Project No.	Sheet No.
U-5112	Sig. 1.0

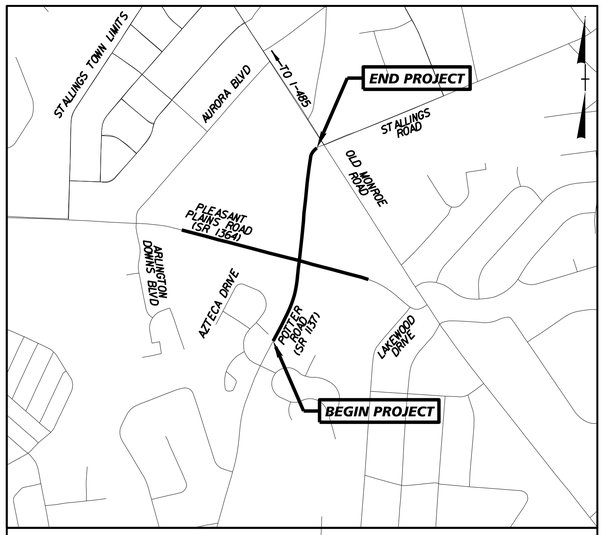
Project: U-5112

STATE OF NORTH CAROLINA

UNION COUNTY

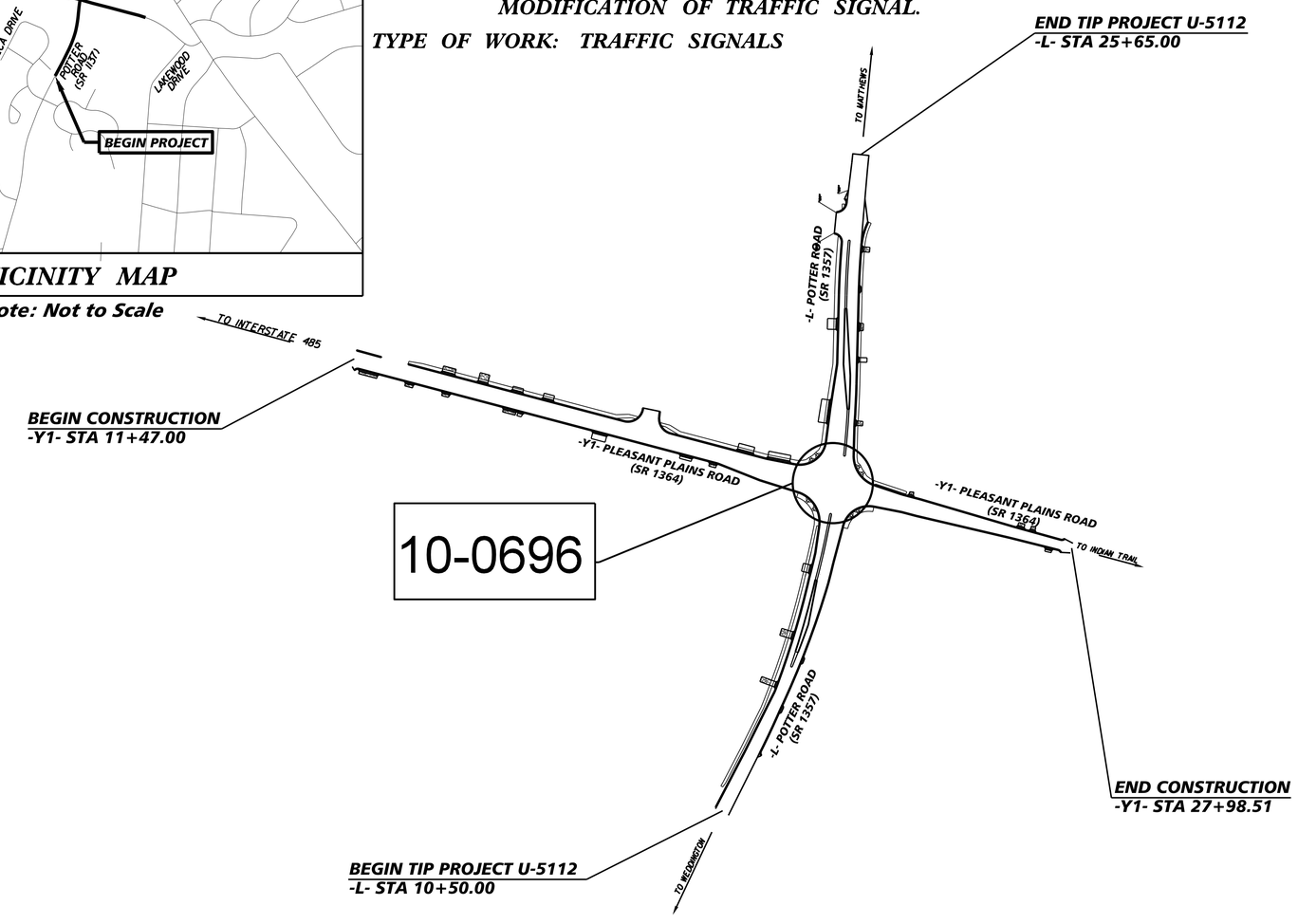
LOCATION: SR 1364 (PLEASANT PLAINS ROAD) AT SR 1357 (POTTERS ROAD) IN STALLINGS. CONSTRUCT INTERSECTION IMPROVEMENTS INCLUDING LEFT TURN LANES AND MODIFICATION OF TRAFFIC SIGNAL.

TYPE OF WORK: TRAFFIC SIGNALS



VICINITY MAP

Note: Not to Scale



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

Index of Plans

Sheet #	Reference #	Location/Description
Sig. 1.0	--------	Title Sheet
Sig. 2.0–2.1	10–0696T1	SR 1357 (Potter Road) at SR 1634 (Pleasant Plains Road)
Sig. 3.0–3.1	10–0696T2	SR 1357 (Potter Road) at SR 1634 (Pleasant Plains Road)
Sig. 4.0–4.2	10–0696T3	SR 1357 (Potter Road) at SR 1634 (Pleasant Plains Road)
Sig. 5.0–5.2	10–0696	SR 1357 (Potter Road) at SR 1634 (Pleasant Plains Road)
Sig. 6.0–6.1	10–0696	SR 1357 (Potter Road) at SR 1634 (Pleasant Plains Road) Metal Pole Loading Diagram
M1–9	--------	Standard Metal Pole Details

TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS

Contacts:

R. Nicholas Zinser, PE – Western Region Signals Engineer

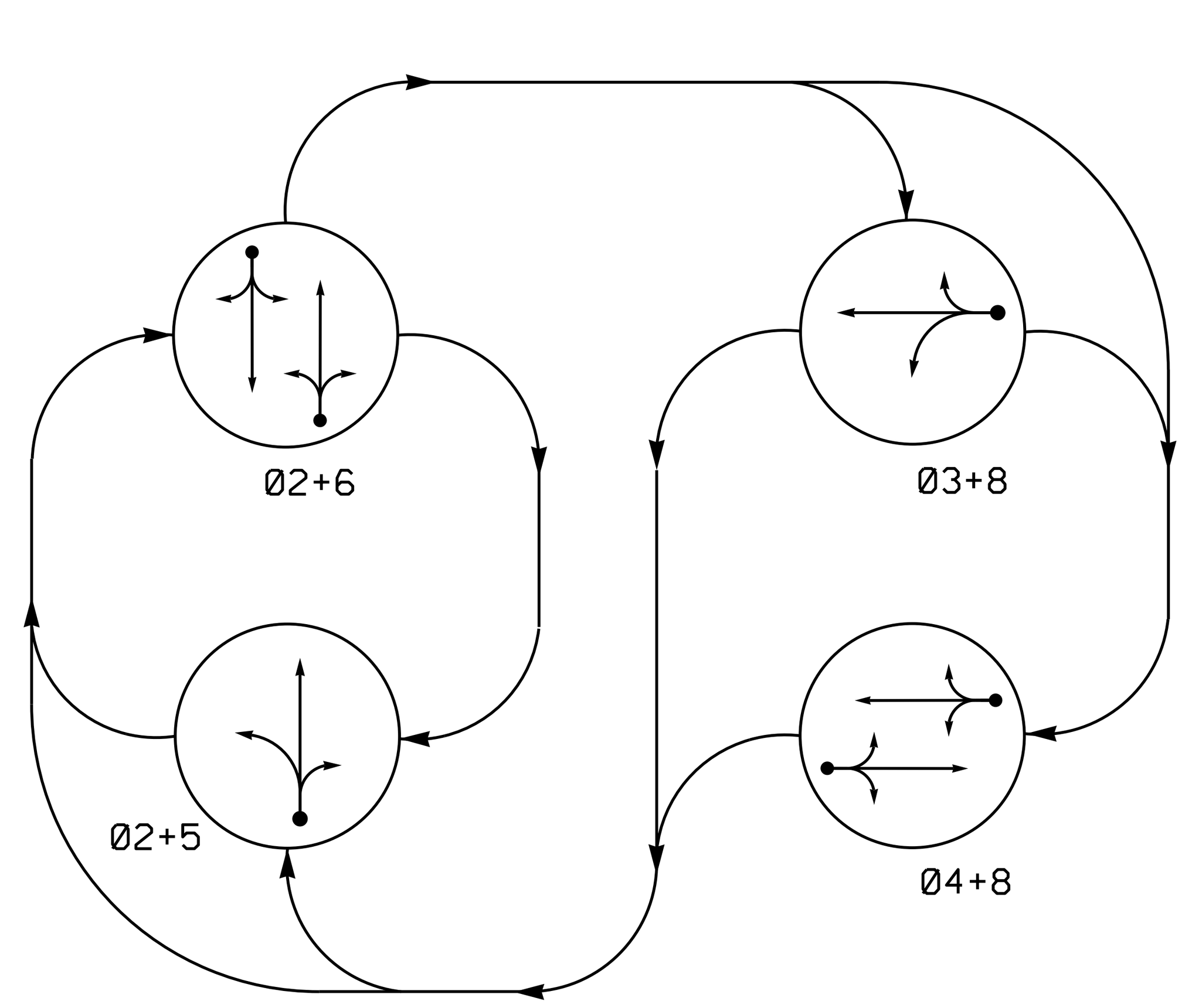
Keith M. Mims – Signal Equipment Design Engineer

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

TSMO UNIT

750 N. Greenfield Parkway, Garner, NC 27529

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

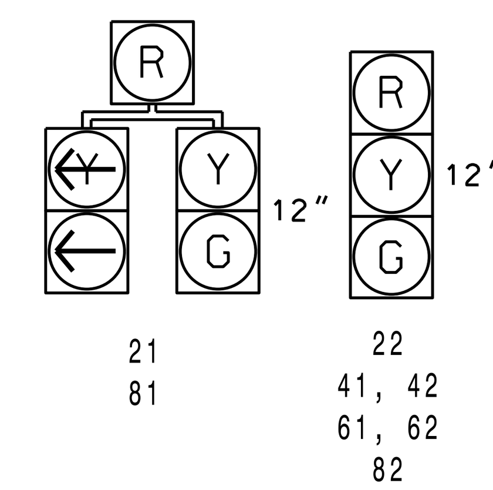
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3+8	Ø4+8	FLASH
21	← / G	G	R	R	Y
22	G	G	R	R	Y
41, 42	R	R	R	G	R
61, 62	R	G	R	R	Y
81	R	R	← / G	G	R
82	R	R	G	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



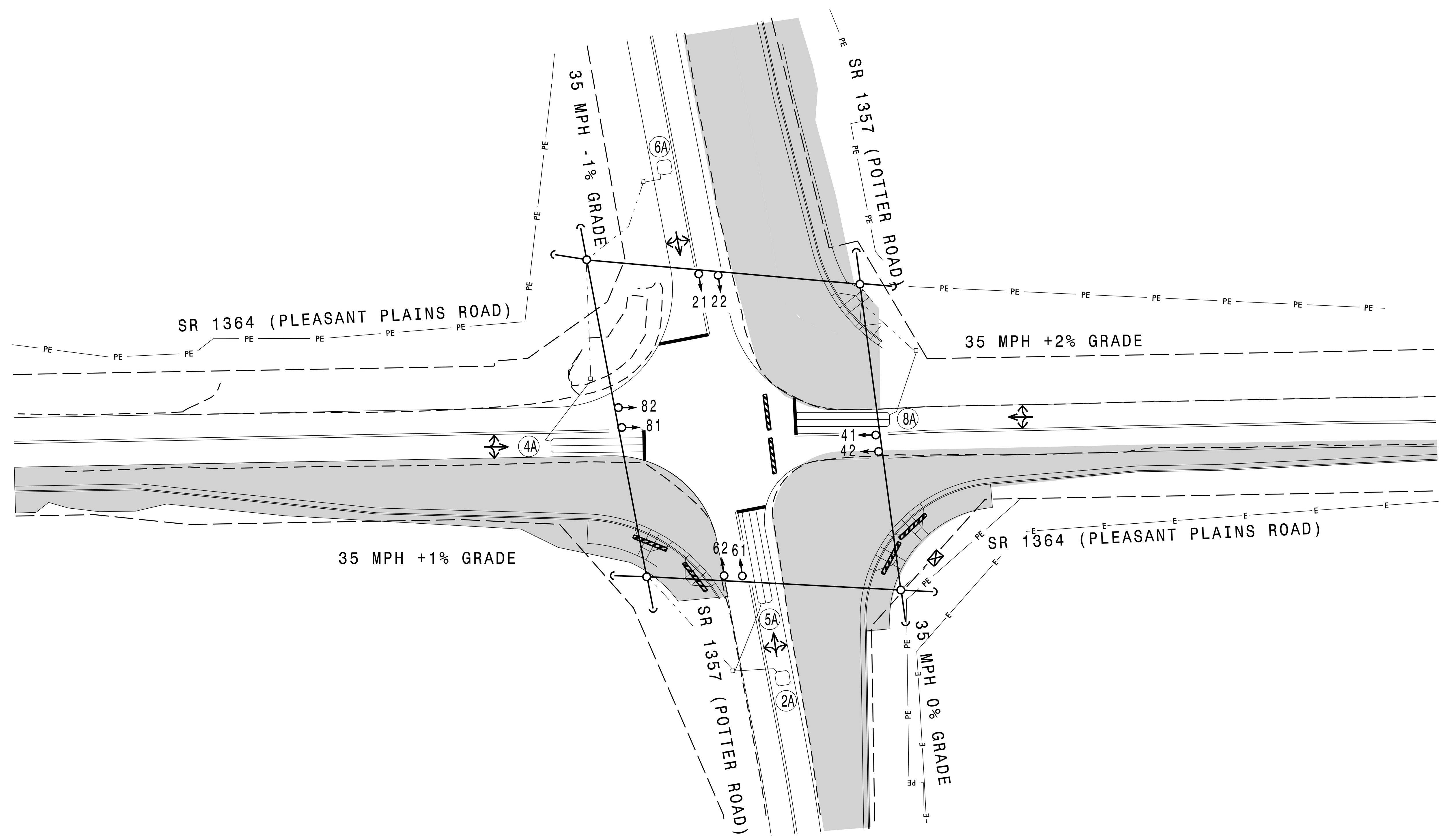
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	70	3	X	2	-	-	X	-	X	-	X
4A	6X40	0	2-4-2	X	4	3.0	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	X
					2	-	-	X	-	X	-	X
6A	6X6	70	4	X	6	-	-	X	-	X	-	X
8A	6X40	0	2-4-2	X	3	15.0	-	X	-	X	-	X
					8	5.0	-	X	-	X	-	X

2 Phase
Fully Actuated
(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. Enable Backup Prevent to allow the controller ot clear from phase 2+6 to 2+5 by progressing through and all red display.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.



LEGEND

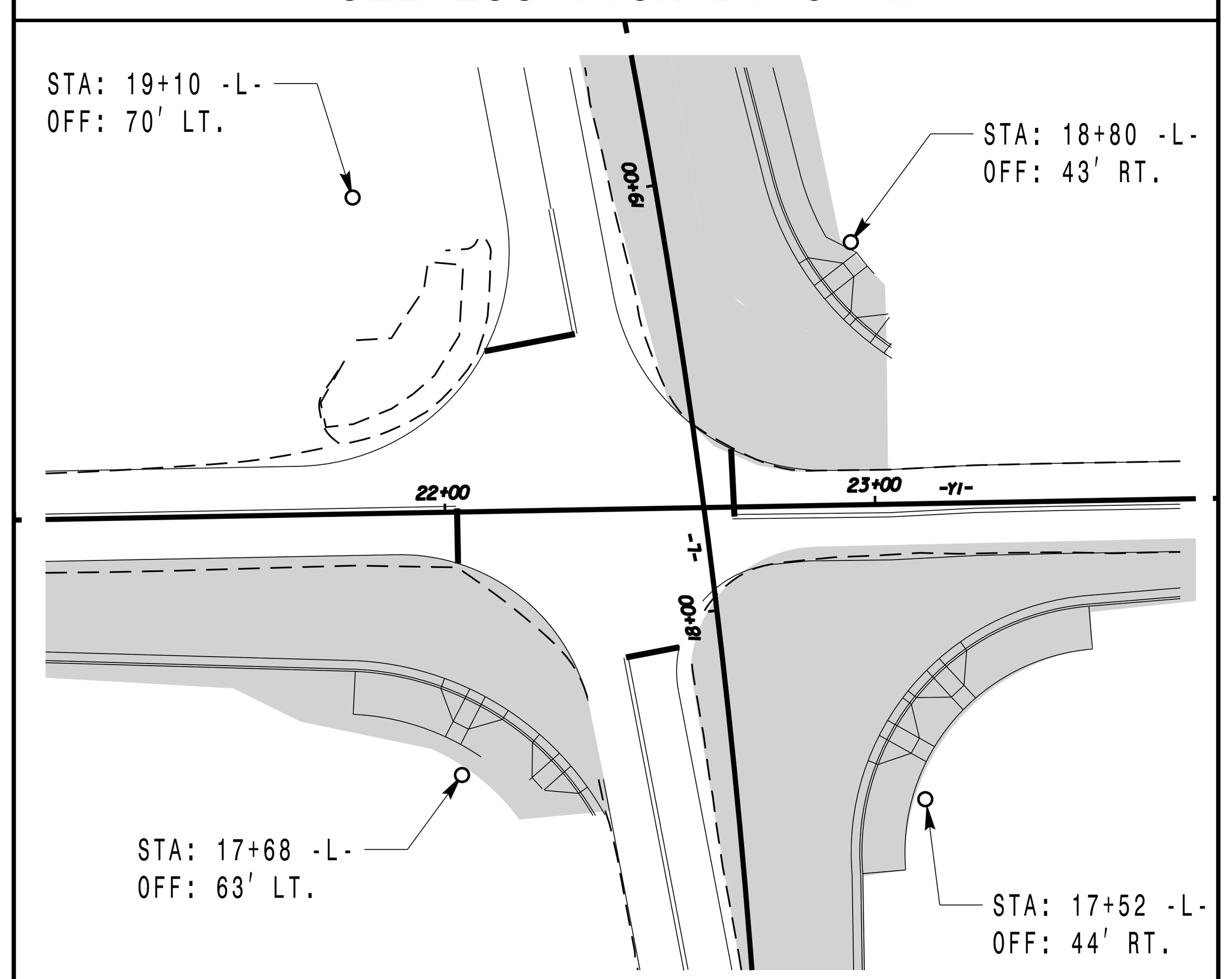
PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
PE	Permanent Easement	PE
E	Temporary Easement	E
	Directional Arrow	
	Construction Zone	

MAXTIME TIMING CHART

FEATURE	PHASE 2	3	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	10	7	7	7	10	7
Passage *	3.0	2.0	2.0	2.0	3.0	2.0
Max 1 *	70	15	30	15	70	30
Yellow Change	3.8	3.0	3.8	3.0	3.9	3.7
Red Clear	1.0	1.4	1.0	1.6	1.1	1.0
Red Revert	5.0	2.0	2.0	2.0	2.0	2.0
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	–	X	X	X	–	X
Vehicle Recall	MIN RECALL	–	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

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

POLE LOCATION DIAGRAM



This plan supersedes the plan signed and sealed on 8/11/23.

