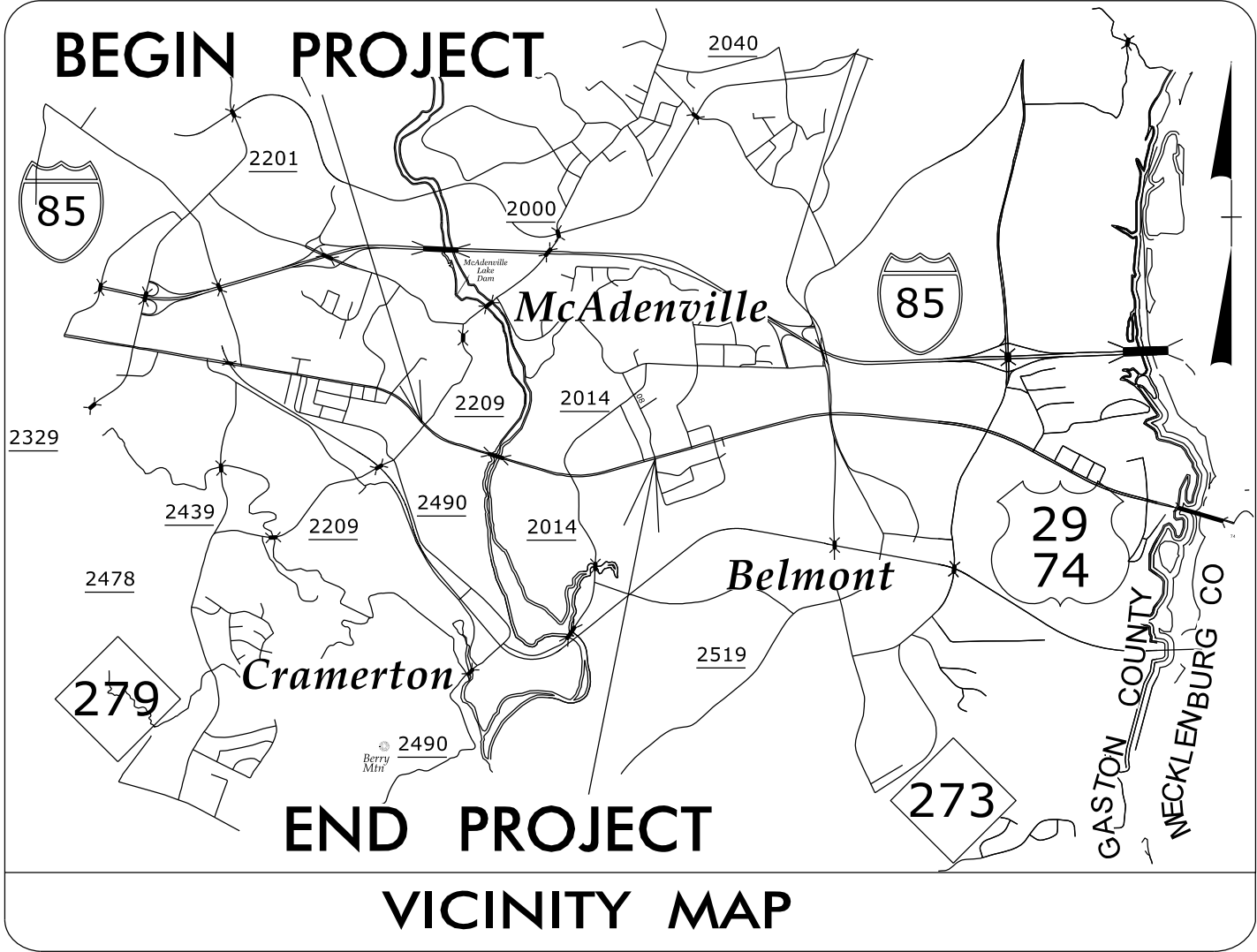


09/08/24

TIP PROJECT: U-6146/B-5857

CONTRACT:



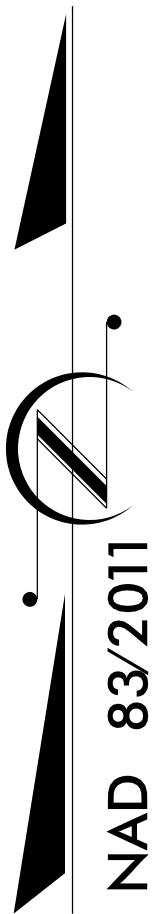
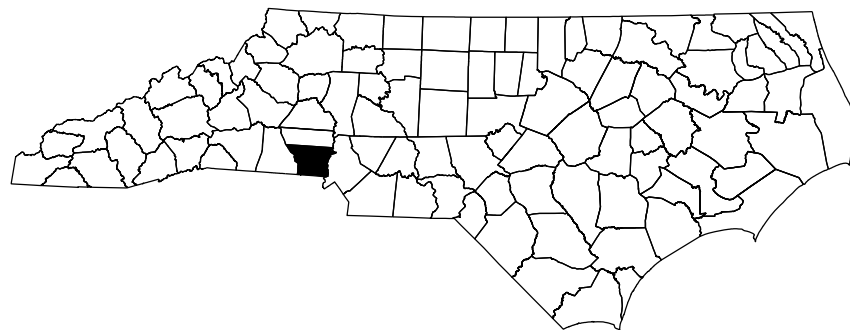
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GASTON COUNTY

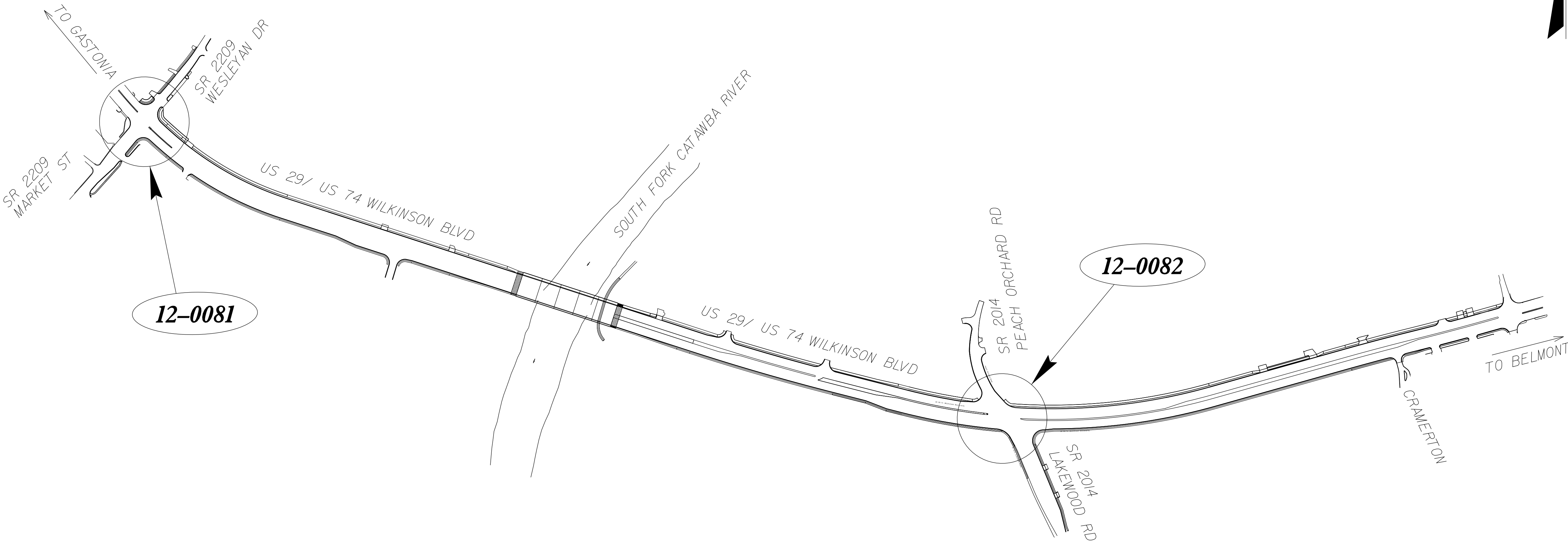
LOCATION: US 29/US 74 (WILKINSON BLVD) FROM SR 2209 (WESLEYAN DR/MARKET ST) TO SR 2016/SR 2017 (GEORGIA BELLE AVE/HUBBARD ST) COMBINED WITH B-5857.

TYPE OF WORK: TRAFFIC SIGNALS AND SIGNAL COMMUNICATION

Project No.	Sheet No.
U-6146/B-5857	Sig. 1.0



NAD 83/2011



INDEX OF PLANS

Sheet #	Reference #	Location /Description
Sig. 1.0	-----	Title Sheet
Sig. 2.0-5.4	12-0081	US 29-74 (Wilkinson Blvd) at SR 2209 (Market St/Wesleyan Dr)
Sig. 6.0-12.1	12-0082	US 29-74 (Wilkinson Blvd) at SR 2209 (Market St/Wesleyan Dr)
MI-M9	-----	Standard Metal Pole Details
SCP. 1-7 SPL. 1-4	-----	Signal Communication Plans

LEGEND

##-####

SIGNAL INVENTORY NUMBER

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

R. Nicholas Zinser, PE – Western Region Signals Engineer

Todd Joyce, PE – Signal Equipment Design Engineer

Gregory A. Green – Signal Communications Project Engineer

Heidi Berggren, EI – Signal Communications Project Design Engineer

Prepared for the North Carolina Department of Transportation
In the Office of:



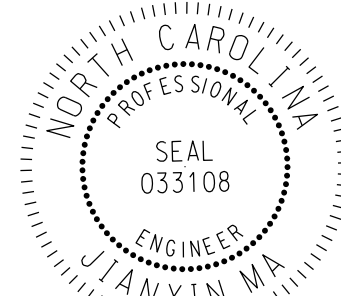
VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606
919.829.0328

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

Jimmy Terry, PE
PROJECT ENGINEER

Jianxin(Justine) Ma, PE PTOE
PROJECT DESIGN ENGINEER

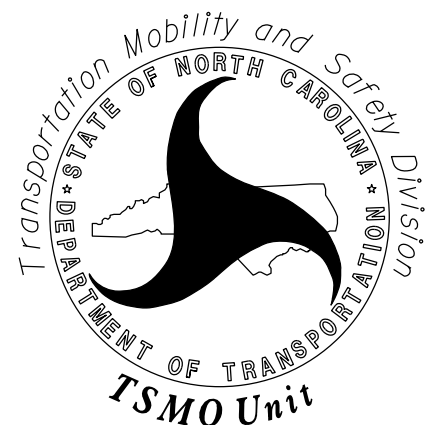
SEAL



DocuSigned by:
Jianxin Ma
027E1953081444F...

11/5/2023
DATE

**DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY
AND SAFETY DIVISION**



750 N. Greenfield Parkway, Garner, NC 27529

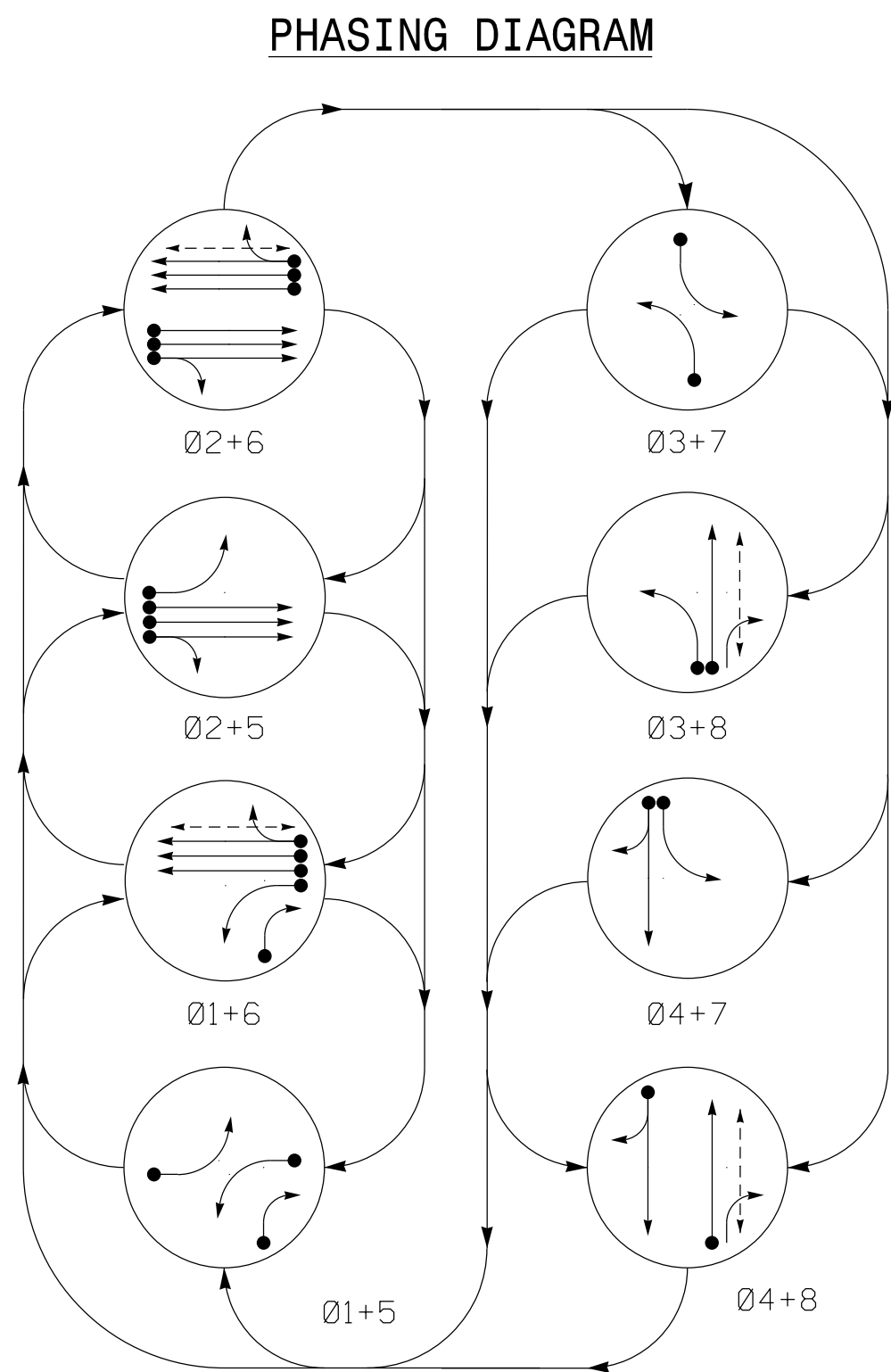
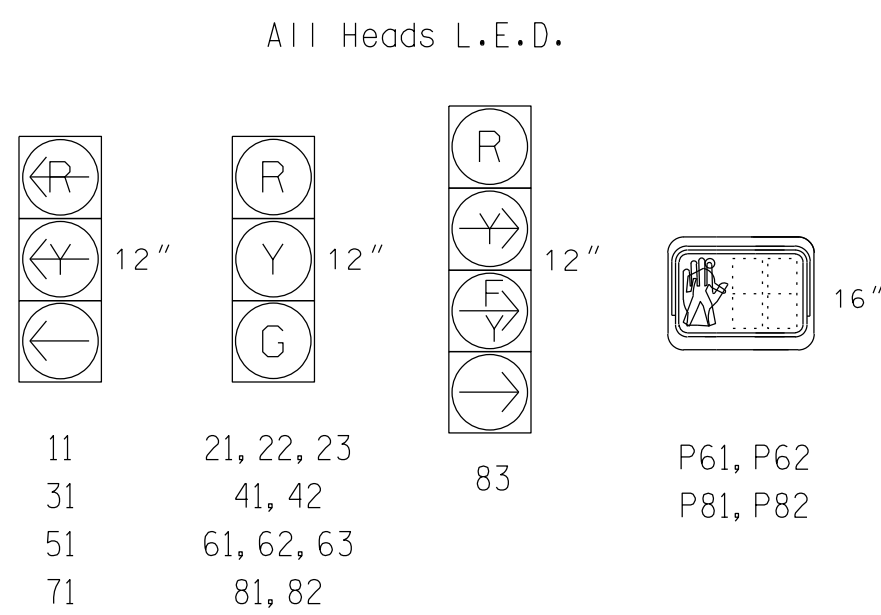


TABLE OF OPERATION								
SIGNAL FACE	PHASE							
	0 1 + 5	0 1 + 6	0 2 + 5	0 2 + 6	0 3 + 7	0 3 + 8	0 4 + 8	F A S H
11	←	←	←	←	←	←	←	←
21,22,23	R	R	G	G	R	R	R	Y
31	←	←	←	←	←	←	←	←
41,42	R	R	R	R	R	G	G	R
51	←	←	←	←	←	←	←	←
61,62,63	R	G	R	G	R	R	R	Y
71	←	←	←	←	←	←	←	←
81, 82	R	R	R	R	G	R	G	R
83	→	→	R	R	R	$\frac{E}{Y}$	$\frac{E}{Y}$	
P61, P62	DW	W	DW	W	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	DW	DRK



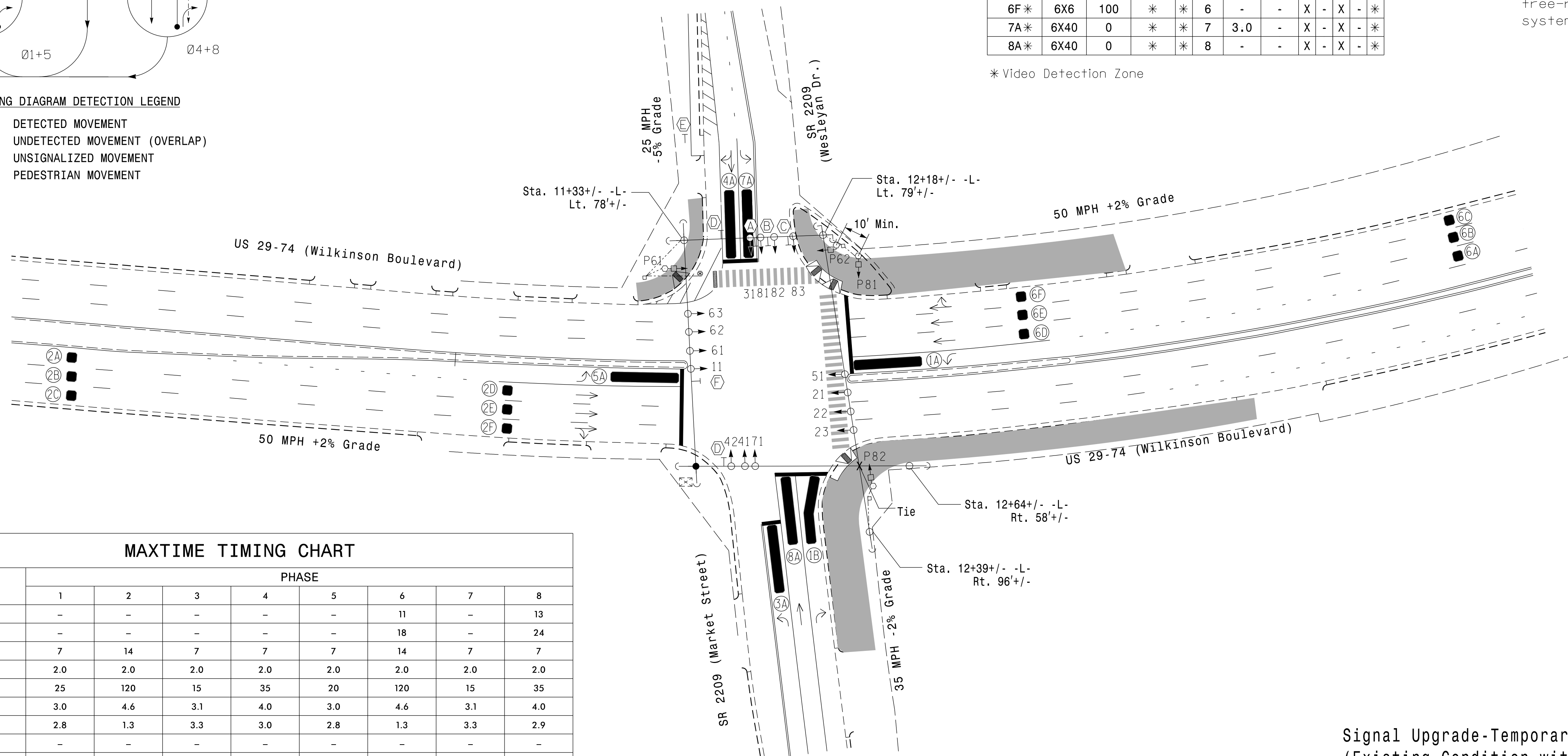
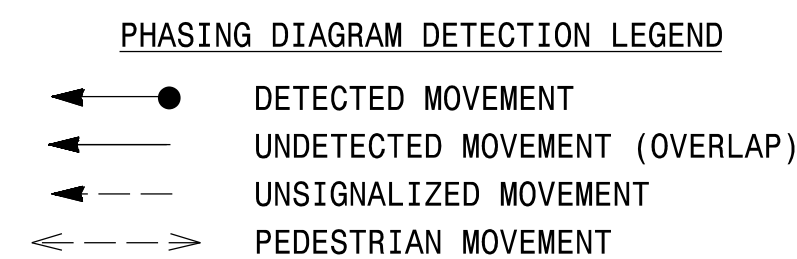
MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A *	6X40	0	*	*	1	-	-	X	-	X	-	*
1B *	6X40	0	*	*	1	15.0	-	X	-	X	-	*
2A *	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2B *	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2C *	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2D *	6X6	100	*	*	2	-	-	X	-	X	-	*
2E *	6X6	100	*	*	2	-	-	X	-	X	-	*
2F *	6X6	100	*	*	2	-	-	X	-	X	-	*
3A *	6X40	0	*	*	3	3.0	-	X	-	X	-	*
4A *	6X40	0	*	*	4	-	-	X	-	X	-	*
5A *	6X40	0	*	*	5	-	-	X	-	X	-	*
6A *	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6B *	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6C *	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6D *	6X6	100	*	*	6	-	-	X	-	X	-	*
6E *	6X6	100	*	*	6	-	-	X	-	X	-	*
6F *	6X6	100	*	*	6	-	-	X	-	X	-	*
7A *	6X40	0	*	*	7	3.0	-	X	-	X	-	*
8A *	6X40	0	*	*	8	-	-	X	-	X	-	*

* Video Detection Zone

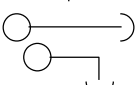
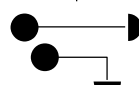
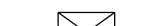
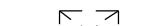
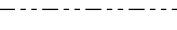
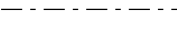
- 8 Phase
Fully Actuated
Belmont Signal System

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. 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. Pavement markings are existing.
9. Install new 2070LX controller inside the existing cabinet.
10. This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



MAXTIME TIMING CHART								
FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	–	–	–	–	–	11	–	13
Ped Clear *	–	–	–	–	–	18	–	24
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max l *	25	120	15	35	20	120	15	35
Yellow Change	3.0	4.6	3.1	4.0	3.0	4.6	3.1	4.0
Red Clear	2.8	1.3	3.3	3.0	2.8	1.3	3.3	2.9
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–	–	–
Advance Walk	–	–	–	–	–	3	–	3
Non Lock Detector	X	–	X	X	X	–	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL	–	–
Dual Entry	–	–	–	–	–	–	–	–

PROPOSED		EXISTING	
	Traffic Signal Head		
	Modified Signal Head		N/A
	Sign		
	Pedestrian Signal Head		
	With Push Button & Sign		
	Signal Pole with Sidewalk Guy		
	Inductive Loop Detector		
	Controller & Cabinet		
	Junction Box		
	2-in Underground Conduit		
N/A	Right of Way		
	Directional Arrow		
	Type I Pushbutton Post		
	Type II Signal Pedestal		
N/A	Curb Ramp		
	Video Detection Zone		N/A
	Construction Zone		N/A
(A)	Left Arrow "ONLY" Sign (R3-5L)	(A)	
(B)	Through Arrow "ONLY" Sign (R3-5A)	(B)	
(C)	Right Arrow "ONLY" Sign (R3-5R)	(C)	
(D)	"NO TURN ON RED" Sign (R10-11)	(D)	
(E)	Pedestrian Crossing Sign (W11-2) w/ Downward Arrow Plaque (W16-7P)	(E)	
(F)	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	(F)	

Signal Upgrade-Temporary Design 1
(Existing Condition with New Temporary Poles)



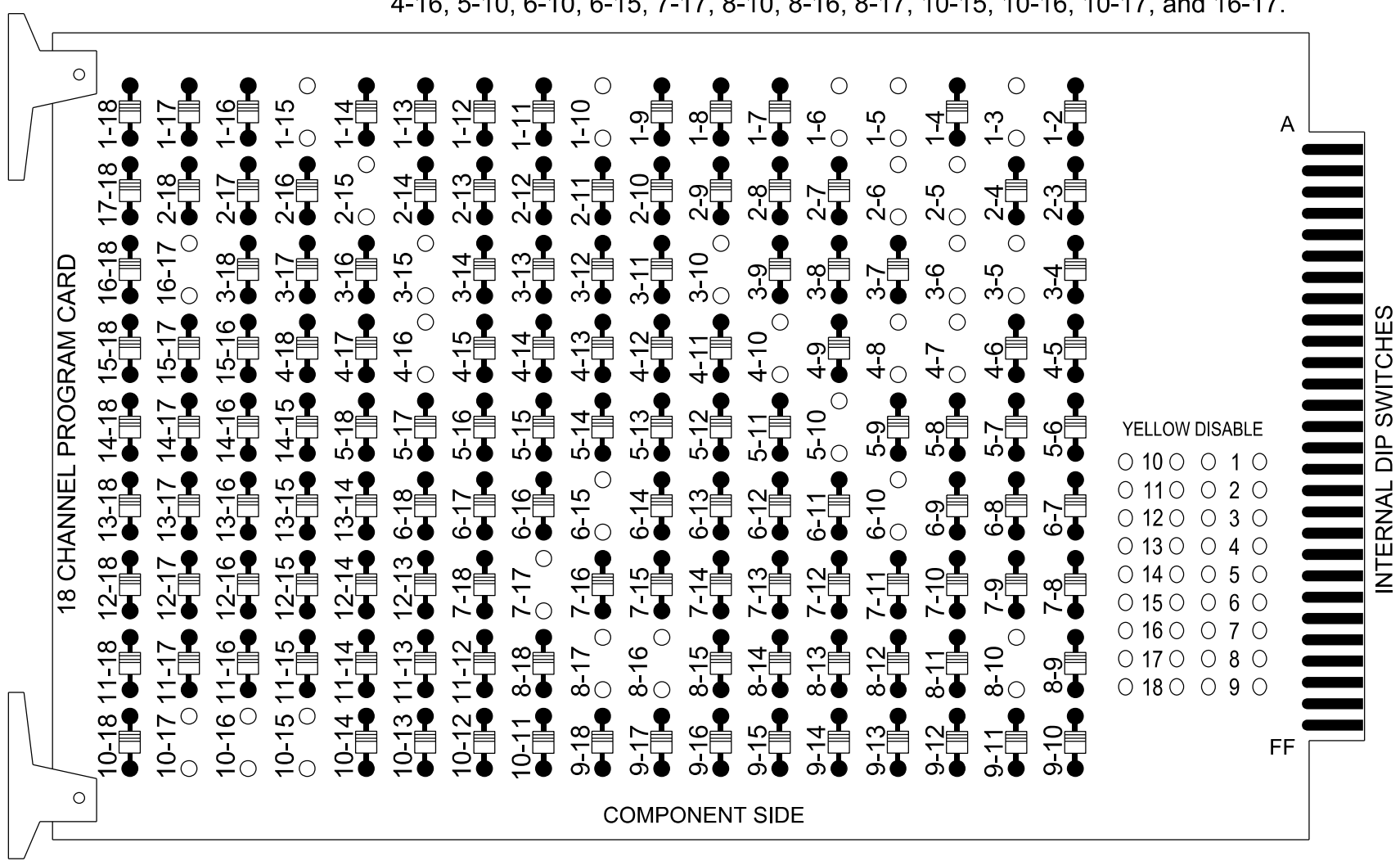
vhb
VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

Prepared For the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529 	US 29-74 (Wilkinson Boulevard) at SR 2209 (Market Street / Wesleyan Drive) Division 12 Gaston County McAdenville PLAN DATE: October 2023 REVIEWED BY: M. L. Styles PREPARED BY: J. Ma REVIEWED BY: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">REVISIONS</th> <th style="width: 20%;">INIT.</th> <th style="width: 20%;">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																															SEAL  DocuSign'd by  11/5/2023 SIC. INVENTORY NO. 12-008121
REVISIONS	INIT.	DATE																																	

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 1-15, 2-5, 2-6, 2-15, 3-5, 3-6, 3-10, 3-15, 4-7, 4-8, 4-10, 4-16, 5-10, 6-10, 6-15, 7-17, 8-10, 8-16, 8-17, 10-15, 10-16, 10-17, and 16-17.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S9,S10,S11,
S12,AUXS2,AUXS3
Phases Used.....1,2,3,4,5,6,6PED,7,8,8PED
Overlap "2".....*
Overlap "5".....*
Overlap "7".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

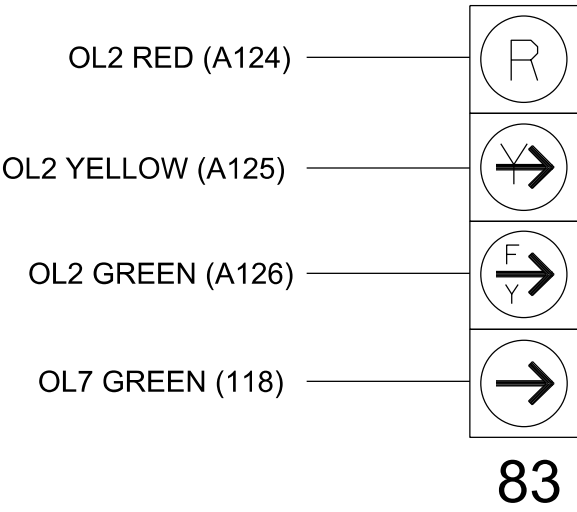
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	OL5	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22,23	NU	83	41,42	NU	51	61,62,63	P61, P62	71	81,82	P81, P82	NU	83	31	NU	NU	NU
RED		128			101			134			107			A124				
YELLOW		129		*	102			135			108							
GREEN		130			103			136			109							
RED ARROW	125						131			122					A111			
YELLOW ARROW	126						132			123					A125	A112		
FLASHING YELLOW ARROW															A126			
GREEN ARROW	127			118			133			124					A113			
HAND									119			110						
PEDESTRIAN									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.

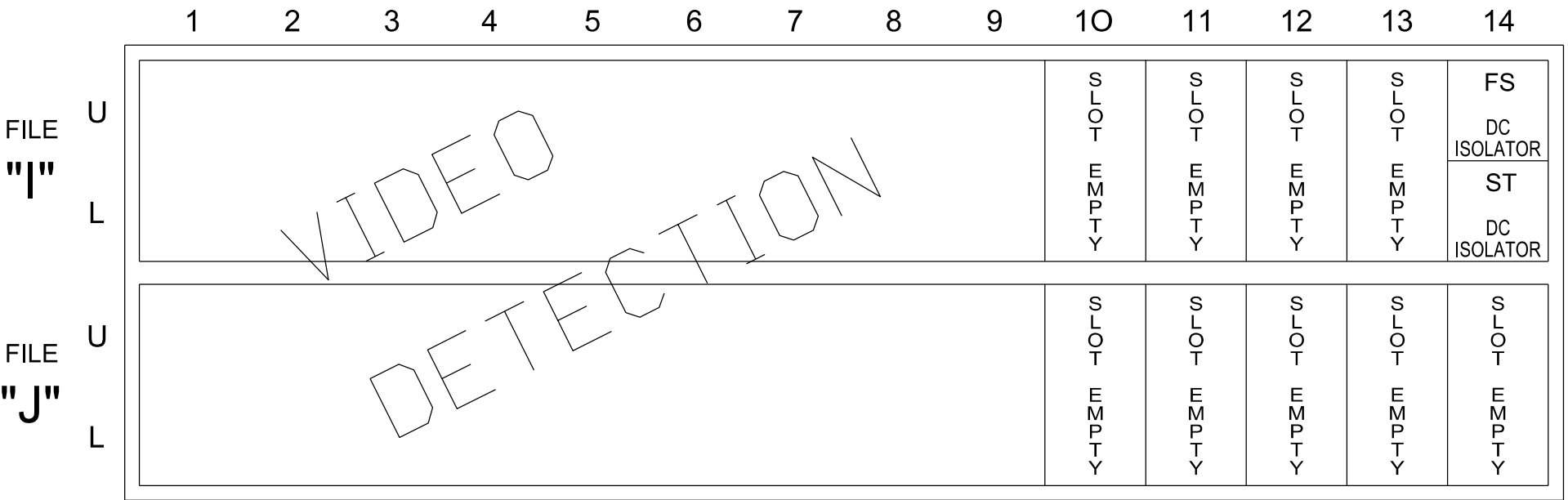
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

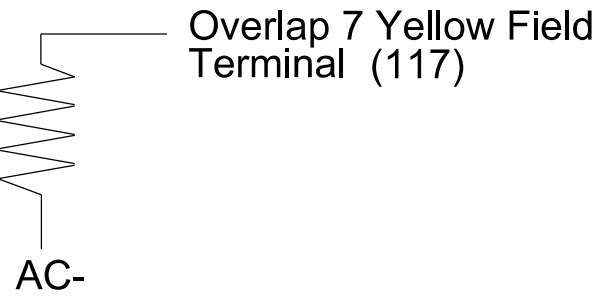
SPECIAL DETECTOR NOTE

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

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)



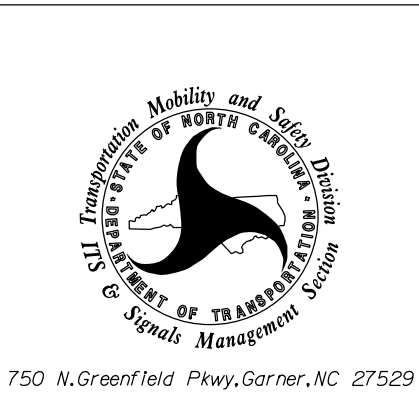
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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 ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081T1
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Sheet 1 of 2-Temporary Design 1

ELECTRICAL AND PROGRAMMING
DETAILS FOR:



750 N.Greenfield Pkwy,Garner,NC 27529

US 29-74 (Wilkinson Boulevard)

at
SR 2209 (Market Street /
Wesleyan Drive)

Division 12 Gaston County Belmont

PLAN DATE: October 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

REVISIONS INIT. DATE

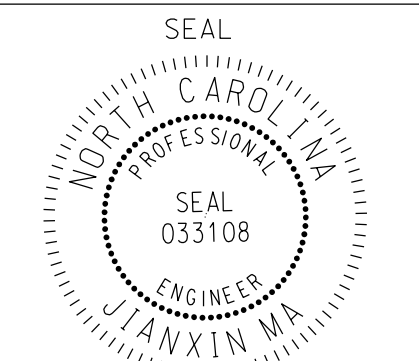
DocuSigned by: 11/5/2023

827E1953081444F DATE

SIG. INVENTORY NO. 12-0081T1



DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED



DocuSigned by: 11/5/2023

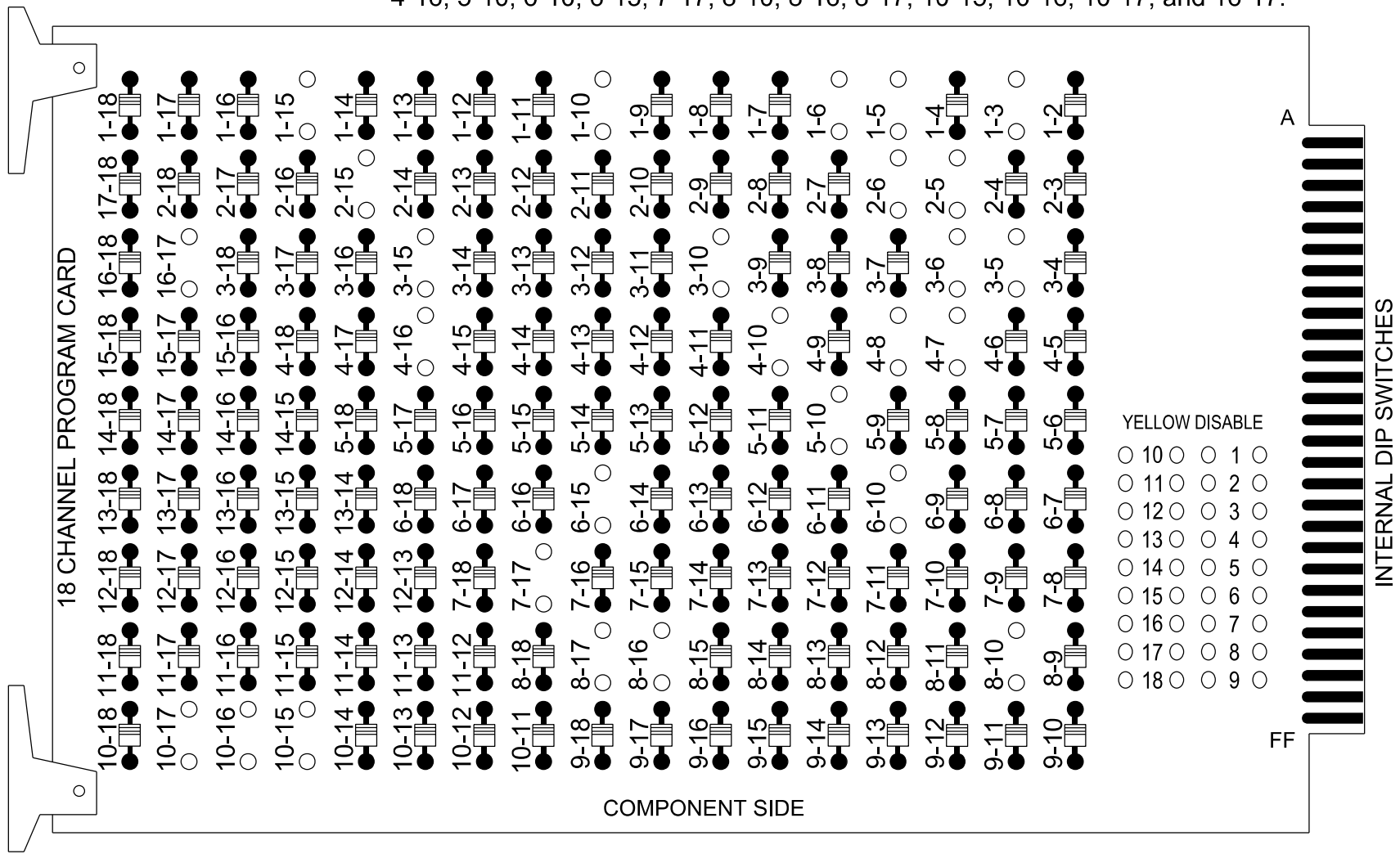
827E1953081444F DATE

SIG. INVENTORY NO. 12-0081T1

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 1-15, 2-5, 2-6, 2-15, 3-5, 3-6, 3-10, 3-15, 4-7, 4-8, 4-10, 4-16, 5-10, 6-10, 6-15, 7-17, 8-10, 8-16, 8-17, 10-15, 10-16, 10-17, and 16-17.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
- Program controller to start up in phase 2 Green No Walk and phase 6 No Walk.
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- The cabinet and controller are part of the Belmont Signal System.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S9,S10,S11,
S12,AUXS2,AUXS3
Phases Used.....1,2,3,4,5,6,6PED,7,8,8PED
Overlap "2".....*
Overlap "5".....*
Overlap "7".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

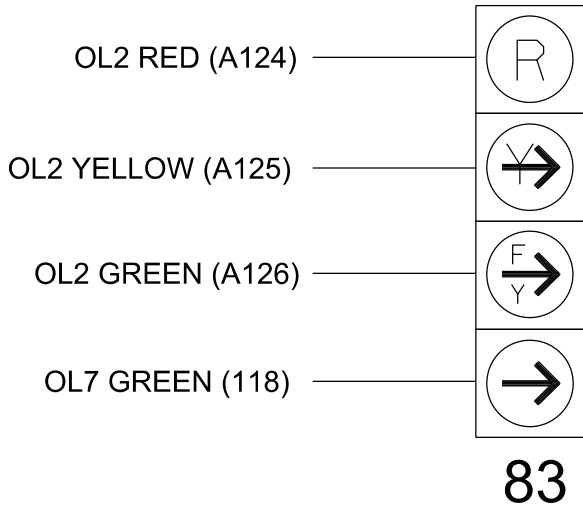
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	OL5	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22,23	NU	83★	41,42	NU	51	61,62,63	P61, P62	71	81,82	P81, P82	NU	83★	31	NU	NU	NU
RED		128			101			134			107			A124				
YELLOW		129		★	102			135			108							
GREEN		130			103			136			109							
RED ARROW	125						131			122					A111			
YELLOW ARROW	126						132			123				A125	A112			
FLASHING YELLOW ARROW														A126				
GREEN ARROW	127			118			133			124					A113			
Hand									119			110						
Walking Person								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.

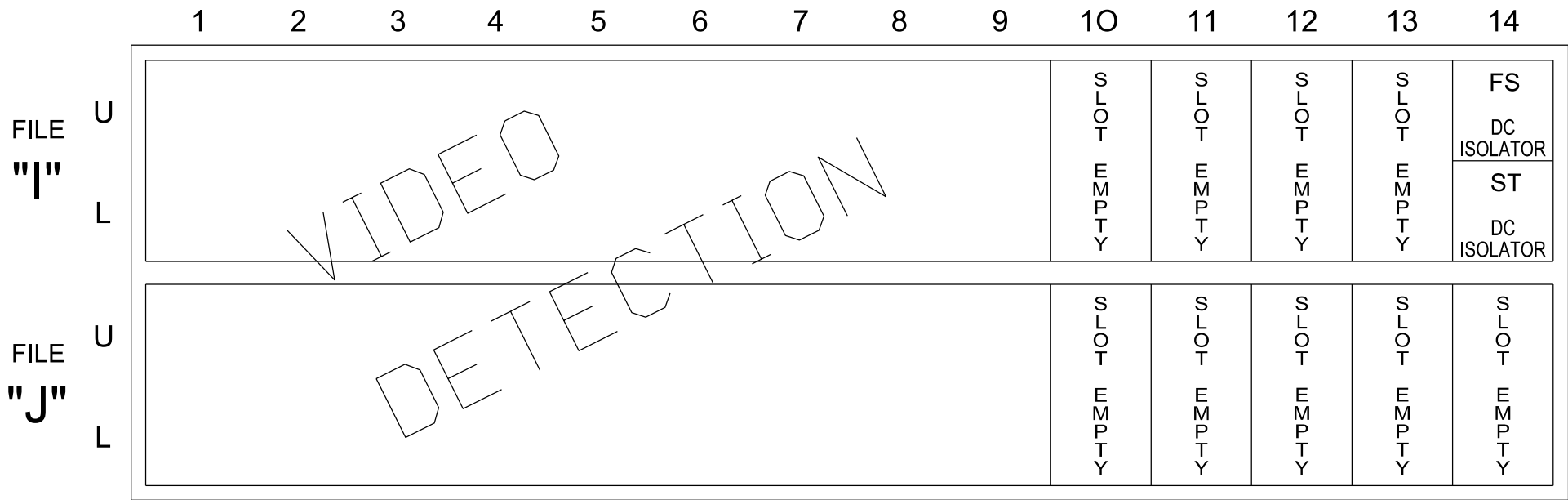
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

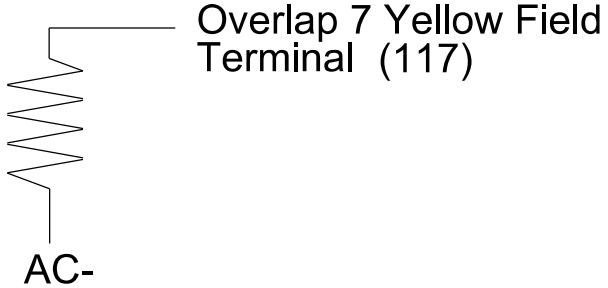
SPECIAL DETECTOR NOTE

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

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 ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081T2
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Sheet 1 of 2-Temporary Design 2

ELECTRICAL AND PROGRAMMING
DETAILS FOR:



750 N.Greenfield Pkwy,Garner,NC 27529

US 29-74 (Wilkinson Boulevard)
at
SR 2209 (Market Street /
Wesleyan Drive)

Division 12 Gaston County Belmont

PLAN DATE: October 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

REVISIONS INIT. DATE

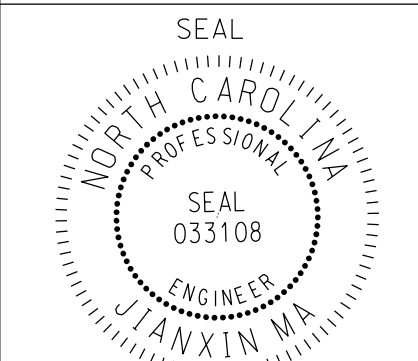
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11/5/2023

SIG. INVENTORY NO. I2-0081T2



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11/5/2023

SIG. INVENTORY NO. I2-0081T2

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

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

NOTICE CONTROL SOURCE 7
ASSIGNED TO CHANNEL 3 ➡

FLASHER CIRCUIT MODIFICATION DETAIL

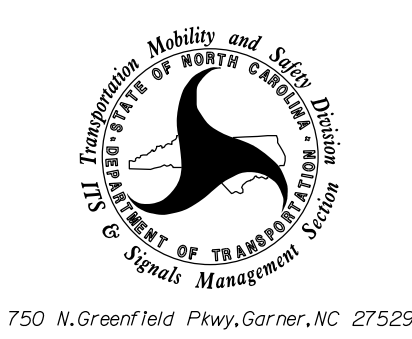
IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

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

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081T2
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Sheet 2 of 2-Temporary Design 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:		US 29-74 (Wilkinson Boulevard) at SR 2209 (Market Street / Wesleyan Drive) Division 12 Gaston County Belmont		
 750 N. Greenfield Pkwy, Garner, NC 27529	PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles		
	PREPARED BY: J. Ma	REVIEWED BY:		
	REVISIONS	INIT.	DATE	
		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JANXIN MA 11/5/2023 DATE 12-0081T2		



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 4.0

8 Phase
Fully Actuated
Belmont Signal System

NOTES

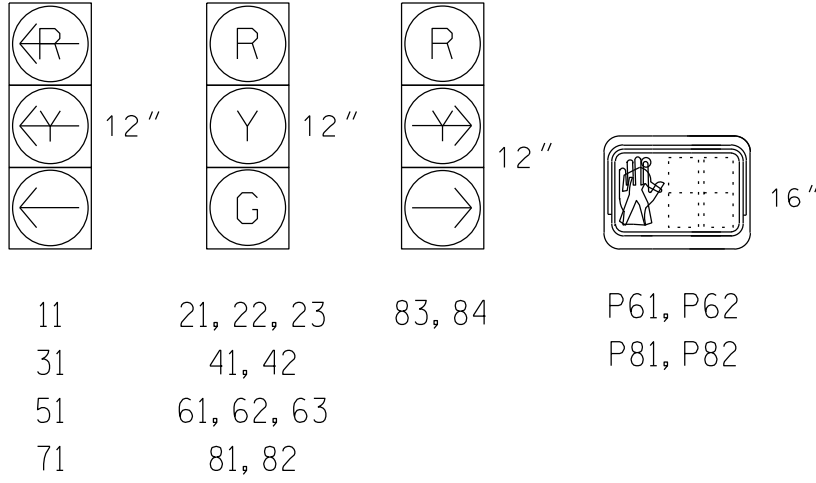
- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Reposition existing signal heads 31, 81, and 82.
- Replace existing 4 Section Flashing Yellow Arrow signal head 83 with 3 Section Flashing Yellow Arrow signal head.
- Remove existing Pedestrian Crossing Sign with Downward Arrow Plaque.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Sign E shall illuminate at the beginning of Phase 8 "Walk" interval, and shall terminate at the end of Phase 8 "Flashing Don't Walk" interval.

MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR						PROGRAMMING					
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
1A*	6X40	0	*	*	1	-	-	X	-	X	-
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-
2C*	6X6	355	*	*	2	-	1.9	X	-	X	-
2D*	6X6	100	*	*	2	-	-	X	-	X	-
2E*	6X6	100	*	*	2	-	-	X	-	X	-
2F*	6X6	100	*	*	2	-	-	X	-	X	-
3A*	6X40	0	*	*	3	3.0	-	X	-	X	-
4A*	6X40	0	*	*	4	-	-	X	-	X	-
5A*	6X40	0	*	*	5	-	-	X	-	X	-
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-
6C*	6X6	355	*	*	6	-	1.9	X	-	X	-
6D*	6X6	100	*	*	6	-	-	X	-	X	-
6E*	6X6	100	*	*	6	-	-	X	-	X	-
6F*	6X6	100	*	*	6	-	-	X	-	X	-
7A*	6X40	0	*	*	7	3.0	-	X	-	X	-
8A*	6X40	0	*	*	8	-	-	X	-	X	-

*Video Detection Zone

SIGNAL FACE I.D.

All Heads L.E.D.



