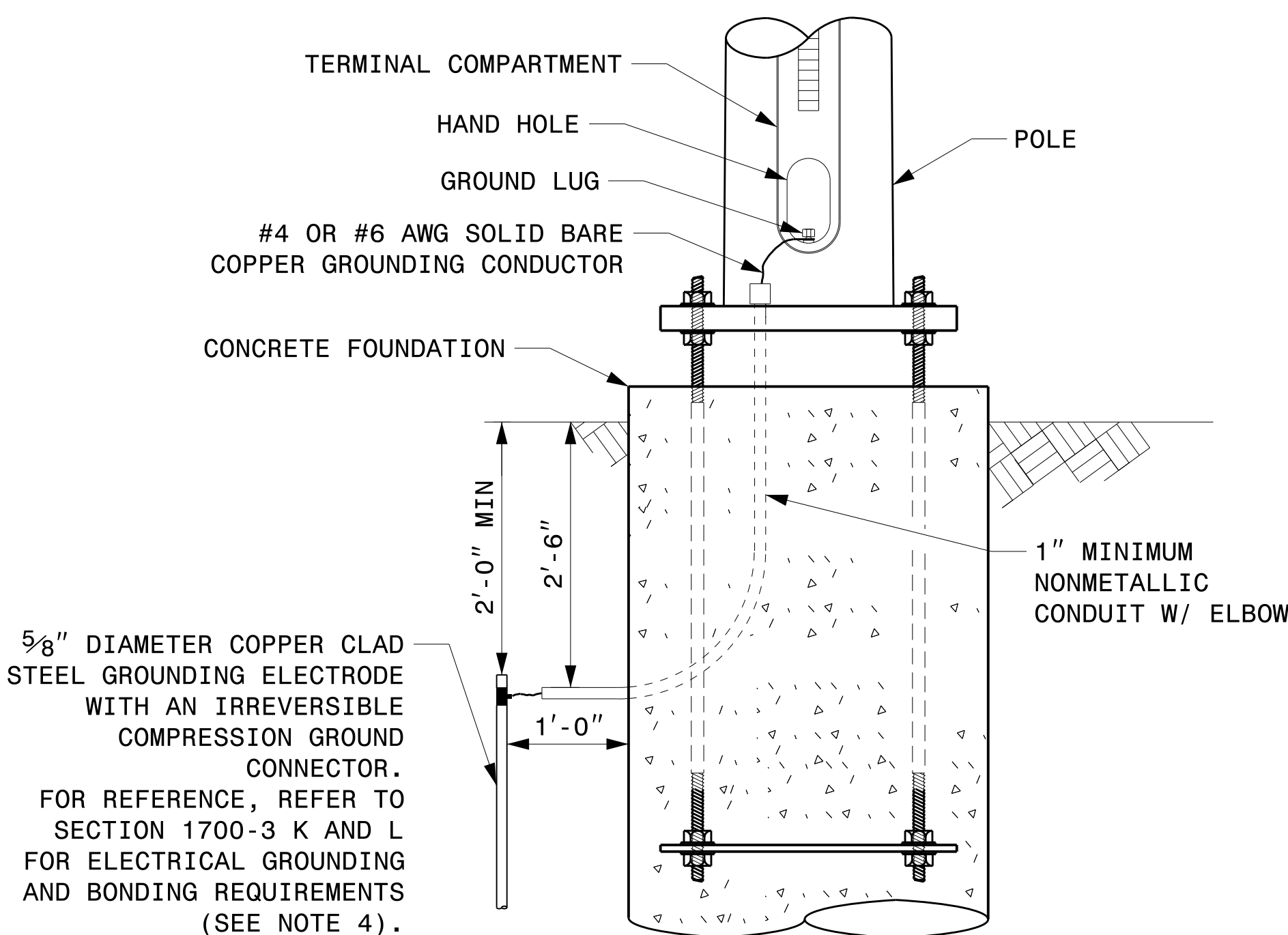


STRAIN POLE ATTACHMENTS

- NOTES:
- 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".
 - PROVIDE MINIMUM TWO SPAN WIRE POLE CLAMPS PER POLE.
 - IT IS PROHIBITED TO ATTACH TWO SPAN WIRES AT ONE POLE CLAMP.
 - 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