Signal Upgrade - Temporary Design 1
TMP Phase 1

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1357 (Potter Road)
AT
SR 1364 (Pleasant Plains Road)

Division 10	Union County		Stallings
PLAN DATE:	December 2023	REVIEWED BY:	R.N. Zinser
PREPARED BY:	T.A. Kenion	REVIEWED BY:	

SCALE 0 40' 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

DocuSigned by: R. Nicholas Zinser 12/05/2023 DATE

SIG. INVENTORY NO. 10-0696T1

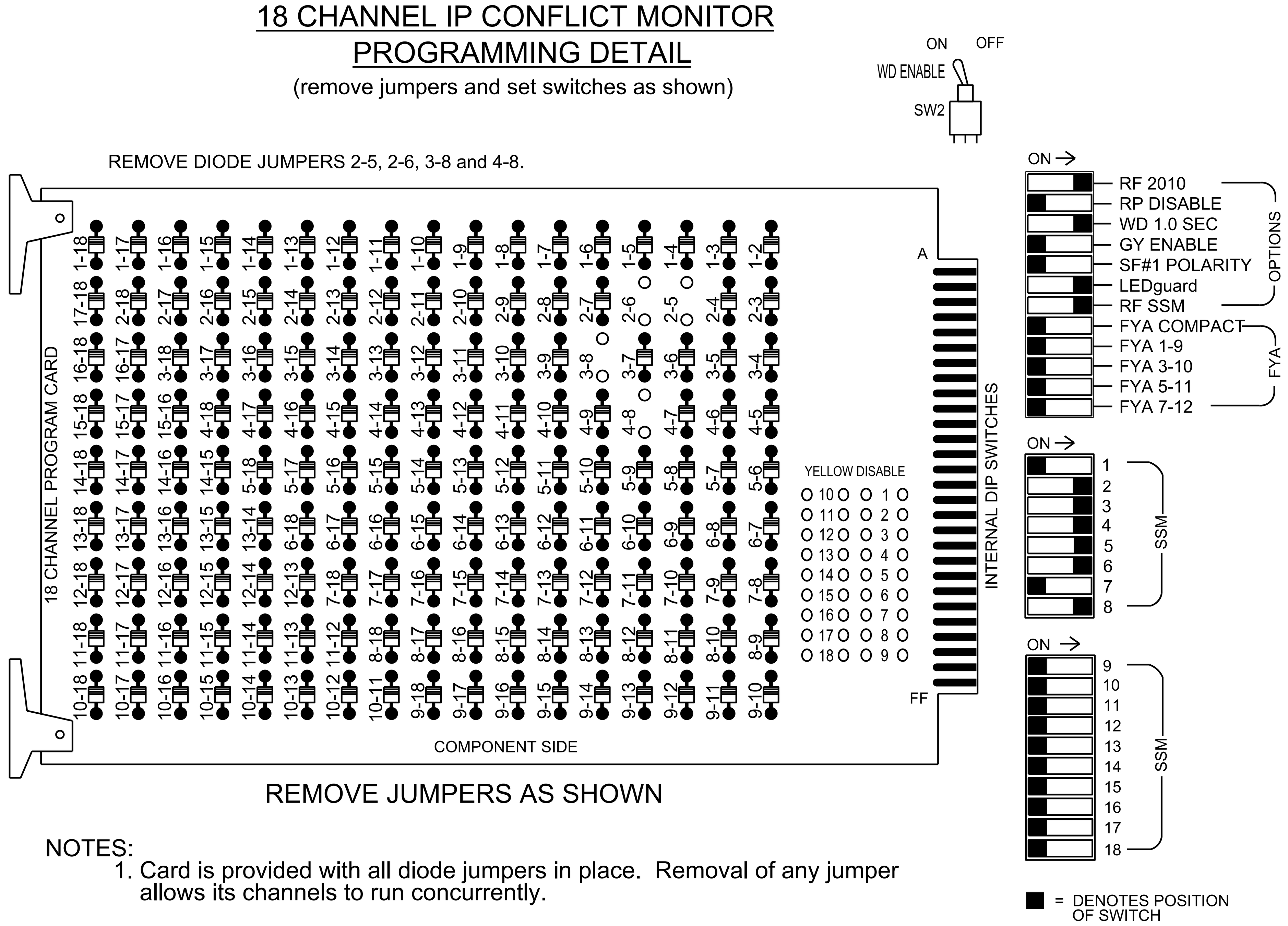
05-DEC-2023 13:54
S:*ITS&SU*ITS Signals*Signal Design Section*Western Region*Div-10*U-5112*2023-12*10-0696*100696T1_sig_dsn_2023mmdd.dgn
takenion

PROJECT REFERENCE NO.: U-5112 | SHEET NO.: Sig. 2.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5, 2-6, 3-8 and 4-8.



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. Integrate monitor with Ethernet network in cabinet.

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

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet...332 w/ Aux
Software...Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions..........................18 With Aux. Output File
Load Switches Used............................S2, S4, S5, S7, S8, S11
Phases Used.......................................2, 3, 4, 5, 6, 8
Overlap "1"..Not Used
Overlap "2"..Not Used
Overlap "3"..Not Used
Overlap "4"..Not Used

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	81	41,42	NU	21	61,62	NU	NU	81,82	NU	NU	NU	NU	NU	NU	NU
RED		128		*	101		*	134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW																		
YELLOW ARROW				117			132											
GREEN ARROW				118			133											

NU = Not Used

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

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	-	-	-	-	-	-	-	-
Serve Phase 3	-	-	-	-	-	-	-	-
Serve Phase 4	-	-	-	-	-	-	-	-
Serve Phase 5	-	-	-	-	-	-	-	-
Serve Phase 6	-	-	-	-	X	-	-	-
Serve Phase 7	-	-	-	-	-	-	-	-
Serve Phase 8	-	-	-	-	-	-	-	-

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ϕ 2 2A	SLOT EMPTY	SLOT EMPTY	ϕ 8 8A	ϕ 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		NOT USED			NOT USED	NOT USED								ST DC ISOLATOR
FILE "J"	U	ϕ 5 5A	ϕ 6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED												

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

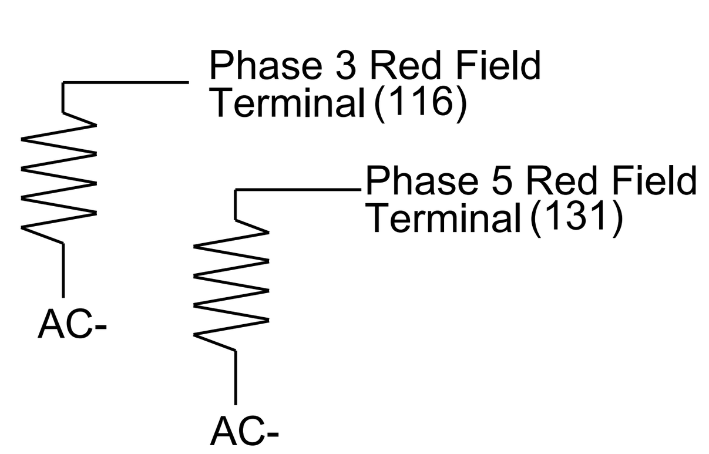
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4	3.0		X		X	
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
8A	TB4-5,6	I5U	58	20	7	3	15.0		X		X	
				-	30	8	5.0		X		X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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)



ALL RED BACKUP PROGRAMMING

Front Panel
Main Menu >Controller >Sequence & Phs Config>Backup Prevention > Backup Through Red

Web Interface
Home >Controller >Backup Prevention >Backup Calls Phase Plans >
(scroll down) to Backup Through Red

Backup Through All Red

Sequence	Backup Through All Red
1	YES

This plan supersedes the plan signed and sealed on 8/11/2023.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 10-0696T1
DESIGNED: December 2023
SEALED: 12/05/2023
REVISED: N/A

Electrical Detail

Electrical and Programming Details For:

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

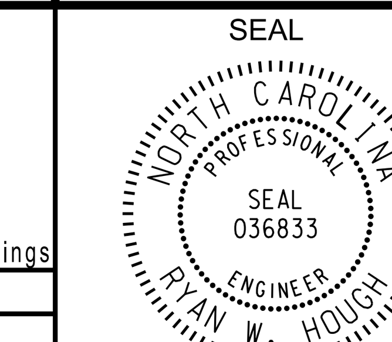
PLAN DATE: December 2023 REVIEWED BY:
PREPARED BY: Sarah Kirkpatrick REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:
Transportation Mobility and Safety Division
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

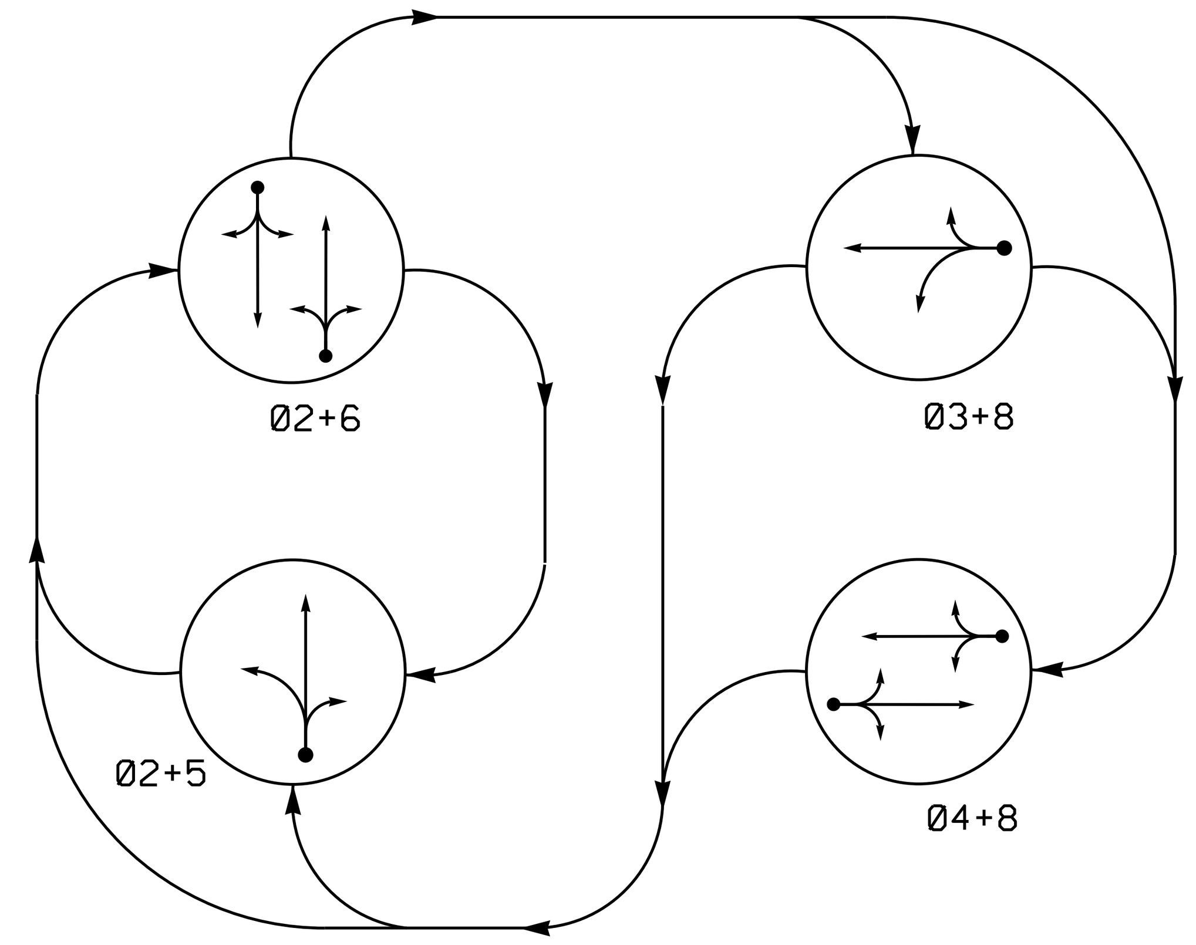
SEAL



DocuSigned by: Ryan W. Hough 12/06/2023
DATE

SIG. INVENTORY NO. 10-0696T1

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

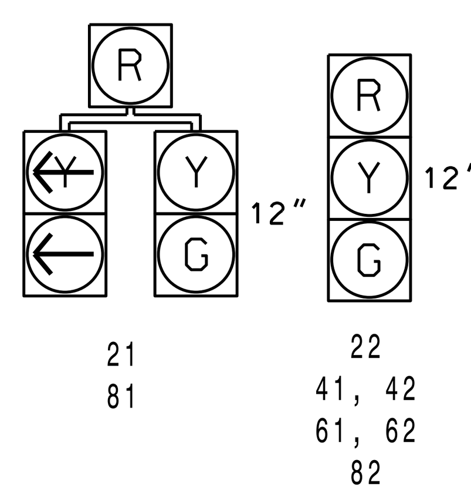
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3+8	Ø4+8	FLASH
21	← / G	G	R	R	Y
22	G	G	R	R	Y
41, 42	R	R	R	G	R
61, 62	R	G	R	R	Y
81	R	R	← / G	G	R
82	R	R	G	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



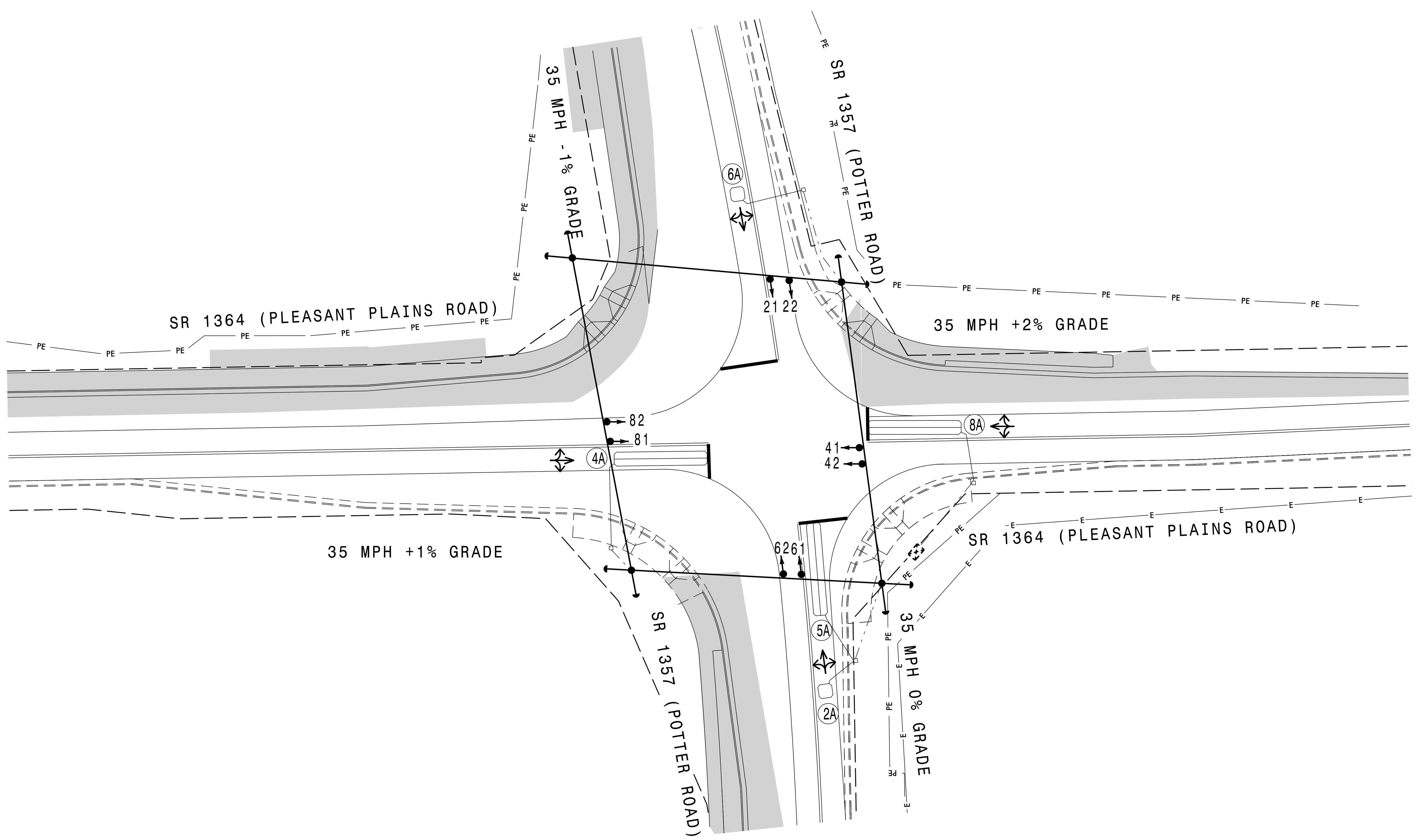
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	70	3	X	2	-	-	X	-	X	-	-
4A	6X40	0	2-4-2	X	4	3.0	-	X	-	X	-	-
5A	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	-
					2	-	-	X	-	X	-	-
6A	6X6	70	4	X	6	-	-	X	-	X	-	-
8A	6X40	0	2-4-2	X	3	15.0	-	X	-	X	-	-
					8	3.0	-	X	-	X	-	-

2 Phase
Fully Actuated
(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. Enable Backup Prevent to allow the controller to clear from phase 2+6 to phase 2+5 by progressing through an all red display.
4. Reposition all existing signal heads.
5. Set all detector units to presence mode.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
PE	Permanent Easement	PE
E	Temporary Easement	E
	Directional Arrow	
	Construction Zone	

MAXTIME TIMING CHART

FEATURE	PHASE 2	3	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	10	7	7	7	10	7
Passage *	3.0	2.0	2.0	2.0	3.0	2.0
Max 1 *	70	15	30	15	70	30
Yellow Change	3.8	3.0	3.8	3.0	3.9	3.7
Red Clear	1.0	1.4	1.0	1.6	1.0	1.0
Red Revert	5.0	2.0	2.0	2.0	2.0	2.0
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	–	X	X	X	–	X
Vehicle Recall	MIN RECALL	–	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

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

This plan supersedes the plan signed and sealed on 8/11/23.

Signal Upgrade - Temporary Design 2
TMP Phase 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1357 (Potter Road)
AT
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY: R.N. Zinser
PREPARED BY: T.A. Kenion REVIEWED BY:

SCALE 0 40' 1"=40'

REVISIONS | INIT. | DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

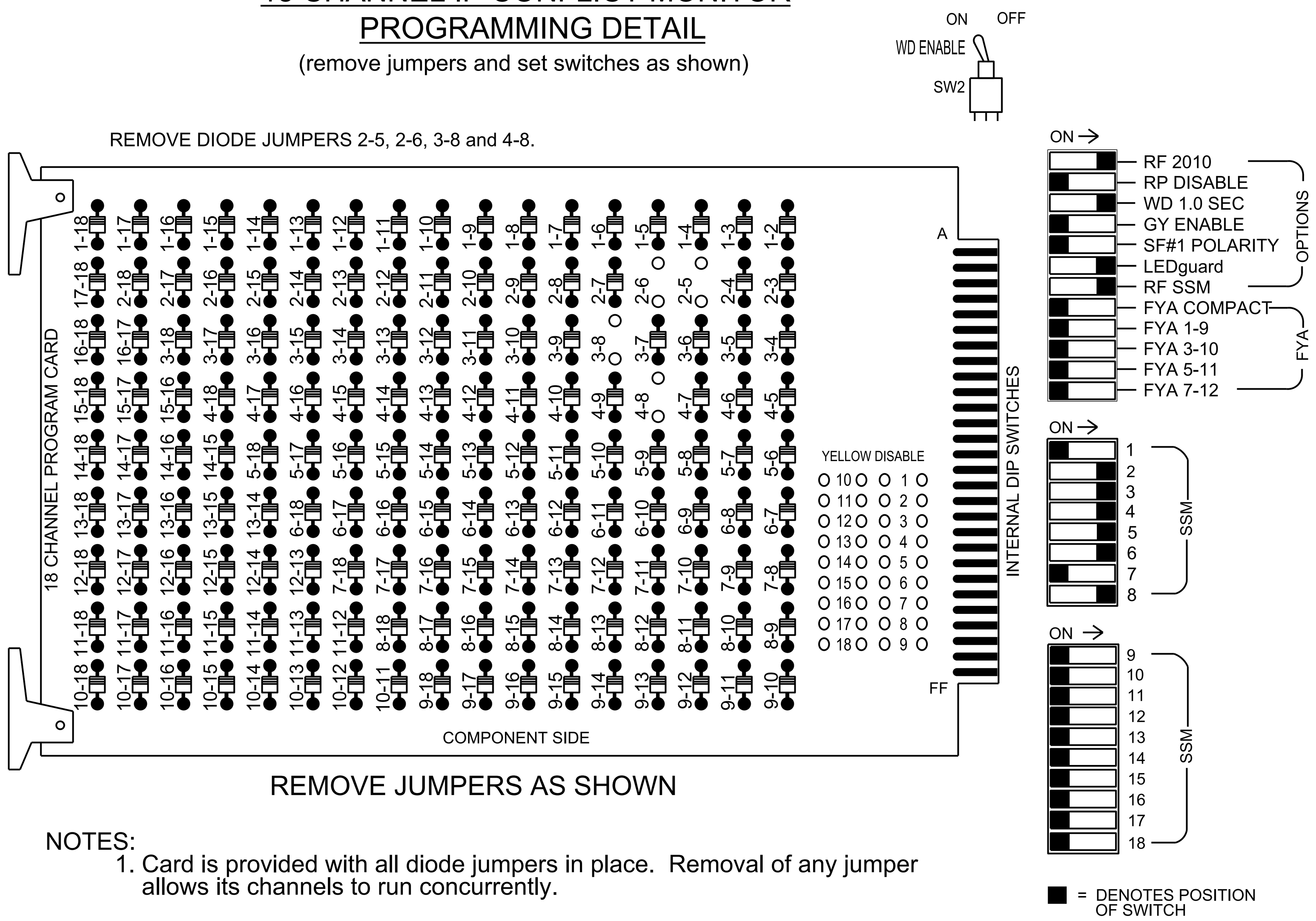
DocuSigned by: R. Nicholas Zinser 12/05/2023 DATE

SIG. INVENTORY NO. 10-0696T2

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5, 2-6, 3-8 and 4-8.



