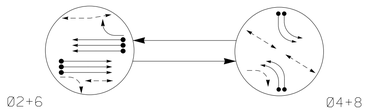
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 70.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

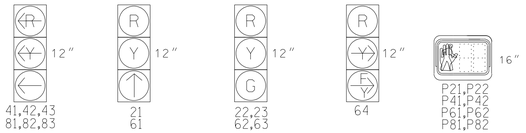
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	FLASH
21	↑	R	R
21,22,23	G	R	R
41,42,43	←R	←R	←R
61	↑	R	R
62,63	G	R	R
64	←Y	R	R
81,82,83	←R	←R	←R
P21,P22	W	DW	DRK
P41,P42	DW	W	DRK
P61,P62	W	DW	DRK
P81,P82	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



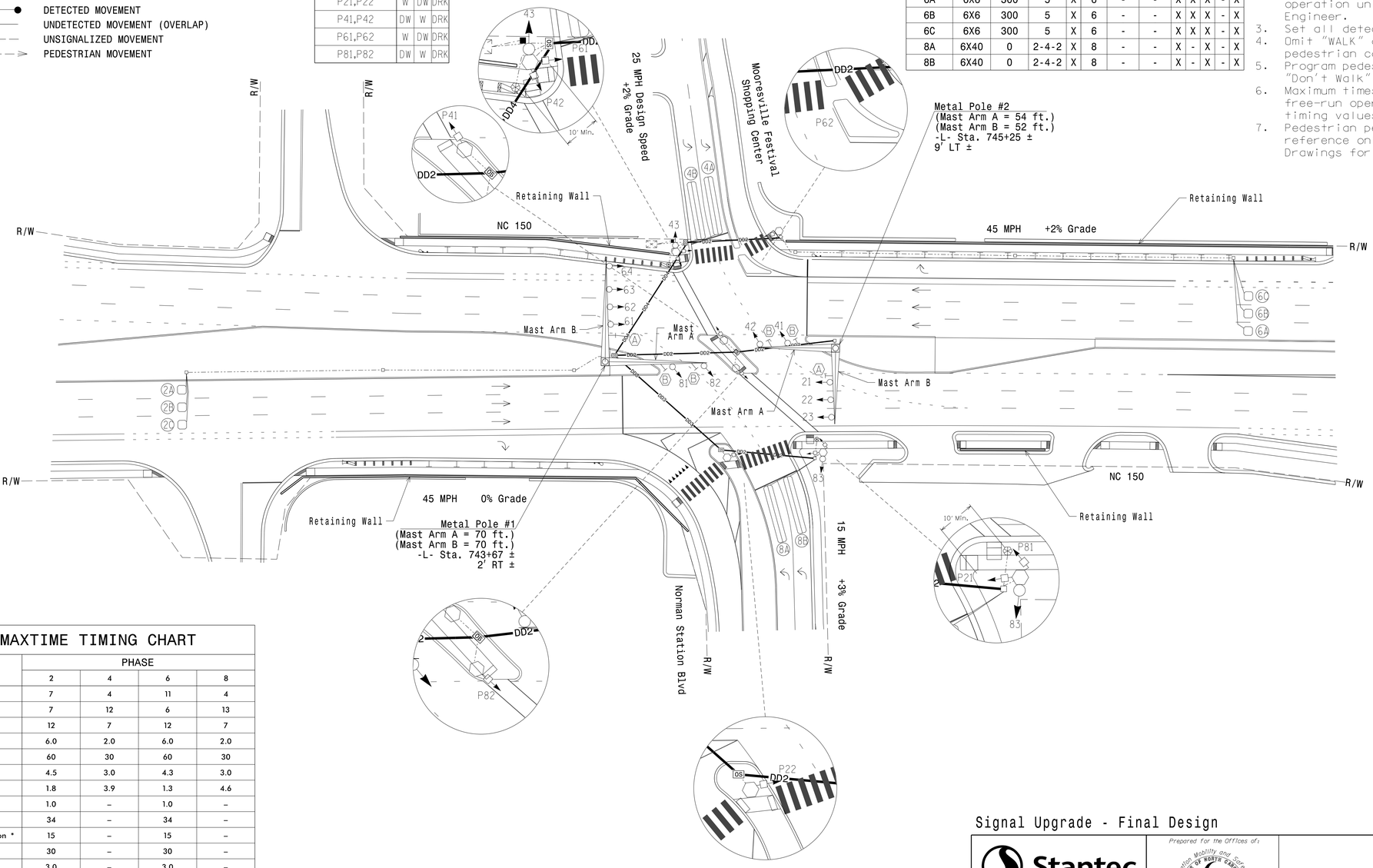
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
2C	6X6	300	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X
6C	6X6	300	5	X	6	-	-	X	X	X	-	X
8A	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
8B	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.



MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6	PHASE 8
Walk *	7	4	11	4
Ped Clear *	7	12	6	13
Min Green	12	7	12	7
Passage *	6.0	2.0	6.0	2.0
Max 1 *	60	30	60	30
Yellow Change	4.5	3.0	4.3	3.0
Red Clear	1.8	3.9	1.3	4.6
Added Initial *	1.0	–	1.0	–
Maximum Initial *	34	–	34	–
Time Before Reduction *	15	–	15	–
Time To Reduce *	30	–	30	–
Minimum Gap	3.0	–	3.0	–
Advance Walk	–	–	4	–
Non Lock Detector	–	X	–	X
Vehicle Recall	MIN RECALL	–	MIN RECALL	–
Dual Entry	–	–	–	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	●→
◐→	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	→
⬭→	Metal Pole with Mastarm	⬭→
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⬡	Type II Signal Pedestal	⬢
⊛	Type I Pushbutton Post	✤
OS	Oversized Junction Box	■
Ⓐ	No Left/No U-Turn Sign (R3-18)	Ⓐ
Ⓑ	Left Arrow "ONLY" Sign (R3-5L)	Ⓑ

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

N

SCALE 0 40 1"=40'

NC 150
at
Norman Station Boulevard/
Mooresville Festival

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

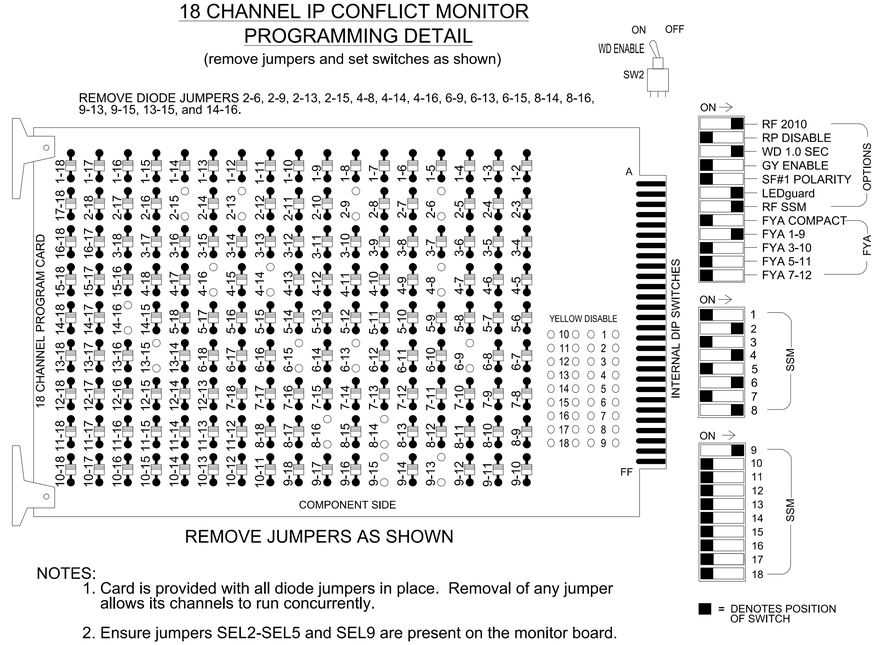
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1330

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 70.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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 phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S12, AUX S1
Phases Used.....2, 2PED, 4, 4PED, 6, 6PED, 8, 8PED
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

*See overlap programming detail on this sheet

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2		S3	S4	S5	S6	S7	S8		S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2		13	3	4	14	5	6		15	7	8	16	9	10	17	11	12	18
PHASE	1	2		2 PED	3	4	4 PED	5	6		6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22,23	P21, P22	NU	41,42, 43	P41, P42	NU	61	62,63	P61, P62	NU	81,82, 83	P81, P82	★ 64	NU	NU	NU	NU	NU
RED		128	128						134	134					A121					
YELLOW		129	129						135	135										
GREEN			130							136										
RED ARROW						101							107							
YELLOW ARROW						102							108		A122					
GREEN ARROW		130				103			136				109		A123					
✋				113			104				119			110						
🚶				115			106				121			112						

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

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	SLOT EMPTY	ø2 2A	ø2 2C	SLOT EMPTY	SLOT EMPTY	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø2 PED DC ISOLATOR	ø6 PED DC ISOLATOR	FS DC ISOLATOR
FILE "I" L		ø2 2B	NOT USED			ø4 4B						ø4 PED DC ISOLATOR	ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J" U	SLOT EMPTY	ø6 6A	ø6 6C	SLOT EMPTY	SLOT EMPTY	ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L		ø6 6B	NOT USED			ø8 8B								

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
2C	TB2-9,10	I3U	63	29	4	2			X	X	X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
4B	TB4-11,12	I6L	45	7	9	4			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	
8A	TB5-9,10	J6U	42	4	22	8			X		X	
8B	TB5-11,12	J6L	46	8	23	8			X		X	
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P41,P42	TB8-5,6	I12L	69	35	4	PED 4						
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

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

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

OVERLAP PROGRAMMING

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

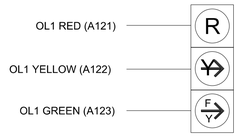
Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1
Type	FYA 4 - Section
Included Phases	2
Modifier Phases	-
Modifier Overlaps	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0
Disable Bridging	X

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



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THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1330
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150
at
Norman Station Boulevard/
Mooresville Festival

Division 12 | Iredell County | Mooresville

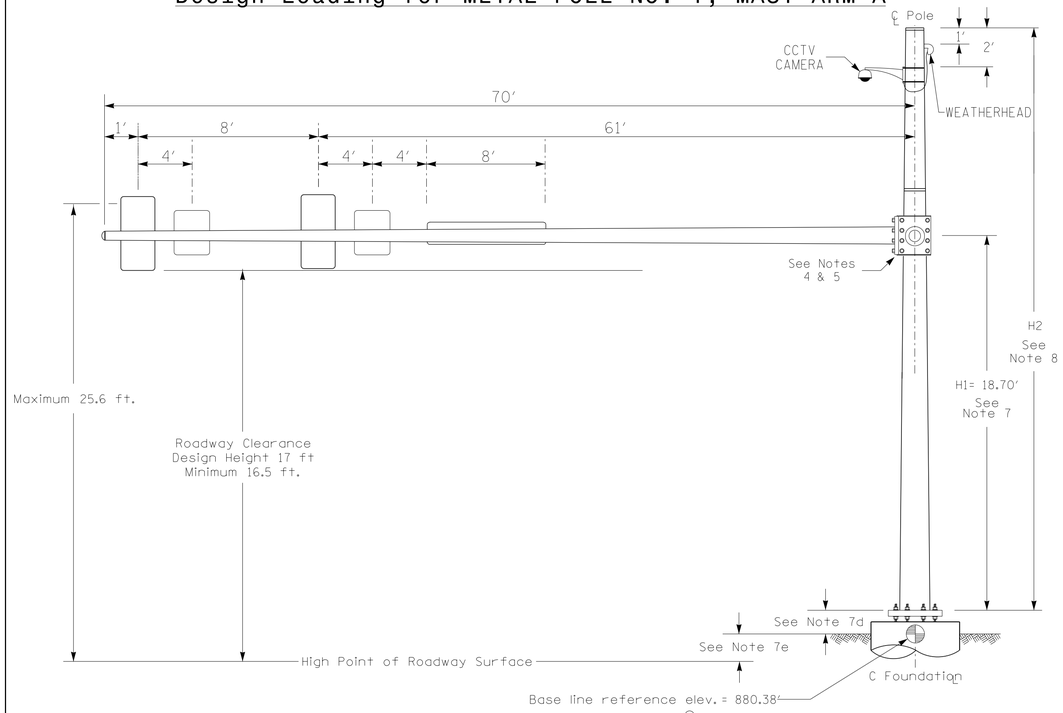
PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

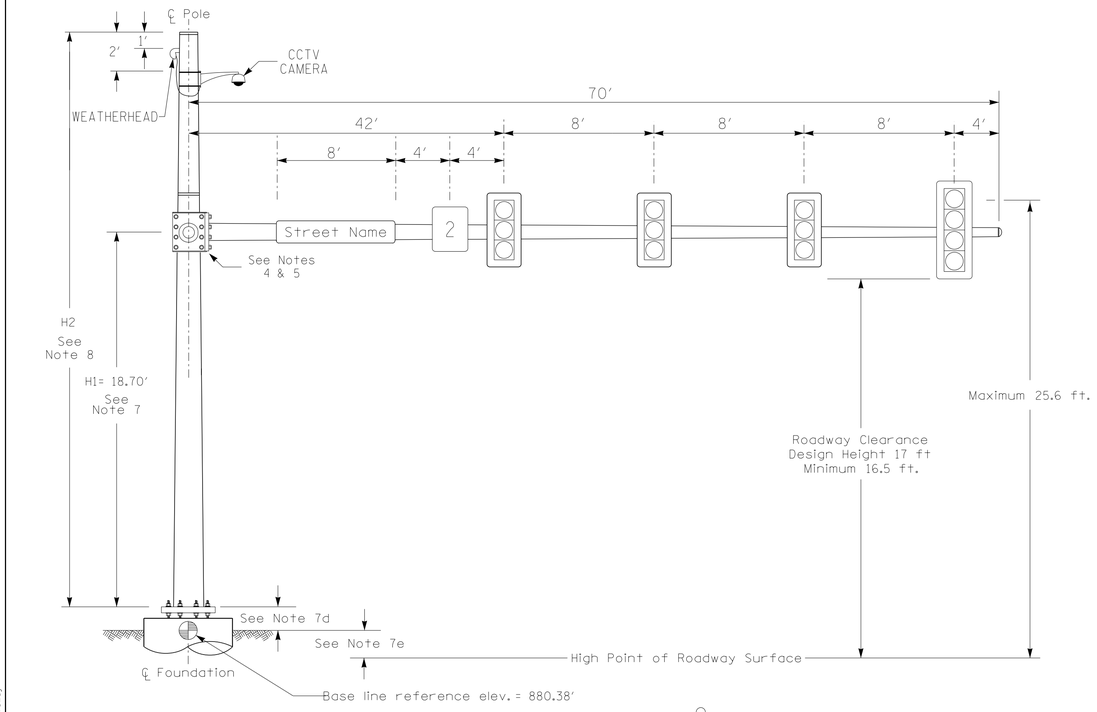
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1330

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



Elevation View @ 0°

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



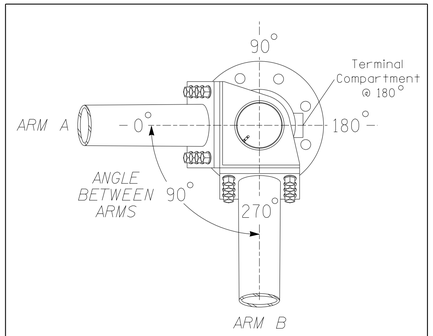
Elevation View @ 270°

SPECIAL NOTE

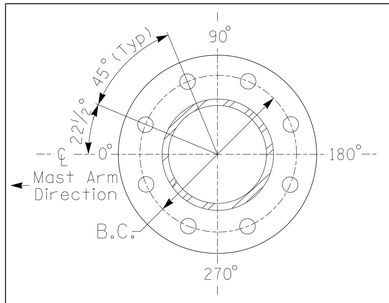
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at ℄ Foundation @ ground level	880.38 ft.	880.38 ft.
Elevation difference at High point of roadway surface	-0.38 ft.	-0.38 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

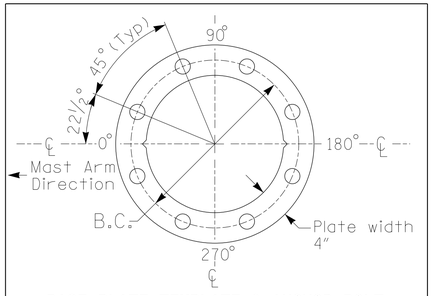


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 70.2

MAST ARM LOADING SCHEDULE

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

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 150
at
Norman Station Boulevard/
Mooresville Festival

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J. Galloway, PE

PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

SCALE 0 N/A N/A

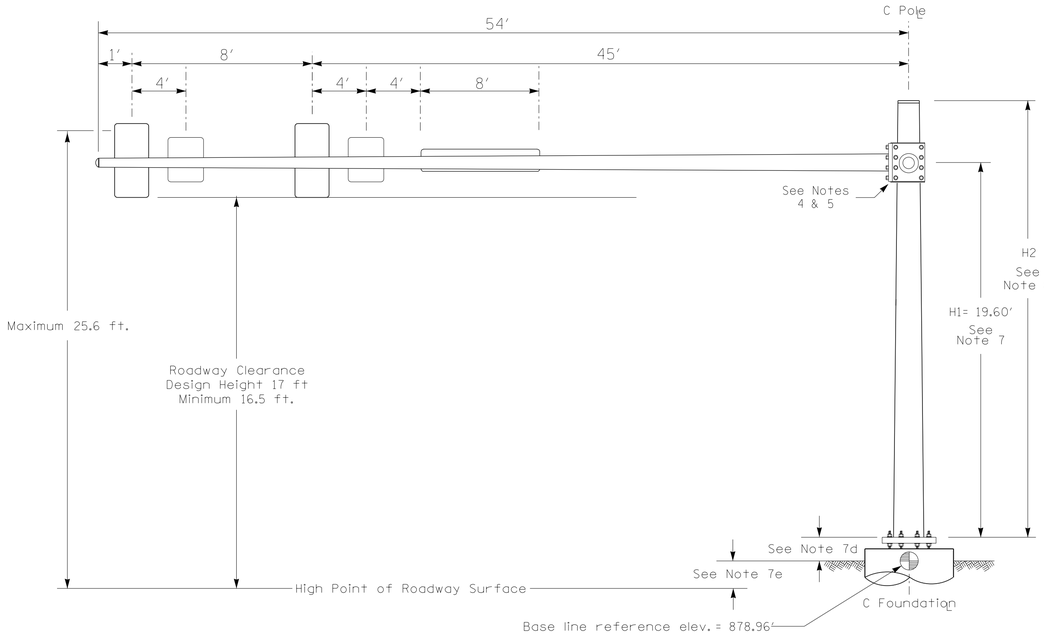
REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

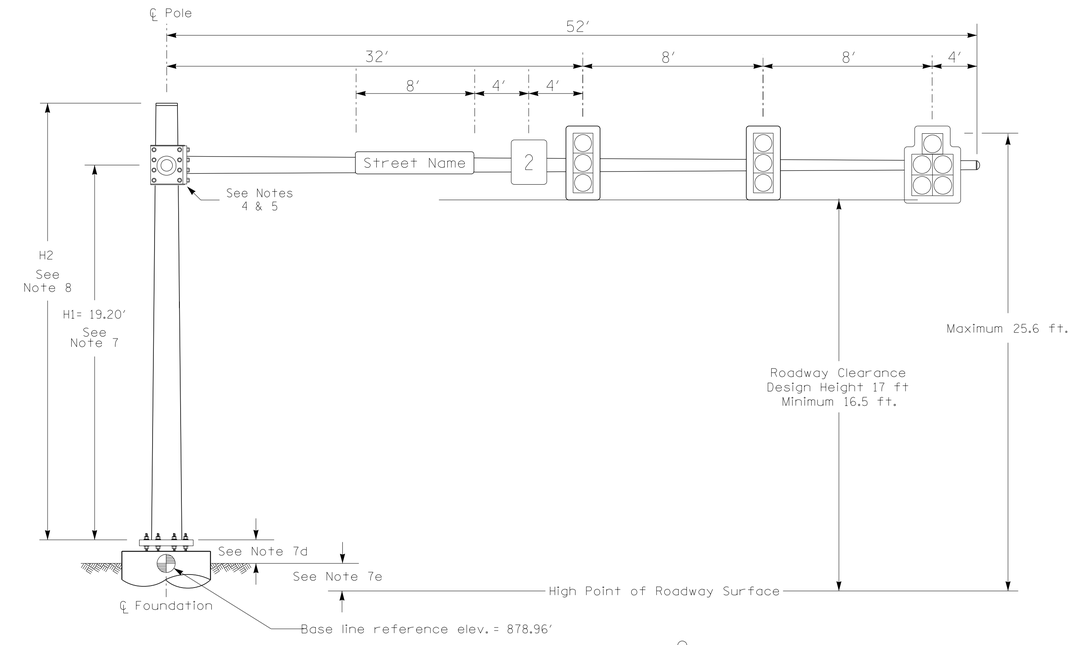
SIG. INVENTORY NO. 12-1330

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



Elevation View @ 0°

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



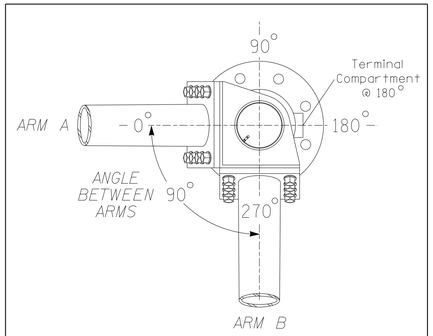
Elevation View @ 270°

SPECIAL NOTE

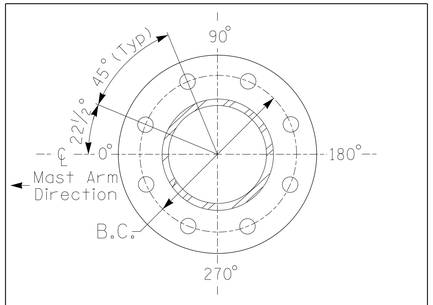
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at ℄ Foundation @ ground level	878.96 ft.	878.96 ft.
Elevation difference at High point of roadway surface	+0.55 ft.	+0.13 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

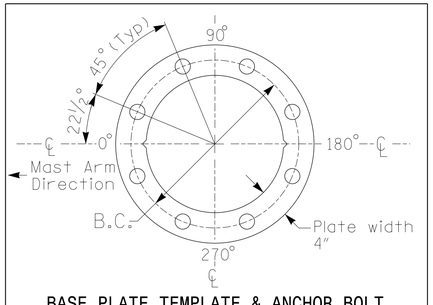


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 70.3

MAST ARM LOADING SCHEDULE

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

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 150
at
Norman Station Boulevard/
Mooresville Festival

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J. Galloway, PE

PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

REVISIONS	INIT.	DATE

SCALE 0 N/A N/A

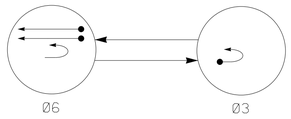
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON D. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...