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

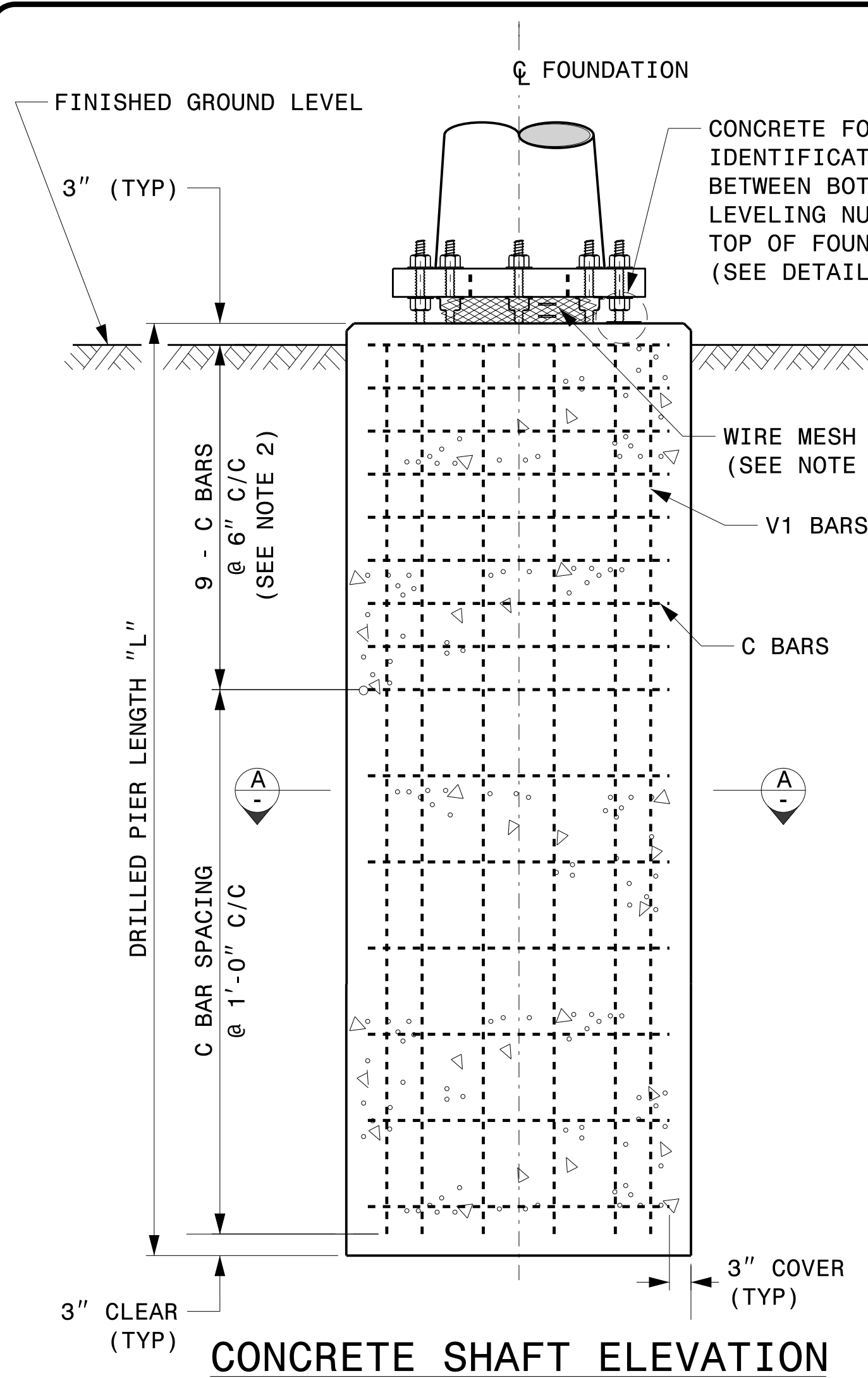
SEAL
NORTH CAROLINA
PROFESSIONAL ENGINEER
SEAL 036626
KEYVIN C. DURIGON

DocuSigned by:
Kevin Durigon
4B23DC79B3784DA...