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. Integrate monitor with Ethernet network in cabinet.

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

EQUIPMENT INFORMATION

Controller..........2070LX
Cabinet..........332 w/ Aux
Software..........Q-Free MAXTIME
Cabinet Mount..........Base
Output File Positions..........18 With Aux. Output File
Load Switches Used..........S2, S4, S5, S7, S8, S11
Phases Used..........2, 3, 4, 5, 6, 8
Overlap "1"..........Not Used
Overlap "2"..........Not Used
Overlap "3"..........Not Used
Overlap "4"..........Not Used

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	81	41,42	NU	21	61,62	NU	NU	81,82	NU	NU	NU	NU	NU	NU	NU
RED		128		*	101		*	134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW																		
YELLOW ARROW				117			132											
GREEN ARROW				118			133											

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.

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	-	-	-	-	-	-	-	-
Serve Phase 3	-	-	-	-	-	-	-	-
Serve Phase 4	-	-	-	-	-	-	-	-
Serve Phase 5	-	-	-	-	-	-	-	-
Serve Phase 6	-	-	-	-	X	-	-	-
Serve Phase 7	-	-	-	-	-	-	-	-
Serve Phase 8	-	-	-	-	-	-	-	-

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø 2 2A	SLOT EMPTY	SLOT EMPTY	ø 8 8A	ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		NOT USED			NOT USED	NOT USED								ST DC ISOLATOR
FILE "J"	U	ø 5 5A	ø 6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED												

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

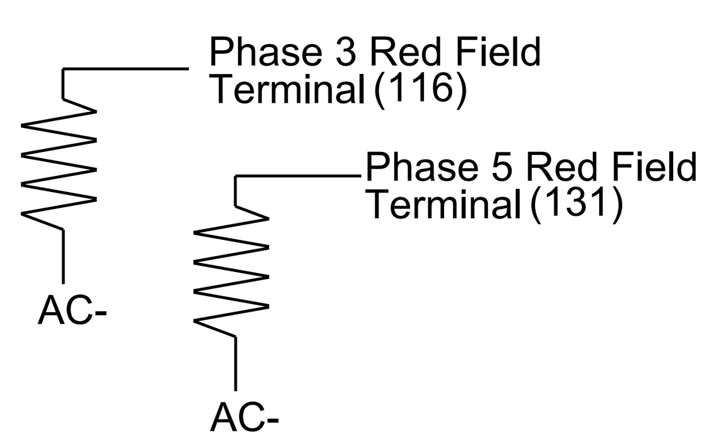
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4	3.0		X		X	
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
8A	TB4-5,6	I5U	58	20	7	3	15.0		X		X	
				-	30	8	3.0		X		X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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)



ALL RED BACKUP PROGRAMMING

Front Panel
Main Menu >Controller >Sequence & Phs Config>Backup Prevention > Backup Through Red

Web Interface
Home >Controller >Backup Prevention >Backup Calls Phase Plans >
(scroll down) to Backup Through Red

Backup Through All Red

Sequence	Backup Through All Red
1	YES

This plan supersedes the plan signed and sealed on 8/11/2023.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 10-0696T2
DESIGNED: December 2023
SEALED: 12/05/2023
REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail

Electrical and Programming Details For:

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

Prepared in the Offices of:
Transportation Mobility and Safety Division
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

PLAN DATE: December 2023 REVIEWED BY:
PREPARED BY: Sarah Kirkpatrick REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

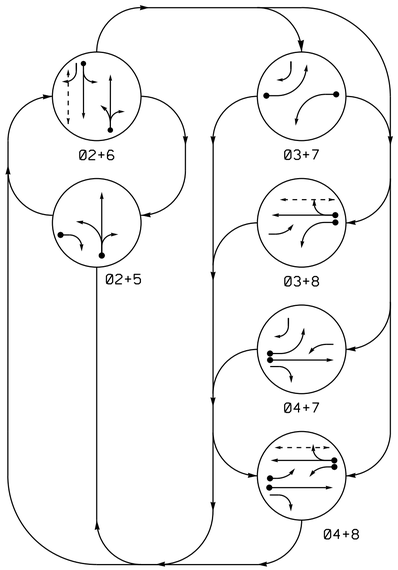
DocuSigned by: Ryan W. Hough 12/06/2023
430320FAA2654C3...
DATE

SIG. INVENTORY NO. 10-0696T2

06-DEC-2023 09:07
S:*ITS&SU*ITS Signals*Workgroups*Sig Man*Projects From Signal Design*Active Projects*Kirkpatrick*U-5112*100696T2*10-0696T2_sm_ele_20231206.dgn
sgkirkpatrick

PROJECT REFERENCE NO.	SHEET NO.
U-5112	Sig. 4.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

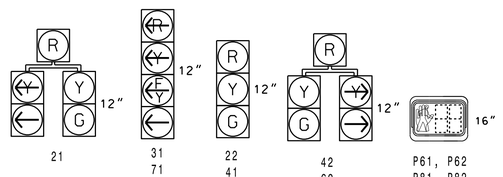
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 02+5	02+6	03+7	03+8	04+7	04+8	FLASH
21	G	G	R	R	R	R	Y
22	G	G	R	R	R	R	Y
31	~~R~~	~~R~~	←	←	~~FY~~	~~FY~~	~~R~~
41	R	R	R	R	G	G	R
42	R	R	R	R	G	G	R
61	R	G	R	R	R	R	Y
62	R	G	R	R	R	R	Y
71	~~R~~	~~R~~	←	←	~~FY~~	~~FY~~	~~R~~
81, 82	R	R	R	G	R	G	R
P61, P62	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	W	DW	W	DRK

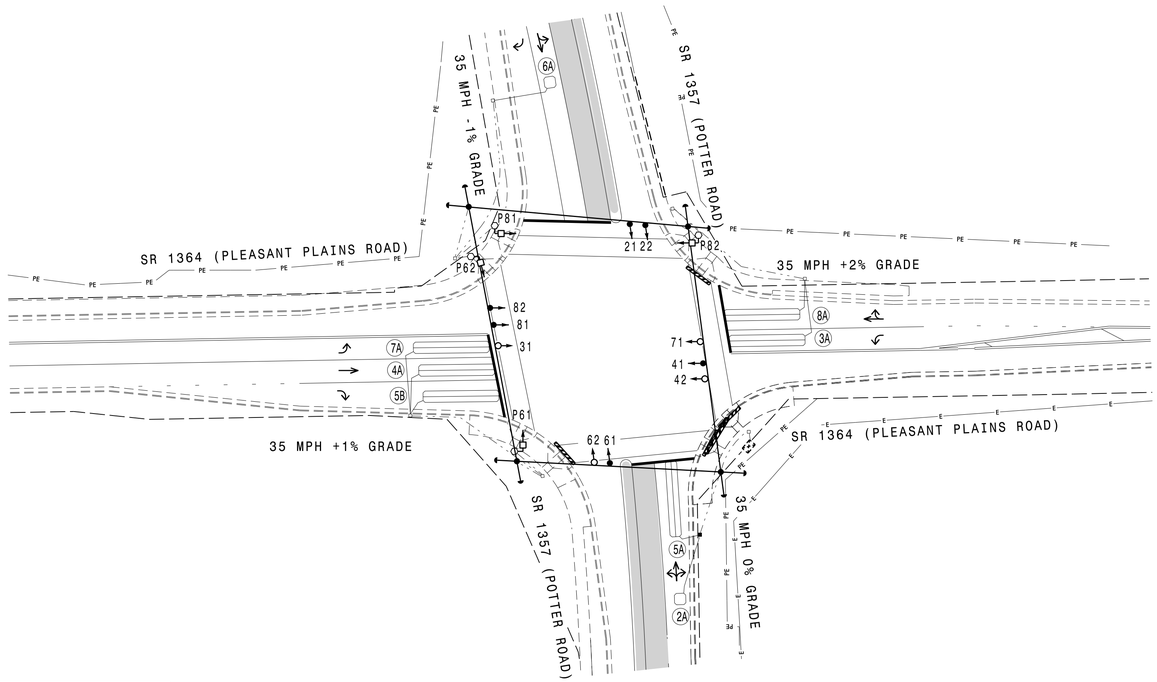
SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	70	3	X	2	-	-	X	-	X	-	-
3A	6X40	0	2-4-2	X	3	15.0	-	X	-	X	-	X
					8	3.0	-	X	-	X	-	
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	-
5A	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	-
					2	-	-	X	-	X	-	
5B	6X40	0	2-4-2	X	5	15.0	-	X	-	X	-	X
6A	6X6	70	4	X	6	-	-	X	-	X	-	-
7A	6X40	0	2-4-2	X	7	15.0	-	X	-	X	-	X
					4	3.0	-	X	-	X	-	
8A	6X40	0	2-4-2	X	8	10.0	-	X	-	X	-	-



MAXTIME TIMING CHART

FEATURE	PHASE 2	3	4	5	6	7	8
Walk *	–	–	–	–	7	–	7
Ped Clear *	–	–	–	–	21	–	22
Min Green	10	7	7	7	10	7	7
Passage *	3.0	2.0	2.0	2.0	3.0	2.0	2.0
Max 1 *	70	30	30	30	70	30	30
Yellow Change	3.8	3.0	3.8	3.0	3.9	3.0	3.8
Red Clear	2.7	2.9	2.3	3.5	2.4	3.1	2.3
Red Revert	5.0	2.0	2.0	2.0	2.0	2.0	2.0
Added Initial *	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–	–
Advance Walk	–	–	–	–	–	–	–
Non Lock Detector	–	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 belower than 4 seconds.

6 Phase
Fully Actuated
(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. Enable Backup Prevent to allow the controller to clear from phase 2+6 to phase 2+5 by progressing through and all red display.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
⬡	Type II Signal Pedestal	⬢
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·	2-in Underground Conduit	·-·-·
N/A	Right of Way	———
PE	Permanent Easement	PE
-E- E-	Temporary Easement	-E- E-
→	Directional Arrow	→
▒	Construction Zone	▒
▨	Barricade	▨

This plan supersedes the plan signed and sealed on 8/11/23.

Signal Upgrade - Temporary Design 3
TMP Phase 3 and Phase 3a

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1357 (Potter Road)
AT
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY: R.N. Zinser
PREPARED BY: T.A. Kenion REVIEWED BY:

SCALE 0 40' 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

DocuSigned by: R. Nicholas Zinser 12/05/2023
E13B9573E7224BF... DATE

SIG. INVENTORY NO. 10-06963

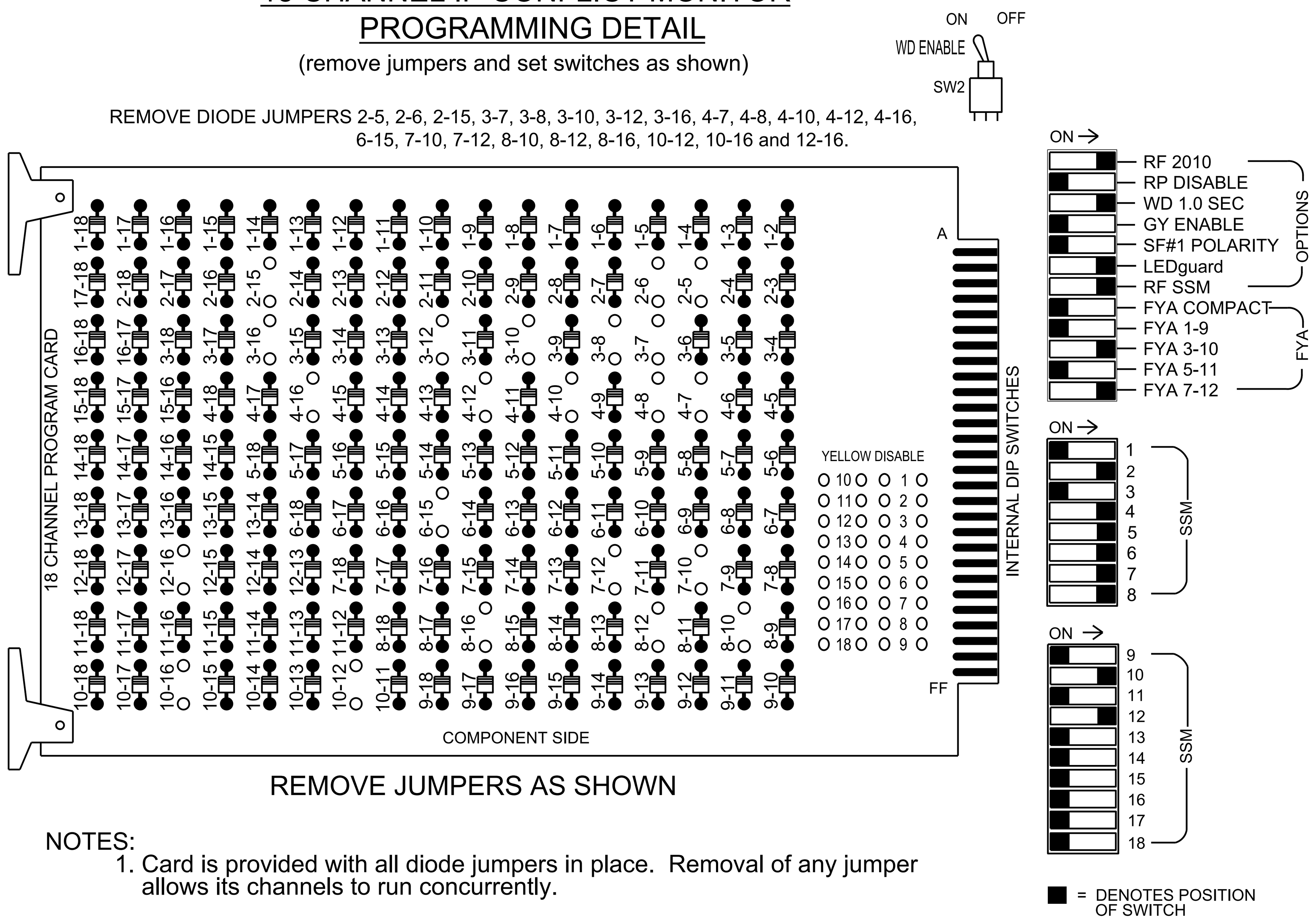
$FILE$ $USER$ $TIME$ $DATE$

PROJECT REFERENCE NO.	SHEET NO.
U-5112	Sig. 4.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5, 2-6, 2-15, 3-7, 3-8, 3-10, 3-12, 3-16, 4-7, 4-8, 4-10, 4-12, 4-16, 6-15, 7-10, 7-12, 8-10, 8-12, 8-16, 10-12, 10-16 and 12-16.



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. Integrate monitor with Ethernet network in cabinet.

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

EQUIPMENT INFORMATION

Controller..2070LX
Cabinet..332 w/ Aux
Software...Q-Free MAXTIME
Cabinet Mount....................................Base
Output File Positions...........................18 With Aux. Output File
Load Switches Used............................S2, S4, S5, S7, S8, S9, S10, S11, S12, AUX S2, AUX S5
Phases Used.......................................2, 3, 4, 5, 6, 6 PED, 7, 8, 8 PED
Overlap "1"..Not Used
Overlap "2"..*
Overlap "3"..Not Used
Overlap "4"..*

*See overlap programming detail on sheet 2

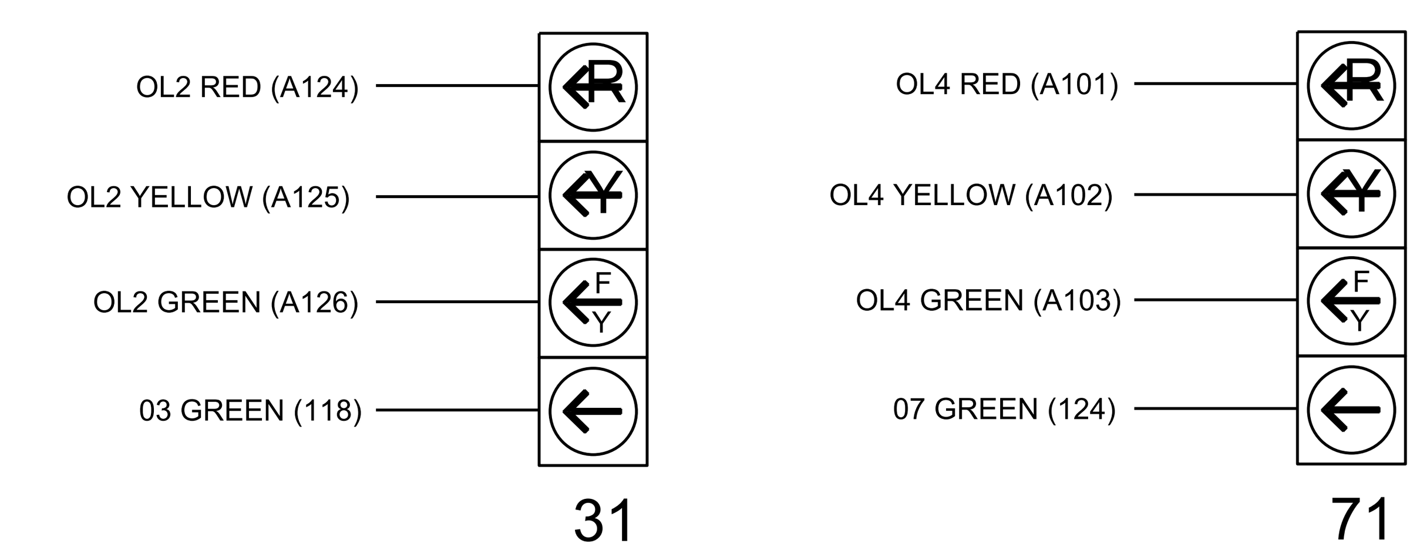
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7		S8	S9	S10		S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5		6	15	7		8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5		6	6 PED	7		8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31★	41,42	NU	21	42	61,62	P61, P62	71★	62	81,82	P81, P82	NU	31★	NU	NU	71★	NU
RED		128			101		*		134		*		107							
YELLOW		129		*	102				135				108							
GREEN		130			103				136				109							
RED ARROW																A124			A101	
YELLOW ARROW							132	132				123				A125			A102	
FLASHING YELLOW ARROW																A126			A103	
GREEN ARROW				118			133	133			124	124								
(Don't Walk)										119				110						
(Walk)										121				112						

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
"I"	U	SLOT EMPTY	ø 2 2A	SLOT EMPTY	SLOT EMPTY	ø 3 3A	ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø6 PED DC ISOLATOR	FS DC ISOLATOR
"I"	L		NOT USED			NOT USED	NOT USED							ø8 PED DC ISOLATOR	ST DC ISOLATOR
"J"	U	ø 5 5A	ø 6 6A	SLOT EMPTY	SLOT EMPTY	ø 7 7A	ø 8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
"J"	L	NOT USED	ø 5 5B			NOT USED	NOT USED								

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X		X	
3A	TB4-5,6	I5U	58	20	7	3	15.0		X		X	
				-	30	8	3.0		X		X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2			X		X	
5B	TB3-7,8	J2L	44	6	17	5	15.0		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
7A	TB5-5,6	J5U	57	19	21	7	15.0		X		X	
				-	32	4	3.0		X		X	
8A	TB5-9,10	J6U	42	4	22	8	10.0		X		X	
PED PUSH BUTTONS												
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

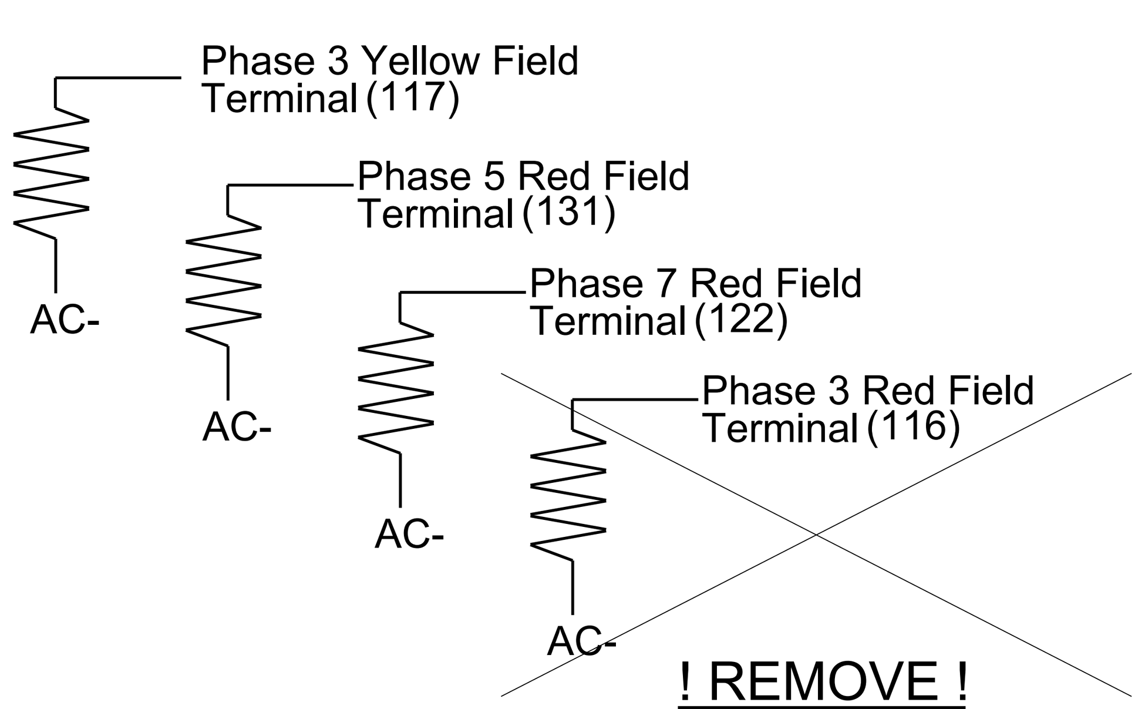
NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

This plan supersedes the plan signed and sealed on 8/11/2023.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 10-0696T3
DESIGNED: December 2023
SEALED: 12/05/2023
REVISED: N/A

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical and Programming Details For:

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY:
PREPARED BY: Sarah Kirkpatrick REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 12/06/2023
DATE

SIG. INVENTORY NO. 10-0696T3

06-DEC-2023 09:09
S:*ITS&SU*ITS Signals*Workgroups*Sig Man*Projects From Signal Design*Active Projects*Kirkpatrick*U-5112*100696T3_sm_ele_20231206.dgn
sgkirkpatrick

PROJECT REFERENCE NO.	SHEET NO.
U-5112	Sig. 4.2

OVERLAP PROGRAMMING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	2	4
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	4	8
Modifier Phases	3	7
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

ALL RED BACKUP PROGRAMMING

Front Panel
Main Menu >Controller >Sequence & Phs Config>Backup Prevention >
Backup Through Red

Web Interface
Home >Controller >Backup Prevention >Backup Calls Phase Plans >
(scroll down) to Backup Through Red

Backup Through All Red

Sequence	Backup Through All Red
1	YES

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.