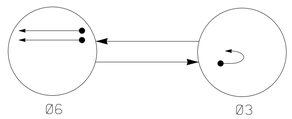
SIG. INVENTORY NO. 12-1330

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 71.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

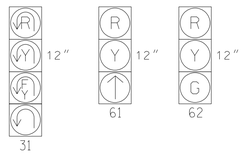
SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31	FY	∩	R
61	↑	R	R
62	G	R	R

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31	R	∩	R
61	↑	R	R
62	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

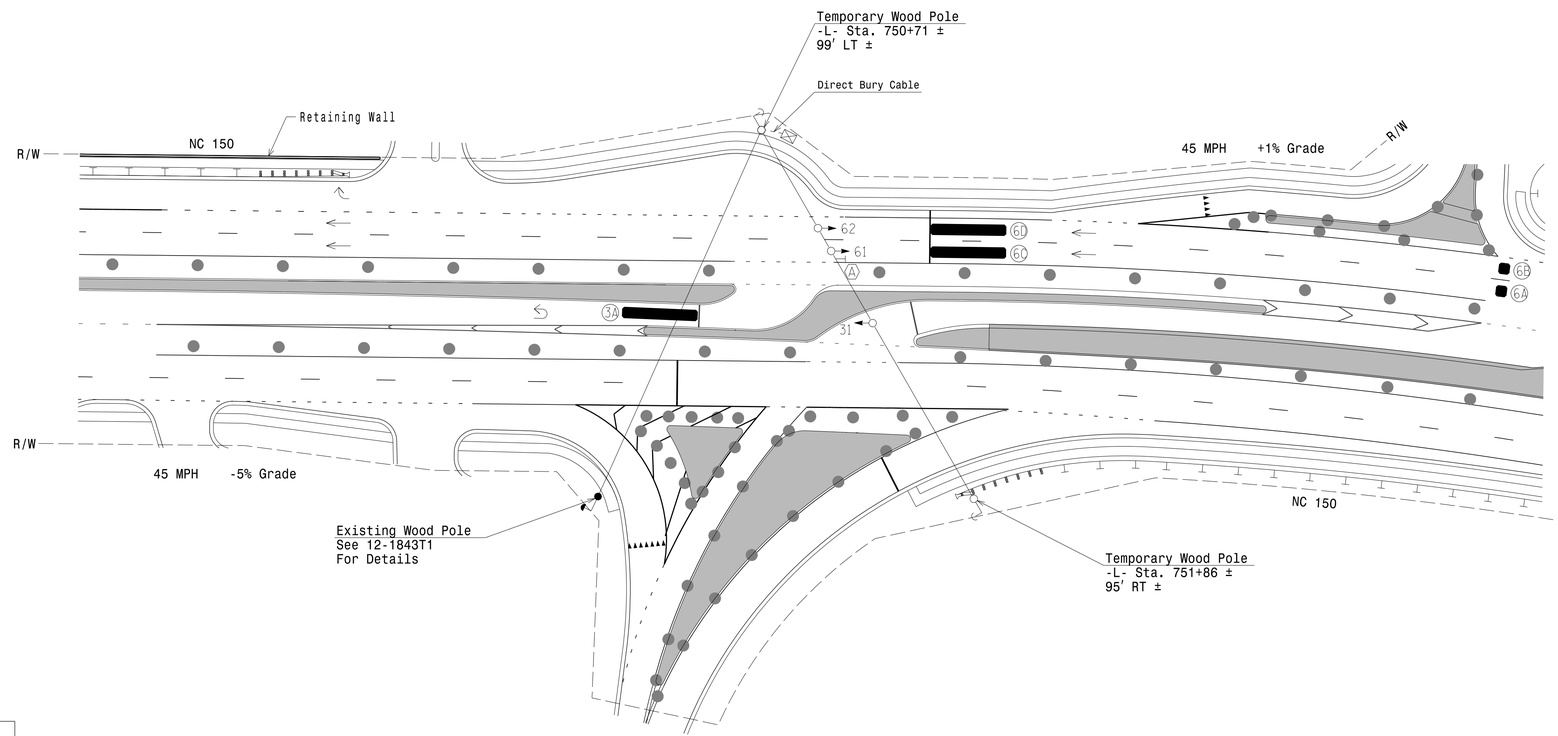
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	15.0★	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.
★ Disable delay during Alternate Phasing Operation.

2 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The Division Traffic Engineer will determine the hours of use for each phasing plan.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Field adjust temporary poles as needed.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○⌐	Signal Pole with Guy	●⌐
○⌐	Signal Pole with Sidewalk Guy	●⌐
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·-·	2-in Underground Conduit	·-·-·-·
N/A	Right of Way	– – – –
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
● ● ●	Drums	N/A
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	3.1	4.4
Red Clear	4.7	1.6
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.0
Advance Walk	–	–
Non Lock Detector	X	X
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

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

New Installation
Temporary Design 1 - TMP Phase III

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

SCALE 0 40 1"=40'

NC 150 WB
at
U-Turn for Consumer Square
Western Entrance

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

SIG. INVENTORY NO. 12-1844T1

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User:jgalloway
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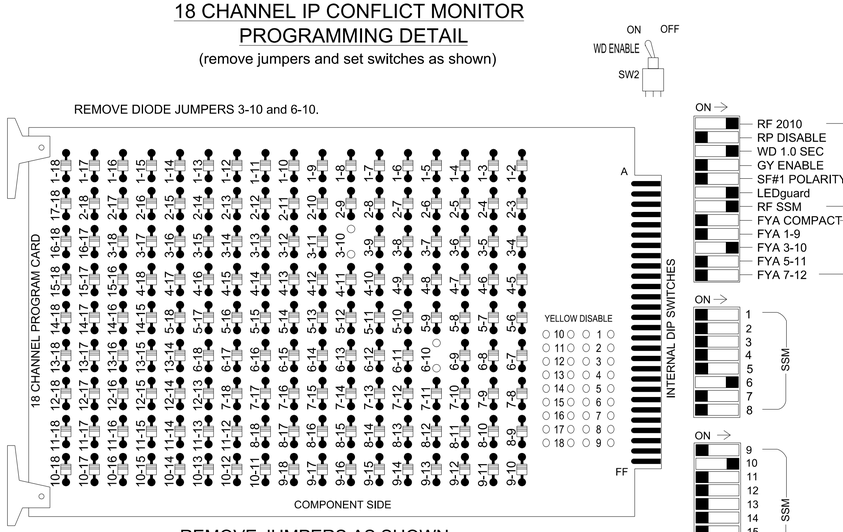
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 71.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Phase Not On 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 NC 150 D12-02_Mooresville CLS.

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.....S4, S8, AUX S2
Phases Used.....3, 6
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.	NU	NU	NU	31★	NU	NU	NU	61	62	NU	NU	NU	NU	NU	31★	NU	NU	NU	NU
RED								134	134										
YELLOW				✳				135	135										
GREEN									136										
RED ARROW															A124				
YELLOW ARROW															A125				
FLASHING YELLOW ARROW															A126				
GREEN ARROW				118				136											

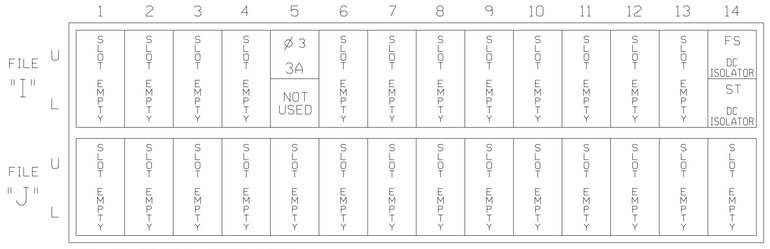
NU = Not Used

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

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
3A	TB4-5,6	I5U	58	20	7 *	3	15.0		X		X	

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

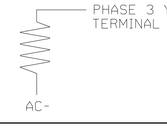
Sequence 1

Ring	Sequence Data
1	6,a,3,b
2	

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



FYA SIGNAL WIRING DETAIL

(wire signal head as shown)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1844T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150 WB
at
U-Turn for Consumer Square
Western Entrance
Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
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SIG. INVENTORY NO. 12-1844T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 71.2

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

OVERLAP PLAN 2: Modifies overlap included phases for head 31 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 3 call on loop 3A to 0 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 3A

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

	Detector	Call Phase	Delay
3A	7	3	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

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

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	2	
Type	FYA 4 - Section	
Included Phases	-	← NOTICE INCLUDED PHASE
Modifier Phases	3	
Modifier Overlaps	-	
Trail Green	0	
Trail Yellow	0.0	
Trail Red	0.0	

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1844T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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Traffic Engineering Branch
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750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
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Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1844T1

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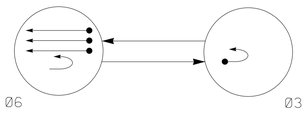
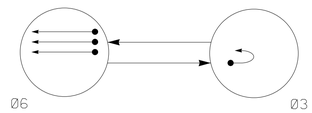
User:rgalloway
U:\Projects\Designs\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sm_ele_12-18441.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 72.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

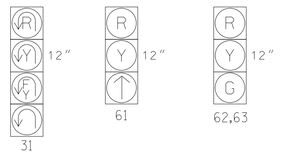
SIGNAL FACE	PHASE Ø6	PHASE Ø3	FLASH
31	Y	R	R
61	↑	R	R
62,63	G	R	R

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	FLASH
31	R	R	R
61	↑	R	R
62,63	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	2-4-2	X	3	15.0★	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X
6C	6X6	300	5	X	6	-	-	X	X	X	-	X

★ Disable delay during Alternate Phasing Operation.

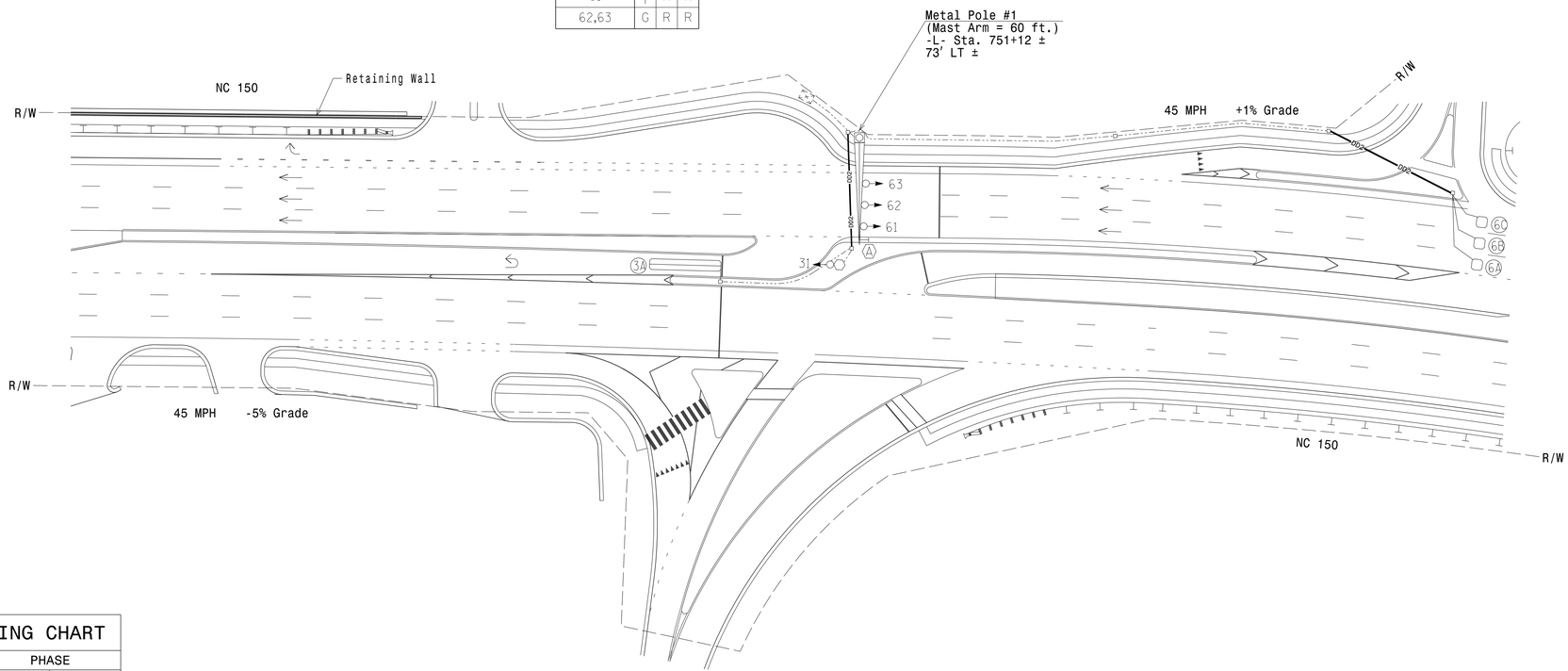
2 Phase Fully Actuated w/ Alternate Phasing NC 150 D12-02_MOORESVILLE CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. The Division Traffic Engineer will determine the hours of use for each phasing plan.
5. 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 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	15	60
Yellow Change	3.1	4.4
Red Clear	4.7	1.6
Added Initial *	–	–
Maximum Initial *	–	1.0
Time Before Reduction *	–	34
Time To Reduce *	–	15
Minimum Gap	–	3.0
Advance Walk	–	3
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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	●→
◐→	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	→
▭→	Metal Pole with Mastarm	▭→
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⬡	Type II Signal Pedestal	⬢
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

New Installation - Final Design

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

SCALE 0 40 1"=40'

NC 150 WB at U-Turn for Consumer Square Western Entrance

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE

PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...

DATE

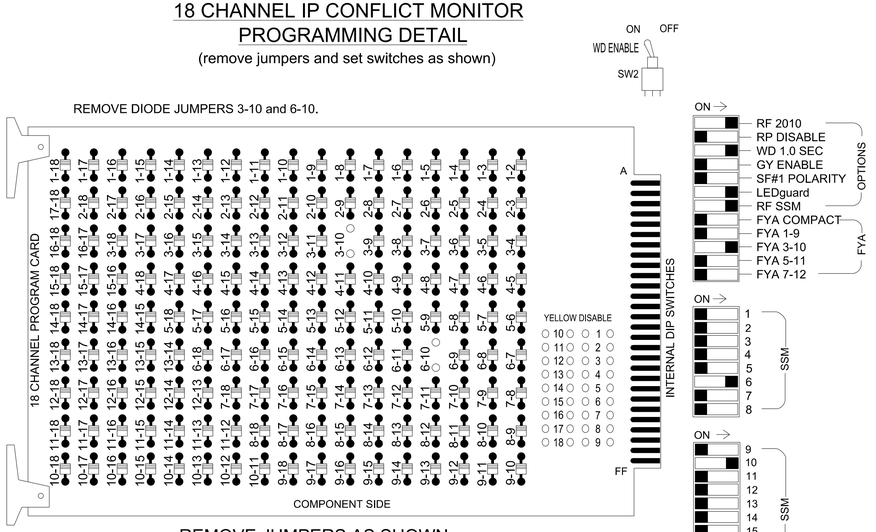
SIG. INVENTORY NO. 12-1844

$$$$$$$SYSDATE$$$$$$
10:41:37 AM
User:jgalloway
User:jgalloway
$$$$$$$SYSDATE$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 72.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Phase Not On 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 NC 150 D12-02_Mooresville CLS.

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.....S4, S8, AUX S2
Phases Used.....3, 6
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.	NU	NU	NU	31★	NU	NU	NU	61	62,63	NU	NU	NU	NU	NU	31★	NU	NU	NU	NU
RED								134	134										
YELLOW				✳				135	135										
GREEN									136										
RED ARROW															A124				
YELLOW ARROW															A125				
FLASHING YELLOW ARROW															A126				
GREEN ARROW				118				136											

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)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø3 3A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L					NOT USED									ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 6A	Ø6 6C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø6 6B	NOT USED											

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
3A	TB4-5,6	I5U	58	20	7 *	3	15.0		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

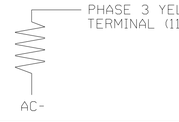
Sequence 1

Ring	Sequence Data
1	6,a,3,b
2	

LOAD RESISTOR INSTALLATION DETAIL

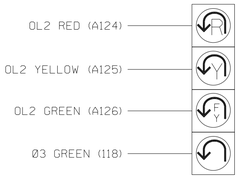
(install resistor as shown below)

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1844
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 1 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
U-Turn for Consumer Square
Western Entrance
Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1844 DATE

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 72.2

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

OVERLAP PLAN 2: Modifies overlap included phases for head 31 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 3 call on loop 3A to 0 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 3A

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

	Detector	Call Phase	Delay
3A	7	3	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

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

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	2	
Type	FYA 4 - Section	
Included Phases	-	← NOTICE INCLUDED PHASE
Modifier Phases	3	
Modifier Overlaps	-	
Trail Green	0	
Trail Yellow	0.0	
Trail Red	0.0	

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1844
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 2 of 2

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Department of Transportation
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NC 150 WB
at
U-Turn for Consumer Square
Western Entrance

Division 12 | Iredell County | Mooresville

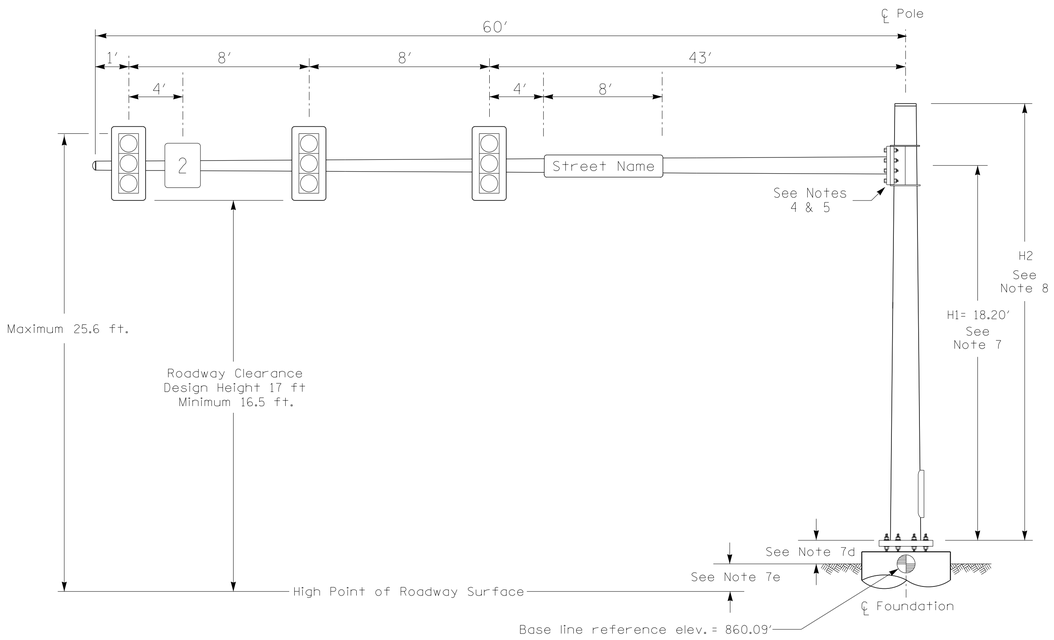
PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1844

Design Loading for METAL POLE NO. 1



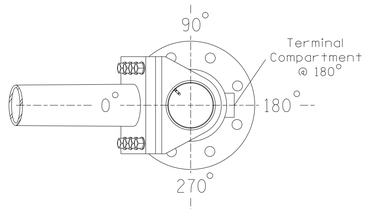
Elevation View

SPECIAL NOTE

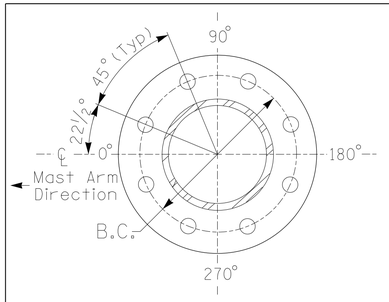
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ⊕ Foundation @ ground level	860.09 ft.	
Elevation difference at High point of roadway surface	-0.85 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

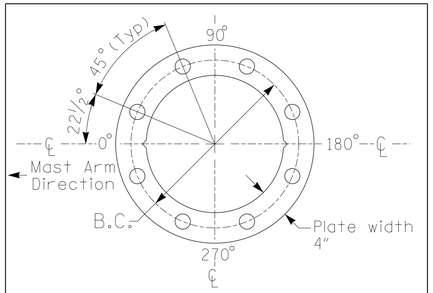


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 72.3

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
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 WB
at
U-Turn for Consumer Square
Western Entrance

Division 12 Iredell County Mooresville

PLAN DATE: November 2023 REVIEWED BY: J. Galloway, PE
PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

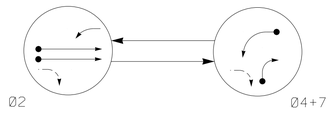
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1844

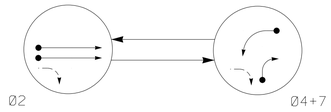
5/17/2024
10:43:23 AM
User:jgallowa
C:\Users\jgallowa\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1844.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 73.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

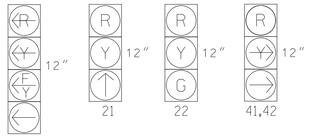
SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	FLASH
21	↑	R	R
22	G	R	R
41,42	R	→	R
71	←Y	←	←R

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	FLASH
21	↑	R	R
22	G	R	R
41,42	R	→	R
71	←R	←	←R

SIGNAL FACE I.D.