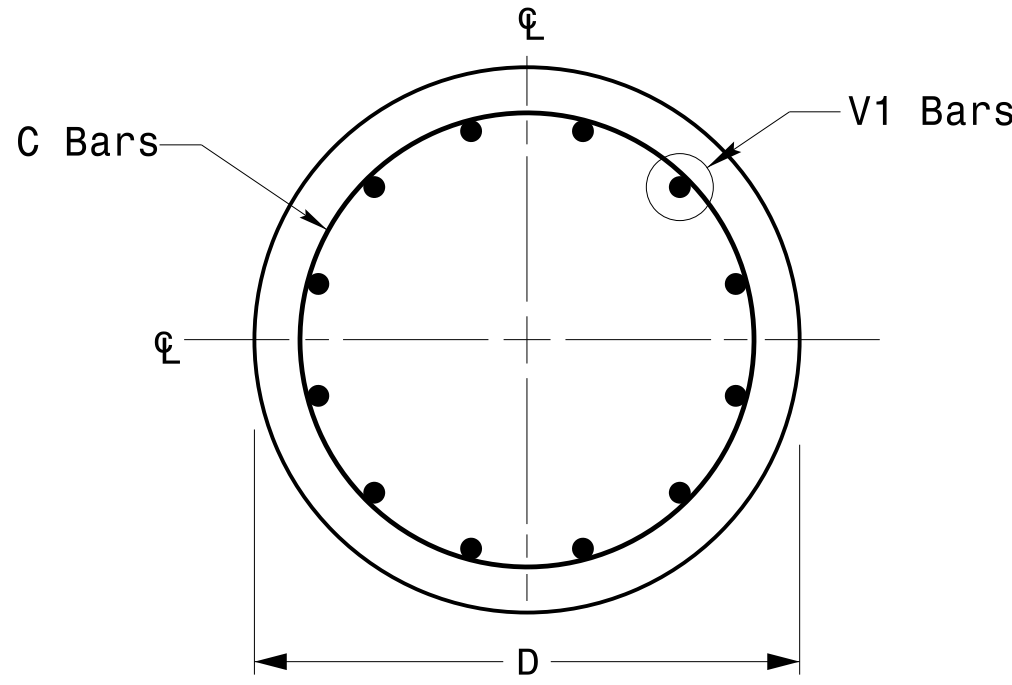
09/21/2023
DATE

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Kedar Igon

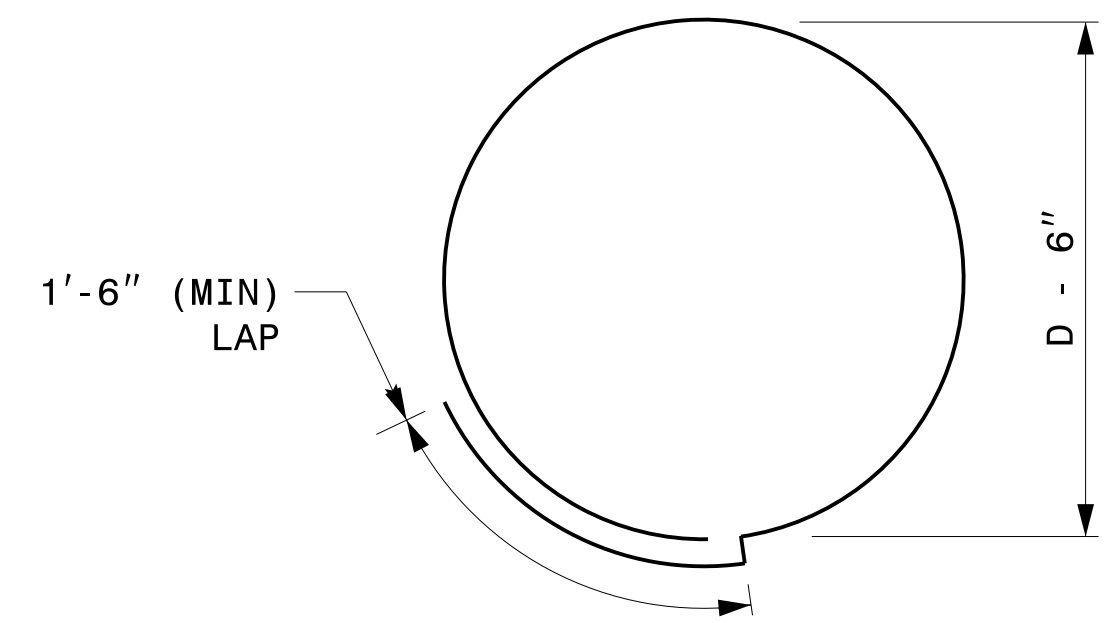
Fabrication Details – Strain Pole Attachments