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	-	-	-	-	-	-	-	-
Serve Phase 3	-	-	-	-	-	-	-	-
Serve Phase 4	-	-	-	-	-	-	-	-
Serve Phase 5	-	-	-	-	-	-	-	-
Serve Phase 6	-	-	-	-	X	-	-	-
Serve Phase 7	-	-	-	-	-	-	-	-
Serve Phase 8	-	-	-	-	-	-	-	-

This plan supersedes the plan signed and sealed on 8/11/2023.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 10-0696T3
DESIGNED: December 2023
SEALED: 12/05/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical and Programming Details For:

Prepared in the Offices of:

Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Signals Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 | Union County | Stallings

PLAN DATE: December 2023 | REVIEWED BY:
PREPARED BY: Sarah Kirkpatrick | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 12/06/2023
ENGINEER'S SIGNATURE DATE

SIG. INVENTORY NO. 10-0696T3

06-DEC-2023 09:10
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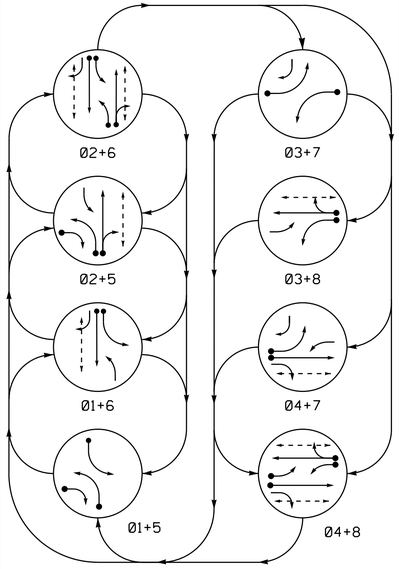
sgkirkpatrick

PROJECT REFERENCE NO.	SHEET NO.
U-5112	Sig. 5.0

DEFAULT PHASING DIAGRAM

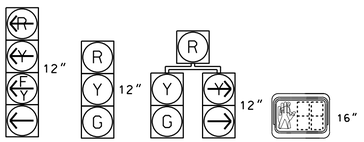


PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.

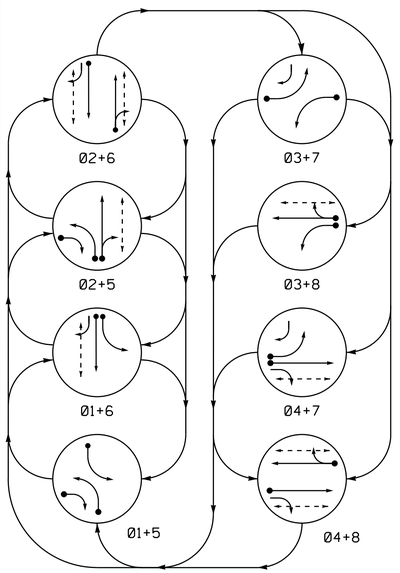


11	21, 22	42	P21, P22
31	41	62	P41, P42
51	61		P61, P62
71	81, 82		P81, P82

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	03+07	03+08	04+07	04+08	FLASH
11	←	←	F Y	F Y	~~R~~	~~R~~	~~R~~	~~R~~	~~Y~~
21, 22	R	R	G	G	R	R	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	F Y	F Y	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R/←	R	R/←	R	R	R	G	G	R
51	←	F Y	←	F Y	~~R~~	~~R~~	~~R~~	~~R~~	~~Y~~
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R/←	R	R/←	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←	F Y	←	F Y	~~R~~
81, 82	R	R	R	R	R	R	G	R	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

ALTERNATE PHASING DIAGRAM



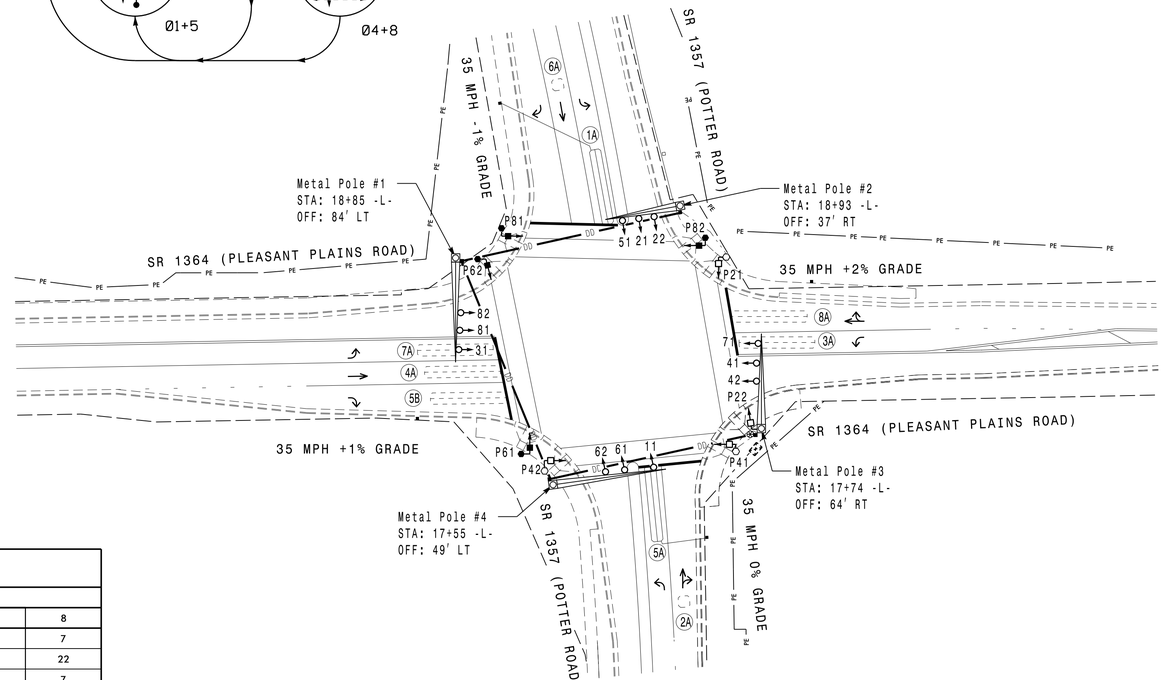
ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	03+07	03+08	04+07	04+08	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~Y~~
21, 22	R	R	G	G	R	R	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R/←	R	R/←	R	R	R	G	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~Y~~
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R/←	R	R/←	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	←	~~R~~	~~R~~
81, 82	R	R	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	W	W	DRK	
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	W	DRK

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	15.0*	-	X	-	X	-	X
					6 #	-	-	X	-	X	-	X
2A	6X6	70	3	-	2	-	-	X	-	X	-	-
3A	6X40	0	2-4-2	-	3	15.0@	-	X	-	X	-	-
					8#	3.0	-	X	-	X	-	-
4A	6X40	0	2-4-2	-	4	-	-	X	-	X	-	-
5A	6X40	0	2-4-2	X	5	15.0*	-	X	-	X	-	-
					2#	-	-	X	-	X	-	-
5B	6X40	0	2-4-2	-	5	15.0	-	X	-	X	-	-
6A	6X6	70	4	-	6	-	-	X	-	X	-	-
7A	6X40	0	2-4-2	-	7	15.0@	-	X	-	X	-	-
					4#	3.0	-	X	-	X	-	-
8A	6X40	0	2-4-2	-	8	10.0	-	X	-	X	-	-

* Reduce Delay to 0 seconds during Alternate Phasing operation.
@ Reduce Delay to 3 seconds during Alternate Phasing operation.
# Disable Phase call for loop during Alternate Phasing operation.



MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	7	–	7	–	7	–	7
Ped Clear *	–	18	–	18	–	21	–	22
Min Green	7	10	7	7	7	10	7	7
Passage *	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0
Max 1 *	30	70	30	30	30	70	30	30
Yellow Change	3.0	3.9	3.0	3.8	3.0	3.9	3.0	3.8
Red Clear	3.2	2.5	2.9	2.7	3.3	2.5	3.5	2.7
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–	–	–
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.

8 Phase
Fully Actuated w/
Alternate Phasing Operation
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024. "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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. The Division Traffic Engineer will determine the hours of use for each phasing plan.
9. See Roadway Pavement Marking Plans for pavement marking locations.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
⊛	Type I Pushbutton Post	⊛
⬡	Type II Signal Pedestal	⬢
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
⊙◺	Metal Pole with Mastarm	⊙◺
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·-·	2-in Underground Conduit	·-·-·-·
—DD—	Directional Drill	N/A
N/A	Right of Way	– – – –
—PE—	Permanent Easement	—PE—
→	Directional Arrow	→

This plan supersedes the plan signed and sealed on 8/11/23.

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1357 (Potter Road)
AT
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY: R.N. Zinser
PREPARED BY: T.A. Kenion REVIEWED BY:

SCALE 0 40' 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

DocuSigned by: R. Nicholas Zinser 12/05/2023
DATE

SIG. INVENTORY NO. 10-0696

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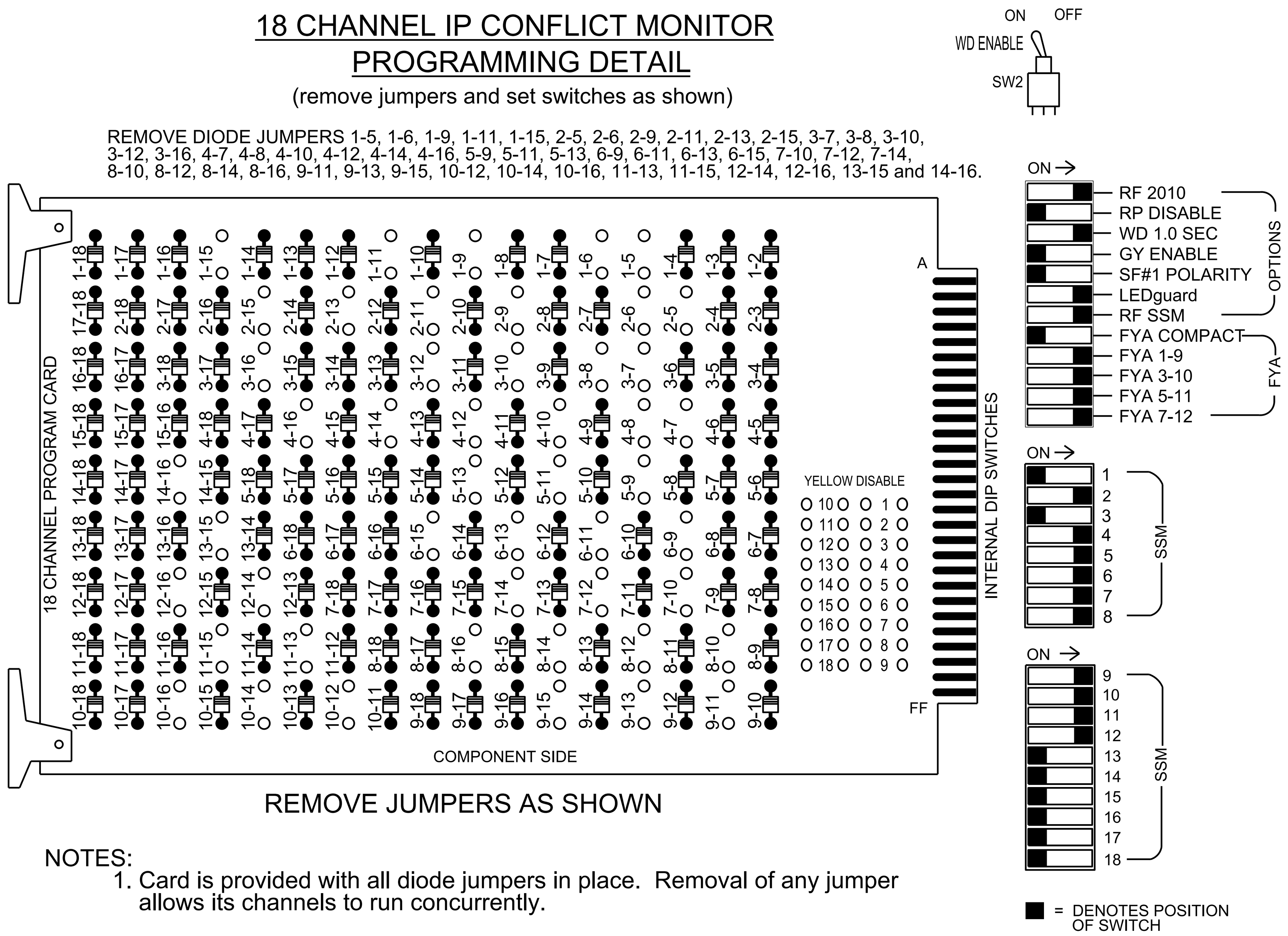
S:\Traffic\Signals\Signal Design Section\Western Region\Div-10\U-5112\2023-12\10-0696\10696_sig_dsn_2023mds.dgn
tkenion

PROJECT REFERENCE NO.	SHEET NO.
U-5112	Sig. 5.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 3-7, 3-8, 3-10, 3-12, 3-16, 4-7, 4-8, 4-10, 4-12, 4-14, 4-16, 5-9, 5-11, 5-13, 6-9, 6-11, 6-13, 6-15, 7-10, 7-12, 7-14, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15 and 14-16.



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. Integrate monitor with Ethernet network in cabinet.

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. 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 S4, AUX S5
Phases Used.......................................1, 2, 2 PED, 3, 4, 4 PED, 5, 6, 6 PED, 7, 8, 8 PED
Overlap "1"..*
Overlap "2"..*
Overlap "3"..*
Overlap "4"..*

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7		S8	S9	S10		S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5		6	15	7		8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5		6	6 PED	7		8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	21,22	P21, P22	31★	41,42	P41, P42	51★	42	61,62	P61, P62	71★	62	81,82	P81, P82	11★	31★	NU	51★	71★	NU
RED		128			101		*		134		*		107							
YELLOW	*	129		*	102				135				108							
GREEN		130			103				136				109							
RED ARROW															A121	A124		A114	A101	
YELLOW ARROW								132				123			A122	A125		A115	A102	
FLASHING YELLOW ARROW															A123	A126		A116	A103	
GREEN ARROW	127			118			133	133			124	124								
(Don't Walk)			113			104				119				110						
(Walk)			115			106				121				112						

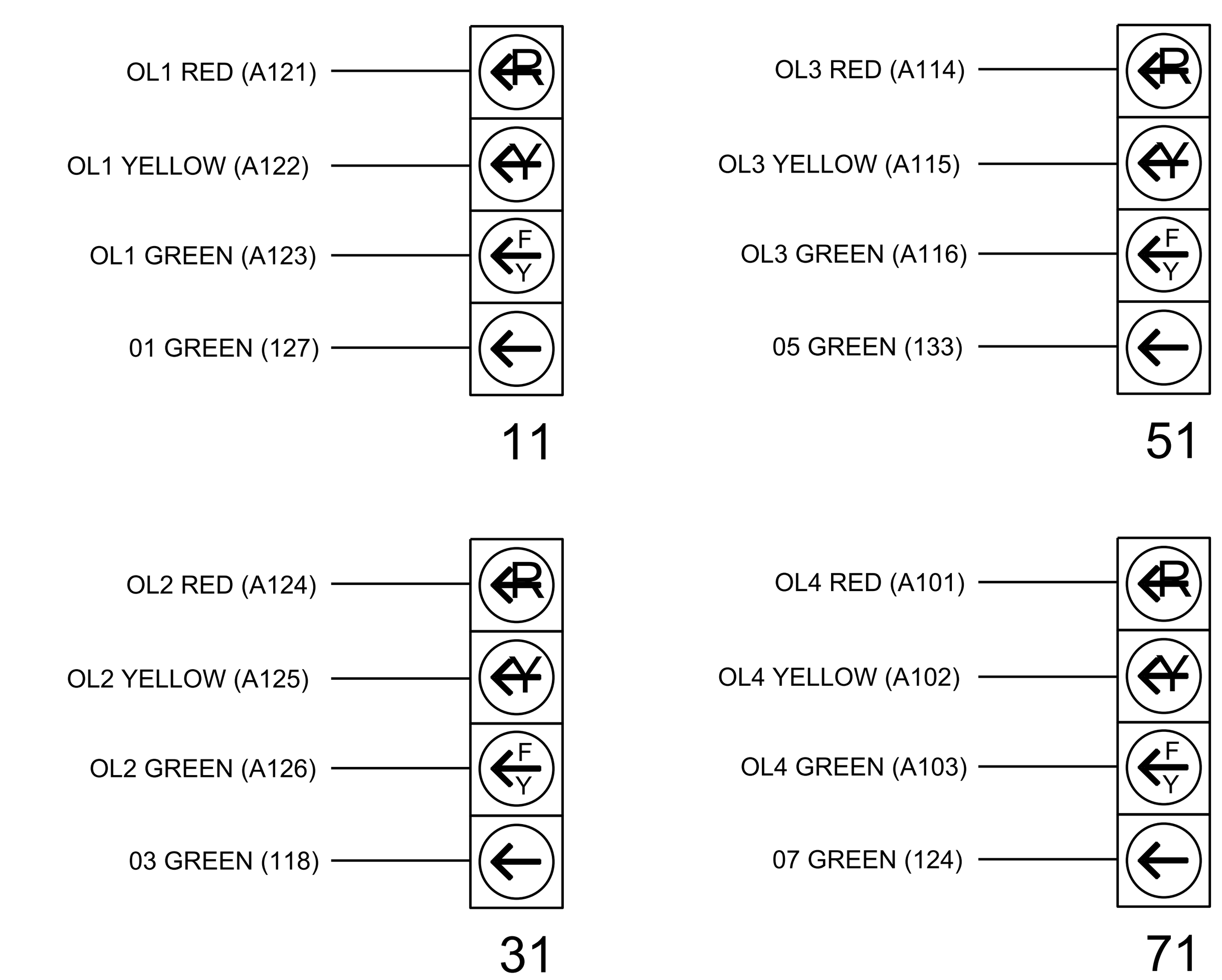
NU = Not Used

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

★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
"I"	U	Ø 1 1A	Ø 2 2A	SLOT EMPTY	SLOT EMPTY	Ø 3 3A	Ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 2 PED DC ISOLATOR	Ø 6 PED DC ISOLATOR	FS DC ISOLATOR
"I"	L	NOT USED	NOT USED			NOT USED	NOT USED						Ø 4 PED DC ISOLATOR	Ø 8 PED DC ISOLATOR	ST DC ISOLATOR
"J"	U	Ø 5 5A	Ø 6 6A	SLOT EMPTY	SLOT EMPTY	Ø 7 7A	Ø 8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
"J"	L	NOT USED	Ø 5 5B			NOT USED	NOT USED								

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
1A	TB2-1,2	I1U	56	18	1 ★	1	15.0		X		X	
				-	29 ★	6			X		X	
2A	TB2-5,6	I2U	39	1	2	2			X		X	
3A	TB4-5,6	I5U	58	20	7 ★	3	15.0		X		X	
				-	30 ★	8	3.0		X		X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
5A	TB3-1,2	J1U	55	17	15 ★	5	15.0		X		X	
				-	31 ★	2			X		X	
5B	TB3-7,8	J2L	44	5	17	5	15.0		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
7A	TB5-5,6	J5U	57	19	21 ★	7	15.0		X		X	
				-	32 ★	4	3.0		X		X	
8A	TB5-9,10	J6U	42	4	22	8	10.0		X		X	
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P41,P42	TB8-5,6	I12L	69	35	4	PED 4						
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

