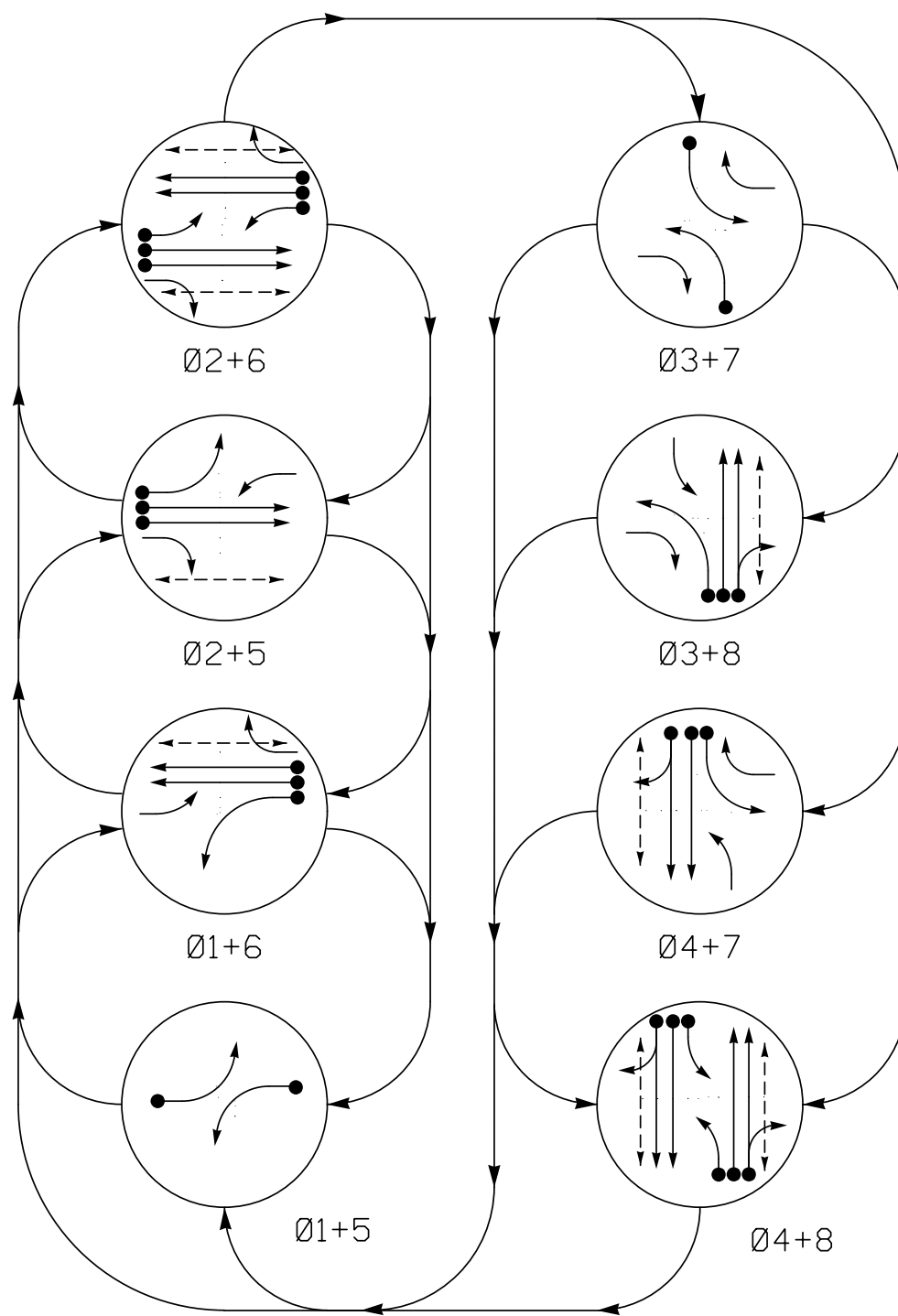


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PHASING DIAGRAM

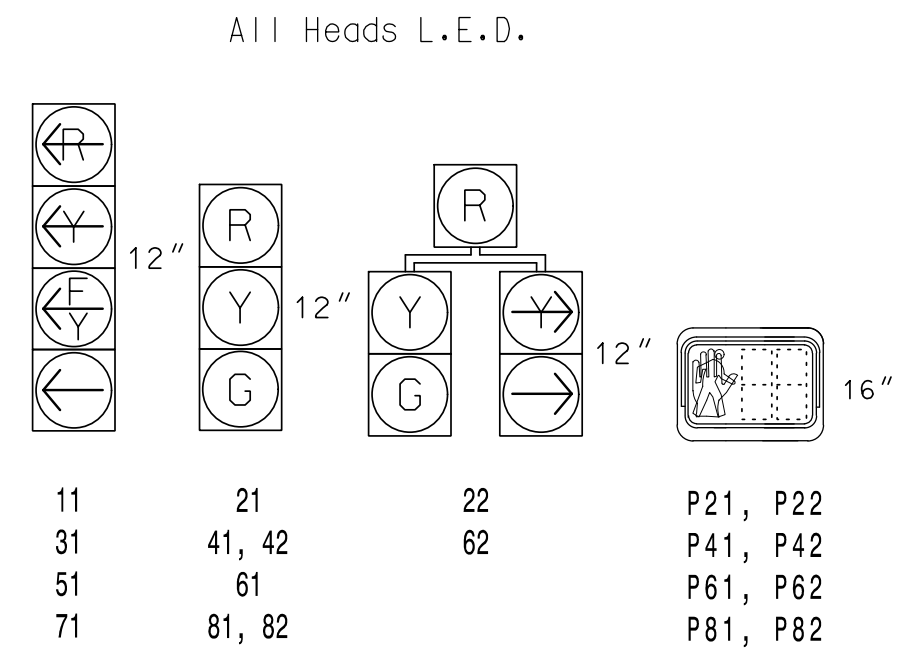


PHASING DIAGRAM DETECTION LEGEND
DETECTED MOVEMENT
UNDETECTED MOVEMENT (OVERLAP)
UNSIGNALIZED MOVEMENT
PEDESTRIAN MOVEMENT

TABLE OF OPERATION

Table with columns for SIGNAL FACE and PHASE (01-08, FL, L, R). Rows list signal faces 11, 21, 22, 31, 41, 42, 51, 61, 62, 71, 81, 82, P21, P22, P41, P42, P61, P62, P81, P82.

SIGNAL FACE I.D.

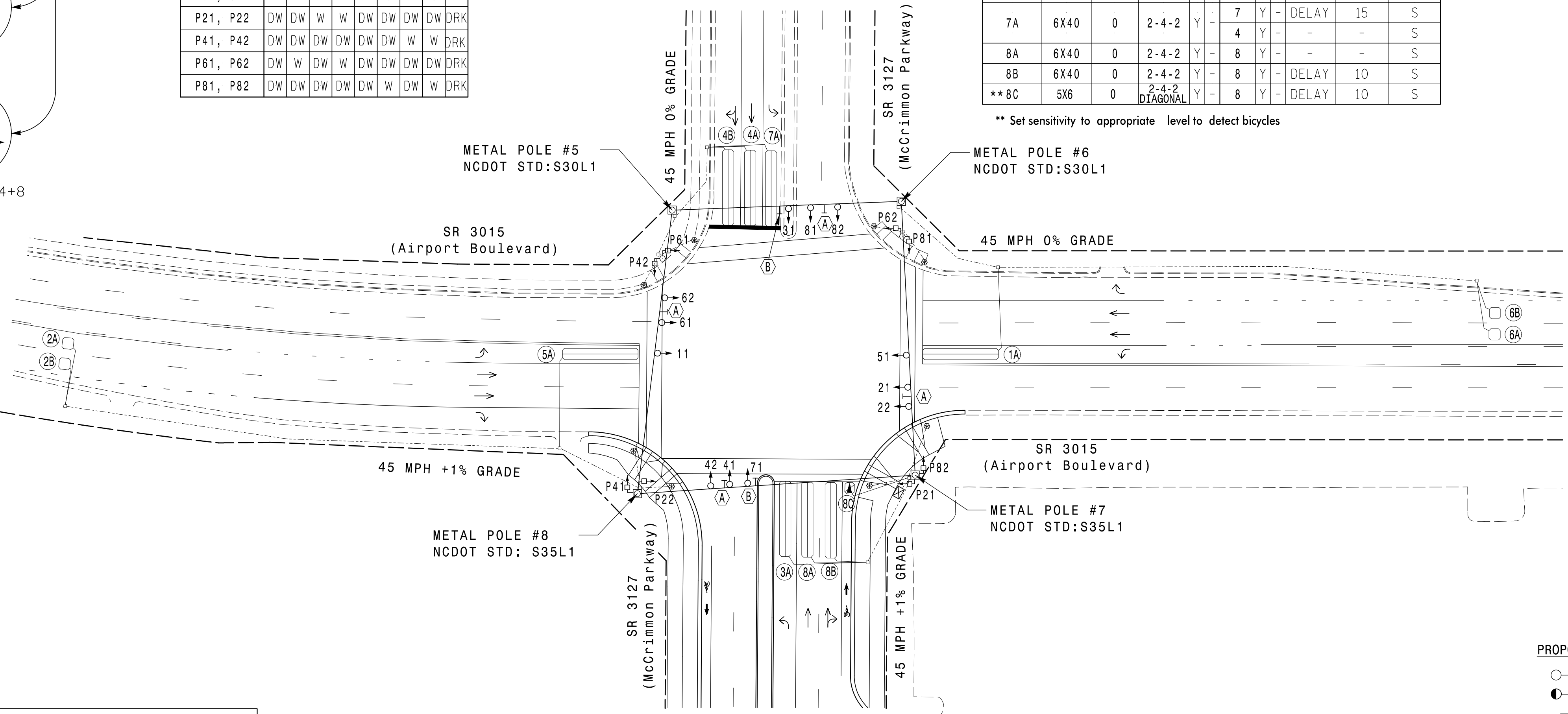


LOOP & DETECTOR INSTALLATION CHART

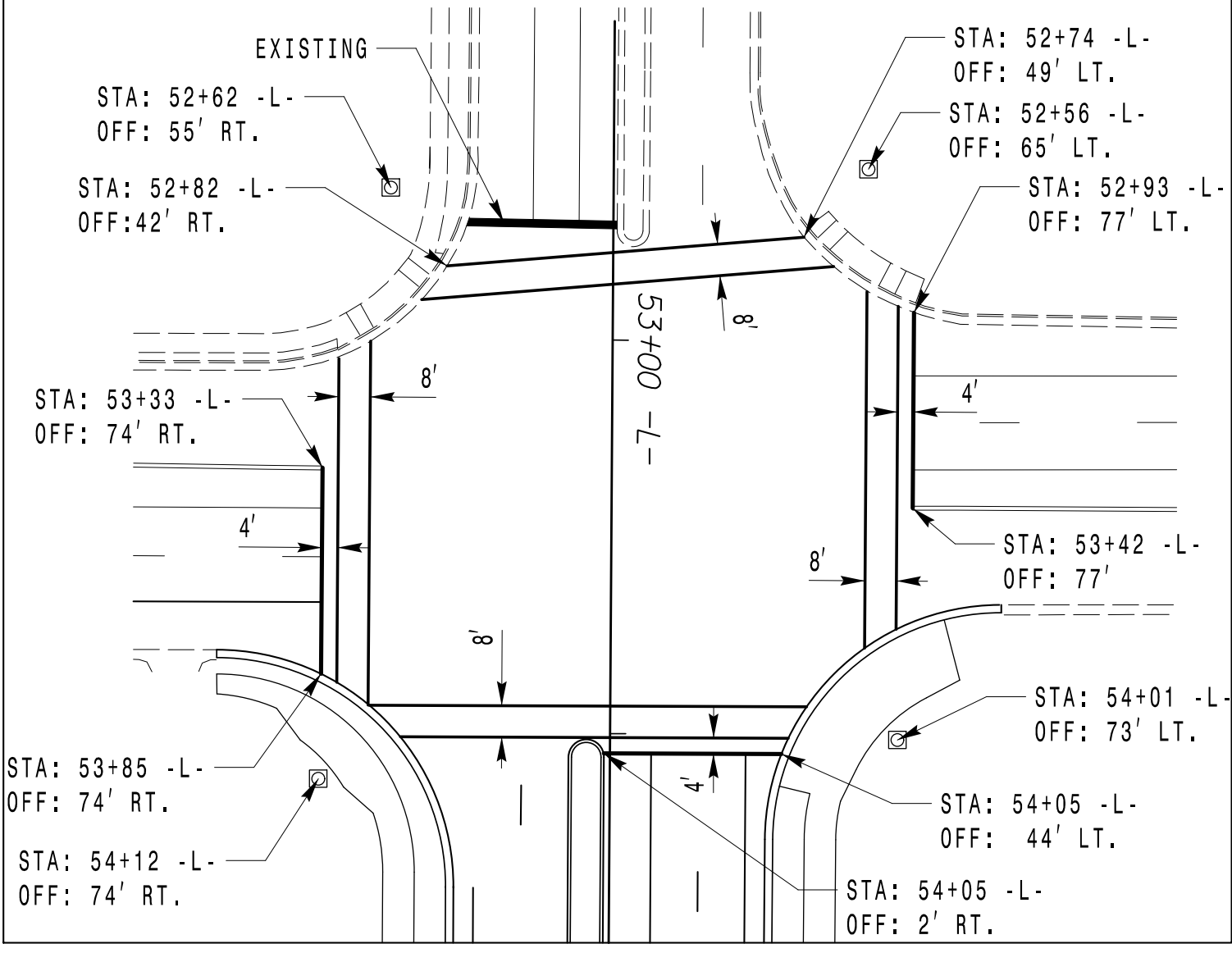
Chart with columns for LOOP NO., SIZE (ft), DIST. FROM STOPBAR (ft), TURNS, NEW EXISTING, NEMA PHASE, NEW EXISTING, TIMING (FEATURE, TIME), DET. TYPE. Rows list loops 1A through 8B and 8C.

8 PHASE FULLY ACTUATED (CARY SIGNAL SYSTEM)

- 1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Maximum times shown in timing chart are for free-run operation only.
10. Pedestrian pedestals are conceptual and shown for reference only.
11. Paint new bicycle markings (as shown on page 9C.05 of the 2009 edition of the MUTCD) in the center of loop 8C.



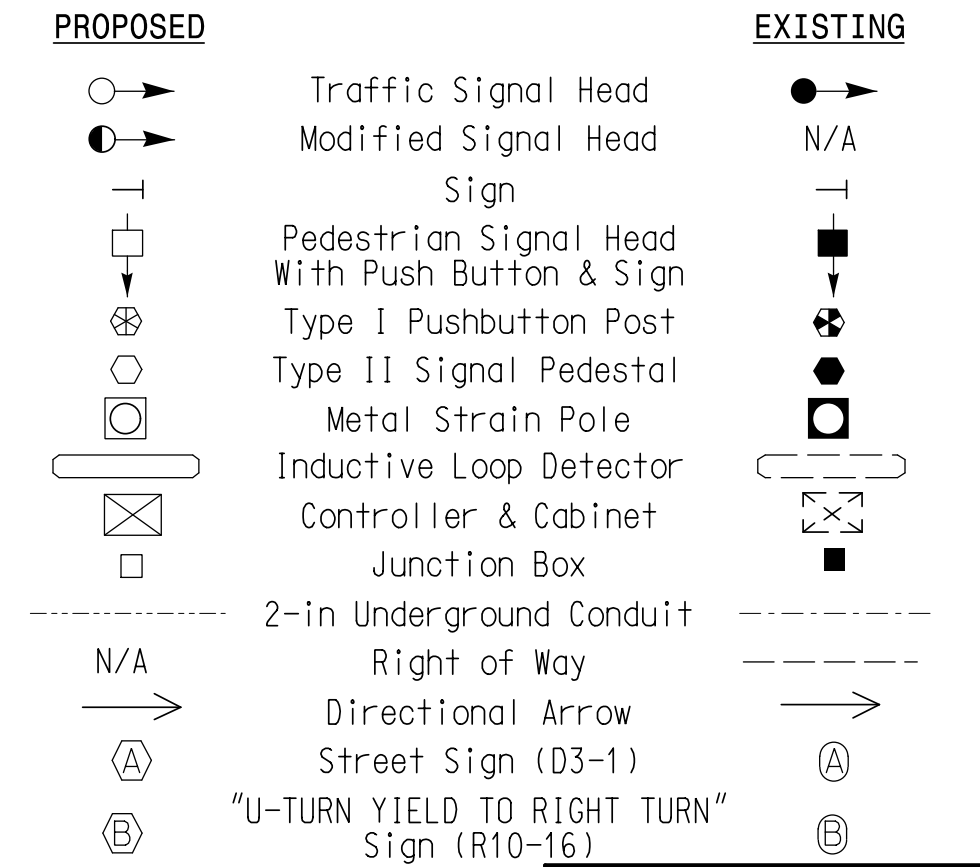
STOPLINE AND POLE LOCATION DIAGRAM



TIMING CHART

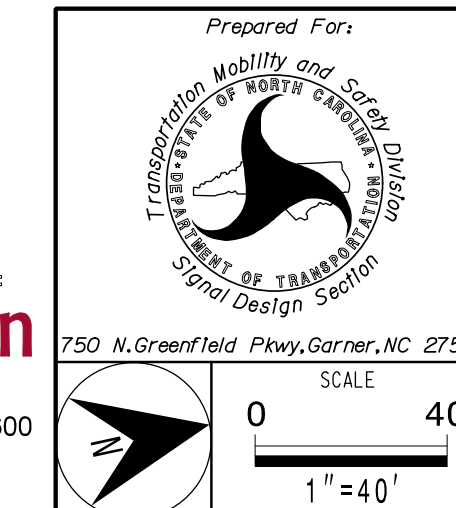
Timing chart table with columns for PHASE (01-08) and rows for various timing parameters like MINIMUM GREEN, VEHICLE EXT., YELLOW CHANGE INT., etc.

LEGEND

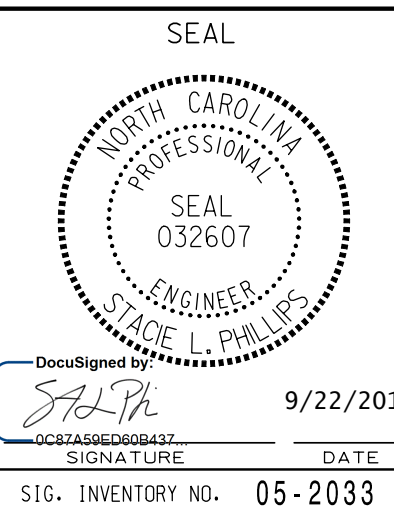


NC Dept of Transportation Division of Highways Final Drawing Date: 10/10/2016

NEW INSTALLATION



SR 3015 (Airport Boulevard) at SR 3127 (McCrimmon Parkway) Division 5 Wake County Morrisville PLAN DATE: APRIL 2016 REVIEWED BY: SL PHILLIPS PREPARED BY: SP PENNINGTON REVIEWED BY: REVISIONS INIT. DATE



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PLANS PREPARED IN THE OFFICE OF: Kimley Horn 421 Fayetteville Street, Suite 600 Raleigh, NC 27601

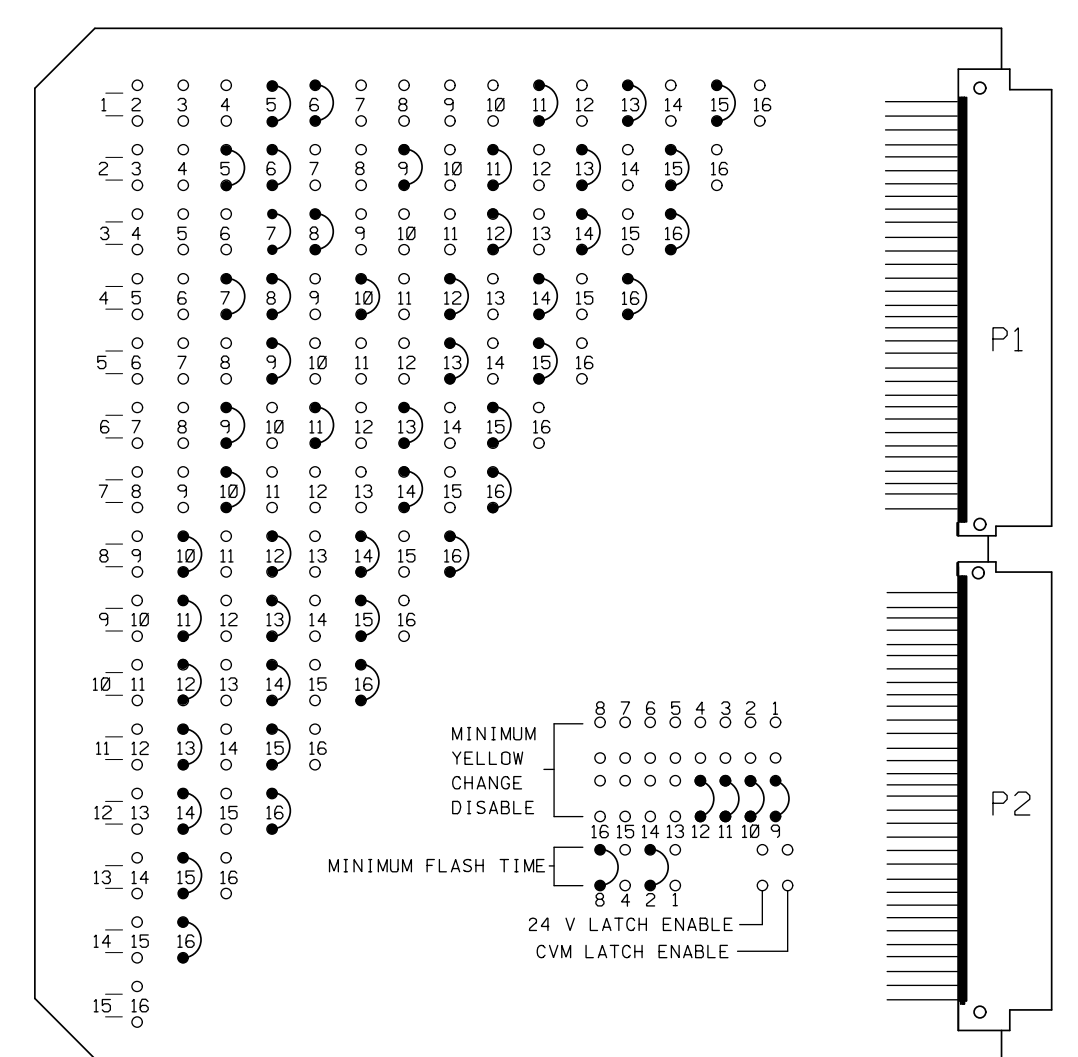


SIG. INVENTORY NO. 05-2033 DATE 9/22/2016

9/22/2016 9:09:42 AM susan.pennington K:\RAL\_Roadway\012108004 - McCrimmon Parkway\Phase 1\Map\ans\Signal\sig1.dgn



### EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL *(program card and tables as shown)*



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	ENABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	ENABLE
8	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
13	ENABLE
14	ENABLE
15	ENABLE
16	ENABLE

MMU PROGRAMMING NOTE  
ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDL	OFF
VM 3x/Day Latch	ON

CONFIG MODE	SETTING
ENABLE CHANNEL PAIR, FYA	B
CH 1-13	ON
CH 3-14	ON
CH 5-15	ON
CH 7-16	ON
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	ON
CH 5	ON
CH 7	ON
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

### NOTES

- To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- Make sure all flash transfer relays are in place.
- Program controller to start up in phase 2 Walk and 6 Walk.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- Program phases 2 and 6 for volume density operation.
- Program phases 4 and 8 for dual entry.
- The cabinet and controller are a part of the Cary Signal System.

### SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD		
SIGNAL HEAD NO.	11★	21,22	22	31★	41,42	51★	61,62	62	71★	81,82	P21, P22	P41, P42	P61, P62	P81, P82	11★	31★	51★	71★
RED	*	2R		*	4R	*	6R		*	8R								
YELLOW	*	2Y			4Y	*	6Y			8Y								
GREEN		2G			4G		6G			8G								
RED ARROW															13R	14R	15R	16R
YELLOW ARROW			3Y						7Y						13Y	14Y	15Y	16Y
FLASHING YELLOW ARROW															13G	14G	15G	16G
GREEN ARROW	1G		3G	3G		5G		7G	7G									
Hand icon										9R	10R	11R	12R					
Foot icon										9G	10G	11G	12G					

NU = Not Used  
\* Denotes install load resistor. See Load Resistor Installation Detail on sheet 3.  
★ See pictorial of head wiring detail this sheet.

### DETECTOR RACK SET-UP DETAIL

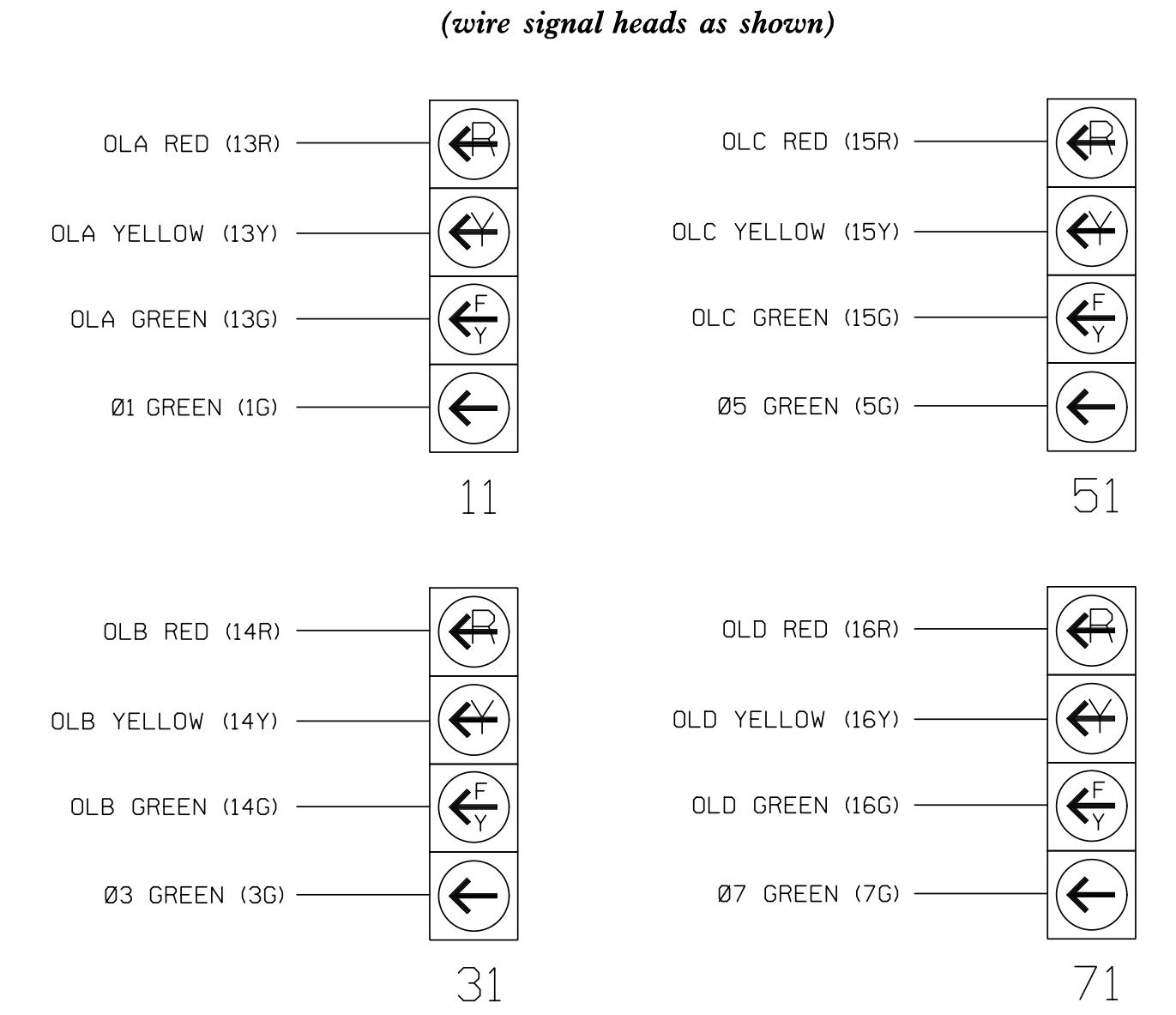
INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #	BIU	CH1	CH1	CH1	CH1	SLOT	CH1	CH1	CH1	SLOT	SLOT	SLOT
RACK #1	BIU	CH1	L1	L7	L5	SLOT	L9	L15	L13	SLOT	SLOT	SLOT
		∅ 2	∅ 1	∅ 4	∅ 3		∅ 5	∅ 7	∅ 6			
RACK #2	BIU	CH2	L2	L8	L6	EMPTY	CH2	L16	L14	EMPTY	EMPTY	EMPTY
		∅ 2	∅ 6	∅ 4	∅ 8		∅ 2	∅ 4	∅ 6			

### EQUIPMENT INFORMATION

CONTROLLER.....2070LN2  
CABINET .....[TS-2] NC-8  
SOFTWARE .....ECONOLITE ASC/3-2070  
CABINET MOUNT.....BASE  
LOADBAY POSITIONS.....16  
LOAD SWITCHES USED.....1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16  
PHASES USED.....1,2,2 PED,3,4,4 PED,5,6,6 PED,7,8,8 PED  
OLA.....\*  
OLB.....\*  
OLC.....\*  
OLD.....\*  
\* See overlap programming detail on sheet 2

### FYA SIGNAL WIRING DETAIL



### NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

### LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	∅ 1
2	∅ 2
3	∅ 3
4	∅ 4
5	∅ 5
6	∅ 6
7	∅ 7
8	∅ 8
9	∅ 2 PED
10	∅ 4 PED
11	∅ 6 PED
12	∅ 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A	L2A, L2B
3A	L3A, L3B
4A	L4A, L4B
5A	L5A, L5B
6A	L6A, L6B
7A	L7A, L7B
8A	L8A, L8B
9A	L9A, L9B
10A	L10A, L10B
11A	L11A, L11B
12A	L12A, L12B
13A	L13A, L13B
14A	L14A, L14B
15A	L15A, L15B
16A	L16A, L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	FEATURE	TIMING TIME (SEC)
1	∅ 1	DELAY	15
* 2	∅ 6	DELAY	3
** 3	∅ 2		
** 4	∅ 2		
5	∅ 3	DELAY	15
6	∅ 8		
7	∅ 4		
8	∅ 4	DELAY	10
9	∅ 5	DELAY	15
* 10	∅ 2	DELAY	3
11			
12			
** 13	∅ 6		
** 14	∅ 6		
15	∅ 7	DELAY	15
16	∅ 4		

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
8A	L17A, L17B
8B	L18A, L18B
8C	L19A, L19B
NU	L20A, L20B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	FEATURE	TIMING TIME (SEC)
17	∅ 8		
18	∅ 8	DELAY	10
19	∅ 8	DELAY	10
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

\* Detector Type - G  
\*\* Detector Type - N

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
Disapproved by: [Signature]  
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2033  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED:

Electrical Detail - Sheet 1 of 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

	Prepared For: <b>SR 3015 (Airport Boulevard) at SR 3127 (McCrimmon Parkway)</b>	SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032607 S. L. PHILLIPS 9/22/2016
	Division 5 Wake County Morrisville PLAN DATE: APRIL 2016 REVIEWED BY: SL PHILLIPS PREPARED BY: SP PENNINGTON REVIEWED BY:	

PLANS PREPARED IN THE OFFICE OF:  
**Kimley-Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000

### ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL (program controller as shown)

- 1. From Main Menu select **2. CONTROLLER**
- 2. From CONTROLLER Submenu select **2. VEHICLE OVERLAPS**

OVERLAP A  
Select TMG VEH OVLP [A] and 'PPLT FYA'

```

TMG VEH OVLP...[A] TYPE: .....PPLT FYA
PROTECTED PHASE (LEFT TURN)..... 1
PERMISSIVE PHASE (OPPOSING THRU).... 2
FLASHING ARROW OUTPUT.....CH13 ISOLATE
DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE..... 0
  
```

Toggle Once

OVERLAP B  
Select TMG VEH OVLP [B] and 'PPLT FYA'

```

TMG VEH OVLP...[B] TYPE: .....PPLT FYA
PROTECTED PHASE (LEFT TURN)..... 3
PERMISSIVE PHASE (OPPOSING THRU).... 4
FLASHING ARROW OUTPUT.....CH14 ISOLATE
DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE..... 0
  
```

Toggle Once

OVERLAP C  
Select TMG VEH OVLP [C] and 'PPLT FYA'

```

TMG VEH OVLP...[C] TYPE: .....PPLT FYA
PROTECTED PHASE (LEFT TURN)..... 5
PERMISSIVE PHASE (OPPOSING THRU).... 6
FLASHING ARROW OUTPUT.....CH15 ISOLATE
DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE..... 0
  
```

Toggle Once

OVERLAP D  
Select TMG VEH OVLP [D] and 'PPLT FYA'

```

TMG VEH OVLP...[D] TYPE: .....PPLT FYA
PROTECTED PHASE (LEFT TURN)..... 7
PERMISSIVE PHASE (OPPOSING THRU).... 8
FLASHING ARROW OUTPUT.....CH16 ISOLATE
DELAY START OF: FYA..0.0 CLEARANCE..0.0
ACTION PLAN SF BIT DISABLE..... 0
  
```

END PROGRAMMING

### ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING (program controller as shown)

- 1. From Main Menu select **1. CONFIGURATION**
- 2. From CONFIGURATION Submenu select **4. PORT 1 (SDLC)**
- 3. From PORT 1 (SDLC) Submenu select **2. MMU PROGRAM**

#### CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data. This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

MMU PROGRAM [	MANUAL ]
CH	6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
1	. X . X . X . . . . X X . . .
2	. X . X . X . X . . . X X . . .
3	X . X . X . . . . X X . . . .
4	X . X . X . X . X X . . . .
5	. X . X . . . . X . . . .
6	. X . X . X . X . . . .
7	X . X . . . . X . . . .
8	X . X . X . X . . . .
9	. X . X . X . . . .
10	X . X . X . . . .
11	. X . X . . . .
12	X . X . . . .
13	. X . . . .
14	X . . . .
15	. . . . .

END PROGRAMMING

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*Paul J. DeWitt*  
1008488274404  
ITS & Signals Unit

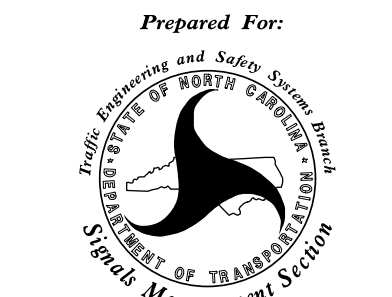
THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-2033  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED:

Electrical Detail - Sheet 2 of 3

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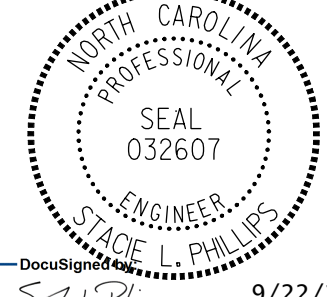
PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared For:  
  
750 N. Greenfield Plaza, Garner, NC 27529

SR 3015 (Airport Boulevard) at SR 3127 (McCrimmon Parkway)	
Division 5	Wake County Morrisville
PLAN DATE: APRIL 2016	REVIEWED BY: SL PHILLIPS
PREPARED BY: SP PENNINGTON	REVIEWED BY:
REVISIONS	INIT. DATE

SEAL



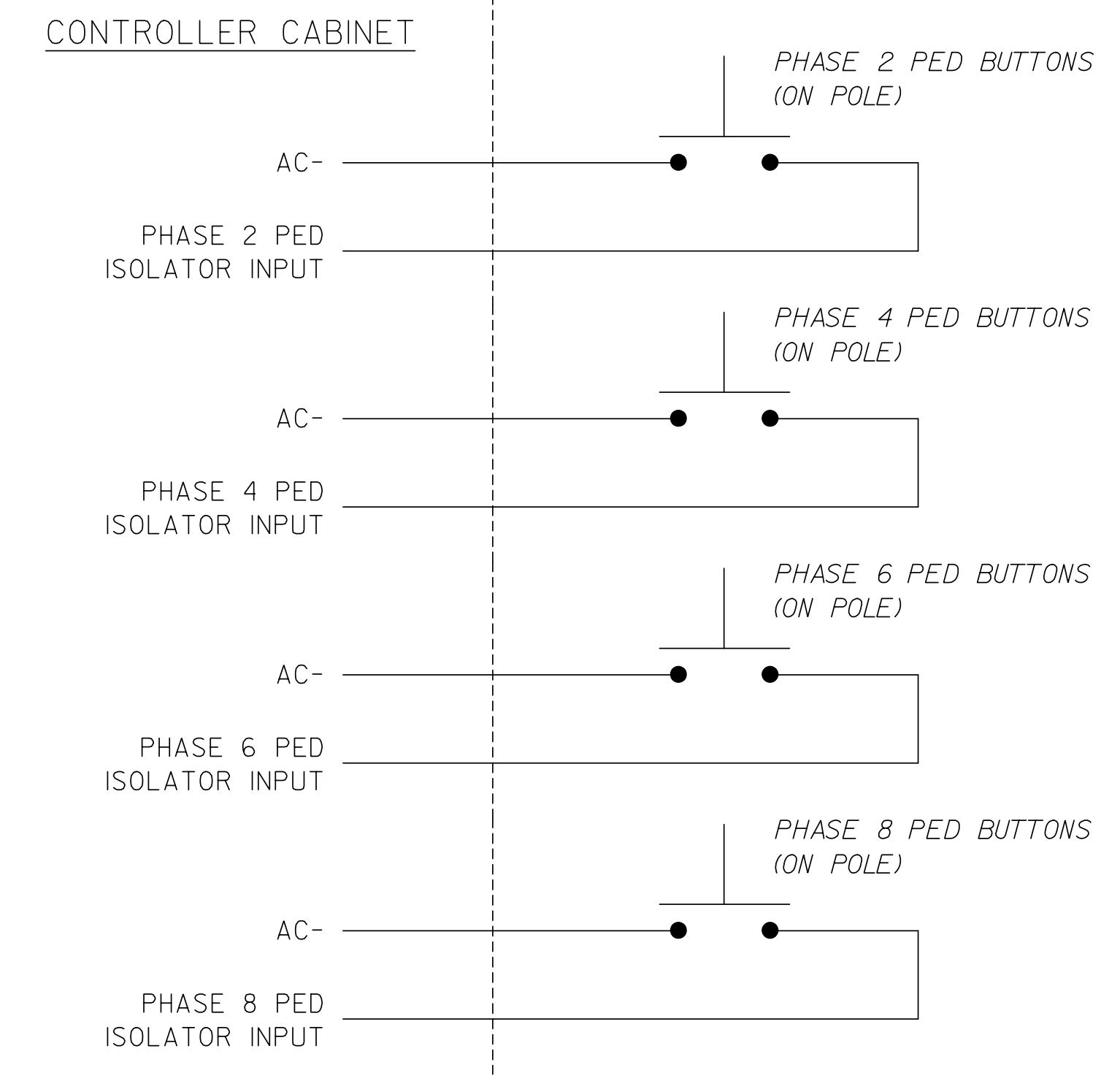
DocuSign  
*Stacie L. Phillips*  
9/22/2016  
DATE  
SIG. INVENTORY NO. 05-2033

K:\RAL\_Roadway\012108004 - McCrimmon Parkway\Phase 1\WP\ans\Signal\sig4 - Signal Des\gn\03\_05-2033\_2016e2.dgn 9/22/2016 9:09:45 AM susan.pennington



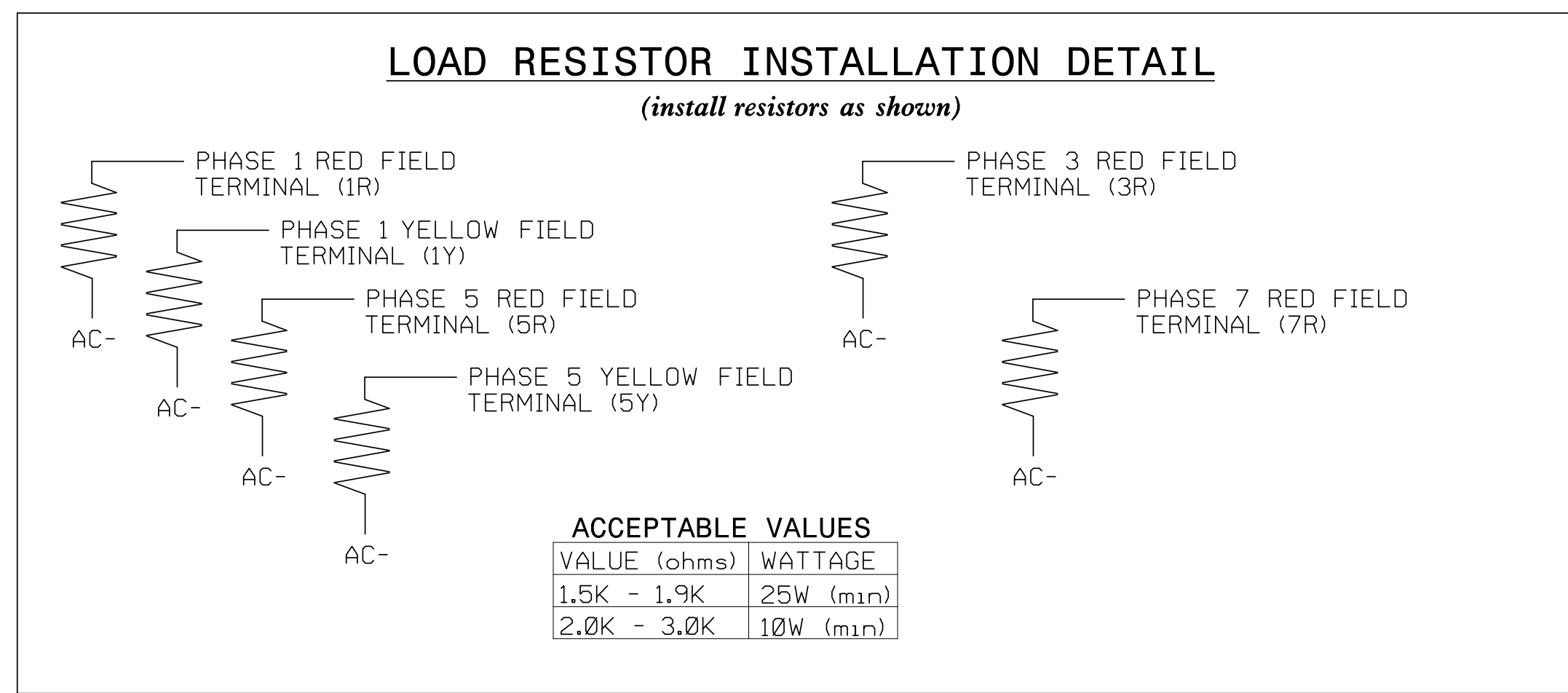
### PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



### LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



### COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
Designed by:  
*Pat J. Suh*  
ITS & Signals Unit

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-2033  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED:

Electrical Detail - Sheet 3 of 3

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PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000

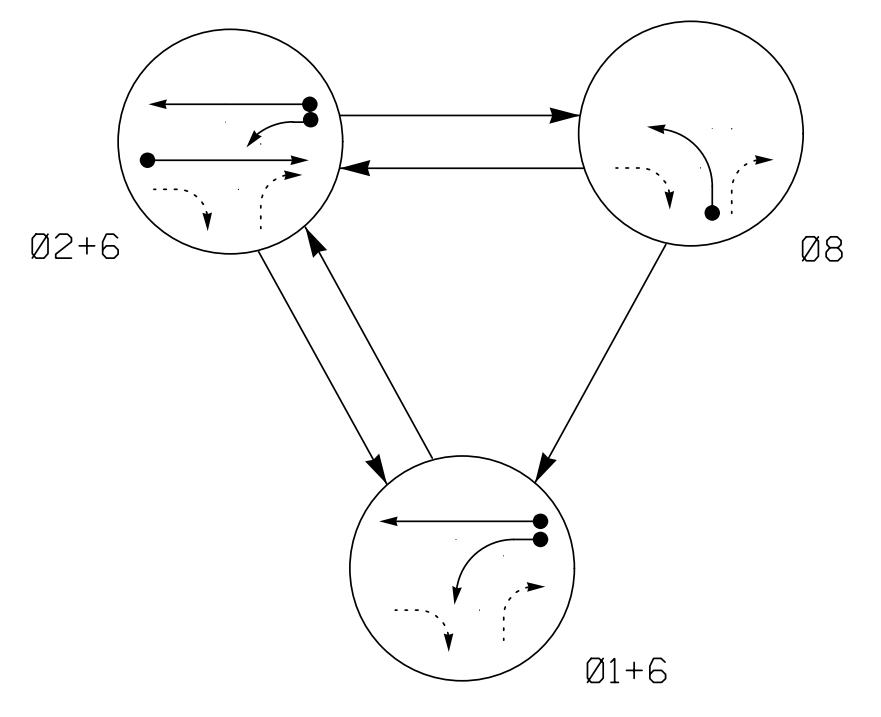
ELECTRICAL AND PROGRAMMING  
DETAILS FOR:  
Prepared For:  
  
750 N. Greenfield Pkwy, Garner, NC 27529

SR 3015 (Airport Boulevard)  
at  
SR 3127 (McCrimmon Parkway)  
Division 5 Wake County Morrisville  
PLAN DATE: APRIL 2016 REVIEWED BY: SL PHILLIPS  
PREPARED BY: SP PENNINGTON REVIEWED BY:  
REVISIONS INIT. DATE  
9/22/2016  
SIG. INVENTORY NO. 05-2033

SEAL  
NORTH CAROLINA  
PROFESSIONAL  
SEAL  
032607  
ENGINEER  
*SL PHILLIPS*  
9/22/2016  
DATE  
SIG. INVENTORY NO. 05-2033

9/22/2016 9:09:46 AM susan.pennington K:\RAL\_Roadway\012108004 - McCrimmon Parkway\Phase 1\WP\ans\Signal\sig4 - Signal Des\gn\04\_05-2033\_2016a3.dgn

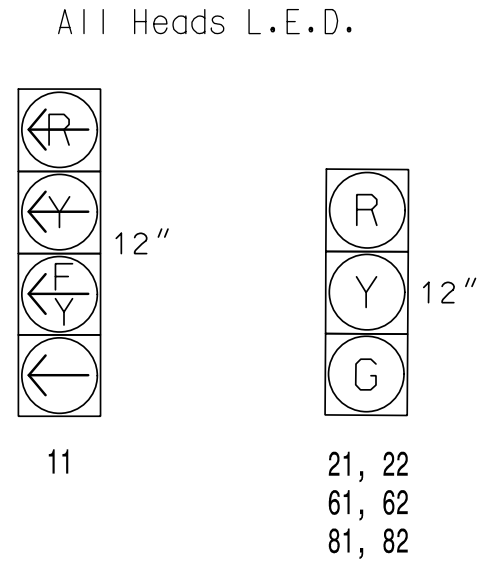
**PHASING DIAGRAM**



**TABLE OF OPERATION**

SIGNAL FACE	PHASE			
	01+6	02+6	08	F L H O P L H O P L
11	←	→	←	→
21, 22	R	G	R	Y
61, 62	G	G	R	Y
81, 82	R	R	G	R

**SIGNAL FACE I.D.**



**LOOP & DETECTOR INSTALLATION CHART**  
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	INDUCTIVE LOOPS		DETECTOR UNITS		TIMING FEATURE	TIME (sec)	DET. TYPE
				NEW	EXISTING	NEW	EXISTING			
1A	6X40	0	2-4-2	X	-	1	X	DELAY	15	S
2A	6X6	300	6	X	-	2	X	-	-	N
6A	6X6	300	6	X	-	6	X	-	-	N
8A	6X40	0	2-4-2	X	-	8	X	-	-	S

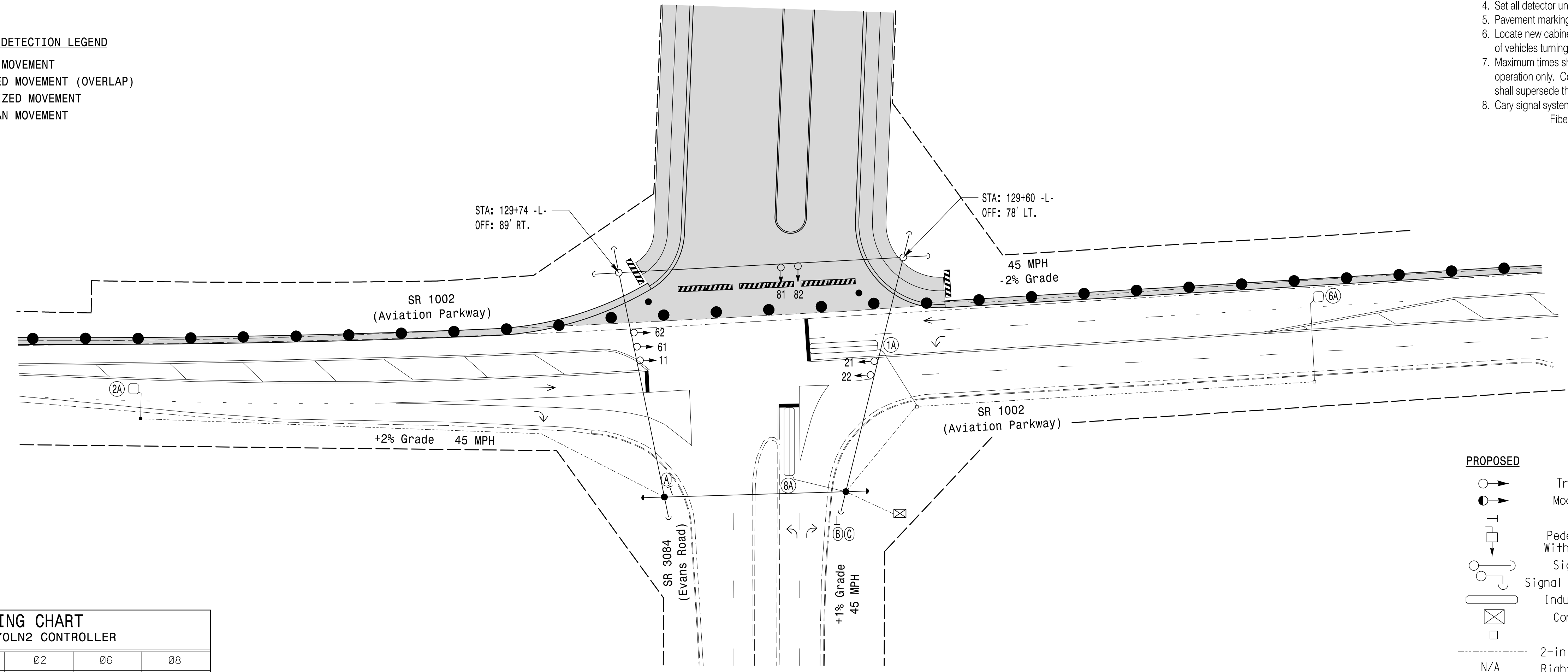
**3 Phase Fully Actuated (Cary Signal System)**

**NOTES**

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012, and all applicable sections of the latest version of the generic Project Special Provisions. The PSP can be accessed at the following website: <https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx>
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Set all detector units to presence mode.
- Pavement markings are existing.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
- Cary signal system data: Fiber channel #: 17.