SIGNAL FACE	PHASE										
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8	Ø 4 + 8 PED	FLASH	FSH
11	←	←	←	←	←	←	←	←	←	←	←
21,22,23	R	R	G	G	R	R	R	R	R	Y	
31	←	←	←	←	←	←	←	←	←	←	←
41,42	R	R	R	R	R	R	R	G	G	R	
51	←	←	←	←	←	←	←	←	←	←	←
61,62,63	R	G	R	G	R	R	R	R	R	Y	
71	←	←	←	←	←	←	←	←	←	←	←
81, 82	R	R	R	R	R	G	R	G	G	R	
83, 84	→	→	R	R	R	→	R	R	R	R	
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DW	DRK	
P81, P82	DW	DW	DW	DW	DW	DW	DW	DW	W	DRK	
* SIGN E	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF

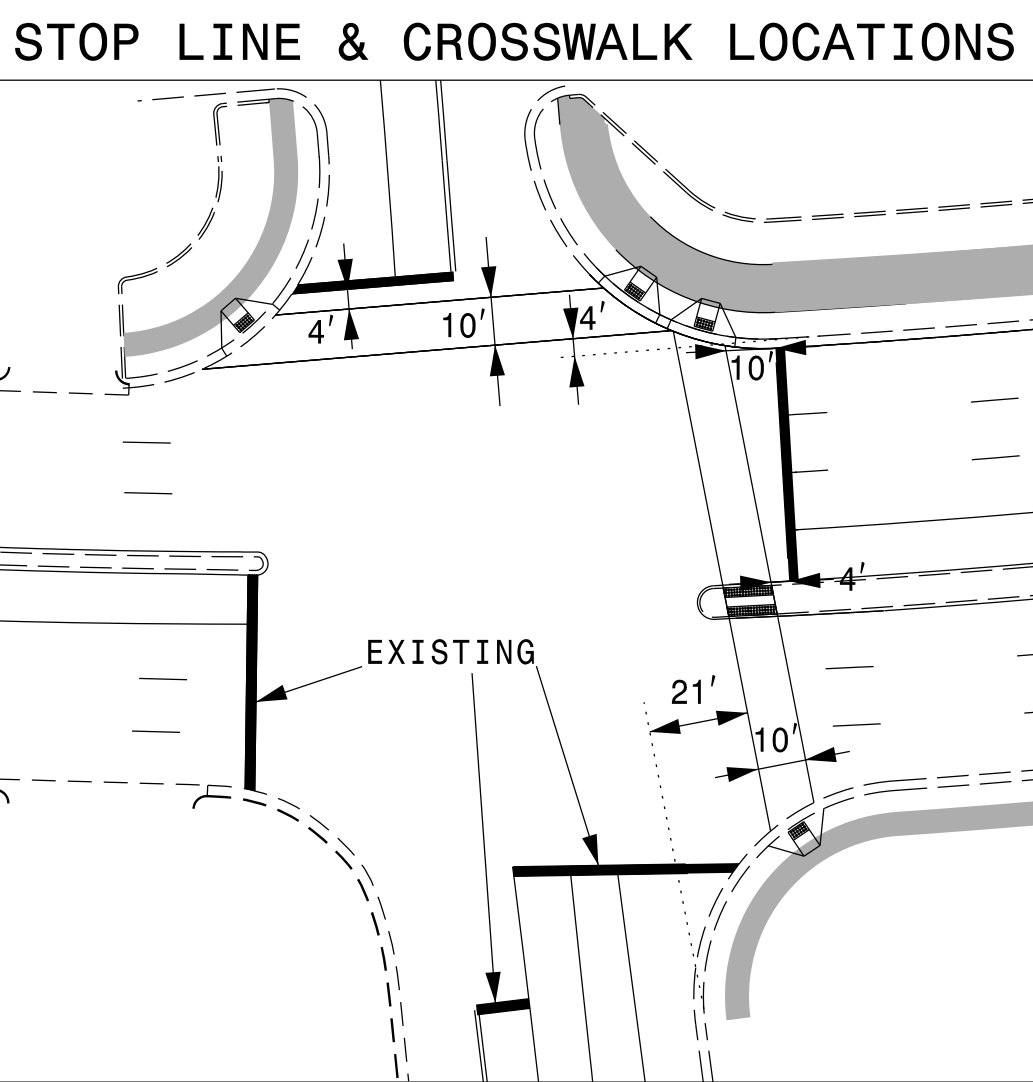
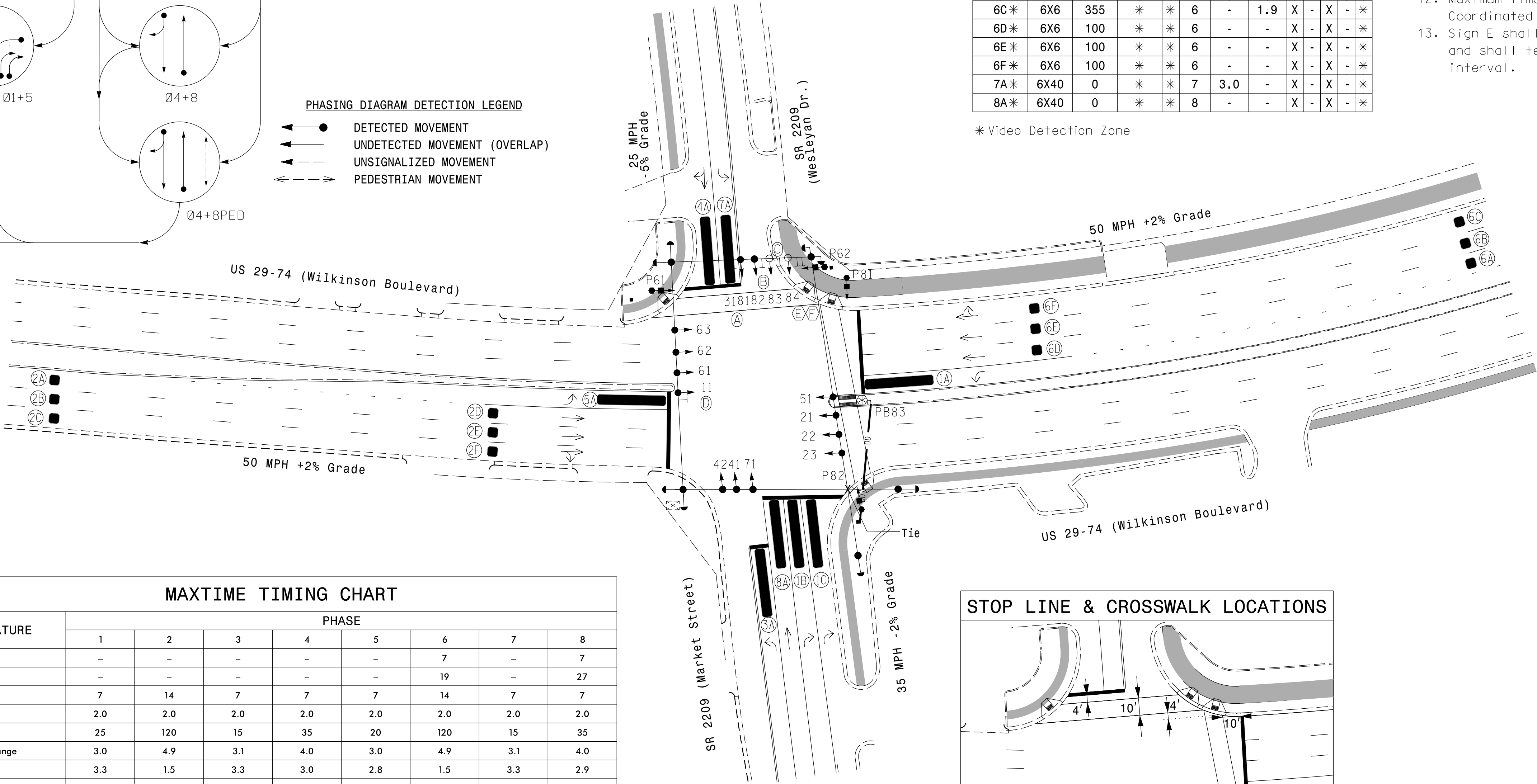
* See Note 13

PHASING DIAGRAM DETECTION LEGEND

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

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	7	-	7
Ped Clear *	-	-	-	-	-	19	-	27
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max I *	25	120	15	35	20	120	15	35
Yellow Change	3.0	4.9	3.1	4.0	3.0	4.9	3.1	4.0
Red Clear	3.3	1.5	3.3	3.0	2.8	1.5	3.3	2.9
Added Initial *	-	-	-	-	-	-	-	-
Maximum Initial *	-	-	-	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-	-	-	-
Time To Reduce *	-	-	-	-	-	-	-	-
Minimum Gap	-	-	-	-	-	-	-	-
Advance Walk	-	-	-	-	-	3	-	3
Non Lock Detector	X	-	X	X	X	-	X	X
Vehicle Recall	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Dual Entry	-	-	-	-	-	-	-	-

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



LEGEND

PROPOSED	EXISTING
Traffic Signal Head	N/A
Modified Signal Head	N/A
Sign	N/A
Pedestrian Signal Head With Push Button & Sign	N/A
Signal Pole with Guy	N/A
Signal Pole with Sidewalk Guy	N/A
Inductive Loop Detector	N/A
Controller & Cabinet	N/A
Junction Box	N/A
2-in Underground Conduit	N/A
Right of Way	N/A
Directional Arrow	N/A
Type II Signal Pedestal	N/A
Curb Ramp	N/A
Construction Zone	N/A
Video Detection Zone	N/A
(A) Left Arrow "ONLY" Sign (R3-5L)	(A)
(B) Through Arrow "ONLY" Sign (R3-5A)	(B)
(C) Right Arrow "ONLY" Sign (R3-5R)	(C)
(D) "U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	(D)
(E) "NO TURN ON RED" LED Blankout Sign	(E)
(F) "RIGHT TURN SIGNAL" Sign (R10-10)	(F)

Signal Upgrade-Temporary Design 3 (Phase III)

Prepared for the Offices of:

TRANSPORTATION MOBILITY AND SAFETY DIVISION
DEPARTMENT OF TRANSPORTATION
SIGNAL DESIGN SECTION

750 N. Greenfield Pkwy, Garner, NC 27529

US 29-74 (Wilkinson Boulevard)
at
SR 2209 (Market Street / Wesleyan Drive)

Division 12 Gaston County McAdenville

PLAN DATE: October 2023 REVIEWED BY: M. L. Styles

PREPARED BY: J. Ma REVIEWED BY:

REVISIONS

SCALE 0 40 1"=40'

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA
PROFESSIONAL ENGINEER
SEAL
033108
JANUARY 11, 2023

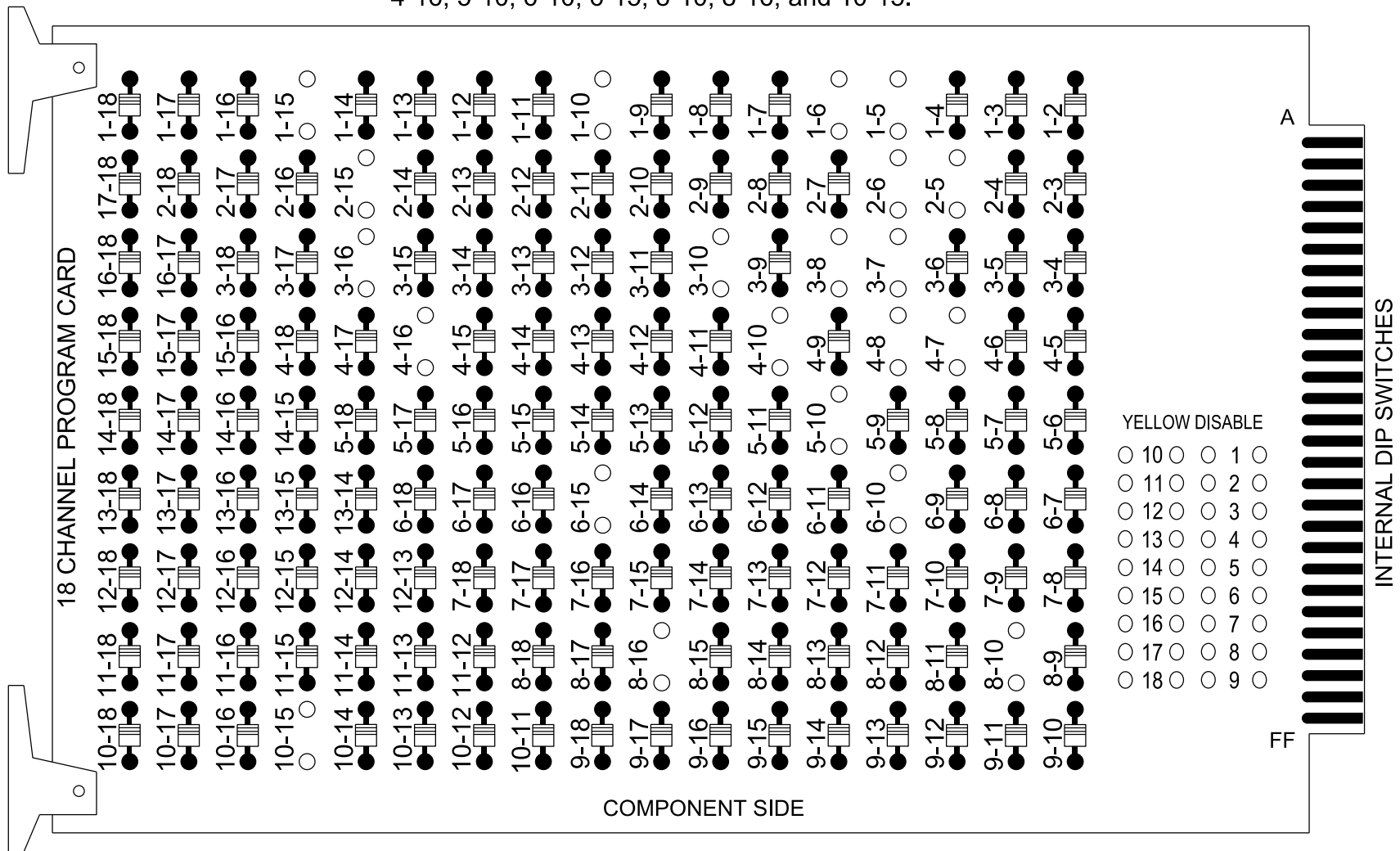
11/5/2023

SIG. INVENTORY NO. 12-0081T3

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

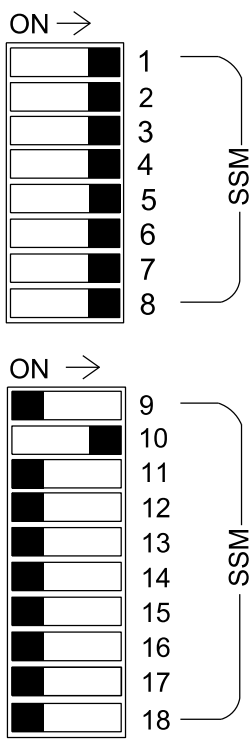
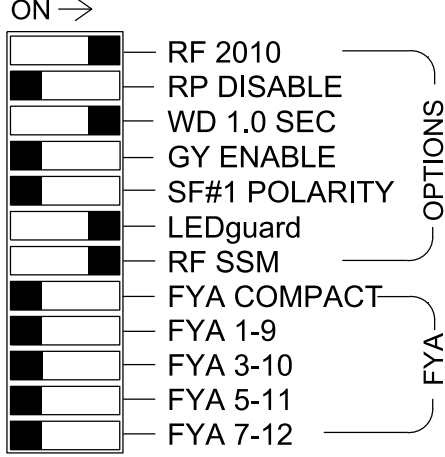
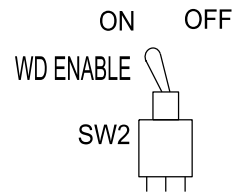
REMOVE DIODE JUMPERS 1-5, 1-6, 1-10, 1-15, 2-5, 2-6, 2-15, 3-7, 3-8, 3-10, 3-16, 4-7, 4-8, 4-10, 4-16, 5-10, 6-10, 6-15, 8-10, 8-16, and 10-15.



REMOVE JUMPERS AS SHOWN

NOTES:

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



■ = DENOTES POSITION OF SWITCH

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S9,S10,S11, S12,AUXS2
Phases Used.....1,2,3,4,5,6,6PED,7,8,8PED
Overlap "2".....*

*See overlap programming detail on this sheet.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6	
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18	
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	N/A	OL1	OL2	OL5	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22 23	NU	31	41,42	NU	51	61,62 63	P61, P62	71	81,82	P81, P82	BLANK OUT SIGN	NU	83,84★	NU	NU	NU	NU
RED		128			101			134			107				A124				
YELLOW		129			102			135			108								
GREEN		130			103			136			109								
RED ARROW	125			116			131			122									
YELLOW ARROW	126			117			132			123					A125				
FLASHING YELLOW ARROW																			
GREEN ARROW	127			118			133			124					A126				
									119			110							
PED YELLOW													*	111					
									121			112							

NU = Not Used

* Blankout sign wired is ped yellow 111. See wiring and programming detail on electrical detail sheet 2.

★ See pictorial of head wiring in detail this sheet.

FLASHER CIRCUIT MODIFICATION DETAIL

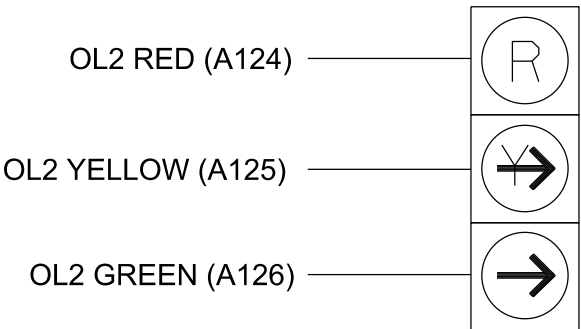
IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

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

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



83,84



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

Electrical Detail-Temporary Design 3-Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: US 29-74 (Wilkinson Boulevard)

at
SR 2209 (Market Street / Wesleyan Drive)

Division 12 Gaston County Belmont

PLAN DATE: October 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

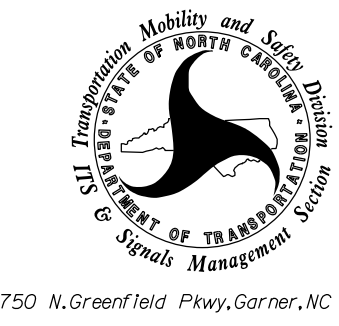
REVISIONS INIT. DATE

DocuSigned by: 11/5/2023

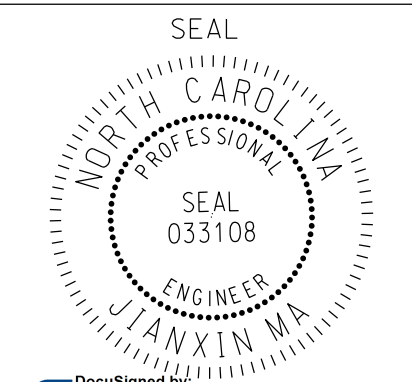
827E1953081444F DATE

SIG. INVENTORY NO. 12-0081T3

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081T3
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A



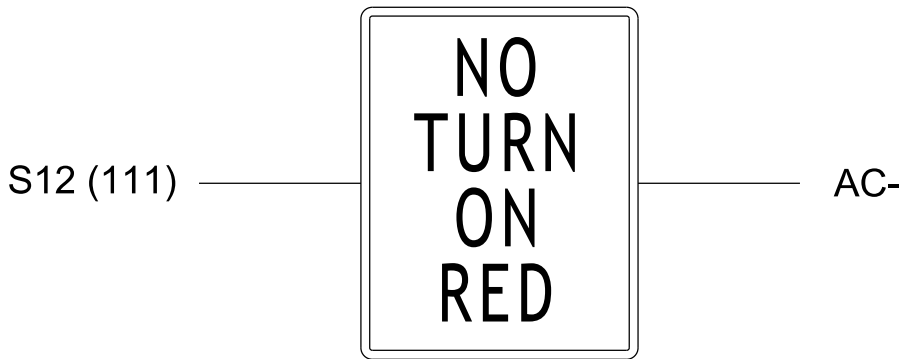
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DocuSigned by: 11/5/2023

827E1953081444F DATE

SIG. INVENTORY NO. 12-0081T3



Statement	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Ext
1	Global Variable	36	Result=(AorB)	Phase Walk	8	Phase Ped Clearance	8	0.0	0.0

Statement 1 Description: Illuminate Sign E at beginning of Phase 8 "Walk" to the end of Phase 8 "Don't Walk".

Overlap	2
Type	Normal
Included Phases	1, 8
Modifier Phases	-
Modifier Overlaps	-
Negative Peds	8
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0
Min Green	7

Output Point	Description	Output Control Type	Index
36	C1-38	Global Variable	36

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081T3
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Temporary Design 3-Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 29-74 (Wilkinson Boulevard)
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SR 2209 (Market Street / Wesleyan Drive)

Division 12 Gaston County Belmont

PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles
-------------------------	---------------------------

PREPARED BY:	J. Ma	REVIEWED BY:	
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REVISIONS	INIT.	DATE

[illegible]

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

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SIGNATURES COMPLETED**

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
033108
ENGINEER
JIANXIN MA

11/5/2023

827E1953081444F... DATE

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 5.0

8 Phase
Fully Actuated
Belmont Signal System

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- All metal poles and arms and pedestals should be BLACK in color as specified in the project special provisions.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Sign E shall illuminate at the beginning of Phase 8 "Walk" interval, and shall terminate at the end of Phase 8 "Flashing Don't Walk" interval.

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
1A	6X40	0	2-4-2	X	1	-	-	X	-	X	-	X
1B	6X40	0	2-4-2	X	1	15.0	-	X	-	X	-	X
1C	6X40	0	2-4-2	X	1	15.0	-	X	-	X	-	X
2A	6X6	355	5	X	2	-	-	X	X	X	-	X
2B	6X6	355	5	X	2	-	-	X	X	X	-	X
2C	6X6	355	5	X	2	-	-	X	X	X	-	X
3A	6X40	0	2-4-2	X	3	3.0	-	X	-	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	-	-	X	-	X	-	X
6A	6X6	355	6	X	6	-	-	X	X	X	-	X
6B	6X6	355	6	X	6	-	-	X	X	X	-	X
6C	6X6	355	6	X	6	-	-	X	X	X	-	X
7A	6X40	0	2-4-2	X	7	3.0	-	X	-	X	-	X
8A	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
S1	6X6	+155	3	X	-	-	-	-	-	-	-	-
S2	6X6	+155	3	X	-	-	-	-	-	-	-	-
S3	6X6	+155	3	X	-	-	-	-	-	-	-	-
S4	6X6	+140	3	X	-	-	-	-	-	-	-	-
S5	6X6	+140	3	X	-	-	-	-	-	-	-	-
S6	6X6	+140	3	X	-	-	-	-	-	-	-	-

SIGNAL FACE I.D.

All Heads L.E.D.

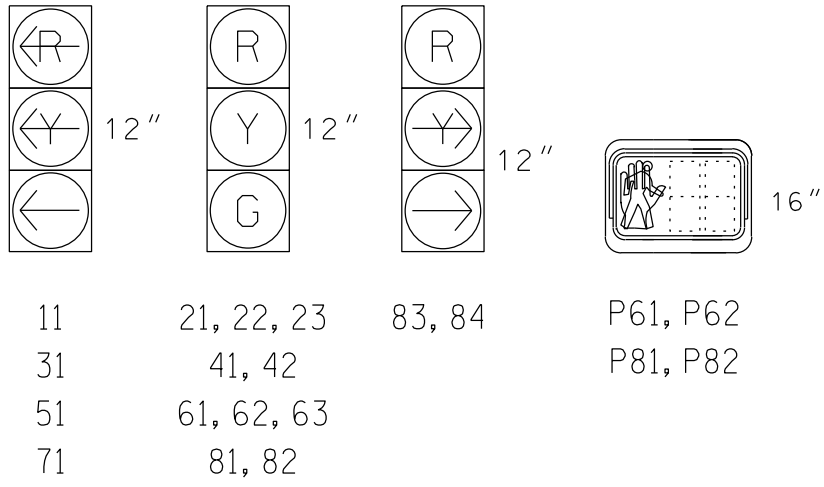
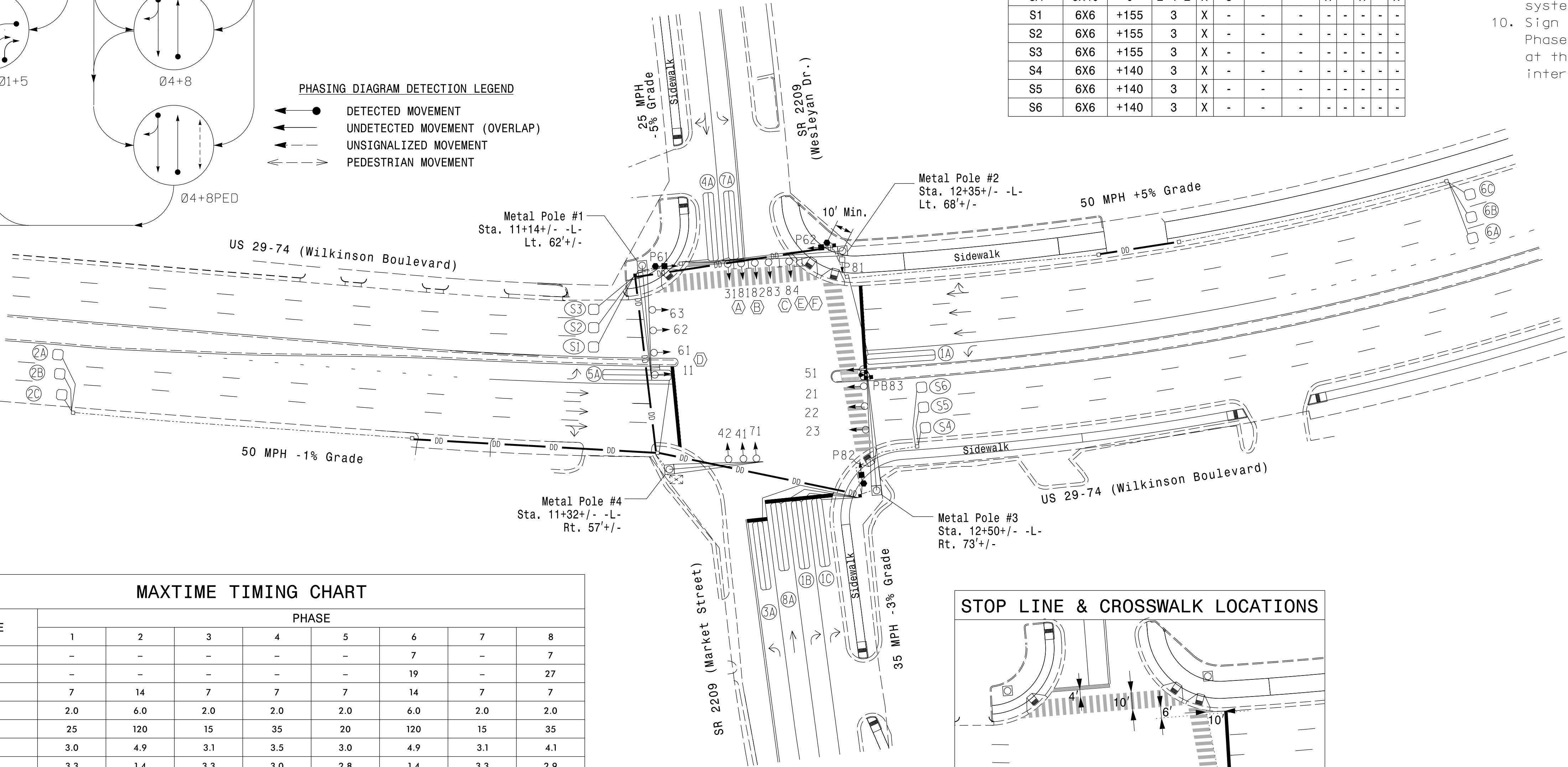


TABLE OF OPERATION												
SIGNAL FACE	PHASE											
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8	Ø 4 + PED	FLASH	ES	HS
11	←	←	→	→	→	→	→	→	→	→	→	→
21,22,23	R	R	G	G	R	R	R	R	R	Y		
31	→	→	→	→	←	←	←	←	←	←	←	←
41,42	R	R	R	R	R	R	R	G	G	R		
51	←	←	←	←	→	→	→	→	→	→	→	→
61,62,63	R	G	R	G	R	R	R	R	R	Y		
71	→	→	→	→	←	←	←	←	←	←	←	←
81, 82	R	R	R	R	R	G	R	G	G	R		
83, 84	→	→	R	R	→	R	R	R	R			
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DW	DRK		
P81, P82	DW	DW	DW	DW	DW	DW	DW	DW	W	DRK		
* SIGN E	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF

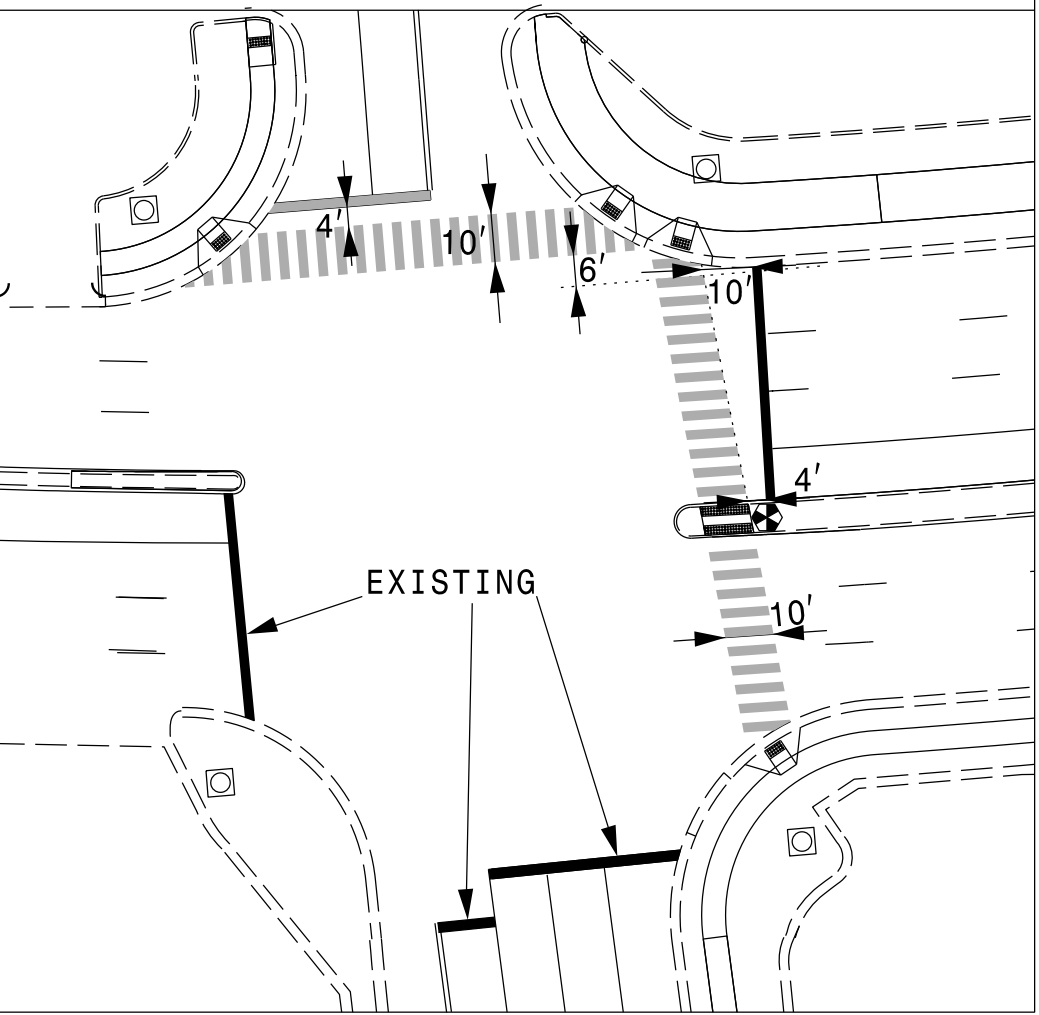
* See Note 10

PHASING DIAGRAM DETECTION LEGEND

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



STOP LINE & CROSSWALK LOCATIONS



LEGEND

PROPOSED	EXISTING
	N/A
N/A	
N/A	

MAXTIME TIMING CHART								
FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	7	-	7
Ped Clear *	-	-	-	-	-	19	-	27
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	25	120	15	35	20	120	15	35
Yellow Change	3.0	4.9	3.1	3.5	3.0	4.9	3.1	4.1
Red Clear	3.3	1.4	3.3	3.0	2.8	1.4	3.3	2.9
Added Initial *	-	1.2	-	-	-	1.2	-	-
Maximum Initial *	-	40	-	-	-	40	-	-
Time Before Reduction *	-	25	-	-	-	25	-	-
Time To Reduce *	-	70	-	-	-	70	-	-
Minimum Gap	-	3.2	-	-	-	3.2	-	-
Advance Walk	-	-	-	-	-	3	-	3
Non Lock Detector	X	-	X	X	X	-	X	X
Vehicle Recall	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Dual Entry	-	-	-	-	-	-	-	-

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

Signal Upgrade-Final Design

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

US 29-74 (Wilkinson Boulevard)
at
SR 2209 (Market Street / Wesleyan Drive)

Division 12 Gaston County McAdenville

PLAN DATE: October 2023 REVIEWED BY: M. L. Styles

PREPARED BY: J. Ma REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

Seal of the State of North Carolina Professional Engineer

Seal 033108

ENGINEER

11/5/2023

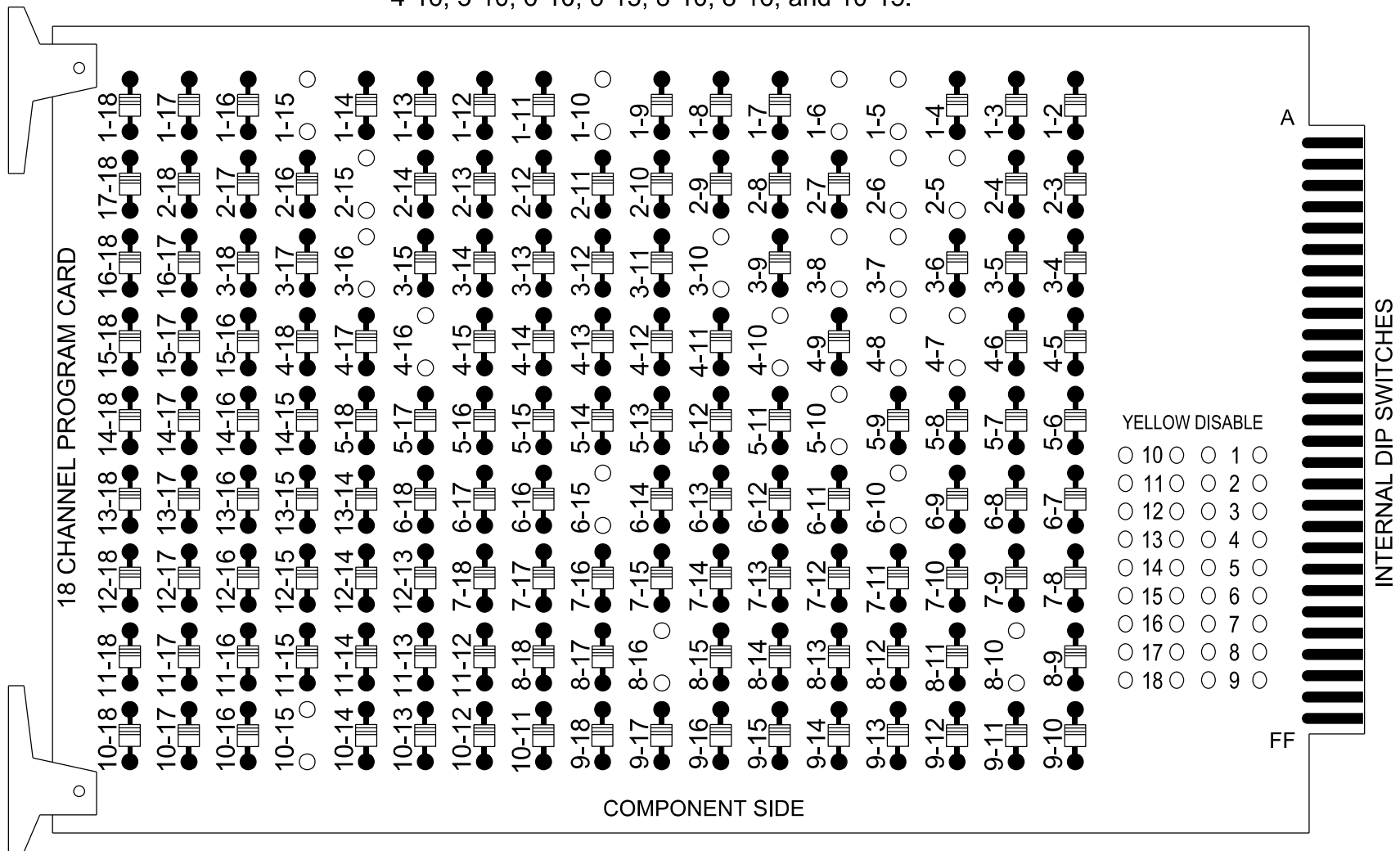
DATE

SIG. INVENTORY NO. 12-0081

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-10, 1-15, 2-5, 2-6, 2-15, 3-7, 3-8, 3-10, 3-16, 4-7, 4-8, 4-10, 4-16, 5-10, 6-10, 6-15, 8-10, 8-16, and 10-15.



REMOVE JUMPERS AS SHOWN

NOTES:

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

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	∅ 1	∅ 2	∅ 2	SLOT 1	∅ 3	∅ 4	SLOT 2	SYS. DET. S5	SYS. DET. S1	SLOT 3	SLOT 4	SLOT 5	∅ 6 PED	FS
	1A	2A	2C		3A	4A		NOT USED	SYS. DET. S2				DC ISOLATOR	DC ISOLATOR
FILE "J" U	NOT USED	∅ 2	NOT USED	SLOT 6	NOT USED	NOT USED	SLOT 7	SYS. DET. S6	SYS. DET. S3	SLOT 8	SLOT 9	SLOT 10	∅ 8 PED	ST
	NOT USED	∅ 6	NOT USED		NOT USED	NOT USED		SYS. DET. S4	SYS. DET. S2				DC ISOLATOR	DC ISOLATOR

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

FS = FLASH SENSE
ST = STOP TIME

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.

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S9,S10,S11, S12,AUXS2
Phases Used.....1,2,3,4,5,6,6PED,7,8,8PED
Overlap "2".....*

*See overlap programming detail on this sheet.

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			X		X		
1B	TB5-11,12	J6L	46	8	23	1	15		X		X		
1C	TB7-1,2	J7U	66	32	24	1	15		X		X		
2A	TB2-5,6	I2U	39	1	2	2			X	X	X		
2B	TB2-7,8	I2L	43	5	3	2			X	X	X		
2C	TB2-9,10	I3U	63	29	4	2			X	X	X		
3A	TB4-5,6	I5U	58	20	7	3	3		X		X		
4A	TB4-9,10	I6U	41	3	8	4			X		X		
5A	TB3-1,2	J1U	55	17	15	5			X		X		
6A	TB3-5,6	J2U	40	2	16	6			X	X	X		
6B	TB3-7,8	J2L	44	6	17	6			X	X	X		
6C	TB3-9,10	J3U	64	30	18	6			X	X	X		
7A	TB5-5,6	J5U	57	19	21	7	3		X		X		
8A	TB5-9,10	J6U	42	4	22	8			X		X		
*S1	TB6-9,10	I9U	60	22	13	SYS			X		X		
*S2	TB6-11,12	I9L	62	24	14	SYS			X		X		
*S3	TB7-9,10	J9U	59	21	27	SYS			X		X		
*S4	TB7-11,12	J9L	61	23	28	SYS			X		X		
*S5	TB6-5,6	I8U	49	11	12	SYS			X		X		
*S6	TB7-5,6	J8U	50	12	26	SYS			X		X		
PED PUSH BUTTONS							NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.						
P61,P62		TB8-7,9	I13U	68	34	6		PED 6					
P81,P82,P83		TB8-8,9	I13L	70	36	8		PED 8					
INPUT FILE POSITION LEGEND: I12													

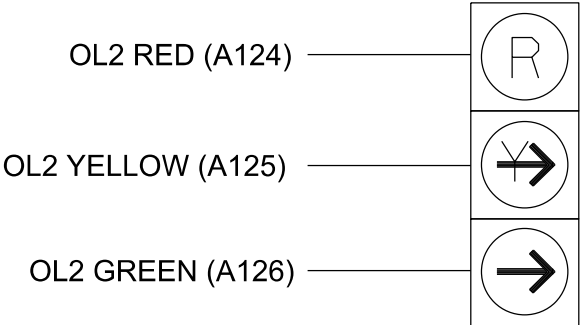
* System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



83,84



Electrical Detail-Final Design - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 29-74 (Wilkinson Boulevard)

at
SR 2209 (Market Street / Wesleyan Drive)

Division 12 Gaston County Belmont

PLAN DATE: October 2023 REVIEWED BY: M.L. Stygles

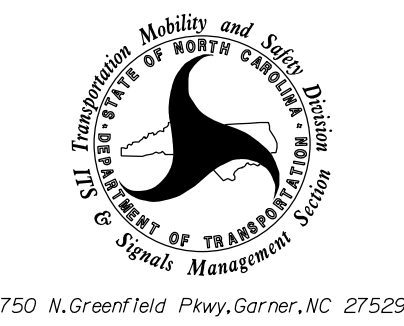
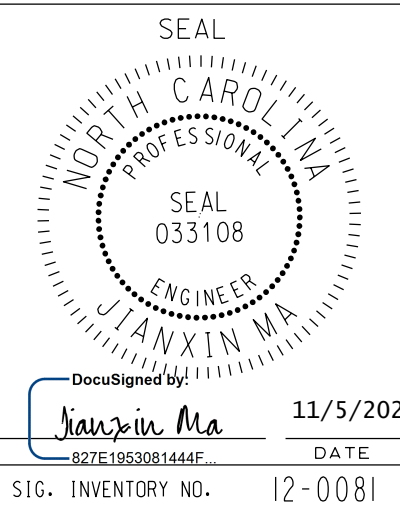
PREPARED BY: J. Ma REVIEWED BY:

REVISIONS INIT. DATE

DATE

SIG. INVENTORY NO. 12-0081

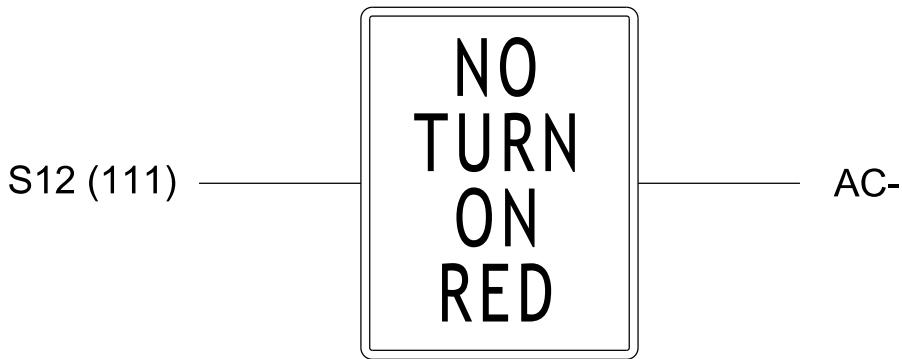
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750 N. Greenfield Pkwy, Garner, NC 27529

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

SIGN "E"



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	Global Variable	36	Result=(AorB)	Phase Walk	8	Phase Ped Clearance	8	0.0	0.0

Statement 1 Description: Illuminate Sign E at beginning of Phase 8 "Walk" to the end of Phase 8 "Don't Walk".

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

Web Interface
Home > Controller >
Overlap Configuration > Overlaps

Overlap Plan 1

Overlap	2
Type	Normal
Included Phases	1, 8
Modifier Phases	-
Modifier Overlaps	-
Negative Peds	8
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0
Min Green	7

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
36	C1-38	Global Variable	36

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0081
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Final Design-Sheet 2 of 2

**ELECTRICAL AND PROGRAMMING
DETAILS FOR:**



US 29-74 (Wilkinson Boulevard)
at
SR 2209 (Market Street /
Wesleyan Drive)

Division 12 Gaston County Belmont

PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles
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PREPARED BY: J. Ma		REVIEWED BY:	
REVISIONS		INIT	DATE

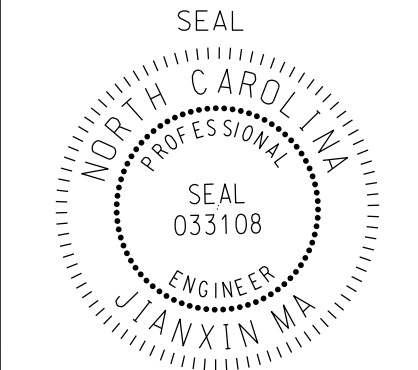
REVISIONS	INIT.	DATE

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vhb

VHB Engineering NC, P.C. (C-3705)
 940 Main Campus Drive, Suite 500
 Raleigh, NC 27607
 P: 919-829-0328

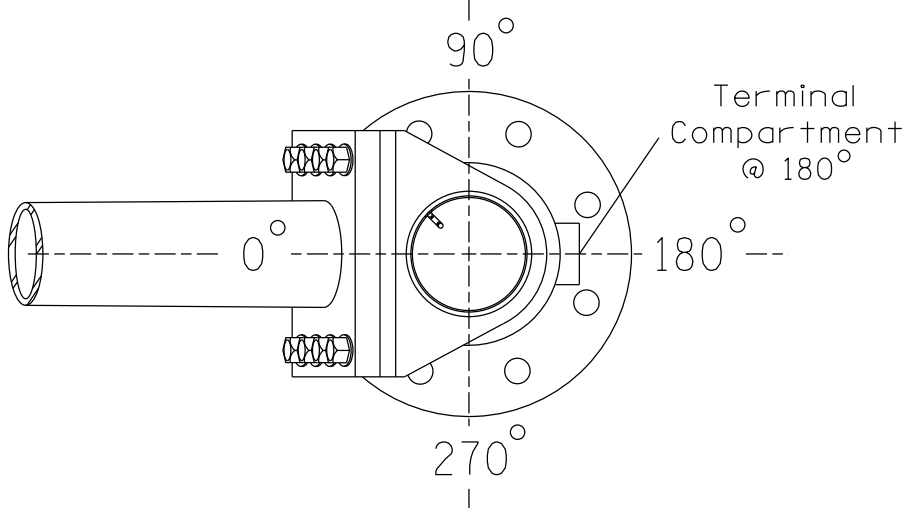
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SIGNATURES COMPLETED**



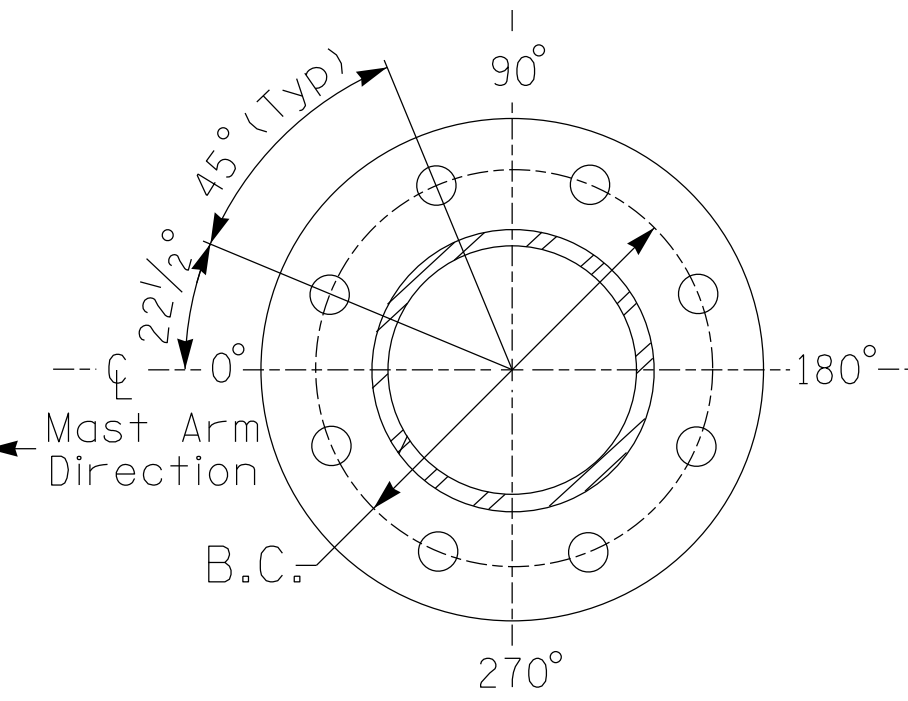
DocuSigned by: 11/5/2023

DATE

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

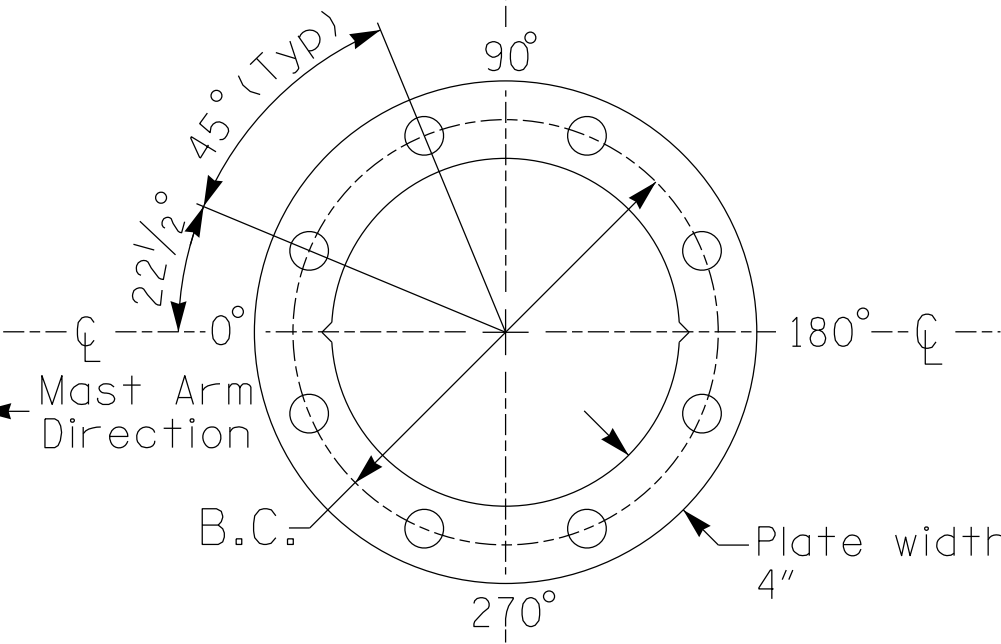


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

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
	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS
	LED, BLANKOUT SIGN RIGID MOUNTED	5.0 S.F.	24.0" W X 36.0" L	110 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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.
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.



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

NCDOT Wind Zone 5 (110 mph)

US 29-74 (Wilkinson Boulevard)
at
SR 2209 (Market Street /
Wesleyan Drive)

Division 12 Gaston County McAdenville

PLAN DATE: October 2023	REVIEWED BY: M. L. Stygles
-------------------------	----------------------------

PREPARED BY: J. Ma	VHB PROJECT NO.: 38536.36
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REVISIONS	INIT.	DATE
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SIGNATURES COMPLETED

EAL

TH CAROL


A circular professional engineer seal is partially visible in the bottom right corner of the page. The text "PROFESSIONAL" is clearly legible within the seal's border.

SEN

033108

ENGINEER



DocuSigned by:

Xianxin Ma 11/5/2023

827E1953081244F
SIGNATURE DATE

INVENTORY NO. 12-0081

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 6.0

8 Phase
Fully Actuated
Belmont Signal System

NOTES

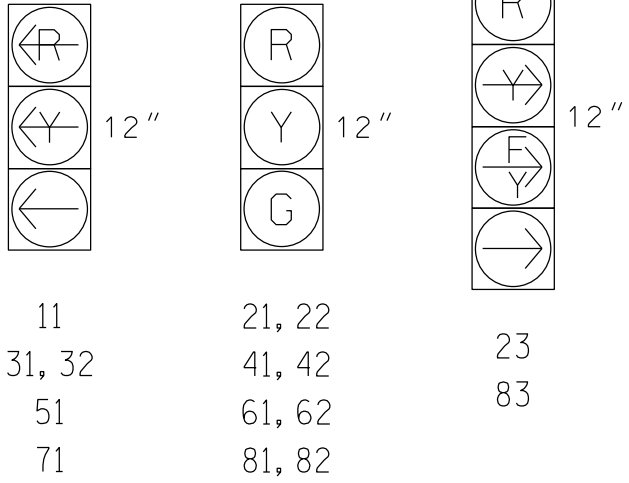
- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Pavement markings are existing.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Install new 2070LX contrller inside the existing cabinet.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR				PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
1A*	6X40	0	*	*	1	-	-	X	-	X	-
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-
1C*	6X6	0	*	*	1	15.0	-	X	-	X	-
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-
2C*	6X6	100	*	*	2	-	-	X	-	X	-
2D*	6X6	100	*	*	2	-	-	X	-	X	-
3A*	6X40	0	*	*	3	-	-	X	-	X	-
3B*	6X40	0	*	*	3	-	-	X	-	X	-
4A*	6X40	0	*	*	4	3.0	-	X	-	X	-
5A*	6X40	0	*	*	5	-	-	X	-	X	-
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-
6C*	6X6	100	*	*	6	-	-	X	-	X	-
6D*	6X6	100	*	*	6	-	-	X	-	X	-
7A*	6X40	0	*	*	7	3.0	-	X	-	X	-
8A*	6X40	0	*	*	8	-	-	X	-	X	-

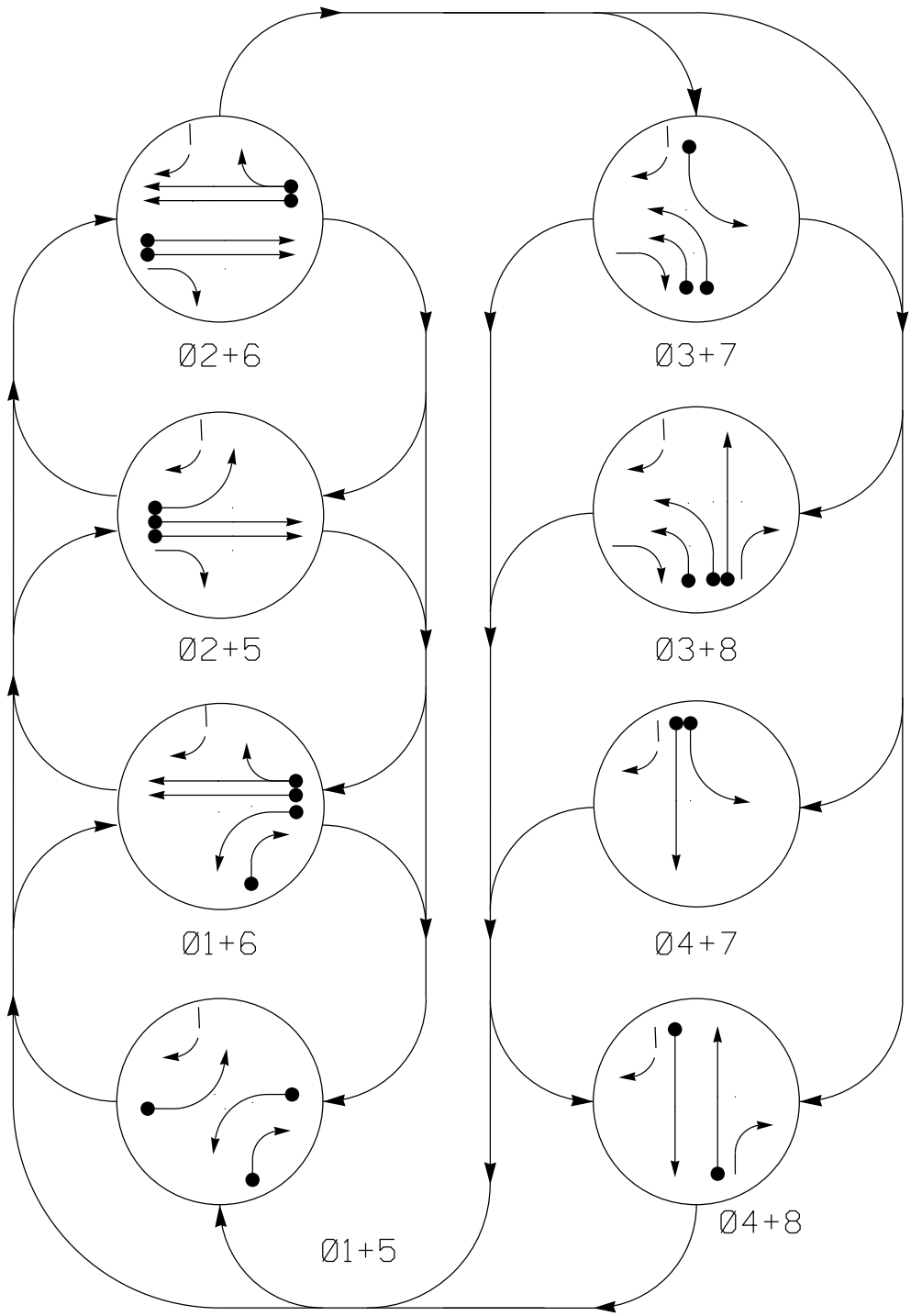
*Video Detection Zone

SIGNAL FACE I.D.

All Heads L.E.D.