All Heads L.E.D.

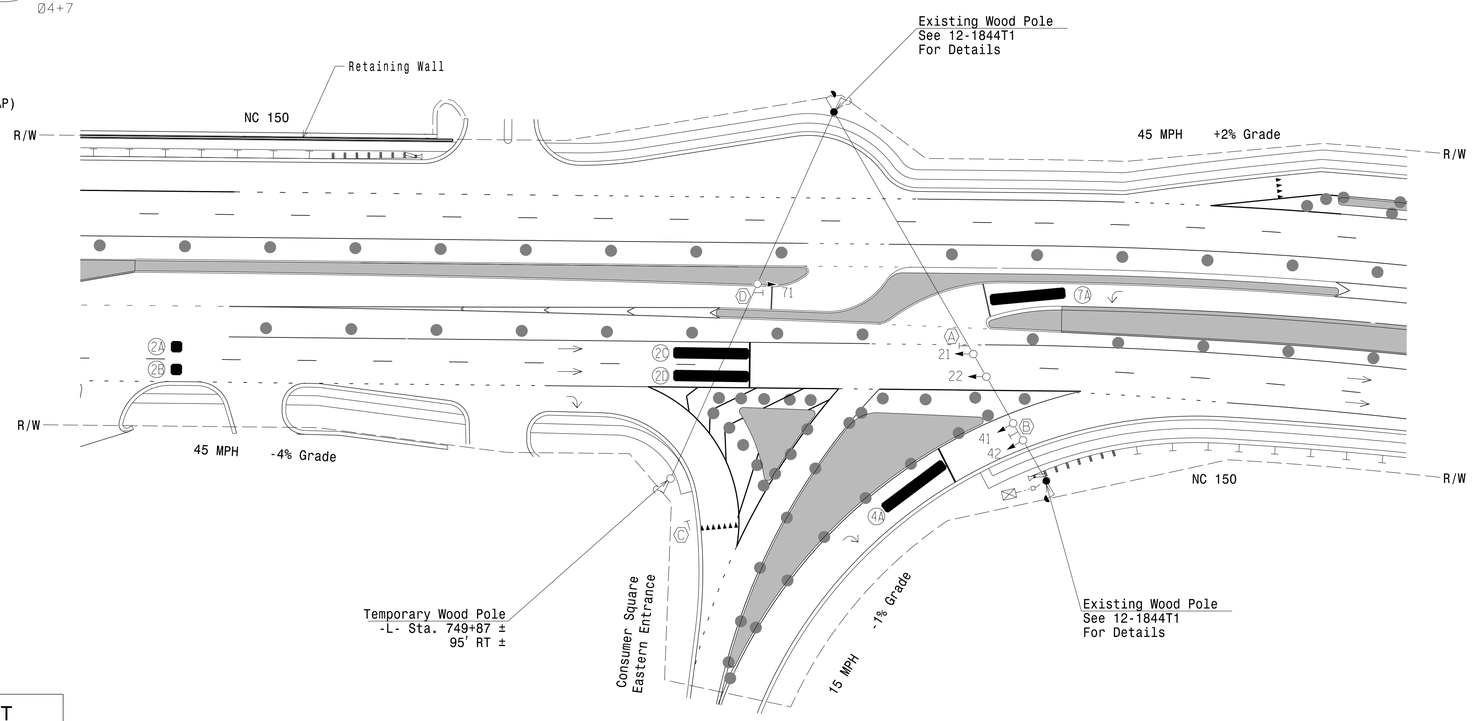


MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
7A	6X40	0	✳	✳	7	15.0★	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

★ Disable delay during Alternate Phasing Operation.



MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	–	–	–
Ped Clear *	–	–	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.9	3.0	3.0
Red Clear	2.9	3.1	3.2
Added Initial *	–	–	–
Maximum Initial *	–	–	–
Time Before Reduction *	15	–	–
Time To Reduce *	30	–	–
Minimum Gap	3.0	–	–
Advance Walk	–	–	–
Non Lock Detector	X	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

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

2 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The Division Traffic Engineer will determine the hours of use for each phasing plan.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Field adjust temporary poles as needed.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●→
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-----	2-in Underground Conduit	-----
N/A	Right of Way	-----
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
●●●	Drums	N/A
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	"YIELD" Sign (R1-2)	Ⓒ
Ⓓ	No U-Turn Sign (R3-4)	Ⓓ

New Installation
Temporary Design 1 - TMP Phase III

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Signal Design Section
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SCALE 0 40 1"=40'

NC 150 EB
at
Consumer Square
Eastern Entrance

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1843TI DATE

$$$$$$$SYSDATE$$$$$
01:45:23 AM
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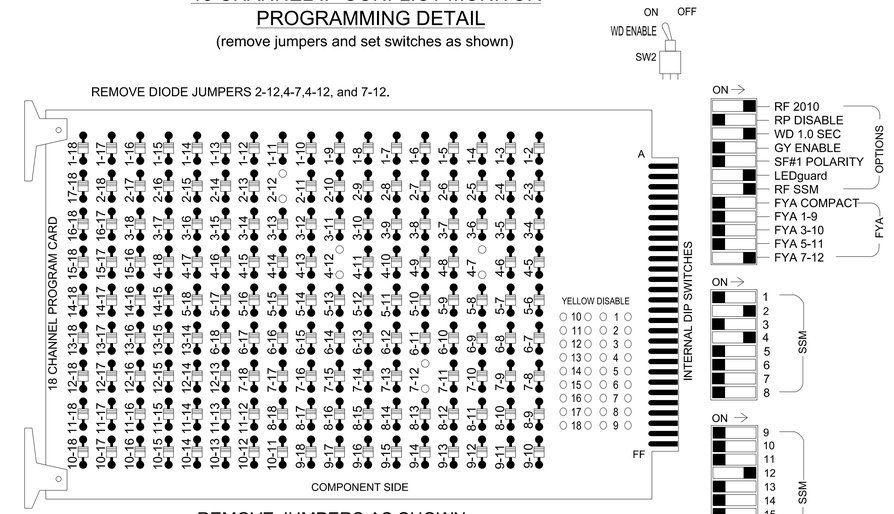
User:jgilloway

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 7 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S10, AUX S5
Phases Used.....2, 4, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....*

*See overlap programming detail on sheet 2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 73.1

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	NU	NU	NU	NU	71 ★	NU	NU	NU	NU	NU	NU	71 ★	NU
RED		128	128			101													
YELLOW		129	129								✳								
GREEN			130																
RED ARROW																		A101	
YELLOW ARROW						102												A102	
FLASHING YELLOW ARROW																		A103	
GREEN ARROW		130				103					124								

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)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS / DC ISOLATOR
FILE "I" L														ST / DC ISOLATOR
FILE "J" U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø7 / 7A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L					NOT USED									

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
7A	TB5-5,6	J5U	57	19	21 *	7	15.0		X		X	

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

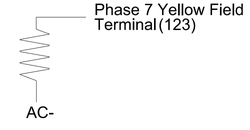
SPECIAL DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

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



FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1843TI
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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www.stantec.com
License No. F-0672

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Traffic Engineering Branch
Traffic & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
Consumer Square
Eastern Entrance
Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1843TI

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

OVERLAP PLAN 2: Modifies overlap included phases for heads 71 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 7 call on loop 7A to 0 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 7A

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

	Detector	Call Phase	Delay
7A	21	7	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

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

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	4	
Type	FYA 4 - Section	
Included Phases	-	← NOTICE INCLUDED PHASE
Modifier Phases	7	
Modifier Overlaps	-	
Trail Green	0	
Trail Yellow	0.0	
Trail Red	0.0	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1843T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150 EB
at
Consumer Square
Eastern Entrance

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024	REVIEWED BY: J Galloway, PE
PREPARED BY: RMM/JPG	REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

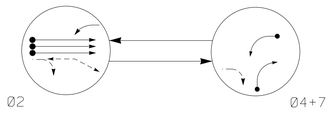
SEAL — NORTH CAROLINA PROFESSIONAL ENGINEER — SEAL 029904 — JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

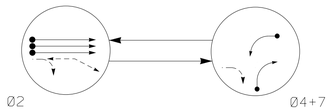
SIG. INVENTORY NO. 12-1843T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 74.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

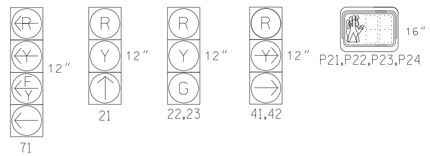
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

DEFAULT PHASING TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	PHASE FLASH
21	↑	R	R
22,23	G	R	R
41,42	R	→	R
71	~~FY~~	~~←~~	~~R~~
P21,P22 P23,P24	W	DW	DRK

ALTERNATE PHASING TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	PHASE FLASH
21	↑	R	R
22,23	G	R	R
41,42	R	→	R
71	~~R~~	~~←~~	~~R~~
P21,P22 P23,P24	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
2C	6X6	300	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
7A	6X40	0	2-4-2	X	7	★15.0	-	X	-	X	-	X

★ Disable delay during Alternate Phasing Operation.

2 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
4. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
5. The Division Traffic Engineer will determine the hours of use for each phasing plan.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.

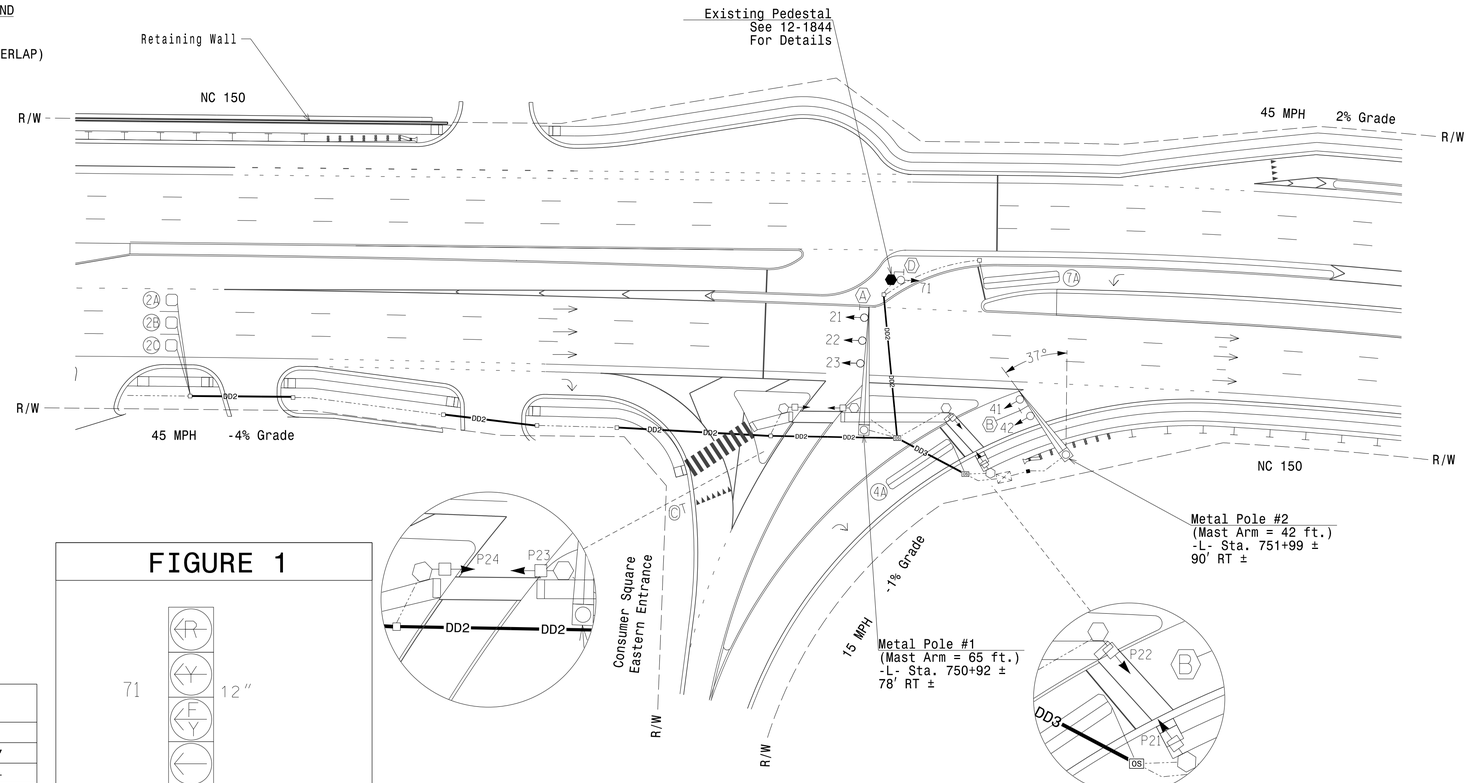
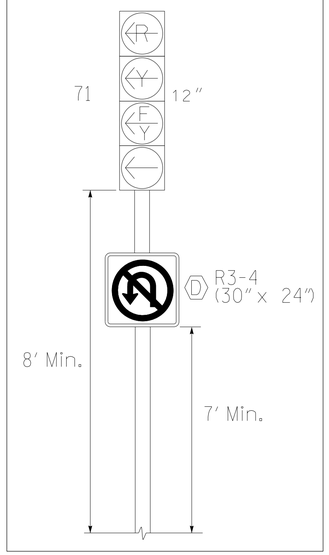


FIGURE 1



MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	4	–	–
Ped Clear *	4	–	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.9	3.0	3.0
Red Clear	2.7	2.8	3.4
Added Initial *	1.0	–	–
Maximum Initial *	34	–	–
Time Before Reduction *	15	–	–
Time To Reduce *	30	–	–
Minimum Gap	3.0	–	–
Advance Walk	–	–	–
Non Lock Detector	–	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○~	Signal Pole with Sidewalk Guy	●~
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·-·	2-in Underground Conduit	·-·-·-·
N/A	Right of Way	- - - -
→	Directional Arrow	→
○◁	Metal Pole with Mastarm	□◁
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⬡	Type II Signal Pedestal	⬢
OS	Oversized Junction Box	■
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	"YIELD" Sign (R1-2)	Ⓒ
Ⓓ	No U-Turn Sign (R3-4) (SEE FIGURE 1)	Ⓓ

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SCALE 0 40 1"=40'

NC 150 EB
at
Consumer Square
Eastern Entrance

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL SEAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

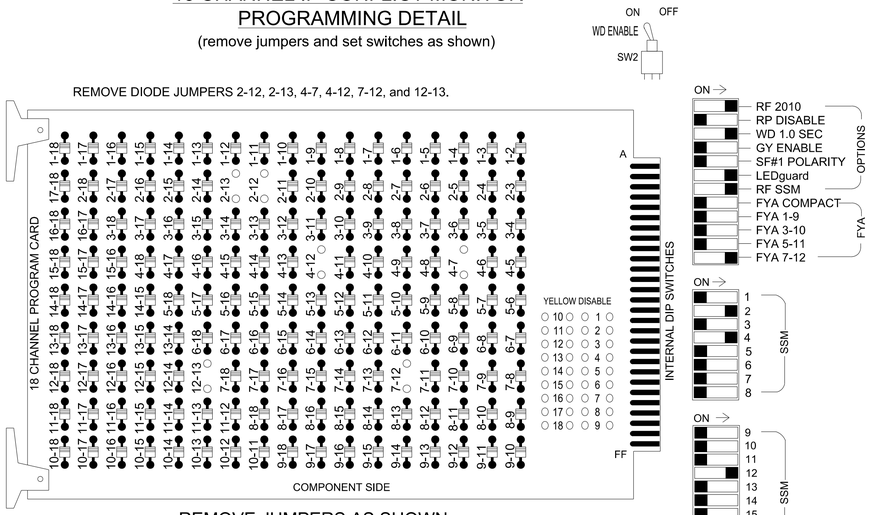
SIG. INVENTORY NO. 12-1843

$$$$$$$$SYSDATE$$$$$$
Date: 4/8/2024 11:48:11 AM
User: jgalloway
Z:\Signals\Design\Signal Design\Final Design\R-2307B_sig_dsn_12-1843.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 74.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 7 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Phase Not On.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S10, AUX S5
Phases Used.....2, 2PED, 4, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....*

*See overlap programming details on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2		S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2		13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2		2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22,23	P21,P22 P23,P24	NU	41,42	NU	NU	NU	NU	71 ★	NU	NU	NU	NU	NU	NU	71 ★	NU
RED		128	128			101													
YELLOW		129	129								✳								
GREEN			130																
RED ARROW																		A101	
YELLOW ARROW						102												A102	
FLASHING YELLOW ARROW																		A103	
GREEN ARROW		130				103					124								
✋				113															
🚶				115															

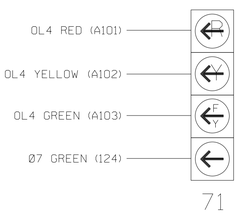
NU = Not Used

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

★ See pictorial of head wiring in detail this sheet.