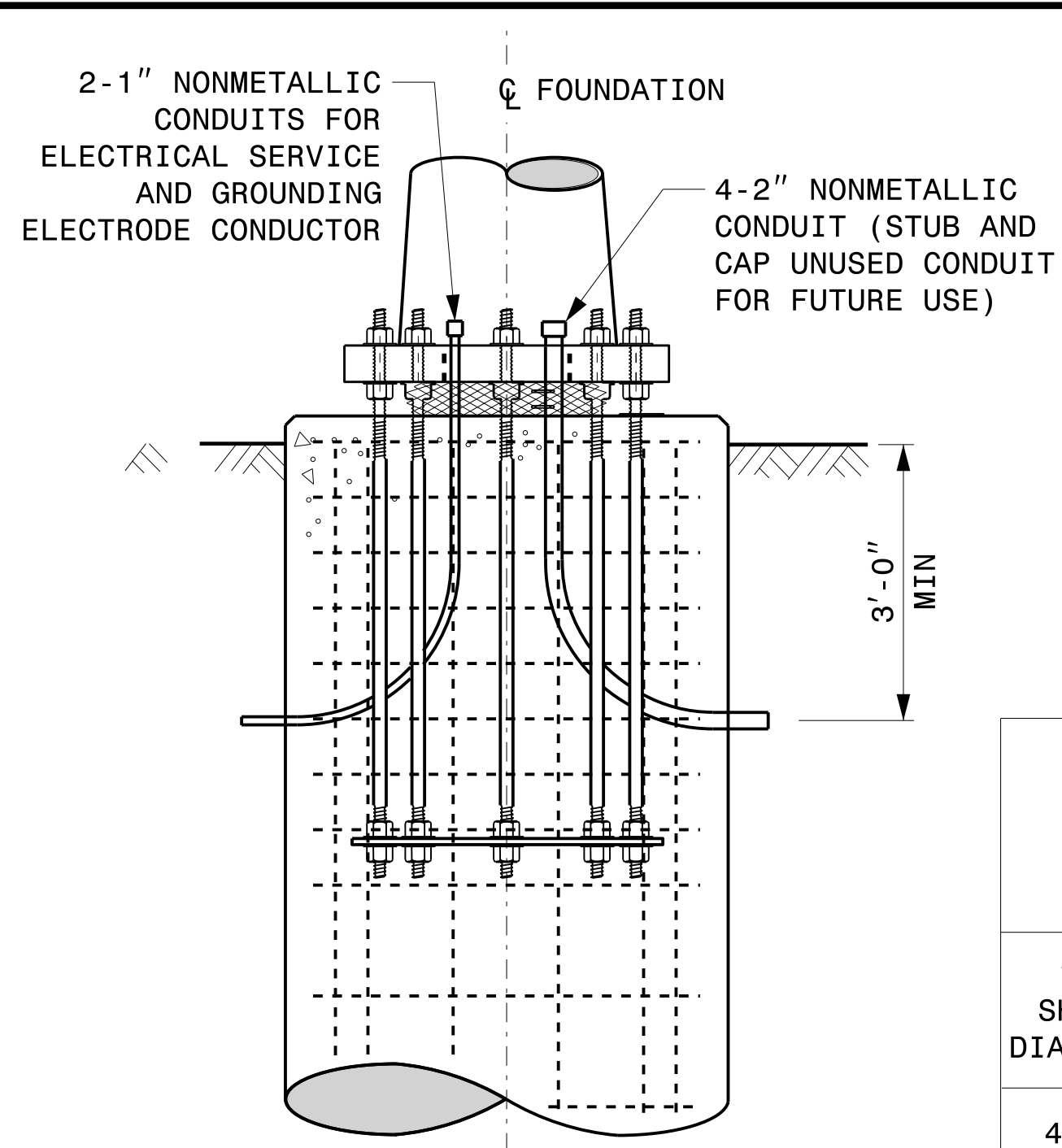
CONCRETE SHAFT ELEVATION



SECTION A-A



TYPICAL "C" BAR DETAIL