PHASING DIAGRAM

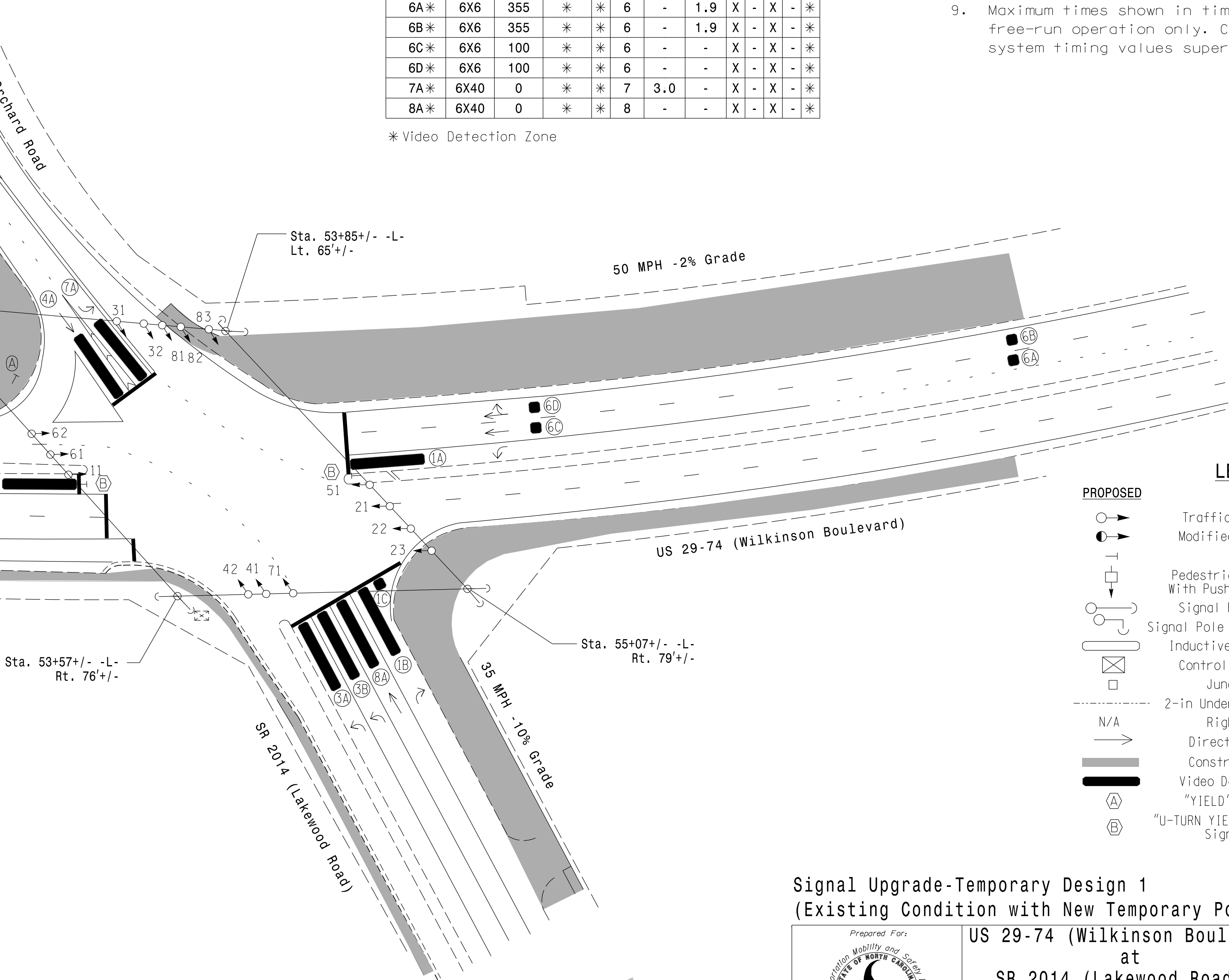


PHASING DIAGRAM DETECTION LEGEND

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

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	-	-	-
Ped Clear *	-	-	-	-	-	-	-	-
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max I *	30	70	20	30	20	70	20	30
Yellow Change	3.0	4.4	3.4	4.3	3.0	5.0	3.1	4.8
Red Clear	2.8	1.8	3.9	2.0	2.6	1.6	3.5	2.5
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	-	-	-	-	-	-	-	-

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



LEGEND

- | PROPOSED | EXISTING |
|--|----------|
| Traffic Signal Head | N/A |
| Modified Signal Head | N/A |
| Sign | N/A |
| Pedestrian Signal Head With Push Button & Sign | N/A |
| Signal Pole with Guy | N/A |
| Signal Pole with Sidewalk Guy | N/A |
| Inductive Loop Detector | N/A |
| Controller & Cabinet | N/A |
| Junction Box | N/A |
| 2-in Underground Conduit | N/A |
| Right of Way | N/A |
| Directional Arrow | N/A |
| Construction Zone | N/A |
| Video Detection Zone | N/A |
| "YIELD" Sign (R1-2) | N/A |
| "U-TURN YIELD TO RIGHT TURN" Sign (R10-16) | N/A |

Signal Upgrade-Temporary Design 1
(Existing Condition with New Temporary Poles)

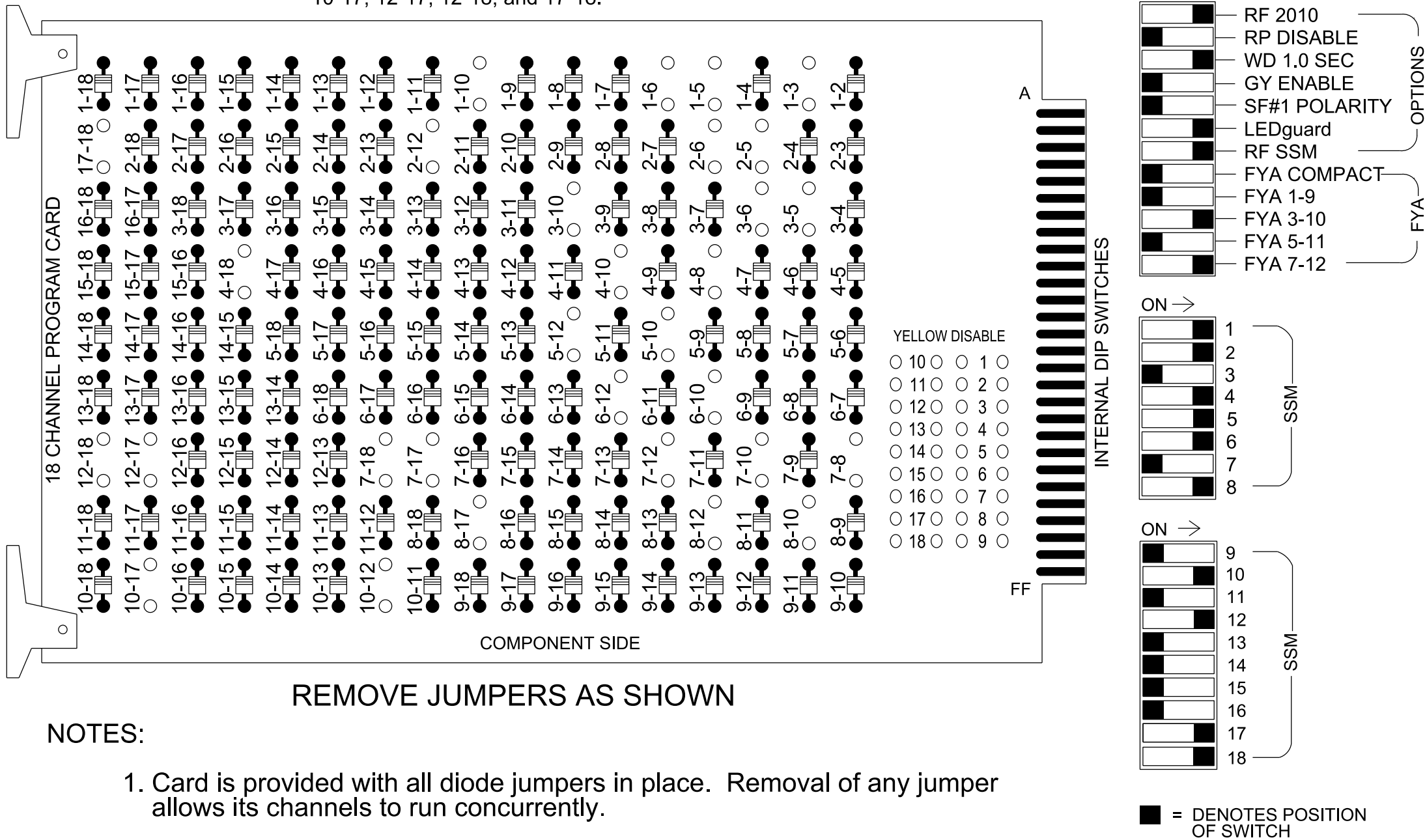
US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road	
Division 12	Gaston County Belmont
PLAN DATE: October 2023	REVIEWED BY: M. L. Stygles
PREPARED BY: J. Ma	REVIEWED BY:
REVISIONS	INIT. DATE

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SEAL NORTH CAROLINA PROFESSIONAL ENGINEER 033108 JANZEN MA 827E1963081444F
11/5/2023 DATE
SIG. INVENTORY NO. 12-008211

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 2-5, 2-6, 2-12, 3-5, 3-6, 3-10, 4-8, 4-10, 4-18, 5-10, 5-12, 6-10, 6-12, 7-8, 7-10, 7-12, 7-17, 7-18, 8-10, 8-12, 8-17, 10-12, 10-17, 12-17, 12-18, and 17-18.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S10,S11, AUXS2,AUXS3,AUXS5,AUXS6
Phases Used.....1,2,3,4,5,6,7,8
Overlap "2".....*
Overlap "4".....*
Overlap "5".....*
Overlap "6".....*
Overlap "7".....*
Overlap "8".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

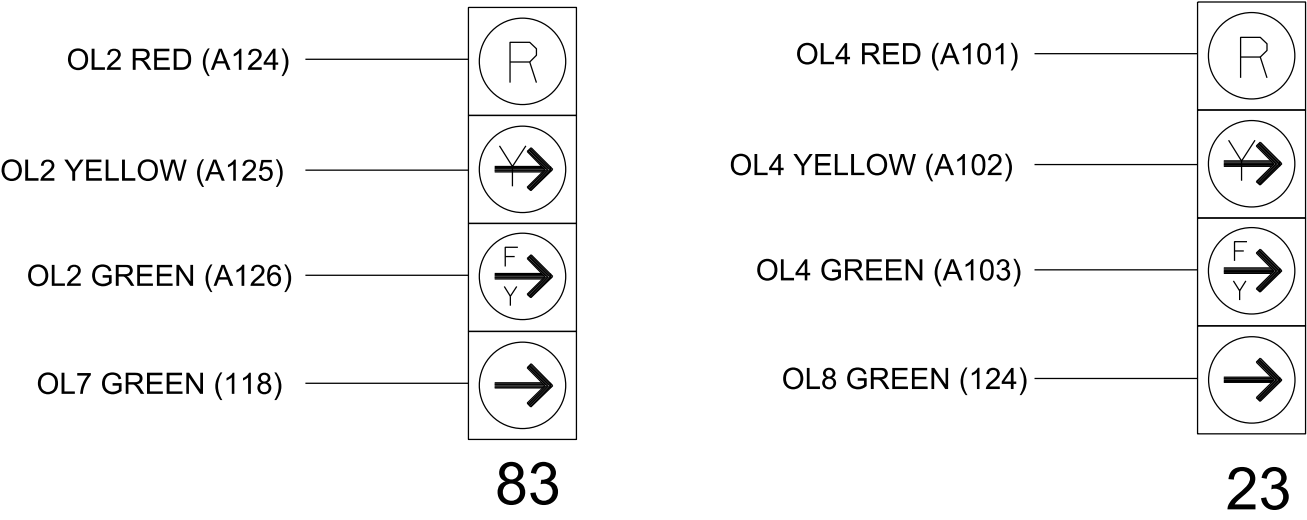
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	OL5	OL3	OL4	OL6
SIGNAL HEAD NO.	11	21,22	NU	83★	41,42	NU	51	61,62	NU	23★	81,82	NU	NU	83★	31,32	NU	23★	71
RED		128			101			134			107			A124			A101	
YELLOW		129		★	102			135		★	108							
GREEN		130			103			136			109							
RED ARROW	125						131								A111			A104
YELLOW ARROW	126						132							A125	A112		A102	A105
FLASHING YELLOW ARROW														A126			A103	
GREEN ARROW	127			118			133			124					A113			A106

NU = Not Used

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

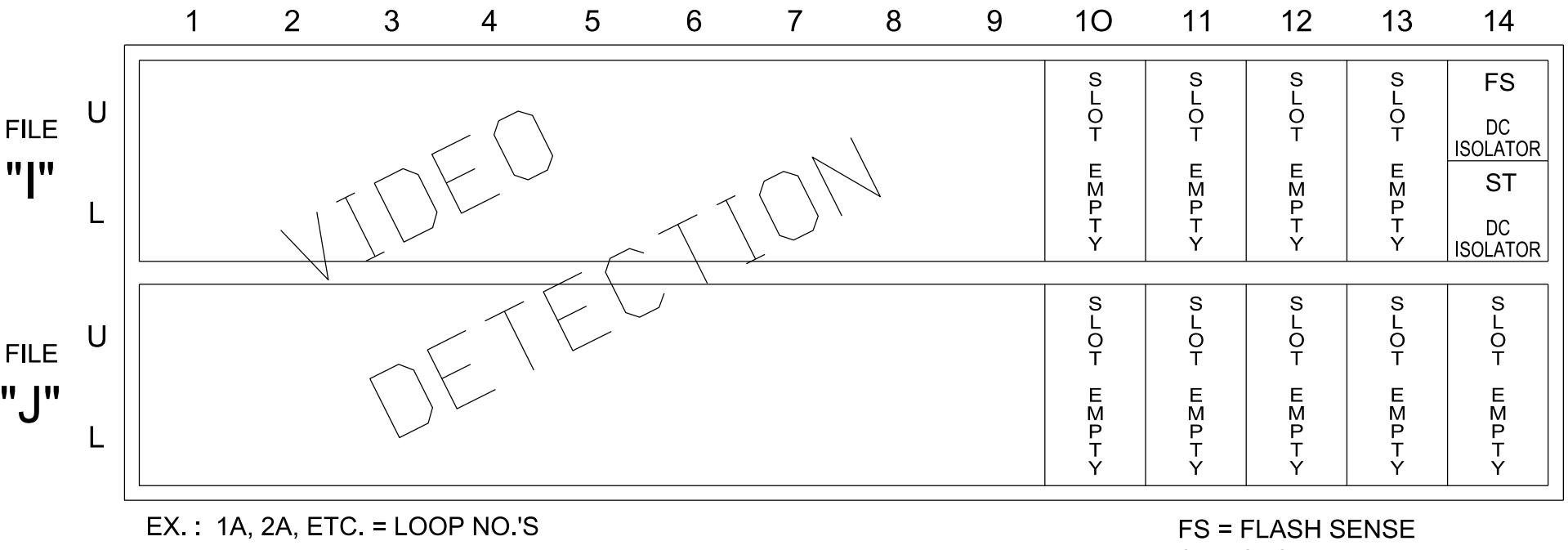
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

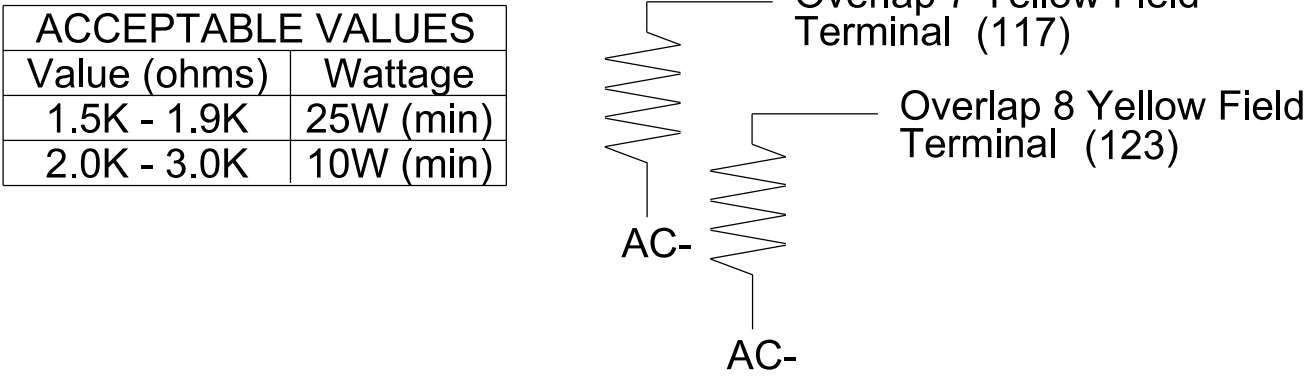
FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T1
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A



Electrical Detail-Sheet 1 of 2-Temporary Design 1

ELECTRICAL AND PROGRAMMING DETAILS FOR: US 29-74 (Wilkinson Boulevard)

at SR 2014 (Lakewood Road) / Peach Orchard Road

Division 12 Gaston County Belmont

PLAN DATE: October 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

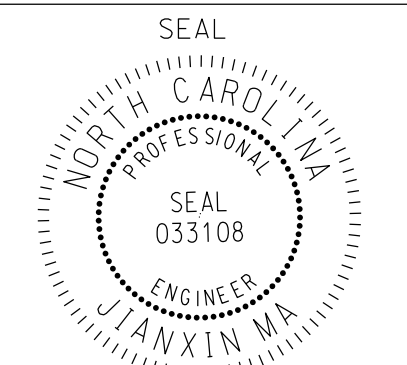
REVISIONS INIT. DATE

750 N.Greenfield Pkwy, Garner, NC 27529

11/5/2023

SIG. INVENTORY NO. 12-0082T1

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED



11/5/2023

SIG. INVENTORY NO. 12-0082T1

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig.6.2

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	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	NORMAL	NORMAL
Included Phases	8	2	1	3
Modifier Phases	-	-	-	-
Modifier Overlaps	7	8	-	-
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 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	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	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 CONTROL SOURCE 7
ASSIGNED TO CHANNEL 3 ➡

NOTICE CONTROL SOURCE 8
ASSIGNED TO CHANNEL 7 ➡

FLASHER CIRCUIT MODIFICATION DETAIL

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

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

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T1
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Sheet 2 of 2-Temporary Design 1

ELECTRICAL AND PROGRAMMING
DETAILS FOR:



US 29-74 (Wilkinson Boulevard)
at
SR 2014 (Lakewood Road) /
Peach Orchard Road
Division 12 Gaston County Belmont

PLAN DATE:	October 2023	REVIEWED BY:	M.L. Stygles
PREPARED BY:	J. Ma	REVIEWED BY:	
REVISIONS		INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL	
NORTH CAROLINA PROFESSIONAL ENGINEER JIANXIN MA	
Sealed by Jianxin Ma 033108	11/5/2023
SIG. INVENTORY NO.	12-0082T1

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 7.0

8 Phase
Fully Actuated
Belmont Signal System

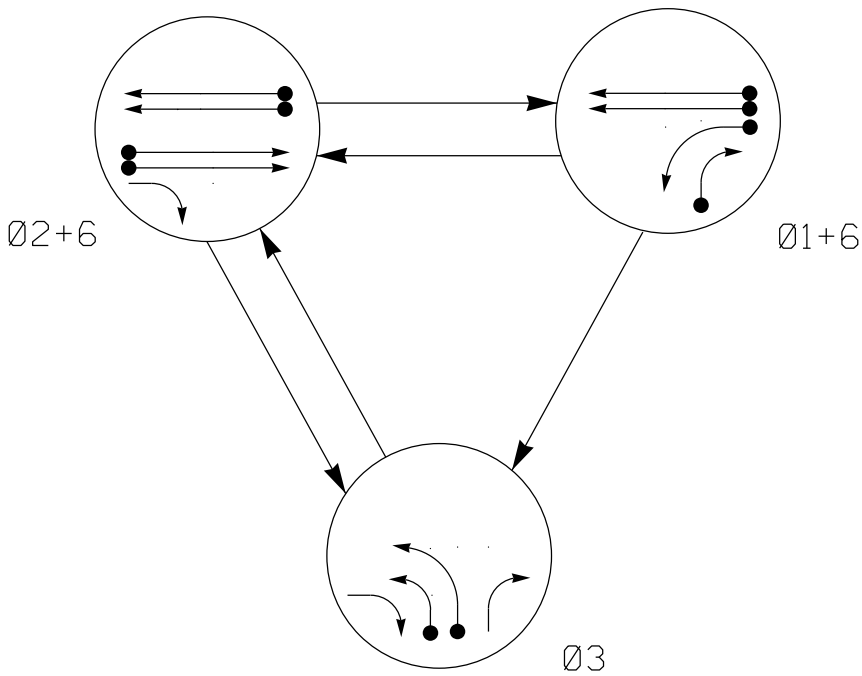
NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Phase 3 may be lagged.
- Set all detector units to presence mode.
- Pavement markings are existing.
- Bag existing signal heads 41, 42, 51, 71, 82 and 83. Renumber existing signal head 83 as 33.
- Cover existing sign A and Sign B for eastbound traffic.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR						PROGRAMMING					
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
1A*	6X40	0	*	*	1	-	-	X	-	X	-
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-
1C*	6X6	0	*	*	1	15.0	-	X	-	X	-
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-
2C*	6X6	100	*	*	2	-	-	X	-	X	-
2D*	6X6	100	*	*	2	-	-	X	-	X	-
3A*	6X40	0	*	*	3	-	-	X	-	X	-
3B*	6X40	0	*	*	3	-	-	X	-	X	-
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-
6C*	6X6	100	*	*	6	-	-	X	-	X	-
6D*	6X6	100	*	*	6	-	-	X	-	X	-

* Video Detection Zone

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

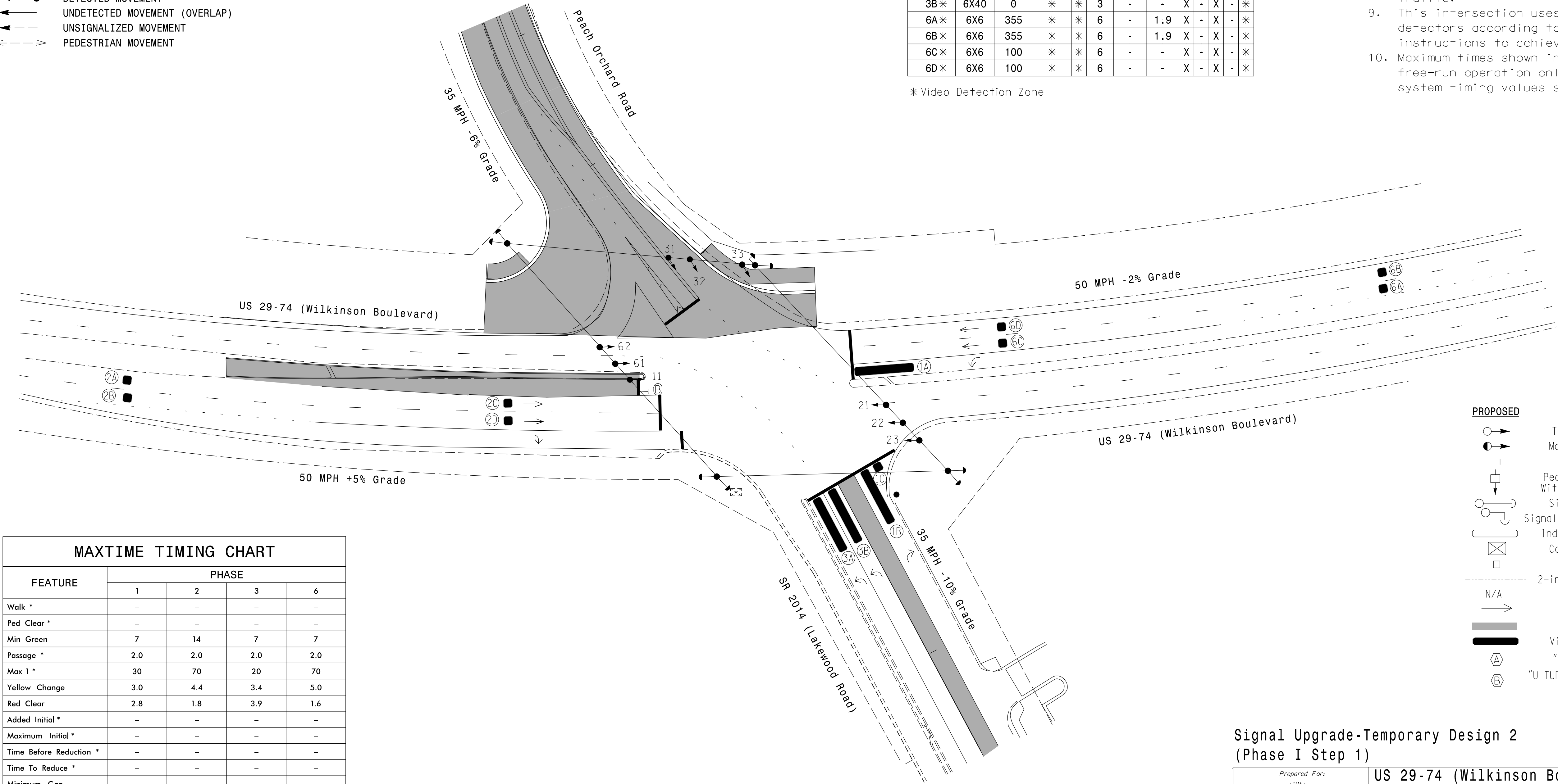
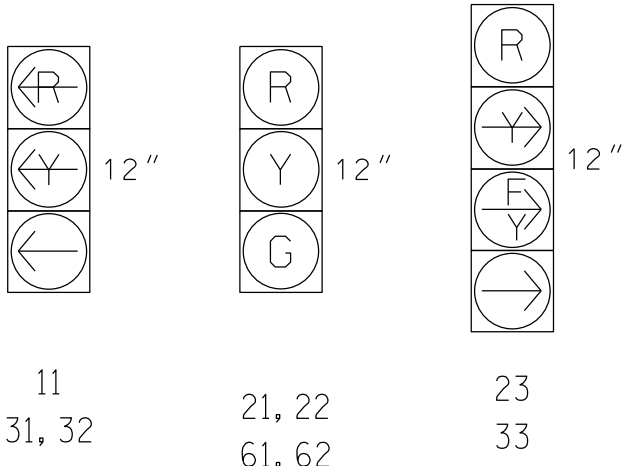
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE			
	Ø 1 + 6	Ø 2 + 6	Ø 3	FLASH
11	← R →	← R →	← R →	
21, 22	R	G	R	Y
23	R	← F →	→ Y	
31, 32	← R →	← R →	← R →	
33	→ R	← F →	R	
61, 62	G	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME TIMING CHART

FEATURE	PHASE			
	1	2	3	6
Walk *	-	-	-	-
Ped Clear *	-	-	-	-
Min Green	7	14	7	7
Passage *	2.0	2.0	2.0	2.0
Max 1 *	30	70	20	70
Yellow Change	3.0	4.4	3.4	5.0
Red Clear	2.8	1.8	3.9	1.6
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 Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED	EXISTING
	N/A
	N/A
	N/A

Signal Upgrade-Temporary Design 2
(Phase I Step 1)

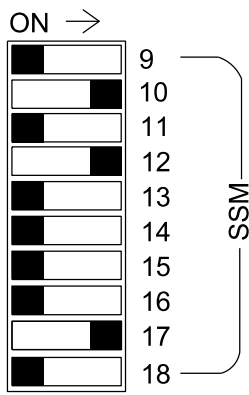
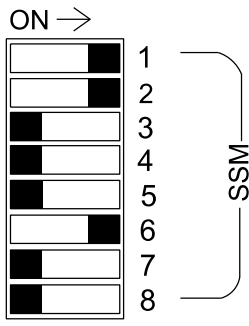
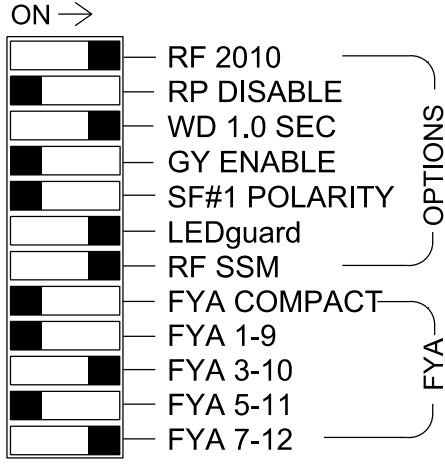
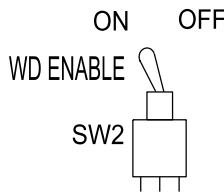
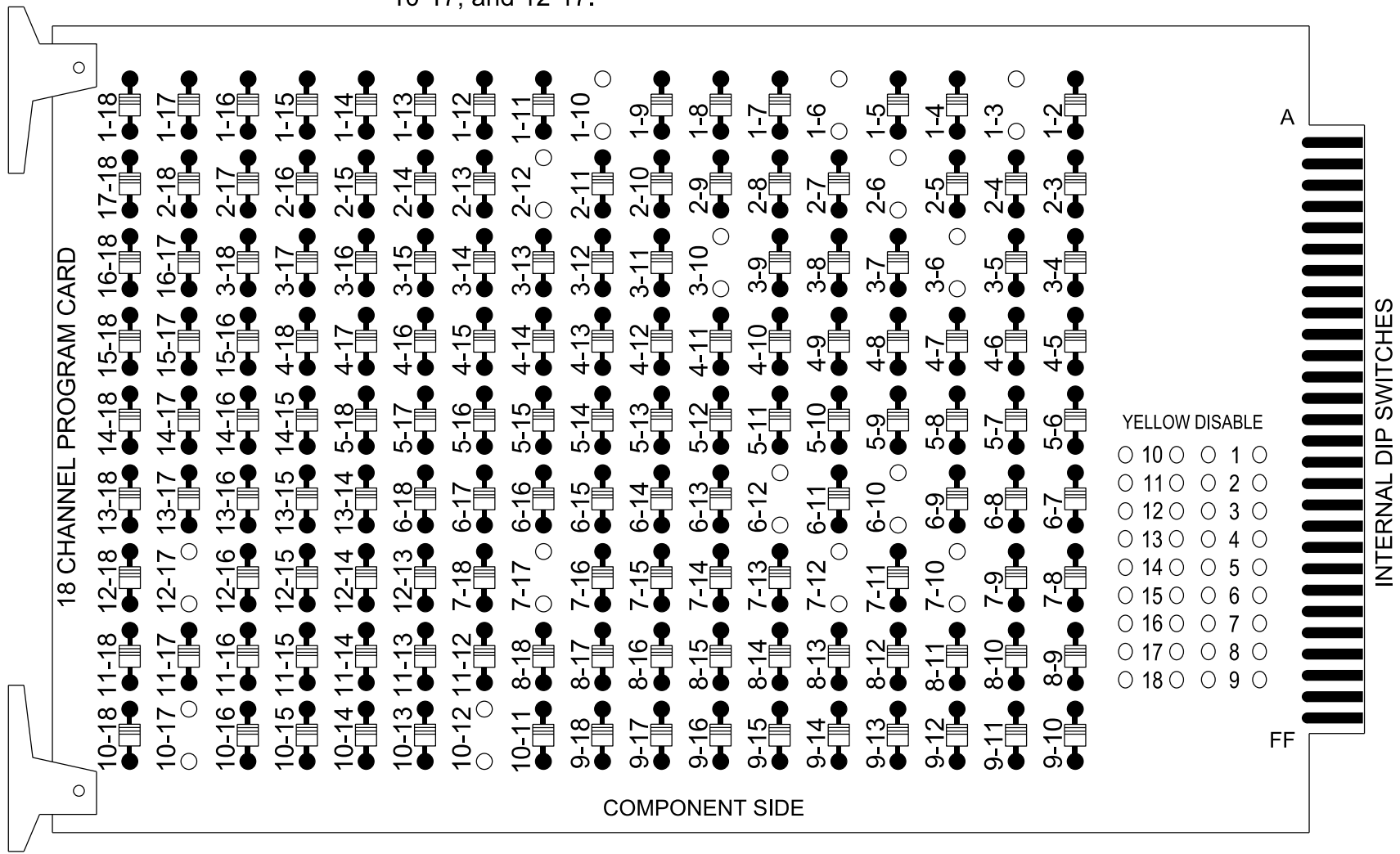


Prepared For: 750 N. Greenfield Pkwy, Garner, NC 27529	US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road Division 12 Gaston County Belmont PLAN DATE: October 2023 REVIEWED BY: M. L. Stygles PREPARED BY: J. Ma REVIEWED BY:	DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL NORTH CAROLINA PROFESSIONAL SEAL 033108 ENGINEER JIAN XIN MA 11/5/2023 DATE SIG. INVENTORY NO. 12-008212
REVISIONS		INIT. DATE

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-6, 1-10, 2-6, 2-12, 3-6, 3-10, 6-10, 6-12, 7-10, 7-12, 7-17, 10-12, 10-17, and 12-17.



■ = DENOTES POSITION OF SWITCH

REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

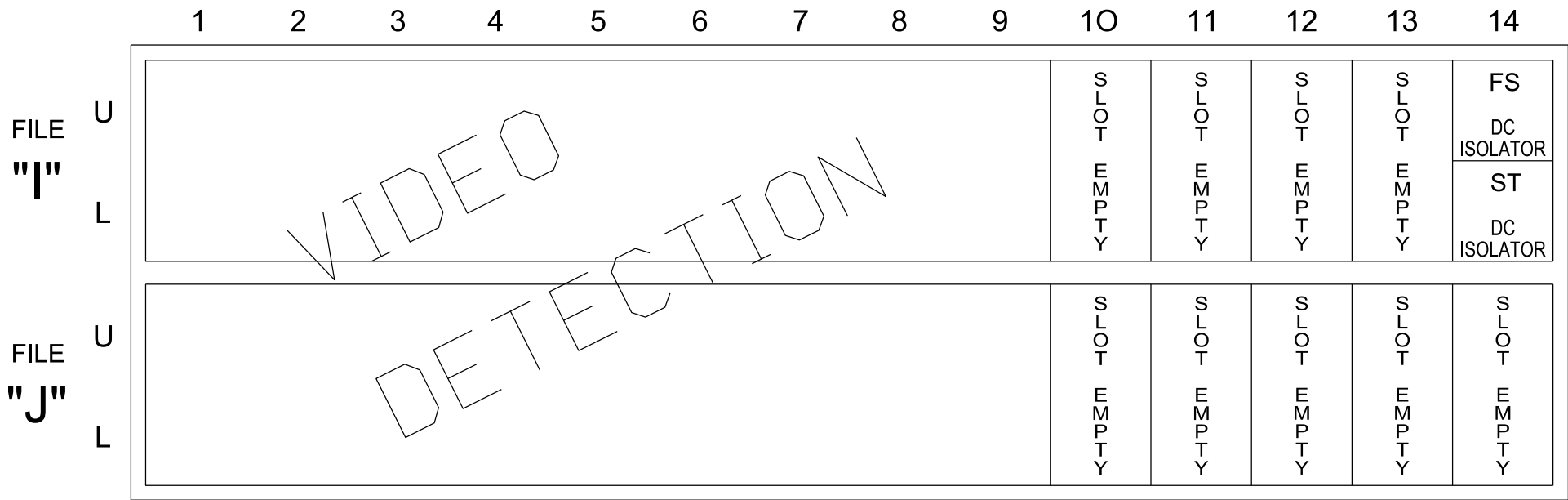
EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S8,S10,
AUXS2,AUXS3,AUXS5
Phases Used.....1,2,3,6
Overlap "2".....*
Overlap "4".....*
Overlap "5".....*
Overlap "7".....*
Overlap "8".....*

*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

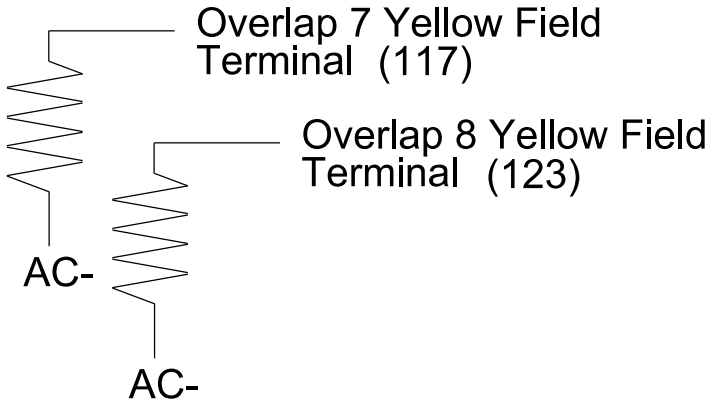
SPECIAL DETECTOR NOTE

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

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)



SIGNAL HEAD HOOK-UP CHART

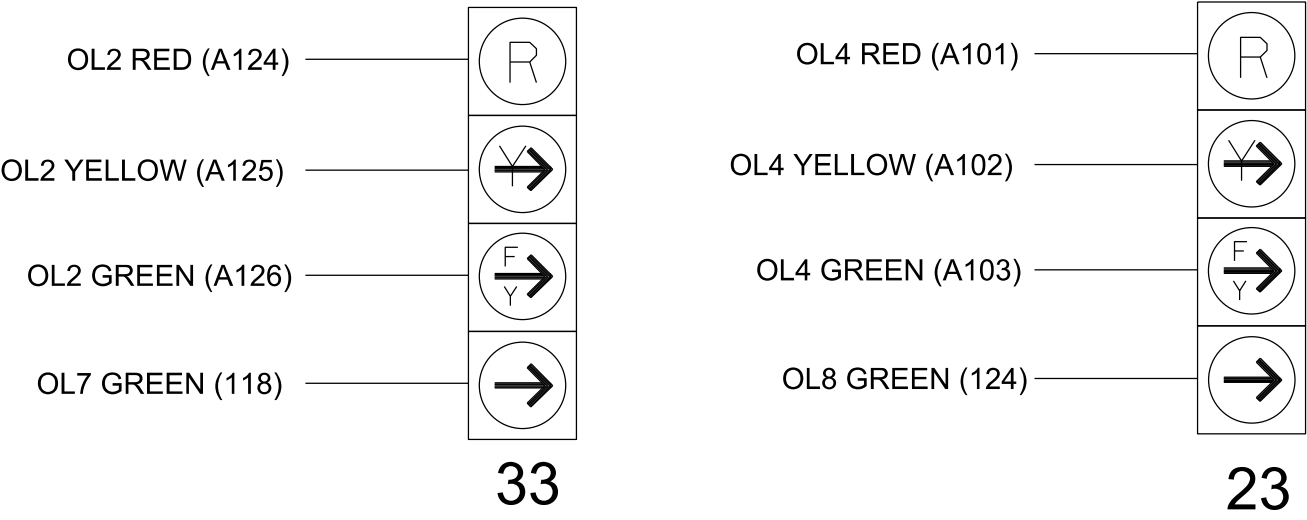
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	OL5	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	NU	33★	NU	NU	NU	61,62	NU	23★	NU	NU	NU	33★	31,32	NU	23★	NU
RED		128						134						A124			A101	
YELLOW		129		★				135		★								
GREEN		130						136										
RED ARROW	125														A111			
YELLOW ARROW	126													A125	A112		A102	
FLASHING YELLOW ARROW														A126			A103	
GREEN ARROW	127			118						124					A113			

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)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T2
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A



Electrical Detail-Sheet 1 of 2-Temporary Design 2

	ELECTRICAL AND PROGRAMMING DETAILS FOR:			US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road					
	Division 12			Gaston County			Belmont		
	PLAN DATE: October 2023			REVIEWED BY: M.L. Stygles					
	PREPARED BY: J. Ma			REVIEWED BY:					
	REVISIONS			INIT.			DATE		
750 N.Greenleaf Pkwy,Garner,NC 27529						DocuSigned by:  11/5/2023			
						DATE			
						SIG. INVENTORY NO. 12-0082T2			

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig.7.2

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	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	NORMAL	NORMAL
Included Phases	3	2	1	3
Modifier Phases	-	-	-	-
Modifier Overlaps	7	8	-	-
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 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	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	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 CONTROL SOURCE 7
ASSIGNED TO CHANNEL 3 ➡

NOTICE CONTROL SOURCE 8
ASSIGNED TO CHANNEL 7 ➡

FLASHER CIRCUIT MODIFICATION DETAIL

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

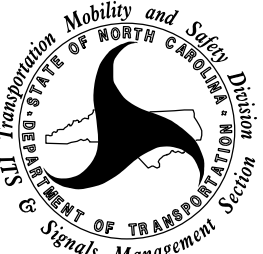
1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

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



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

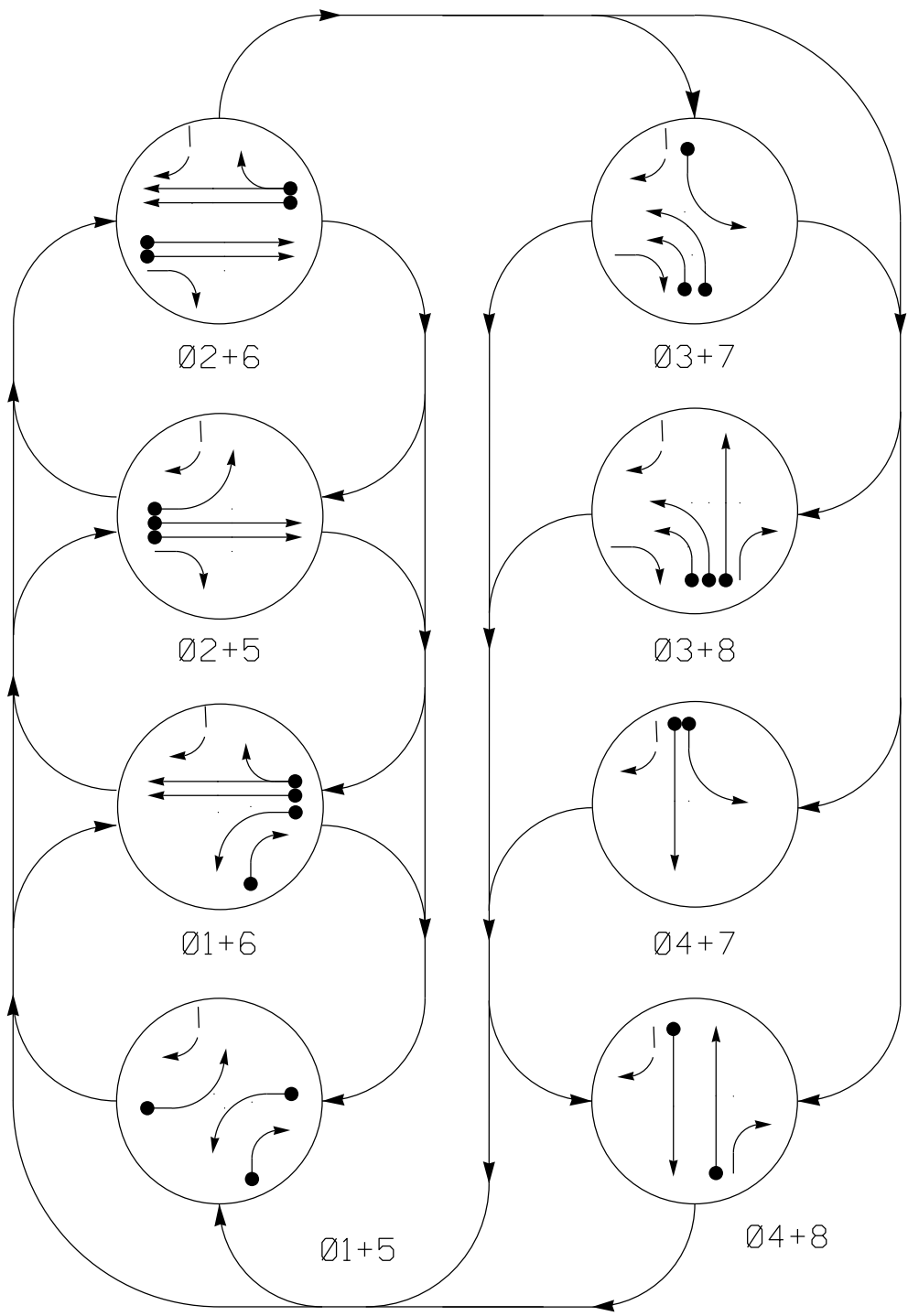
Electrical Detail-Sheet 2 of 2-Temporary Design 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:  750 N.Greenfield Pkwy, Garner, NC 27529	US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 033108 JIANXIN MA	
	Division 12 Gaston County Belmont		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
	PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles		
	PREPARED BY: J. Ma	REVIEWED BY:		
	REVISIONS	INIT.	DATE	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T2
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

DocuSigned by:
Jianxin Ma
11/5/2023
DATE
SIG. INVENTORY NO. 12-0082T2

PHASING DIAGRAM



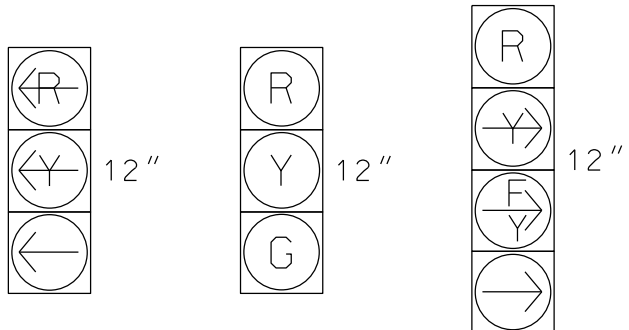
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE							
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8
11	←	←	→	→	→	→	→	→
21, 22	R	R	G	G	R	R	R	R
23	R	R	←	←	→	→	R	R
31, 32	←	←	→	→	←	←	←	←
41, 42	R	R	R	R	R	R	G	G
51	←	←	←	←	→	→	→	→
61, 62	R	G	R	G	R	R	R	R
71	←	←	←	←	←	←	←	←
81, 82	R	R	R	R	R	G	R	G
83	→	→	R	R	←	←	←	←

SIGNAL FACE I.D.

All Heads L.E.D.



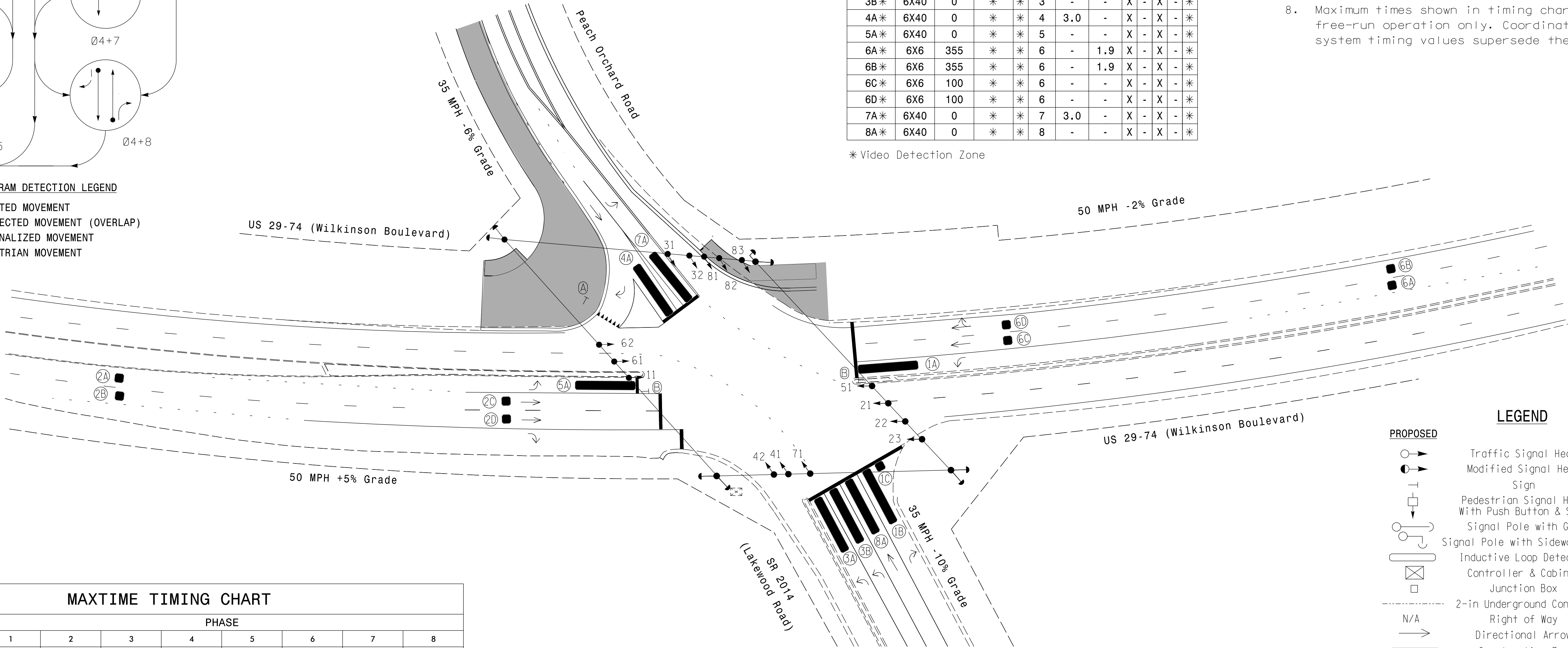
MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A*	6X40	0	*	*	1	-	-	X	-	X	-	*
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-	*
1C*	6X6	0	*	*	1	15.0	-	X	-	X	-	*
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2C*	6X6	100	*	*	2	-	-	X	-	X	-	*
2D*	6X6	100	*	*	2	-	-	X	-	X	-	*
3A*	6X40	0	*	*	3	-	-	X	-	X	-	*
3B*	6X40	0	*	*	3	-	-	X	-	X	-	*
4A*	6X40	0	*	*	4	3.0	-	X	-	X	-	*
5A*	6X40	0	*	*	5	-	-	X	-	X	-	*
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6C*	6X6	100	*	*	6	-	-	X	-	X	-	*
6D*	6X6	100	*	*	6	-	-	X	-	X	-	*
7A*	6X40	0	*	*	7	3.0	-	X	-	X	-	*
8A*	6X40	0	*	*	8	-	-	X	-	X	-	*

* Video Detection Zone

8 Phase Fully Actuated Belmont Signal System

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Unbag existing signal heads and signs.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

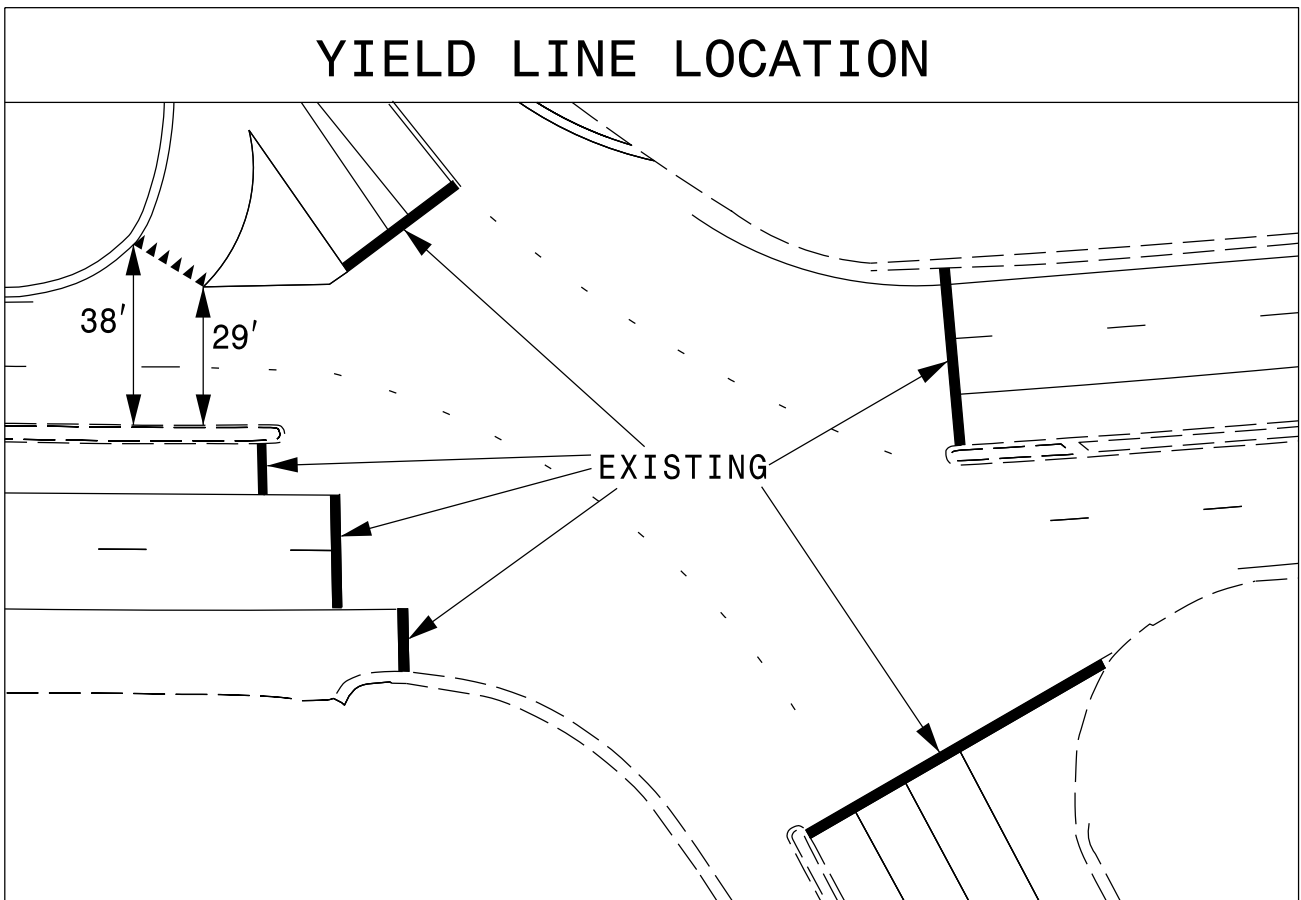
- | PROPOSED | EXISTING |
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MAXTIME TIMING CHART

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	-	-	-
Ped Clear *	-	-	-	-	-	-	-	-
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	30	70	20	30	20	70	20	30
Yellow Change	3.0	4.4	3.4	4.3	3.0	5.0	3.1	4.8
Red Clear	2.8	1.8	3.9	2.0	2.6	1.6	3.5	2.5
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	-	-	-	-	-	-	-	-

* 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.

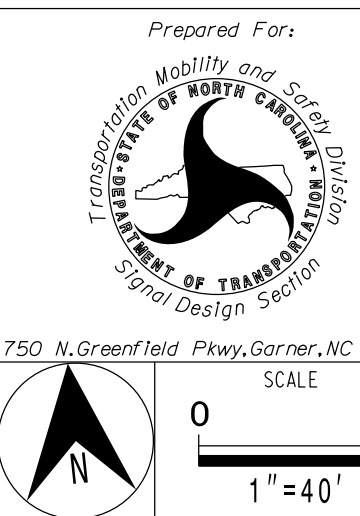
YIELD LINE LOCATION



Signal Upgrade-Temporary Design 3 (Phase I Step 2)



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940 Main Campus Drive, Suite 500
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P: 919-829-0328



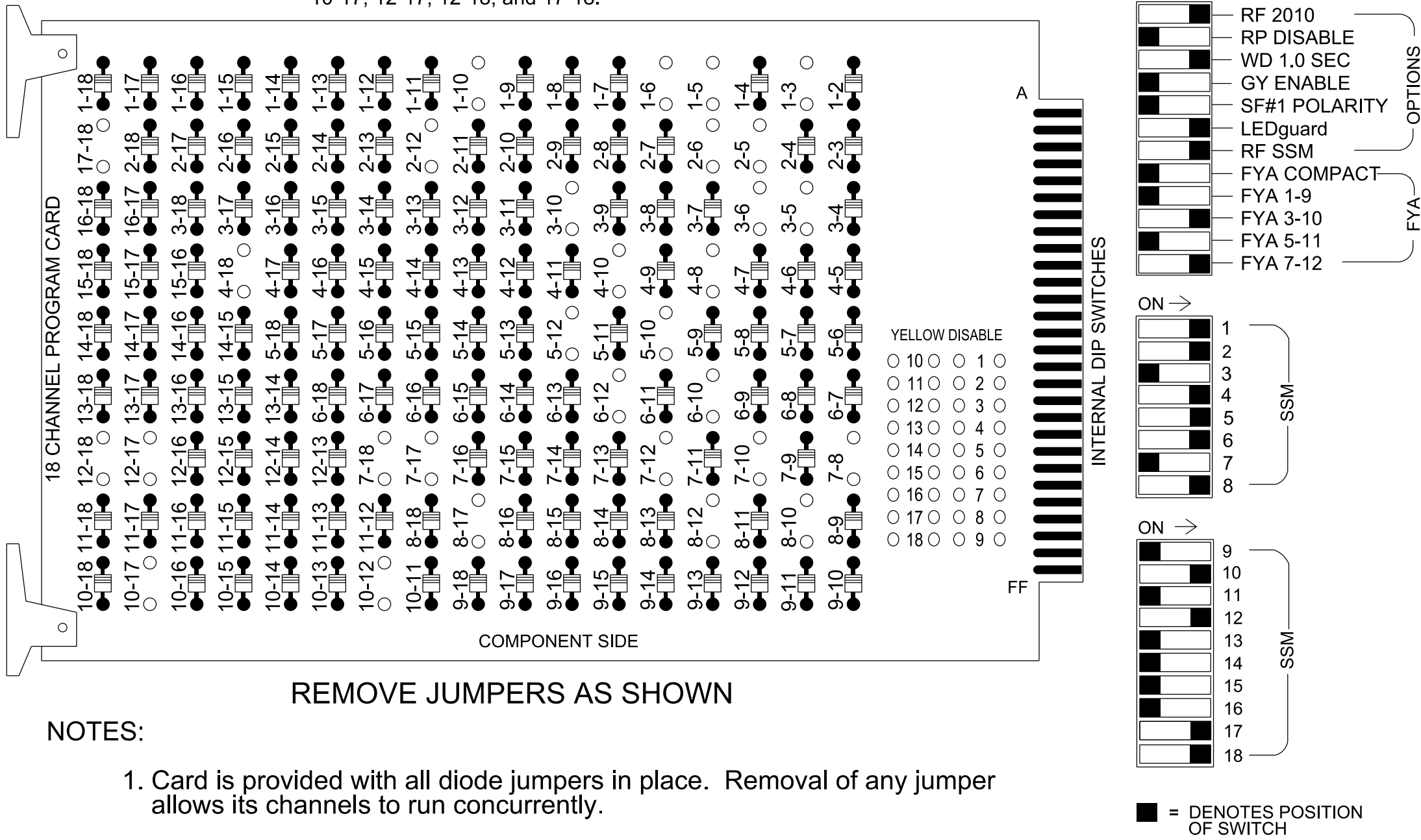
US 29-74 (Wilkinson Boulevard)
at
SR 2014 (Lakewood Road) /
Peach Orchard Road
Division 12 Gaston County Belmont
PLAN DATE: October 2023 REVIEWED BY: M. L. Styles
PREPARED BY: J. Ma REVIEWED BY:
REVISIONS
INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SEAL
NORTH CAROLINA
SEAL
033108
ENGINEER
JANUARY 11, 2024
11/5/2023
DATE
SIG. INVENTORY NO. 12-008213

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 2-5, 2-6, 2-12, 3-5, 3-6, 3-10, 4-8, 4-10, 4-18, 5-10, 5-12, 6-10, 6-12, 7-8, 7-10, 7-12, 7-17, 7-18, 8-10, 8-12, 8-17, 10-12, 10-17, 12-17, 12-18, and 17-18.