**PHASING DIAGRAM DETECTION LEGEND**

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



**TIMING CHART**  
ASC/3-2070LN2 CONTROLLER

PHASE	01	02	06	08
MINIMUM GREEN *	7 SEC.	12 SEC.	12 SEC.	7 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.7 SEC.	4.7 SEC.	3.0 SEC.
RED CLEARANCE	1.6 SEC.	1.4 SEC.	1.4 SEC.	2.6 SEC.
MAX. I *	25 SEC.	90 SEC.	90 SEC.	30 SEC.
RECALL POSITION	NONE	MIN. RECALL	MIN. RECALL	NONE
LOCK DET.	OFF	ON	ON	OFF
WALK *	- SEC.	- SEC.	- SEC.	- SEC.
PED. CLEAR	- SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	- VEH.	0 VEH.	0 VEH.	- VEH.
SEC. PER ACTUATION *	- SEC.	2.5 SEC.	2.5 SEC.	- SEC.
MAX. INITIAL *	- SEC.	34 SEC.	34 SEC.	- SEC.
TIME B4 REDUCTION *	- SEC.	15 SEC.	15 SEC.	- SEC.
TIME TO REDUCE *	- SEC.	45 SEC.	45 SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	3.0 SEC.	- SEC.
DUAL ENTRY	OFF	OFF	OFF	OFF
SIMULTANEOUS GAP	ON	ON	ON	ON

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

**LEGEND**

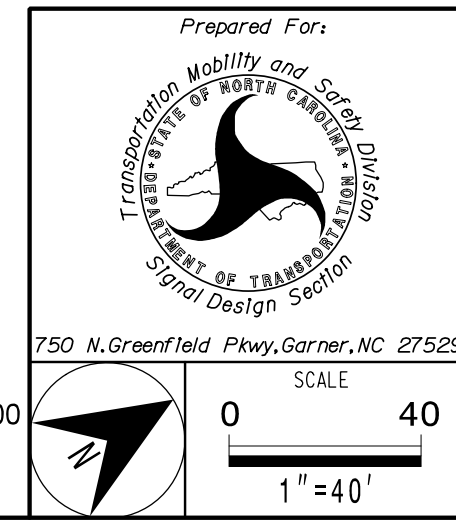
PROPOSED	EXISTING
○ → Traffic Signal Head	● → N/A
● → Modified Signal Head	— Sign
⊥ Pedestrian Signal Head With Push Button & Sign	⊥ Signal Pole with Guy
○ ⊥ Signal Pole with Sidewalk Guy	⊥ Inductive Loop Detector
⊠ Controller & Cabinet	⊠ Junction Box
□ 2-in Underground Conduit	— Right of Way with Marker
→ Directional Arrow	→ "YIELD" Sign (R1-2)
Ⓐ Added Lane Sign (W4-3)	Ⓑ "FREE FLOW RIGHT LANE KEEP MOVING" Plaque
Ⓒ Construction Zone Drums	■ Construction Zone

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
ITS & Signals Unit

**SIGNAL UPGRADE - TEMPORARY DESIGN 1  
TM PLANS PHASE 1**

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

PLANS PREPARED IN THE OFFICE OF:  
**Kimley-Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000



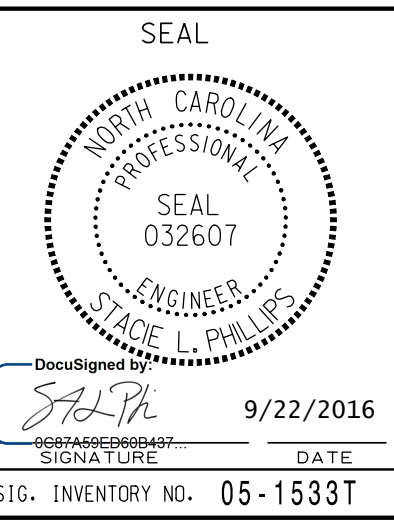
**SR 1002 (Aviation Parkway)  
at  
SR 3084 (Evans Road)**

Division 5 Wake County Morrisville

PLAN DATE: APRIL 2016 REVIEWED BY: SL PHILLIPS

PREPARED BY: SP PENNINGTON REVIEWED BY:

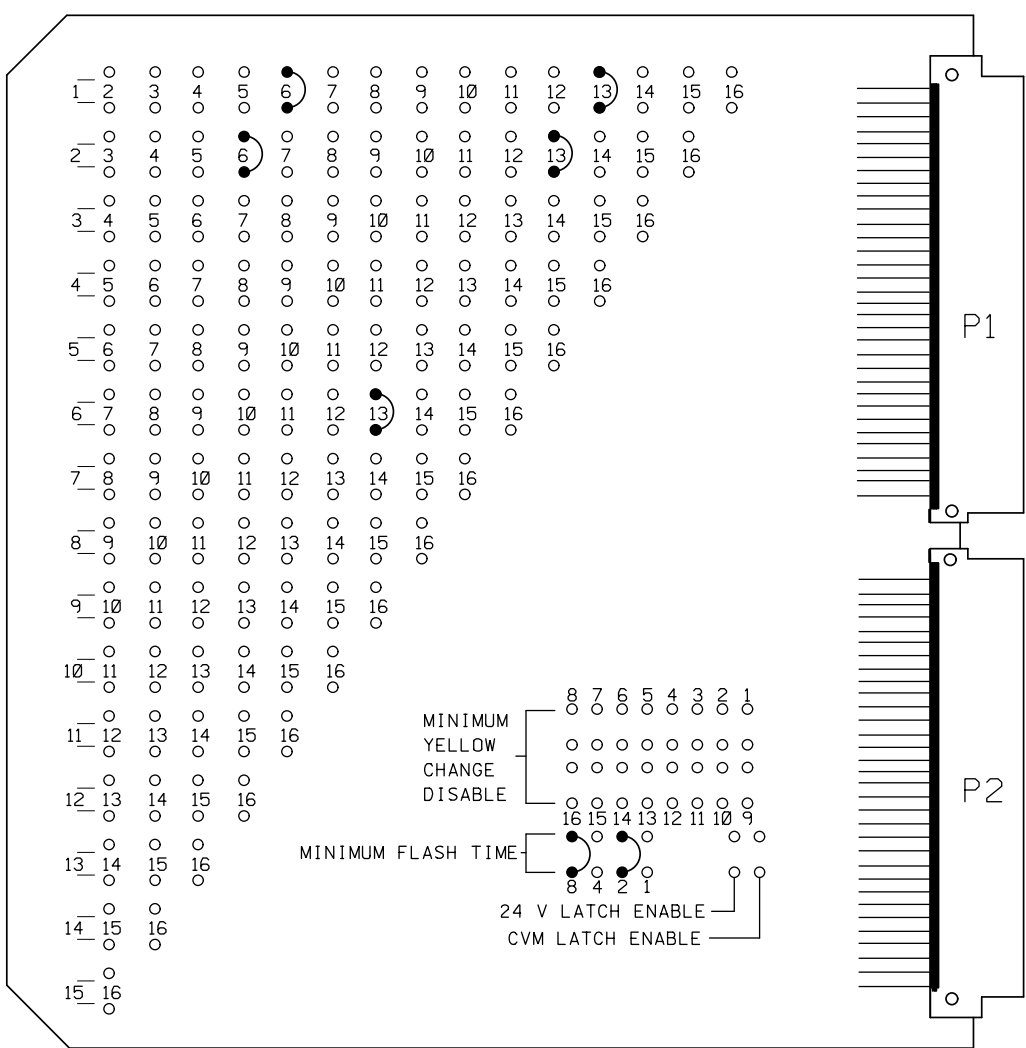
REVISIONS	INIT.	DATE



9/22/2016 9:03:48 AM susan.pennington K:\RAL\_Roadway\07108004 - MCR\Imon Parkway\Phase 1\Plan\Signal\Signal\54 - Signal Design\05\_08-1533T1\_2016.dgn



**EDI MODEL MMU2-16LEip  
MALFUNCTION MANAGEMENT UNIT  
PROGRAMMING DETAIL**  
*(program card and tables as shown)*



MMU PROGRAMMING CARD

**FIELD CHECK ENABLE  
DUAL IND ENABLE  
RED FAIL ENABLE**

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	DISABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	DISABLE
16	DISABLE

**UNIT OPTIONS**

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLIC	OFF
VM 3x/Day Latch	ON

**FLASHING YELLOW ARROW**

CONFIG MODE	SETTING
CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

**MMU PROGRAMMING NOTE**  
ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

**NOTES**

- To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red outputs 3, 4, 5, 7, 9, 10, 11, 12, 14, 15 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
- Program controller to start up in phase 2 Green and 6 Green.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- Program phases 2 and 6 for volume density operation.
- The cabinet and controller are a part of the Cary Signal System.

**SIGNAL HEAD HOOK-UP CHART**

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	21,22	NU	NU	NU	61,62	NU	81,82	NU	NU	NU	NU	11★	NU	NU	NU
RED	*	2R				6R		8R								
YELLOW	*	2Y				6Y		8Y								
GREEN		2G				6G		8G								
RED ARROW													13R			
YELLOW ARROW													13Y			
FLASHING YELLOW ARROW													13G			
GREEN ARROW	1G															

NU = Not Used  
\* Denotes install load resistor. See Load Resistor Installation Detail on sheet 2.  
★ See pictorial of head wiring detail this sheet.

**DETECTOR RACK SET-UP DETAIL**

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #	BIU	CH1	CH1	CH1	SLOT	CH1	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
#1	BIU	L3	L1	L7	SLOT	L11	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
		NOT USED	∅ 1	∅ 6	∅ 6	NOT USED	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8	∅ 8
#2	BIU	CH2	CH2	CH2	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
		L4	L2	L8	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
		∅ 2	∅ 6	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
		**	*	∅ 8	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

**WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW**

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B L2A, L2B
NU	L3A, L3B
2A	L4A, L4B
NU	L5A, L5B
NU	L6A, L6B
6A	L7A, L7B
NU	L8A, L8B
NU	L9A, L9B
NU	L10A, L10B
NU	L11A, L11B
8A	L12A, L12B
NU	L13A, L13B
NU	L14A, L14B
NU	L15A, L15B
NU	L16A, L16B

**PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW**

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1	∅ 1	DELAY	15
* 2	∅ 6	DELAY	3
3			
** 4	∅ 2		
5			
6			
* 7	∅ 6		
8			
9			
10			
11			
12	∅ 8		
13			
14			
15			
16			

**WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW**

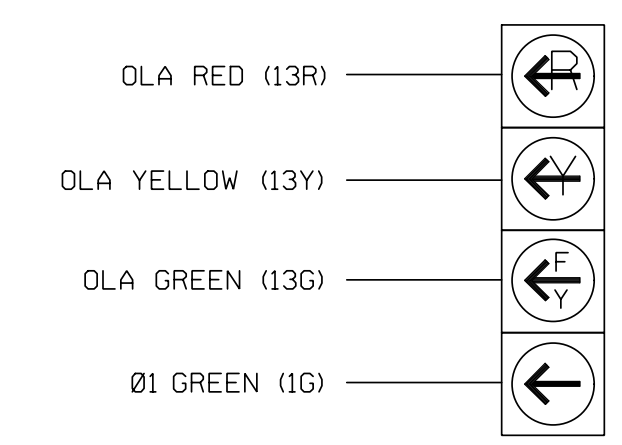
LOOP NO.	LOOP PANEL TERMINALS
NU	L17A, L17B
NU	L18A, L18B
NU	L19A, L19B
NU	L20A, L20B
NU	L21A, L21B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

**NOTE**  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070LN2  
CABINET .....NC-8 [TS-2]  
SOFTWARE .....ECONOLITE ASC/3-2070  
CABINET MOUNT.....BASE  
LOADBAY POSITIONS.....16  
LOAD SWITCHES USED.....1,2,6,8,13  
PHASES USED.....1,2,6,8  
OLA.....\*  
OLB.....NOT USED  
OLC.....NOT USED  
OLD.....NOT USED  
\* See overlap programming detail on sheet 2

**FYA SIGNAL WIRING DETAIL**  
*(wire signal heads as shown)*



11

**LOAD SWITCH ASSIGNMENT DETAIL**  
*(program controller according to schedule in chart below)*

LOAD SWITCH NUMBER	FUNCTION
1	∅ 1
2	∅ 2
3	∅ 3
4	∅ 4
5	∅ 5
6	∅ 6
7	∅ 7
8	∅ 8
9	∅ 2 PED
10	∅ 4 PED
11	∅ 6 PED
12	∅ 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533T1  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED: N/A

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*Stack L. Phillips*  
ITS & Signals Unit

TEMPORARY DESIGN 1 - SHEET 1 OF 2

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

 Prepared For: Wake County 750 N. Greenfield Plaza, Garner, NC 27529	Division 5 PLAN DATE: April 2016 PREPARED BY: SP PENNINGTON	Wake County MORRISVILLE REVIEWED BY: SL PHILLIPS REVIEWED BY:	SEAL  DATE: 9/22/2016
	SR 1002 (Aviation Parkway) at SR 3084 (Evans Road)	REVISIONS INIT. DATE	DATE

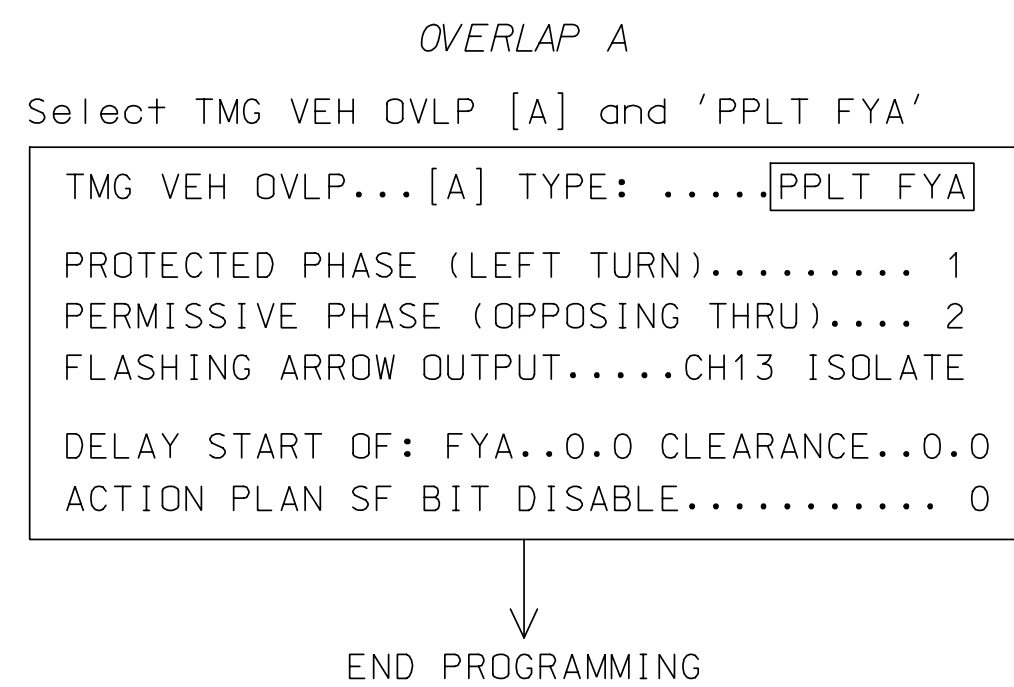
PLANS PREPARED IN THE OFFICE OF:  
**Kimley-Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000

9/22/2016 9:09:50 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\Iman Parfwoy\Phase 1\WP\ans\Signal\sig4 - Signal Des\gnwg.05-1533T1\_2016e1.dgn

## ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

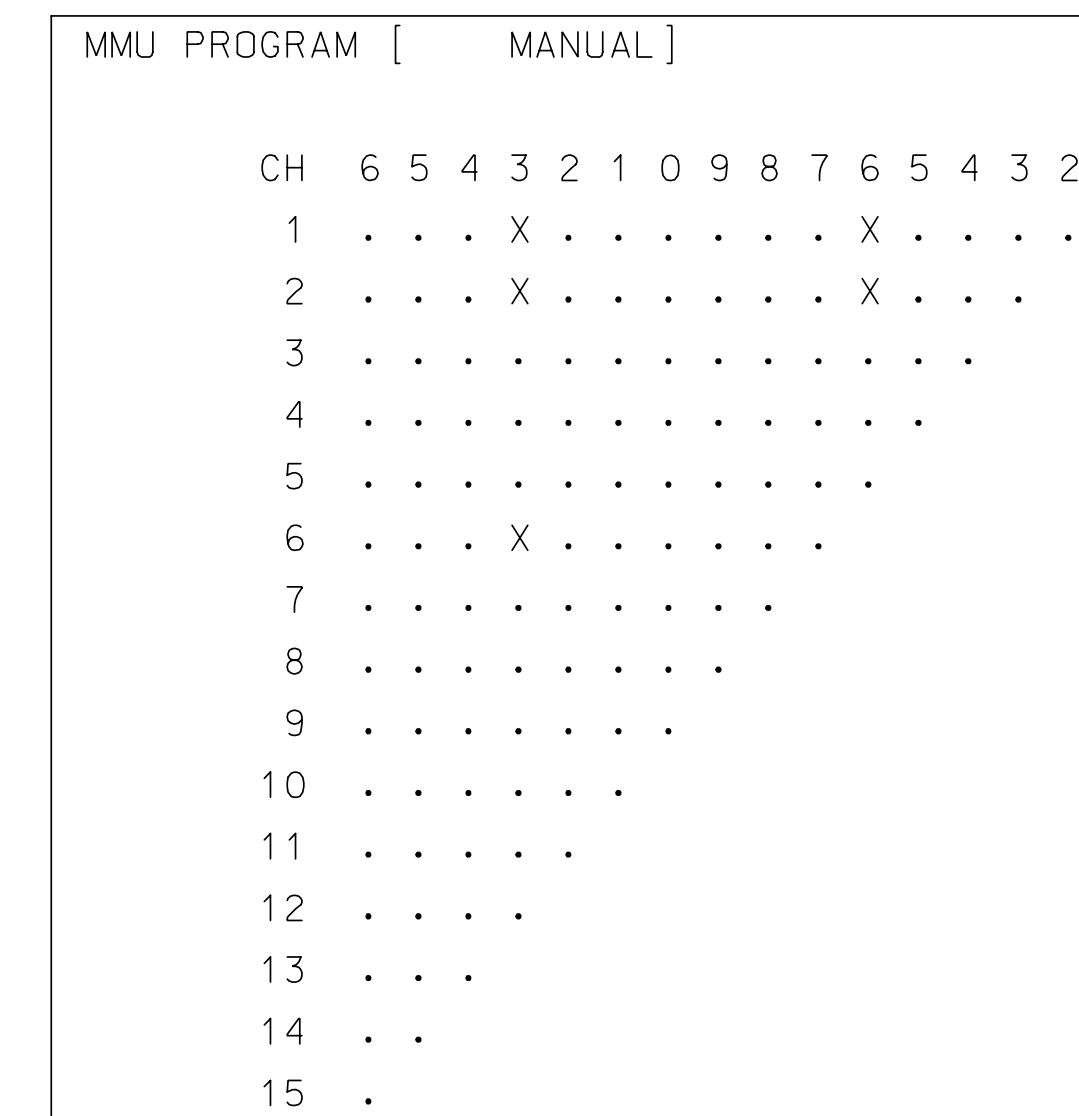
1. From Main Menu select 2. CONTROLLER
2. From CONTROLLER Submenu select 2. VEHICLE OVERLAPS



## ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

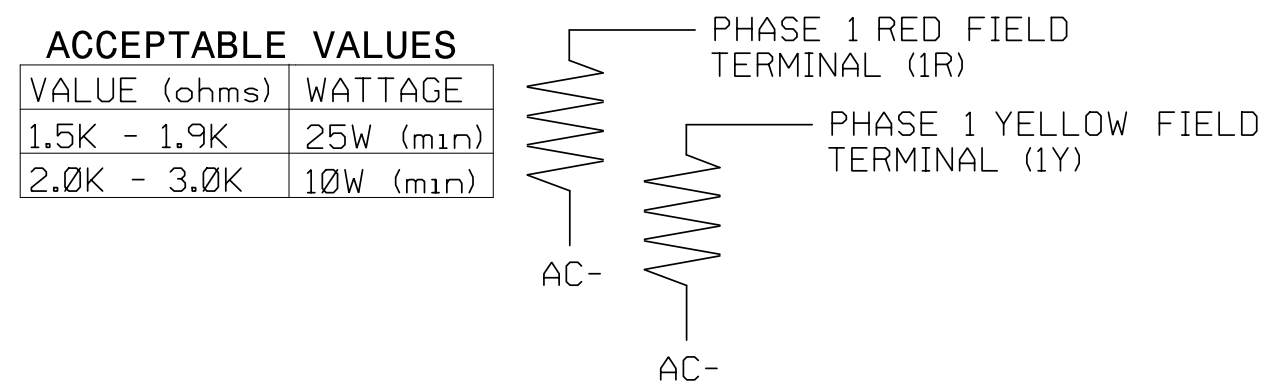
(program controller as shown)

1. From Main Menu select 1. CONFIGURATION
2. From CONFIGURATION Submenu select 4. PORT 1 (SDLC)
3. From PORT 1 (SDLC) Submenu select 2. MMU PROGRAM



### LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1533T1  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED: N/A

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*Stacie L. Phillips*  
SEAL  
STACIE L. PHILLIPS  
ENGINEER  
ITS & Signals Unit

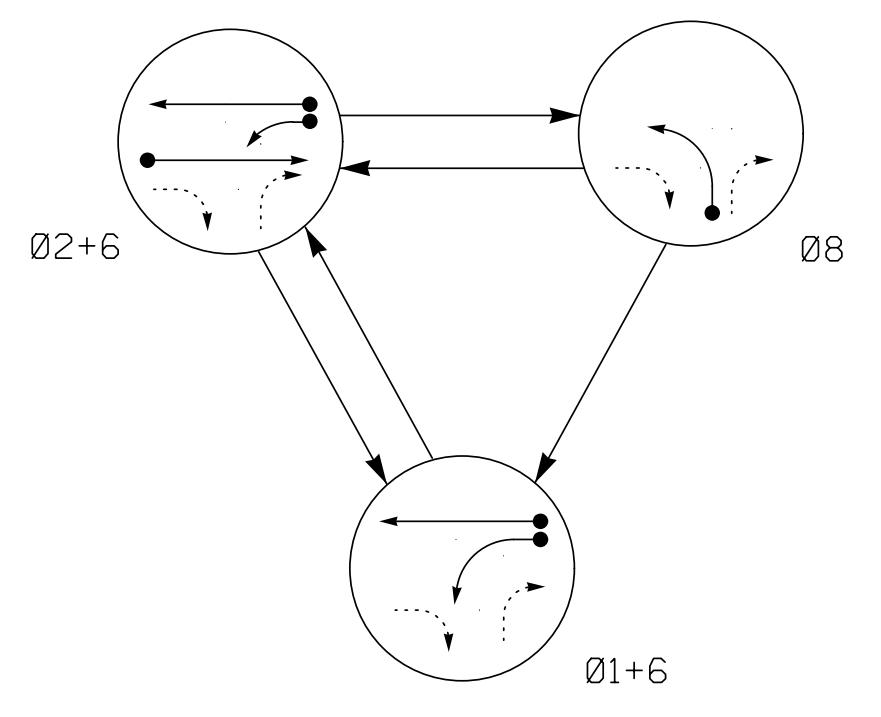
TEMPORARY DESIGN 1 - SHEET 2 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	SR 1002 (Aviation Parkway) at SR 3084 (Evans Road)	SEAL 
Prepared For: 	Division 5      Wake County      Morrisville	PLAN DATE: April 2016      REVIEWED BY: SL PHILLIPS
PLANS PREPARED IN THE OFFICE OF: <b>Kimley»Horn</b> NC License #F-0102 421 Fayetteville Street, Suite 600 Raleigh, NC 27601 (919) 677-2000	PREPARED BY: SP PENNINGTON      REVIEWED BY:	REVISIONS      INIT.      DATE
750 N. Greenfield Plaza, Garner, NC 27529		DocuSigned by:  9/22/2016 SIG. INVENTORY NO. 05-1533T1

9/22/2016 9:09:52 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\mcr\ParWay\Phase 1\WP\anMS\Signal\sk4 - Signal\_Design\07\_05-1533T1\_2016e2.dgn



PHASING DIAGRAM

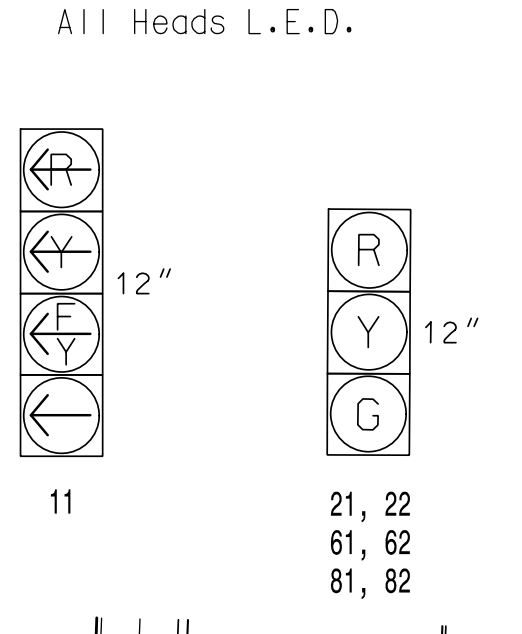


PHASING DIAGRAM DETECTION LEGEND
DETECTED MOVEMENT
UNDETECTED MOVEMENT (OVERLAP)
UNSIGNALIZED MOVEMENT
PEDESTRIAN MOVEMENT

TABLE OF OPERATION

Table with columns: SIGNAL FACE, PHASE (01+6, 02+6, 08, TOTAL), and rows for signal faces 11, 21, 22, 61, 62, 81, 82.

SIGNAL FACE I.D.



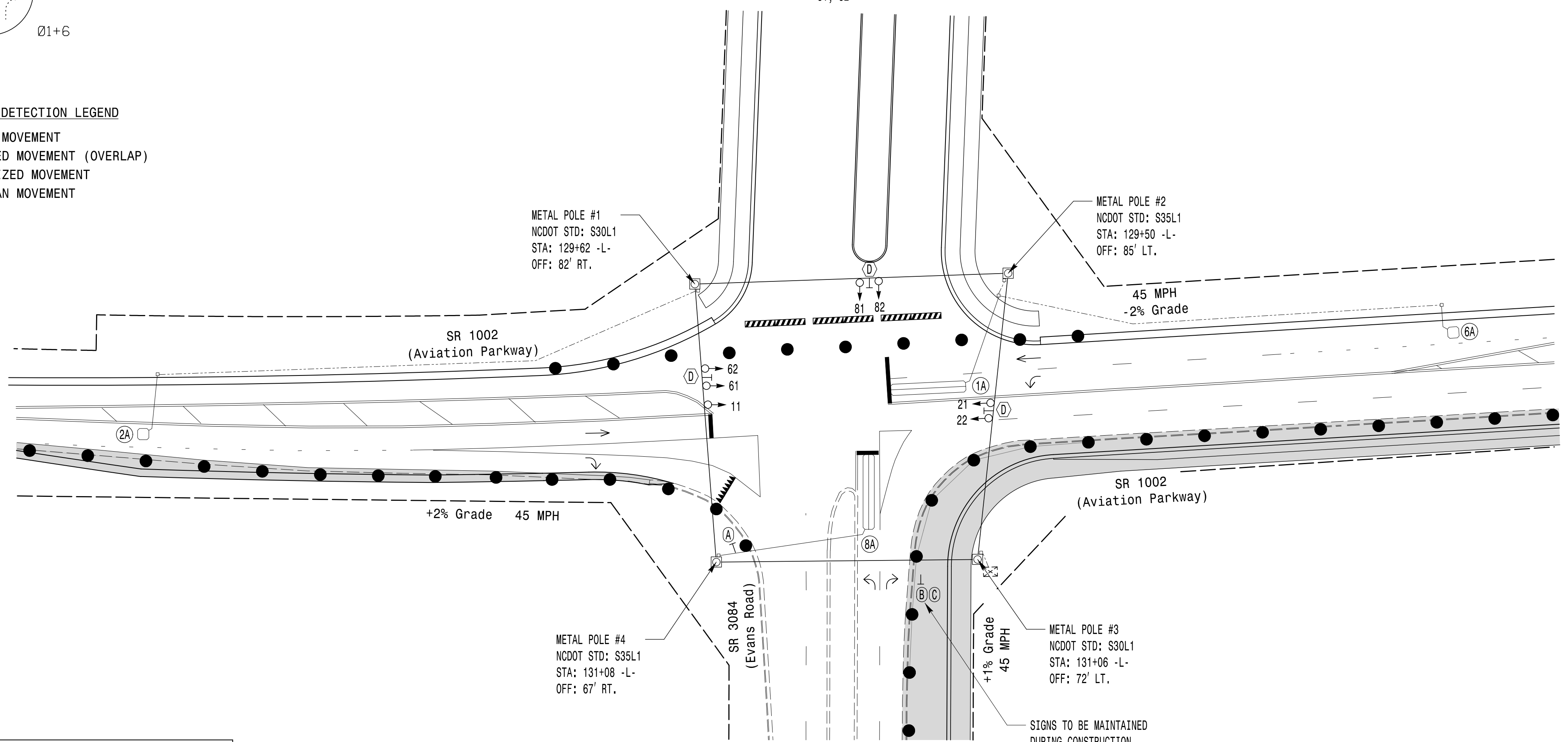
LOOP & DETECTOR INSTALLATION CHART

Chart with columns: LOOP NO., SIZE (ft), DIST. FROM STOPBAR (ft), TURNS, NEW/EXISTING, NEMA PHASE, NEW/EXISTING, TIMING (FEATURE, TIME [sec]), DET. TYPE.

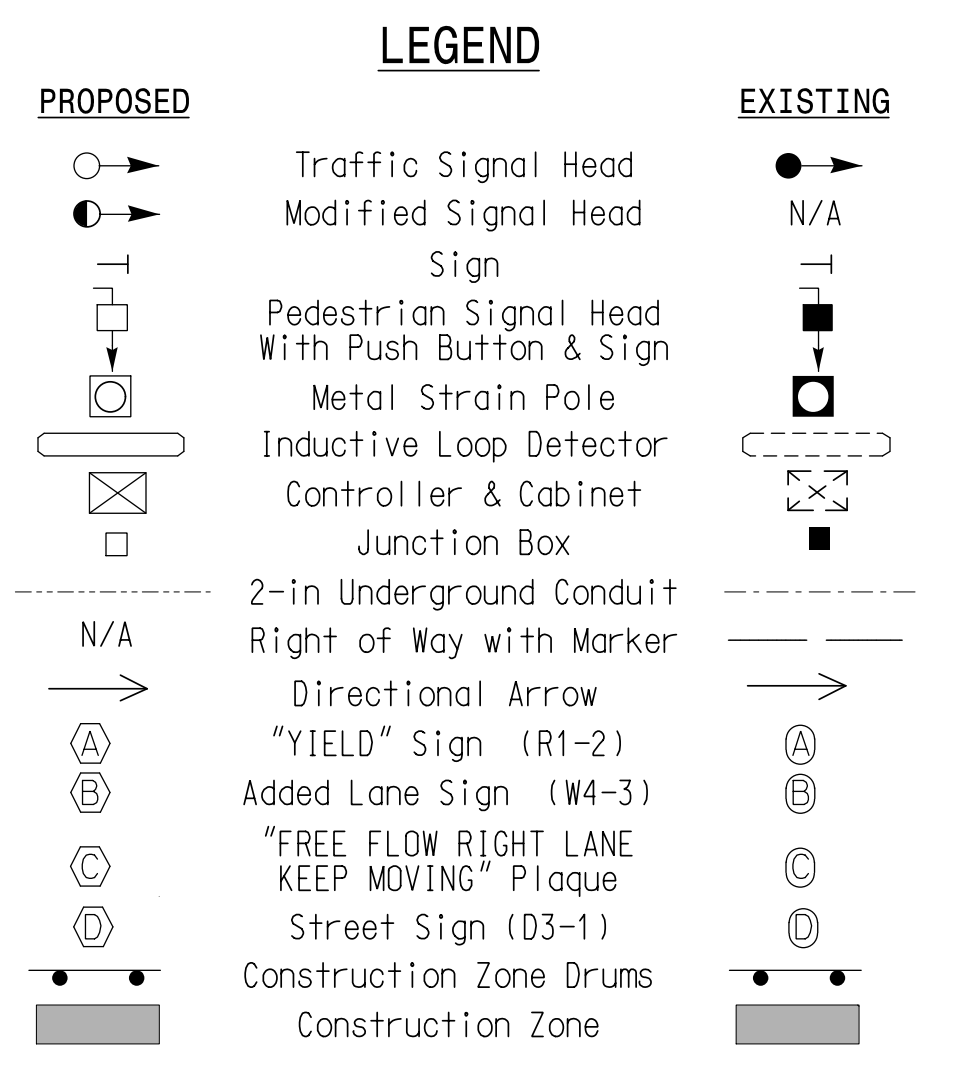
3 Phase Fully Actuated (Cary Signal System)

NOTES

- 1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012...
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. Pavement markings are existing.
6. Maximum times shown in timing chart are for free-run operation only.
7. Cary signal system data: Fiber channel #: 17.



TIMING CHART ASC/3-2070LN2 CONTROLLER. Table with columns: PHASE, 01, 02, 06, 08 and rows for MINIMUM GREEN, VEHICLE EXT., YELLOW CHANGE INT., RED CLEARANCE, etc.

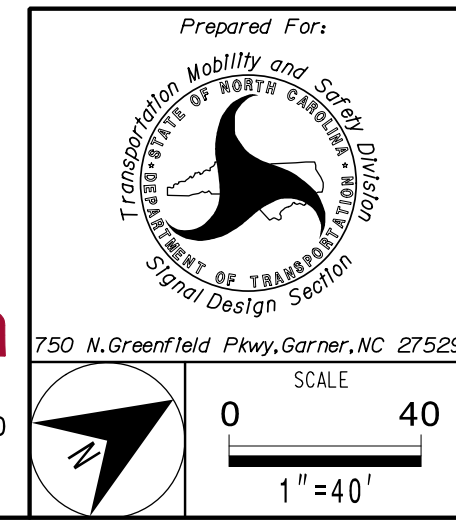


NC Dept of Transportation Division of Highways
Final Drawing Date: 10/10/2016
ITS & Signals Unit

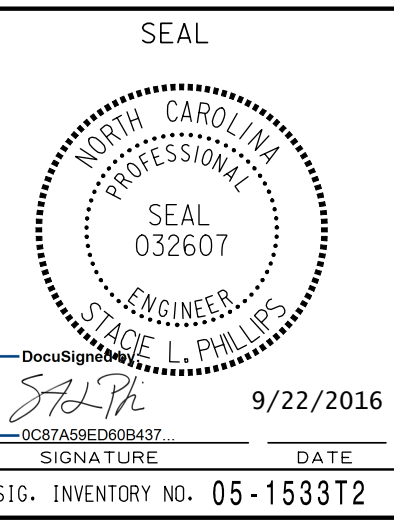
SIGNAL UPGRADE - TEMPORARY DESIGN 2 TM PLANS PHASE 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PLANS PREPARED IN THE OFFICE OF: Kimley-Horn
750 N. Greenfield Pkwy, Garner, NC 27529
NC License #F-0102
421 Fayetteville Street, Suite 600
Raleigh, NC 27601
(919) 677-2000



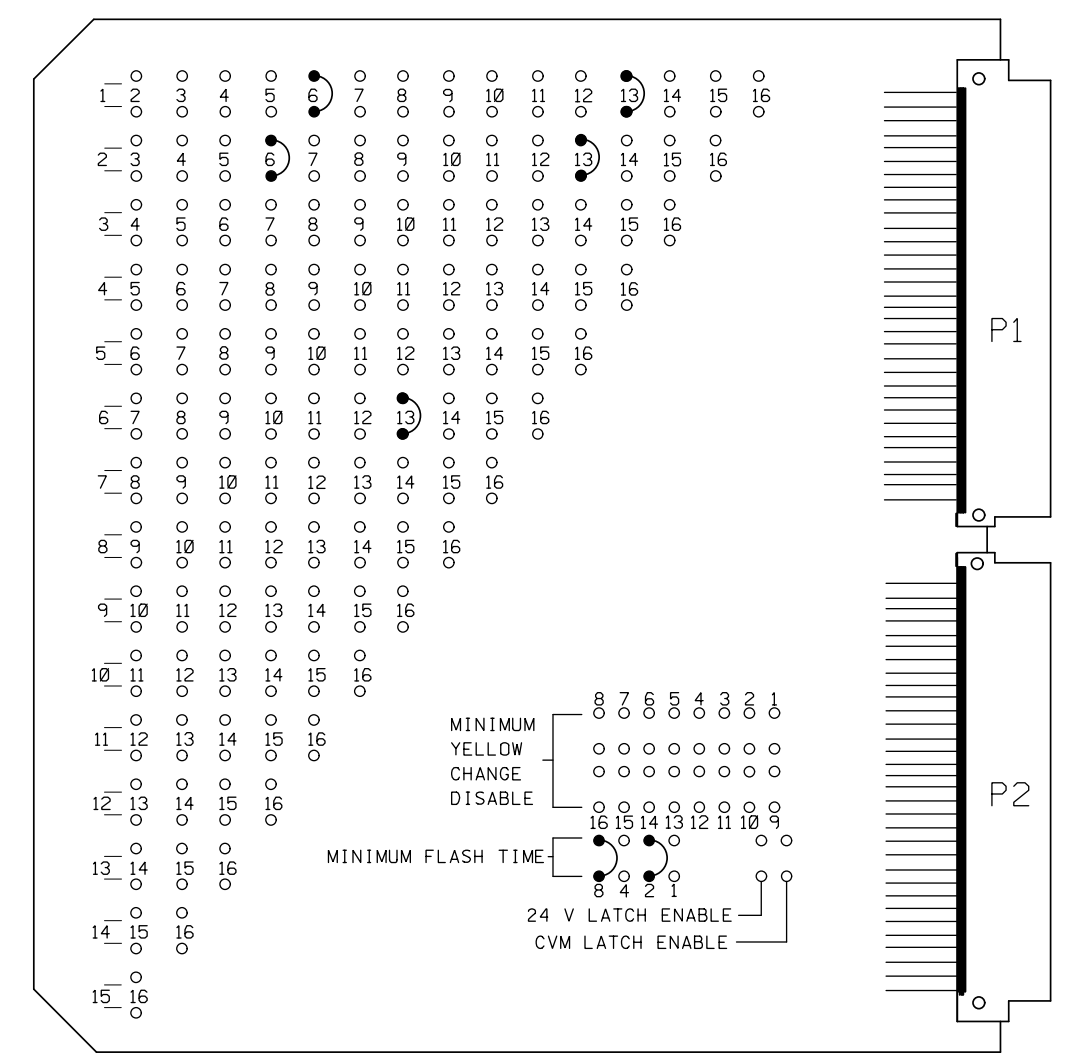
Project information table: SR 1002 (Aviation Parkway) at SR 3084 (Evans Road), Division 5, Wake County, Morrisville. Includes dates, names, and revision table.



9/22/2016 9:08:53 AM susan.pennington K:\RAL\_Roadway\07108004 - MCR\Imon Parkway\Phase 1\Plan\Signal\sig8.dgn



**EDI MODEL MMU2-16LEip  
MALFUNCTION MANAGEMENT UNIT  
PROGRAMMING DETAIL**  
*(program card and tables as shown)*



MMU PROGRAMMING CARD

**FIELD CHECK ENABLE  
DUAL IND ENABLE  
RED FAIL ENABLE**

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	DISABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	DISABLE
16	DISABLE

**UNIT OPTIONS**

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLIC	OFF
VM 3x/Day Latch	ON

**FLASHING YELLOW ARROW**

CONFIG MODE	B
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF
RED/YEL INPUT ENABLE	
CH 1	ON
CH 3	OFF
CH 5	OFF
CH 7	OFF
FLASH RATE FAULT	ON
FYA TRAP DETECT	ON

MMU PROGRAMMING NOTE  
ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

**NOTES**

- To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red outputs 3, 4, 5, 7, 9, 10, 11, 12, 14, 15 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
- Program controller to start up in phase 2 Green and 6 Green.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- Program phases 2 and 6 for volume density operation.
- The cabinet and controller are a part of the Cary Signal System.

**SIGNAL HEAD HOOK-UP CHART**

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11★	21,22	NU	NU	NU	61,62	NU	81,82	NU	NU	NU	NU	11★	NU	NU	NU
RED	*	2R				6R		8R								
YELLOW	*	2Y				6Y		8Y								
GREEN		2G				6G		8G								
RED ARROW													13R			
YELLOW ARROW													13Y			
FLASHING YELLOW ARROW													13G			
GREEN ARROW	1G															
Hand icon																
Person icon																

NU = Not Used  
\* Denotes install load resistor. See Load Resistor Installation Detail on sheet 2.  
★ See pictorial of head wiring detail this sheet.