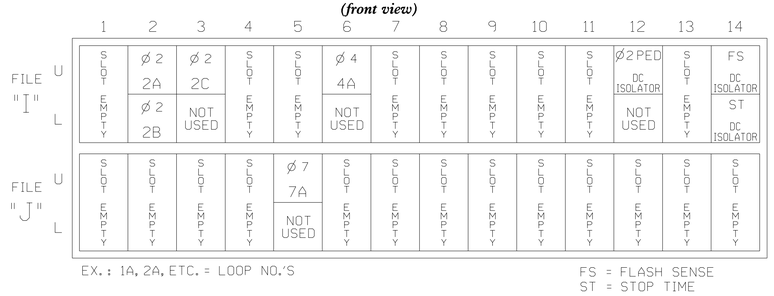
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)



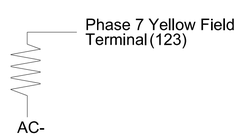
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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 resistors as shown)

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



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	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
2C	TB2-9,10	I3U	63	29	4	2			X	X	X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
7A	TB5-5,6	J5U	57	19	21 *	7	15.0		X		X	
PED PUSH BUTTONS												
P21,P22,P23,P24	TB8-4,6	I12U	67	33	2	PED 2						

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I12.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1843
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
SR 3290 (Rolling Hills Road)

Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4D46E... DATE
SIG. INVENTORY NO. 12-1843

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 74.2

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

OVERLAP PLAN 2: Modifies overlap included phases for head 71 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 7 call on loop 7A to 0 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 7A

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

	Detector	Call Phase	Delay
7A	21	7	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

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

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

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

← NOTICE INCLUDED PHASE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1843
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Traffic Engineering Branch, Transportation Mobility and Safety Division, NC Department of Transportation
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
SR 3290 (Rolling Hills Road)

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

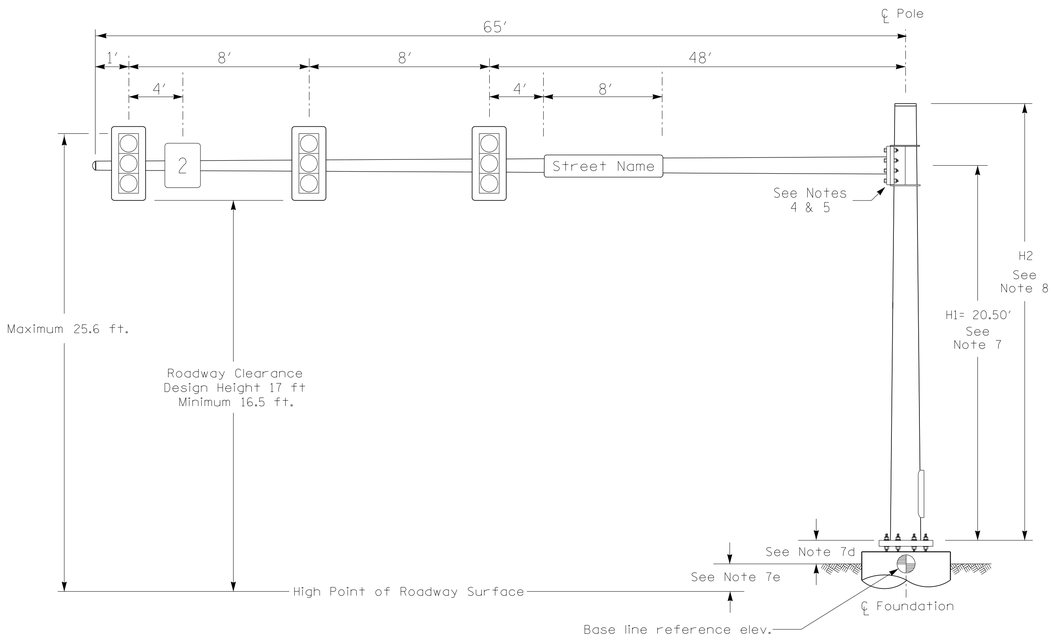
SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1843 DATE

METAL POLE No. 1 and 2

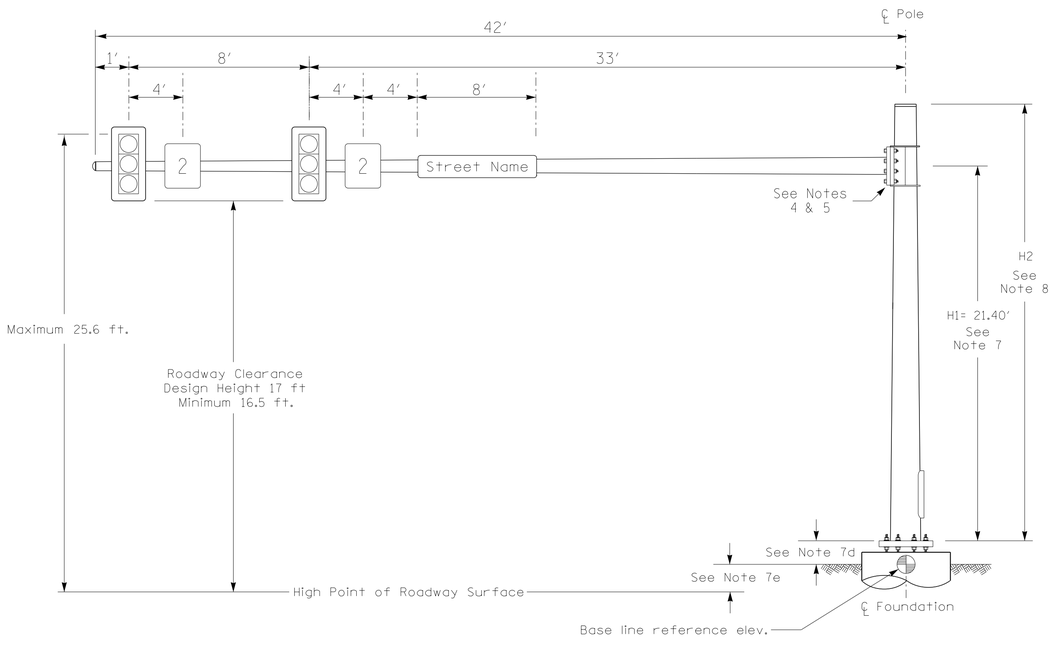
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 74.3

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



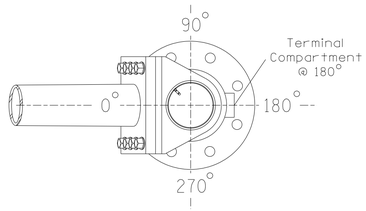
Elevation View

SPECIAL NOTE

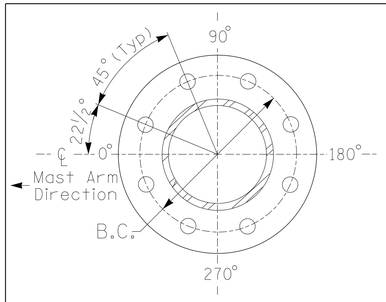
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	857.68 ft.	853.57 ft.
Elevation difference at High point of roadway surface	+1.49 ft.	+2.34 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

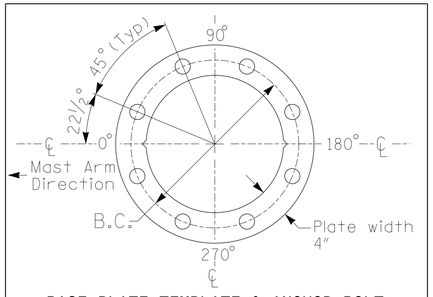


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

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
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
North Carolina Department of Transportation
Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 EB
at
Consumer Square
Eastern Entrance

Division 12 Iredell County Mooresville

PLAN DATE: November 2023 REVIEWED BY: J. Galloway, PE
PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

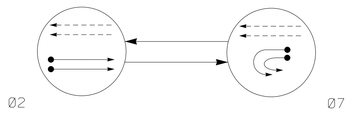
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1843

5/17/2024
10:59:00 AM
User:jgalloway
C:\Users\jgalloway\Desktop\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1843.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 75.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

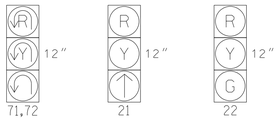
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21	↑	R	R
22	G	R	R
71,72	↓R	↓R	

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

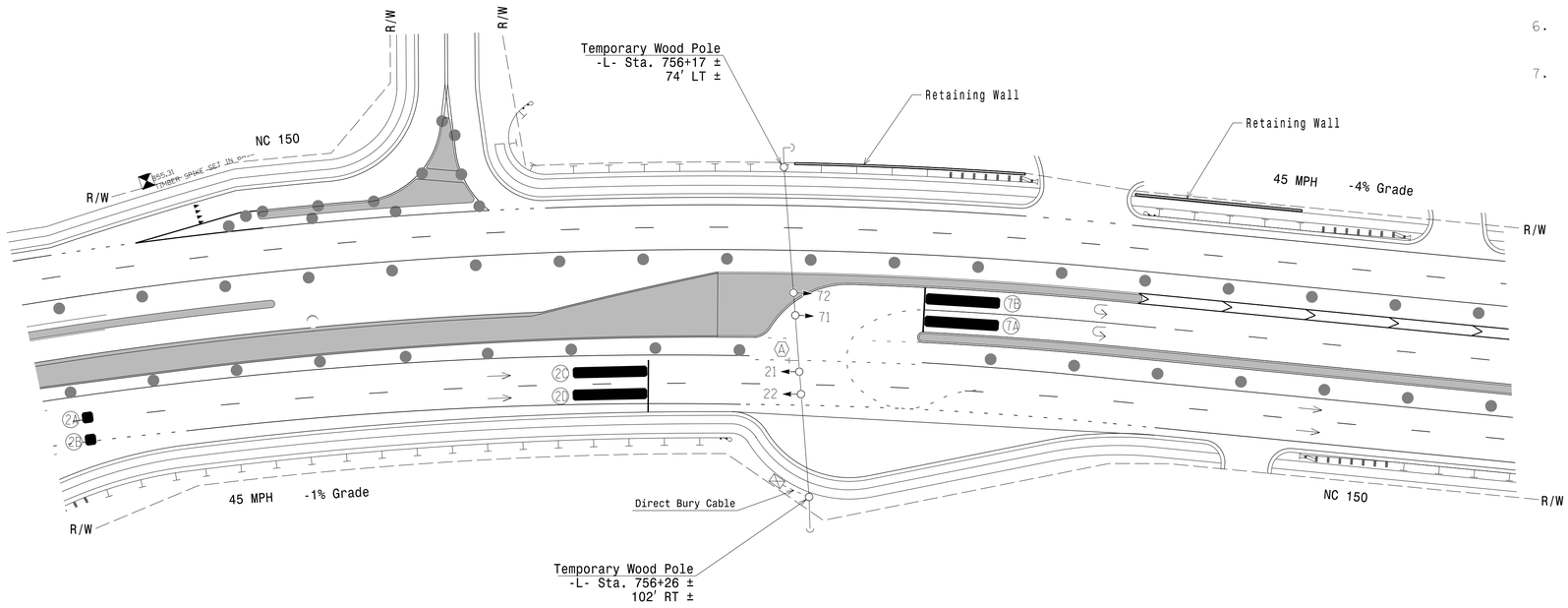
DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The cabinet should be designed to include an Auxiliary Output File for future use.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Field adjust temporary poles as needed.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
▬	Video Detection Area	N/A
▬	Construction Zone	N/A
●●●	Drums	N/A
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.6	3.0
Red Clear	2.2	4.7
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
Advance Walk	–	–
Non Lock Detector	X	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

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

New Installation
Temporary Design 1 - TMP Phase III

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

NC 150 EB
at
SR 1116 (Talbert Road) U-Turn

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

SCALE: 0 40 1"=40'

REVISIONS	INIT.	DATE

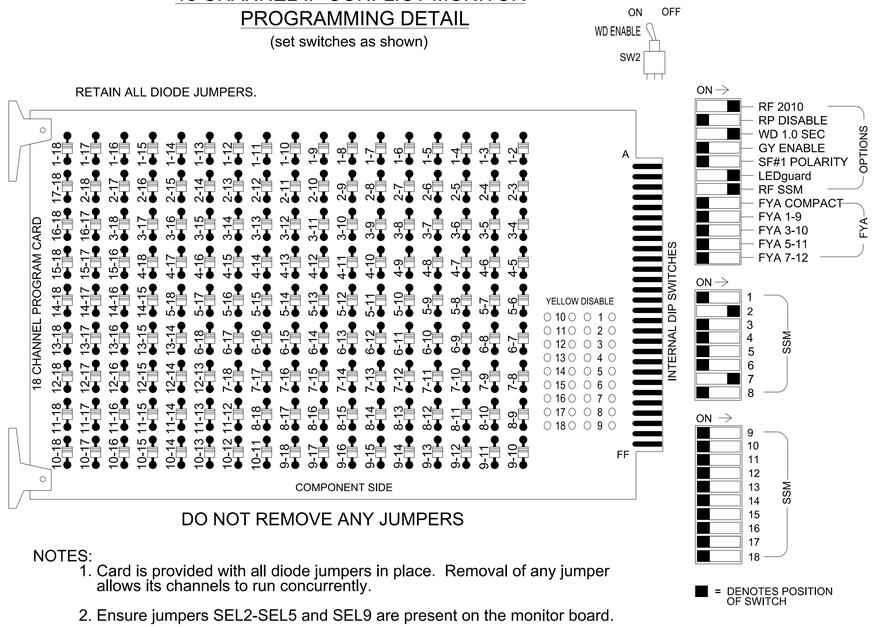
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1845TI

$$$$$$$YSDATE$$$$$
10:51:20 AM
User:jgalloway
User:jgalloway
C:\Users\jgalloway\Documents\Signal Design\Temporary Design\Phase 3 TEMP\R-2307B_sig_dsn_12-184511.dgn

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



DO NOT REMOVE ANY JUMPERS

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 Phase Not On.
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 NC 150 D12-02_Mooresville CLS.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 75.1

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	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128																
YELLOW		129																
GREEN		130																
RED ARROW										122								
YELLOW ARROW										123								
GREEN ARROW										124								

NU = Not Used

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, S10
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

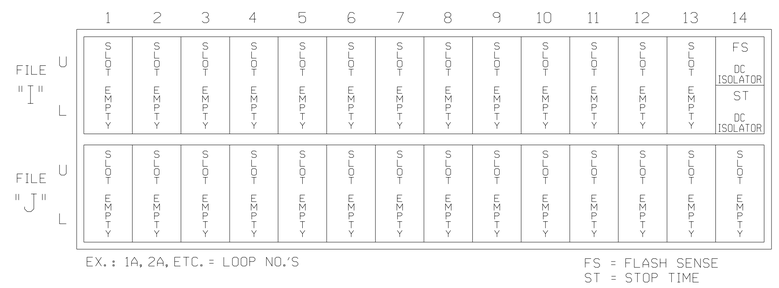
Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	2,a,7,b
2	

INPUT FILE POSITION LAYOUT

(front view)



SPECIAL DETECTOR NOTE

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1845T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
SR 1116 (Talbert Road) U-Turn

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

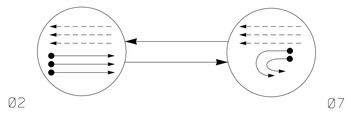
REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1845T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 76.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

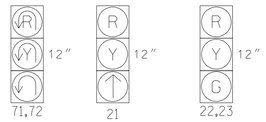
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21	↑	R	R
22,23	G	R	R
71,72	(R)	↓	(R)

SIGNAL FACE I.D.

All Heads L.E.D.



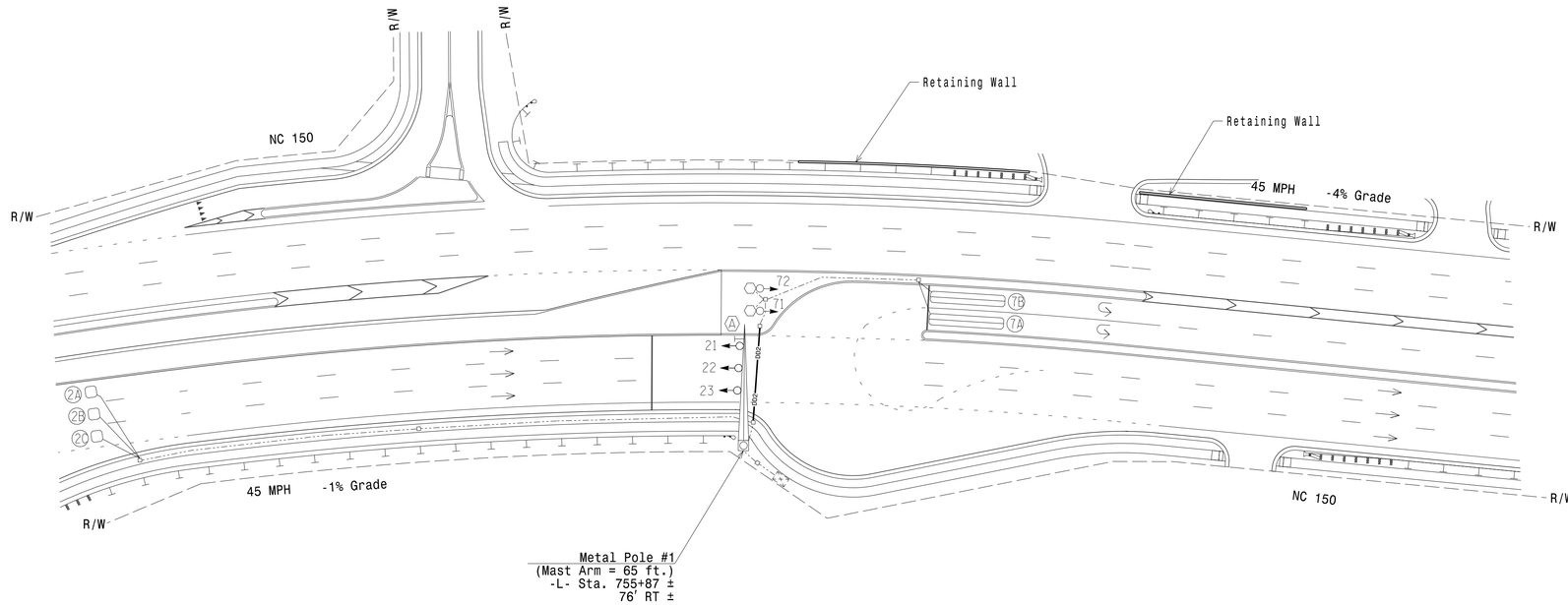
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	4	X	2	-	-	X	X	X	-	X
2B	6X6	300	4	X	2	-	-	X	X	X	-	X
2C	6X6	300	4	X	2	-	-	X	X	X	-	X
7A	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
7B	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. 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	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.6	3.0
Red Clear	2.2	5.2
Added Initial *	1.0	–
Maximum Initial *	34	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
Advance Walk	–	–
Non Lock Detector	–	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
◁	Metal Pole with Mastarm	◘
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⬡	Type II Signal Pedestal	⬢
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 150 EB
at
SR 1116 (Talbert Road) U-Turn

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright | REVIEWED BY: R Muncey, PE

SCALE: 0 40 — 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1845

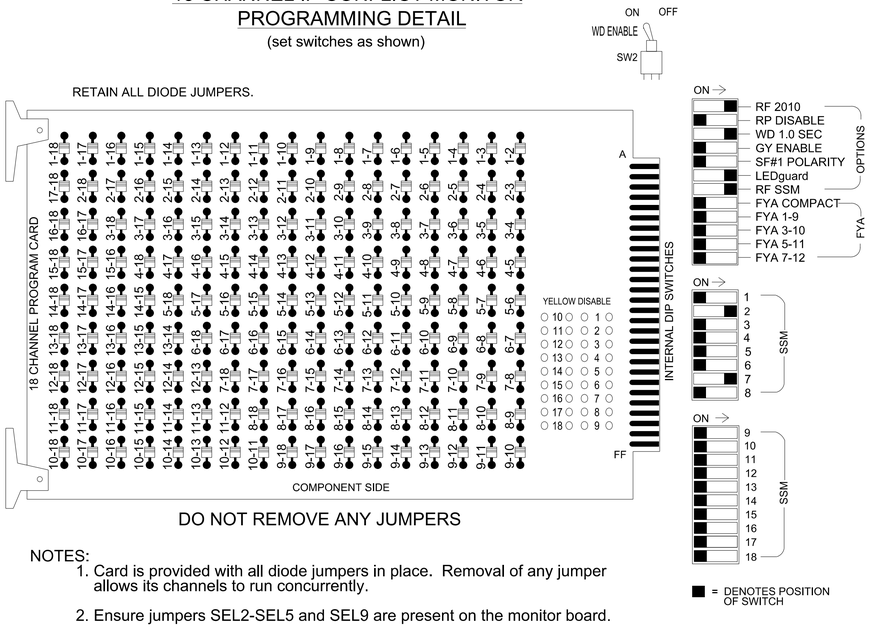
$$$$$$$STSDATE$$$$$$
10:15:51 AM
User:rgalloway
User:jgalloway

$$$$$$$STSDATE$$$$$$
10:15:51 AM
User:rgalloway
User:jgalloway
C:\Users\rgalloway\Documents\Design\Signal Design\R-2307B_sig_dsn_12-1845.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 76.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



DO NOT REMOVE ANY JUMPERS

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 Phase Not On.
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 NC 150 D12-02_Mooresville CLS.