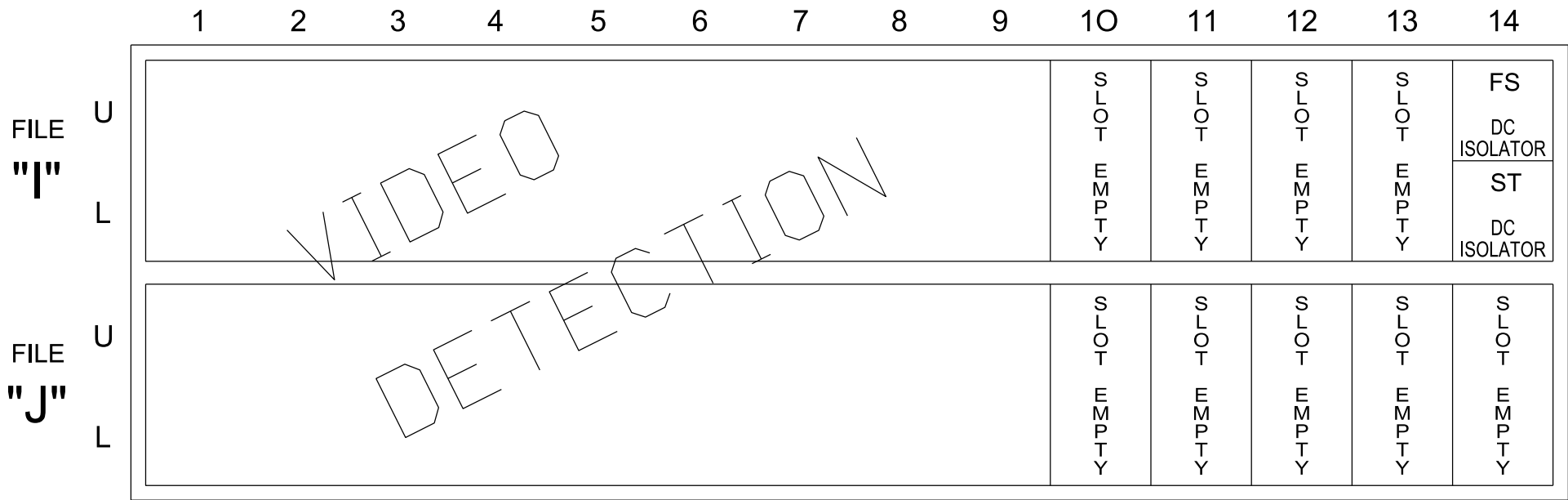
REMOVE JUMPERS AS SHOWN

NOTES:

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

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

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

NOTES

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

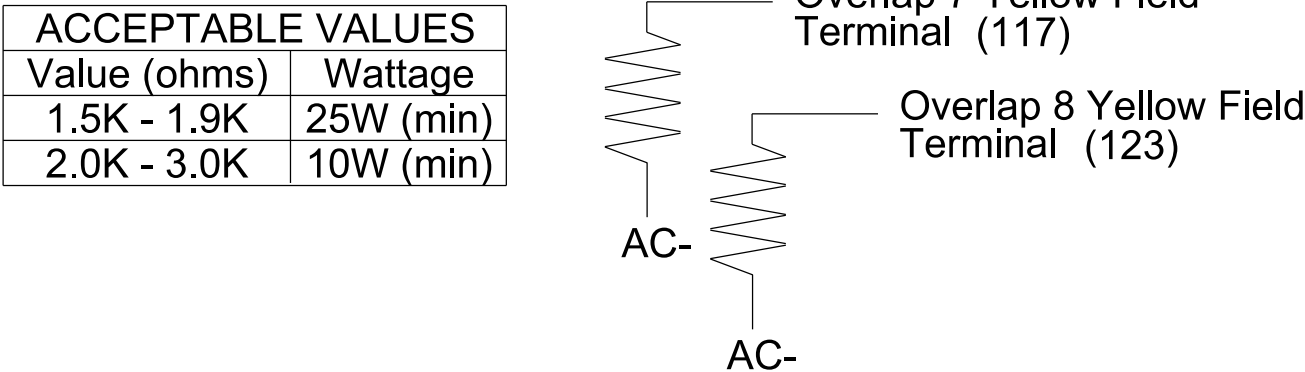
EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S10,S11, AUXS2,AUXS3,AUXS5,AUXS6
Phases Used.....1,2,3,4,5,6,7,8
Overlap "2".....*
Overlap "4".....*
Overlap "5".....*
Overlap "6".....*
Overlap "7".....*
Overlap "8".....*

*See overlap programming detail on sheet 2.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



SIGNAL HEAD HOOK-UP CHART

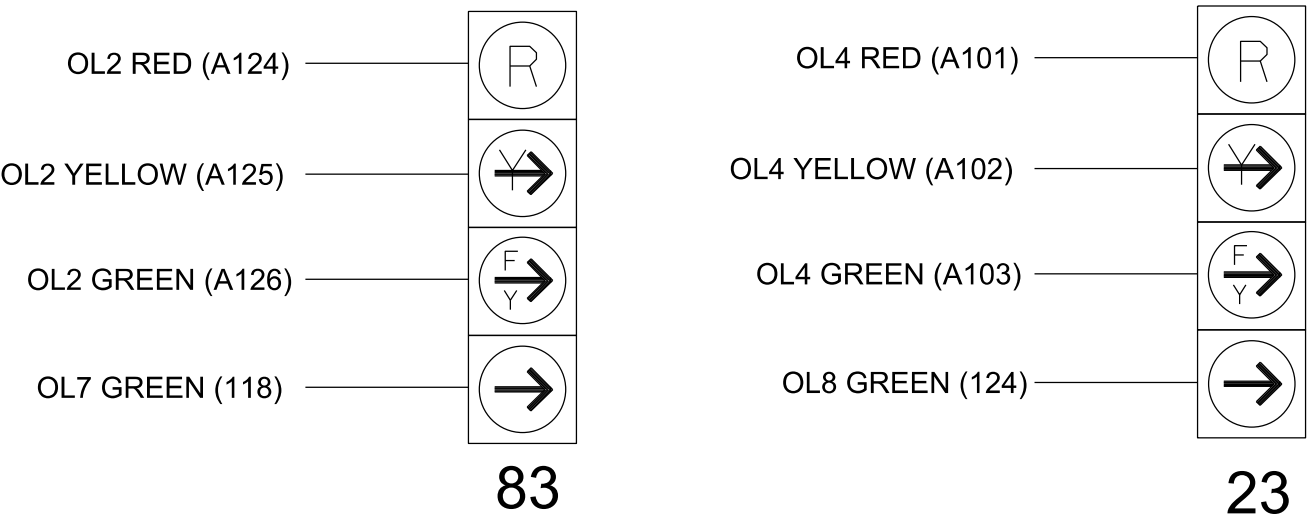
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	OL5	OL3	OL4	OL6
SIGNAL HEAD NO.	11	21,22	NU	83★	41,42	NU	51	61,62	NU	23★	81,82	NU	NU	83★	31,32	NU	23★	71
RED		128			101			134			107			A124			A101	
YELLOW		129		★	102			135		★	108							
GREEN		130			103			136			109							
RED ARROW	125						131								A111			A104
YELLOW ARROW	126						132							A125	A112		A102	A105
FLASHING YELLOW ARROW														A126			A103	
GREEN ARROW	127			118			133			124					A113			A106

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)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T3
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A



Electrical Detail-Sheet 1 of 2-Temporary Design 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 29-74 (Wilkinson Boulevard)			SEAL	
	at SR 2014 (Lakewood Road) / Peach Orchard Road				
Division 12		Gaston County	Belmont		
PLAN DATE: October 2023		REVIEWED BY: M.L. Stygles			
PREPARED BY: J. Ma		REVIEWED BY:			
REVISIONS		INIT.	DATE		

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	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	NORMAL	NORMAL
Included Phases	8	2	1	3
Modifier Phases	-	-	-	-
Modifier Overlaps	7	8	-	-
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 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	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	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 CONTROL SOURCE 7
ASSIGNED TO CHANNEL 3 ➡

NOTICE CONTROL SOURCE 8
ASSIGNED TO CHANNEL 7 ➡

FLASHER CIRCUIT MODIFICATION DETAIL

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

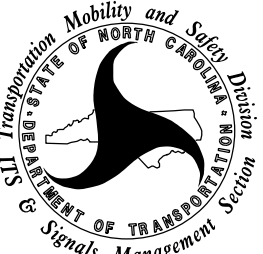
1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

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



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

Electrical Detail-Sheet 2 of 2-Temporary Design 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:  750 N. Greenfield Pkwy, Garner, NC 27529	US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JIANXIN MA 033108	
	Division 12 Gaston County Belmont		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
	PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles	DocuSigned by: 11/5/2023	
	PREPARED BY: J. Ma	REVIEWED BY:	INIT.	DATE
	REVISIONS		DATE	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T3
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

SIG. INVENTORY NO. 12-0082T3

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 9.0

8 Phase
Fully Actuated
Belmont Signal System

NOTES

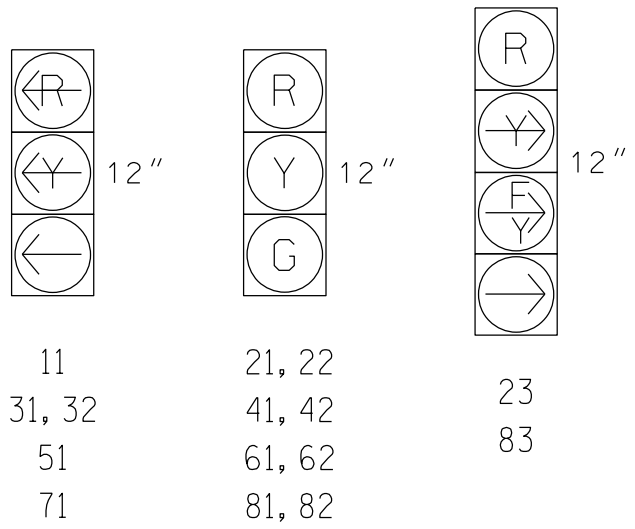
- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Reposition all existing signal heads and sign.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR						PROGRAMMING					
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURN	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN NEW CARD
1A*	6X40	0	*	*	1	-	-	X	-	X	-
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-
1C*	6X6	0	*	*	1	15.0	-	X	-	X	-
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-
2C*	6X6	100	*	*	2	-	-	X	-	X	-
2D*	6X6	100	*	*	2	-	-	X	-	X	-
3A*	6X40	0	*	*	3	-	-	X	-	X	-
3B*	6X40	0	*	*	3	-	-	X	-	X	-
4A*	6X40	0	*	*	4	3.0	-	X	-	X	-
5A*	6X40	0	*	*	5	-	-	X	-	X	-
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-
6C*	6X6	100	*	*	6	-	-	X	-	X	-
6D*	6X6	100	*	*	6	-	-	X	-	X	-
7A*	6X40	0	*	*	7	3.0	-	X	-	X	-
8A*	6X40	0	*	*	8	-	-	X	-	X	-

* Video Detection Zone

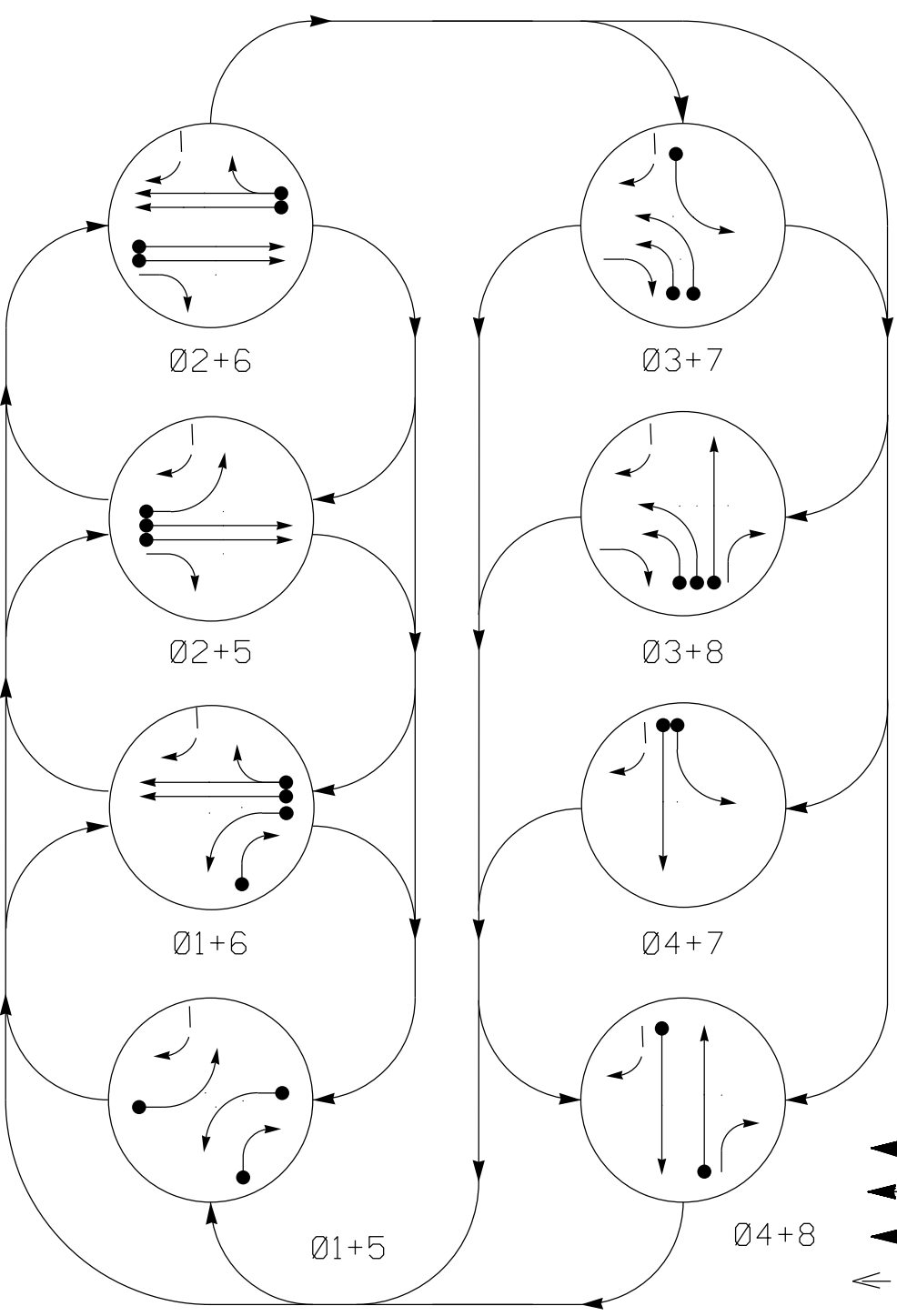
SIGNAL FACE I.D.

All Heads L.E.D.



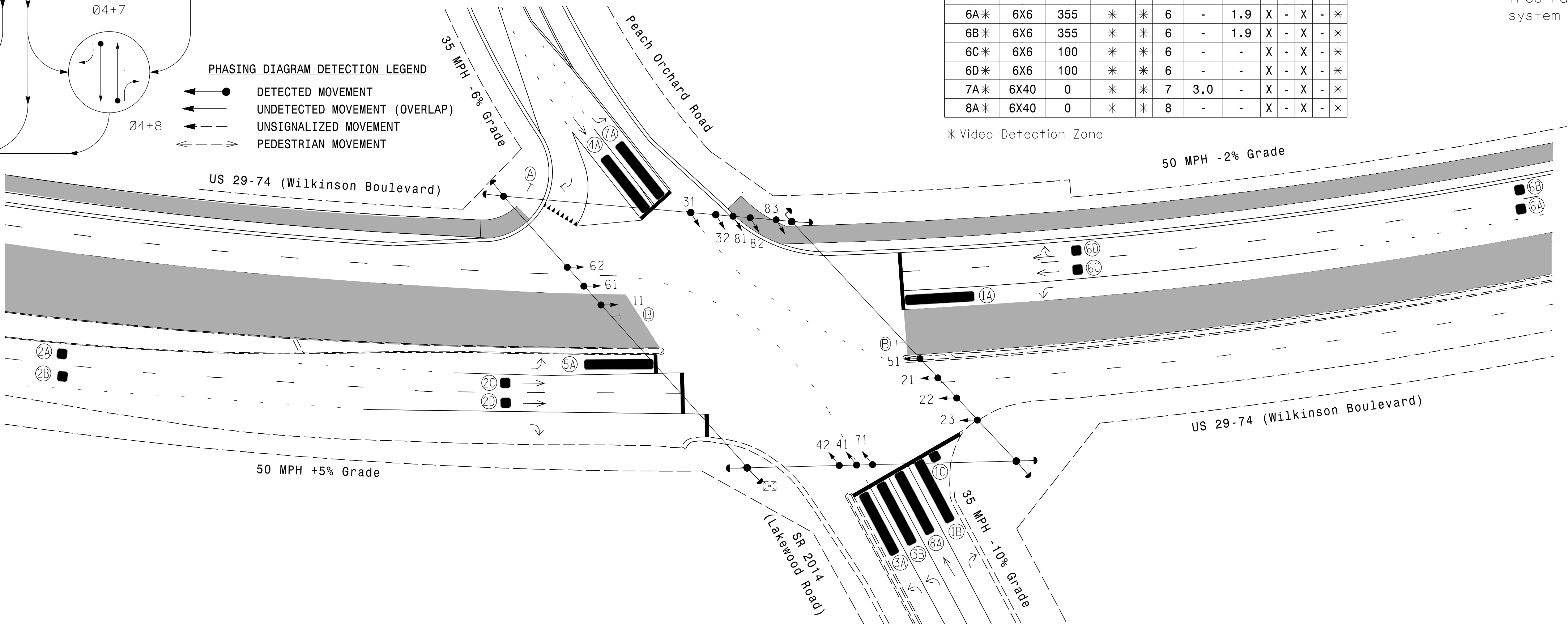
SIGNAL FACE	PHASE							
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8
11	←	←	→	→	→	→	→	→
21, 22	R	R	G	G	R	R	R	Y
23	R	R	→	→	→	→	R	R
31, 32	→	→	→	→	←	←	→	→
41, 42	R	R	R	R	R	R	G	G
51	←	←	←	←	←	←	←	←
61, 62	R	G	R	G	R	R	R	Y
71	→	→	→	→	←	←	→	→
81, 82	R	R	R	R	R	G	R	G
83	→	→	R	R	R	→	→	R

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

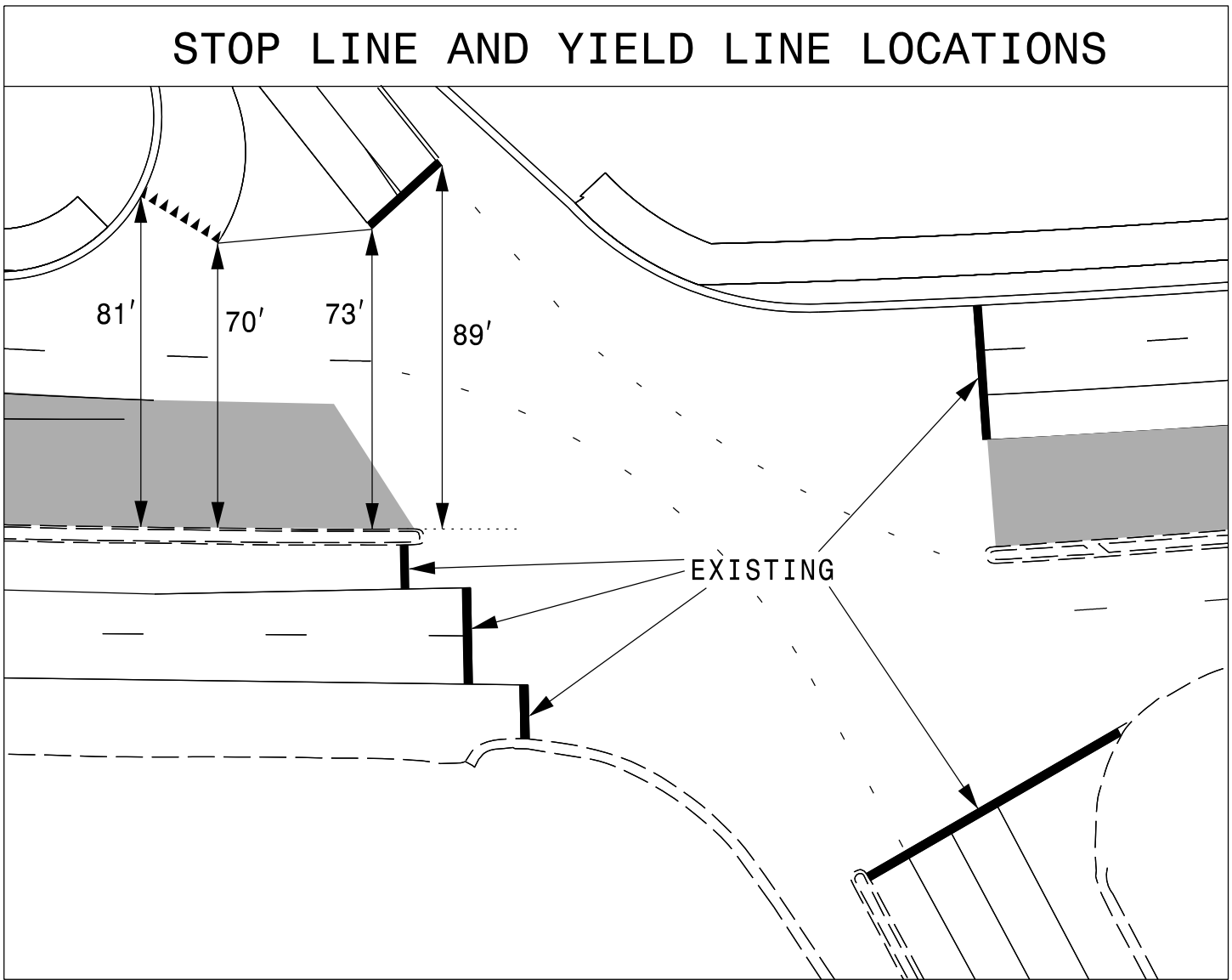


MAXTIME TIMING CHART

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	-	-	-
Ped Clear *	-	-	-	-	-	-	-	-
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	30	70	20	30	20	70	20	30
Yellow Change	3.0	4.4	3.4	4.3	3.0	5.0	3.1	4.8
Red Clear	3.2	1.8	4.4	3.0	2.9	1.9	4.3	3.1
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	-	-	-	-	-	-	-	-

* 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.

STOP LINE AND YIELD LINE LOCATIONS



LEGEND

PROPOSED	EXISTING

Signal Upgrade-Temporary Design 4
(Phase I Step 3)

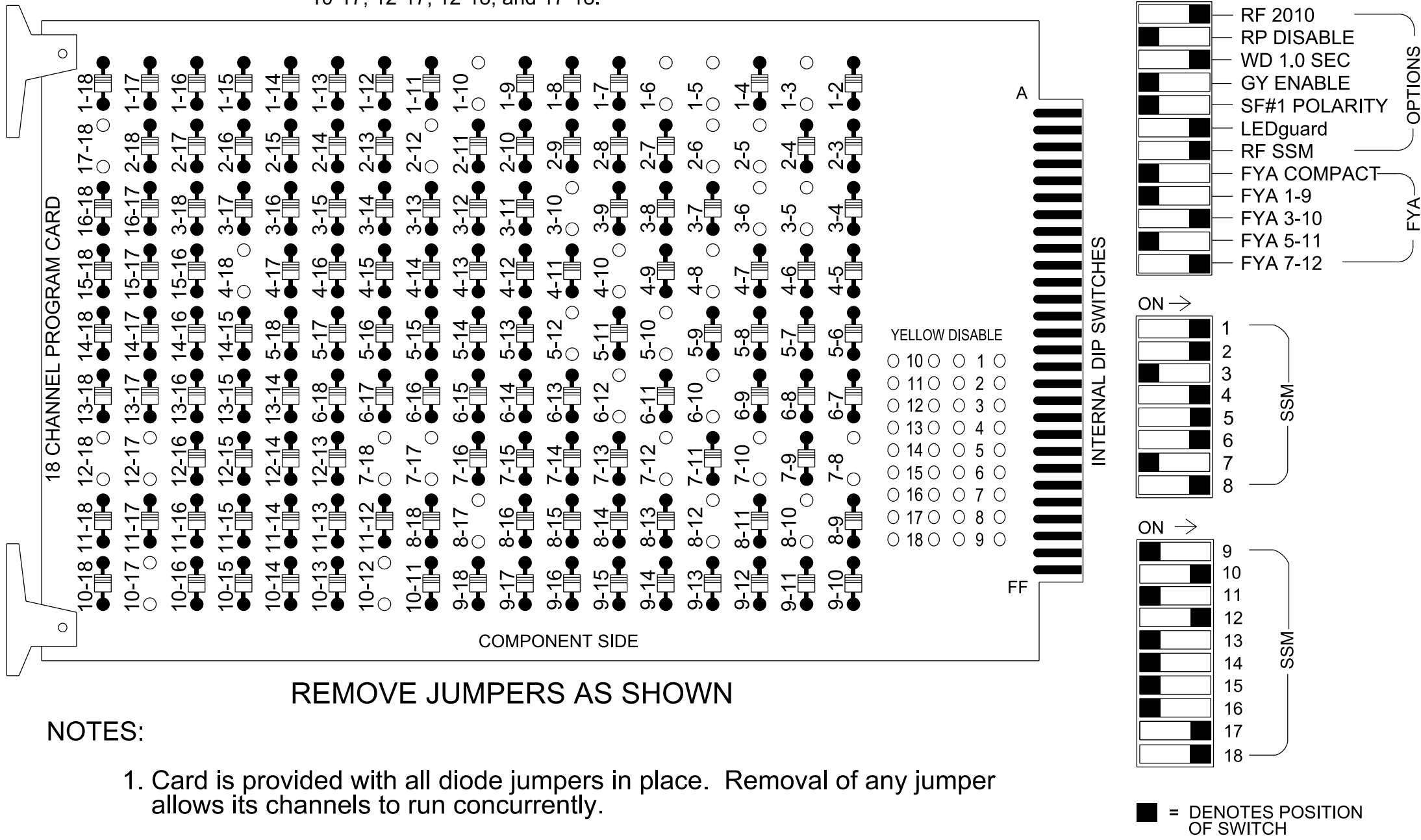


Prepared For: 750 N. Greenfield Pkwy, Garner, NC 27529	US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road Division 12 Gaston County Belmont PLAN DATE: October 2023 REVIEWED BY: M. L. Stygles PREPARED BY: J. Ma REVIEWED BY:	DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JANUARY 11, 2023 DATE 11/5/2023 SIG. INVENTORY NO. 12-008214
SCALE 0 40 1"=40'	REVISIONS INIT. DATE	

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 2-5, 2-6, 2-12, 3-5, 3-6, 3-10, 4-8, 4-10, 4-18, 5-10, 5-12, 6-10, 6-12, 7-8, 7-10, 7-12, 7-17, 7-18, 8-10, 8-12, 8-17, 10-12, 10-17, 12-17, 12-18, and 17-18.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S10,S11, AUXS2,AUXS3,AUXS5,AUXS6
Phases Used.....1,2,3,4,5,6,7,8
Overlap "2".....*
Overlap "4".....*
Overlap "5".....*
Overlap "6".....*
Overlap "7".....*
Overlap "8".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

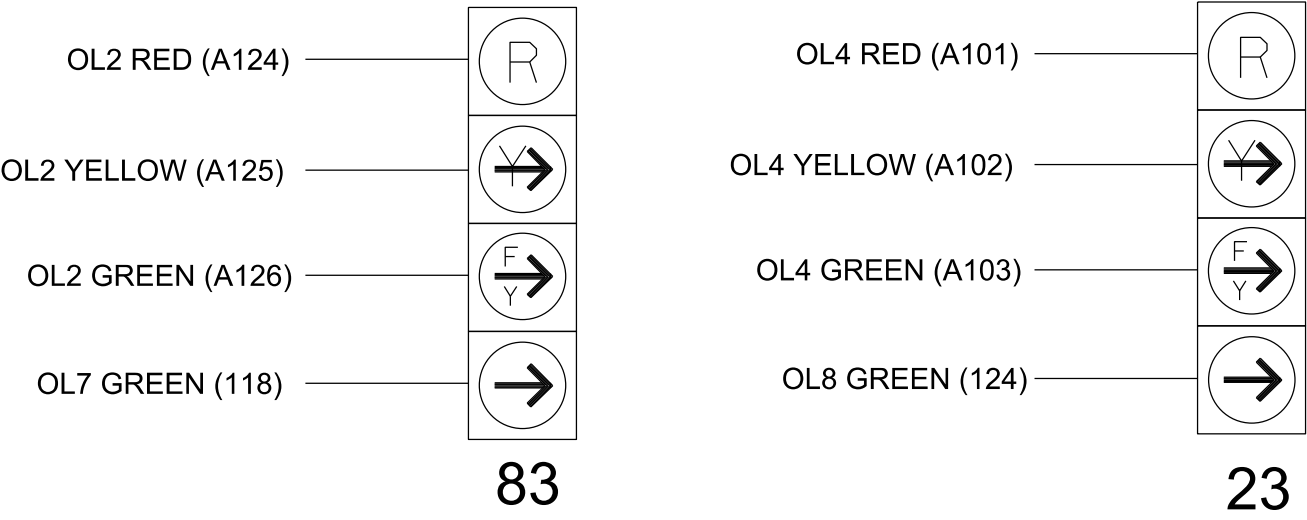
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	OL5	OL3	OL4	OL6
SIGNAL HEAD NO.	11	21,22	NU	83★	41,42	NU	51	61,62	NU	23★	81,82	NU	NU	83★	31,32	NU	23★	71
RED		128			101			134			107			A124			A101	
YELLOW		129		★	102			135		★	108							
GREEN		130			103			136			109							
RED ARROW	125						131								A111			A104
YELLOW ARROW	126						132							A125	A112		A102	A105
FLASHING YELLOW ARROW														A126			A103	
GREEN ARROW	127			118			133			124					A113			A106

NU = Not Used

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

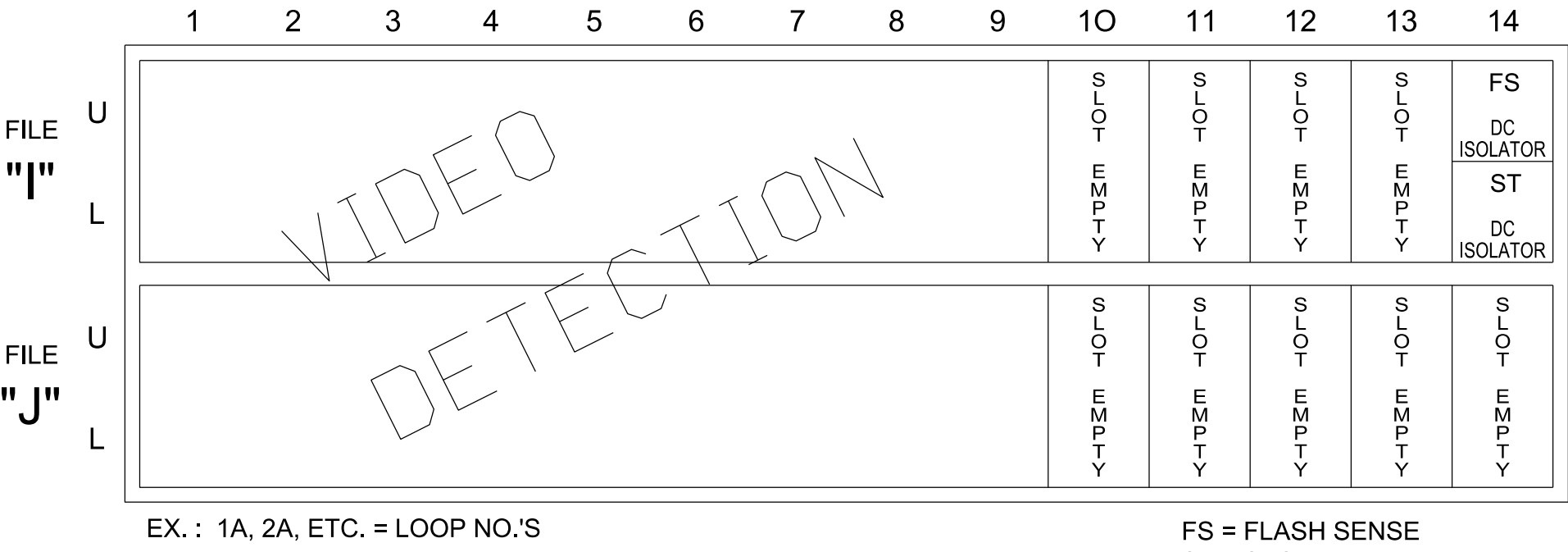
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

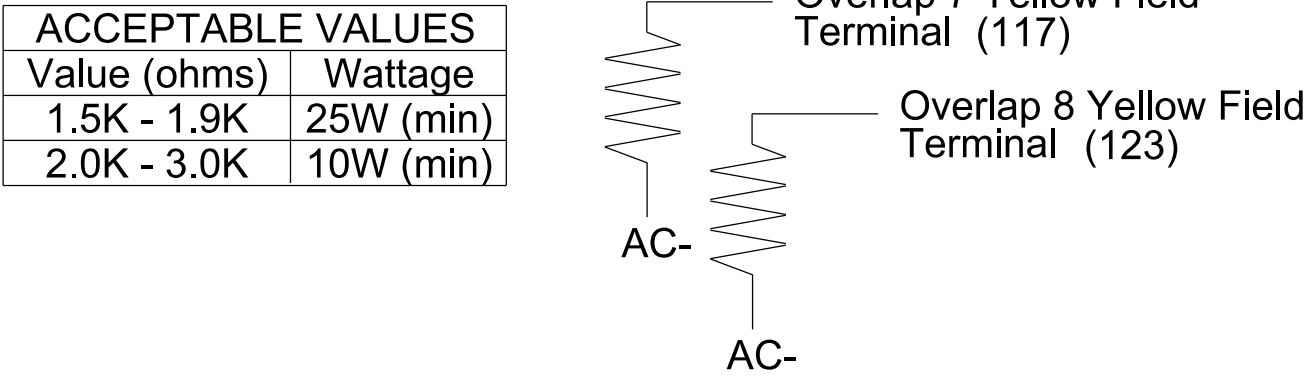


SPECIAL DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T4
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A



Electrical Detail-Sheet 1 of 2-Temporary Design 4

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 29-74 (Wilkinson Boulevard)				DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
	at SR 2014 (Lakewood Road) / Peach Orchard Road				SEAL	
Division 12 Gaston County Belmont	PLAN DATE: October 2023				REVIEWED BY: M.L. Stygles	
	PREPARED BY: J. Ma				REVIEWED BY:	
750 N.Greenfield Pkwy, Garner, NC 27529	REVISIONS				INIT.	
					DATE	
11/5/2023	DocuSigned by: J. Ma				DATE	
	SIG. INVENTORY NO. 12-0082T4					

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig.9.2

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	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	NORMAL	NORMAL
Included Phases	8	2	1	3
Modifier Phases	-	-	-	-
Modifier Overlaps	7	8	-	-
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 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	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	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 CONTROL SOURCE 7
ASSIGNED TO CHANNEL 3 ➡

NOTICE CONTROL SOURCE 8
ASSIGNED TO CHANNEL 7 ➡

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.



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

Electrical Detail-Sheet 2 of 2-Temporary Design 4

ELECTRICAL AND PROGRAMMING DETAILS FOR:  750 N.Greenfield Pkwy,Corner,NC 27529	US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road		SEAL	
	Division 12 Gaston County Belmont		NORTH CAROLINA PROFESSIONAL ENGINEER JIANXIN MA	
	PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles	DocuSigned by Jianxin Ma 11/5/2023	
	PREPARED BY: J. Ma	REVIEWED BY:	DATE	
	REVISIONS	INIT.	DATE	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T4
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL	11/5/2023
DATE	
SIG. INVENTORY NO.	12-0082T4

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 10.0

8 Phase
Fully Actuated
Belmont Signal System

NOTES

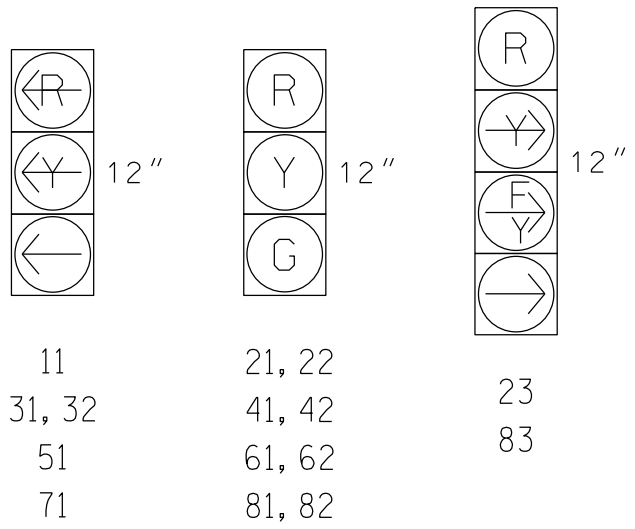
- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Reposition existing signal heads 51, 21, 22, and 23 and Sign B.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

MAXTIME 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
1A*	6X40	0	*	*	1	-	-	X	-	X	-	*
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-	*
1C*	6X6	0	*	*	1	15.0	-	X	-	X	-	*
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2C*	6X6	100	*	*	2	-	-	X	-	X	-	*
2D*	6X6	100	*	*	2	-	-	X	-	X	-	*
3A*	6X40	0	*	*	3	-	-	X	-	X	-	*
3B*	6X40	0	*	*	3	-	-	X	-	X	-	*
4A*	6X40	0	*	*	4	3.0	-	X	-	X	-	*
5A*	6X40	0	*	*	5	-	-	X	-	X	-	*
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6C*	6X6	100	*	*	6	-	-	X	-	X	-	*
6D*	6X6	100	*	*	6	-	-	X	-	X	-	*
7A*	6X40	0	*	*	7	3.0	-	X	-	X	-	*
8A*	6X40	0	*	*	8	-	-	X	-	X	-	*

* Video Detection Zone

SIGNAL FACE I.D.

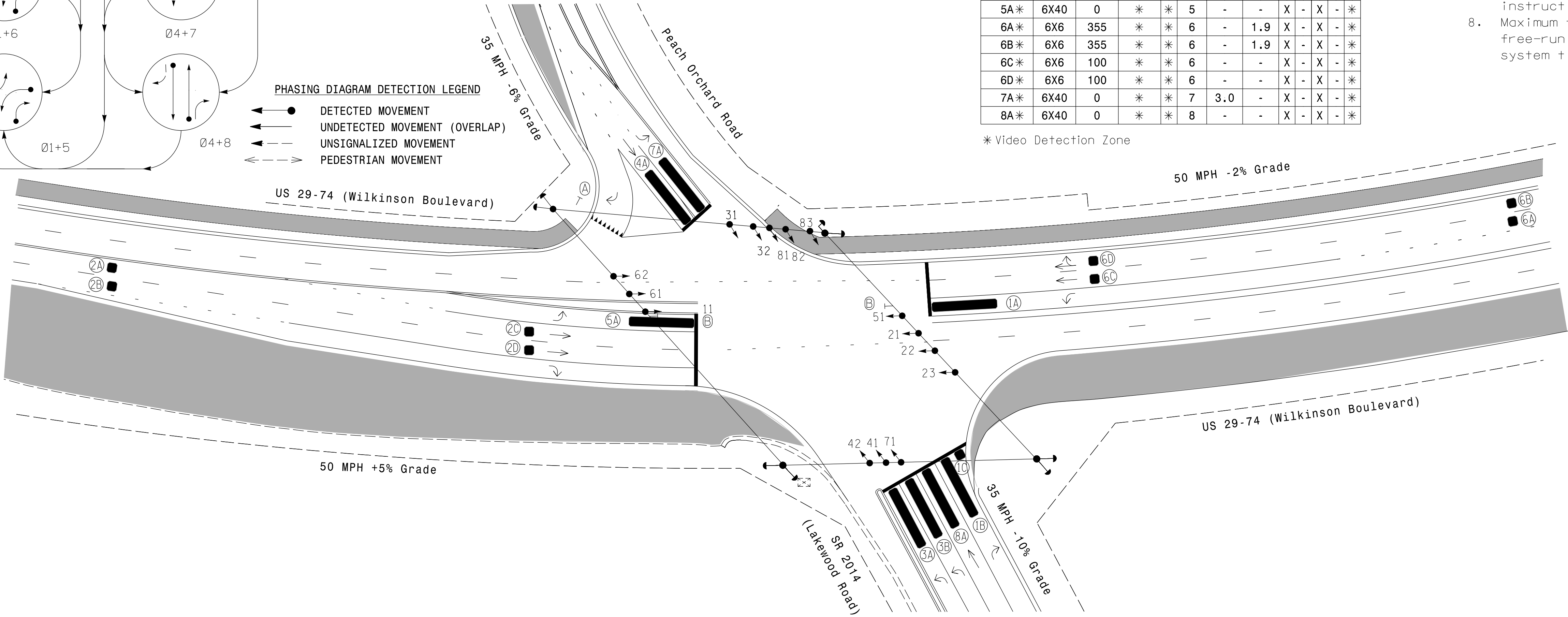
All Heads L.E.D.



SIGNAL FACE	PHASE							
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8
11	←	←	→	→	→	→	→	→
21, 22	R	R	G	G	R	R	R	Y
23	R	R	→	→	→	→	R	Y
31, 32	→	→	→	→	←	←	→	R
41, 42	R	R	R	R	R	R	G	R
51	←	→	←	→	→	→	→	→
61, 62	R	G	R	G	R	R	R	Y
71	→	→	→	→	←	←	→	→
81, 82	R	R	R	R	R	G	R	G
83	→	→	R	R	→	→	→	R

PHASING DIAGRAM DETECTION LEGEND

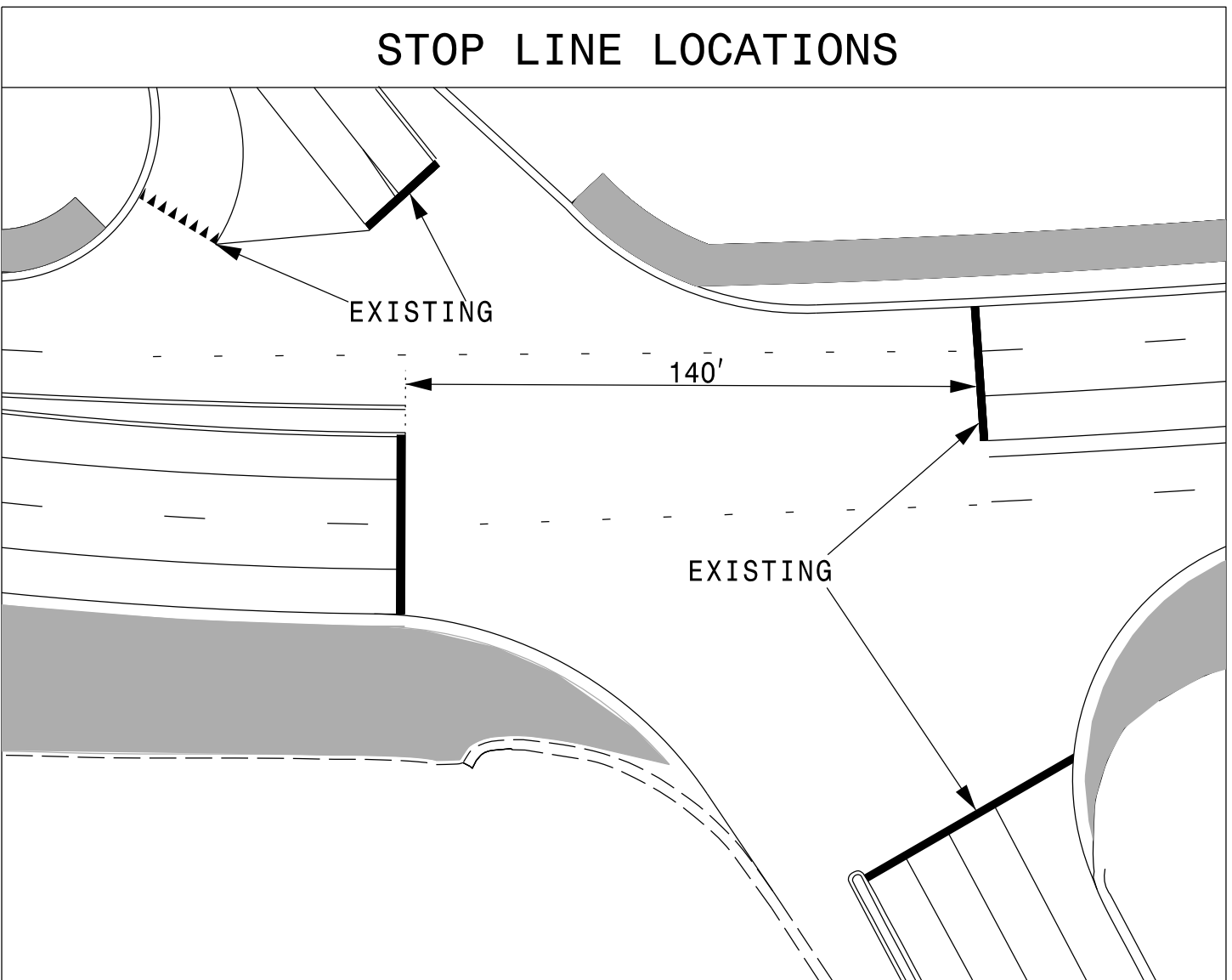
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT



FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	-	-	-
Ped Clear *	-	-	-	-	-	-	-	-
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	30	70	20	30	20	70	20	30
Yellow Change	3.0	4.4	3.4	4.3	3.0	5.0	3.1	4.8
Red Clear	3.1	1.8	4.4	2.6	2.9	1.9	4.3	3.1
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	-	-	-	-	-	-	-	-

* 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.

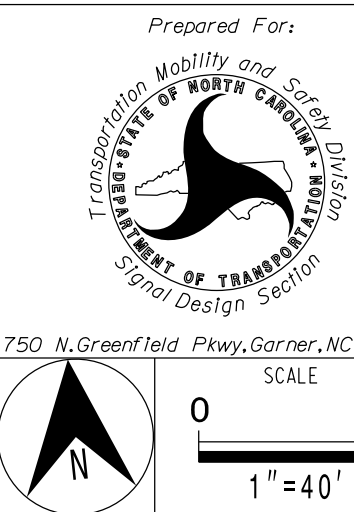
STOP LINE LOCATIONS



LEGEND

PROPOSED	EXISTING

Signal Upgrade-Temporary Design 5
(Phase II)



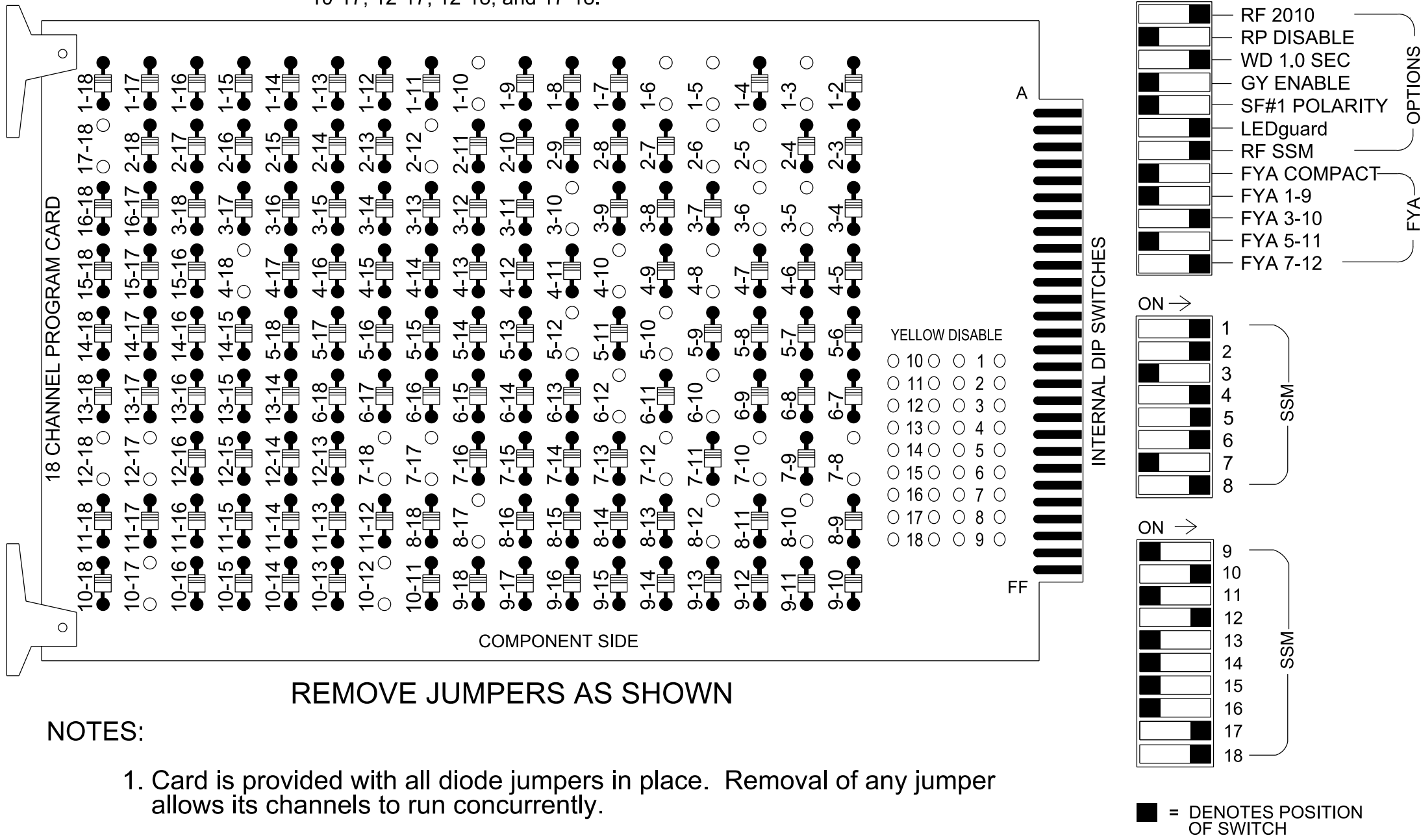
US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road			
Division 12	Gaston County	Belmont	
PLAN DATE: October 2023	REVIEWED BY: M. L. Styles		
PREPARED BY: J. Ma	REVIEWED BY:		
REVISIONS	INIT.	DATE	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED
SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JIANXIN MA 033108
11/5/2023
SIG. INVENTORY NO. 12-008215

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 2-5, 2-6, 2-12, 3-5, 3-6, 3-10, 4-8, 4-10, 4-18, 5-10, 5-12, 6-10, 6-12, 7-8, 7-10, 7-12, 7-17, 7-18, 8-10, 8-12, 8-17, 10-12, 10-17, 12-17, 12-18, and 17-18.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S10,S11, AUXS2,AUXS3,AUXS5,AUXS6
Phases Used.....1,2,3,4,5,6,7,8
Overlap "2".....*
Overlap "4".....*
Overlap "5".....*
Overlap "6".....*
Overlap "7".....*
Overlap "8".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

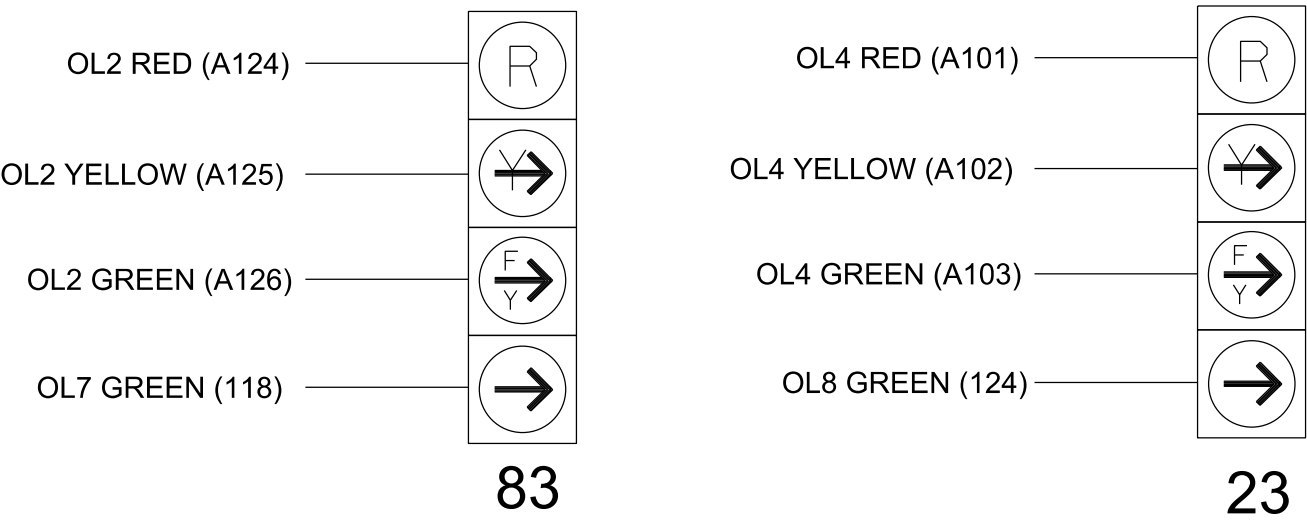
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	OL5	OL3	OL4	OL6
SIGNAL HEAD NO.	11	21,22	NU	83★	41,42	NU	51	61,62	NU	23★	81,82	NU	NU	83★	31,32	NU	23★	71
RED		128			101			134			107			A124			A101	
YELLOW		129		★	102			135		★	108							
GREEN		130			103			136			109							
RED ARROW	125						131								A111			A104
YELLOW ARROW	126						132							A125	A112		A102	A105
FLASHING YELLOW ARROW														A126			A103	
GREEN ARROW	127			118			133			124					A113			A106

NU = Not Used

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

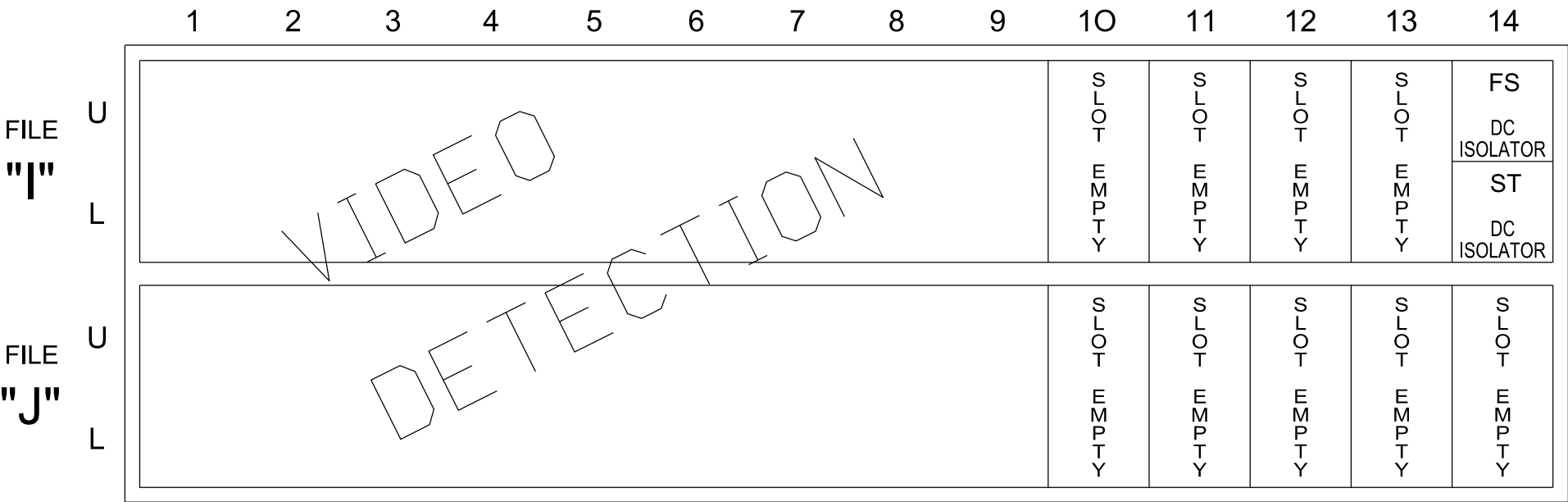
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



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

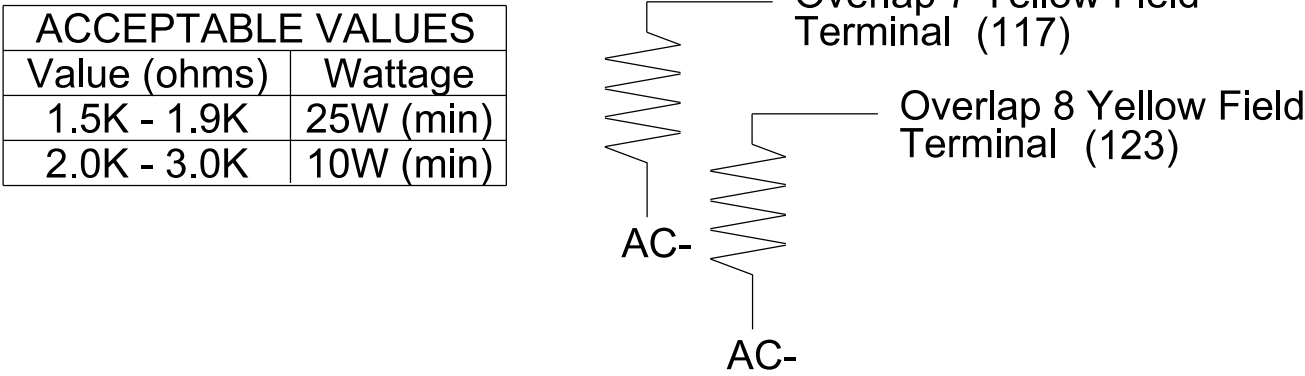
FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T5
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Sheet 1 of 2-Temporary Design 5

ELECTRICAL AND PROGRAMMING DETAILS FOR: US 29-74 (Wilkinson Boulevard)

at
SR 2014 (Lakewood Road) /
Peach Orchard Road

Division 12 Gaston County Belmont

PLAN DATE: October 2023 REVIEWED BY: M.L. Stygles

PREPARED BY: J. Ma REVIEWED BY:

REVISIONS INIT. DATE

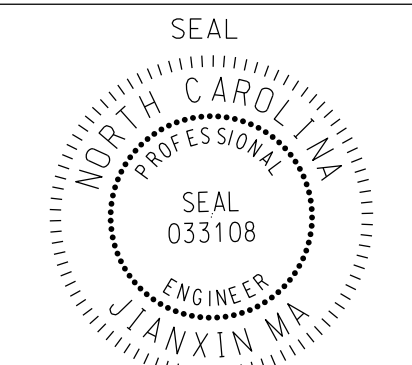
750 N.Greenfield Pkwy,Garner,NC 27529

11/5/2023

SIG. INVENTORY NO. 12-0082T5



DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED



DocuSigned by: J. Ma

11/5/2023

SIG. INVENTORY NO. 12-0082T5

Overlap	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	NORMAL	NORMAL
Included Phases	8	2	1	3
Modifier Phases	-	-	-	-
Modifier Overlaps	7	8	-	-
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

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	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	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 CONTROL SOURCE 8
ASSIGNED TO CHANNEL 7



Seal of the Professional Engineer, State of North Carolina, No. 033108, Jianxin Ma.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T5
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig 11.0

8 Phase
Fully Actuated
Belmont Signal System
NOTES

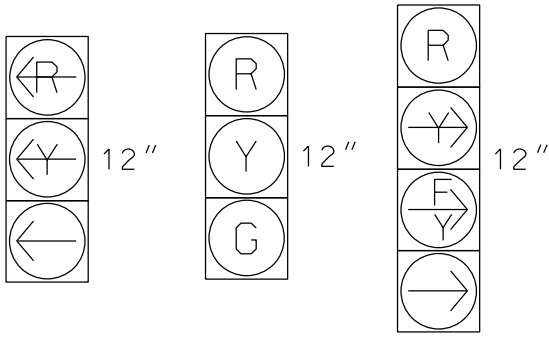
- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Reposition all existing signal heads and signs.
- Renumber existing signal head 23 as 24.
- This intersection uses video detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

MAXTIME 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
1A*	6X40	0	*	*	1	-	-	X	-	X	-	*
1B*	6X40	0	*	*	1	15.0	-	X	-	X	-	*
1C*	6X40	0	*	*	1	15.0	-	X	-	X	-	*
2A*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2B*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2C*	6X6	355	*	*	2	-	1.9	X	-	X	-	*
2D*	6X6	100	*	*	2	-	-	X	-	X	-	*
2E*	6X6	100	*	*	2	-	-	X	-	X	-	*
2F*	6X6	100	*	*	2	-	-	X	-	X	-	*
3A*	6X40	0	*	*	3	-	-	X	-	X	-	*
3B*	6X40	0	*	*	3	-	-	X	-	X	-	*
4A*	6X40	0	*	*	4	3.0	-	X	-	X	-	*
5A*	6X40	0	*	*	5	-	-	X	-	X	-	*
6A*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6B*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6C*	6X6	355	*	*	6	-	1.9	X	-	X	-	*
6D*	6X6	100	*	*	6	-	-	X	-	X	-	*
6E*	6X6	100	*	*	6	-	-	X	-	X	-	*
6F*	6X6	100	*	*	6	-	-	X	-	X	-	*
7A*	6X40	0	*	*	7	3.0	-	X	-	X	-	*
8A*	6X40	0	*	*	8	-	-	X	-	X	-	*

*Video Detection Zone

SIGNAL FACE I.D.