**DETECTOR RACK SET-UP DETAIL**

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #	BIU	CH1	CH1	CH1	CH1	CH2	CH2	CH2	CH2	CH2	CH2	CH2	CH2	CH2	CH2	CH2	CH2
RACK #1	BIU	L3	L1	L7	L11	L4	L2	L8	L12	L5	L3	L9	L6	L10	L8	L4	L2
		NOT USED	∅ 1	∅ 6	NOT USED	∅ 2	∅ 6	NOT USED	∅ 8	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
RACK #2	BIU	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
		EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B L2A, L2B
NU	L3A, L3B
2A	L4A, L4B
NU	L5A, L5B
NU	L6A, L6B
6A	L7A, L7B
NU	L8A, L8B
NU	L9A, L9B
NU	L10A, L10B
NU	L11A, L11B
8A	L12A, L12B
NU	L13A, L13B
NU	L14A, L14B
NU	L15A, L15B
NU	L16A, L16B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1	∅ 1	DELAY	15
* 2	∅ 6	DELAY	3
3			
** 4	∅ 2		
5			
6			
* 7	∅ 6		
8			
9			
10			
11			
12	∅ 8		
13			
14			
15			
16			

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
NU	L17A, L17B
NU	L18A, L18B
NU	L19A, L19B
NU	L20A, L20B
NU	L21A, L21B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

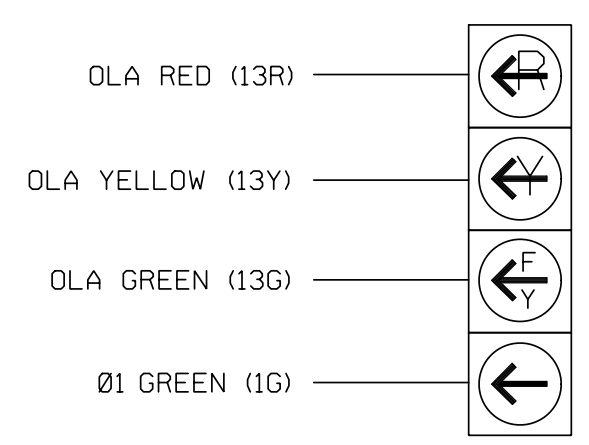
CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

**EQUIPMENT INFORMATION**

CONTROLLER.....2070LN2  
CABINET .....NC-8 [TS-2]  
SOFTWARE .....ECONOLITE ASC/3-2070  
CABINET MOUNT.....BASE  
LOADBAY POSITIONS.....16  
LOAD SWITCHES USED.....1,2,6,8,13  
PHASES USED.....1,2,6,8  
OLA.....\*  
OLB.....NOT USED  
OLC.....NOT USED  
OLD.....NOT USED

\* See overlap programming detail on sheet 2

**FYA SIGNAL WIRING DETAIL**  
*(wire signal heads as shown)*



11

**NOTE**

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

**LOAD SWITCH ASSIGNMENT DETAIL**  
*(program controller according to schedule in chart below)*

LOAD SWITCH NUMBER	FUNCTION
1	∅ 1
2	∅ 2
3	∅ 3
4	∅ 4
5	∅ 5
6	∅ 6
7	∅ 7
8	∅ 8
9	∅ 2 PED
10	∅ 4 PED
11	∅ 6 PED
12	∅ 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533T2  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED: N/A

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*Signature*  
ITS & Signals Unit

TEMPORARY DESIGN 2 - SHEET 1 OF 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared For:  
  
750 N. Greenfield Plaza, Garner, NC 27529

SR 1002 (Aviation Parkway) at SR 3084 (Evans Road)

REVISIONS	INIT.	DATE

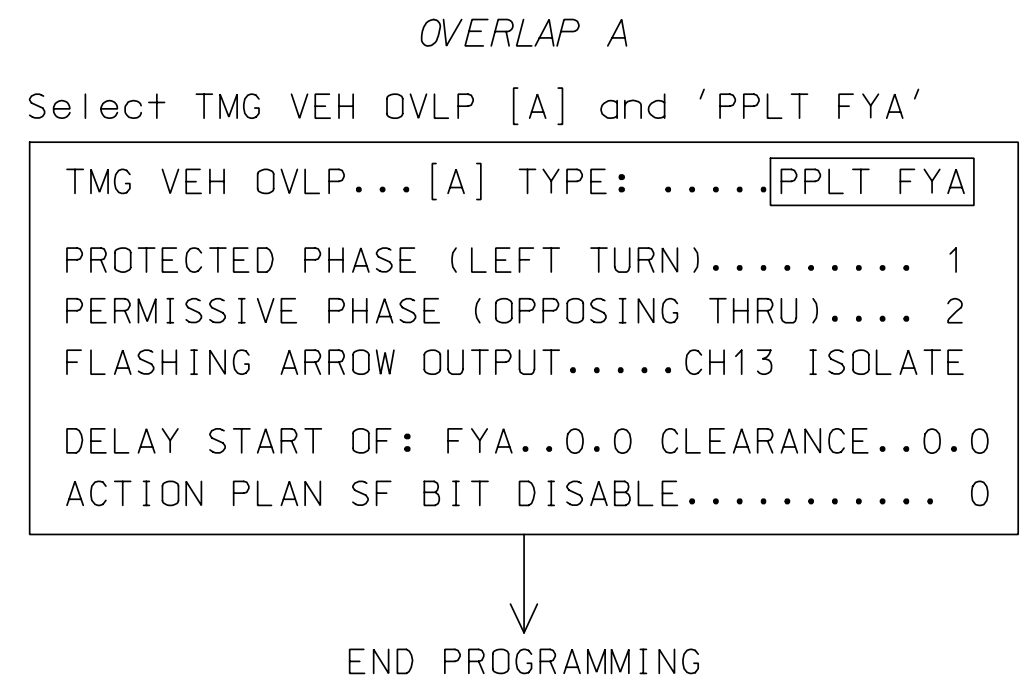
SEAL  
  
Stack L. Phillips  
Professional Engineer  
9/22/2016  
SIG. INVENTORY NO. 05-1533T2

PLANS PREPARED IN THE OFFICE OF:  
**KimleyHorn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000



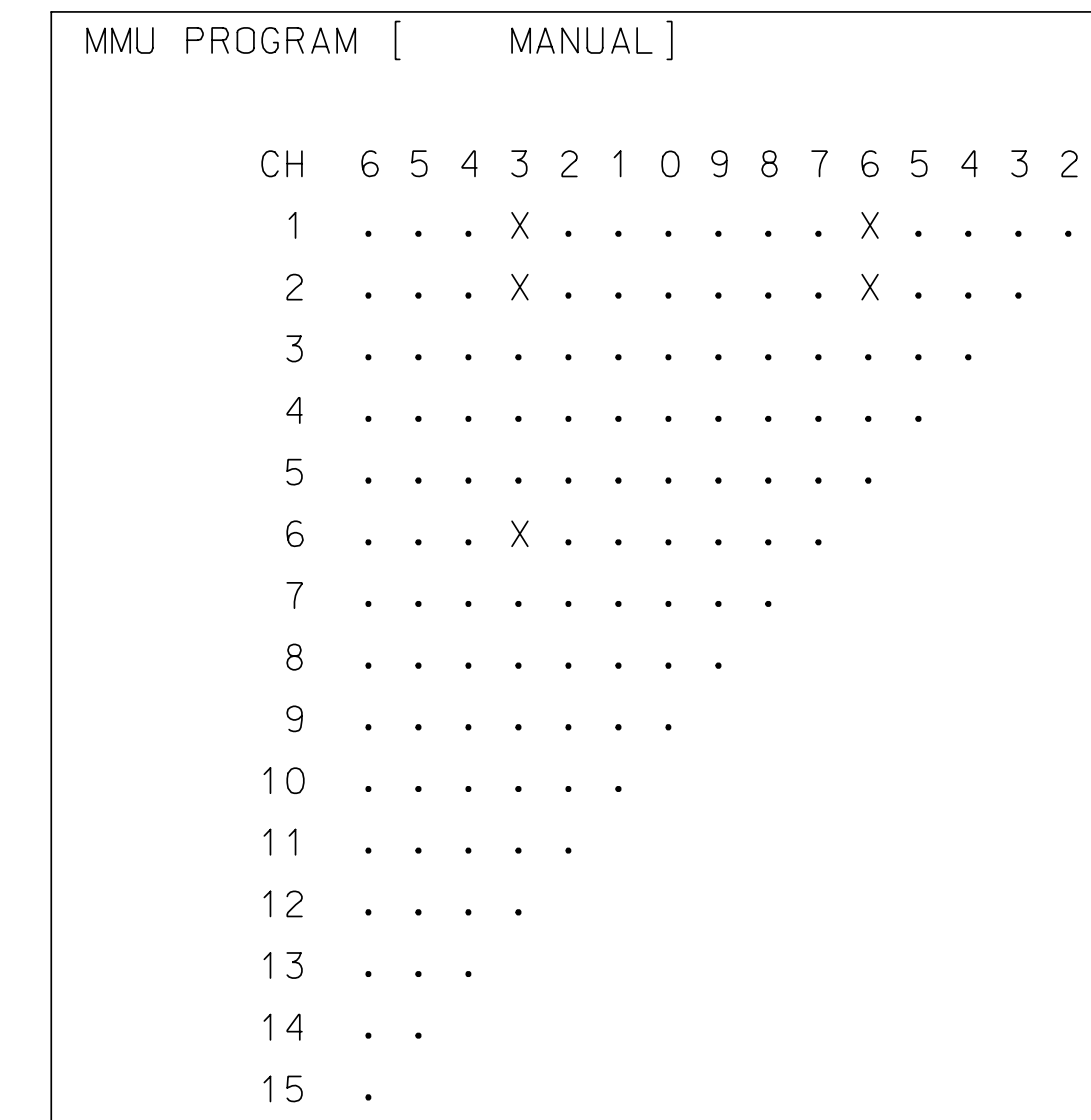
### ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL (program controller as shown)

- From Main Menu select **2. CONTROLLER**
- From CONTROLLER Submenu select **2. VEHICLE OVERLAPS**



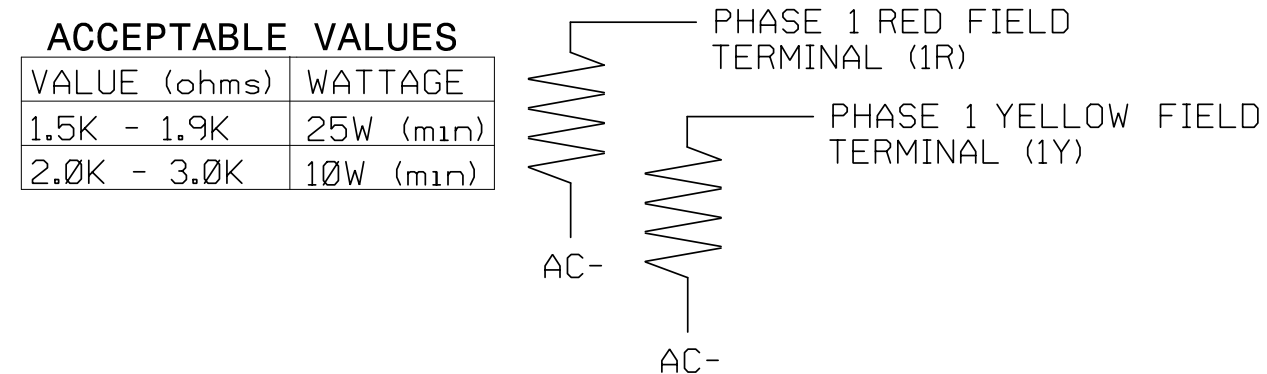
### ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING (program controller as shown)

- From Main Menu select **1. CONFIGURATION**
- From CONFIGURATION Submenu select **4. PORT 1 (SDLC)**
- From PORT 1 (SDLC) Submenu select **2. MMU PROGRAM**



END PROGRAMMING

### LOAD RESISTOR INSTALLATION DETAIL (install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533T2  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED: N/A

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*Stacie L. Phillips*  
SEAL  
1566486274488  
ITS & Signals Unit

9/22/2016 9:09:56 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\man Parkway\Phase 1\WP\anMS\Signal\sig4 - Signal - Des\gn\0.05-1533T2\_2016e2.dgn

PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000

TEMPORARY DESIGN 2 - SHEET 2 OF 2

 Prepared For: Wake County 750 N. Greenfield Plaza, Garner, NC 27529	<b>SR 1002 (Aviation Parkway) at SR 3084 (Evans Road)</b>		SEAL  SEAL 032607 STACIE L. PHILLIPS ENGINEER 9/22/2016
	Division 5 PLAN DATE: April 2016 PREPARED BY: SP PENNINGTON	Wake County REVIEWED BY: SL PHILLIPS REVIEWED BY:	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

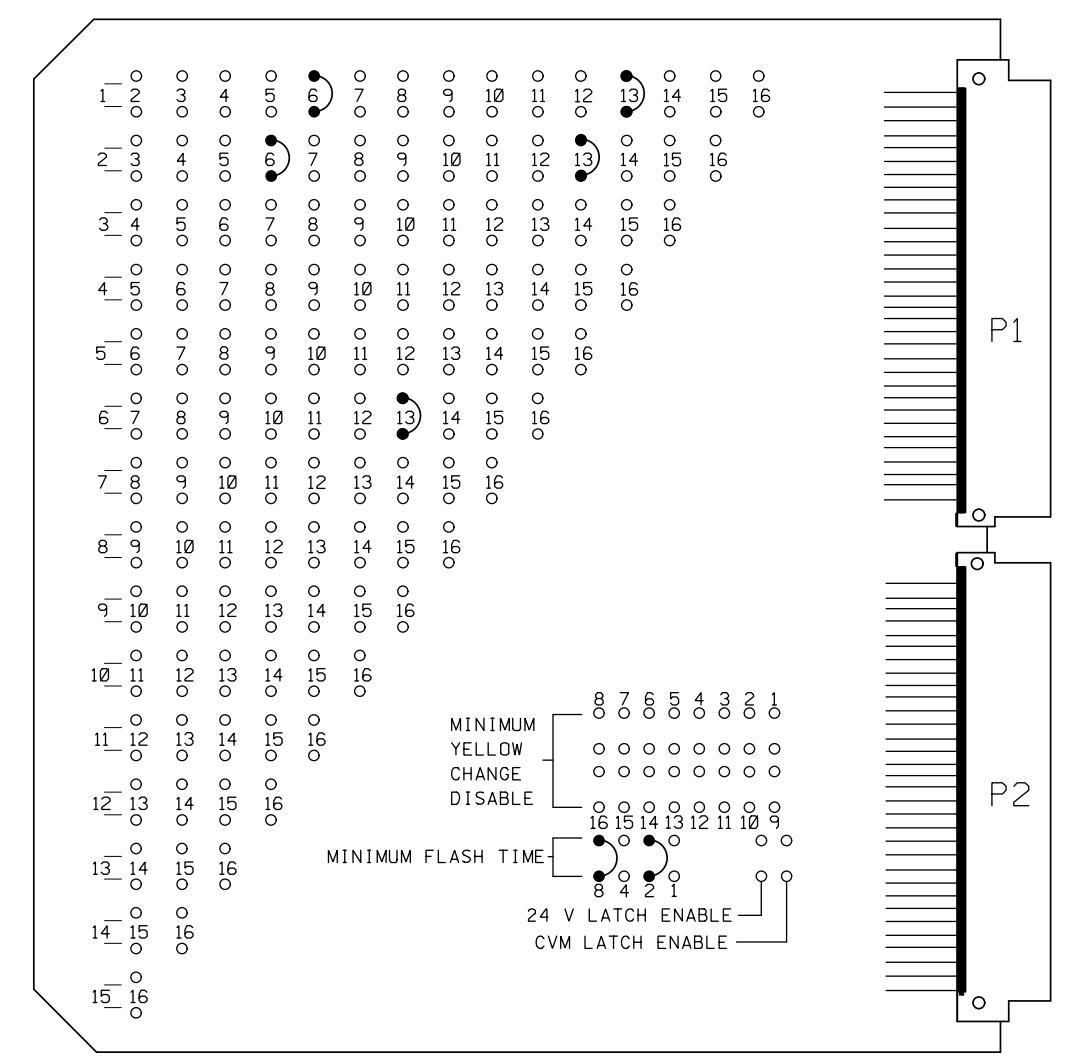
SIG. INVENTORY NO. 05-1533T2





EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

Table with 2 columns: CHANNEL NUMBER, ENABLE/DISABLE. Lists channels 1-16 and their status.

Table with 2 columns: OPTION, SETTING. Lists various unit options like RECURRENT PULSE, WALK DISABLE, etc.

Table with 2 columns: CONFIG MODE, ENABLE CHANNEL PAIR, FYA. Lists settings for flashing yellow arrow and channel pairs.

MMU PROGRAMMING NOTE ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

- 1. To prevent "flash-conflict" problems, wire all unused load switches to flash red.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3, 4, 5, 7, 9, 10, 11, 12, 14, 15 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out).
3. Program controller to start up in phase 2 Green and 6 Green.
4. Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit.
5. Enable simultaneous gap-out feature for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6 for volume density operation.
10. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

Signal head hook-up chart table with columns for PHASE, SIGNAL HEAD NO., RED, YELLOW, GREEN, RED ARROW, YELLOW ARROW, FLASHING YELLOW ARROW, GREEN ARROW and rows for channels 1-16.

NU = Not Used
\* Denotes install load resistor. See Load Resistor Installation Detail on sheet 2.
★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

Detector rack set-up detail table showing rack #1 and rack #2 with columns for CH1, CH2, SLOT, and various channel identifiers like L3, L1, L5, L11, etc.

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

Table with 2 columns: LOOP NO., LOOP PANEL TERMINALS. Lists loop numbers 1A through 16A and their corresponding terminal pairs.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

Table with 3 columns: CONTROLLER DETECTOR NO., FUNCTION, TIMING. Lists detector numbers 1-16 and their functions and timing.

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

Table with 2 columns: LOOP NO., LOOP PANEL TERMINALS. Lists loop numbers NU and their corresponding terminal pairs.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

Table with 3 columns: CONTROLLER DETECTOR NO., FUNCTION, TIMING. Lists detector numbers 17-32 and their functions and timing.

NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET .....NC-8 TS-2
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,6,8,13
PHASES USED.....1,2,6,8
OLA.....\*
OLB.....NOT USED
OLC.....NOT USED
OLD.....NOT USED

\* See overlap programming detail on sheet 2

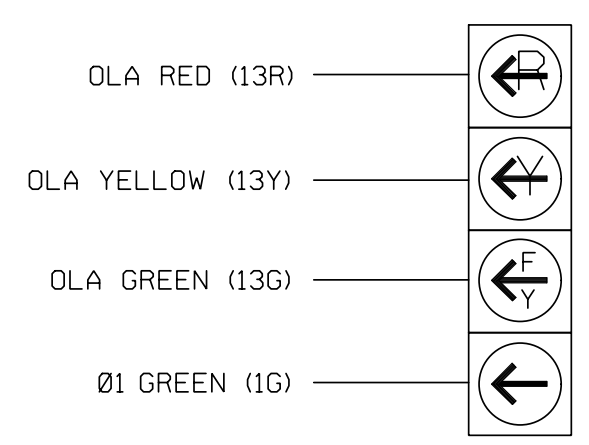
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

Table with 2 columns: LOAD SWITCH NUMBER, FUNCTION. Lists load switch numbers 1-16 and their functions.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



11

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533T3
DESIGNED: APRIL 2016
SEALED: 9/22/2016
REVISED: N/A

NC Dept of Transportation Division of Highways
Final Drawing Date: 10/10/2016
Signature: [Signature]
ITS & Signals Unit

TEMPORARY DESIGN 3 - SHEET 1 OF 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Logo for Kimley-Horn and Associates, Inc. with text: Prepared For: [Blank], PLAN PREPARED IN THE OFFICE OF: Kimley-Horn, 421 Fayetteville Street, Suite 600, Raleigh, NC 27601, (919) 677-2000

Table with 2 columns: REVISIONS, INIT., DATE. Lists revision details for the drawing.

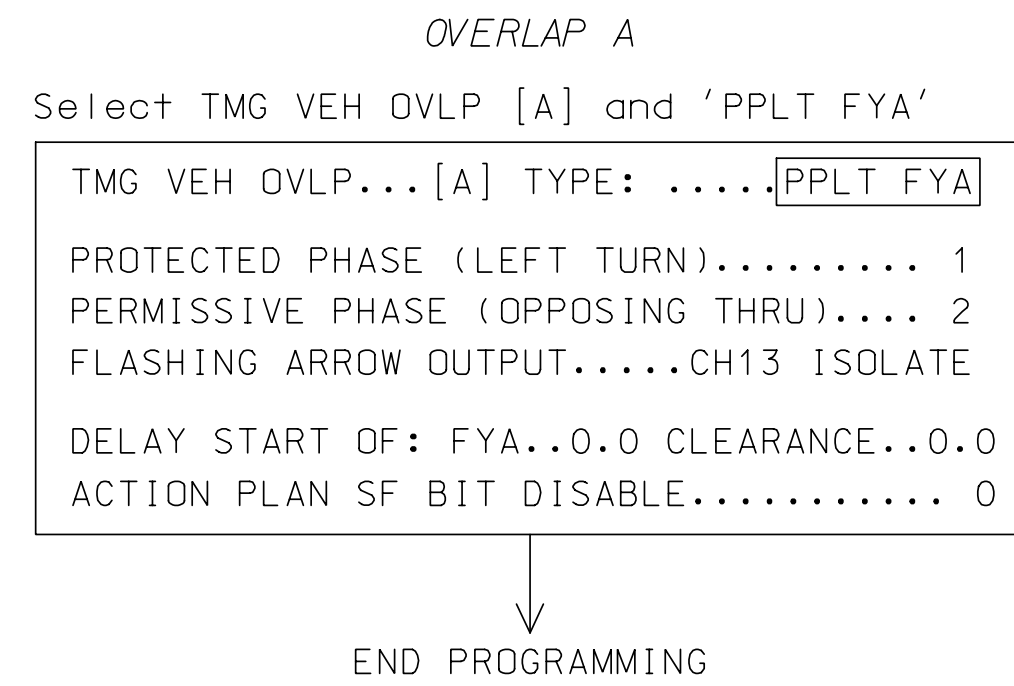
Professional Engineer Seal for Stacie L. Phillips, State of North Carolina, License No. 032607, dated 9/22/2016.

Vertical text on the left margin: K:\RAL\_Roadway\012108004 - MCF\mcom Parkway\Phase 1\MP\lanMS\Signal\sig54 - Signal - Des\gn\K2\_05-1533T3\_2016e1.dgn

## ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

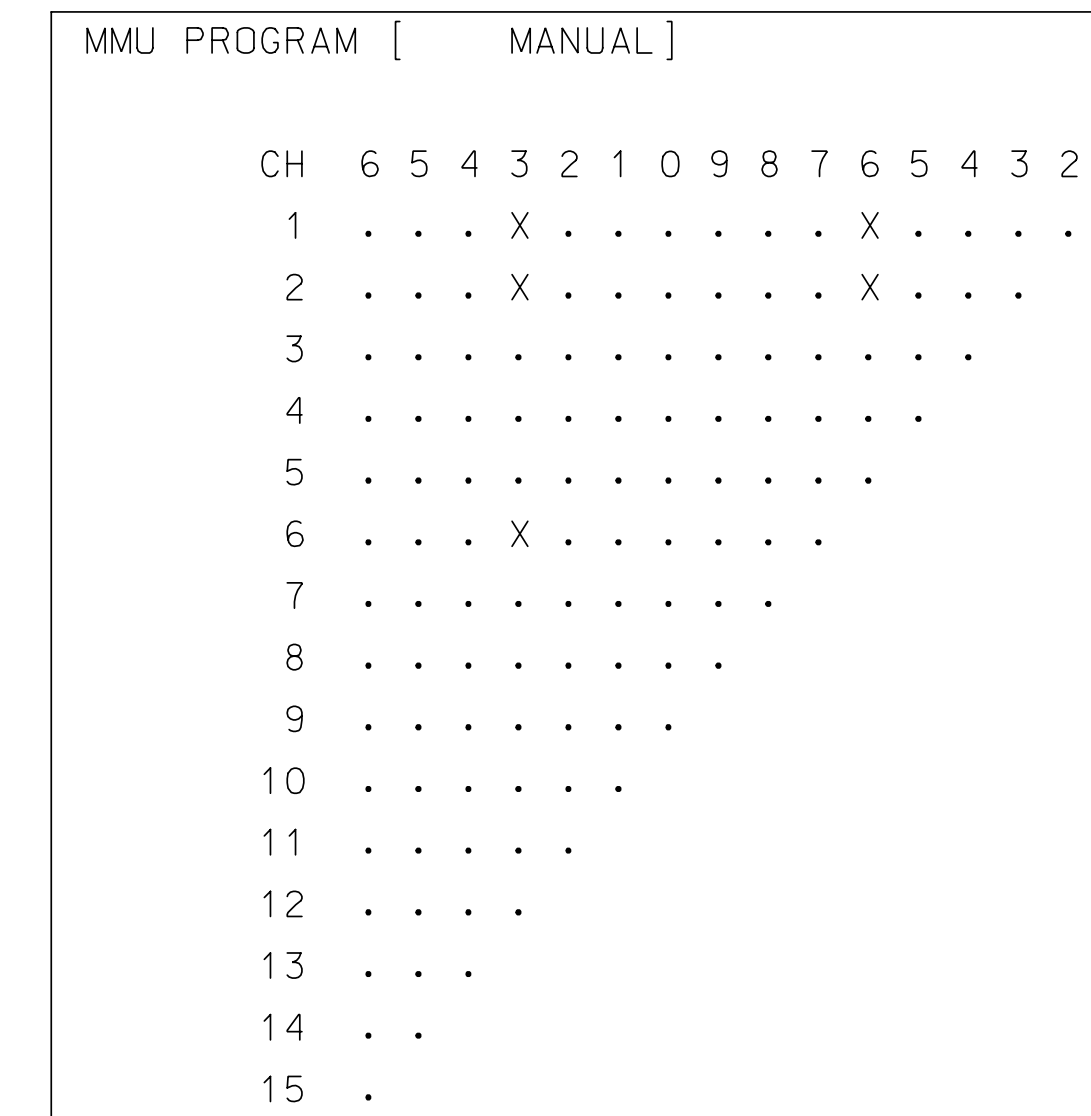
1. From Main Menu select 2. CONTROLLER
2. From CONTROLLER Submenu select 2. VEHICLE OVERLAPS



## ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING

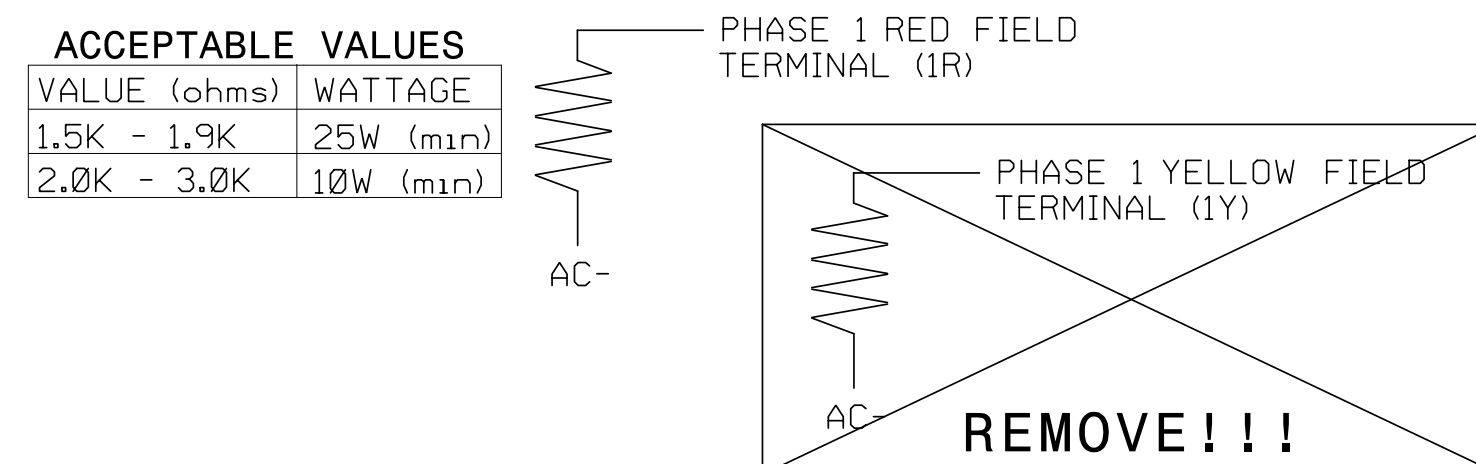
(program controller as shown)

1. From Main Menu select 1. CONFIGURATION
2. From CONFIGURATION Submenu select 4. PORT 1 (SDLC)
3. From PORT 1 (SDLC) Submenu select 2. MMU PROGRAM



## LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533T3  
 DESIGNED: APRIL 2016  
 SEALED: 9/22/2016  
 REVISED: N/A

NC Dept of Transportation  
 Division of Highways

Final Drawing Date: 10/10/2016

*Stacie L. Phillips*  
 18984866274404  
 ENGINEER  
 ITS & Signals Unit

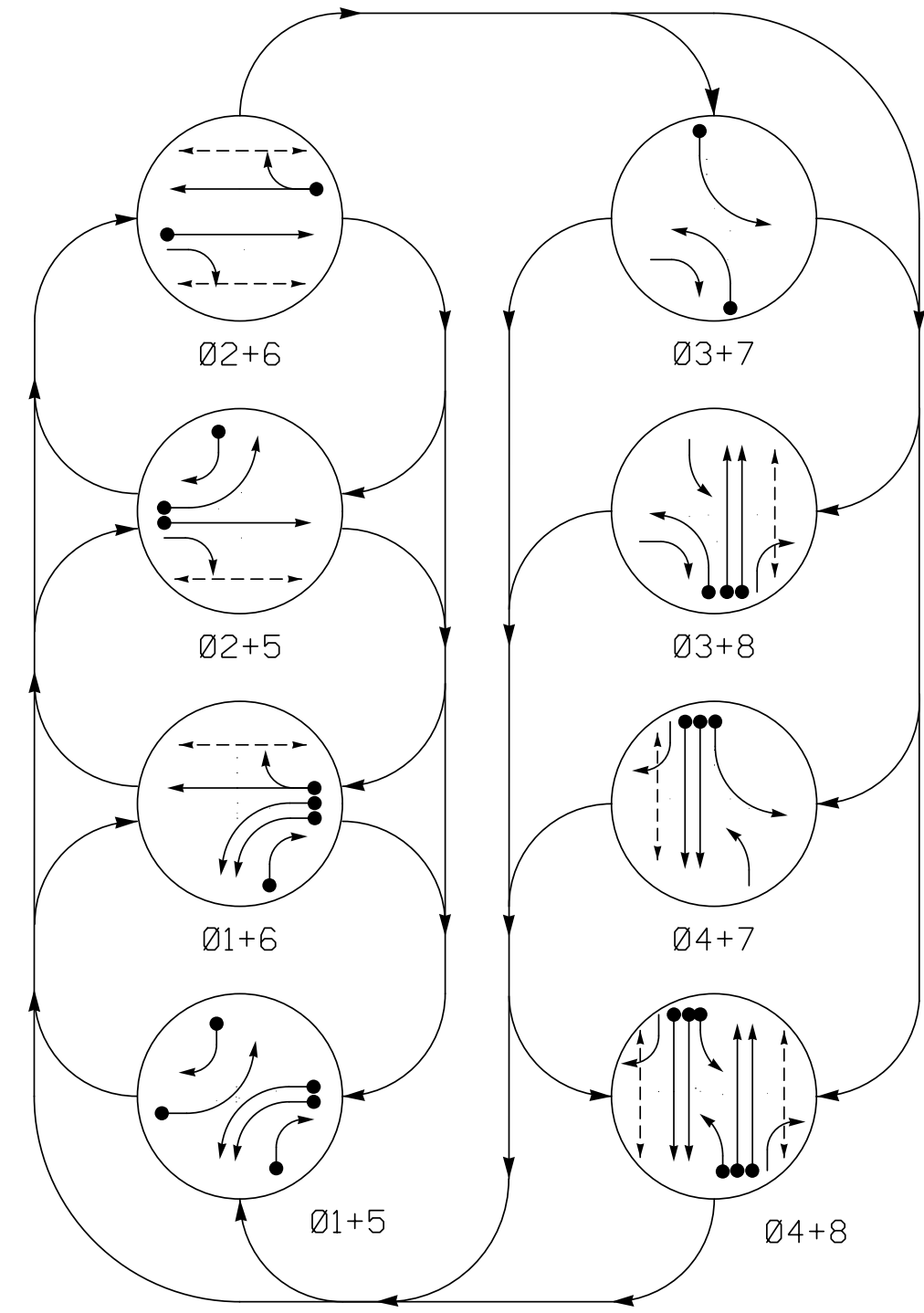
TEMPORARY DESIGN 3 - SHEET 2 OF 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	<b>SR 1002 (Aviation Parkway)</b> at <b>SR 3084 (Evans Road)</b>	SEAL 
Prepared For: 	Division 5      Wake County      Morrisville	PLAN DATE: April 2016      REVIEWED BY: SL PHILLIPS
NC License #F-0102 421 Fayetteville Street, Suite 600 Raleigh, NC 27601 (919) 677-2000	PREPARED BY: SP PENNINGTON      REVIEWED BY:	DocuSigned by: <i>SP Pennington</i> 0CB7A9E006437      9/22/2016
REVISIONS      INIT.      DATE		SIG. INVENTORY NO. 05-1533T3

9/22/2016 9:10:03 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\man\_Parkway\Phase 1\WP\anMS\Signal\sk4 - Signal - Des\gn\13\_05-1533T3\_2016e2.dgn



**PHASING DIAGRAM**



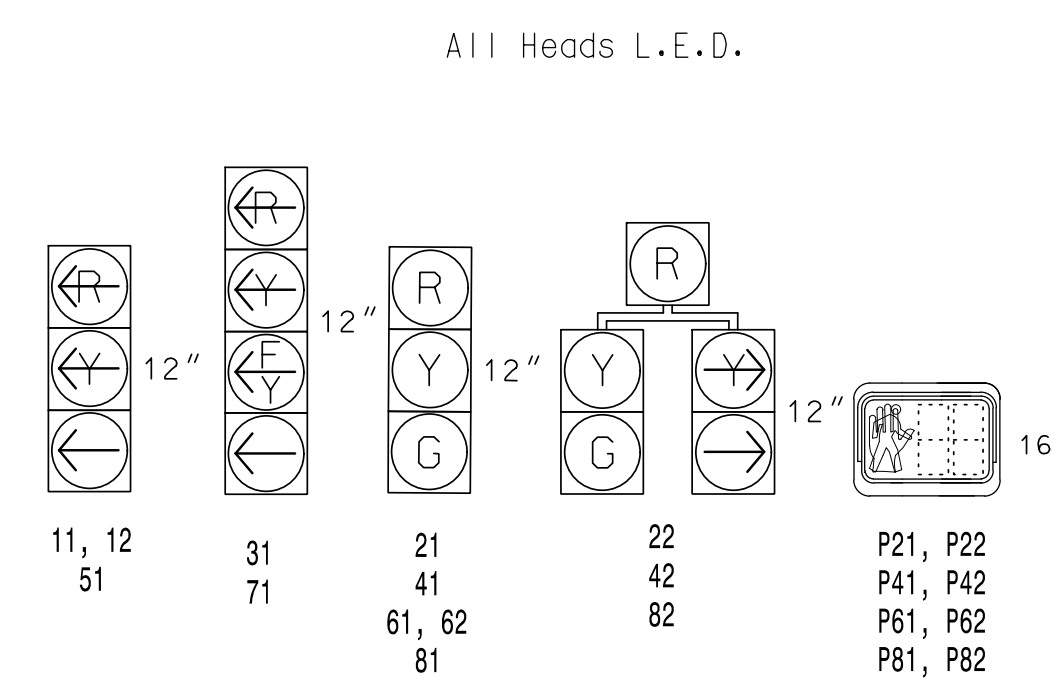
**PHASING DIAGRAM DETECTION LEGEND**

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

**TABLE OF OPERATION**

SIGNAL FACE	PHASE								FLASH
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	
11, 12	←	←	←	←	←	←	←	←	
21	R	R	G	G	R	R	R	Y	
22	R	R	G	G	R	R	R	Y	
31	←	←	←	←	←	←	←		
41	R	R	R	R	R	R	G	G	R
42	R	R	R	R	R	R	G	G	R
51	←	←	←	←	←	←	←		
61, 62	R	G	R	G	R	R	R	Y	
71	←	←	←	←	←	←	←		
81	R	R	R	R	R	G	R	G	R
82	R	R	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DRK	
P41, P42	DW	DW	DW	DW	DW	DW	W	DRK	
P61, P62	DW	W	DW	W	DW	DW	DW	DRK	
P81, P82	DW	DW	DW	DW	DW	W	DW	DRK	

**SIGNAL FACE I.D.**



**LOOP & DETECTOR INSTALLATION CHART**  
ASC/3-2070LN2 CONTROLLER w/ TS-2 CABINET

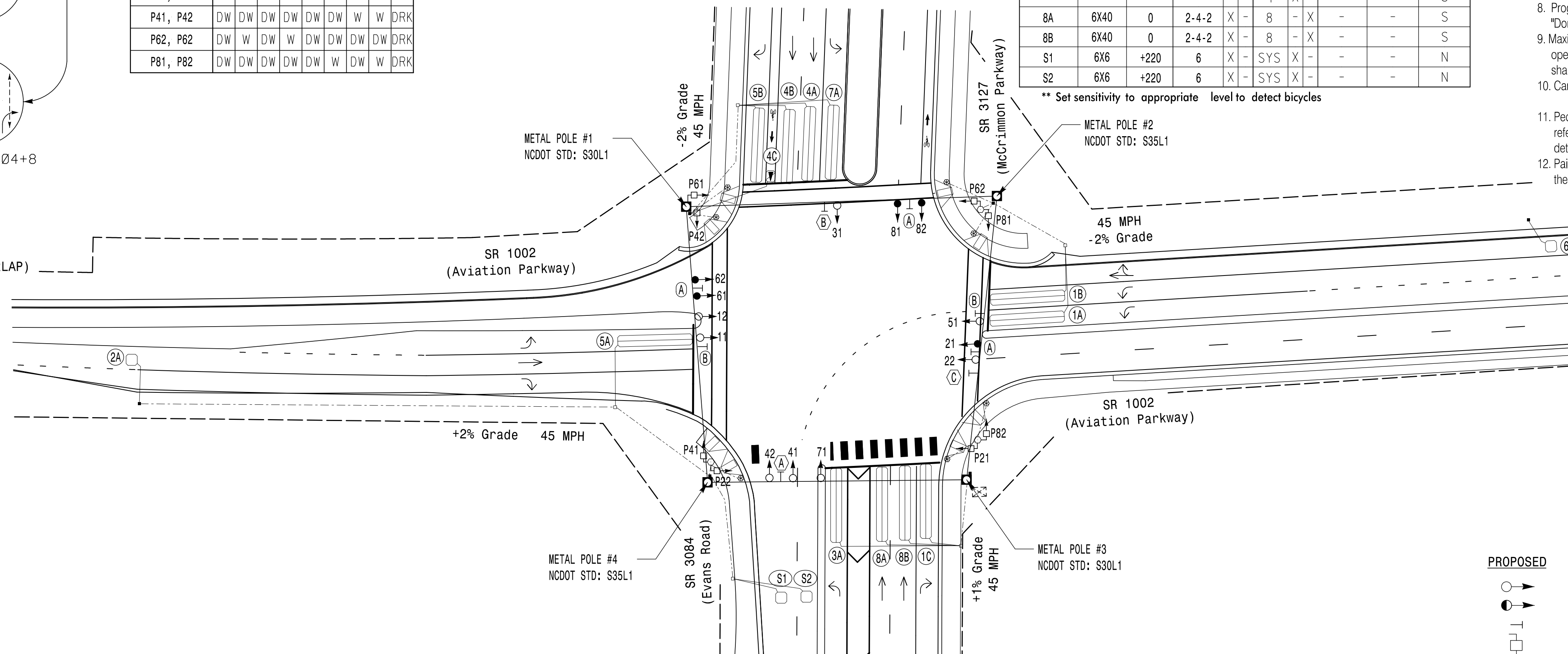
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW		EXISTING		TIMING		DET. TYPE
				EXISTING	NEW	EXISTING	NEW	FEATURE	TIME (sec)	
1A	6X40	0	2-4-2	X	-	1	-	-	-	S
1B	6X40	0	2-4-2	X	-	1	-	-	-	S
1C	6X40	0	2-4-2	X	-	1	-	DELAY	15	S
2A	6X6	300	6	X	-	2	-	-	-	N
3A	6X40	0	2-4-2	X	-	3	-	DELAY	15	S
4A	6X40	0	2-4-2	X	-	4	-	-	-	S
4B	6X40	0	2-4-2	X	-	4	-	-	-	S
**4C	5X6	0	2-4-2 DIAGONAL	X	-	4	-	-	-	S
5A	6X40	0	2-4-2	X	-	5	-	-	-	S
5B	6X40	0	2-4-2	X	-	5	-	DELAY	15	S
6A	6X6	300	6	X	-	6	-	-	-	N
7A	6X40	0	2-4-2	X	-	7	-	DELAY	15	S
8A	6X40	0	2-4-2	X	-	8	-	-	-	S
8B	6X40	0	2-4-2	X	-	8	-	-	-	S
S1	6X6	+220	6	X	-	SYS	X	-	-	N
S2	6X6	+220	6	X	-	SYS	X	-	-	N

\*\* Set sensitivity to appropriate level to detect bicycles

**8 Phase Fully Actuated (Cary Signal System)**

**NOTES**

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012, and all applicable sections of the latest version of the generic Project Special Provisions. The PSP can be accessed at the following website: <https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx>
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Reposition existing signal head 81 and 82.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
- Cary signal system data:  
Fiber channel #: 17.
- Pedestrian pedestals are conceptual and shown for reference only. See sheet P1-P3 for pushbuttons locations details.
- Paint new bicycle markings (as shown on page 9C.05 of the 2009 edition of the MUTCD) in the center of loop 4C.

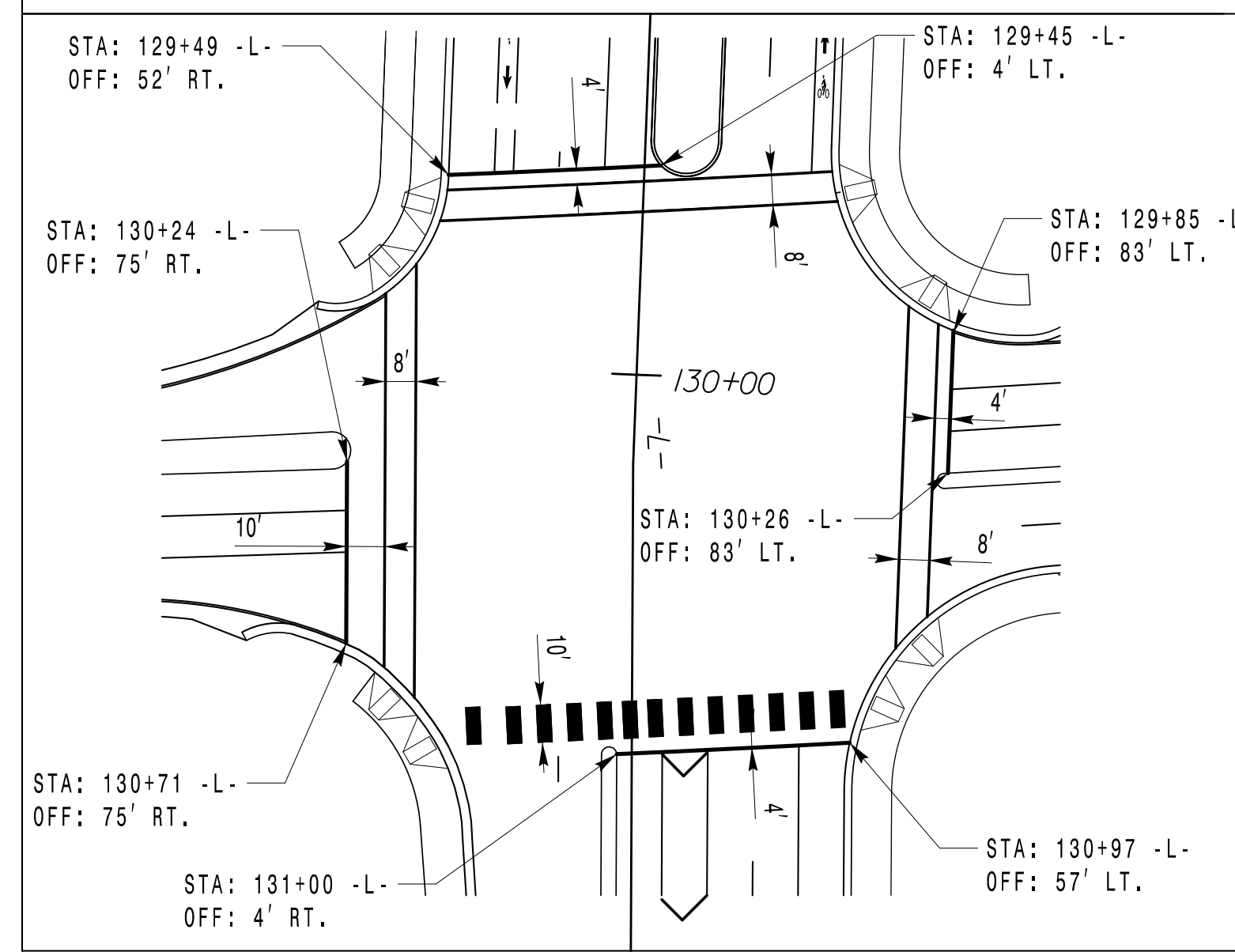


**TIMING CHART**  
ASC/3-2070LN2 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	12 SEC.	7 SEC.	12 SEC.	7 SEC.	12 SEC.
VEHICLE EXT. *	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.
DELAYED GREEN. *	- SEC.	5.0 SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.3 SEC.	3.0 SEC.	4.7 SEC.	3.0 SEC.	4.7 SEC.	3.0 SEC.	4.7 SEC.
RED CLEARANCE	3.9 SEC.	2.3 SEC.	3.4 SEC.	2.2 SEC.	3.8 SEC.	2.2 SEC.	3.6 SEC.	2.2 SEC.
MAX. I *	30 SEC.	90 SEC.	30 SEC.	20 SEC.	20 SEC.	90 SEC.	20 SEC.	20 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
LOCK DET.	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
WALK *	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.
PED. CLEAR	- SEC.	29 SEC.	- SEC.	27 SEC.	- SEC.	26 SEC.	- SEC.	22 SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
ACTUATION B4 ADD *	- VEH.	0 VEH.	- VEH.	- VEH.	- VEH.	0 VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	- SEC.	2.5 SEC.	- SEC.	- SEC.	- SEC.	2.5 SEC.	- SEC.	- SEC.
MAX. INITIAL *	- SEC.	34 SEC.	- SEC.	- SEC.	- SEC.	34 SEC.	- SEC.	- SEC.
TIME B4 REDUCTION *	- SEC.	15 SEC.	- SEC.	- SEC.	- SEC.	15 SEC.	- SEC.	- SEC.
TIME TO REDUCE *	- SEC.	45 SEC.	- SEC.	- SEC.	- SEC.	45 SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	- SEC.	- SEC.	- SEC.	3.0 SEC.	- SEC.	- SEC.
DUAL ENTRY	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
SIMULTANEOUS GAP	ON	ON	ON	ON	ON	ON	ON	ON

\* 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.

**STOPLINE LOCATION DIAGRAM**



NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*[Signature]*  
ITS & Signals Unit

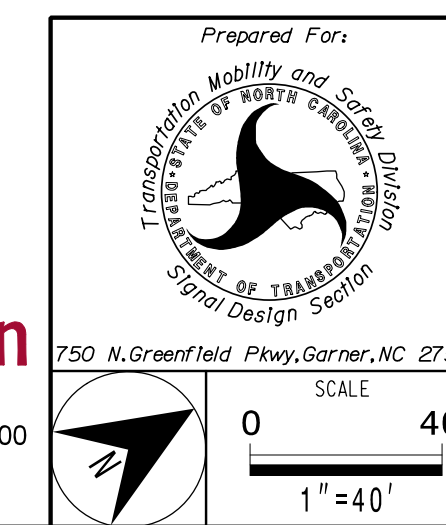
**LEGEND**

- |  |                 |
|--|-----------------|
| <b>PROPOSED</b>                              | <b>EXISTING</b> |
| ○ Traffic Signal Head                        | ● N/A           |
| ● Modified Signal Head                       | ○ N/A           |
| ○ Pedestrian Signal Head                     | ○ N/A           |
| □ With Push Button & Sign                    | □ N/A           |
| ○ Type I Pushbutton Post                     | ○ N/A           |
| ○ Type II Signal Pedestal                    | ○ N/A           |
| ○ Metal Strain Pole                          | ○ N/A           |
| □ Inductive Loop Detector                    | □ N/A           |
| □ Controller & Cabinet                       | □ N/A           |
| □ Junction Box                               | □ N/A           |
| --- 2-in Underground Conduit                 | --- N/A         |
| --- Right of Way with Marker                 | --- N/A         |
| N/A  | N/A             |
| → Directional Arrow                          | → N/A           |
| Ⓐ Street Sign (D3-1)                         | Ⓐ N/A           |
| Ⓑ "U-TURN YIELD TO RIGHT TURN" Sign (R10-16) | Ⓑ N/A           |
| Ⓒ Right Arrow "ONLY" Sign (R3-5R)            | Ⓒ N/A           |

**SIGNAL UPGRADE - FINAL DESIGN**

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

PLANS PREPARED IN THE OFFICE OF:  
**Kimley-Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000



Prepared For:  
Mobility and Safety Division  
STATE OF NORTH CAROLINA  
SIGNAL DESIGN SECTION

SR 1002 (Aviation Parkway)  
at  
SR 3127 (McCrimmon Parkway) /  
SR 3084 (Evans Road)

Division 5 Wake County Morrisville

PLAN DATE: APRIL 2016 REVIEWED BY: SL PHILLIPS

PREPARED BY: SP PENNINGTON REVIEWED BY:

REVISIONS	INIT.	DATE

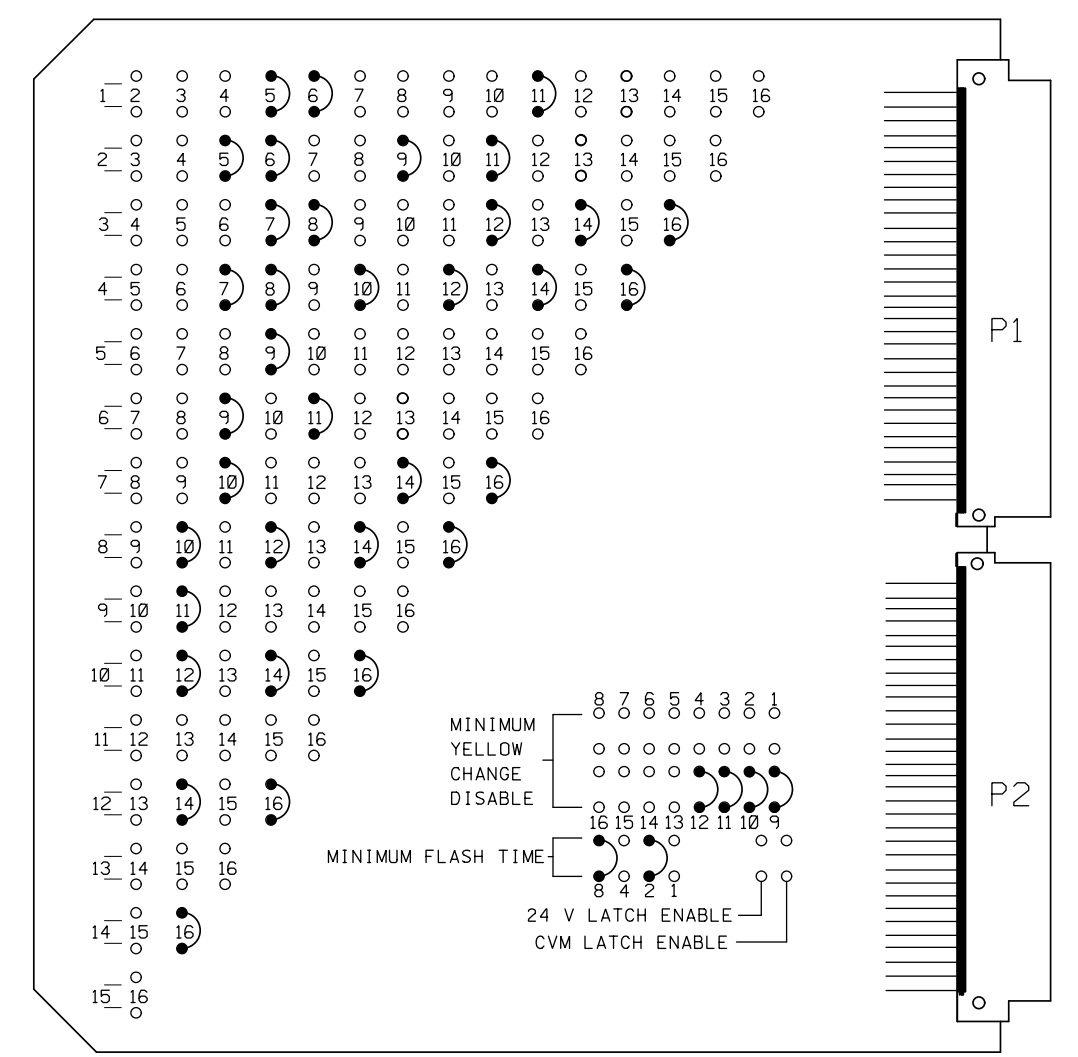
SEAL  
NORTH CAROLINA  
PROFESSIONAL  
ENGINEER  
STATE OF NORTH CAROLINA  
LICENSE NO. 032607

DocuSigned by:  
*[Signature]*  
DATE: 9/22/2016  
SIGNATURE DATE  
SIG. INVENTORY NO. 05-1533



EDI MODEL MMU2-16LEip MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown)



MMU PROGRAMMING CARD

Table with 2 columns: CHANNEL NUMBER (1-16) and ENABLE/DISABLE status.

UNIT OPTIONS table with columns: OPTION (RECURRENT PULSE, WALK DISABLE, LOG CVM FAULTS, etc.) and SETTING (ON/OFF).

FLASHING YELLOW ARROW table with columns: CONFIG MODE, ENABLE CHANNEL PAIR, CH 1-13, CH 3-14, CH 5-15, CH 7-16, RED/YEL INPUT ENABLE, CH 1, CH 3, CH 5, CH 7, FLASH RATE FAULT, FYA TRAP DETECT.

