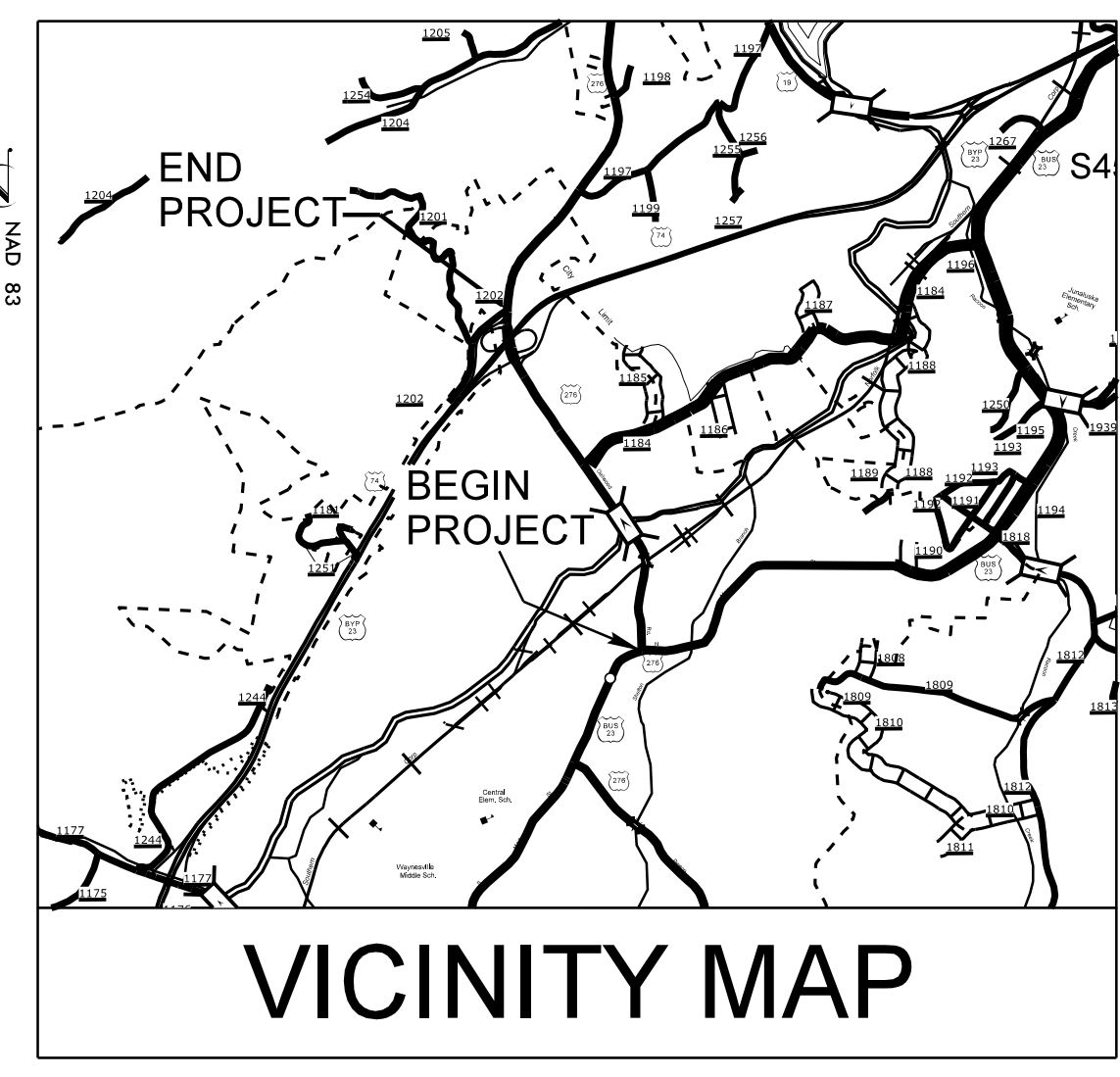


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TIP PROJECT: U-5839

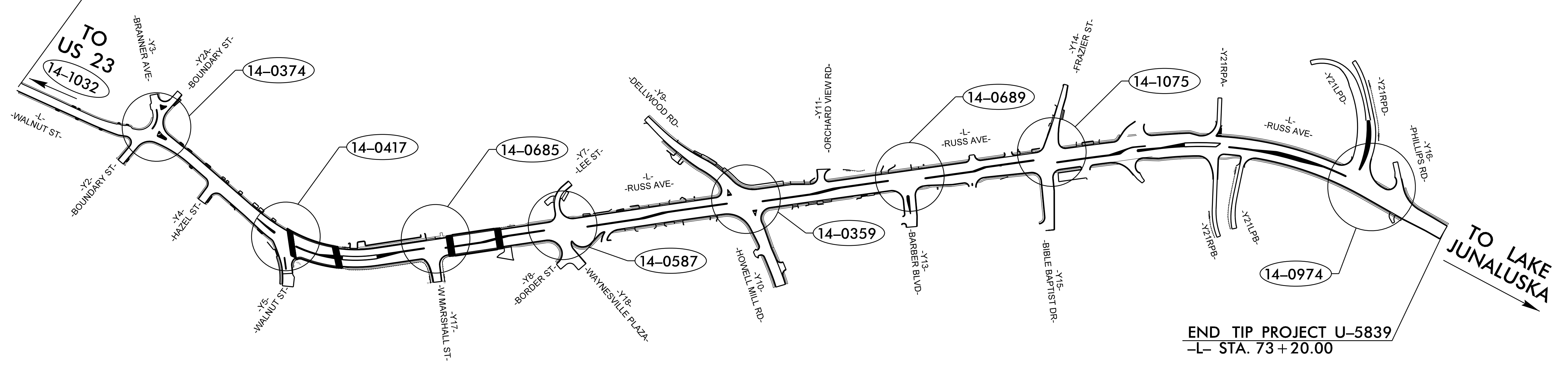
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
HAYWOOD COUNTY

LOCATION: RUSS AVENUE - US 276 FROM US 23/74 (GREAT SMOKY MOUNTAINS EXPWY) TO US 23 BUS (N MAIN ST)
TYPE OF WORK: TRAFFIC SIGNALS AND SIGNAL COMMUNICATION



PROJECT REFERENCE NO. U-5839	SHEET NO. Sig 1.0
APPROVED BY: <i>William J. Hamilton</i> DATE: 04/11/2023	
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

BEGIN TIP PROJECT U-5839
-L- STA. 10+19.45



END TIP PROJECT U-5839
-L- STA. 73+20.00

Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.

Infrastructure Consulting Services, Inc.
RKA
RAMEY KEMP ASSOCIATES
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Phone: 704-549-4300 | www.rameykemp.com | NC License No. P-1489

PLANS PREPARED BY:

W. Jason Hamilton, P.E., PTOE - Project Manager

Timothy S. Popelka, P.E. - Project Engineer

INDEX OF PLANS

Sheet Number	SIN	Location/Description
Sig. 1.0	-	Project Title Sheet
Sig. 1.1-1.2	-	2018 Standard Plate Sheets
Sig. 1.3	-	CCTV Wood Pole Detail
Sig. 2.0-2.9	14-0374	US 276 (Walnut Street/Russ Avenue) at Branner Avenue/Boundary Street
Sig. 3.0-3.9	14-0417	US 276 (Russ Avenue) at Walnut Street
Sig. 4.0-4.13	14-0685	US 276 (Russ Avenue) at West Marshall Street/Bank Drive
Sig. 5.0-5.11	14-0587	US 276 (Russ Avenue) at Shopping Center Entrance /Lee Street
Sig. 6.0-6.15	14-0359	US 276 (Russ Avenue) at Delwood Road /SR 1184 (Howell Mill Road)
Sig. 7.0-7.13	14-0689	US 276 (Russ Avenue) at Ingles Shopping Center /Long John Silver Drive
Sig. 8.0-8.14	14-1075	US 276 (Russ Avenue) at Frazier Street/Ingles Entrance
Sig. 9.0-9.12	14-0974	US 276 (Russ Avenue) at US 23-74 WB Ramps
Sig. M1-M8	-	Standard Metal Pole Drawings
SCPI-SCP21	-	Signal Communication Plans

DIVISION OF HIGHWAYS

750 N. Greenfield Pkwy, Garner, NC 27529

LEGEND

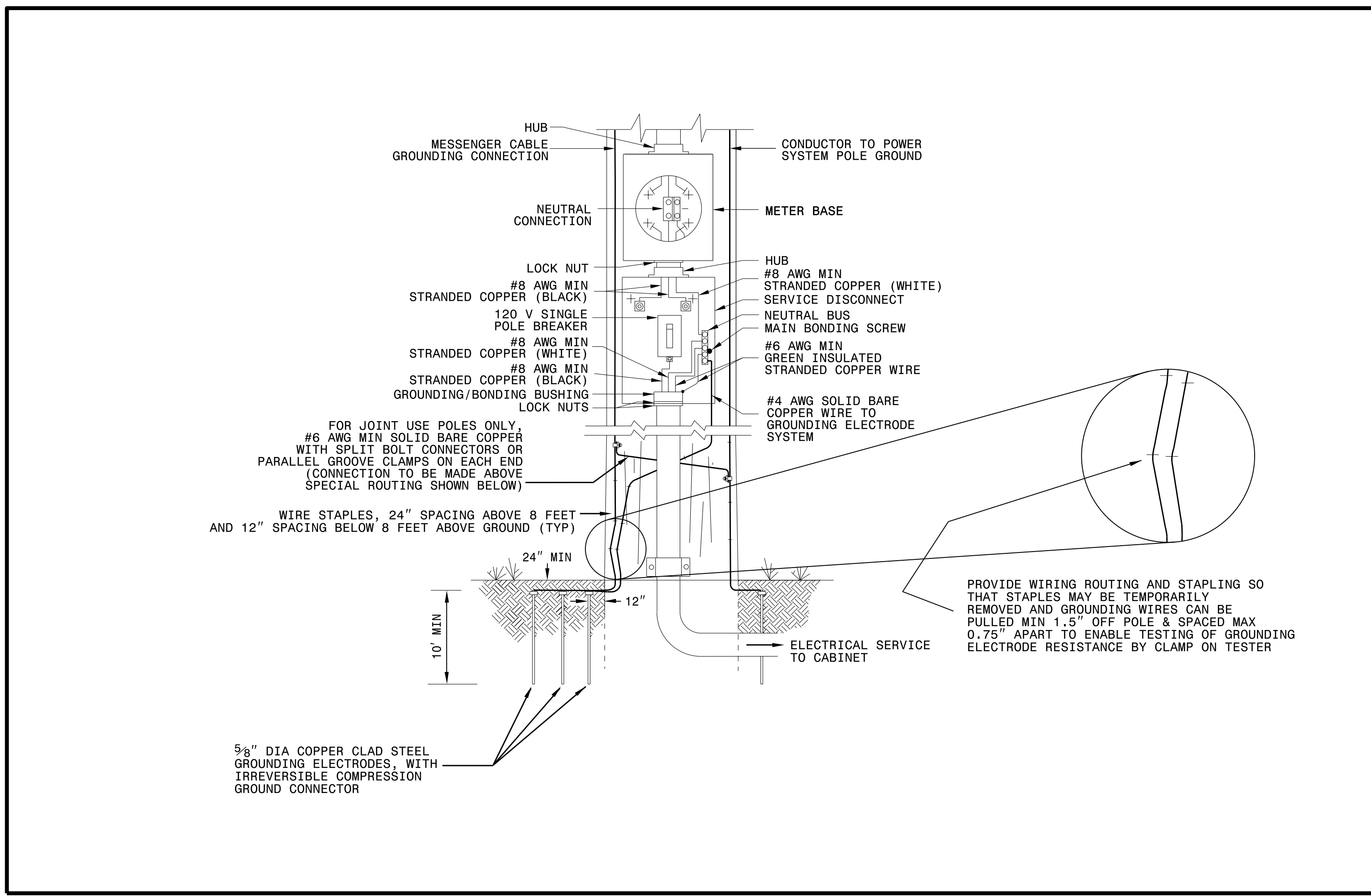
(XX-XXXX) **TRAFFIC SIGNAL**

**TRANSPORTATION SYSTEMS
MANAGEMENT & OPERATIONS**

Contacts:

R. Nicholas Zinser, P.E. - Western Region Signals Engineer
D. Todd Joyce, P.E. - Signal Equipment Design Review Engineer
Gregory A. Green - Signal Communications Project Engineer
Heidi T. Berggren, E.I. - Signal Communications Project Design Engineer

4/12/2023
\\04-Design\U5839_sig_1.sh.dgn
User: jwendt



1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

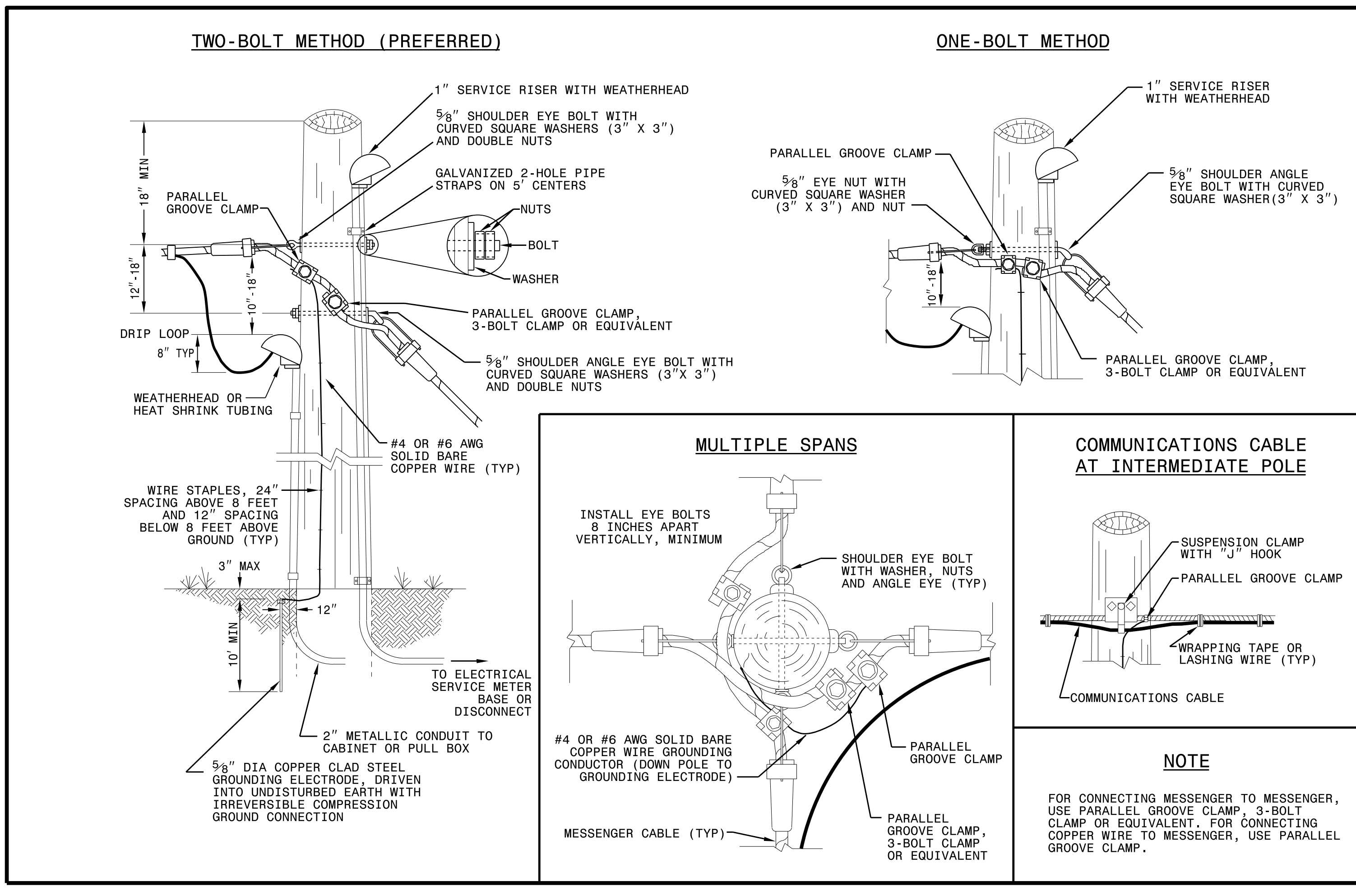
ENGLISH STANDARD DRAWING FOR

ELECTRICAL SERVICE GROUNDING

GROUNDING AND BONDING

SHEET 1 OF 1

1700D01



1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR

WOOD POLES

METHODS OF ATTACHMENT AND GROUNDING

SHEET 1 OF 1

1720D01

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FINAL UNLESS ALL
SIGNATURES COMPLETED

See Plate for Title

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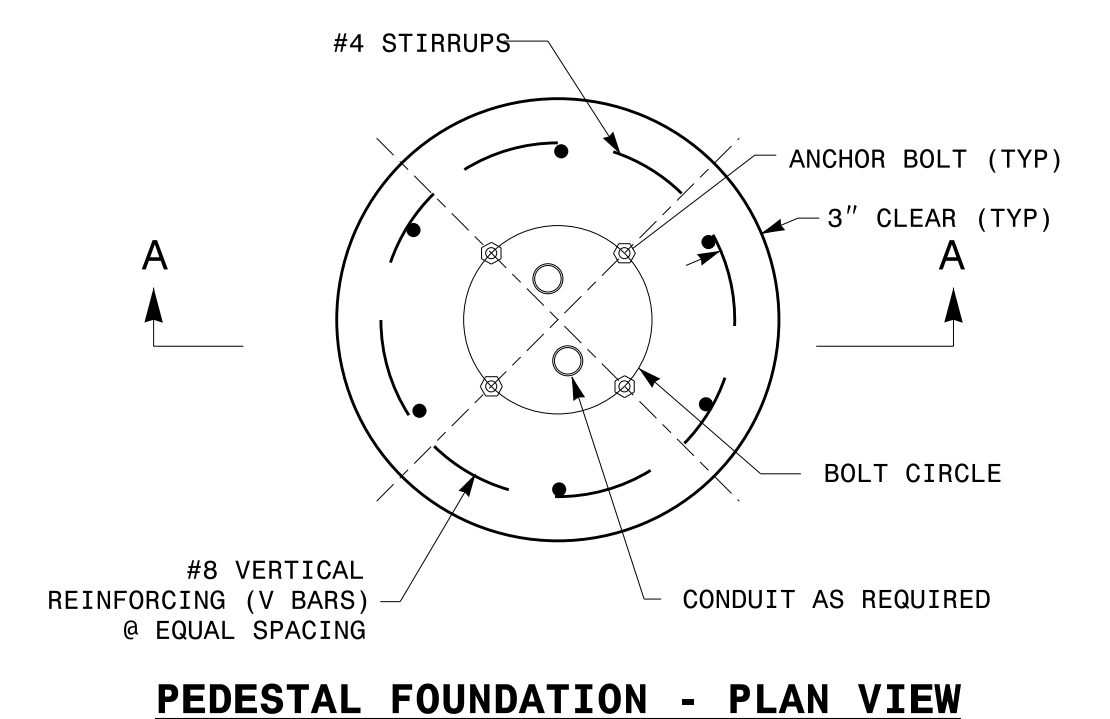
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Garner, NC 27529

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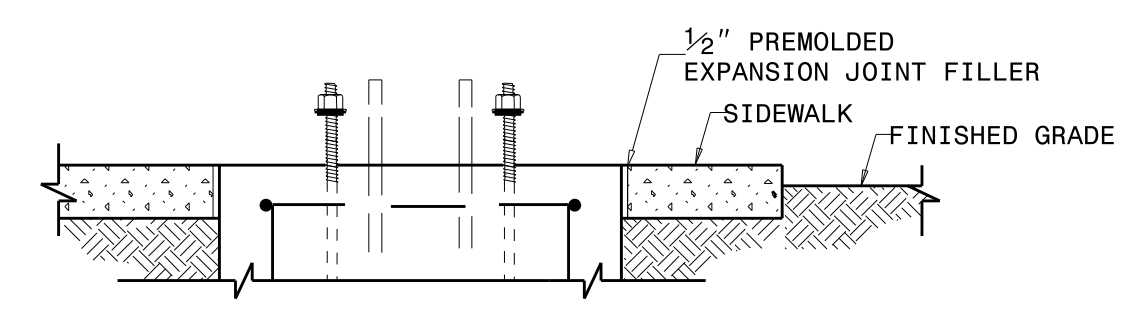
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Mohd. Aslami

10/11/2017
DATE

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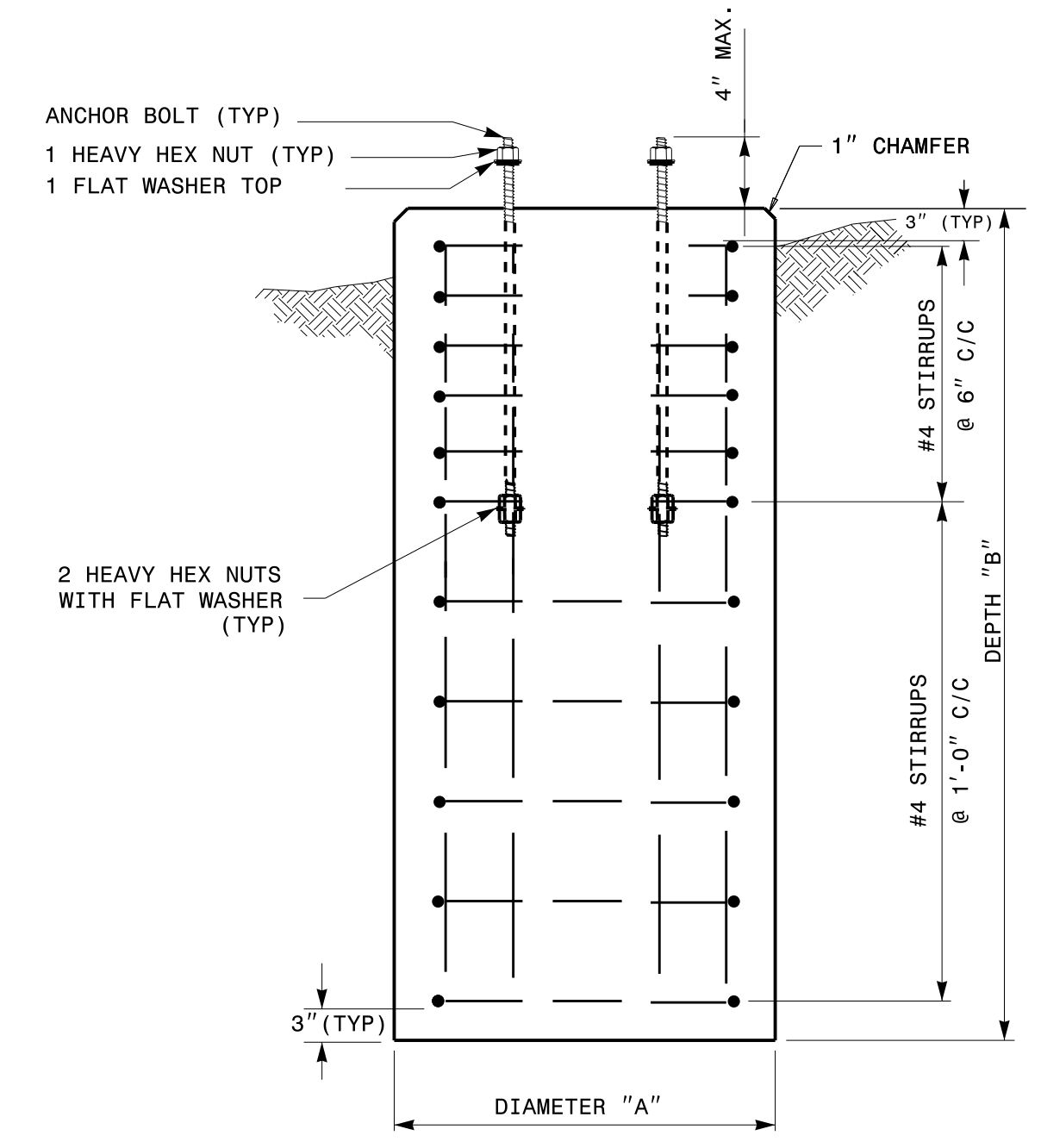
PEDESTAL FOUNDATION - PLAN VIEW



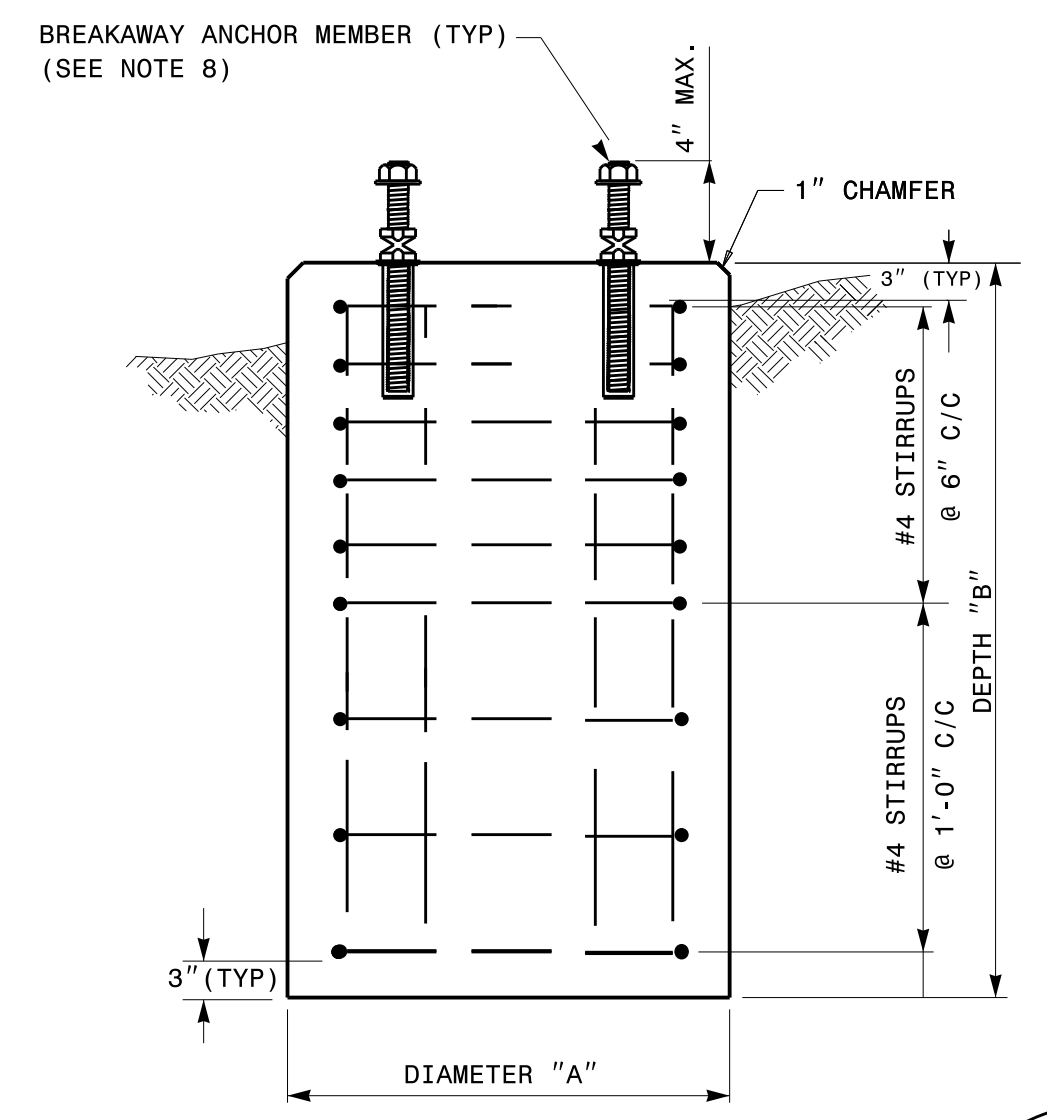
PEDESTAL FOUNDATION DETAILS FOR SIDEWALK

NOTES:

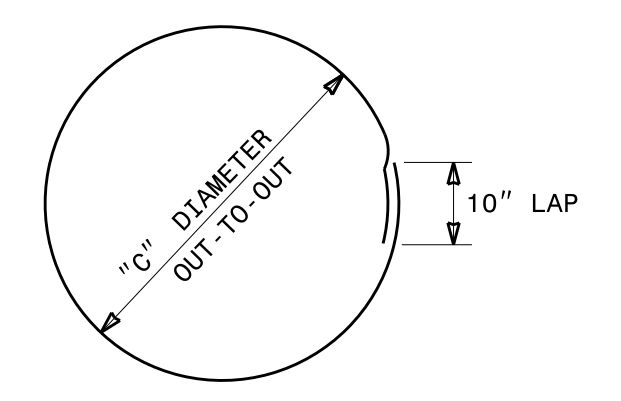
- CAST FOUNDATION AGAINST UNDISTURBED SOIL WHEREVER CONDITIONS PERMIT. IN UNSTABLE SOIL, CAST-IN-PLACE TUBE FORMS ARE ALLOWED WITH APPROVAL.
- COMPLY WITH APPLICABLE PROVISIONS OF SECTION 825 FOR CONCRETE CONSTRUCTION.
- USE CLASS "A" CONCRETE THAT MEETS THE REQUIREMENTS OF SECTION 1000 WITH A COMPRESSION STRENGTH AT 28 DAYS OF $F'c = 3000$ PSI (MIN.).
- USE ASTM GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL.
- GRADE IS ASSUMED TO BE (8H:1V) OR FLATTER. FOUNDATION SIZE AND DEPTHS ARE BASED ON THE FOLLOWING SOIL DESIGN PARAMETERS:
 - SANDY TYPE SOIL
 - NO GROUND WATER WITHIN 5'-0" OF SURFACE ELEVATION
 - WIND SPEED NOT TO EXCEED 140 MPH
 IF ACTUAL CONDITIONS VARY SUBSTANTIALLY FROM THOSE ASSUMED, THE FOUNDATION DEPTH MAY BE ADJUSTED. IN THIS CASE, CONTACT THE ENGINEER.
- MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
- ORIENT CONDUIT AS REQUIRED BY THE DESIGN OR AS DICTATED BY FIELD CONDITIONS.
- USE ADHESIVE ANCHOR FOR THREADED COUPLING INSERT. FOR TYPE I MINIMUM DEPTH NECESSARY IS 0'-4 1/2" AND FOR TYPE II MINIMUM DEPTH NECESSARY IS 0'-6 5/8". FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.



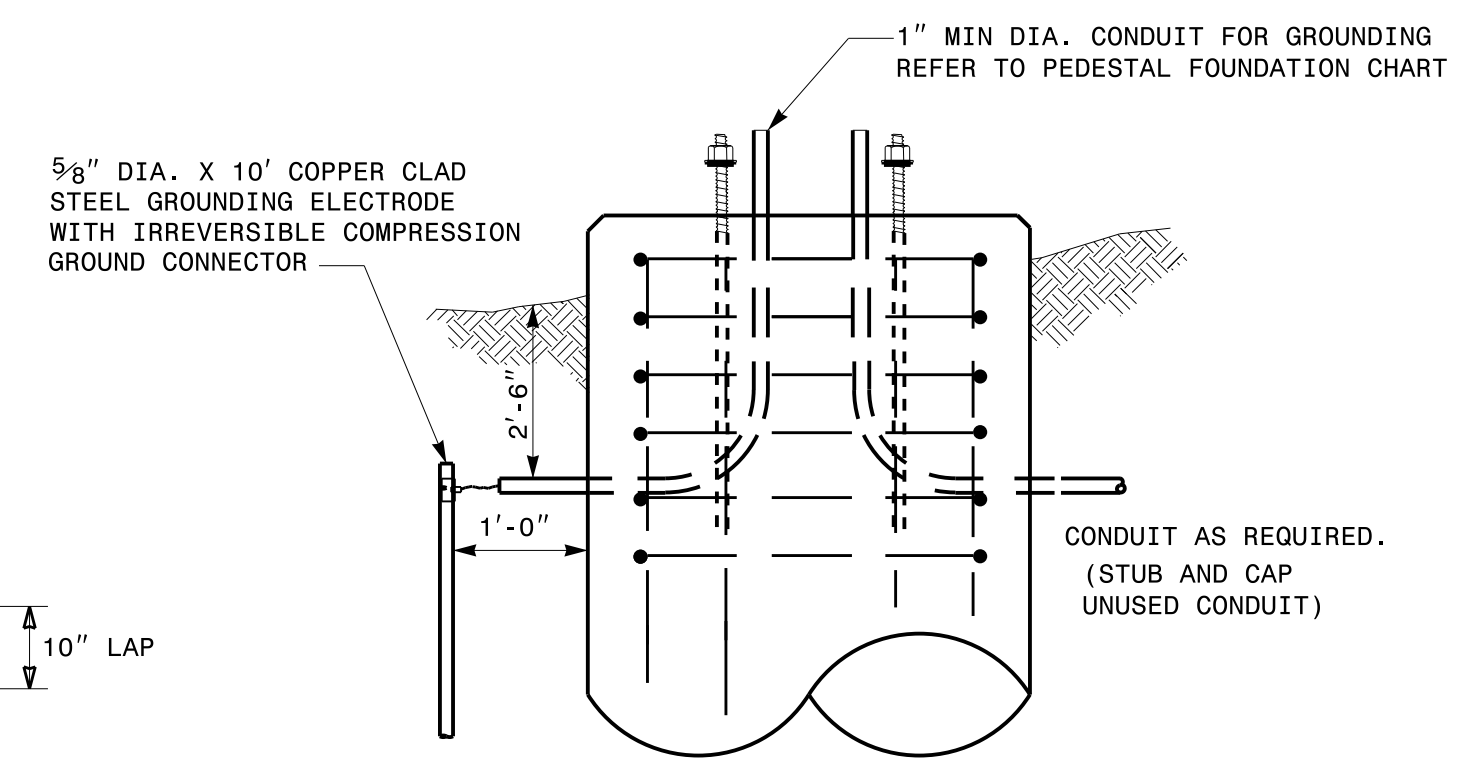
TYPES I, II & III SECTION A-A



TYPES I & II ONLY SECTION A-A



CLOSED HOOPS



GROUNDING & CONDUIT DETAIL

PEDESTAL FOUNDATION TYPE AND SIZE							
TYPE	PEDESTAL DESCRIPTION	SIZE			ANCHOR BOLT		INSTALL GROUNDING SYSTEM (YES/NO)
		DIAMETER "A" FT	DEPTH "B" FT	CONCRETE VOLUME CY	DIAMETER (MIN.) IN	LENGTH FT-IN	
I	PEDESTRIAN PUSHBUTTON	2'-0"	3'-6"	.41	1/2	1'-6"	NO
II	NORMAL-DUTY	2'-0"	5'-0"	.58	3/4	2'-0"	YES
III	HEAVY-DUTY	2'-6"	7'-0"	1.27	1	4'-0"	YES

REINFORCING STEEL SCHEDULE													
TYPE	V-BAR				STIRRUP								
	SIZE #	QTY	LENGTH	WEIGHT LBS	QUANTITY			LENGTH	DIAMETER "C" FT	OVERLAP MIN.	WEIGHT LBS	TOTAL STEEL WEIGHT LBS	
					VERTICAL SPACING ON 6" CENTERS	ON 12" CENTERS	TOTAL						
I	8	6	3'-0"	56	4	0	4	5'-7"	1'-6"	0'-10"	15	71	
II	8	6	4'-6"	86	4	5	3	8	5'-7"	1'-6"	0'-10"	30	116
III	8	6	6'-6"	122	4	7	4	11	7'-2"	2'-0"	0'-10"	53	175

STATE OF NORTH CAROLINA
 DEPT. OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 RALEIGH, N.C.

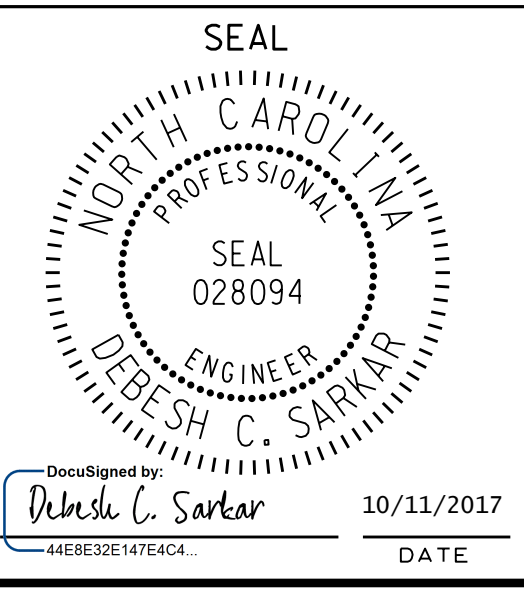
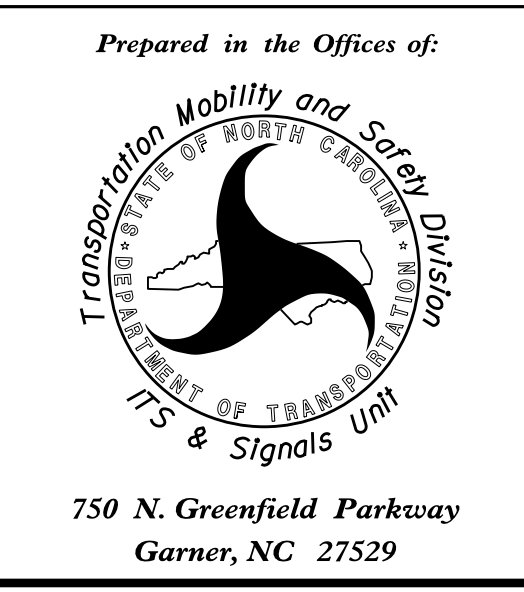
ENGLISH STANDARD DRAWING FOR
PEDESTALS
 FOUNDATIONS

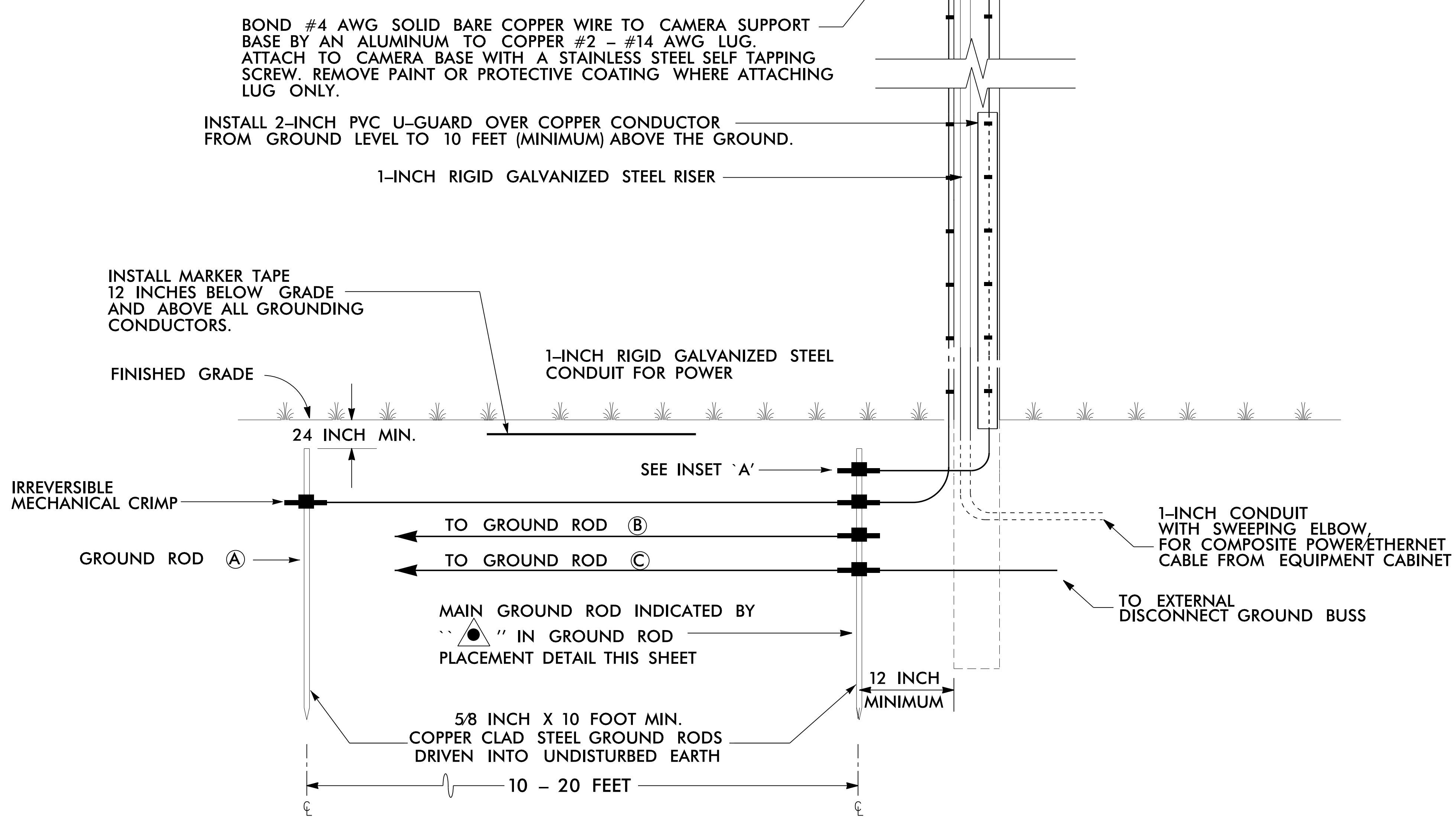
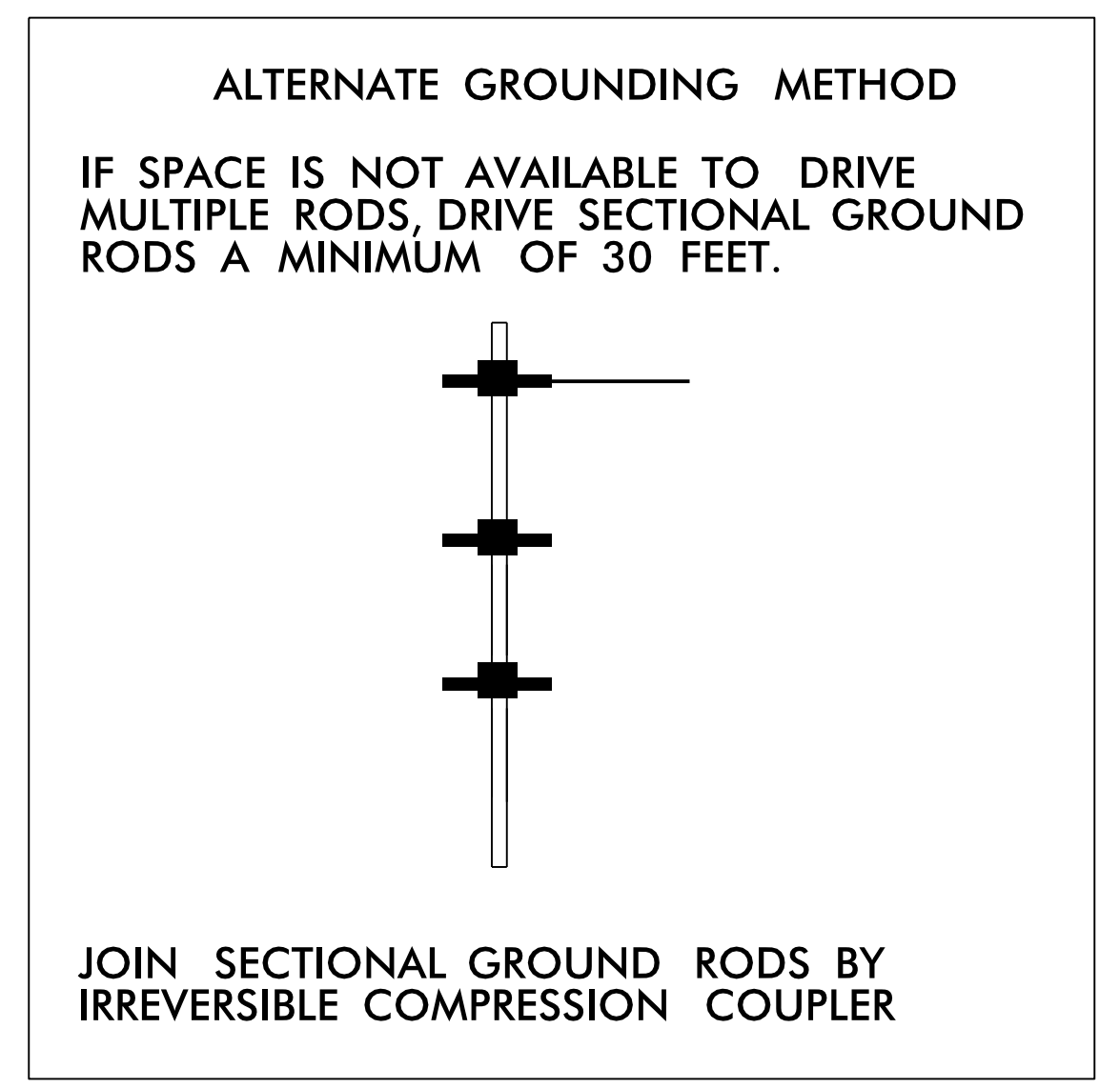
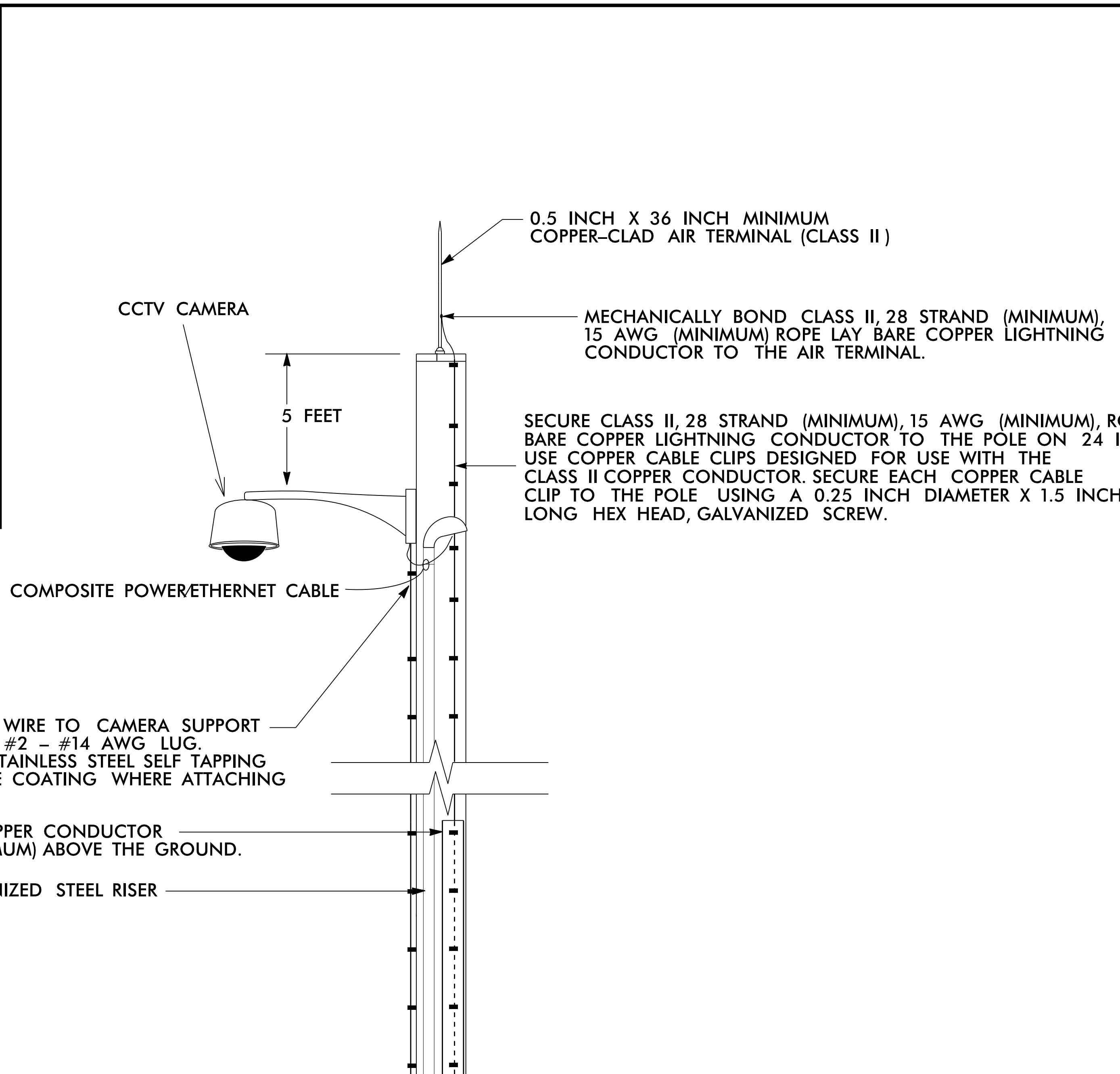
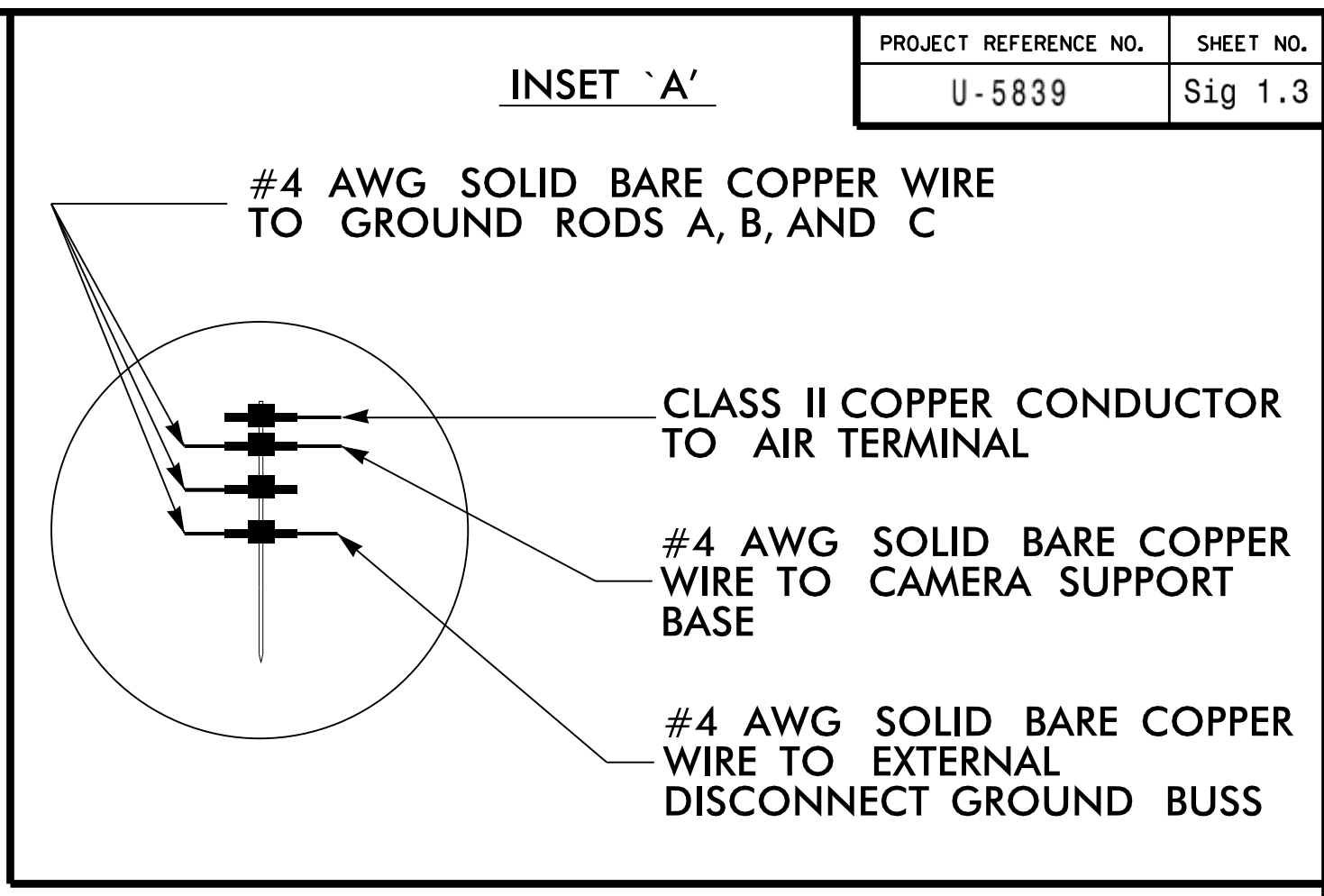
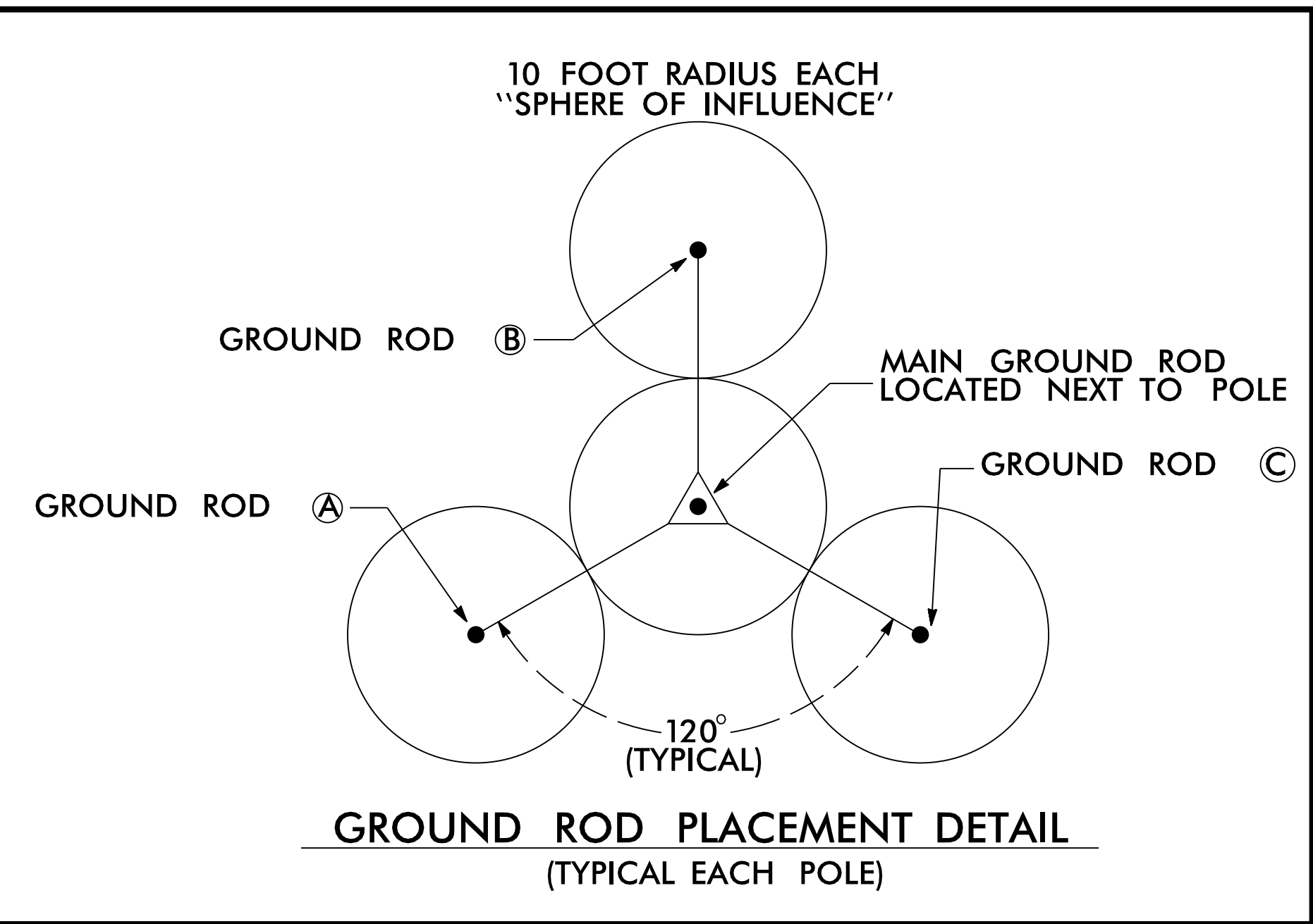
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See Plate for Title