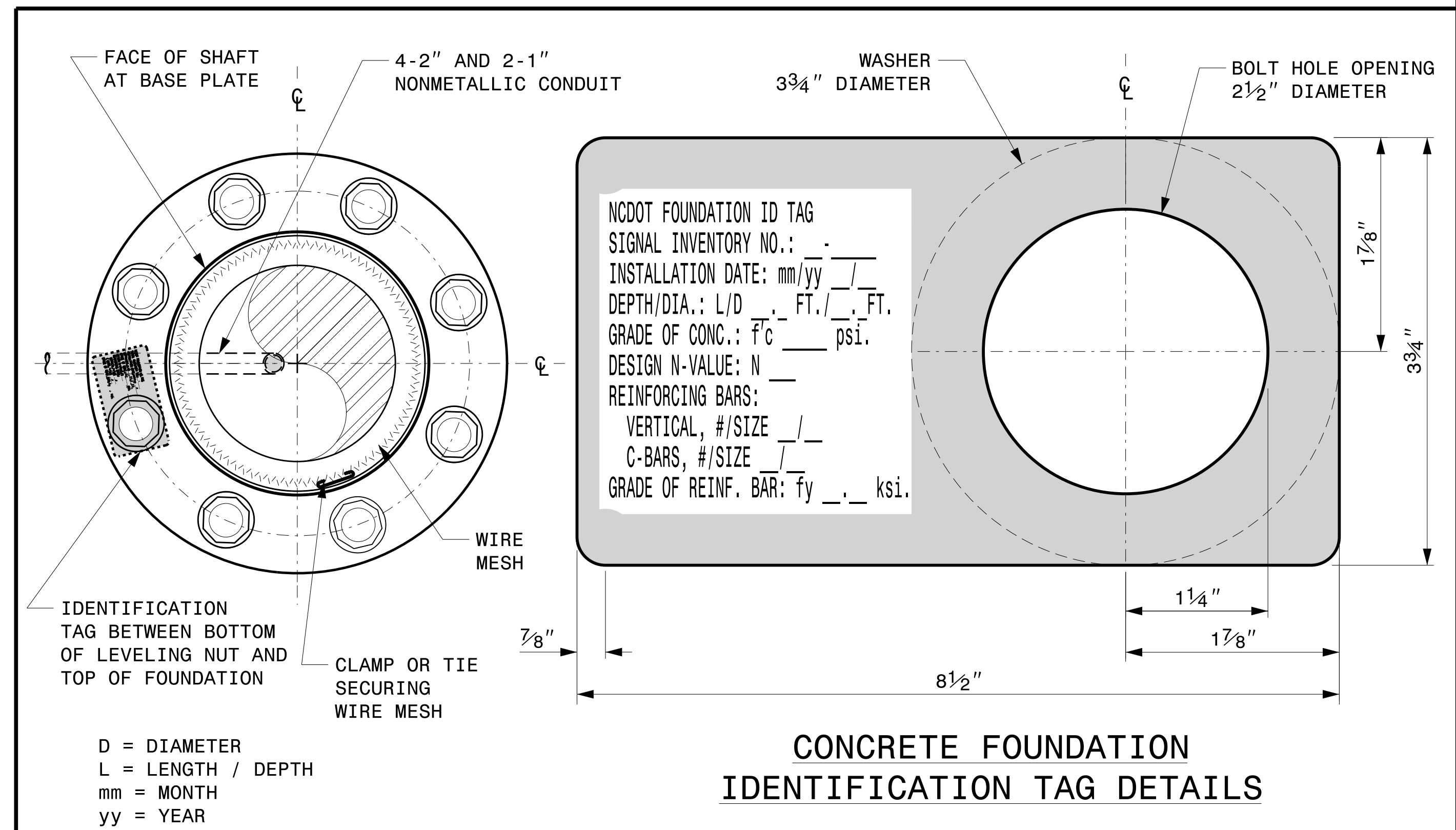
TYPICAL FOUNDATION CONDUIT DETAILS

GENERAL NOTES:

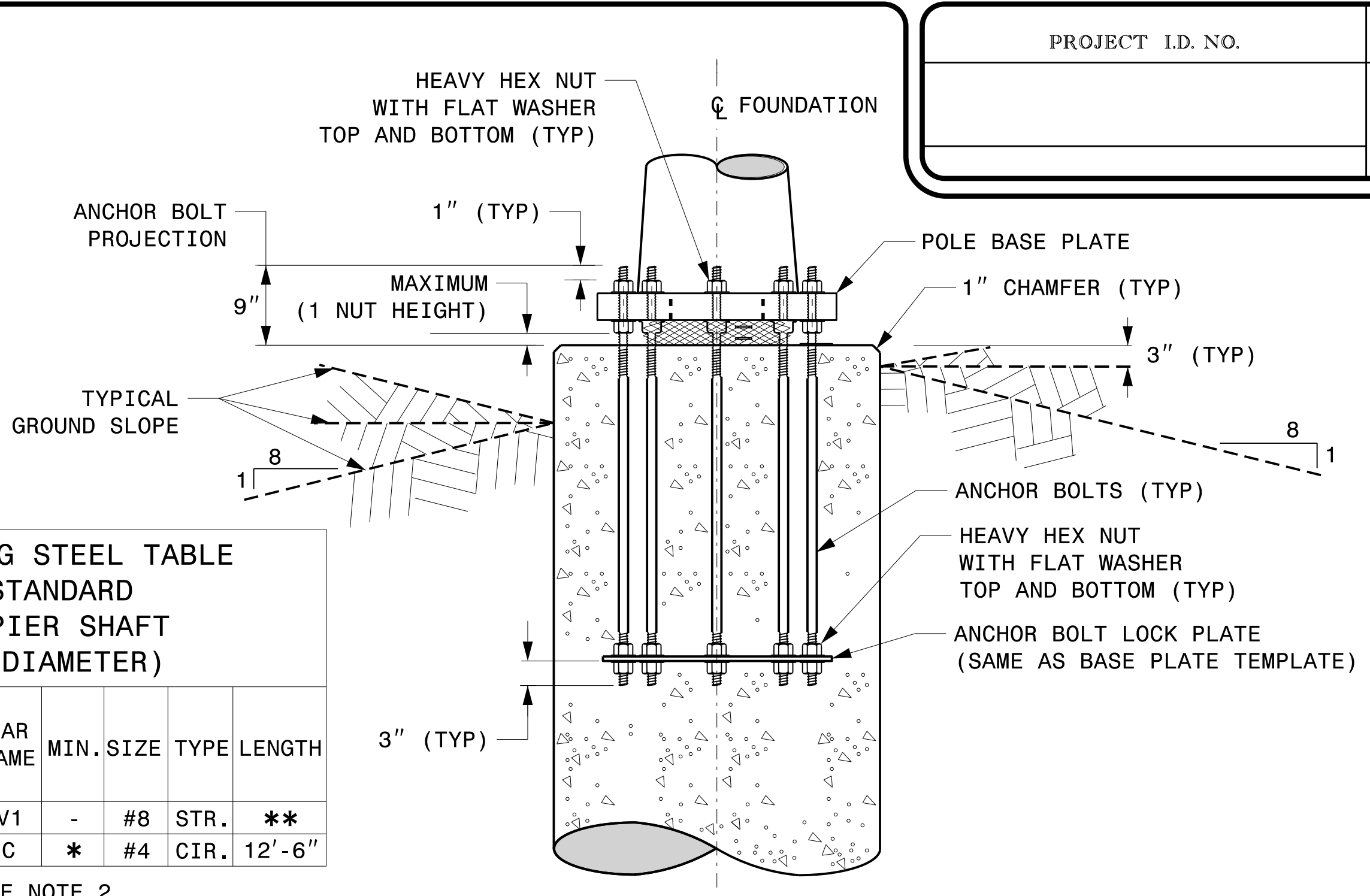
- IF ACTUAL SUBSURFACE CONDITIONS DIFFER SIGNIFICANTLY FROM BORING DATA, CONTACT THE ENGINEER BEFORE EXCAVATING OR PLACING CONCRETE.
- CIRCULAR TIE REINFORCING RINGS MAY BE VERTICALLY ADJUSTED BY +/-3" AT A DEPTH BETWEEN 2'-0" AND 3'-0" TO FACILITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING IN THE CAGE.
- FOR STANDARD FOUNDATIONS, SEE SHEET SIG. M8 FOR DETAILS. VERTICAL REINFORCING BARS (V1) MAY BE HORIZONTALLY ADJUSTED BY +/-3" TO FACILITATE THE INSTALLATION OF ELECTRICAL CONDUIT ENTERING INTO THE CAGE.
- PROVIDE 2" TO 5" FOUNDATION PROJECTION ABOVE GROUND LEVEL, DEPENDING ON THE GROUND SLOPE.
- UNLESS OTHERWISE SHOWN, FOUNDATION DESIGNS ARE BASED ON NON-SLOPING LEVEL GROUND SURFACES WITH SLOPE RATIOS OF 8:1 (H:V) OR FLATTER. IF ACTUAL GROUND LINE SLOPES ARE STEEPER, CONTACT THE ENGINEER BEFORE EXCAVATING OR PLACING CONCRETE.
- CONSTRUCT FOUNDATIONS IN ACCORDANCE WITH NCDOT STANDARD PROVISIONS SP09 R005- FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES. ALL APPLICABLE 2024 NCDOT STANDARD SPECIFICATIONS ARE REFERENCED IN THIS PROVISION. REFER TO THE NCDOT RESOURCES/SPECIFICATIONS PAGE LOCATED ON THE CONNECT NCDOT WEBSITE.
[https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx](https://connect.ncdot.gov/resources/Specifications%20and%20Special%20Provisions.aspx)
- USE AIR ENTRAINED AA CONCRETE MIX WITH A COMPRESSION STRENGTH OF f'c=4500 psi (MIN) AFTER 28 DAYS.
- USE ASTM A615 GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL. MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
- LOCATE IDENTIFICATION TAG ON TOP OF THE FOUNDATION, DIRECTLY ABOVE THE CONDUIT'S ENTRY POINT.
- PROVIDE TWO LAYERS OF 4 MESH GALVANIZED WELDED 23 GAUGE (0.025) 6" WIDE AROUND PIPES UNDER THE BASE PLATE AND SECURE IT WITH TIES IF NECESSARY.
- PREFERRED LOCATION FOR THE I.D. TAG IS AS SHOWN IN DETAIL-A: DIRECTLY ABOVE THE CONDUIT ENTERING THE FOUNDATION.