MMU PROGRAMMING NOTE ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

- 1. To prevent "flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 13 and 15 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (RED out). Make sure all flash transfer relays are in place.
3. Program phases 4 and 8 for dual entry.
4. Program controller to start up in phase 2 Walk and 6 Walk.
5. Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
6. Enable simultaneous gap-out feature for all phases.
7. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
8. Program detector call delay and extension timing on the controller, unless otherwise specified.
9. Set all detector card unit channels to "presence" mode.
10. Program phases 2 and 6 for volume density operation.
11. The cabinet and controller are a part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

Signal Head Hook-up Chart table with columns: PHASE (RED, YELLOW, GREEN), SIGNAL HEAD NO., and various channel/phase assignments (e.g., 1R, 1Y, 1G, 2R, 2Y, 2G, etc.).

NU = Not Used
\* Denotes install load resistor. See Load Resistor Installation Detail on sheet 3.
★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

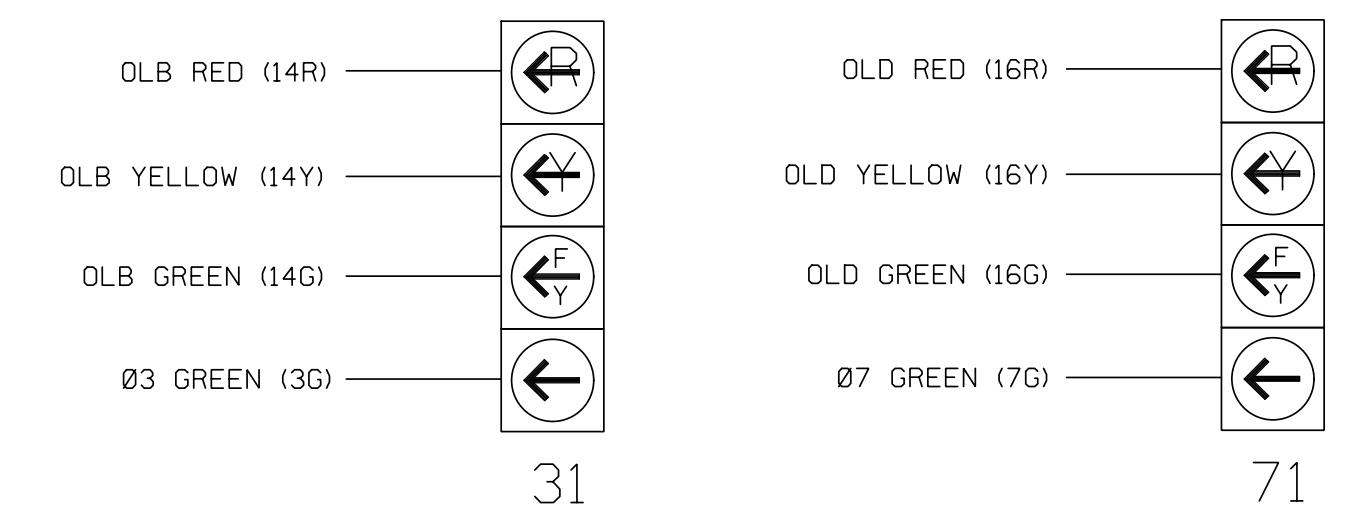
Detector Rack Set-up Detail table showing Rack #1 and Rack #2 configurations with columns for CH1-CH8, SLOTS, and detector types (BIU).

EQUIPMENT INFORMATION

CONTROLLER.....2070LN2
CABINET .....NC-8 [TS-2]
SOFTWARE .....ECONOLITE ASC/3-2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,3,4,5,6,7,8,9,10,11,12,14,16
PHASES USED.....1,2,2PED,3,4,4PED,5,6,6PED,7,8,8PED
OLA.....NOT USED
OLB.....\*
OLC.....NOT USED
OLD.....\*
\* See overlap programming detail on sheet 2

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

Load Switch Assignment Detail table with columns: LOAD SWITCH NUMBER (1-16) and FUNCTION (Ø 1, Ø 2, Ø 3, etc.).

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

Wire Loops to Terminals table with columns: LOOP NO., LOOP PANEL TERMINALS (e.g., 1A, L1A, L1B).

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

Program Controller Detectors table with columns: CONTROLLER DETECTOR NO., FUNCTION, FEATURE, TIME (SEC).

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

Wire Loops to Terminals table with columns: LOOP NO., LOOP PANEL TERMINALS (e.g., S1, L17A, L17B).

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

Program Controller Detectors table with columns: CONTROLLER DETECTOR NO., FUNCTION, FEATURE, TIME (SEC).

\*\* Detector Type - N

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533
DESIGNED: APRIL 2016
SEALED: 9/22/2016
REVISED: N/A

NC Dept of Transportation Division of Highways
Final Drawing Date: 10/10/2016
ITS & Signals Unit

FINAL DESIGN - SHEET 1 OF 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical and Programming Details For: SR 1002 (Aviation Parkway) at SR 3127 (McCrimmon Parkway)/ SR 3084 (Evans Road)

Table with columns: REVISIONS, INIT., DATE. Includes plan date (April 2016) and reviewed by (SL PHILLIPS).

Professional Engineer Seal for ACIE L. PHILLIPS, State of North Carolina, License No. 032607. Date: 9/22/2016.

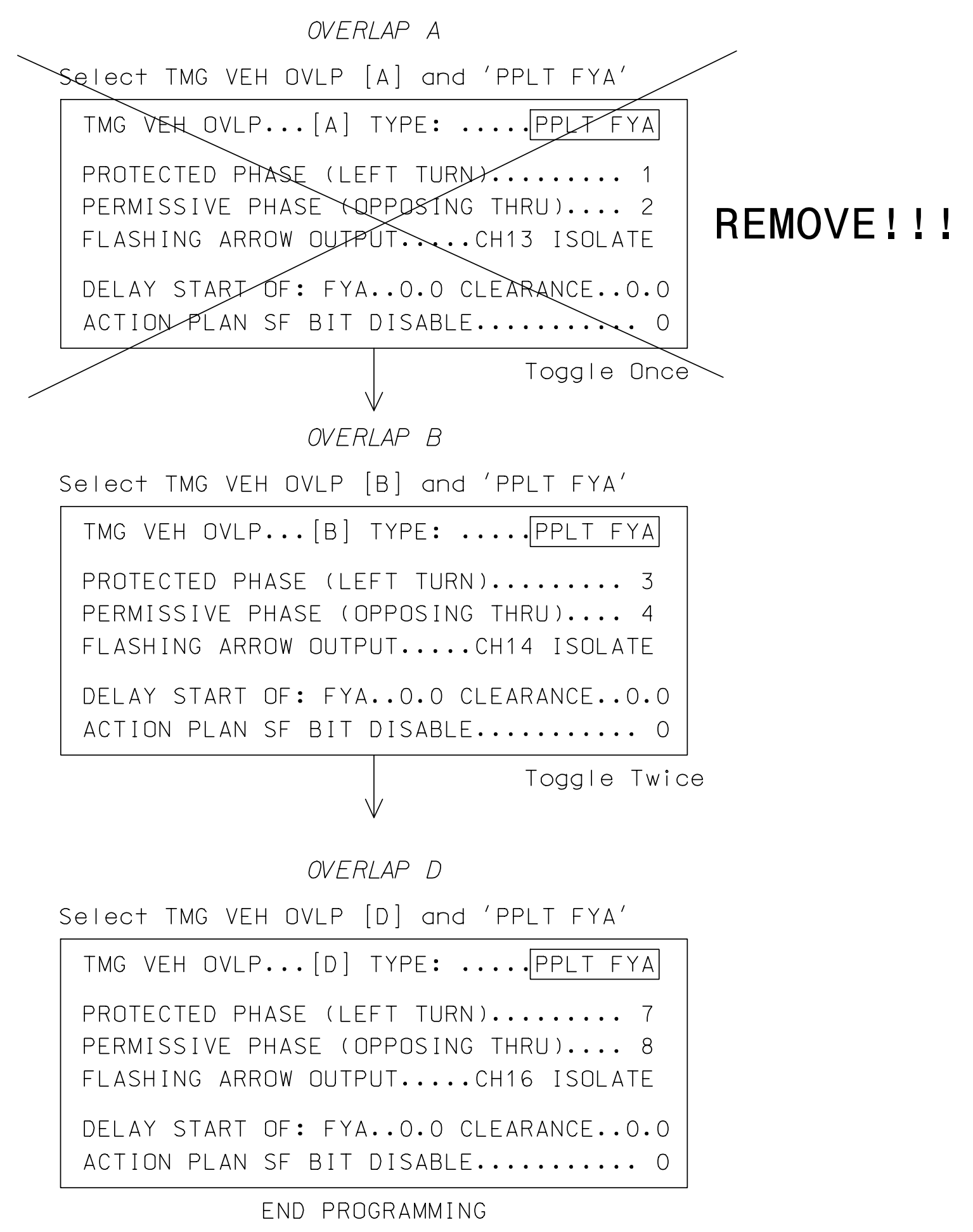
PLANS PREPARED IN THE OFFICE OF: KimleyHorn
NC License #F-0102
421 Fayetteville Street, Suite 600
Raleigh, NC 27601
(919) 677-2000

9/22/2016 9:10:07 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\man ParkWay\Phase 1\WP\ans\signal\sig4 - Signal Des\gn\05-05-1533\_2016.rvt.dgn



### ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL (program controller as shown)

- From Main Menu select 2. CONTROLLER
- From CONTROLLER Submenu select 2. VEHICLE OVERLAPS



### ECONOLITE ASC/3-2070 SPECIAL MMU PROGRAMMING (program controller as shown)

- From Main Menu select 1. CONFIGURATION
- From CONFIGURATION Submenu select 4. PORT 1 (SDLC)
- From PORT 1 (SDLC) Submenu select 2. MMU PROGRAM

#### CAUTION!

Set intersection to Flash before attempting to enter or change any MMU programming data.

This programming and that of the MMU programming card must match exactly. If they do not, the intersection will be placed into Flash.

MMU PROGRAM [	MANUAL ]
CH	6 5 4 3 2 1 0 9 8 7 6 5 4 3 2
1	. . . . . X . . . . X X . . .
2	. . . . . X . X . . X X . . .
3	X . X . X . . . X X . . .
4	X . X . X . X . X X . . .
5	. . . . . X . . . . .
6	. . . . . X . X . . .
7	X . X . . . X . . . .
8	X . X . X . X . . . .
9	. . . . . X . . . . .
10	X . X . X . . . . . .
11	. . . . .
12	X . X . . . . . . . .
13	. . . . .
14	X . . . . . . . . .
15	. . . . .

END PROGRAMMING

NC Dept of Transportation  
Division of Highways

Final Drawing Date: 10/10/2016

*Robert J. Duh*  
1008488274404  
ITS & Signals Unit

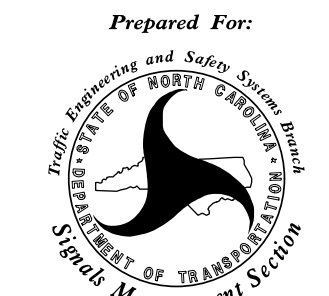
THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1533  
DESIGNED: APRIL 2016  
SEALED: 9/22/2016  
REVISED: N/A

FINAL DESIGN - SHEET 2 OF 3

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000


ELECTRICAL AND PROGRAMMING  
DETAILS FOR:

Prepared For:  


750 N. Greenfield Place, Garner, NC 27529

SR 1002 (Aviation Parkway) at SR 3127 (McCrimmon Parkway) / SR 3084 (Evans Road)	
Division 5	Wake County Morrisville
PLAN DATE: April 2016	REVIEWED BY: SL PHILLIPS
PREPARED BY: SP PENNINGTON	REVIEWED BY:
REVISIONS	INIT. DATE

SEAL



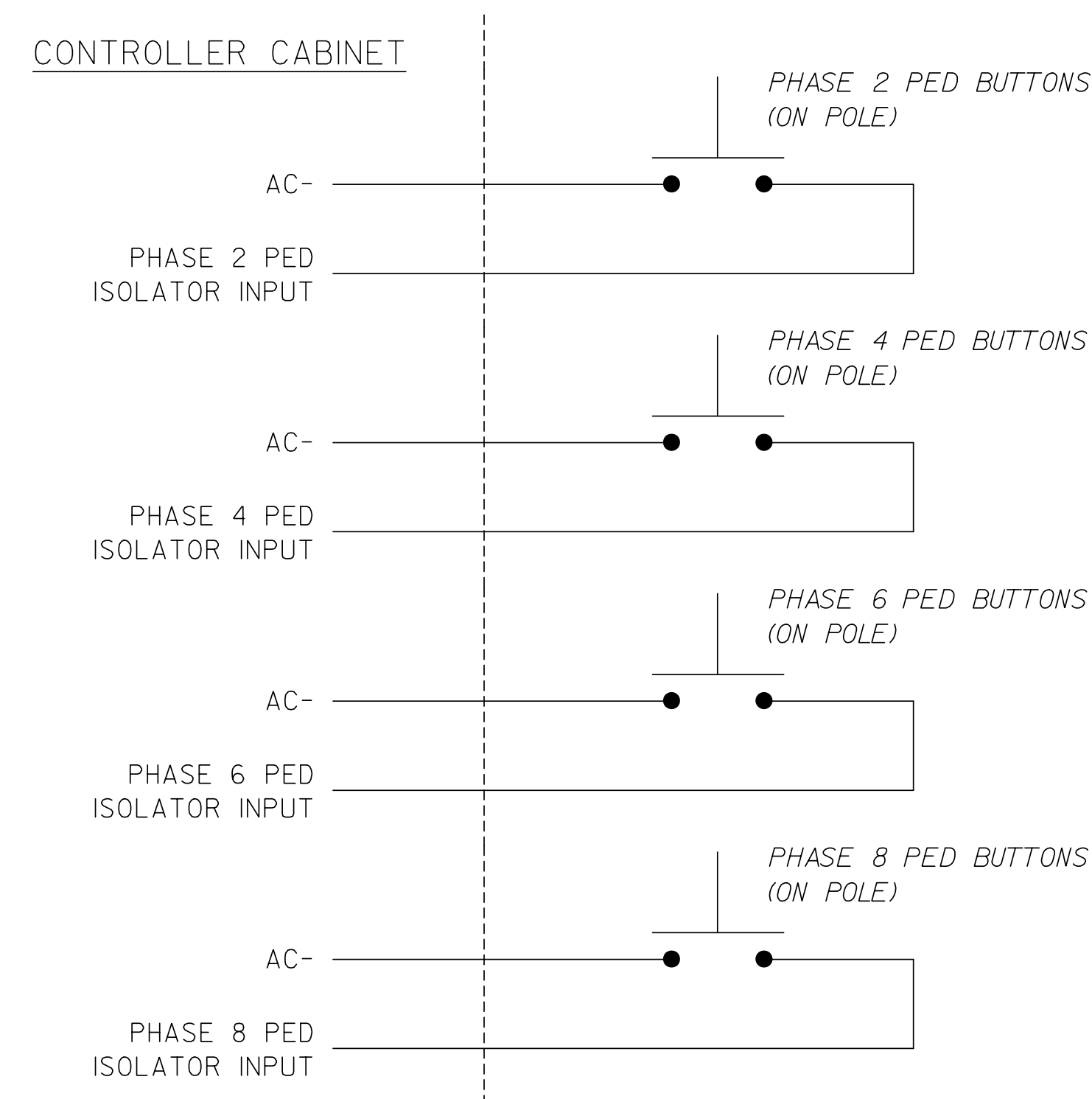
DocuSigned By:  
*Stacie L. Phillips*  
0027A55E9D08437  
9/22/2016  
DATE

SIG. INVENTORY NO. 05-1533

9/22/2016 9:10:08 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\Immon Parkway\Phase 1\WP\ans\Signal\sig4 - Signal\_Design\16\_05-1533\_2016e2.dgn

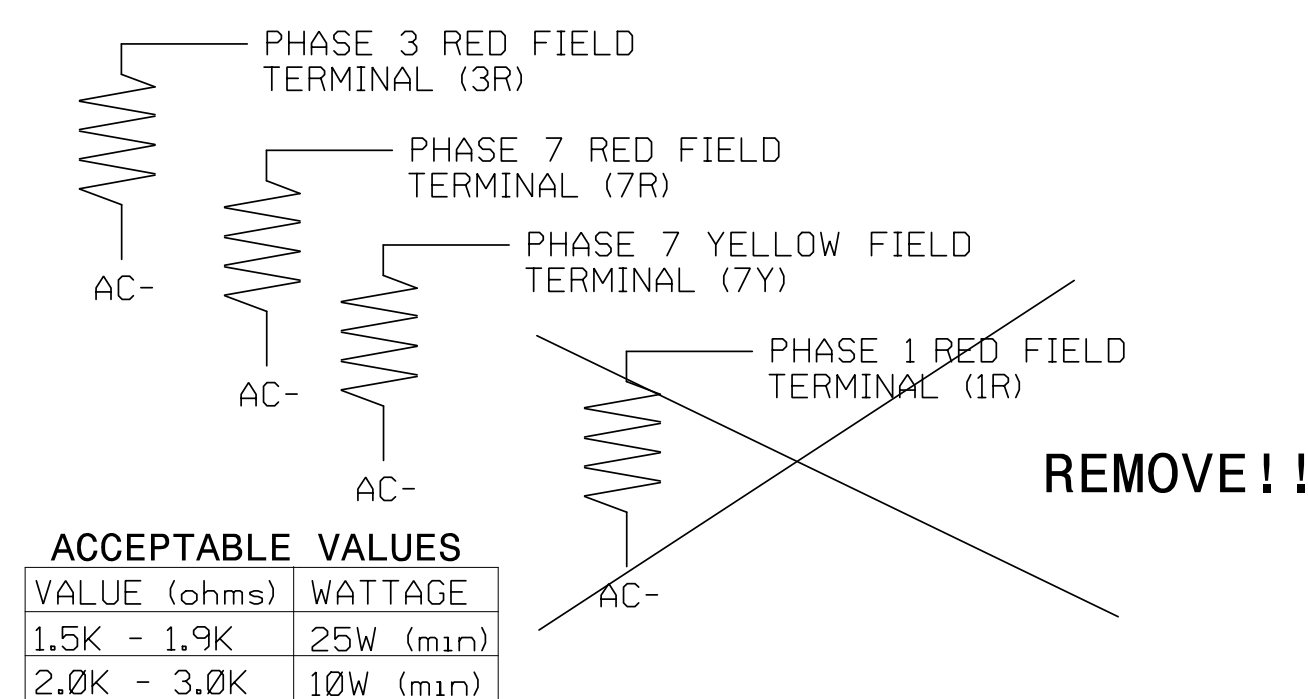
### PEDESTRIAN PUSH BUTTON WIRING DETAIL

(wire push buttons as shown)



### LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



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

### COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1533  
 DESIGNED: APRIL 2016  
 SEALED: 9/22/2016  
 REVISED: N/A

NC Dept of Transportation  
 Division of Highways  
 Final Drawing Date: 10/10/2016  
  
 STACIE L. PHILLIPS  
 ITS & Signals Unit

FINAL DESIGN - SHEET 3 OF 3

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
 NC License #F-0102  
 421 Fayetteville Street, Suite 600  
 Raleigh, NC 27601  
 (919) 677-2000

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared For:  
  
 750 N. Greenfield Plaza, Garner, NC 27529

SR 1002 (Aviation Parkway) at SR 3127 (McCrimmon Parkway)/ SR 3084 (Evans Road)	
Division 5	Wake County
PLAN DATE: April 2016	REVIEWED BY: SL PHILLIPS
PREPARED BY: SP PENNINGTON	REVIEWED BY:
REVISIONS	INIT. DATE

SEAL

DocuSigned by:  
  
 0C87A58ED06B437  
 DATE: 9/22/2016

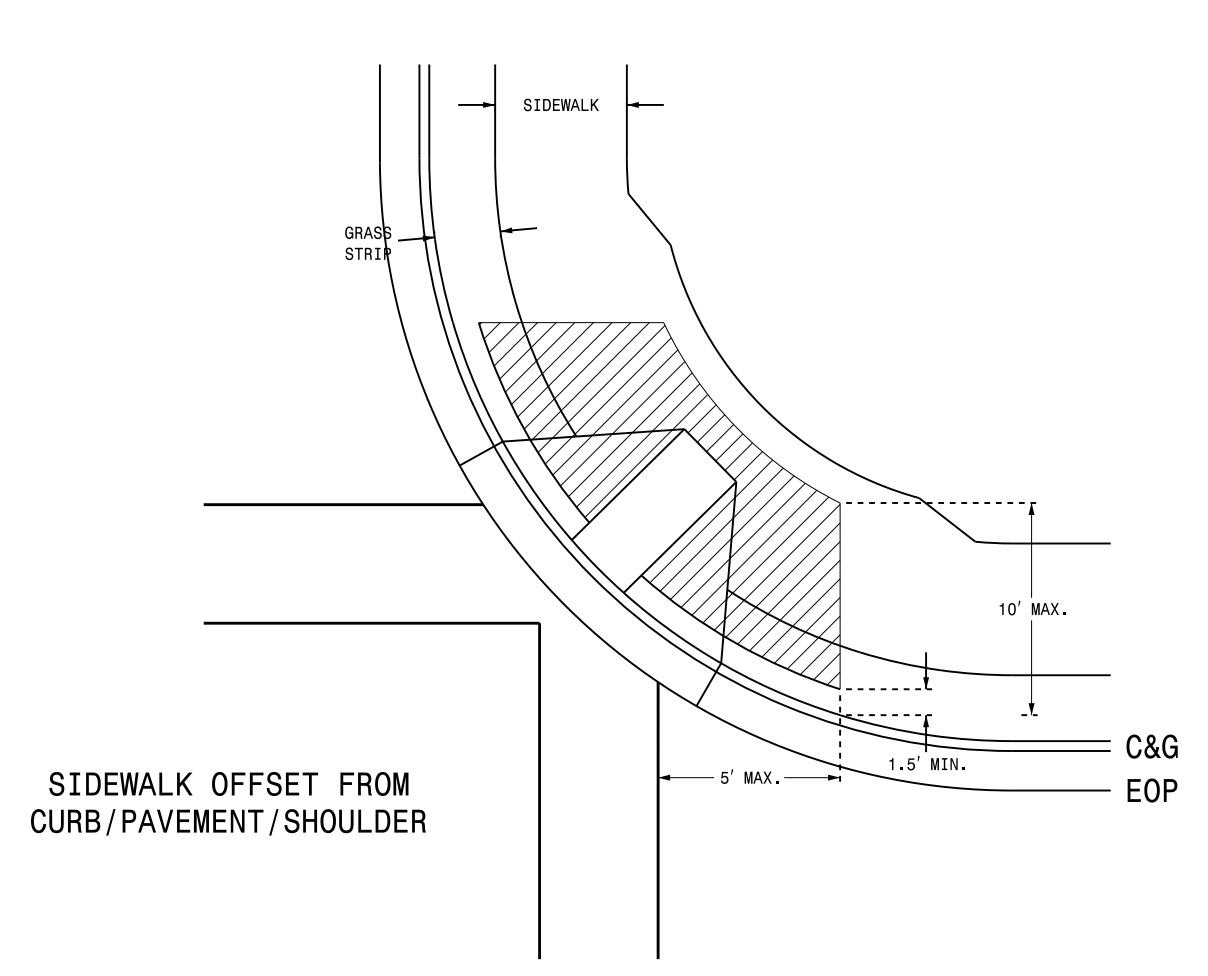
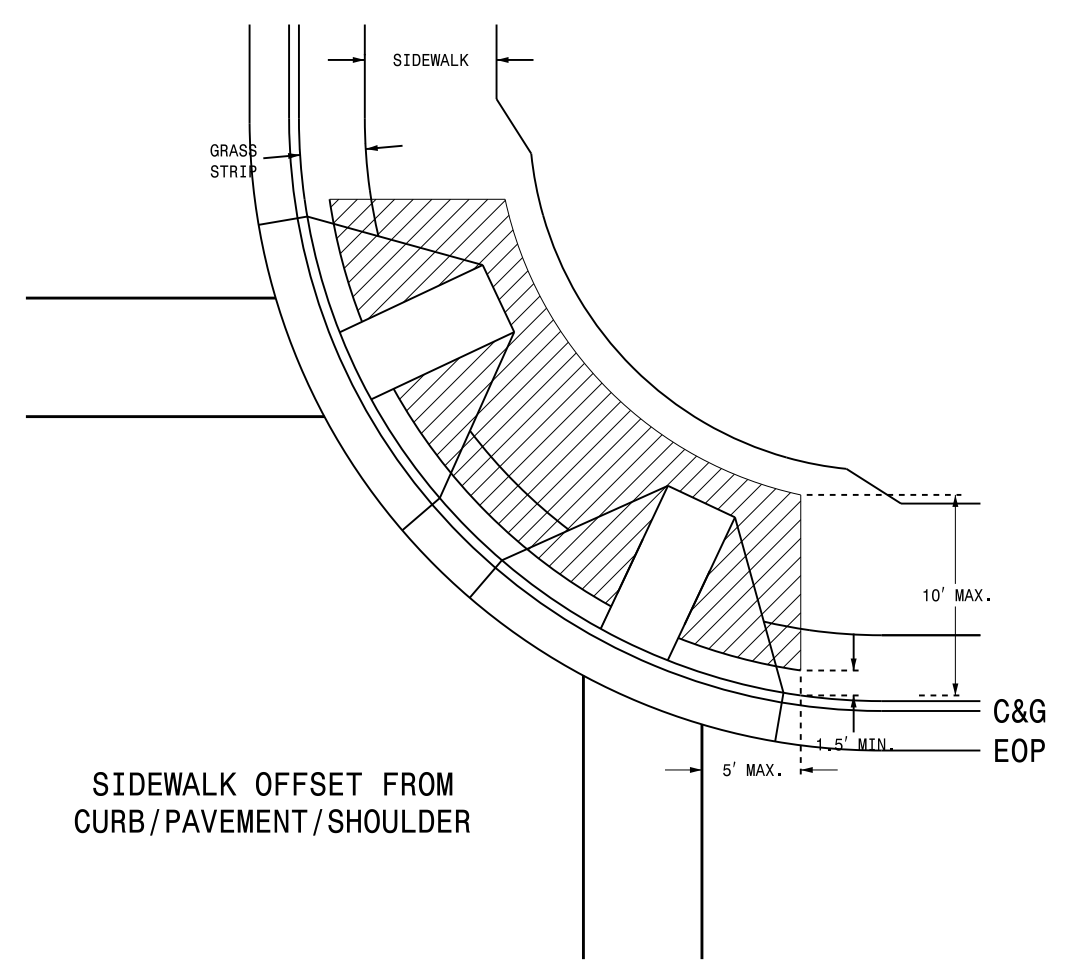
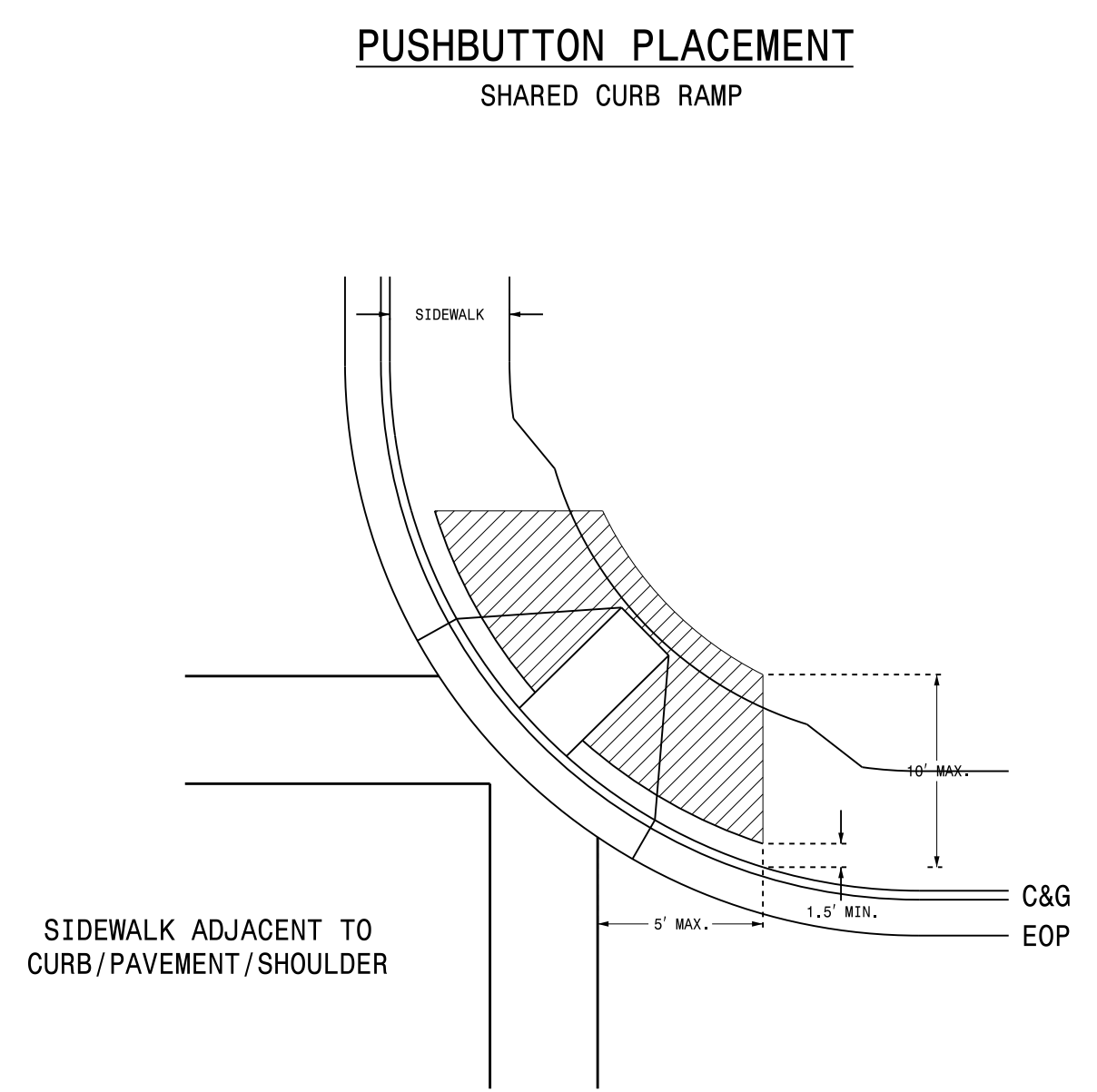
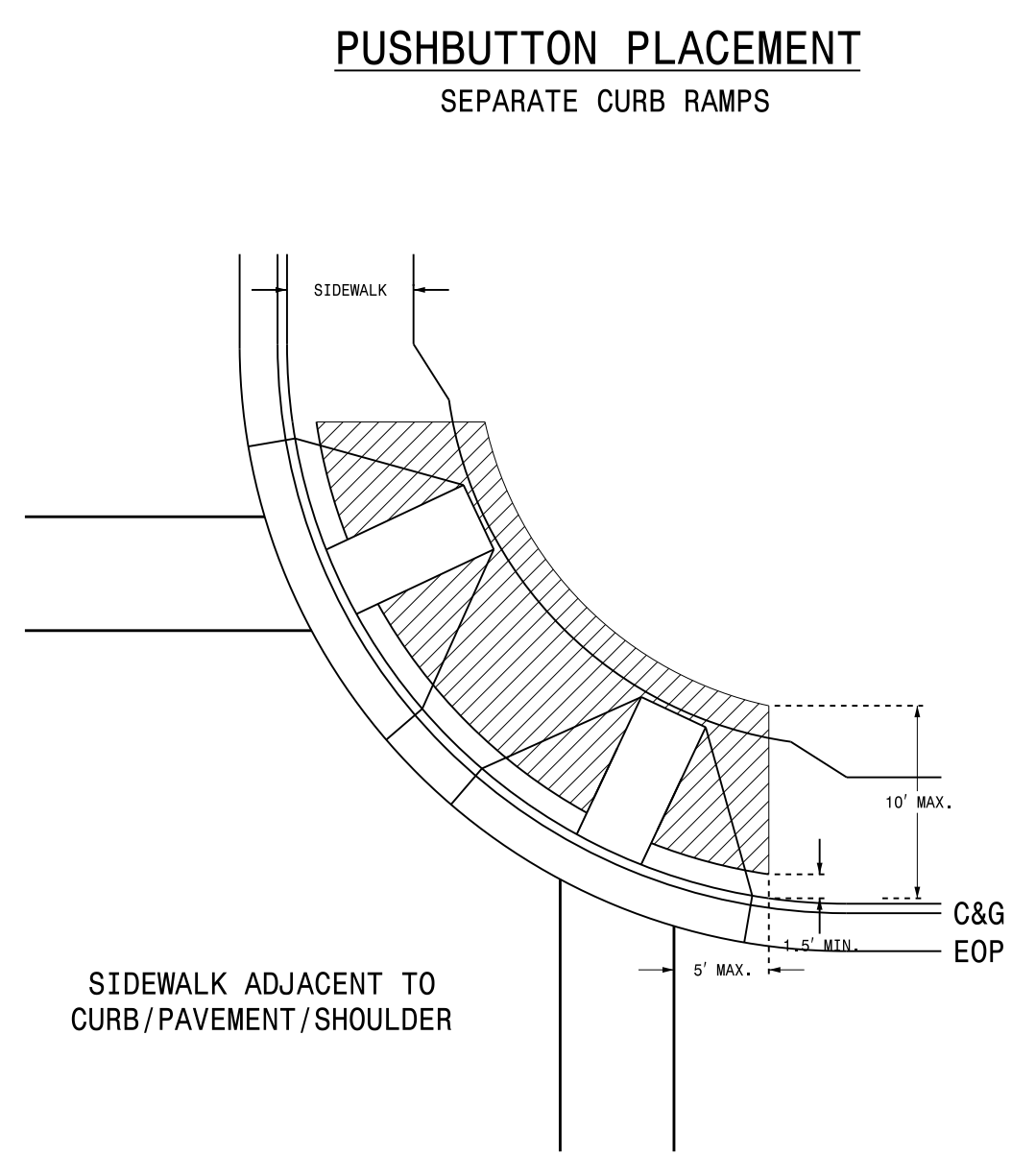
SIG. INVENTORY NO. 05-1533



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

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
 PLACEMENT DETAIL

SHEET 1 OF 3  
**1705D01**



- NOTES**
1. Pushbutton pedestals should not be located further than 10 feet from the edge of curb, shoulder, or pavement.
  2. The face of the pushbutton should be parallel to the applicable crosswalk.
  3. Separate pushbuttons used on the same corner should be separated by a distance of at least 10 feet.
  4. Pushbuttons shall be installed adjacent to a level surface with a maximum reach distance of 10 inches.
  5. Maintain 4 feet of clearance around pedestal if located in sidewalk.
  6. Refer to section 1705 of the 2012 NCDOT Roadway Standard Drawings for Pushbutton Assembly details.
  7. Refer to section 1743 of the 2012 NCDOT Roadway Standard Drawings for Pedestal details.
  8. Contact Division Traffic Engineer for pushbutton location approval prior to installation.
  9. Curb ramps are for symbolic use only and may not reflect actual design or field conditions.

PROPOSED	LEGEND
	Signal Pole
	Type I Pushbutton Post
	Type II Signal Pedestal
	Pushbutton & Sign
	Pedestrian Signal Head
	Curb Ramp
	Pushbutton Location Area

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

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
 PLACEMENT DETAIL

SHEET 1 OF 3  
**1705D01**

See Plate for Title

*Prepared in the Offices of:*

750 N. Greenfield Parkway  
 Garner, NC 27529

SEAL

DocuSigned by:  
  
 18084802744604

SIGNATURE

6/17/2014  
DATE

06-AUG-2014 16:37  
 S:\ITS\ASU\ITS\_Signal\Signal Design Section\Central Region\Rob's Files\Red Stds\Pushbutton Drawings\20140617.dgn  
 rz1emba

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

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

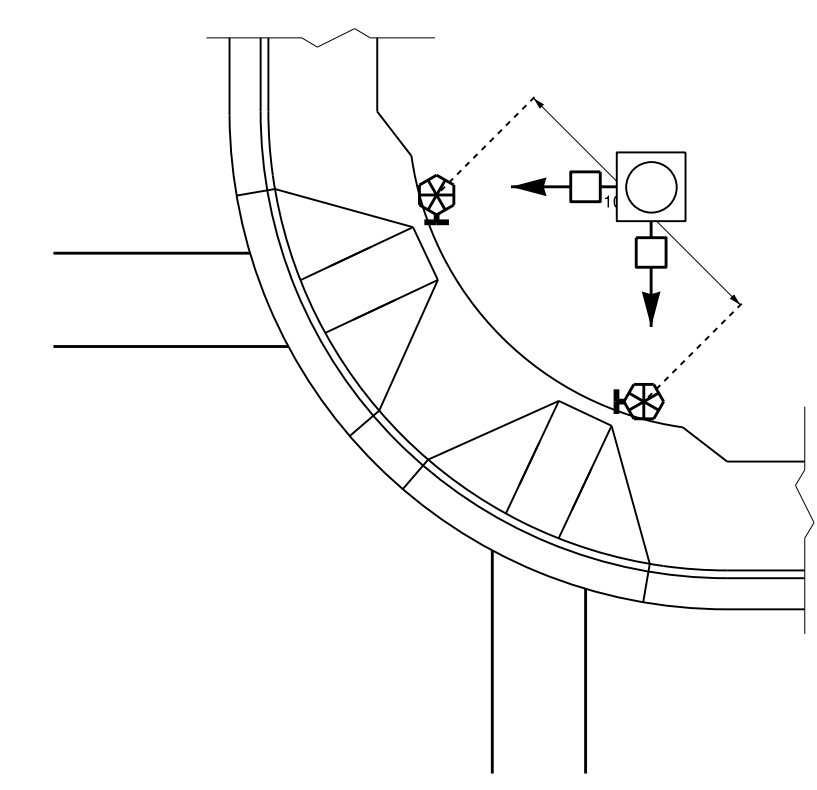
SHEET 2 OF 3  
**1705D01**

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

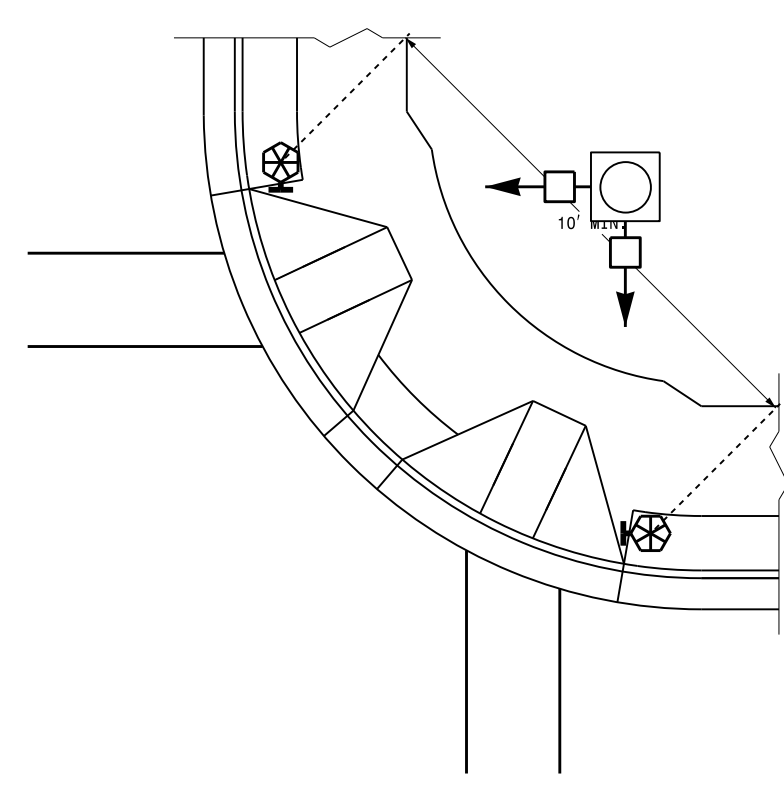
ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 2 OF 3  
**1705D01**

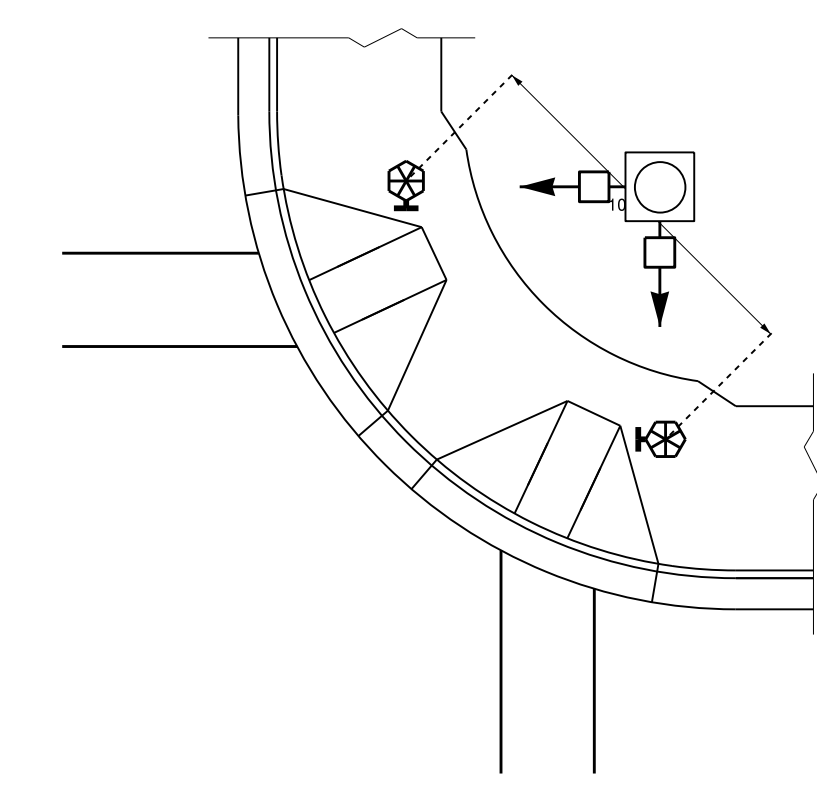
**TYPICAL PUSHBUTTON LOCATIONS (CASE I)**  
SEPARATE CURB RAMPS W/ TYPE I PEDESTALS



BACK OF SIDEWALK IS WITHIN 10'  
OF CURB OR PAVEMENT/SHOULDER

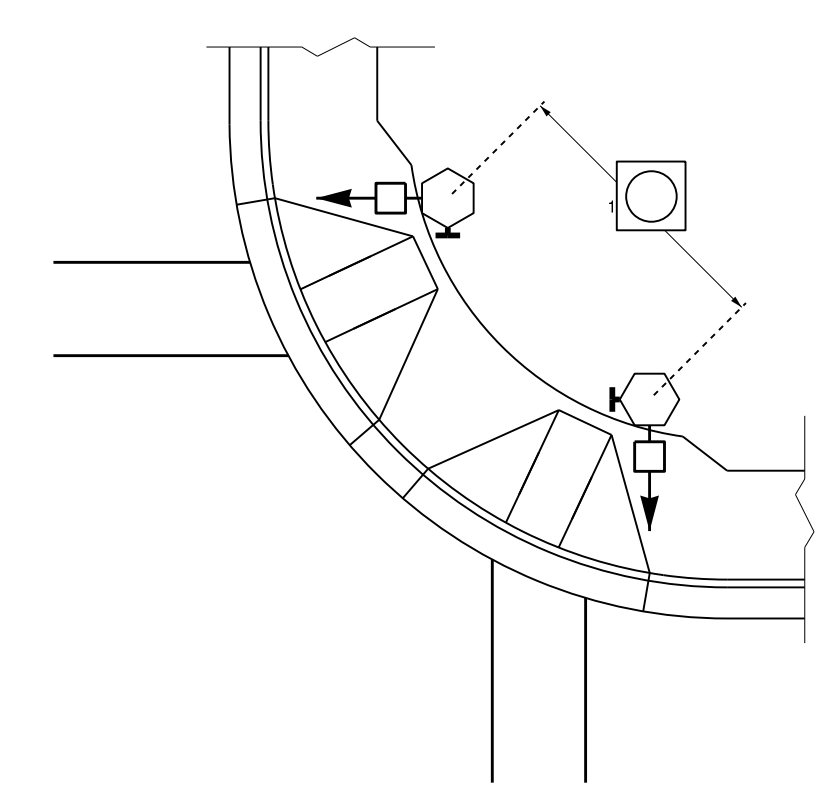


GRASS STRIP PLACEMENT IF BACK  
OF SIDEWALK EXCEEDS 10' FROM  
CURB OR PAVEMENT/SHOULDER

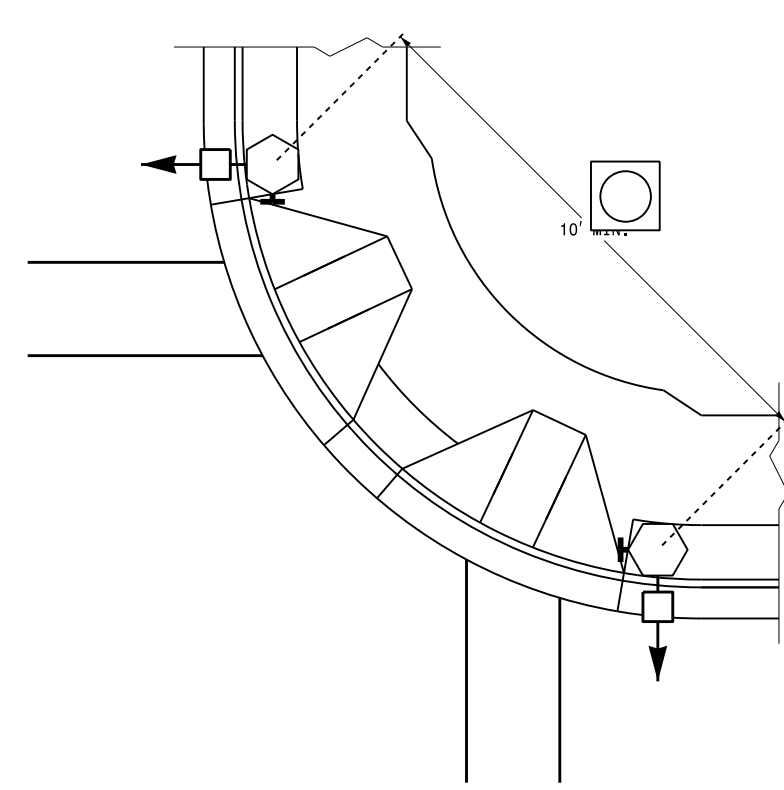


PUSHBUTTON PLACEMENT  
IN WIDE SIDEWALK

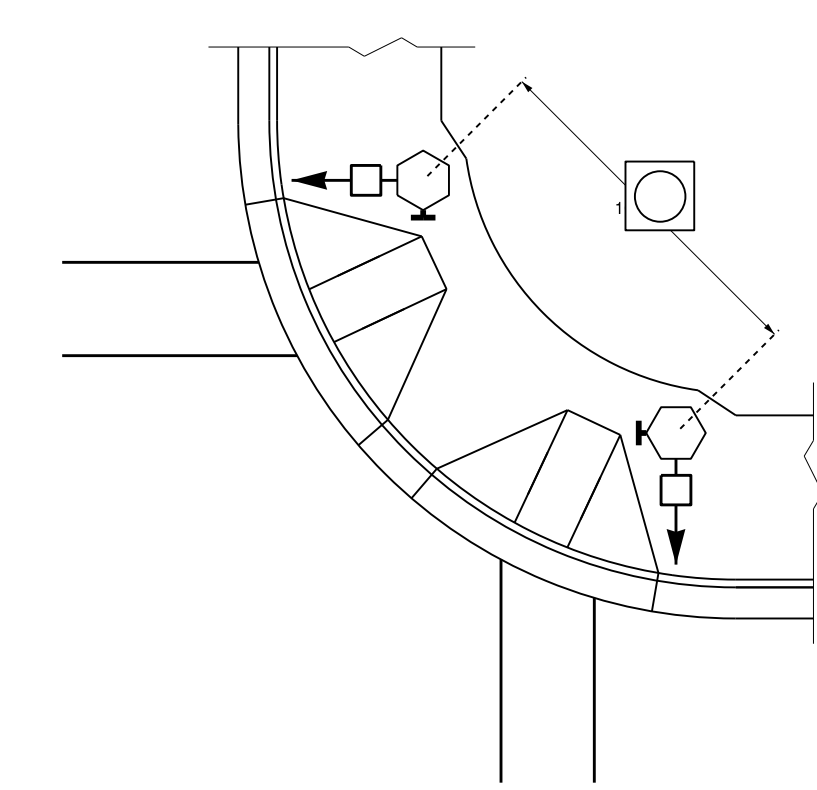
**TYPICAL PUSHBUTTON LOCATIONS (CASE II)**  
SEPARATE CURB RAMPS W/ TYPE II PEDESTALS