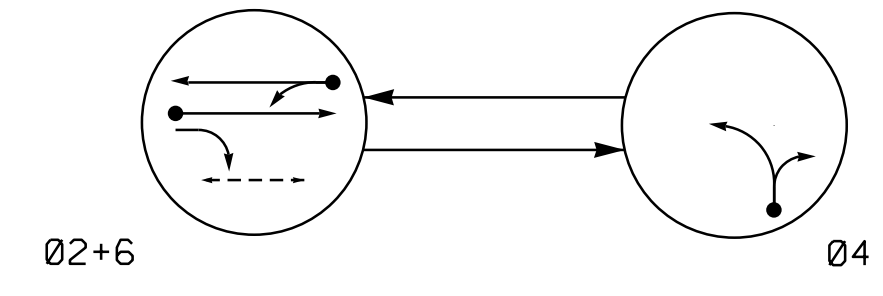


NOTES

1. BOND CLASS II, 28 STRAND (MINIMUM), 15 AWG (MINIMUM) ROPE-LAY BARE COPPER CONDUCTOR TO THE MAIN GROUND ROD BY AN IRREVERSIBLE MECHANICAL CRIMP. MAINTAIN MAXIMUM HORIZONTAL SEPARATION BETWEEN COPPER CONDUCTOR AND RISER.
2. ALL CONNECTIONS TO GROUND RODS SHOULD BE MADE WITH AN IRREVERSIBLE MECHANICAL CRIMP METHOD.
3. THE CONTRACTOR MAY, UPON APPROVAL OF THE ENGINEER, INSTALL A 30-FOOT SECTIONAL GROUND ROD FOR INSTANCES WHEN CONDITIONS WILL NOT ALLOW FOR THE INSTALLATION OF THE 3 - RADIAL GROUND RODS.
4. INSTALL MARKER TAPE DIRECTLY ABOVE ALL GROUNDING ELECTRODES AND CONDUCTORS AT A DEPTH OF 12 INCHES.
5. REMOVE BONDING JUMPER BETWEEN EQUIPMENT CABINET GROUND BUSS AND NEUTRAL BUSS.

<p>Prepared in the Offices of: Public Engineering and Safety Services DIVISION OF TRANSPORTATION NORTH CAROLINA DEPARTMENT OF TRANSPORTATION</p> <p>250 N. Greenfield Plaza, Garner, NC 27529</p>	<p>CCTV CAMERA INSTALLATION FOR WOOD POLES</p> <p>TYPICAL DETAIL</p>		<p>SEAL</p>					
	<p>PLAN DATE: JANUARY 2008</p> <p>REVIEWED BY:</p>	<p>PREPARED BY:</p> <p>REVIEWED BY:</p>		<p>SIGNATURE</p> <p>DATE</p>				
<p>SCALE</p> <p>0</p> <p>NONE</p>	<table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>2018 STANDARD SPECIFICATIONS UPGRADE TO IRREVERSIBLE MECHANICAL CRIMP</td> <td>A.J.S.</td> <td>11/2017</td> </tr> </tbody> </table>	REVISIONS	INIT.	DATE	2018 STANDARD SPECIFICATIONS UPGRADE TO IRREVERSIBLE MECHANICAL CRIMP	A.J.S.	11/2017	<p>CADD FILE NAME</p>
REVISIONS	INIT.	DATE						
2018 STANDARD SPECIFICATIONS UPGRADE TO IRREVERSIBLE MECHANICAL CRIMP	A.J.S.	11/2017						

PHASING DIAGRAM



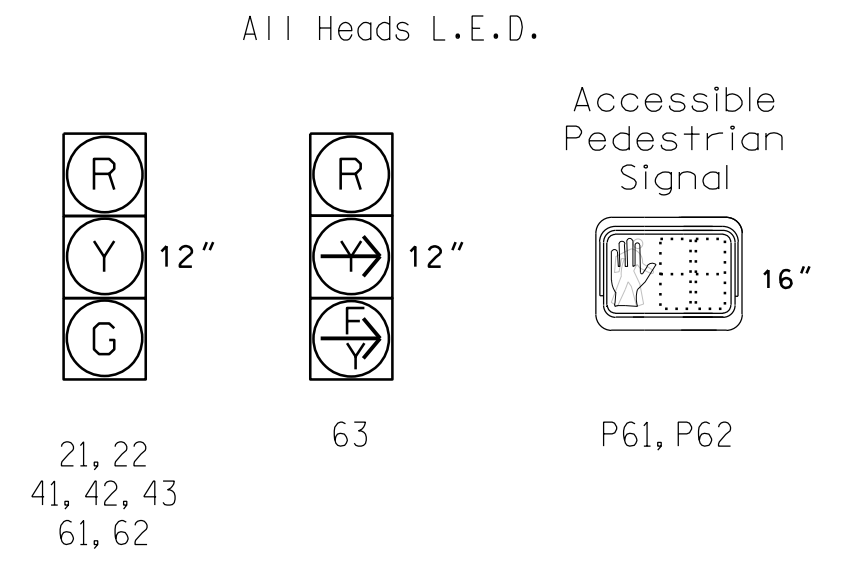
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	02+6	04	FLASH
21, 22	G	R	Y
41, 42, 43	R	G	R
61, 62	G	R	Y
63	Y	R	Y
P61, P62	W	DW	DRK

SIGNAL FACE I.D.



MAXTIME DETECTOR INSTALLATION CHART

ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	PROGRAMMING								
				NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL CALL	NEW CARD		
2A	6X6	70	*	*	2	-	-	X	-	X	-	*
4A	6X40	0	*	*	4	10	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*

* Multizone Microwave Detection.

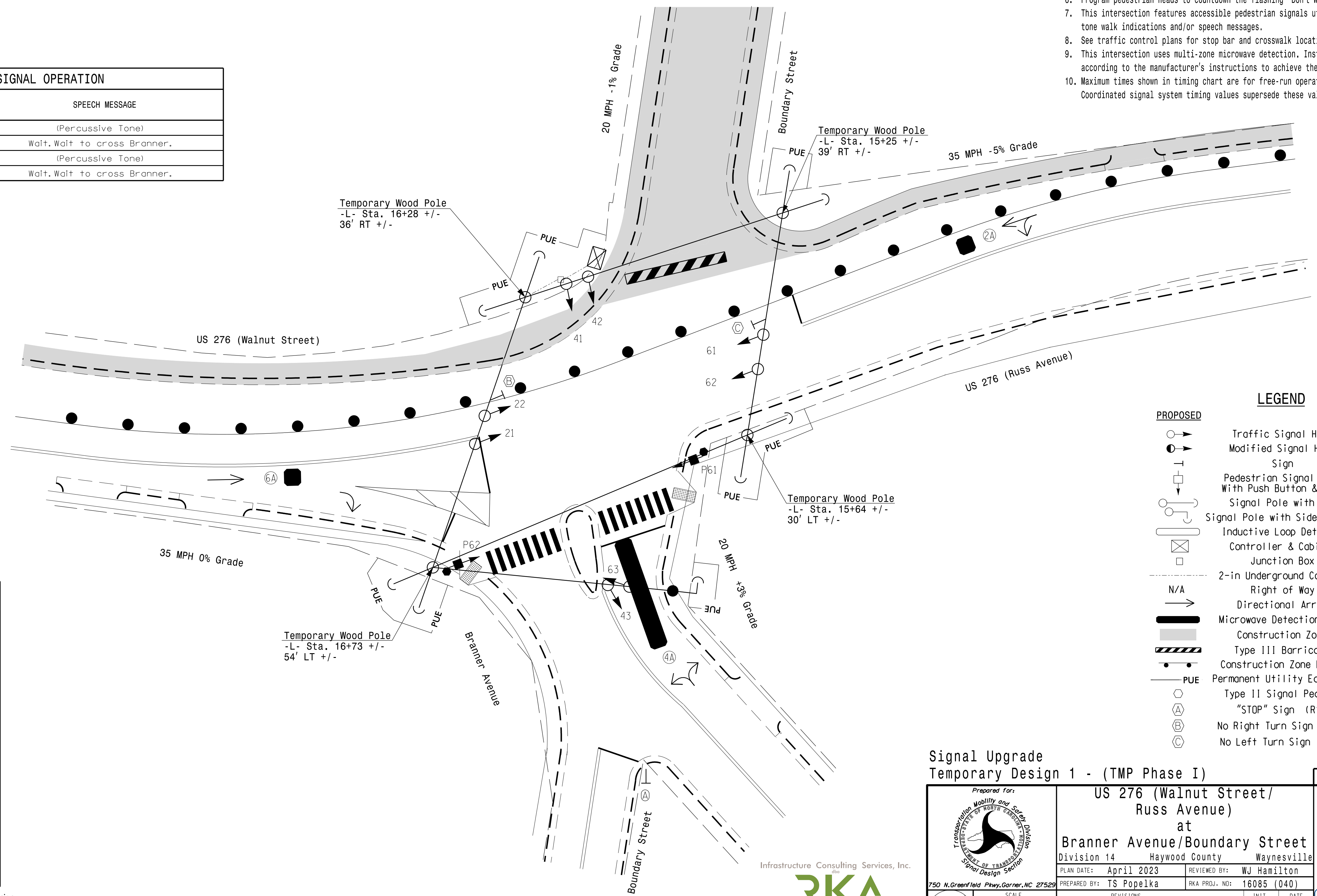
2 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection uses multi-zone microwave 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.

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE	TONES	INTERVAL	SPEECH MESSAGE
P61	-	X	Walk	(Percussive Tone)
	X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Branner.
P62	-	X	Walk	(Percussive Tone)
	X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Branner.



MAXTIME TIMING CHART

FEATURE	PHASE		
	2	4	6
Walk *	-	-	7
Ped Clear *	-	-	17
Min Green	10	7	10
Passage *	3.0	2.0	3.0
Max I *	45	30	45
Yellow Change	4.2	3.0	4.2
Red Clear	2.7	1.9	2.7
Added Initial *	-	-	-
Maximum Initial *	-	-	-
Time Before Reduction *	-	-	-
Time To Reduce *	-	-	-
Minimum Gap	-	-	-
Advance Walk	-	-	-
Non Lock Detector	-	X	-
Vehicle Recall	MIN RECALL	-	MIN RECALL
Dual Entry	-	-	-

LEGEND

PROPOSED	EXISTING
○ Traffic Signal Head	● Traffic Signal Head
○ Modified Signal Head	N/A
○ Pedestrian Signal Head With Push Button & Sign	○ Pedestrian Signal Head
○ Signal Pole with Guy	○ Signal Pole with Guy
○ Signal Pole with Sidewalk Guy	○ Signal Pole with Sidewalk Guy
□ Inductive Loop Detector	□ Inductive Loop Detector
□ Controller & Cabinet	□ Controller & Cabinet
□ Junction Box	□ Junction Box
--- 2-in Underground Conduit	--- 2-in Underground Conduit
N/A Right of Way	N/A Right of Way
→ Directional Arrow	→ Directional Arrow
■ Microwave Detection Zone	N/A
■ Construction Zone	N/A
■ Type III Barricade	N/A
■ Construction Zone Drums	N/A
— PUE Permanent Utility Easement	N/A
○ Type II Signal Pedestal	○ Type II Signal Pedestal
⊙ "STOP" Sign (R1-1)	⊙ "STOP" Sign (R1-1)
⊙ No Right Turn Sign (R3-1)	⊙ No Right Turn Sign (R3-1)
⊙ No Left Turn Sign (R3-2)	⊙ No Left Turn Sign (R3-2)

Signal Upgrade Temporary Design 1 - (TMP Phase I)

Infrastructure Consulting Services, Inc. **RKA** RAMEY KEMP ASSOCIATES

750 N. Greenfield Pkwy, Garner, NC 27529

Prepared For: **US 276 (Walnut Street/ Russ Avenue) at Branner Avenue/ Boundary Street**

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

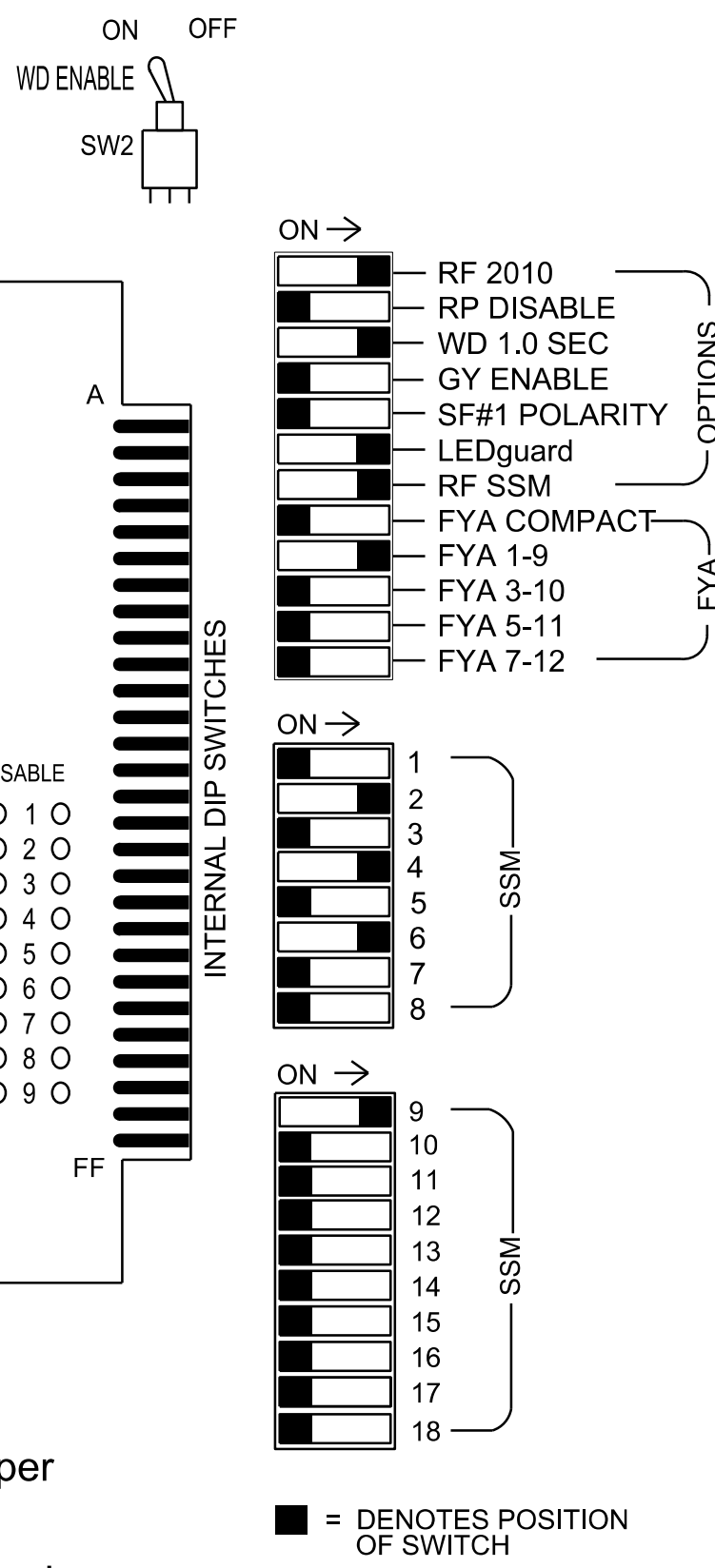
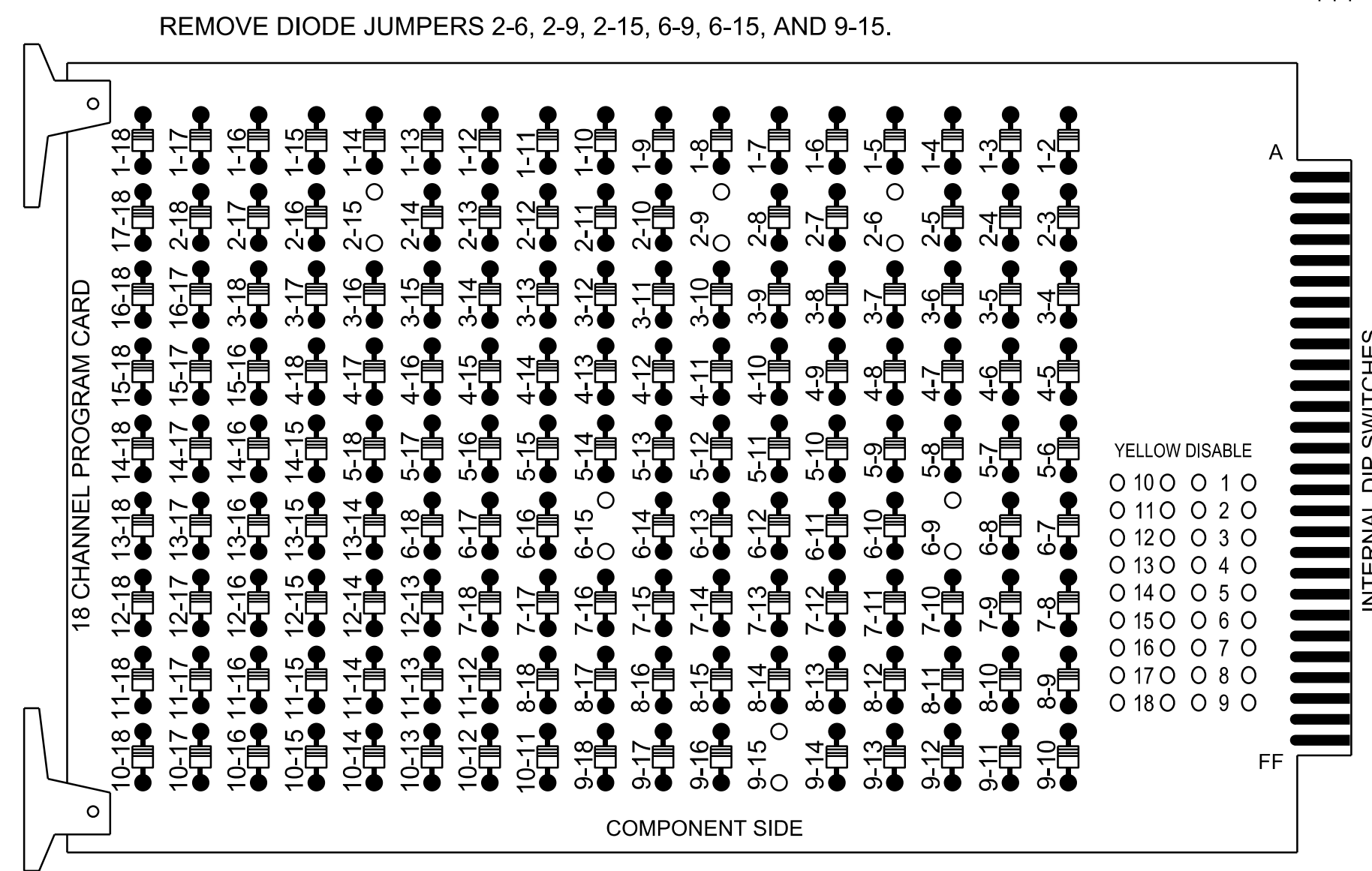
REVISIONS: _____ INIT. DATE

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SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
WILLIAM J. HAMILTON
32396
04/11/2023
DATE
SIG. INVENTORY NO. 14-037411

* 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.

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

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 6 Green 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 D14-12 Waynesville Signal System.

EQUIPMENT INFORMATION

Controller.....2070LX
 Cabinet.....332 w/ Aux
 Software.....Q-Free MAXTIME
 Cabinet Mount.....Base
 Output File Positions.....18 With Aux. Output File
 Load Switches Used.....S2, S5, S8, S9, AUX S1
 Phases Used.....2, 4, 6, 6PED
 Overlap "1".....*
 Overlap "2".....NOT USED
 Overlap "3".....NOT USED
 Overlap "4".....NOT USED

*See overlap programming detail on this sheet.

SPECIAL DETECTOR NOTE

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

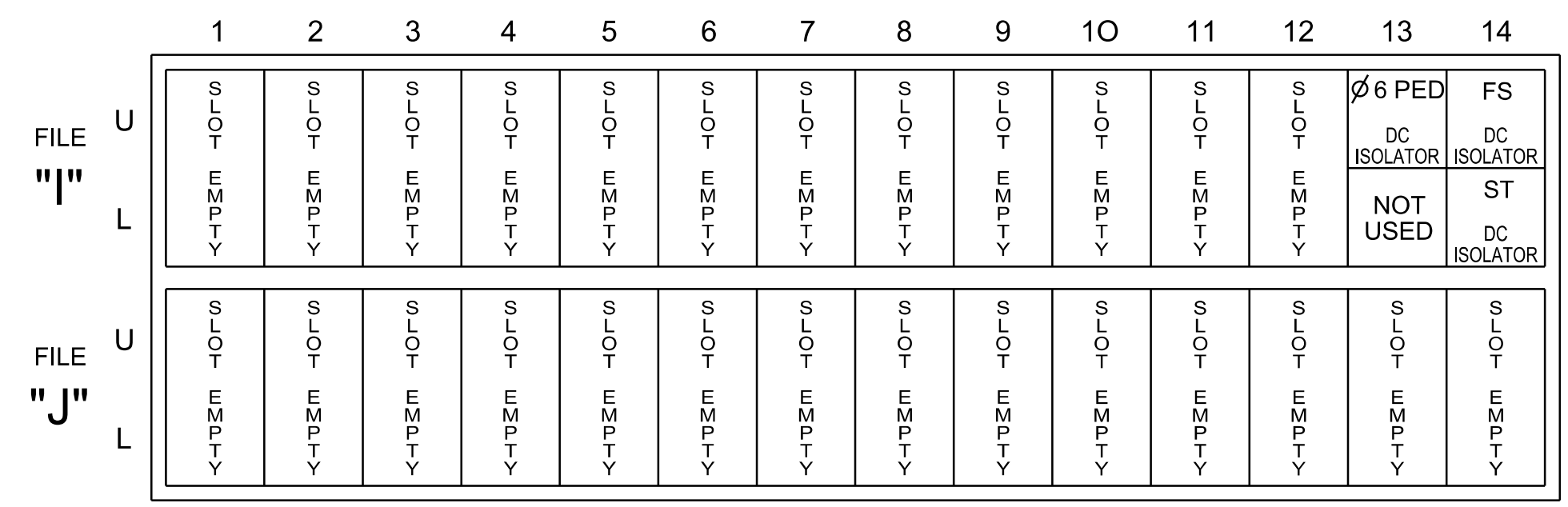
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42,43	NU	NU	61,62	P61, P62	NU	NU	NU	63	NU	NU	NU	NU	NU
RED		128			101			134					A121					
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW																		
Hand icon												119						
Walking person icon												121						

NU = Not Used
 ★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)

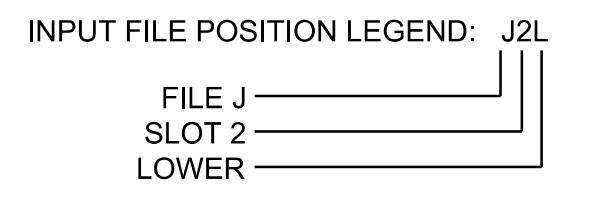


EX. : 1A, 2A, ETC. = LOOP NO.'S
 FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

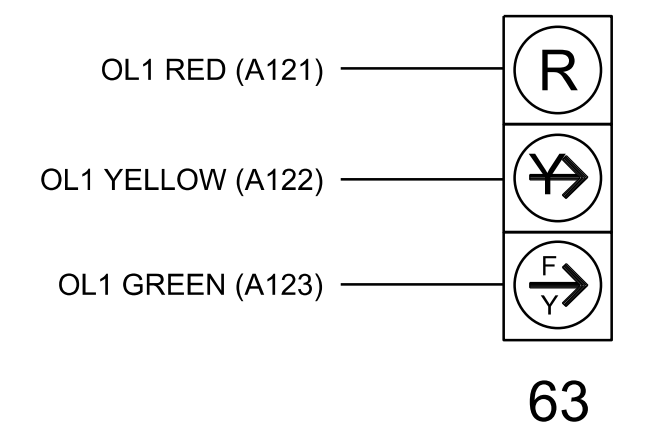
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT I13.



FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



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.

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

- Install push buttons and APS equipment per manufacturer's instructions.
- Provide a dedicated cable to each push button per manufacturer's instructions.
- If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
- Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
- Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

OVERLAP PROGRAMMING

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

Web Interface
 Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1
Type	FYA 4 - Section
Included Phases	6
Modifier Phases	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0374T1
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail Temporary Design 1 - (TMP Phase I)

US 276 (Walnut Street/ Russ Avenue) at Branner Avenue/Boundary Street
 Division 14 Haywood County Waynesville

Prepared for:

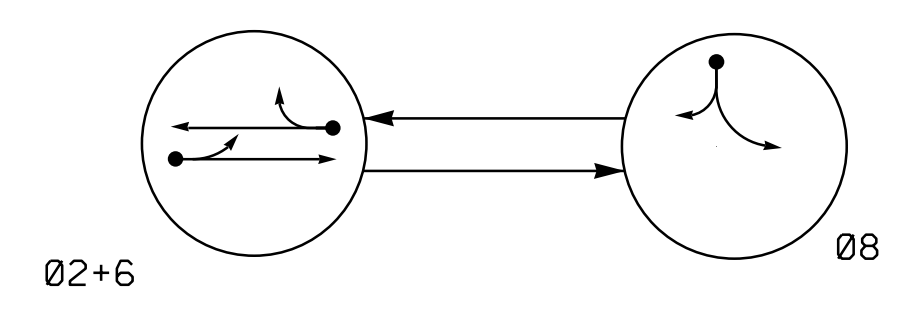
PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

750 N. Greenfield Pkwy, Garner, NC 27529

REVISIONS: _____ INIT. DATE

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 NORTH CAROLINA PROFESSIONAL ENGINEER
 WILLIAM J. HAMILTON
 04/11/2023
 SIG. INVENTORY NO. 14-0374T1

PHASING DIAGRAM

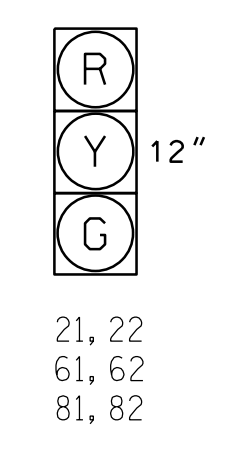


PHASING DIAGRAM DETECTION LEGEND
◄● DETECTED MOVEMENT
◄ UNDETECTED MOVEMENT (OVERLAP)
◄- UN SIGNALIZED MOVEMENT
◄- - PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE		
	Ø2+6	Ø8	FLASH
21, 22	G	R	Y
61, 62	G	R	Y
81, 82	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



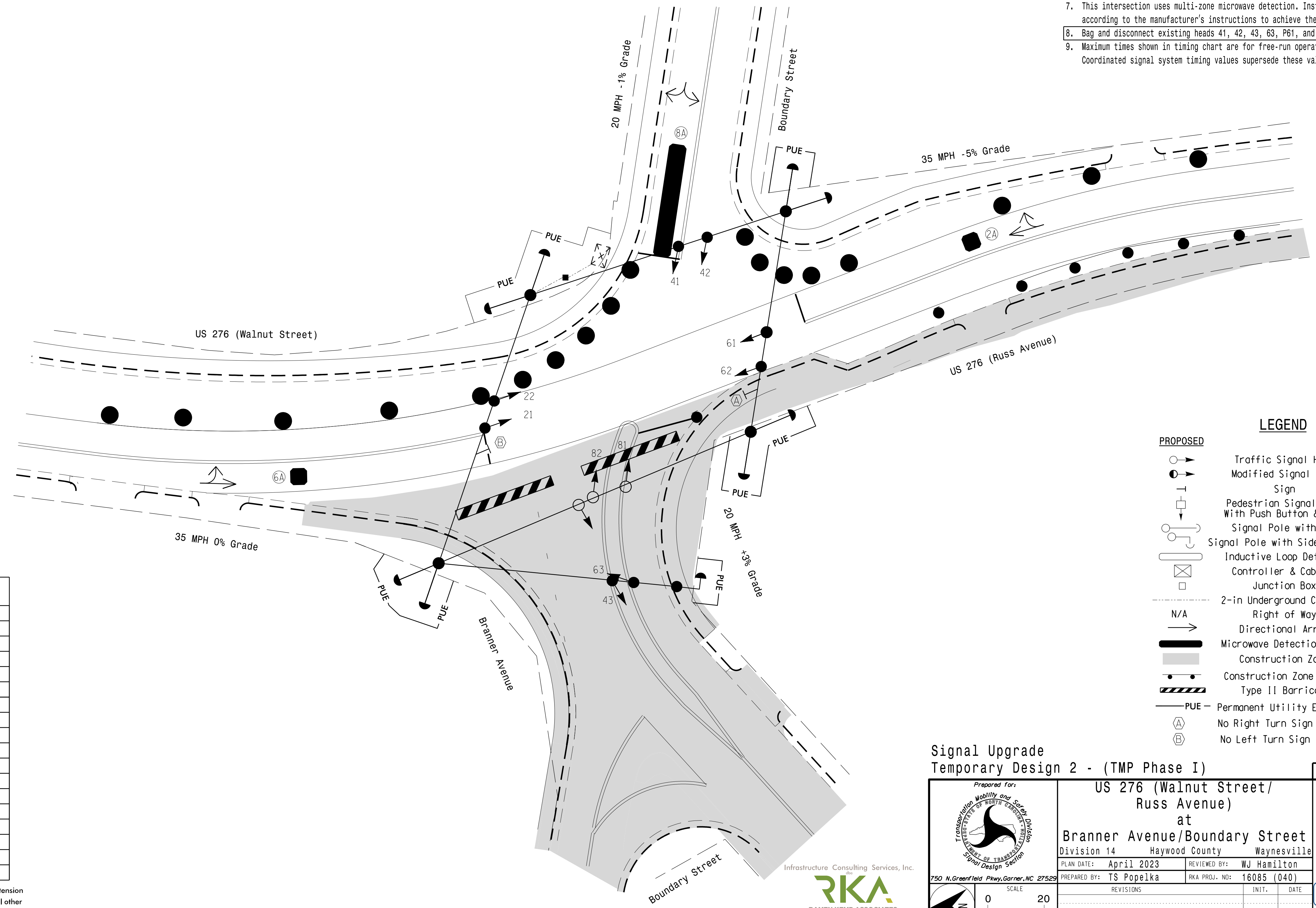
MAXTIME DETECTOR INSTALLATION CHART												
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	70	*	*	2	-	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	*	*	8	10	-	X	-	X	-	*

* Multizone Microwave Detection.

2 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Reposition existing heads numbered 21, 22, 61 and 62.
- Remove existing No Right Turn sign and existing No Left Turn sign.
- Set all detector units to presence mode.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection uses multi-zone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Bag and disconnect existing heads 41, 42, 43, 63, P61, and P62.
- 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		
	2	6	8
Walk *	-	-	-
Ped Clear *	-	-	-
Min Green	10	10	7
Passage *	3.0	3.0	2.0
Max I *	45	45	30
Yellow Change	4.2	4.2	3.0
Red Clear	2.3	2.3	1.8
Added Initial *	-	-	-
Maximum Initial *	-	-	-
Time Before Reduction *	-	-	-
Time To Reduce *	-	-	-
Minimum Gap	-	-	-
Advance Walk	-	-	-
Non Lock Detector	-	-	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
	N/A
	N/A
	N/A

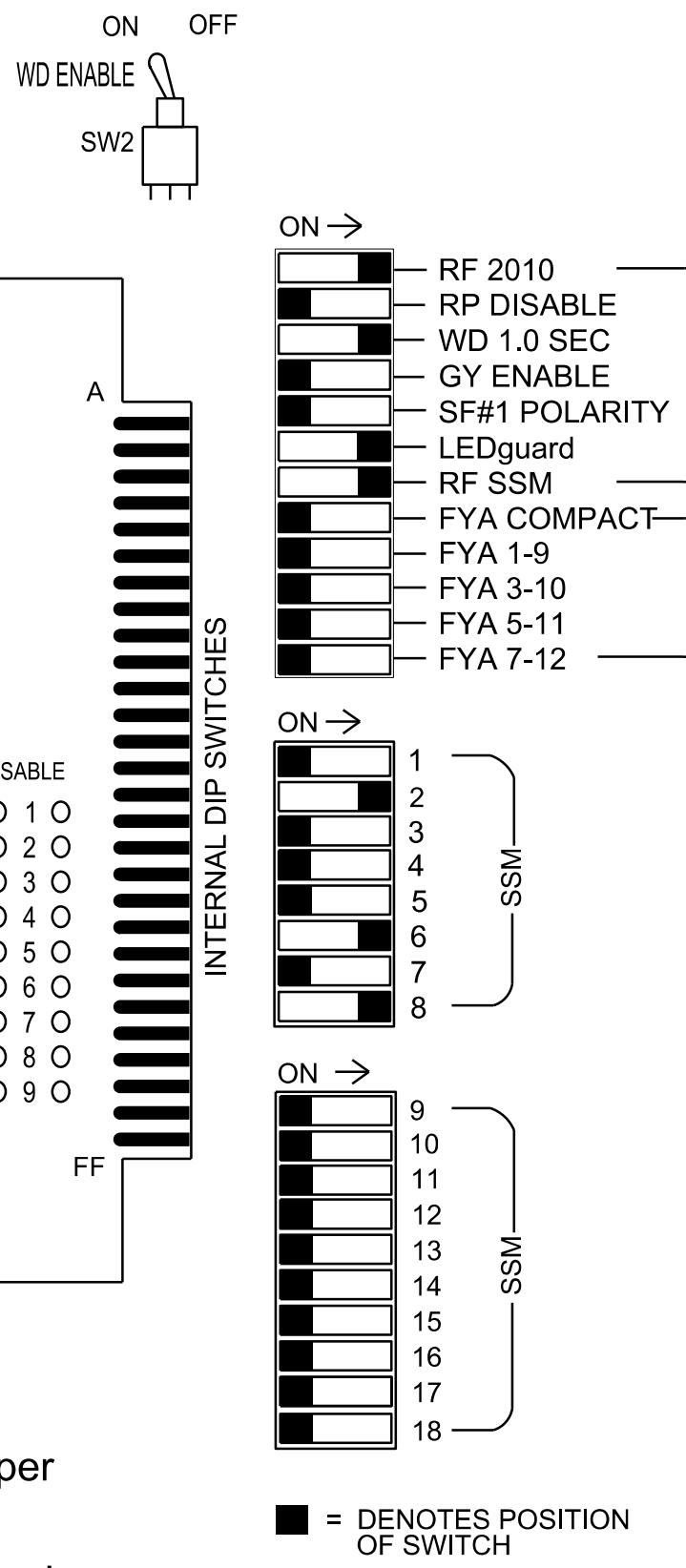
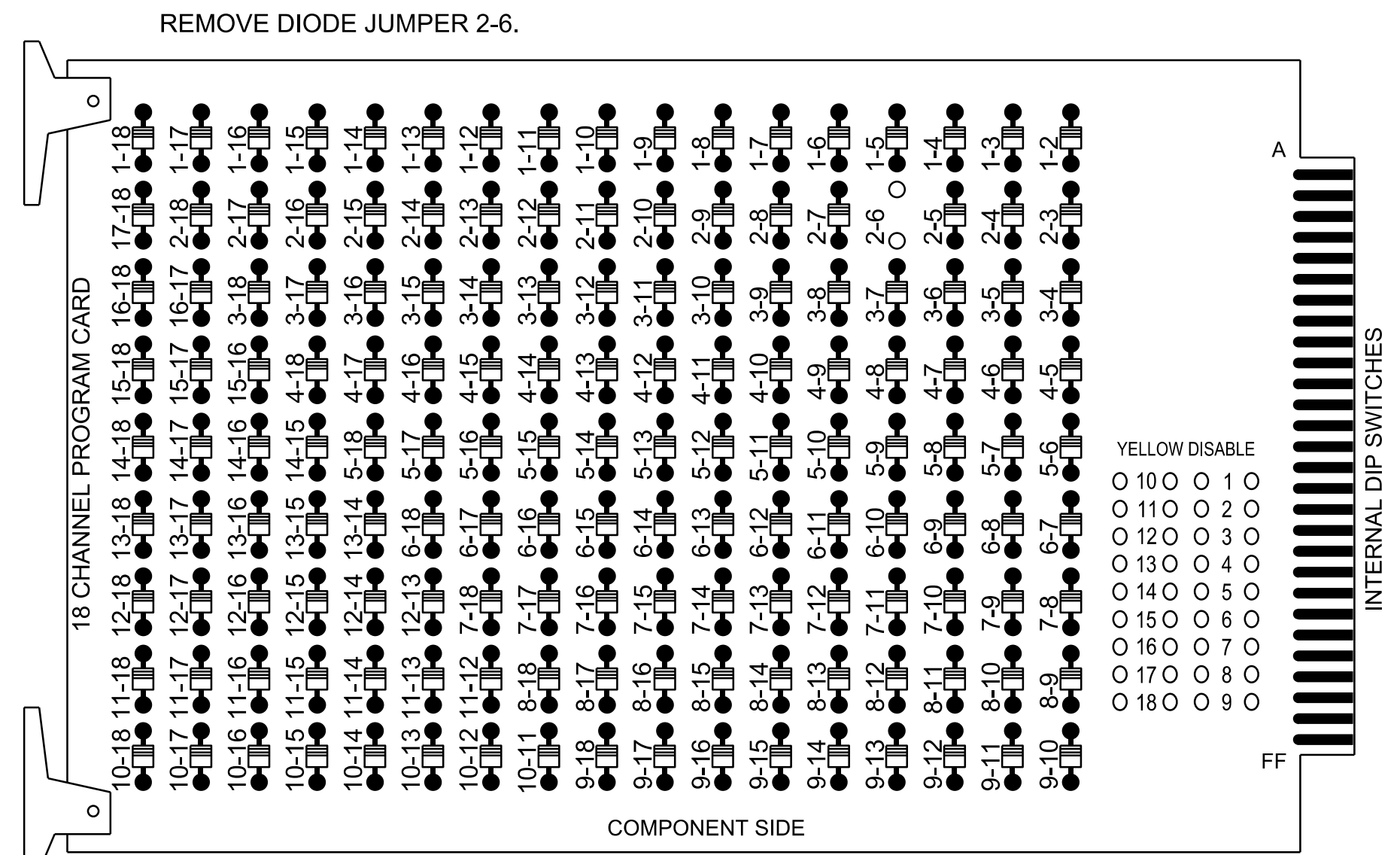
Signal Upgrade Temporary Design 2 - (TMP Phase I)

	US 276 (Walnut Street/ Russ Avenue) at Branner Avenue/Boundary Street Division 14 Haywood County Waynesville		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER WILLIAM J. HAMILTON License No. 32396
	PLAN DATE: April 2023 PREPARED BY: TS Popelka SCALE: 1"=20' REVISIONS:	REVIEWED BY: WJ Hamilton RKA PROJ. NO.: 16085 (040) DATE:	



18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all 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 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the D14-12 Waynesville Signal System.

EQUIPMENT INFORMATION

Controller.....2070LX
 Cabinet.....332 w/ Aux
 Software.....Q-Free MAXTIME
 Cabinet Mount.....Base
 Output File Positions.....18 With Aux. Output File
 Load Switches Used.....S2, S8, S11
 Phases Used.....2, 6, 8
 Overlaps.....NONE

SIGNAL HEAD HOOK-UP CHART

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

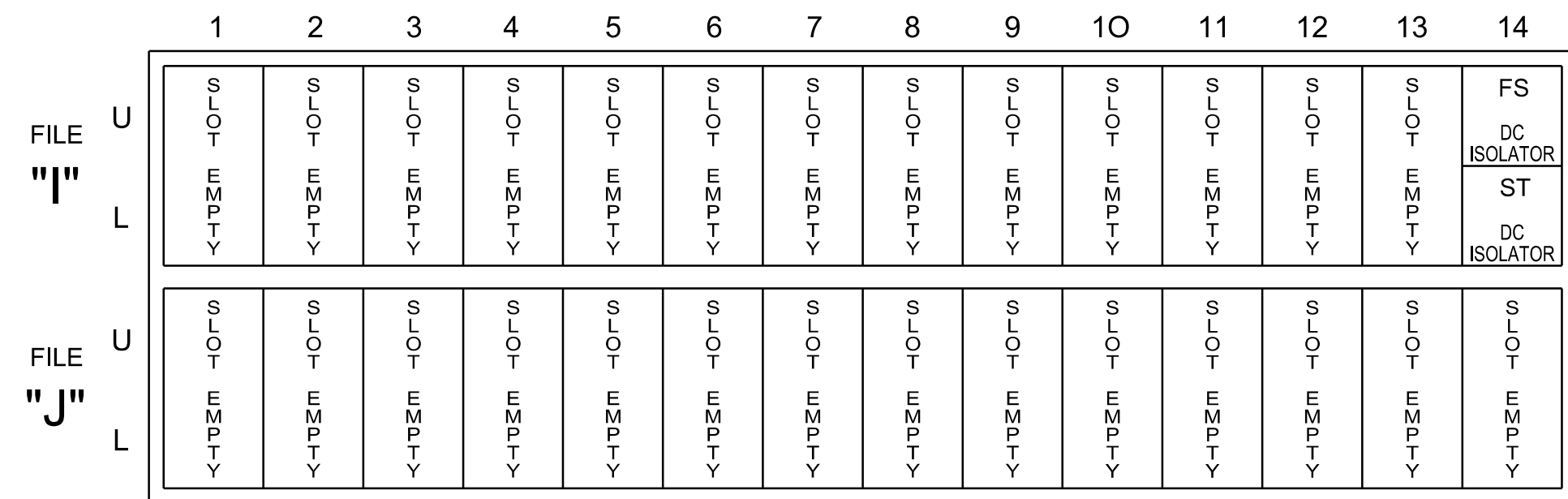
NU = Not Used
 Signal heads 41, 42, 43 and 63 have been bagged and disconnected for this phase of construction.