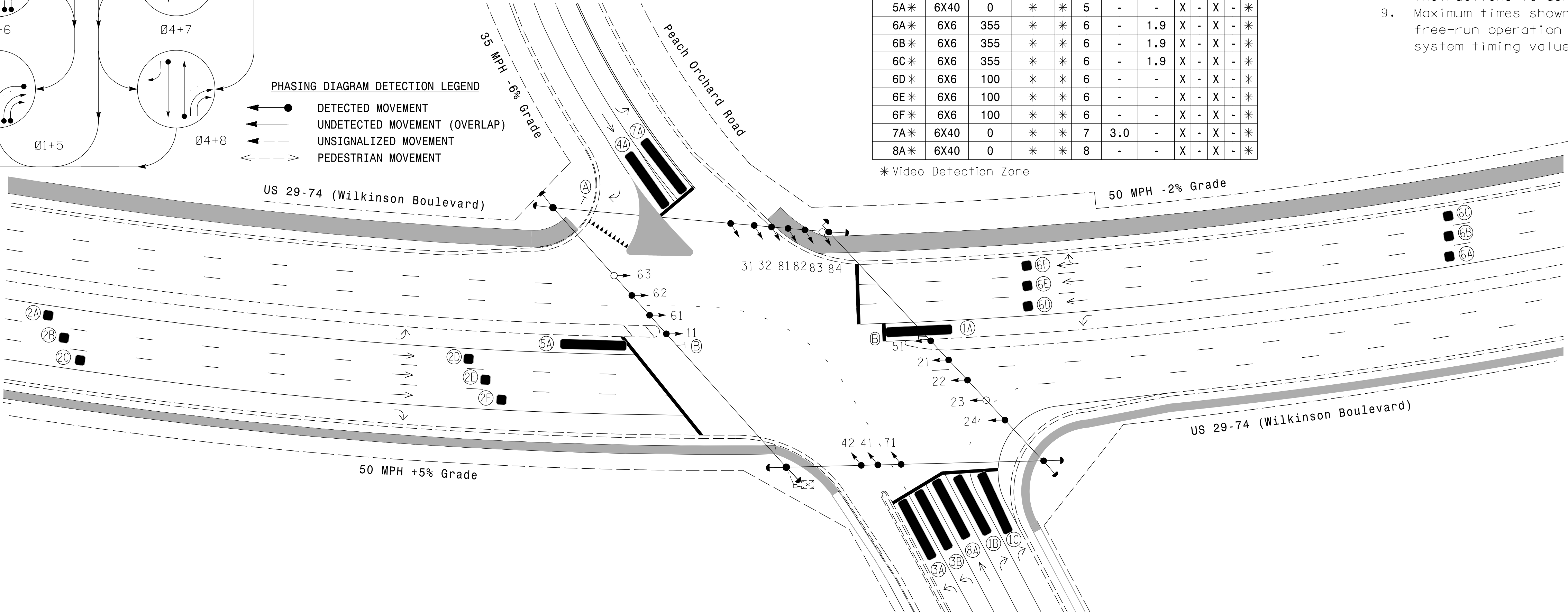
All Heads L.E.D.



SIGNAL FACE	PHASE									
	Ø 1+5	Ø 1+6	Ø 2+5	Ø 2+6	Ø 3+7	Ø 3+8	Ø 4+7	Ø 4+8	F	H
11	←	←	←	←	←	←	←	←	←	←
21, 22, 23	R	R	G	G	R	R	R	R	Y	
24	R	R	F	F	→	→	R	R	Y	
31, 32	←	←	←	←	←	←	←	←	←	←
41, 42	R	R	R	R	R	R	G	G	R	
51	←	←	←	←	←	←	←	←	←	←
61, 62, 63	R	G	R	G	R	R	R	R	Y	
71	←	←	←	←	←	←	←	←	←	←
81, 82	R	R	R	R	R	G	R	G	R	
83, 84	→	→	R	R	R	F	F	F	R	

PHASING DIAGRAM DETECTION LEGEND

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

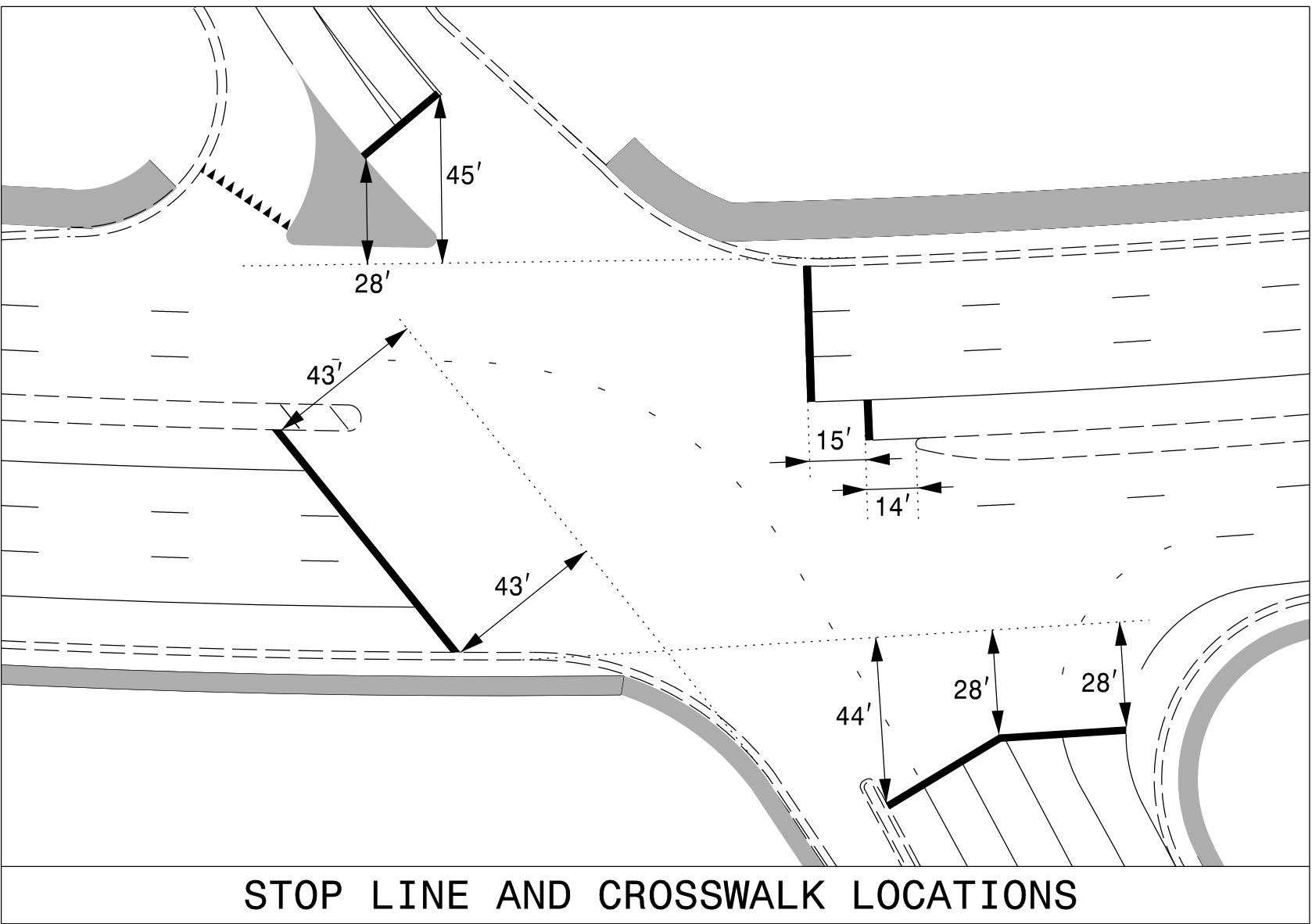


LEGEND

PROPOSED	EXISTING
	N/A
	N/A
N/A	Right of Way
	Directional Arrow
	N/A
	N/A
	A
	B

MAXTIME TIMING CHART								
FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	-	-	-	-	-	-	-
Ped Clear *	-	-	-	-	-	-	-	-
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	30	70	20	30	20	70	20	30
Yellow Change	3.0	4.4	3.4	4.3	3.0	5.0	3.1	4.8
Red Clear	2.6	2.2	5.0	3.2	3.2	1.9	4.5	3.2
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	-	-	-	-	-	-	-	-

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



Signal Upgrade-Temporary Design 6
(Phase III)

Prepared For
TRANSPORTATION MOBILITY AND SAFETY DIVISION
DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE
0 40
1"=40'

US 29-74 (Wilkinson Boulevard)
at
SR 2014 (Lakewood Road) /
Peach Orchard Road
Belmont

Division 12 Gaston County

PLAN DATE: October 2023
PREPARED BY: J. Ma
REVIEWED BY: M. L. Stygles

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

SEAL
NORTH CAROLINA
PROFESSIONAL ENGINEER
JAN XIN MA
033108

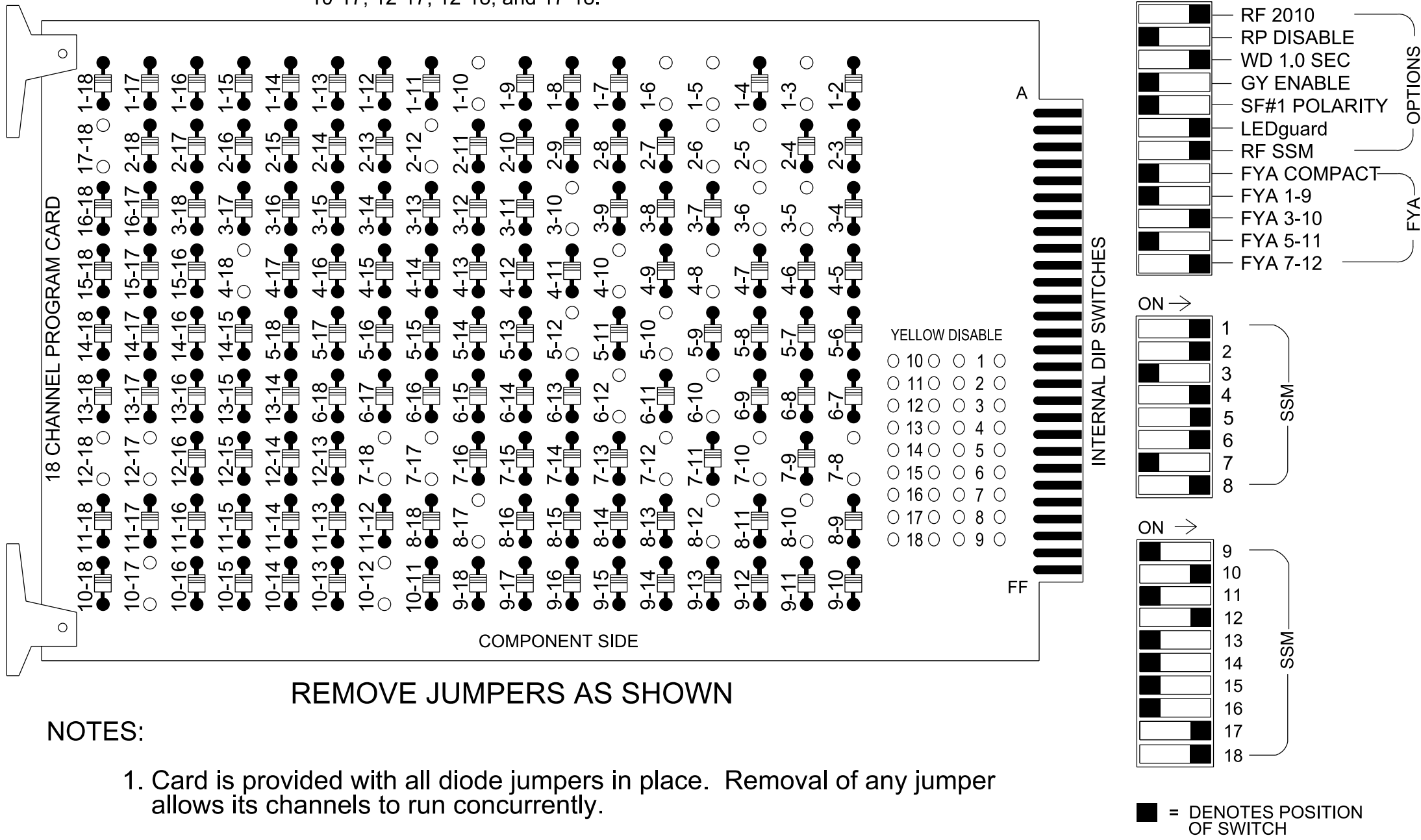
11/5/2023
DATE

SIG. INVENTORY NO. 12-008276

18 CHANNEL CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-3, 1-5, 1-6, 1-10, 2-5, 2-6, 2-12, 3-5, 3-6, 3-10, 4-8, 4-10, 4-18, 5-10, 5-12, 6-10, 6-12, 7-8, 7-10, 7-12, 7-17, 7-18, 8-10, 8-12, 8-17, 10-12, 10-17, 12-17, 12-18, and 17-18.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1,S2,S4,S5,S7,S8,S10,S11,
AUXS2,AUXS3,AUXS5,AUXS6
Phases Used.....1,2,3,4,5,6,7,8
Overlap "2".....*
Overlap "4".....*
Overlap "5".....*
Overlap "6".....*
Overlap "7".....*
Overlap "8".....*

*See overlap programming detail on sheet 2.

SIGNAL HEAD HOOK-UP CHART

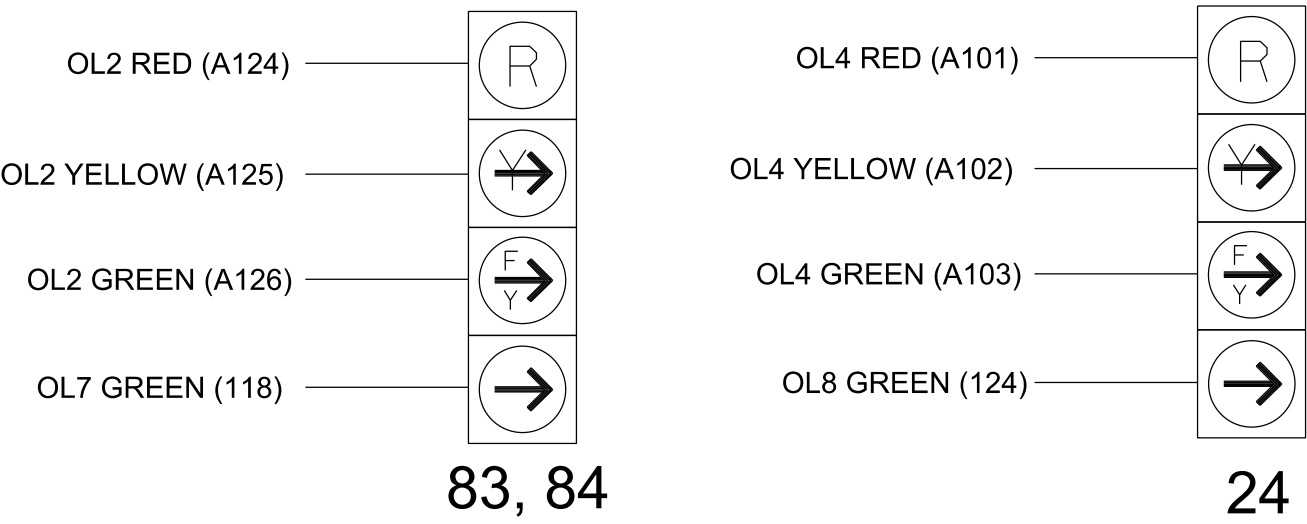
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	OL7	4	4 PED	5	6	6 PED	OL8	8	8 PED	OL1	OL2	OL5	OL3	OL4	OL6
SIGNAL HEAD NO.	11	21,22,23	NU	83,84★	41,42	NU	51	61,62,63	NU	24★	81,82	NU	NU	83,84★	31,32	NU	24★	71
RED		128			101			134			107			A124			A101	
YELLOW		129		★	102			135		★	108							
GREEN		130			103			136			109							
RED ARROW	125						131							A111			A104	
YELLOW ARROW	126						132						A125	A112			A102	A105
FLASHING YELLOW ARROW													A126				A103	
GREEN ARROW	127			118			133			124				A113			A106	

NU = Not Used

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

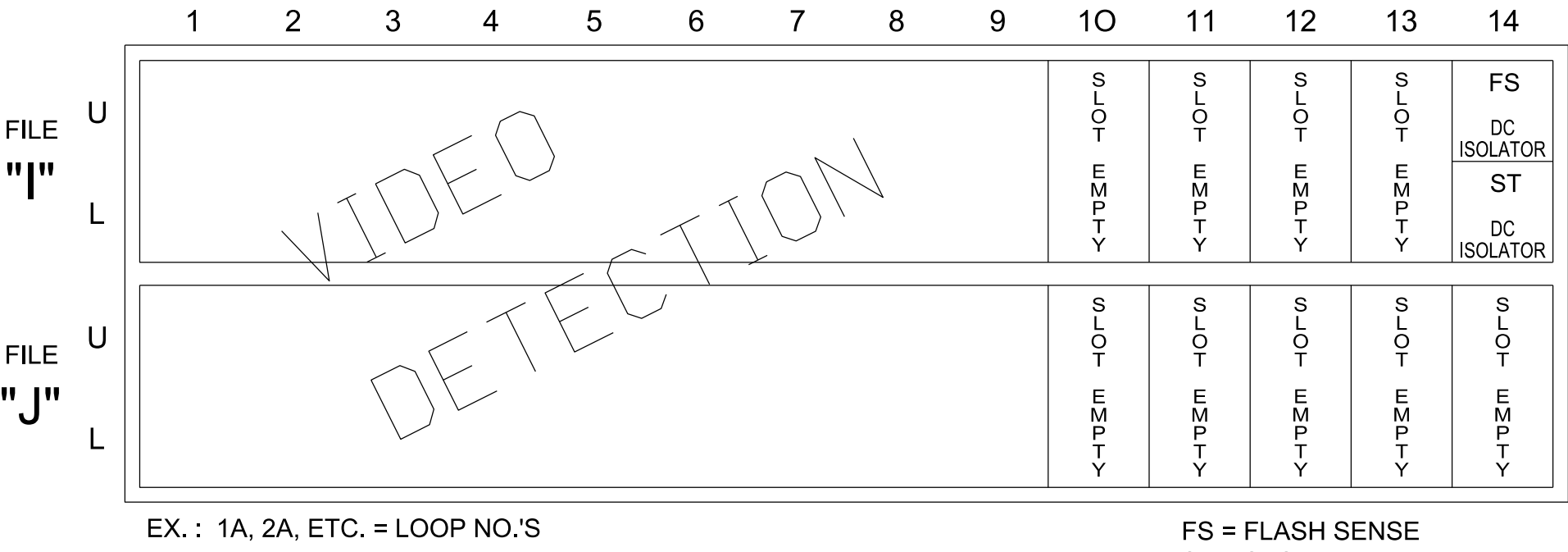
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

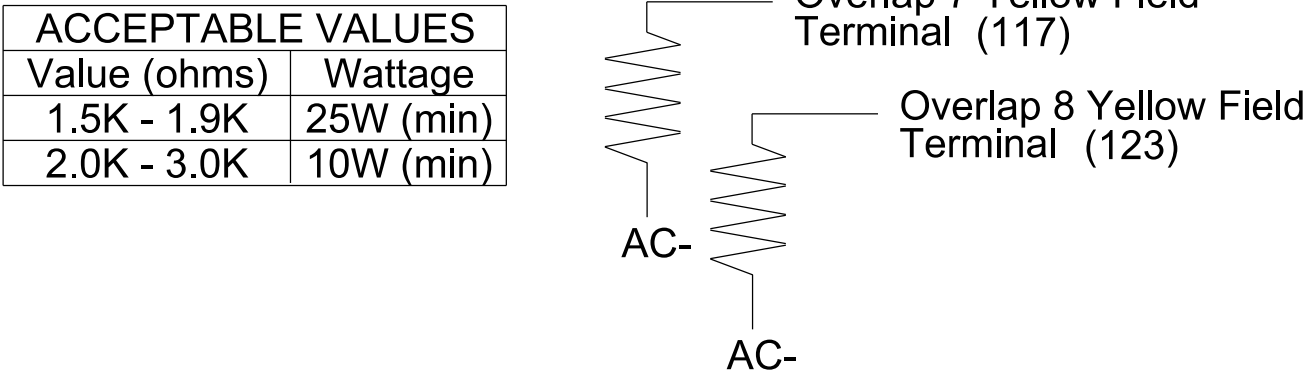


SPECIAL DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082T6
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A



Electrical Detail-Sheet 1 of 2-Temporary Design 6

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 29-74 (Wilkinson Boulevard)			
	at SR 2014 (Lakewood Road) / Peach Orchard Road			
Division 12 Gaston County Belmont	PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles		
	PREPARED BY: J. Ma	REVIEWED BY:		
750 N.Greenfield Pkwy, Garner, NC 27529	REVISIONS	INIT.	DATE	
				11/5/2023
				SIG. INVENTORY NO. 12-0082T6

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	Sig.11.2

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	2	4	7	8
Type	FYA 4 - Section	FYA 4 - Section	NORMAL	NORMAL
Included Phases	8	2	1	3
Modifier Phases	-	-	-	-
Modifier Overlaps	7	8	-	-
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 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	Overlap	7	-	X	X	3
4	Phase Vehicle	4	-	X	-	4
5	Phase Vehicle	5	-	X	-	5
6	Phase Vehicle	6	X	-	X	6
7	Overlap	8	-	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 CONTROL SOURCE 7
ASSIGNED TO CHANNEL 3 ➡

NOTICE CONTROL SOURCE 8
ASSIGNED TO CHANNEL 7 ➡

FLASHER CIRCUIT MODIFICATION DETAIL

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

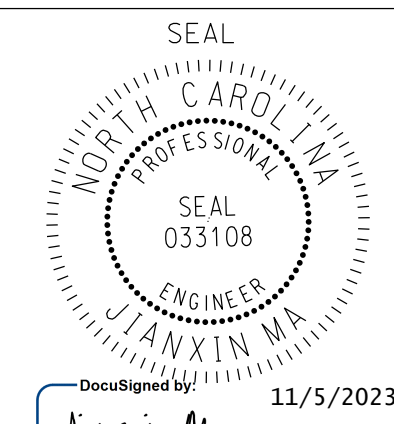
1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

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



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

Electrical Detail-Sheet 2 of 2-Temporary Design 6

ELECTRICAL AND PROGRAMMING DETAILS FOR:	US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road			
	Division 12 Gaston County Belmont			
	PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles		
	PREPARED BY: J. Ma	REVIEWED BY:		
	REVISIONS		INIT.	DATE
 750 N.Greenfield Pkwy,Carner,NC 27529				
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-0082T5 DESIGNED: October 2023 SEALED: 11/5/2023 REVISED: N/A  11/5/2023				
SIG. INVENTORY NO. 12-0082T6				

8 Phase
Fully Actuated
Belmont Signal System

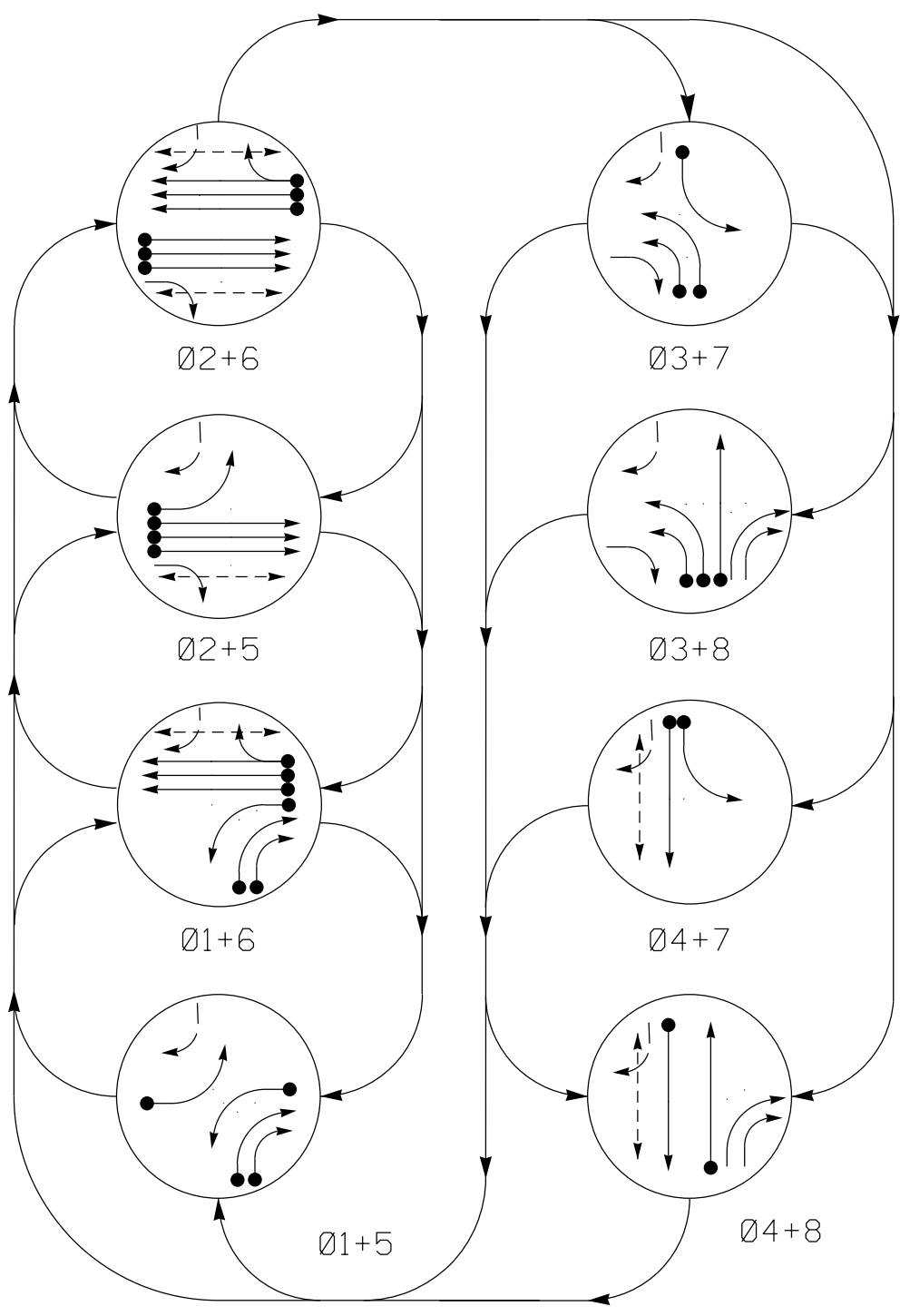
NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing 'Don't Walk' time only.
- All metal poles and arms and pedestals should be BLACK in color as specified in the project special provisions.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

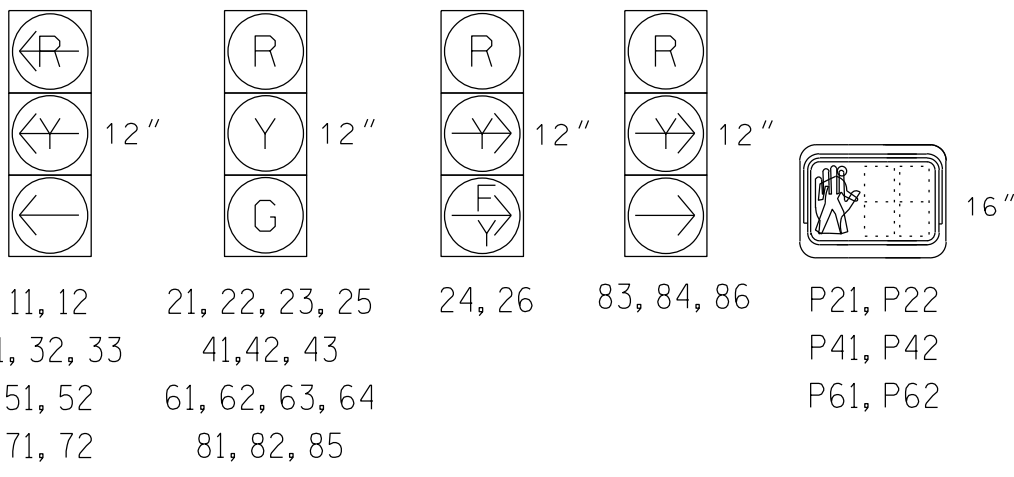
PROPOSED	EXISTING
	Traffic Signal Head
	Modified Signal Head
	Sign
	Pedestrian Signal Head With Push Button & Sign
	Signal Pole with Guy
	Signal Pole with Sidewalk Guy
	Inductive Loop Detector
	Controller & Cabinet
	Junction Box
	2-in Underground Conduit
	Right of Way
	Directional Arrow
	Metal Strain Pole
	Type II Signal Pedestal
	Type I Pushbutton Post
	Curb Ramp
	Directional Drill
	Guardrail
	"YIELD" Sign (R1-2)
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)
	Pedestrian Crossing Sign (W11-2) & Left Downward Diagonal Arrow Plaque (W16-TpL)
	Pedestrian Crossing Sign (W11-2) & Right Downward Diagonal Arrow Plaque (W16-TpR)
	Right "TURNING VEHICLES" Yield "TO" Pedestrians Sign (R10-15R)

PHASING DIAGRAM



SIGNAL FACE I.D.

All Heads L.E.D.



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE							
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3 + 7	Ø 3 + 8	Ø 4 + 7	Ø 4 + 8
11, 12	←	←	→	→	→	→	→	→
21, 22, 23, 25	R	R	G	G	R	R	R	→
24, 26	R	R	→	→	→	→	R	→
31, 32, 33	→	→	→	→	←	←	→	→
41, 42, 43	→	R	R	R	R	R	G	R
51, 52	←	←	→	→	→	→	→	→
61, 62, 63, 64	R	G	R	G	R	R	R	→
71, 72	→	→	→	→	←	←	→	→
81, 82, 85	R	R	R	R	R	G	R	G
83, 84, 86	→	→	R	R	→	R	→	R
P21,P22	DW	DW	W	W	DW	DW	DW	DRK
P41,P42	DW	DW	DW	DW	DW	DW	W	DRK
P61,P62	DW	W	DW	W	DW	DW	DW	DRK

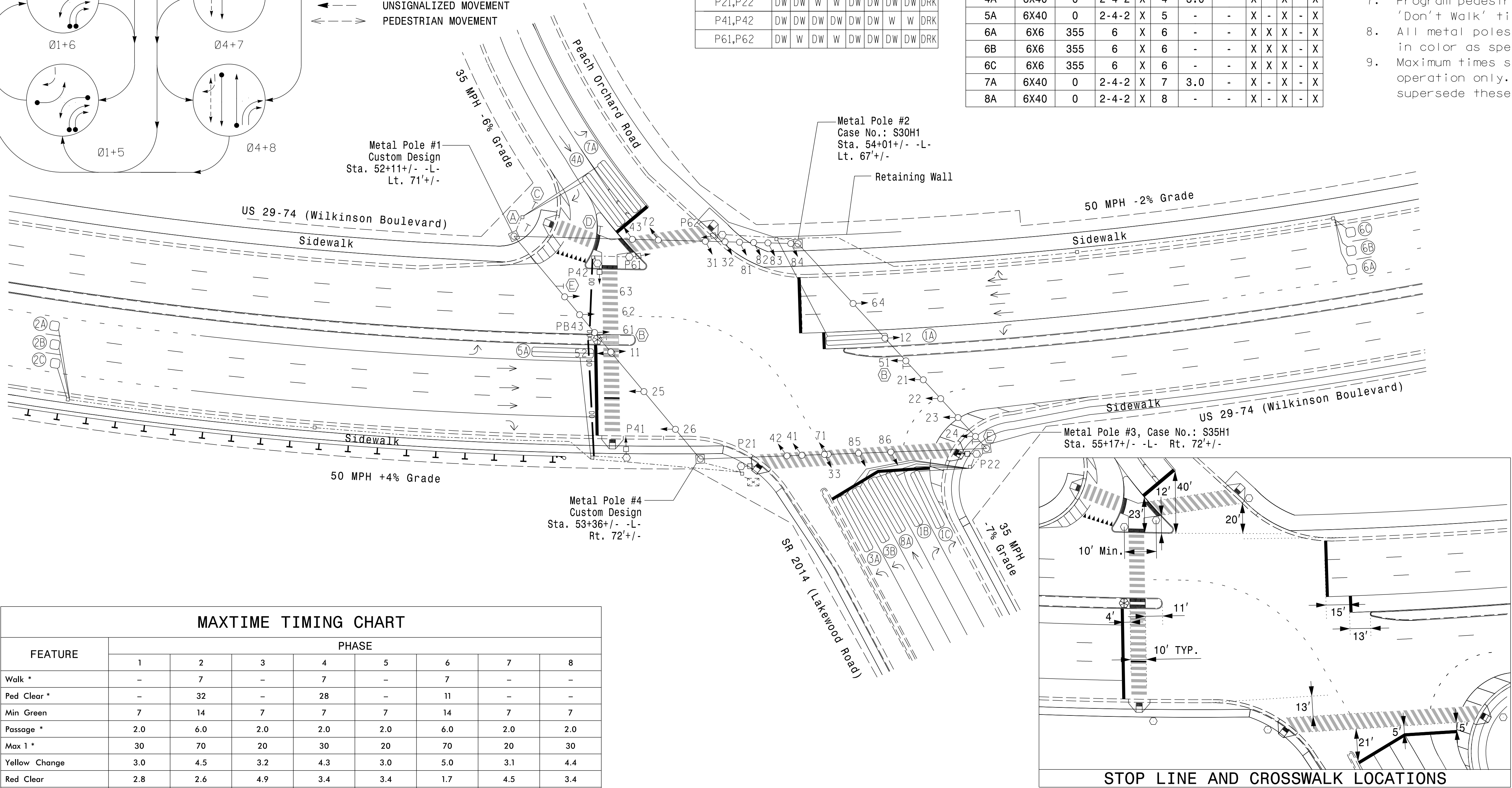
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR				PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	URNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	-	-	X	-	X	-
1B	6X40	0	2-4-2	X	1	15.0	-	X	-	X	-
1C	6X6	0	5	X	1	15.0	-	X	-	X	-
2A	6X6	355	5	X	2	-	-	X	X	X	-
2B	6X6	355	5	X	2	-	-	X	X	X	-
2C	6X6	355	5	X	2	-	-	X	X	X	-
3A	6X40	0	2-4-2	X	3	-	-	X	-	X	-
3B	6X40	0	2-4-2	X	3	-	-	X	-	X	-
4A	6X40	0	2-4-2	X	4	3.0	-	X	-	X	-
5A	6X40	0	2-4-2	X	5	-	-	X	-	X	-
6A	6X6	355	6	X	6	-	-	X	X	X	-
6B	6X6	355	6	X	6	-	-	X	X	X	-
6C	6X6	355	6	X	6	-	-	X	X	X	-
7A	6X40	0	2-4-2	X	7	3.0	-	X	-	X	-
8A	6X40	0	2-4-2	X	8	-	-	X	-	X	-

MAXTIME TIMING CHART

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Walk *	-	7	-	7	-	7	-	-
Ped Clear *	-	32	-	28	-	11	-	-
Min Green	7	14	7	7	7	14	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	30	70	20	30	20	70	20	30
Yellow Change	3.0	4.5	3.2	4.3	3.0	5.0	3.1	4.4
Red Clear	2.8	2.6	4.9	3.4	3.4	1.7	4.5	3.4
Added Initial *	-	1.8	-	-	-	1.8	-	-
Maximum Initial *	-	40	-	-	-	40	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	45	-	-	-	45	-	-
Minimum Gap	-	3.1	-	-	-	3.1	-	-
Advance Walk	-	3	-	3	-	3	-	-
Non Lock Detector	X	-	X	X	X	-	X	X
Vehicle Recall	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Dual Entry	-	-	-	-	-	-	-	-

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

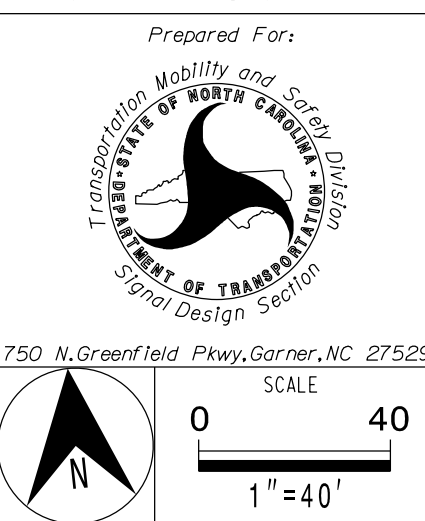


STOP LINE AND CROSSWALK LOCATIONS

Signal Upgrade-Final Design



VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

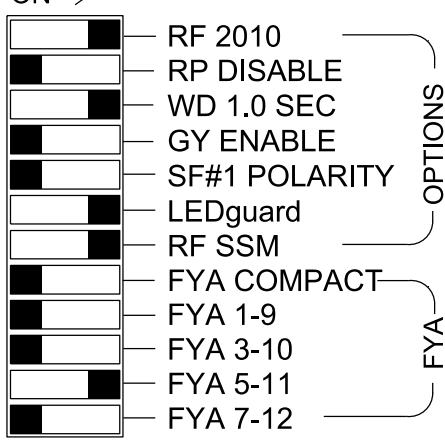


US 29-74 (Wilkinson Boulevard) at SR 2014 (Lakewood Road) / Peach Orchard Road			
Division 12	Gaston County	Belmont	
PLAN DATE:	October 2023	REVIEWED BY:	M. L. Styles
PREPARED BY:	J. Ma	REVIEWED BY:	
REVISIONS		INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
SEAL	
	
DocuSigned by: <i>Jianxin Ma</i> 827E19B30B1444E	11/5/2023 DATE
SIG. INVENTORY NO.	12-0082

(remove jumpers and set switches as shown)

ON OFF
WD ENABLE
SW2




 = DENOTES POSITION OF SWITCH

NOTES:

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

(front view)

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

FS = FLASH SENSE
ST = STOP TIME

Front Panel

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

Web Interface

Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	2	3	6
Type	Normal	FYA 4 - Section	Normal
Included Phases	8	2,3	5
Modifier Phases	-	-	-
Modifier Overlaps	-	-	-
Trail Green	0	0	0
Trail Yellow	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0

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

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,S8,S9,S10,S11, AUXS2,AUXS4,AUXS6
Phases Used.....	1,2,2PED,3,4,4PED,5,6,6PED,7,8
Overlap "2".....	*
Overlap "3".....	*
Overlap "6".....	*

*See overlap programming detail on this sheet.

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.

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			X		X	
1B	TB5-11,12	J6L	46	8	23	1	15		X		X	
1C	TB7-1,2	J7U	66	32	24	1	15		X		X	
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
2C	TB2-9,10	I3U	63	29	4	2			X	X	X	
3A	TB4-5,6	I5U	58	20	7	3			X		X	
3B	TB4-1,2	I4U	47	9	6	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4	3		X		X	
5A	TB3-1,2	J1U	55	17	15	5			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	
7A	TB5-5,6	J5U	57	19	21	7	3		X		X	
8A	TB5-9,10	J6U	42	4	22	8			X		X	

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

INPUT FILE POSITION LEGEND: J2L

FILE J _____
SLOT 2 _____
LOWER _____

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.

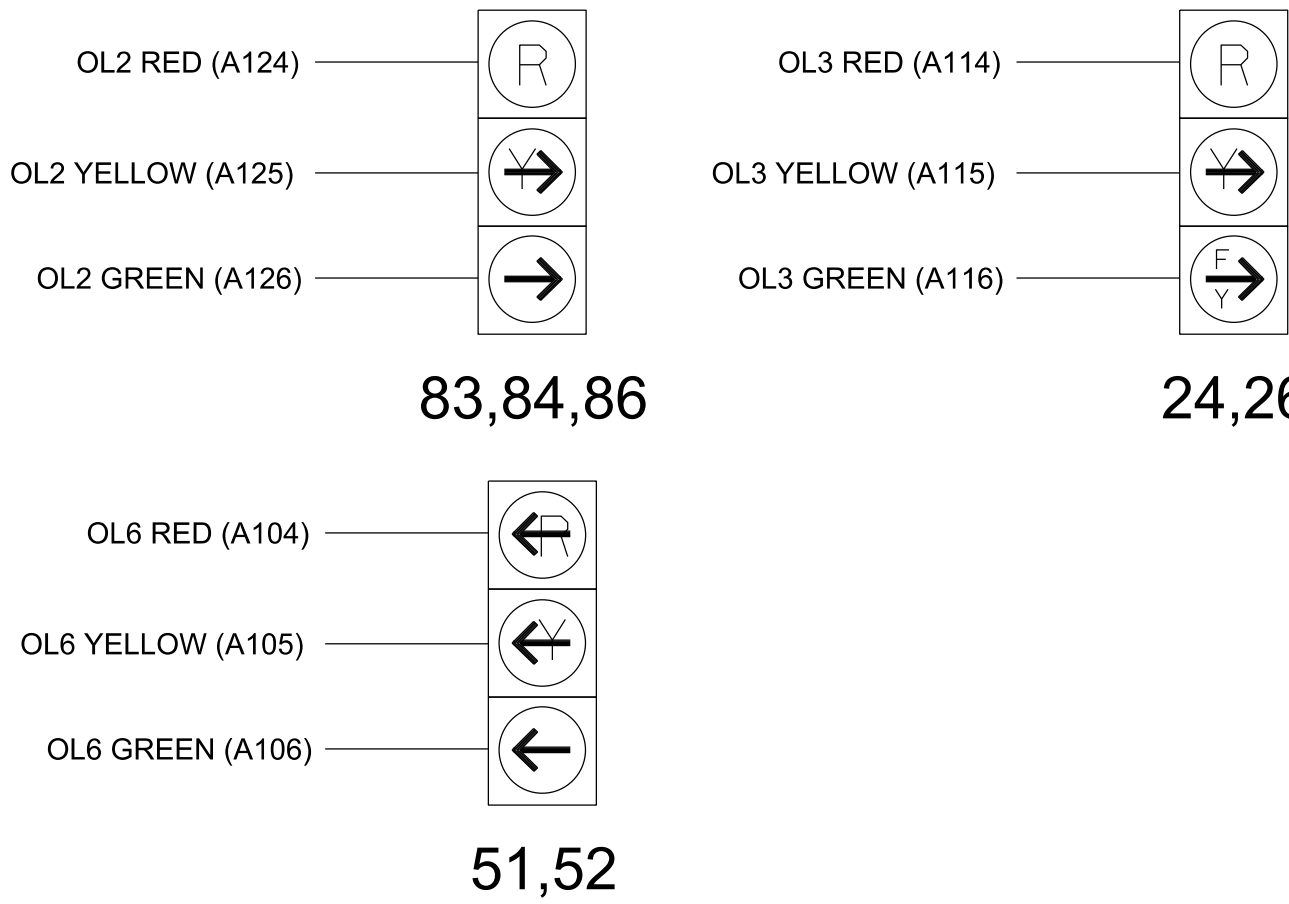
THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

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	OL5	OL3	OL4	OL6
SIGNAL HEAD NO.	11,12	21,22, 23,25	P21, P22	31,32, 33	41,42, 43	P41, P42	NU	61,62, 63,64	P61, P62	71,72	81,82, 85	NU	NU	83,84, 86	NU	24,26	NU	51,52
RED		128			101			134			107			A124		A114		
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW	125			116						122								A104
YELLOW ARROW	126			117						123				A125		A115		A105
FLASHING YELLOW ARROW																A116		
GREEN ARROW	127			118						124				A126				A106
			113						119			110						
			115						121			112						

NU = Not Used

★ See pictorial of head wiring in detail this sheet.

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0082
DESIGNED: October 2023
SEALED: 11/5/2023
REVISED: N/A

Electrical Detail-Final Design

US 29-74 (Wilkinson Boulevard)
at

SR 2014 (Lakewood Road)
Peach Orchard Road

Division 12 Gaston County Belmont

PLAN DATE: October 2023	REVIEWED BY: M.L. Stygles
-------------------------	---------------------------

PREPARED BY: J. Ma	REVIEWED BY:
--------------------	--------------

REVISIONS	INIT.	DATE

DATE _____

SIG. INVENTORY NO. 12-0082



vhb
VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27607
P: 919-829-0328

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

DocuSigned by: 11/5/2023
Jianxin Ma
827E1953081444F... DATE
SIG. INVENTORY NO. 12-0082

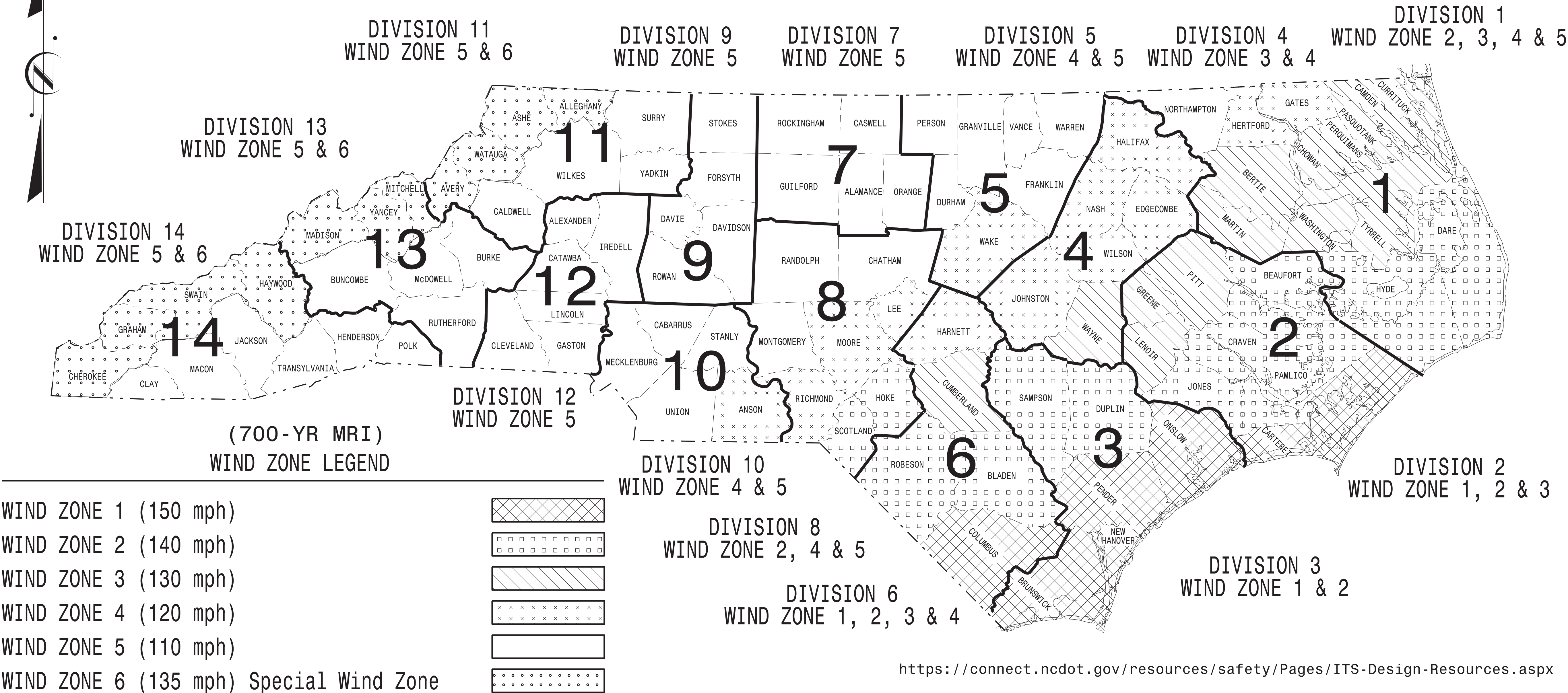
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NCDOT METAL POLE STANDARDS



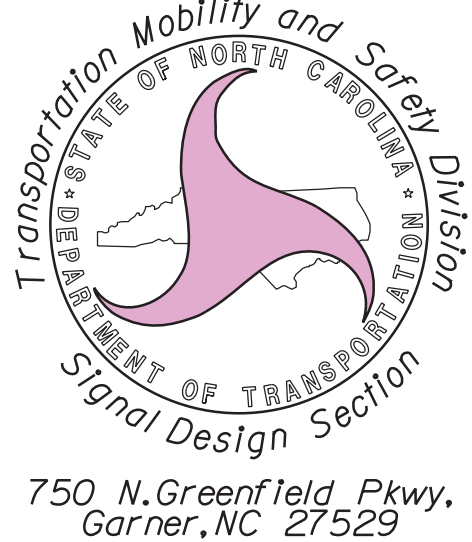
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)

PROJECT I.D. NO.	SHEET NO.
U-6146/B-5857	Sig.M1A



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

Prepared in the Offices of:



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

**AASHTO
LRFD**

Standard Specifications for
Highway Signs, Luminaires,
and Traffic Signals

DRAWING
NUMBER

INDEX OF PLANS
DESCRIPTION

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

MOBILITY AND SAFETY DIVISION -
TRANSPORTATION SYSTEMS MANAGEMENT
AND OPERATIONS UNIT

D.Y. ISHAK - STATE SIGNALS ENGINEER

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

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

SEAL



DocuSigned by:

Kevin Durigon

4B23DC79B3784DA...