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, S10
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

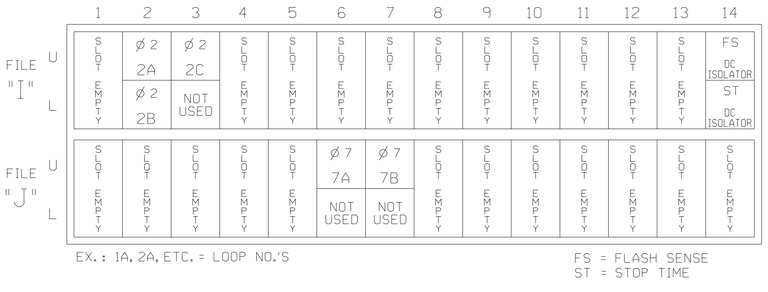
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2		S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2		13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2		2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22,23	NU	NU	NU	NU	NU	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128																
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW											123								
GREEN ARROW		130									124								

NU = Not Used

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
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
2C	TB2-9,10	I3U	63	29	4	2			X	X	X	
7A	TB5-5,6	J5U	57	19	21	7			X		X	
7B	TB5-9,10	J6U	42	4	22	7			X		X	

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	2,a,7,b
2	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1845
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150 EB
at
SR 1116 (Talbert Road) U-Turn

Division 12 Iredell County Mooresville

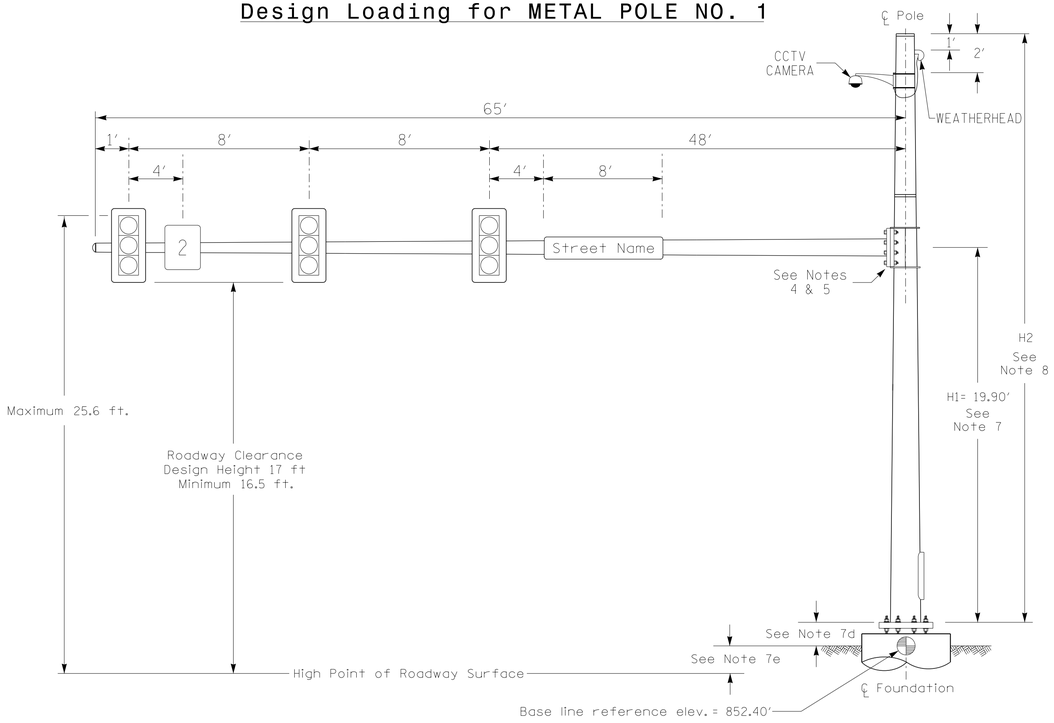
PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE
SIG. INVENTORY NO. 12-1845

Design Loading for METAL POLE NO. 1



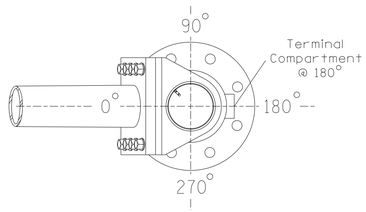
Elevation View

SPECIAL NOTE

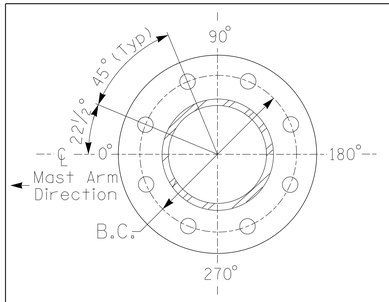
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ℄ Foundation @ ground level	852.40 ft.	
Elevation difference at High point of roadway surface	+0.89 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

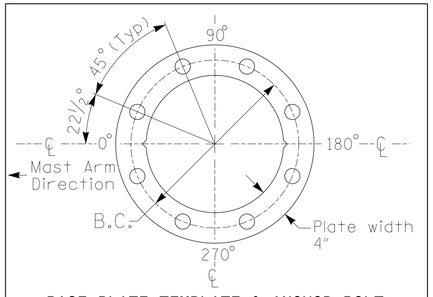


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 76.2

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
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS
	CCTV CAMERA ARM-MOUNTED	1.0 S.F.	11.0″W X 11.0″L	30 LBS

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

NC 150 EB
at
SR 1116 (Talbert Road) U-Turn

Division 12 Iredell County Mooresville

PLAN DATE: November 2023 REVIEWED BY: J. Galloway, PE

PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

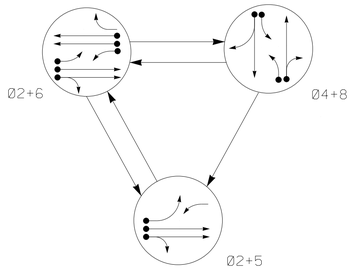
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1845

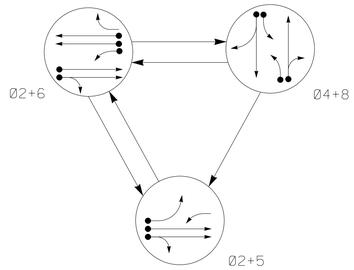
5/17/2024
10:15:42 AM
User:jgalloway
U:\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1845.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 77.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4+8	FLASH
21,22	G	G	R	R
41,42	R	R	G	R
51	←	~~F Y~~	~~R~~	~~R~~
61	~~F Y~~	~~F Y~~	~~R~~	~~R~~
62,63	R	G	R	R
81,82	R	R	G	R

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø4+8	FLASH
21,22	G	G	R	R
41,42	R	R	G	R
51	←	~~R~~	~~R~~	~~R~~
61	~~F Y~~	~~F Y~~	~~R~~	~~R~~
62,63	R	G	R	R
81,82	R	R	G	R

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	3.0	-	X	-	X	-	✳
4B	6X40	0	✳	✳	4	10.0	-	X	-	X	-	✳
4C	6X6	0	✳	✳	4	15.0	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
					2#	3.0	-	X	-	X	X	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	-	X	-	X	-	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6E	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
8A	6X40	0	✳	✳	8	3.0	-	X	-	X	-	✳
8B	6X40	0	✳	✳	8	10.0	-	X	-	X	-	✳
8C	6X6	0	✳	✳	8	15.0	-	X	-	X	-	✳

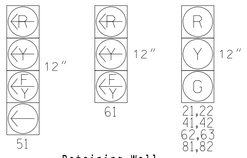
✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.
Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.

PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Field adjust temporary poles as needed.

3 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02_MOORESVILLE
CLS

MAXTIME TIMING CHART

FEATURE	PHASE 2	4	5	6	8
Walk *	–	–	–	–	–
Ped Clear *	–	–	–	–	–
Min Green	12	7	7	12	7
Passage *	6.0	2.0	2.0	6.0	2.0
Max 1 *	90	35	15	0	35
Yellow Change	4.5	3.3	3.0	4.5	3.1
Red Clear	1.2	2.6	2.3	1.2	2.8
Added Initial *	–	–	–	–	–
Maximum Initial *	–	–	–	–	–
Time Before Reduction *	15	–	–	15	–
Time To Reduce *	30	–	–	30	–
Minimum Gap	3.0	–	–	3.0	–
Advance Walk	–	–	–	–	–
Non Lock Detector	X	X	X	X	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	●→
◐→	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	→
▬	Video Detection Area	N/A
▬	Construction Zone	N/A
●●●	Drums	N/A

Signal Upgrade
Temporary Design 1 - TMP Phase I

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SCALE 0 40 1"=40'

NC 150
at
Corporate Center Drive/
CarPros Entrance

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright | REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

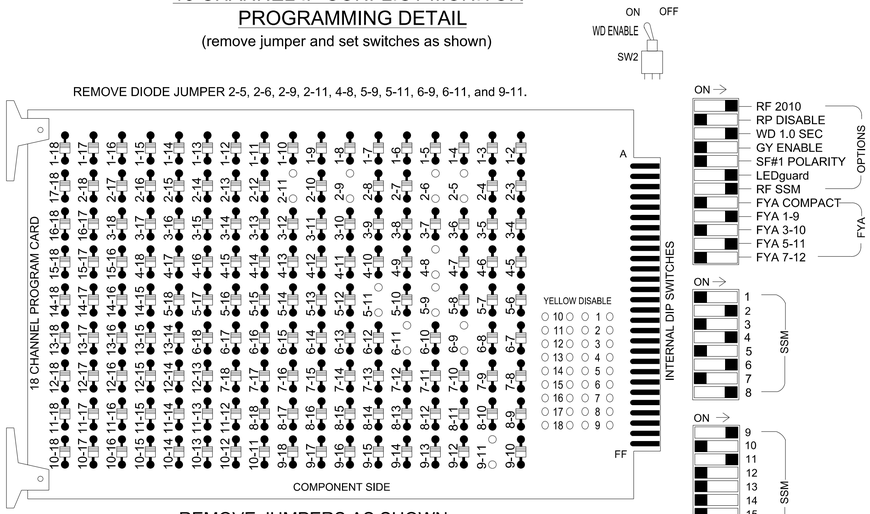
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1760TI

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 77.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S7, S8, S11, AUX S1, AUX S4
Phases Used.....2, 4, 5, 6, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

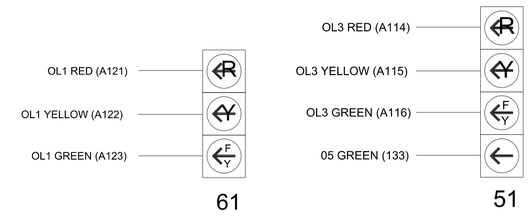
SIGNAL HEAD HOOK-UP CHART

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.	NU	21,22	NU	NU	41,42	NU	51 ★	62,63	NU	NU	81,82	NU	61 ★	NU	NU	51 ★	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							133											

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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
5A	TB3-1,2	J1U	55	17	15 *	5	15.0		X		X	
				-	31 *	2	3.0		X		X	

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

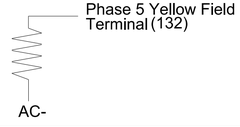
DETECTOR NOTE

1. For all loops install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.
2. For loop 5A, detector card placement is typical for a NCDOT installation.Detection associated with these slots are compatible with the Vehicle Detector Programming located on sheet 2 of this electrical detail.

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: 12-1760T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150
at
Corporate Center Drive/
CarPros Entrance

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	D Waller, PE	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1760T1 DATE

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 77.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	-	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3	
Type	FYA 4 - Section	FYA 4 - Section	
Included Phases	2	-	← NOTICE INCLUDED PHASE
Modifier Phases	-	5	
Modifier Overlaps	-	-	
Trail Green	0	0	
Trail Yellow	0.0	0.0	
Trail Red	0.0	0.0	

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 5A

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

OVERLAP PLAN 2: Modifies overlap included phases for head 51 to run protected turns only.

VEH DET PLAN 2: Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1760T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
TSS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150
at
Corporate Center Drive/
CarPros Entrance

Division 12 Iredell County Mooresville

PLAN DATE: May 2024	REVIEWED BY: J Galloway, PE
PREPARED BY: D Waller, PE	REVIEWED BY: R Muncey, PE

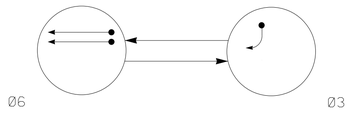
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1760T1 DATE

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 78.0

PHASING DIAGRAM



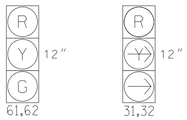
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø6	PHASE Ø3	FLASH
31,32	R	→	R
61,62	G	R	R

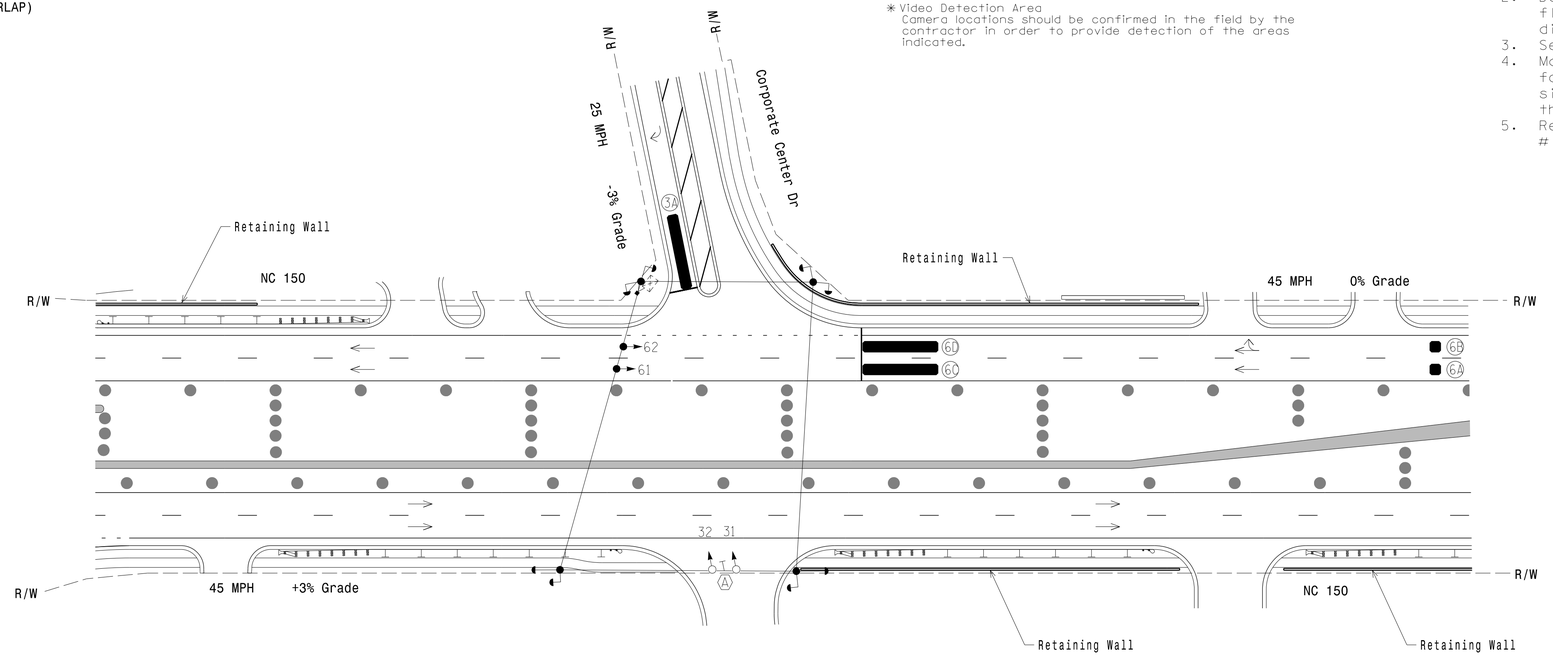
SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	15.0	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.



2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
5. Reposition existing signal heads numbered # 61 & 62

MAXTIME TIMING CHART		
FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	3.3	4.5
Red Clear	1.4	1.9
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.0
Advance Walk	–	–
Non Lock Detector	X	X
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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	●→
◐→	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	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
● ● ●	Drums	N/A
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ

Signal Upgrade
Temporary Design 2 - TMP Phase III

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

NC 150 WB
at
Corporate Center Drive

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

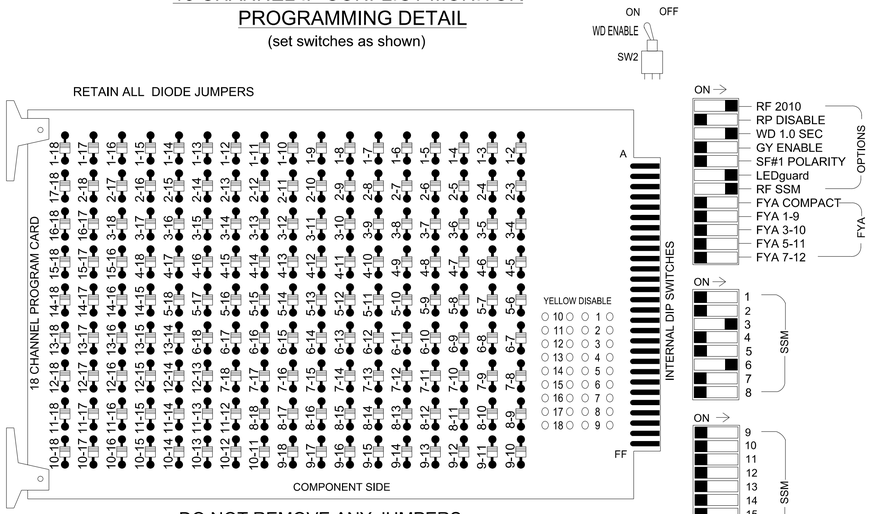
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON K. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. I2-1760T2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 78.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



= DENOTES POSITION OF SWITCH

DO NOT REMOVE ANY JUMPERS

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. Return controller to Factory Defaults before programming per this electrical detail.
3. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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

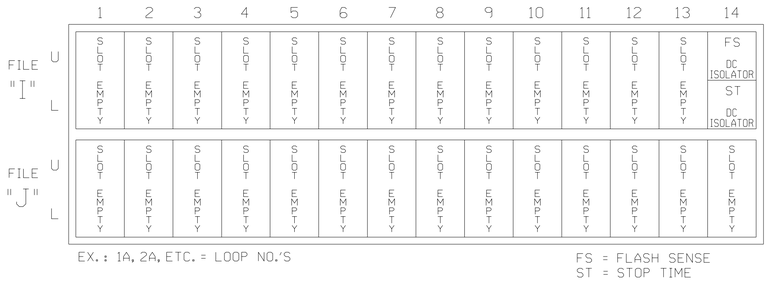
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED				116				134										
YELLOW								135										
GREEN								136										
RED ARROW																		
YELLOW ARROW				117														
GREEN ARROW				118														

NU = Not Used

INPUT FILE POSITION LAYOUT

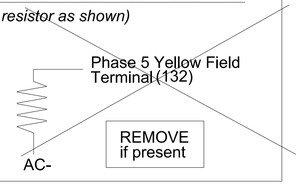
(front view)



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)



SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	6,a,3,b
2	

DETECTOR NOTE

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1760T2
DESIGNED:
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 2 - TMP Phase III
Electrical Detail

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
Corporate Center Drive

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: D Waller, PE REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

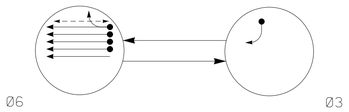
SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1760T2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 79.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

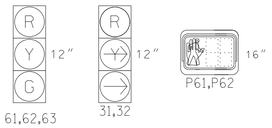
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31,32	R	→	R
61,62,63, 64,65	G	R	R
P61,P62	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



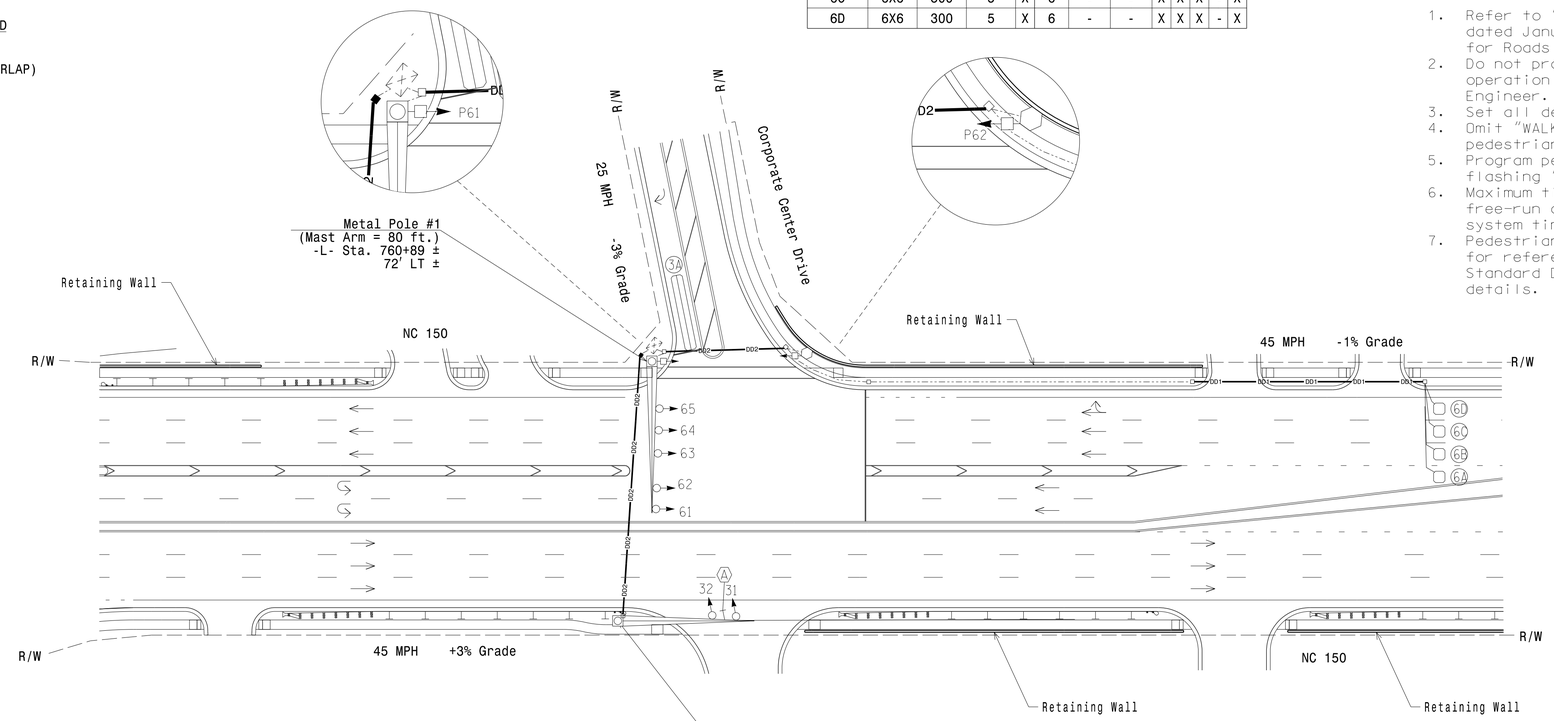
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	2-4-2	X	3	15.0	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X
6C	6X6	300	5	X	6	-	-	X	X	X	-	X
6D	6X6	300	5	X	6	-	-	X	X	X	-	X

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.



MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6
Walk *	–	14
Ped Clear *	–	17
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	3.3	4.6
Red Clear	1.7	1.9
Added Initial *	–	1.0
Maximum Initial *	–	34
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.0
Advance Walk	–	7
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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	●→
◐→	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	→
◯	Metal Strain Pole	■
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⬡	Type II Signal Pedestal	⬢
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 150 WB
at
Corporate Center Drive

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON E. GALLOWAY

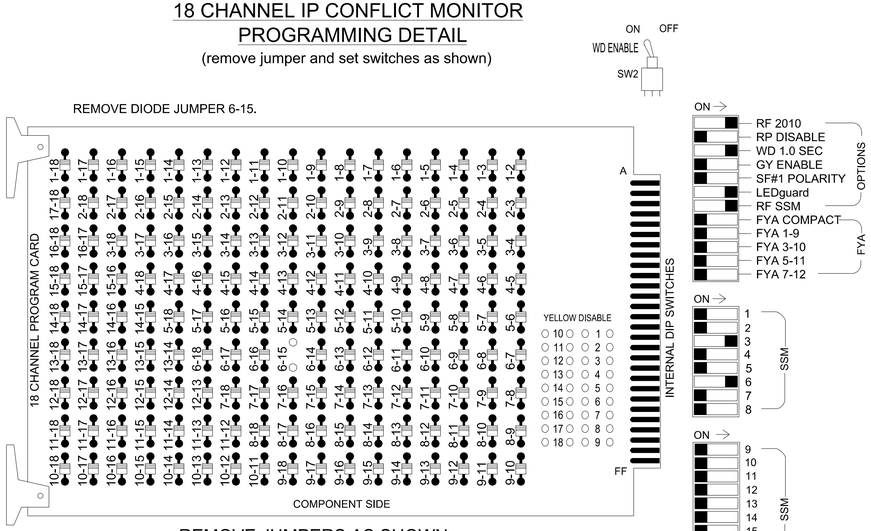
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1760

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 79.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Phase Not On and 6 Green 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 NC 150 D12-02_Mooresville CLS.

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	NU	NU	31,32	NU	NU	NU	61,62 63,64 65	P61, P62	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED				116				134										
YELLOW								135										
GREEN								136										
RED ARROW																		
YELLOW ARROW				117														
GREEN ARROW				118														
✋									119									
🚶									121									

NU = Not Used

EQUIPMENT INFORMATION

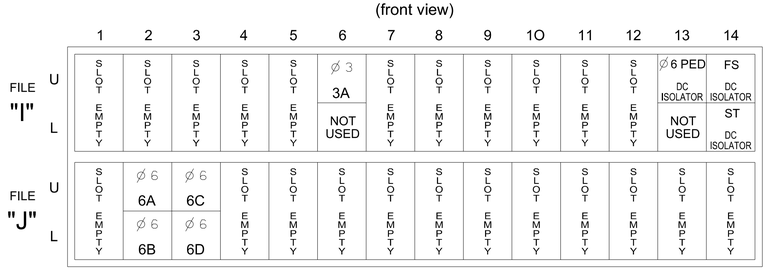
Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S4, S8, S9
Phases Used.....3, 6, 6PED
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT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

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.

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
3A	TB4-9,10	I6U	41	3	8	3	15.0		X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	
6D	TB3-11,12	J3L	77	43	19	6			X	X	X	
PED PUSH BUTTONS												
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	6,a,3,b
2	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1760
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Electrical Detail - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
Corporate Center Drive

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	D Waller, PE	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

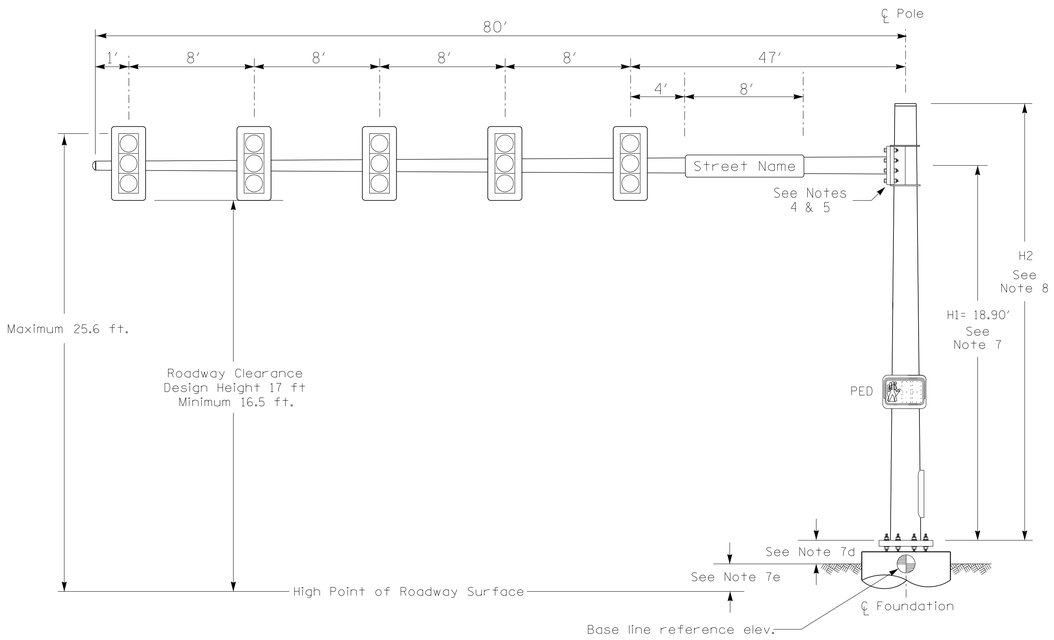
SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. CALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1760

METAL POLE No. 1 and 2

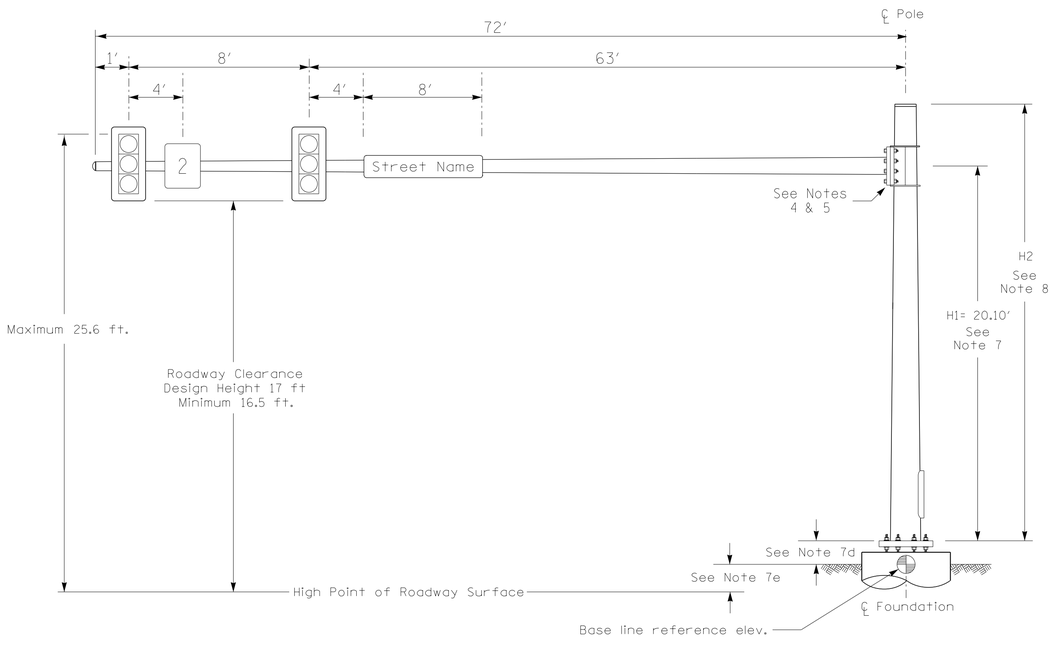
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 79.2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



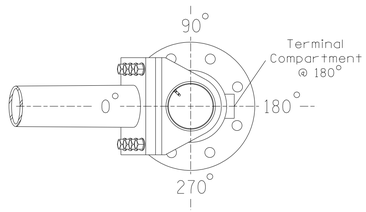
Elevation View

SPECIAL NOTE

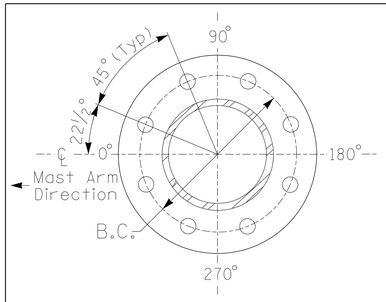
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	868.27 ft.	867.26 ft.
Elevation difference at High point of roadway surface	-0.20 ft.	+1.08 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

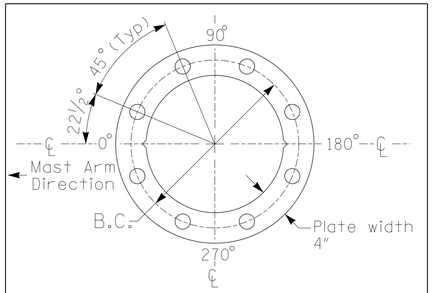


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

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
PED	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5"W X 17.0"L	21 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared for the Offices of:
Transportation Mobility and Safety
North Carolina Department of Transportation
Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 WB
at
Corporate Center Drive

Division 12 Iredell County Mooresville

PLAN DATE: November 2023 REVIEWED BY: J. Galloway, PE

PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

North Carolina Professional Seal 029904 Engineer Jason D. Galloway

DocuSigned by: Jason Galloway 5/20/2024
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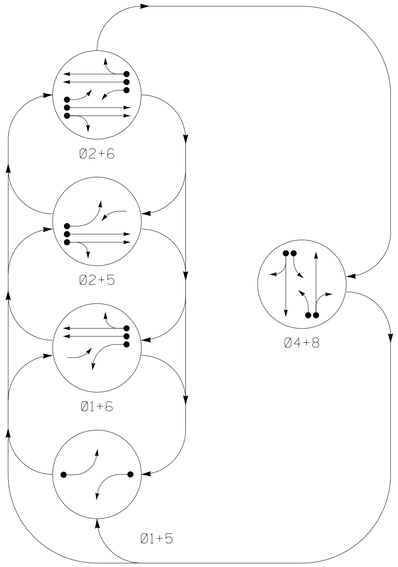
SIG. INVENTORY NO. 12-1760

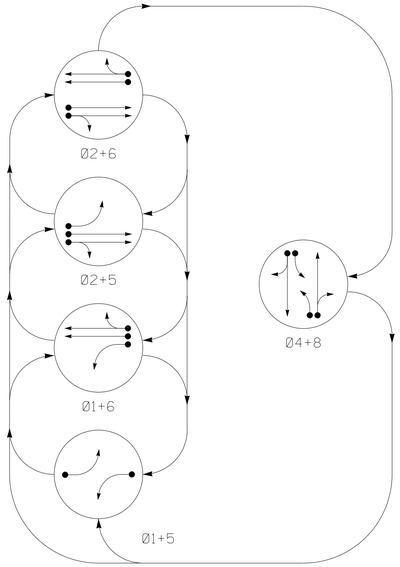
5/17/2024
11:02:08 AM
User:jgalloway
C:\Users\jgalloway\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1760.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 80.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

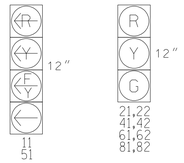
SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	F Y	F Y	~~R~~	~~R~~
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←	F Y	←	F Y	~~R~~	~~R~~
61,62	R	G	R	G	R	R
81,82	R	R	R	R	G	R

ALTERNATE PHASING TABLE OF OPERATIONS

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	R
81,82	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
				✳	6#	3.0	-	X	-	X	X	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	3.0	-	X	-	X	-	✳
4B	6X40	0	✳	✳	4	10.0	-	X	-	X	-	✳
4C	6X6	0	✳	✳	4	15.0	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
				✳	2#	3.0	-	X	-	X	X	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
8A	6X40	0	✳	✳	8	3.0		X	-	X	-	✳
8B	6X40	0	✳	✳	8	10.0	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.
Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.

5 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Field adjust temporary poles as needed.

PHASING DIAGRAM DETECTION LEGEND

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

LEGEND

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

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	7	12	7	7	12	7
Passage *	2.0	6.0	2.0	2.0	6.0	2.0
Max 1 *	15	90	35	15	90	35
Yellow Change	3.0	4.6	4.1	3.0	4.6	3.8
Red Clear	2.1	1.3	1.8	2.4	1.3	2.3
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	15	–
Time To Reduce *	–	30	–	–	30	–
Minimum Gap	–	3.0	–	–	3.0	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	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.

Signal Upgrade
Temporary Design 1 - TMP Phase I

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON A. GALLOWAY

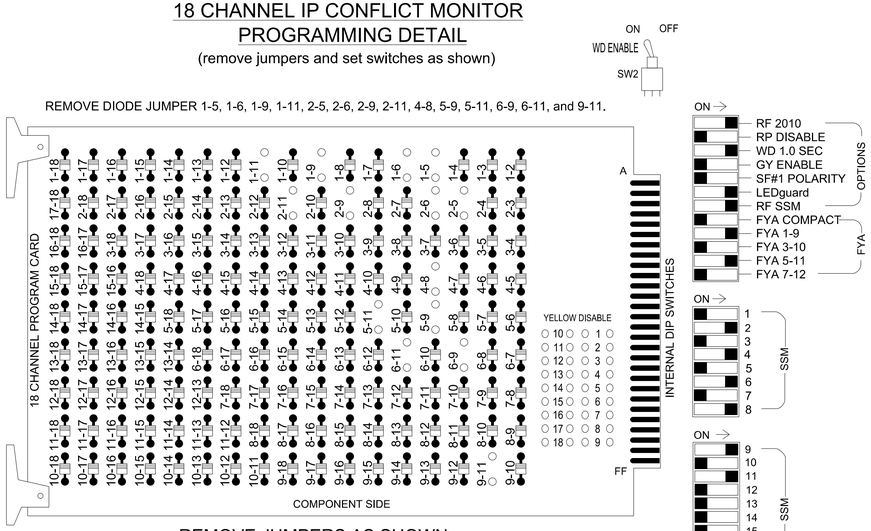
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-133ITI

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 80.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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 phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S7, S8, S11, AUX S1, AUX S4
Phases Used.....1, 2, 4, 5, 6, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

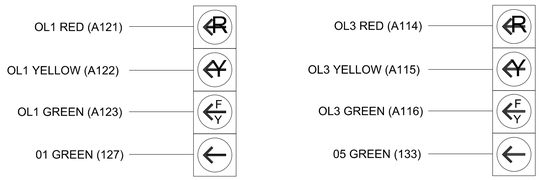
SIGNAL HEAD HOOK-UP CHART

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 ★	21,22	NU	NU	41,42	NU	51 ★	61,62	NU	NU	81,82	U	11 ★	NU	NU	51 ★	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						133											

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1	15.0		X		X	
				-	29	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2	3.0		X		X	X

* For the detectors to work as shown on the signal design plans, see the Vehicle Detector Programming Detail for Alternate Phasing on sheet 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

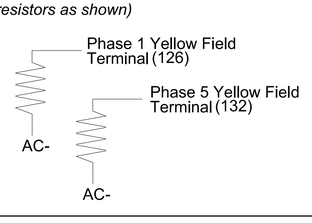
DETECTOR NOTE

1. For all loops install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.
2. For loops 1A and 5A, detector card placement is typical for a NCDOT installation.Detection associated with these slots are compatible with the Vehicle Detector Programming located on sheet 2 of this electrical detail.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1331T1
DESIGNED: MAY 2024
SEALED: N/A 5/20/2024
REVISED: N/A

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

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Traffic Engineering Branch
Transportation Mobility and Safety Division
N.C. DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	D Waller, PE	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1331T1 DATE

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 80.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3	
Type	FYA 4 - Section	FYA 4 - Section	
Included Phases	-	-	← NOTICE INCLUDED PHASE
Modifier Phases	1	5	
Modifier Overlaps	-	-	
Trail Green	0	0	
Trail Yellow	0.0	0.0	
Trail Red	0.0	0.0	

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

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

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

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

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1331T1
DESIGNED: MAY 2024
SEALED: N/A 5/20/2024
REVISED: N/A

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

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

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024	REVIEWED BY: J Galloway, PE
PREPARED BY: D Waller, PE	REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

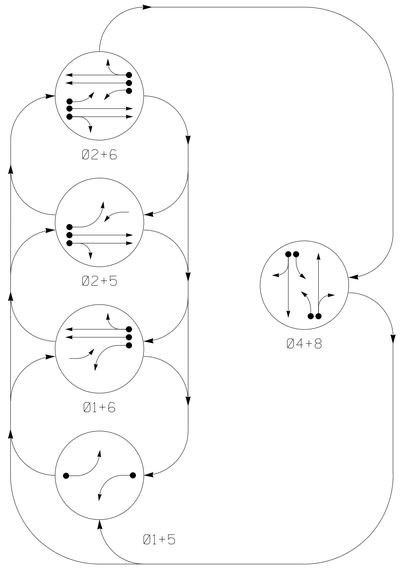
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E
SIG. INVENTORY NO. 12-1331T1 DATE

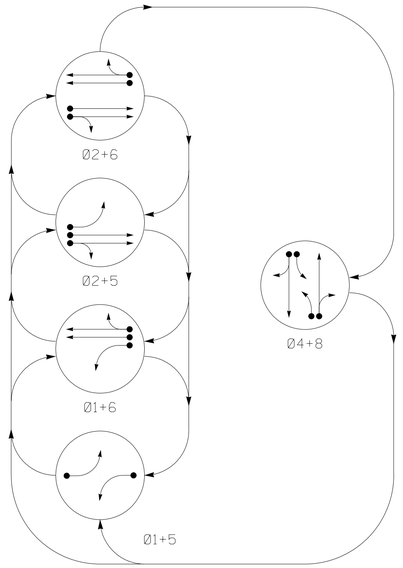
11:04:33 AM
User:jgalloway
C:\Users\jgalloway\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sm_ele_12-1331t1.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 81.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

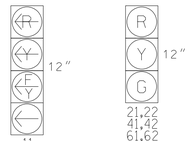
SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←—	←—	←F/Y	←F/Y	←R	←R
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←—	←F/Y	←—	←F/Y	←R	←R
61,62	R	G	R	G	R	R
81,82	R	R	R	R	G	R

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←—	←—	←R	←R	←R	←R
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←—	←R	←—	←R	←R	←R
61,62	R	G	R	G	R	R
81,82	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
					6#	3.0	-	X	-	X	X	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	3.0	-	X	-	X	-	✳
4B	6X40	0	✳	✳	4	10.0	-	X	-	X	-	✳
4C	6X6	0	✳	✳	4	15.0	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
					2#	3.0	-	X	-	X	X	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
8A	6X40	0	✳	✳	8	3.0	-	X	-	X	-	✳
8B	6X40	0	✳	✳	8	10.0	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.