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

* SEE NOTE 2
** SEE NOTE 3



DETAIL-A



TYPICAL FOUNDATION ANCHOR BOLT DETAILS

(REINFORCING CAGE NOT SHOWN FOR CLARITY)

Prepared In the Offices of:

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
4B23DC79B3784DA
09/23/2023
DATE

03-dpt-2023 19x46
S:\1\SS14115 Signal\Signal Design Section\Structures\Drawings\2024 Metal Pole Std Drawings for LRF\02024 Sig.M7 Std. Construction Details-Strain Poles.dgn
Kedur.fgm

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

GENERAL NOTES:

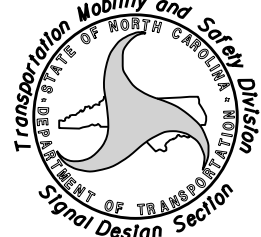
1. VALUES SHOWN IN THE "REACTIONS AT THE POLE BASE" COLUMN REPRESENT THE MINIMUM ACCEPTABLE CAPACITY ALLOWED FOR DESIGN USING A COMBINED FORCE RATIO (CFR) OF 1.00.
2. USE CHAIRS AND SPACERS TO MAINTAIN PROPER CLEARANCE.
3. FOR FOUNDATION, ALWAYS USE AIR-ENTRAINED CONCRETE MIX.

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.

09-001-2023 19x48
S:\1\SSM1415 Signal\Signal Design Section\Structures\Drawings\2024 Metal Pole Str Drawings for LBF02024 Sig.M8 Str. Strain Pole Found.–Saturated Soil Condition.dgn
Kedur.fgm

Prepared In the Offices of:



750 N.Greenfield Pkwy,Garner,NC 27529

SCALE

0 1"=10' NA

NONE

Standard Strain Pole Foundation for All Soil Conditions

PLAN DATE: SEPTEMBER 2023

DESIGNED BY: K.C. DURIGON

PREPARED BY: K.C. DURIGON

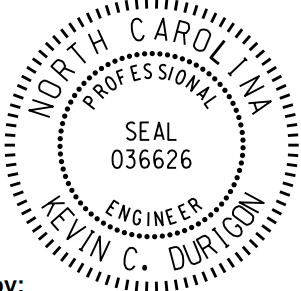
REVIEWED BY: D.C. SARKAR

REVISIONS

INIT.