09/21/2023
DATE

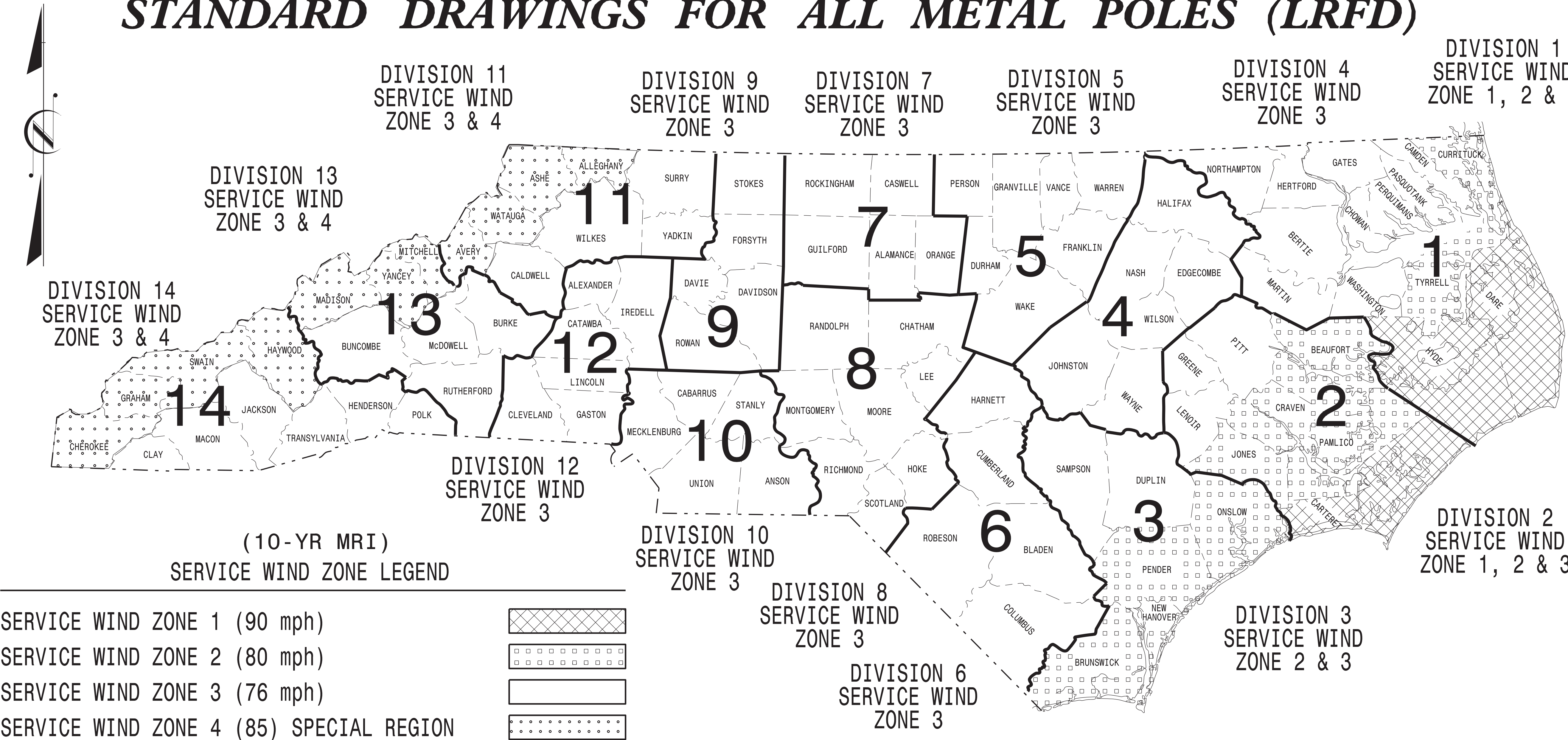
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NCDOT METAL POLE STANDARDS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

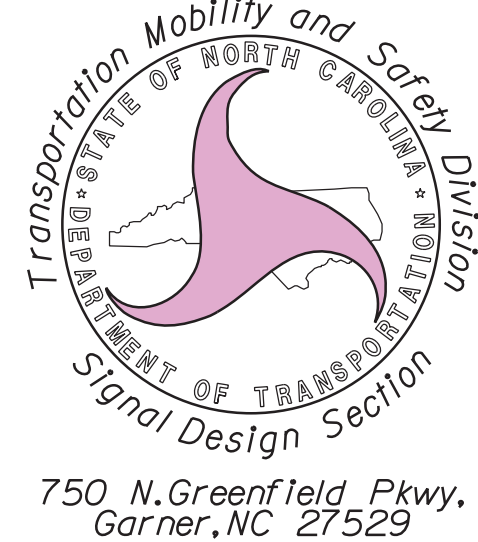
PROJECT I.D. NO.	SHEET NO.
U-6146/B-5857	Sig.M1B

STANDARD DRAWINGS FOR ALL METAL POLES (LRFD)



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

Prepared in the Offices of:



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

**AASHTO
LRFD**

Standard Specifications for
Highway Signs, Luminaires,
and Traffic Signals

DRAWING
NUMBER

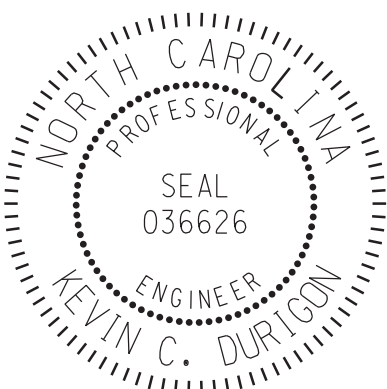
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Sig. M 1A	1A	Statewide Wind Zone Map (700-yr MRI)
Sig. M 1B	1B	Statewide Wind Zone Map (10-yr MRI)
Sig. M 2	2	Typical Fabrication Details-All Metal Poles
Sig. M 3	3	Typical Fabrication Details-Strain Poles
Sig. M 4	4	Typical Fabrication Details-Mast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

INDEX OF PLANS
DESCRIPTION

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

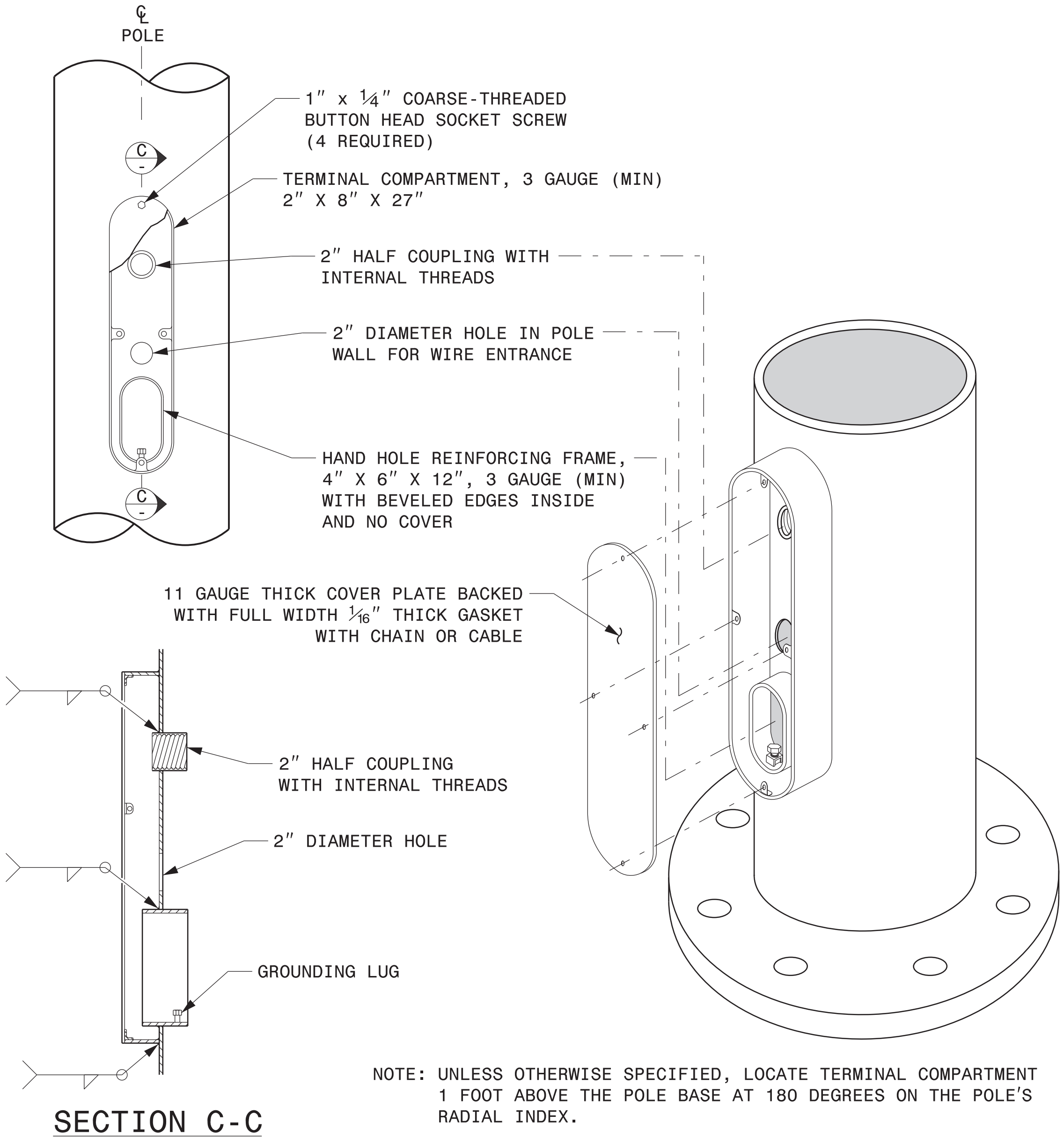
D.Y. ISHAK - STATE SIGNALS ENGINEER
K. DURIGON, P.E. - ITS AND SIGNALS STRUCTURAL ENGINEER
B. WALKER, P.E. - ITS AND SIGNALS STRUCTURAL ENGINEER

SEAL



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

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Kedar Koon



SECTION C-C

TERMINAL COMPARTMENT DETAIL

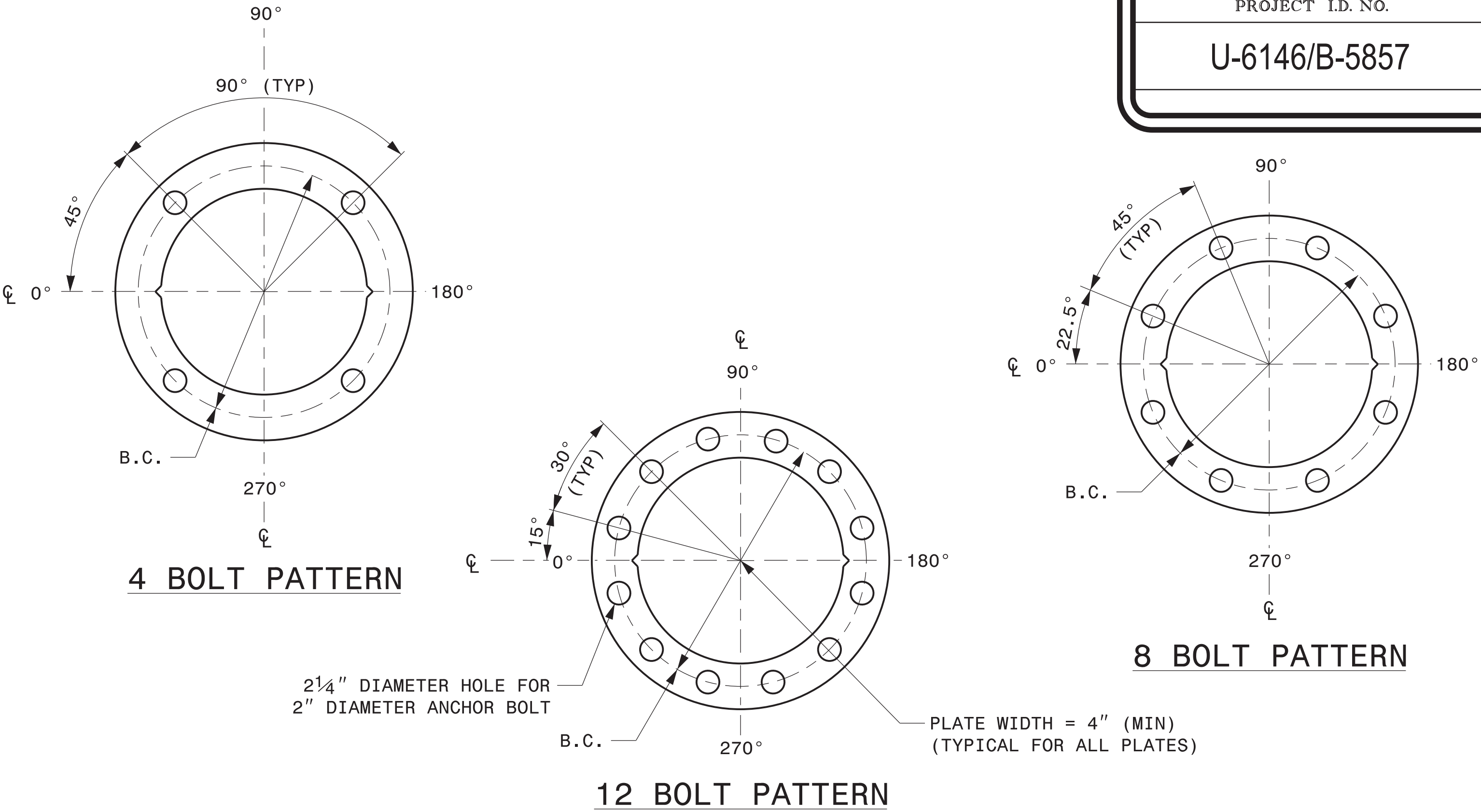
MFG _____	MFG. DATE: MM/YY _____
SHAFT D/T/L/Y _____	_____
ARM-A D/T/L/Y _____	_____
ARM-B D/T/L/Y _____	_____
A.B. DIA./B.C./L/Y _____	_____
NCDOT SIG. INV. NO. _____	_____
NCDOT POLE NO. _____	_____

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

NOTES:

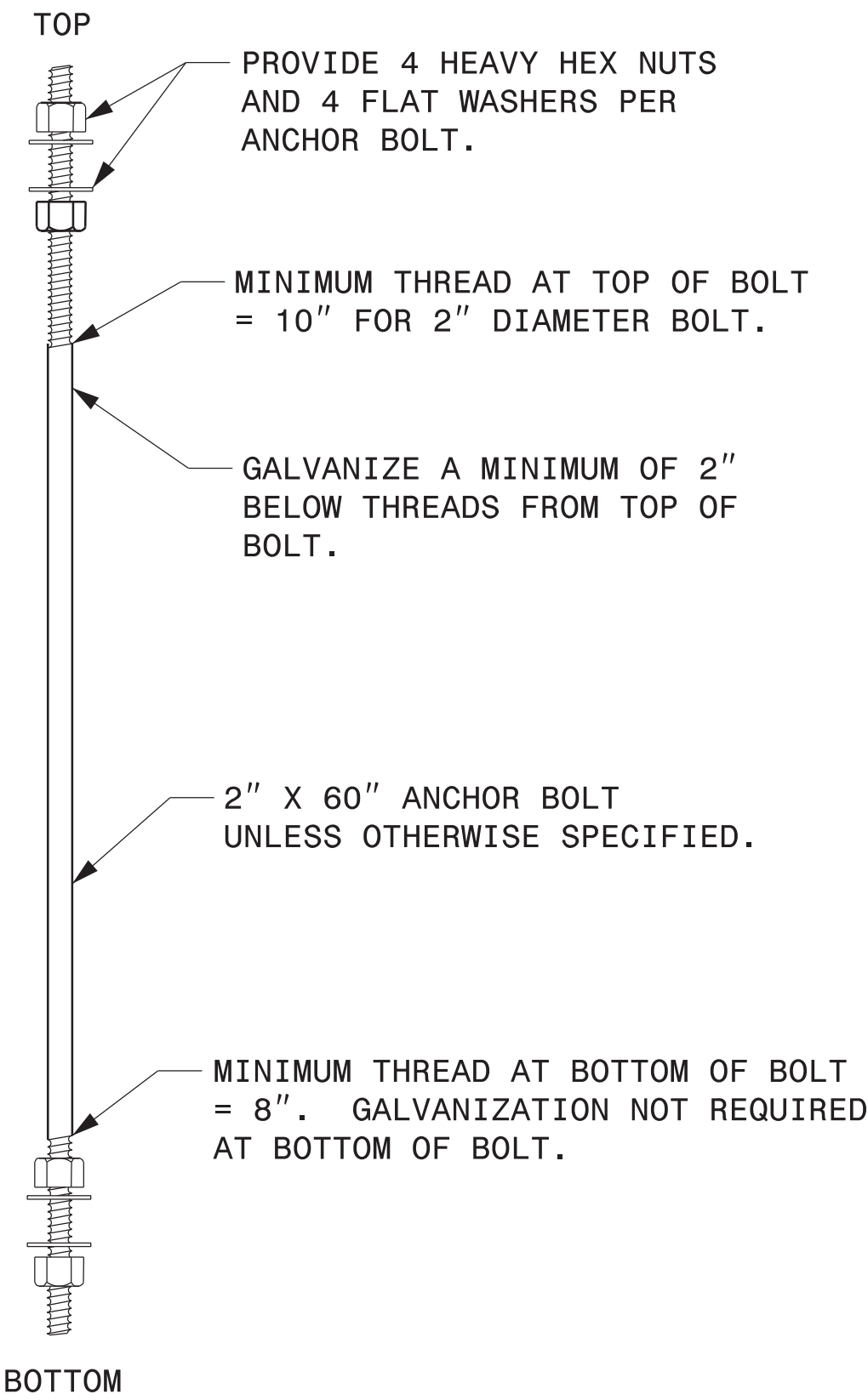
- D = DIAMETER, T = THICKNESS, L = LENGTH, Y = YIELD STRENGTH
- A.B. = ANCHOR BOLT
- B.C. = BOLT CIRCLE OF ANCHOR BOLTS
- IF STANDARD DESIGN, INCLUDE CASE NUMBER IN ADDITION TO POLE NUMBER ON "NCDOT POLE NO." LINE.
- SIGNAL INV. NUMBER AND POLE I.D. NUMBER.
SEE DRAWING M3 AND M4 FOR MOUNTING POSITIONS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

IDENTIFICATION TAG DETAILS



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

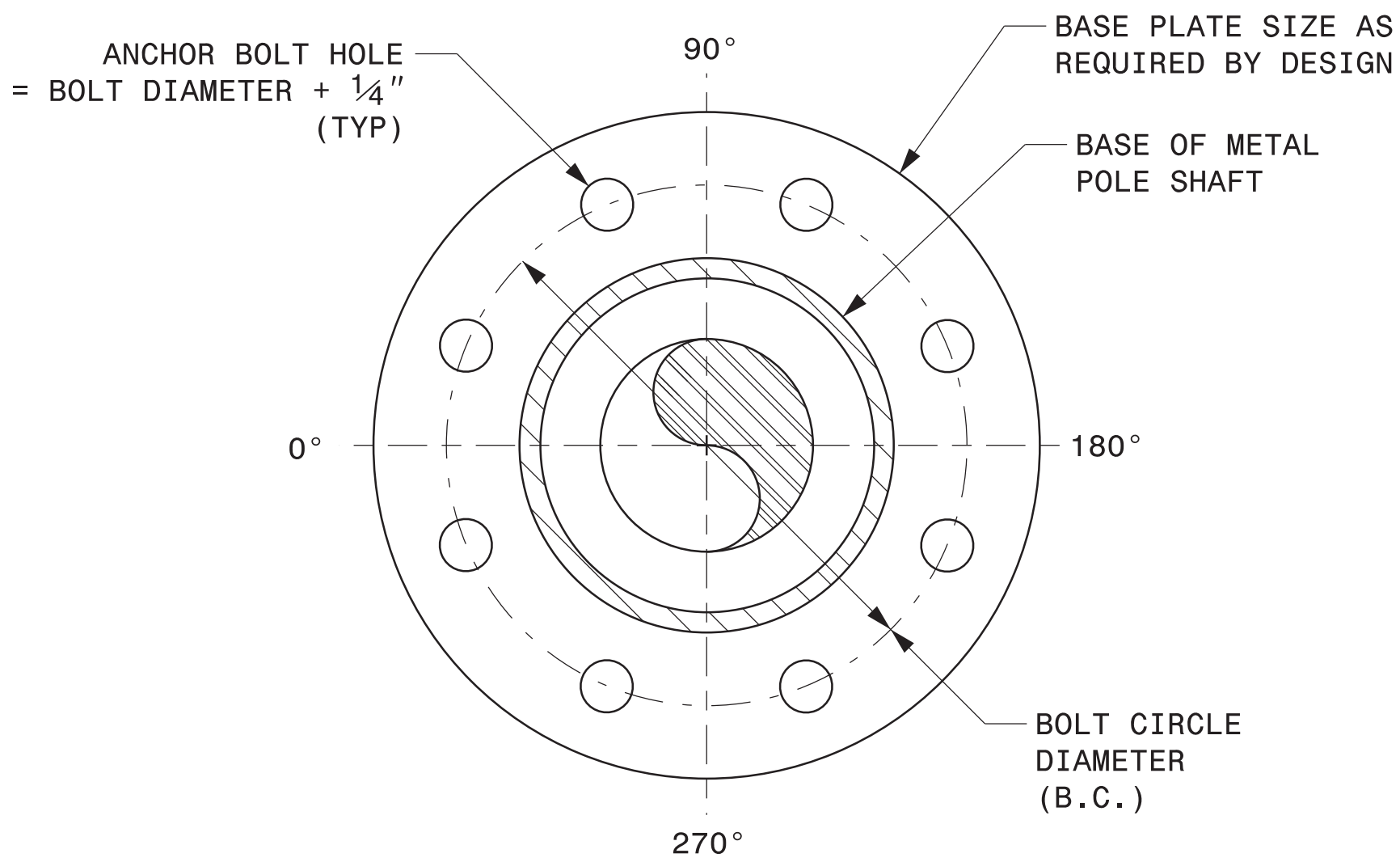
BASE PLATE TEMPLATE AND ANCHOR BOLT LOCK PLATE DETAILS



TOP

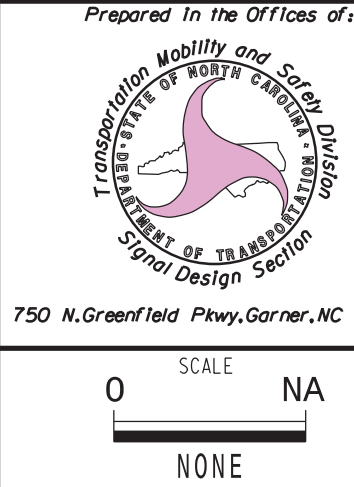
BOTTOM

ANCHOR BOLT DETAIL



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

TYPICAL BASE PLATE DETAIL



Typical Fabrication Details
For
All Metal Poles

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

REVISIONS	INIT.	DATE

DocuSigned by:
Kevin Durigon
4B23DC79B3784DA...

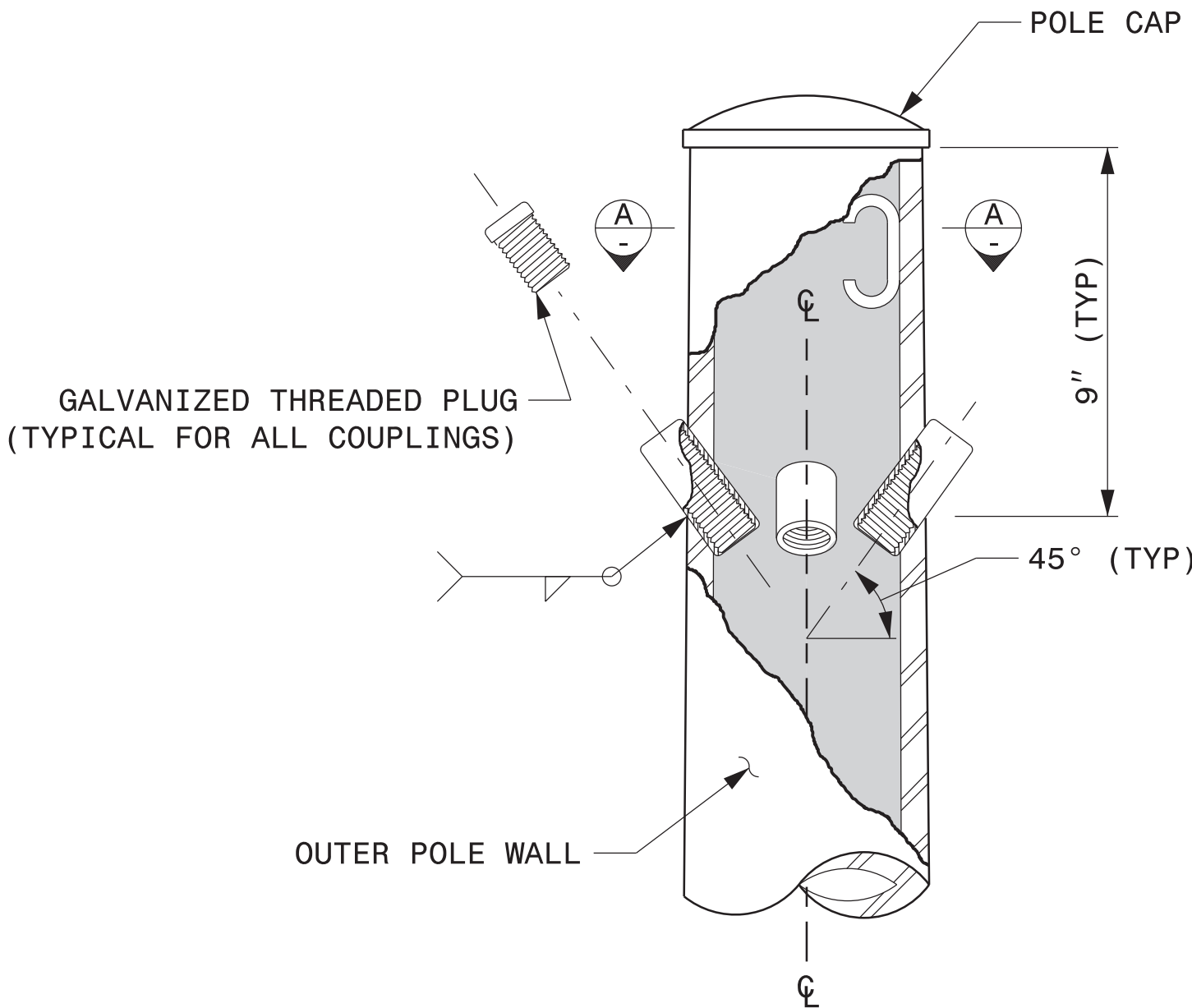
SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEER
036626
K.C. DURIGON

09/21/2023
DATE

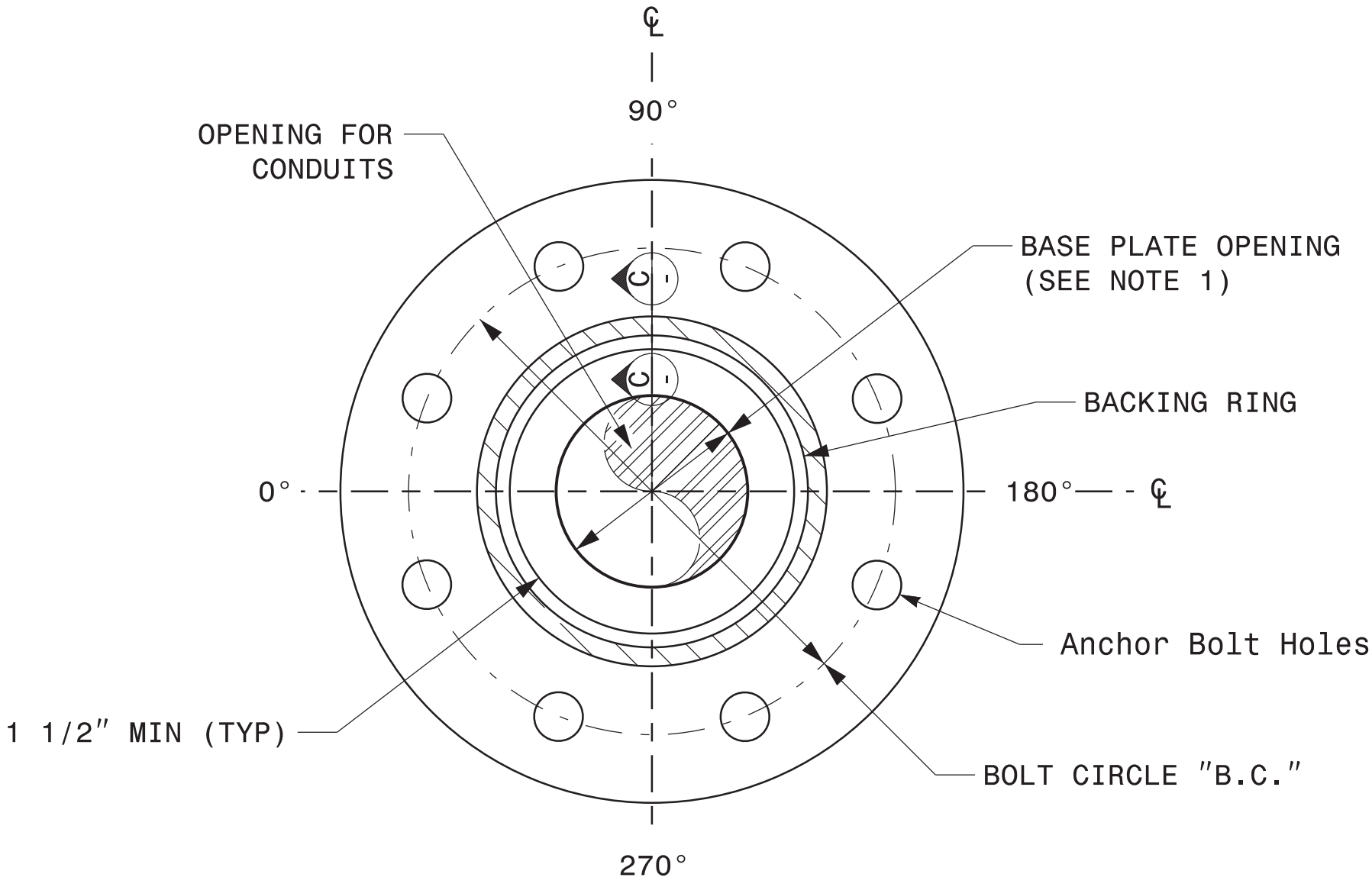
PROJECT I.D. NO.	SHEET NO.
U-6146/B-5857	Sig.M3

NOTE:

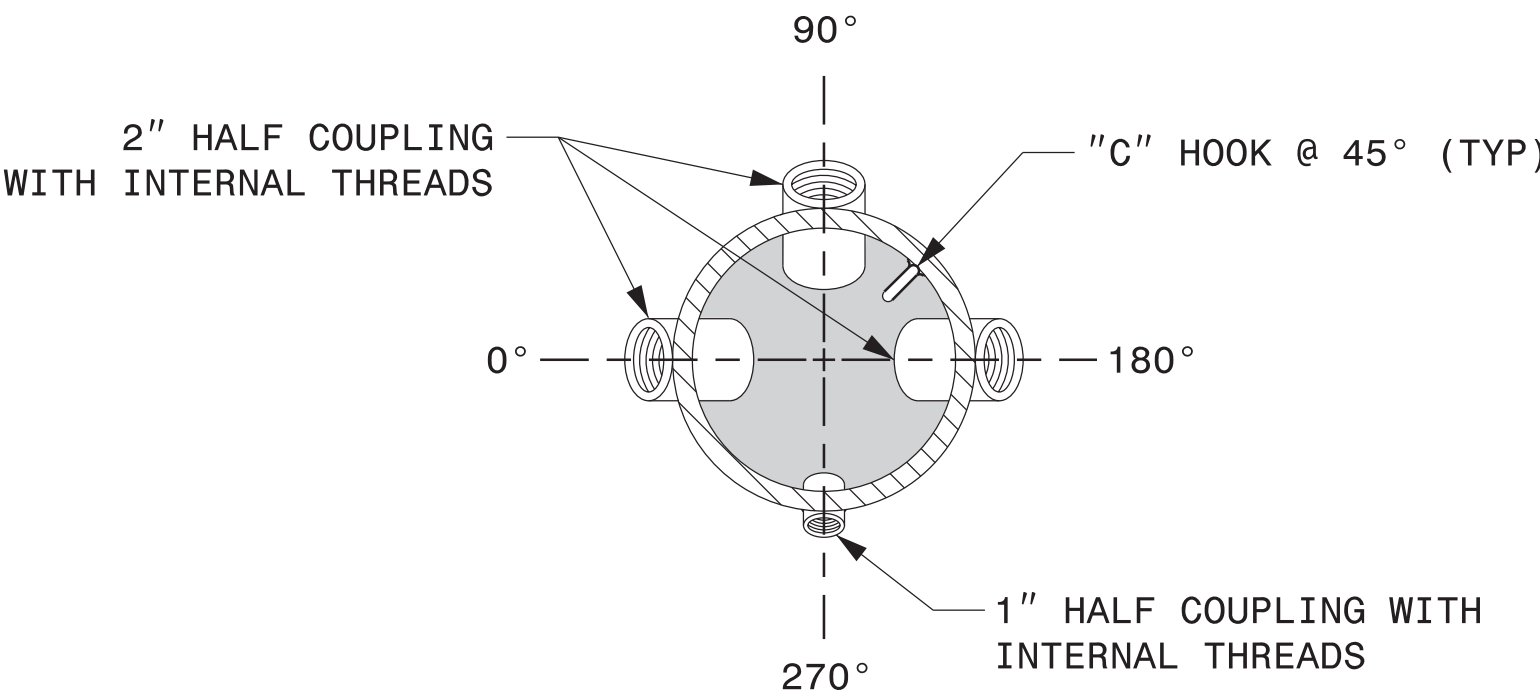
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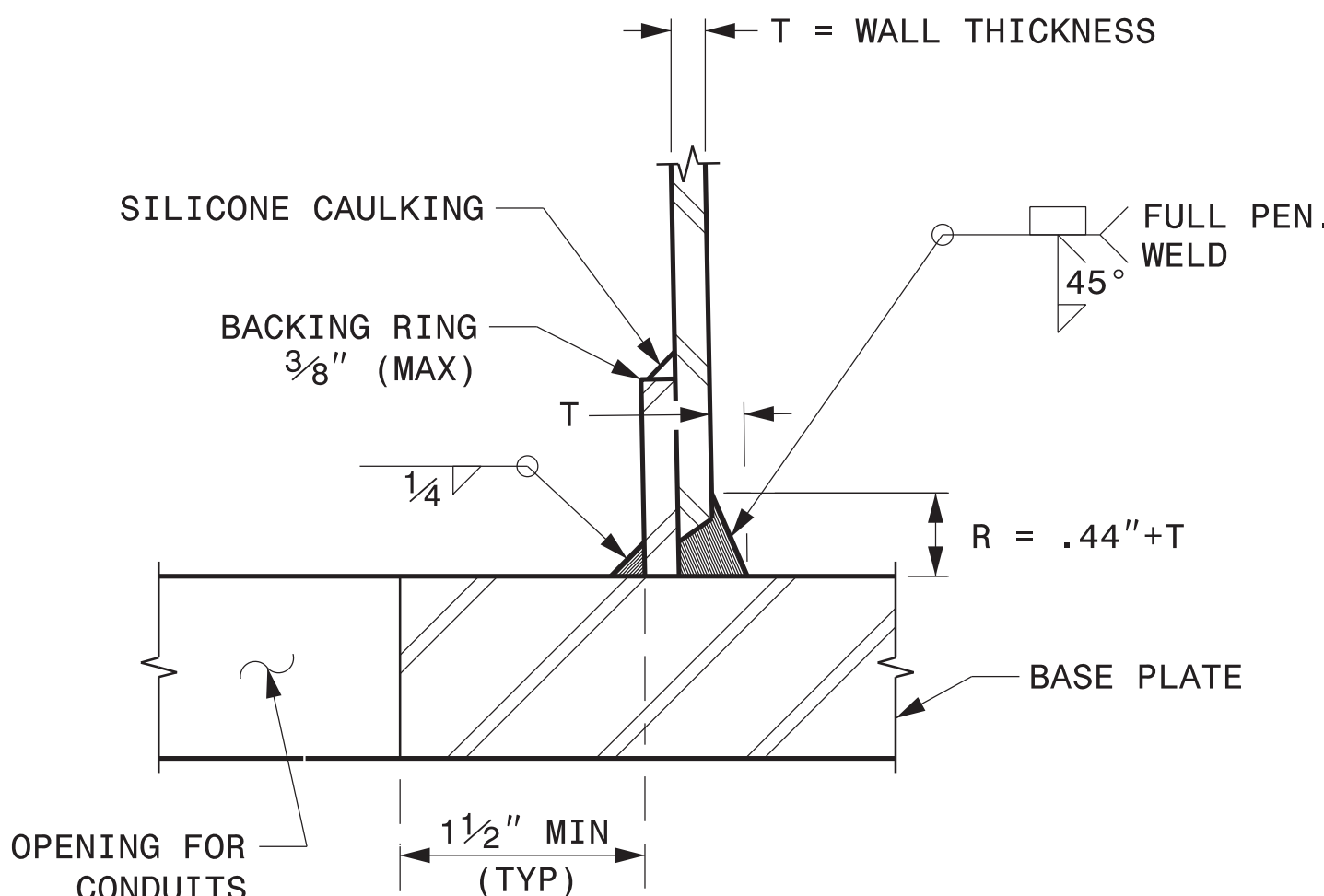
CABLE ENTRANCES AT TOP OF POLE



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

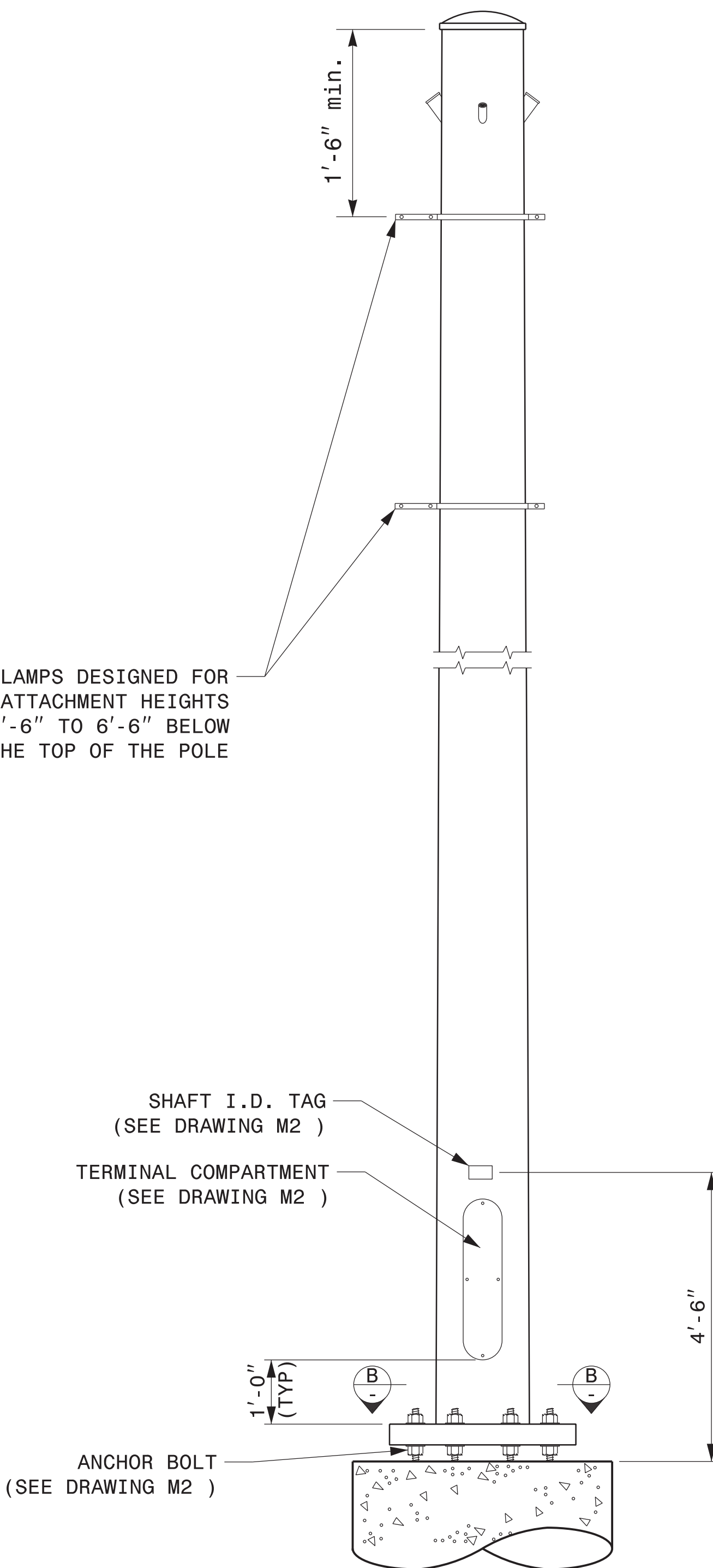


SECTION A-A
RADIAL ORIENTATION OF FACTORY INSTALLED
ACCESSORIES AT TOP OF POLE



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

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



MONOTUBE STRAIN POLE

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

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

SCALE: NA
NONE

SEAL

DocuSigned by:
Kevin Durigon

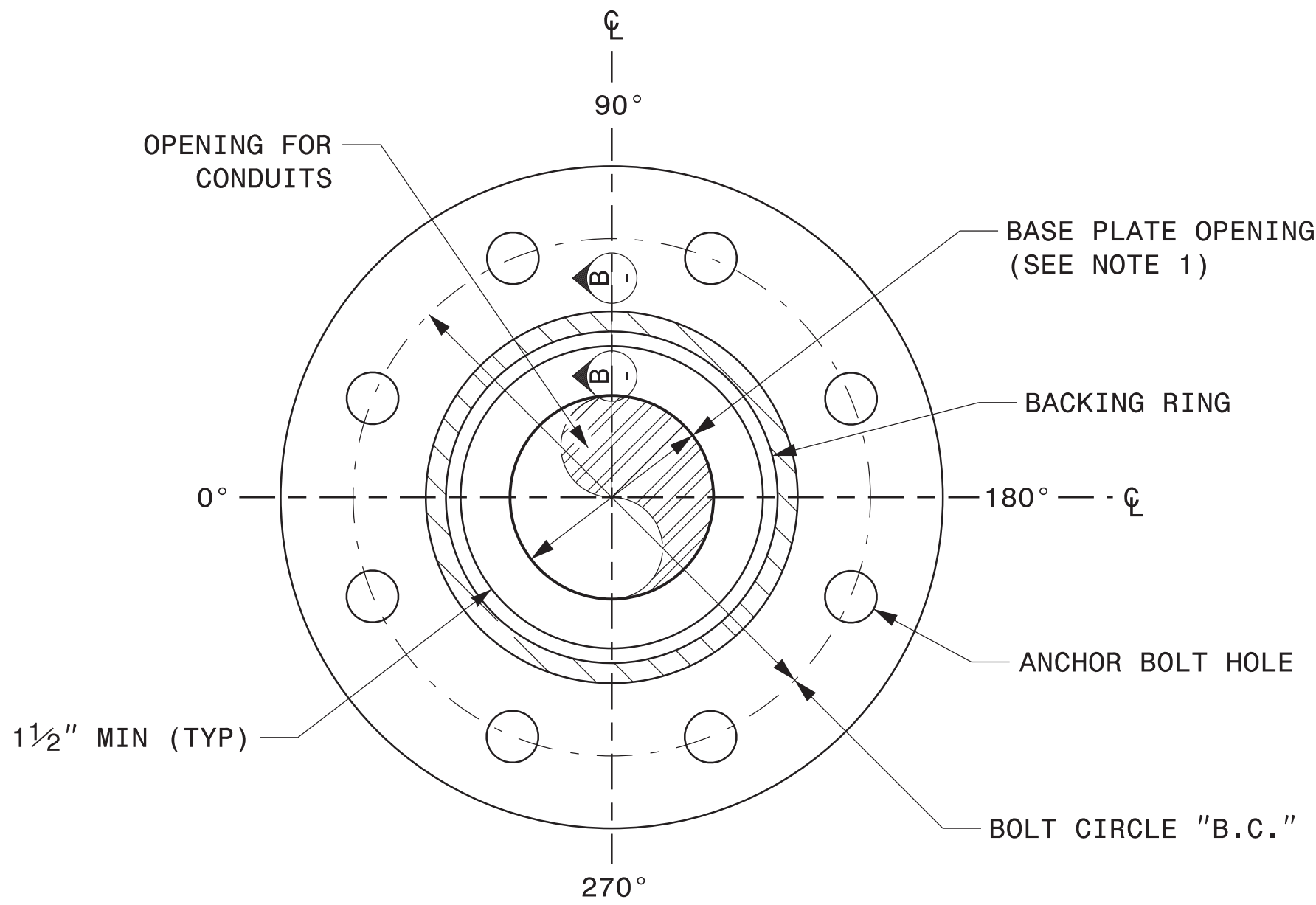
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09/21/2023
DATE

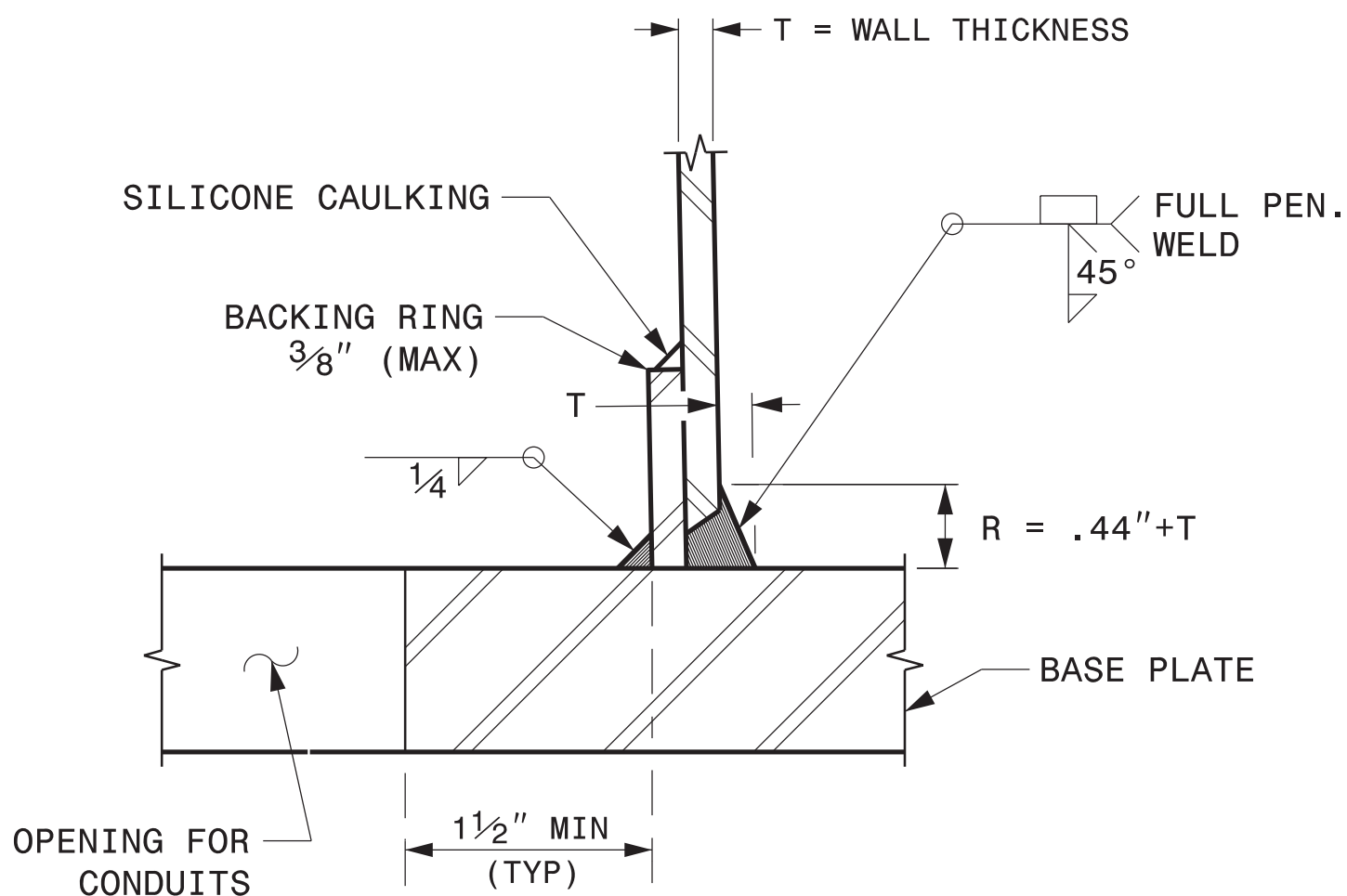
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U-6146/B-5857	Sig.M4

NOTE:

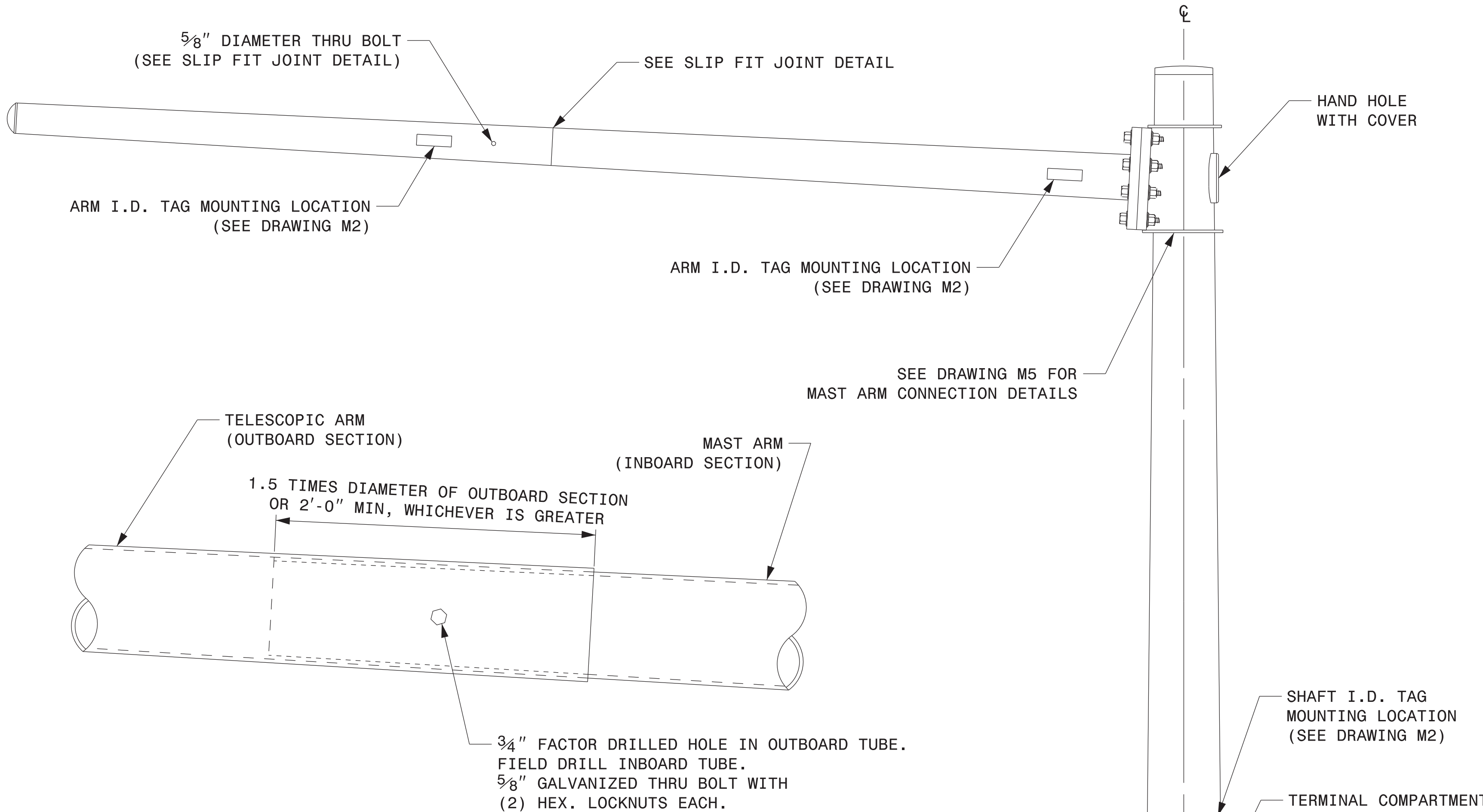
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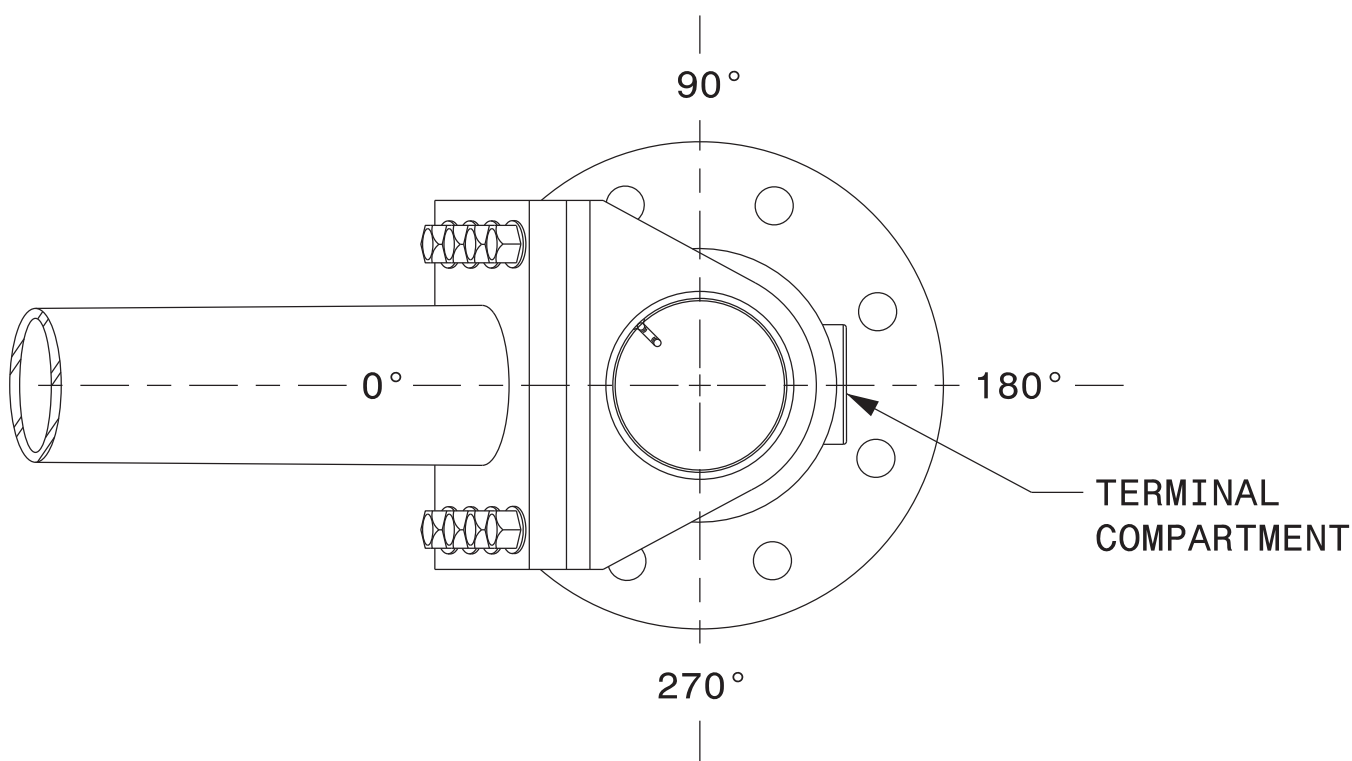
SECTION A-A
POLE BASE PLATE DETAILS