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

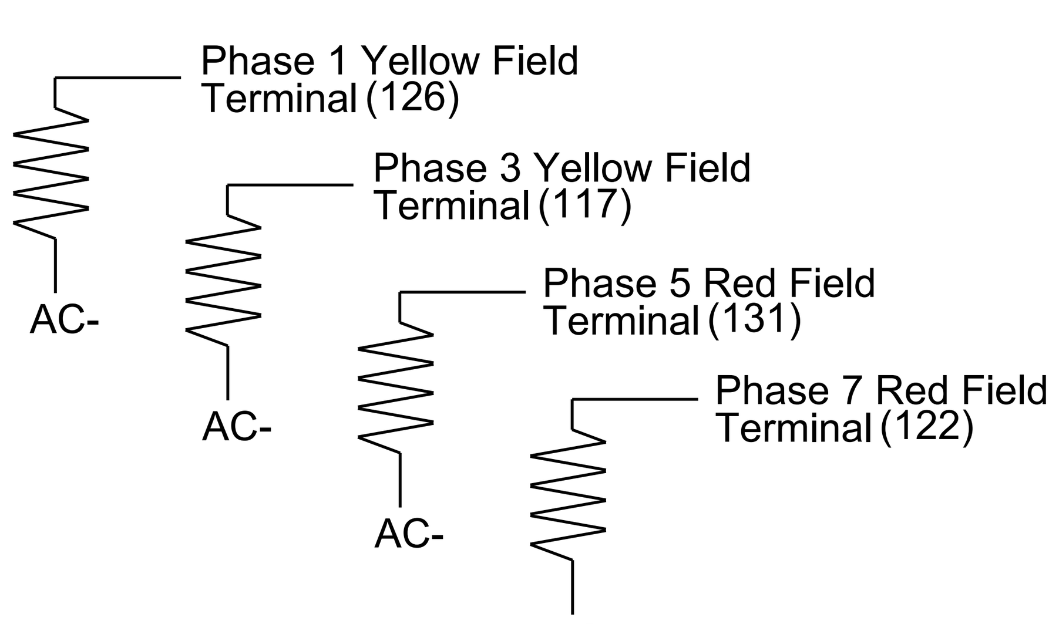
★ For the detectors to work as shown on the signal plan see the Detector Programming Detail for Alternate Phasing on Sheet 2 of this plan.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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)



COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

This plan supersedes the plan signed and sealed on 8/11/2023.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 10-0696
DESIGNED: December 2023
SEALED: 12/05/2023
REVISED: N/A

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical and Programming Details For:

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY:
PREPARED BY: Sarah Kirkpatrick REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:
Transportation Mobility and Safety Division
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by:
Ryan W. Hough
430320FAA2654C3
12/06/2023
DATE

SIG. INVENTORY NO. 10-0696

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PROJECT REFERENCE NO.	SHEET NO.
U-5112	Sig. 5.2

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
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section
Included Phases	2	4	6	8
Modifier Phases	1	3	5	7
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

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
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section
Included Phases	-	-	-	-
Modifier Phases	1	3	5	7
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

← NOTICE INCLUDED PHASE

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 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.

! REMOVE ! 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	-	-	-	-	-	-	-	-
Serve Phase 3	-	-	-	-	-	-	-	-
Serve Phase 4	-	-	-	-	-	-	-	-
Serve Phase 5	-	-	-	-	-	-	-	-
Serve Phase 6	-	-	-	-	X	-	-	-
Serve Phase 7	-	-	-	-	-	-	-	-
Serve Phase 8	-	-	-	-	-	-	-	-

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	0.0
29	0	0.0

3A

Detector	Call Phase	Delay
7	3	3.0
30	0	3.0

5A

Detector	Call Phase	Delay
15	5	0.0
31	0	0.0

7A

Detector	Call Phase	Delay
21	7	3.0
32	0	3.0

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

This plan supersedes the plan signed and sealed on 8/11/2023.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 10-0696
DESIGNED: December 2023
SEALED: 12/05/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical and Programming Details For:

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 | Union County | Stallings

PLAN DATE: December 2023 | REVIEWED BY:
PREPARED BY: Sarah Kirkpatrick | REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036833 ENGINEER RYAN W. HOUGH

DocuSigned by: Ryan W. Hough 12/06/2023
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DATE

SIG. INVENTORY NO. 10-0696

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sgkirkpatrick

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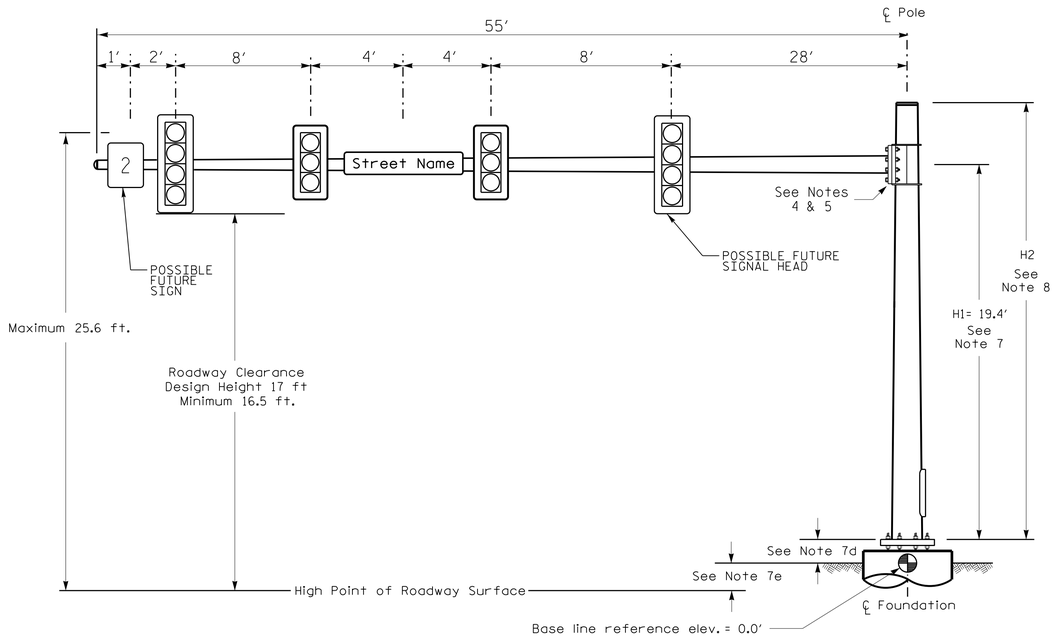
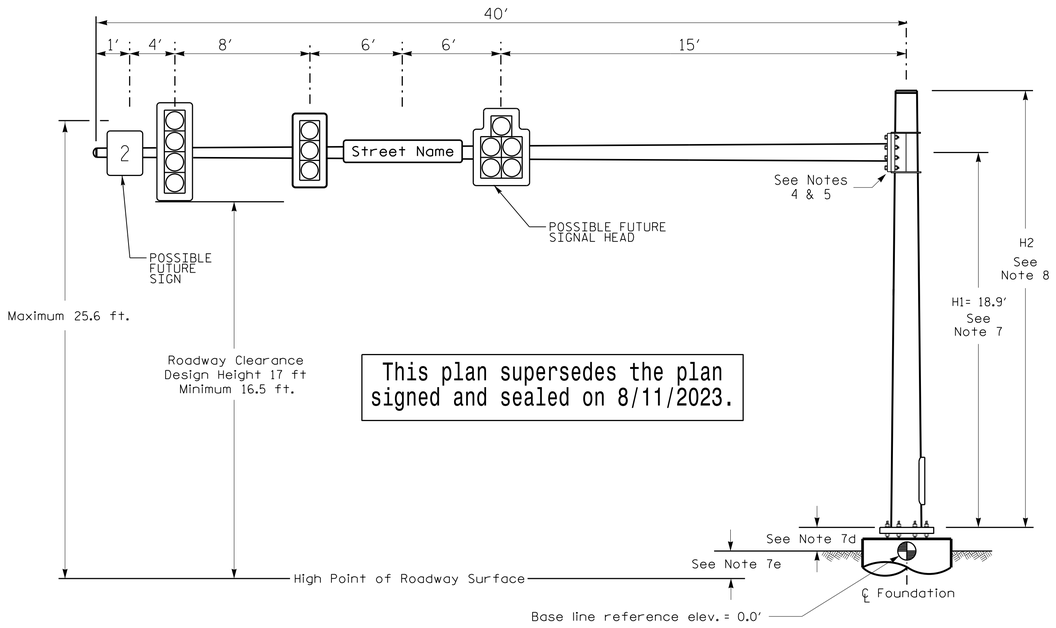


Elevation View

Design Loading for METAL POLE NO. 2



This plan supersedes the plan signed and sealed on 8/11/2023.

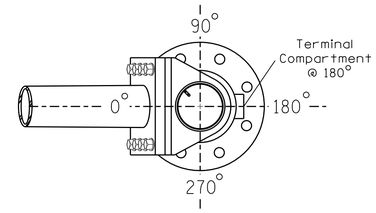
Elevation View

SPECIAL NOTE

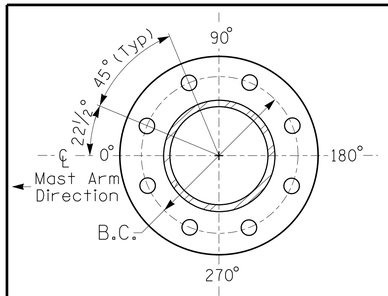
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ⊕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.4 ft.	-0.1 ft.
Elevation difference at Edge of travelway or face of curb	+0.4 ft.	-0.1 ft.

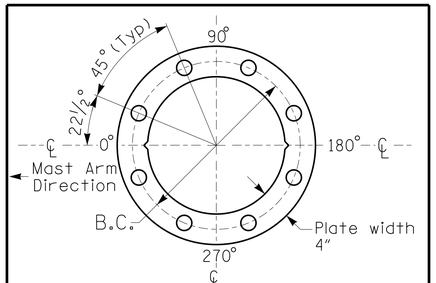


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0″W X 56.0″L	103 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2024 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

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

All metal poles and arms should be Black in color as specified in the project special provisions.

NCDOT Wind Zone 5 (110 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY: R.N. Zinser

PREPARED BY: T.A. Kenion REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

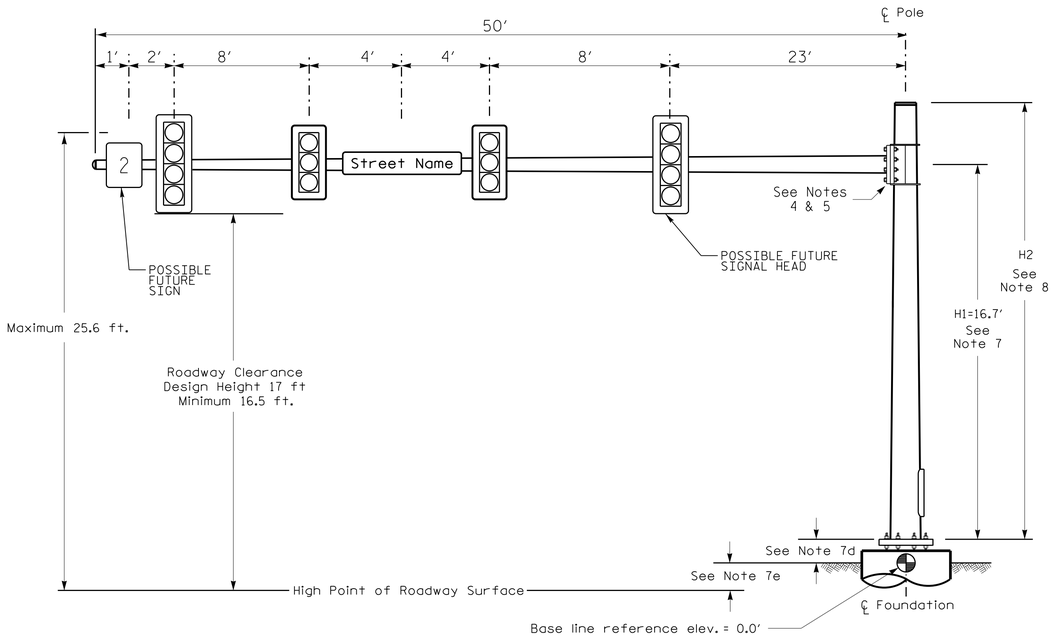
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

DocuSigned by: R. Nicholas Zinser 12/05/2023
F13B8973472248F
DATE

SIG. INVENTORY NO. 10-0696

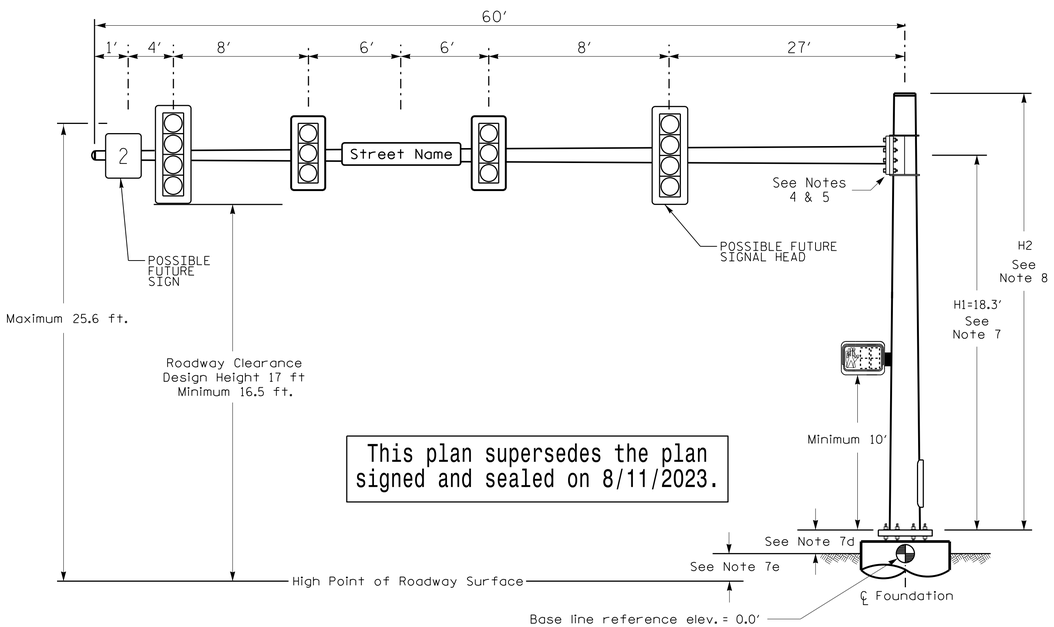
06-DEC-2023 15:53
S:\HITSIGUNITS Signals\Signal Design Section\Eastern Region\Div-10\U-5112\2023-12\10-0696\100696_sig_ml_m2_2023mods.dgn
tkenion

Design Loading for METAL POLE NO. 3



Elevation View

Design Loading for METAL POLE NO. 4



Elevation View

This plan supersedes the plan signed and sealed on 8/11/2023.

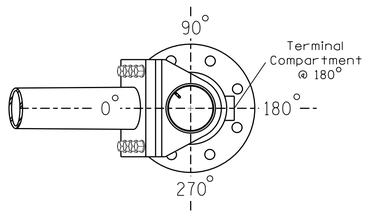
$FILE$
$USER$
$TIME$
$DATE$

SPECIAL NOTE

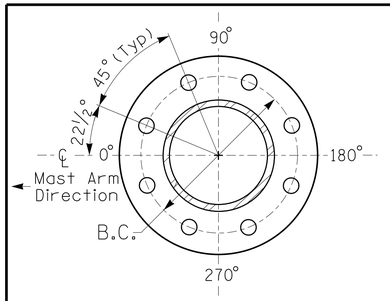
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at ℄ Foundation @ ground level ⊕	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-2.3 ft.	-0.7 ft.
Elevation difference at Edge of travelway or face of curb	-2.3 ft.	-0.7 ft.

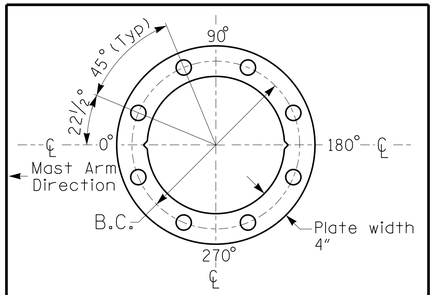


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5″W X 17.0″L	21 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
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4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
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   d. The top of the pole base plate is 0.75 feet above the ground elevation.
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8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
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9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
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11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

All metal poles and arms should be Black in color as specified in the project special provisions.

NCDOT Wind Zone 5 (110 mph)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SR 1357 (Potter Road)
at
SR 1364 (Pleasant Plains Road)