SPECIAL DETECTOR NOTE

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

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
 ST = STOP TIME

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0374T2
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail
 Temporary Design 2 - (TMP Phase I)



Prepared For: **US 276 (Walnut Street/ Russ Avenue) at Branner Avenue/Boundary Street**
 Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

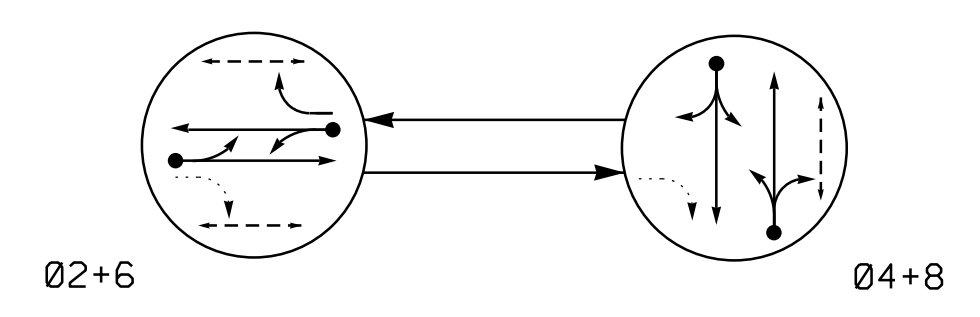
REVISIONS	INIT.	DATE

750 N. Greenfield Pkwy, Garner, NC 27529

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 32396
 WILLIAM J. HAMILTON
 Signature: William J. Hamilton
 DATE: 04/11/2023
 SIGNATURE DATE
 SIG. INVENTORY NO. 14-0374T2

PHASING DIAGRAM



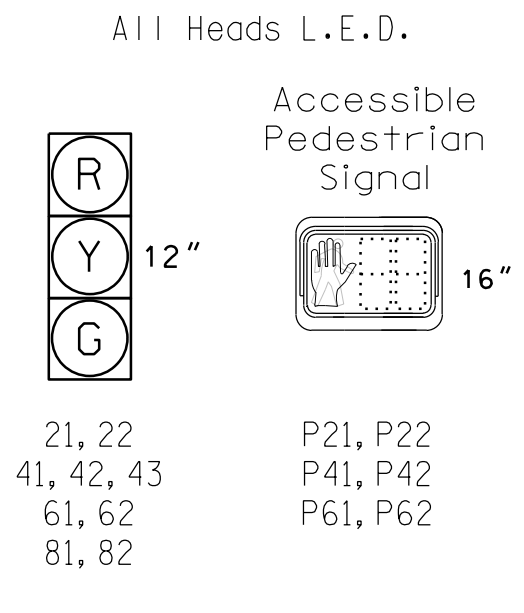
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	02+6	04+8	FLASH
21, 22	G	R	Y
41, 42, 43	R	G	R
61, 62	G	R	Y
81, 82	R	G	R
P21, P22	W	DW	DRK
P41, P42	DW	W	DRK
P61, P62	W	DW	DRK

SIGNAL FACE I.D.



MAXTIME DETECTOR INSTALLATION CHART

ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL CALL	DELAY DURING GREEN	NEW CARD	
2A	6X6	70	*	*	2	-	-	X	-	X	-	*
4A	6X40	0	*	*	4	10	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	*	*	8	10	-	X	-	X	-	*

* Multizone Microwave Detection.

2 Phase Fully Actuated D14-12_Waynesville NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Remove existing No Right Turn sign and existing No Left Turn sign.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection uses multi-zone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Remove bags and reconnect signal heads 41, 42, 43, and 63.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

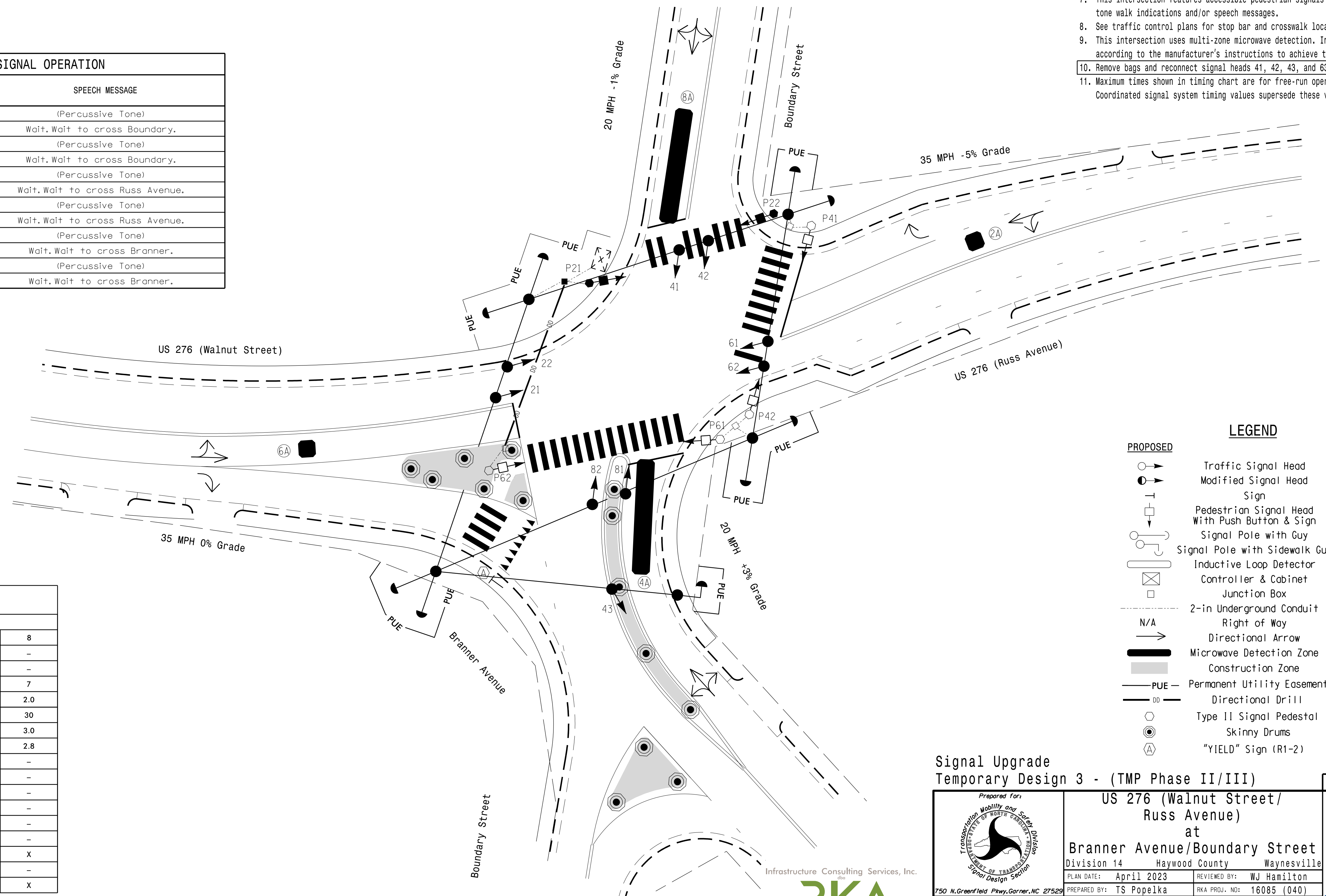
ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE TONES	INTERVAL	SPEECH MESSAGE
P21	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Boundary.
P22	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Boundary.
P41	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Russ Avenue.
P42	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Russ Avenue.
P61	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Branner.
P62	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Branner.

MAXTIME TIMING CHART

FEATURE	PHASE			
	2	4	6	8
Walk *	7	7	7	-
Ped Clear *	9	12	15	-
Min Green	10	7	10	7
Passage *	3.0	2.0	3.0	2.0
Max I *	45	30	45	30
Yellow Change	4.2	3.0	3.8	3.0
Red Clear	2.0	2.4	1.8	2.8
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	-	X	-	X

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



LEGEND

PROPOSED	EXISTING
○ → Traffic Signal Head	● → N/A
● → Modified Signal Head	— → N/A
— T Sign	— T Sign
○ Pedestrian Signal Head With Push Button & Sign	— Pedestrian Signal Head With Push Button & Sign
○ Signal Pole with Guy	● Signal Pole with Guy
○ Signal Pole with Sidewalk Guy	● Signal Pole with Sidewalk Guy
⊠ Inductive Loop Detector	⊠ Inductive Loop Detector
⊠ Controller & Cabinet	⊠ Controller & Cabinet
⊠ Junction Box	⊠ Junction Box
— 2-in Underground Conduit	— 2-in Underground Conduit
N/A Right of Way	— Right of Way
→ Directional Arrow	→ Directional Arrow
▬ Microwave Detection Zone	N/A
▬ Construction Zone	N/A
— PUE Permanent Utility Easement	N/A
— DD Directional Drill	N/A
○ Type II Signal Pedestal	● Type II Signal Pedestal
○ Skinny Drums	N/A
⊠ "YIELD" Sign (R1-2)	⊠ "YIELD" Sign (R1-2)

Signal Upgrade Temporary Design 3 - (TMP Phase II/III)

Prepared For: **Transposition Mobility and Safety Solutions**
 UNIVERSITY OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 SIGNAL DESIGN SECTION

750 N. Greenfield Pkwy, Garner, NC 27529
 SCALE: 0 20 1"=20'

US 276 (Walnut Street/ Russ Avenue) at Branner Avenue/Boundary Street

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

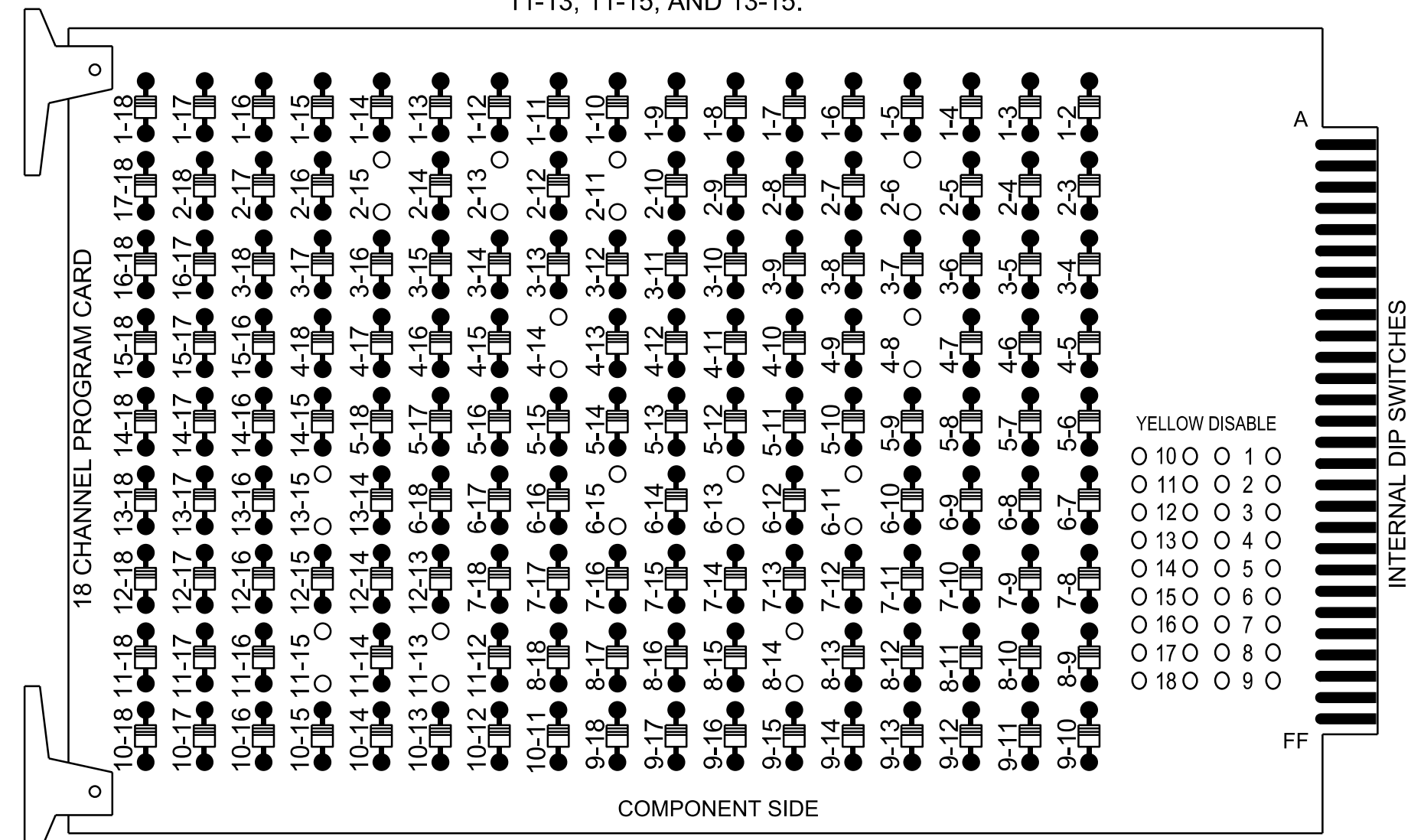
SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 32396
 WILLIAM J. HAMILTON
 DATE: 04/11/2023
 SIGNATURE: William J. Hamilton
 SIG. INVENTORY NO. 14-037473



18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-11, 2-13, 2-15, 4-8, 4-14, 6-11, 6-13, 6-15, 8-14, 11-13, 11-15, AND 13-15.

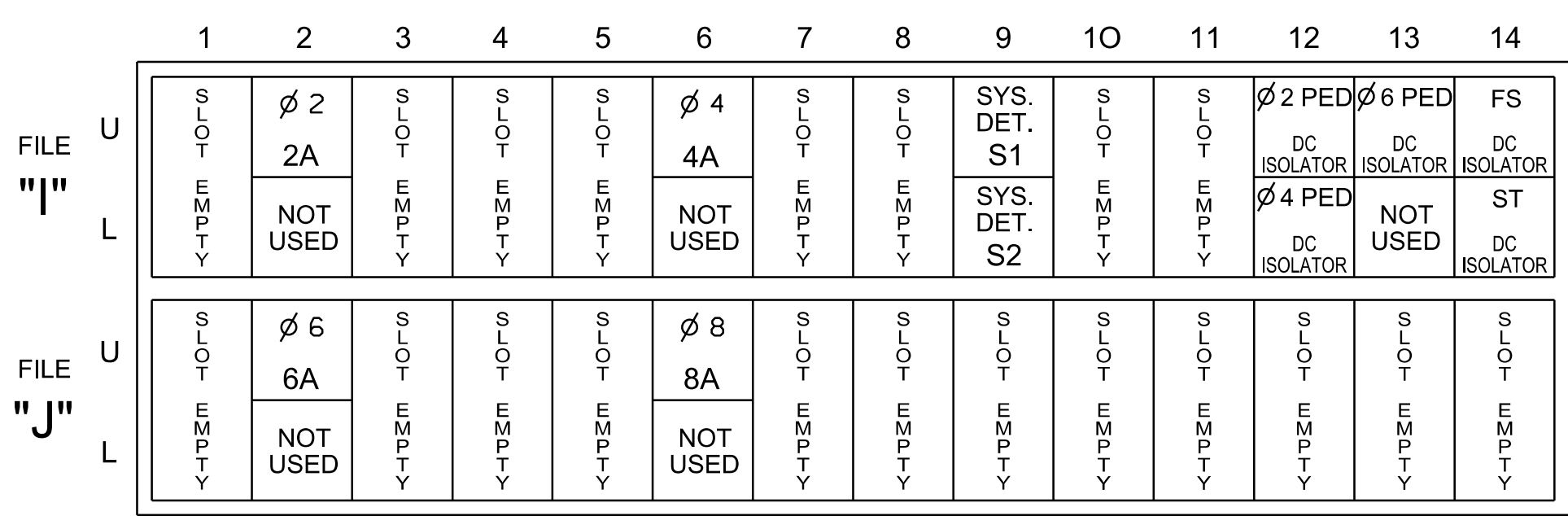


REMOVE JUMPERS AS SHOWN

- 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.
 - Integrate monitor with Ethernet network in cabinet.

INPUT FILE POSITION LAYOUT

(front view)



ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

- Install push buttons and APS equipment per manufacturer's instructions.
- Provide a dedicated cable to each push button per manufacturer's instructions.
- If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
- Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
- Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
- Program phases 4 and 8 for Dual Entry.
- Program controller to start up in phase 2 Green Walk and 6 Green 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 D14-12 Waynesville Signal System.

EQUIPMENT INFORMATION

Controller.....2070LX
 Cabinet.....332 w/ Aux
 Software.....Q-Free MAXTIME
 Cabinet Mount.....Base
 Output File Positions.....18 With Aux. Output File
 Load Switches Used.....S2, S3, S5, S6, S8, S9, S11, AUX S4
 Phases Used.....2, 2PED, 4, 4PED, 6, 6PED, 8
 Overlap "1".....NOT USED
 Overlap "2".....NOT USED
 Overlap "3".....*
 Overlap "4".....NOT USED

*See overlap programming detail on this sheet.

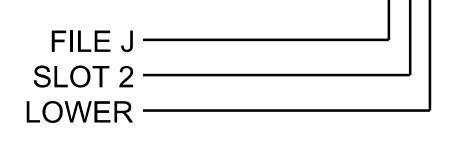
INPUT FILE CONNECTION & PROGRAMMING CHART

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
2A	TB2-5,6	I2U	39	1	2	2			X		X	
4A	TB4-9,10	I6U	41	3	8	4	10		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
8A	TB5-9,10	J6U	42	4	22	8	10		X		X	
* S1	TB6-9,10	I9U	60	22	13							
* S2	TB6-11,12	I9L	62	24	14							
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P41,P42	TB8-5,6	I12L	69	35	4	PED 4						
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

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

*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L



OVERLAP PROGRAMMING

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

Web Interface
 Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

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

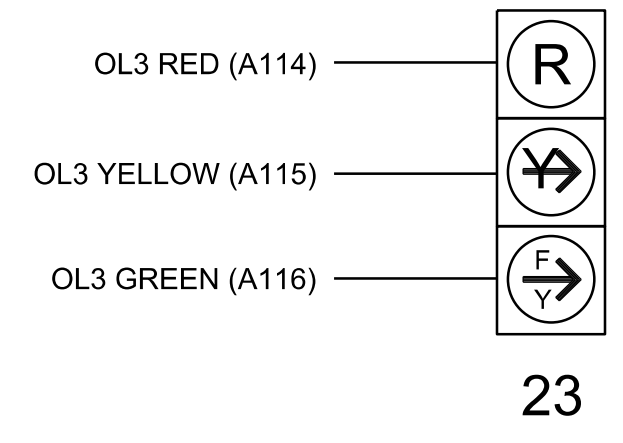
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	P21, P22	NU	41,42, 43	P41, P42	NU	61,62	P61, P62	NU	81,82, 83	NU	NU	NU	NU	23	NU	NU
RED		128			101			134			107					A114		
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW																		
YELLOW ARROW																A115		
FLASHING YELLOW ARROW																A116		
GREEN ARROW																		
Hand icon							113		104		119							
Walking person icon									106									

NU = Not Used
 ★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



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: 14-0374
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail Final Design

Prepared For:

US 276 (Walnut Street/ Russ Avenue) at Branner Avenue/Boundary Street Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

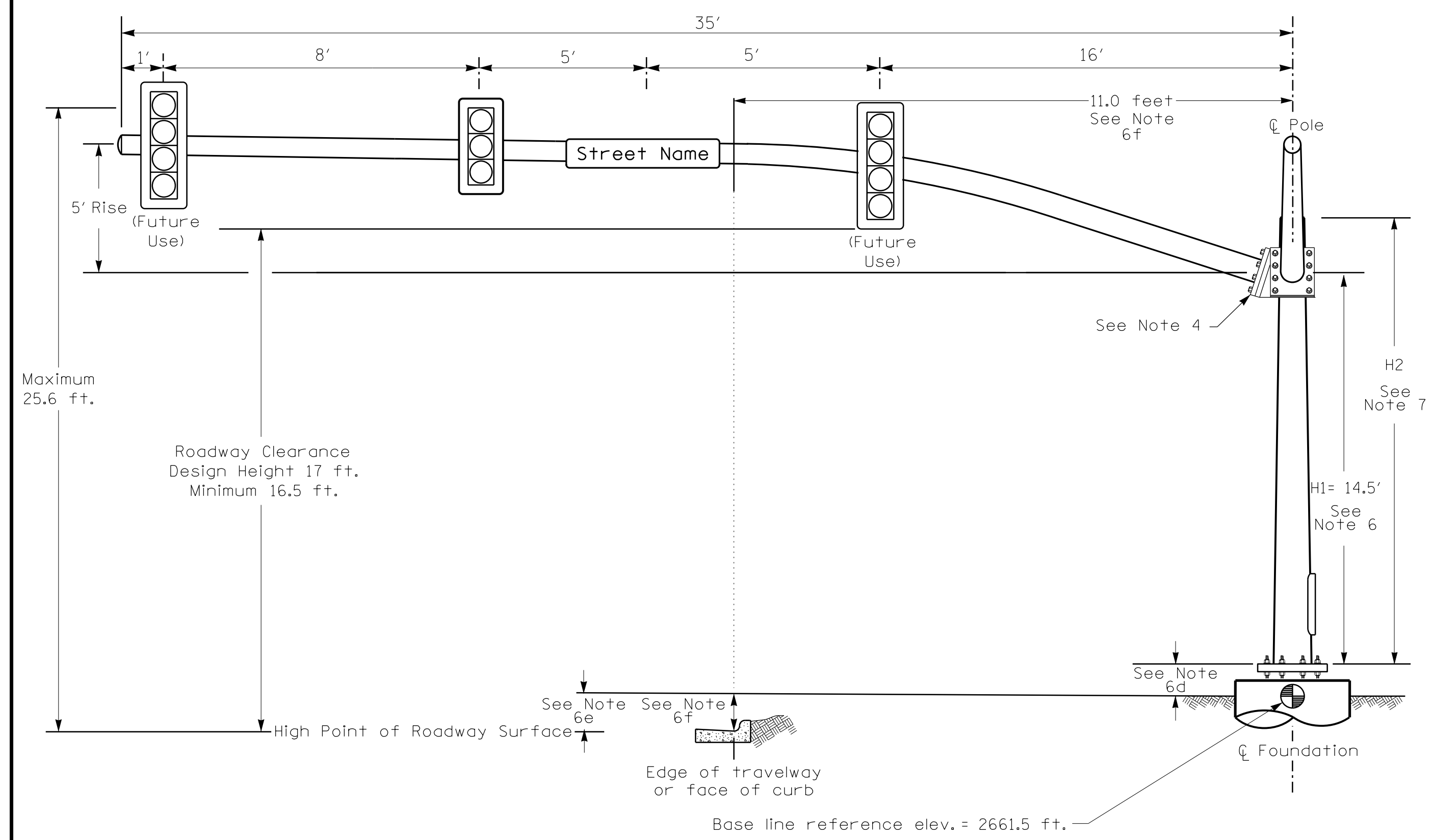
REVISIONS	INIT.	DATE

750 N. Greenfield Pkwy, Garner, NC 27529

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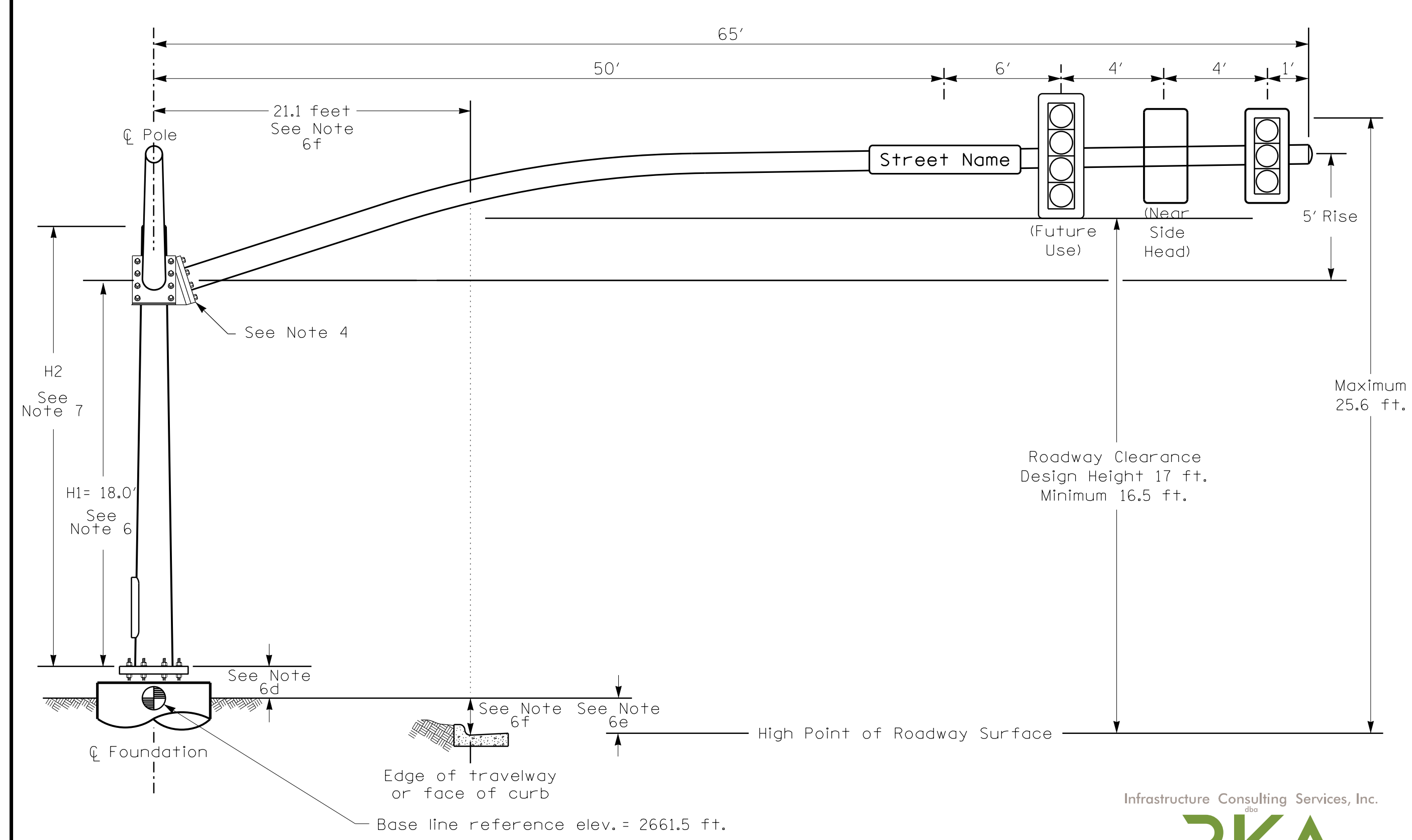
SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 32396
 WILLIAM J. HAMILTON
 Signature: William J. Hamilton
 DATE: 04/11/2023
 SIG. INVENTORY NO. 14-0374

Design Loading for METAL POLE NO. 1, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 1, MAST ARM B



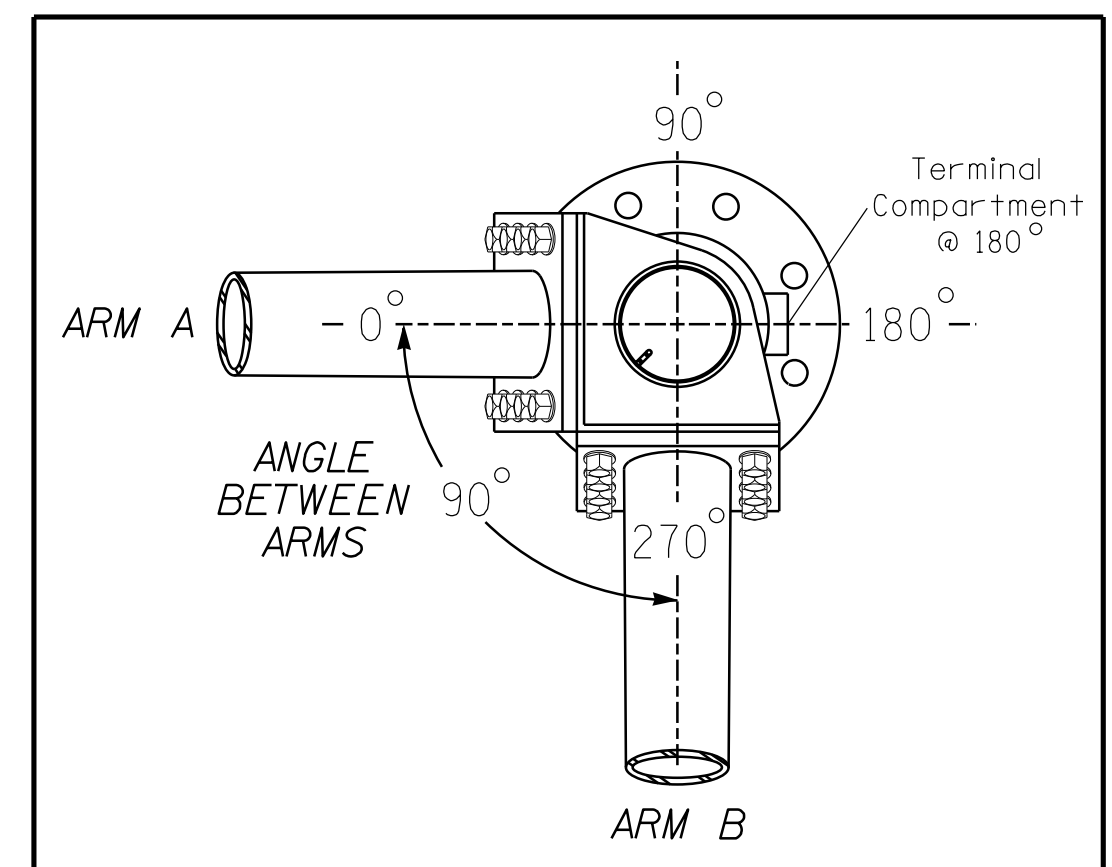
Elevation View @ 0°

SPECIAL NOTE

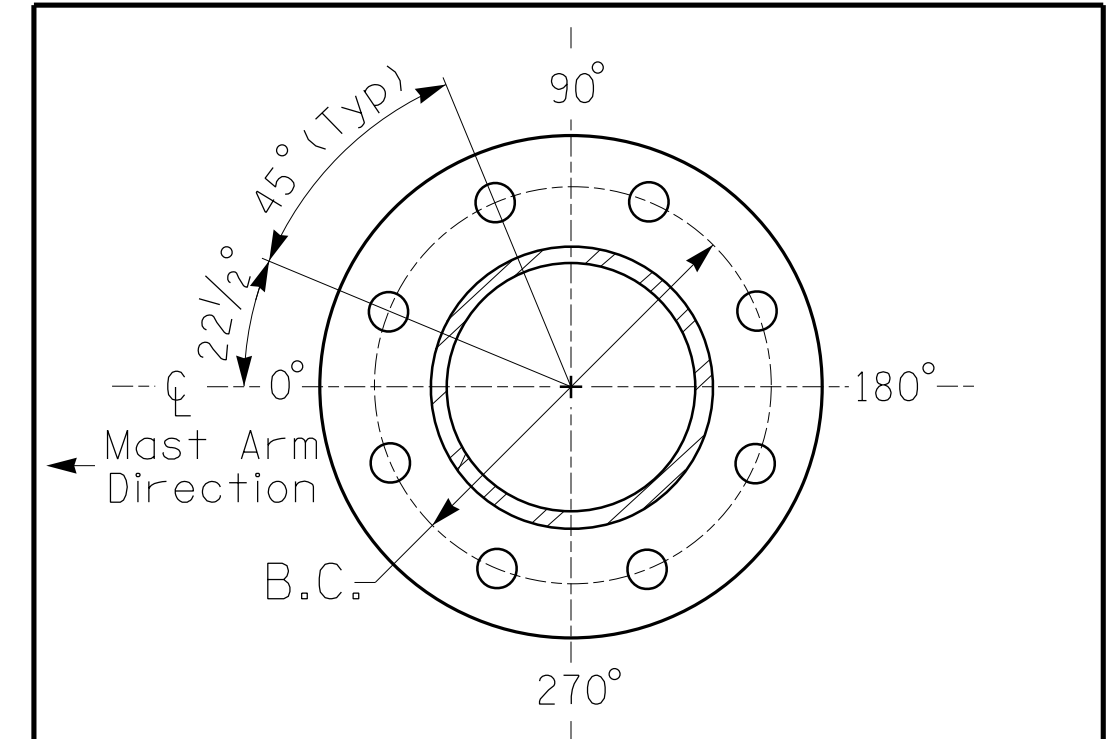
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

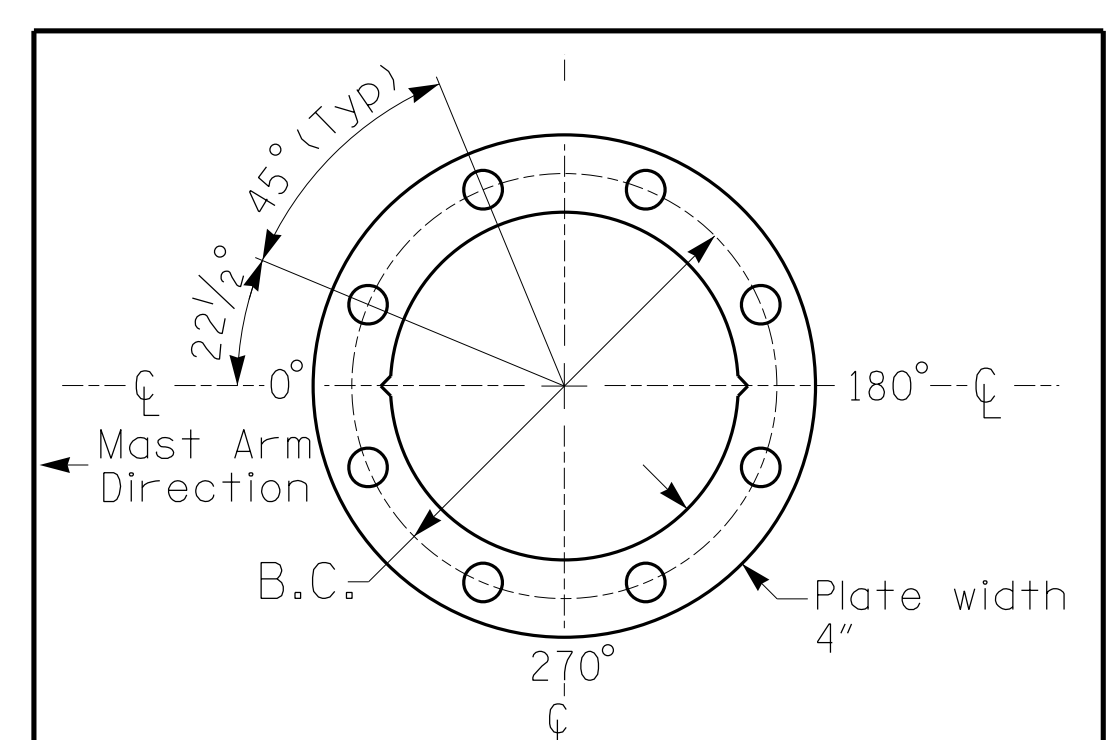
Elevation Differences for:	Arm A	Arm B
Baseline reference point at \odot Foundation @ ground level	2661.5 ft.	2661.5 ft.
Elevation difference at High point of roadway surface	+0.2 ft.	+3.9 ft.
Elevation difference at Edge of travelway or face of curb	-0.3 ft.	+0.4 ft.



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL



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

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

- Design the traffic signal structure and foundation in accordance with:
 - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
 - The 2018 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/LTS-Design-Resources.aspx>

DESIGN REQUIREMENTS

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads are rigidly mounted and vertically centered on the mast arm.
 - The roadway clearance for design is as shown in the elevation views.
 - The top of the pole base plate is 0.75 feet above the ground elevation.
 - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
 - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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.
- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 5 (120 mph)

US 276 (Walnut Street / Russ Avenue) at Branner Avenue/Boundary Street
 Division 14 Haywood County Waynesville
 PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka REVIEWED BY: 16085 (040)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

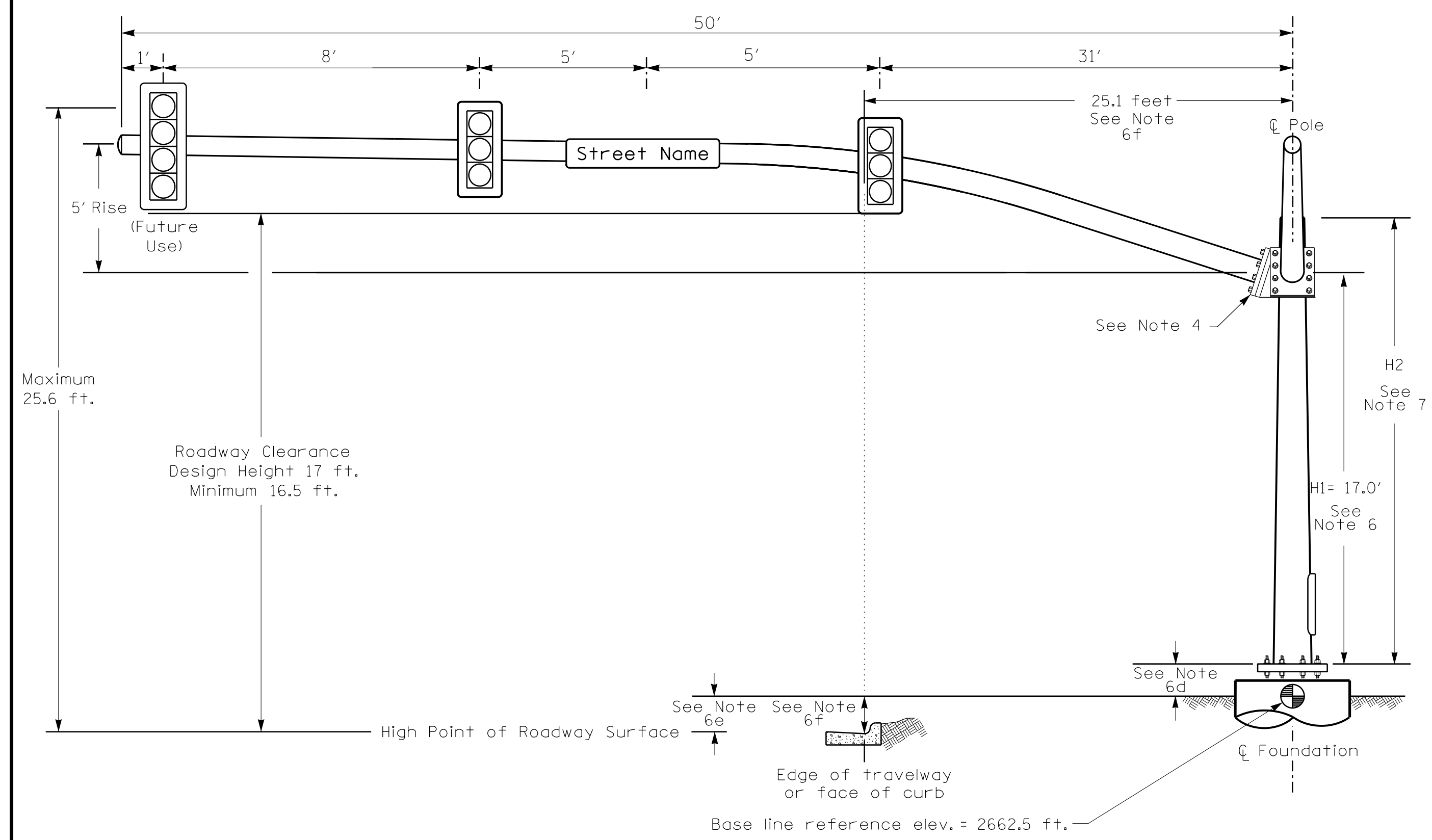
WILLIAM J. HAMILTON
 PROFESSIONAL ENGINEER
 STATE OF NORTH CAROLINA
 LICENSE NO. 32396

SIGNATURE DATE: 04/11/2023

SIG. INVENTORY NO. 14-0374

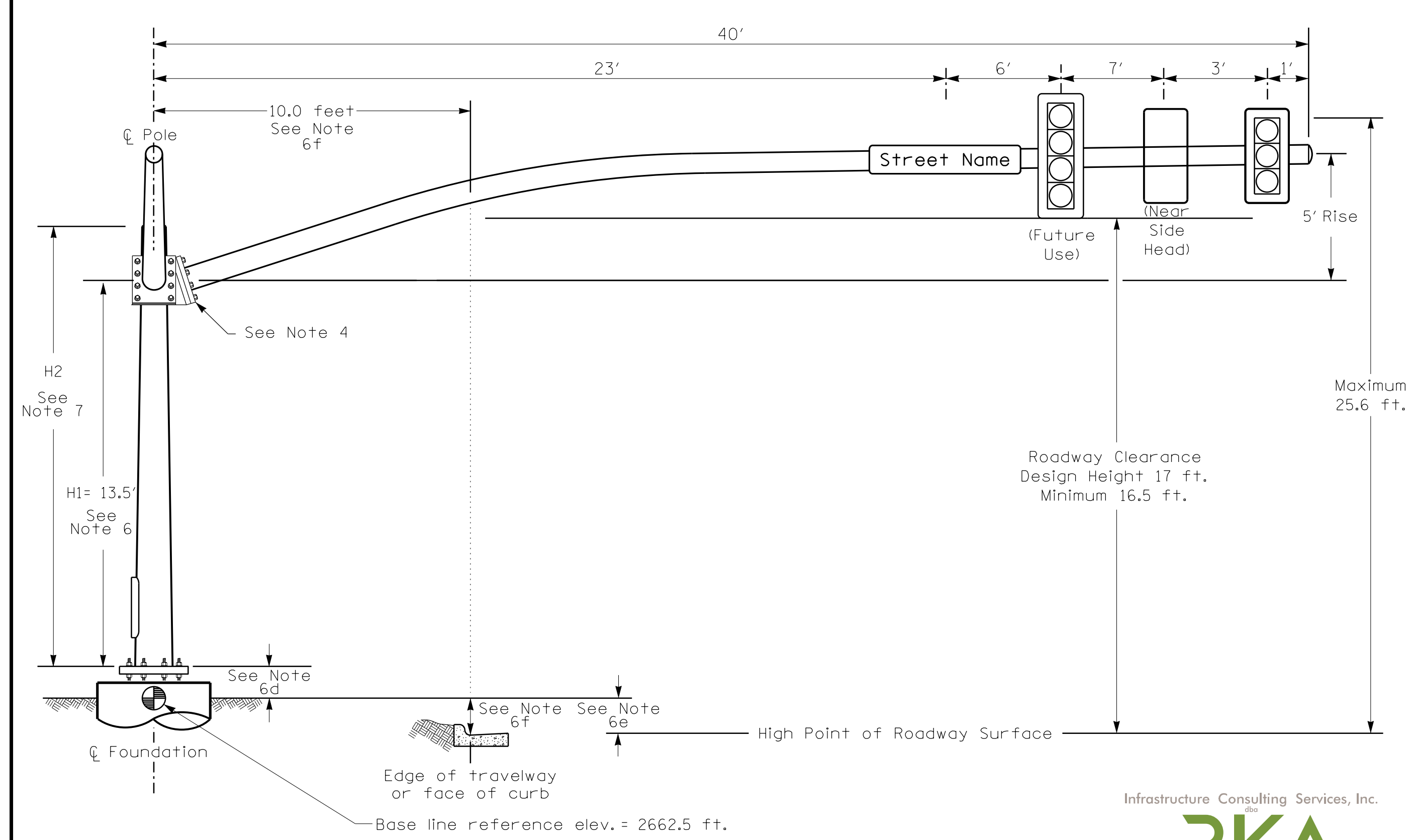
METAL POLE NO. 2

Design Loading for METAL POLE NO. 2, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 2, MAST ARM B

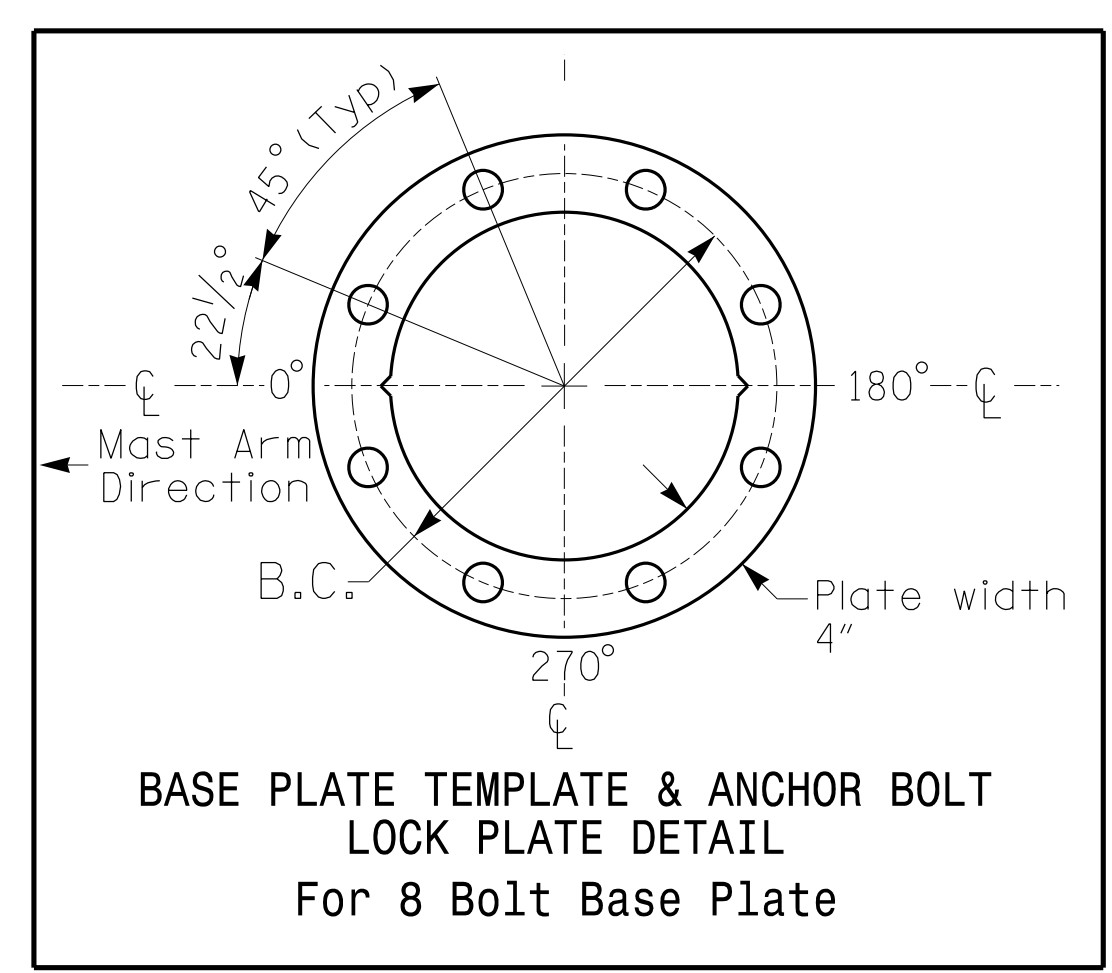
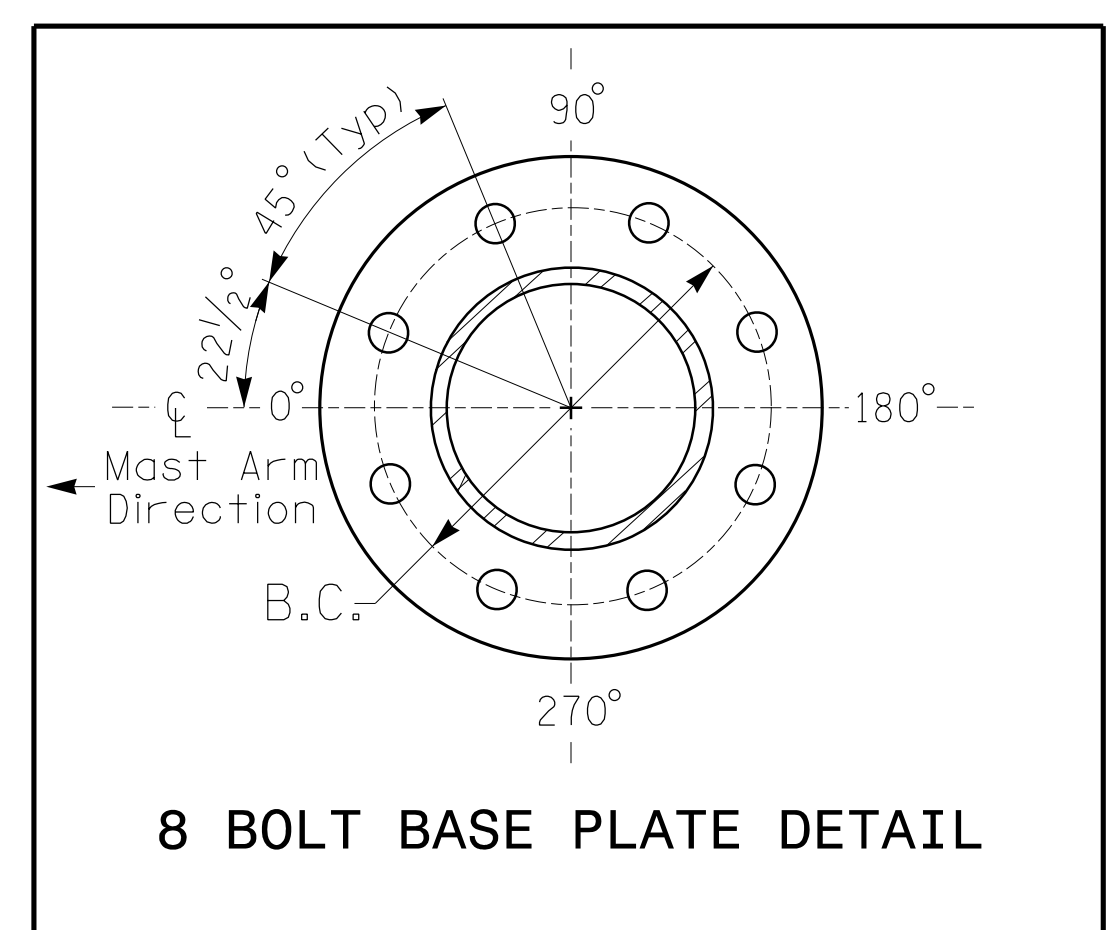
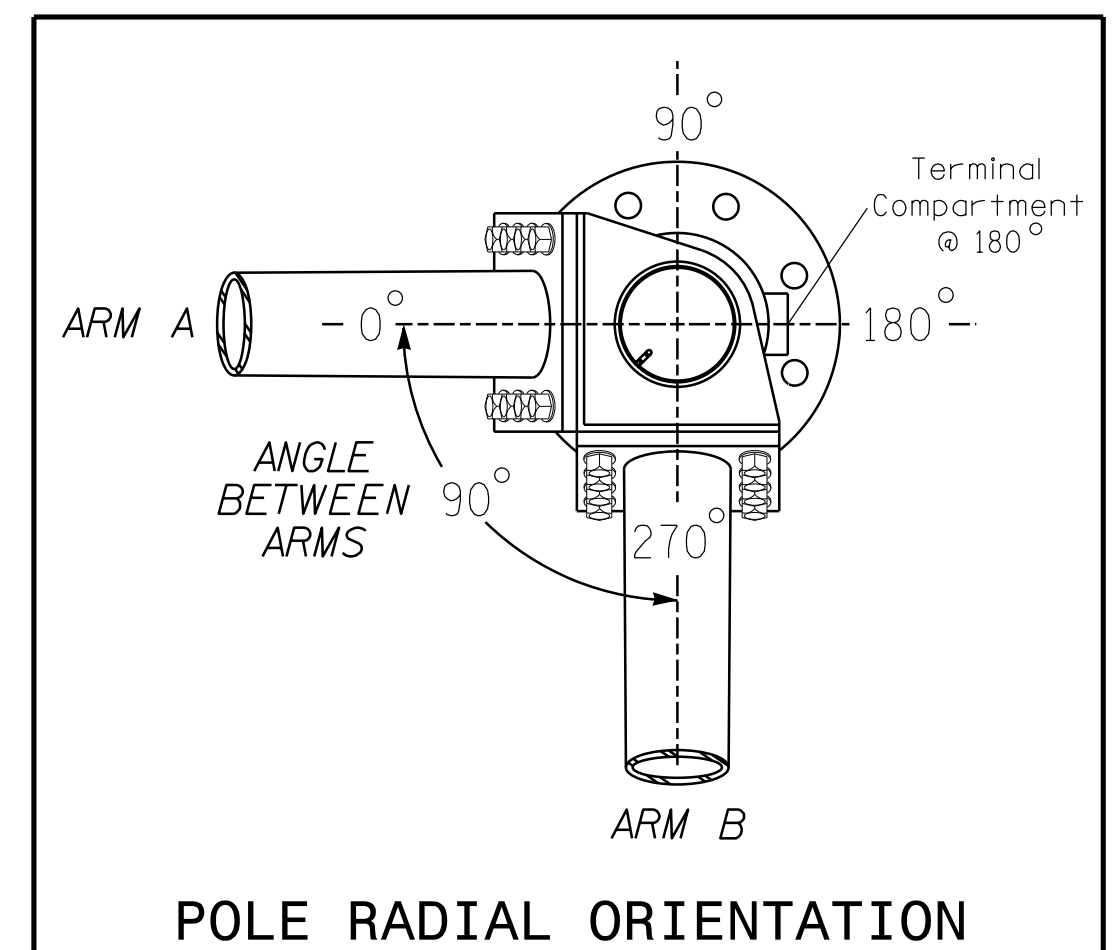


Elevation View @ 0°

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

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at \odot Foundation @ ground level	2662.5 ft.	2662.5 ft.
Elevation difference at High point of roadway surface	+2.7 ft.	-0.6 ft.
Elevation difference at Edge of travelway or face of curb	+1.7 ft.	-0.6 ft.



MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

- Design the traffic signal structure and foundation in accordance with:
 - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
 - The 2018 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

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads are rigidly mounted and vertically centered on the mast arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is 0.75 feet above the ground elevation.
 - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
 - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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.
- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 5 (120 mph)

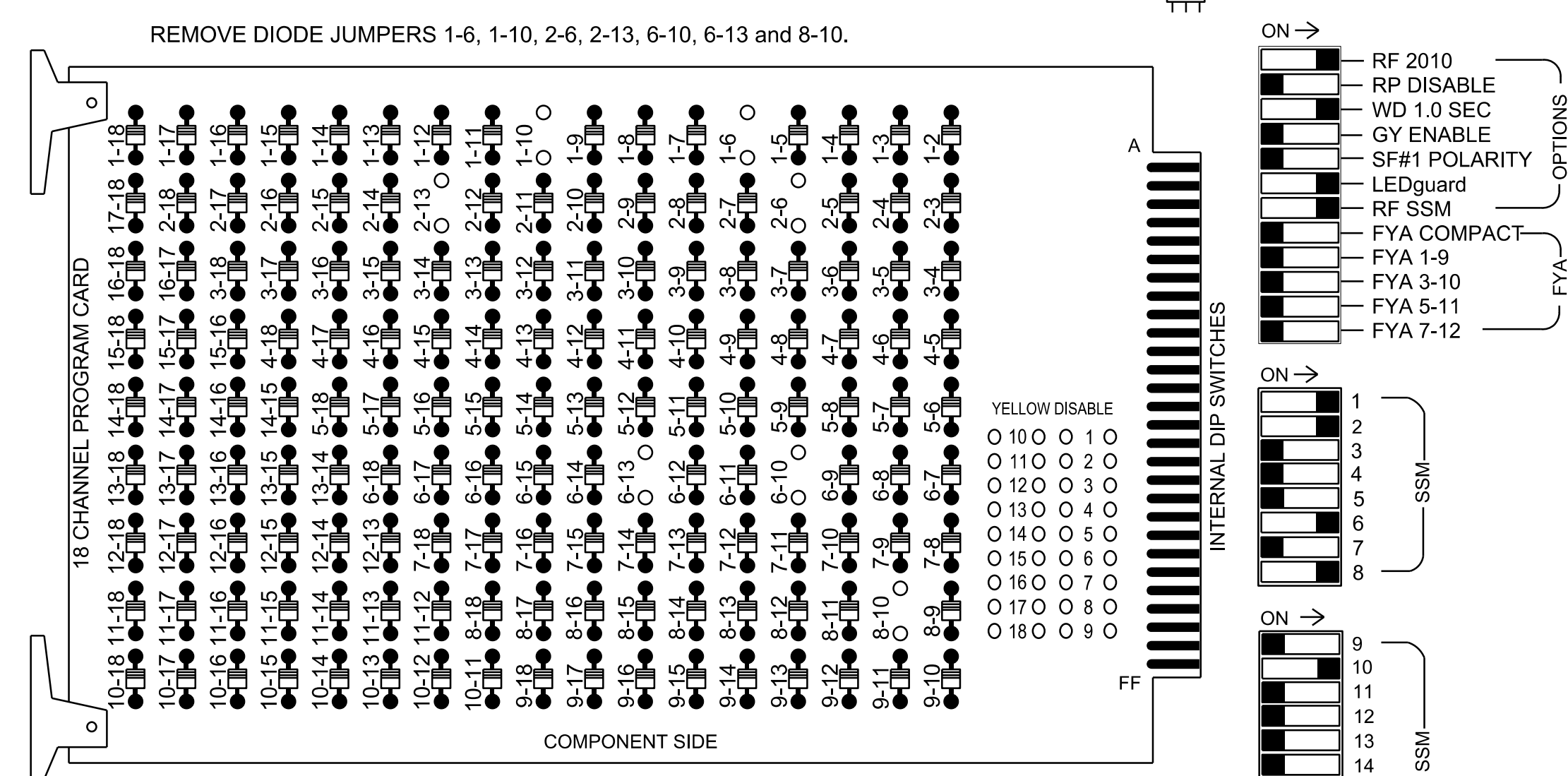
	US 276 (Walnut Street / Russ Avenue) at Branner Avenue/Boundary Street Division 14 Haywood County Waynesville		
	PLAN DATE: April 2023 PREPARED BY: TS Popelka	REVIEWED BY: WJ Hamilton REVIEWED BY: 16085 (040)	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SIG. INVENTORY NO. 14-0374

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

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 Walk and 6 Green No Walk.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
- The cabinet and controller are part of the D14-12 Waynesville 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, S3, S8, S11, AUX S2
 Phases Used.....1, 2, 2PED, 6, 8
 Overlap "1".....NOT USED
 Overlap "2".....*
 Overlap "3".....NOT USED
 Overlap "4".....NOT USED

*See overlap programming detail on this sheet

SPECIAL DETECTOR NOTE

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

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
GMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	61	21,22	P21, P22	NU	NU	NU	NU	61,62	NU	NU	81	NU	NU	82,83	NU	NU	NU	NU
RED	*	128						134						A124				
YELLOW		129						135										
GREEN		130						136										
RED ARROW											107							
YELLOW ARROW	126										108			A125				
FLASHING YELLOW ARROW																		
GREEN ARROW	127										109			A126				
Hand icon																		
Walking person icon																		

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

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

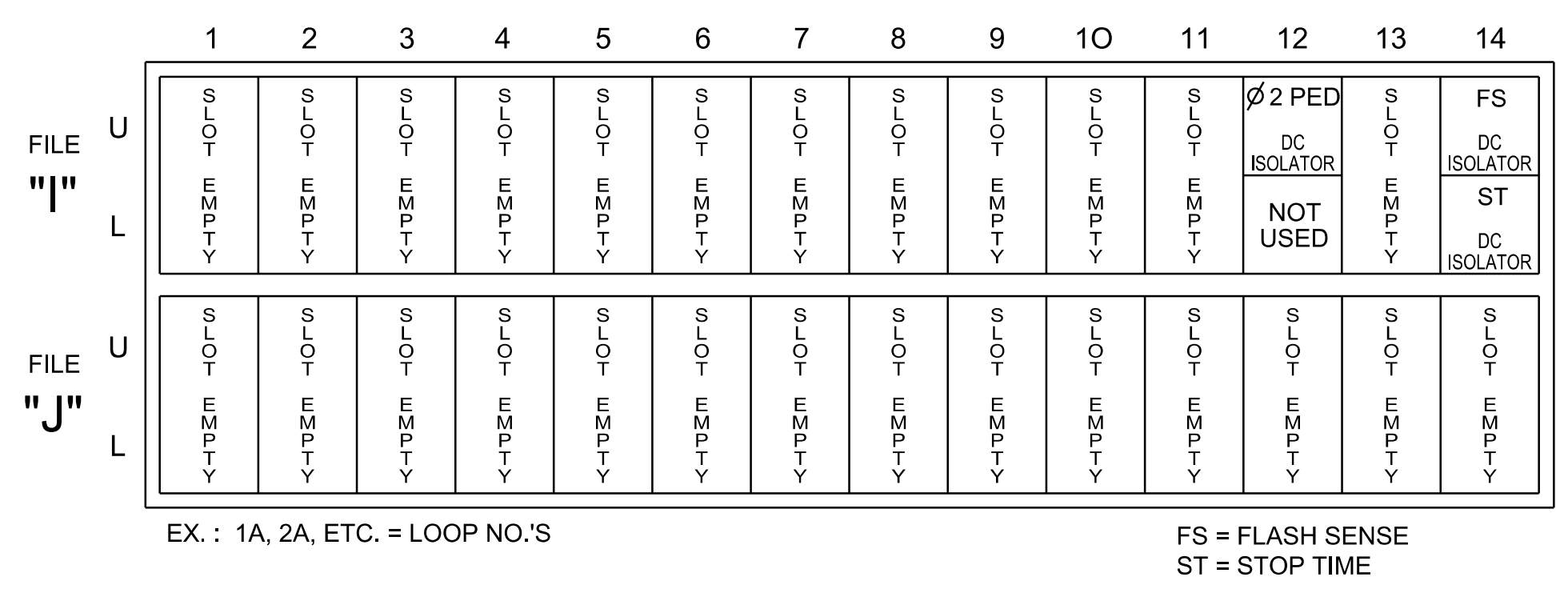
Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

- Install push buttons and APS equipment per manufacturer's instructions.
- Provide a dedicated cable to each push button per manufacturer's instructions.
- If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
- Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
- Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

INPUT FILE POSITION LAYOUT

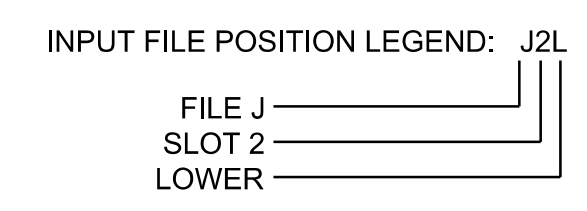
(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT I12



OVERLAP PROGRAMMING

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

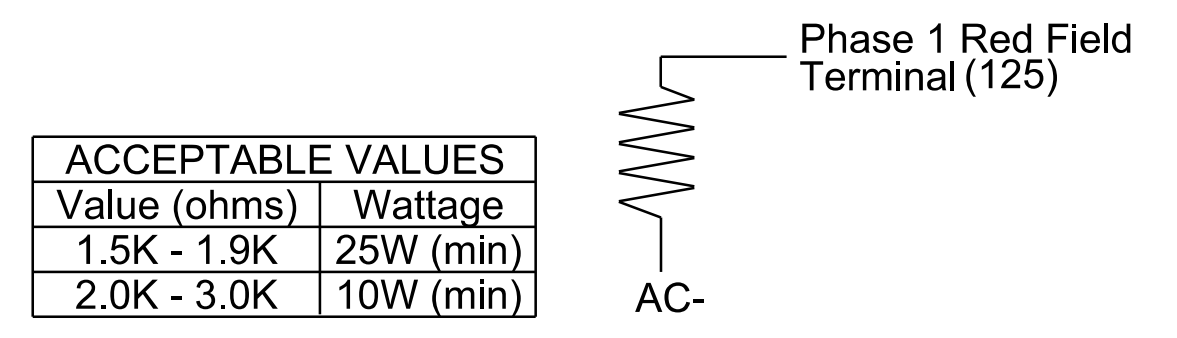
Web Interface
 Home > Controller > Overlap Configuration > Overlaps

Overlap Plan 1

Overlap	2
Type	Normal
Included Phases	1,8
Modifier Phases	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

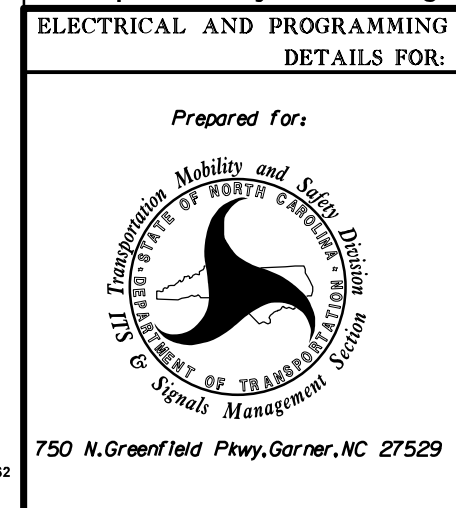
LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)



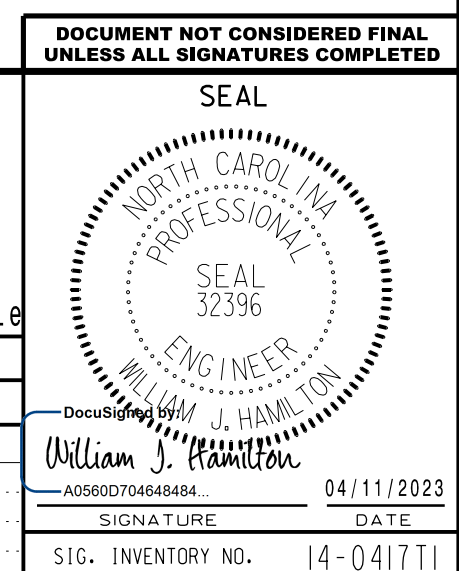
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0417T1
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail
 Temporary Design 1 - (TMP Phase II)



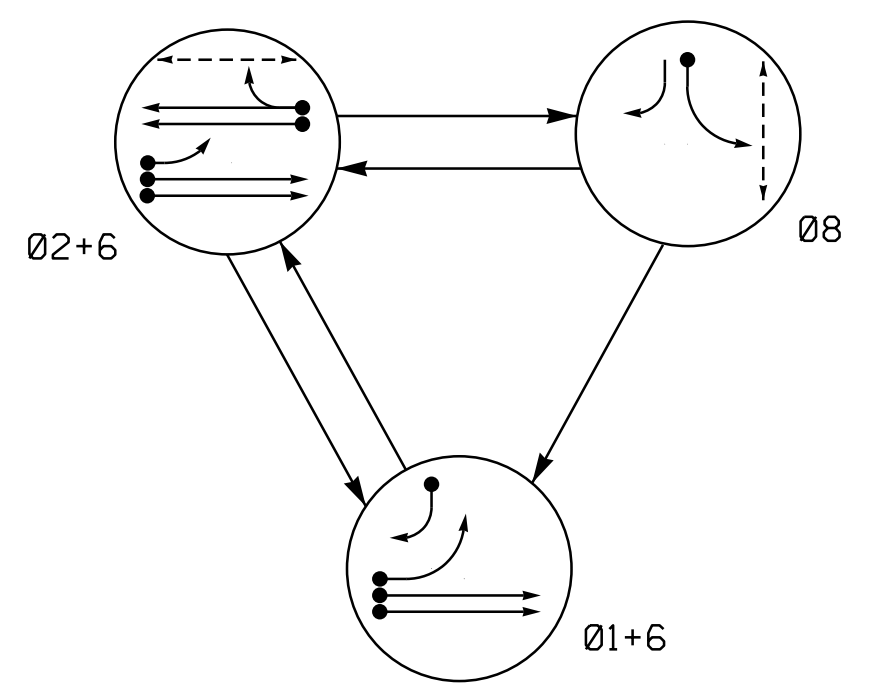
US 276 (Russ Avenue) at Walnut Street
 Division 14 Haywood County Waynesville
 PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

REVISIONS	INIT.	DATE



DATE: 04/11/2023
 SIGNATURE: William J. Hamilton
 SIG. INVENTORY NO. 14-0417T1

PHASING DIAGRAM



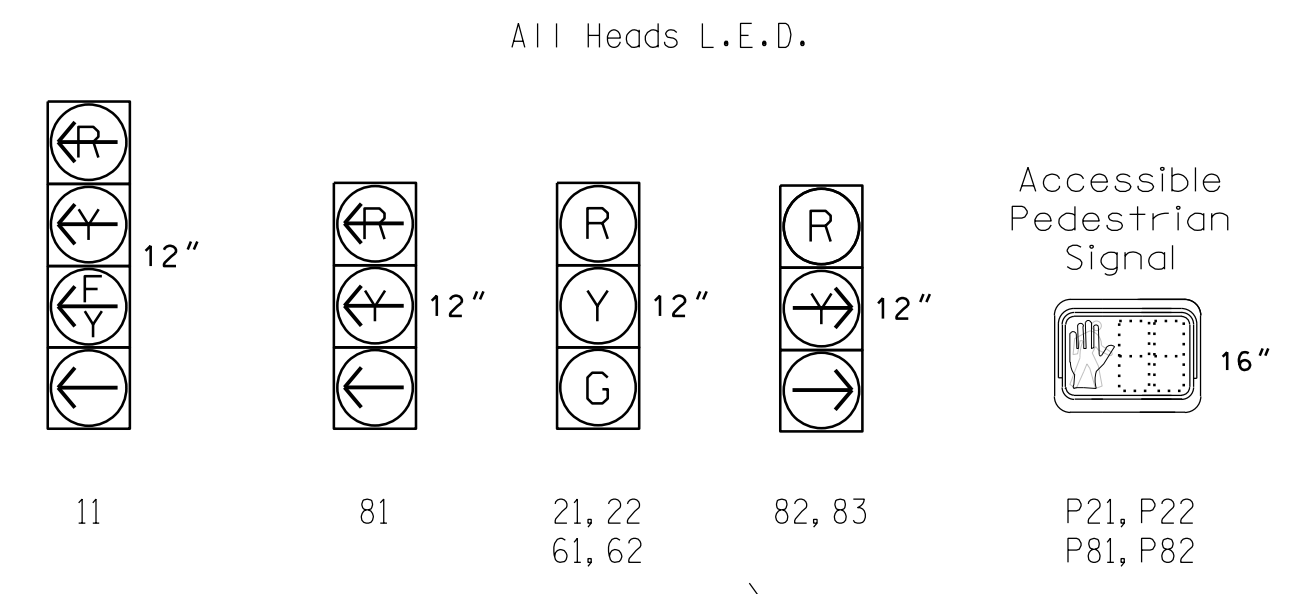
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE			FLASH
	01+6	02+6	08	
11	←	→	←	Y
21, 22	R	G	R	Y
61, 62	G	G	R	Y
81	←	←	←	Y
82, 83	→	→	→	R
P21, P22	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

SIGNAL FACE I.D.



MAXTIME DETECTOR INSTALLATION CHART

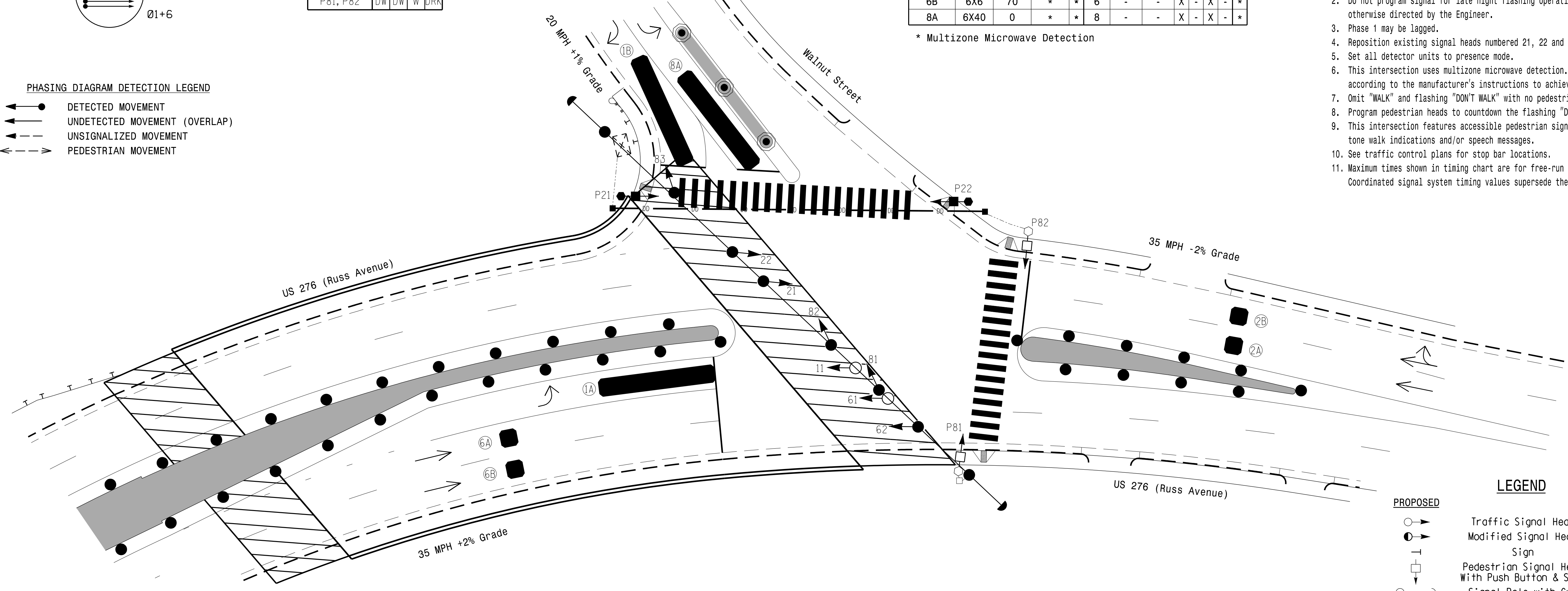
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL CALL	BEHOLD GREEN	NEW CARD	
1A	6X40	0	*	*	1	15	-	X	-	X	-	*
1B	6X40	0	*	*	1	15	-	X	-	X	-	*
2A	6X6	70	*	*	2	-	-	X	-	X	-	*
2B	6X6	70	*	*	2	-	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
6B	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	*	*	8	-	-	X	-	X	-	*

* Multizone Microwave Detection

3 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Reposition existing signal heads numbered 21, 22 and 62.
- Set all detector units to presence mode.
- This intersection uses multizone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- See traffic control plans for stop bar locations.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



MAXTIME TIMING CHART

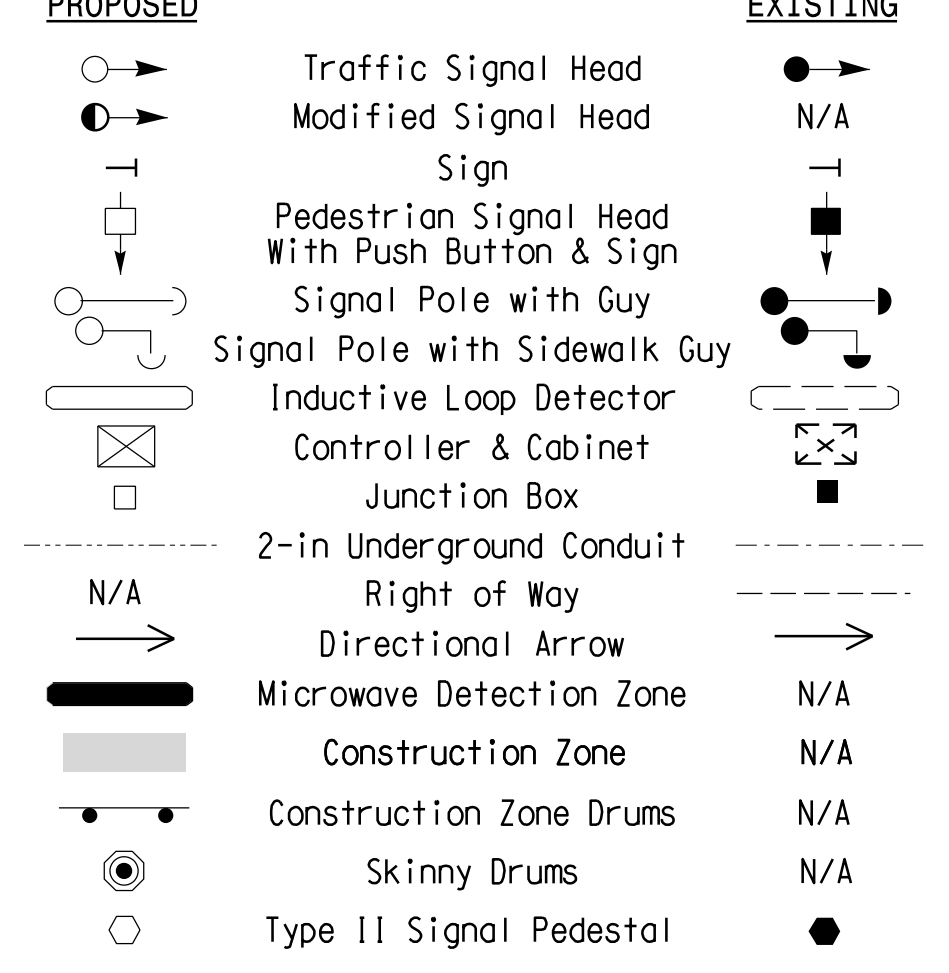
FEATURE	PHASE			
	1	2	6	8
Walk *	-	7	-	7
Ped Clear *	-	25	-	16
Min Green	7	10	10	7
Passage *	2.0	3.0	3.0	2.0
Max I *	15	45	45	25
Yellow Change	3.0	4.0	3.7	3.0
Red Clear	2.6	2.1	1.9	3.4
Added Initial *	-	-	-	-
Maximum Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
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.

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE TONES	INTERVAL	SPEECH MESSAGE
P21	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Walnut.
P22	- X	Walk	Walnut. Walk sign is on to cross Walnut.
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Walnut.
P81	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Russ.
P82	- X	Walk	Russ. Walk sign is on to cross Russ.
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Russ.

LEGEND



Signal Upgrade Temporary Design 2 - (TMP Phase III)

Prepared for:

Infrastructure Consulting Services, Inc.

RKA

RAMEY KEMP ASSOCIATES

8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28262
Phone: 704-549-4260 | www.rameykemp.com | NC License No. P-1489

US 276 (Russ Avenue) at Walnut Street

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka RKA PROJ. NO.: 16085 (040)

REVISIONS	INIT.	DATE

SEAL

William J. Hamilton

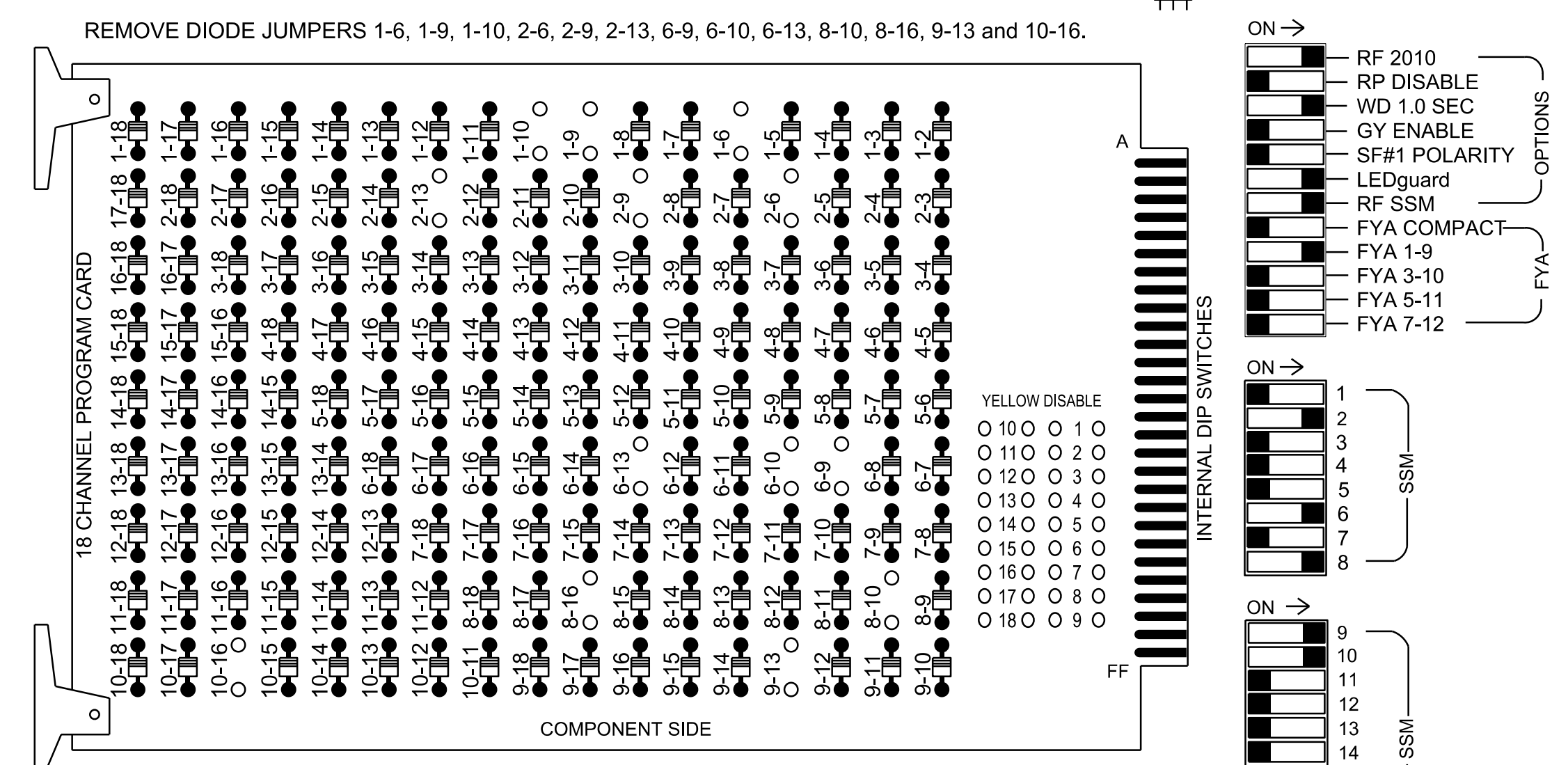
04/11/2023

SIGNATURE DATE

SIG. INVENTORY NO. 14-04172

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

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 Walk and 6 Green No Walk.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
- The cabinet and controller are part of the D14-12 Waynesville 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, S3, S8, S11, S12, AUX S1, AUX S2
 Phases Used.....1, 2, 2PED, 6, 8, 8PED
 Overlap "1".....*
 Overlap "2".....*
 Overlap "3".....NOT USED
 Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

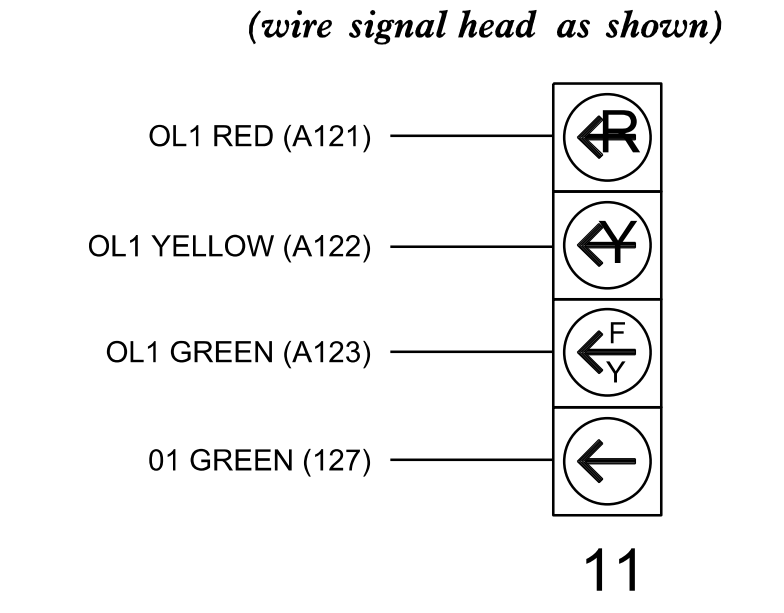
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	P21, P22	NU	NU	NU	NU	61,62	NU	NU	81	P81, P82	11	82,83	NU	NU	NU	NU
RED		128						134							A124			
YELLOW	*	129						135										
GREEN		130						136										
RED ARROW												107		A121				
YELLOW ARROW												108		A122	A125			
FLASHING YELLOW ARROW														A123				
GREEN ARROW	127											109		A126				
Hand			113															
Walking												112						

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

SPECIAL DETECTOR NOTE

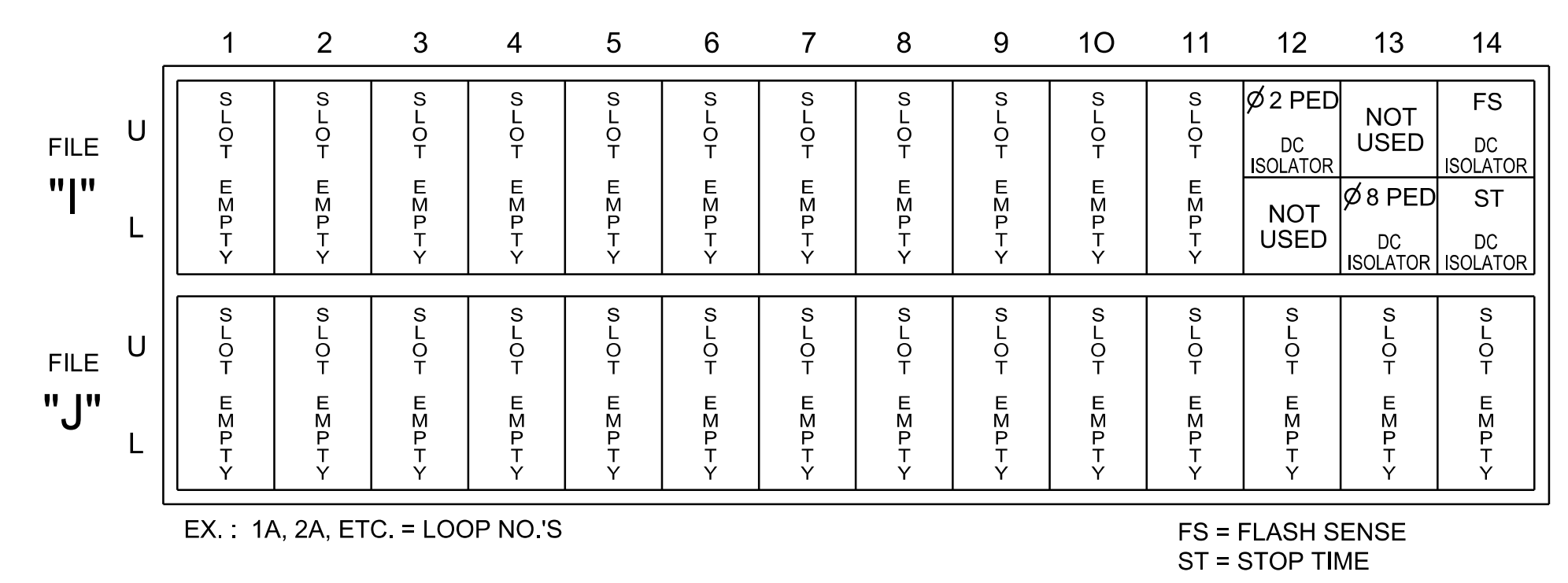
Install a multizone microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

FYA SIGNAL WIRING DETAIL



INPUT FILE POSITION LAYOUT

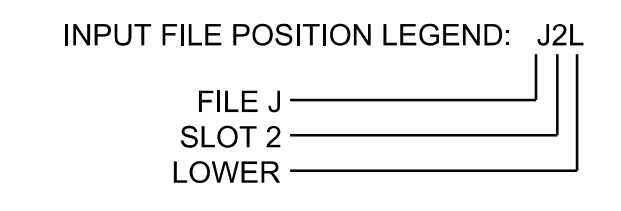
(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

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

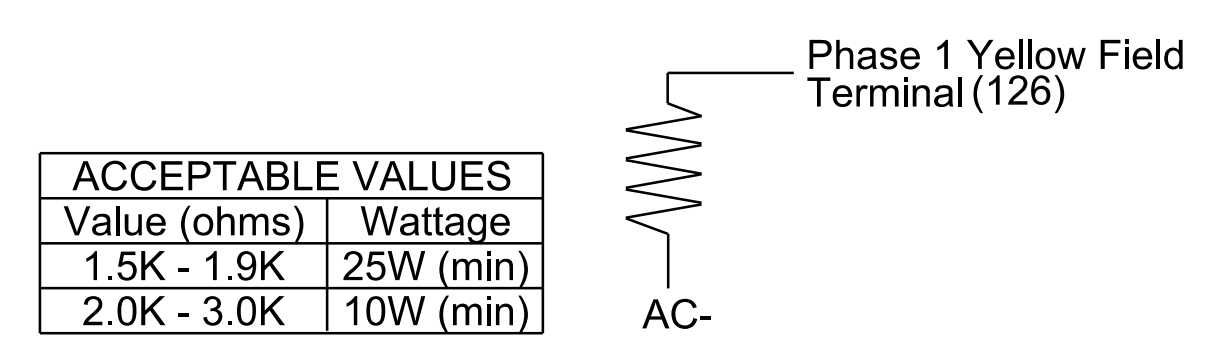


COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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.

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0417T2
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail - Sheet 1 of 2
 Temporary Design 2 - (TMP Phase III)



Prepared For:

US 276 (Russ Avenue) at Walnut Street

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

REVISIONS	INIT.	DATE

750 N. Greenfield Pkwy, Garner, NC 27529

DocuSign Envelope ID: 40562074648484
 William J. Hamilton
 ENGINEER
 SEAL 32396
 04/11/2023
 SIGNATURE DATE
 SIG. INVENTORY NO. 14-0417T2

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OVERLAP PROGRAMMING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

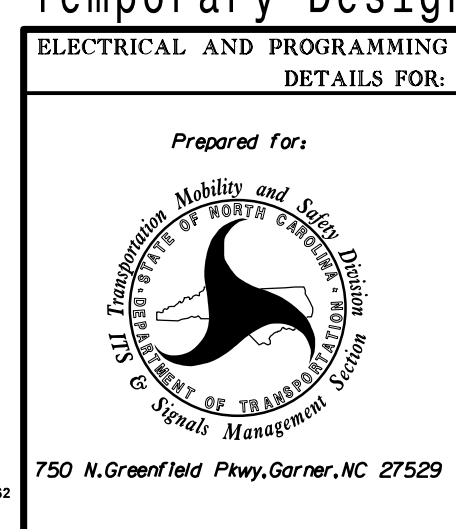
Overlap	1	2
Type	FYA - 4 Section	Normal
Included Phases	2	1,8
Modifier Phases	1	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

1. Install push buttons and APS equipment per manufacturer's instructions.
2. Provide a dedicated cable to each push button per manufacturer's instructions.
3. If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
4. Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
5. Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0417T2
DESIGNED: Apr 2023
SEALED: 04/11/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 2 - (TMP Phase III)



ELECTRICAL AND PROGRAMMING DETAILS FOR:		US 276 (Russ Avenue) at Walnut Street	
PLAN DATE: April 2023	REVIEWED BY: WJ Hamilton	Division 14 Haywood County Waynesville	
PREPARED BY: TS Popelka	RKA PROJ. NO: 16085 (040)	REVISIONS	INIT. DATE

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

SEAL

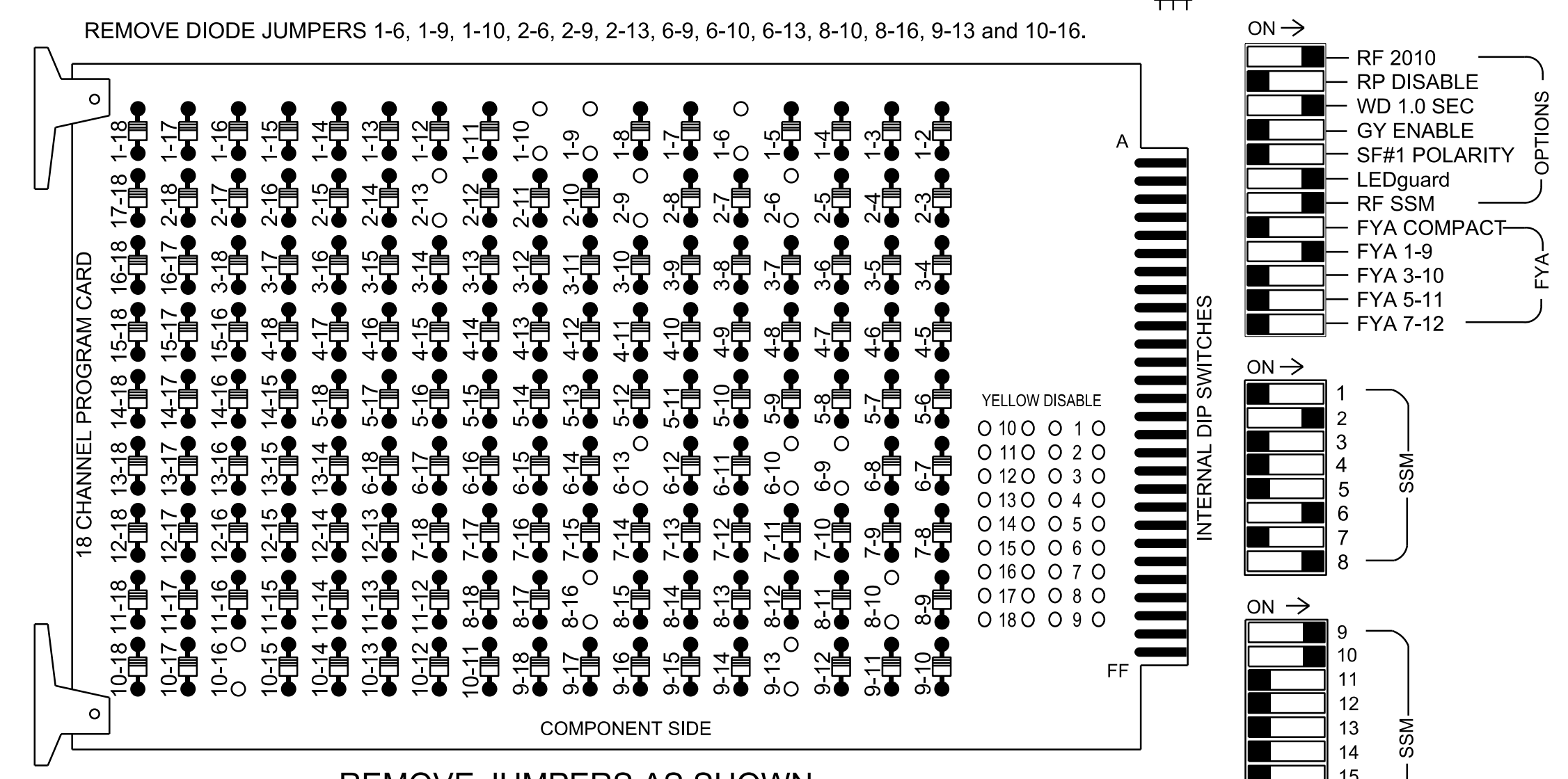
SEAL
32396
ENGINEER
WILLIAM J. HAMILTON

04/11/2023
DATE

SIG. INVENTORY NO. 14-0417T2

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

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 Walk and 6 Green No Walk.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
- The cabinet and controller are part of the D14-12 Waynesville 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, S3, S8, S11, S12, AUX S1, AUX S2
 Phases Used.....1, 2, 2PED, 6, 8, 8PED
 Overlap "1".....*
 Overlap "2".....*
 Overlap "3".....NOT USED
 Overlap "4".....NOT USED

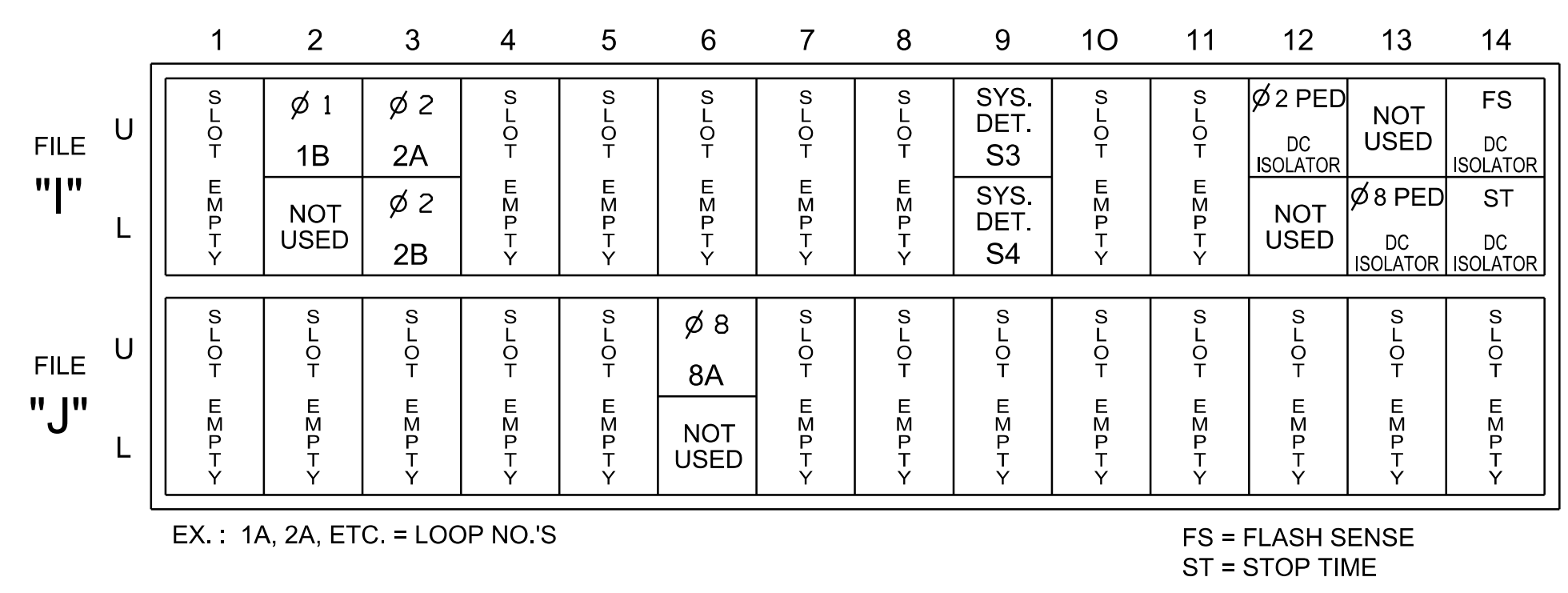
*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21, 22, 23	P21, P22	NU	NU	NU	NU	61, 62, 63	NU	NU	81	P81, P82	11	82, 83	NU	NU	NU	NU
RED		128						134										A124
YELLOW	*	129						135										
GREEN		130						136										
RED ARROW													107					A121
YELLOW ARROW													108					A122 A125
FLASHING YELLOW ARROW																		A123
GREEN ARROW	127												109					A126
																		110
																		112

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

INPUT FILE POSITION LAYOUT (front view)



SPECIAL DETECTOR NOTE

For detection zones 1A, 6A and 6B, install a multizone microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

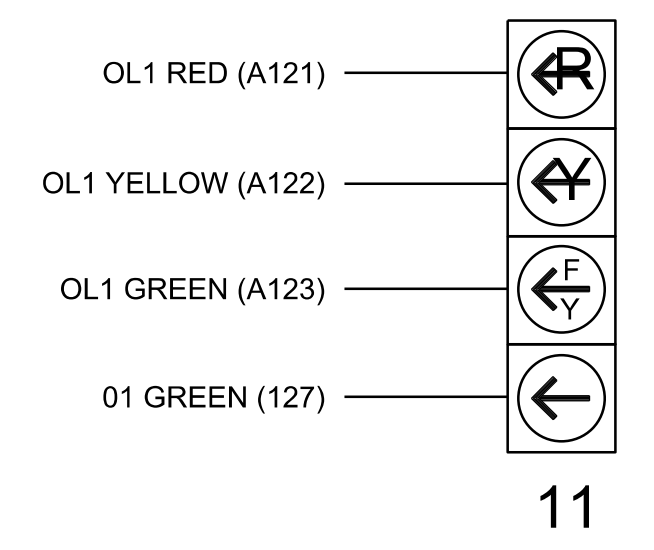
INPUT FILE CONNECTION & PROGRAMMING CHART

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
1B	TB2-5,6	I2U	39	1	2	1	15		X		X	
2A	TB2-9,10	I3U	63	29	4	2			X		X	
2B	TB2-11,12	I3L	76	42	5	2			X		X	
8A	TB5-9,10	J6U	42	4	22	8			X		X	
*S3	TB6-9,10	I9U	60	22	13							
*S4	TB6-11,12	I9L	62	24	14							
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

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

*System detector only. Remove any assigned vehicle phase.