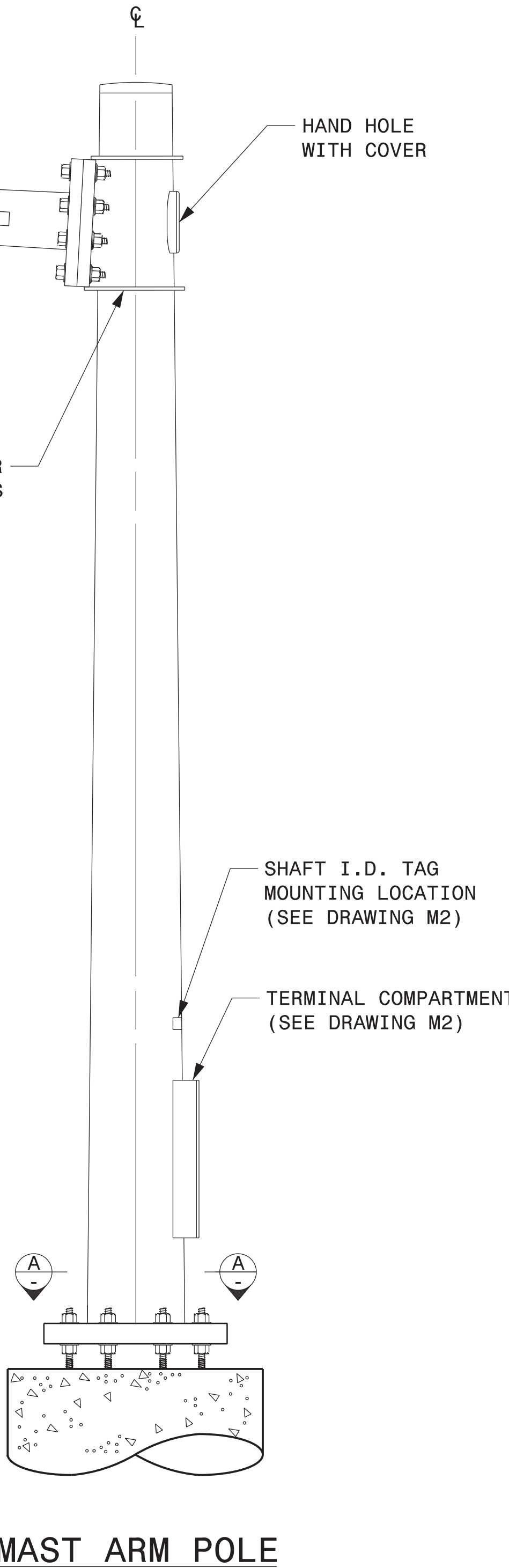
SECTION B-B
(POLE ATTACHMENT TO BASE PLATE)
FULL-PENETRATION
GROOVE WELD DETAIL



SLIP FIT JOINT DETAIL FOR MAST ARM



MAST ARM RADIAL ORIENTATION



Prepared in the Offices of:

Transportation Mobility and Safety Solutions
DIVISION OF TRANSPORTATION
SIGNAL DESIGN SECTION

750 N. Greenfield Pkwy, Garner, NC 27529

Typical Fabrication Details
For
Mast Arm Poles

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

REVISIONS	INIT.	DATE

SCALE: NA
NONE

SEAL

NORTH CAROLINA
PROFESSIONAL
ENGINEER
SEAL
036626
K.C. DURIGON

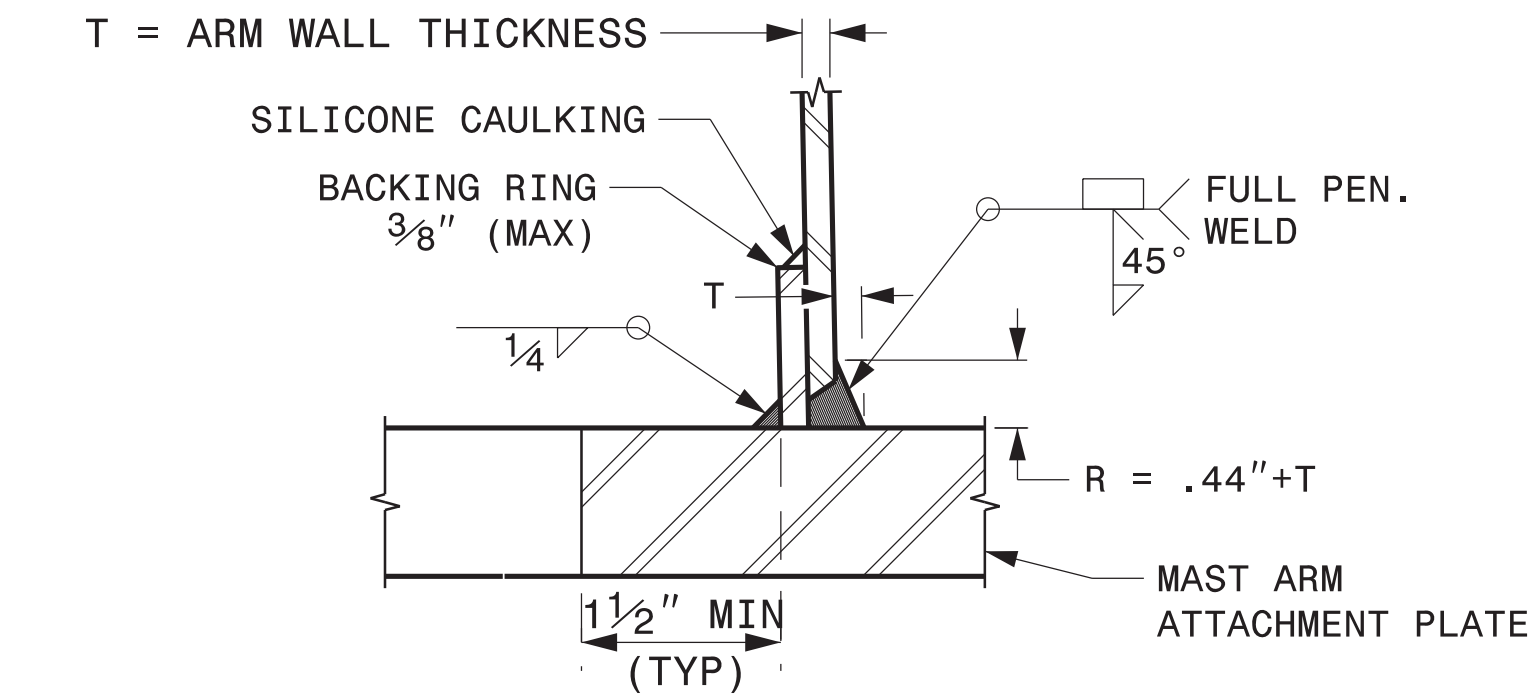
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Kevin Durigon

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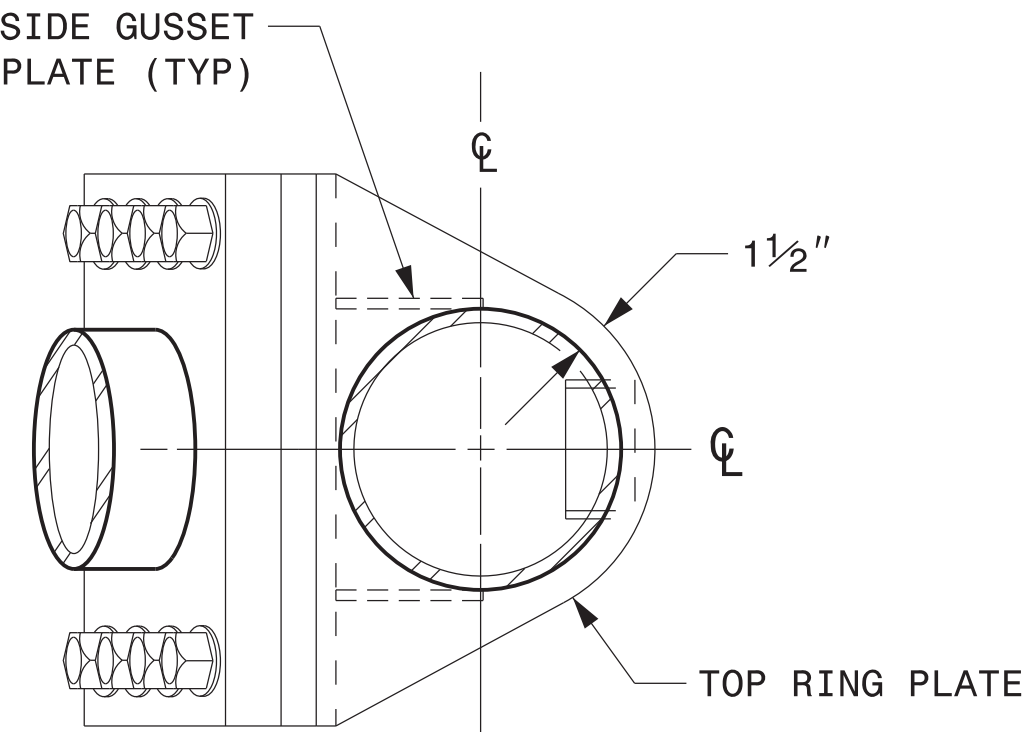
09/21/2023
DATE

WELDED RING STIFFENED MAST ARM CONNECTION

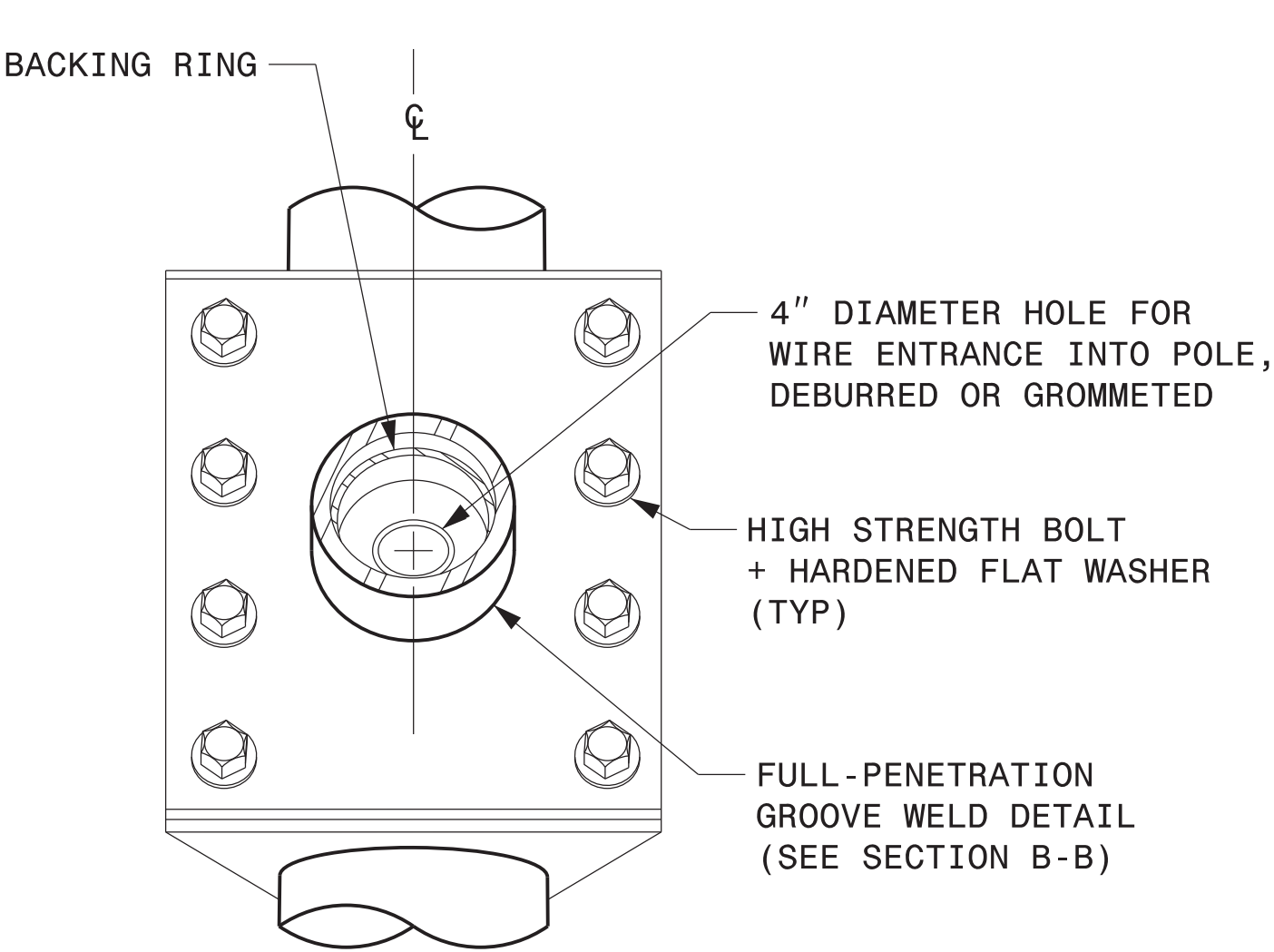
PROJECT I.D. NO.	SHEET NO.
U-6146/B-5857	Sig.M5



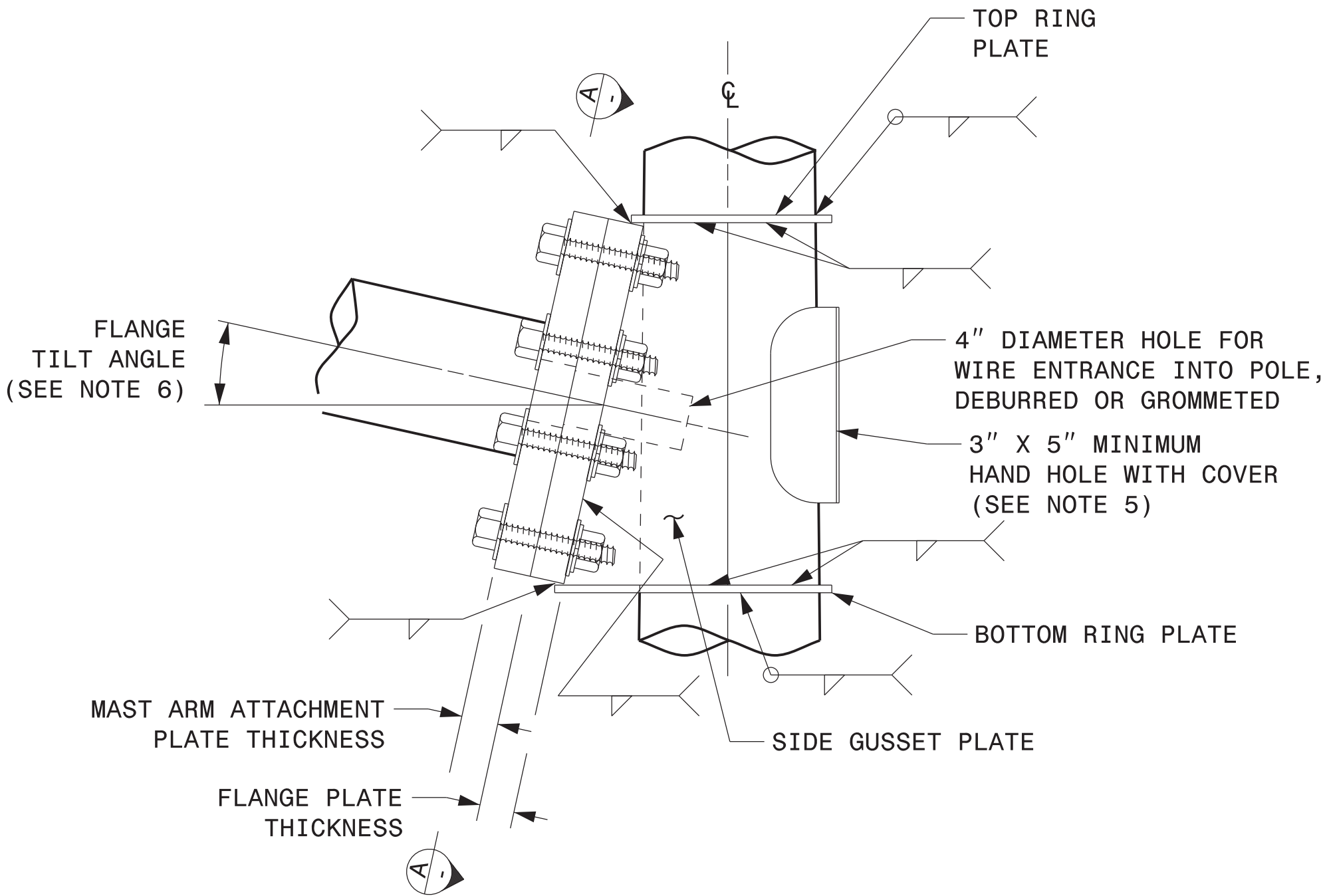
SECTION B-B
FULL-PENETRATION GROOVE WELD DETAIL



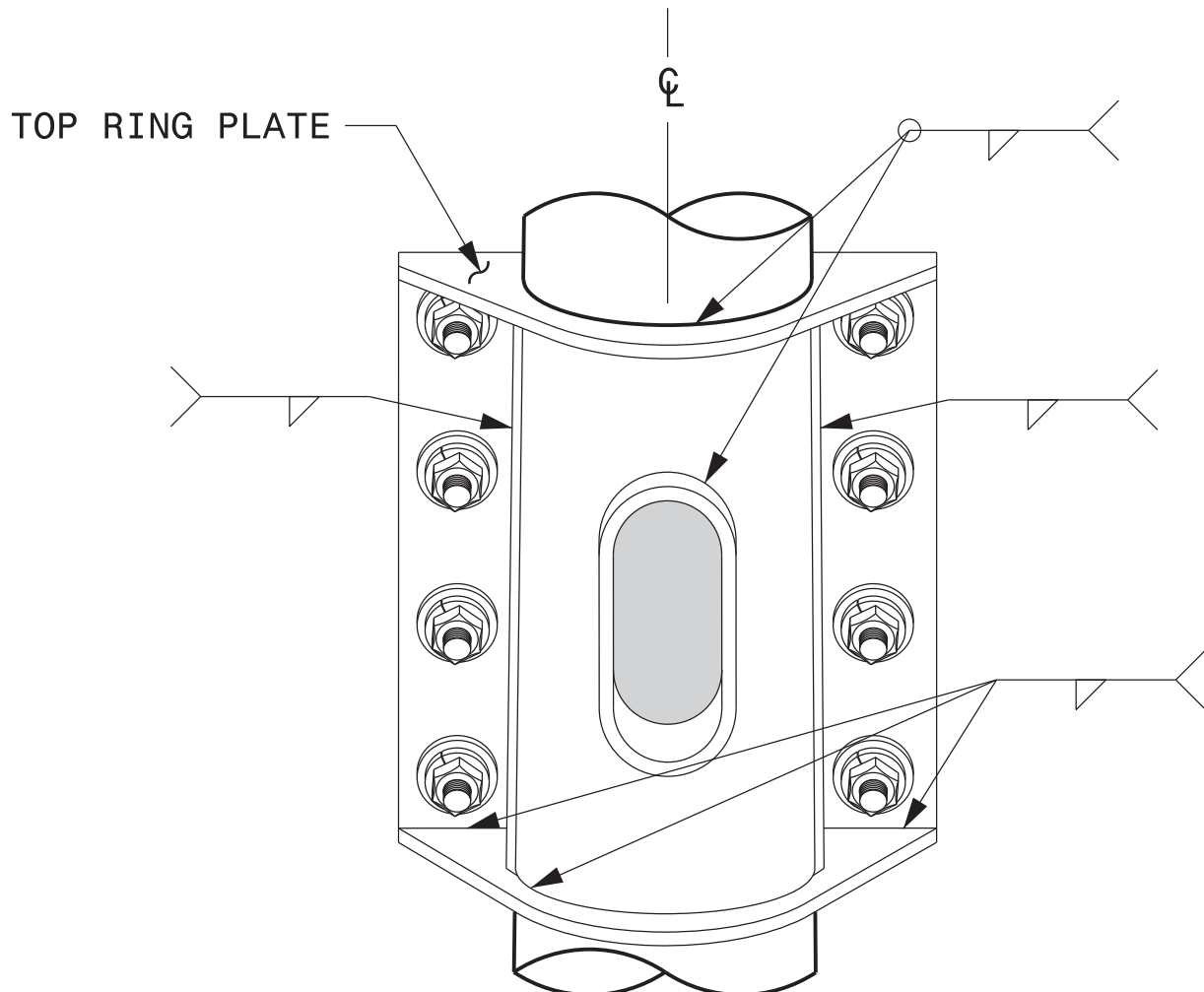
PLAN VIEW



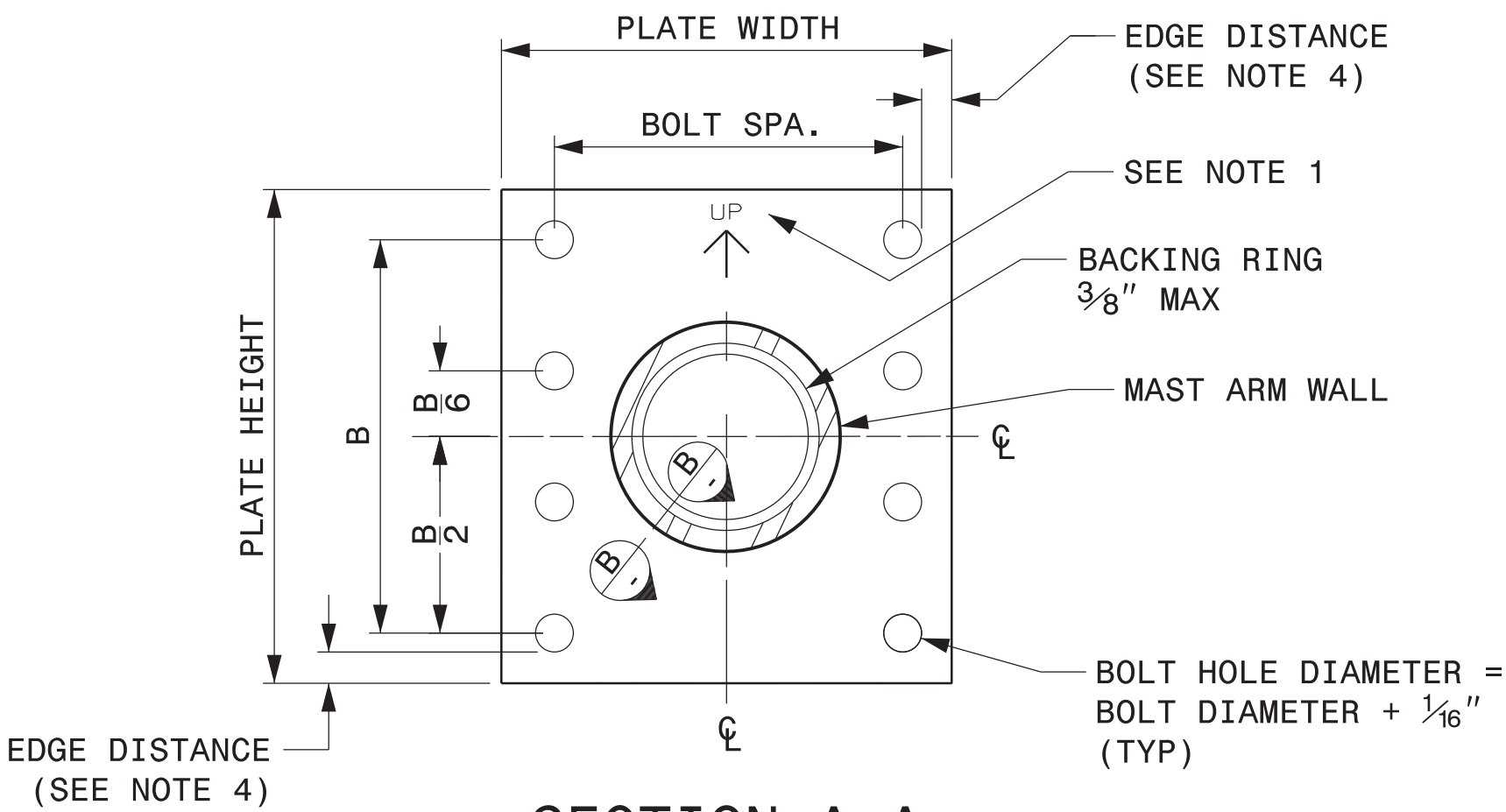
FRONT ELEVATION VIEW



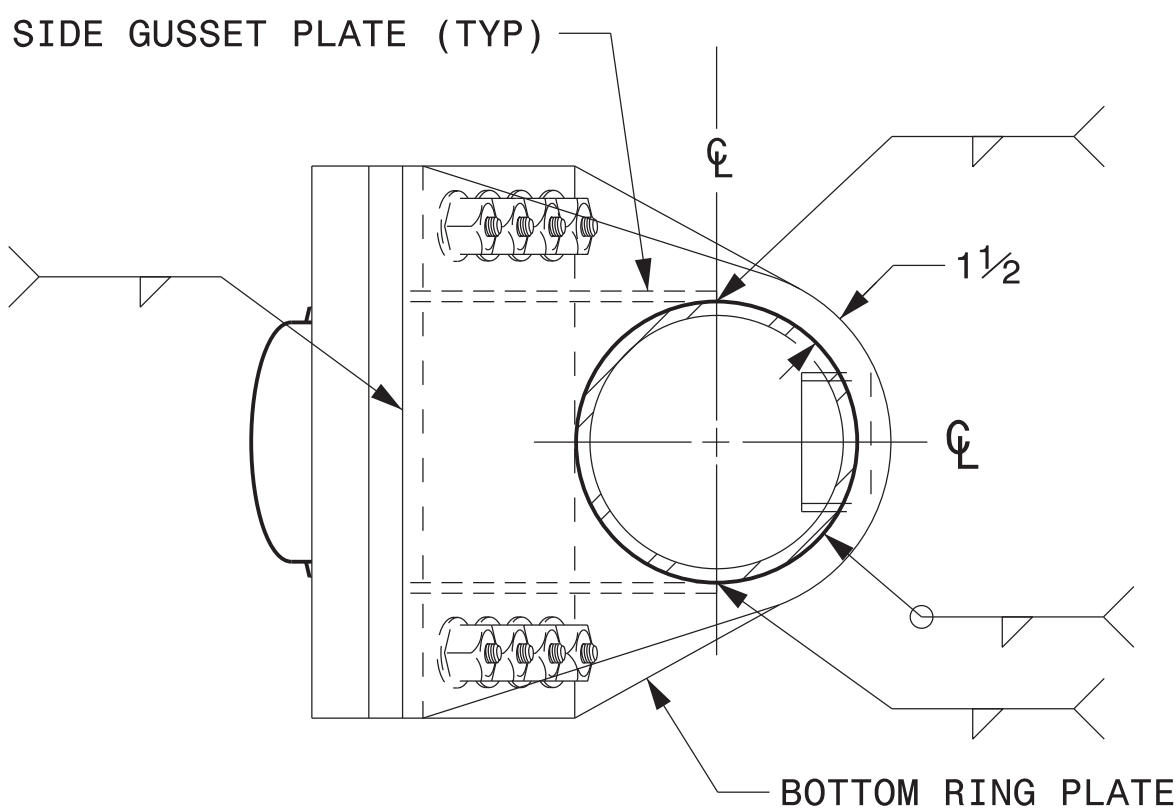
SIDE ELEVATION VIEW



BACK ELEVATION VIEW



SECTION A-A
MAST ARM ATTACHMENT PLATE



BOTTOM VIEW

NOTES:

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

21-SEP-2023 08:01
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Kadur Ram

Fabrication Details – Mast Arm Connection

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

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

SCALE: NA
NONE

DocuSigned by:

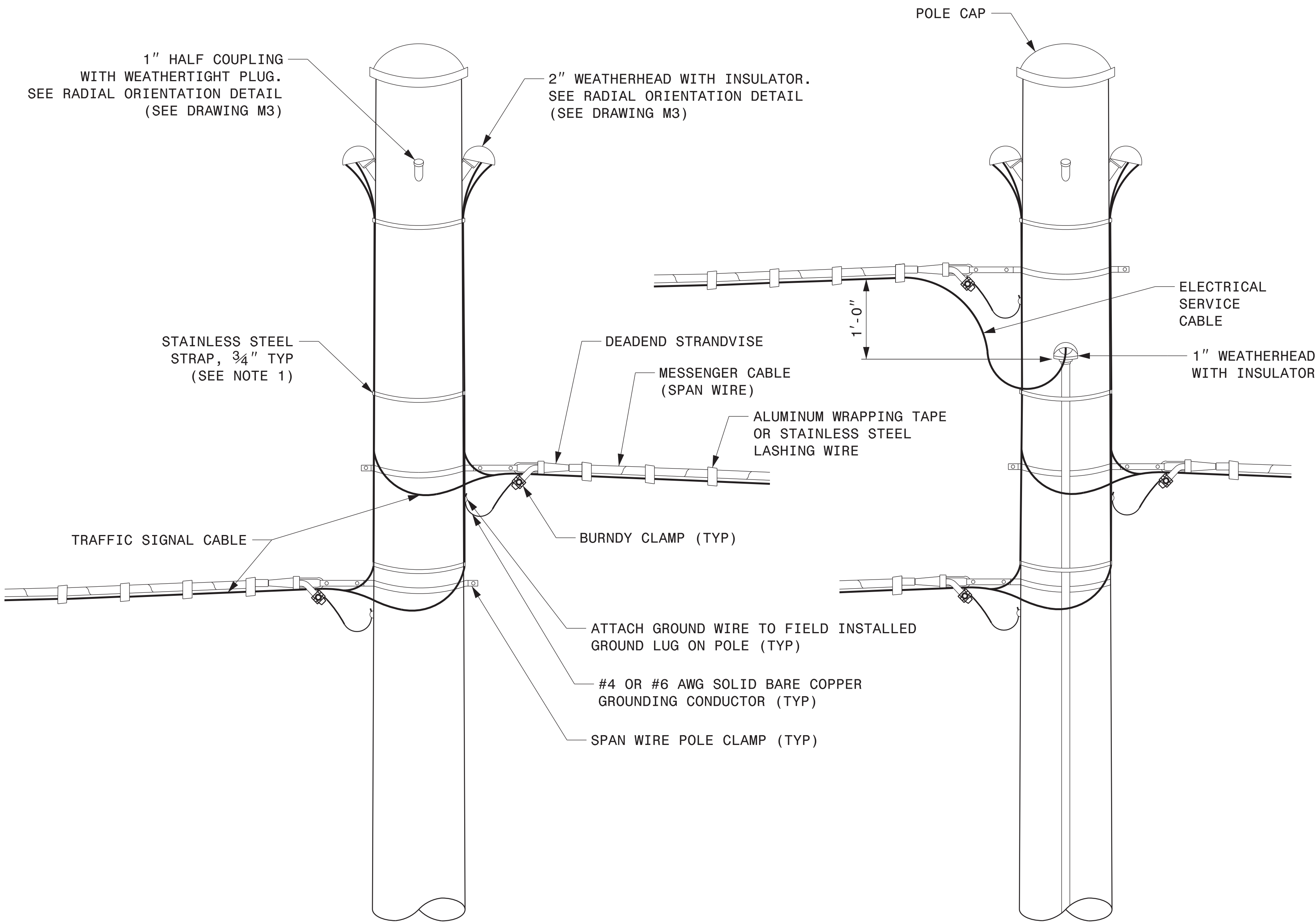
Kevin Durigon

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SEAL

09/21/2023
DATE

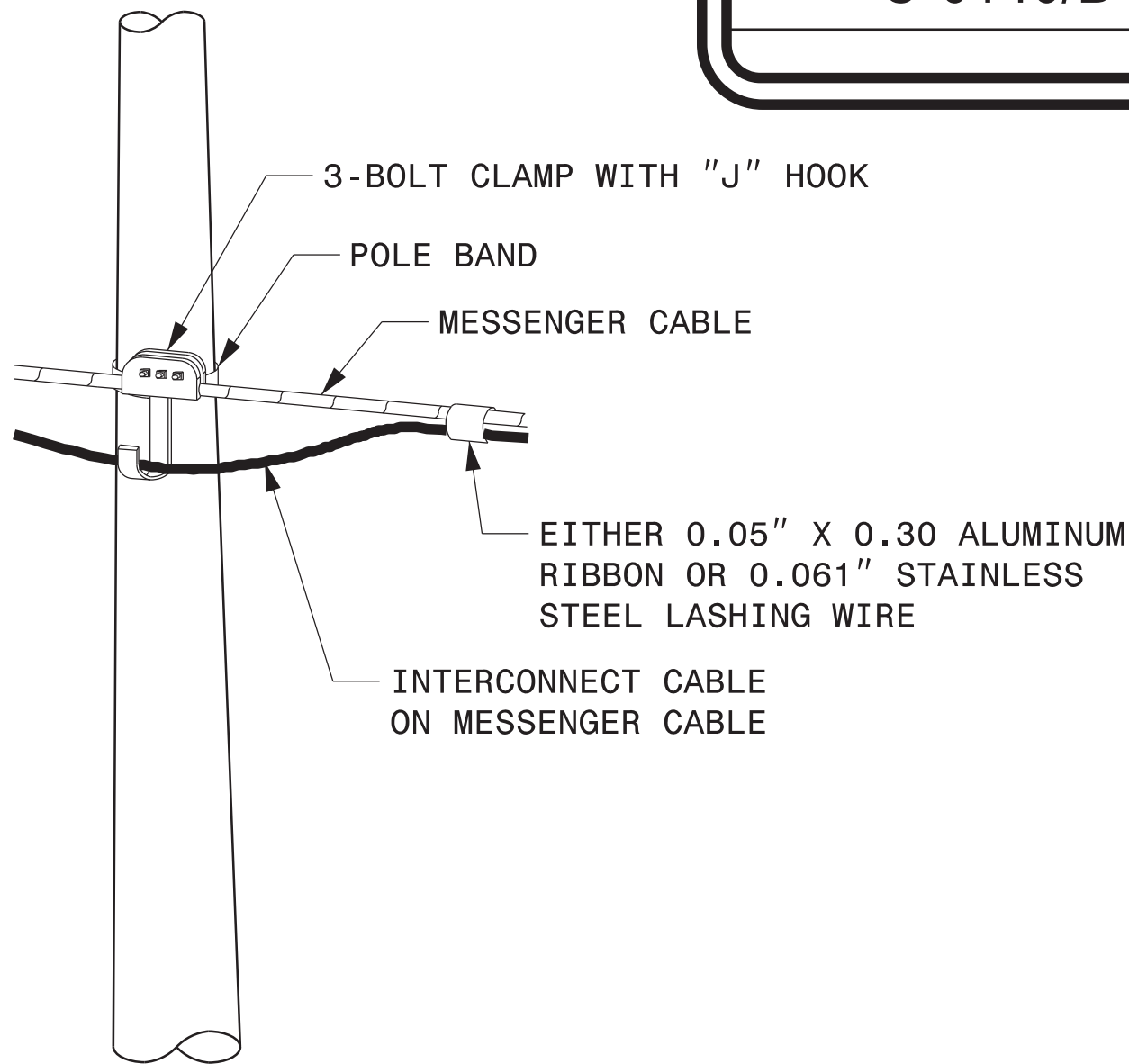
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Kadur Iyan



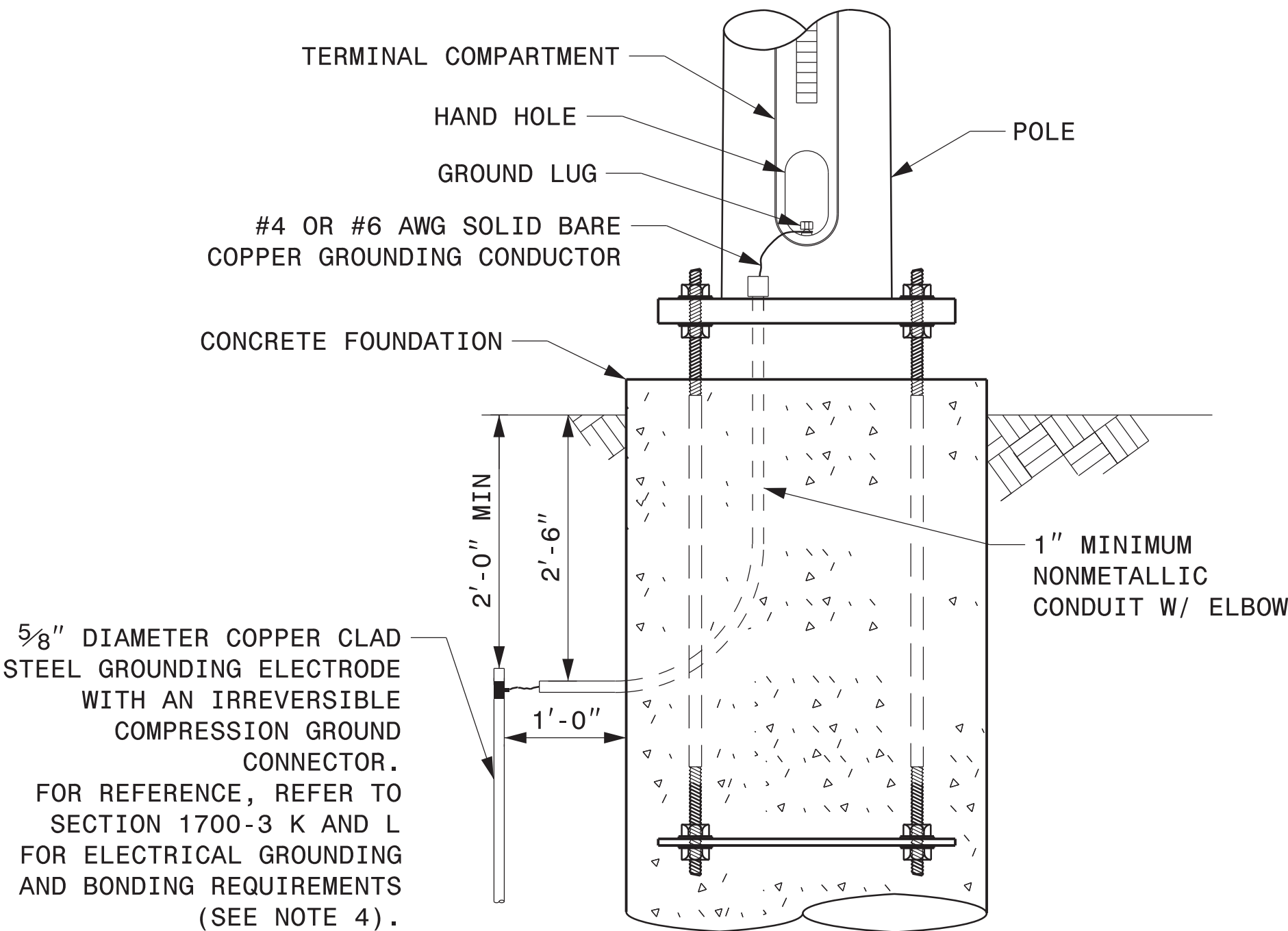
STRAIN POLE ATTACHMENTS

NOTES:

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



ATTACHMENT OF CABLE TO INTERMEDIATE METAL POLE



METAL POLE GROUNDING DETAIL FOR STRAIN POLE AND MAST ARM

Prepared in the Offices of:



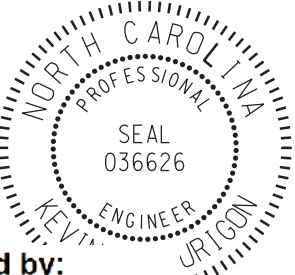
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: NA
NONE

Typical Fabrication Details For Strain Pole Attachments

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

SEAL

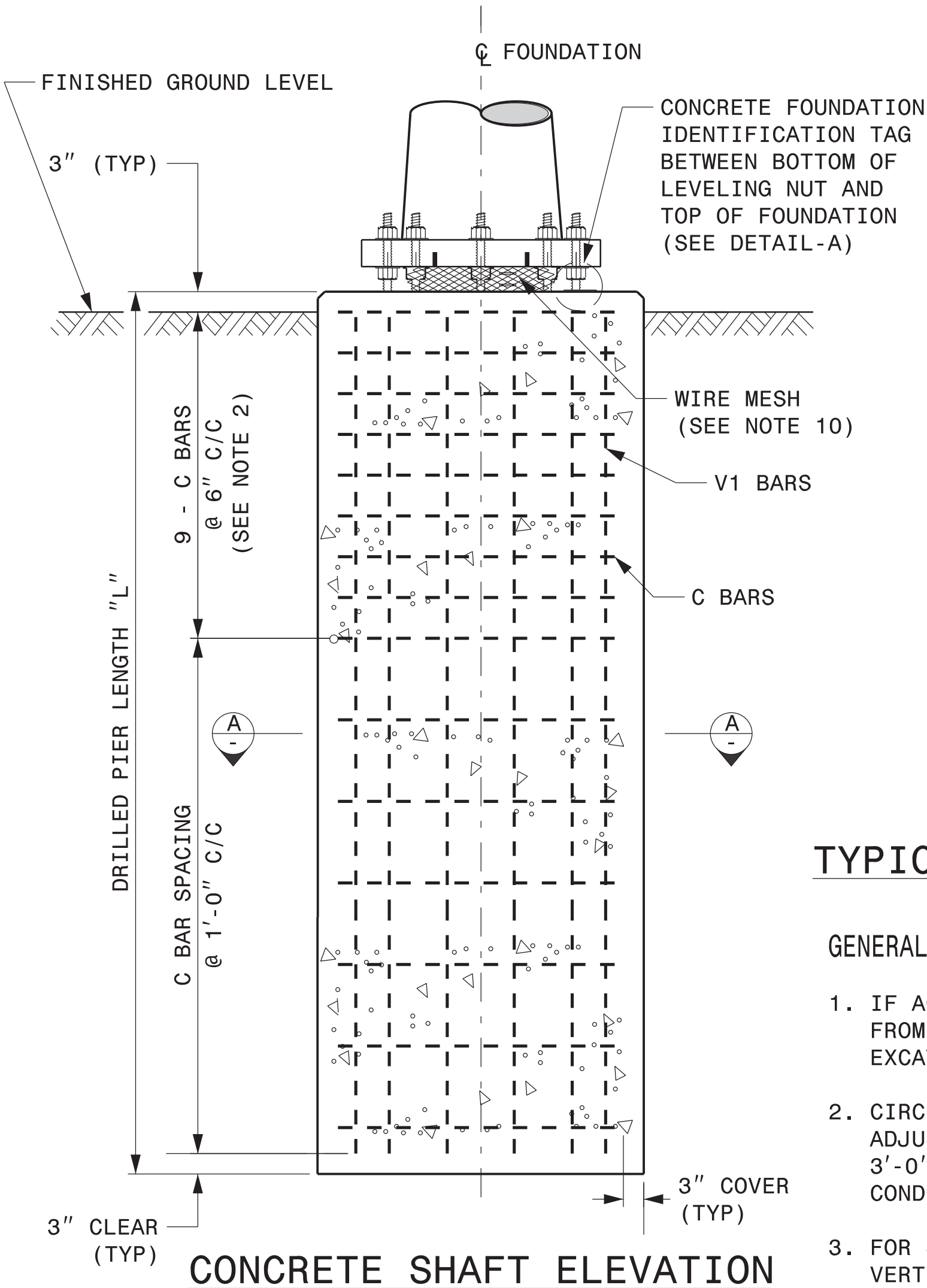


DocuSigned by: Kevin Durigon

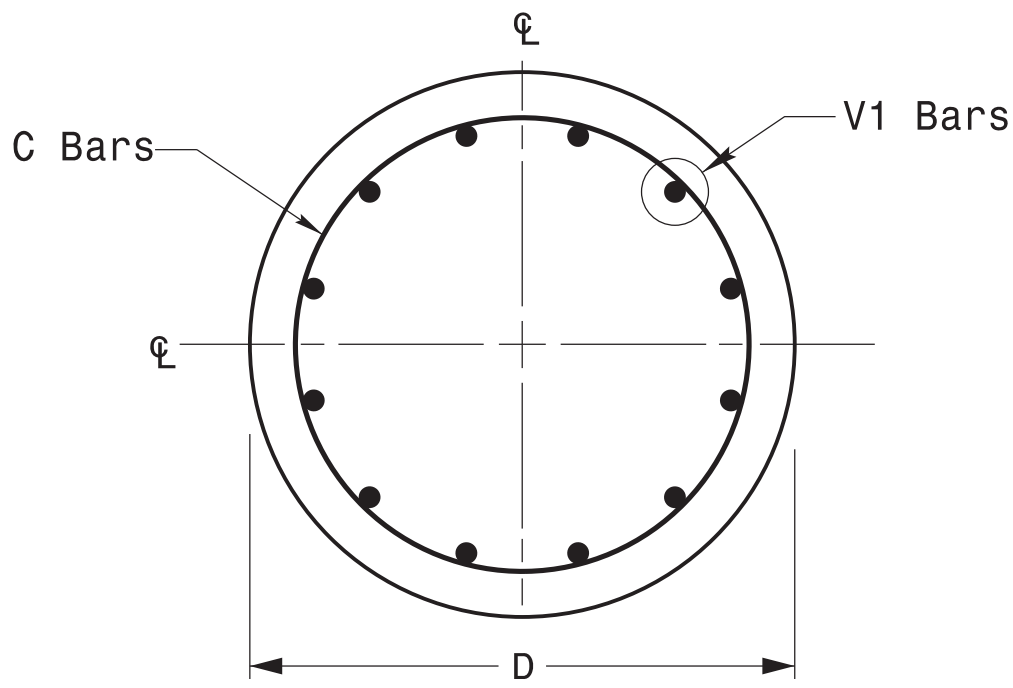
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09/21/2023
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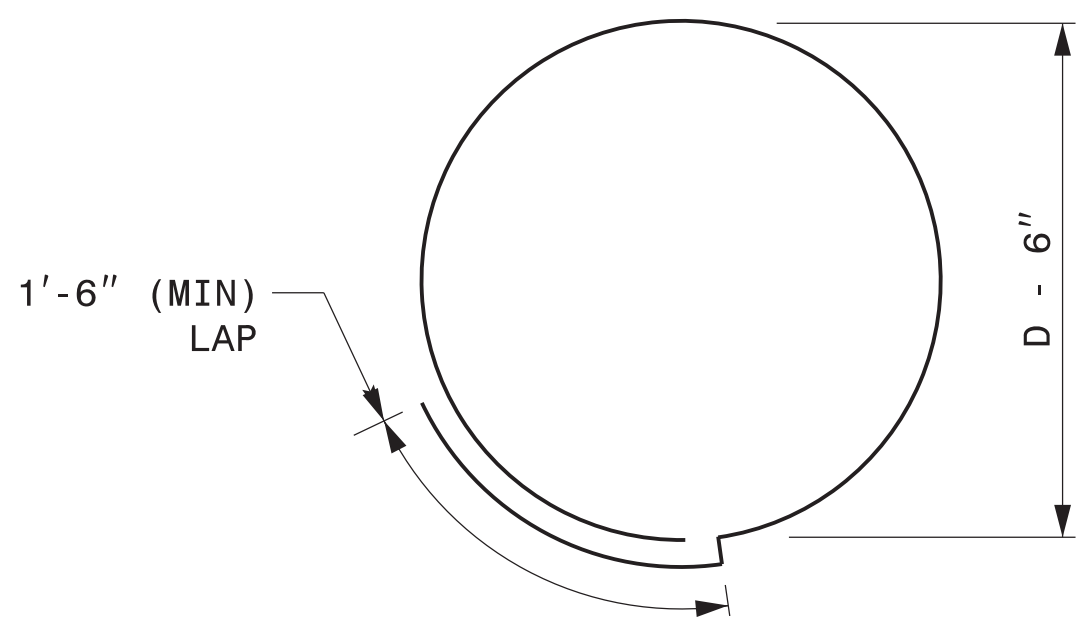
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Kadur Iyann



CONCRETE SHAFT ELEVATION



SECTION A-A



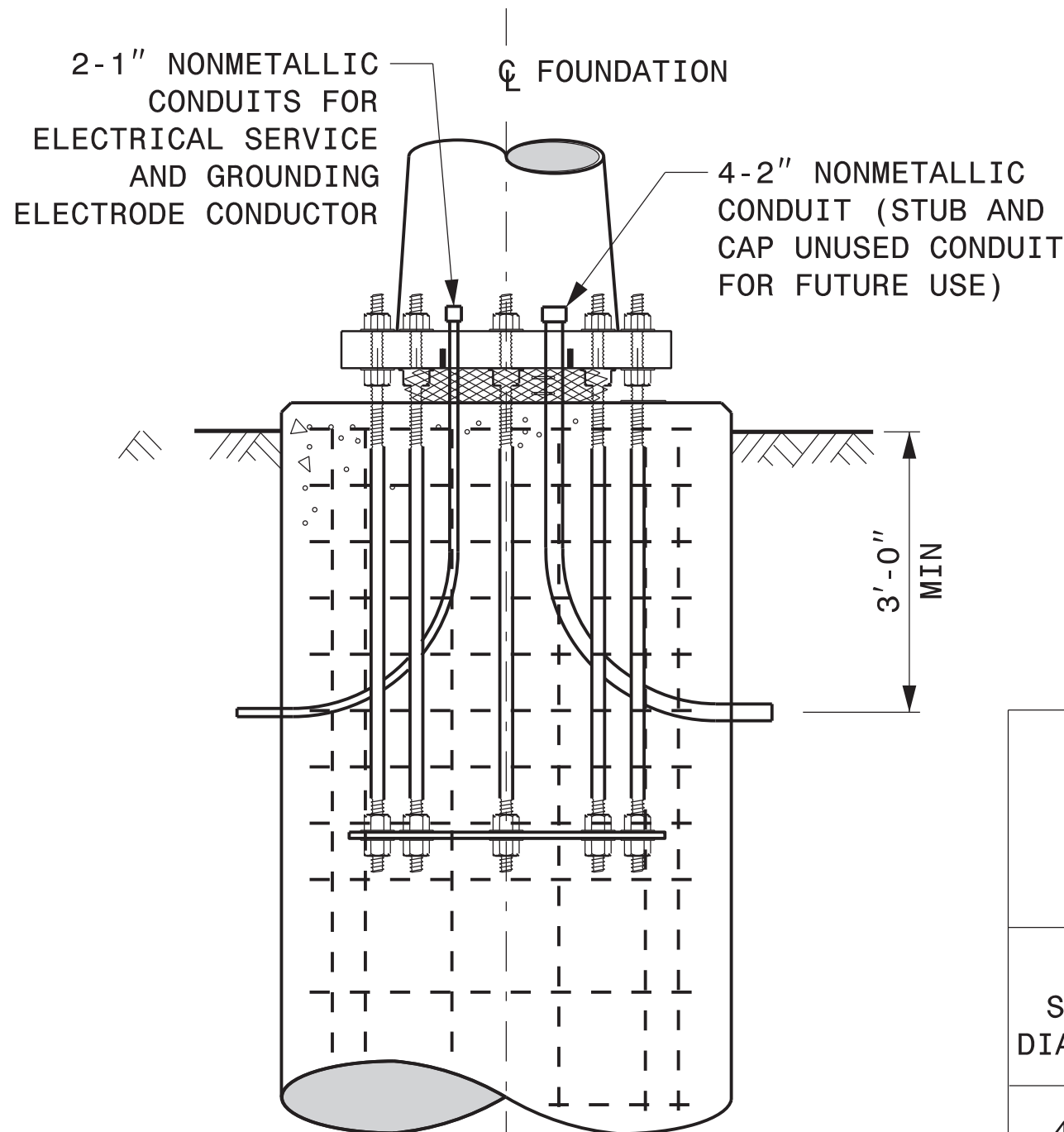
TYPICAL "C" BAR DETAIL

TYPICAL FOUNDATION CONDUIT DETAILS

GENERAL NOTES:

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

[https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx](https://connect.ncdot.gov/resources/Specifications%20and%20Special%20Provisions.aspx)
- USE AIR ENTRAINED AA CONCRETE MIX WITH A COMPRESSION STRENGTH OF $f'c=4500$ psi (MIN) AFTER 28 DAYS.
- USE ASTM A615 GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL. MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
- LOCATE IDENTIFICATION TAG ON TOP OF THE FOUNDATION, DIRECTLY ABOVE THE CONDUIT'S ENTRY POINT.
- PROVIDE TWO LAYERS OF 4 MESH GALVANIZED WELDED 23 GAUGE (0.025) 6" WIDE AROUND PIPES UNDER THE BASE PLATE AND SECURE IT WITH TIES IF NECESSARY.
- PREFERRED LOCATION FOR THE I.D. TAG IS AS SHOWN IN DETAIL-A: DIRECTLY ABOVE THE CONDUIT ENTERING THE FOUNDATION.

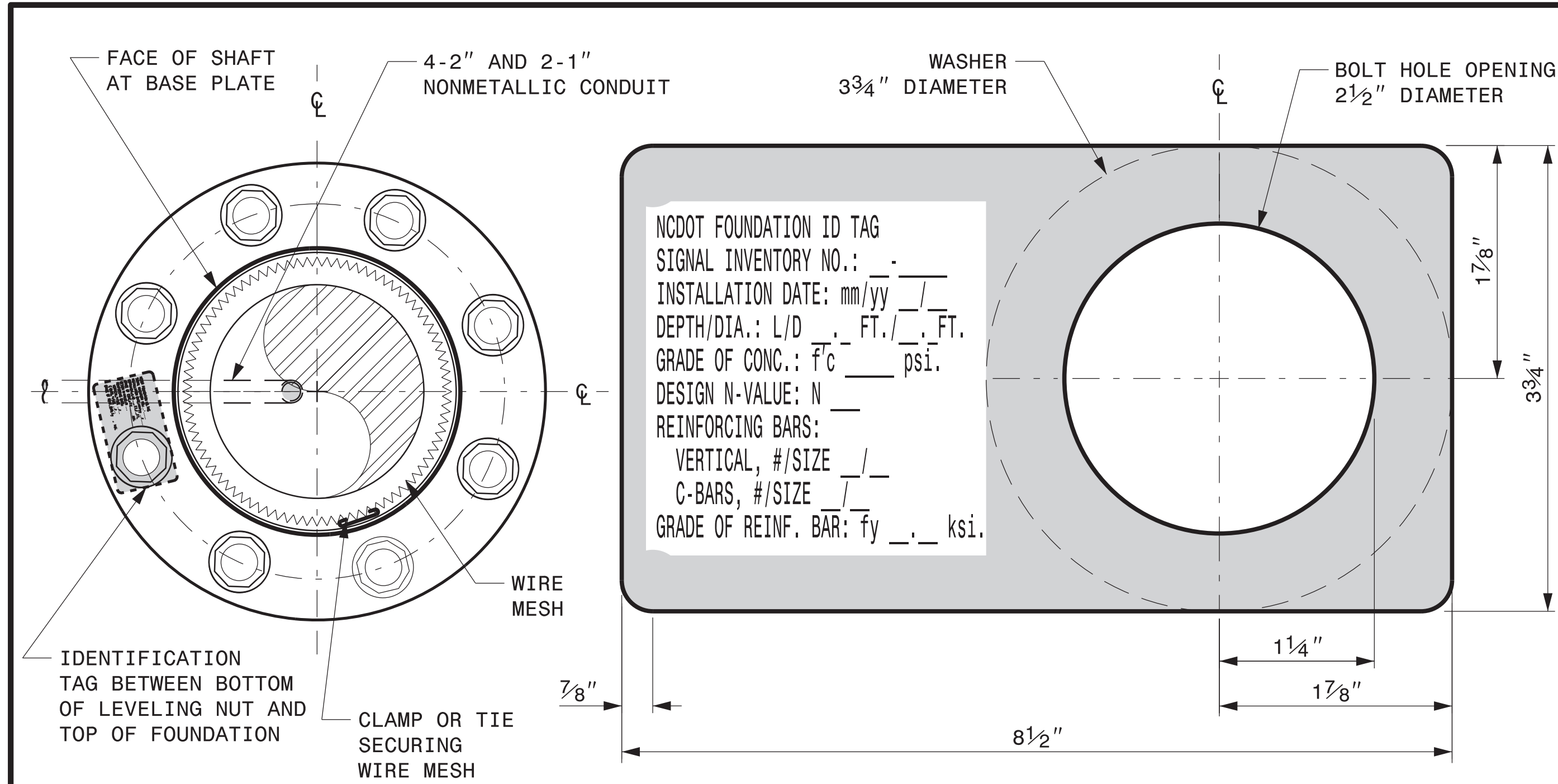


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4'-0" DIAMETER)						
"D" SHAFT DIAMETER	CONCRETE VOLUME (CU. YDS)	BAR NAME	MIN. SIZE	TYPE	LENGTH	
4'-0"	.465 X L	V1	-	#8	STR.	**
		C	*	#4	CIR.	12'-6"

* SEE NOTE 2
** SEE NOTE 3

TYPICAL FOUNDATION ANCHOR BOLT DETAILS

(REINFORCING CAGE NOT SHOWN FOR CLARITY)



CONCRETE FOUNDATION IDENTIFICATION TAG DETAILS

DETAIL-A

Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529		Construction Details For Foundations		SEAL 	
PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON		PREPARED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR		DocuSigned by: Kevin Durigon	
SCALE: NA		REVISIONS		INIT. DATE	
NONE					
				4B23DC79B3784DA...	