Division 10 Union County Stallings

PLAN DATE: December 2023 REVIEWED BY: R.N. Zinser

PREPARED BY: T.A. Kenion REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

DocuSigned by: R. Nicholas Zinser 12/05/2023
F13B0873472248F... DATE

SIG. INVENTORY NO. 10-0696

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

DIVISION 11
WIND ZONE 5 & 6

DIVISION 9
WIND ZONE 5

DIVISION 7
WIND ZONE 5

DIVISION 5
WIND ZONE 4 & 5

DIVISION 4
WIND ZONE 3 & 4

DIVISION 1
WIND ZONE 2, 3, 4 & 5

DIVISION 13
WIND ZONE 5 & 6

DIVISION 14
WIND ZONE 5 & 6

DIVISION 12
WIND ZONE 5

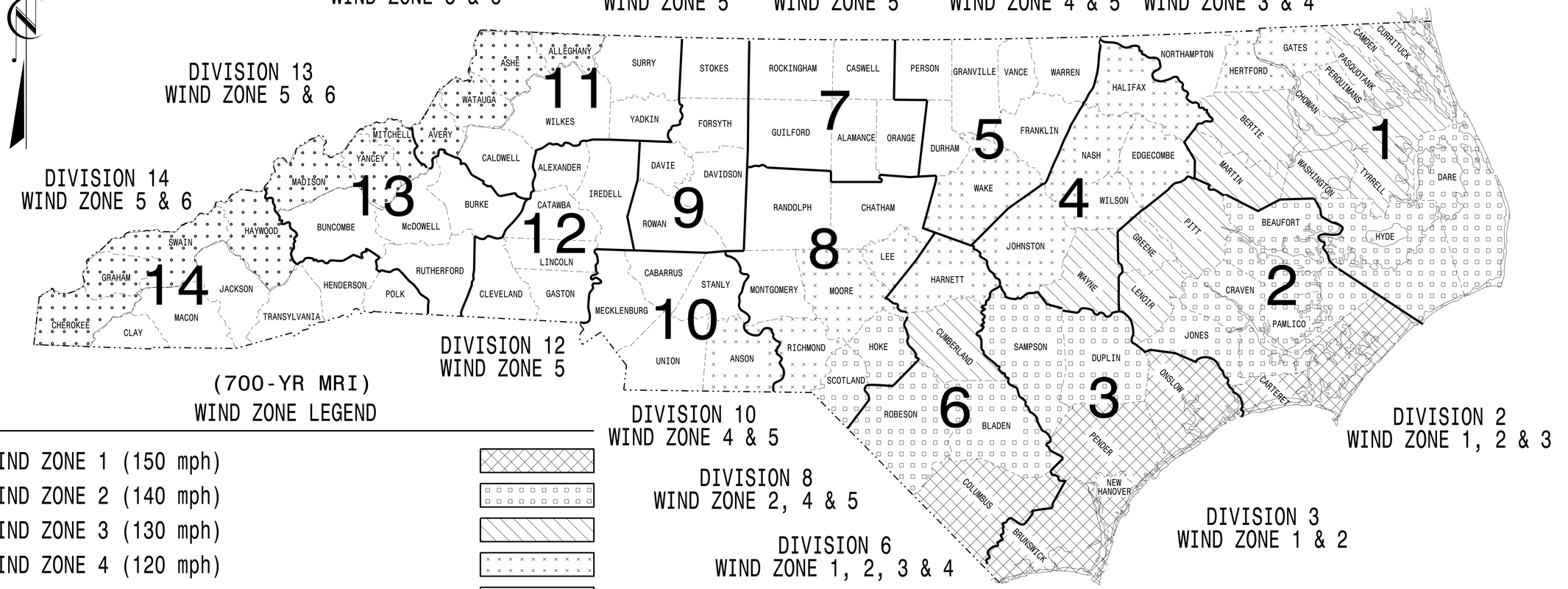
DIVISION 10
WIND ZONE 4 & 5

DIVISION 8
WIND ZONE 2, 4 & 5

DIVISION 6
WIND ZONE 1, 2, 3 & 4

DIVISION 2
WIND ZONE 1, 2 & 3

DIVISION 3
WIND ZONE 1 & 2



(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

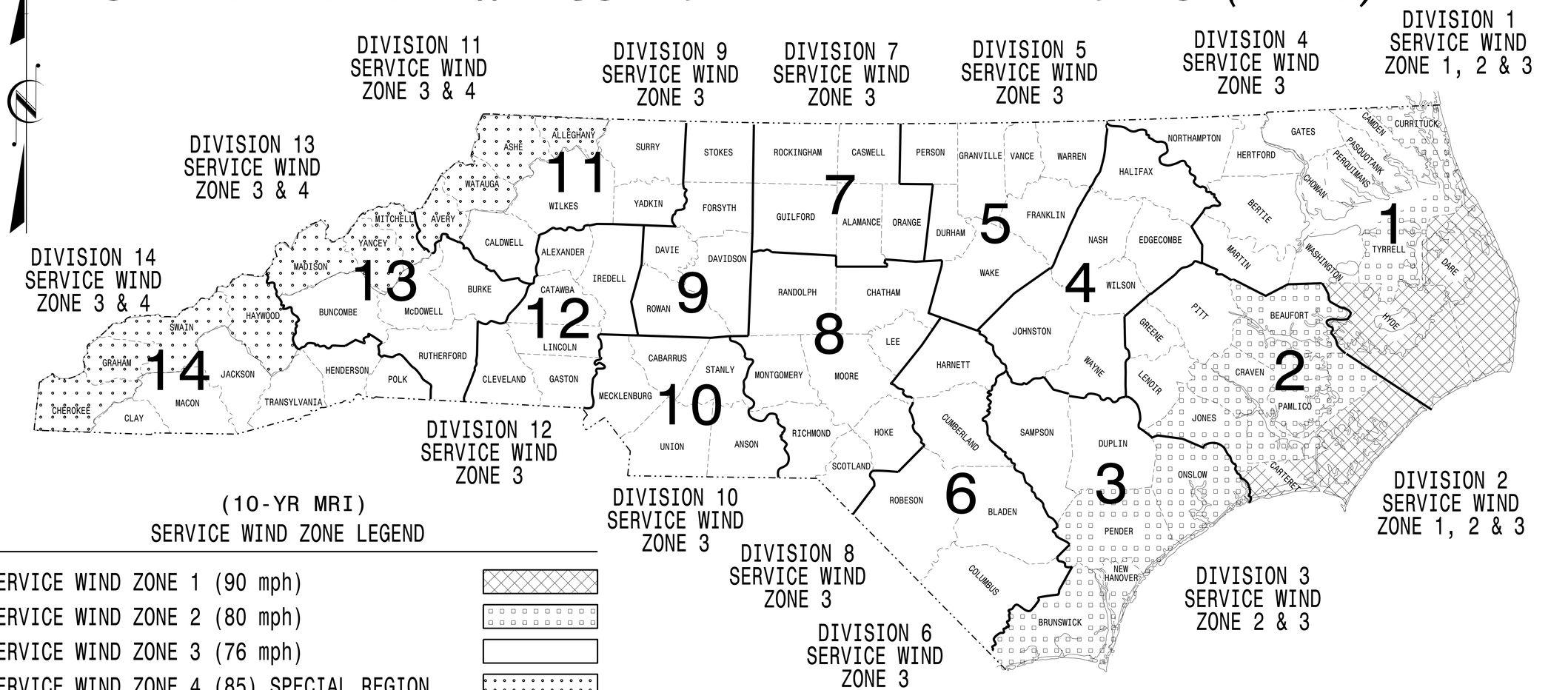
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

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

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

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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

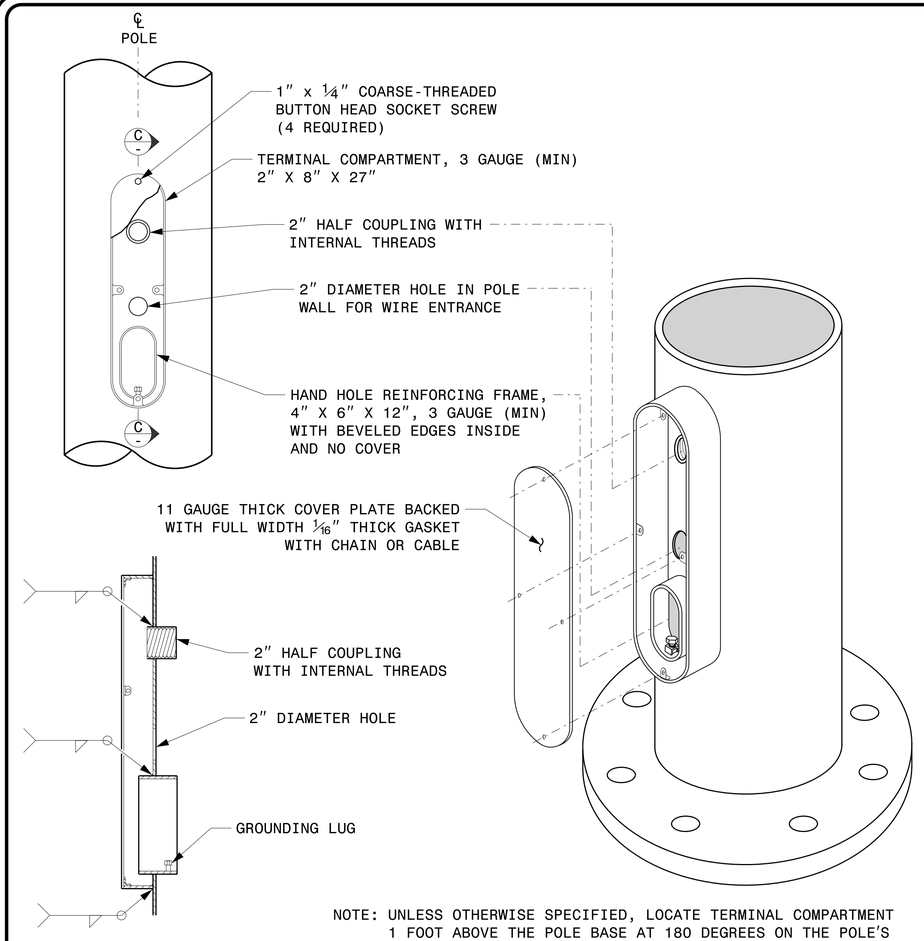
B. WALKER, P.E. – ITS AND SIGNALS STRUCTURAL ENGINEER

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...

09/21/2023
DATE



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

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)

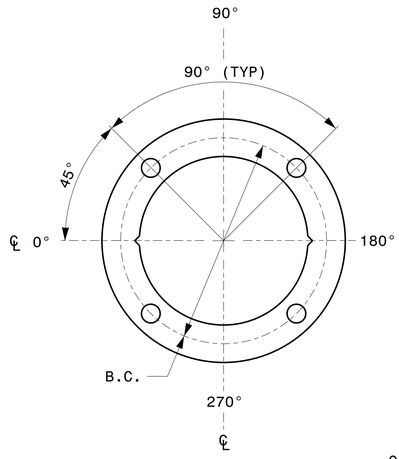
MFG _____ MFG. DATE: MM/YY
SECTION D/T/L/Y ----/----/----/----
NCDOT SIG. INV. NO. _ _ _ _ _ _ _ _
NCDOT POLE NO. _ _ _ _ _ _ _ _

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

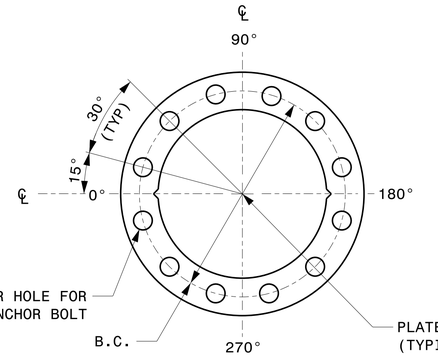
NOTES:

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.

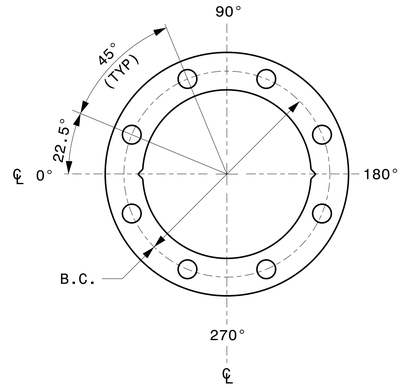
IDENTIFICATION TAG DETAILS



4 BOLT PATTERN



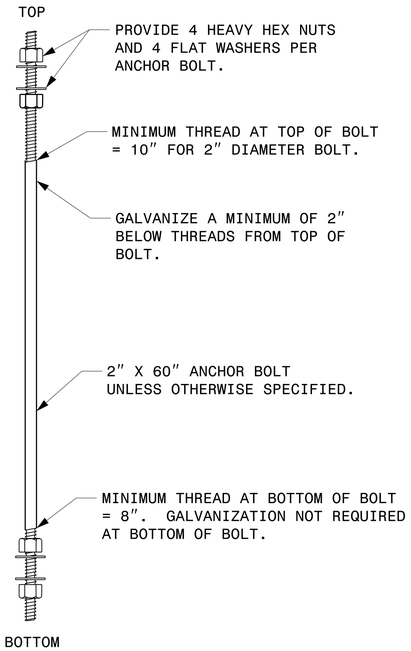
12 BOLT PATTERN



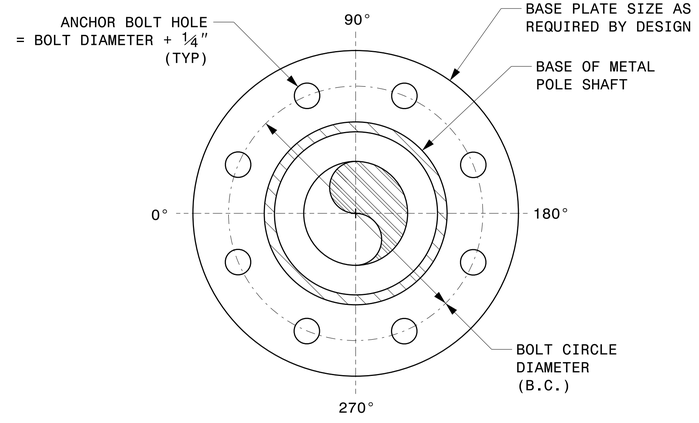
8 BOLT PATTERN

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

BASE PLATE TEMPLATE AND ANCHOR BOLT LOCK PLATE DETAILS



ANCHOR BOLT DETAIL



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

TYPICAL BASE PLATE DETAIL

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

Fabrication Details – All Metal Poles

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
All Metal Poles

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

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 036626
ENGINEER
KEVIN C. DURIGON

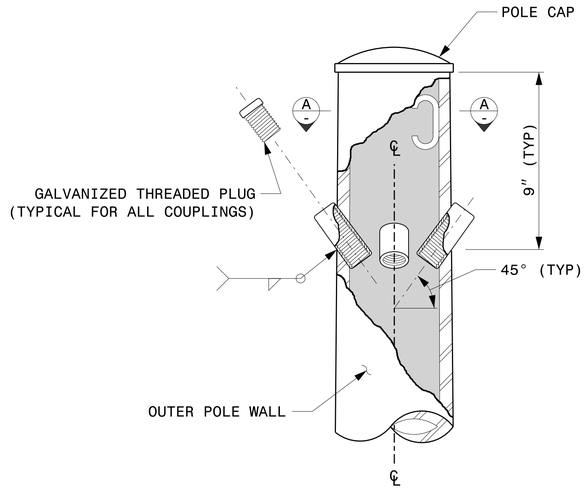
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

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

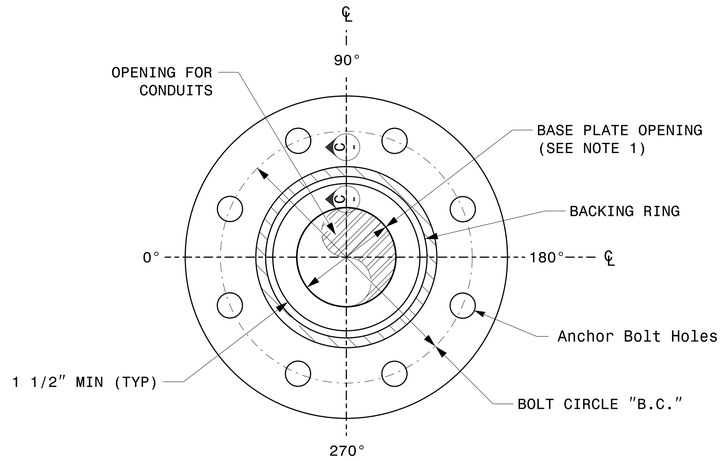
Fabrication Details – Strain Poles

NOTE:

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

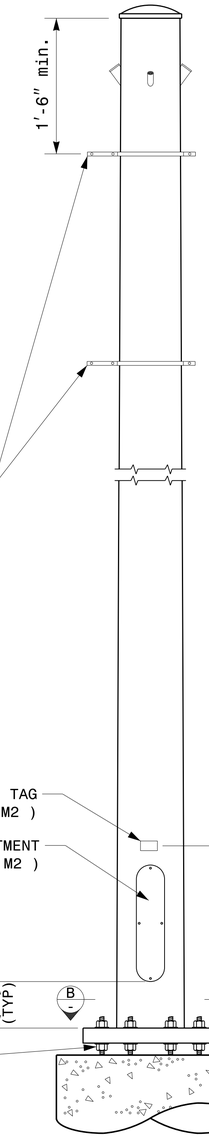


CABLE ENTRANCES AT TOP OF POLE

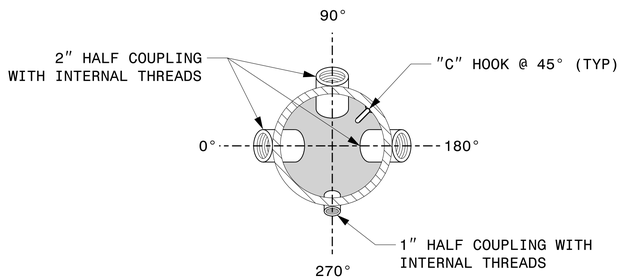


SECTION B-B

POLE BASE PLATE DETAILS
(8 AND 12 BOLT PATTERN)

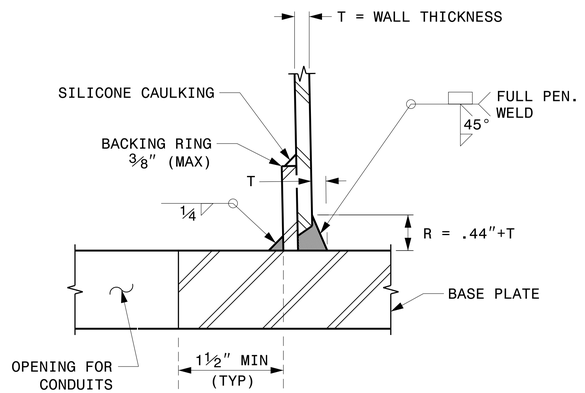


MONOTUBE STRAIN POLE



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

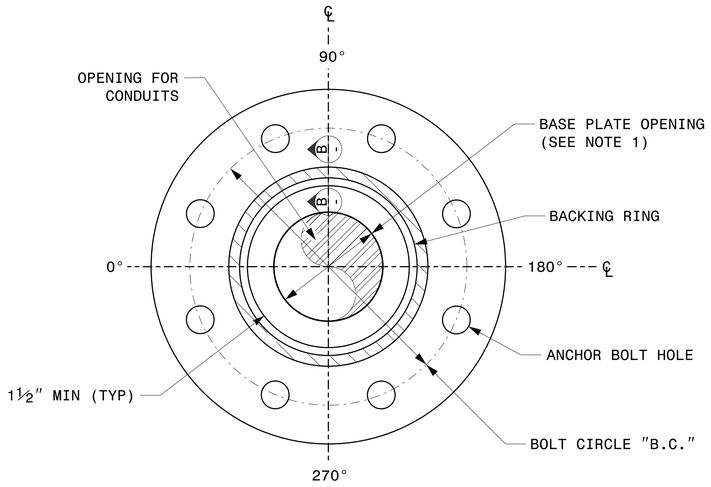
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
036626
ENGINEER
KEVIN C. DURIGON

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

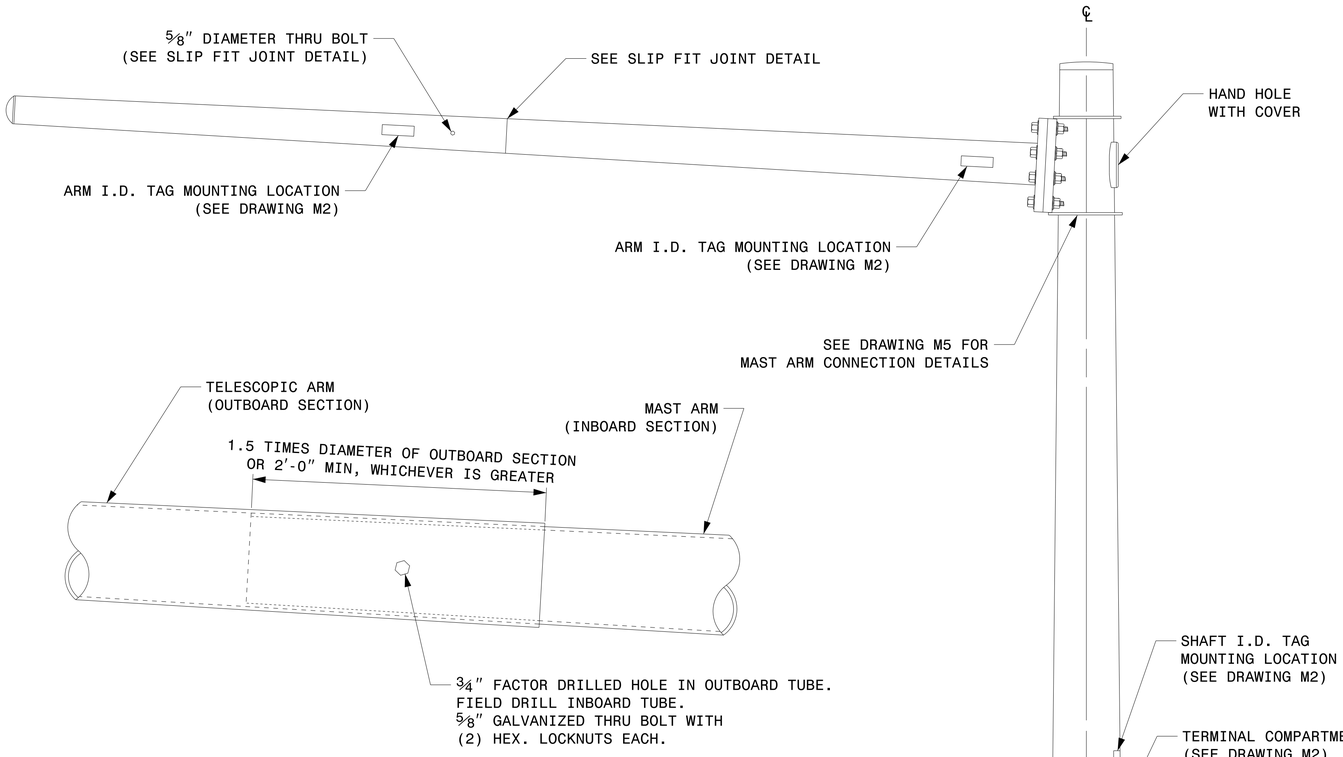
PROJECT I.D. NO.	SHEET NO.
	Sig.M4

NOTE:

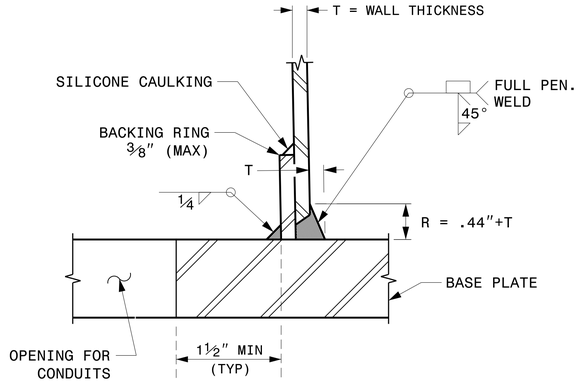
1. OPENING IN POLE BASE PLATE SHALL BE EQUAL TO POLE BASE INSIDE DIAMETER MINUS 3½" BUT SHALL NOT BE LESS THAN 8½".