BACK OF SIDEWALK IS WITHIN 10'  
OF CURB OR PAVEMENT/SHOULDER



GRASS STRIP PLACEMENT IF BACK  
OF SIDEWALK EXCEEDS 10' FROM  
CURB OR PAVEMENT/SHOULDER



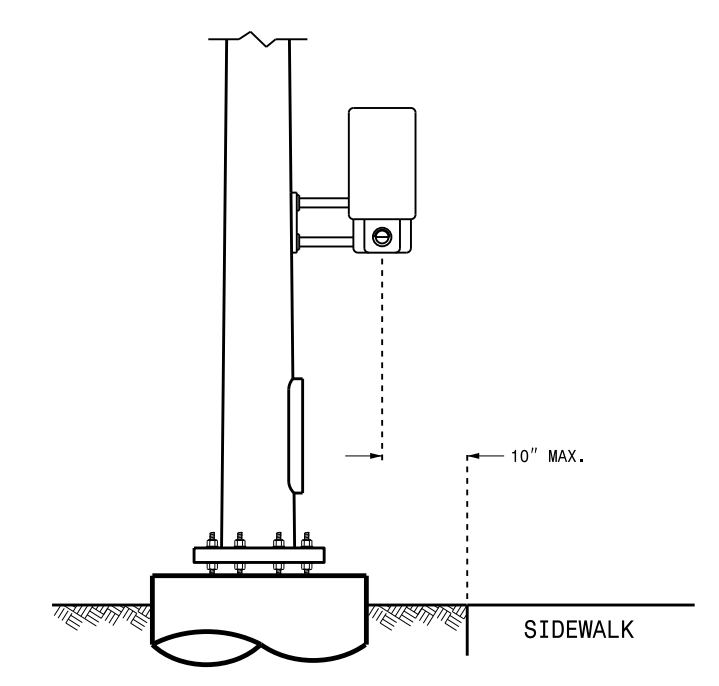
PUSHBUTTON PLACEMENT  
IN WIDE SIDEWALK

**LEGEND**

PROPOSED

- Signal Pole
- Type I Pushbutton Post
- Type II Signal Pedestal
- Pushbutton & Sign
- Pedestrian Signal Head
- Curb Ramp
- Pushbutton Location Area

**OPTIONAL PUSHBUTTON EXTENSION**  
FACE OF PUSHBUTTON PARALLEL TO  
APPLICABLE CROSSWALK



06-AUG-2014 16:38  
 S:\ITS\ASU\ITS\_Signal\Signal Design Section\Central Region\Rob's Files\Red State\Pushbutton Drawings\Pushbutton Place Drawings\20140617.dgn  
 rz1emba

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway  
Garner, NC 27529

SEAL

DocuSigned by:  
*Robert J. Ziemba*  
18BB486274464

SIGNATURE DATE

6/17/2014



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

06-14

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 3 OF 3  
**1705D01**

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

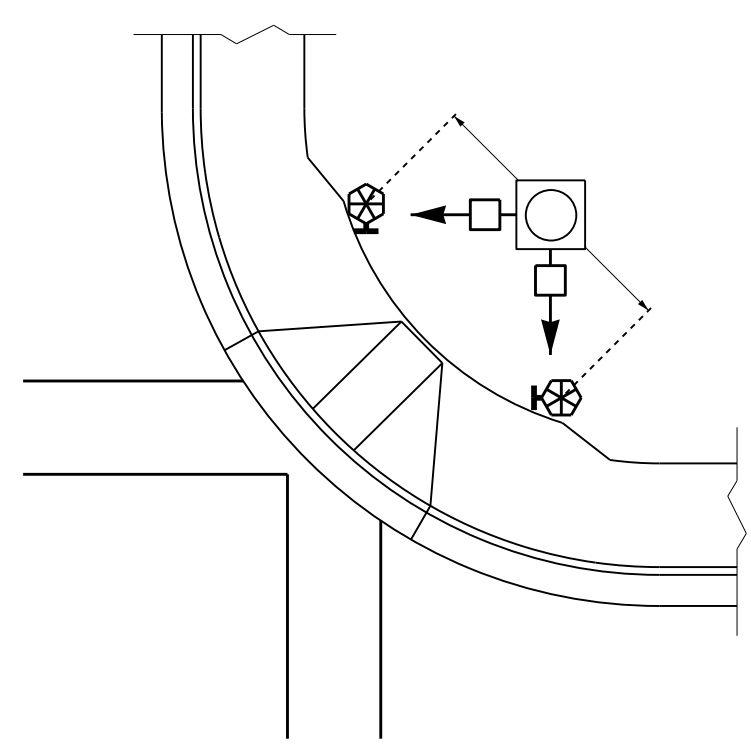
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ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

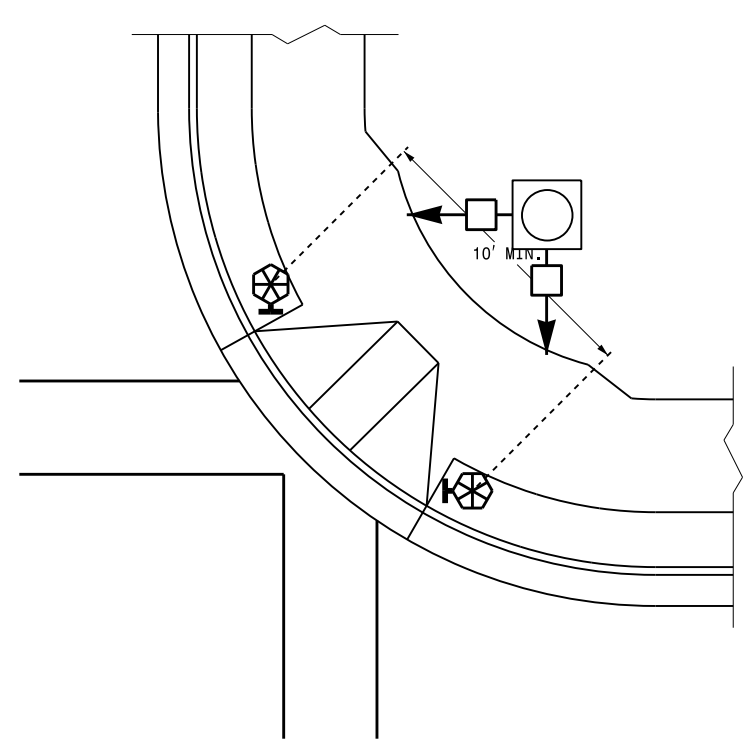
SHEET 3 OF 3  
**1705D01**

**TYPICAL PUSHBUTTON LOCATIONS (CASE III)**

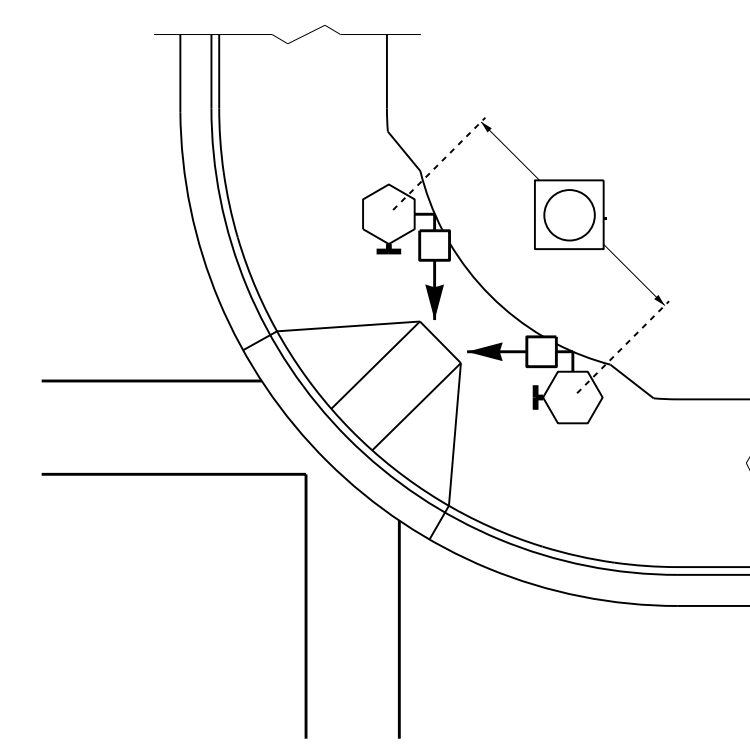
SHARED CURB RAMPS



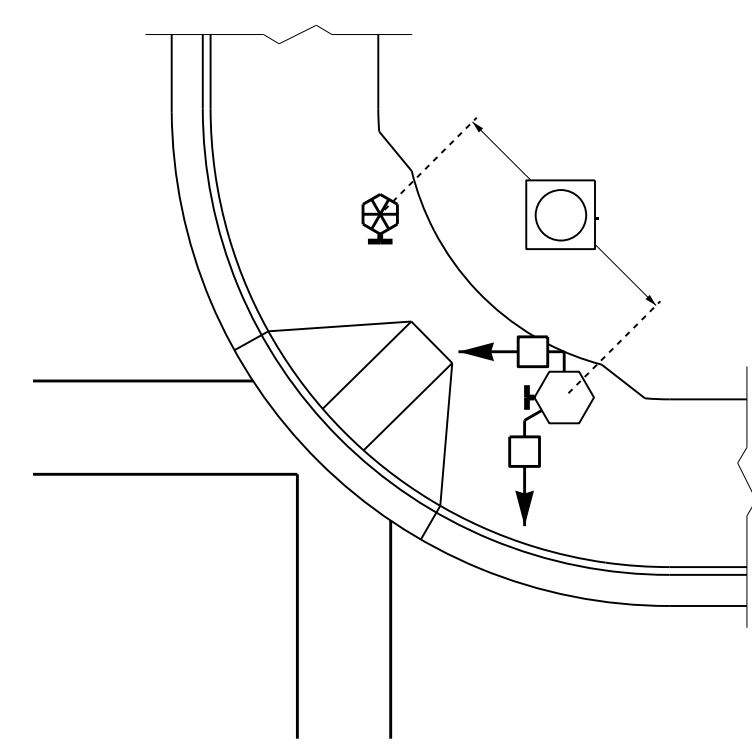
BACK OF SIDEWALK IS WITHIN 10' OF CURB OR PAVEMENT/SHOULDER



GRASS STRIP PLACEMENT IF BACK OF SIDEWALK EXCEEDS 10' FROM CURB OR PAVEMENT/SHOULDER

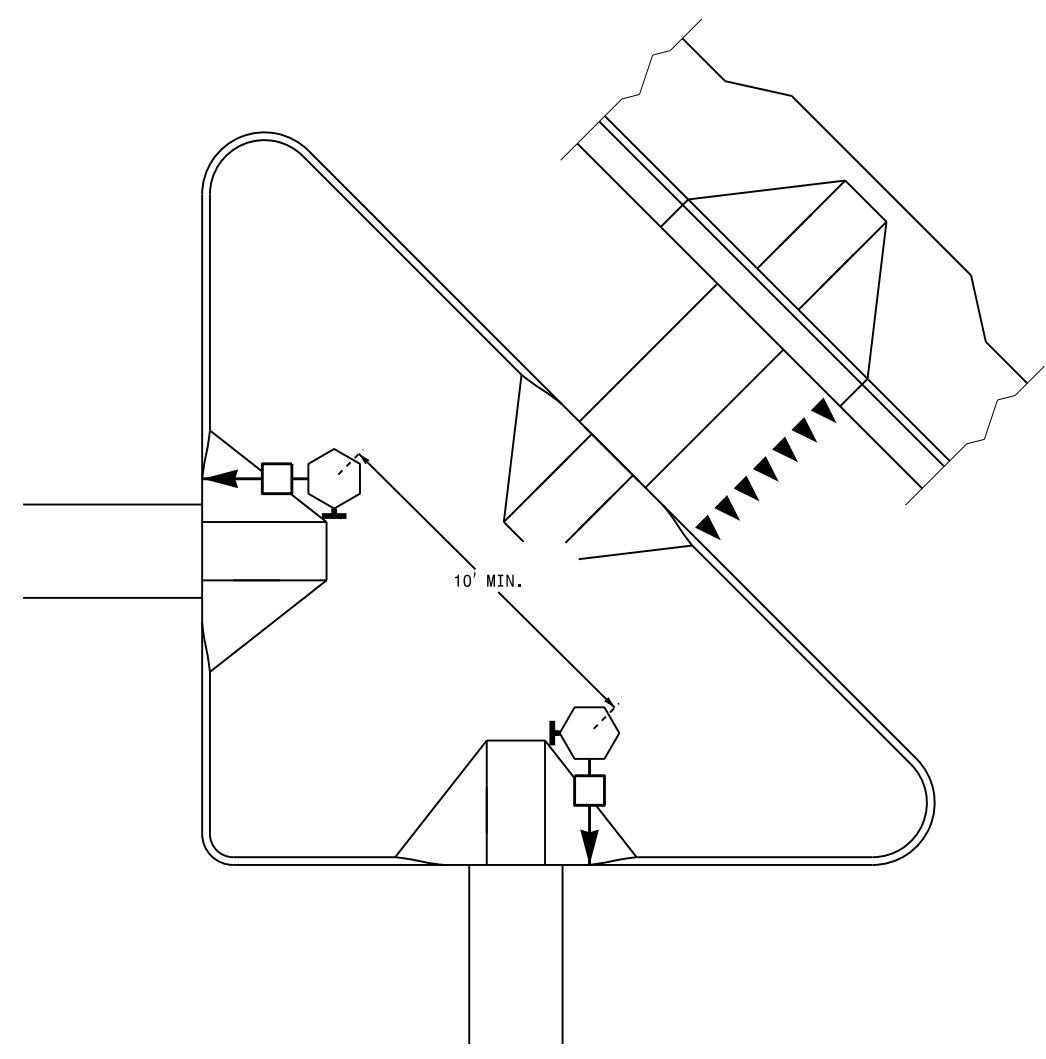


PUSHBUTTON PLACEMENT IN WIDE SIDEWALK (CORRESPONDING PUSHBUTTONS AND SIGNAL HEADS ON DIFFERENT PEDESTALS)

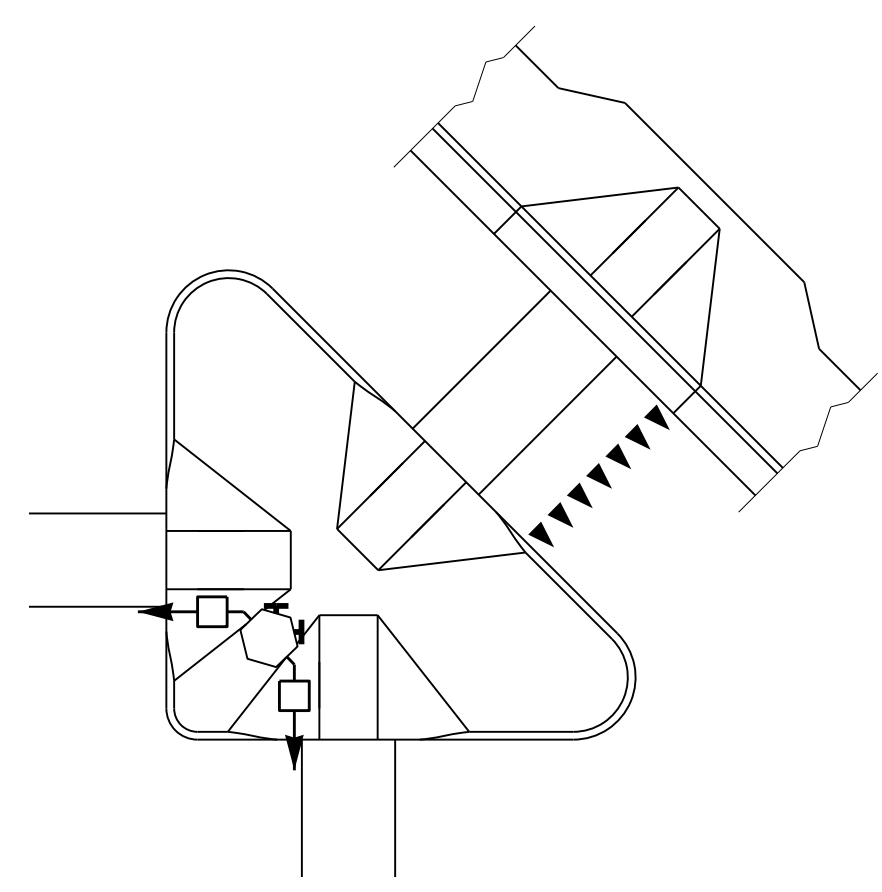


PUSHBUTTON PLACEMENT WITH SHARED TYPE II SIGNAL PEDESTAL AND TYPE I PUSHBUTTON POST

**TRAFFIC ISLAND PUSHBUTTON LOCATIONS**



PUSHBUTTON PLACEMENT IN LARGE "PORK CHOP ISLAND" WITH SEPARATE PEDESTALS



PUSHBUTTON PLACEMENT IN SMALL "PORK CHOP ISLAND" WITH SHARED PEDESTAL

**PUSHBUTTON PLACEMENT IN MEDIAN**

TYPE II PEDESTAL (FOR STAGED OR MULTI-PHASE CROSSING)

TYPE I PEDESTAL (FOR COMPLETE CROSSING CURB TO CURB WITH OPTIONAL REFUGE)

**PROPOSED**

	Signal Pole
	Type I Pushbutton Post
	Type II Signal Pedestal
	Pushbutton & Sign
	Pedestrian Signal Head
	Curb Ramp
	Pushbutton Location Area

**LEGEND**

06-AUG-2014 16:39  
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 rz1emba

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway  
Garner, NC 27529

SEAL

DocuSigned by:

18084982744494

SIGNATURE DATE

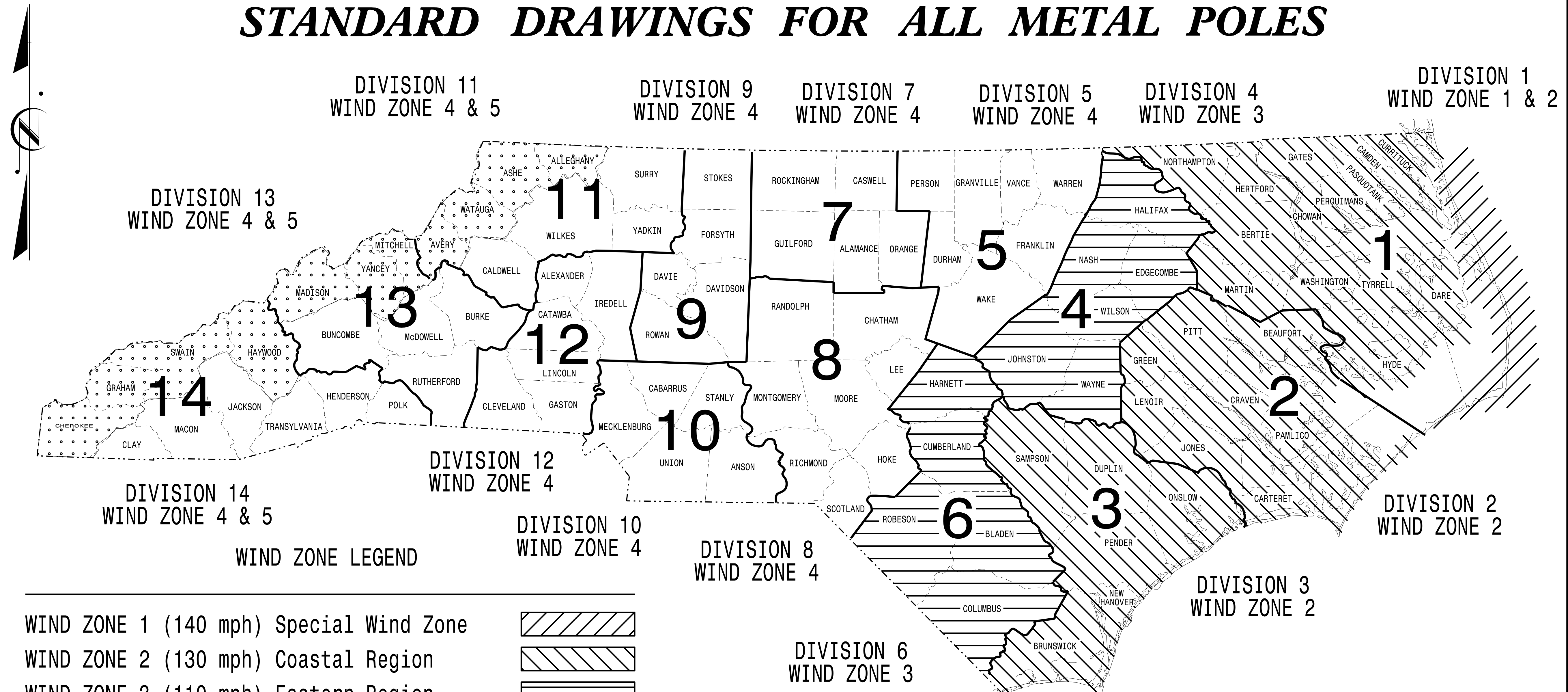
6/17/2014



# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

PROJECT I.D. NO. U-5828	SHEET NO. Sig.M1
----------------------------	---------------------

## STANDARD DRAWINGS FOR ALL METAL POLES



WIND ZONE LEGEND

WIND ZONE 1 (140 mph) Special Wind Zone	
WIND ZONE 2 (130 mph) Coastal Region	
WIND ZONE 3 (110 mph) Eastern Region	
WIND ZONE 4 (90 mph) Central & Mtn. Region	
WIND ZONE 5 (120 mph) Special Wind Zone	

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

Prepared In the Offices of:

750 N. Greenfield Pkwy.  
Garner, NC 27529

Designed in conformance  
with the latest  
2015 Interim to the  
6th Edition 2013  
**AASHTO**  
Standard Specifications for  
Structural Supports for  
Highway Signs, Luminaires,  
and Traffic Signals

DRAWING NUMBER	DESCRIPTION
Sig. M 1	Statewide Wind Zone Map
Sig. M 2	Typical Fabrication Details-All Metal Poles
Sig. M 3	Typical Fabrication Details-Strain Poles
Sig. M 4	Typical Fabrication Details-Mast Arm Poles
Sig. M 5	Typical Fabrication Details-Mast Arm Connection
Sig. M 6	Typical Fabrication Details-Strain Pole Attachments
Sig. M 7	Construction Details-Foundations
Sig. M 8	Standard Strain Pole Foundation-All Soil Conditions

**NC DOT CONTACTS:**

**MOBILITY AND SAFETY DIVISION - ITS AND SIGNALS UNIT**

---

G. A. FULLER, P.E. - STATE ITS AND SIGNALS ENGINEER

G. G. MURR, JR., P.E. - STATE SIGNALS ENGINEER

D. C. SARKAR, P.E. - ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER

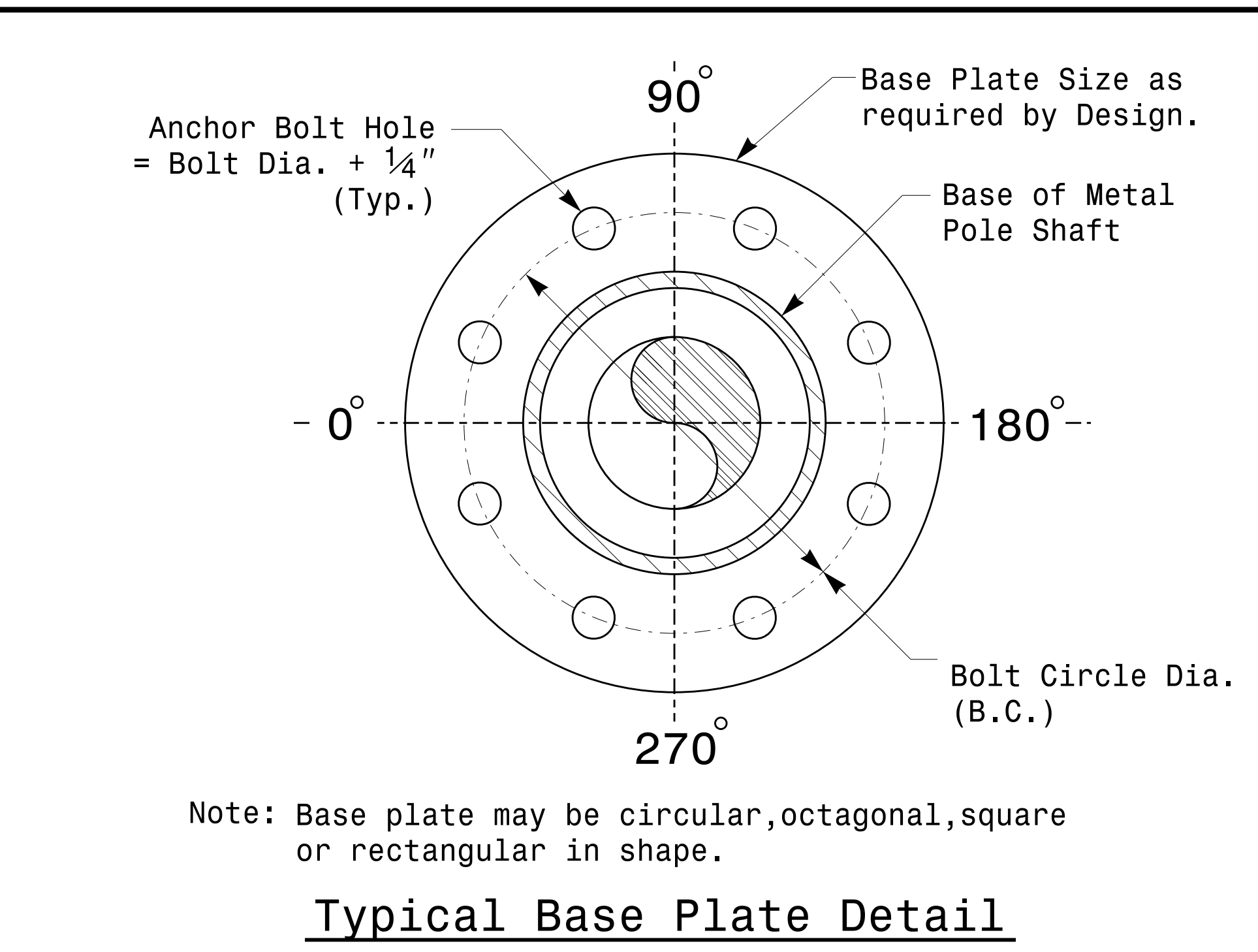
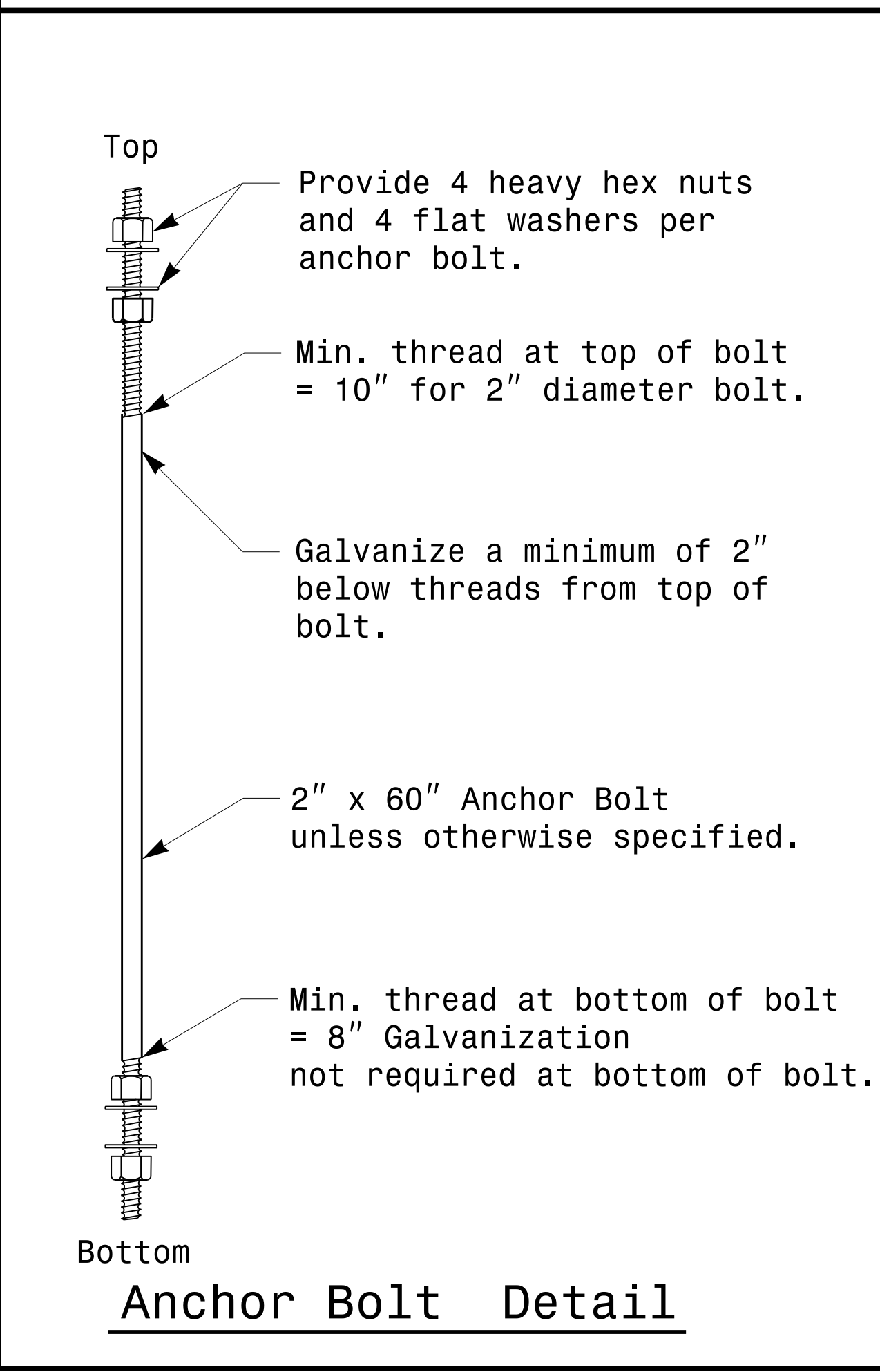
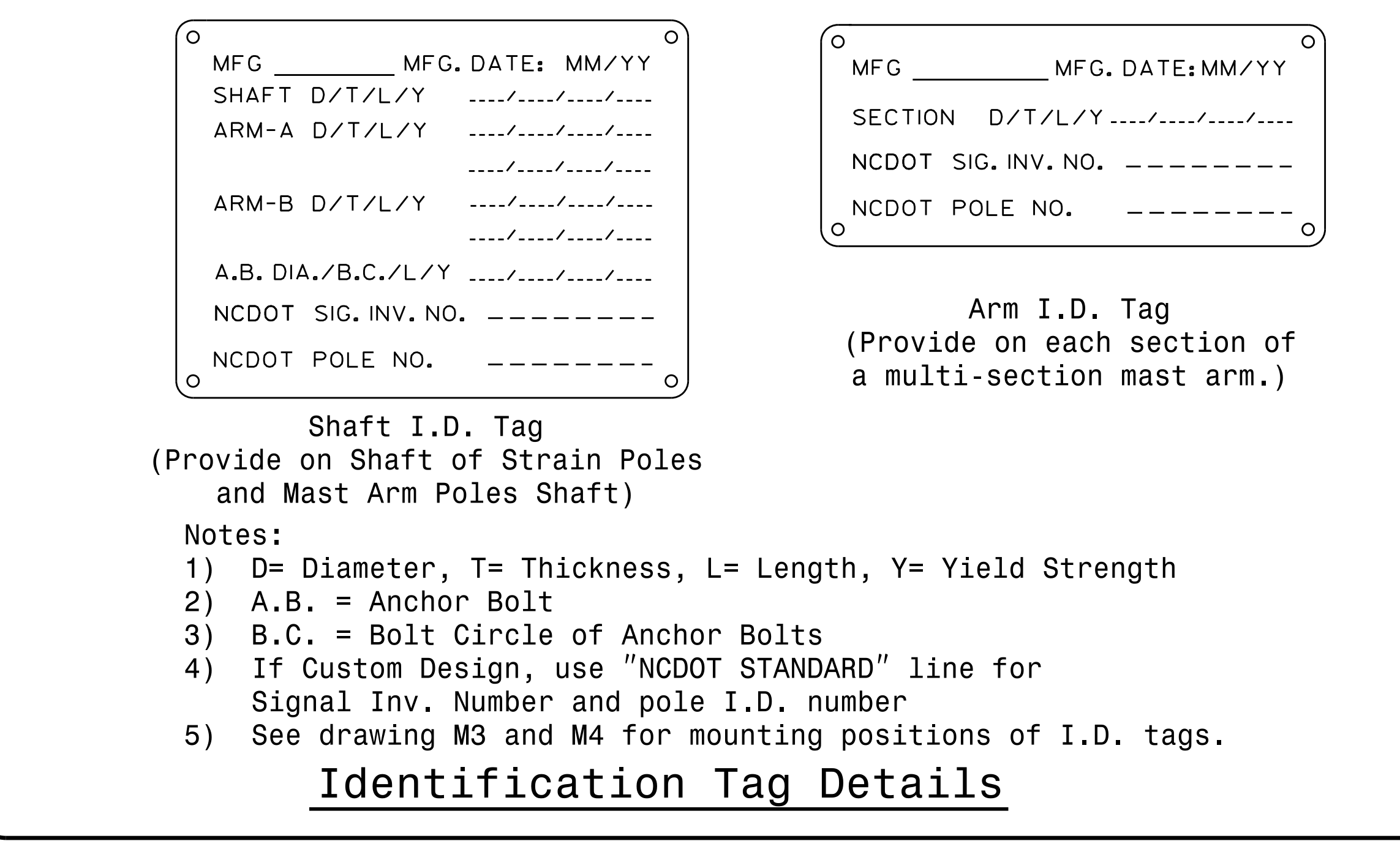
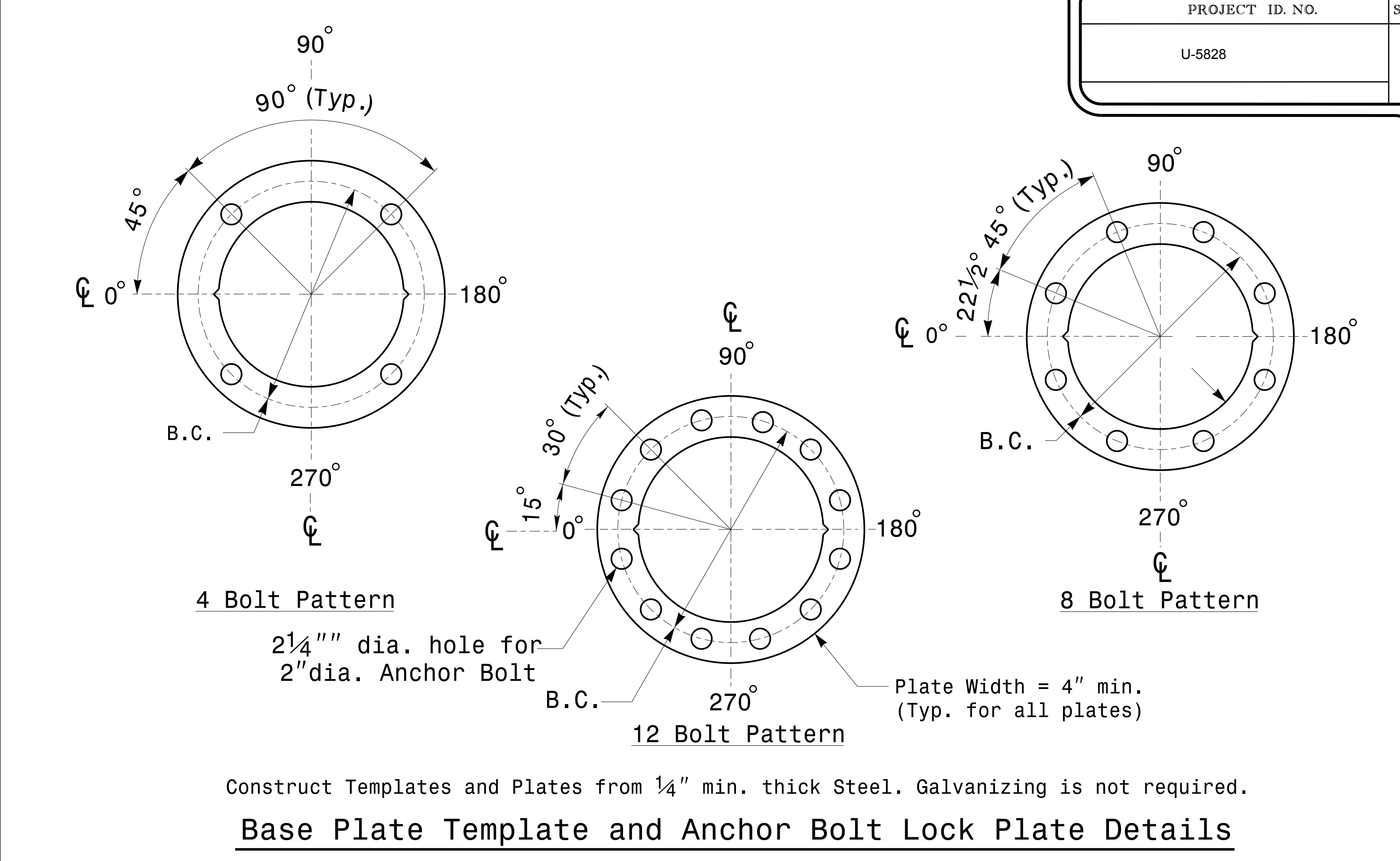
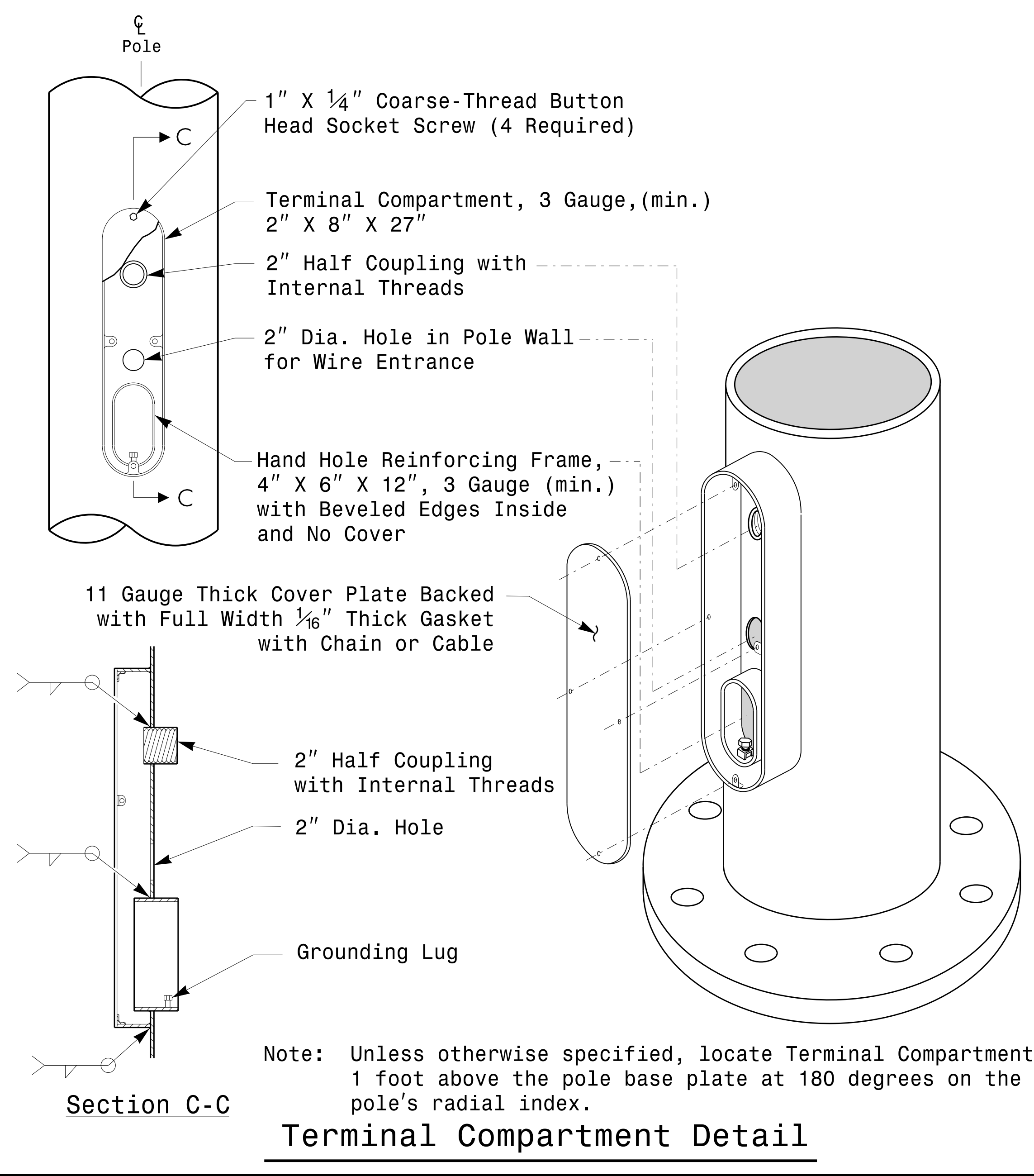
C. F. ANDREWS - ITS AND SIGNALS JOURNEY STRUCTURAL ENGINEER

SEAL

DocuSigned by:  
*Debesh C. Sarkar*

2/17/2016  
DATE

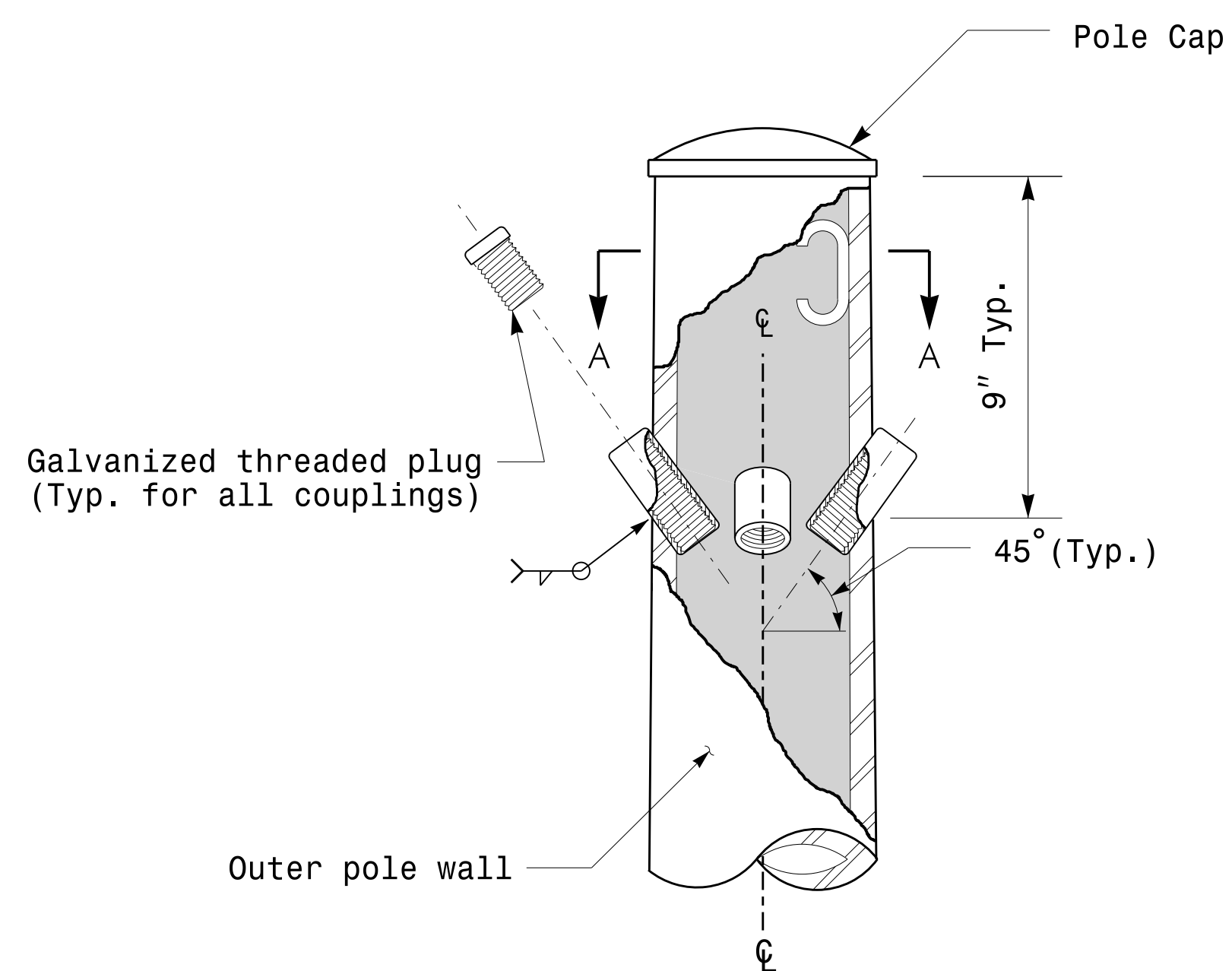




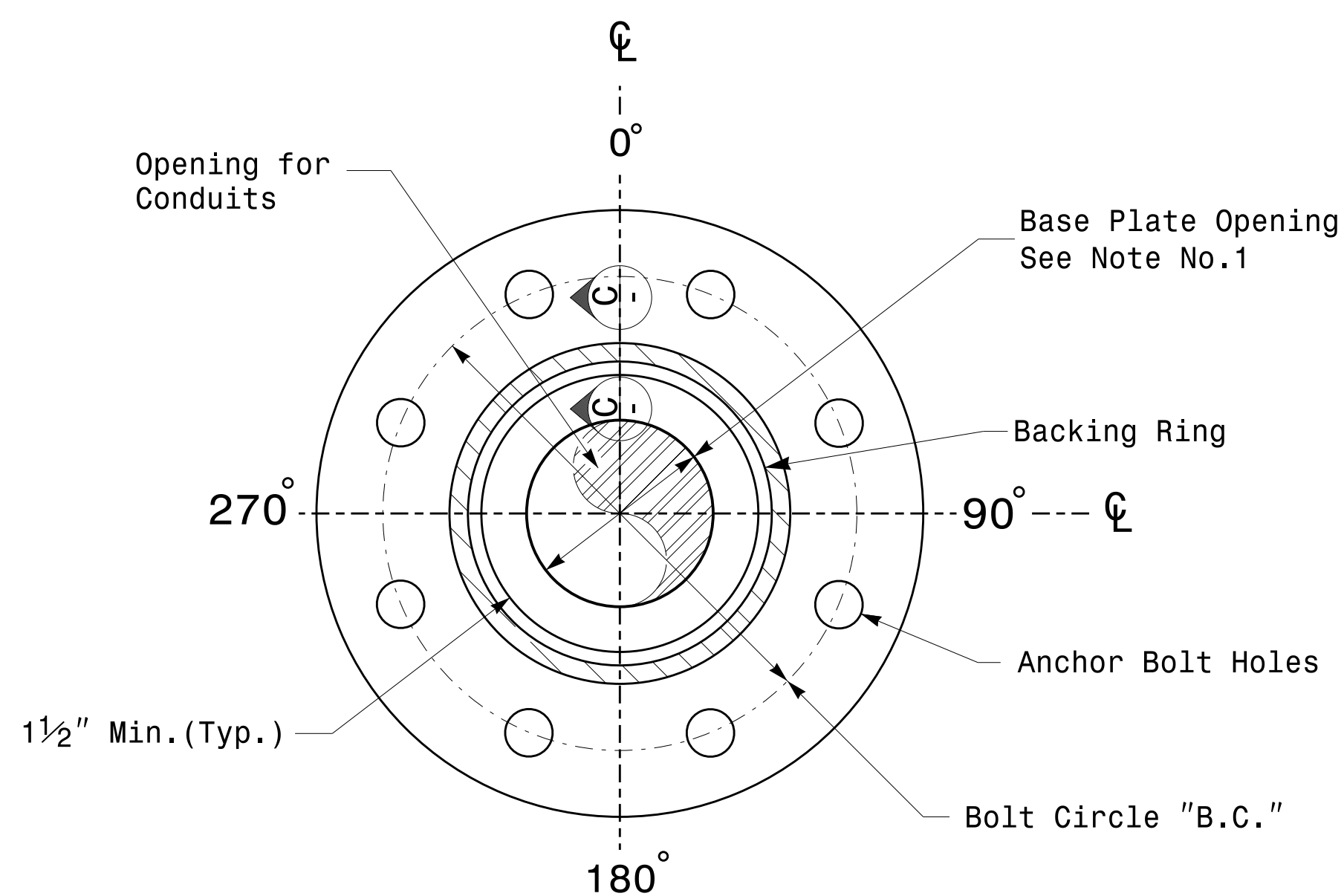
	<b>Typical Fabrication Details For All Metal Poles</b>		
	PLAN DATE: FEBRUARY 2016 PREPARED BY: N. BITTING REVISIONS:	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR INITI: DATE:	

17-FEB-2016 16:02  
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 3/21/2016