5 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Reposition existing signal heads numbered #41 and 42.
5. Set all detector units to presence mode.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. 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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▭	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	-·-·-·-
N/A	Right of Way	———
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
●●●	Drums	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	7	12	7	7	12	7
Passage *	2.0	6.0	2.0	2.0	6.0	2.0
Max 1 *	15	90	35	15	90	35
Yellow Change	3.0	4.6	4.1	3.0	4.6	3.8
Red Clear	1.9	1.4	2.0	2.4	1.4	2.5
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	15	–
Time To Reduce *	–	30	–	–	30	–
Minimum Gap	–	3.0	–	–	3.0	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

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

Signal Upgrade
Temporary Design 2 - TMP Phase II

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Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

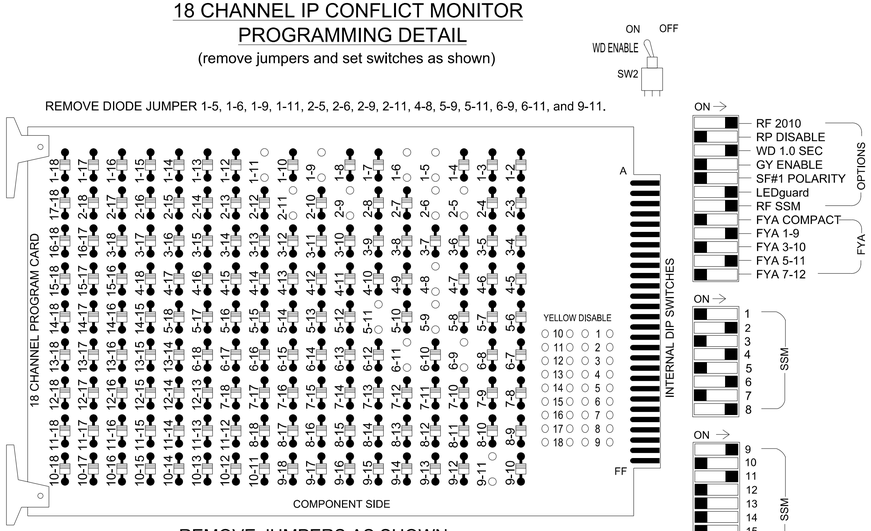
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON H. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-133IT2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 81.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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 phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S7, S8, S11, AUX S1, AUX S4
Phases Used.....1, 2, 4, 5, 6, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

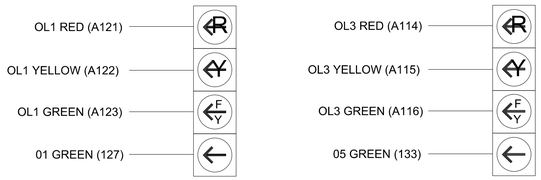
SIGNAL HEAD HOOK-UP CHART

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 ★	21,22	NU	NU	41,42	NU	51 ★	61,62	NU	NU	81,82	U	11 ★	NU	NU	51 ★	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						133											

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1	15.0		X		X	
				-	29	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	15	5	15.0		X		X	
				-	31	2	3.0		X		X	X

* For the detectors to work as shown on the signal design plans, see the Vehicle Detector Programming Detail for Alternate Phasing on sheet 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

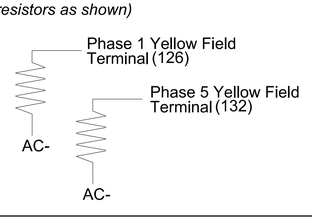
DETECTOR NOTE

1. For all loops install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.
2. For loops 1A and 5A, detector card placement is typical for a NCDOT installation.Detection associated with these slots are compatible with the Vehicle Detector Programming located on sheet 2 of this electrical detail.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1331T2
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

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NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	D Waller, PE	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1331T2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 81.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	-	-
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

← NOTICE INCLUDED PHASE

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

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

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

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

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

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

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

ALTERNATE PHASING CHANGE SUMMARY

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

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

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1331T2
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024	REVIEWED BY: J Galloway, PE
PREPARED BY: D Waller, PE	REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

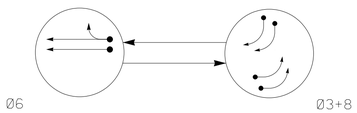
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1331T2 DATE

11:07:25 AM
User:jgalloway
C:\Projects\Signals\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sm_ele_12-1331t2.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 82.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

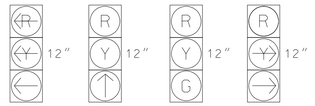
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	PHASE FLASH
31,32	←R	←	←R
61	↑	R	R
62	G	R	R
81,82,83	R	→	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

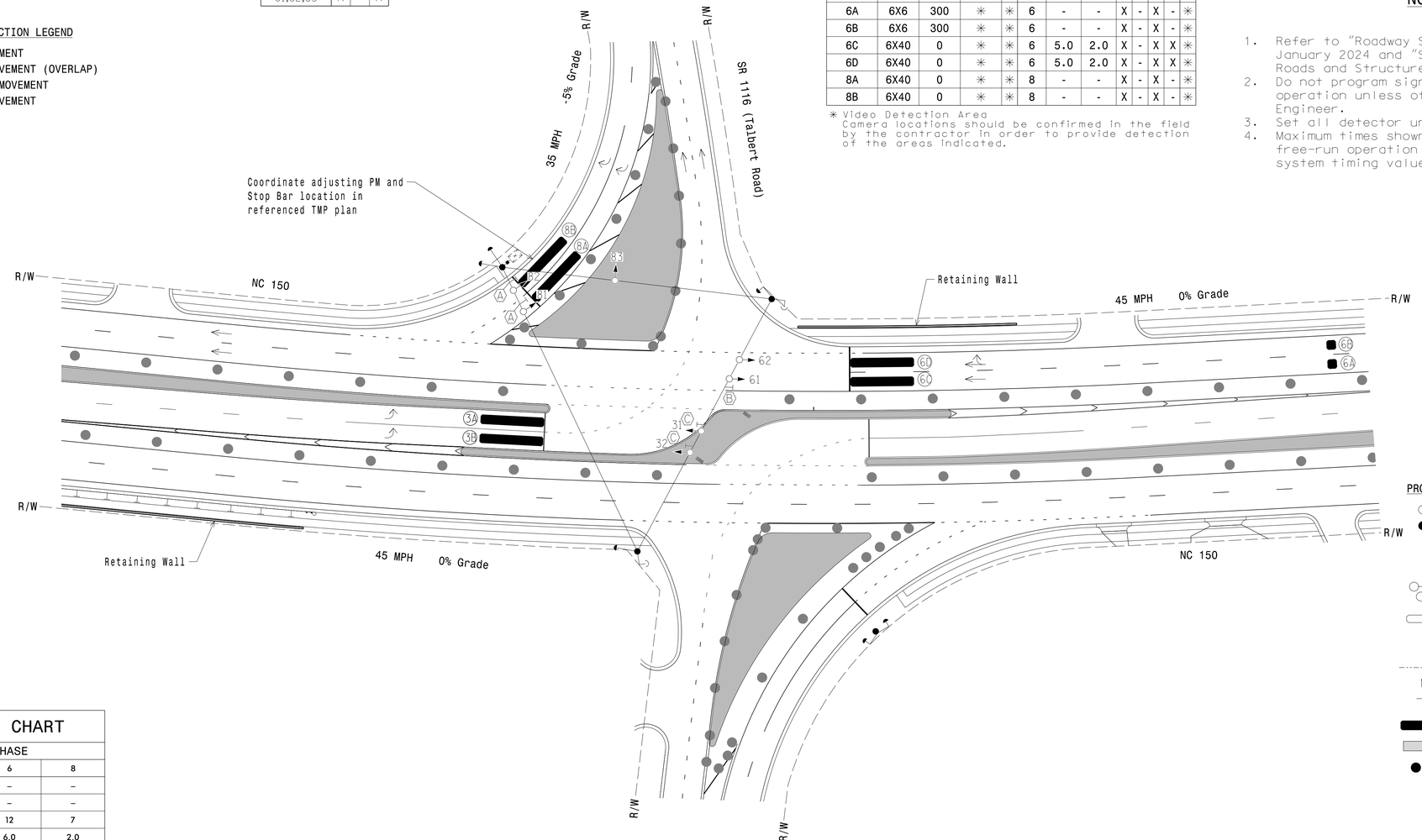
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳
8B	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	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	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
●●●	Drums	N/A
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No U-Turn Sign (R3-4)	Ⓒ

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6	PHASE 8
Walk *	–	–	–
Ped Clear *	–	–	–
Min Green	7	12	7
Passage *	2.0	6.0	2.0
Max 1 *	15	90	15
Yellow Change	3.0	4.5	3.8
Red Clear	3.5	3.4	2.0
Added Initial *	–	–	–
Maximum Initial *	–	–	–
Time Before Reduction *	–	15	–
Time To Reduce *	–	30	–
Minimum Gap	–	3.0	–
Advance Walk	–	–	–
Non Lock Detector	X	X	X
Vehicle Recall	–	MIN RECALL	–
Dual Entry	X	–	X

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

Signal Upgrade
Temporary Design 3 - TMP Phase III

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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright | REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

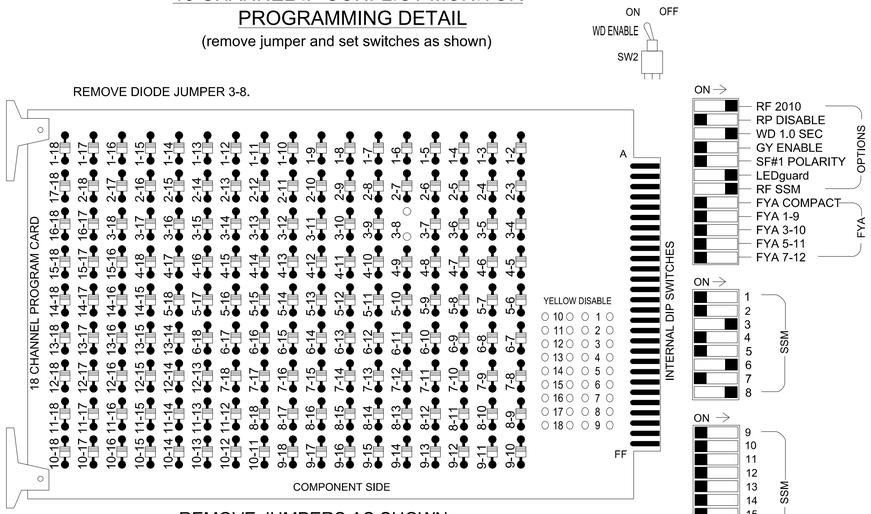
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER
JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE
SIG. INVENTORY NO. 12-133IT3

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 82.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Return controller to Factory Defaults before programming per this electrical detail.
3. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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.....S4, S8, S11
Phases Used.....3, 6, 8
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

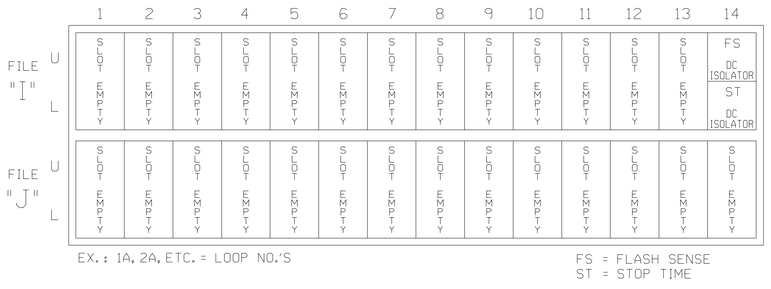
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8		S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6		15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6		6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61	62	NU	NU	81,82 83	NU	NU	NU	NU	NU	NU	NU
RED								134	134			107							
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117								108							
GREEN ARROW				118				136				109							

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



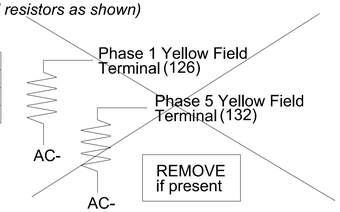
DETECTOR NOTE

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

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)

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



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-133IT3
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 3 - TMP Phase III
Electrical Detail

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Prepared for the Offices of:
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State of North Carolina
Traffic & Signals Management Section
Department of Transportation
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: D Waller, PE REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

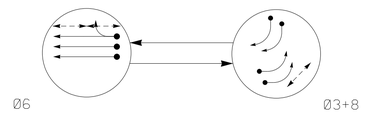
SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-133IT3

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 83.0

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

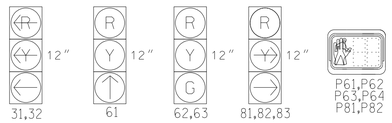
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	PHASE FLASH
31,32	←R	←	←R
61	↑	R	R
62,63	G	R	R
81,82,83	R	→	R
P61,P62,P63,P64	W	DW	DRK
P81,P82	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.

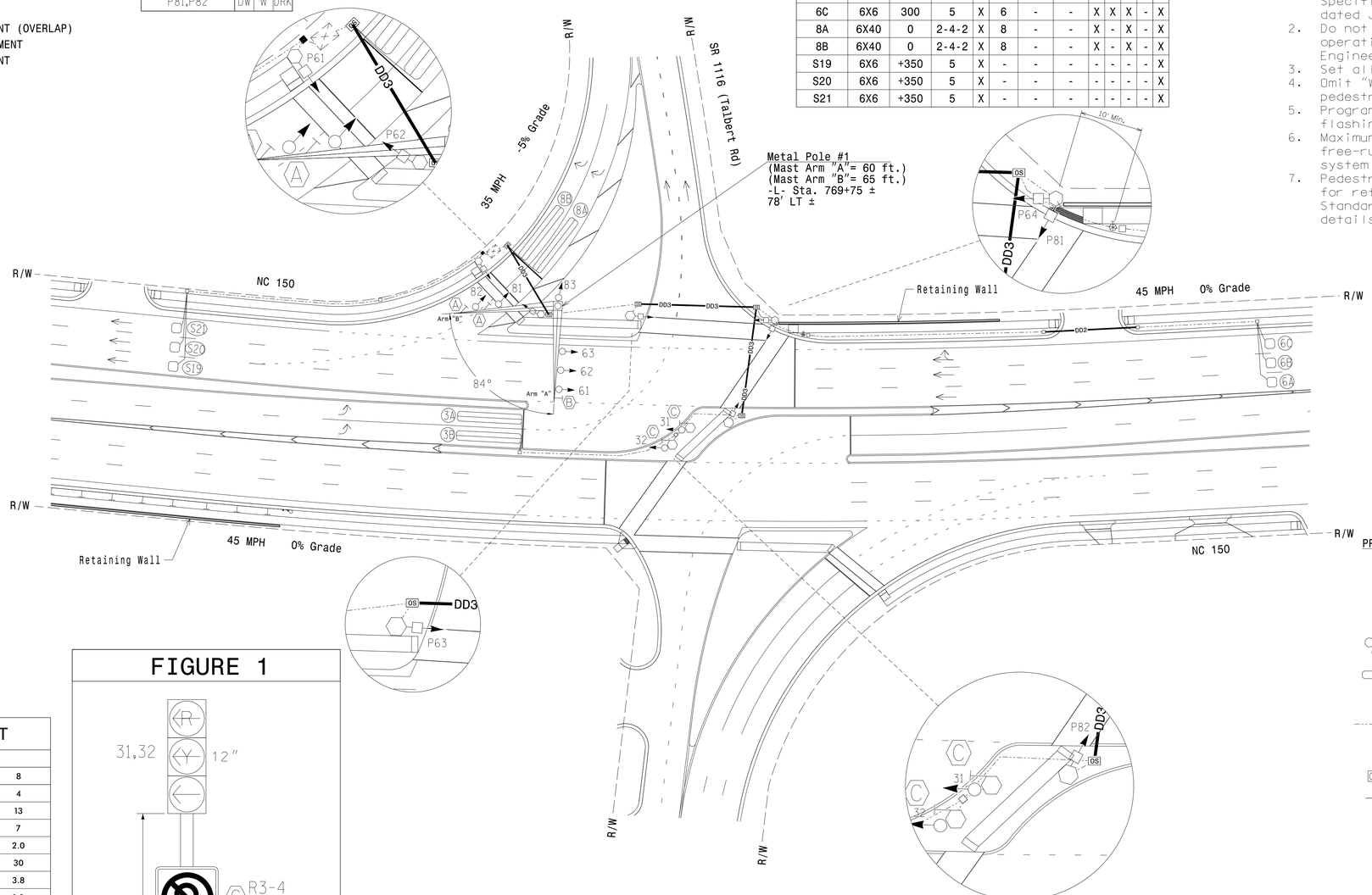


MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
3B	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X
6C	6X6	300	5	X	6	-	-	X	X	X	-	X
8A	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
8B	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
S19	6X6	+350	5	X	-	-	-	-	-	-	-	X
S20	6X6	+350	5	X	-	-	-	-	-	-	-	X
S21	6X6	+350	5	X	-	-	-	-	-	-	-	X

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.



LEGEND

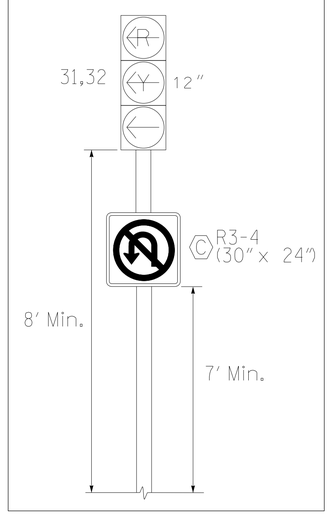
PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	
DD#	Directional Drill (#) x 2" Conduit	N/A
	Type I Pushbutton Post	
	Type II Signal Pedestal	
OS	Oversized Junction Box	
(A)	"NO TURN ON RED" Sign (R10-11)	(A)
(B)	No Left Turn Sign (R3-2)	(B)
(C)	No U-Turn Sign (R3-4) (SEE FIGURE 1)	(C)

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6	PHASE 8
Walk *	–	14	4
Ped Clear *	–	19	13
Min Green	7	12	7
Passage *	2.0	6.0	2.0
Max 1 *	30	60	30
Yellow Change	3.8	4.5	3.8
Red Clear	3.6	3.3	1.3
Added Initial *	–	1.0	–
Maximum Initial *	–	34	–
Time Before Reduction *	–	15	–
Time To Reduce *	–	30	–
Minimum Gap	–	3.0	–
Advance Walk	–	7	–
Non Lock Detector	X	–	X
Vehicle Recall	–	MIN RECALL	–
Dual Entry	X	–	X

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

FIGURE 1



Signal Upgrade - Final Design

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SCALE 0 40 1"=40'

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at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

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PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
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ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

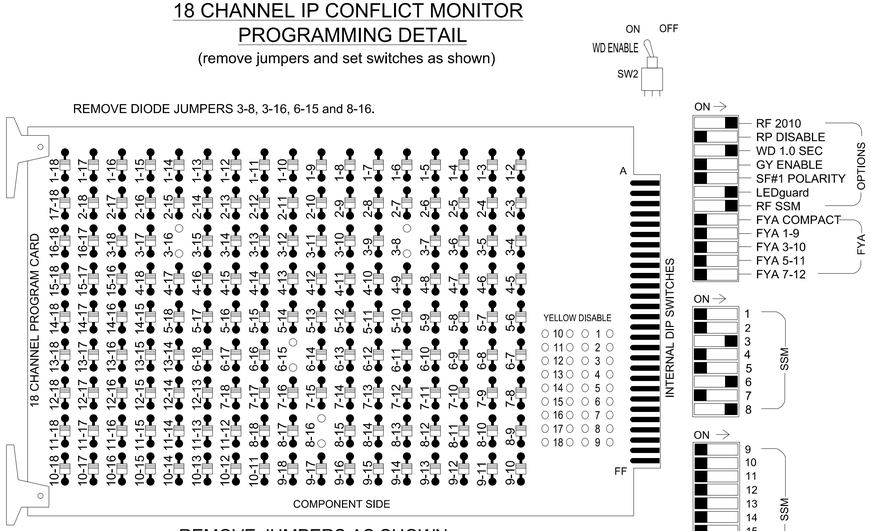
SIG. INVENTORY NO. 12-1331

$$$$$$$SYSDATE$$$$$$
11-10-21 AM
User:jgalloway
$$$$$$$SYSDATE$$$$$$
User:jgalloway
I:\Projects\Signals\Design\Signal Design\Final Design\R-2307B_sig_dsn_12-1331.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 83.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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 phases 3 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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.....S4, S8, S9, S11, S12
Phases Used.....3, 6, 6PED, 8, 8PED
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8		S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6		15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6		6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61	62,63	P61,P62 P63,P64	NU	81,82 83	P81, P82	NU	NU	NU	NU	NU	NU
RED								134	134			107							
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117								108							
GREEN ARROW				118				136				109							
✋										119			110						
🚶										121			112						

NU = Not Used

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.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅3 3A	∅3 3B	SLOT EMPTY	SLOT EMPTY	SYS. DET. S19	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	∅6 PED DC ISOLATOR	FS DC ISOLATOR
	L					NOT USED	NOT USED			SYS. DET. S20				∅8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	∅6 6A	∅6 6C	SLOT EMPTY	SLOT EMPTY	∅8 8A	SLOT EMPTY	SLOT EMPTY	SYS. DET. S21	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		∅6 6B	NOT USED			∅8 8B			NOT USED					

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
3A	TB4-5,6	I5U	58	20	7	3			X		X	
3B	TB4-9,10	I6U	41	3	8	3			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
6B	TB3-7,8	J2L	44	6	17	6			X		X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	
8A	TB5-9,10	J6U	42	4	22	8			X	X	X	
8B	TB5-11,12	J6L	46	8	23	8			X	X	X	
*S19	TB6-9,10	I9U	60	22	13	SYS			X		X	
*S20	TB6-11,12	I9L	62	24	14	SYS			X		X	
*S21	TB7-9,10	J9U	59	21	27	SYS			X		X	
PED PUSH BUTTONS												
P61,P62,P63,P64	TB8-7,9	I13U	68	34	6	PED 6						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1331
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Electrical Detail - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