SECTION A-A
POLE BASE PLATE DETAILS

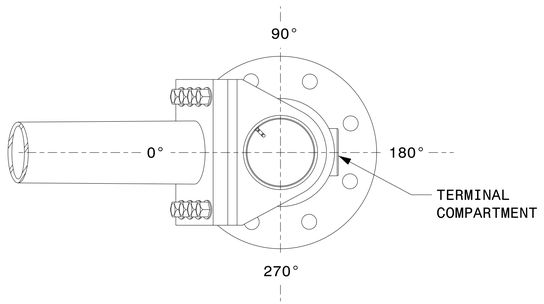


SLIP FIT JOINT DETAIL FOR MAST ARM



SECTION B-B
(POLE ATTACHMENT TO BASE PLATE)

FULL-PENETRATION GROOVE WELD DETAIL



MAST ARM RADIAL ORIENTATION

MAST ARM POLE

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

SCALE 0 NA NONE

Typical Fabrication Details For Mast Arm Poles

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

REVISIONS	INIT.	DATE

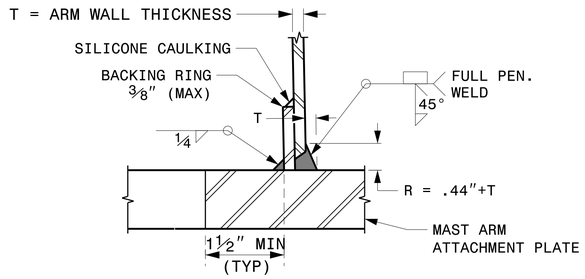
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

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

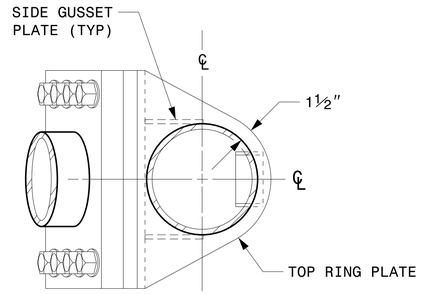
03-OCT-2023 12:25
S:*ITS\SIG\M*ITS\Signals\Signal Design Section\Structures\Drawings*2024 Metal Pole Std Drawings for LRFD*2024 Sig.M4 Std. Fabrication Details-Mast Arm Poles.dgn
kcdurigon

WELDED RING STIFFENED MAST ARM CONNECTION

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



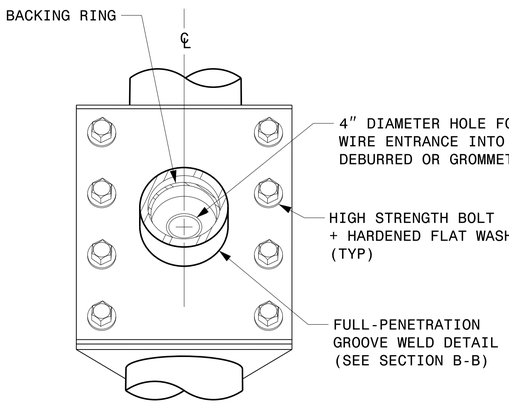
SECTION B-B
FULL-PENETRATION GROOVE WELD DETAIL



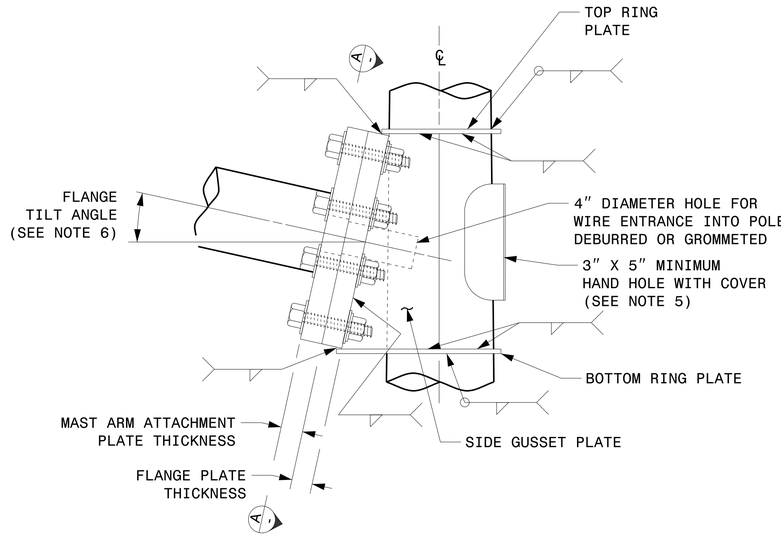
PLAN VIEW

NOTES:

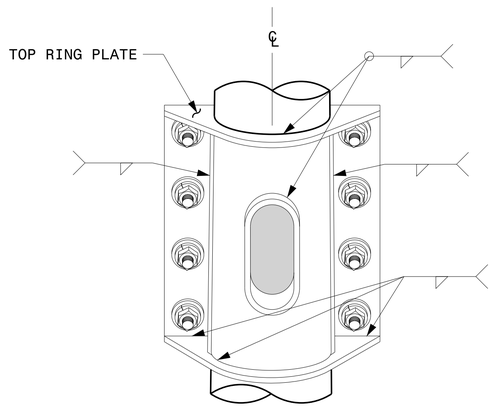
1. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ABOVE THE MAST ARM TO INDICATE PROPER ATTACHMENT ORIENTATION OF THE MAST ARM.
2. DESIGNER WILL DETERMINE THE SIZE OF ALL STRUCTURAL COMPONENTS, PLATES, FASTENERS, AND WELDS SHOWN UNLESS THEY ARE ALREADY SPECIFIED.
3. FABRICATOR IS RESPONSIBLE FOR PROVIDING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



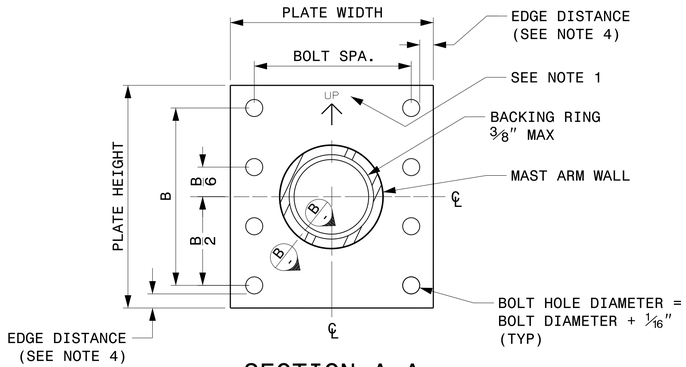
FRONT ELEVATION VIEW



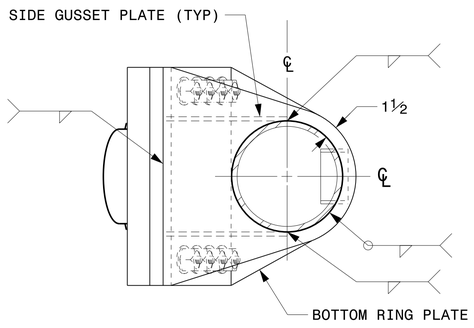
SIDE ELEVATION VIEW



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
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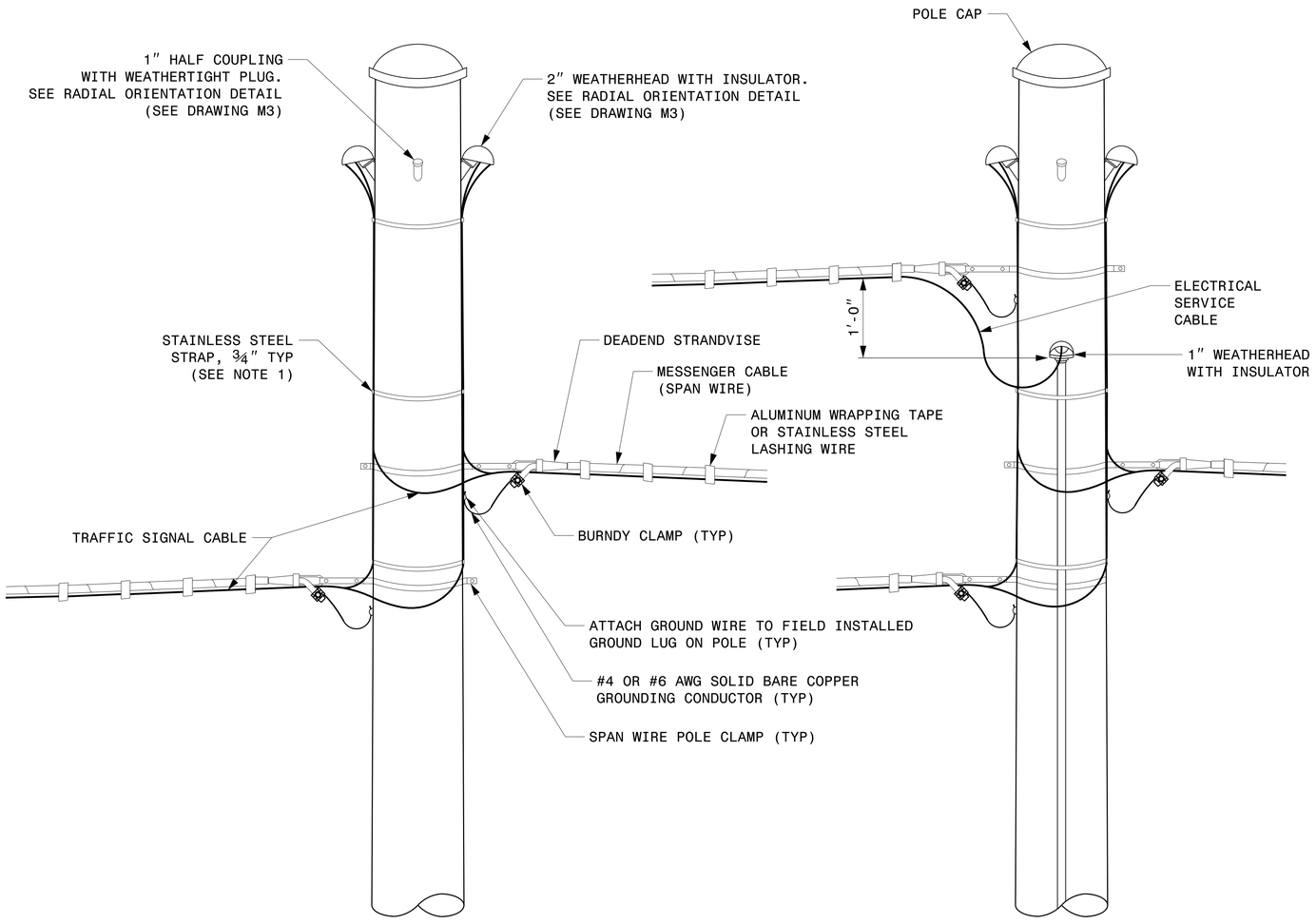
4B23DC79B3784DA...
09/21/2023
DATE

Fabrication Details – Mast Arm Connection

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

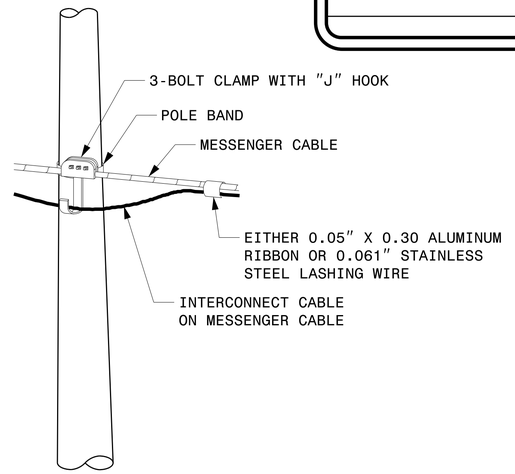
Fabrication Details – Strain Pole Attachments



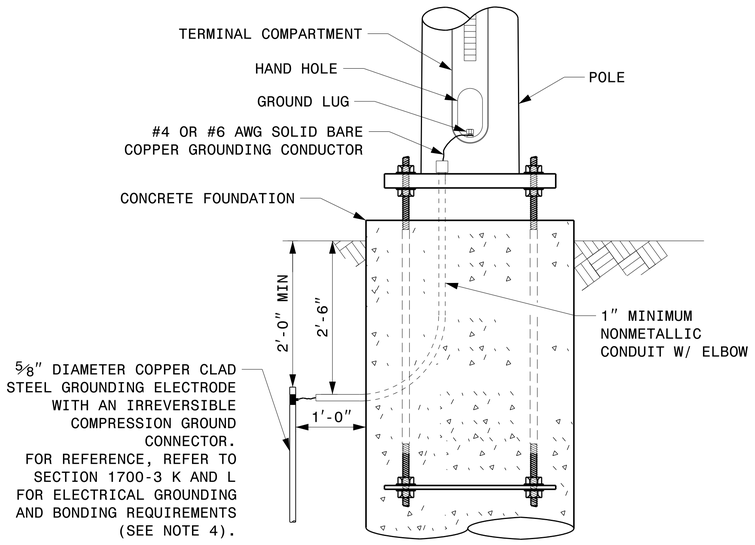
STRAIN POLE ATTACHMENTS

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

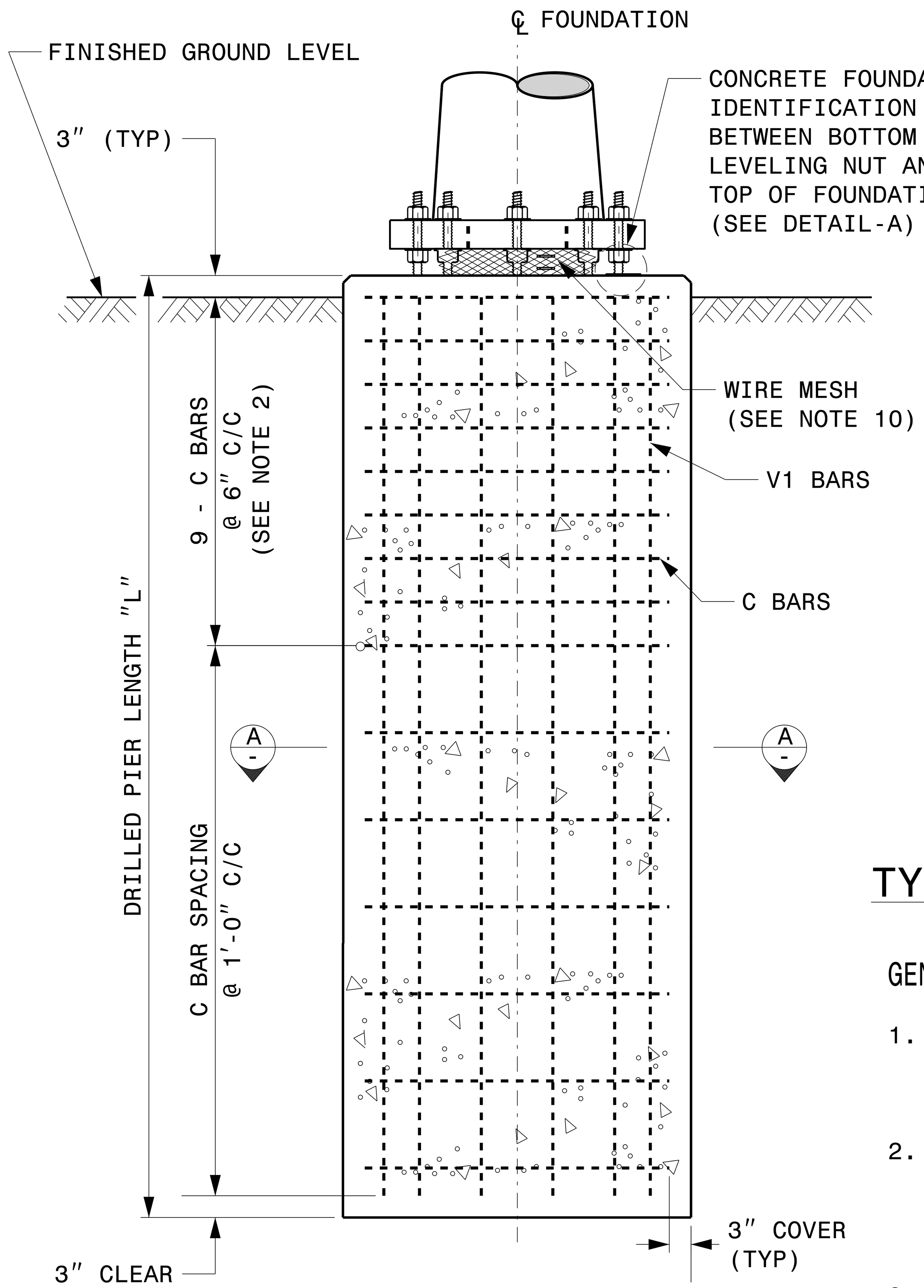
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 036626 ENGINEER KEVIN C. DURIGON

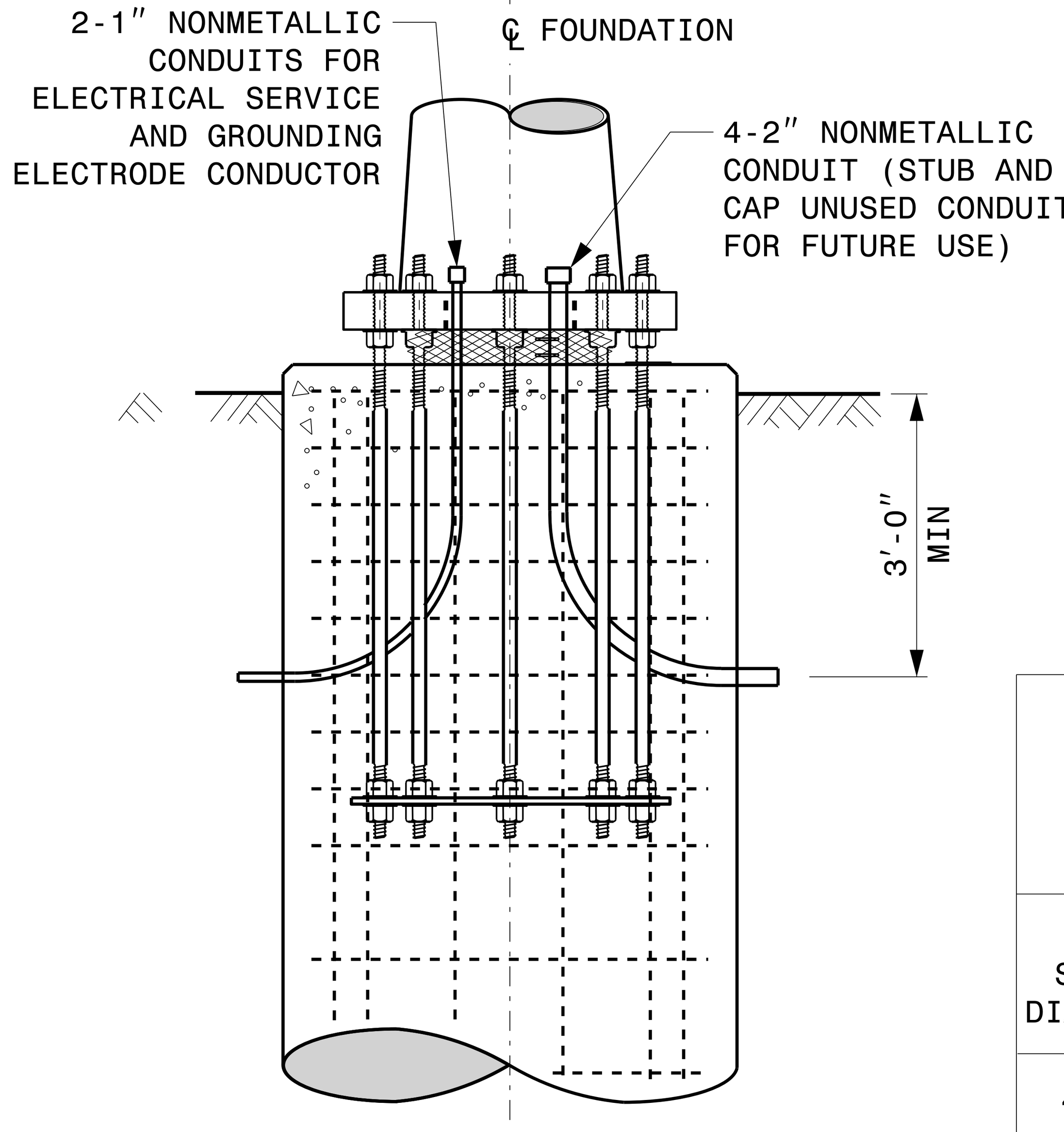
DocuSigned by:
Kevin Durigon
SIGNATURE
4B23DC79B3784DA...
09/21/2023
DATE