SOIL CONDITION

PROJECT I.D. NO.	SHEET NO.
U-6146/B-5857	Sig.M8

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

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

21-SEP-2023 08:08
S:\ITS&S\ITS Signal\Signal Design Section\Structures\Drawings\2024 Metal Pole Std Drawings for URFD\2024 Sig.M8 Std. Strain Pole Found.-Saturated Soil Condition.dgn
Kadur Iyan

Prepared in the Offices of:

750 N.Greenfield Pkwy,Garner,NC 27529

SCALE

NA

NONE

Standard Strain Pole Foundation for All Soil Conditions

PLAN DATE: SEPTEMBER 2023

DESIGNED BY: K.C. DURIGON

PREPARED BY: K.C. DURIGON

REVIEWED BY: D.C. SARKAR

REVISIONS

INIT.

DATE

SEAL

DocuSigned by:

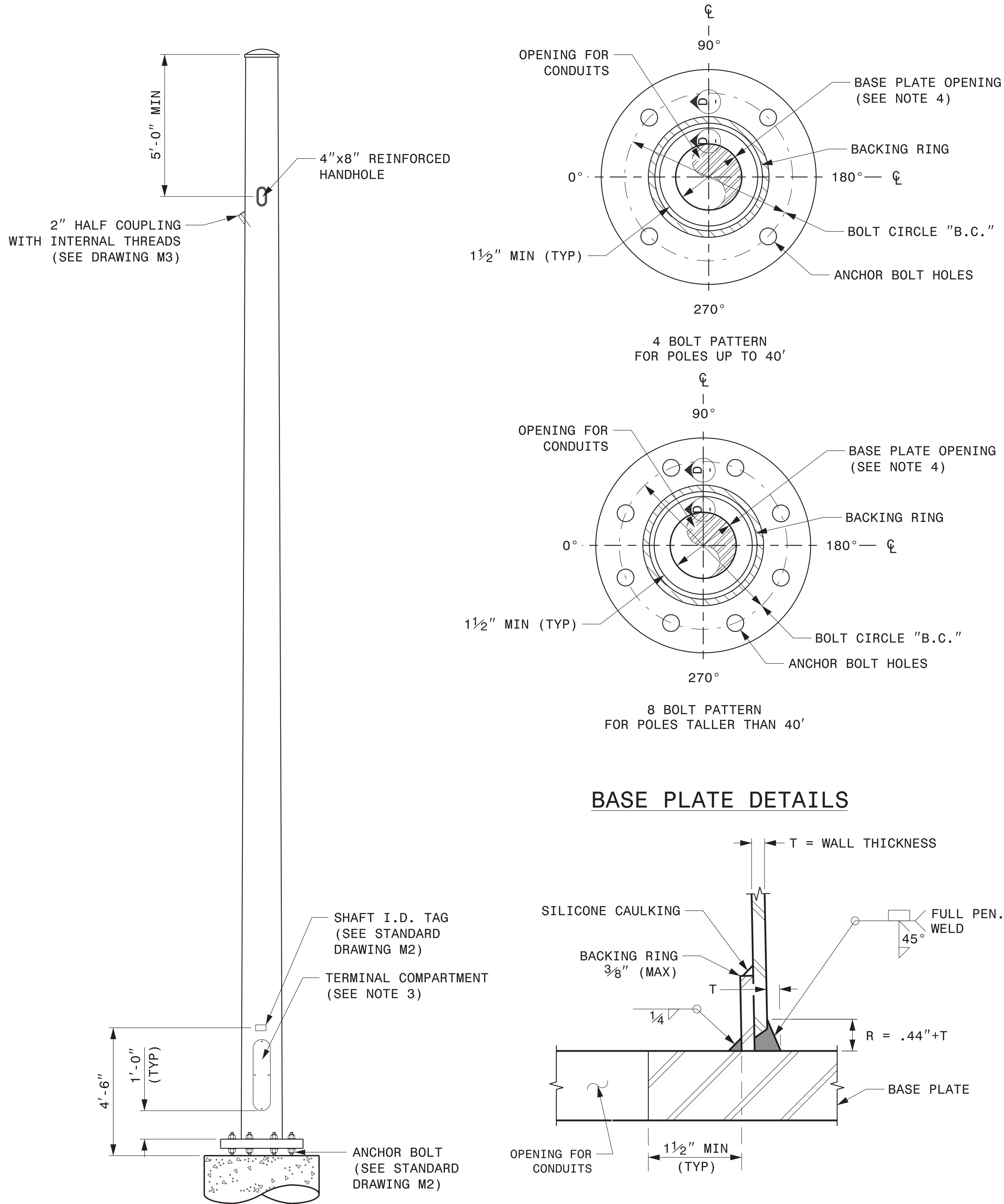
Kevin Durigon

4B23DC79B3784DA...

09/21/2023

DATE

21-SEP-2023 08:16
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Kevin Durigon



CCTV CAMERA POLE
(NOT TO SCALE)

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.

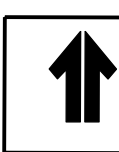
	Typical Fabrication Details For CCTV Poles		SEAL 	
	PLAN DATE: SEPTEMBER 2023 DESIGNED BY: K.C. DURIGON		DocuSigned by: 	
	PREPARED BY: K.C. DURIGON REVIEWED BY: C.F. ANDREWS		09/21/2023 DATE	

REVISIONS	INIT.	DATE

4B23DC79B3784DA...

34	INSTALL CABINET FOUNDATION
35	INSTALL CCTV CAMERA POLE MOUNTED CABINET
36	INSTALL CCTV CAMERA ASSEMBLY
37	INSTALL CCTV WOOD POLE
38	INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39	INSTALL STANDARD JUNCTION BOX
40A	INSTALL OVERSIZED JUNCTION BOX
40B	INSTALL SPECIAL SIZE JUNCTION BOX (36" x 36" x 24")
41	REMOVE EXISTING JUNCTION BOX
42	INSTALL WOOD POLE
43	REMOVE EXISTING WOOD POLE
44	INSTALL AERIAL GUY ASSEMBLY
45	INSTALL STANDARD GUY ASSEMBLY
46	INSTALL SIDEWALK GUY ASSEMBLY
47	INSTALL MESSENGER CABLE
48A	REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
48B	REMOVE EXISTING COMMUNICATIONS CABLE
49	BACK PULL EXISTING COMMUNICATIONS CABLE
50	INSTALL TELEPHONE SERVICE
51	INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52A	INSTALL DELINEATOR MARKER
52B	INSTALL JUNCTION BOX MARKER
53	STORE 50 FEET OF COMMUNICATIONS CABLE
54	LASH CABLE(S) TO EXISTING COMMUNICATIONS CABLE
55	LASH CABLE(S) TO EXISTING MESSENGER CABLE
56	LASH CABLE(S) TO NEW MESSENGER CABLE
57	MODIFY EXISTING ELECTRICAL SERVICE
58	INSTALL NEW ELECTRICAL SERVICE
59	INSTALL NEW ETHERNET EDGE SWITCH
60	BOND TRACER WIRE TO EQUIPMENT GROUND BUS
61	DO NOT BOND TRACER WIRE TO EQUIPMENT GROUND BUS
62	BOND RISER AND MESSENGER CABLE TO POLE GROUND
63	BOND RISER TO POLE GROUND
64	BOND MESSENGER CABLE TO POLE GROUND
65	INSTALL HEAT SHRINK TUBING
66	INSTALL MOLDABLE DUCT SEAL
67	SLACK SPAN

Prepared in the



NC FIRM
320
Hillsb

CONSTRUCTION NOTE SYMBOL KEY

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

Prepared in the Office of:

↑

SUMMIT

DESIGN AND ENGINEERING SERVICES

NC FIRM LICENSE No: P-0339

320 Executive Court
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared For:

750 N. Greenfield Pkwy., Garner, NC 27529

SCALE

N/A

Communications Cable &
Conduit Routing Plans
Construction Notes

Division 12

Gaston County

Belmont

PLAN DATE: October 2023

REVIEWED BY: S. Yow

PREPARED BY: J. Smith

REVIEWED BY: G. Fuller

REVISIONS

INIT.

DATE

Seal

Seal

053312

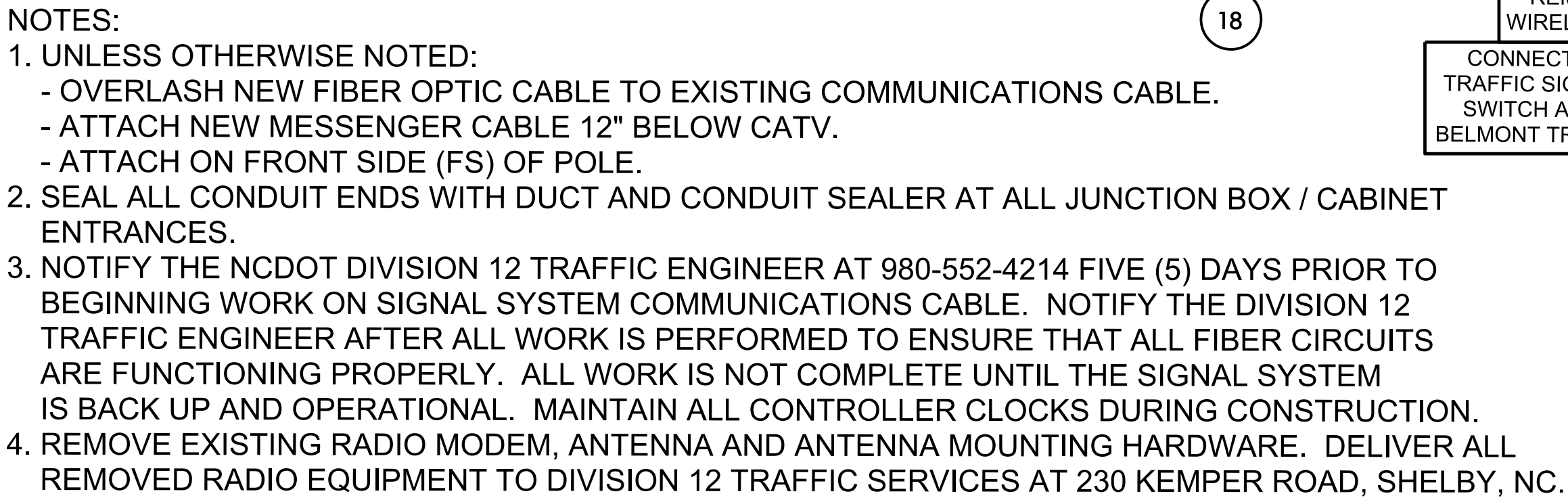
JAMES D. SMITH

Decal Signed by:

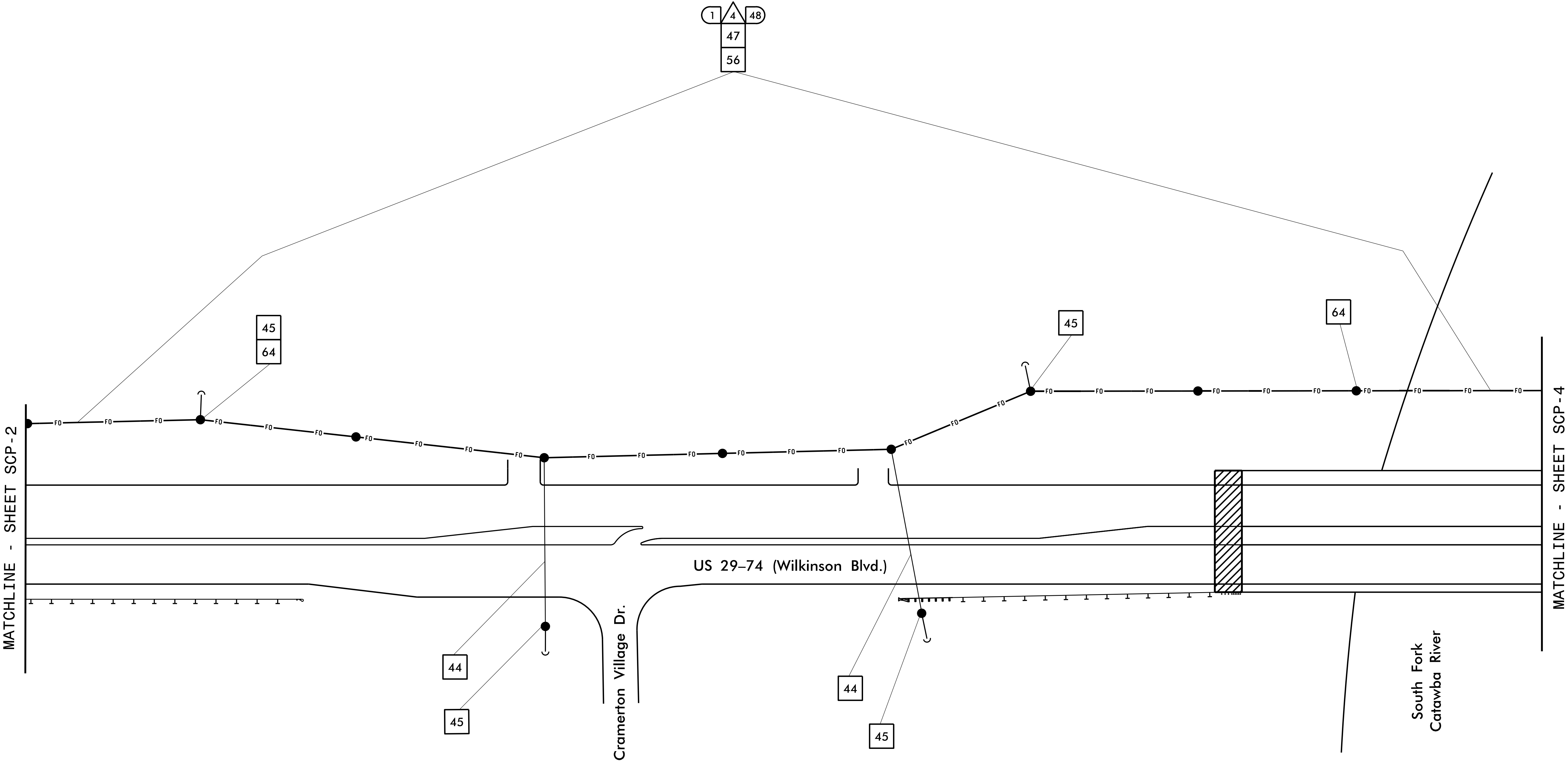
James D. Smith

10/3/2023

CADD Filename:



Prepared in the Office of: SUMMIT DESIGN AND ENGINEERING SERVICES NC FIRM LICENSE No: P-0339 320 Executive Court Hillsborough, NC 27278 (919) 732-3883 (919) 732-6676 (FAX)	Prepared For: 750 N. Greenfield Pkwy., Garner, NC 27529	Communications Cable & Conduit Routing Plans <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Division 12</td> <td style="width: 33%;">Gaston County</td> <td style="width: 33%;">Belmont</td> </tr> <tr> <td>PLAN DATE: October 2023</td> <td>REVIEWED BY: S. Yow</td> <td></td> </tr> <tr> <td>PREPARED BY: J. Smith</td> <td>REVIEWED BY: G. Fuller</td> <td></td> </tr> <tr> <td style="text-align: center;">REVISIONS</td> <td style="text-align: center;">INIT.</td> <td style="text-align: center;">DATE</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> </table>	Division 12	Gaston County	Belmont	PLAN DATE: October 2023	REVIEWED BY: S. Yow		PREPARED BY: J. Smith	REVIEWED BY: G. Fuller		REVISIONS	INIT.	DATE																						SEAL Documented by: JAMES D. SMITH 10/3/2023 DATE CADD Filename:
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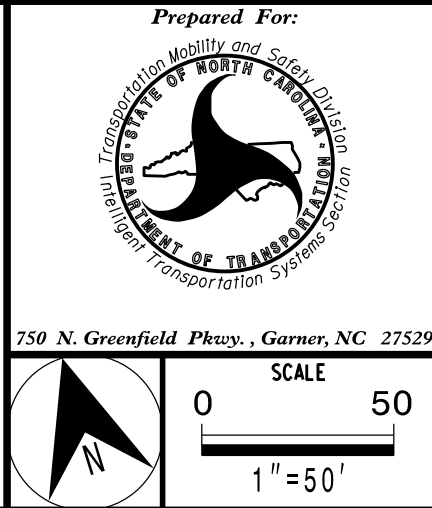
- UNLESS OTHERWISE NOTED:
 - OVERLASH NEW FIBER OPTIC CABLE TO EXISTING COMMUNICATIONS CABLE.
 - ATTACH NEW MESSENGER CABLE 12" BELOW CATV.
 - ATTACH ON FRONT SIDE (FS) OF POLE.
- SEAL ALL CONDUIT ENDS WITH DUCT AND CONDUIT SEALER AT ALL JUNCTION BOX / CABINET ENTRANCES.
- NOTIFY THE NCDOT DIVISION 12 TRAFFIC ENGINEER AT 980-552-4214 FIVE (5) DAYS PRIOR TO BEGINNING WORK ON SIGNAL SYSTEM COMMUNICATIONS CABLE. NOTIFY THE DIVISION 12 TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL. MAINTAIN ALL CONTROLLER CLOCKS DURING CONSTRUCTION.

DOCUMENT NOT CONSIDERED FINAL
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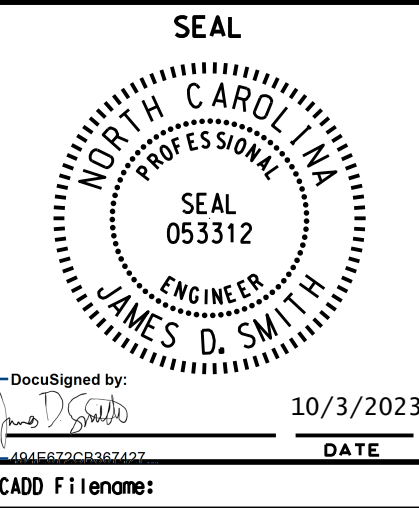
Prepared in the Office of:

SUMMIT
DESIGN AND ENGINEERING SERVICES

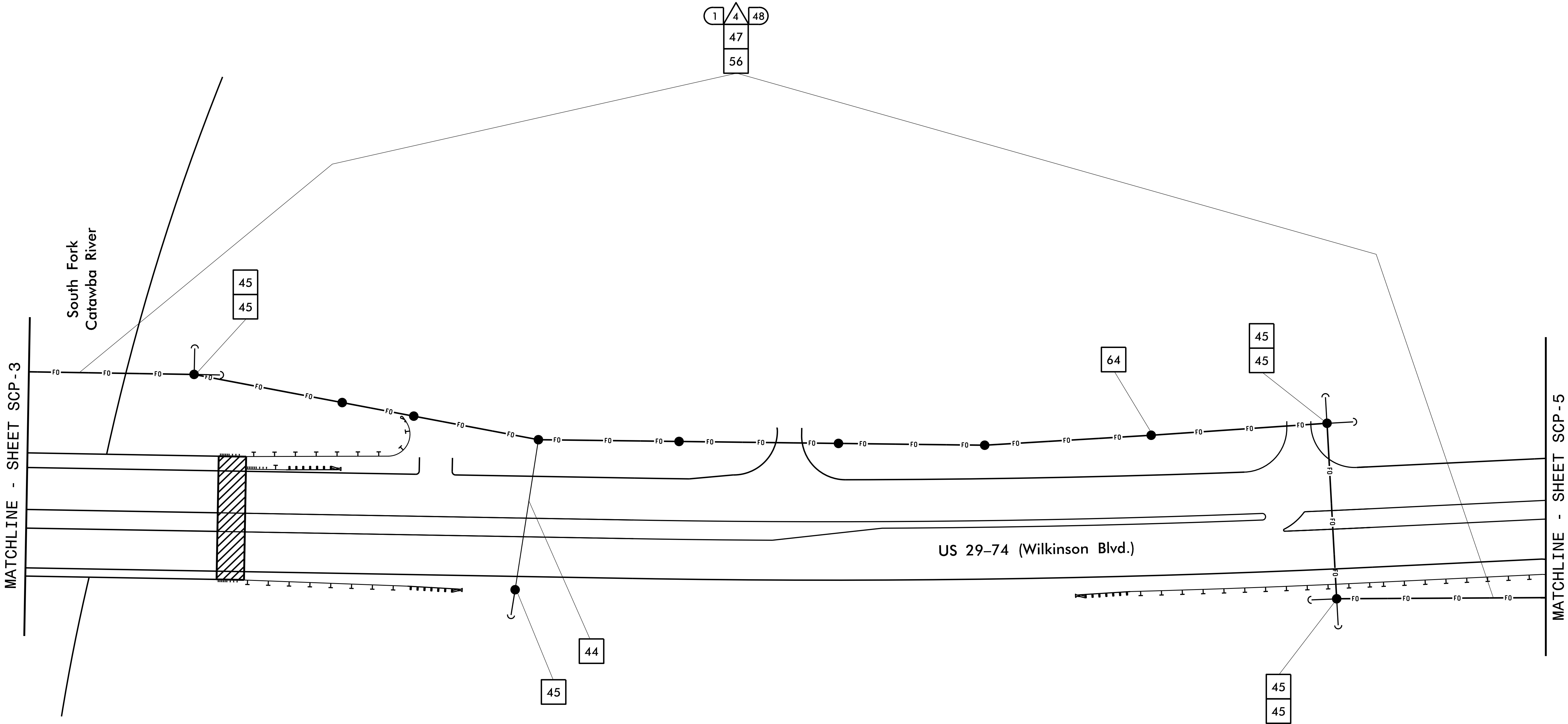
NC FIRM LICENSE No: P-0339
320 Executive Court
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)



Communications Cable & Conduit Routing Plans			
Division 12 Gaston County Belmont			
PLAN DATE: October 2023	REVIEWED BY: S. Yow		
PREPARED BY: J. Smith	REVIEWED BY: G. Fuller		
REVISIONS	INIT.	DATE	



PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	SCP-4

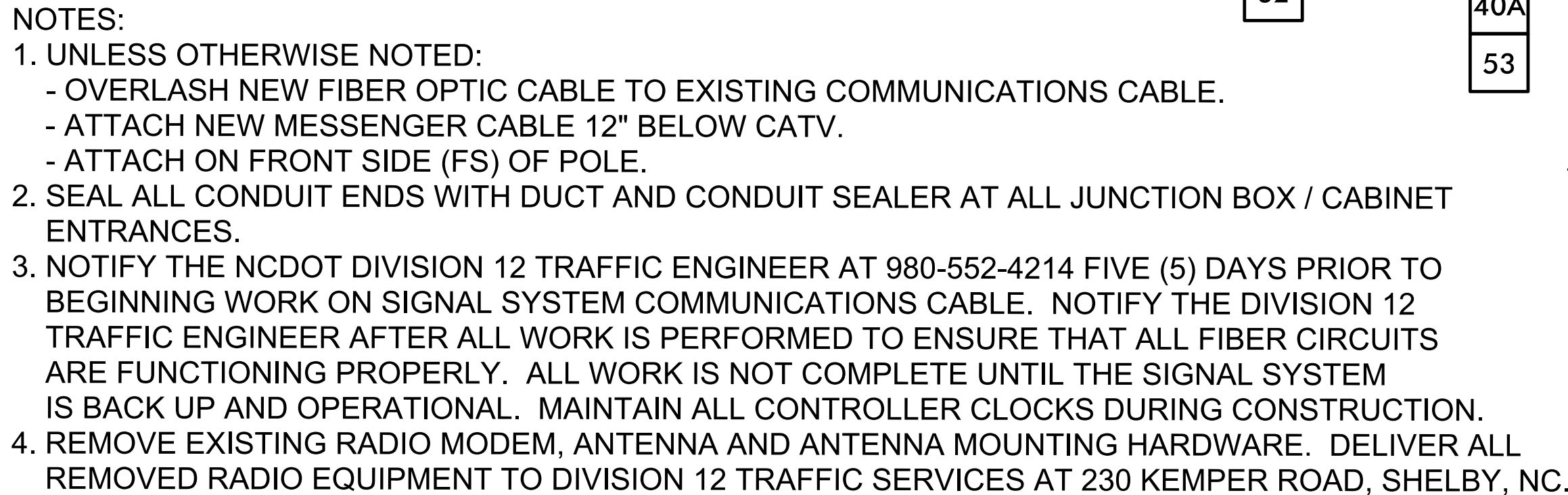


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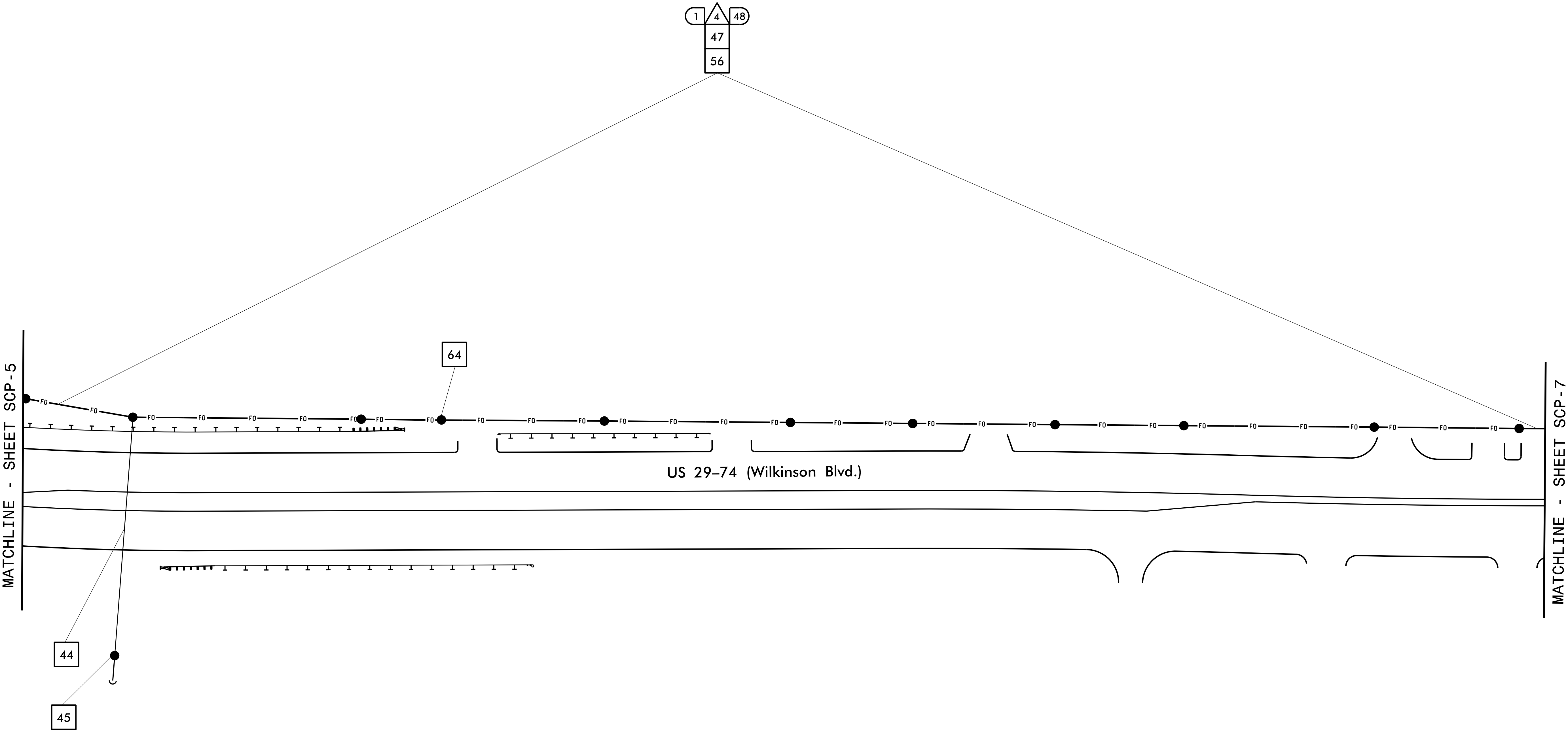
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Prepared in the Office of: NC FIRM LICENSE No: P-0339 320 Executive Court Hillsborough, NC 27278 (919) 732-3883 (919) 732-6676 (FAX)	 750 N. Greenfield Pkwy., Garner, NC 27529	Communications Cable & Conduit Routing Plans		 DocuSigned by: 10/3/2023 CADD Filename:	
		Division 12	Gaston County		Belmont
		PLAN DATE: October 2023	REVIEWED BY: S. Yow		
		PREPARED BY: J. Smith	REVIEWED BY: G. Fuller		
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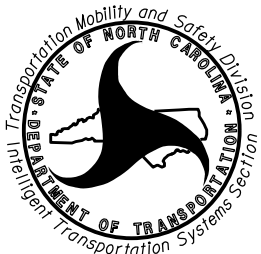
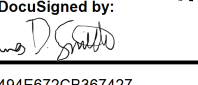
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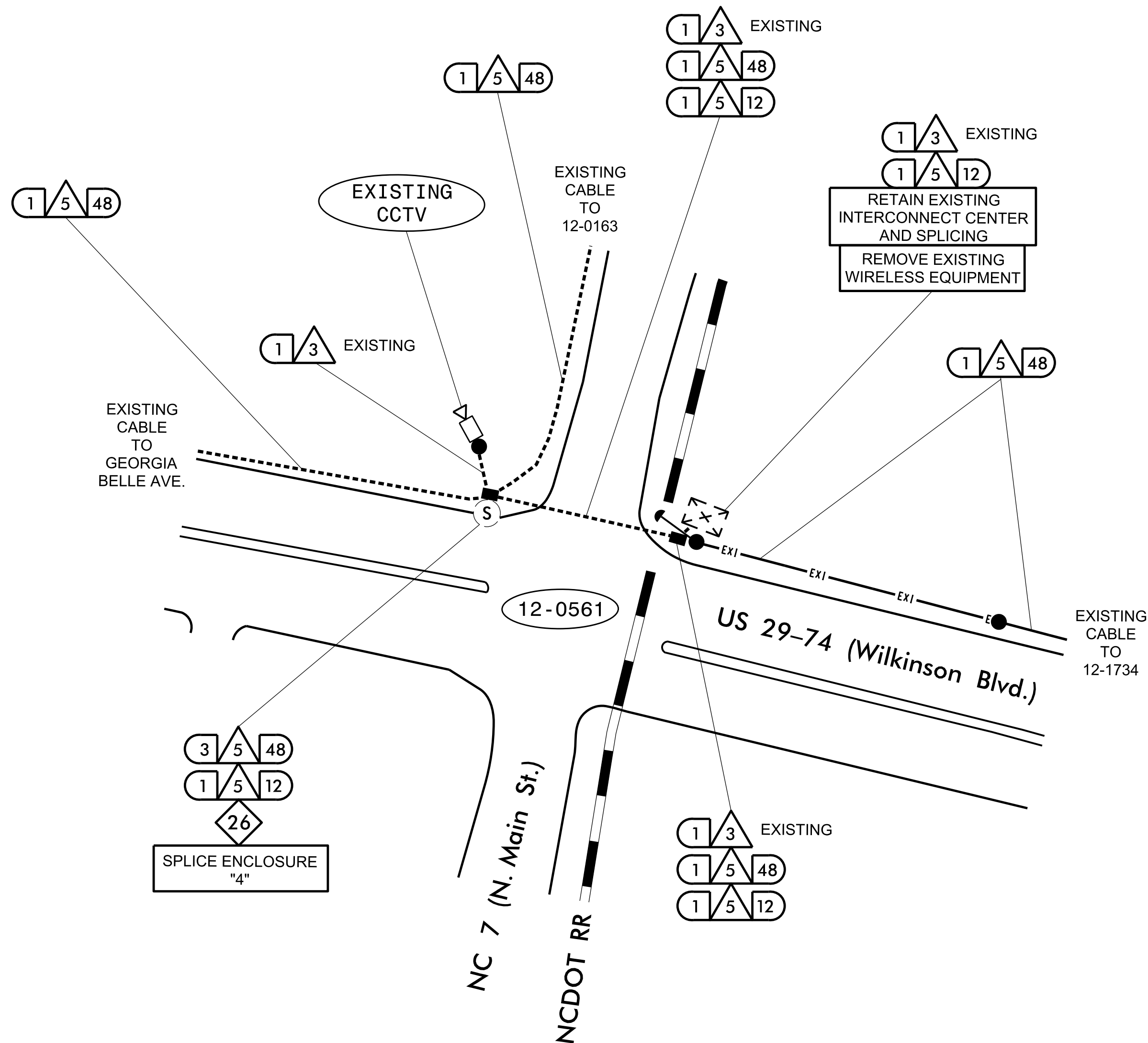


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Prepared in the Office of:  NC FIRM LICENSE No: P-0339 320 Executive Court Hillsborough, NC 27278 (919) 732-3883 (919) 732-6676 (FAX)	Prepared For:  750 N. Greenfield Pkwy., Garner, NC 27529	Communications Cable & Conduit Routing Plans		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JAMES D. SMITH 053312
		Division 12 Gaston County Belmont		
		PLAN DATE: October 2023	REVIEWED BY: S. Yow	
		PREPARED BY: J. Smith	REVIEWED BY: G. Fuller	
REVISIONS		INIT.	DATE	DocuSigned by:  10/3/2023



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4. REMOVE EXISTING RADIO MODEM, ANTENNA AND ANTENNA MOUNTING HARDWARE. DELIVER ALL REMOVED RADIO EQUIPMENT TO DIVISION 12 TRAFFIC SERVICES AT 230 KEMPER ROAD, SHELBY, NC.

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Prepared in the Office of:  SUMMIT DESIGN AND ENGINEERING SERVICES NC FIRM LICENSE No: P-0339 320 Executive Court Hillsborough, NC 27278 (919) 732-3883 (919) 732-6676 (FAX)	<i>Prepared For:</i>  750 N. Greenfield Pkwy., Garner, NC 27529	Communications Cable & Conduit Routing Plans <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">Division 12</td> <td>Gaston County</td> <td>Belmont</td> </tr> <tr> <td>PLAN DATE:</td> <td>October 2023</td> <td>REVIEWED BY:</td> <td>S. Yow</td> </tr> <tr> <td>PREPARED BY:</td> <td>J. Smith</td> <td>REVIEWED BY:</td> <td>G. Fuller</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">REVISIONS</td> <td style="width: 20%;">INIT.</td> <td style="width: 20%;">DATE</td> </tr> <tr> <td style="height: 40px;"> </td> <td> </td> <td> </td> </tr> </table>	Division 12		Gaston County	Belmont	PLAN DATE:	October 2023	REVIEWED BY:	S. Yow	PREPARED BY:	J. Smith	REVIEWED BY:	G. Fuller	REVISIONS	INIT.	DATE				SEAL  10/3/2023 DATE
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PLAN DATE:	October 2023	REVIEWED BY:	S. Yow																		
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REVISIONS	INIT.	DATE																			

Splice Enclosure #1 at
Wilkinson Blvd at
Market St/ Wesleyan Dr
Sig ID 12-0081

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	SPL-1

COLOR CODE
TIA/EIA 598-C

(1) BLUE

(2) ORANGE

(3) GREEN

(4) BROWN

(5) SLATE

(6) WHITE

(7) RED

(8) BLACK

(9) YELLOW

(10) VIOLET

(11) ROSE

(12) AQUA

LEGEND

X - FUSION SPlice

○ - EXISTING SPlice

□ - EXPRESS INDIVIDUAL FIBER

EXPRESS

SPLICE

EXPRESS ENTIRE BUFFER TUBE

SPLICE ENTIRE BUFFER TUBE OR MAINTAIN IF EXISTING EXPRESSED

NOTES:

1. FIBER INTERCONNECT CENTER RACKS ARE SCHEMATIC ONLY- ACTUAL EQUIPMENT FORM MAY VARY.

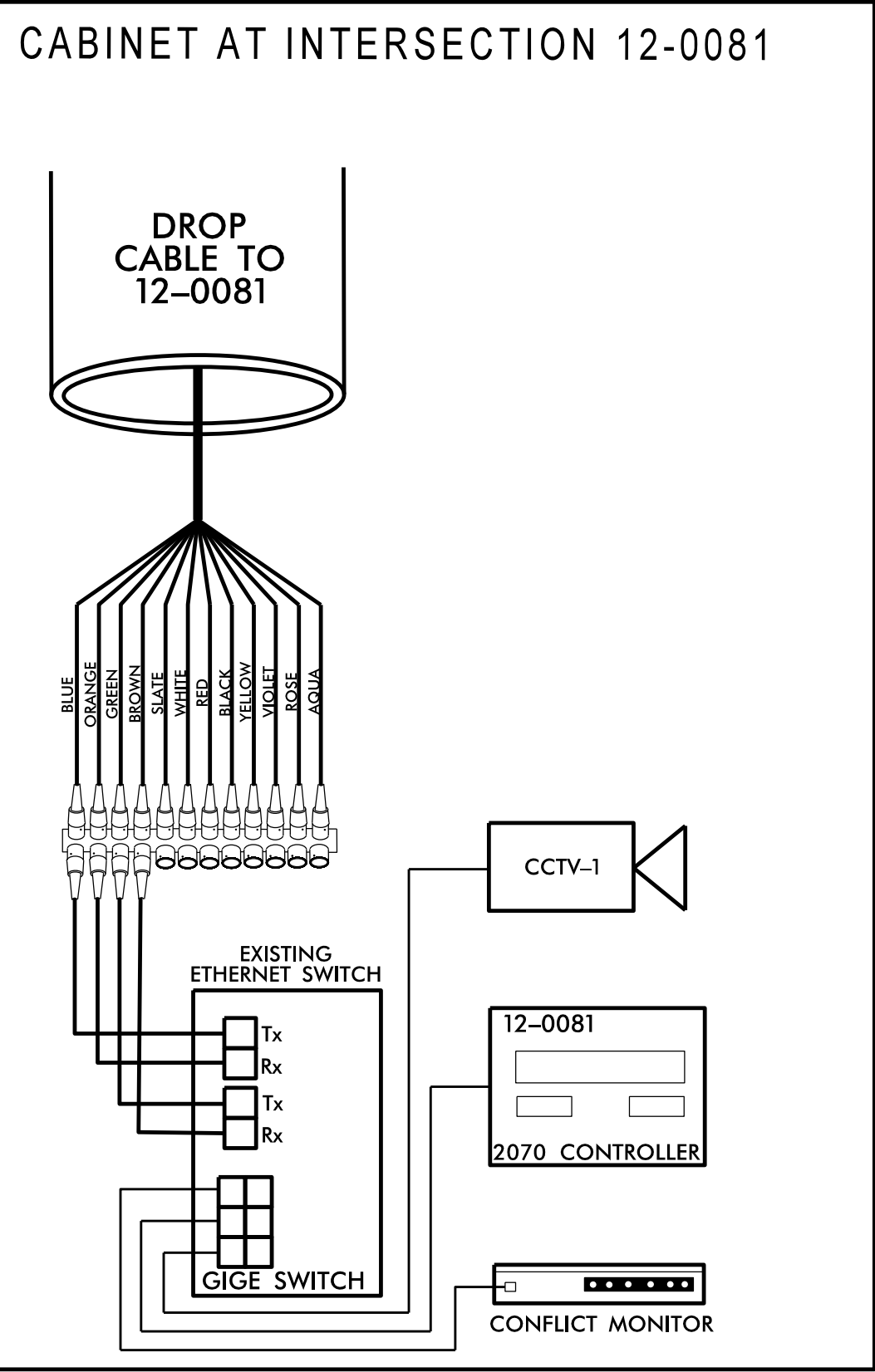
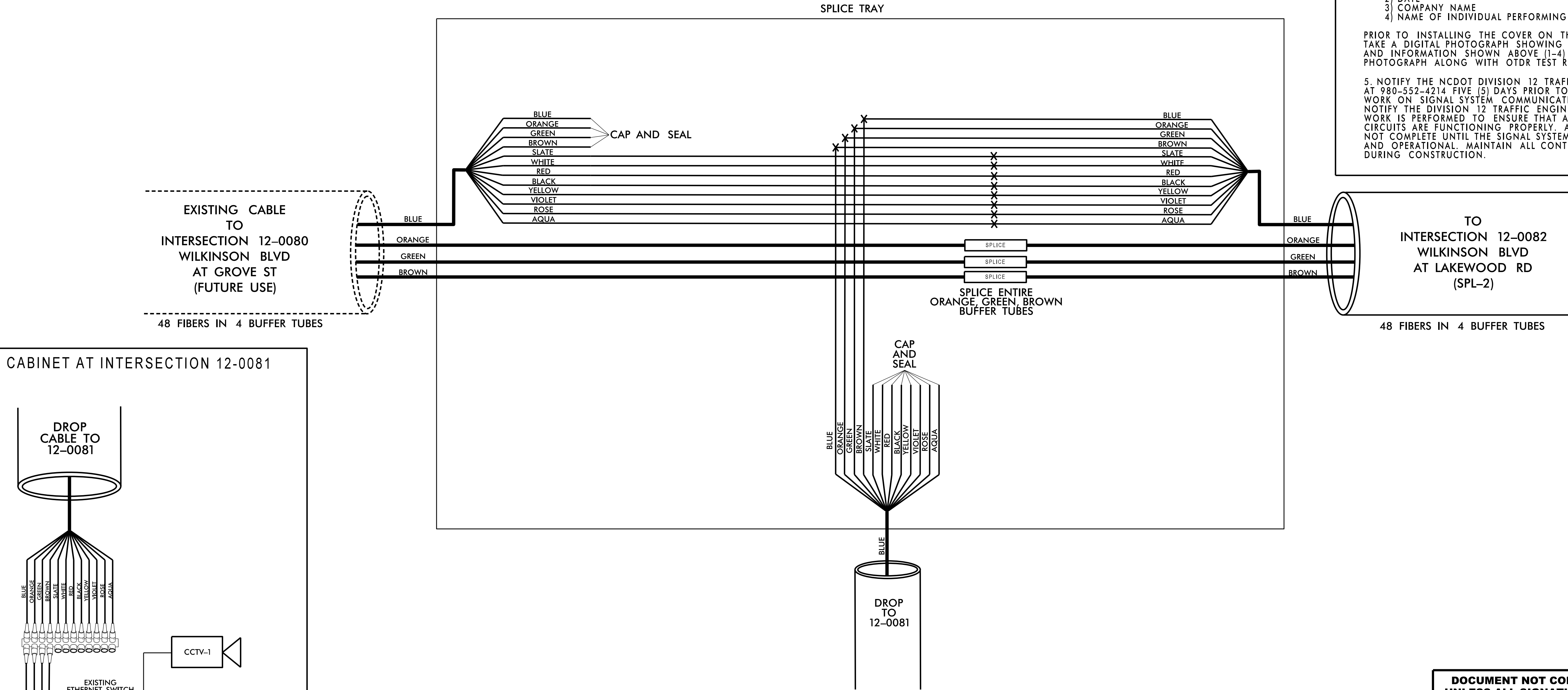
2. ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING/ENSURING PROPER TERMINATION.

3. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING SPlicing. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER WHERE EXISTING SPlicing IS NOT AS EXPECTED.

4. INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPlicing

5. NOTIFY THE NCDOT DIVISION 12 TRAFFIC ENGINEER AT 980-552-4214 FIVE (5) DAYS PRIOR TO BEGINNING WORK ON SIGNAL SYSTEM COMMUNICATIONS CABLE. NOTIFY THE DIVISION 12 TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL. MAINTAIN ALL CONTROLLER CLOCKS DURING CONSTRUCTION.



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Prepared in the Office of:

SUMMIT

DESIGN AND ENGINEERING SERVICES

NC FIRM LICENSE No: P-0339

320 Executive Court
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared for:

SEAL

PROFESSIONAL ENGINEER

SEAL

053312

ENGINEER

JAMES D. SMITH

Fiber-Optic Splicing Details

Division 12

Gaston County

Belmont

PLAN DATE: October 2023

REVIEWED BY: S. Yow

PREPARED BY: J. Smith

REVIEWED BY: G. Fuller

REVISIONS

INIT.

DATE

SCALE

N/A

DocuSigned by:

10/3/2023

DATE

CADD Filename:

Splice Enclosure #2 at
Wilkinson Blvd at
Lakewood Rd
Sig ID 12-0082

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	SPL-2

COLOR CODE
TIA/EIA 598-C

(1) BLUE

(2) ORANGE

(3) GREEN

(4) BROWN

(5) SLATE

(6) WHITE

(7) RED

(8) BLACK

(9) YELLOW

(10) VIOLET

(11) ROSE

(12) AQUA

LEGEND

X - FUSION SPlice

○ - EXISTING SPlice

□ - EXPRESS INDIVIDUAL FIBER

EXPRESS - EXPRESS ENTIRE BUFFER TUBE

SPlice - SPlice ENTIRE BUFFER TUBE OR MAINTAIN IF EXISTING EXPRESSED

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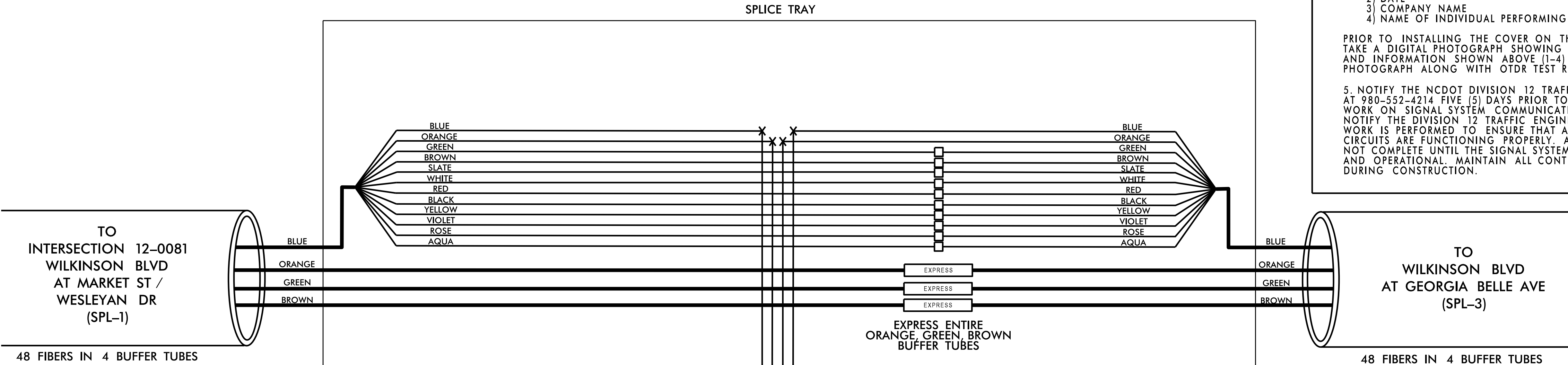
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3. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING SPlicing. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER WHERE EXISTING SPlicing IS NOT AS EXPECTED.

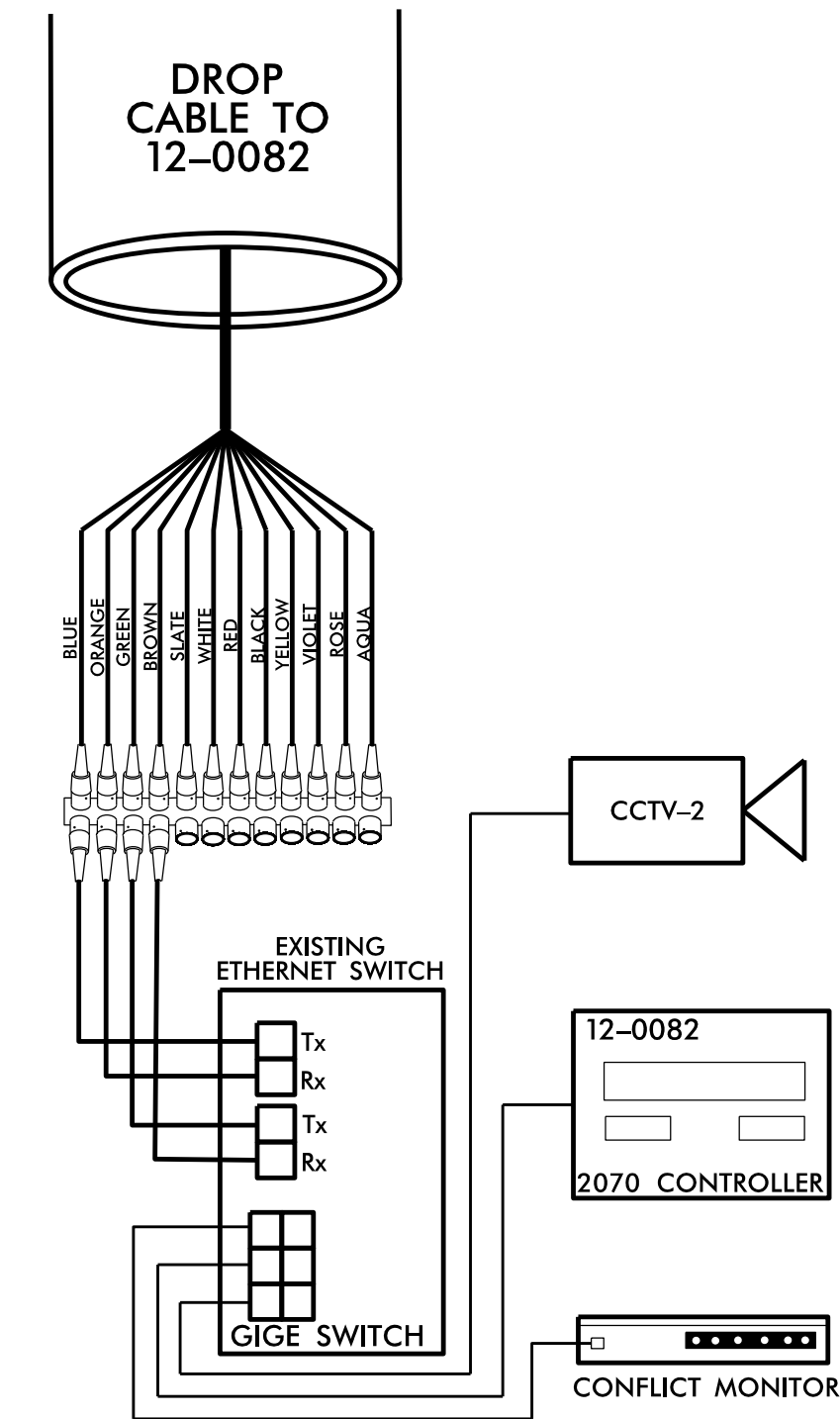
4. INCLUDE ON THE COVER OF EACH SPlice TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPlice ENCLOSURE"

1) SPlice LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPlicing

5. NOTIFY THE NCDOT DIVISION 12 TRAFFIC ENGINEER AT 980-552-4214 FIVE (5) DAYS PRIOR TO BEGINNING WORK ON SIGNAL SYSTEM COMMUNICATIONS CABLE. NOTIFY THE DIVISION 12 TRAFFIC ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL. MAINTAIN ALL CONTROLLER CLOCKS DURING CONSTRUCTION.



CABINET AT INTERSECTION 12-0082



DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

Prepared in the Office of:

↑

SUMMIT

DESIGN AND ENGINEERING SERVICES

NC FIRM LICENSE No: P-0339
320 Executive Court
Hillsborough, NC 27278
(919) 732-3883
(919) 732-6676 (FAX)

Prepared for:

Seal of the State of North Carolina
Department of Transportation
Division 12

750 N. Greenfield Place, Garner, NC 27529

SCALE
N/A

Fiber-Optic Splicing Details

Division 12

Gaston County

Belmont

PLAN DATE: October 2023

REVIEWED BY: S. Yow

PREPARED BY: J. Smith

REVIEWED BY: G. Fuller

REVISIONS

INIT.

DATE

Seal of the State of North Carolina
Professional Engineer
JAMES D. SMITH
SEAL 053312

DocuSigned by:
J. Smith
10/3/2023
DATE

CADD Filename:

Splice Enclosure #3 at
Wilkinson Blvd at
Georgia Belle Ave

PROJECT REFERENCE NO.	SHEET NO.
U-6146/B-5857	SPL-3

COLOR CODE
TIA/EIA 598-C

(1) BLUE

(2) ORANGE

(3) GREEN

(4) BROWN

(5) SLATE

(6) WHITE

(7) RED

(8) BLACK

(9) YELLOW

(10) VIOLET

(11) ROSE

(12) AQUA

LEGEND

X - FUSION SPlice

○ - EXISTING SPlice

□ - EXPRESS INDIVIDUAL FIBER

EXPRESS

EXPRESS ENTIRE BUFFER TUBE

SPlice

SPlice ENTIRE BUFFER TUBE OR MAINTAIN IF EXISTING EXPRESSED

NOTES:

1. FIBER INTERCONNECT CENTER RACKS ARE SCHEMATIC ONLY- ACTUAL EQUIPMENT FORM MAY VARY.

2. ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING/ENSURING PROPER TERMINATION.

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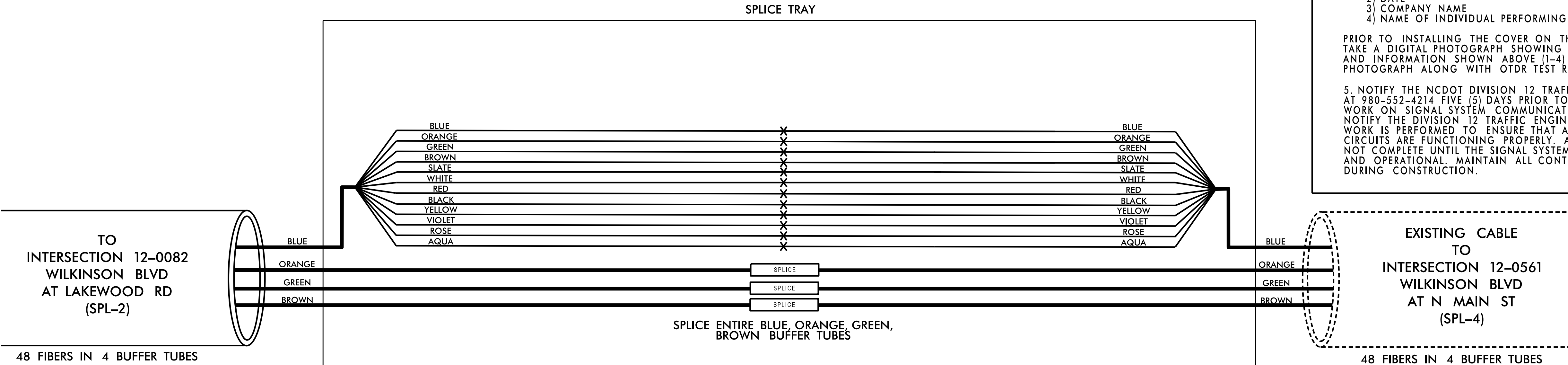
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Prepared for:

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Division 12

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N/A

Fiber-Optic Splicing Details

Division 12Gaston CountyBelmont

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Professional Engineer

SEAL 053312

ENGINEER JAMES D. SMITH

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James D. Smith

10/3/2023

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