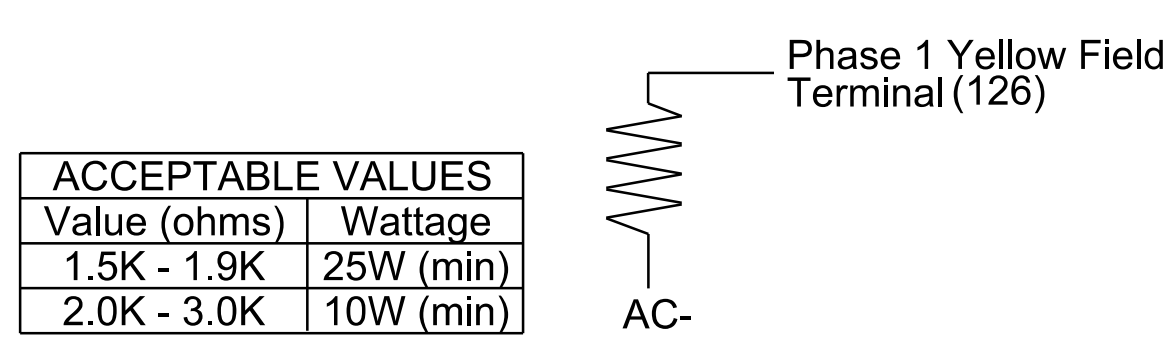
FYA SIGNAL WIRING DETAIL (wire signal head as shown)



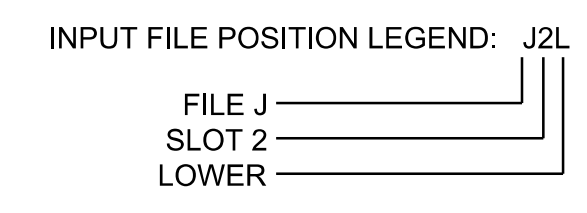
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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.

LOAD RESISTOR INSTALLATION DETAIL (install resistor as shown)



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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0417
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail - Sheet 1 of 2
 Final Design



US 276 (Russ Avenue) at Walnut Street

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)

REVISIONS	INIT.	DATE

750 N. Greenfield Pkwy, Garner, NC 27529

DocuSign Envelope ID: 82D8C649-8B56-4745-B9CD-FF1402C4349A

SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 32396
 WILLIAM J. HAMILTON
 04/11/2023
 SIGNATURE DATE
 SIG. INVENTORY NO. 14-0417

OVERLAP PROGRAMMING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

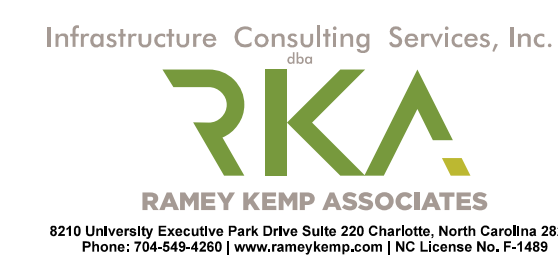
Overlap	1	2
Type	FYA - 4 Section	Normal
Included Phases	2	1,8
Modifier Phases	1	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

1. Install push buttons and APS equipment per manufacturer's instructions.
2. Provide a dedicated cable to each push button per manufacturer's instructions.
3. If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
4. Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
5. Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0417
DESIGNED: Apr 2023
SEALED: 04/11/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Final Design



ELECTRICAL AND PROGRAMMING
DETAILS FOR:

Prepared For:

750 N. Greenfield Pkwy, Garner, NC 27529

US 276 (Russ Avenue)
at
Walnut Street

Division 14 Haywood County Waynesville

PLAN DATE: April 2023	REVIEWED BY: WJ Hamilton
PREPARED BY: TS Popelka	RKA PROJ. NO: 16085 (040)

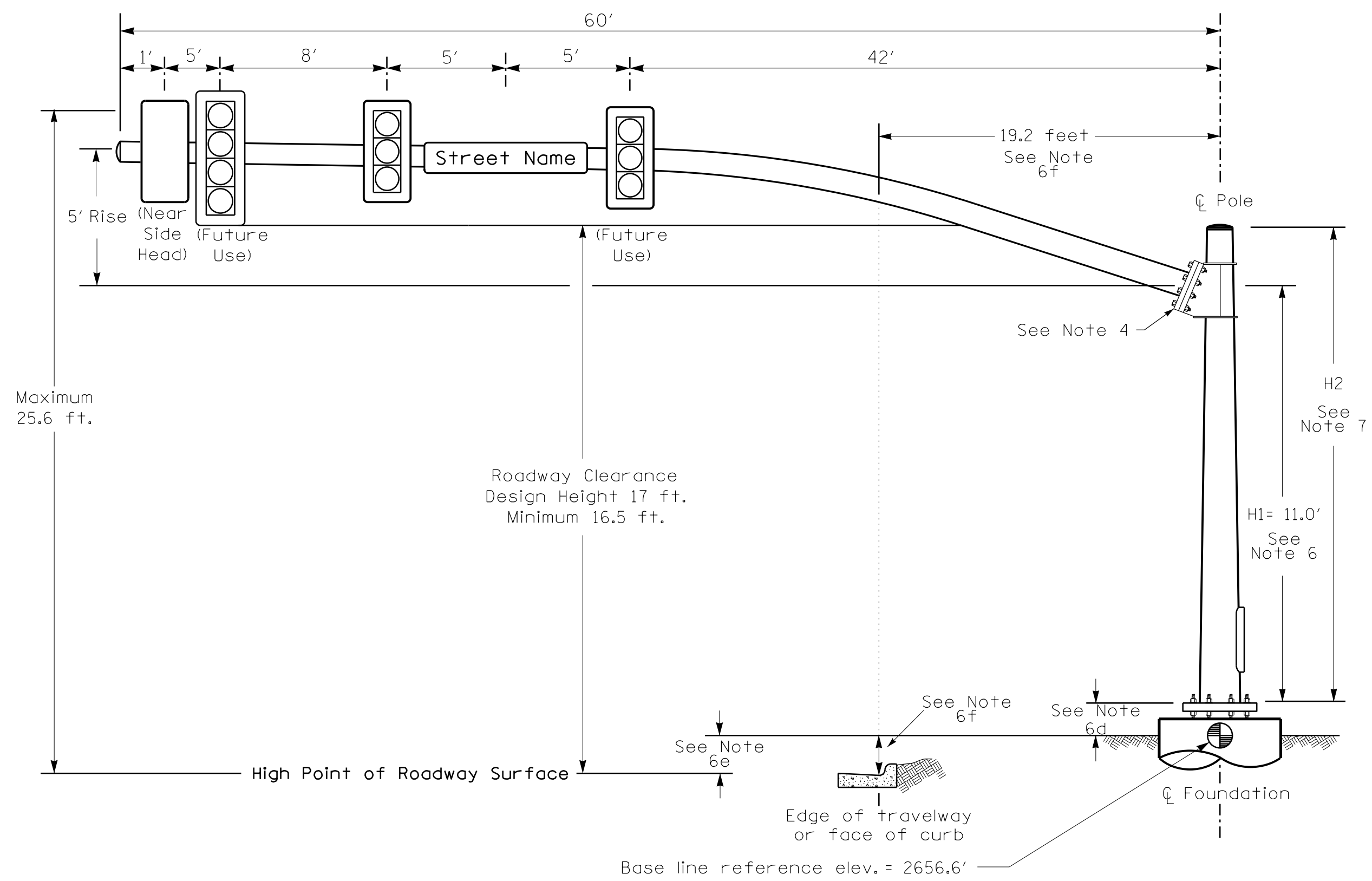
REVISIONS	INIT.	DATE

SEAL

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

SIGNATURE	DATE
William J. Hamilton	04/11/2023
SIG. INVENTORY NO.	14-0417

Design Loading for METAL POLE NO. 1



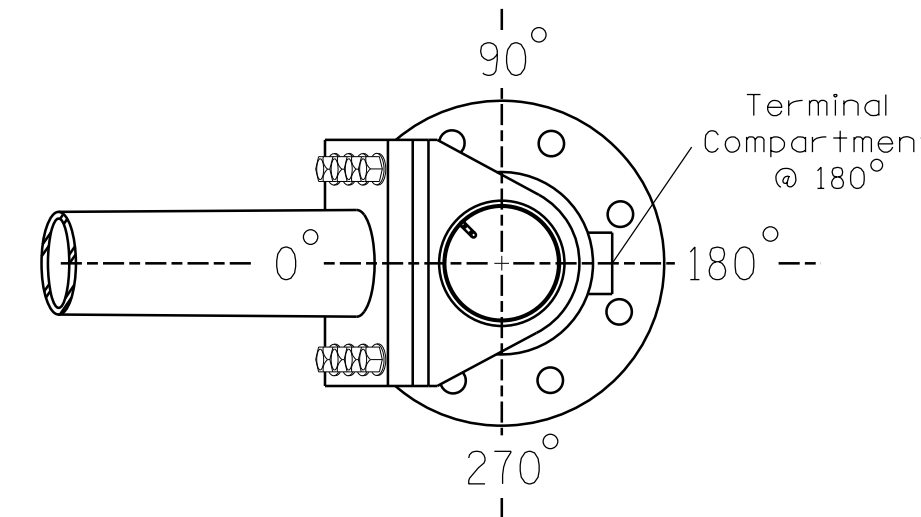
Elevation View

SPECIAL NOTE

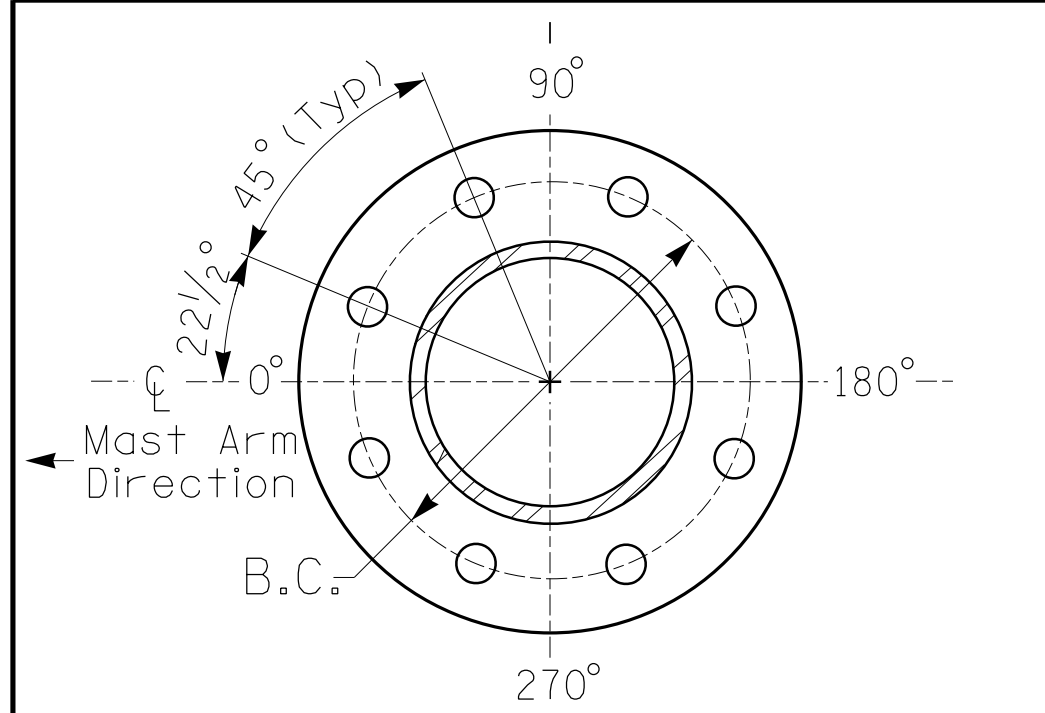
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

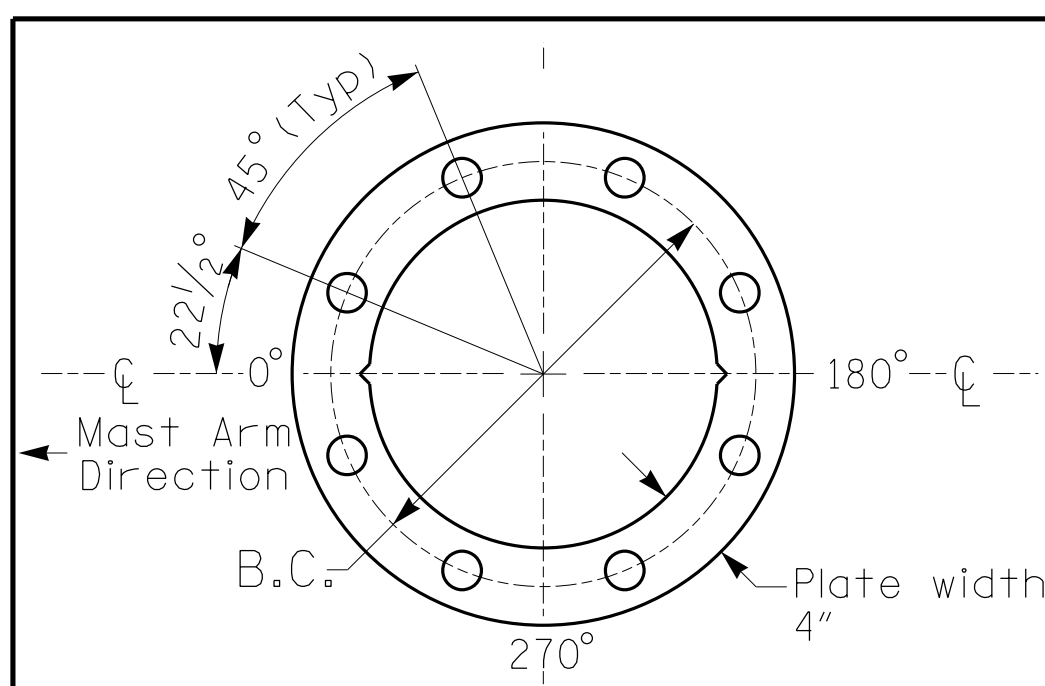
Elevation Differences for:	Pole 1
Baseline reference point at ϕ Foundation @ ground level	2656.6 ft.
Elevation difference at High point of roadway surface	-3.0 ft.
Elevation difference at Edge of travelway or face of curb	-2.9 ft.



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL



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

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
U-5839	Sig 3.8

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

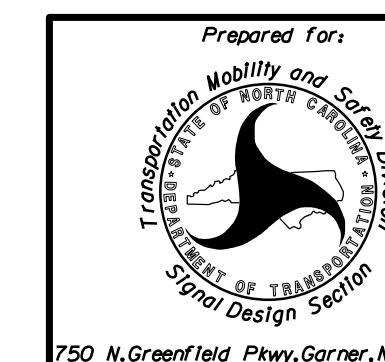
- Design the traffic signal structure and foundation in accordance with:
 - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
 - The 2018 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

- 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.
- All signal supports using stress ratios that do not exceed 0.9.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads are rigidly mounted and vertically centered on the mast arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is 0.75 feet above the ground elevation.
 - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
 - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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.
- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 5 (120 mph)



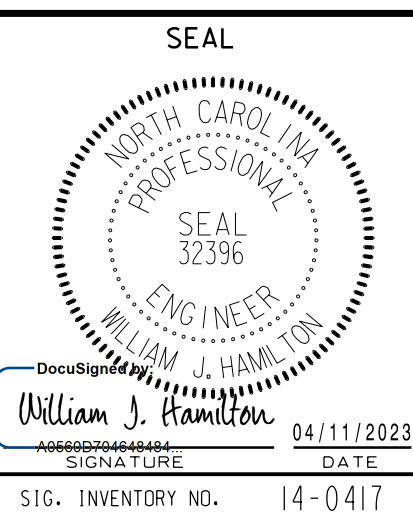
750 N. Greenfield Pkwy, Garner, NC 27529

US 276 (Russ Avenue) at Walnut Street
 Division 14 Haywood County Waynesville
 PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
 PREPARED BY: TS Popelka REVIEWED BY: 16085 (040)

SCALE	N/A
0	N/A
N/A	

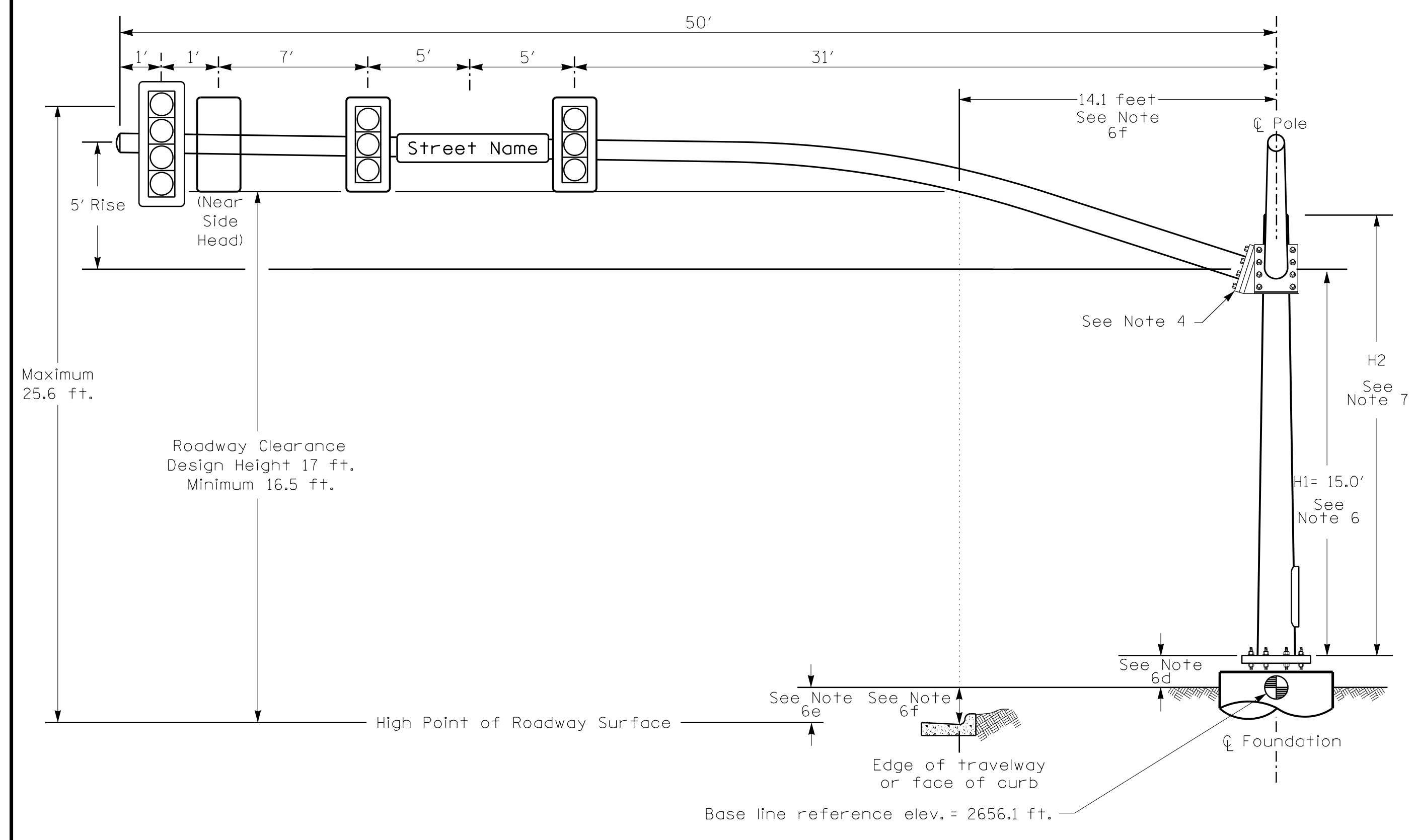
REVISIONS	INIT.	DATE

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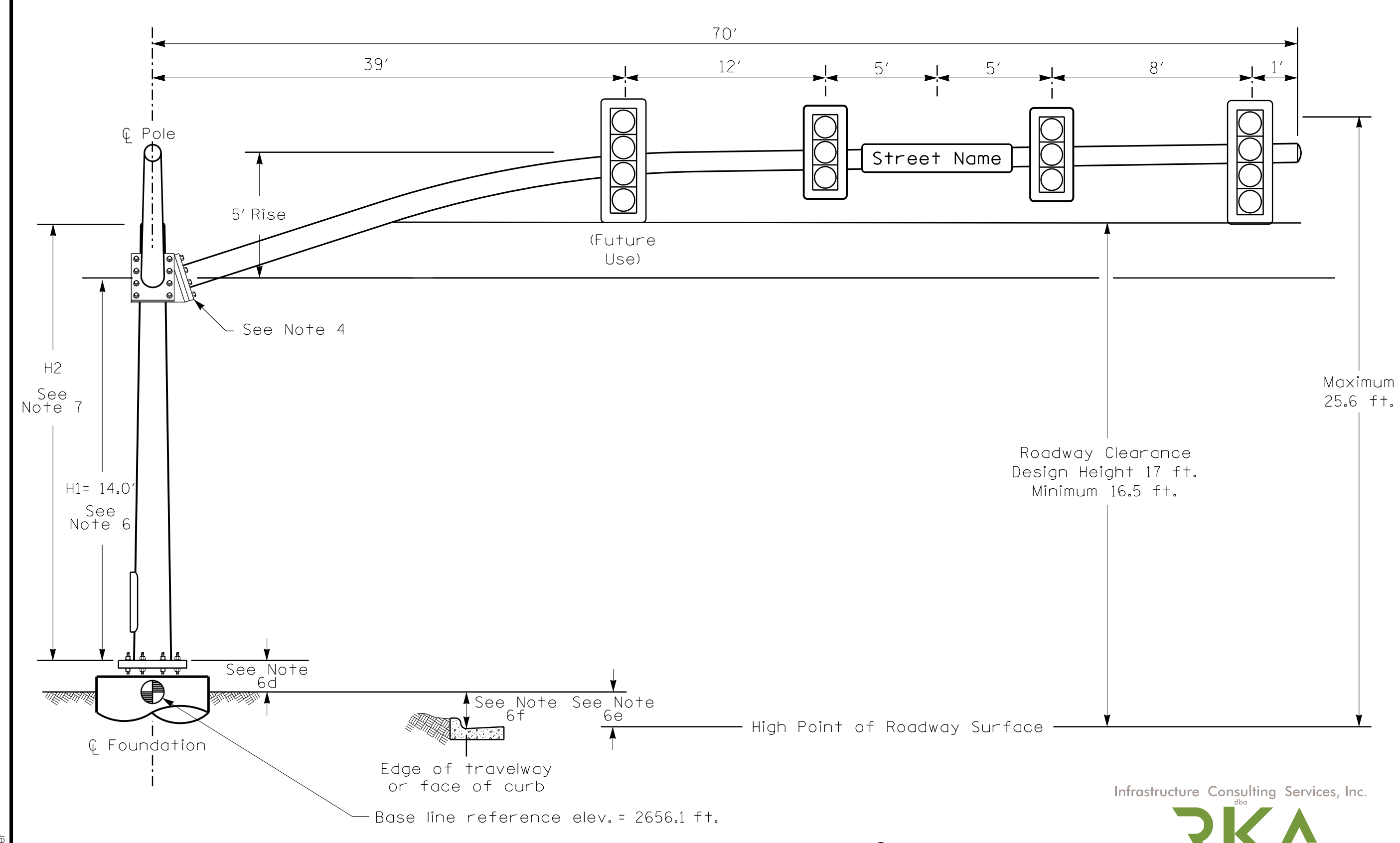
SIGNATURE: William J. Hamilton
 DATE: 04/11/2023
 SIG. INVENTORY NO. 14-0417

Design Loading for METAL POLE NO. 2, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 2, MAST ARM B



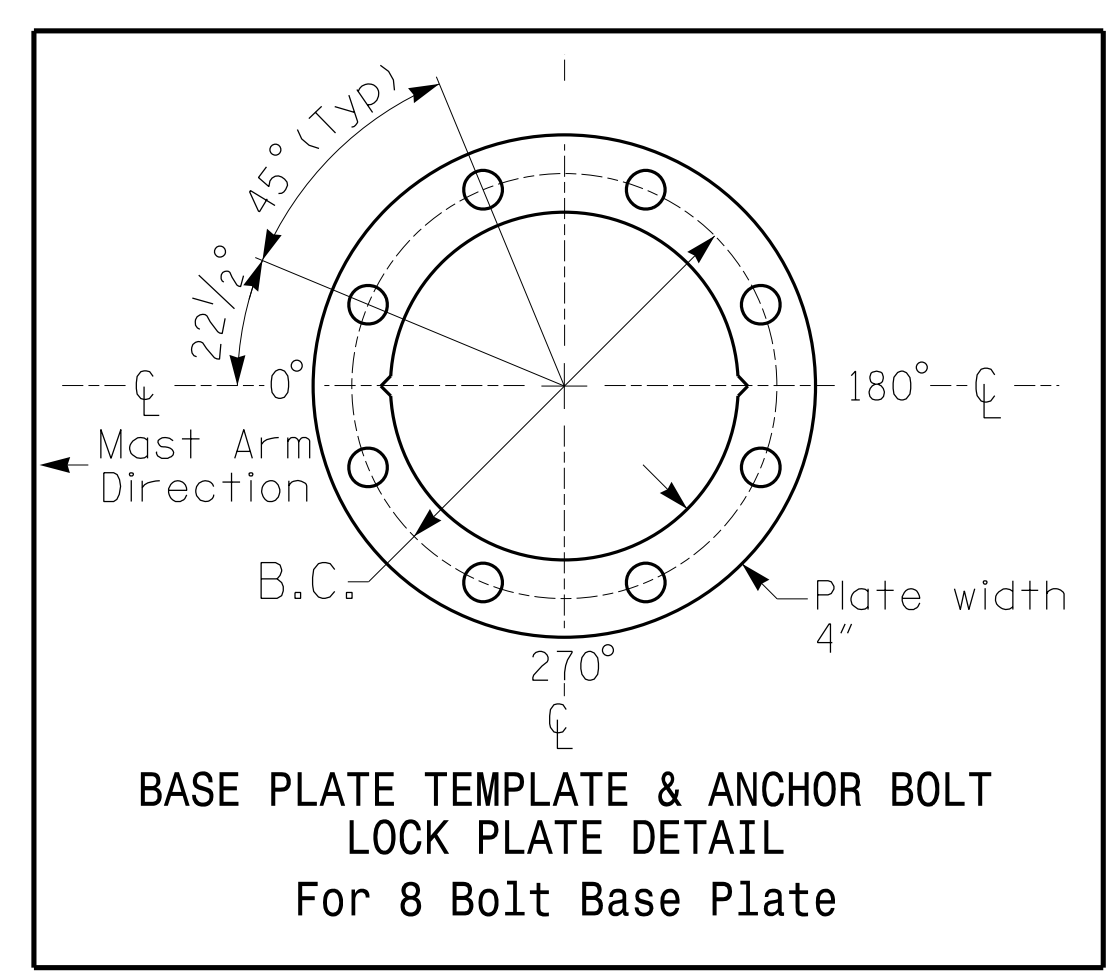
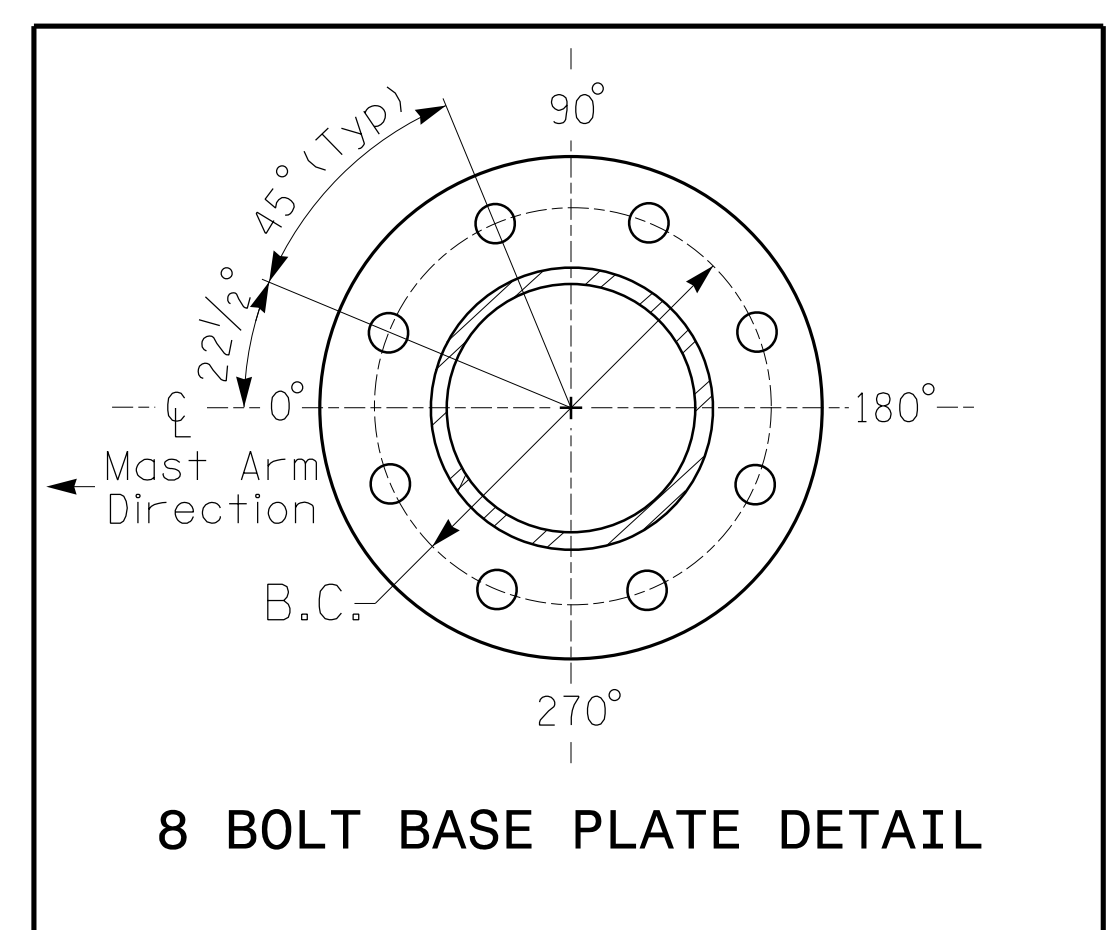
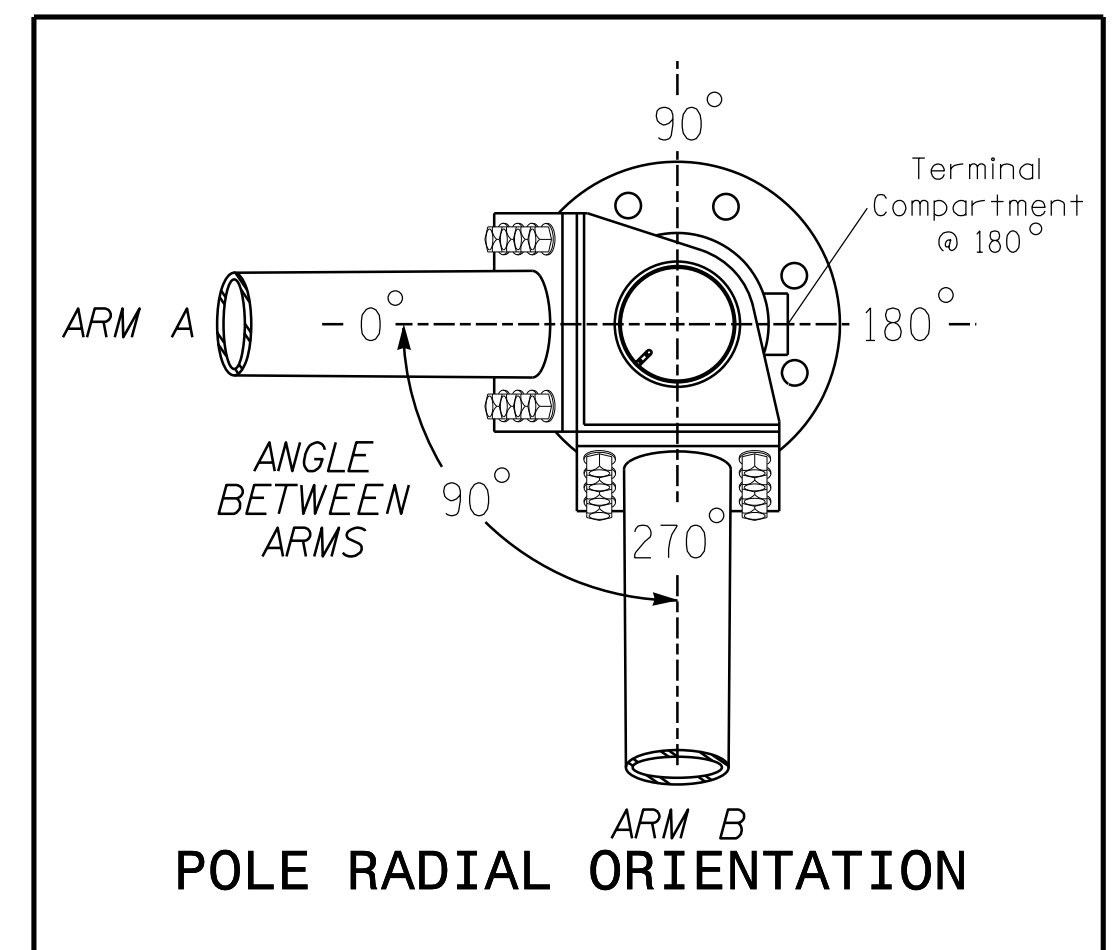
Elevation View @ 0°

SPECIAL NOTE

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

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at \odot Foundation @ ground level	2656.1 ft.	2656.1 ft.
Elevation difference at High point of roadway surface	+1.0 ft.	-0.3 ft.
Elevation difference at Edge of travelway or face of curb	+0.4 ft.	0.0 ft.



MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

- Design the traffic signal structure and foundation in accordance with:
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DESIGN REQUIREMENTS

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
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 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is 0.75 feet above the ground elevation.
 - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
 - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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.
- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 5 (120 mph)

US 276 (Russ Avenue) at Walnut Street

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka REVIEWED BY: 16085 (040)

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

WILLIAM J. HAMILTON

PROFESSIONAL ENGINEER

STATE OF NORTH CAROLINA

SEAL 32396

DATE: 04/11/2023

SIGNATURE

SIG. INVENTORY NO. 14-0417

4/10/2023
 10:41:17 AM
 User: saw11.dbr

PHASING DIAGRAM

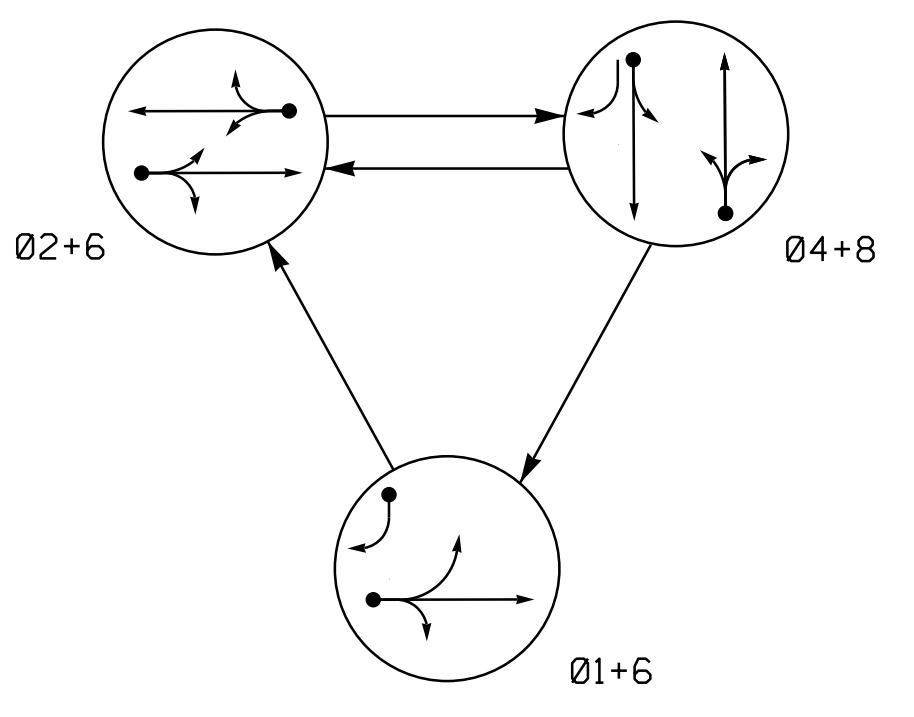
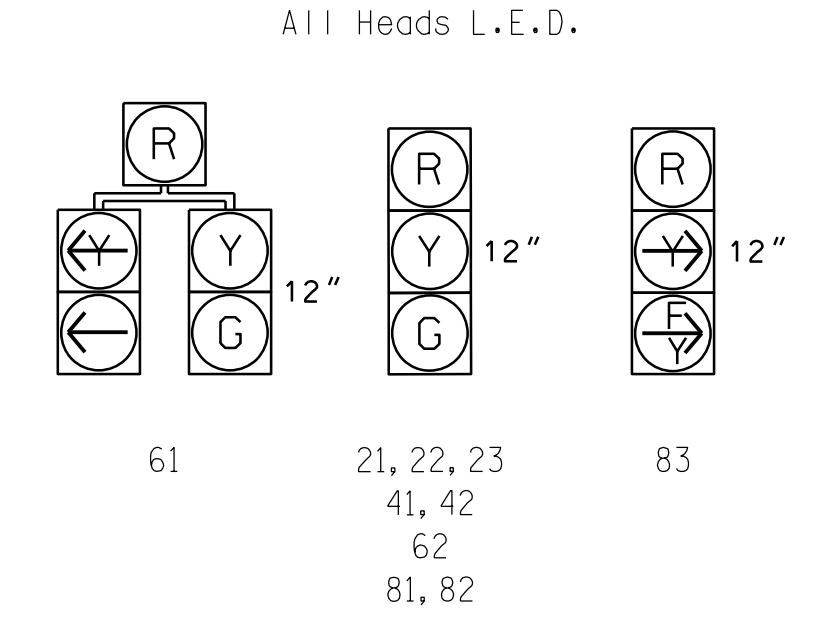


TABLE OF OPERATION

SIGNAL FACE	PHASE			
	01+6	02+6	04+8	FLASH
21, 22, 23	R	G	R	Y
41, 42	R	R	G	R
61	G	G	R	Y
62	G	G	R	Y
81, 82	R	R	G	R
83	R	R	E	R

SIGNAL FACE I.D.



MAXTIME DETECTOR INSTALLATION CHART

ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND INITIAL	CALL	DELAY DURING GREEN	NEW CARD	
1A	6X40	0	*	*	1	15	-	X	-	X	-	*
1B	6X40	0	*	*	6	3	-	X	-	X	X	*
2A	6X6	70	*	*	2	-	-	X	-	X	-	*
4A	6X40	0	*	*	4	10	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	*	*	8	3	-	X	-	X	-	*

* Multizone Microwave Detection

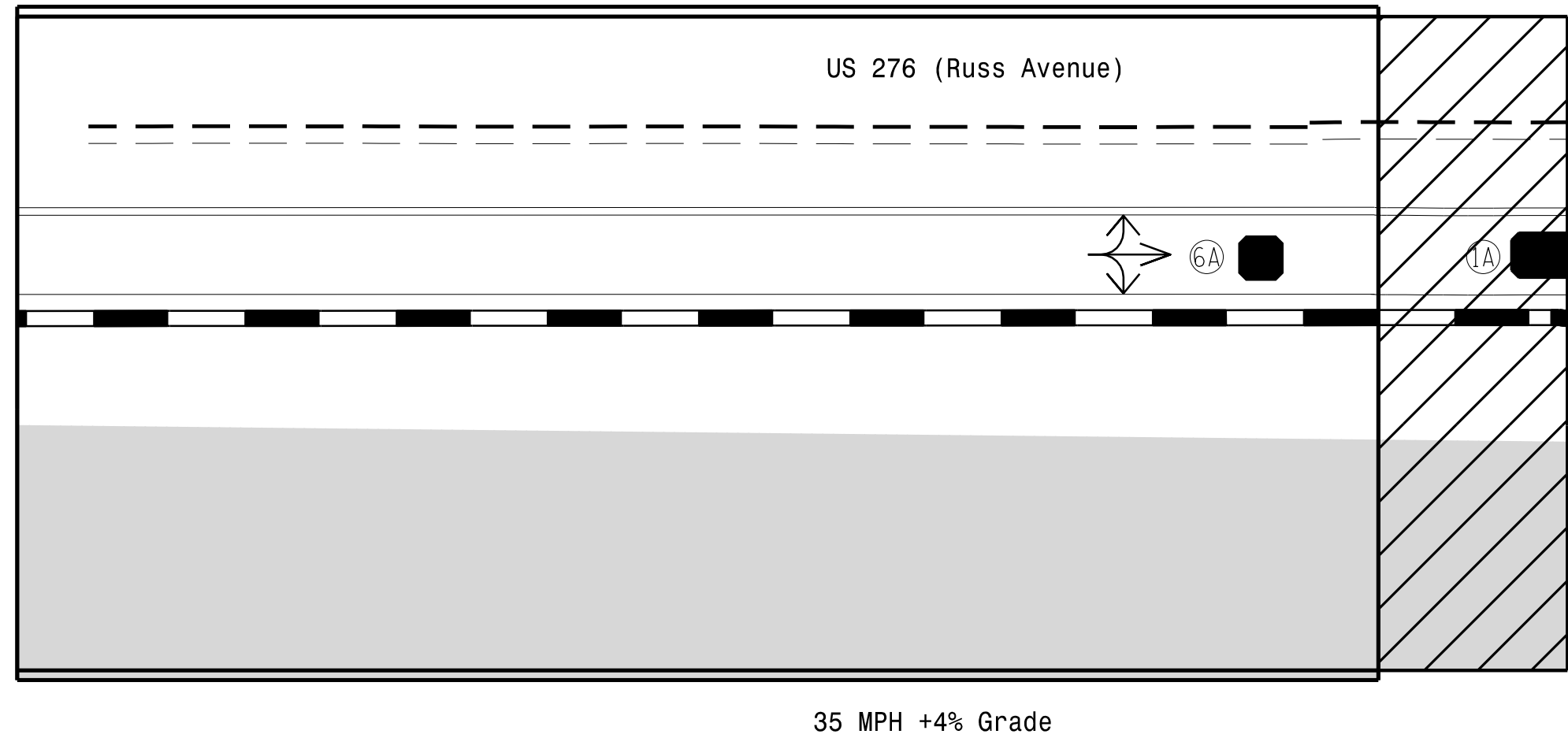
3 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Enable Backup Protect for phase 6 to allow the controller to clear from phase 2+6 to phase 1+6 by progressing through an all red display.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection utilizes multi-zone microwave 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.

PHASING DIAGRAM DETECTION LEGEND

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



Maintain access as directed by engineer during construction.

MAXTIME TIMING CHART

FEATURE	PHASE				
	1	2	4	6	8
Walk *	-	-	-	-	-
Ped Clear *	-	-	-	-	-
Min Green	7	10	7	10	7
Passage *	2.0	3.0	2.0	3.0	2.0
Max I *	15	45	25	45	25
Yellow Change	4.2	4.2	3.2	4.2	3.0
Red Clear	1.1	1.1	1.2	1.1	1.6
Red Revert	2.0	2.0	2.0	5.0	2.0
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Advance Walk	-	-	-	-	-
Non Lock Detector	X	-	X	-	X
Vehicle Recall	-	MIN RECALL	-	MIN RECALL	-
Dual Entry	-	-	X	-	X

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

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 |
| ○ → Microwave Detection Zone | ○ → N/A |
| ○ → Construction Zone | ○ → N/A |
| ○ → Construction Barrier | ○ → N/A |
| ○ → Construction Zone Drums | ○ → N/A |

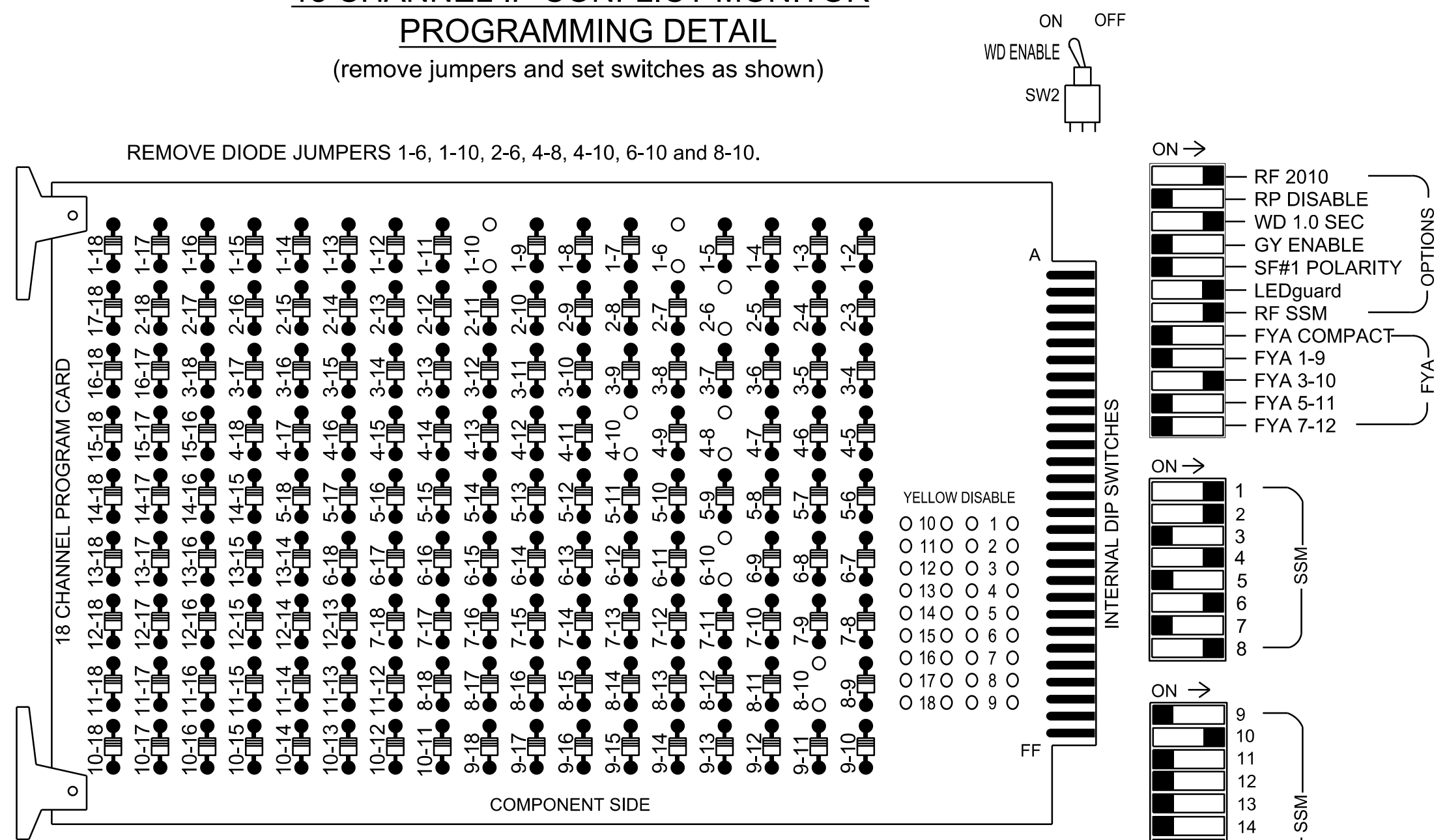
Signal Upgrade Temporary Design 1 - (TMP Phase I)

	<p>US 276 (Russ Avenue) at West Marshall Street / Bank Drive</p>		
	<p>Division 14 Haywood County Wayneville</p>	<p>PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton</p>	
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>SCALE: 0" = 20'</p>	<p>REVISIONS</p>	<p>INIT. DATE</p>
<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p>			<p>Signature: William J. Hamilton DATE: 04/11/2023 SIG. INVENTORY NO. 14-068511</p>

4/12/2023
 User: j.wend
 ...*068511...s:\p_dsn_2020mcd.dgn

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
- Program phases 4 and 8 for Dual Entry.
- Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
- The cabinet and controller are part of the D14-12 Waynesville 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, S5, S8, S11, AUX S2
 Phases Used.....1, 2, 4, 6, 8
 Overlap "1".....NOT USED
 Overlap "2".....*
 Overlap "3".....NOT USED
 Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

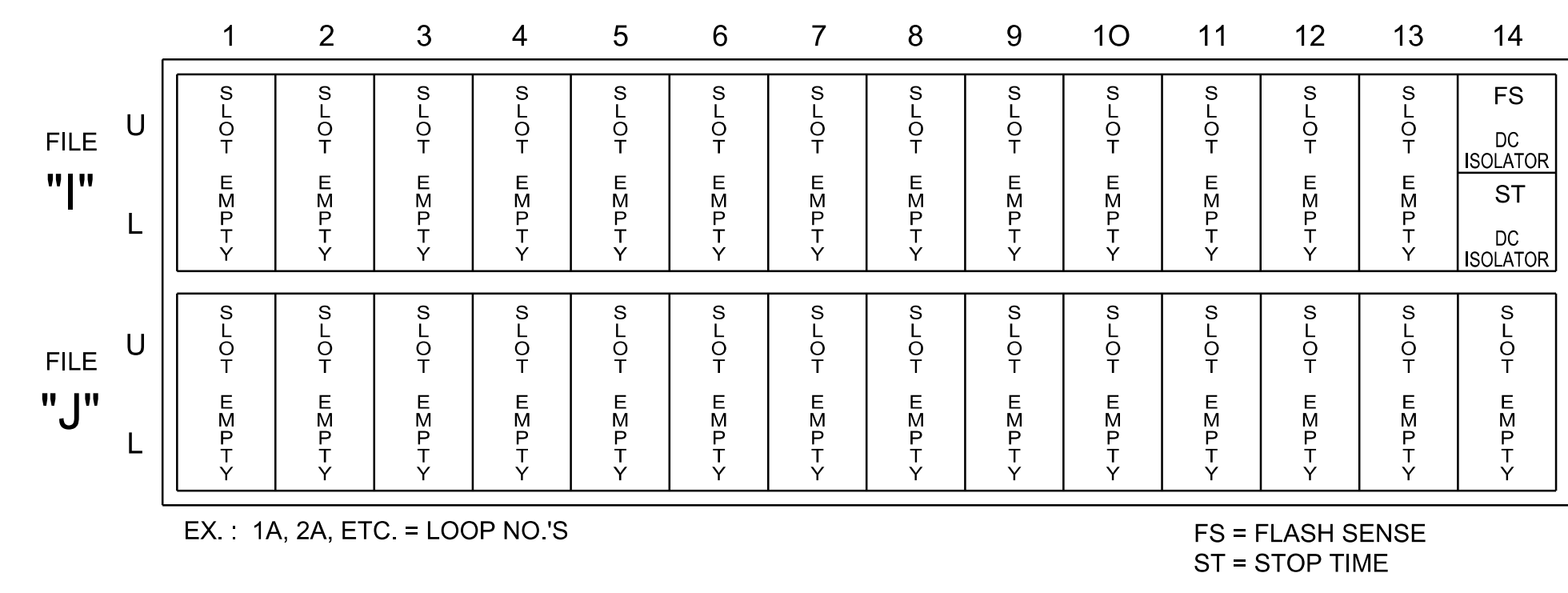
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	61	21,22,23	NU	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU	NU	83	NU	NU	NU	NU
RED	*	128			101			134			107			A124				
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW																		
YELLOW ARROW	126													A125				
FLASHING YELLOW ARROW														A126				
GREEN ARROW	127																	

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

INPUT FILE POSITION LAYOUT

(front view)

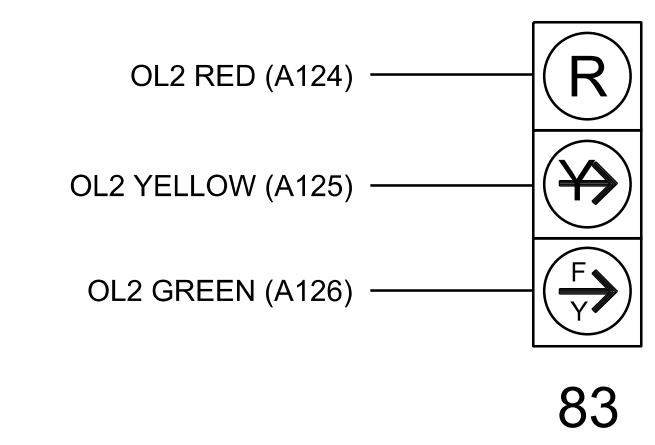


SPECIAL DETECTOR NOTE

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

FYA SIGNAL WIRING DETAIL

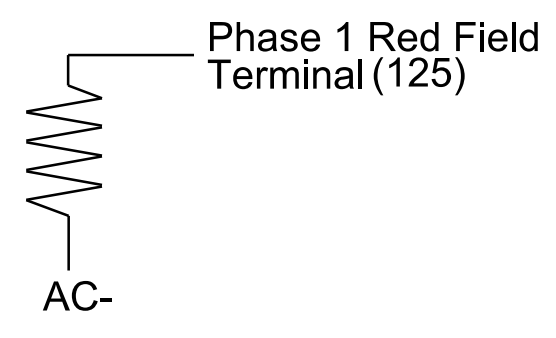
(wire signal head as shown)



LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)

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



Electrical Detail - Sheet 1 of 2
 Temporary Design 1 (TMP Phase I)



Prepared for:
 US 276 (Russ Avenue)
 at
 West Marshall Street / Bank Drive
 Division 14 Haywood County Waynesville

PLAN DATE: April 2023	REVIEWED BY: WJ Hamilton
PREPARED BY: TS Popelka	RKA PROJ. NO: 16085 (040)
REVISIONS	INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 32396
 WILLIAM J. HAMILTON
 Signature: William J. Hamilton
 DATE: 04/11/2023
 SIG. INVENTORY NO. 14-0685T1

BACKUP PREVENTION PROGRAMMING

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

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

Sequence 1

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

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.