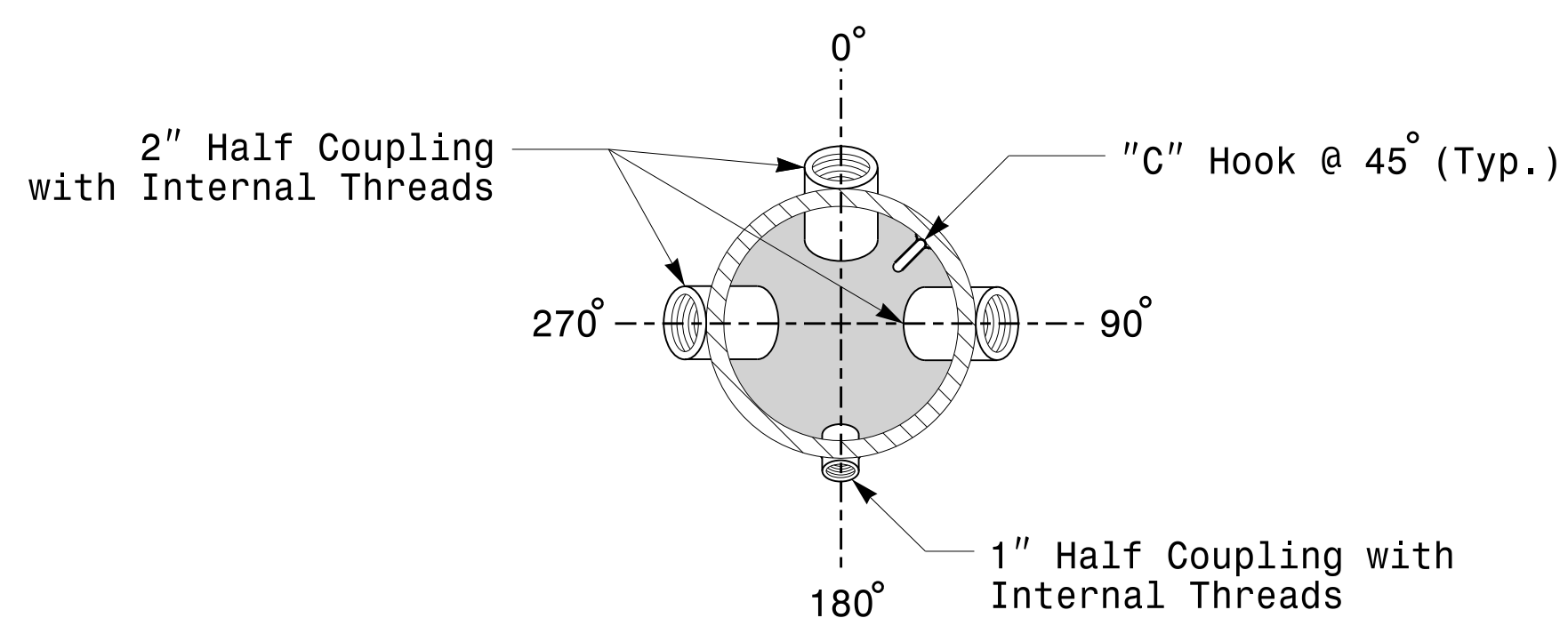
Note:  
 1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



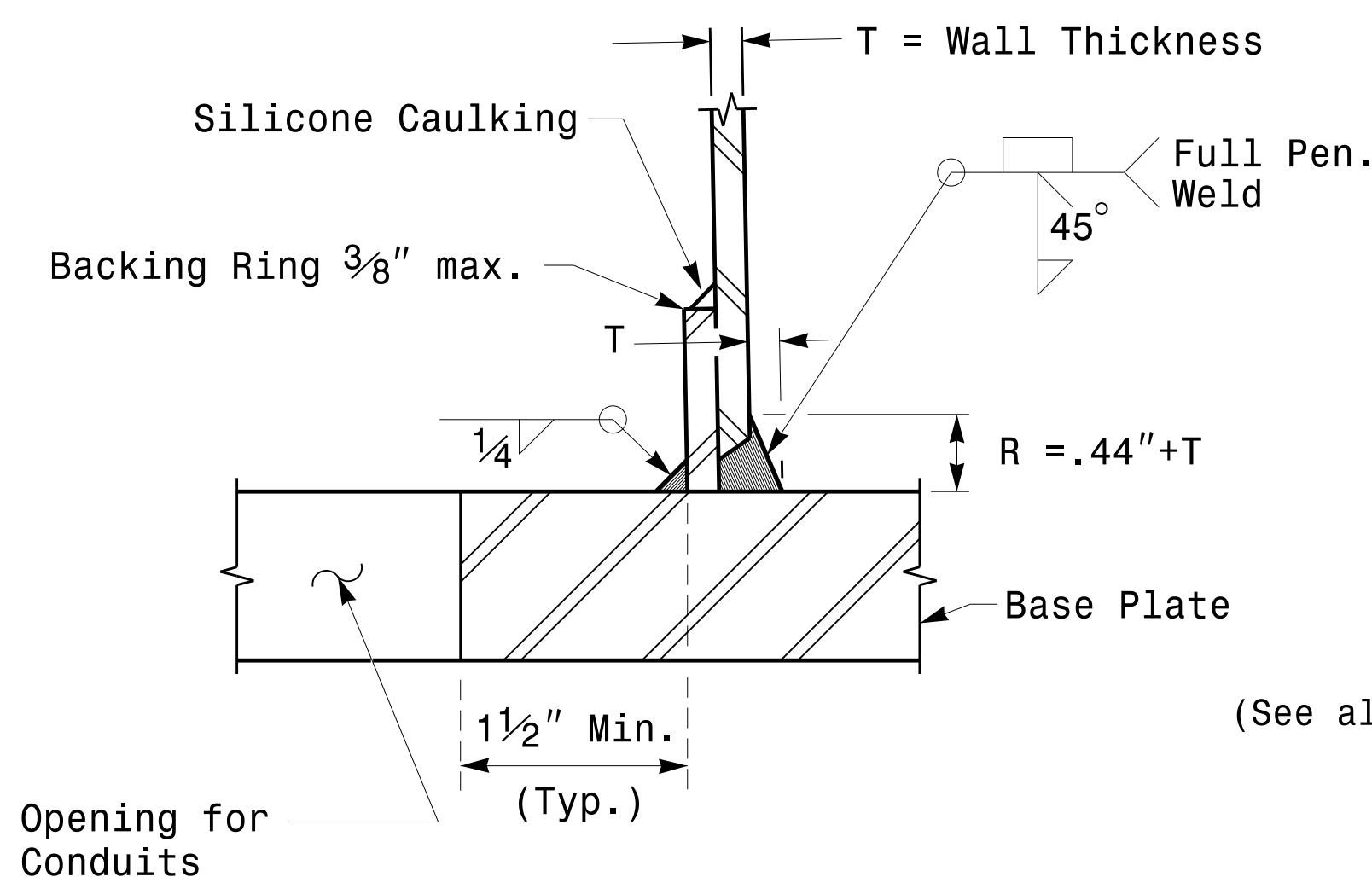
Cable Entrances at Top of Pole



Section B-B Pole Base Plate Details (8 and 12 Bolt Pattern)

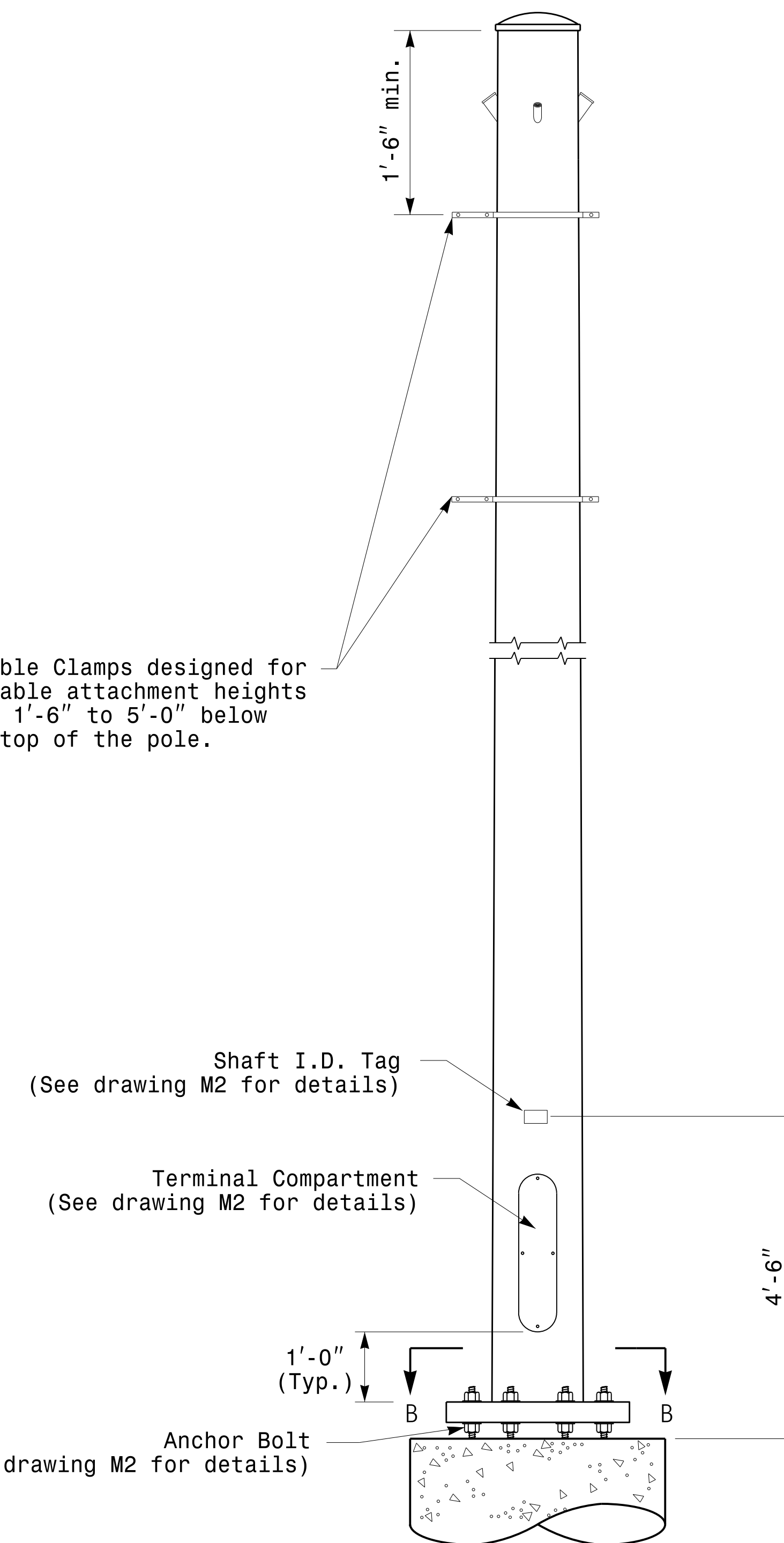


Section A-A Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C Full-Penetration Groove Weld Detail (Pole Attachment to Base Plate)

2 Cable Clamps designed for variable attachment heights from 1'-6" to 5'-0" below the top of the pole.



Monotube Strain Pole

Prepared in the Offices of:  
  
 750 N. Greenleaf Pkwy, Garner, NC 27529

Typical Fabrication Details For Strain Poles

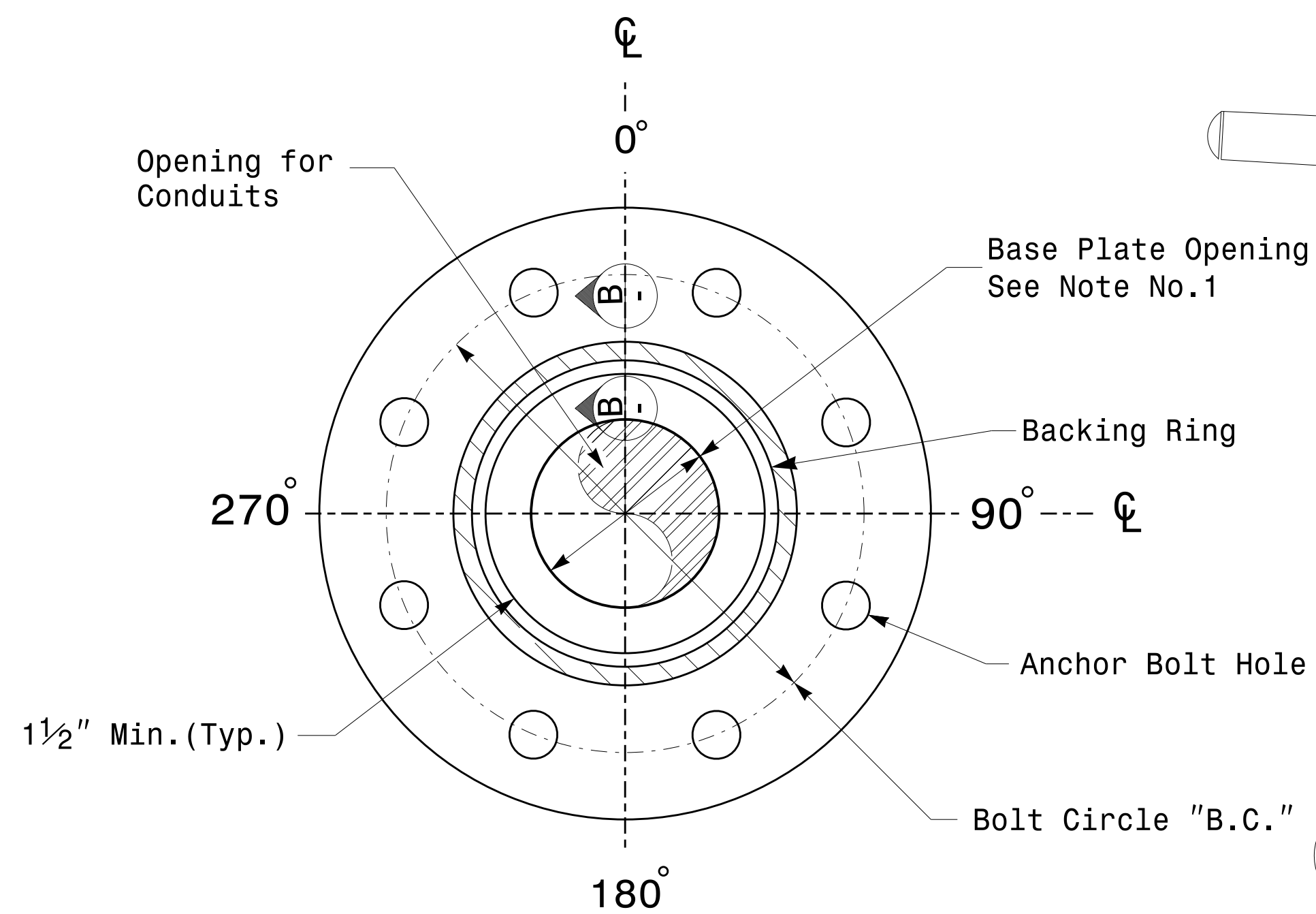
PLAN DATE: FEBRUARY 2016	DESIGNED BY: K.C. DURIGON
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

SEAL  
  
 DocuSigned by  
 Debesh C. Sarkar  
 SIGNATURE  
 44E8E32E147E4C4...  
 2/17/2016  
 DATE

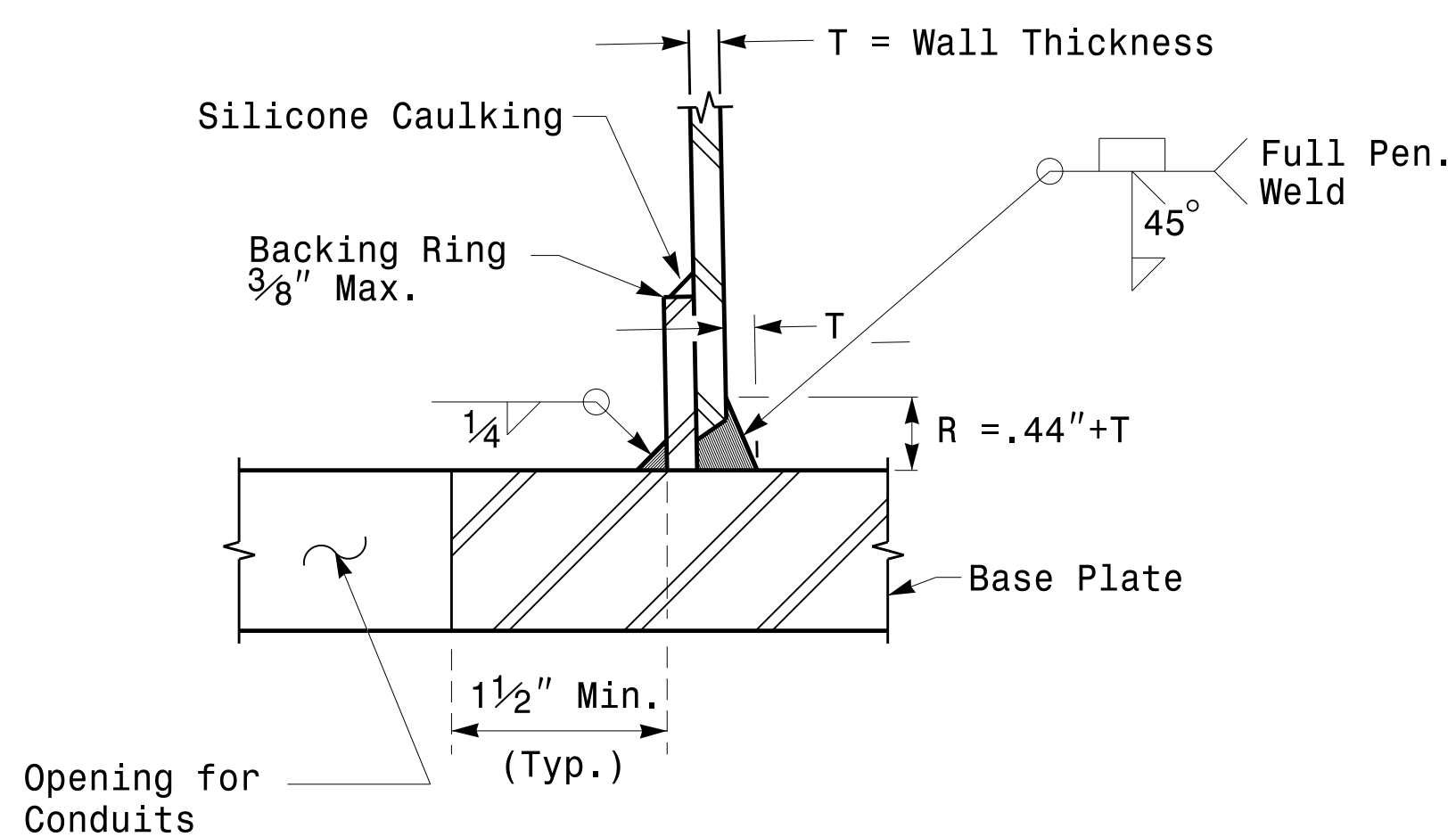
Fabrication Details – Strain Poles



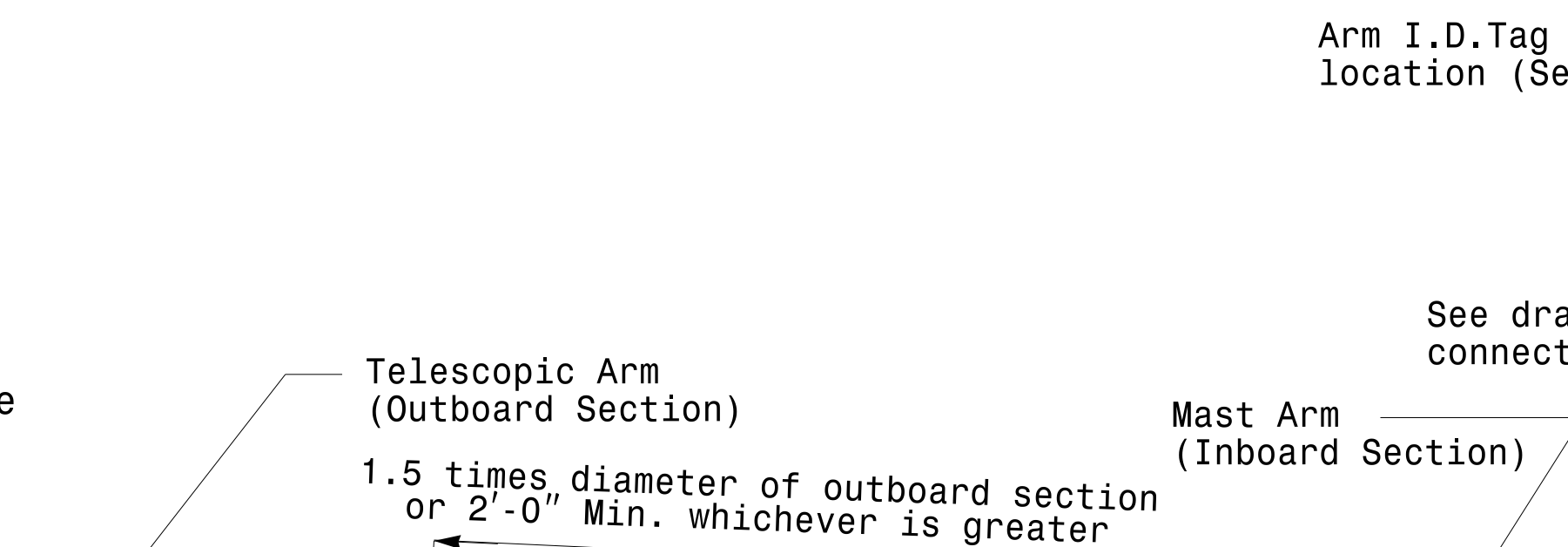
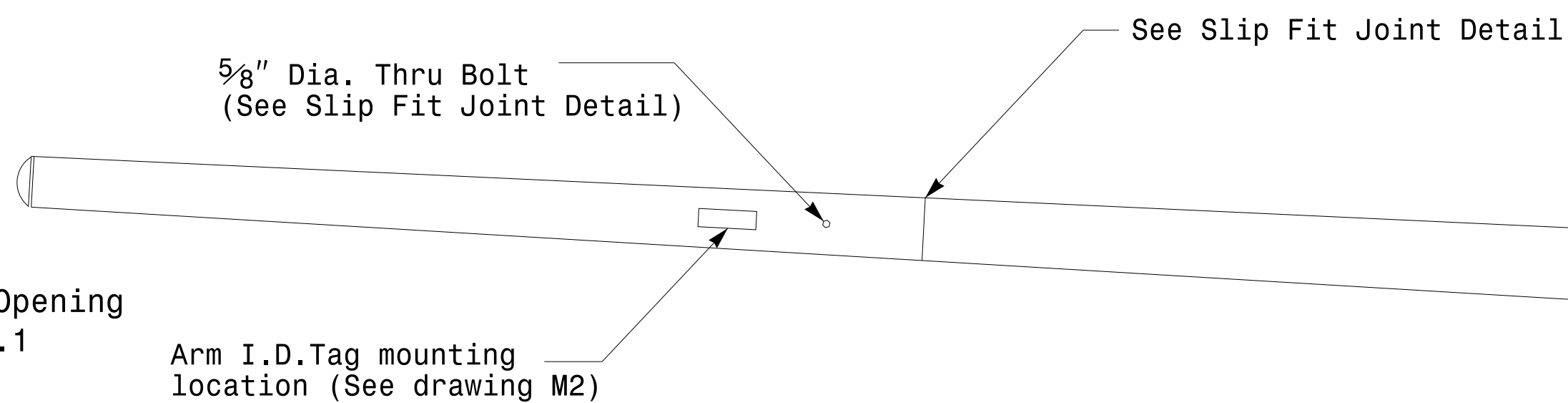
Note:  
 1. Opening in pole base plate shall be equal to pole base inside diameter minus  $3\frac{1}{2}$ " but shall not be less than  $8\frac{1}{2}$ ".



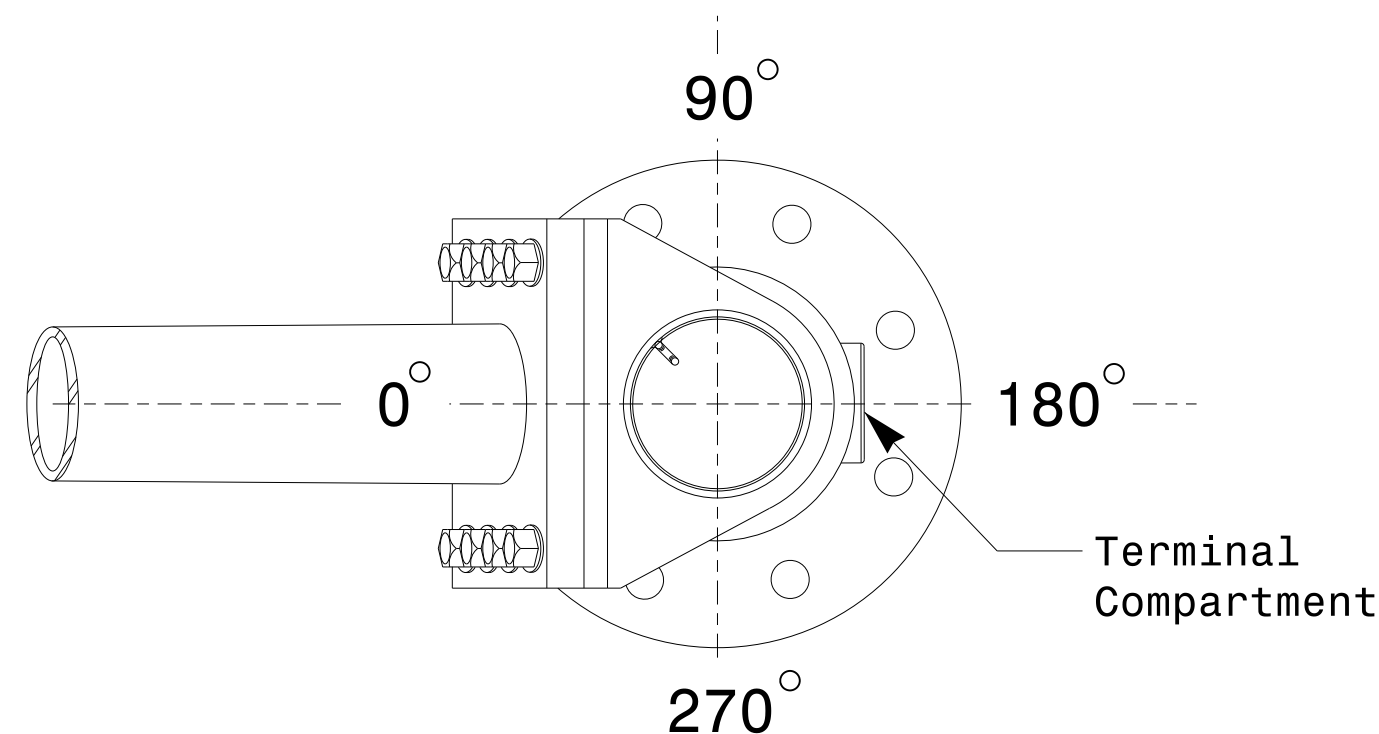
**Section A-A**  
**Pole Base Plate Details**



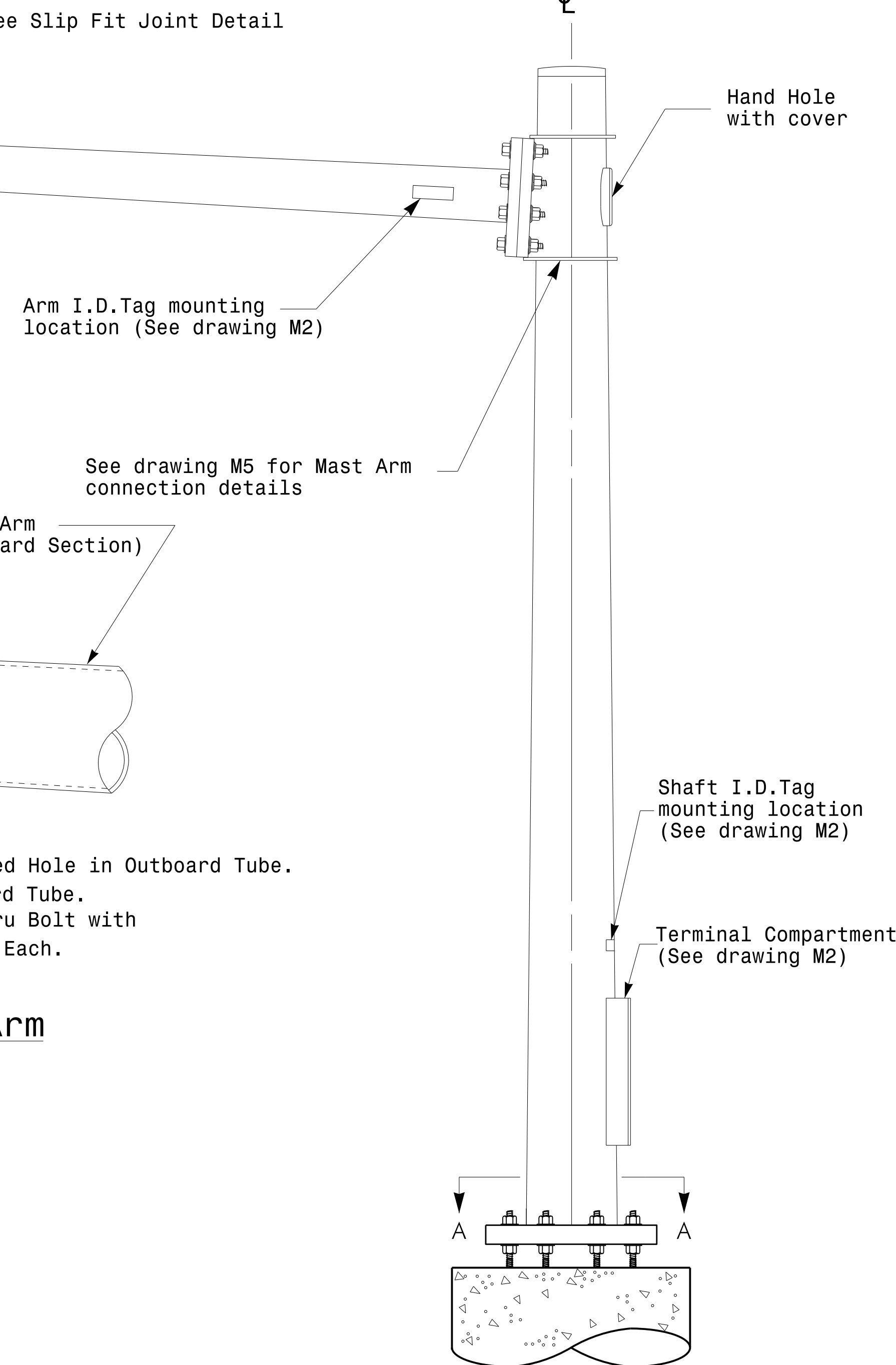
**Section B-B**  
 (Pole Attachment to Base Plate)  
**Full-Penetration Groove Weld Detail**



**Slip Fit Joint Detail for Mast Arm**



**Mast Arm Radial Orientation**



**Mast Arm Pole**

**Fabrication Details – Mast Arm Poles**

17-FEB-2016 16:05  
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 3:01:03

<p>Prepared in the Offices of:</p> <p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details          For          Mast Arm Poles</p>		<p>SEAL</p> <p>DocuSigned by:  <i>Debash C. Sarkar</i>          44E8E32E147E4C4...</p>	
	<p>PLAN DATE: FEBRUARY 2016</p>	<p>DESIGNED BY: K.C. DURIGON</p>		<p>DATE</p>
	<p>PREPARED BY: N. BITTING</p>	<p>REVIEWED BY: D.C. SARKAR</p>		<p>INIT.</p>
<p>SCALE: 0 NA NONE</p>	<p>REVISIONS</p>	<p>DATE</p>	<p>2/17/2016</p>	

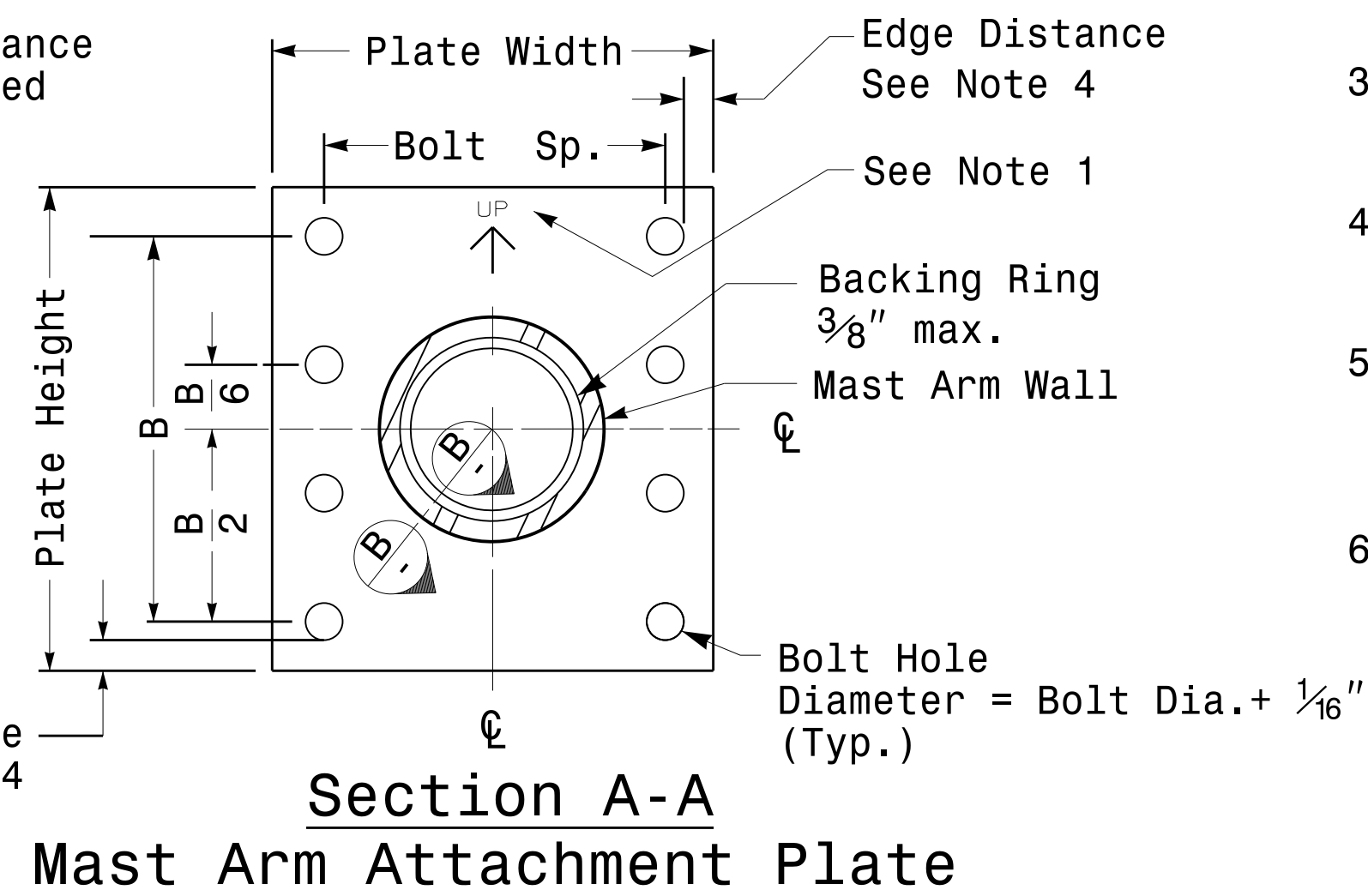
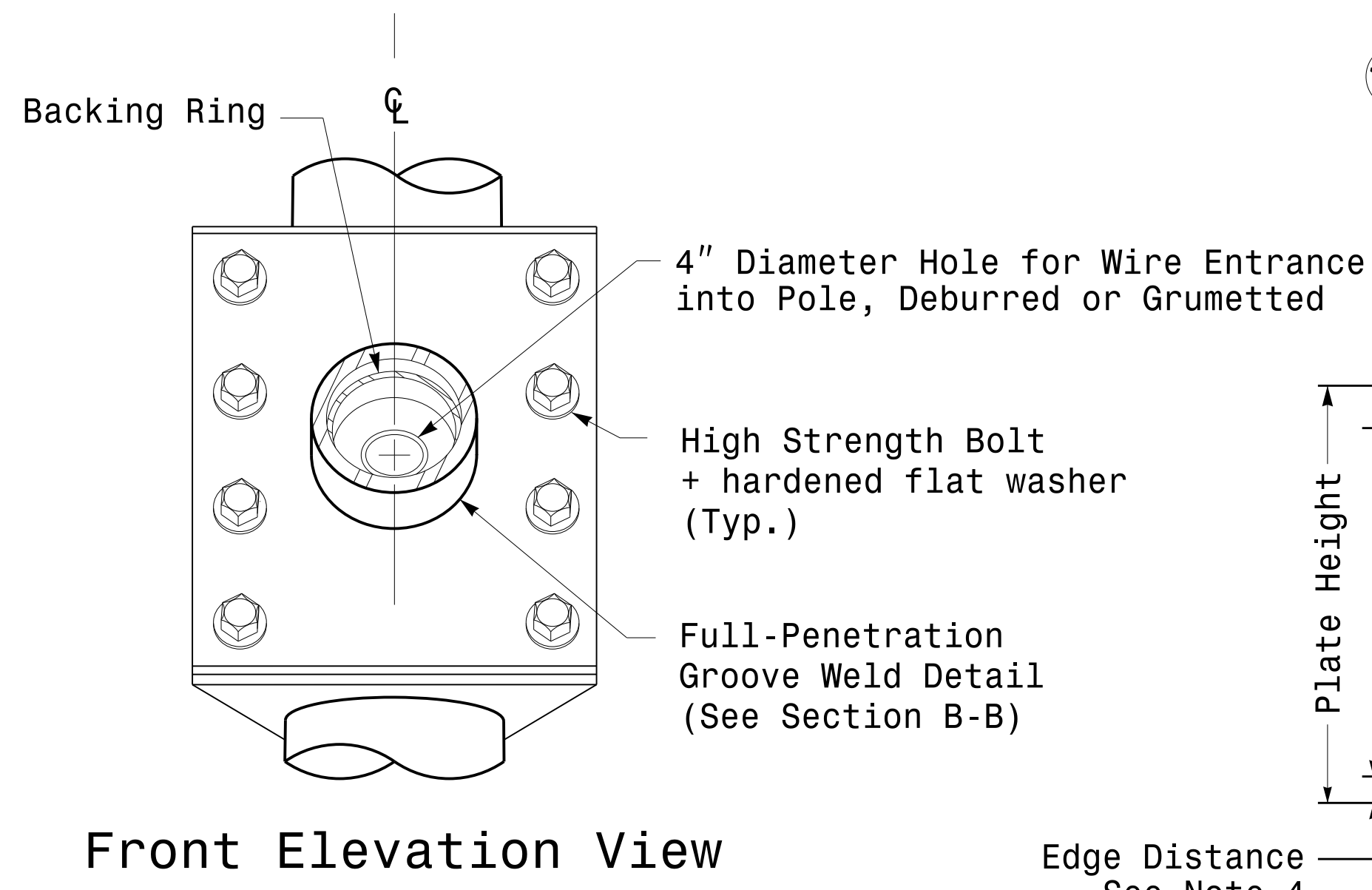
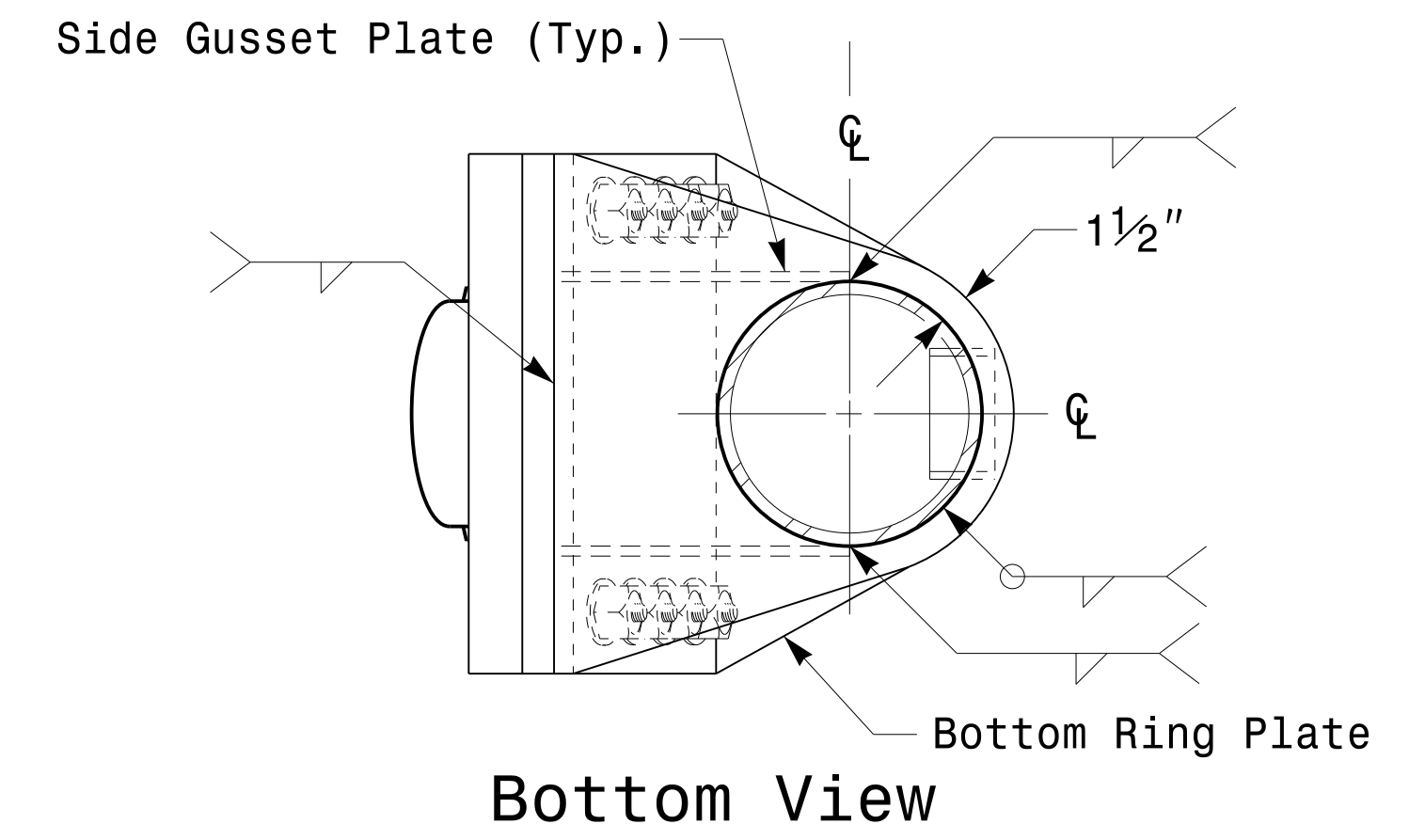
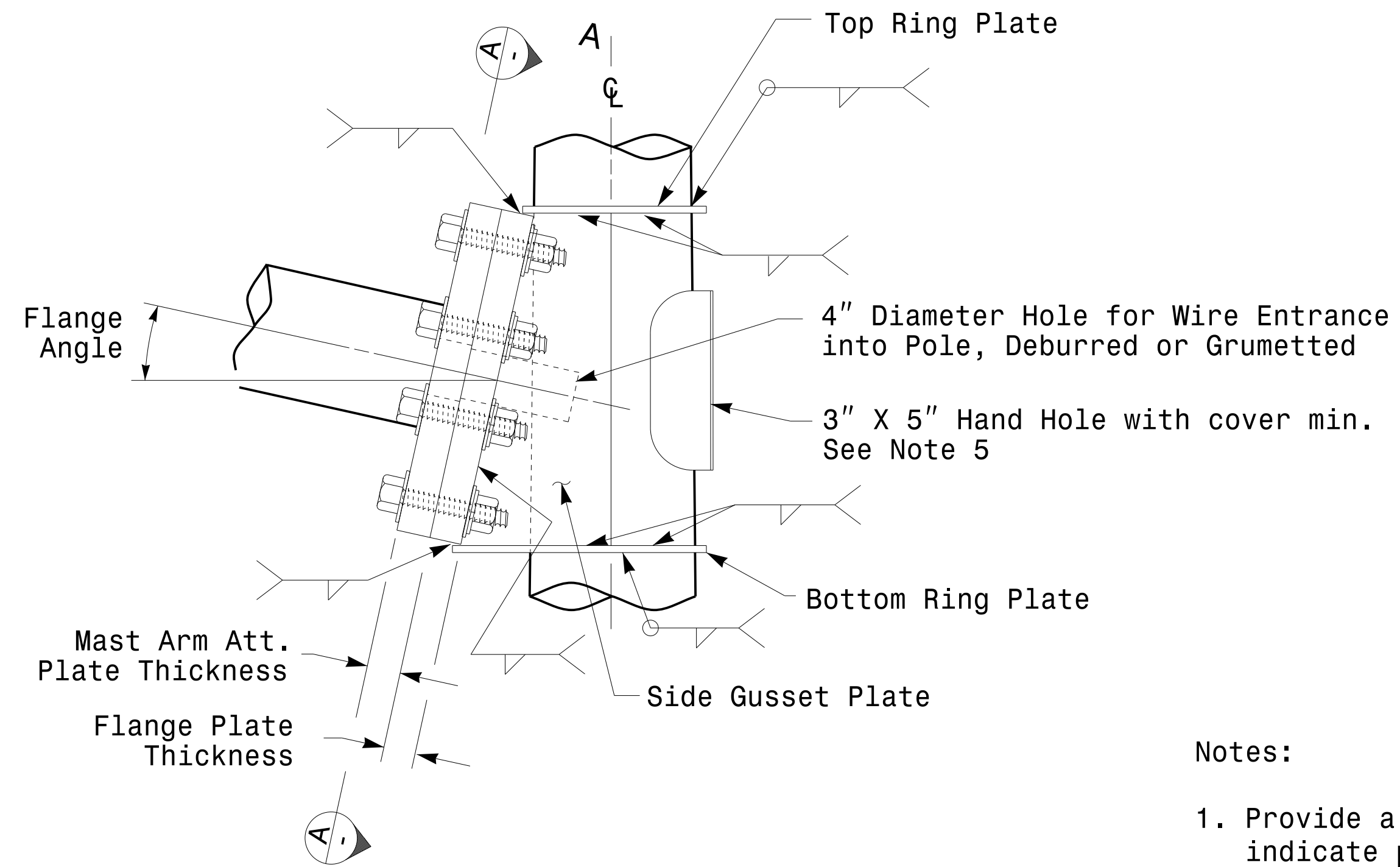
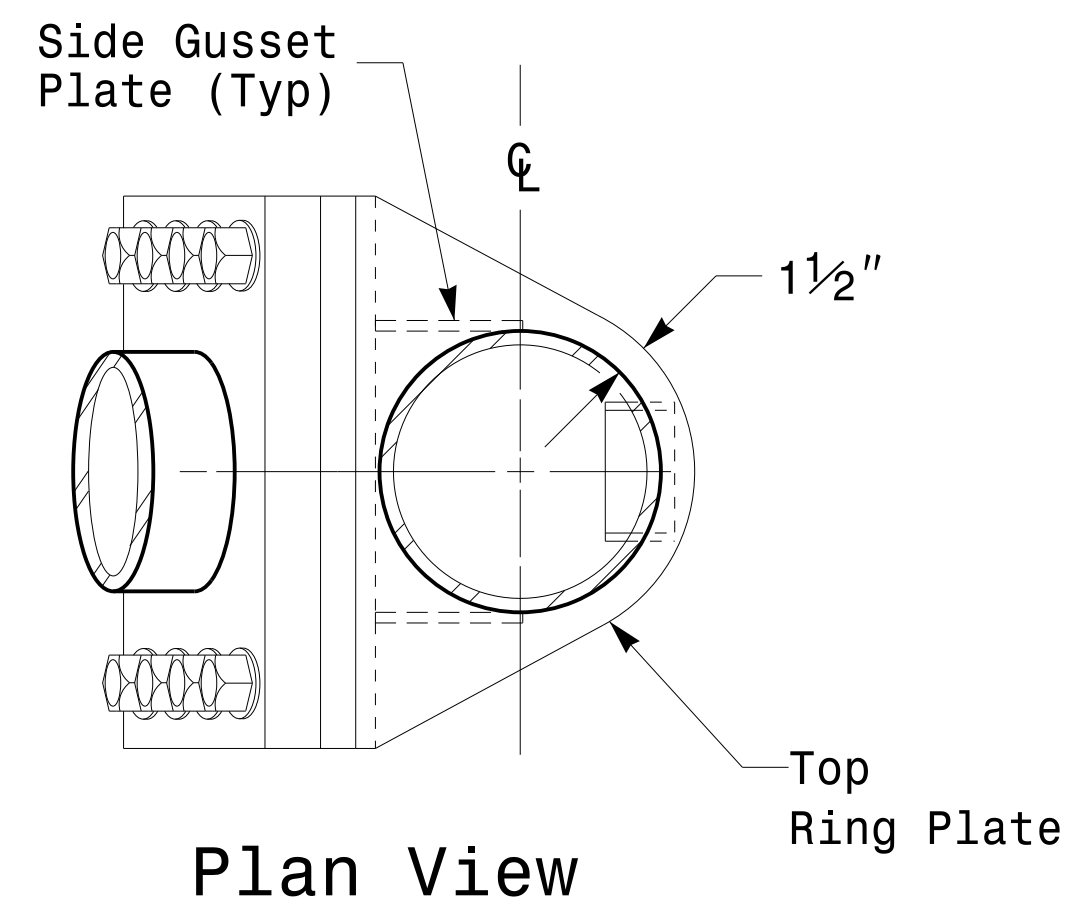
# Welded Ring Stiffened Mast Arm Connection

PROJECT ID. NO.