PROJECT I.D. NO.	SHEET NO.
	Sig.M7

Construction Details – Foundations



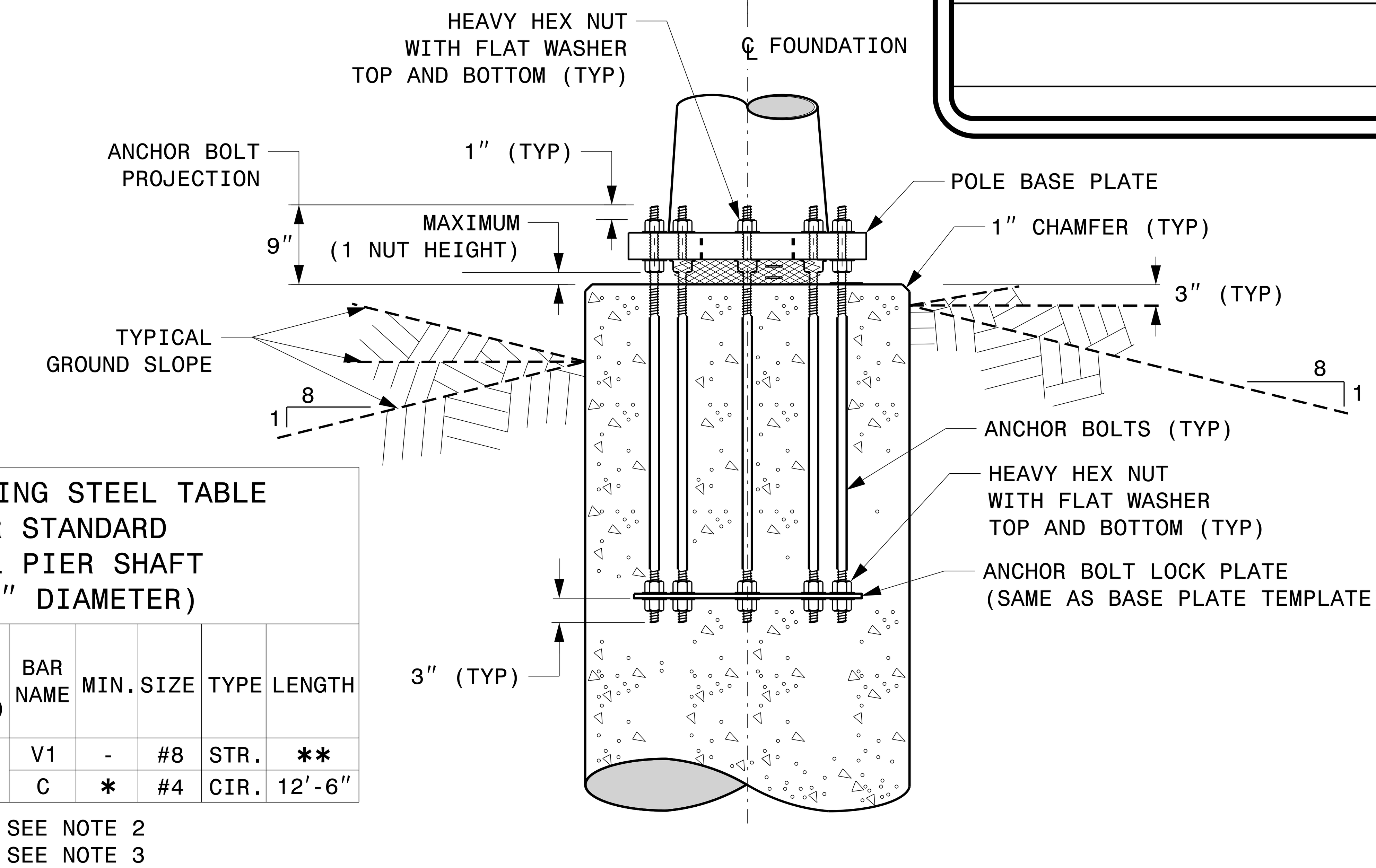
CONCRETE SHAFT ELEVATION



TYPICAL FOUNDATION CONDUIT DETAILS

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

* SEE NOTE 2
** SEE NOTE 3

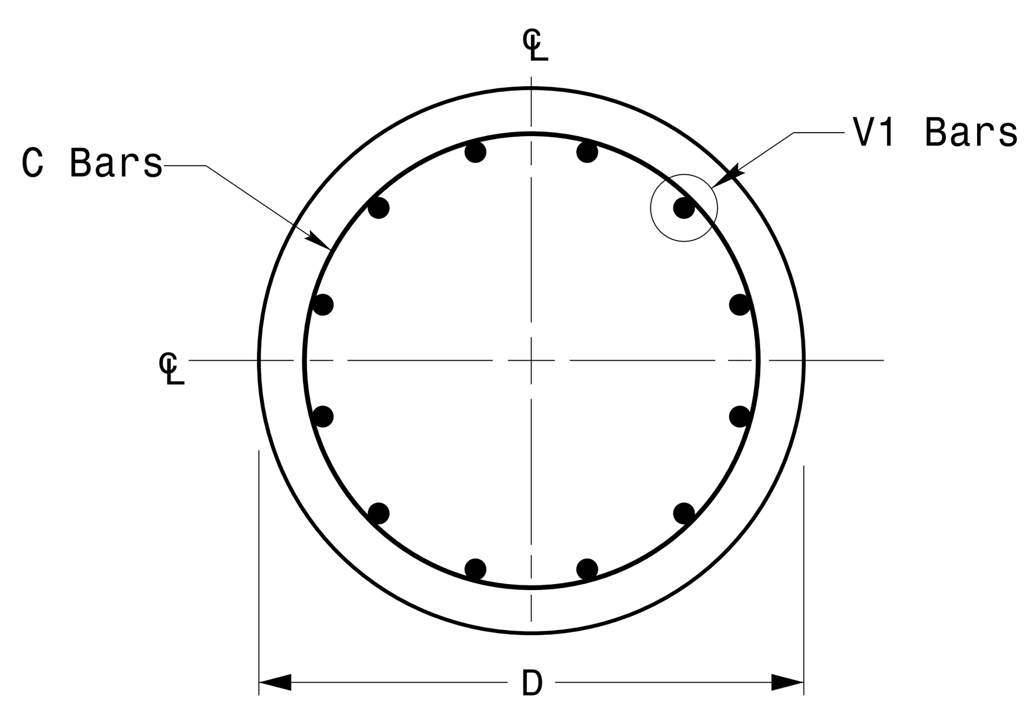


TYPICAL FOUNDATION ANCHOR BOLT DETAILS
(REINFORCING CAGE NOT SHOWN FOR CLARITY)

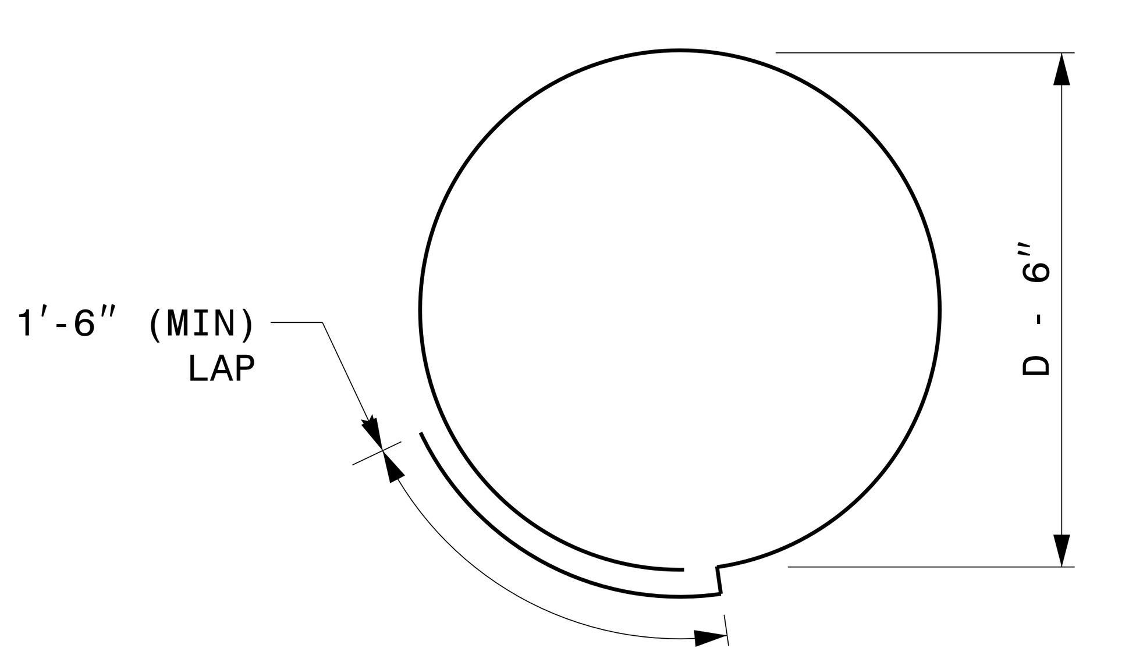
GENERAL NOTES:

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.

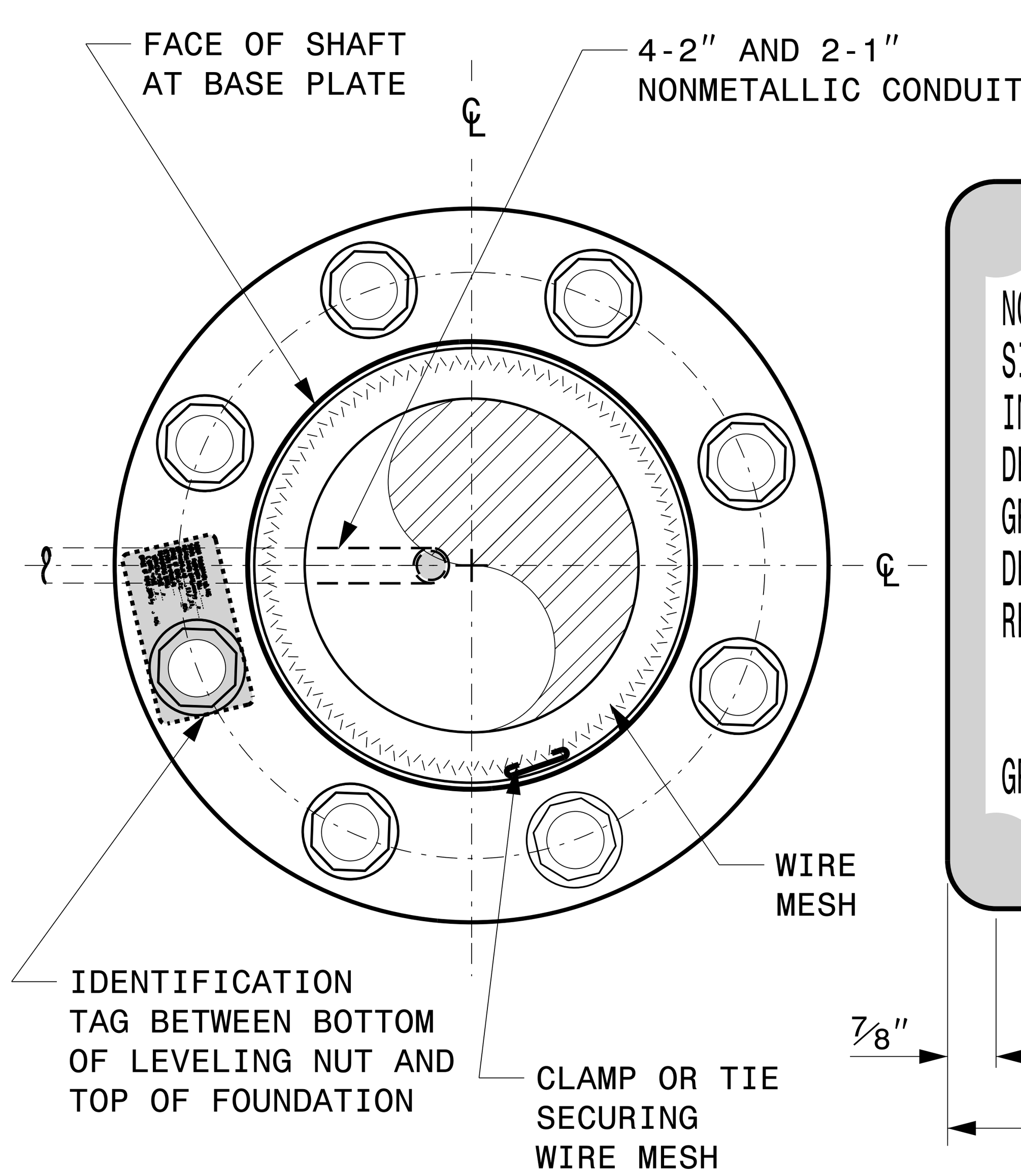
   https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx
7. USE AIR ENTRAINED AA CONCRETE MIX WITH A COMPRESSION STRENGTH OF f′c=4500 psi (MIN) AFTER 28 DAYS.
8. USE ASTM A615 GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL. MAINTAIN AT LEAST 3″ COVER ON ALL REINFORCEMENT.
9. LOCATE 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.



SECTION A-A

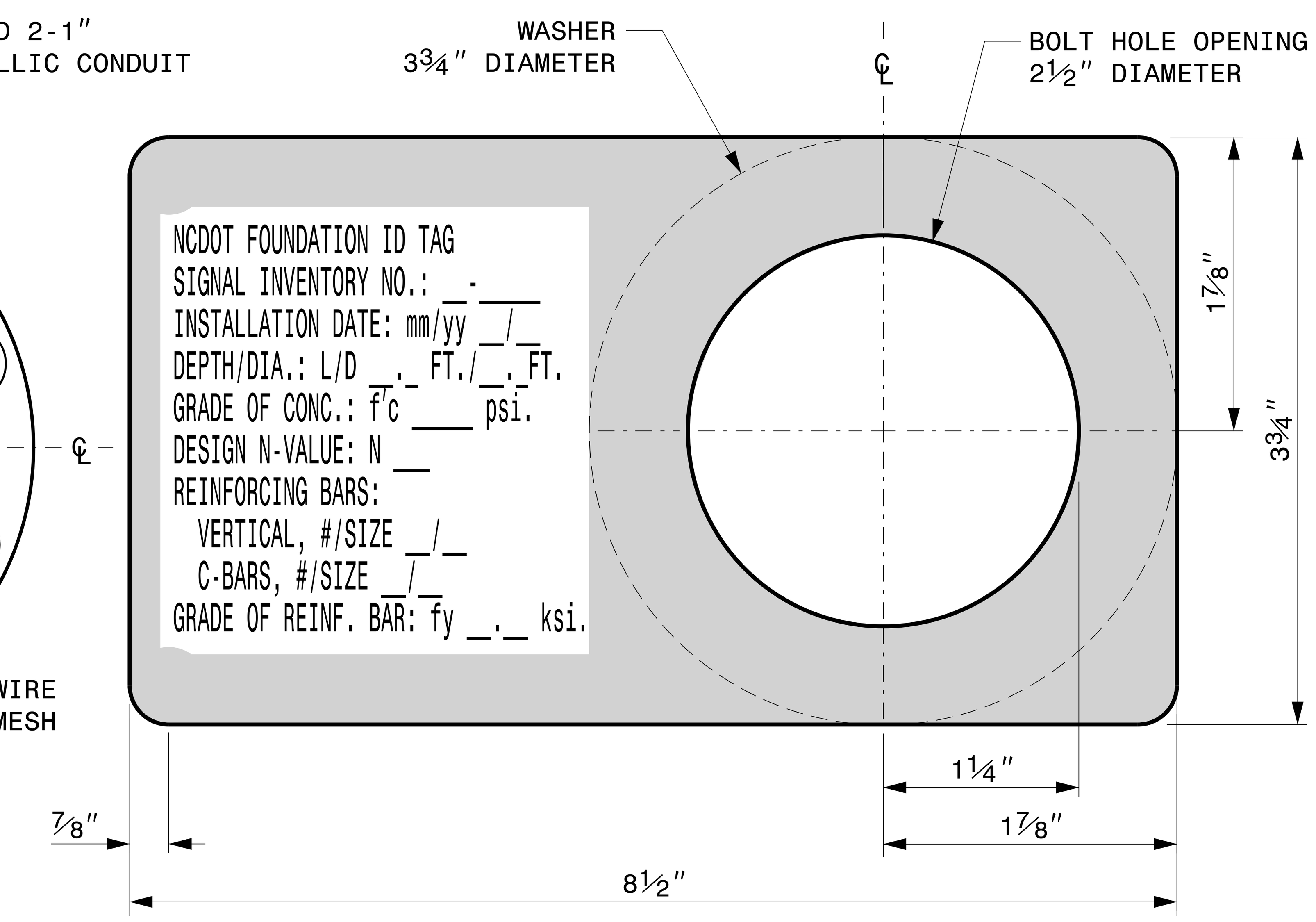


TYPICAL "C" BAR DETAIL



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 SEAL 036626 ENGINEER KEVIN C. DURIGON

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

03-OCT-2023 12:45
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kcdurigon

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: Axial (kip)	Reactions at the Pole Base: Shear (kip)	Reactions at the Pole Base: Moment (ft–kip)	Clay: Medium N–Value 4–8	Clay: Stiff N–Value 9–15	Clay: Very Stiff N–Value 16–30	Clay: Hard N–Value >30	Sand: Loose N–Value 4–10	Sand: Medium N–Value 11–30	Sand: Dense N–Value >30	Longitudinal: Bar Size (#)	Longitudinal: Quantity (ea.)	Stirrups: Bar Size (#)	Stirrups: 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.

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

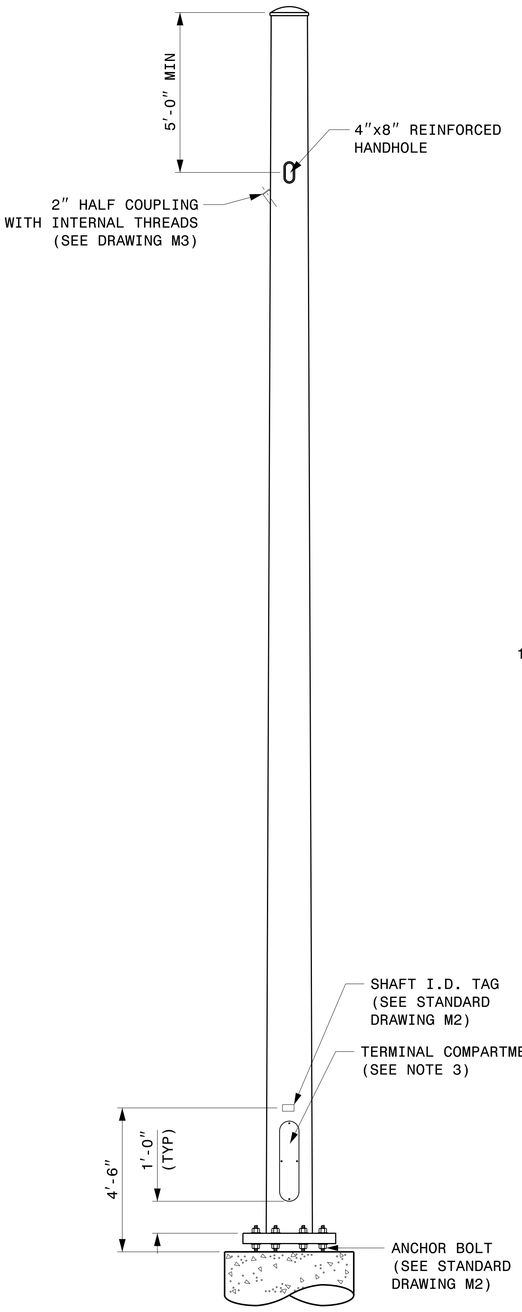
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 036626 KEVIN C. DURIGON

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

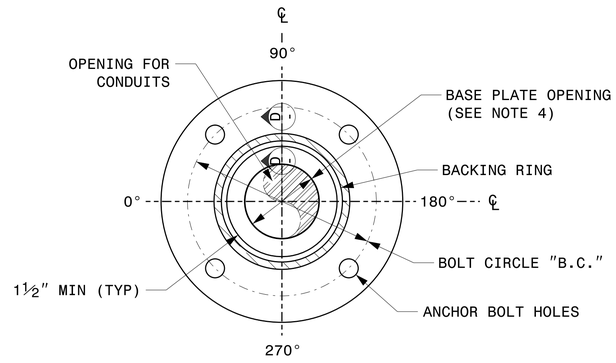
PROJECT I.D. NO.	SHEET NO.
	Sig.M9

Fabrication Details – CCTV Camera Poles

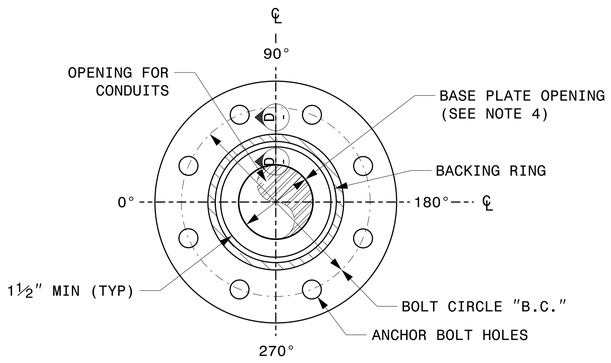


CCTV CAMERA POLE

(NOT TO SCALE)

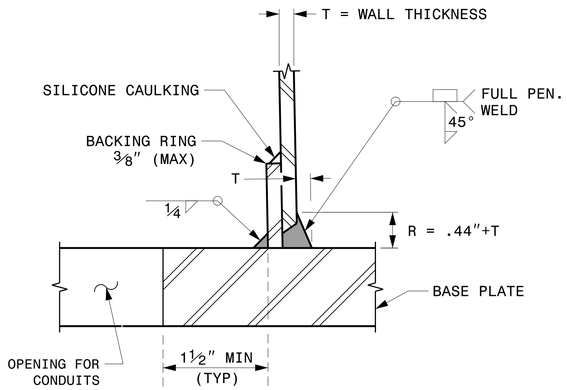


4 BOLT PATTERN
FOR POLES UP TO 40'



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
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09/21/2023
DATE

03-OCT-2023 12:51
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kcdurigon