OVERLAP PROGRAMMING

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

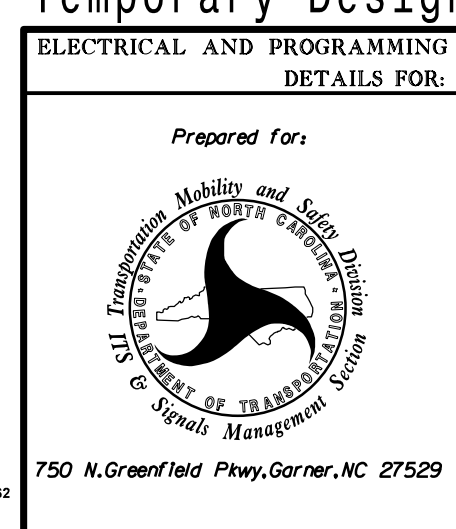
Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	2
Type	FYA 4 - Section
Included Phases	1,8
Modifier Phases	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 14-0685T1
DESIGNED: Apr 2023
SEALED: 04/11/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 1 (TMP Phase I)



ELECTRICAL AND PROGRAMMING DETAILS FOR:		US 276 (Russ Avenue) at West Marshall Street / Bank Drive	
Division 14		Haywood County Waynesville	
PLAN DATE:	April 2023	REVIEWED BY:	WJ Hamilton
PREPARED BY:	TS Popelka	RKA PROJ. NO.:	16085 (040)
REVISIONS	INIT.	DATE	

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

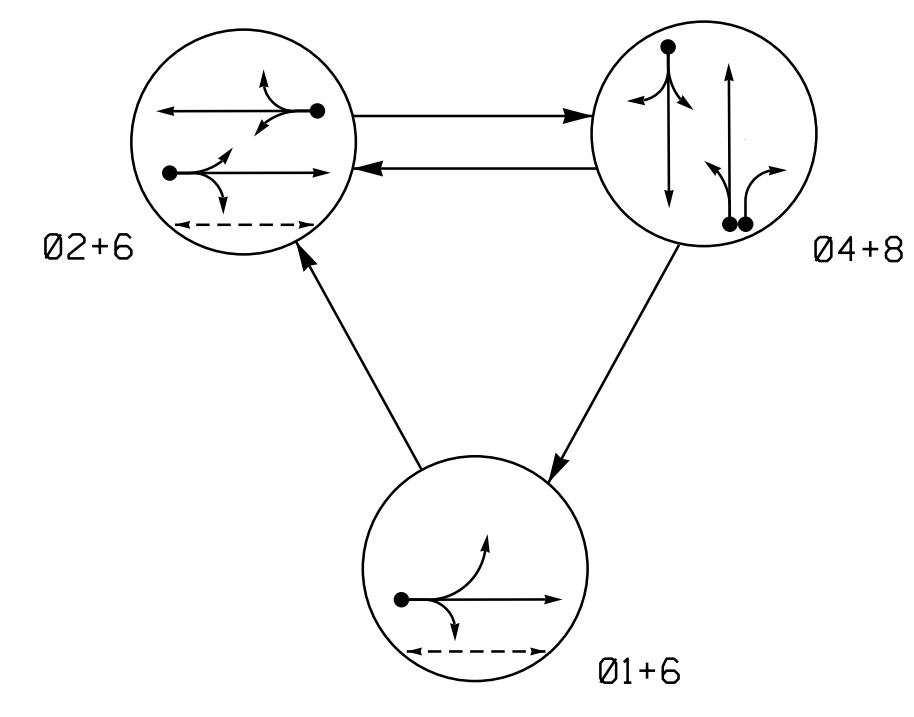
SEAL

SEAL
32396
ENGINEER
WILLIAM J. HAMILTON

DocuSign
Signature
04/11/2023
DATE

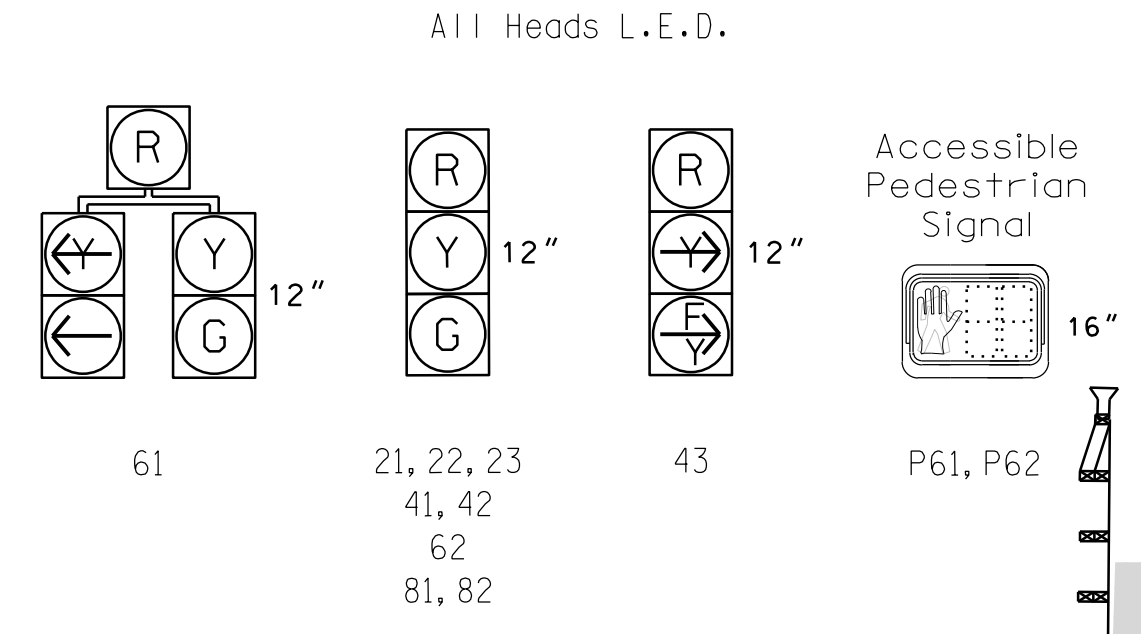
SIG. INVENTORY NO. 14-0685T1

PHASING DIAGRAM



SIGNAL FACE	PHASE			
	01+6	02+6	04+8	FL
21, 22, 23	R	G	R	Y
41, 42	R	R	G	R
43	R	R	E	R
61	G	G	R	Y
62	G	G	R	Y
81, 82	R	R	G	R
P61, P62	W	W	DW	DRK

SIGNAL FACE I.D.



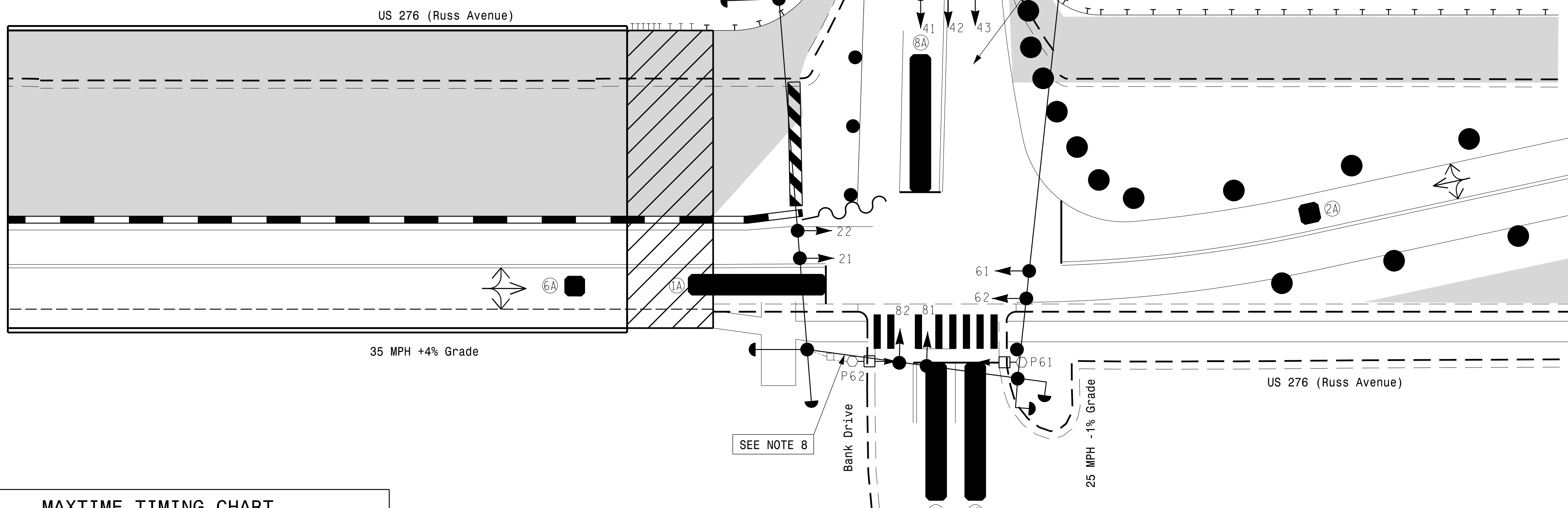
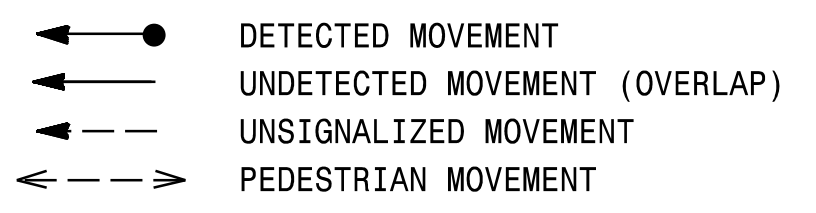
MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR				PROGRAMMING							
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD
1A	6X40	0	*	*	1	15	-	X	-	X	*
					6	3	-	X	-	X	*
2A	6X6	70	*	*	2	-	-	X	-	X	*
4A	6X40	0	*	*	4	3	-	X	-	X	*
4B	6X40	0	*	*	4	15	-	X	-	X	*
6A	6X6	70	*	*	6	-	-	X	-	X	*
8A	6X40	0	*	*	8	10	-	X	-	X	*

3 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Enable Backup Protect for phase 6 to allow the controller to clear from phase 2+6 to phase 1+6 by progressing through an all red display.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- Reposition signal heads 21, 22, 41, 42, 61, 62, 81, and 82.
- Contractor shall disconnect and bag head 83 during this temporary signal design phase.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection utilizes multi-zone microwave 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.
- Closed loop system data: Controller Asset # 0685.

PHASING DIAGRAM DETECTION LEGEND



MAXTIME TIMING CHART

FEATURE	PHASE				
	1	2	4	6	8
Walk *	-	-	-	7	-
Ped Clear *	-	-	-	8	-
Min Green	7	10	7	10	7
Passage *	2.0	3.0	2.0	3.0	2.0
Max 1 *	15	45	25	45	25
Yellow Change	4.2	4.2	3.2	4.2	3.0
Red Clear	1.1	1.1	1.3	1.1	1.4
Red Revert	2.0	2.0	2.0	5.0	2.0
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Advance Walk	-	-	-	-	-
Non Lock Detector	X	-	X	-	X
Vehicle Recall	-	MIN RECALL	-	MIN RECALL	-
Dual Entry	-	-	X	-	X

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

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE TONES	INTERVAL	SPEECH MESSAGE
P61	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Bank.
P62	- X	Walk	(Percussive Tone)
	X -	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Bank.

PROPOSED	LEGEND	EXISTING
	Traffic Signal Head	
	Modified Signal Head	
	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	
	Microwave Detection Zone	N/A
	Construction Zone	N/A
	Construction Zone Drums	N/A
	Type III Barricade	N/A
	Type II Signal Pedestal	

Signal Upgrade Temporary Design 2 - (TMP Phase II)

Infrastructure Consulting Services, Inc.

750 N. Greenfield Pkwy, Garner, NC 27529

US 276 (Russ Avenue) at West Marshall Street / Bank Drive

Division 14 Haywood County Wayneville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka RKA PROJ. NO.: 16085 (040)

SEAL

William J. Hamilton 04/11/2023

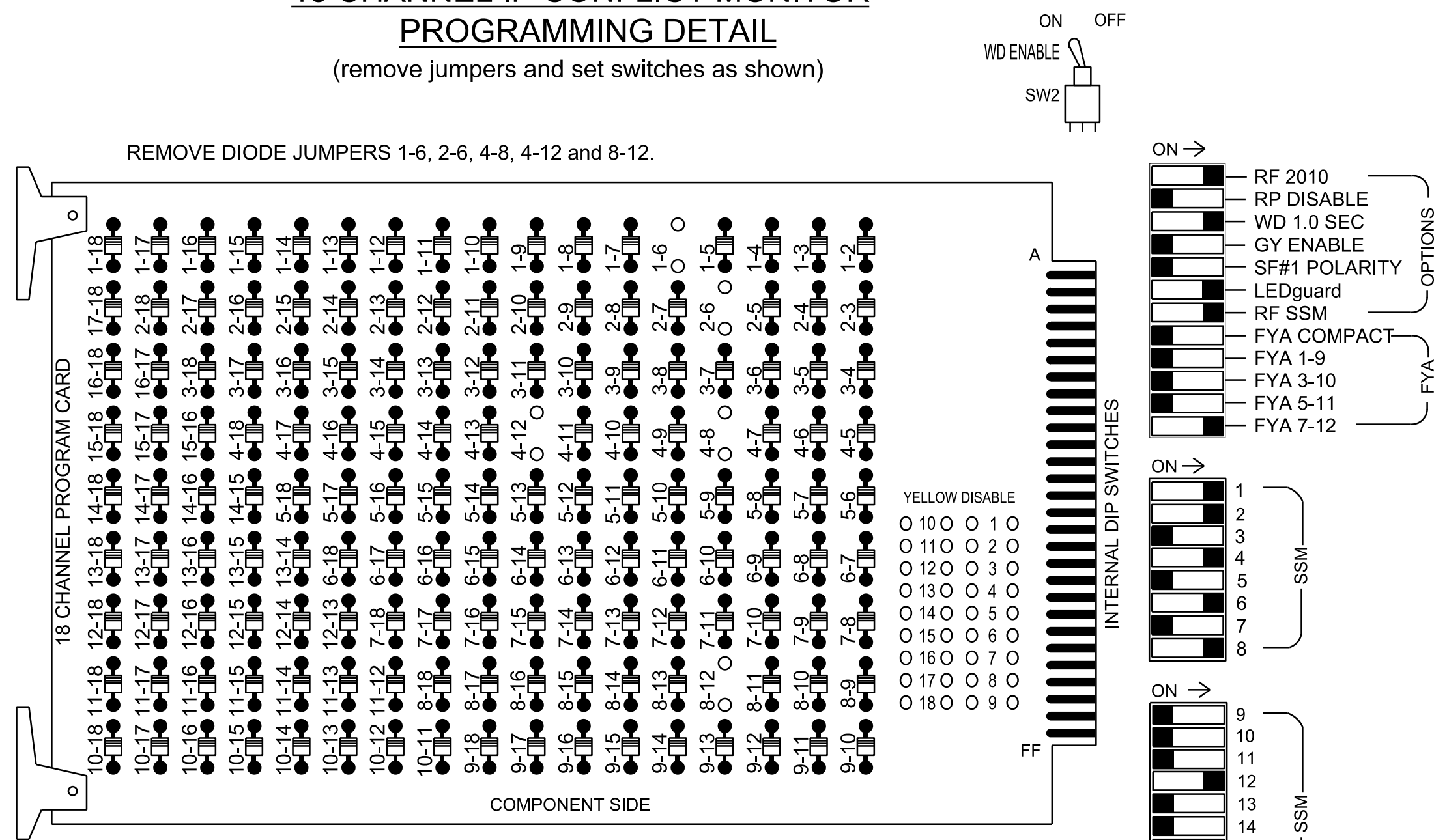
REVISIONS	INIT.	DATE

SCALE: 0 20 1"=20'

4/10/2023 4:06:51 PM User: saw11dbr

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
- Program phases 4 and 8 for Dual Entry.
- Program controller to start up in phase 2 Green No Walk and 6 Green 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 D14-12 Waynesville 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, S5, S8, S9, S11, AUX S5
 Phases Used.....1, 2, 4, 6, 6PED, 8
 Overlap "1".....NOT USED
 Overlap "2".....NOT USED
 Overlap "3".....NOT USED
 Overlap "4".....*

*See overlap programming detail on sheet 2

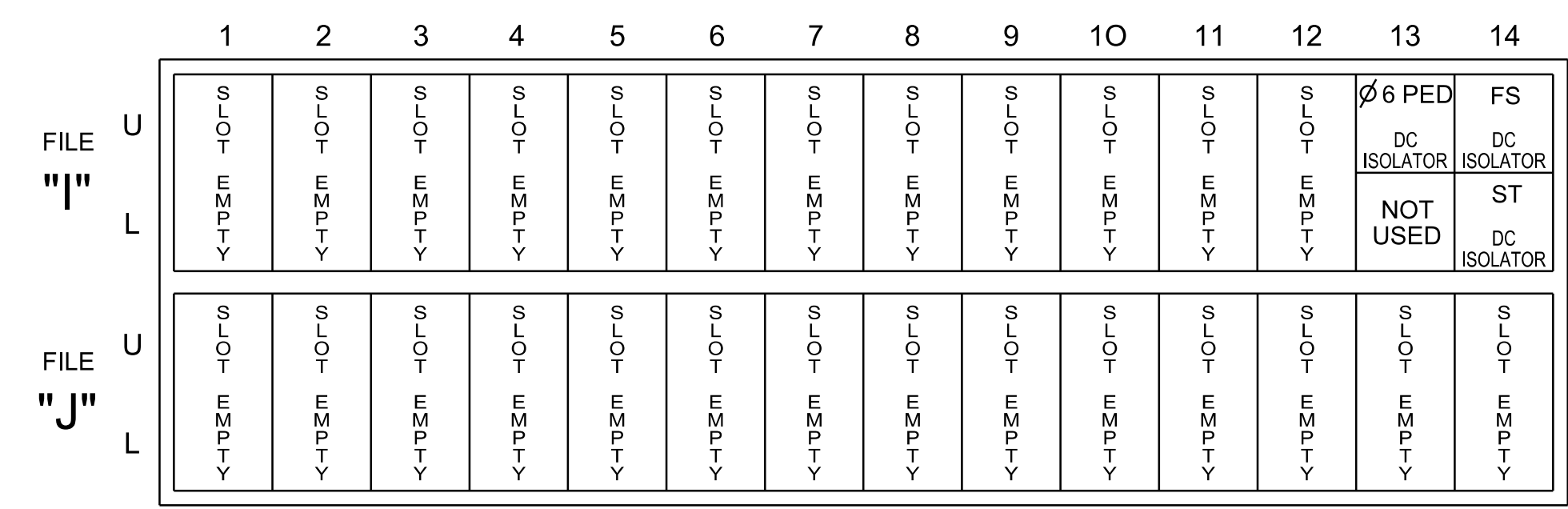
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	61	21,22,23	NU	NU	41,42	NU	NU	61,62	P61, P62	NU	81,82	NU	NU	NU	NU	NU	43	NU
RED	*	128			101			134			107							A101
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW																		
YELLOW ARROW		126																A102
FLASHING YELLOW ARROW																		A103
GREEN ARROW		127																
Hand										119								
Walker										121								

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

INPUT FILE POSITION LAYOUT

(front view)



EX : 1A, 2A, ETC. = LOOP NO.'S
 FS = FLASH SENSE
 ST = STOP TIME

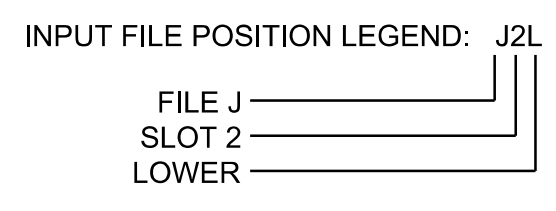
SPECIAL DETECTOR NOTE

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

INPUT FILE CONNECTION & PROGRAMMING CHART

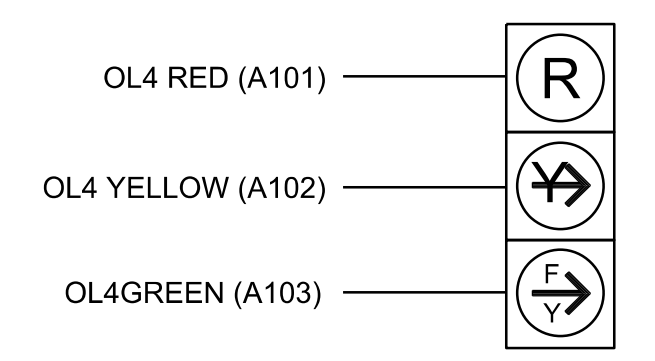
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
PED PUSH BUTTONS												
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

NOTE:
 INSTALL DC ISOLATOR IN INPUT FILE SLOT I13.



FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



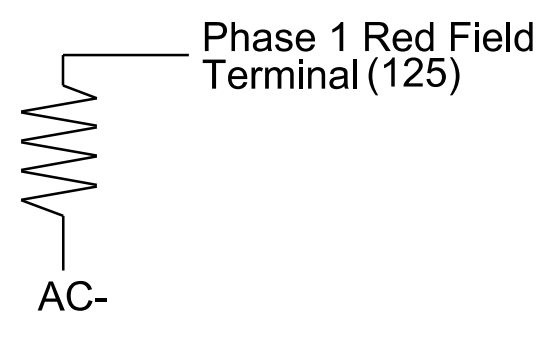
43

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0685T2
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

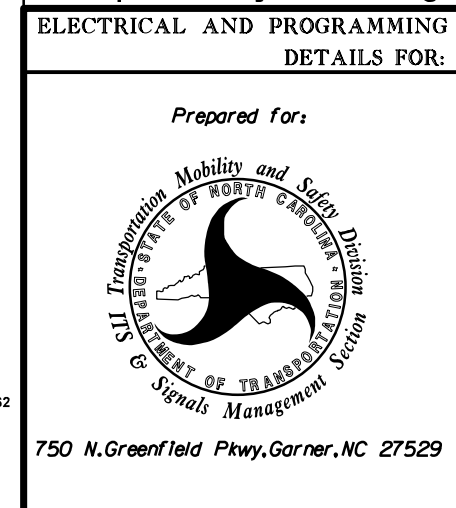
LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)

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



Electrical Detail - Sheet 1 of 2
 Temporary Design 2 (TMP Phase II)



US 276 (Russ Avenue) at West Marshall Street / Bank Drive
 Division 14 Haywood County Waynesville

PLAN DATE: April 2023	REVIEWED BY: WJ Hamilton
PREPARED BY: TS Popelka	RKA PROJ. NO: 16085 (040)
REVISIONS	INIT. DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL	04/11/2023
SIGNATURE	DATE
SIG. INVENTORY NO.	14-0685T2

BACKUP PREVENTION PROGRAMMING

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

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

Sequence 1

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

OVERLAP PROGRAMMING

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

Web Interface
Home > Controller > Overlap Configuration > Overlaps

Overlap Plan 1

Overlap	2	4
Type	Off	FYA 4 - Section
Included Phases	-	4
Modifier Phases	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

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.

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

1. Install push buttons and APS equipment per manufacturer's instructions.
2. Provide a dedicated cable to each push button per manufacturer's instructions.
3. If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
4. Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
5. Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

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: 14-0685T2
DESIGNED: Apr 2023
SEALED: 04/11/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Temporary Design 2 (TMP Phase II)

<p style="font-size: small;">ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p style="text-align: center;">Prepared for:</p>	<p>US 276 (Russ Avenue) at West Marshall Street / Bank Drive</p> <p>Division 14 Haywood County Waynesville</p> <p>PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton</p> <p>PREPARED BY: TS Popelka RKA PROJ. NO: 16085 (040)</p> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>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> </tbody> </table>	REVISIONS	INIT.	DATE										<p style="font-size: x-small; text-align: center;">DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p> <p style="text-align: center;">SEAL</p> <p style="font-size: x-small;">SIGNATURE: <i>William J. Hamilton</i> DATE: 04/11/2023</p> <p style="font-size: x-small;">SIG. INVENTORY NO. 14-0685T2</p>
REVISIONS	INIT.	DATE												

PHASING DIAGRAM

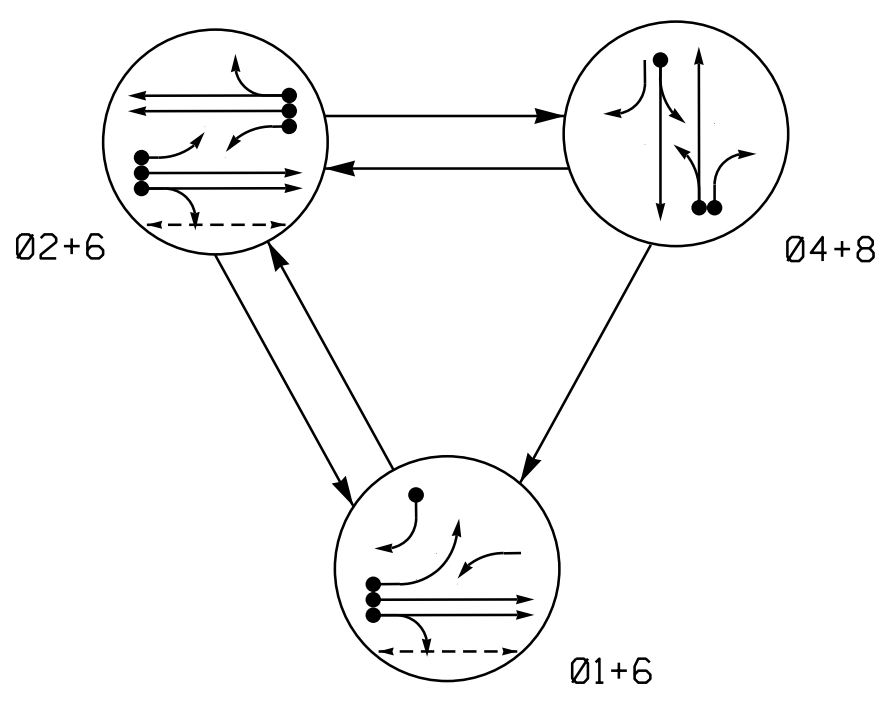
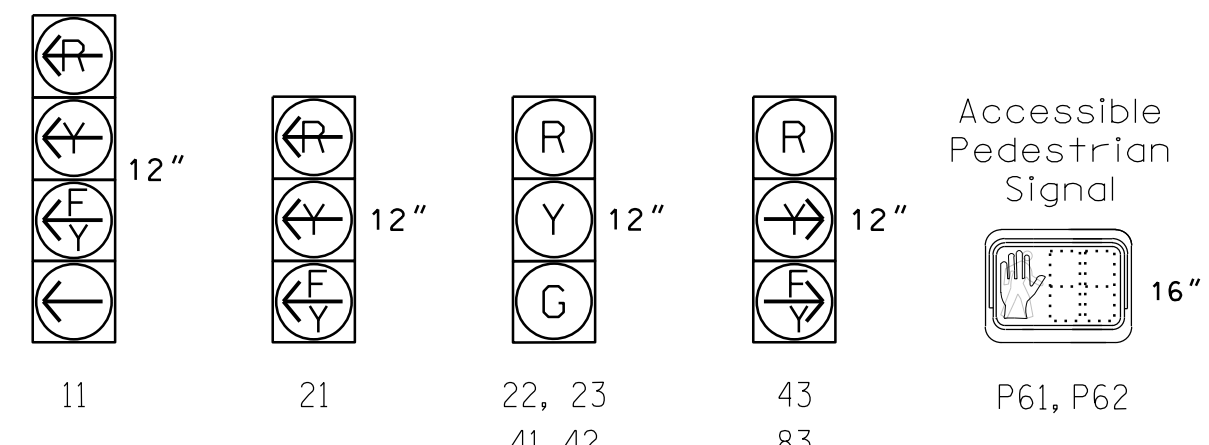


TABLE OF OPERATION

SIGNAL FACE	PHASE			
	01+6	02+6	04+8	FLASH
11	F	R	R	Y
21	F	F	R	Y
22, 23	R	G	R	Y
41, 42	R	R	G	R
43	R	R	F	R
61, 62	G	G	R	Y
81, 82	R	R	G	R
83	F	R	F	R
P61, P62	W	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	NEW CARD	
1A	6X40	0	*	*	1	15	-	X	-	X	-	*
1B	6X40	0	*	*	6	-	-	X	-	X	X	*
2A	6X6	70	*	*	1	15	-	X	-	X	-	*
2B	6X6	70	*	*	2	-	-	X	-	X	-	*
2C	6X40	0	*	*	2	-	-	X	-	X	-	*
4A	6X40	0	*	*	4	3	-	X	-	X	-	*
4B	6X40	0	*	*	4	15	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
6B	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	*	*	8	3	-	X	-	X	-	*

* Multizone Microwave Detection

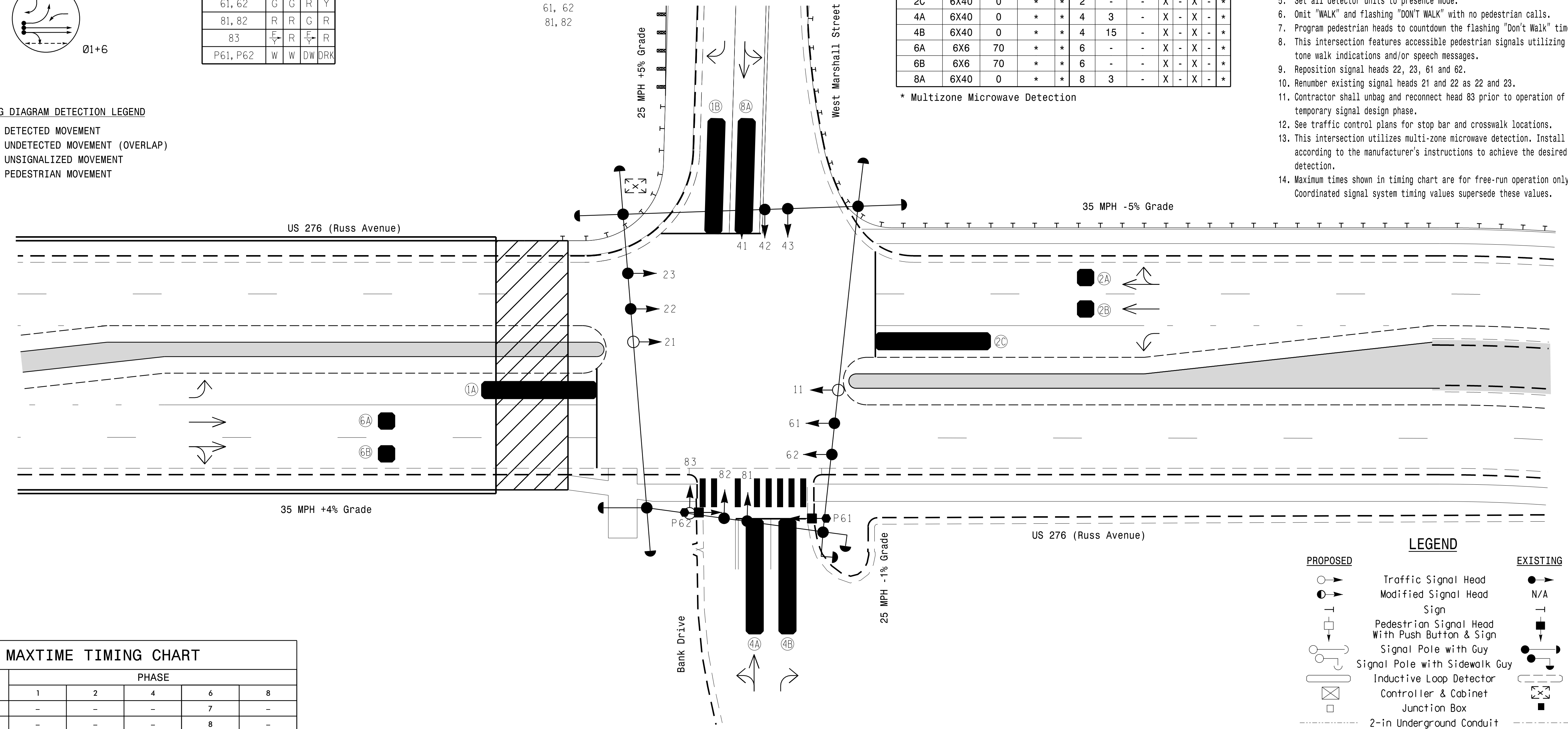
3 Phase Fully Actuated D14-12 Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Disable Backup Protect for phase 6.
- Phase 1 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.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- Reposition signal heads 22, 23, 61 and 62.
- Renumber existing signal heads 21 and 22 as 22 and 23.
- Contractor shall unbag and reconnect head 83 prior to operation of this temporary signal design phase.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection utilizes multi-zone microwave 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.

PHASING DIAGRAM DETECTION LEGEND

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



MAXTIME TIMING CHART

FEATURE	PHASE				
	1	2	4	6	8
Walk *	-	-	-	7	-
Ped Clear *	-	-	-	8	-
Min Green	7	10	7	10	7
Passage *	2.0	3.0	2.0	3.0	2.0
Max 1 *	15	45	25	45	25
Yellow Change	3.0	4.2	3.2	4.2	3.0
Red Clear	2.8	2.2	2.4	2.2	2.5
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Advance Walk	-	-	-	-	-
Non Lock Detector	X	-	X	-	X
Vehicle Recall	-	MIN RECALL	-	MIN RECALL	-
Dual Entry	-	-	X	-	X

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

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE TONES	INTERVAL	SPEECH MESSAGE
P61	- X	Walk	(Percussive Tone)
X	- X	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Bank.
P62	- X	Walk	(Percussive Tone)
X	- X	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Bank.

LEGEND

- PROPOSED**
 - 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
 - Microwave Detection Zone
 - Construction Zone
 - Type II Signal Pedestal
- EXISTING**
 - N/A
 - Signal Pole with Sidewalk Guy
 - Controller & Cabinet
 - Junction Box
 - 2-in Underground Conduit
 - Right of Way
 - Directional Arrow
 - N/A
 - N/A
 - Signal Pole Pedestal

Signal Upgrade Temporary Design 3 - (TMP Phase III)

Infrastructure Consulting Services, Inc.

RAMEY KEMP ASSOCIATES

8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28226
Phone: 704-549-4260 | www.rameykemp.com | NC License No. F-1489

US 276 (Russ Avenue)
at
West Marshall Street / Bank Drive

Division 14 Haywood County Waynesville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton

PREPARED BY: TS Popelka RKA PROJ. NO.: 16085 (040)

REVISIONS	INIT.	DATE

SEAL

William J. Hamilton

DATE: 04/11/2023

SIGNATURE

DATE

SIG. INVENTORY NO. 14-0685T3

OVERLAP PROGRAMMING

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

Web Interface
Home > Controller > Overlap Configuration > Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section
Included Phases	2	1,8	6	4
Modifier Phases	1	-	-	-
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

REMOVE

BACKUP PREVENTION PROGRAMMING

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

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

Sequence 1

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

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

1. Install push buttons and APS equipment per manufacturer's instructions.
2. Provide a dedicated cable to each push button per manufacturer's instructions.
3. If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
4. Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
5. Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

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.

FLASHER CIRCUIT MODIFICATION DETAIL

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


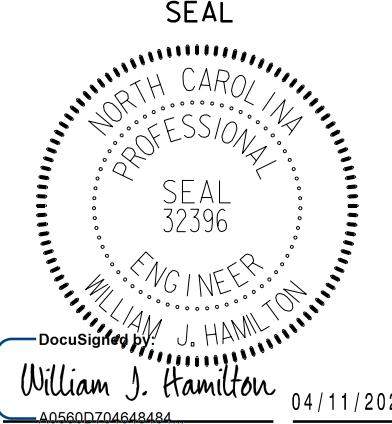
1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0685T3
DESIGNED: Apr 2023
SEALED: 04/11/2023
REVISED: N/A

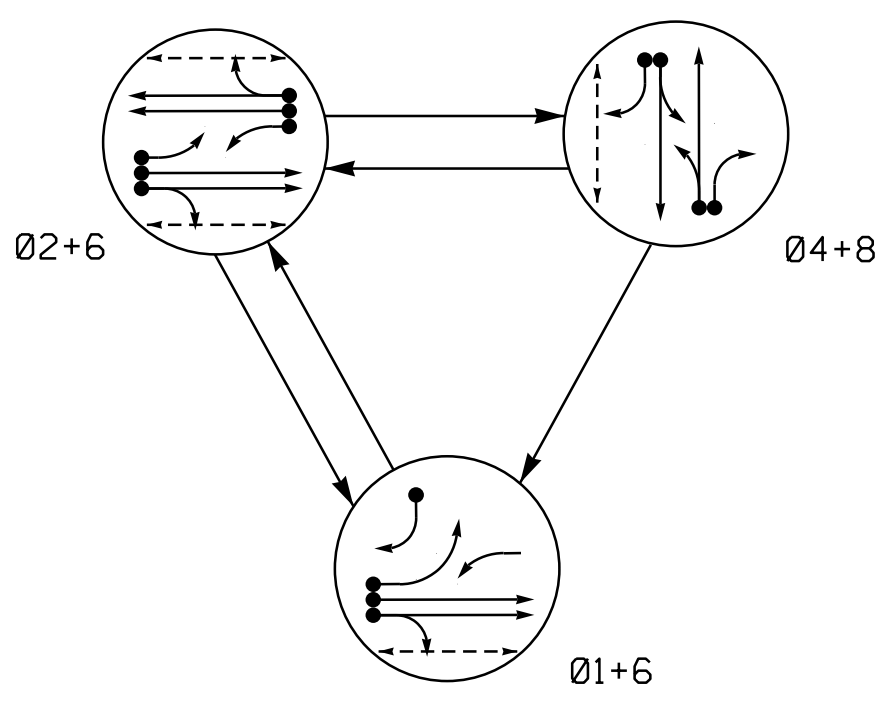
Electrical Detail - Sheet 2 of 2
Temporary Design 3 (TMP Phase III)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared For: 	US 276 (Russ Avenue) at West Marshall Street / Bank Drive Division 14 Haywood County Waynesville		SEAL 
	PLAN DATE: April 2023 PREPARED BY: TS Popelka	REVIEWED BY: WJ Hamilton RKA PROJ. NO: 16085 (040)	

SIG. INVENTORY NO. 14-0685T3

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

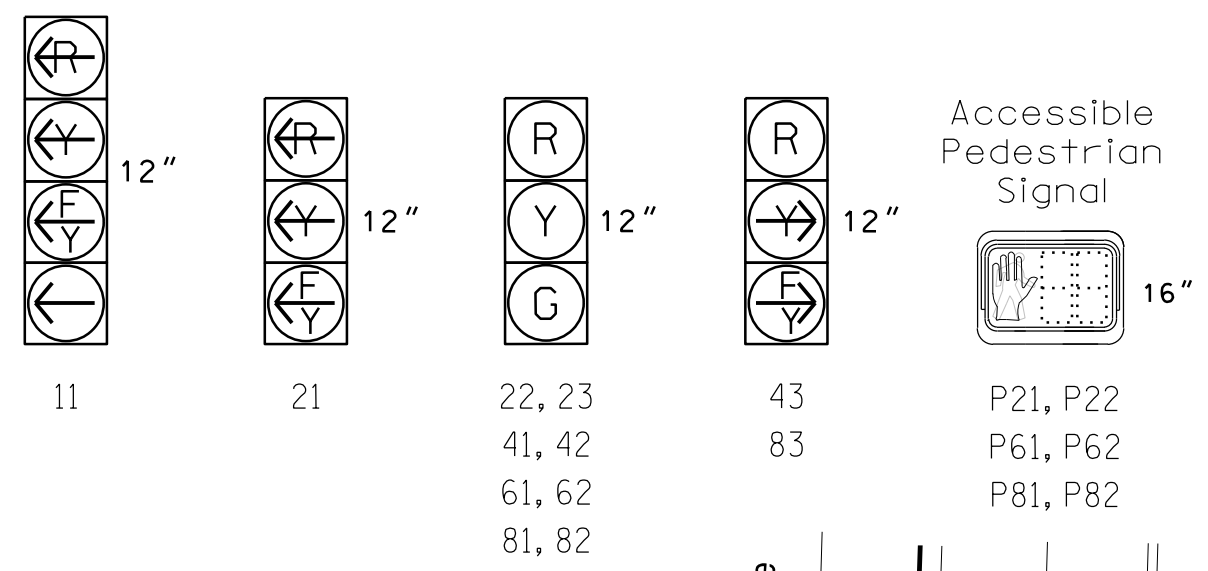
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE			
	01+6	02+6	04+8	FL TOTAL
11	←	→	→	→
21	←	→	→	→
22, 23	R	G	R	Y
41, 42	R	R	G	R
43	←	→	→	→
61, 62	G	G	R	Y
81, 82	R	R	G	R
83	←	→	→	→
P21, P22	DW	W	DW	DRK
P61, P62	W	W	DW	DRK
P81, P82	DW	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



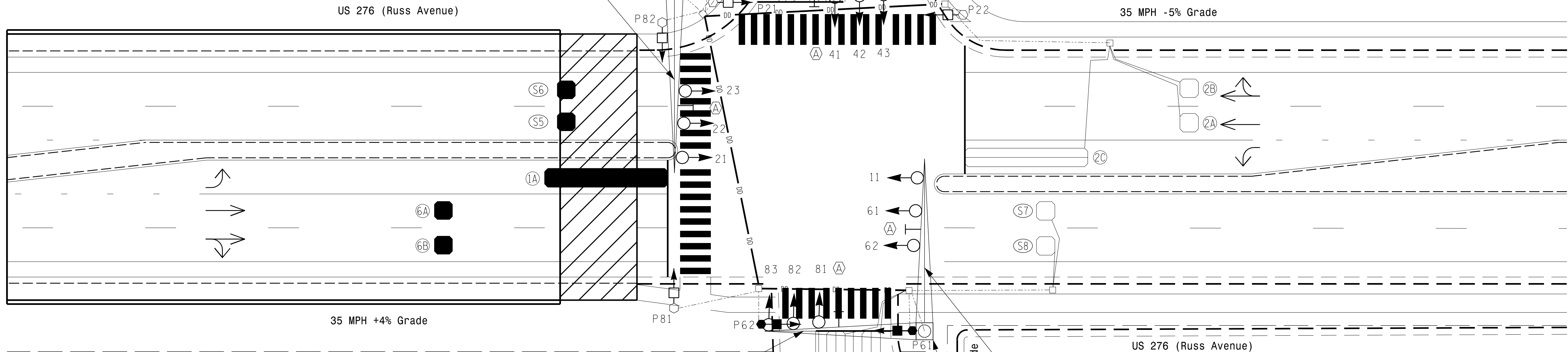
MAXTIME DETECTOR INSTALLATION CHART

LOOP/ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING							
					CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	QUEUE	CALL DURING GREEN	NEW CARD
1A	6X40	0	*	*	1	15	-	X	-	X	-	*
1B	6X40	0	2-4-2	X	1	10	-	X	-	X	-	*
2A	6X6	70	5	X	2	-	-	X	-	X	-	X
2B	6X6	70	5	X	2	-	-	X	-	X	-	X
2C	6X40	0	2-4-2	X	2	-	-	X	-	X	-	X
4A	6X40	0	2-4-2	X	4	3	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	10	-	X	-	X	-	X
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
6B	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	2-4-2	X	8	3	-	X	-	X	-	X
S5	6X6	+120	*	*	-	-	-	-	-	-	-	*
S6	6X6	+120	*	*	-	-	-	-	-	-	-	*
S7	6X6	+120	5	X	-	-	-	-	-	-	-	X
S8	6X6	+120	5	X	-	-	-	-	-	-	-	X

3 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 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.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- See pavement marking plans for stop bar and crosswalk locations.
- This intersection uses multizone microwave 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 TIMING CHART

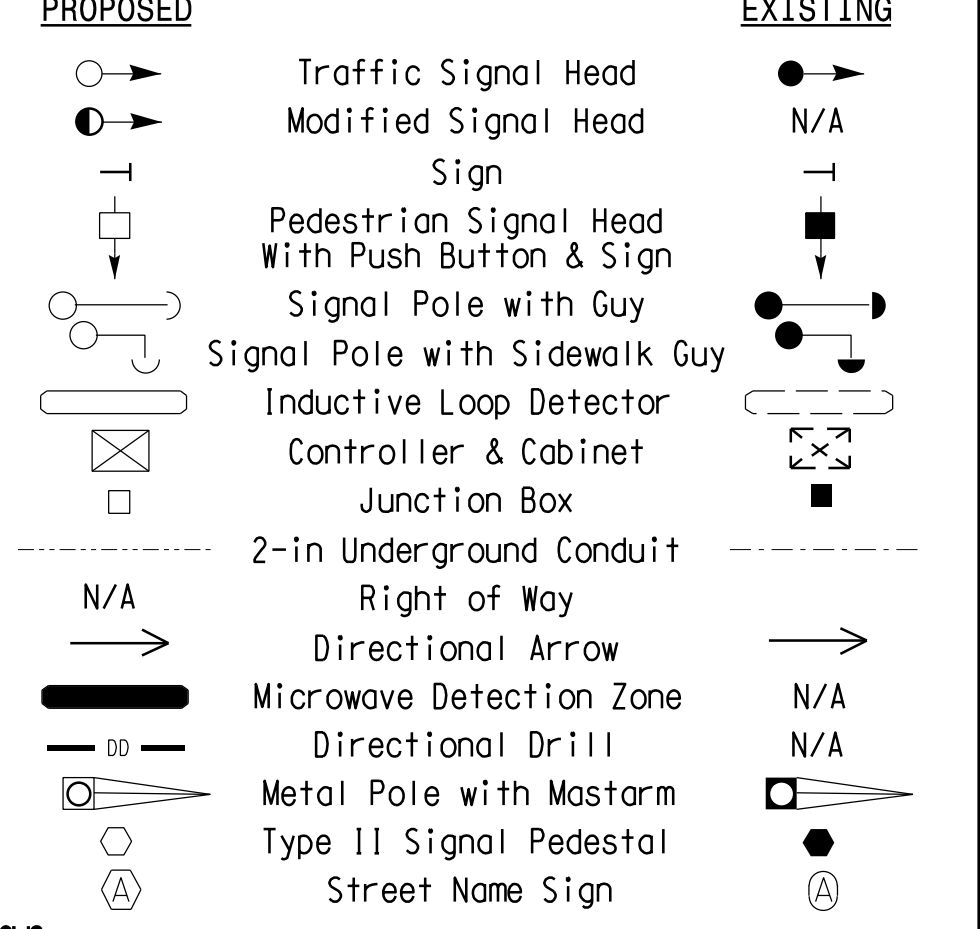
FEATURE	PHASE				
	1	2	4	6	8
Walk *	-	7	-	7	7
Ped Clear *	-	15	-	8	19
Min Green	7	10	7	10	7
Passage *	2.0	3.0	2.0	3.0	2.0
Max 1 *	15	45	25	45	25
Yellow Change	3.0	4.2	3.2	4.2	3.0
Red Clear	2.6	2.0	2.6	2.0	2.6
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Advance Walk	-	-	-	-	-
Non Lock Detector	X	-	X	-	X
Vehicle Recall	-	MIN RECALL	-	MIN RECALL	-
Dual Entry	-	-	X	-	X

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

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE TONES	INTERVAL	SPEECH MESSAGE
P21	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Mountain Creek.
P22	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Mountain Creek.
P61	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Bank.
P62	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Bank.
P81	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Russ.
P82	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Russ.