DATE

SEAL



SEAL 036626

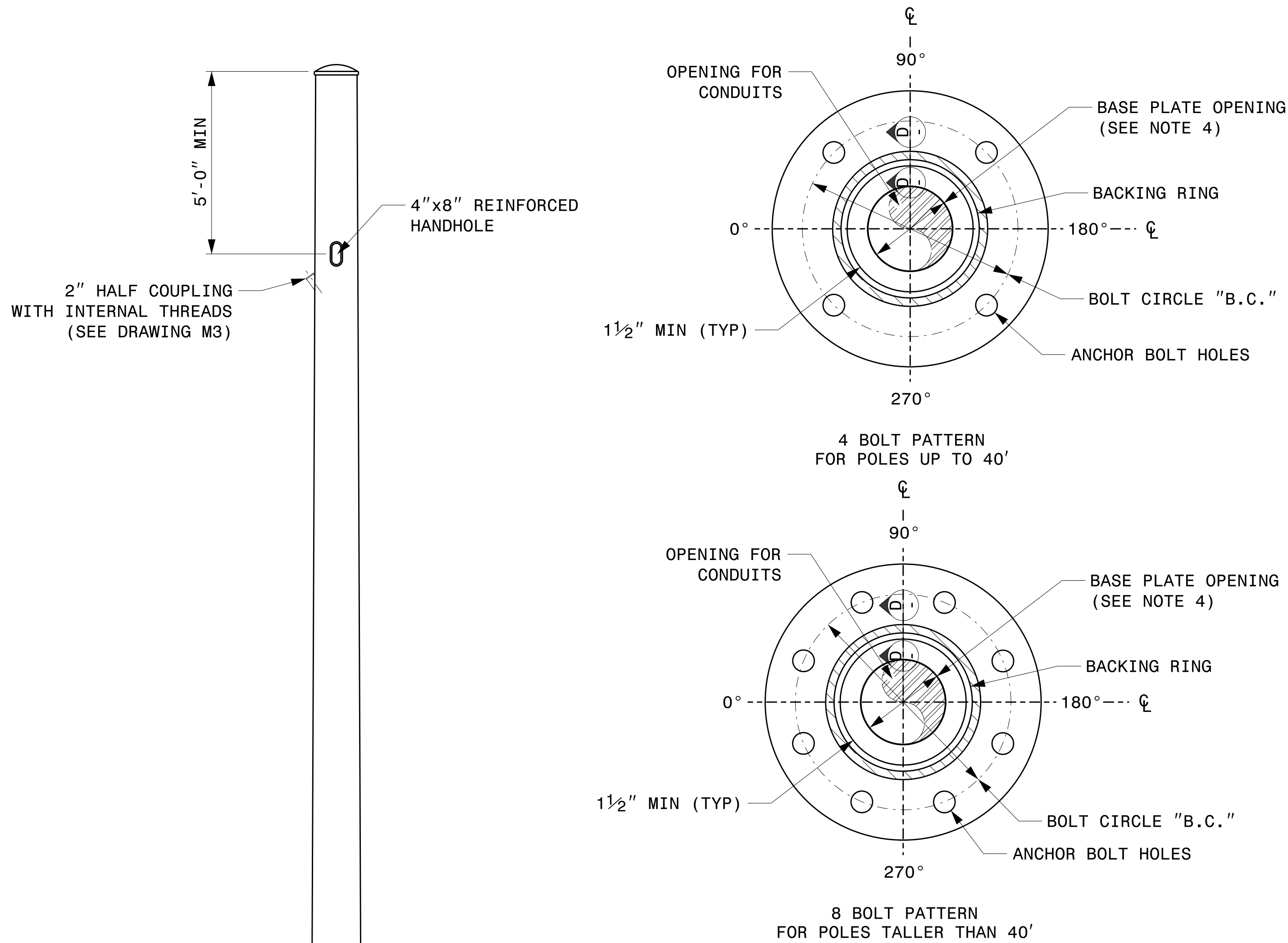
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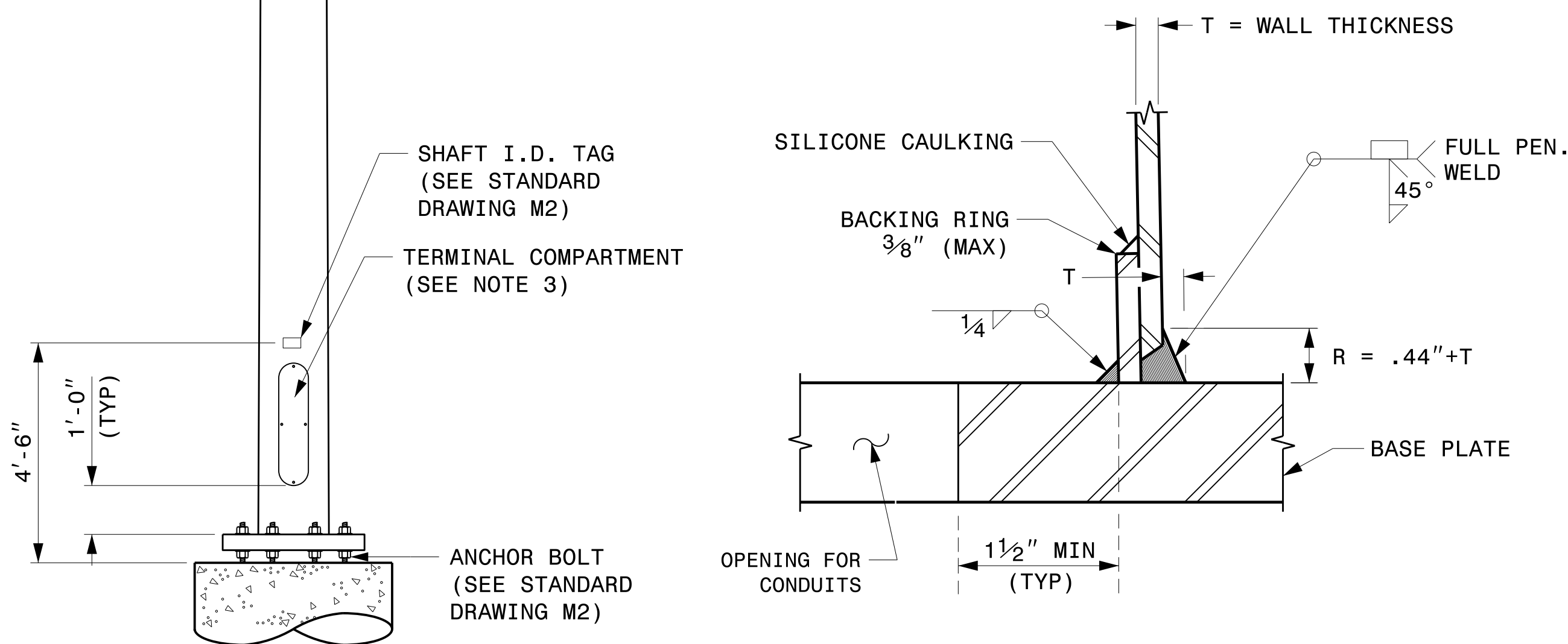
4B23DC79B3784DA

09/21/2023

DATE



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 3 1/2" BUT SHALL NOT BE LESS THAN 8 1/2".
5. USE COMPACT SECTION CRITERIA D/T RATIO PER AASHTO LTS-LRFD 1ST EDITION SECTION 5.7.2.

CCTV CAMERA POLE
(NOT TO SCALE)

	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	
SCALE 0 NA NONE	REVISIONS	INIT.	DATE
DocuSigned by: 		09/21/2023 DATE	