SHEET NO.

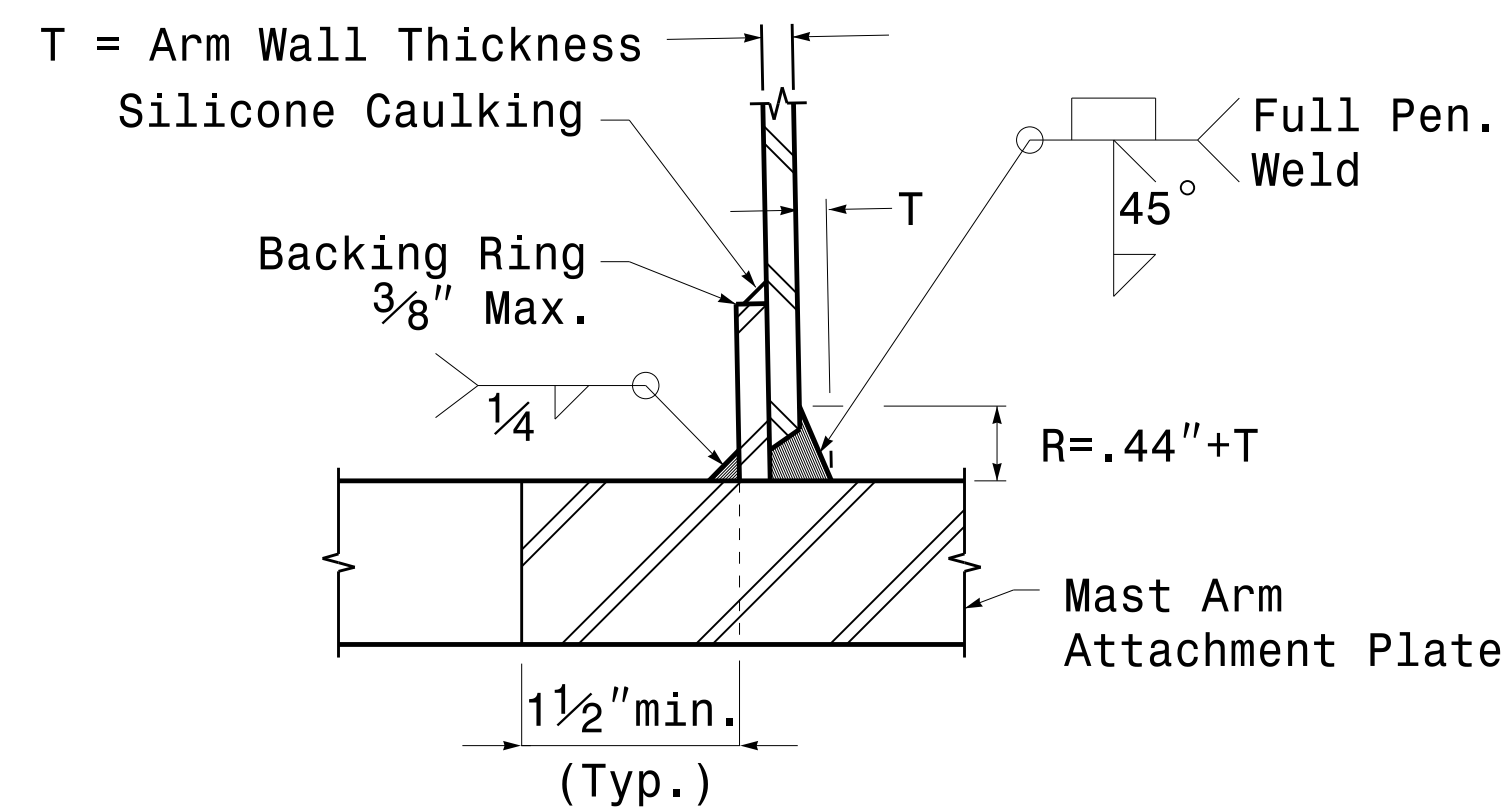
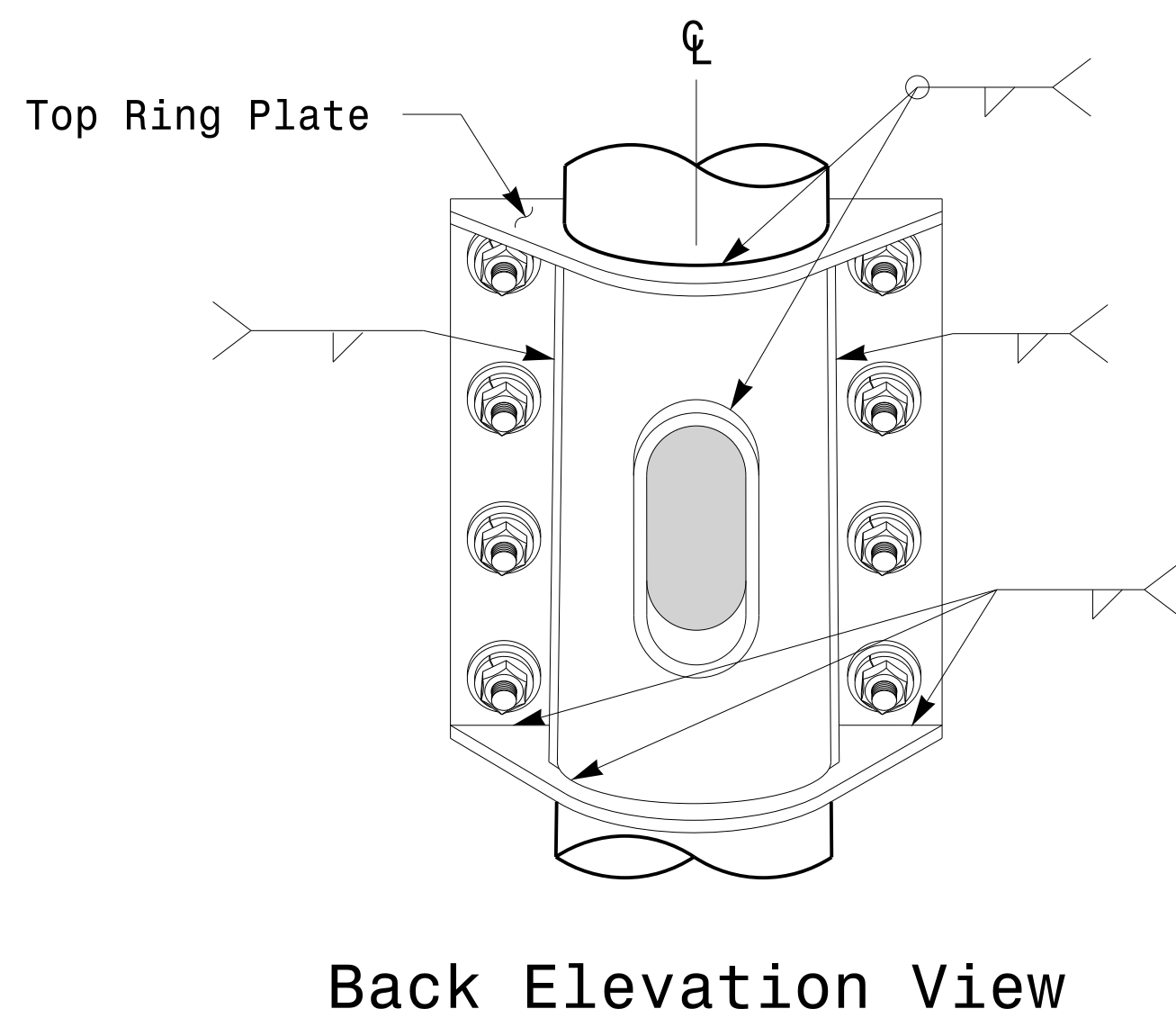
U-5828

Sig.M5



**Notes:**

1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
3. Fabricator is responsible for providing appropriate holes at drainage points to drain galvanizing materials.
4. For minimum edge distance follow AISC Table J3.4 and J3.5. For nominal bolt hole size use Table J3.3.
5. Provide upper handhole as necessary when shaft extensions are required for luminaire arms or camera. For poles without luminaires/camera, wiring can be done through the top of pole.
6. Allowable range of flange tilt angle will vary from 0° to as required.



Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 NA NONE

Typical Fabrication Details For Mast Arm Connection To Pole

PLAN DATE: FEBRUARY 2016	DESIGNED BY: C.F. ANDREWS
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

SEAL

DocuSigned by: Debesh C. Sarkar

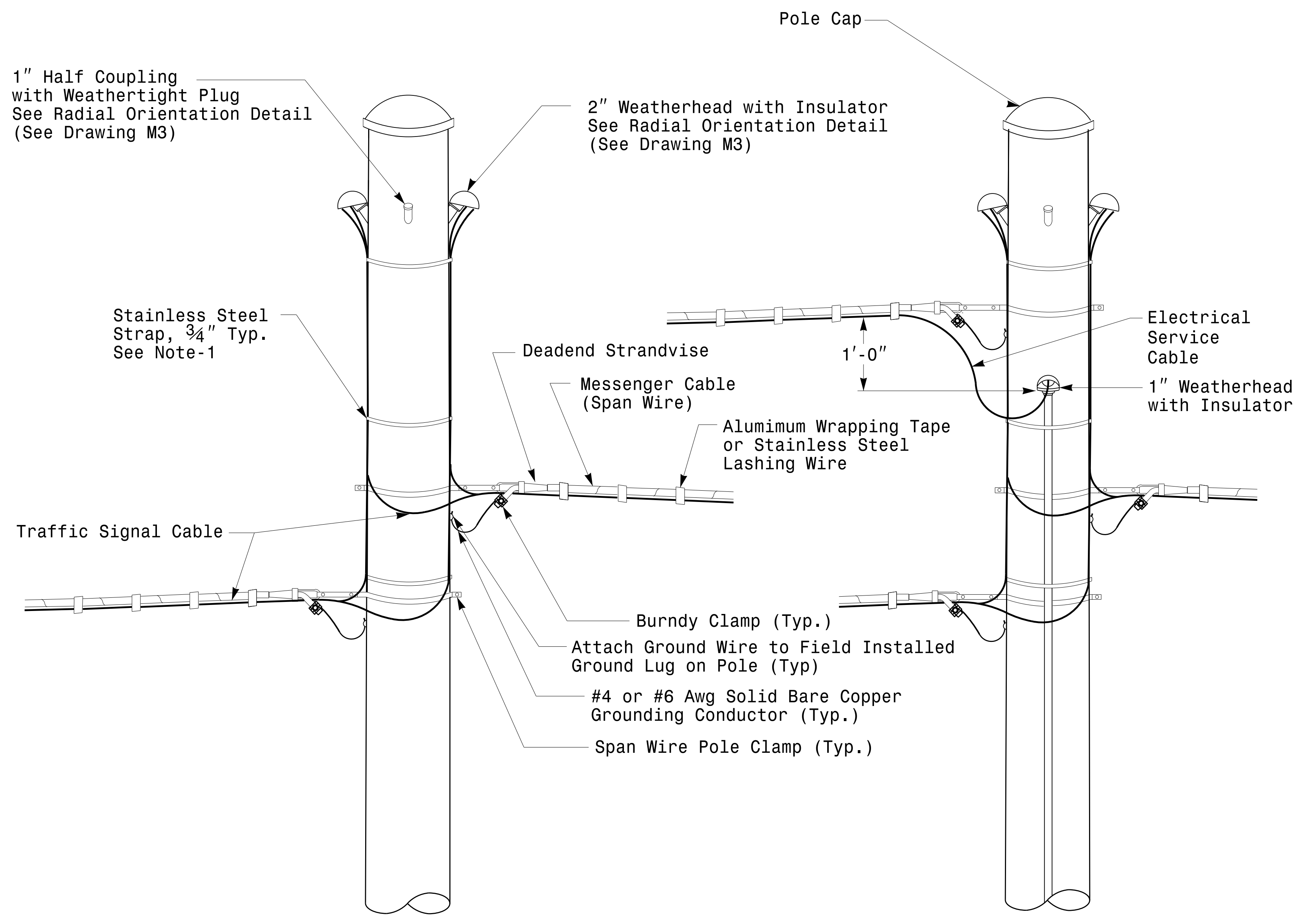
2/17/2016

DATE

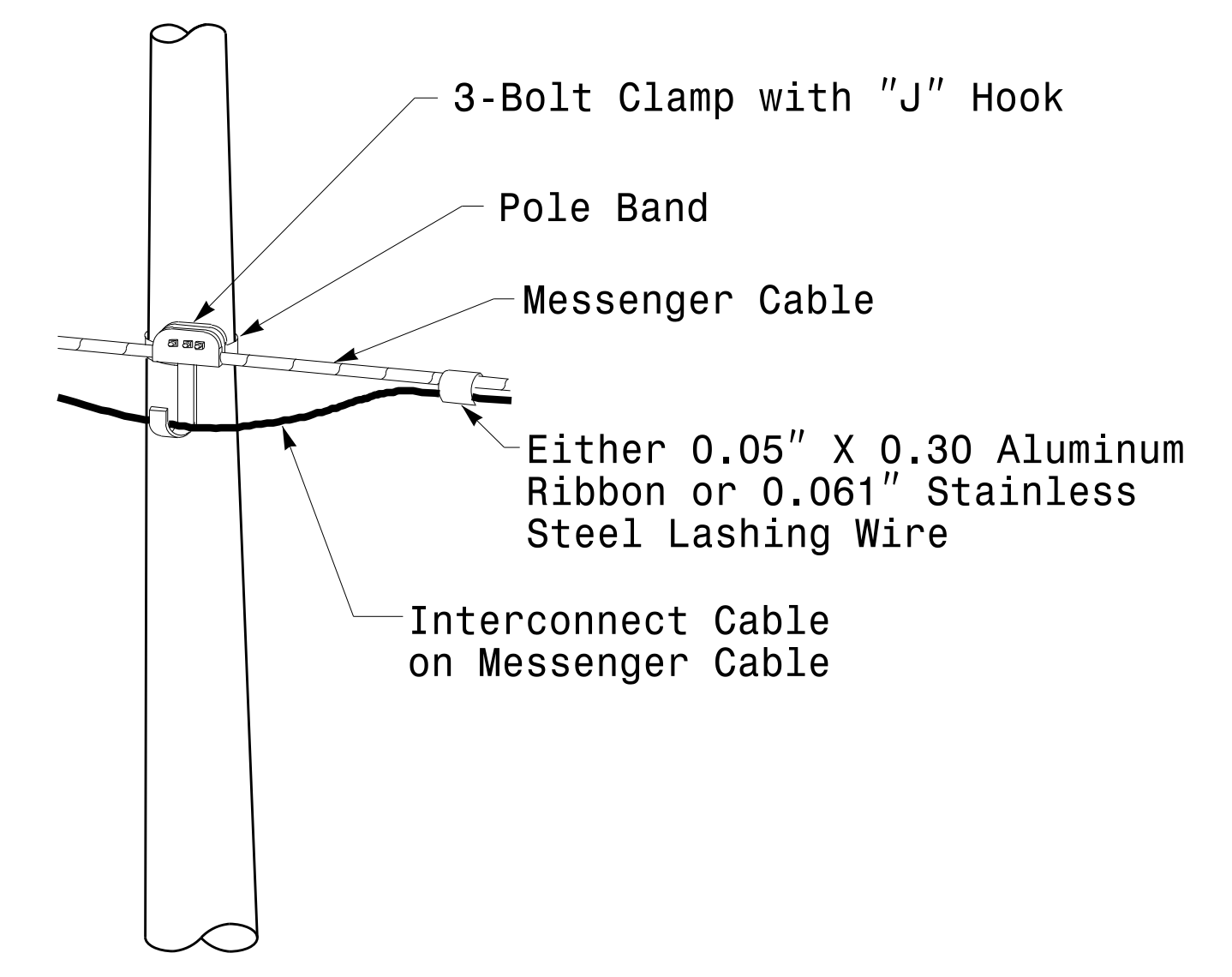
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Fabrication Details - Mast Arm Connection

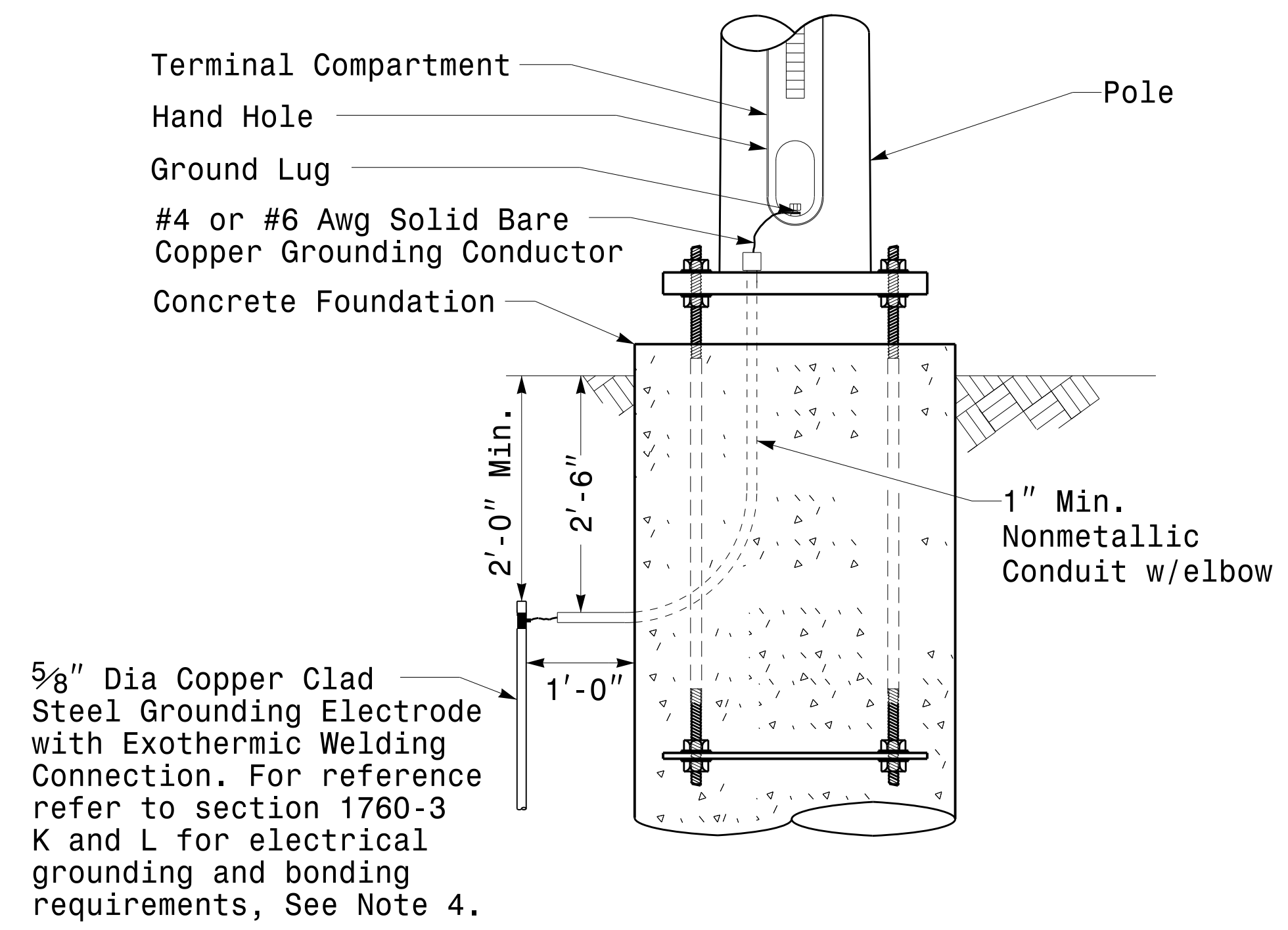




**Strain Pole Attachments**



**Attachment of Cable to Intermediate Metal Pole**



**Metal Pole Grounding Detail For Strain Pole and Mast Arm**

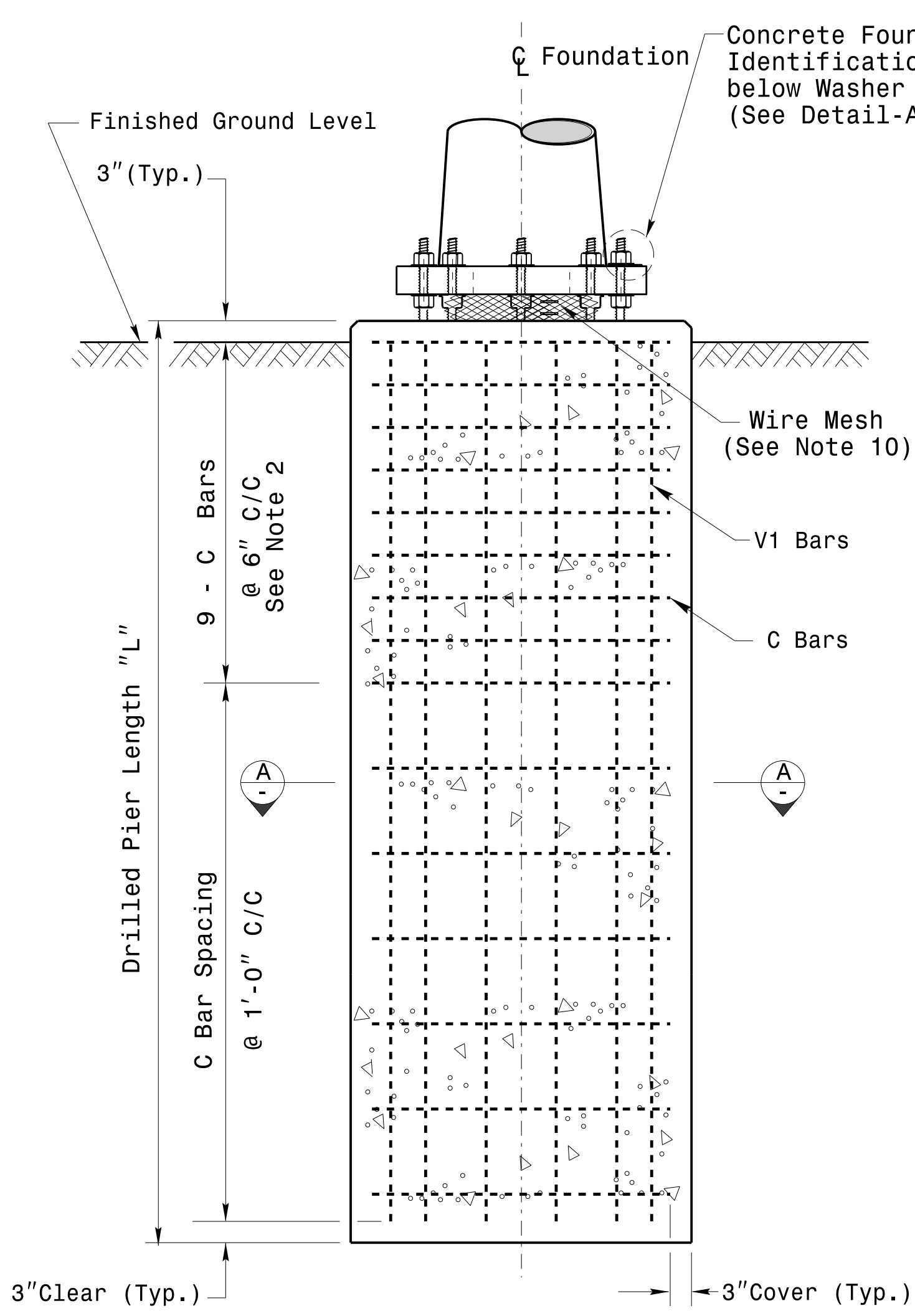
**NOTE:**

1. Strap all signal cables to the side of the pole with 3/4" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 3'-0".
2. Provide minimum two spanwire pole clamps per pole.
3. It is prohibited to attach two span wires at one pole clamp.
4. For general requirements refer to NCDOT Standard Specifications for Roadway and Structures, January 2012.

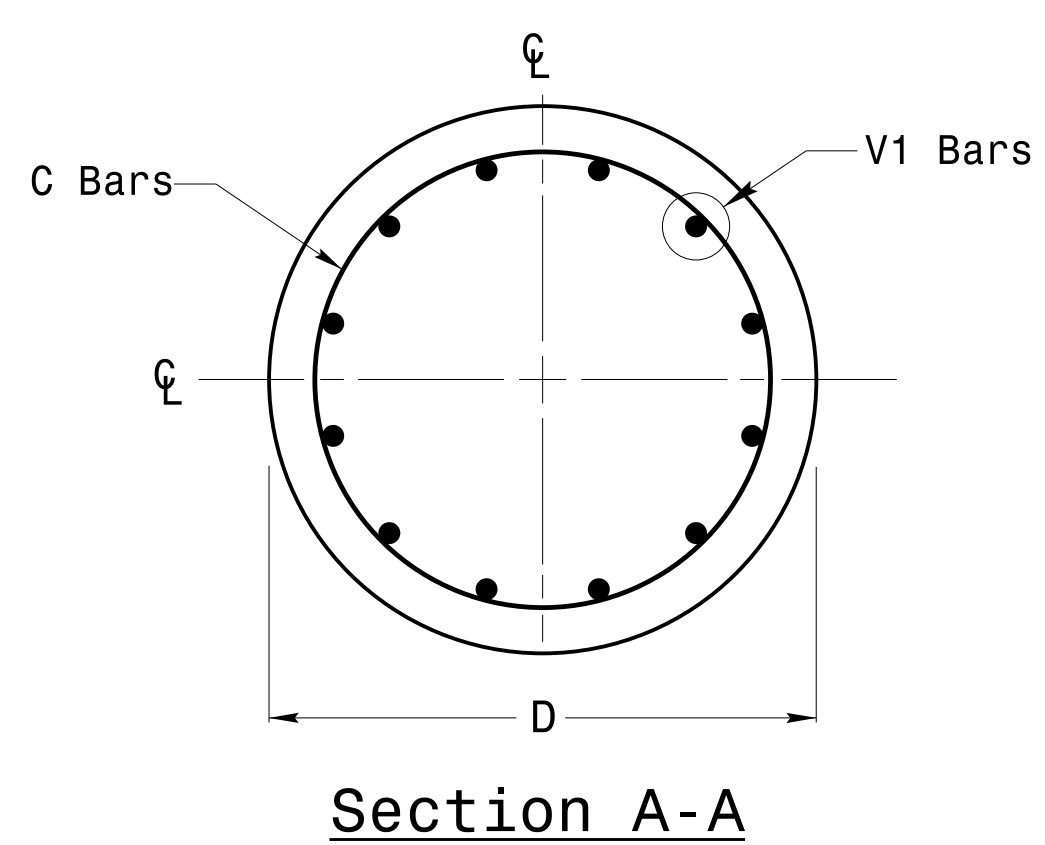
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3:01:00pm

 Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529	<b>Typical Fabrication Details For Strain Pole Attachments</b>		SEAL  DocuSigned By: <b>Devesh C. Sarkar</b> 44E8E32E147E4C4...
	PLAN DATE: FEBRUARY 2016 PREPARED BY: N. BITTING	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS:	INIT.:	DATE:

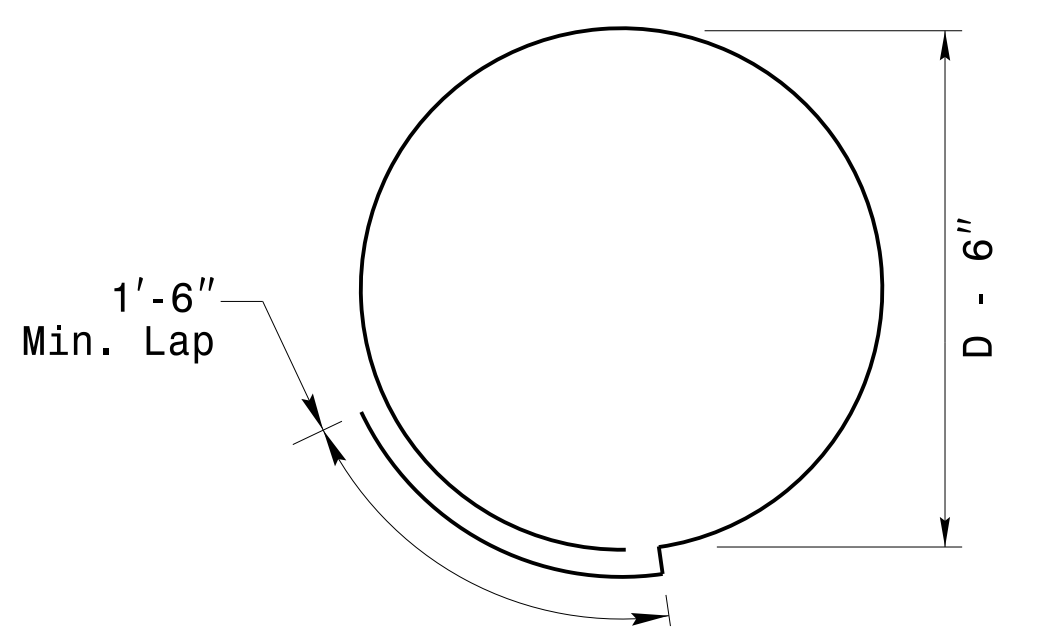




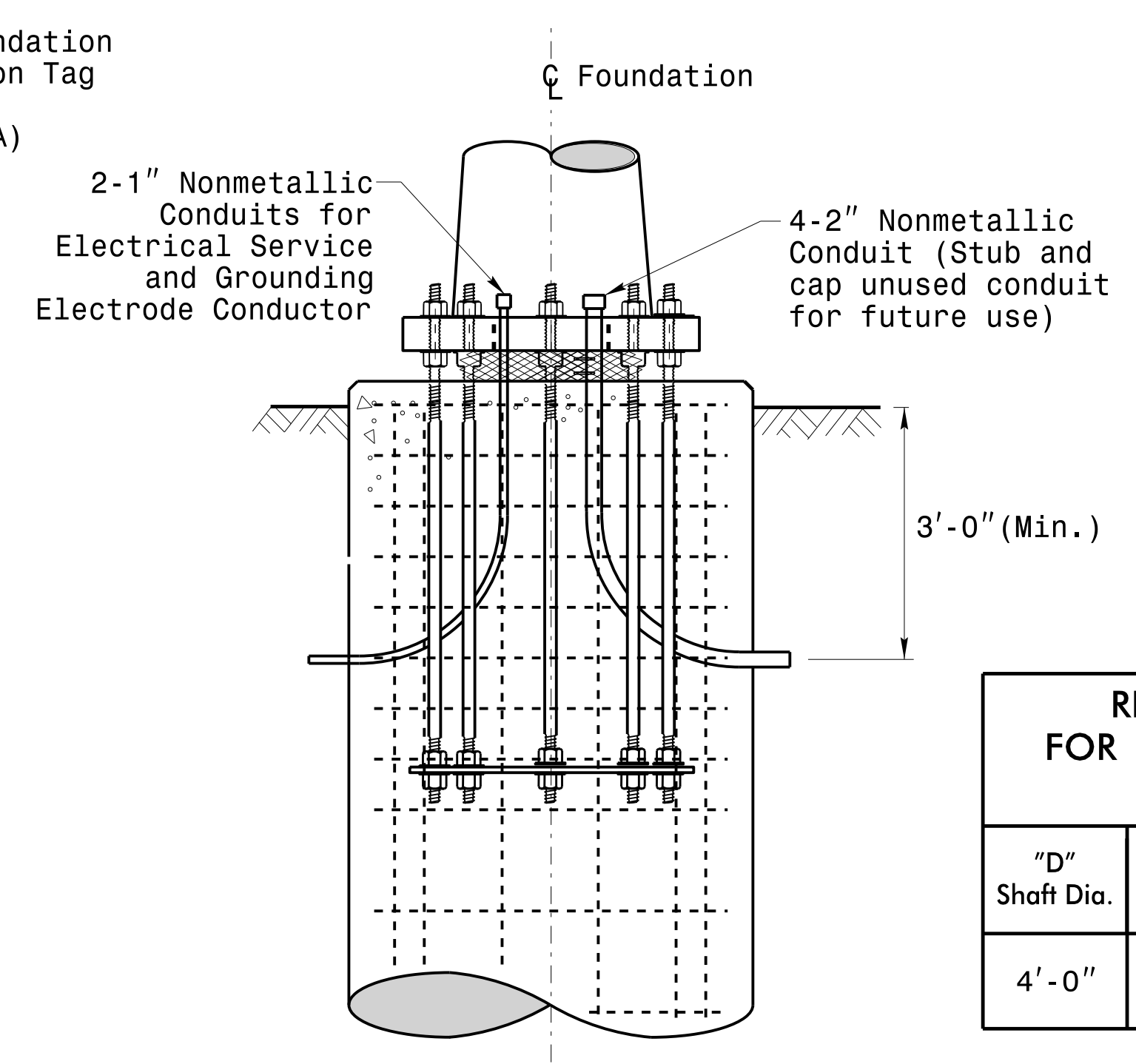
**Concrete Shaft Elevation**



**Section A-A**



**Typical "C" Bar Detail**



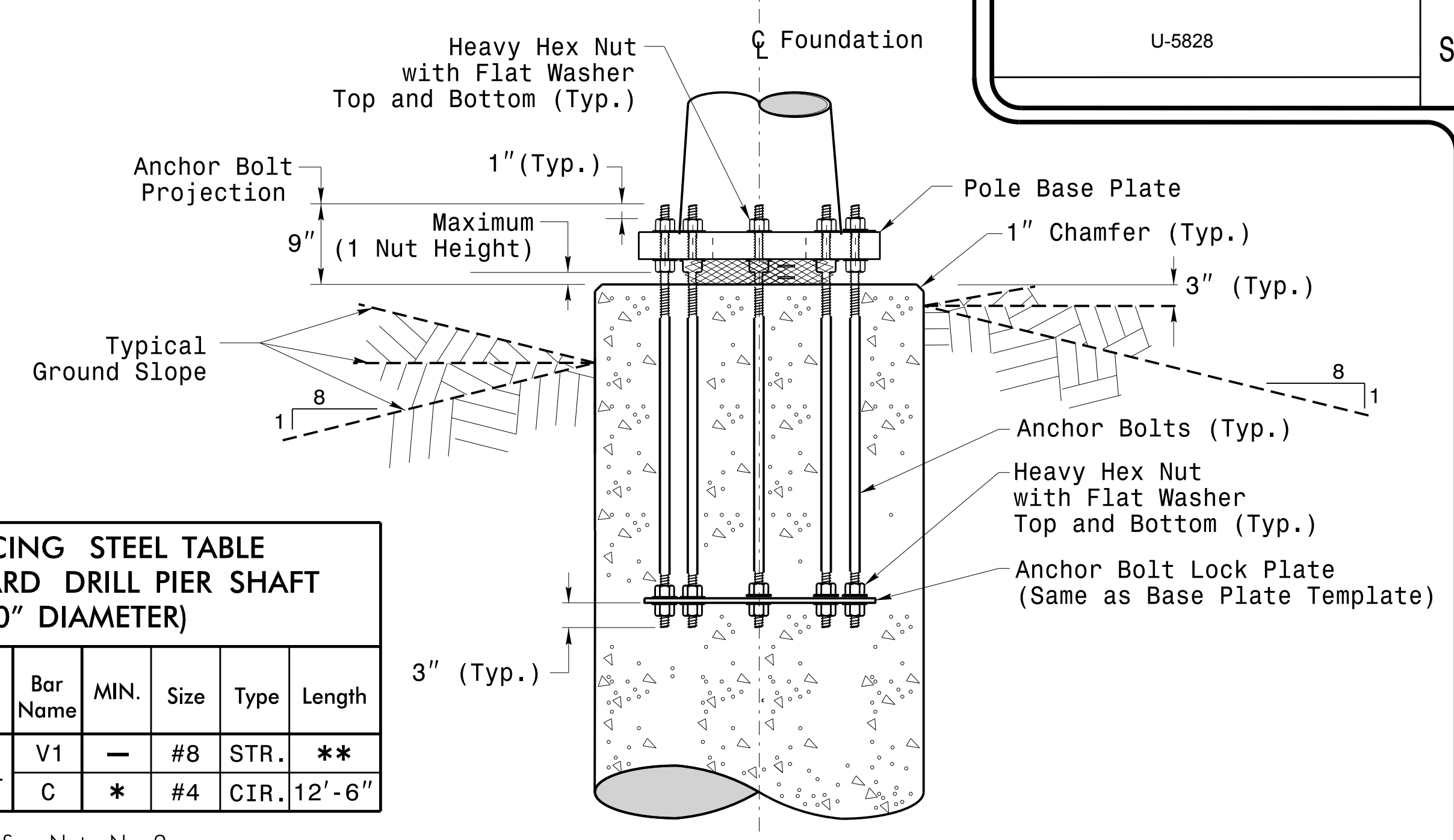
**Typical Foundation Conduit Details**

**General Notes:**

1. If actual subsurface conditions differ significantly from boring data contact the Engineer before excavating or placing concrete.
2. Circular tie reinforcing rings may be vertically adjusted by +/-3" at a depth between 2'-0" and 3'-0" to facilitate the installation of electrical conduit entering in the cage.
3. For standard foundations, see sheet Sig. M8 for details. Vertical reinforcing bars (V1) may be horizontally adjusted by +/-3" to facilitate the installation of electrical conduit entering into the cage.
4. Provide 2" to 5" foundation projection above ground level depending on the ground slope.
5. Unless otherwise shown, foundation designs are based on non-sloping level ground surfaces with slope ratios of 8:1 (H:V) or flatter. If actual ground line slopes are steeper contact the Engineer before excavating or placing concrete.
6. Construct foundations in accordance with NCDOT Standard Provisions SP09 R005- Foundations and Anchor Rod Assemblies for Metal Poles. All applicable 2012 NCDOT Standard Specifications are referenced in this provision. Refer to the NCDOT Resources/Specifications page located on the Connect NCDOT website.  
[https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx](https://connect.ncdot.gov/resources/Specifications%20and%20Special%20Provisions.aspx)
7. Use air entrained AA concrete mix with a compression strength of f'c=4500 psi.(min.) after 28 days.
8. Use ASTM A615 grade 60 deformed bars for all reinforcing steel. Maintain at least 3" cover on all reinforcement.
9. Locate the Identification Tag on the top of the base plate, directly above the conduit's entry point.
10. Provide two layers of galvanized welded 23 gauge (0.25) 6" wide 4 mesh wire around pipes under the base plate and secure it with ties if necessary.
11. Preferred location for the I.D. Tag is as shown in Detail-A; directly above the conduit entering the foundation.

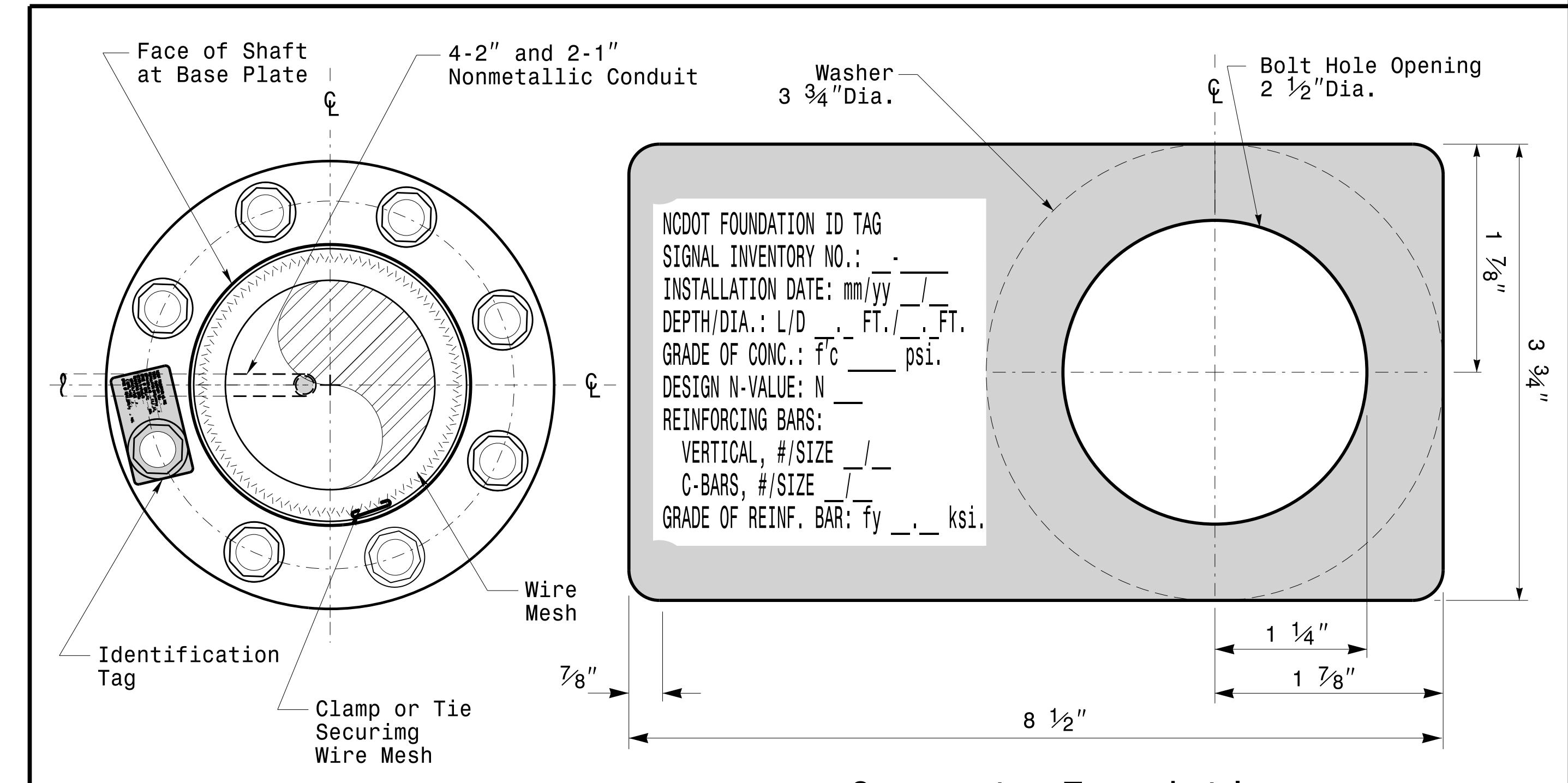
"D" Shaft Dia.	Conc. Volume (cu. yds.)	Bar Name	MIN.	Size	Type	Length
4'-0"	.465 x L	V1	-	#8	STR.	**
		C	*	#4	CIR.	12'-6"

\* See Note No. 2  
\*\* See Note No. 3



**Typical Foundation Anchor Bolt Details**

(Reinforcing Cage Not Shown for Clarity)



**Concrete Foundation Identification Tag Details**

D = Diameter  
L = Length/Depth  
mm = Month  
yy = Year

**Detail-A**

	<p>Construction Details For Foundations</p>		
	<p>PLAN DATE: FEBRUARY 2016</p>	<p>DESIGNED BY: C.B. COGDILL</p>	
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>PREPARED BY: N. BITTING</p>	<p>REVIEWED BY: D.C. SARKAR</p>	<p>DocuSigned by: <i>Debesu C. Sarkar</i></p>
<p>SCALE: NONE</p>	<p>REV. NO. 1</p>	<p>COMMENTS: Revised Foundation Top Details</p>	<p>INIT. N.B. DATE: 5/11/2015</p>
			<p>DATE: 2/17/2016</p>

**Construction Details - Foundations**

17-FEB-2016 16:11:03 TSC04W115 Stipolis\sigal Design Section\Eastern Region\m7 Sheets\2016\2014\_Sig.M7\_Shd\_Construction\_Detail\Is-Strain\_Poles.dgn



# SOIL CONDITION

PROJECT ID. NO.	SHEET NO.
U-5828	Sig.M8

		STANDARD STRAIN POLES					STANDARD FOUNDATIONS 48" Diameter Drilled Pier Length (L) - Feet							Reinforcement				
		Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Reactions at the Pole Base			Clay				Sand			Longitudinal		Stirrups	
					Axial (kip)	Shear (kip)	Moment (ft-kip)	Medium N-Value 4-8	Stiff N-Value 9-15	Very Stiff N-Value 16-30	Hard N-Value >30	Loose N-Value 4-10	Medium N-Value 11-30	Dense N-Value >30	Bar Size (#)	Quantity (ea.)	Bar Size (#)	Spacing (in.)
WIND ZONE 1	LIGHT	S26L3	26	25	2	11	270	19	13	10	8	17	14.5	12.5	8	12	4	12
		S30L3	30	25	2	11	300	19.5	13.5	10	8	17.5	15	13	8	14	4	12
		S35L3	35	25	3	11	320	20	13.5	10.5	8	17.5	15	13	8	14	4	12
	HEAVY	S30H3	30	29	3	16	450	24.5	16	12	9	21	17.5	15	8	16	4	6
		S35H3	35	29	4	16	515	26	17	12.5	9.5	22	18.5	16	8	16	4	6
WIND ZONE 2	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
WIND ZONE 3	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
WIND ZONE 4	LIGHT	S26L1	26	22	2	8	190	16	11.5	8.5	8	15	12.5	11	8	12	4	12
		S30L1	30	22	2	8	205	16.5	11.5	9	8	15	13	11.5	8	12	4	12
		S35L1	35	22	3	8	230	17	12	9	8	15.5	13.5	11.5	8	12	4	12
	HEAVY	S30H1	30	25	3	12	320	20.5	13.5	10.5	8	18	15	13.5	8	16	4	6
		S35H1	35	25	4	12	350	21	14	10.5	8.5	18.5	15.5	13.5	8	16	4	6
WIND ZONE 5	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6

**General Notes:**

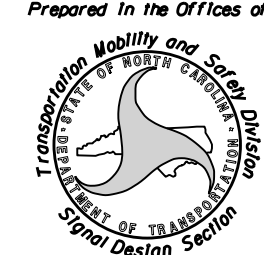

1. Values shown in the "Reactions at the Pole Base" column represent the minimum acceptable capacity allowed for design using a design CSR of 1.00.
2. Use chairs and spacers to maintain proper clearance.
3. For foundation, always use air-entrain concrete mix.

**Foundation Selection:**

1. Perform a standard penetration test at each proposed foundation site to determine "N" value.
2. Select the appropriate wind zone from M 1 drawing.
3. Select the soil type (Clay or Sand) that best describes the soil characteristics.
4. Get the appropriate standard pole case number from the plans or from the Engineer.
5. Select the appropriate column under "Standard Foundations" based on soil type and "N" value. Select the appropriate row based on the pole load case.
6. The foundation depth is the value shown in the "Standard Foundations" category where the column and the row intersect.
7. Use Construction Procedures and Design Methods prescribed by FHWA-NHI-10-016 for Reference Drilled Shafts.

**Standard Strain Pole Foundation-All Soil Condition**

48" Dia. Foundations Concrete Volume (cubic yards) = (0.465) x Drilled Pier Length

 Prepared in the Office of: Transportation Mobility and Safety Division North Carolina Department of Transportation Design Section 750 N. Greenfield Pkwy, Corner, NC 27529	<b>Standard Strain Pole Foundation for All Soil Conditions</b>	 SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 028094 DEBESH C. SARKAR
PLAN DATE: FEBRUARY 2016    DESIGNED BY: C.B. COGDILL PREPARED BY: N. BITTING    REVIEWED BY: D.C. SARKAR	REVISIONS Changed "Foundation Depth" to "Drilled Pier Length" in Conc. Egn.    N.B.    7/12/2015	
SCALE: 0 NA NONE	DocuSigned by: Debes C. Sarkar    2/17/2016 SIGNATURE    DATE 44E8E32E147E4C4...	