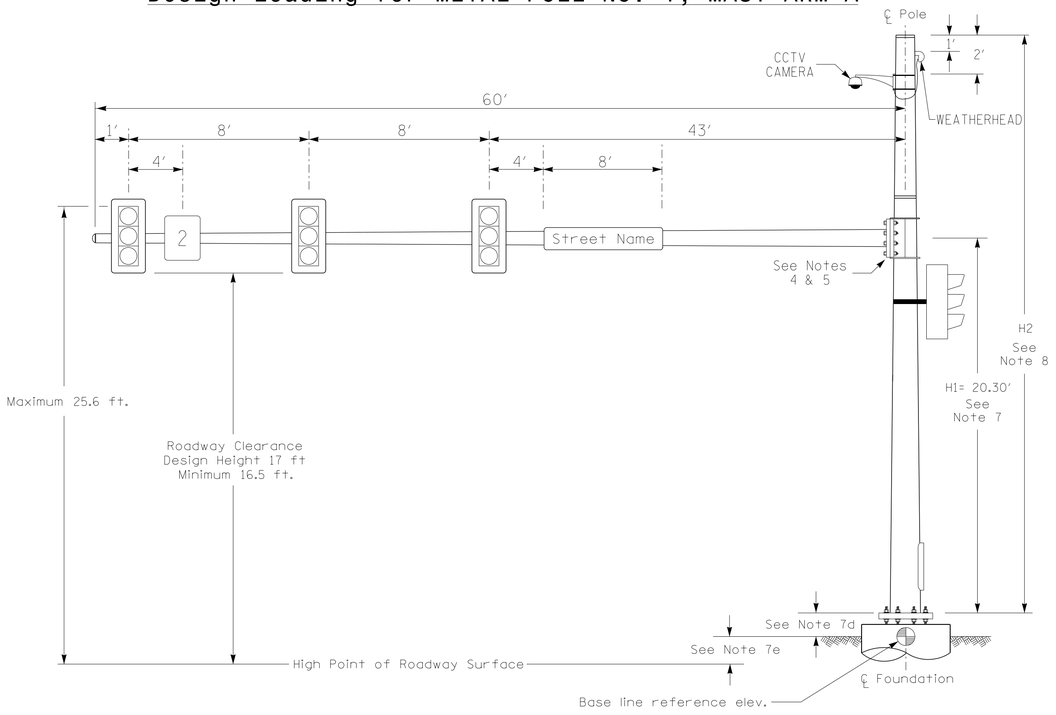
PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: D Waller, PE REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

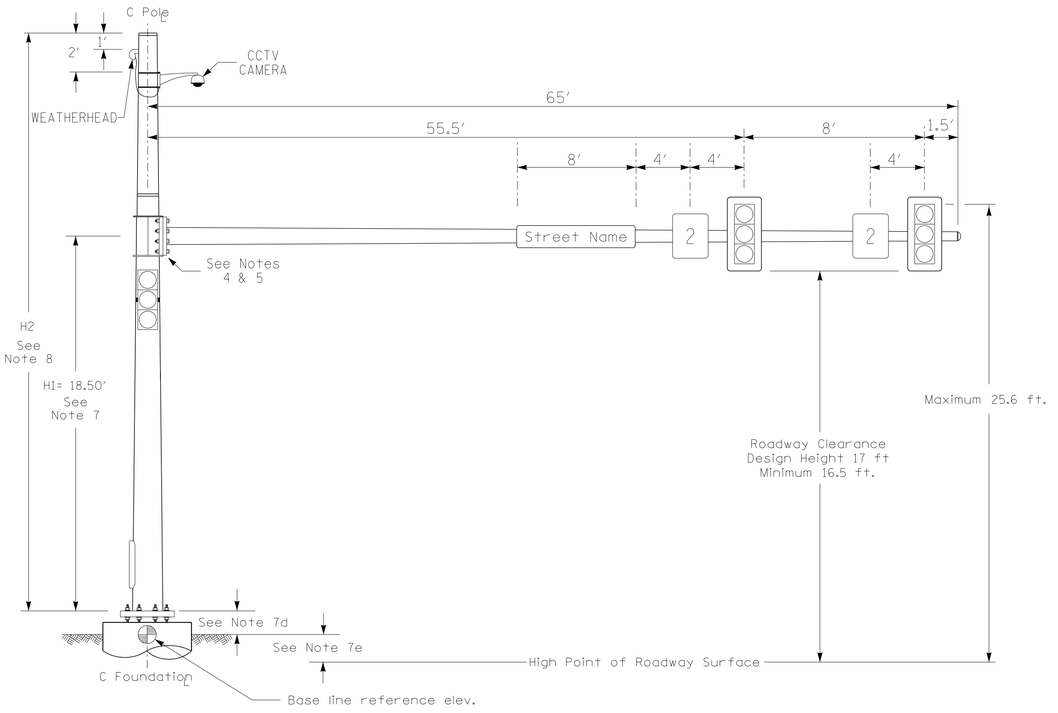
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1331

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



Elevation View

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



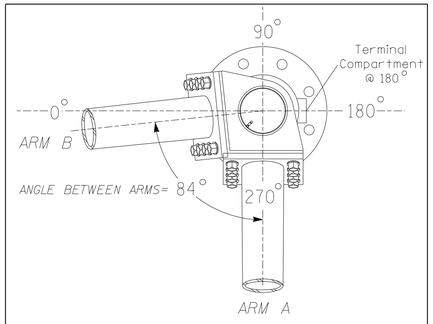
Elevation View

SPECIAL NOTE

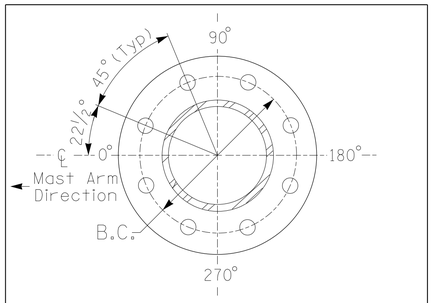
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at ℄ Foundation @ ground level	869.77 ft.	872.24 ft.
Elevation difference at High point of roadway surface	+1.21 ft.	-0.59 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

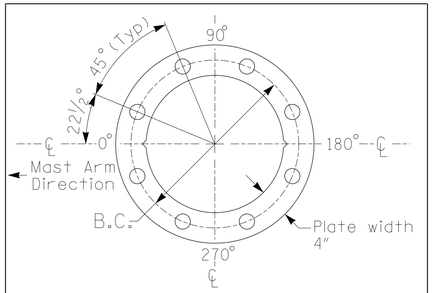


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 83.2

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
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS
	CCTV CAMERA ARM-MOUNTED	1.0 S.F.	11.0"W X 11.0"L	30 LBS

NOTES

DESIGN REFERENCE MATERIAL

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

DESIGN REQUIREMENTS

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

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 WB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: November 2023 REVIEWED BY: J. Galloway, PE
PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

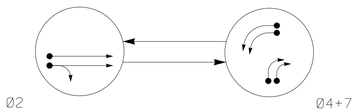
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1331

5/17/2024
11:12:10 AM
User:jgalloway
K:\TEAMS\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1331.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 84.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

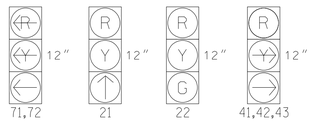
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	PHASE FLASH
21	↑	R	R
22	G	R	R
41,42,43	R	→	R
71,72	←R	←	←R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

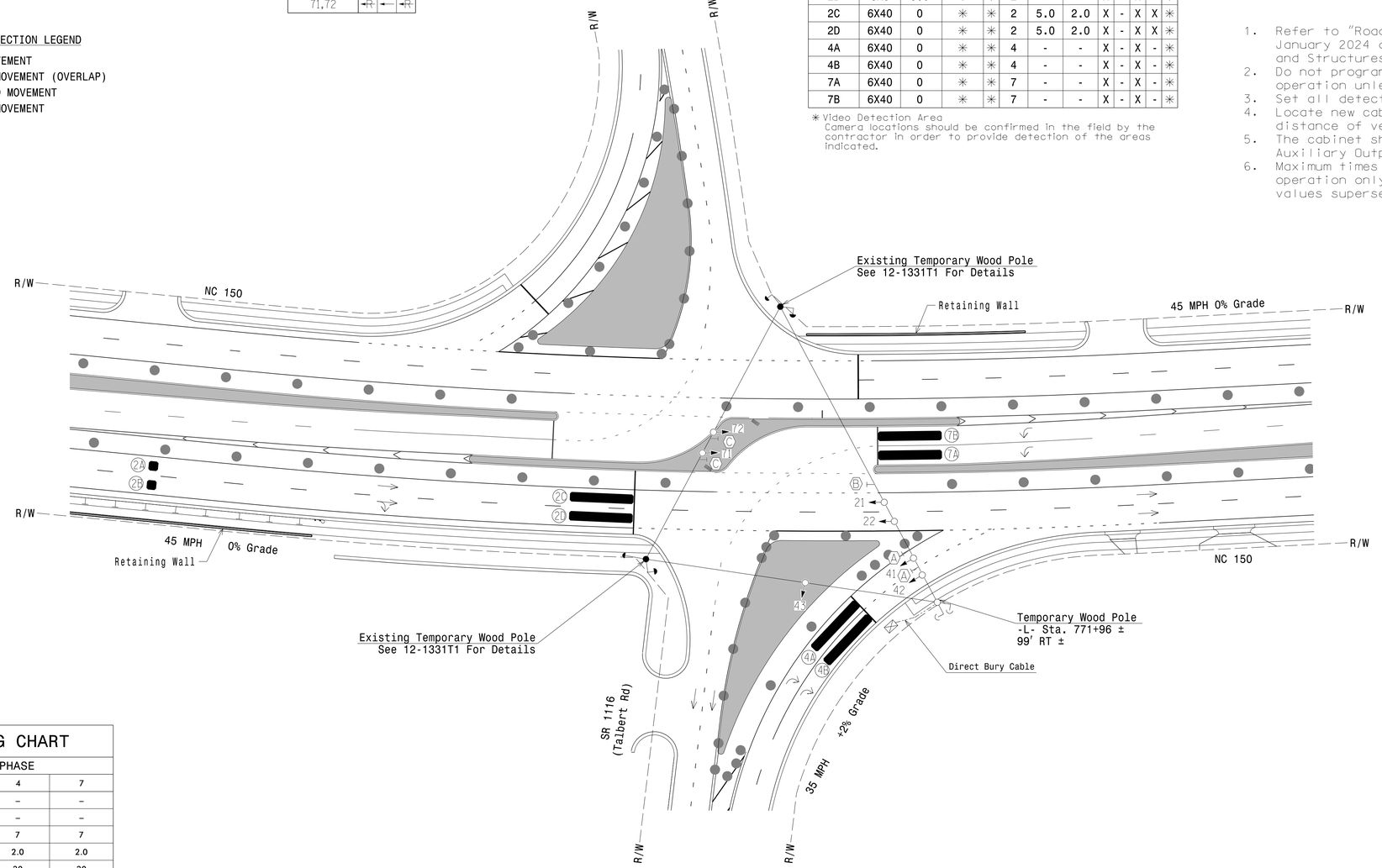
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
4B	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The cabinet should be designed to include an Auxiliary Output File for future use.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	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	
	Metal Pole with Mastarm	
DD#	Directional Drill (#) x 2" Conduit	N/A
	Type II Signal Pedestal	
	Video Detection Area	N/A
	Construction Zone	N/A
	Drums	N/A
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No U-Turn Sign (R3-4)	Ⓒ

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	–	–	–
Ped Clear *	–	–	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.5	3.4	3.0
Red Clear	3.2	2.1	3.4
Added Initial *	–	–	–
Maximum Initial *	–	–	–
Time Before Reduction *	15	–	–
Time To Reduce *	30	–	–
Minimum Gap	3.0	–	–
Advance Walk	–	–	–
Non Lock Detector	X	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

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

New Installation
Temporary Design 1 - TMP Phase III

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

SCALE 0 40 1"=40'

NC 150 EB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

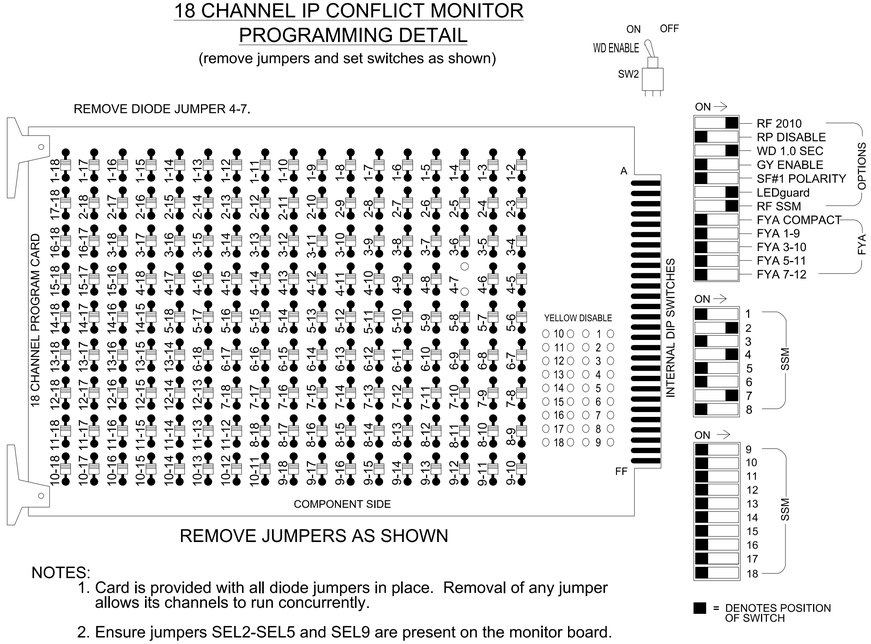
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. DATE
12-1846TI

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 7 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Phase Not On.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

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, S10
Phases Used.....2, 4, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 84.1

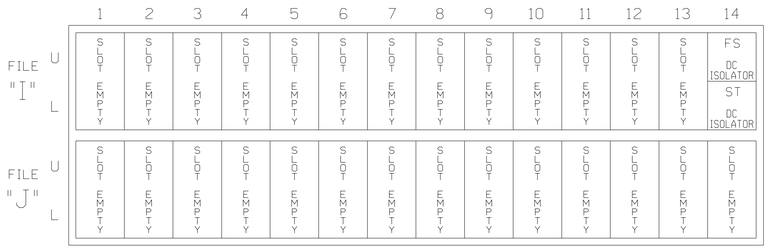
SIGNAL HEAD HOOK-UP CHART

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	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128			101													
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW						102					123								
GREEN ARROW		130				103					124								

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1846T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	RMM/JPG	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. GALLOWAY

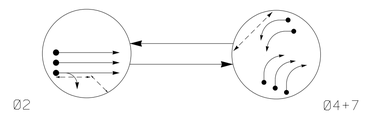
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1846T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 85.0

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

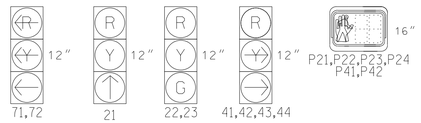
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	PHASE FLASH
21	↑	R	R
22,23	G	R	R
41,42,43,44	R	→	R
71,72	◄R	←	◄R
P21,P22	W	DW	DRK
P23,P24	W	DW	DRK
P41,P42	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
2C	6X6	300	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4C	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
7A	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
7B	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
S22	6X6	+400	4	X	-	-	-	-	-	-	-	X
S23	6X6	+400	4	X	-	-	-	-	-	-	-	X
S24	6X6	+400	4	X	-	-	-	-	-	-	-	X

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.

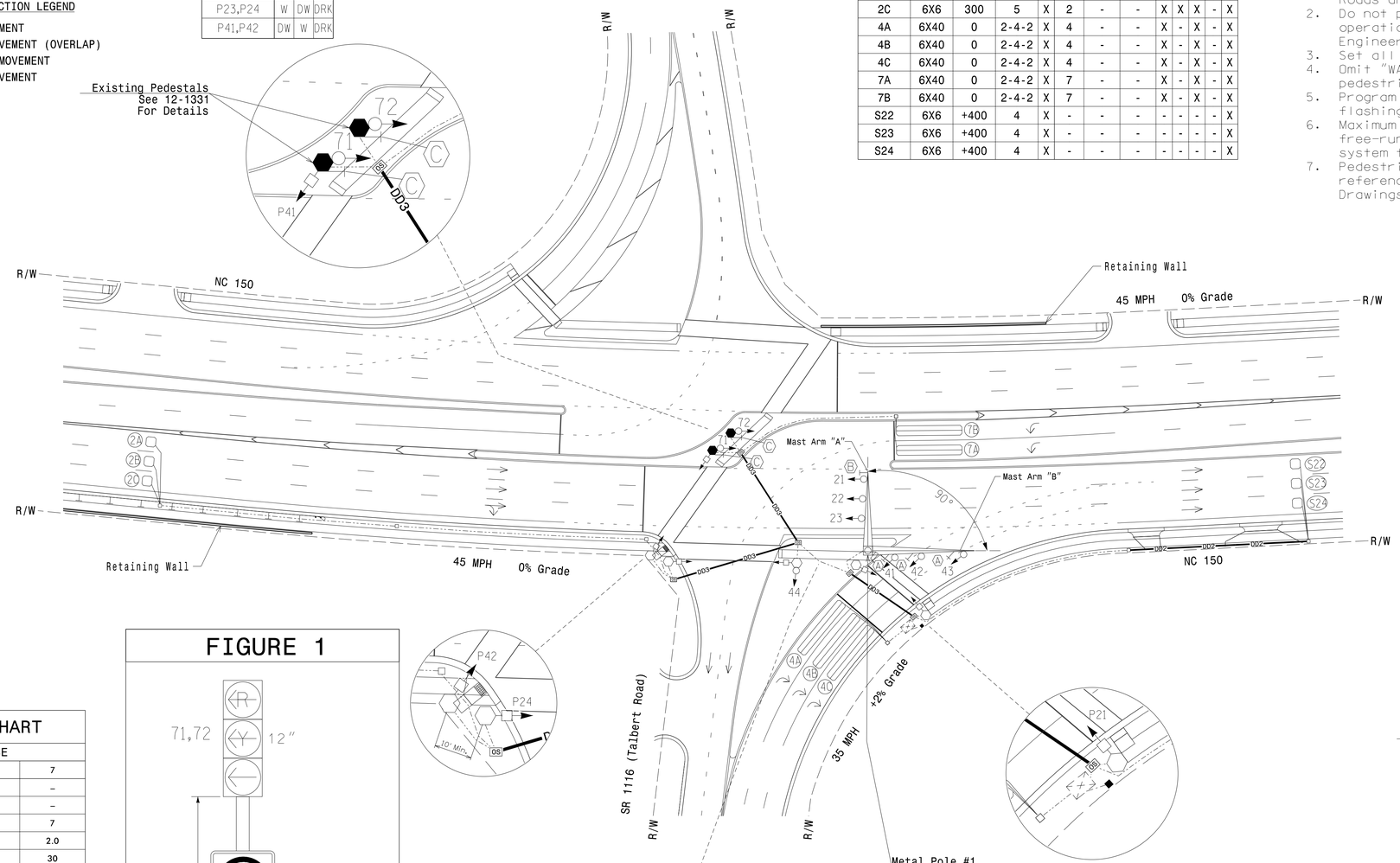
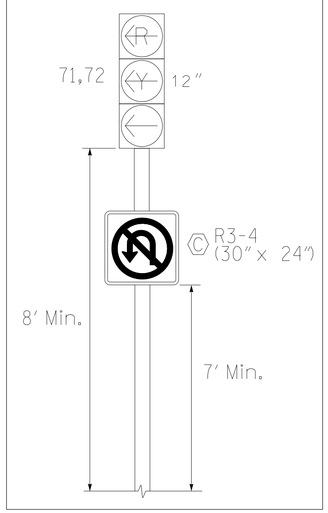


FIGURE 1



MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	14	4	–
Ped Clear *	15	13	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.5	3.4	3.0
Red Clear	2.8	1.2	3.9
Added Initial *	1.0	–	–
Maximum Initial *	34	–	–
Time Before Reduction *	15	–	–
Time To Reduce *	30	–	–
Minimum Gap	3.0	–	–
Advance Walk	7	–	–
Non Lock Detector	–	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

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

LEGEND

PROPOSED		EXISTING
○►	Traffic Signal Head	●►
◐►	Modified Signal Head	N/A
⊣	Sign	⊣
▭	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·····	2-in Underground Conduit	·····
N/A	Right of Way	———
→	Directional Arrow	→
◯	Metal Pole with Mastarm	◯
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⬡	Type II Signal Pedestal	■
OS	Oversized Junction Box	■
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓐ
Ⓒ	No U-Turn Sign (R3-4) SEE FIGURE 1	Ⓒ

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

NC 150 EB
at
SR 1116 (Talbert Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

SIG. INVENTORY NO. 12-1846

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