LEGEND



Signal Upgrade - Final Design

Infrastructure Consulting Services, Inc.

8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28226
Phone: 704-549-4260 | www.ramkemp.com | NC License No. F-1489

US 276 (Russ Avenue)
at
West Marshall Street / Bank Drive

Division 14 Haywood County Wayneville

PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton
PREPARED BY: TS Popelka RKA PROJ. NO.: 16085 (040)

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 20
1" = 20'

SEAL

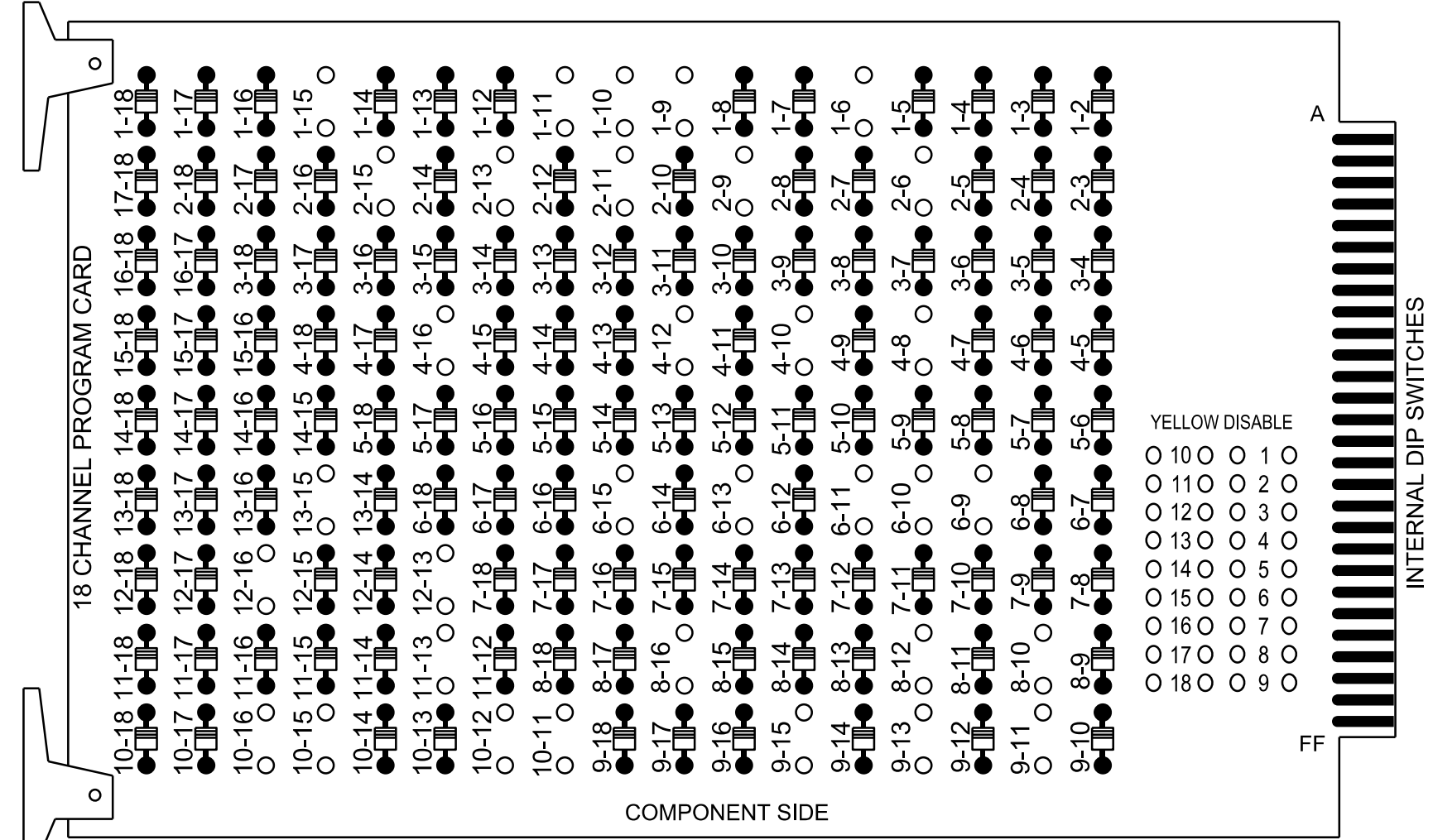
William J. Hamilton
Professional Engineer
No. 32396

DATE: 04/11/2023
SIGNATURE: [Signature]
SIC. INVENTORY NO. 14-0685

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

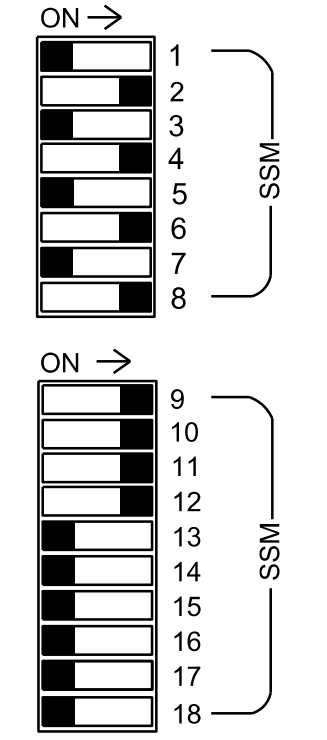
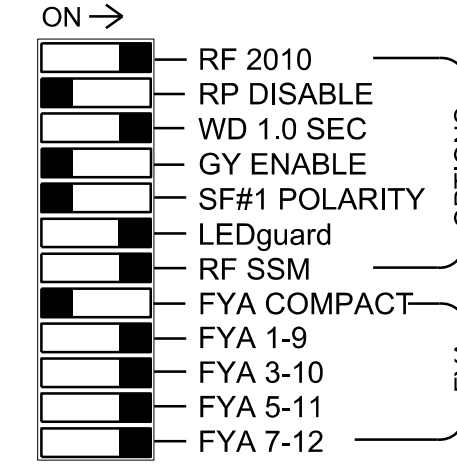
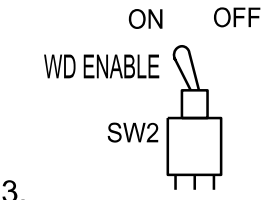
REMOVE DIODE JUMPERS 1-6, 1-9, 1-10, 1-11, 1-15, 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-10, 4-12, 4-16, 6-9, 6-10, 6-11, 6-13, 6-15, 8-10, 8-12, 8-16, 9-11, 9-13, 9-15, 10-11, 10-12, 10-15, 10-16, 11-13, 12-13, 12-16 AND 13-15.



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.
- Integrate monitor with Ethernet network in cabinet.



■ = DENOTES POSITION OF SWITCH

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
- Program phases 4 and 8 for Dual Entry.
- Program controller to start up in phase 2 Green Walk and 6 Green 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 D14-12 Waynesville 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, S3, S5, S8, S9, S11, S12, AUX S1, AUX S2, AUX S4, AUX S5
 Phases Used.....1, 2, 2PED, 4, 6, 6PED, 8, 8PED
 Overlap "1".....*
 Overlap "2".....*
 Overlap "3".....*
 Overlap "4".....*

*See overlap programming detail on sheet 2

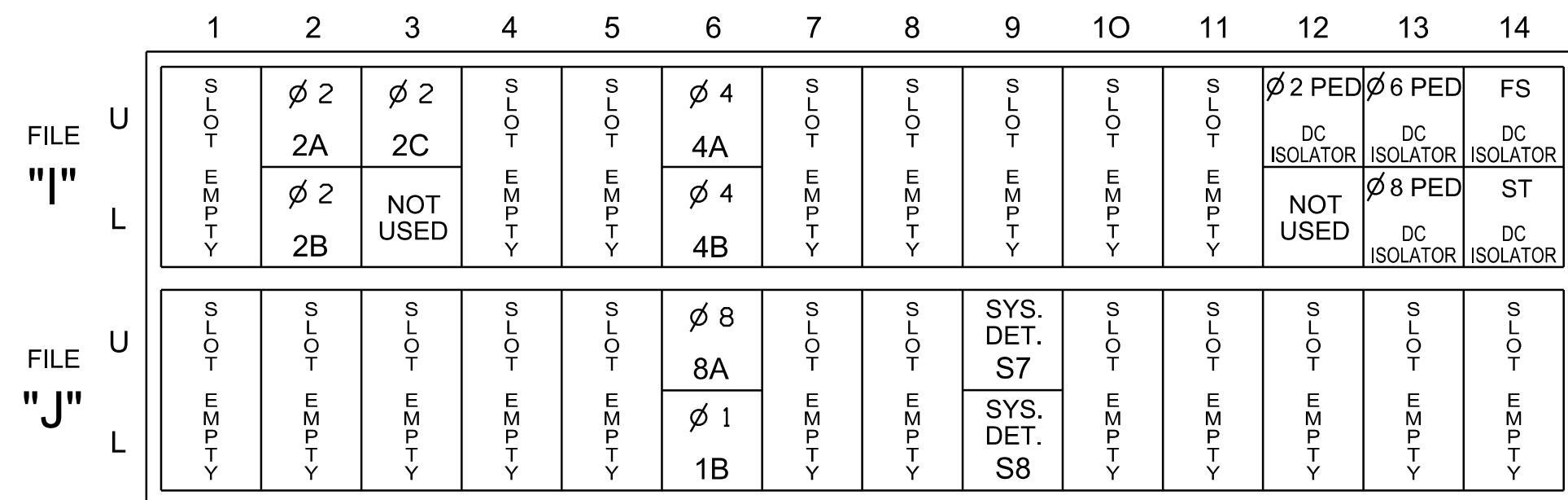
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6	
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18	
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE	
SIGNAL HEAD NO.	11*	22,23	P21, P22	NU	41,42	NU	NU	61,62	P61, P62	NU	81,82	P81, P82	11*	83*	NU	21*	43*	NU	
RED		128			101				134			107			A124			A101	
YELLOW	*	129			102				135			108							
GREEN		130			103				136			109							
RED ARROW															A121			A114	
YELLOW ARROW															A122	A125		A115	A102
FLASHING YELLOW ARROW															A123	A126		A116	A103
GREEN ARROW	127																		
Hand																			
Walking																			

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

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
 ST = STOP TIME

SPECIAL DETECTOR NOTE

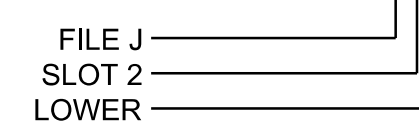
For detection zones 1A, 6A, 6B, S5, S6, install a multizone microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

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	QUEUE	CALL	DELAY DURING GREEN
1B	TB5-11,12	J6L	46	8	23	1	10		X			X	
2A	TB2-5,6	I2U	39	1	2	2			X			X	
2B	TB2-7,8	I2L	43	5	3	2			X			X	
2C	TB2-9,10	I3U	63	29	4	2			X			X	
4A	TB4-9,10	I6U	41	3	8	4	3		X			X	
4B	TB4-11,12	I6L	45	7	9	4	10		X			X	
8A	TB5-9,10	J6U	42	4	22	8	3		X			X	
*S7	TB7-9,10	J9U	59	21	27								
*S8	TB7-11,12	J9L	61	23	28								
PED PUSH BUTTONS													
P21,P22	TB8-4,6	I12U	67	33	2	PED 2							
P61,P62	TB8-7,9	I13U	68	34	6	PED 6							
P81,P82	TB8-8,9	I13L	70	36	8	PED 8							

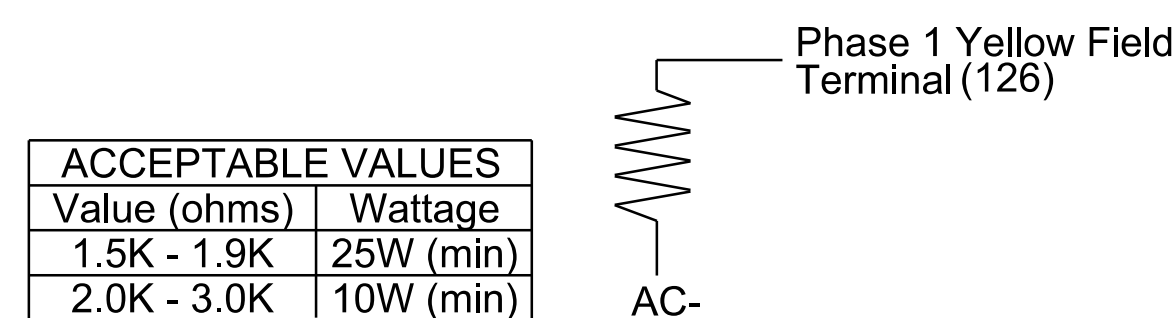
*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L



LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)



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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0685
 DESIGNED: Apr 2023
 SEALED: 04/11/2023
 REVISED: N/A

Electrical Detail - Sheet 1 of 2
 Final Design



Prepared For:

750 N. Greenfield Pkwy, Garner, NC 27529

US 276 (Russ Avenue) at West Marshall Street / Bank Drive

Division 14 Haywood County Waynesville

PLAN DATE: April 2023	REVIEWED BY: WJ Hamilton
PREPARED BY: TS Popelka	RKA PROJ. NO: 16085 (040)
REVISIONS	INIT. DATE

SEAL

William J. Hamilton
 ENGINEER
 04/11/2023
 DATE
 SIGNATURE
 DATE
 SIG. INVENTORY NO. 14-0685

OVERLAP PROGRAMMING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	2	3	4
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section
Included Phases	2	1,8	6	4
Modifier Phases	1	-	-	-
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

ACCESSIBLE PEDESTRIAN SIGNAL (APS) INSTALLATION NOTES

1. Install push buttons and APS equipment per manufacturer's instructions.
2. Provide a dedicated cable to each push button per manufacturer's instructions.
3. If APS equipment is mounted in cabinet, use filtered power (i.e., Controller Receptacle) to power APS equipment. Do not use Equipment Receptacle, which is a GFCI outlet.
4. Never attempt to operate a standard contact closure push button with the APS system unless cabinet is re-wired for standard button operation or unless explicitly allowed by the manufacturer.
5. Place manufacturer's instructions in cabinet with cabinet prints, signal plans, and electrical details.

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.

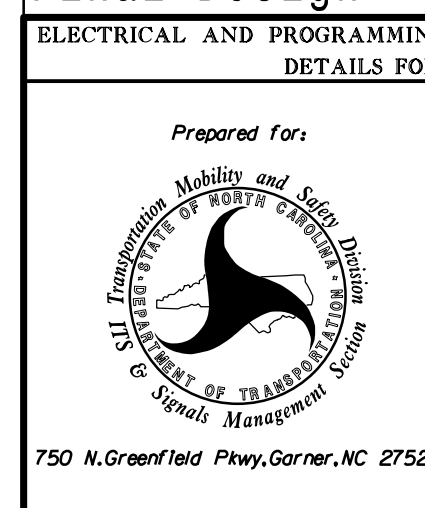
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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: 14-0685
DESIGNED: Apr 2023
SEALED: 04/11/2023
REVISED: N/A

Electrical Detail - Sheet 2 of 2
Final Design

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



ELECTRICAL AND PROGRAMMING DETAILS FOR:		US 276 (Russ Avenue) at West Marshall Street / Bank Drive	
Division 14		Haywood County Waynesville	
PLAN DATE:	April 2023	REVIEWED BY:	WJ Hamilton
PREPARED BY:	TS Popelka	RKA PROJ. NO.:	16085 (040)
REVISIONS	INIT.	DATE	

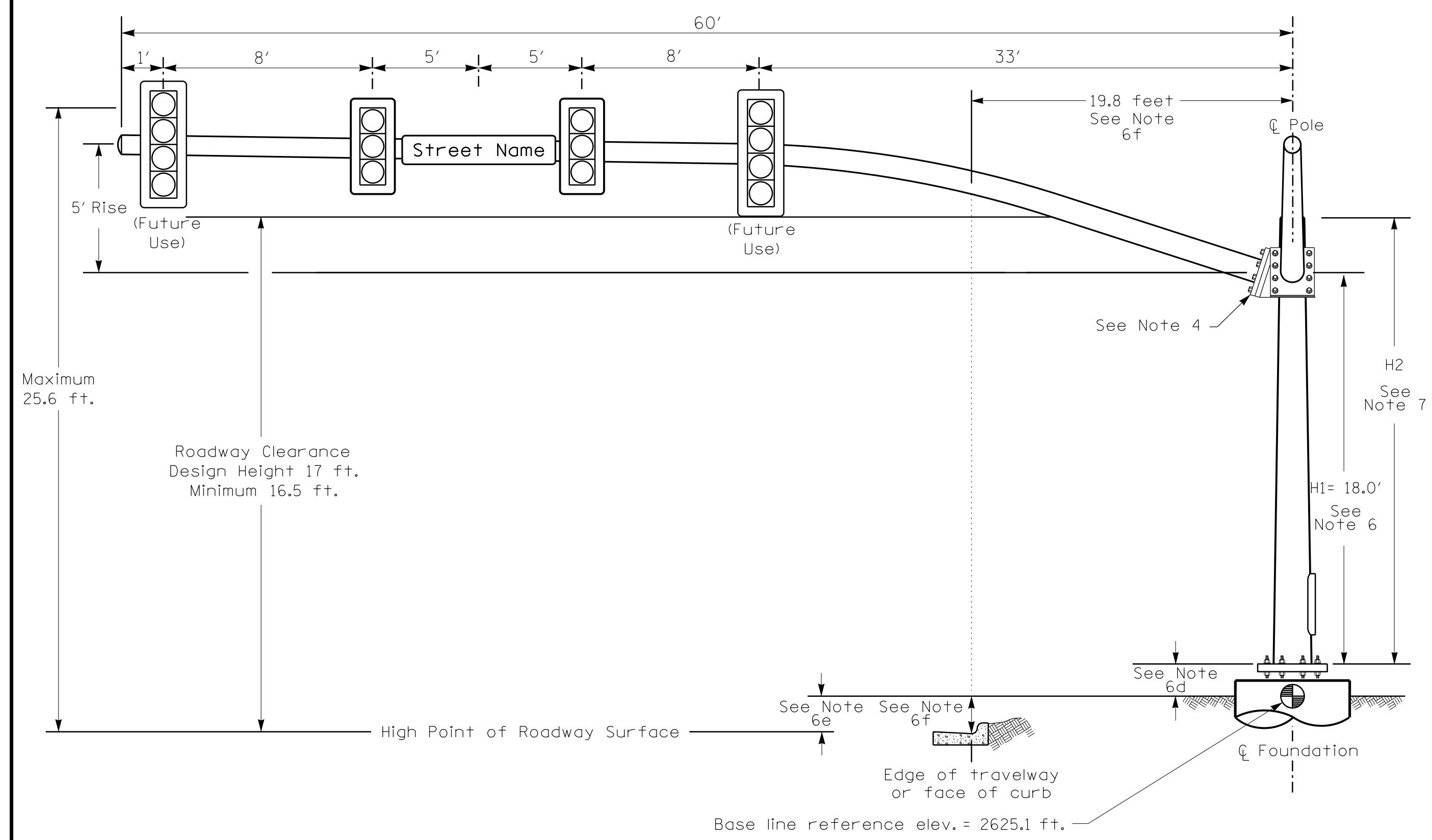
SEAL

SEAL
32396
ENGINEER
WILLIAM J. HAMILTON

DocuSign
William J. Hamilton
04/11/2023
SIGNATURE DATE

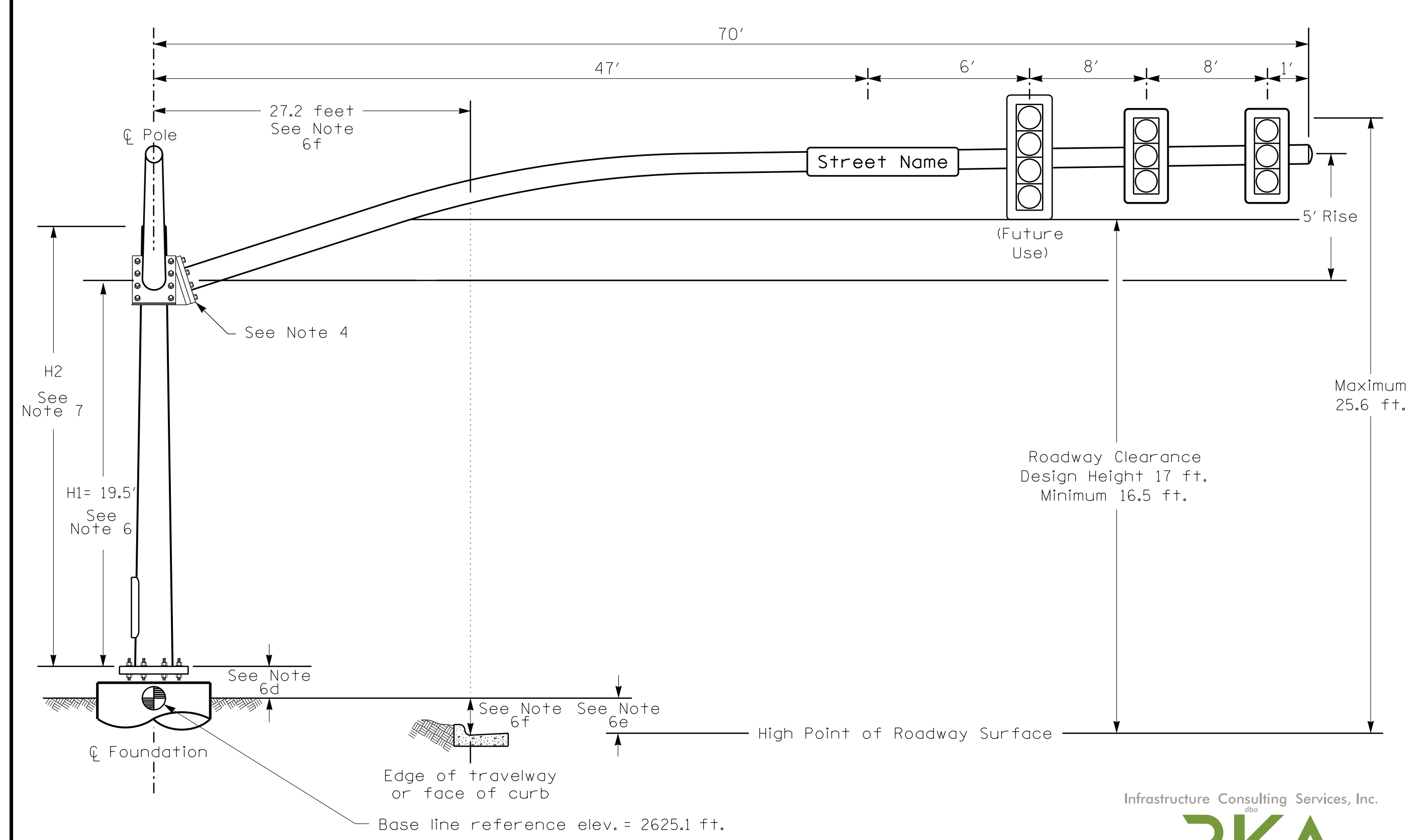
SIG. INVENTORY NO. 14-0685

Design Loading for METAL POLE NO. 1, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 1, MAST ARM B



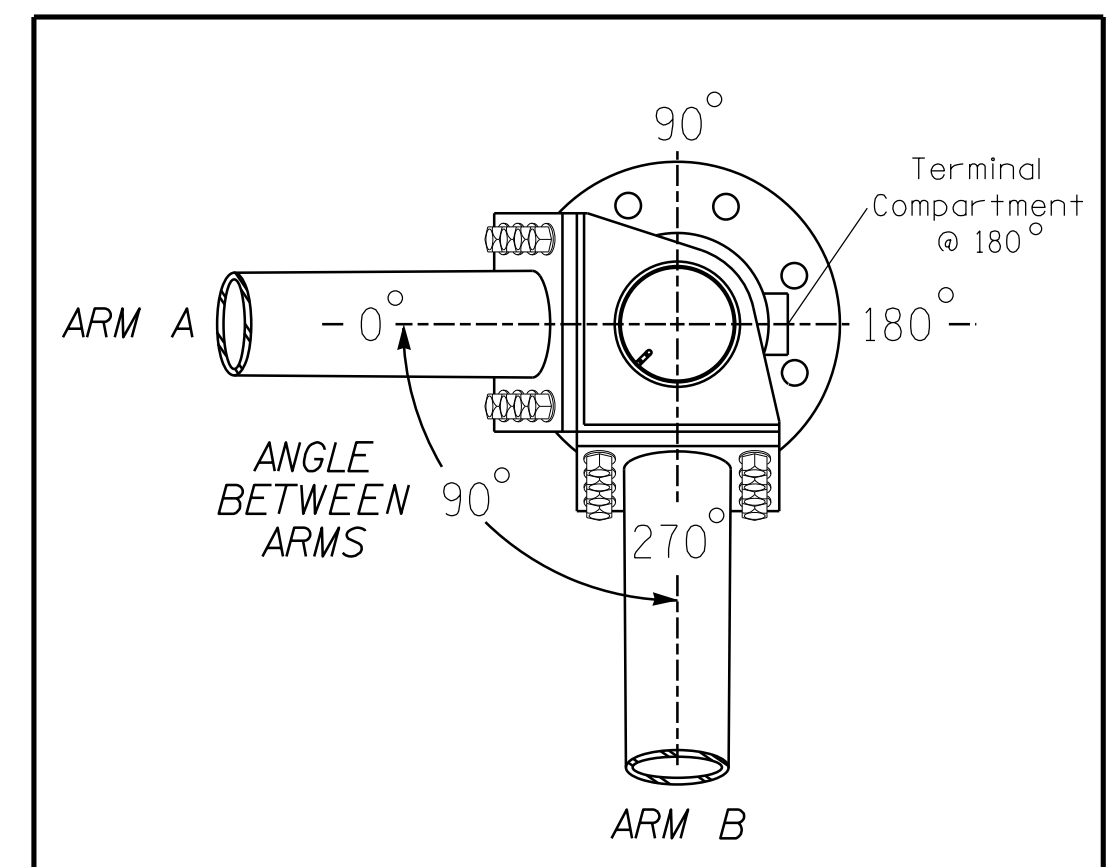
Elevation View @ 0°

SPECIAL NOTE

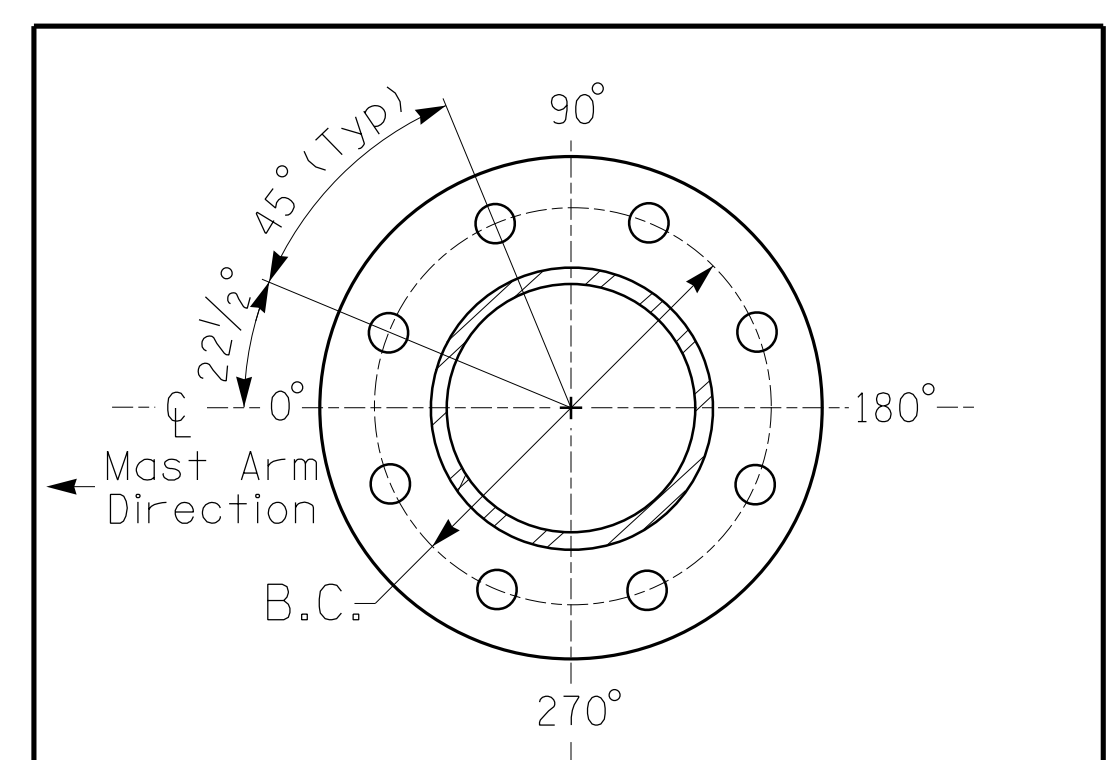
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

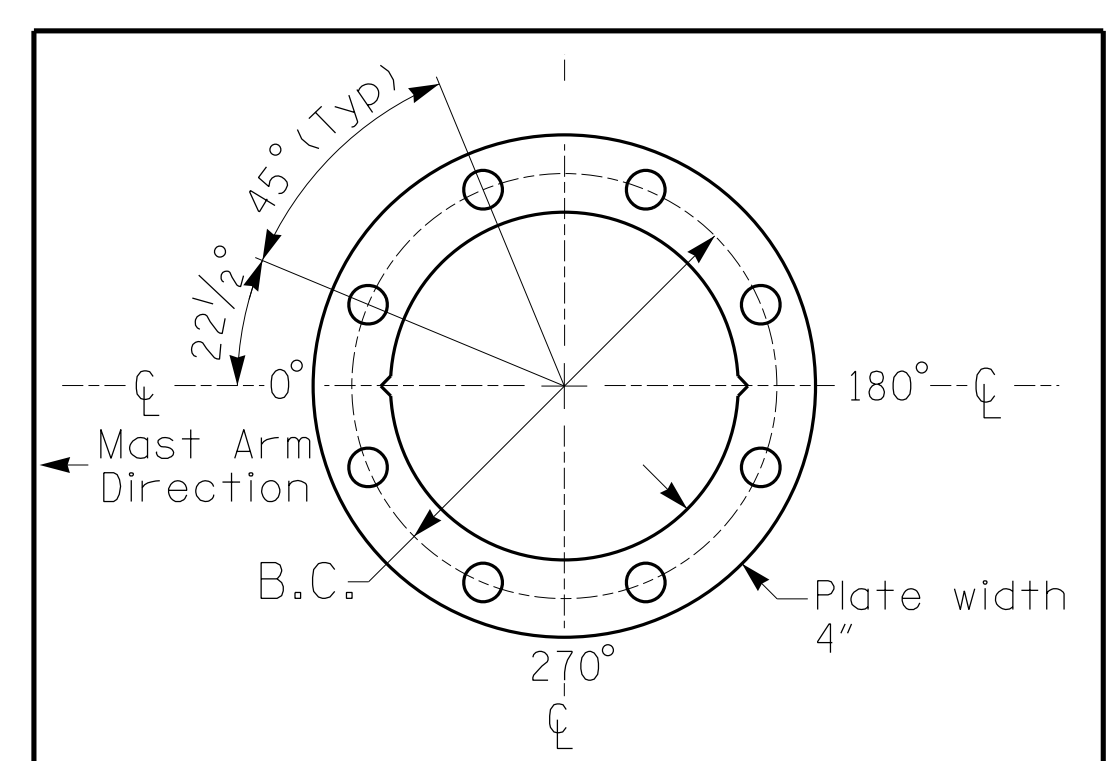
Elevation Differences for:	Arm A	Arm B
Baseline reference point at \odot Foundation @ ground level	2625.1 ft.	2625.1 ft.
Elevation difference at High point of roadway surface	+4.1 ft.	+5.4 ft.
Elevation difference at Edge of travelway or face of curb	+4.4 ft.	+4.6 ft.



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL



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

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	STREET NAME SIGN RIGID MOUNTED	12.0 S.F.	18.0" W X 96.0" L	27 LBS

NOTES

DESIGN REFERENCE MATERIAL

- Design the traffic signal structure and foundation in accordance with:
 - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
 - The 2018 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

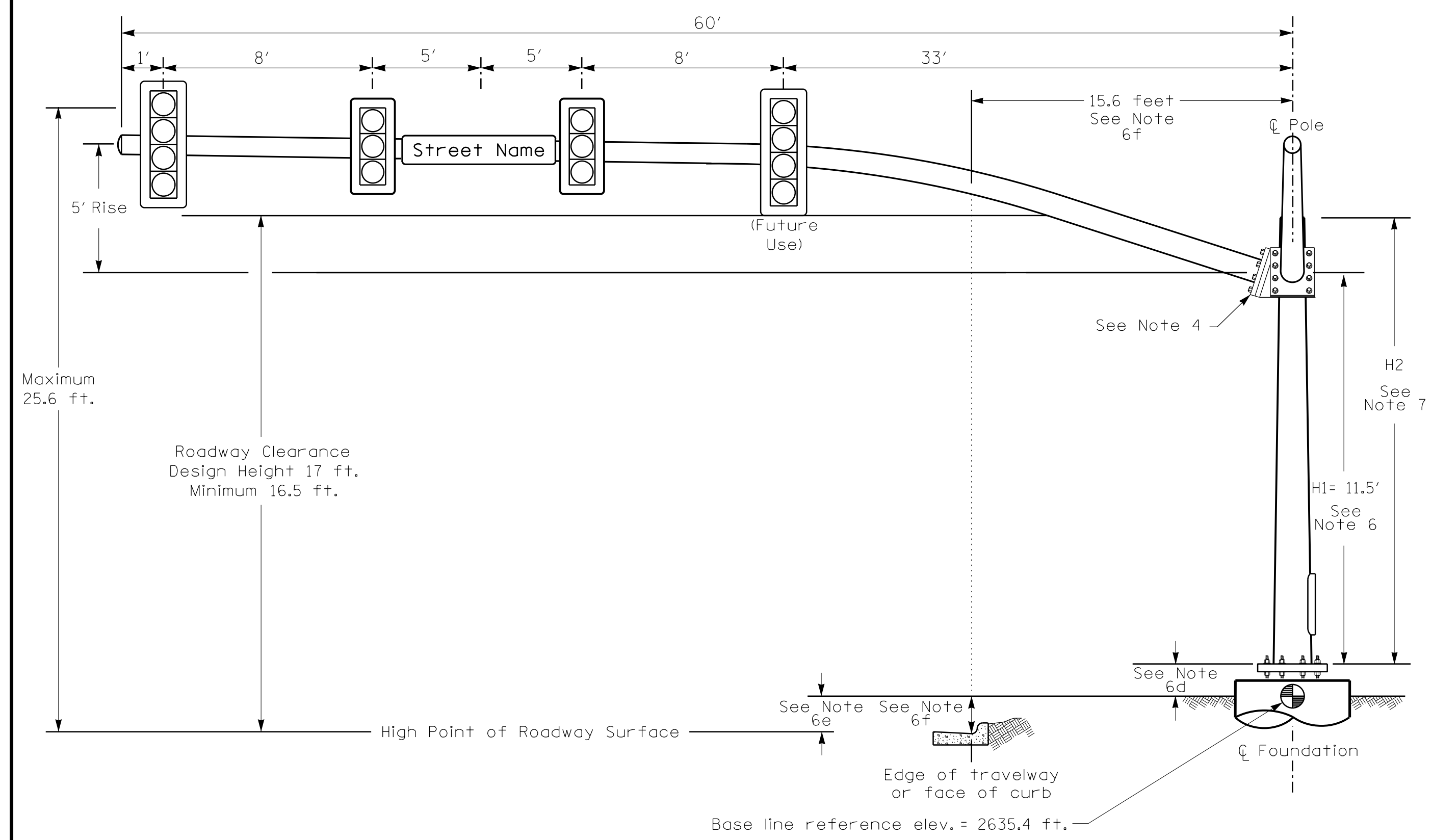
- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads are rigidly mounted and vertically centered on the mast arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is 0.75 feet above the ground elevation.
 - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
 - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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.
- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 5 (120 mph)

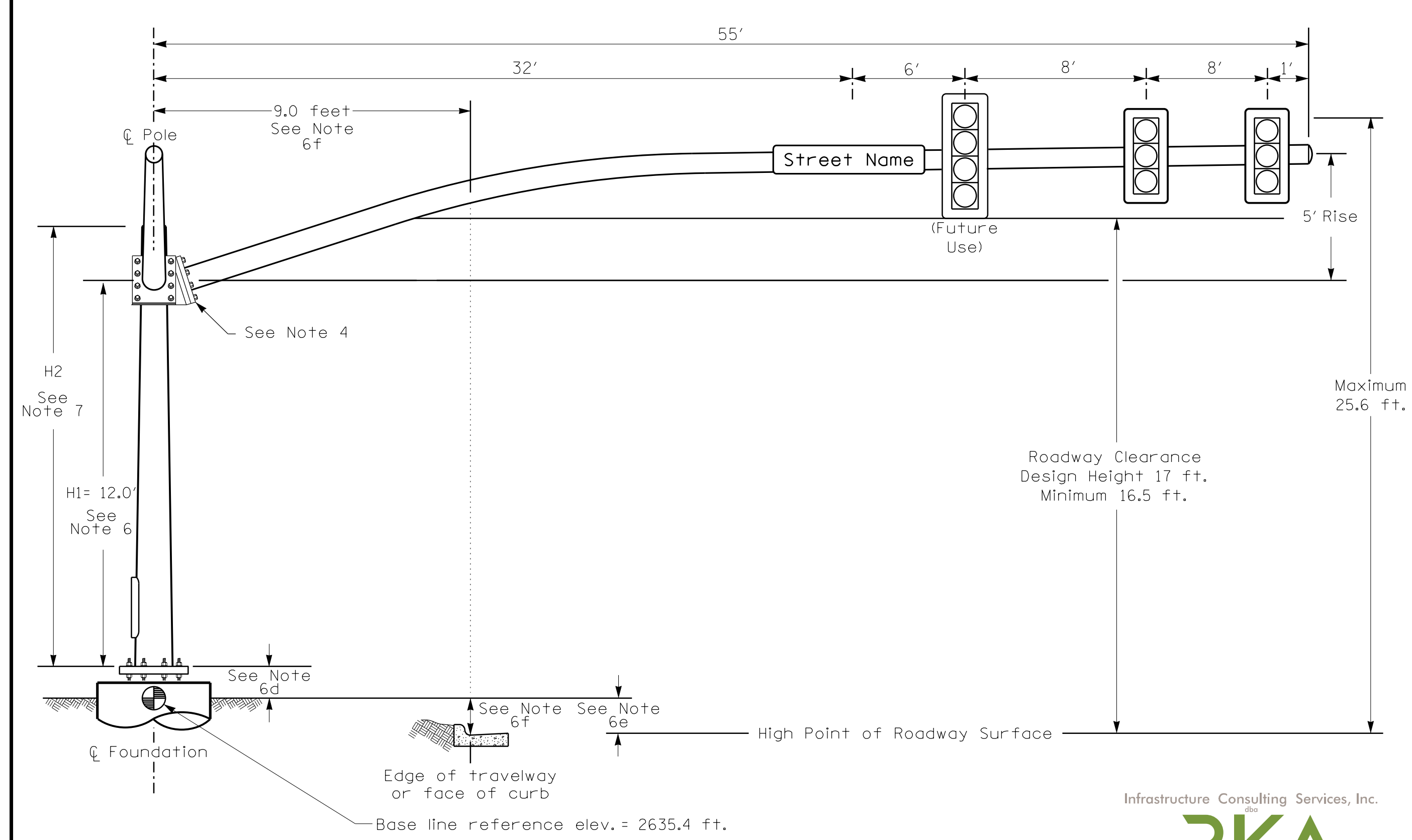
	Prepared For: US 276 (Russ Avenue) at West Marshall Street / Bank Drive		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL
	Division 14 PLAN DATE: April 2023 PREPARED BY: TS Popelka	Haywood County REVIEWED BY: WJ Hamilton REVIEWED BY: 16085 (040)	

Design Loading for METAL POLE NO. 2, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 2, MAST ARM B



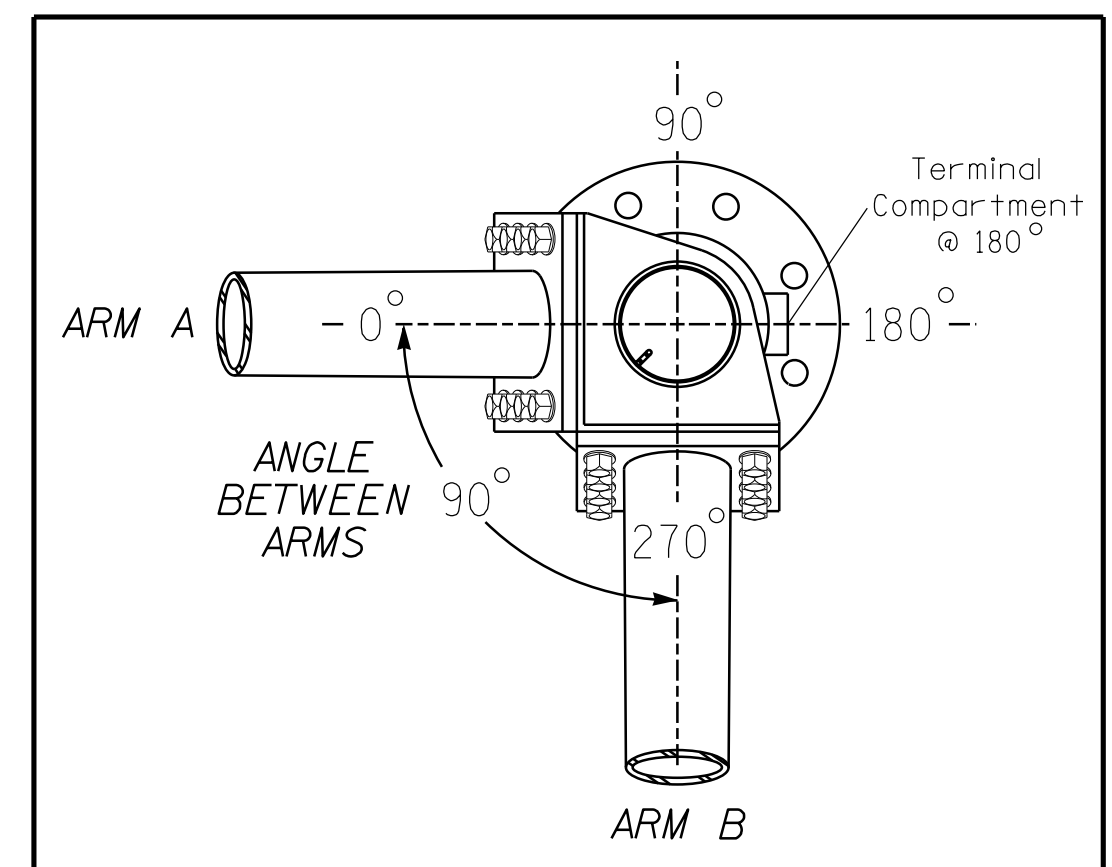
Elevation View @ 0°

SPECIAL NOTE

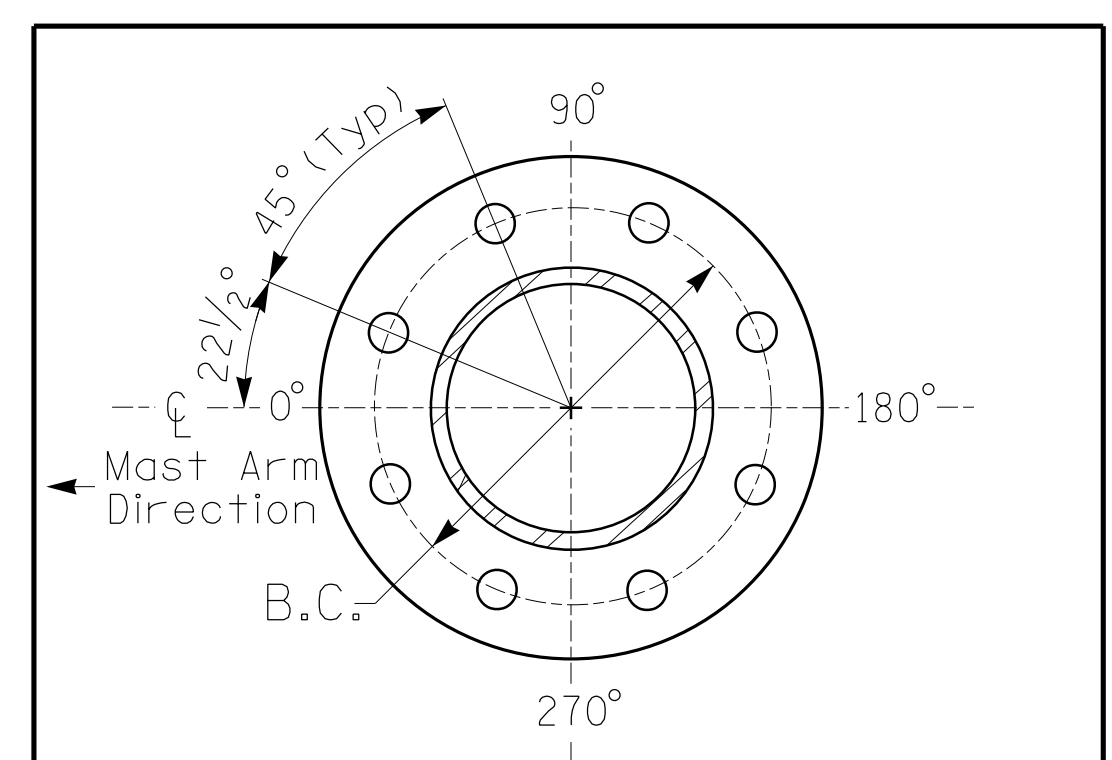
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

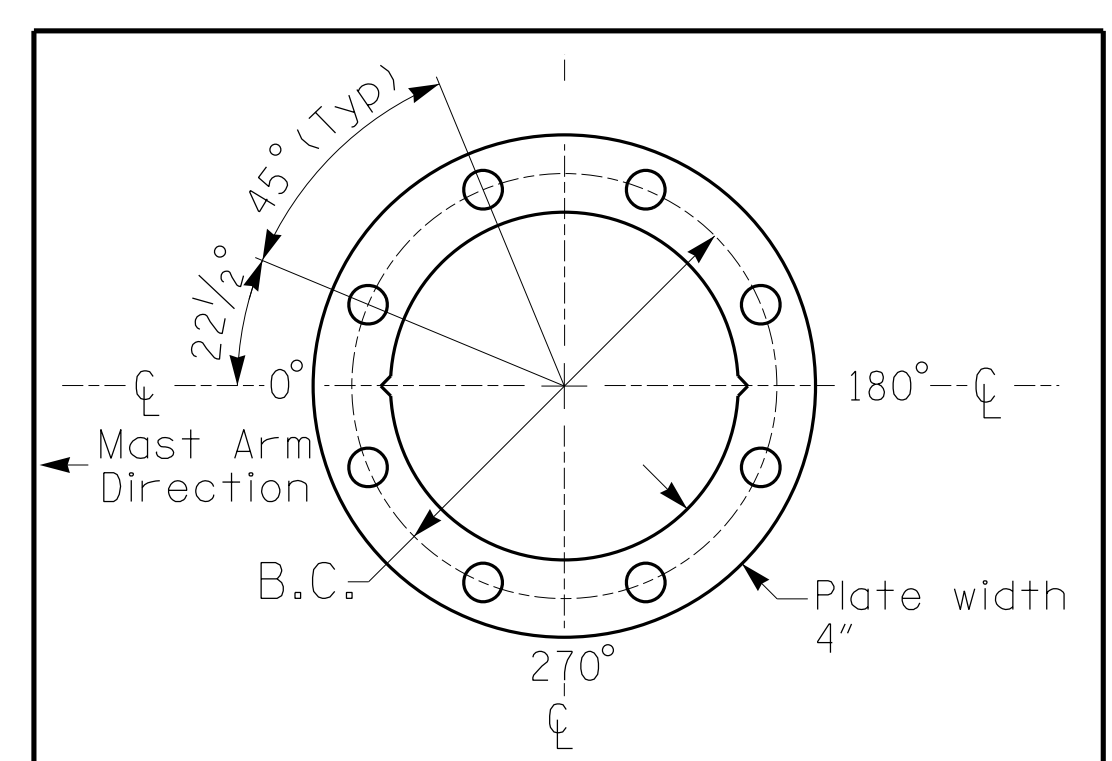
Elevation Differences for:	Arm A	Arm B
Baseline reference point at \odot Foundation @ ground level	2635.4 ft.	2635.4 ft.
Elevation difference at High point of roadway surface	-2.6 ft.	-1.9 ft.
Elevation difference at Edge of travelway or face of curb	-2.3 ft.	-1.9 ft.



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL



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

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
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NOTES

DESIGN REFERENCE MATERIAL

- Design the traffic signal structure and foundation in accordance with:
 - The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
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 - The 2018 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/LTS-Design-Resources.aspx>

DESIGN REQUIREMENTS

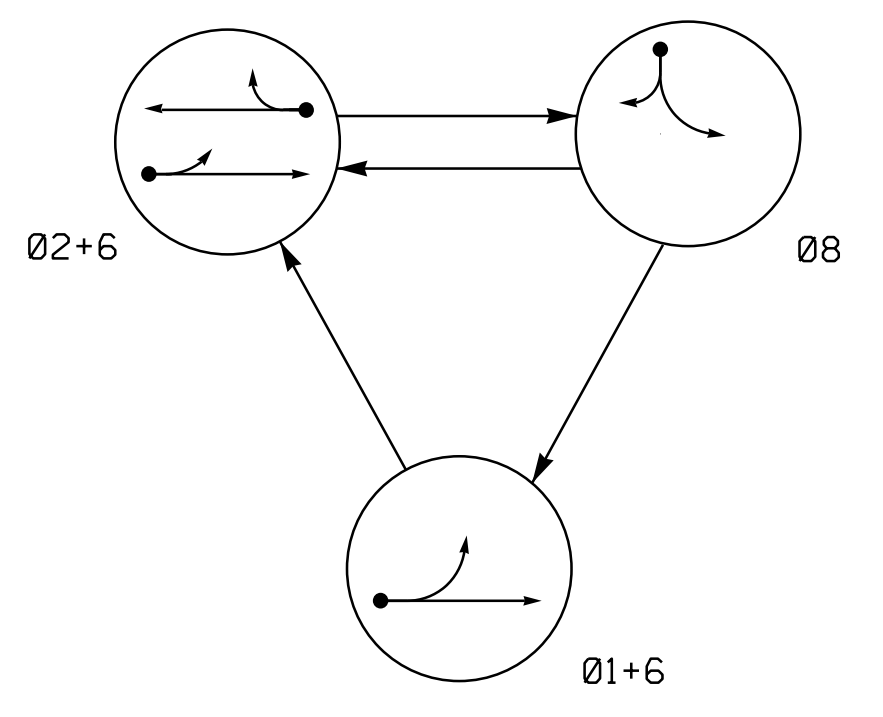
- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
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 - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
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- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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

NCDOT Wind Zone 5 (120 mph)

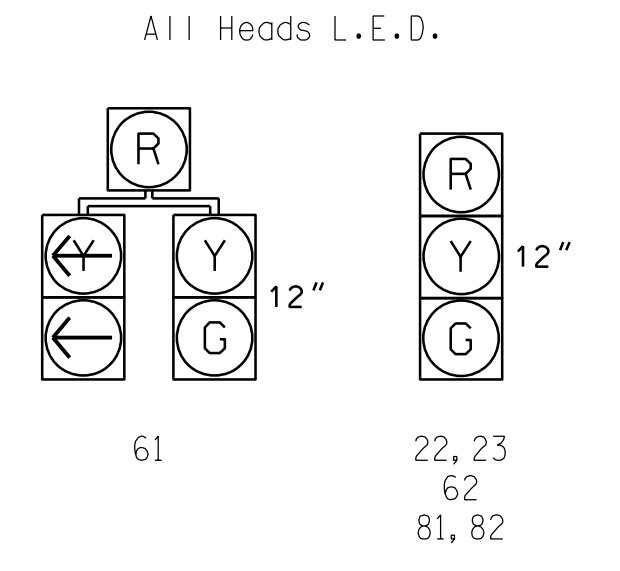
	<p>US 276 (Russ Avenue) at West Marshall Street / Bank Drive</p>		
	<p>Division 14 Haywood County Waynesville</p>	<p>Division 14 Haywood County Waynesville</p>	
<p>PLAN DATE: April 2023</p>	<p>REVIEWED BY: WJ Hamilton</p>	<p>PREPARED BY: TS Popelka</p>	<p>REVIEWED BY: 16085 (040)</p>
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>SCALE: 0 N/A</p>	<p>REVISIONS</p>	<p>INIT. DATE</p>
<p>Infrastructure Consulting Services, Inc. RKA RAMEY KEMP ASSOCIATES 8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28226 Phone: 704-648-4260 www.rameykemp.com NC License No. F-1489</p>	<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p>	<p>SEAL</p>	<p>SIG. INVENTORY NO. 14-0685</p>

PHASING DIAGRAM



SIGNAL FACE	PHASE			
	01+6	02+6	08	FLASH
21, 22	R	G	R	Y
61	G	G	R	Y
62	G	G	R	Y
81, 82	R	R	G	R

SIGNAL FACE I.D.



MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR					PROGRAMMING							
ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	*	*	1	15	-	X	-	X	-	*
2A	6X6	70	*	*	6	-	-	X	-	X	-	*
6A	6X6	70	*	*	6	-	-	X	-	X	-	*
8A	6X40	0	*	*	8	10	-	X	-	X	-	*

* Multizone Microwave Detection

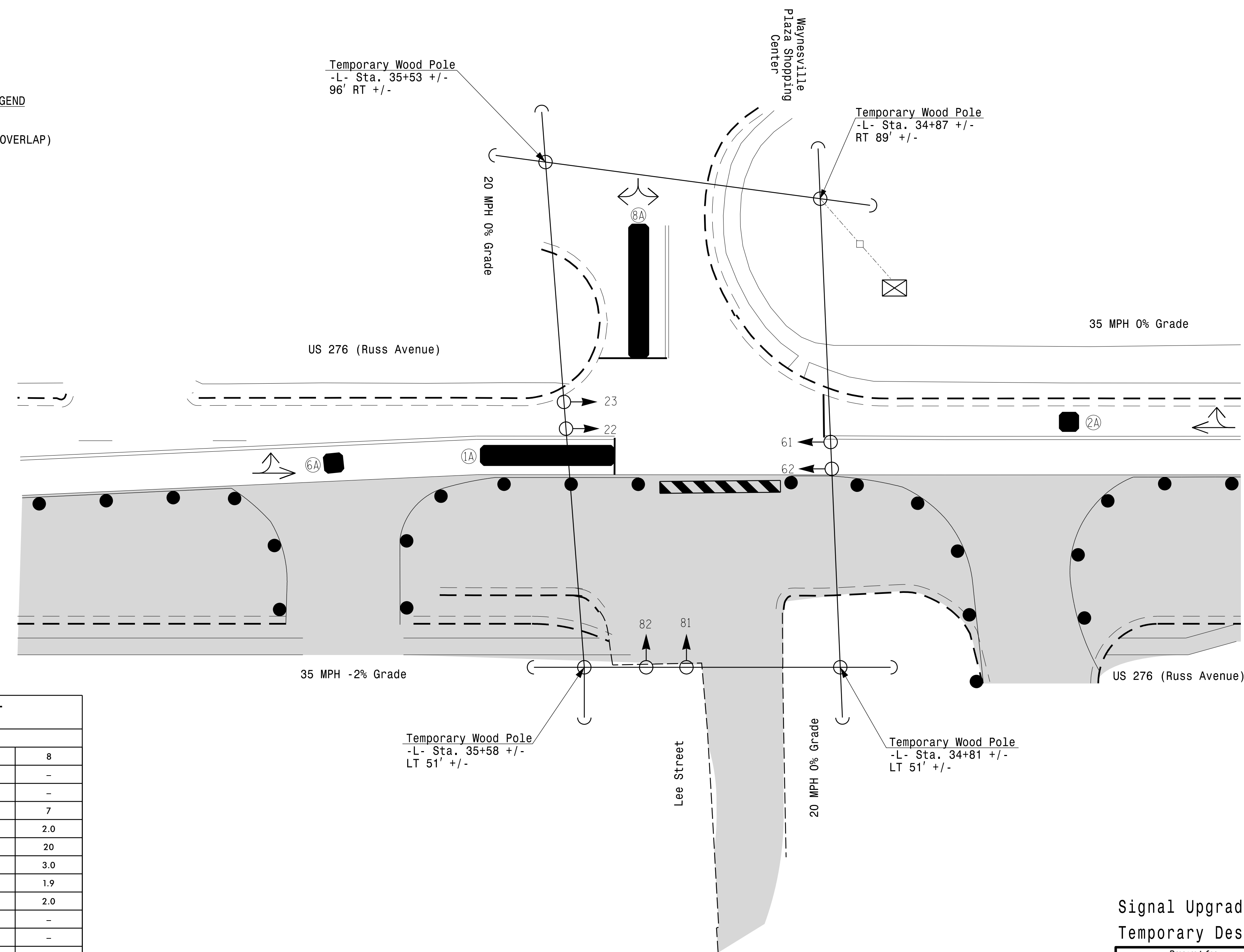
3 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings MCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Enable Backup Protect for phase 6 to allow the controller to clear from phase 2+6 to phase 1+6 by progressing through an all red display.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- This intersection uses multizone microwave detection. Install detectors according to the manufacturer's instructions to achieve the desired detection.
- See traffic control plans for stop bar and crosswalk locations.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND

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



MAXTIME TIMING CHART

FEATURE	PHASE			
	1	2	6	8
Walk *	-	-	-	-
Ped Clear *	-	-	-	-
Min Green	7	10	10	7
Passage *	1.0	3.0	3.0	2.0
Max 1 *	15	45	45	20
Yellow Change	3.0	3.8	4.0	3.0
Red Clear	1.0	1.2	1.0	1.9
Red Revert	2.0	2.0	5.0	2.0
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 |
|--|----------|
| ○ → 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 |
| ○ → Microwave Detection Zone | ○ → N/A |
| ○ → Construction Zone | ○ → N/A |
| ○ → Construction Zone Drums | ○ → N/A |
| ○ → Type III Barricade | ○ → N/A |

Signal Upgrade Temporary Design 1 - (TMP Phase I)

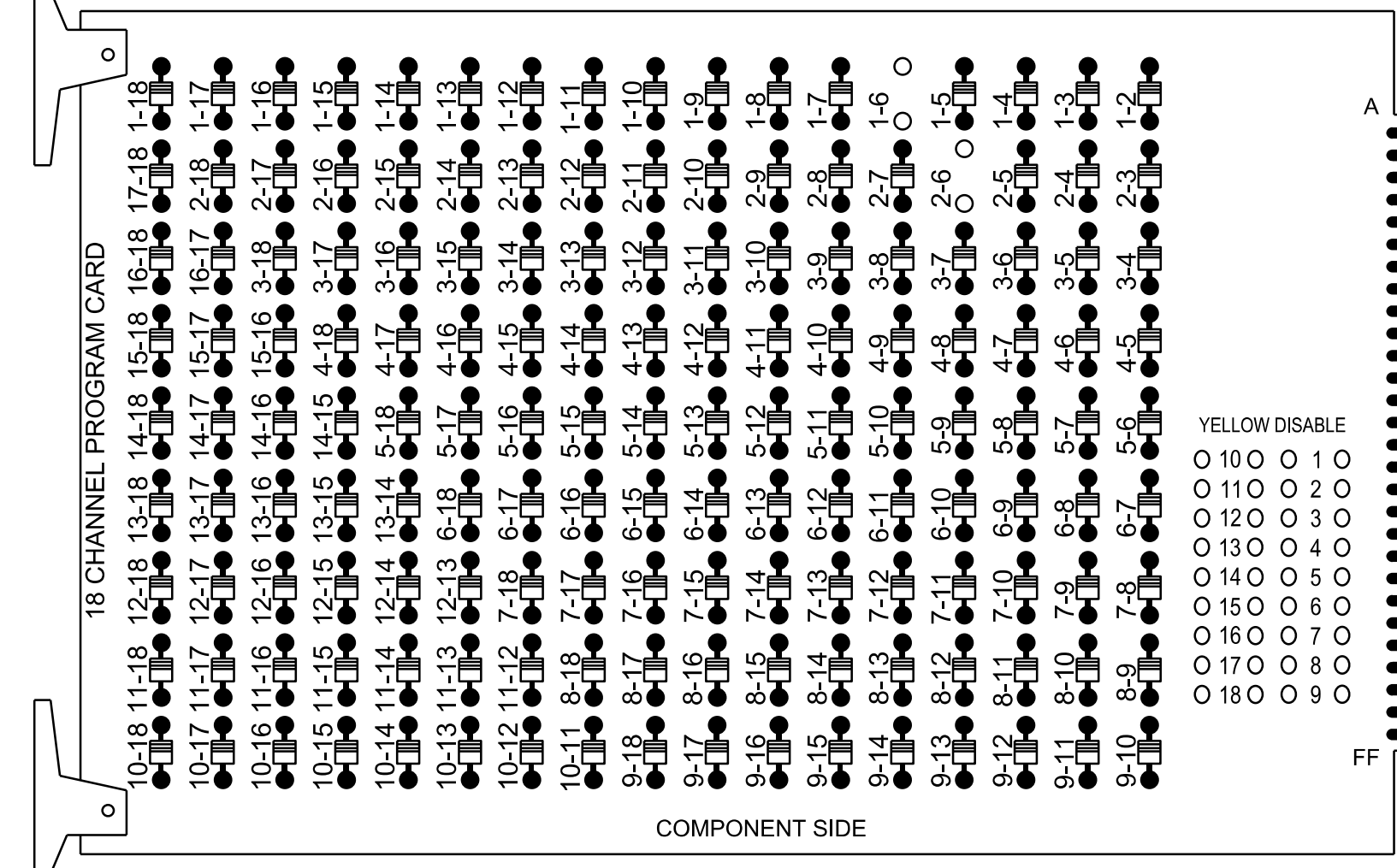
<p>Infrastructure Consulting Services, Inc.</p> <p>8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28226 Phone: 704-649-4260 www.rkainc.com NC License No. F-1489</p>	<p>Prepared For:</p> <p>US 276 (Russ Avenue) at Shopping Center Entrance/ Lee Street</p> <p>Division 14 Haywood County Waynesville</p> <p>PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton</p> <p>PREPARED BY: TS Popelka RKA PROJ. NO.: 16085 (040)</p>	<p>SEAL</p> <p>WILLIAM J. HAMILTON</p> <p>ENGINEER</p> <p>32396</p> <p>Signature: William J. Hamilton</p> <p>DATE: 04/11/2023</p>						
	<p>750 N. Greenfield Pkwy, Garner, NC 27529</p> <p>SCALE: 0 20 1"=20'</p>	<p>REVISIONS</p> <table border="1"> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	NO.	INIT.	DATE			
NO.	INIT.	DATE						

4/12/2023
 ***4058711.dwg: g.dsn: 2020mcd.dgn
 User: jwmcndt

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

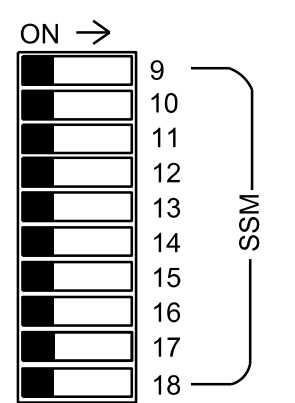
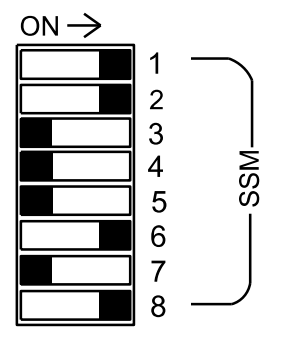
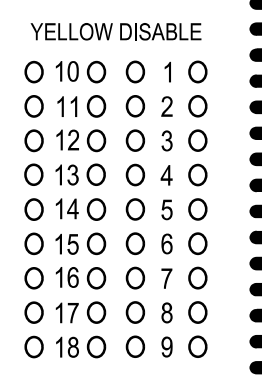
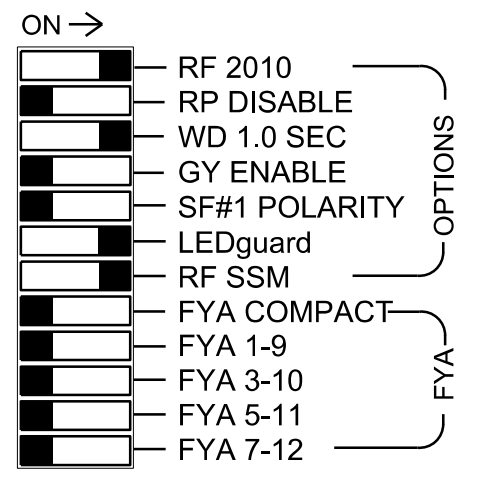
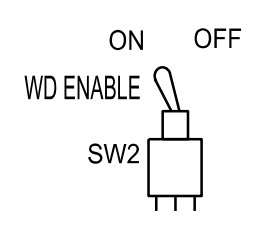
REMOVE DIODE JUMPERS 1-6 and 2-6.



REMOVE JUMPERS AS SHOWN

NOTES:

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



■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the D14-12 Waynesville 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, S8, S11
 Phases Used.....1, 2, 6, 8
 Overlaps.....NONE

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	PED	3	4	PED	5	6	PED	7	8	PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	61	22,23	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU	NU	NU	NU	NU	NU	NU
RED	*	128						134			107							
YELLOW		129						135			108							
GREEN		130						136			109							
RED ARROW																		
YELLOW ARROW	126																	
FLASHING YELLOW ARROW																		
GREEN ARROW	127																	

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

BACKUP PREVENTION PROGRAMMING

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

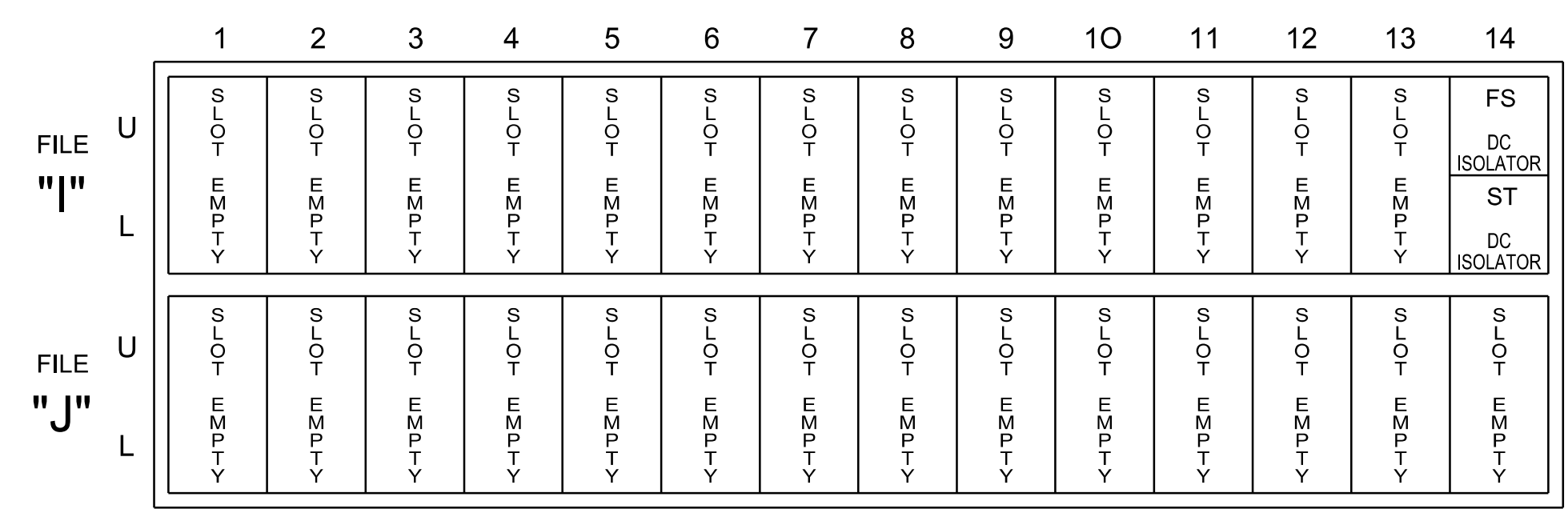
Web Interface
 Home >Controller> Backup Prevention >Backup Protection Plan

Sequence 1

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

INPUT FILE POSITION LAYOUT

(front view)



EX. : 1A, 2A, ETC. = LOOP NO.'S
 FS = FLASH SENSE
 ST = STOP TIME

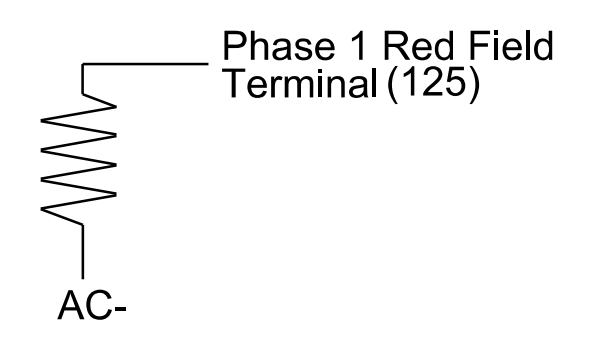
SPECIAL DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)

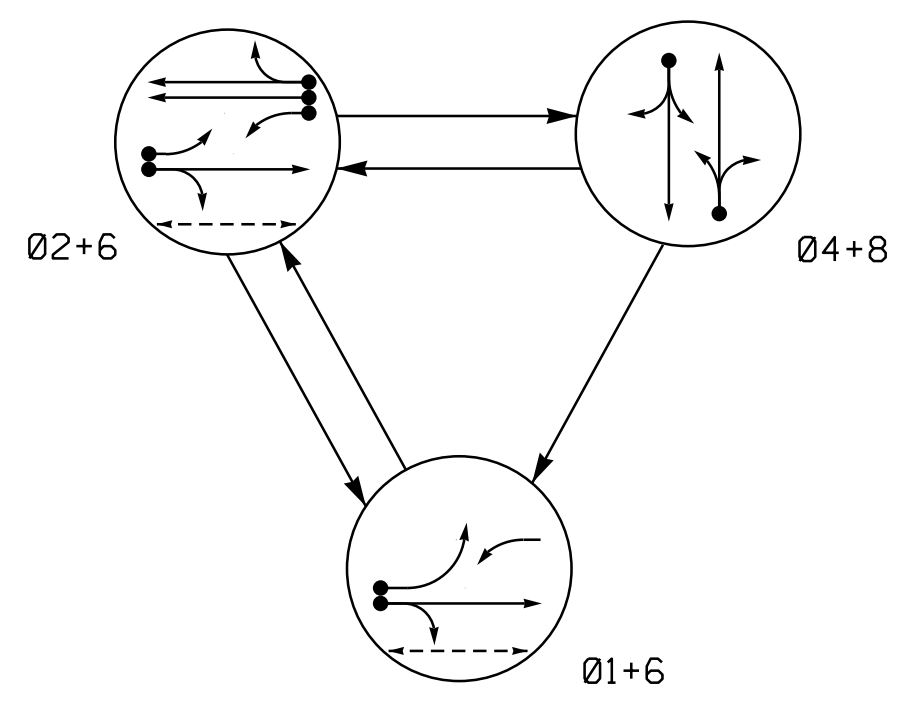
ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



Electrical Detail Temporary Design 1 - (TMP Phase I)

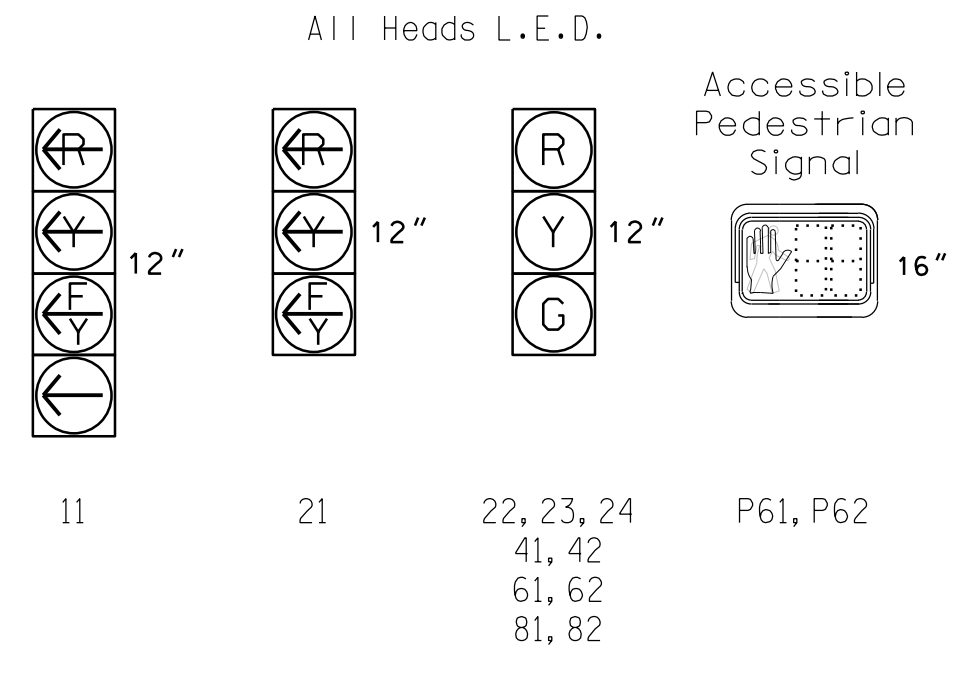
ELECTRICAL AND PROGRAMMING DETAILS FOR: RAMEY KEMP ASSOCIATES 8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28223 Phone: 704-548-4200 www.rameykemp.com NC License No. F-1489	Prepared For: US 276 (Russ Avenue) at Shopping Center Entrance/ Lee Street Division 14 Haywood County Waynesville	DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL WILLIAM J. HAMILTON ENGINEER SEAL 32396 DATE: 04/11/2023
	PLAN DATE: April 2023 PREPARED BY: TS Popelka REVIEWED BY: WJ Hamilton RKA PROJ. NO: 16085 (040)	REVISIONS INIT. DATE

PHASING DIAGRAM



SIGNAL FACE	PHASE			
	01+6	02+6	04+8	FLASH
11	←	→	↔	↔
21	←	→	↔	↔
22, 23, 24	R	G	R	Y
41, 42	R	R	G	R
61, 62	G	G	R	Y
81, 82	R	R	G	R
P61, P62	W	W	DW	DRK

SIGNAL FACE I.D.



MAXTIME DETECTOR INSTALLATION CHART											
DETECTOR						PROGRAMMING					
ZONE	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	15	-	X	X	-	*
2A, 2B	6X6	70	*	*	6	-	-	X	X	-	*
2C	6X40	0	*	*	2	3	-	X	X	-	*
4A	6X40	0	*	*	4	10	-	X	X	-	*
6A	6X6	70	*	*	6	-	-	X	X	-	*
8A	6X40	0	*	*	8	10	-	X	X	-	*

* Multizone Microwave Detection

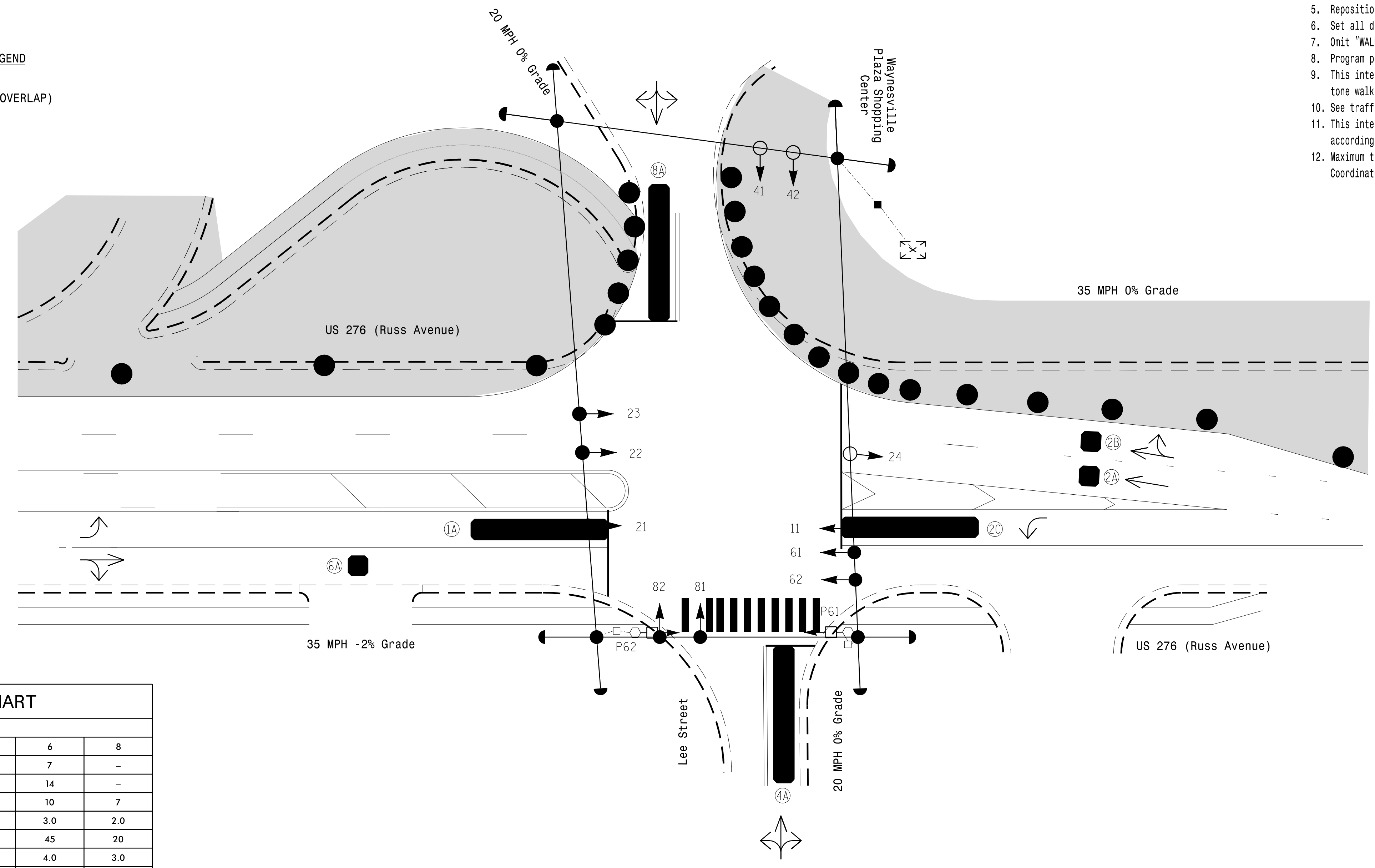
3 Phase Fully Actuated D14-12_Waynesville

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Remove Backup Protect for phase 6.
- Phase 1 may be lagged.
- Reposition existing signal heads numbered 61 and 62.
- 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.
- This intersection features accessible pedestrian signals utilizing percussive tone walk indications and/or speech messages.
- See traffic control plans for stop bar and crosswalk locations.
- This intersection uses multizone microwave 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.

PHASING DIAGRAM DETECTION LEGEND

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



MAXTIME TIMING CHART

FEATURE	PHASE				
	1	2	4	6	8
Walk *	-	-	-	7	-
Ped Clear *	-	-	-	14	-
Min Green	7	10	7	10	7
Passage *	2.0	3.0	3.0	3.0	2.0
Max I *	15	45	20	45	20
Yellow Change	3.0	4.0	3.0	4.0	3.0
Red Clear	2.1	1.1	2.9	1.1	2.9
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Advance Walk	-	-	-	-	-
Non Lock Detector	X	-	X	-	X
Vehicle Recall	-	MIN RECALL	-	MIN RECALL	-
Dual Entry	-	-	X	-	X

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

ACCESSIBLE PEDESTRIAN SIGNAL OPERATION

SIGNAL FACE	VOICE TONES	INTERVAL	SPEECH MESSAGE
P61	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Lee.
P62	- X	Walk	(Percussive Tone)
X	-	Flashing Don't Walk / Don't Walk	Wait. Wait to cross Lee.

LEGEND

- | | | | |
|-----|--|-----|----------|
| ○ → | TRAFFIC SIGNAL HEAD | ● → | EXISTING |
| ● → | MODIFIED SIGNAL HEAD | N/A | |
| ⊥ | SIGN | ⊥ | |
| ⊥ | PEDESTRIAN SIGNAL HEAD WITH PUSH BUTTON & SIGN | ⊥ | |
| ⊥ | SIGNAL POLE WITH GUY | ⊥ | |
| ⊥ | SIGNAL POLE WITH SIDEWALK GUY | ⊥ | |
| ⊥ | INDUCTIVE LOOP DETECTOR | ⊥ | |
| ⊥ | CONTROLLER & CABINET | ⊥ | |
| ⊥ | JUNCTION BOX | ⊥ | |
| ⊥ | 2-IN UNDERGROUND CONDUIT | ⊥ | |
| N/A | RIGHT OF WAY | --- | |
| → | DIRECTIONAL ARROW | → | |
| ■ | MICROWAVE DETECTION ZONE | N/A | |
| ■ | CONSTRUCTION ZONE | N/A | |
| ○ | TYPE II SIGNAL PEDESTAL | ● | |

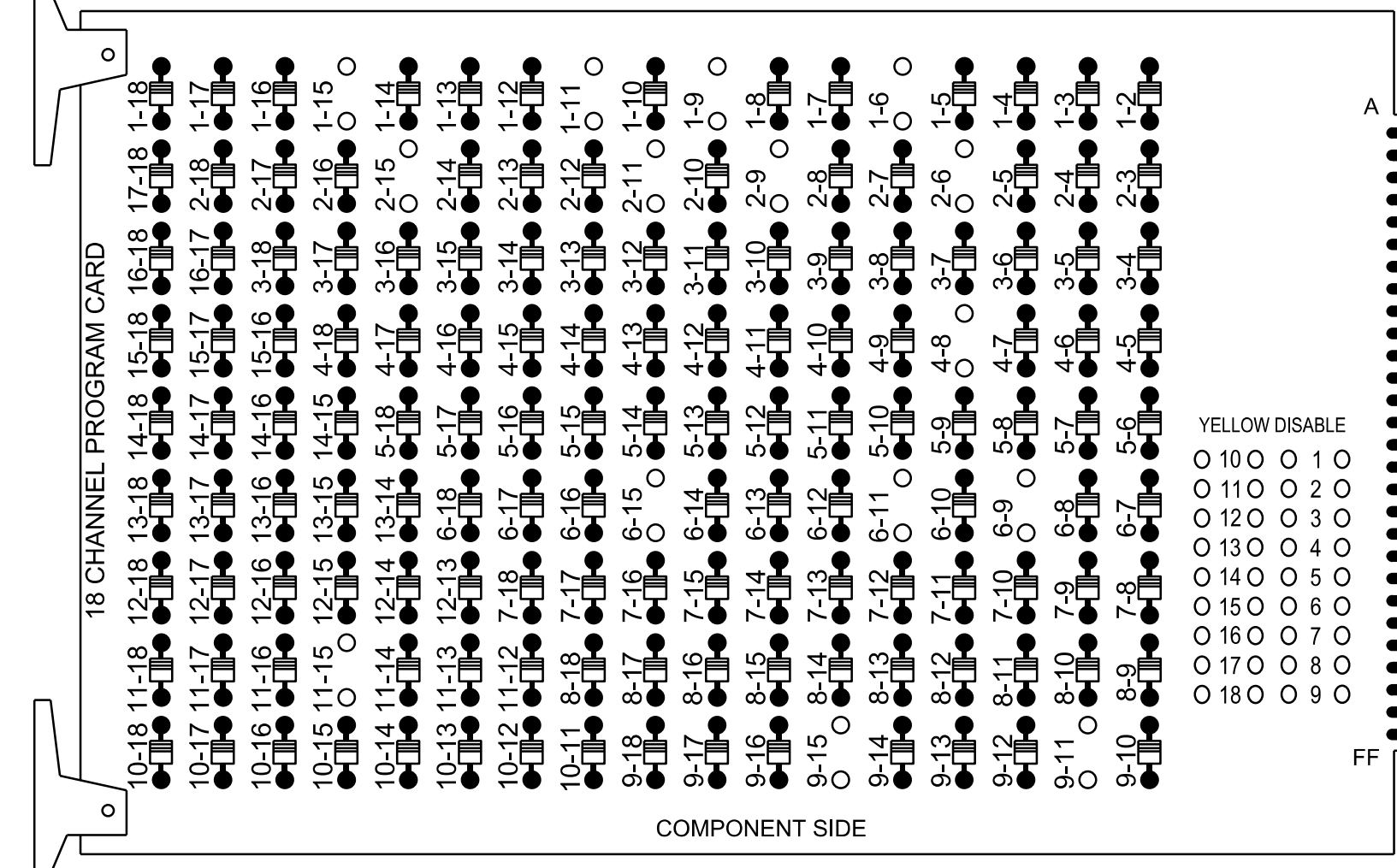
Signal Upgrade Temporary Design 2 - (TMP Phase II)

<p>Infrastructure Consulting Services, Inc.</p> <p>8210 University Executive Park Drive Suite 220 Charlotte, North Carolina 28226 Phone: 704-549-4260 www.rkamkemp.com NC License No. F-1489</p>	<p>US 276 (Russ Avenue) at Shopping Center Entrance/ Lee Street</p> <p>Division 14 Haywood County Waynesville</p> <p>PLAN DATE: April 2023 REVIEWED BY: WJ Hamilton</p> <p>PREPARED BY: TS Popelka RKA PROJ. NO.: 16085 (040)</p>		<p>SEAL</p> <p>William J. Hamilton</p> <p>04/11/2023</p> <p>SIG. INVENTORY NO. 14-058712</p>				
	<p>750 N. Greenfield Pkwy, Garner, NC 27529</p> <p>SCALE: 0 20 1"=20'</p>	<p>REVISIONS</p> <table border="1"> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		NO.	INIT.	DATE	
NO.	INIT.	DATE					

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

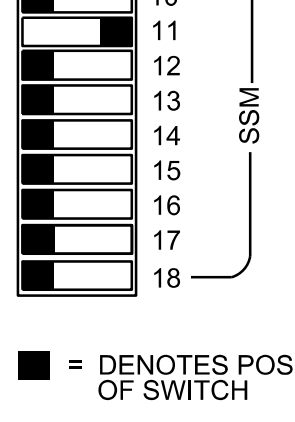
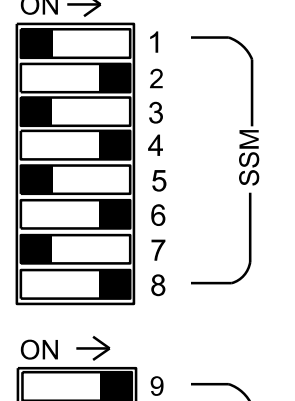
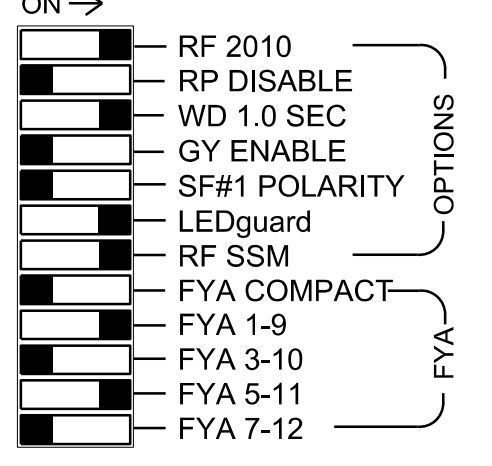
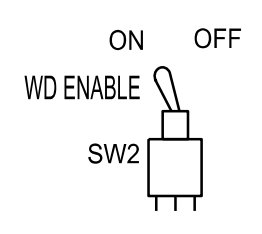
REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 1-15, 2-6, 2-9, 2-11, 2-15, 4-8, 6-9, 6-11, 6-15, 9-11, 9-15, AND 11-15.



REMOVE JUMPERS AS SHOWN

NOTES:

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



■ = DENOTES POSITION OF SWITCH

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
- Program phases 4 and 8 for Dual Entry.
- Program controller to start up in phase 2 Green No Walk and 6 Green 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 D14-12 Waynesville 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, S5, S8, S9, S11, AUX S1, AUX S4
 Phases Used.....1, 2, 4, 6, 6PED, 8
 Overlap "1".....*
 Overlap "2".....NOT USED
 Overlap "3".....*
 Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

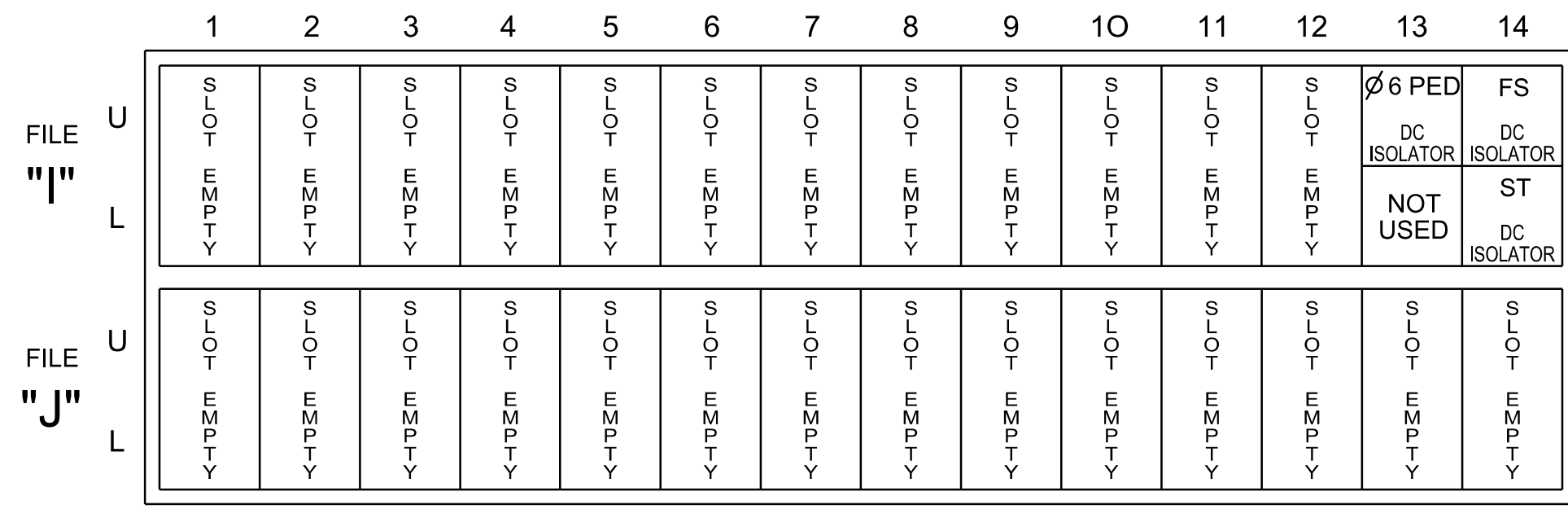
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	22,23,24	NU	NU	41,42	NU	NU	61,62	P61, P62	NU	81,82	NU	11	NU	NU	21	NU	NU
RED		128			101			134			107							
YELLOW	*	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121			A114		
YELLOW ARROW													A122			A115		
FLASHING YELLOW ARROW													A123			A116		
GREEN ARROW	127																	
Hand icon													119					
Walking person icon													121					

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

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
 ST = STOP TIME

SPECIAL DETECTOR NOTE

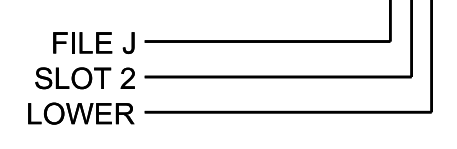
Install a multizone microwave detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

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
PED PUSH BUTTONS												
P61,P62	TB8-7,9	I13U	88	34	6	PED 6						

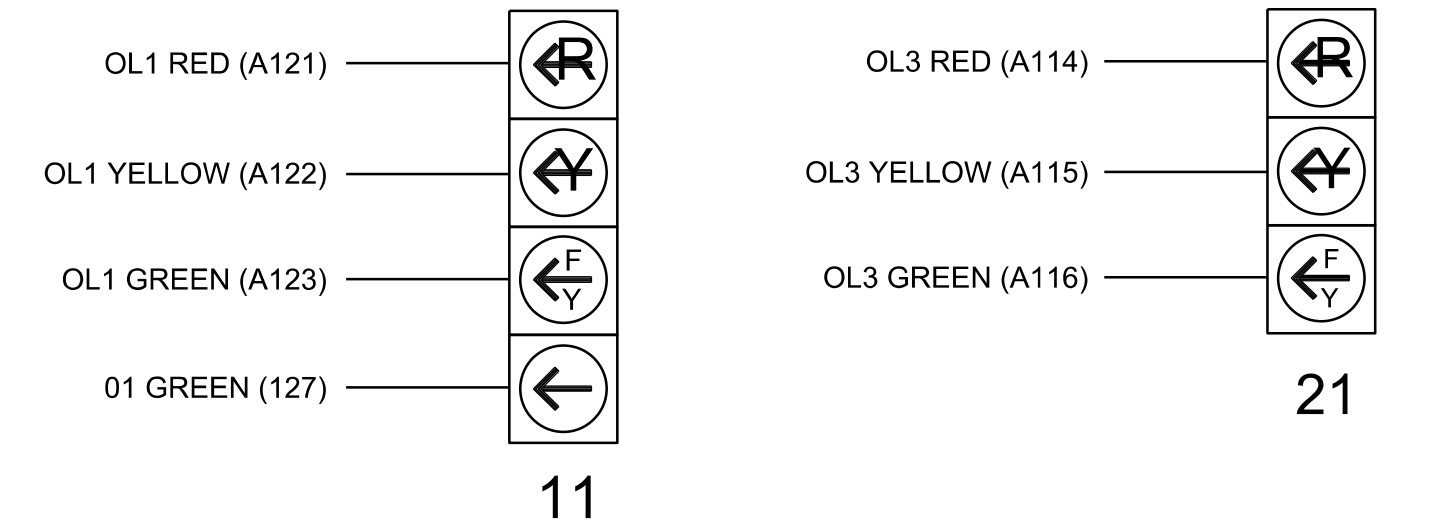
NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT I13.

INPUT FILE POSITION LEGEND: J2L



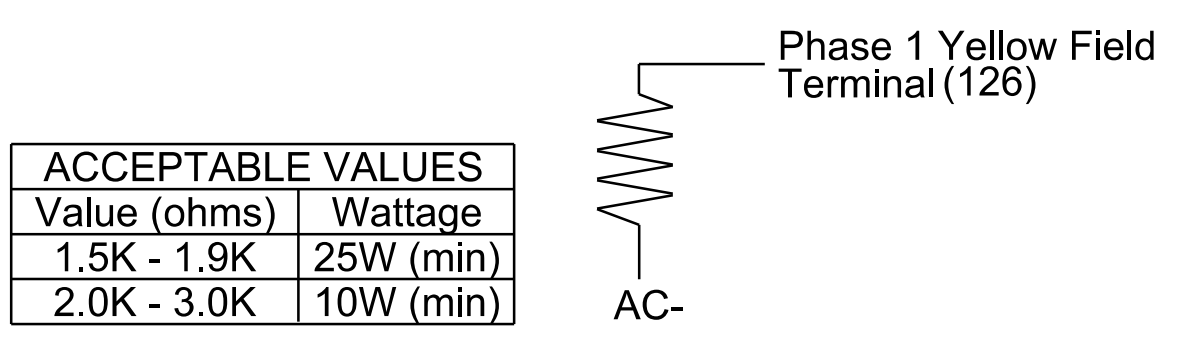
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown)



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

Electrical Detail - Sheet 1 of 2
 Temporary Design 2 - (TMP Phase II)

US 276 (Russ Avenue)
 at
 Shopping Center Entrance/
 Lee Street
 Division 14 Haywood County Waynesville

Prepared For:

Plan Date: April 2023
 Prepared By: TS Popelka
 RKA PROJ. NO: 16085 (040)

Reviewed By: WJ Hamilton
 Date: 04/11/2023

Signature:

Seal:

Document Not Considered Final Unless All Signatures Completed