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- 1 INSTALL REA, PE - 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 2 INSTALL REA, PE - 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 3 INSTALL REA, PE - 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 4 INSTALL SMFO CABLE
- 5 INSTALL MMFO CABLE
- 6 INSTALL FIBER OPTIC DROP CABLE
- 7 INSTALL TRACER WIRE
- 8 TRENCH OR PLOW
- 9 INSTALL PVC CONDUIT
- 10 INSTALL RIGID, GALVANIZED STEEL CONDUIT
- 11 INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
- 12 INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
- 13 INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
- 14 INSTALL POLYETHYLENE CONDUIT
- 15 DIRECTIONAL DRILL CONDUIT
- 16 BORE AND JACK CONDUIT
- 17 INSTALL CABLE(S) IN EXISTING CONDUIT
- 18 INSTALL CABLE(S) IN NEW CONDUIT
- 19 INSTALL CABLE(S) IN EXISTING RISER
- 20 INSTALL CABLE(S) IN NEW RISER
- 21 INSTALL CABLE(S) IN EXISTING CONDUIT STUB-OUTS
- 22 INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
- 23 INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
- 24 INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
- 25 INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
- 26 TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 27 INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 28 INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
- 29 INSTALL UNDERGROUND SPLICE ENCLOSURE
- 30 MODIFY EXISTING SPLICE ENCLOSURE
- 31 INSTALL POLE MOUNTED SPLICE CABINET
- 32 INSTALL BASE MOUNTED SPLICE CABINET
- 33 REMOVE EXISTING SPLICE CABINET

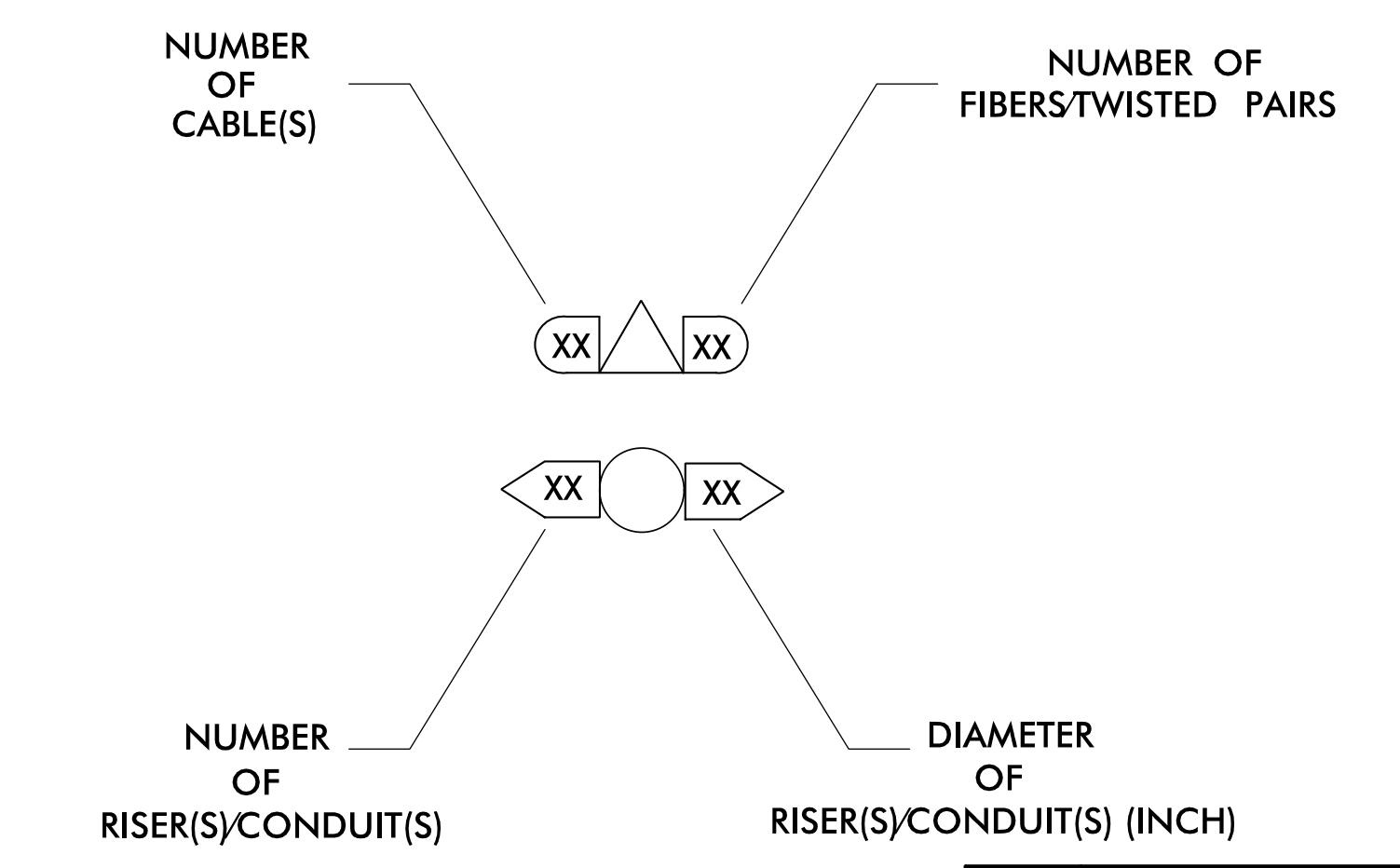
- 34 INSTALL CABINET FOUNDATION
- 35 REMOVE EXISTING CABINET FOUNDATION
- 36 INSTALL CCTV CAMERA ASSEMBLY
- 37 INSTALL CCTV CAMERA WOOD POLE
- 38 INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
- 39 INSTALL JUNCTION BOX
- 40 INSTALL OVERSIZED JUNCTION BOX
- 41 REMOVE EXISTING JUNCTION BOX
- 42 INSTALL WOOD POLE
- 43 REMOVE EXISTING WOOD POLE
- 44 INSTALL AERIAL GUY ASSEMBLY
- 45 INSTALL STANDARD GUY ASSEMBLY
- 46 INSTALL SIDEWALK GUY ASSEMBLY
- 47 INSTALL MESSENGER CABLE
- 48 REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
- 49 REMOVE EXISTING MESSENGER CABLE
- 50 INSTALL TELEPHONE SERVICE
- 51 INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
- 52 INSTALL DELINEATOR MARKER
- 53 STORE 30 FEET OF COMMUNICATIONS CABLE
- 54 LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
- 55 LASH CABLE(S) TO EXISTING MESSENGER CABLE
- 56 LASH CABLE(S) TO NEW MESSENGER CABLE
- 57 MODIFY EXISTING ELECTRICAL SERVICE
- 58 INSTALL NEW ELECTRICAL SERVICE
- 59 INSTALL NEW FIELD ETHERNET SWITCH
- 60 BACK PULL EXISTING COMMUNICATIONS CABLE

**LEGEND**

- NEW FIBER OPTIC COMMUNICATIONS CABLE
- NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXISTING COMMUNICATIONS CABLE
- EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- NEW DIRECTIONAL DRILLED CONDUIT
- NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING SPLICE ENCLOSURE
- NEW SPLICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV ASSEMBLY
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- EXISTING SPLICE CABINET
- NEW SPLICE CABINET
- SIGNAL POLE
- SIGNAL INVENTORY NUMBER

**CONSTRUCTION NOTE SYMBOLOGY KEY**

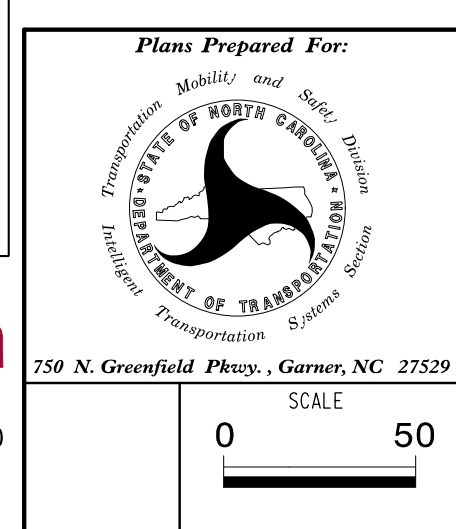
- INDICATES NUMBER OF CABLES, LOOPS, ETC.
- INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



K:\RAL\_Roadway\012108004 - MCR\Imon Parkway\Phase 1\WPLANS\Signal\636 - Cable Routing\Misc\me\_SCP\_psh1.dgn 9/21/2016 9:39:13 AM susan.pennington

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*[Signature]*  
ITS & Signals Unit

PLANS PREPARED IN THE OFFICE OF:  
**Kimley Horn**  
750 N. Greenfield Place, Garner, NC 27529  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000

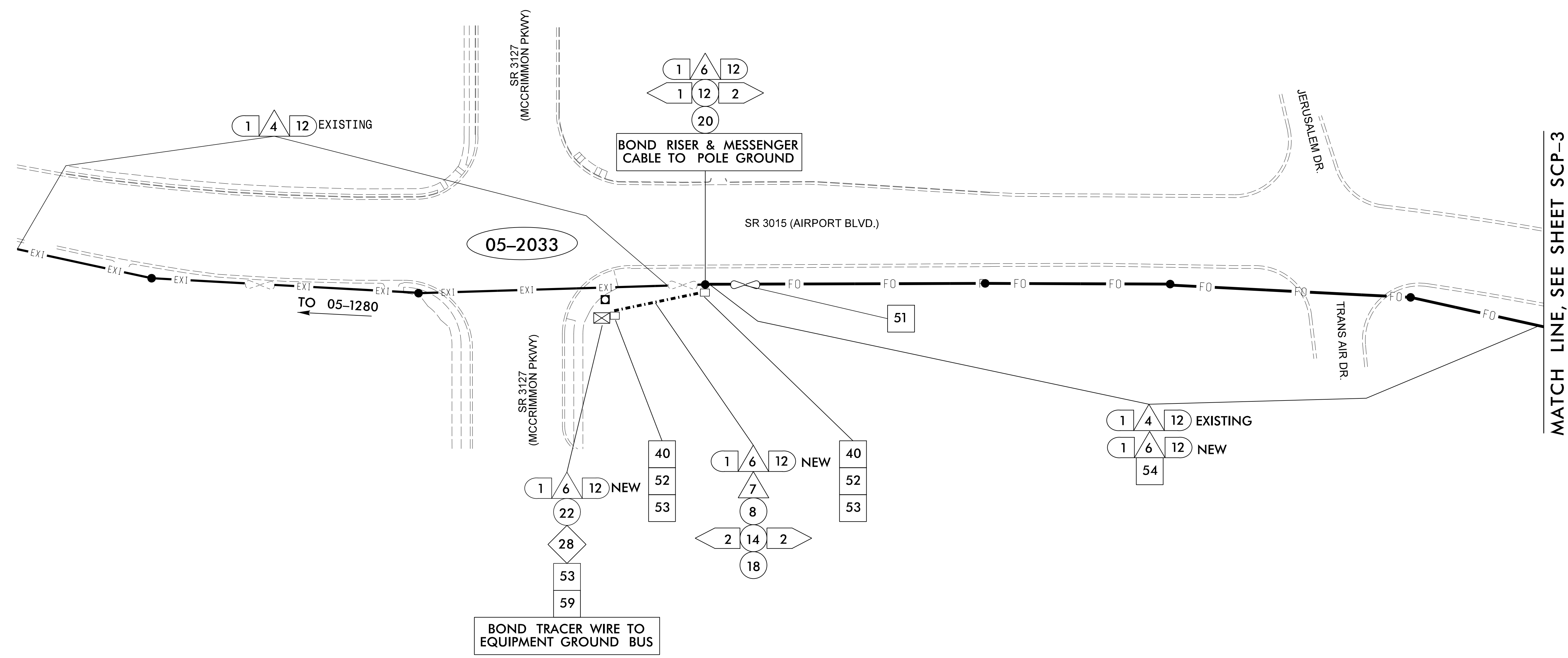


CONSTRUCTION NOTES	
DIVISION 05 MORRISVILLE	WAKE COUNTY
PLAN DATE: APRIL 2016	REVIEWED BY: T HONEYCUTT
PREPARED BY: SP PENNINGTON	REVIEWED BY: K. SMITH
REVISIONS	INIT. DATE

SEAL  
NORTH CAROLINA PROFESSIONAL ENGINEER  
TAYLOR A. HONEYCUTT  
SEAL 043814  
DocuSigned by:  
*Taylor Honeycutt* 9/22/2016  
SIGNATURE DATE  
CADD File name:

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



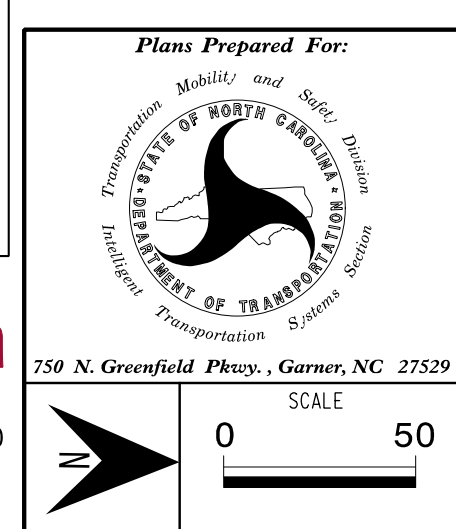


MATCH LINE, SEE SHEET SCP-3

K:\RAL\_Roadway\012108004 - MCCRimmon Parkway\Phase 1\PLANS\Signal\516 - Cable Routing\MCCr-im2\_SCP\_psr2.dgn  
9/21/2016 9:39:21 AM susan.pennington

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
Designed by: *[Signature]*  
ITS & Signals Unit

PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
NC License #F-0102  
421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
(919) 677-2000



**COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN**

DIVISION 05 MORRISVILLE WAKE COUNTY

PLAN DATE: APRIL 2016 REVIEWED BY: T HONEYCUTT

PREPARED BY: SP PENNINGTON REVIEWED BY: K. SMITH

REVISIONS	INIT.	DATE

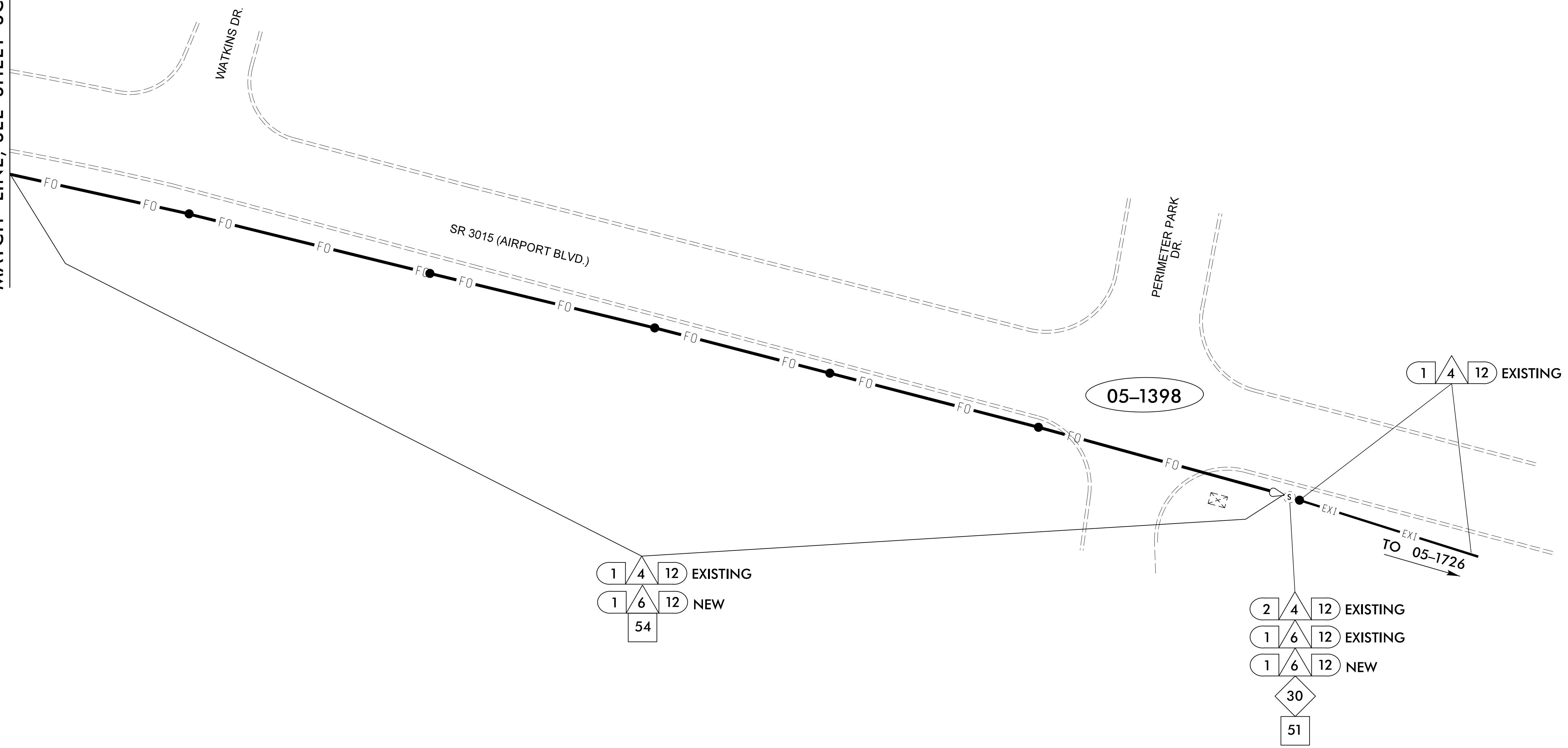
SEAL

*[Signature]*  
Taylor A. Honeycutt  
9/22/2016  
DATE

CADD Filename:

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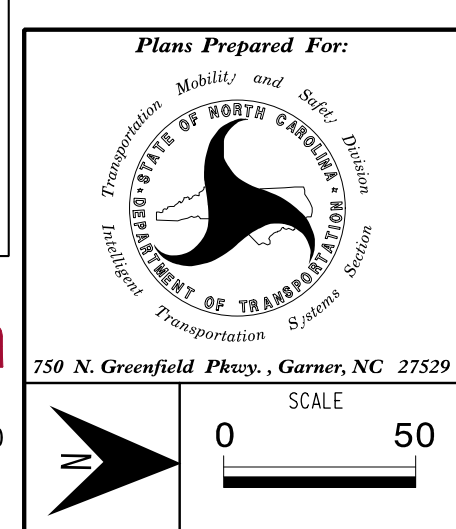
MATCH LINE, SEE SHEET SCP-2



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NC Dept of Transportation  
 Division of Highways  
 10/10/2016  
 Final Drawing Date:  
*Robert J. Duh*  
 ITS & Signals Unit

PLANS PREPARED IN THE OFFICE OF:  
**Kimley»Horn**  
 421 Fayetteville Street, Suite 600  
 Raleigh, NC 27601  
 (919) 677-2000

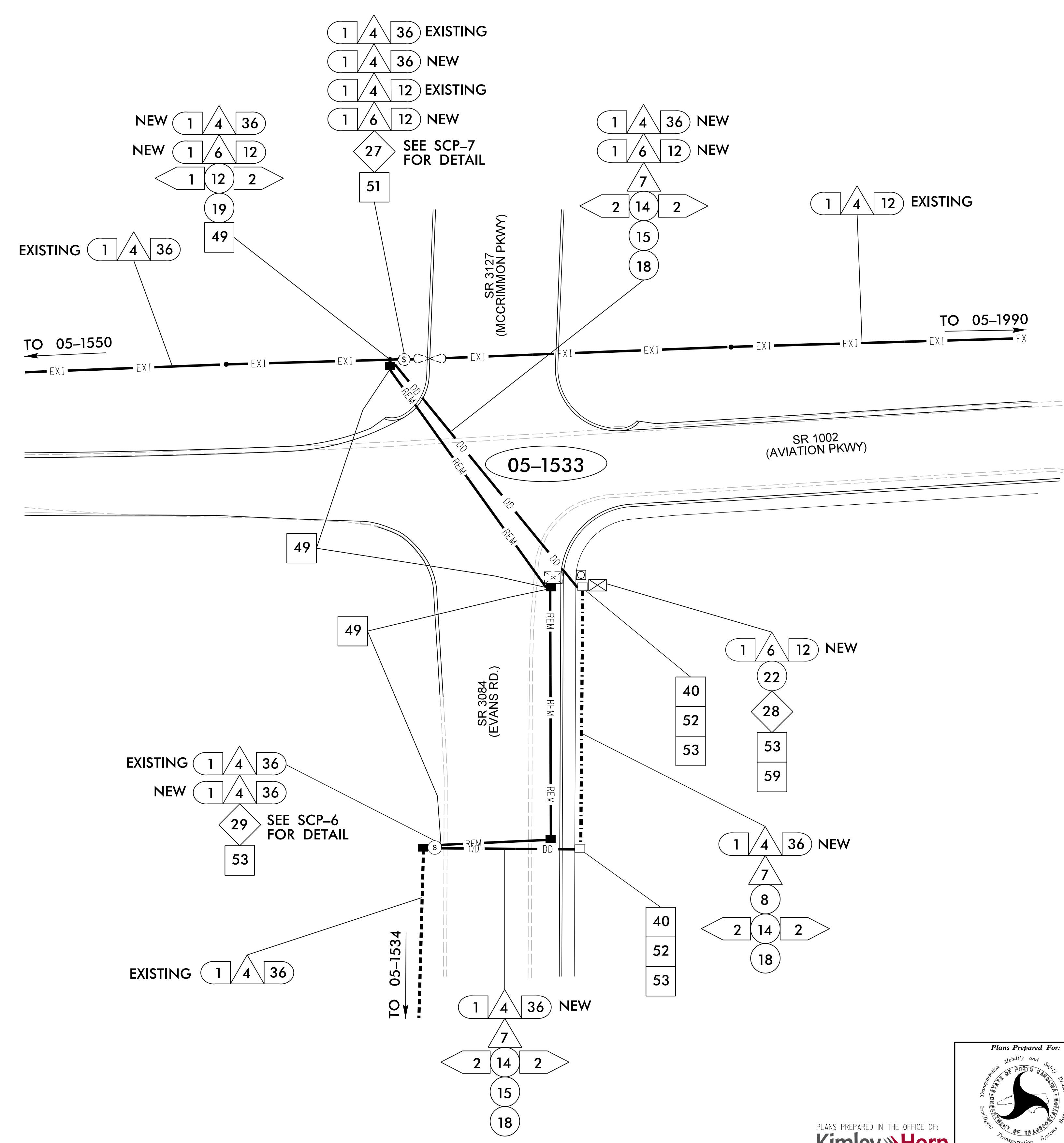


COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN			
DIVISION 05	MORRISVILLE	WAKE COUNTY	
PLAN DATE:	APRIL 2016	REVIEWED BY:	T. HONEYCUTT
PREPARED BY:	SP PENNINGTON	REVIEWED BY:	K. SMITH
REVISIONS	INIT.	DATE	

SEAL  
 NORTH CAROLINA  
 PROFESSIONAL  
 SEAL  
 043814  
 TAYLOR A. HONEYCUTT  
 ENGINEER  
 DocuSigned by:  
*Taylor Honeycutt*/22/2016  
 SIGNATURE DATE  
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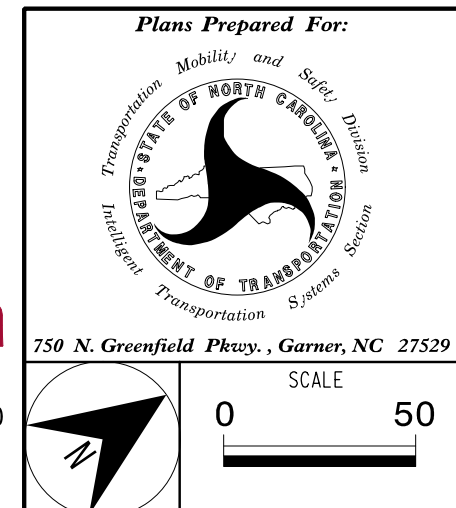


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NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
  
 TAYLOR A. HONEYCUTT  
 ITS & Signals Unit

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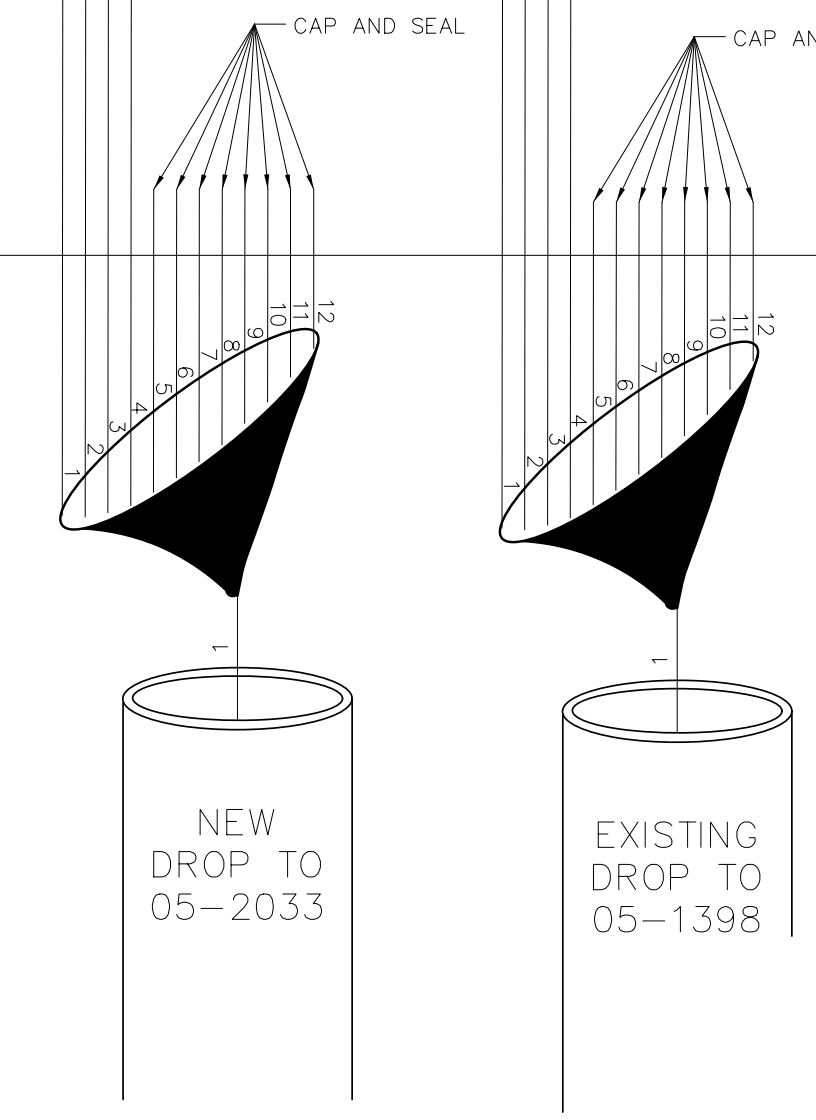
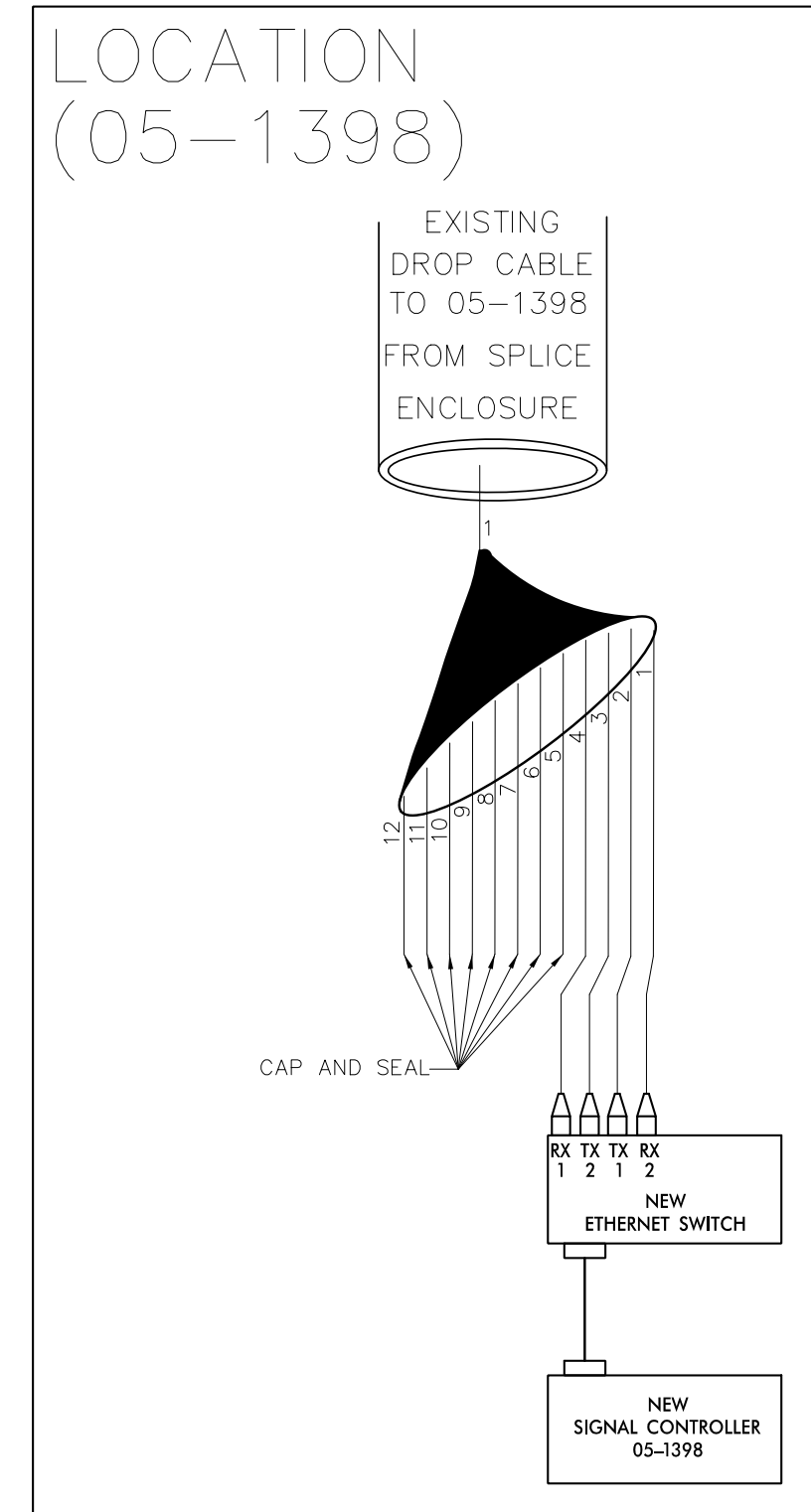
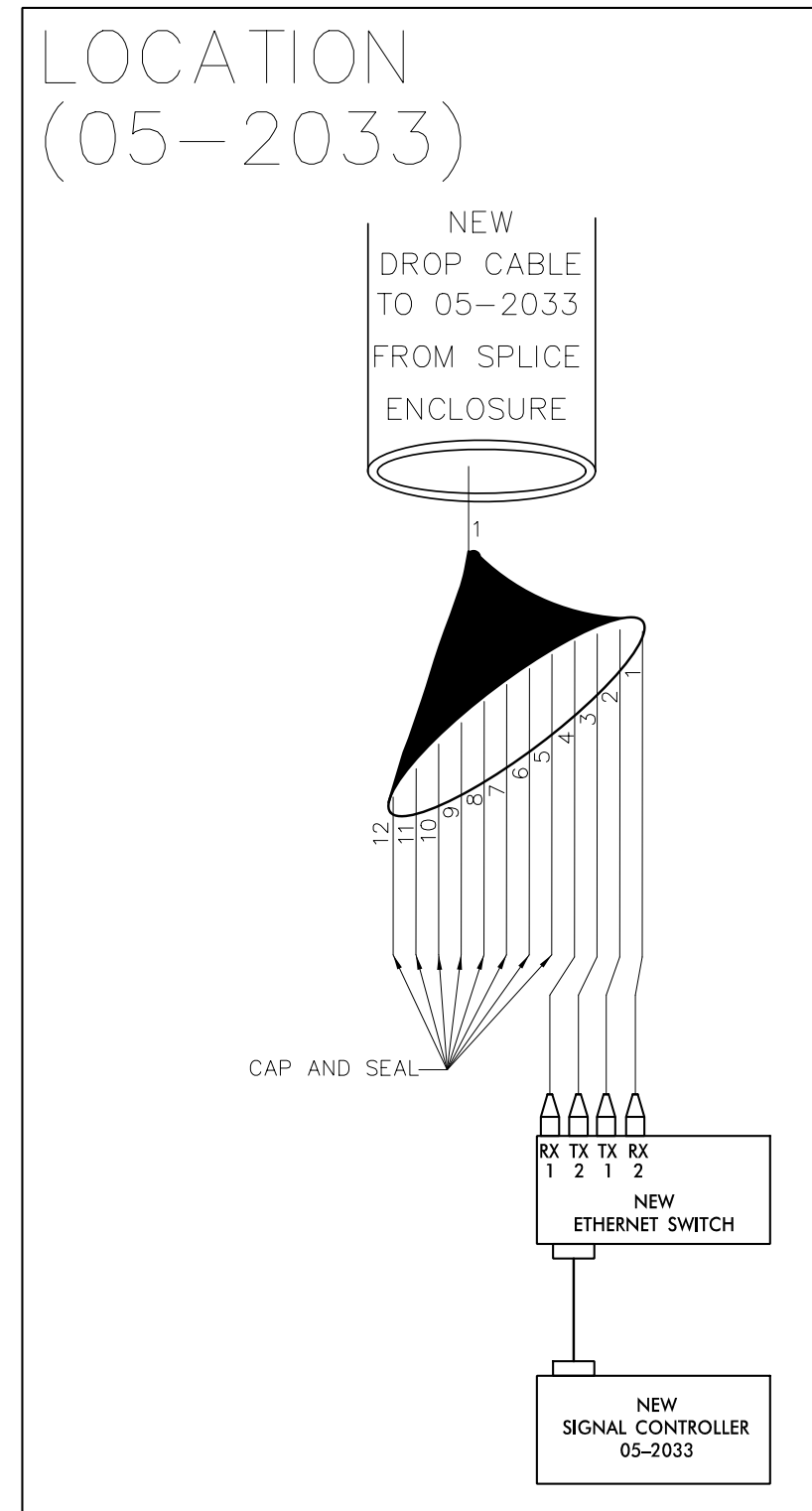
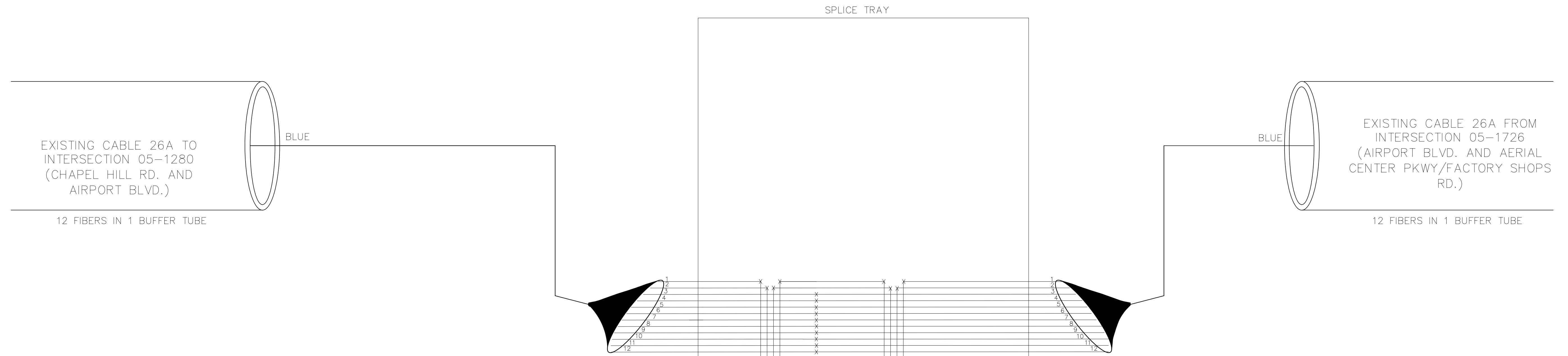
PLANS PREPARED IN THE OFFICE OF:  
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<b>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN</b>	
DIVISION 05	MORRISVILLE WAKE COUNTY
PLAN DATE: APRIL 2016	REVIEWED BY: T. HONEYCUTT
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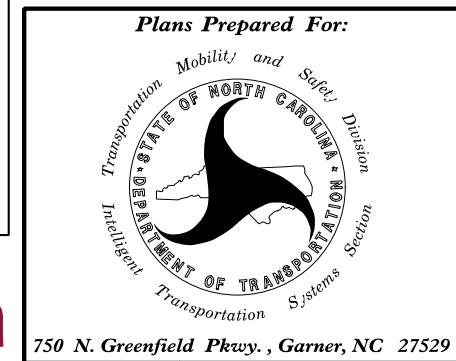
SEAL  
 NORTH CAROLINA  
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 SEAL  
 043814  
 TAYLOR A. HONEYCUTT  
 ENGINEER  
 DocuSigned by:  
 Taylor Honeycutt/22/2016  
 SIGNATURE DATE  
 CADD File name:

# EXISTING SPLICE ENCLOSURE AT 05-2033 AIRPORT BLVD. AND McCRIMMON PARKWAY CHANNEL 26



NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
Designed by: *Paul J. Suh*  
ITS & Signals Unit

PLANS PREPARED IN THE OFFICE OF:  
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SPLICING DETAIL			
DIVISION 05	MORRISVILLE	WAKE COUNTY	
PLAN DATE: APRIL 2016	REVIEWED BY: T HONEYCUTT		
PREPARED BY: SP PENNINGTON	REVIEWED BY: K. SMITH		
REVISIONS	INIT.	DATE	

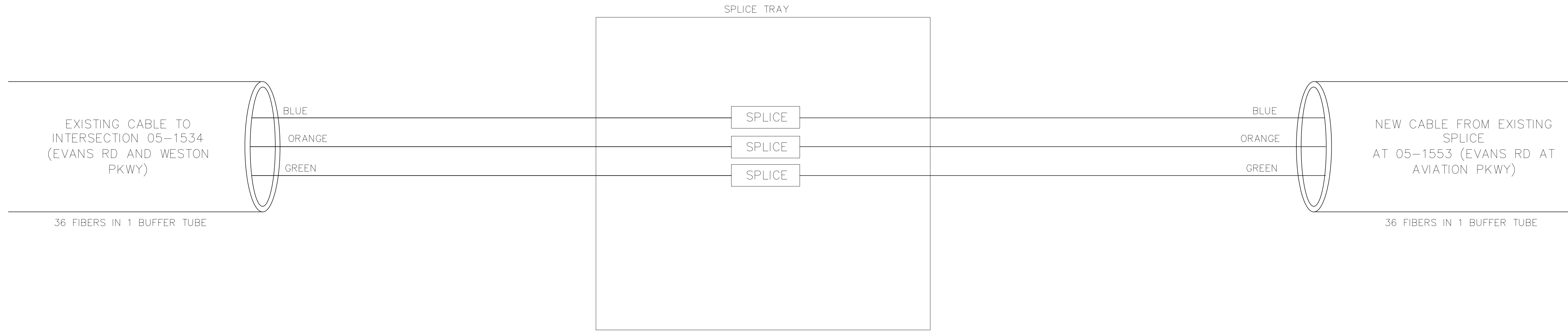
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PROFESSIONAL  
SEAL  
043814  
TAYLOR A. HONEYCUTT  
ENGINEER  
DocuSigned by:  
*Taylor Honeycutt*  
9/22/2016  
SIGNATURE DATE  
CADD Filename:

9/21/2016 9:39:26 AM susan.pennington K:\RAL\_Roadway\012108004 - McCrImmon Parkway\Phase 1\WP\anKSignal\sk56 - Cable Routing\McCr-imz\_SCP\_psh5.dgn



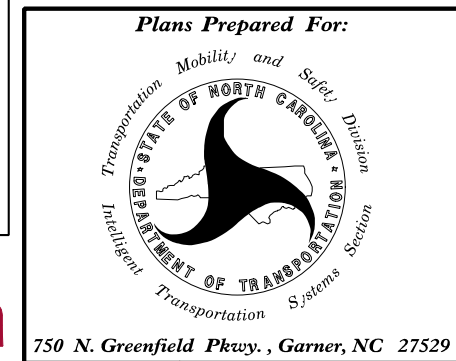
# NEW SPLICE ENCLOSURE NEAR 05-1533 EVANS RD. AT AVIATION PKWY CHANNEL 26



9/21/2016 9:39:27 AM susan.pennington K:\RAL\_Roadway\012108004 - MCR\Iman Parkway\Phase 1\Plan\Signals\K56 - Cable Routing\MCR-nz\_SCP\_psh6.dgn

NC Dept of Transportation  
Division of Highways  
Final Drawing Date: 10/10/2016  
*Susan Pennington*  
ITS & Signals Unit

PLANS PREPARED IN THE OFFICE OF:  
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421 Fayetteville Street, Suite 600  
Raleigh, NC 27601  
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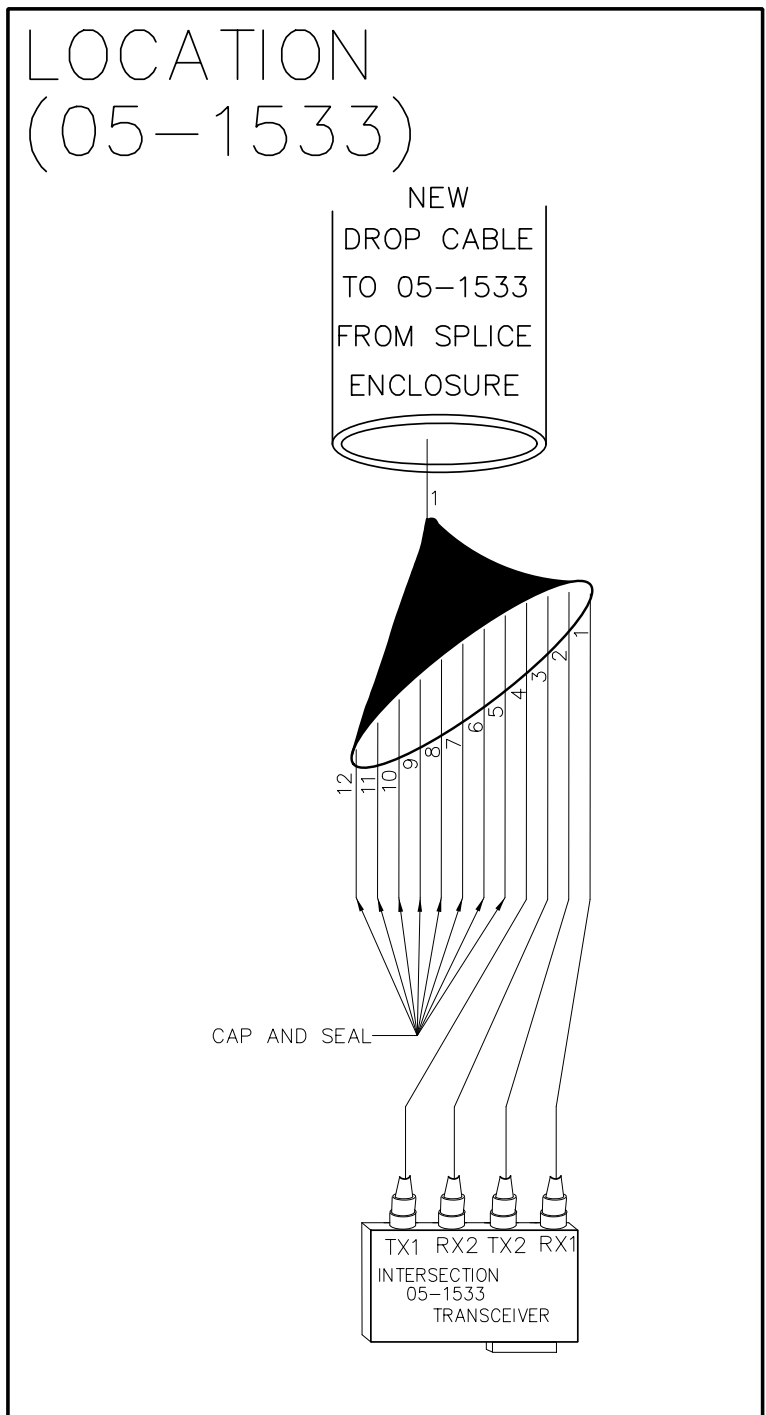
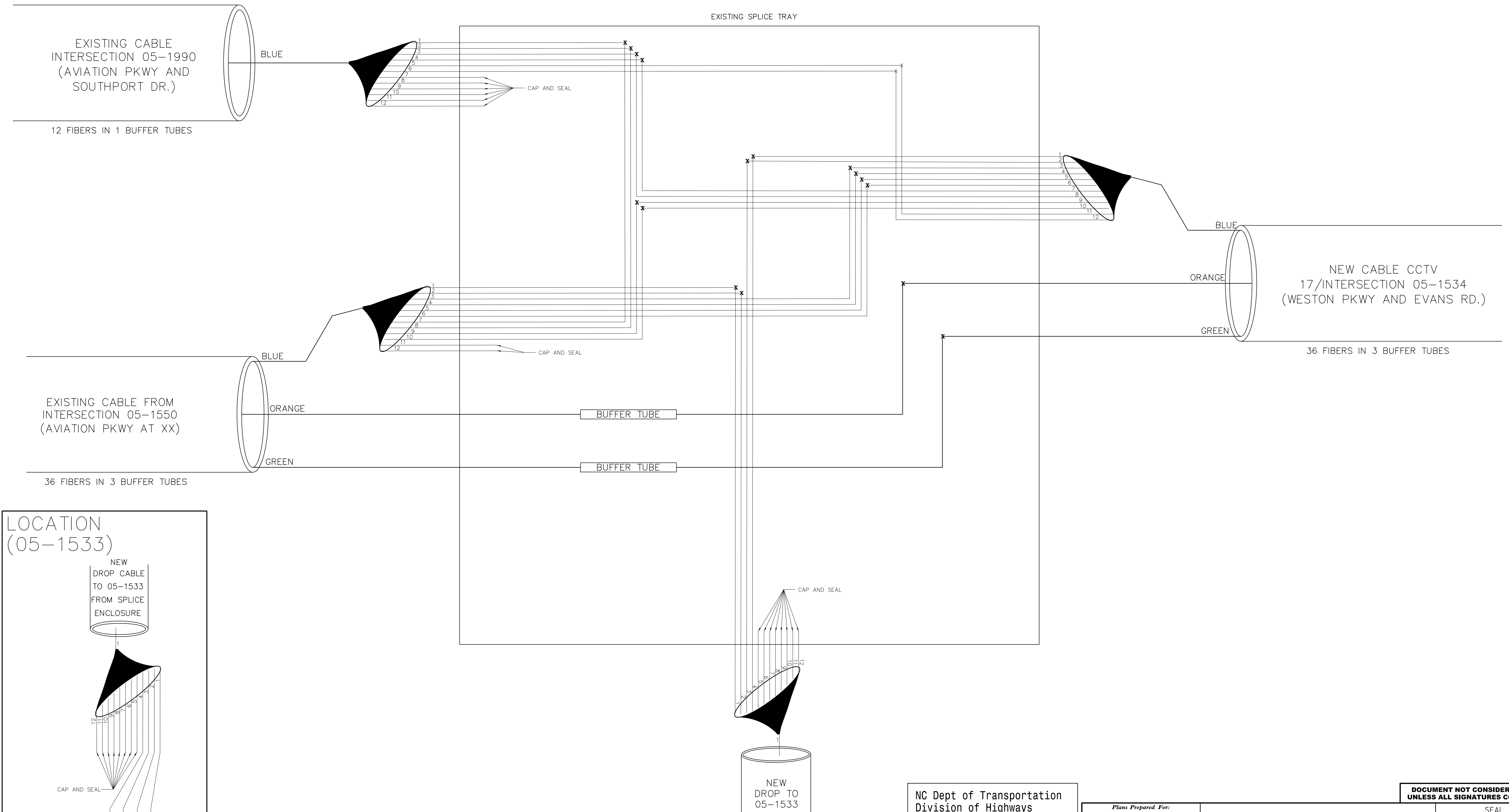


SPLICING DETAIL			
DIVISION 05	MORRISVILLE	WAKE COUNTY	
PLAN DATE:	APRIL 2016	REVIEWED BY:	T HONEYCUTT
PREPARED BY:	SP PENNINGTON	REVIEWED BY:	K. SMITH
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PROFESSIONAL  
SEAL  
043814  
ENGINEER  
TAYLOR A. HONEYCUTT  
DocuSigned by:  
*Taylor Honeycutt* 9/22/2016  
E818CCD57E7EFA  
SIGNATURE DATE  
CADD Filename:

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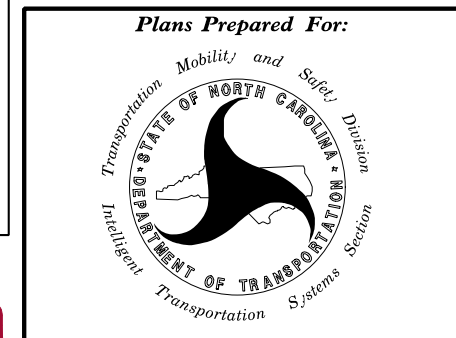
# EXISTING SPLICE ENCLOSURE 05-1533 EVANS RD. AT AVIATION PKWY CHANNEL 17



9/21/2016 9:39:28 AM susan.pennington K:\RAL\_Roadway\05108004 - MCR\man Parkway\Phase 1\Map\an\Signal\sk6 - Cable Routing\Misc\me\_scp\_psh7.dgn

NC Dept of Transportation  
 Division of Highways  
 Final Drawing Date: 10/10/2016  
 ITS & Signals Unit

PLANS PREPARED IN THE OFFICE OF:  
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DIVISION 05 MORRISVILLE WAKE COUNTY		
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PREPARED BY: SP PENNINGTON	REVIEWED BY: K. SMITH	
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 NORTH CAROLINA  
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 SEAL  
 043814  
 TAYLOR A. HONEYCUTT  
 ENGINEER  
 DocuSigned by:  
 Taylor Honeycutt 9/22/2016  
 EB18CCD87174FA  
 SIGNATURE DATE  
 CADD Filename: