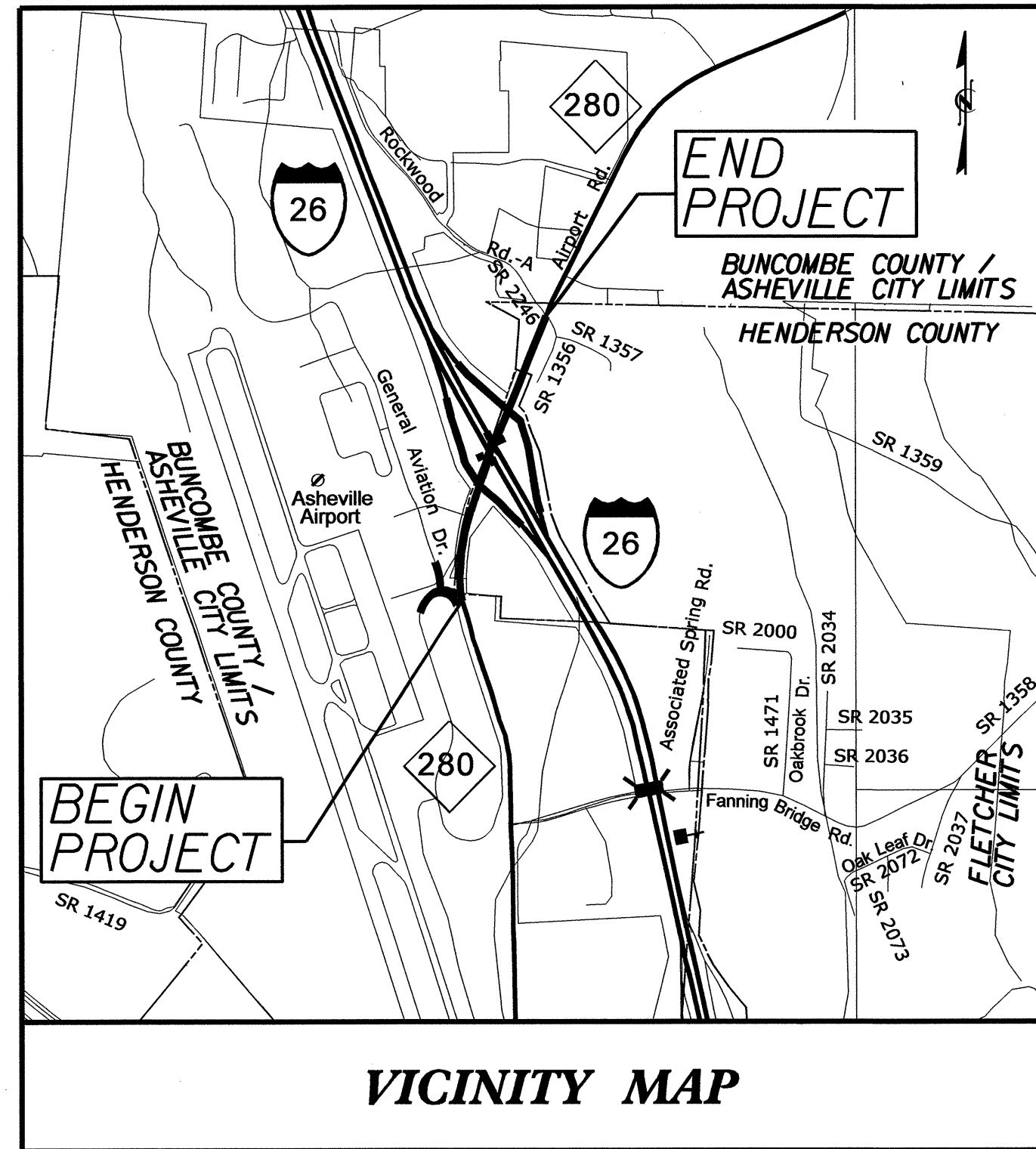


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

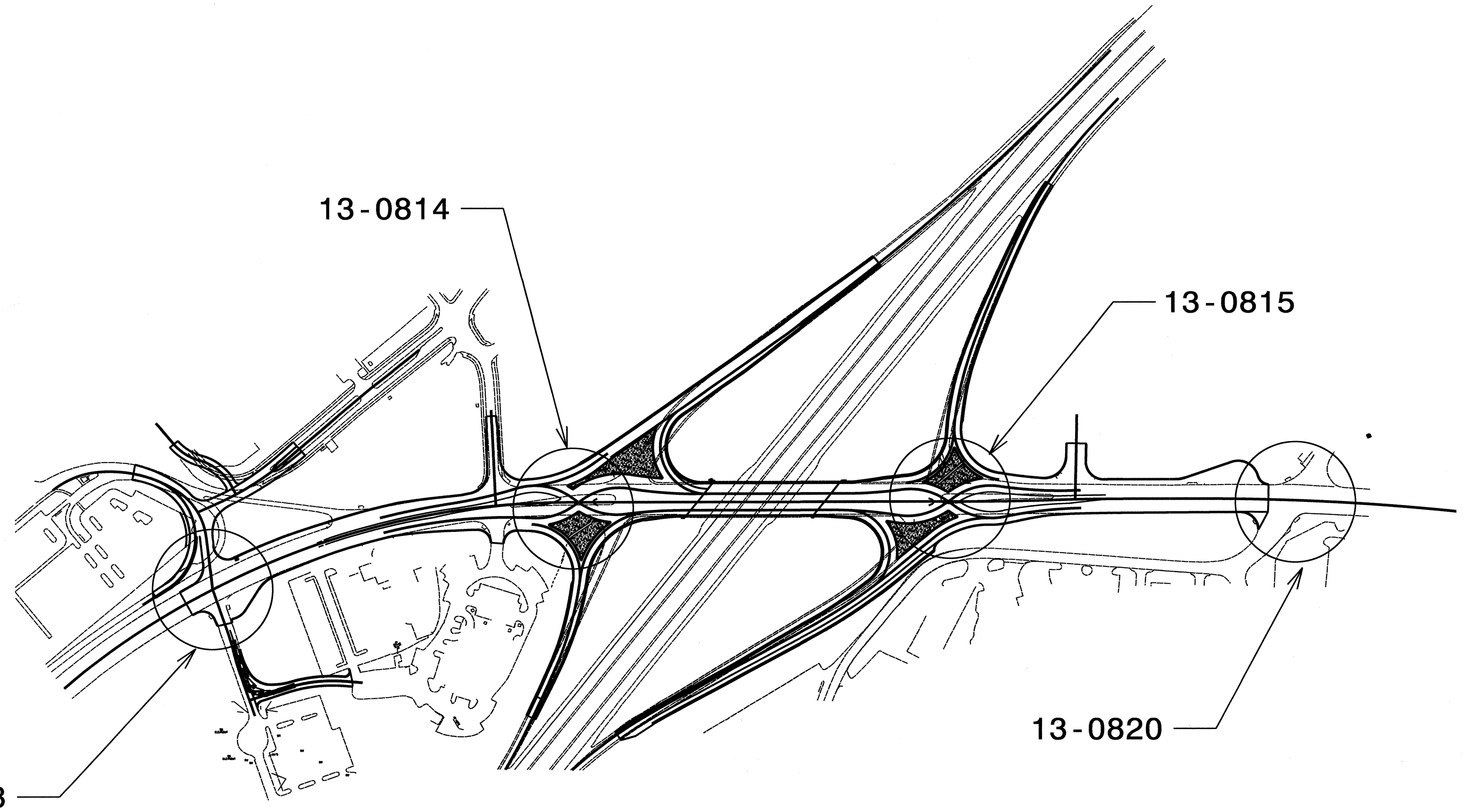
BUNCOMBE & HENDERSON COUNTIES

LOCATION: I-26 / NC 280 INTERCHANGE IN ASHEVILLE
TYPE OF WORK: TRAFFIC SIGNALS

Project: I-5501



VICINITY MAP



Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.

| Sheet # | Reference # | Index of Plans | Location/Description |
|------------|-------------|---|----------------------|
| Sig. 1 | | Title Sheet | |
| Sig. 2-7 | 13-1118 | NC 280 (Airport Road) at Airport Park Road/Airport Entrance | |
| Sig. 8-16 | 13-0814 | NC 280 (Airport Road) at I-26 Eastbound Ramps | |
| Sig. 17-25 | 13-0815 | NC 280 at I-26 Westbound Ramps | |
| Sig. 26-31 | 13-0820 | NC 280 (Airport Road) at SR 3568 (Rockwood Road) | |
| Sig. 32-36 | N/A | Signal Communication Plans | |
| Sig. 37-44 | N/A | Metal Pole Standard Drawings | |

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT
Contacts:

Greg A. Fuller, PE - State ITS and Signals Engineer
Timothy J. Williams, PE - Western Region Signals Engineer
John T. Rowe, Jr., PE - Signal Equipment Design Engineer

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

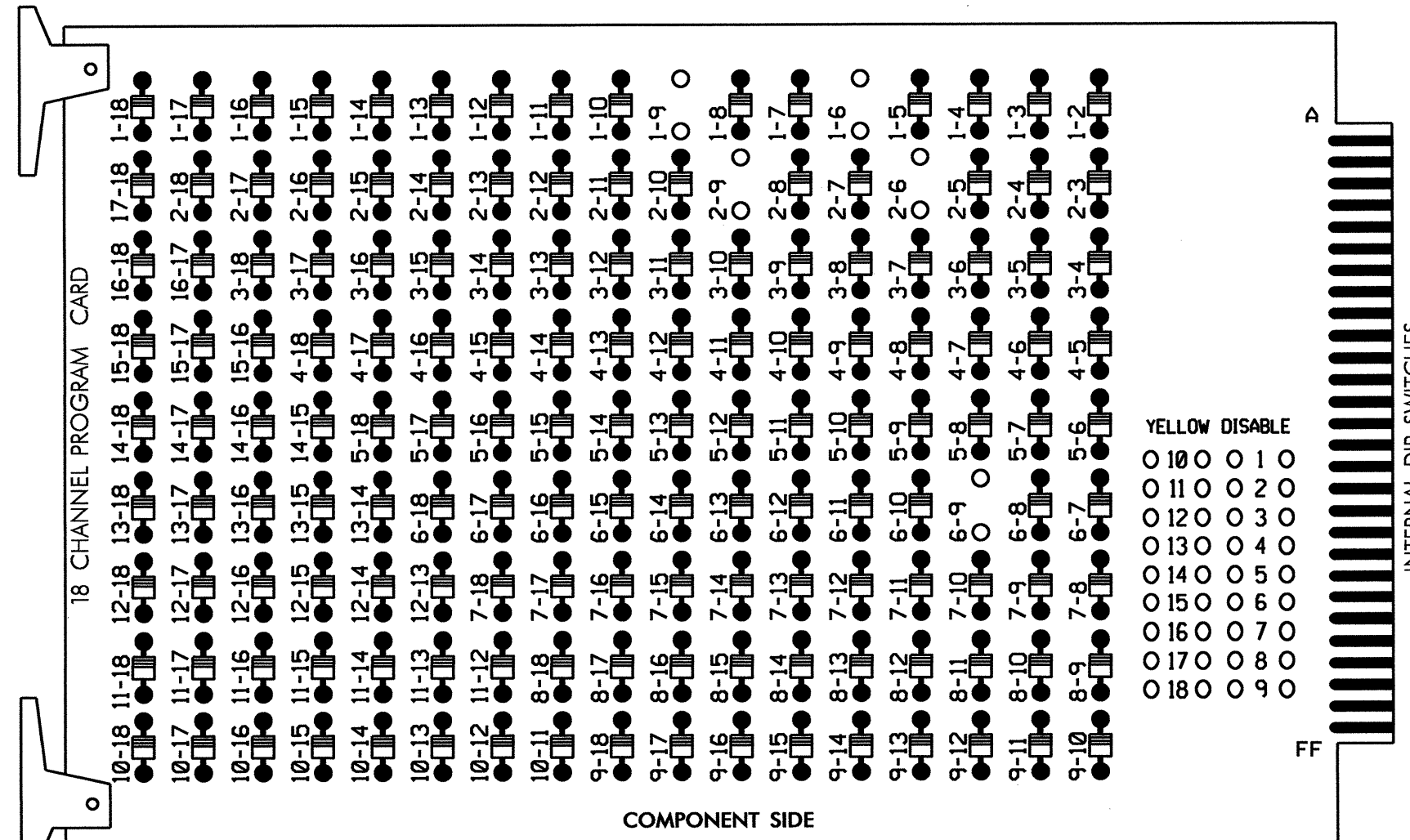
750 N. Greenfield Parkway, Garner, NC 27529

23-MAY-2013 2:43:33 \\f:\c\signals\Design\1\1\sheet\I-5501.sig.tsh.dgn

EDI MODEL 2018ECL-NC CONFLICT MONITOR
PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

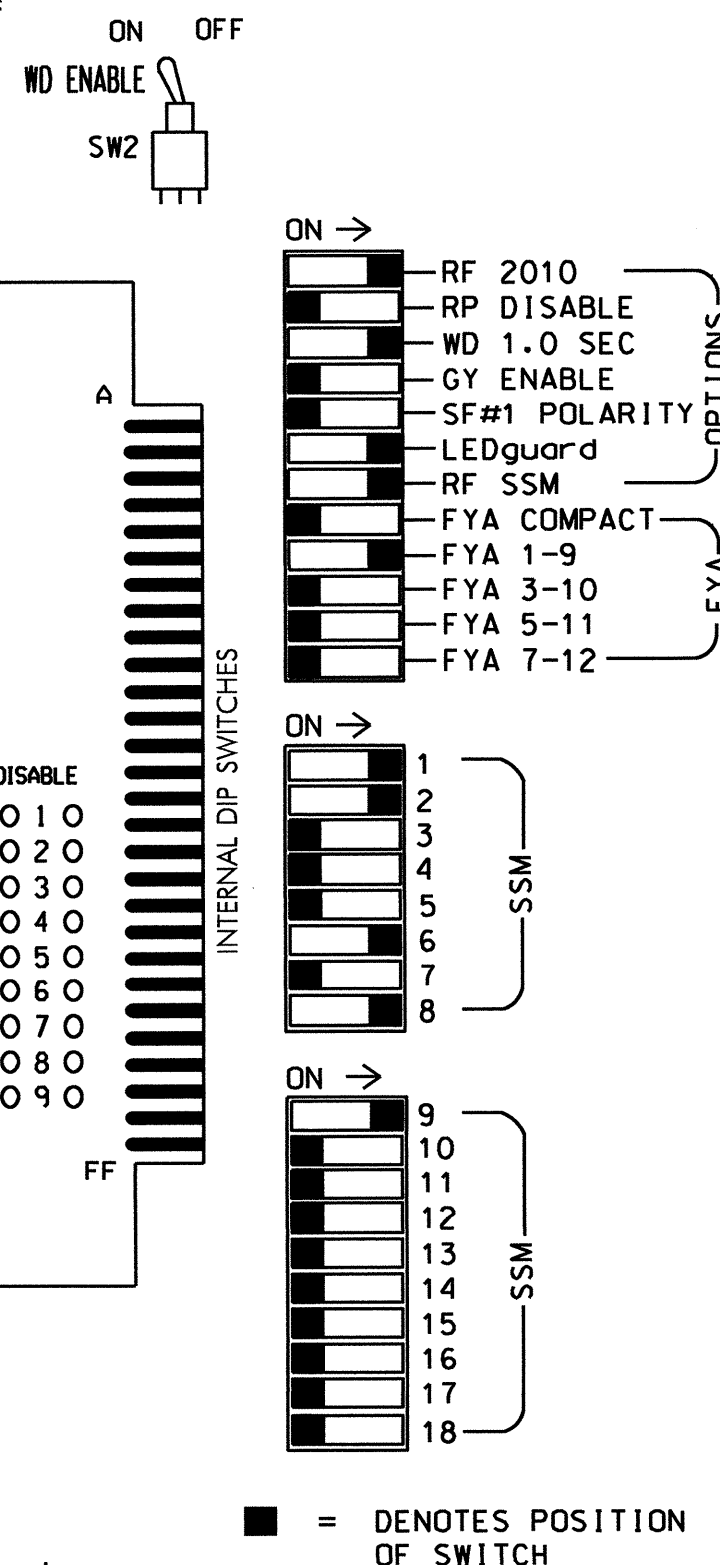
REMOVE DIODE JUMPERS 1-6, 1-9, 2-6, 2-9, and 6-9.



REMOVE JUMPERS AS SHOWN

NOTES:

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



NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332 W/ AUX
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
 LOAD SWITCHES USED.....S1,S2,S8,S11,AUX S1
 PHASES USED.....1,2,6,8
 OVERLAP "A".....1+2
 OVERLAP "B".....NOT USED
 OVERLAP "C".....NOT USED
 OVERLAP "D".....NOT USED

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | AUX S1 | AUX S2 | AUX S3 | AUX S4 | AUX S5 | AUX S6 |
|-----------------------|-----|-----|-------|----|----|-------|----|-------|-------|-----|-------|-------|--------|--------|--------|--------|--------|--------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 | 9 | 10 | 17 | 11 | 12 | 18 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED | OLA | OLB | SPARE | OLC | OLD | SPARE |
| SIGNAL HEAD NO. | 11 | 82 | 21,22 | NU | NU | NU | NU | 61,62 | NU | NU | 81,82 | NU | 11 | NU | NU | NU | NU | NU |
| RED | * | 128 | | | | | | 134 | | | 107 | | | | | | | |
| YELLOW | | 129 | | | | | | 135 | | | 108 | | | | | | | |
| GREEN | | 130 | | | | | | 136 | | | 109 | | | | | | | |
| RED ARROW | | | | | | | | | | | | | A121 | | | | | |
| YELLOW ARROW | 126 | | | | | | | | | | | | A122 | | | | | |
| FLASHING YELLOW ARROW | | | | | | | | | | | | | A123 | | | | | |
| GREEN ARROW | 127 | 127 | | | | | | | | | | | | | | | | |

NU = Not Used

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

* See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

| FILE "I" | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|----------|---|--------|---|---|---|---|---|---|---|----|----|----|----|-------------|
| U | S | 2A/S05 | S | S | S | S | S | S | S | S | S | S | S | FS |
| L | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | DC ISOLATOR |
| U | S | 2B/S06 | S | S | S | S | S | S | S | S | S | S | S | ST |
| L | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | ← | DC ISOLATOR |

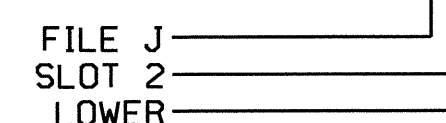
EX. : 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

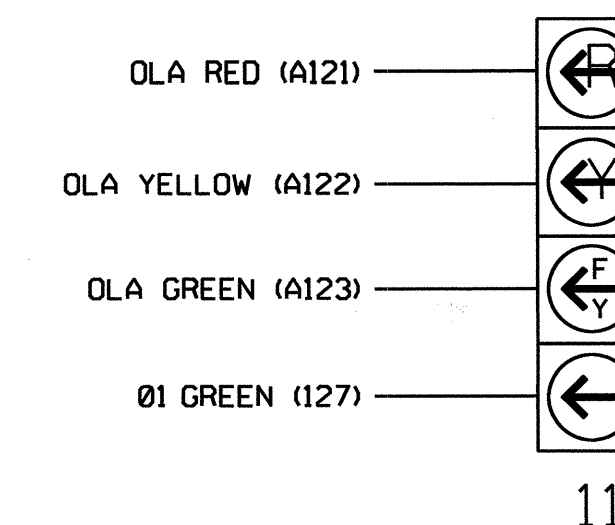
| LOOP NO. | LOOP TERMINAL | INPUT FILE POS. | PIN NO. | INPUT ASSIGNMENT NO. | DETECTOR NO. | NEMA PHASE | CALL | EXTEND | FULL TIME DELAY | STRETCH TIME | DELAY TIME |
|----------|---------------|-----------------|---------|----------------------|--------------|------------|------|--------|-----------------|--------------|------------|
| *1A | | | | | | 1 | Y | Y | | | 15 |
| *1B | | | | | | 6 | Y | Y | Y | | 3 |
| 2A/S05 | TB2-5,6 | I2U | 39 | 1 | 2 | 2/SYS | Y | Y | | | |
| 2B/S06 | TB2-7,8 | I2L | 43 | 5 | 12 | 2/SYS | Y | Y | | | |
| *6A/S07 | | | | | | 6/SYS | Y | Y | | | |
| *6B/S08 | | | | | | 6/SYS | Y | Y | | | |
| *6C | | | | | | 6 | Y | Y | Y | 2.0 | 5 |
| *6D | | | | | | 6 | Y | Y | Y | 2.0 | 5 |
| *8A | | | | | | 8 | Y | Y | | | 3 |

INPUT FILE POSITION LEGEND: J2L



FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



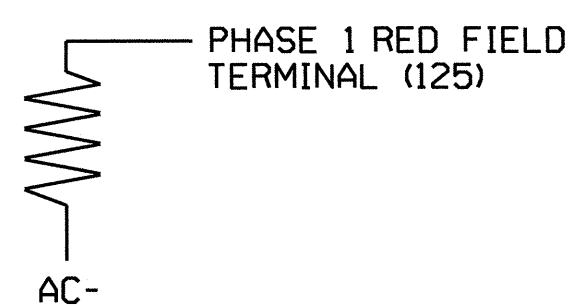
NOTE

The sequence display for signal heads 11 requires special logic programming. See sheet 2 for programming instructions.

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

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



*** SPECIAL DETECTOR NOTE**

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

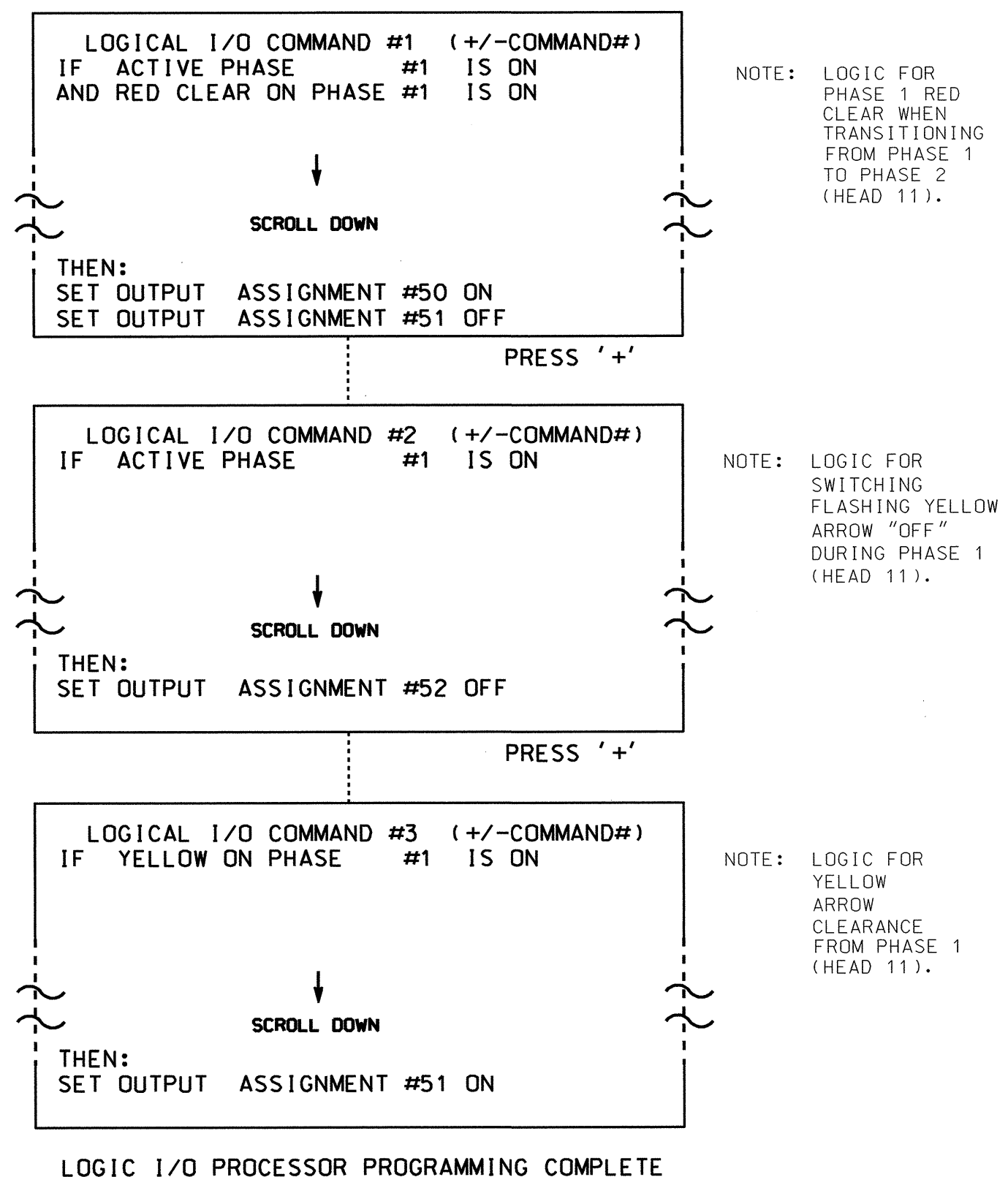
Temporary Signal - Construction Phases I & II - Sheet 1 of 2

| | | | |
|--|---|---|--|
| ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529 | NC 280 (Airport Road) at Airport Park Road | | SEAL JOHN T. ROWEL, P.E. 5-28-13 |
| | Division 13 PLAN DATE: May 2013 PREPARED BY: S. Armstrong | Buncombe County REVIEWED BY: JTR REVIEWED BY: | |

**LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE**

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS), SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, AND 3.
- FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).



OUTPUT REFERENCE SCHEDULE

OUTPUT 50 = Overlap A Red
OUTPUT 51 = Overlap A Yellow
OUTPUT 52 = Overlap A Green

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE: 12345678910111213141516
VEH OVL PARENTS: XX
VEH OVL NOT VEH: :
VEH OVL NOT PED: :
VEH OVL GRN EXT: :
STARTUP COLOR: - RED - YELLOW - GREEN
FLASH COLORS: - RED - YELLOW X GREEN
SELECT VEHICLE OVERLAP OPTIONS: (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0-255 SEC)...0
YELLOW CLEAR (0=PARENT, 3-25.5 SEC)...0.0
RED CLEAR (0=PARENT, 0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)...0

← NOTICE GREEN FLASH

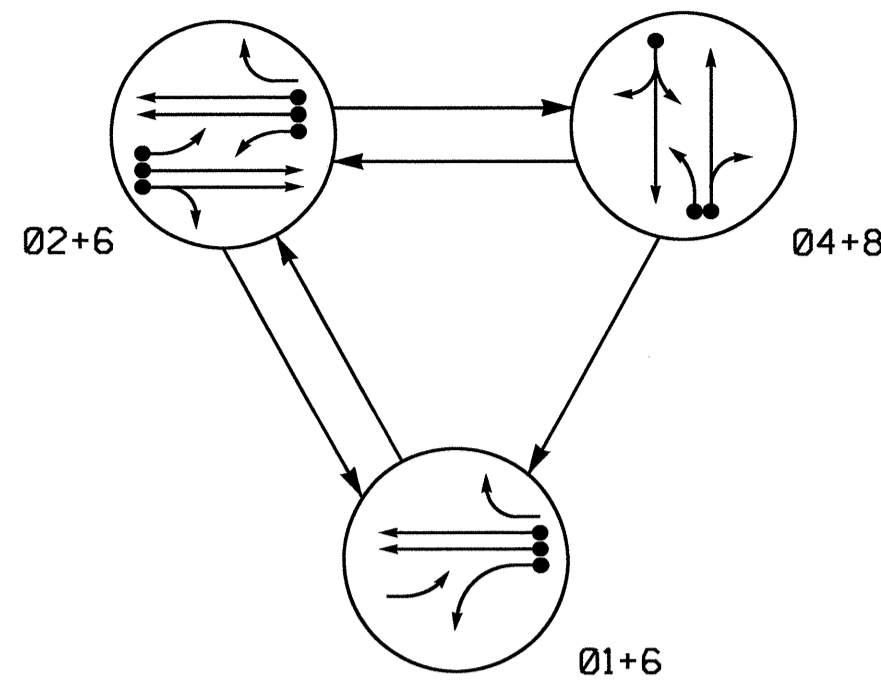
OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 13-1118T
DESIGNED: April 2013
SEALED: 5/24/13
REVISED: N/A

Temporary Signal - Construction Phases I & II - Sheet 2 of 2

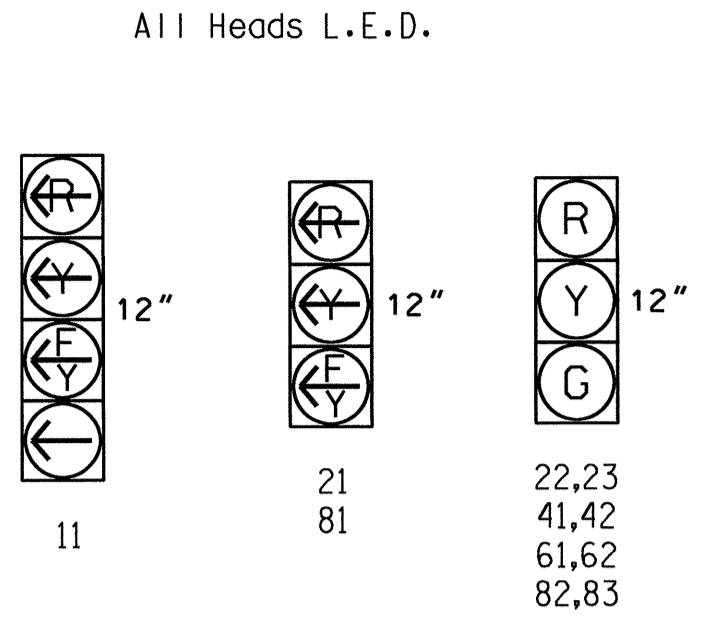
| | | | |
|---|---|-------------------------|---|
| <p>750 N. Greenfield Pkwy, Garner, NC 27529</p> | <p>ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p>NC 280 (Airport Road) at Airport Park Road</p> | | <p>SEAL</p> |
| | <p>Division 13 Buncombe County Fletcher</p> | | |
| | <p>PLAN DATE: May 2013</p> | <p>REVIEWED BY: JTR</p> | |
| | <p>PREPARED BY: S. Armstrong</p> | <p>REVIEWED BY:</p> | |
| <p>REVISIONS</p> | | <p>INIT. DATE</p> | <p>SIGNATURE: John T. Rowley 5-28-13 DATE</p> |
| <p>SIG. INVENTORY NO. 13-1118T</p> | | | |

PHASING DIAGRAM



| SIGNAL FACE | PHASE | | | |
|-------------|-------|------|------|-------|
| | 01+6 | 02+6 | 04+8 | FLASH |
| 11 | ← | ← | ← | ← |
| 21 | ← | ← | ← | ← |
| 22,23 | R | G | R | Y |
| 41,42 | R | R | G | R |
| 61,62 | G | G | R | Y |
| 81 | ← | ← | ← | ← |
| 82,83 | R | R | G | R |

SIGNAL FACE I.D.



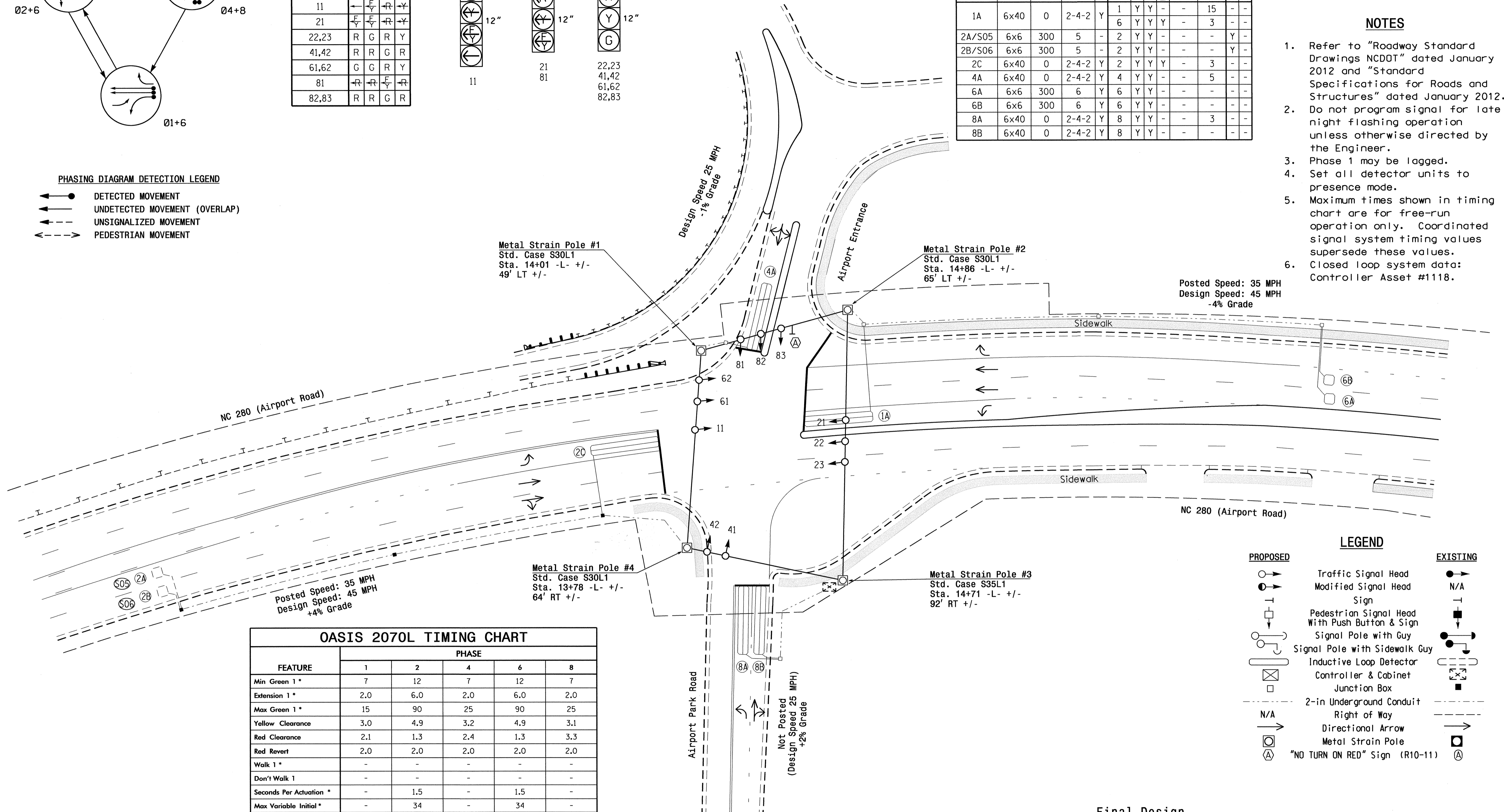
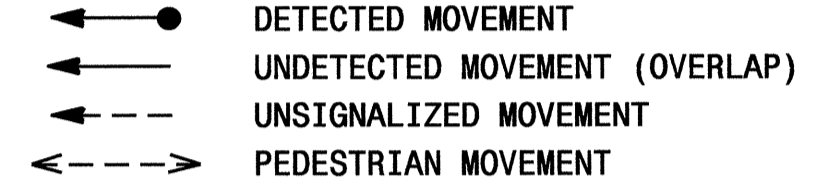
| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | DETECTOR PROGRAMMING | | | | SYSTEM LOOP | NEW CARD |
|--------|-----------|----------------------------|-------|----------|----------------------|---------|-----------|--------------|-------------|----------|
| | | | | | PHASE | CALLING | EXTENSION | STRETCH TIME | | |
| 1A | 6x40 | 0 | 2-4-2 | Y | 1 | Y | Y | - | 15 | - |
| 2A/S05 | 6x6 | 300 | 5 | - | 2 | Y | Y | - | - | Y |
| 2B/S06 | 6x6 | 300 | 5 | - | 2 | Y | Y | - | - | Y |
| 2C | 6x40 | 0 | 2-4-2 | Y | 2 | Y | Y | - | 3 | - |
| 4A | 6x40 | 0 | 2-4-2 | Y | 4 | Y | Y | - | 5 | - |
| 6A | 6x6 | 300 | 6 | Y | 6 | Y | Y | - | - | - |
| 6B | 6x6 | 300 | 6 | Y | 6 | Y | Y | - | - | - |
| 8A | 6x40 | 0 | 2-4-2 | Y | 8 | Y | Y | - | 3 | - |
| 8B | 6x40 | 0 | 2-4-2 | Y | 8 | Y | Y | - | - | - |

3 Phase Fully Actuated NC 280 (Airport Road) CLS

NOTES

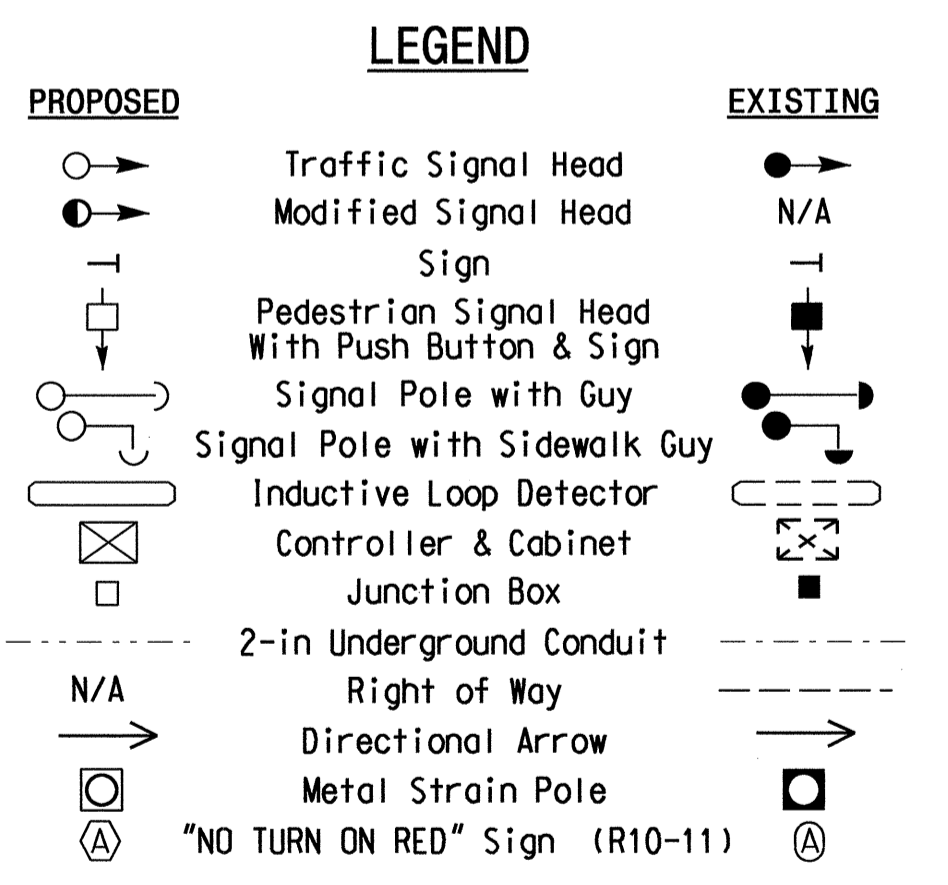
- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Set all detector units to presence mode.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Closed loop system data: Controller Asset #1118.

PHASING DIAGRAM DETECTION LEGEND



| FEATURE | PHASE | | | | |
|-------------------------|-------|------------|-----|------------|-----|
| | 1 | 2 | 4 | 6 | 8 |
| Min Green 1 * | 7 | 12 | 7 | 12 | 7 |
| Extension 1 * | 2.0 | 6.0 | 2.0 | 6.0 | 2.0 |
| Max Green 1 * | 15 | 90 | 25 | 90 | 25 |
| Yellow Clearance | 3.0 | 4.9 | 3.2 | 4.9 | 3.1 |
| Red Clearance | 2.1 | 1.3 | 2.4 | 1.3 | 3.3 |
| Red Revert | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Walk 1 * | - | - | - | - | - |
| Don't Walk 1 | - | - | - | - | - |
| Seconds Per Actuation * | - | 1.5 | - | 1.5 | - |
| Max Variable Initial * | - | 34 | - | 34 | - |
| Time Before Reduction * | - | 15 | - | 15 | - |
| Time To Reduce * | - | 30 | - | 30 | - |
| Minimum Gap | - | 3.0 | - | 3.0 | - |
| Recall Mode | - | MIN RECALL | - | MIN RECALL | - |
| Vehicle Call Memory | - | YELLOW | - | YELLOW | - |
| Dual Entry | - | - | ON | - | ON |
| Simultaneous Gap | ON | ON | ON | ON | ON |

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



Final Design

NC 280 (Airport Road)
at
Airport Park Road/Airport Entrance

Division 13 Buncombe County Fletcher
 PLAN DATE: April 2013 REVIEWED BY: Z.M. Little
 PREPARED BY: R.N. Zinser REVIEWED BY: T.J. Williams

SCALE
0 30
1"=30'

REVISIONS

| NO. | DESCRIPTION | INIT. | DATE |
|-----|-------------|-------|------|
| | | | |

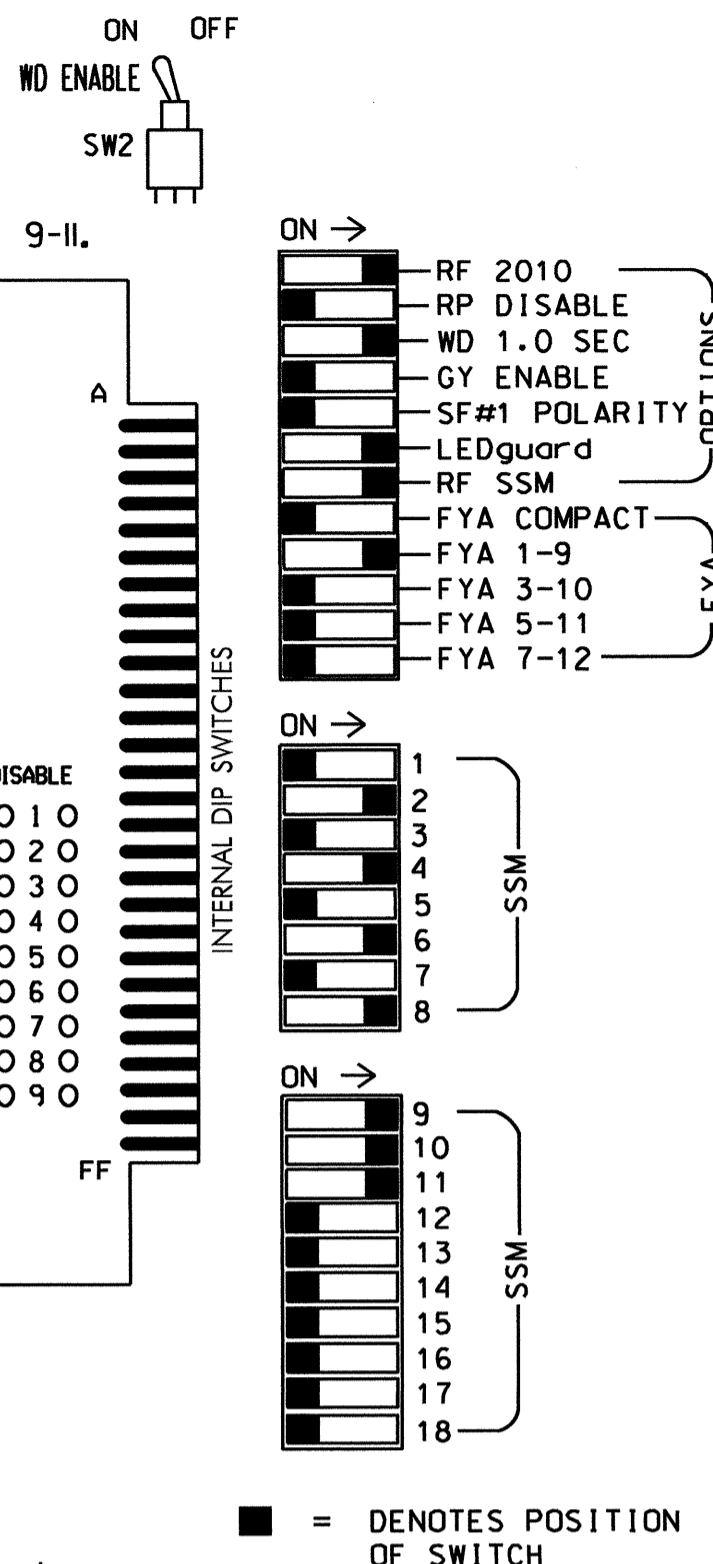
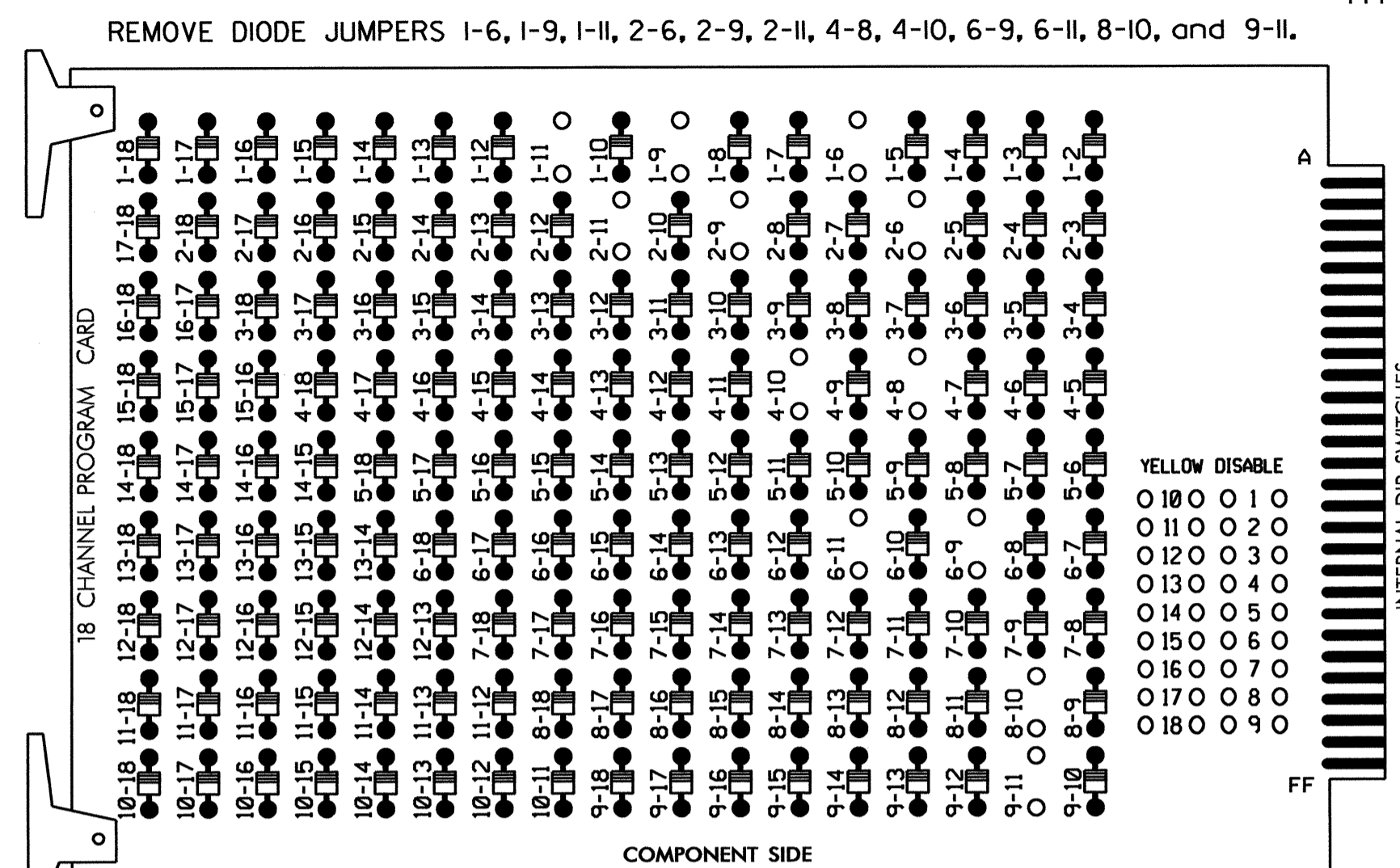
DATE: 5/24/13
 SIGNATURE: T.J. Williams
 SEAL: 24393
 SIG. INVENTORY NO. 13-1118

29-MAY-2013 20:35 R:\Projects\GIS\GIS\13-1118\131118-519.dgn-2013mdd.dgn

EDI MODEL 2018ECL-NC CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Program phases 4 and 8 for Dual Entry.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Variable Initial and Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash and overlaps 1 and 2 as Wag Overlaps.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332 W/ AUX
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
 LOAD SWITCHES USED.....S1,S2,S5,S8,S11,AUX S1,AUX S2,AUX S4
 PHASES USED.....1,2,4,6,8
 OVERLAP "A".....1+2
 OVERLAP "B".....8
 OVERLAP "C".....6
 OVERLAP "D".....NOT USED

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | AUX S1 | AUX S2 | AUX S3 | AUX S4 | AUX S5 | AUX S6 |
|-----------------------|-----|-------|-------|----|-------|-------|----|-------|-------|-----|-------|-------|--------|--------|--------|--------|--------|--------|
| CHU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 | 9 | 10 | 17 | 11 | 12 | 18 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED | OLA | OLB | SPARE | OLC | OLD | SPARE |
| SIGNAL HEAD NO. | 11* | 22,23 | NU | NU | 41,42 | NU | NU | 61,62 | NU | NU | 82,83 | NU | 11* | 81* | NU | 21* | NU | NU |
| RED | | 128 | | | 101 | | | 134 | | | 107 | | | | | | | |
| YELLOW | * | 129 | | | 102 | | | 135 | | | 108 | | | | | | | |
| GREEN | | 130 | | | 103 | | | 136 | | | 109 | | | | | | | |
| RED ARROW | | | | | | | | | | | | | A121 | A124 | | A114 | | |
| YELLOW ARROW | | | | | | | | | | | | | A122 | A125 | | A115 | | |
| FLASHING YELLOW ARROW | | | | | | | | | | | | | A123 | A126 | | A116 | | |
| GREEN ARROW | 127 | | | | | | | | | | | | | | | | | |

NU = Not Used

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

★ See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

| FILE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------|----------|---------|----------|---|---|----------|---|---|---|----|----|----|----|-------------|
| U | ∅ 1 | ∅ 2/SYS | ∅ 2 | S | S | ∅ 4 | S | S | S | S | S | S | S | FS |
| I | 1A | 2A/S05 | 2C | - | - | 4A | - | - | - | - | - | - | - | DC ISOLATOR |
| L | NOT USED | ∅ 2/SYS | NOT USED | Y | Y | NOT USED | Y | Y | Y | Y | Y | Y | Y | ST |
| U | S | ∅ 6 | S | S | S | ∅ 8 | S | S | S | S | S | S | S | S |
| I | Y | 6A | Y | Y | Y | 8A | Y | Y | Y | Y | Y | Y | Y | DC ISOLATOR |
| L | Y | ∅ 6 | Y | Y | Y | 8B | Y | Y | Y | Y | Y | Y | Y | Y |

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

FS = FLASH SENSE
 ST = STOP TIME

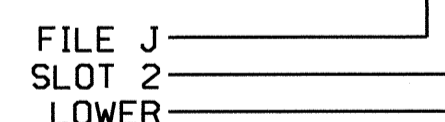
⊗ Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

| LOOP NO. | LOOP TERMINAL | INPUT FILE POS. | PIN NO. | INPUT ASSIGNMENT NO. | DETECTOR NO. | NEMA PHASE | CALL | EXTEND | FULL TIME DELAY | STRETCH TIME | DELAY TIME |
|-----------------|---------------|-----------------|---------|----------------------|--------------|------------|------|--------|-----------------|--------------|------------|
| 1A ¹ | TB2-1,2 | I1U | 56 | 18 | 1 | 1 | Y | Y | | | 15 |
| | | J4U | 48 | 10 | 26 | 6 | Y | Y | Y | | 3 |
| 2A/S05 | TB2-5,6 | I2U | 39 | 1 | 2 | 2/SYS | Y | Y | | | |
| 2B/S06 | TB2-7,8 | I2L | 43 | 5 | 12 | 2/SYS | Y | Y | | | |
| 2C | TB2-9,10 | I3U | 63 | 25 | 32 | 2 | Y | Y | Y | | 3 |
| 4A | TB4-9,10 | I6U | 41 | 3 | 4 | 4 | Y | Y | | | 5 |
| 6A | TB3-5,6 | J2U | 40 | 2 | 6 | 6 | Y | Y | | | |
| 6B | TB3-7,8 | J2L | 44 | 6 | 16 | 6 | Y | Y | | | |
| 8A | TB5-9,10 | J6U | 42 | 4 | 8 | 8 | Y | Y | | | 3 |
| 8B | TB5-11,12 | J6L | 46 | 8 | 18 | 8 | Y | Y | | | |

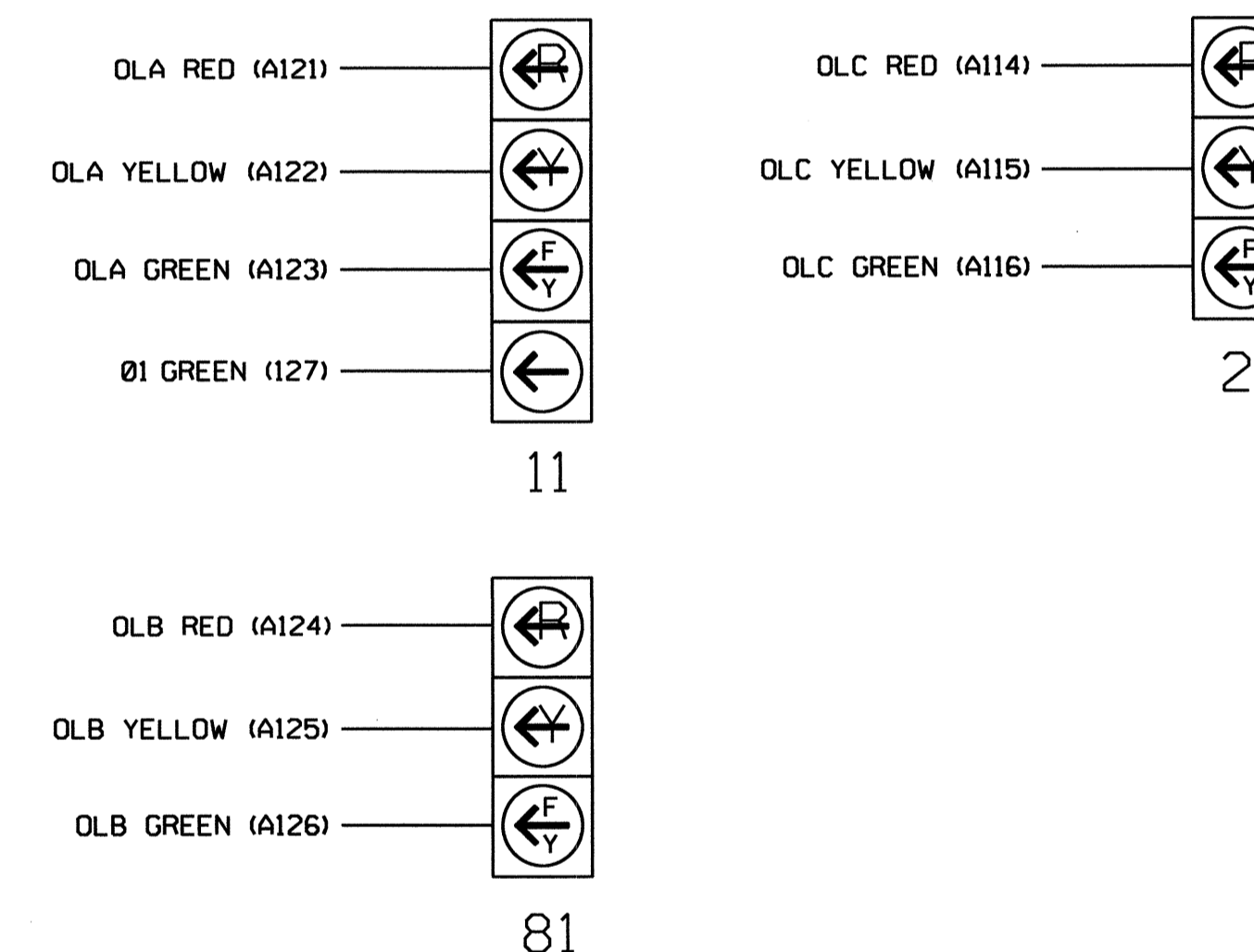
¹Add jumper from I1-W to J4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L



FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

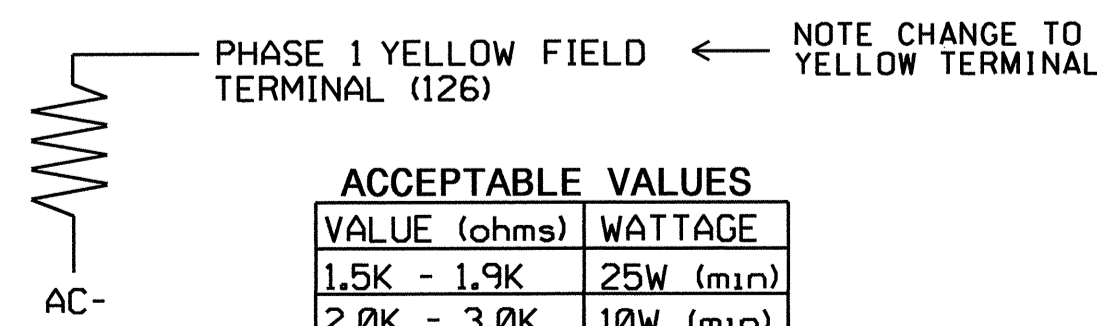


NOTE

The sequence display for signal head 11 requires special logic programming. See sheet 2 for programming instructions.

LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)



IMPORTANT: Move Load Resistor from Red Field Terminal to Yellow Field Terminal for Phase 1.

Final Design - Sheet 1 of 2

Electrical and Programming Details for: **NC 280 (Airport Road) at Airport Park Road/ Airport Entrance**

Prepared in the Offices of: **Transportation Mobility and Safety Solutions**

Division 13 Buncombe County Fletcher

PLAN DATE: May 2013 REVIEWED BY: JTR

PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS: INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, III

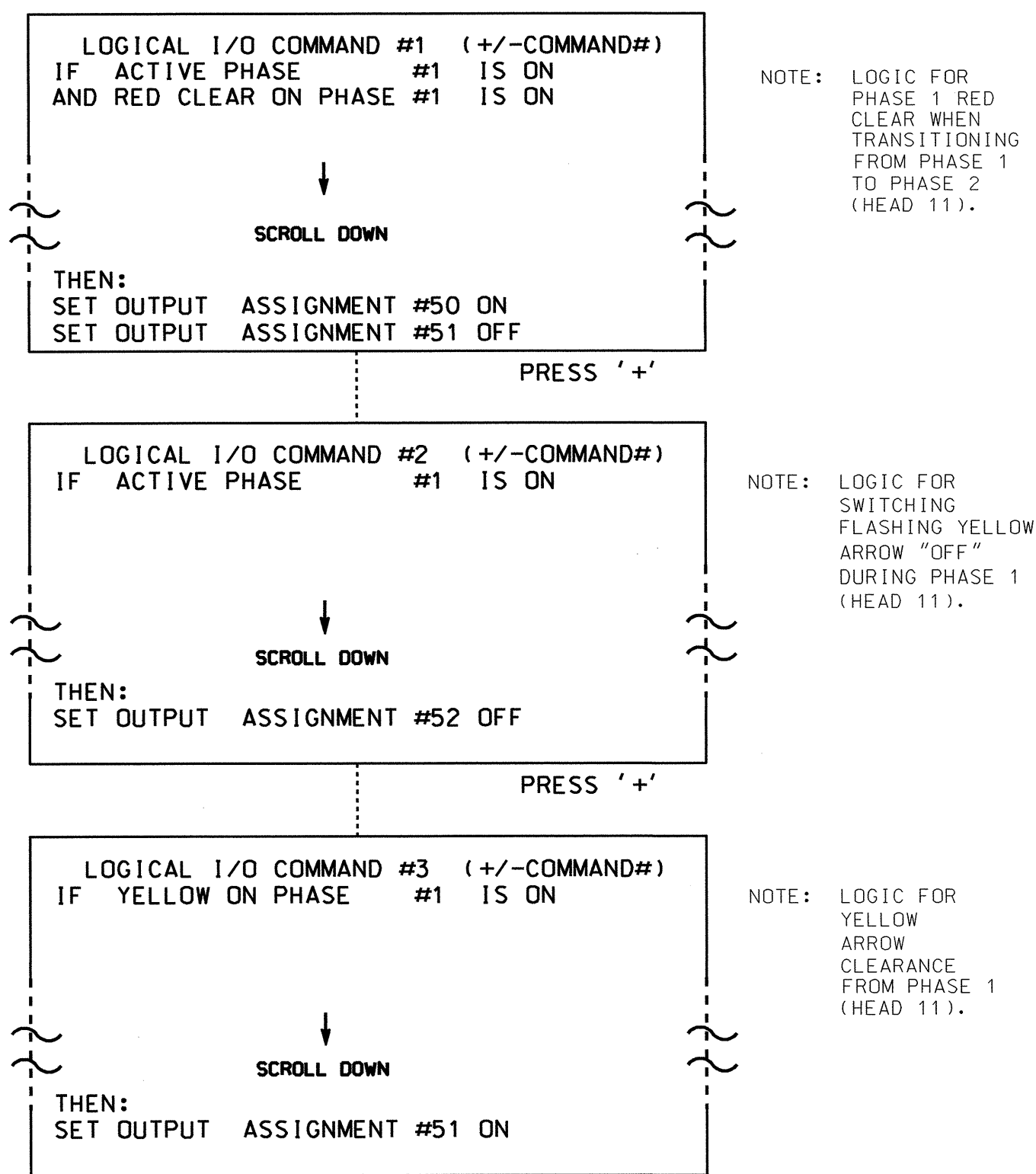
SIGNATURE: *John T. Rowe* DATE: 5-28-13

SIG. INVENTORY NO. 13-1118

**LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE**

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, AND 3.
- FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).



LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

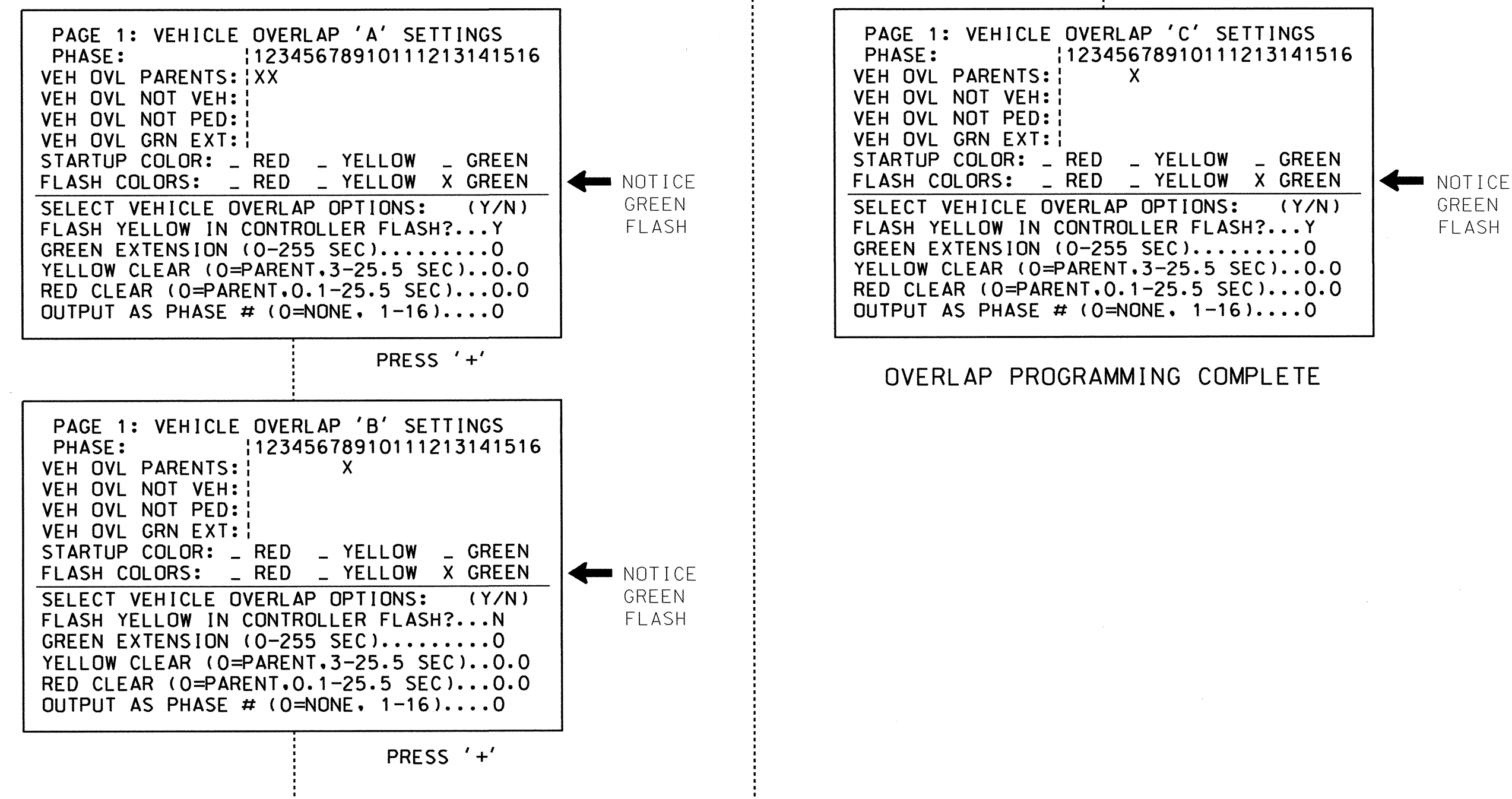
OUTPUT REFERENCE SCHEDULE

- OUTPUT 50 = Overlap A Red
- OUTPUT 51 = Overlap A Yellow
- OUTPUT 52 = Overlap A Green

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).



FLASHER CIRCUIT MODIFICATION DETAIL

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

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

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

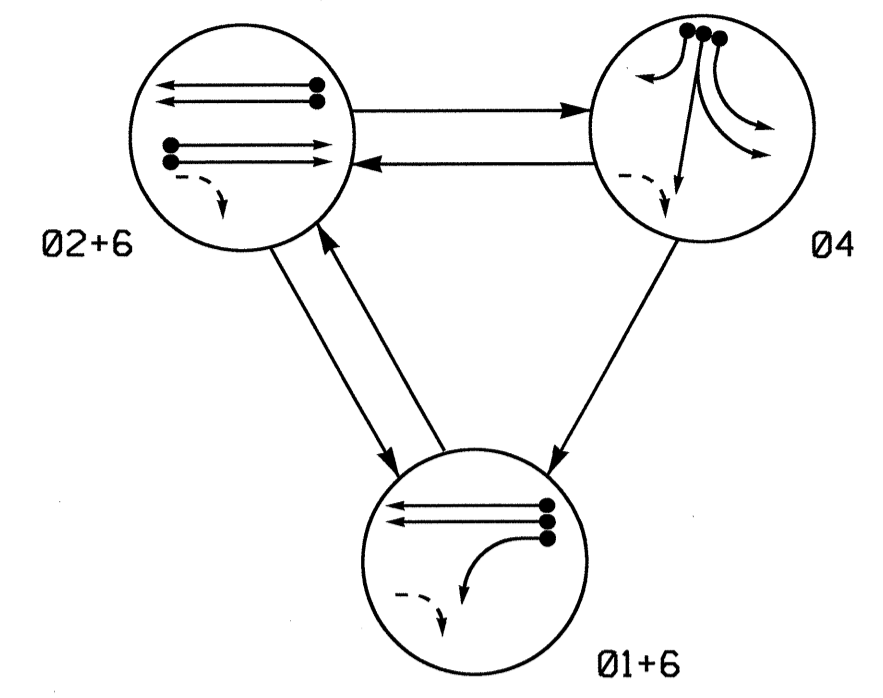
Final Design - Sheet 2 of 2

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1118
DESIGNED: April 2013
SEALED: 5/24/13
REVISED: N/A

| | | | |
|-----------|---|----------------------------------|---|
| | NC 280 (Airport Road) at Airport Park Road/ Airport Entrance | | |
| | Division 13 Buncombe County Fletcher | | |
| | PLAN DATE: May 2013 PREPARED BY: S. Armstrong | REVIEWED BY: JTR REVIEWED BY: | |
| REVISIONS | | INIT. DATE | SIGNATURE: <i>John T. Rowe</i> 5-28-13 DATE: |

750 N. Greenfield Pkwy, Garner, NC 27529

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

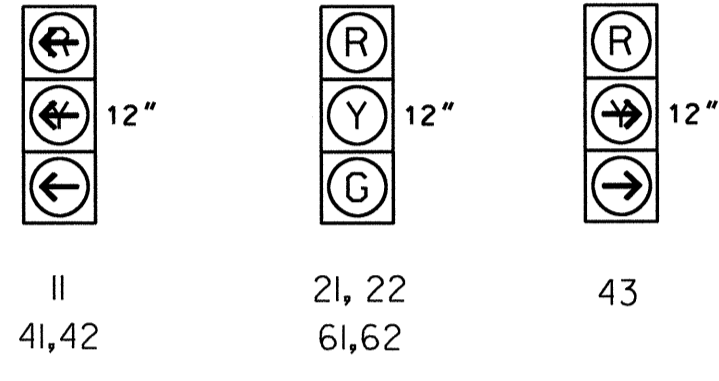
- ←●→ DETECTED MOVEMENT
- ←○→ UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- ←- - -> PEDESTRIAN MOVEMENT

TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | |
|-------------|-------|------|----|------|
| | 01+6 | 02+6 | 04 | FLTS |
| II | ← | ← | ← | ← |
| 21,22 | R | G | R | Y |
| 41,42 | ← | ← | ← | ← |
| 43 | R | R | ← | R |
| 61,62 | G | G | R | Y |

SIGNAL FACE I.D.

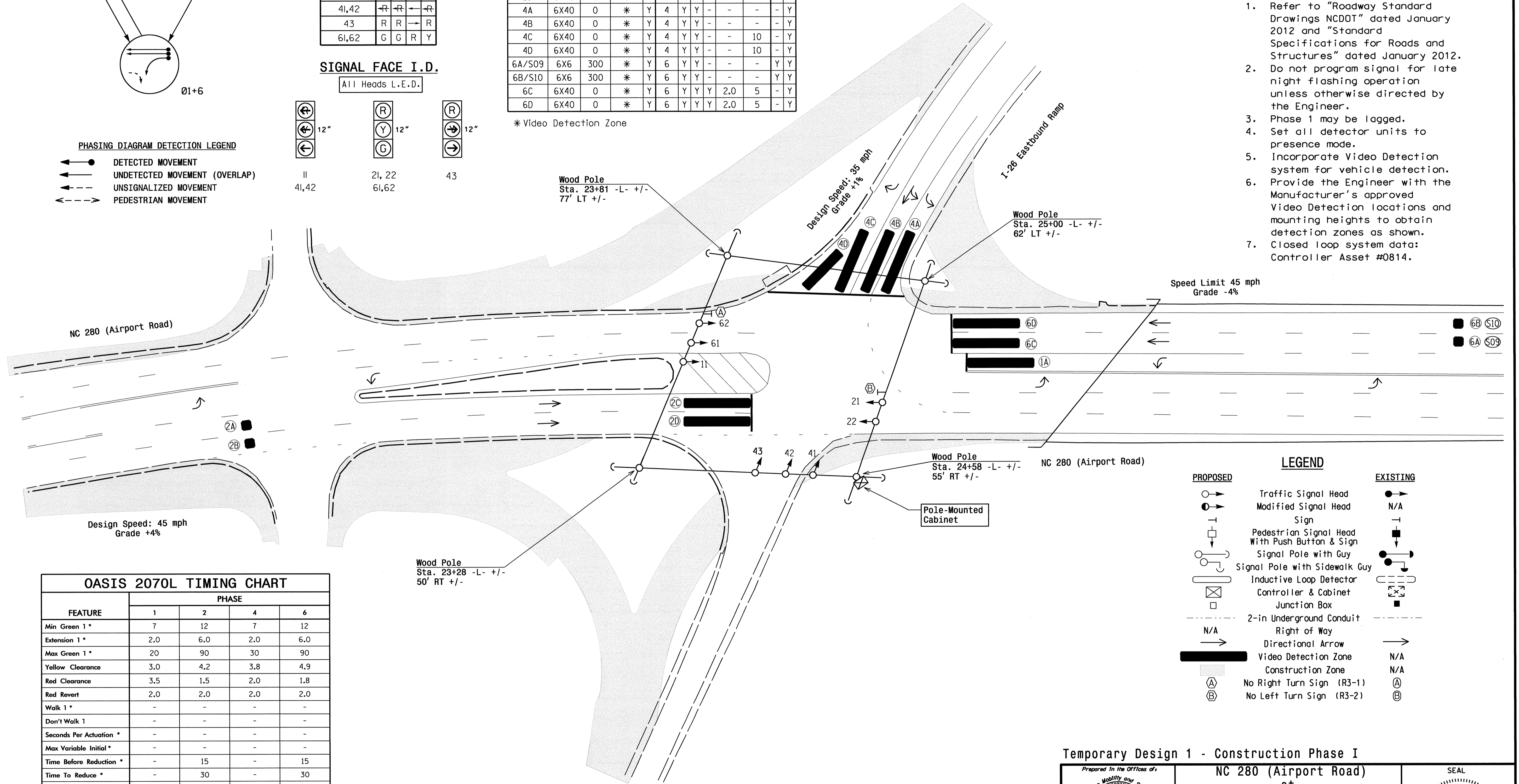
All Heads L.E.D.



OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | DETECTOR PROGRAMMING | | | | | SYSTEM LOOP | NEW CARD | |
|--------|-----------|----------------------------|-------|----------|----------------------|---------|-----------|-----------------|--------------|-------------|----------|------------|
| | | | | | PHASE | CALLING | EXTENSION | FULL TIME DELAY | STRETCH TIME | | | DELAY TIME |
| 1A | 6X40 | 0 | * | Y | 1 | Y | Y | - | - | 3 | - | Y |
| 2A | 6X6 | 300 | * | Y | 2 | Y | Y | - | - | - | - | Y |
| 2B | 6X6 | 300 | * | Y | 2 | Y | Y | - | - | - | - | Y |
| 2C | 6X40 | 0 | * | Y | 2 | Y | Y | Y | 2.0 | 5 | - | Y |
| 2D | 6X40 | 0 | * | Y | 2 | Y | Y | Y | 2.0 | 5 | - | Y |
| 4A | 6X40 | 0 | * | Y | 4 | Y | Y | - | - | - | - | Y |
| 4B | 6X40 | 0 | * | Y | 4 | Y | Y | - | - | - | - | Y |
| 4C | 6X40 | 0 | * | Y | 4 | Y | Y | - | - | 10 | - | Y |
| 4D | 6X40 | 0 | * | Y | 4 | Y | Y | - | - | 10 | - | Y |
| 6A/S09 | 6X6 | 300 | * | Y | 6 | Y | Y | - | - | - | - | Y |
| 6B/S10 | 6X6 | 300 | * | Y | 6 | Y | Y | - | - | - | - | Y |
| 6C | 6X40 | 0 | * | Y | 6 | Y | Y | Y | 2.0 | 5 | - | Y |
| 6D | 6X40 | 0 | * | Y | 6 | Y | Y | Y | 2.0 | 5 | - | Y |

* Video Detection Zone



3 Phase Fully Actuated NC 280 CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" 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. Incorporate Video Detection system for vehicle detection.
6. Provide the Engineer with the Manufacturer's approved Video Detection locations and mounting heights to obtain detection zones as shown.
7. Closed loop system data: Controller Asset #0814.

OASIS 2070L TIMING CHART

| FEATURE | PHASE | | | |
|-------------------------|-------|------------|-----|------------|
| | 1 | 2 | 4 | 6 |
| Min Green 1 * | 7 | 12 | 7 | 12 |
| Extension 1 * | 2.0 | 6.0 | 2.0 | 6.0 |
| Max Green 1 * | 20 | 90 | 30 | 90 |
| Yellow Clearance | 3.0 | 4.2 | 3.8 | 4.9 |
| Red Clearance | 3.5 | 1.5 | 2.0 | 1.8 |
| Red Revert | 2.0 | 2.0 | 2.0 | 2.0 |
| Walk 1 * | - | - | - | - |
| Don't Walk 1 | - | - | - | - |
| Seconds Per Actuation * | - | - | - | - |
| Max Variable Initial * | - | - | - | - |
| Time Before Reduction * | - | 15 | - | 15 |
| Time To Reduce * | - | 30 | - | 30 |
| Minimum Gap | - | 3.0 | - | 3.0 |
| Recall Mode | - | MIN RECALL | - | MIN RECALL |
| Vehicle Call Memory | - | YELLOW | - | YELLOW |
| Dual Entry | - | - | - | - |
| 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 | ●→ Traffic Signal Head |
| ●→ Modified Signal Head | N/A |
| ⊥ Sign | ⊥ Sign |
| ⊥ Pedestrian Signal Head With Push Button & Sign | ⊥ Pedestrian Signal Head With Push Button & Sign |
| ○ Signal Pole with Guy | ● Signal Pole with Guy |
| ○ Signal Pole with Sidewalk Guy | ● Signal Pole with Sidewalk Guy |
| ⊠ Inductive Loop Detector | ⊠ Inductive Loop Detector |
| ⊠ Controller & Cabinet | ⊠ Controller & Cabinet |
| ⊠ Junction Box | ⊠ Junction Box |
| - - - 2-in Underground Conduit | - - - 2-in Underground Conduit |
| N/A Right of Way | - - - Right of Way |
| → Directional Arrow | → Directional Arrow |
| ▬ Video Detection Zone | N/A |
| ▬ Construction Zone | N/A |
| Ⓐ No Right Turn Sign (R3-1) | Ⓐ No Right Turn Sign (R3-1) |
| Ⓑ No Left Turn Sign (R3-2) | Ⓑ No Left Turn Sign (R3-2) |

Temporary Design 1 - Construction Phase I

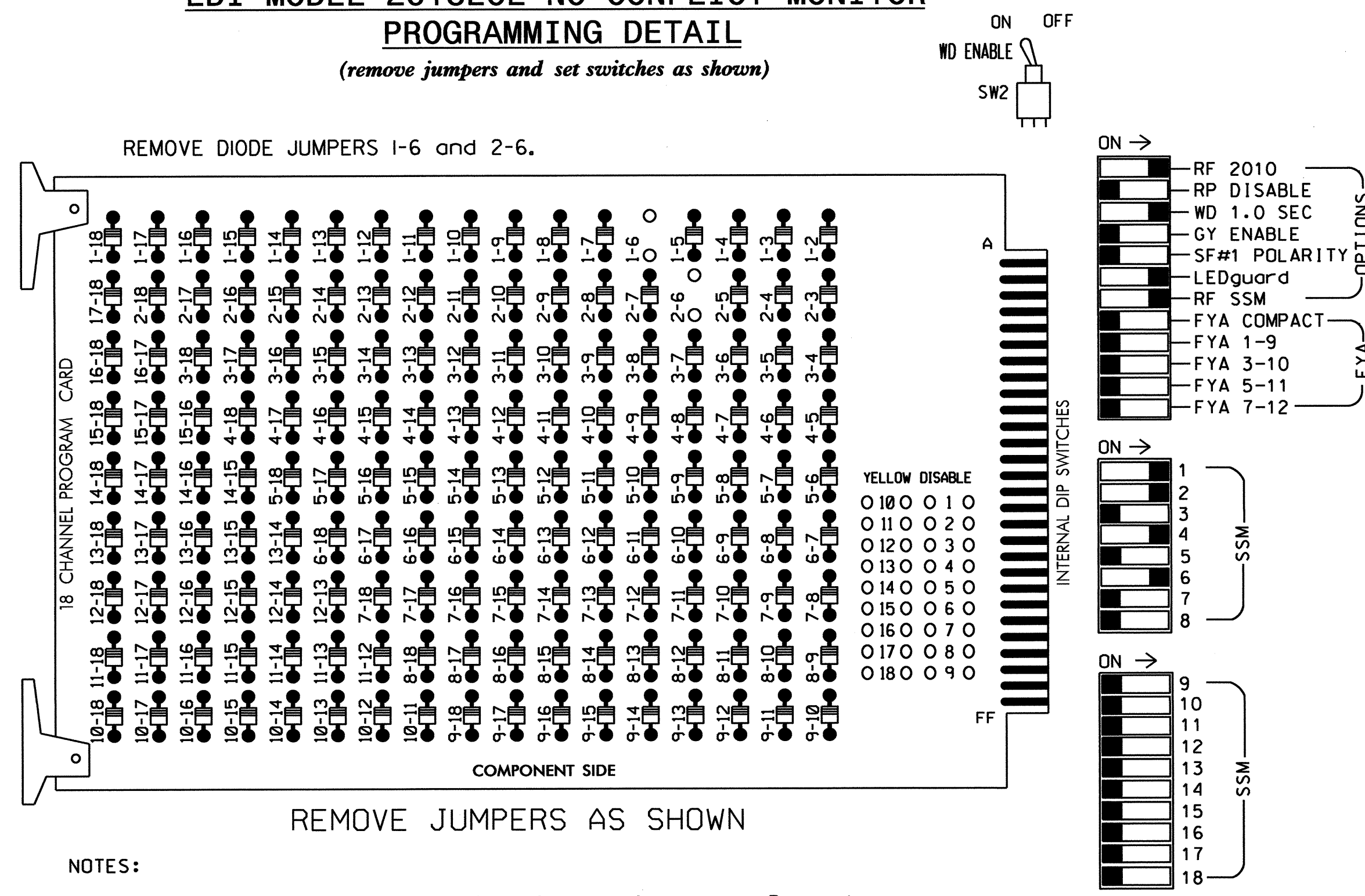
Prepared In the Offices of:

NC 280 (Airport Road) at I-26 Eastbound Ramps
 Division 13 Buncombe County Fletcher
 PLAN DATE: April 2013 REVIEWED BY: T.J. Williams
 PREPARED BY: Z.M. Little REVIEWED BY:
 REVISIONS INIT. DATE
 SCALE 0 30
 1" = 30'
 750 N. Greenfield Pkwy, Garner, NC 27529
 5/24/13
 SIG. INVENTORY NO. 13-0814 T

22-MAY-2013 11:00
 R:\MTR\offices\signal\0814\0814-01\130814\130814.dgn
 zml

**EDI MODEL 2018ECL-NC CONFLICT MONITOR
PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Enable Simultaneous Gap-Out for all phases.
3. Program phases 2 and 6 for Gap Reduction.
4. Program phases 2 and 6 for Start Up In Green.
5. Program phases 2 and 6 for Yellow Flash.
6. The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....336
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....POLE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S1,S2,S5,S8
 PHASES USED.....1,2,4,6
 OVERLAPS.....NONE

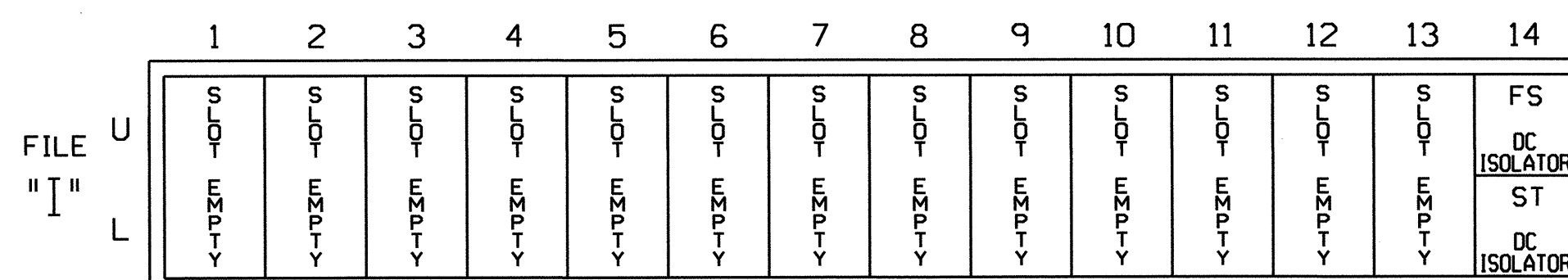
SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 |
|-----------------|-----|-------|-------|----|-------|-------|----|----|-------|-----|-----|-------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED |
| SIGNAL HEAD NO. | 11 | 21,22 | NU | NU | 41,42 | 43 | NU | NU | 61,62 | NU | NU | NU |
| RED | | 128 | | | 101 | | | | 134 | | | |
| YELLOW | | 129 | | | | | | | 135 | | | |
| GREEN | | 130 | | | | | | | 136 | | | |
| RED ARROW | 125 | | | | 101 | | | | | | | |
| YELLOW ARROW | 126 | | | | 102 | 102 | | | | | | |
| GREEN ARROW | 127 | | | | 103 | 103 | | | | | | |

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
 ST = STOP TIME

SPECIAL DETECTOR NOTE

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0814T1
 DESIGNED: April 2013
 SEALED: 5/24/13
 REVISED: N/A

Temporary Design 1 - Construction Phase I

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 280 (Airport Road) at I-26 Eastbound Ramps

Prepared In the Offices of:

 750 N. Greenfield Pkwy, Garner, NC 27529

Division 13 Buncombe County Fletcher

PLAN DATE: May 2013 REVIEWED BY: JTR

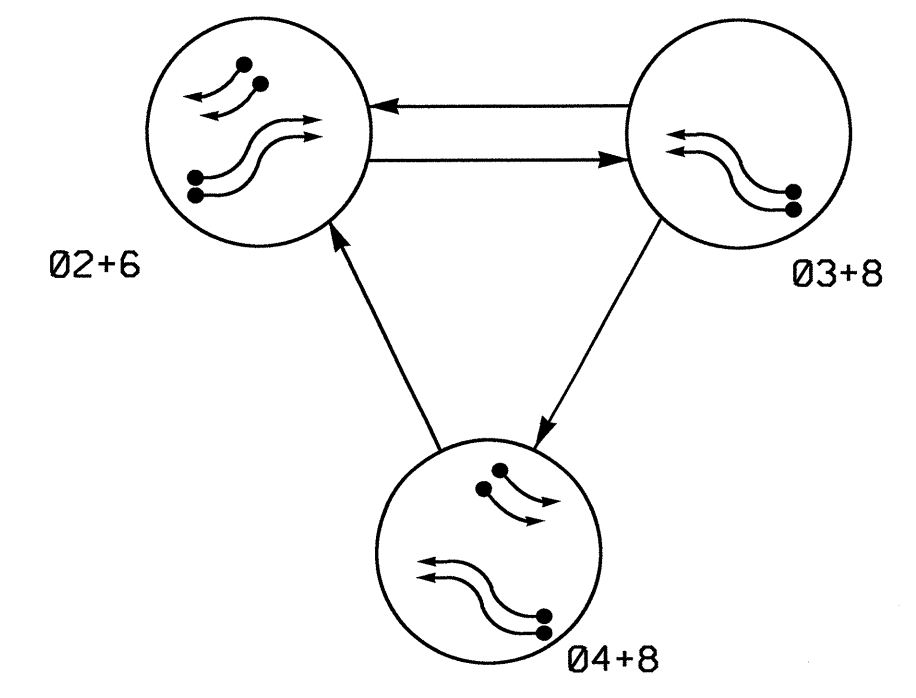
PREPARED BY: S. Armstrong REVIEWED BY:

| REVISIONS | INIT. | DATE |
|-----------|-------|------|
| | | |

SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 008453
 JOHN T. ROWE, III
 SIGNATURE DATE 5-28-13
 SIG. INVENTORY NO. 13-0814T1

PHASING DIAGRAM

Program all phases for "Red Rest".



PHASING DIAGRAM DETECTION LEGEND

- ←●→ DETECTED MOVEMENT
- ←○→ UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- ←- - -> PEDESTRIAN MOVEMENT

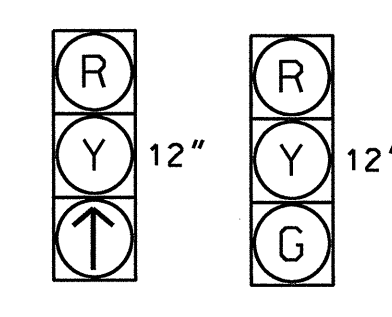
| SIGNAL FACE | PHASE | | | |
|-------------|-------|------|------|-------|
| | 02+6 | 03+8 | 04+8 | LOCAL |
| 21,22,23 | ↑ | R | R | R |
| 41,42 | R | R | G | R |
| 61,62 | G | R | R | R |
| 81,82 | R | ↑ | ↑ | R |

| OASIS 2070L LOOP & DETECTOR INSTALLATION CHART | | | | | | | | | | | | |
|--|-----------|----------------------------|-------|----------|-------|----------------------|-----------|-----------------|--------------|------------|-------------|----------|
| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | PHASE | DETECTOR PROGRAMMING | | | | | | |
| | | | | | | CALLING | EXTENSION | FULL TIME DELAY | STRETCH TIME | DELAY TIME | SYSTEM LOOP | NEW CARD |
| 2A | 6X40 | 0 | * | Y | 2 | Y | Y | - | - | - | - | Y |
| 2B | 6X40 | 0 | * | Y | 2 | Y | Y | - | - | - | - | Y |
| 2C | 6X40 | 0 | * | Y | 2 | Y | Y | - | - | - | - | Y |
| 4A | 6X40 | 0 | * | Y | 3/4 | Y | Y | - | - | - | - | Y |
| 4B | 6X40 | 0 | * | Y | 3/4 | Y | Y | - | - | - | - | Y |
| 6A | 6X6 | 300 | * | Y | 6 | - | Y | - | 2.4 | - | - | Y |
| 6B | 6X6 | 300 | * | Y | 6 | - | Y | - | 2.4 | - | - | Y |
| 6C | 6X40 | 0 | * | Y | 6 | Y | Y | - | - | - | - | Y |
| 6D | 6X40 | 0 | * | Y | 6 | Y | Y | - | - | - | - | Y |
| 8A | 6X40 | 0 | * | Y | 8 | Y | Y | - | - | - | - | Y |
| 8B | 6X40 | 0 | * | Y | 8 | Y | Y | - | - | - | - | Y |

* Video Detection Zone

SIGNAL FACE I.D.

All Heads L.E.D.

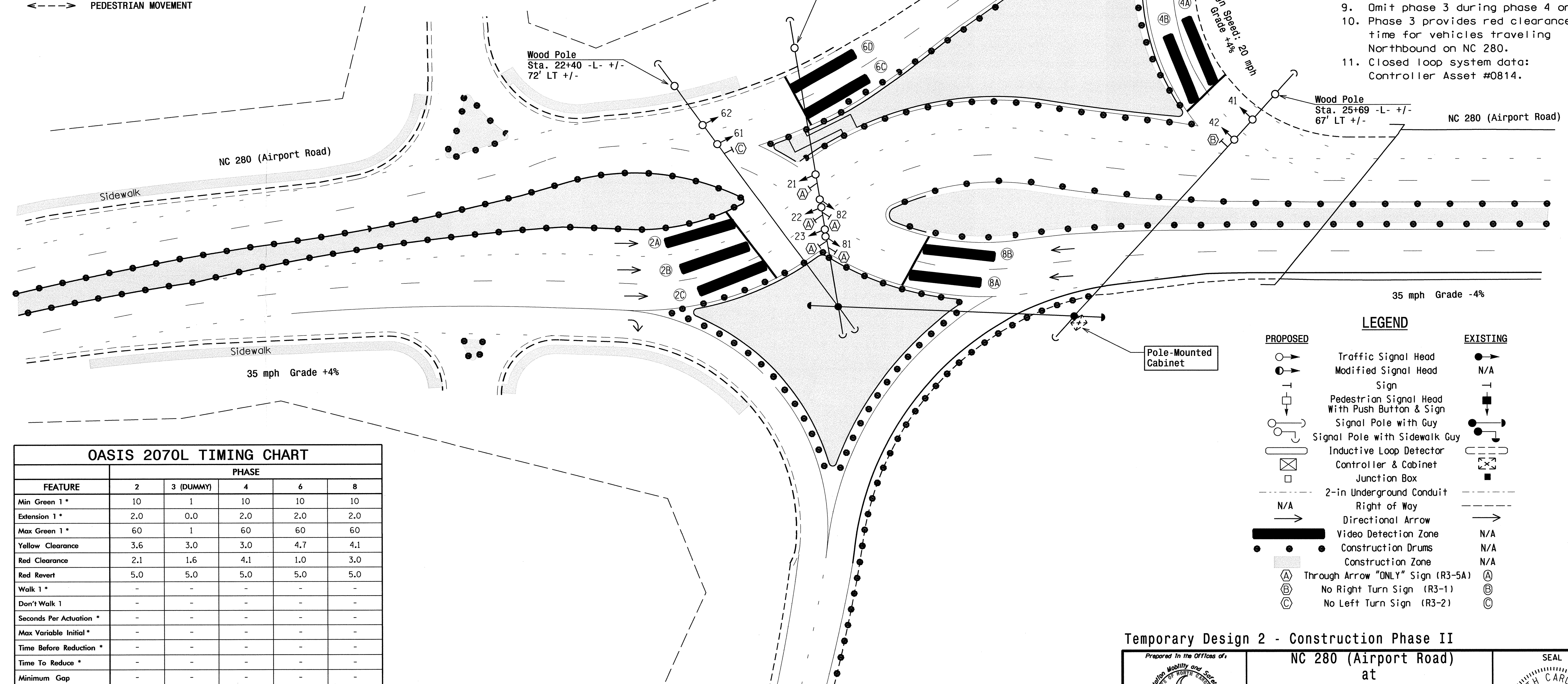


21,22,23 41,42
81,82 61,62

3 Phase Fully Actuated NC 280 (Airport Road) CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation.
3. Set all detector units to presence mode.
4. Incorporate Video Detection system for vehicle detection.
5. Provide the Engineer with the Manufacturer's approved Video Detection locations and mounting heights to obtain detection zones as shown.
6. Program all phases for "Red Rest".
7. Omit phase 4 during phase 2+6 on.
8. Program controller to clear from phase 2+6 to phase 4 by progressing through phase 3.
9. Omit phase 3 during phase 4 on.
10. Phase 3 provides red clearance time for vehicles traveling Northbound on NC 280.
11. Closed loop system data: Controller Asset #0814.



| FEATURE | PHASE | | | | |
|-------------------------|-------|-----------|-----|-----|-----|
| | 2 | 3 (DUMMY) | 4 | 6 | 8 |
| Min Green 1 * | 10 | 1 | 10 | 10 | 10 |
| Extension 1 * | 2.0 | 0.0 | 2.0 | 2.0 | 2.0 |
| Max Green 1 * | 60 | 1 | 60 | 60 | 60 |
| Yellow Clearance | 3.6 | 3.0 | 3.0 | 4.7 | 4.1 |
| Red Clearance | 2.1 | 1.6 | 4.1 | 1.0 | 3.0 |
| Red Revert | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Walk 1 * | - | - | - | - | - |
| Don't Walk 1 | - | - | - | - | - |
| Seconds Per Actuation * | - | - | - | - | - |
| Max Variable Initial * | - | - | - | - | - |
| Time Before Reduction * | - | - | - | - | - |
| Time To Reduce * | - | - | - | - | - |
| Minimum Gap | - | - | - | - | - |
| Recall Mode | - | - | - | - | - |
| Vehicle Call Memory | - | - | - | - | - |
| Dual Entry | ON | ON | ON | ON | ON |
| Simultaneous Gap | 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.

LEGEND

- | PROPOSED | EXISTING |
|--|-----------------------------------|
| ○ → Traffic Signal Head | ● → Modified Signal Head |
| □ → Pedestrian Signal Head With Push Button & Sign | □ → Sign |
| ○ → Signal Pole with Guy | ○ → Signal Pole with Sidewalk Guy |
| ⊠ → Inductive Loop Detector | ⊠ → Controller & Cabinet |
| □ → Junction Box | □ → Junction Box |
| - - - → 2-in Underground Conduit | - - - → Right of Way |
| → → Directional Arrow | → → Video Detection Zone |
| ● → Construction Drums | ● → Construction Zone |
| Ⓐ → Through Arrow "ONLY" Sign (R3-5A) | Ⓑ → No Right Turn Sign (R3-1) |
| Ⓒ → No Left Turn Sign (R3-2) | Ⓒ → No Left Turn Sign (R3-2) |

Temporary Design 2 - Construction Phase II

750 N. Greenfield Pkwy, Garner, NC 27529

NC 280 (Airport Road) at I-26 Eastbound Ramps

Division 13 Buncombe County Fletcher

PLAN DATE: April 2013 REVIEWED BY: T.J. Williams

PREPARED BY: Z.M. Little REVIEWED BY:

SEAL

PROFESSIONAL ENGINEER

T.J. WILLIAMS

24393

5/24/13

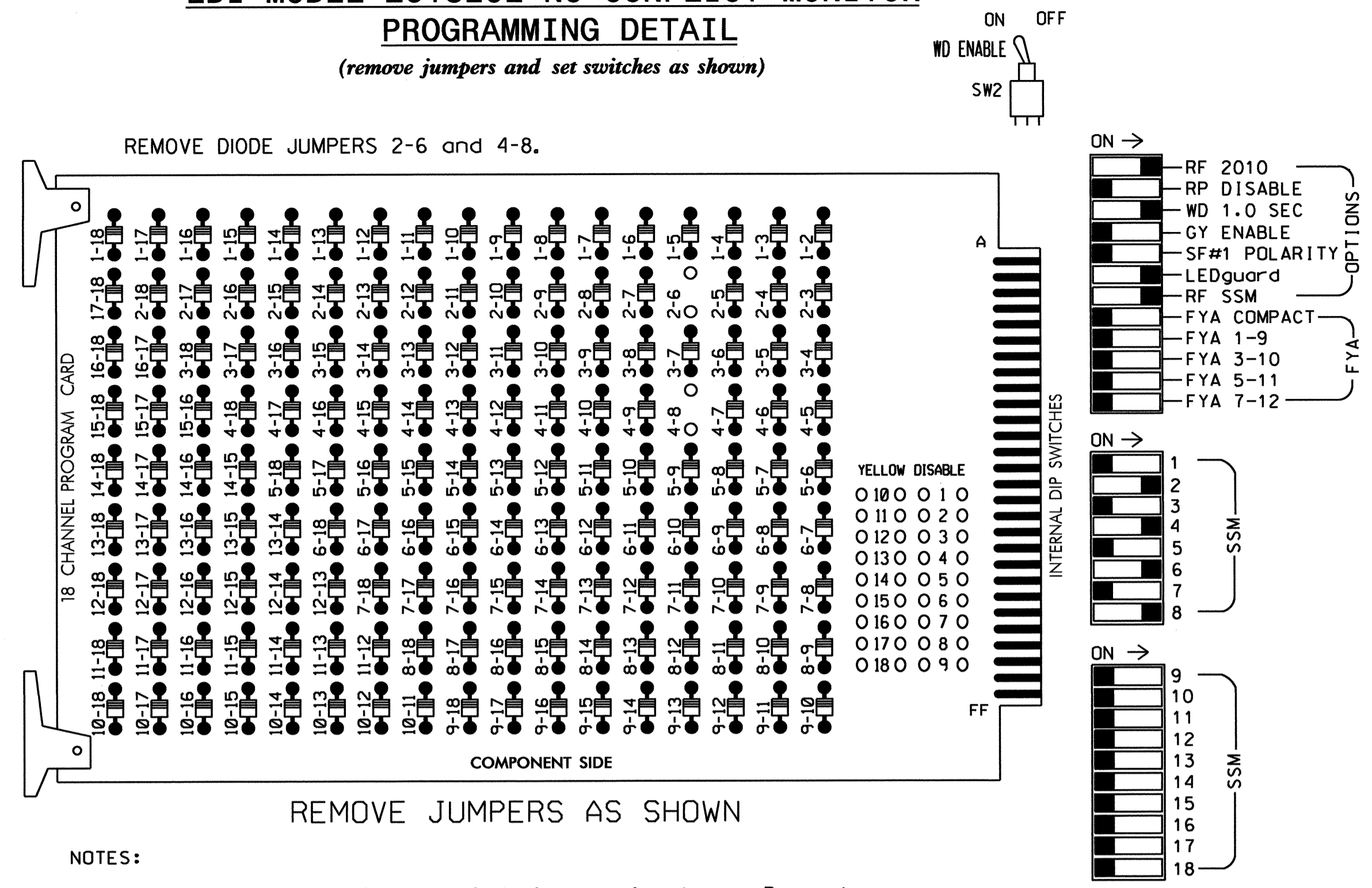
SIGNATURE DATE

SCALE: 1" = 30'

| REVISIONS | INIT. | DATE |
|-----------|-------|------|
| | | |

SIG. INVENTORY NO. 13-0814 T2

**EDI MODEL 2018ECL-NC CONFLICT MONITOR
PROGRAMMING DETAIL**
(remove jumpers and set switches as shown)



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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Program phases 2, 3, 4, 6, and 8 for Dual Entry.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2, 3, 4, 6, and 8 for Red Rest.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....336
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....POLE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S5,S8,S11
 PHASES USED.....2,*3,4,6,8
 OVERLAPS.....NONE

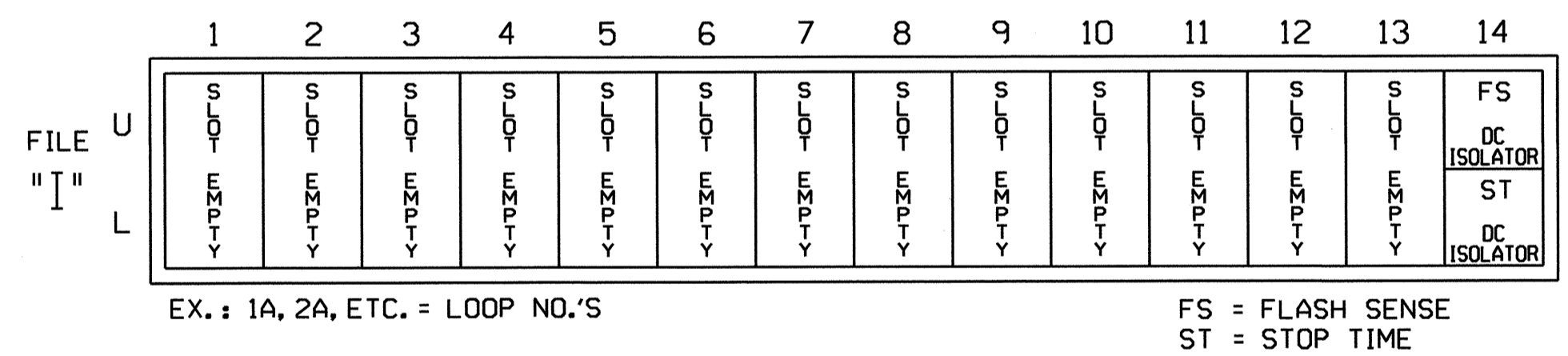
* PHASE USED FOR TIMING PURPOSES ONLY

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 |
|-----------------|----|-------------|-------|----|-------|-------|----|-------|-------|-----|-------|-------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED |
| SIGNAL HEAD NO. | NU | 21,22 23 | NU | NC | 41,42 | NU | NU | 61,62 | NU | NU | 81,82 | NU |
| RED | | 128 | | | 101 | | | 134 | | | 107 | |
| YELLOW | | 129 | | | 102 | | | 135 | | | 108 | |
| GREEN | | | | | 103 | | | 136 | | | | |
| RED ARROW | | | | | | | | | | | | |
| YELLOW ARROW | | | | | | | | | | | | |
| GREEN ARROW | | 130 | | | | | | | | | 109 | |

NU = Not Used
 NC = Not Connected

INPUT FILE POSITION LAYOUT
(from view)



SPECIAL DETECTOR NOTE

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

DYNAMIC OMIT CONTROL PROGRAMMING
(program controller as shown below)

- From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Scroll to the bottom of the menu and enable Dynamic/Backup Control Functions 1 and 2.
- From Phase Control Functions Menu press '2' (Dynamic/Backup Control Functions).

DYNAMIC/BACKUP CONTROL FUNCTION #01
 OVERLAPS: ABCDEFGHIJKLMNOP
 IF OVERLAPS ARE ACTIVE :
 OR PHASES: 12345678910111213141516
 IF PHASES ARE ON : X X
 OMIT PHASES : X
 CALL PHASES : X

PRESS 'NEXT'

DYNAMIC/BACKUP CONTROL FUNCTION #02
 OVERLAPS: ABCDEFGHIJKLMNOP
 IF OVERLAPS ARE ACTIVE :
 OR PHASES: 12345678910111213141516
 IF PHASES ARE ON : X
 OMIT PHASES : X
 CALL PHASES : X

DYNAMIC OMIT PROGRAMMING COMPLETE

NOTE: THIS PROGRAMMING ENSURES THAT PHASE 3 WILL BE SERVED PRIOR TO PHASE 4 WHEN CONTROLLER IS ADVANCING FROM 2+6.

PHASE 3 IS USED TO PROVIDE EXTENDED RED CLEARANCE BEFORE SERVING PHASE 4.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0814T2
 DESIGNED: April 2013
 SEALED: 5/24/13
 REVISED: N/A

Temporary Design 2 - Construction Phase II

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 280 (Airport Road) at I-26 Eastbound Ramps

Division 13 Buncombe County Fletcher

Prepared In the Offices of:

 750 N. Greenfield Pkwy, Garner, NC 27529

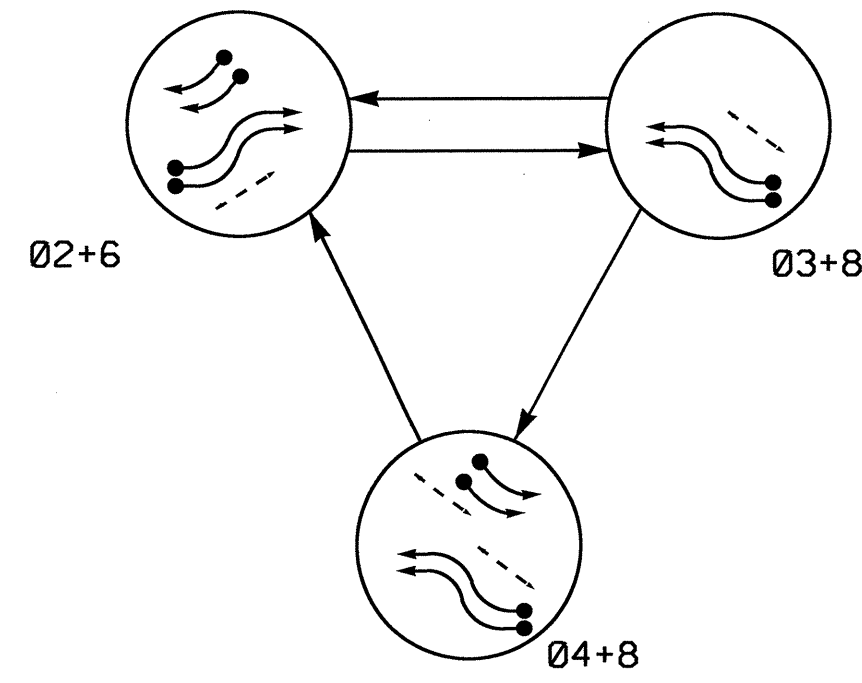
SEAL
 NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 008453
 JOHN T. ROWE, JR.
 ENGINEER

PLAN DATE: May 2013 REVIEWED BY: JTR
 PREPARED BY: S. Armstrong REVIEWED BY:
 REVISIONS INIT. DATE
 SIGNATURE DATE
 5-28-13
 SIG. INVENTORY NO. 13-0814T2

28-MAY-2013 10:12
 S:\IT\SS\JTS\S1\proj\workgroups\519\Main\mstrong\130814\sm.ele_xxxx.dgn
 smstrong

PHASING DIAGRAM

Program all phases for "Red Rest".



PHASING DIAGRAM DETECTION LEGEND

- (solid) DETECTED MOVEMENT
- (dashed) UNDETECTED MOVEMENT (OVERLAP)
- (dotted) UNSIGNALIZED MOVEMENT
- (dashed with arrow) PEDESTRIAN MOVEMENT

TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | |
|-------------|-------|------|------|-----|
| | 02+6 | 03+8 | 04+8 | F |
| 21,22,23 | ↑ | R | R | R |
| 24,25 | ↘ | R | R | R |
| 41,42 | R | R | G | R |
| 43,44 | ↗ | R | R | R |
| 61,62 | G | R | R | R |
| 63,64 | ↖ | R | R | R |
| 81,82 | R | ↑ | ↑ | R |
| 83,84 | ↙ | ↙ | ↙ | ↙ |
| P21,P22 | W | DW | DW | DRK |
| P41,P42 | DW | DW | W | DRK |
| P81,P82 | DW | W | W | DRK |

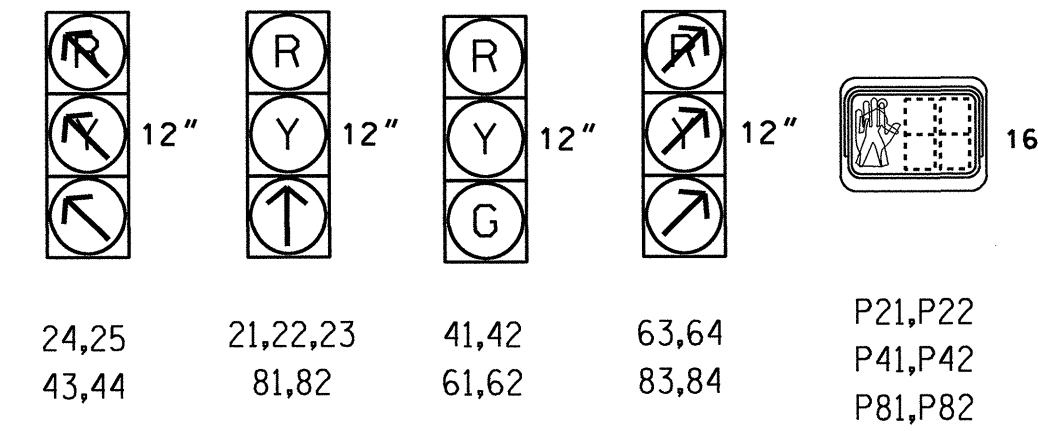
W - Walk
 DW - Don't Walk
 DRK - Dark

OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | DETECTOR PROGRAMMING | | | | | | | |
|------|-----------|----------------------------|-------|----------|----------------------|---------|-----------|-----------------|--------------|------------|-------------|----------|
| | | | | | PHASE | CALLING | EXTENSION | FULL TIME DELET | STRETCH TIME | DELAY TIME | SYSTEM LOOP | NEW CARD |
| 2A | 6X40 | 0 | 2-4-2 | Y | 2 | Y | Y | - | - | - | - | Y |
| 2B | 6X40 | 0 | 2-4-2 | Y | 2 | Y | Y | - | - | - | - | Y |
| 2C | 6X40 | 0 | 2-4-2 | Y | 2 | Y | Y | - | - | - | - | Y |
| 4A | 6X40 | 0 | 2-4-2 | Y | 3/4 | Y | Y | - | - | - | - | Y |
| 4B | 6X40 | 0 | 2-4-2 | Y | 3/4 | Y | Y | - | - | - | - | Y |
| 6A | 6X6 | 300 | 5 | Y | 6 | - | Y | - | 2.4 | - | - | Y |
| 6B | 6X6 | 300 | 5 | Y | 6 | - | Y | - | 2.4 | - | - | Y |
| 6C | 6X40 | 0 | 2-4-2 | Y | 6 | Y | Y | - | - | - | - | Y |
| 6D | 6X40 | 0 | 2-4-2 | Y | 6 | Y | Y | - | - | - | - | Y |
| 8A | 6X40 | 0 | 2-4-2 | Y | 8 | Y | Y | - | - | - | - | Y |
| 8B | 6X40 | 0 | 2-4-2 | Y | 8 | Y | Y | - | - | - | - | Y |
| S07 | 6X6 | +20 | 3 | Y | - | - | - | - | - | - | Y | Y |
| S08 | 6X6 | +20 | 3 | Y | - | - | - | - | - | - | Y | Y |
| S09 | 6X6 | +8 | 4 | Y | - | - | - | - | - | - | Y | Y |
| S10 | 6X6 | +8 | 4 | Y | - | - | - | - | - | - | Y | Y |
| S11 | 6X6 | +6 | 3 | Y | - | - | - | - | - | - | Y | Y |
| S12 | 6X6 | +6 | 3 | Y | - | - | - | - | - | - | Y | Y |
| S13 | 6X6 | +6 | 3 | Y | - | - | - | - | - | - | Y | Y |
| S14 | 6X6 | +25 | 3 | Y | - | - | - | - | - | - | Y | Y |
| S15 | 6X6 | +25 | 3 | Y | - | - | - | - | - | - | Y | Y |

SIGNAL FACE I.D.

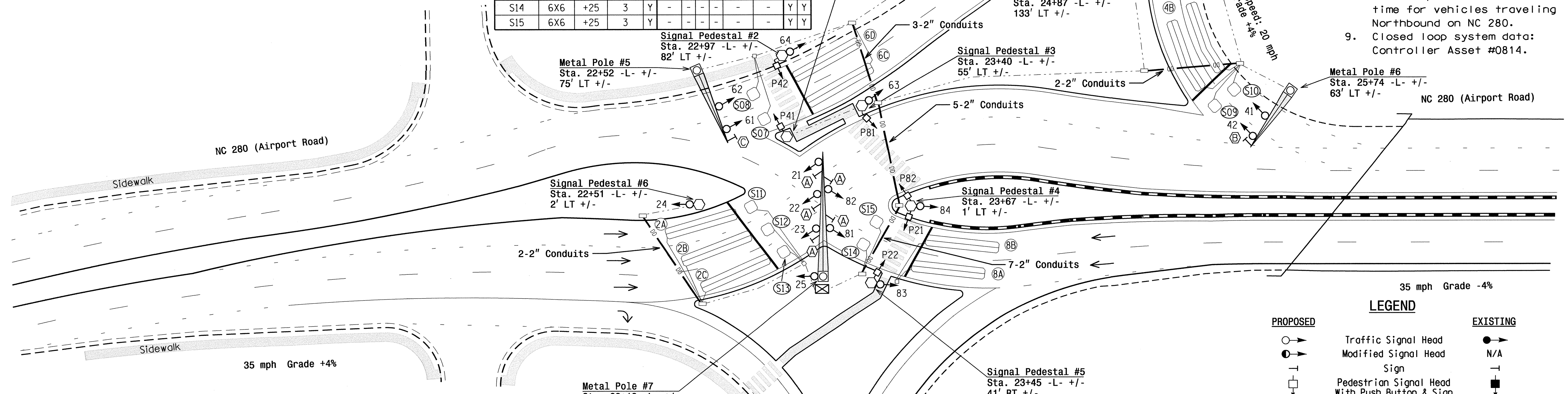
All Heads L.E.D.



3 Phase Fully Actuated NC 280 (Airport Road) CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation.
3. Set all detector units to presence mode.
4. Program all phases for "Red Rest".
5. Omit phase 4 during phase 2+6 on.
6. Program controller to clear from phase 2+6 to phase 4 by progressing through phase 3.
7. Omit phase 3 during phase 4 on.
8. Phase 3 provides red clearance time for vehicles traveling Northbound on NC 280.
9. Closed loop system data: Controller Asset #0814.



OASIS 2070L TIMING CHART

| FEATURE | PHASE | | | | |
|------------------------|-------|-----------|-----|-----|-----|
| | 2 | 3 (DUMMY) | 4 | 6 | 8 |
| Min Green 1* | 10 | 1 | 10 | 10 | 10 |
| Extension 1* | 2.0 | 0.0 | 2.0 | 2.0 | 2.0 |
| Max Green 1* | 60 | 1 | 60 | 60 | 60 |
| Yellow Clearance | 3.6 | 3.0 | 3.0 | 4.7 | 4.1 |
| Red Clearance | 2.1 | 1.6 | 4.1 | 1.0 | 3.0 |
| Red Revert | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Walk 1* | 7 | - | 7 | - | 7 |
| Don't Walk 1 | 7 | - | 7 | - | 11 |
| Seconds Per Actuation* | - | - | - | - | - |
| Max Variable Initial* | - | - | - | - | - |
| Time Before Reduction* | - | - | - | - | - |
| Time To Reduce* | - | - | - | - | - |
| Minimum Gap | - | - | - | - | - |
| Recall Mode | - | - | - | - | - |
| Vehicle Call Memory | - | - | - | - | - |
| Dual Entry | ON | ON | ON | ON | ON |
| Simultaneous Gap | 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.

LEGEND

| PROPOSED | EXISTING |
|--|---------------------------------------|
| ○ → Traffic Signal Head | ● → Traffic Signal Head |
| ○ → Modified Signal Head | N/A |
| □ → Sign | □ → Sign |
| □ → Pedestrian Signal Head With Push Button & Sign | □ → Pedestrian Signal Head |
| □ → Signal Pole with Guy | □ → Signal Pole with Guy |
| □ → Signal Pole with Sidewalk Guy | □ → Signal Pole with Sidewalk Guy |
| ⊗ → Inductive Loop Detector | ⊗ → Inductive Loop Detector |
| □ → Controller & Cabinet | □ → Controller & Cabinet |
| □ → Junction Box | □ → Junction Box |
| □ → Over-sized Junction Box | □ → Over-sized Junction Box |
| — → 2-in Underground Conduit | — → 2-in Underground Conduit |
| N/A | → Right of Way |
| → Directional Arrow | → Directional Arrow |
| ○ → Signal Pedestal | ○ → Signal Pedestal |
| ⊗ → Metal Pole with Mastarm | ⊗ → Metal Pole with Mastarm |
| — DD → Directional Drill Polyethylene Conduit | N/A |
| Ⓐ → Through Arrow "ONLY" Sign (R3-5A) | Ⓐ → Through Arrow "ONLY" Sign (R3-5A) |
| Ⓑ → No Right Turn Sign (R3-1) | Ⓑ → No Right Turn Sign (R3-1) |
| Ⓒ → No Left Turn Sign (R3-2) | Ⓒ → No Left Turn Sign (R3-2) |

Final Design

NC 280 (Airport Road) at I-26 Eastbound Ramps

Division 13 Buncombe County Fletcher

PLAN DATE: April 2013 REVIEWED BY: T.J. Williams

PREPARED BY: Z.W. Little REVIEWED BY:

SEAL

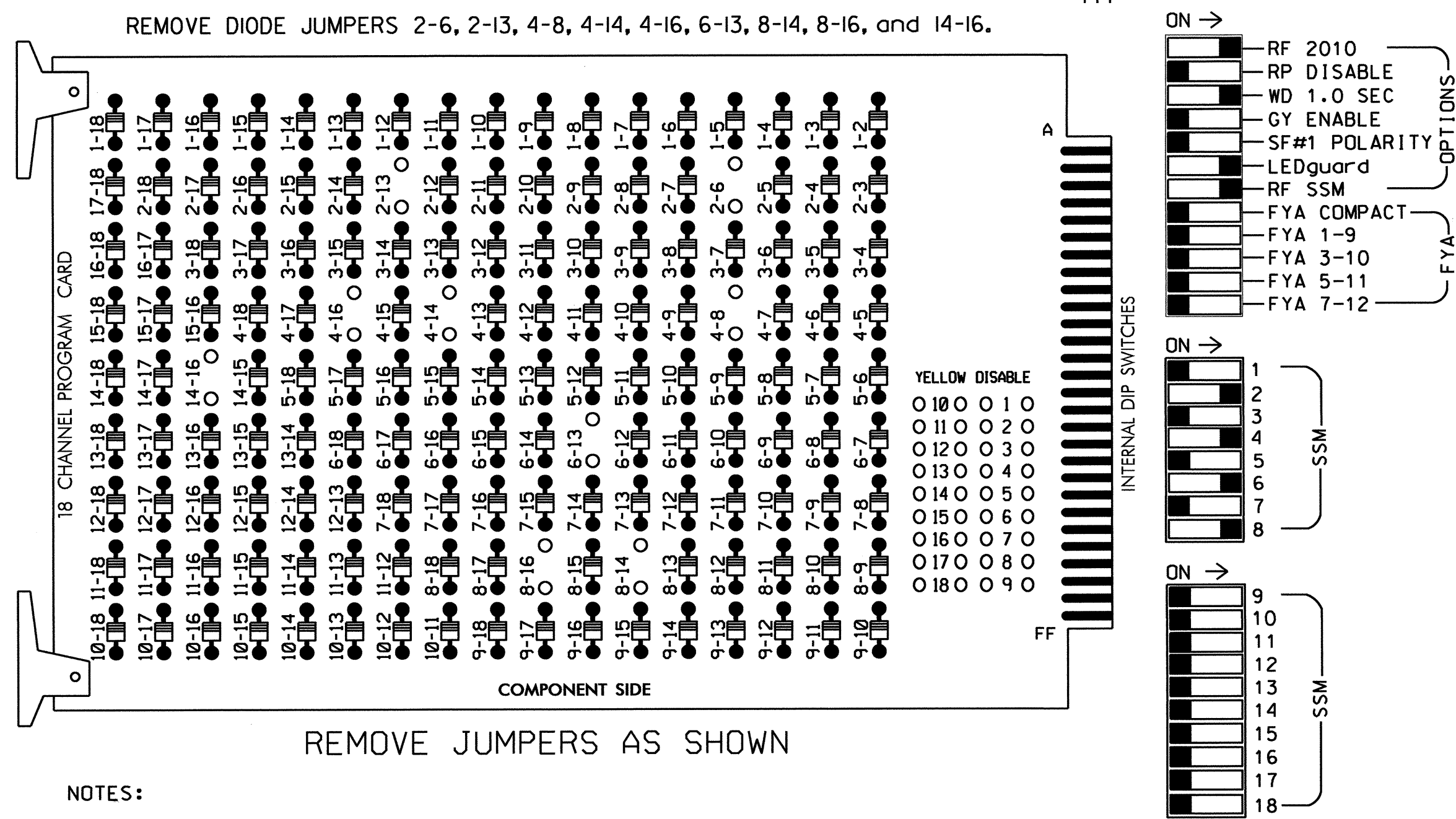
| REVISIONS | INIT. | DATE |
|-----------|-------|------|
| | | |
| | | |

SCALE: 1"=30'

SIG. INVENTORY NO. 13-0814

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Program phases 2, 3, 4, 6, and 8 for Dual Entry.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2, 4, and 8 for 'STARTUP PED CALL'.
- Program phases 2, 3, 4, 6, and 8 for Red Rest.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S3,S5,S6,S8,S11,S12
 PHASES USED.....2,2PED,*3,4,4PED,6,8,8PED
 OVERLAPS.....NONE

* PHASE USED FOR TIMING PURPOSES ONLY

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 |
|-----------------|----|-------------|-------|-------------|-----|----------------|-------------|-----|----------------|-----|----------------|-------------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED |
| SIGNAL HEAD NO. | NU | 21,22 23 | 24,25 | P21, P22 | NC | 41,42 43,44 | P41, P42 | NU | 61,62 63,64 | NU | 81,82 83,84 | P81, P82 |
| RED | | 128 | | | 101 | | | 134 | | | 107 | |
| YELLOW | | 129 | | | 102 | | | 135 | | | 108 | |
| GREEN | | | | | 103 | | | 136 | | | | |
| RED ARROW | | | 128 | | | 101 | | | 134 | | | 107 |
| YELLOW ARROW | | | 129 | | | 102 | | | 135 | | | 108 |
| GREEN ARROW | | 130 | 130 | | | 103 | | | 136 | | 109 | 109 |
| Hand icon | | | | 113 | | | 104 | | | | | 110 |
| Walker icon | | | | 115 | | | 106 | | | | | 112 |

NU = Not Used
 NC = Not Connected

INPUT FILE POSITION LAYOUT

(front view)

| FILE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------|----|----|----------|----|------|---------------|---------------|---------------|--------|----------|----|-------------|-------------|-------------|
| U | ∅2 | ∅2 | ∅2 | ∅2 | ∅3/4 | SYS. DET. S07 | SYS. DET. S09 | SYS. DET. S10 | ∅2 PED | NOT USED | FS | DC ISOLATOR | DC ISOLATOR | DC ISOLATOR |
| L | 2A | 2C | NOT USED | 2B | 4A | SYS. DET. S08 | NOT USED | SYS. DET. S11 | ∅4 PED | ∅8 PED | ST | DC ISOLATOR | DC ISOLATOR | DC ISOLATOR |
| U | ∅6 | ∅6 | ∅6 | ∅6 | ∅8 | SYS. DET. S12 | SYS. DET. S14 | SYS. DET. S15 | ∅6 | ∅6 | ∅6 | ∅6 | ∅6 | ∅6 |
| L | 6A | 6C | 6B | 6D | 8A | SYS. DET. S13 | SYS. DET. S15 | | | | | | | |

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

FS = FLASH SENSE
 ST = STOP TIME

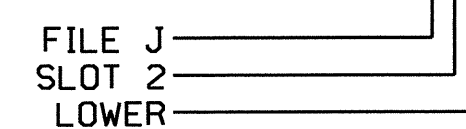
INPUT FILE CONNECTION & PROGRAMMING CHART

| LOOP NO. | LOOP TERMINAL | INPUT FILE POS. | PIN NO. | INPUT ASSIGNMENT NO. | DETECTOR NO. | NEMA PHASE | CALL | EXTEND | FULL TIME DELAY | STRETCH TIME | DELAY TIME |
|------------------|---------------|-----------------|---------|----------------------|--------------|------------|------|--------|-----------------|--------------|------------|
| 2A | TB2-5,6 | I2U | 39 | 1 | 2 | 2 | Y | Y | | | |
| 2B | TB2-7,8 | I2L | 43 | 5 | 12 | 2 | Y | Y | | | |
| 2C | TB2-9,10 | I3U | 63 | 25 | 32 | 2 | Y | Y | | | |
| 4A | TB4-9,10 | I6U | 41 | 3 | 4 | 3/4 | Y | Y | | | |
| 4B | TB4-11,12 | I6L | 45 | 7 | 14 | 3/4 | Y | Y | | | |
| 6A | TB3-5,6 | J2U | 40 | 2 | 6 | 6 | Y | Y | | 2.4 | |
| 6B | TB3-7,8 | J2L | 44 | 6 | 16 | 6 | Y | Y | | 2.4 | |
| 6C | TB3-9,10 | J3U | 64 | 26 | 36 | 6 | Y | Y | | | |
| 6D | TB3-11,12 | J3L | 77 | 39 | 46 | 6 | Y | Y | | | |
| 8A | TB5-9,10 | J6U | 42 | 4 | 8 | 8 | Y | Y | | | |
| 8B | TB5-11,12 | J6L | 46 | 8 | 18 | 8 | Y | Y | | | |
| * S07 | TB6-1,2 | I7U | 65 | 27 | 34 | SYS | | | | | |
| * S08 | TB6-3,4 | I7L | 78 | 40 | 44 | SYS | | | | | |
| * S09 | TB6-5,6 | I8U | 49 | 11 | 24 | SYS | | | | | |
| * S10 | TB6-9,10 | I9U | 60 | 22 | 11 | SYS | | | | | |
| * S11 | TB6-11,12 | I9L | 62 | 24 | 13 | SYS | | | | | |
| * S12 | TB7-1,2 | J7U | 66 | 28 | 38 | SYS | | | | | |
| * S13 | TB7-3,4 | J7L | 79 | 41 | 48 | SYS | | | | | |
| * S14 | TB7-9,10 | J9U | 59 | 21 | 15 | SYS | | | | | |
| * S15 | TB7-11,12 | J9L | 61 | 23 | 17 | SYS | | | | | |
| PED PUSH BUTTONS | | | | | | | | | | | |
| P21,P22 | TB8-4,6 | I12U | 67 | 29 | PED 2 | 2 PED | | | | | |
| P41,P42 | TB8-5,6 | I12L | 69 | 31 | PED 4 | 4 PED | | | | | |
| P81,P82 | TB8-8,9 | I13L | 70 | 32 | PED 8 | 8 PED | | | | | |

NOTE:
 INSTALL DC ISOLATORS
 IN INPUT FILE SLOTS
 112 AND 113.

* System detector only. Remove the vehicle phase assigned to this detector in the default programming.

INPUT FILE POSITION LEGEND: J2L



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: 13-0814
 DESIGNED: April 2013
 SEALED: 5/24/13
 REVISED: N/A

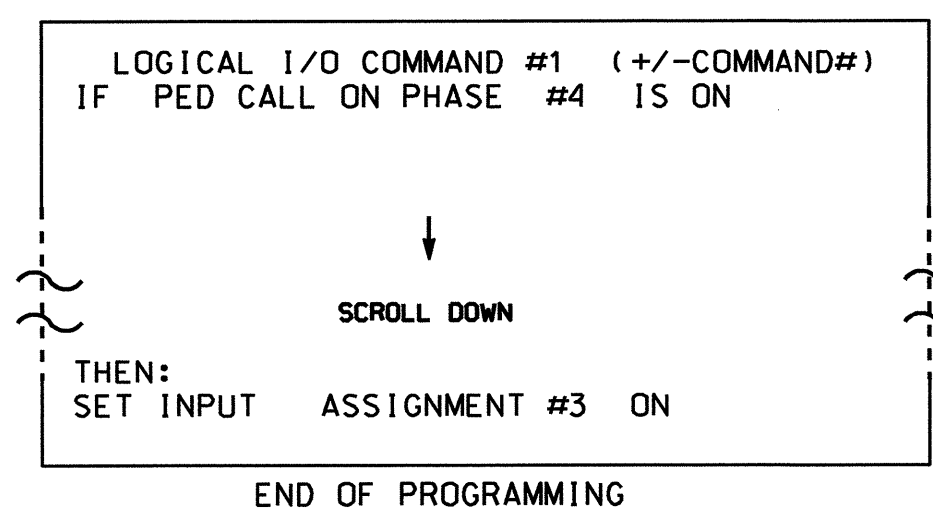
Final Design - Sheet 1 of 2

| | | | |
|--|---|-------------------------------------|---------------|
| | NC 280 (Airport Road) at I-26 Eastbound Ramps | | SEAL |
| | Division 13 Buncombe County Fletcher | | |
| Prepared In the Offices of: | PLAN DATE: May 2013 PREPARED BY: S. Armstrong | REVIEWED BY: JTR REVIEWED BY: | DATE: |
| REVISIONS | | INIT. | DATE |
| 750 N. Greenfield Pkwy, Carrer, NC 27529 | | SIGNATURE: <i>John T. Rowe, Jr.</i> | DATE: 5-28-13 |
| | | SIG. INVENTORY NO. 13-0814 | |

**LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO APPLY PHASE 4 VEH. CALL WITH PHASE 4 PED CALL**

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMAND 1.
- FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).



NOTE: THIS LOGIC ENSURES THAT WHENEVER A PHASE 4 PED CALL EXISTS, A PHASE 4 VEH. CALL WILL ALSO BE PLACED.
THIS IS NECESSARY SO THAT THE "DYNAMIC" PROGRAMMING OPERATES PROPERLY WHEN ONLY A PED CALL EXISTS IN THE FIELD ON PHASE 4.

INPUT REFERENCE
INPUT 3 = VEH. DET. 4

DYNAMIC OMIT CONTROL PROGRAMMING

(program controller as shown below)

- From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Scroll to the bottom of the menu and enable Dynamic/Backup Control Functions 1 and 2.
- From Phase Control Functions Menu press '2' (Dynamic/Backup Control Functions).

```

    DYNAMIC/BACKUP CONTROL FUNCTION #01
    OVERLAPS: ABCDEFGHIJKLMNOP
    IF OVERLAPS ARE ACTIVE:
    OR PHASES: 12345678910111213141516
    IF PHASES ARE ON: X X
    OMIT PHASES: X
    CALL PHASES: X
  
```

PRESS 'NEXT'

```

    DYNAMIC/BACKUP CONTROL FUNCTION #02
    OVERLAPS: ABCDEFGHIJKLMNOP
    IF OVERLAPS ARE ACTIVE:
    OR PHASES: 12345678910111213141516
    IF PHASES ARE ON: X
    OMIT PHASES: X
    CALL PHASES:
  
```

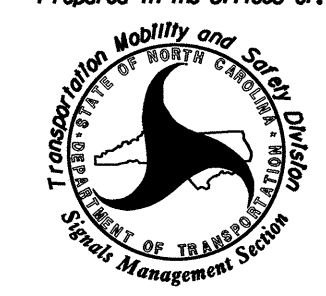
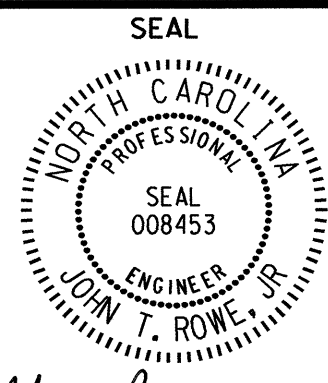
DYNAMIC OMIT PROGRAMMING COMPLETE

NOTE: THIS PROGRAMMING ENSURES THAT PHASE 3 WILL BE SERVED PRIOR TO PHASE 4 WHEN CONTROLLER IS ADVANCING FROM 2+6.

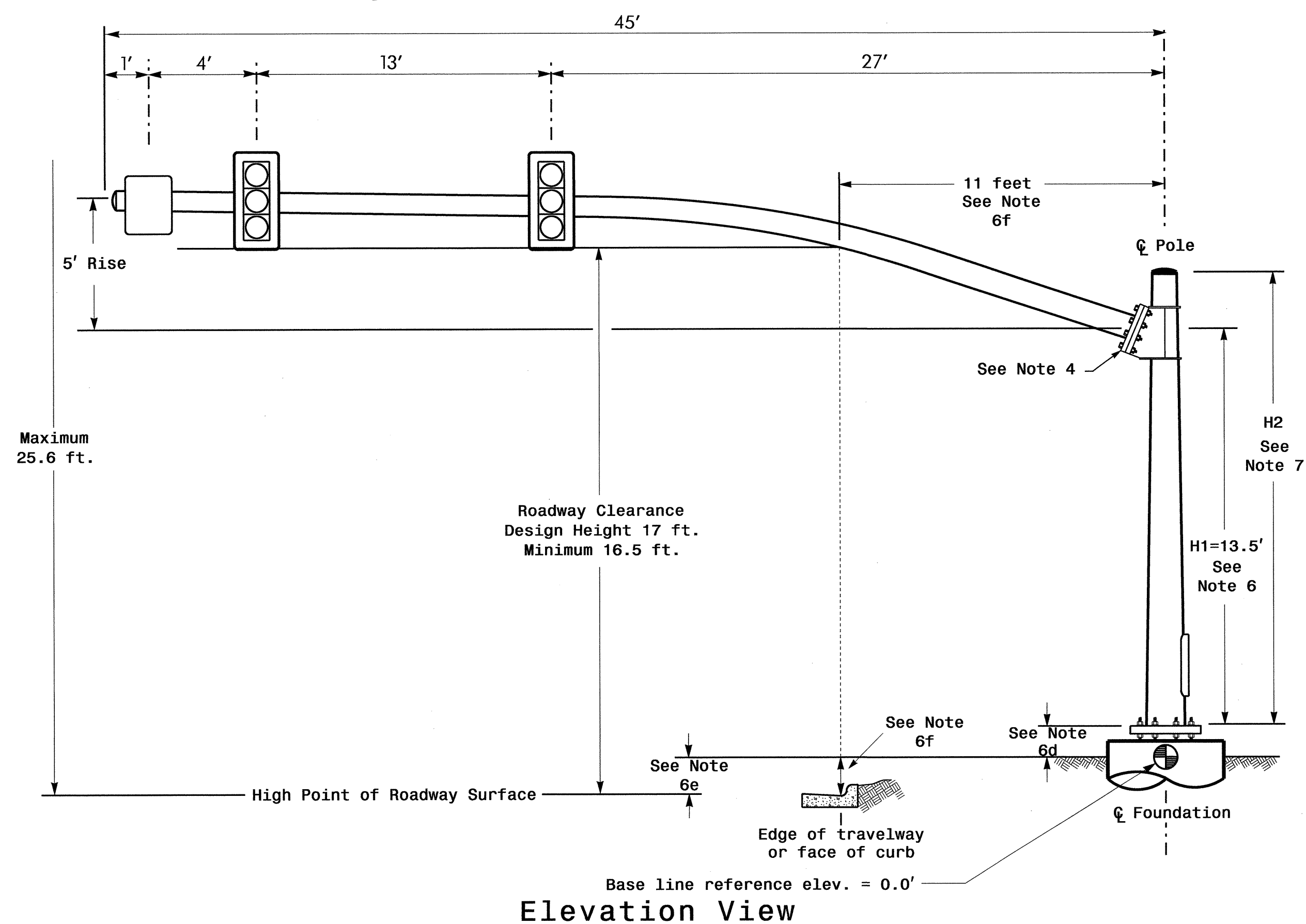
PHASE 3 IS USED TO PROVIDE EXTENDED RED CLEARANCE BEFORE SERVING PHASE 4.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 13-0814
DESIGNED: April 2013
SEALED: 5/24/13
REVISED: N/A

Final Design - Sheet 2 of 2

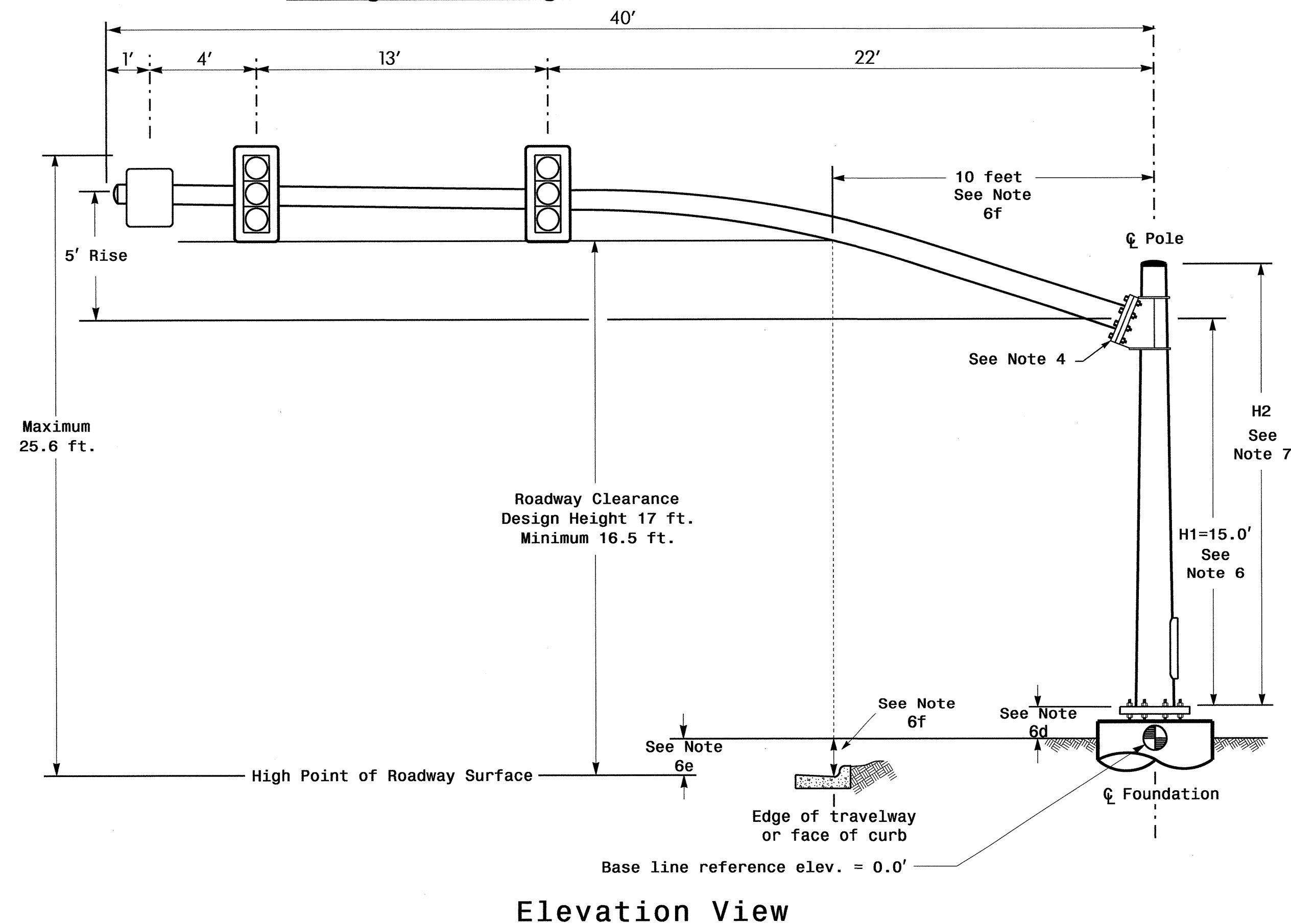
| | | | |
|--|--|--|--|
| ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529 | NC 280 (Airport Road) at I-26 Eastbound Ramps | | SEAL  JOHN T. ROWE, JR. ENGINEER SEAL 008453 |
| | Division 13 Buncombe County Fletcher | PLAN DATE: May 2013 REVIEWED BY: JTR | PREPARED BY: S. Armstrong REVIEWED BY: |
| | REVISIONS INIT. DATE | SIGNATURE: <i>John T. Rowe</i> 5-28-13 <small>SIGNATURE DATE</small> | SIG. INVENTORY NO. 13-0814 |
| | REVISIONS INIT. DATE | REVISIONS INIT. DATE | REVISIONS INIT. DATE |

Design Loading for METAL POLE NO. 5



Elevation View

Design Loading for METAL POLE NO. 6



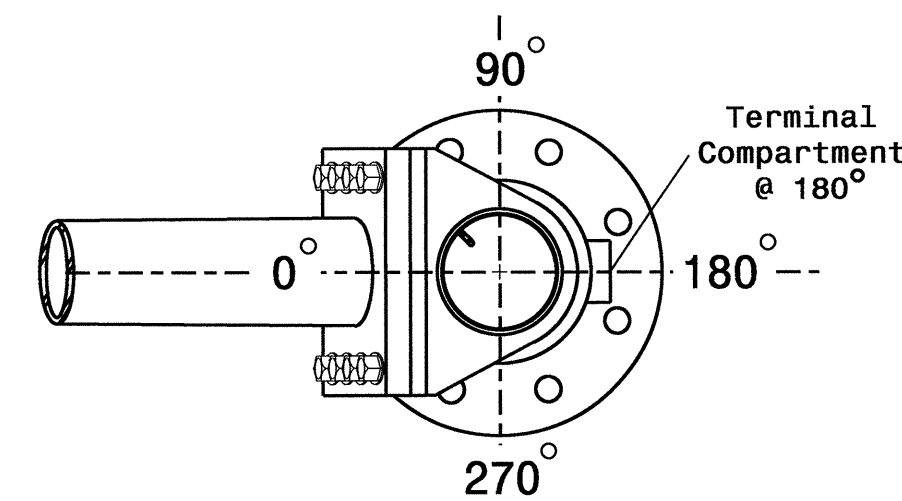
Elevation View

SPECIAL NOTE

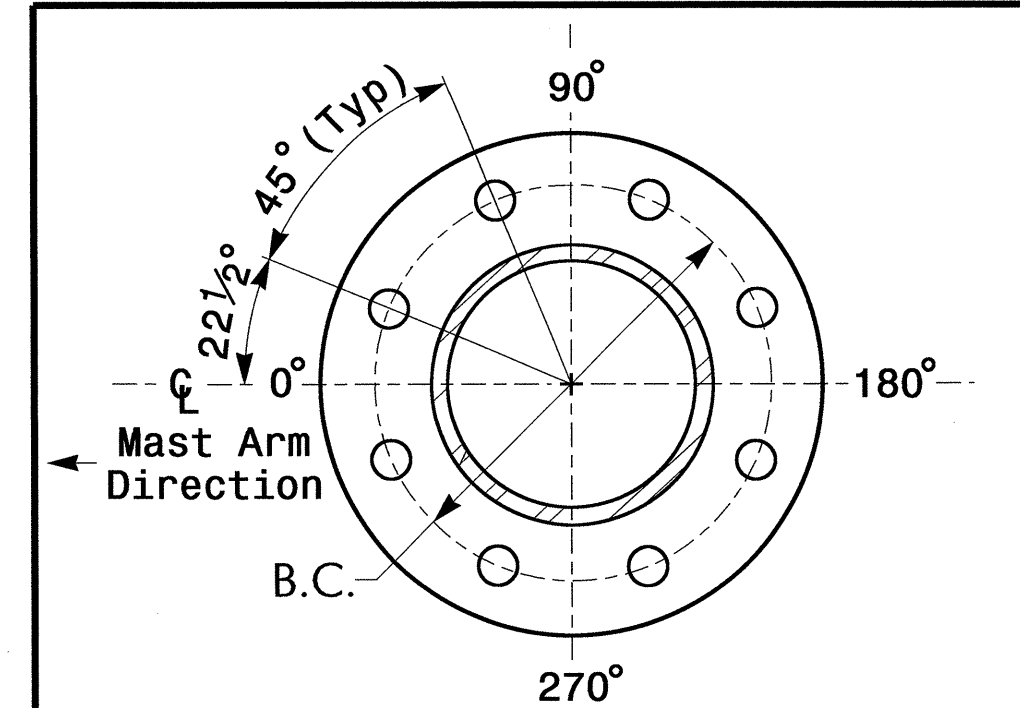
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

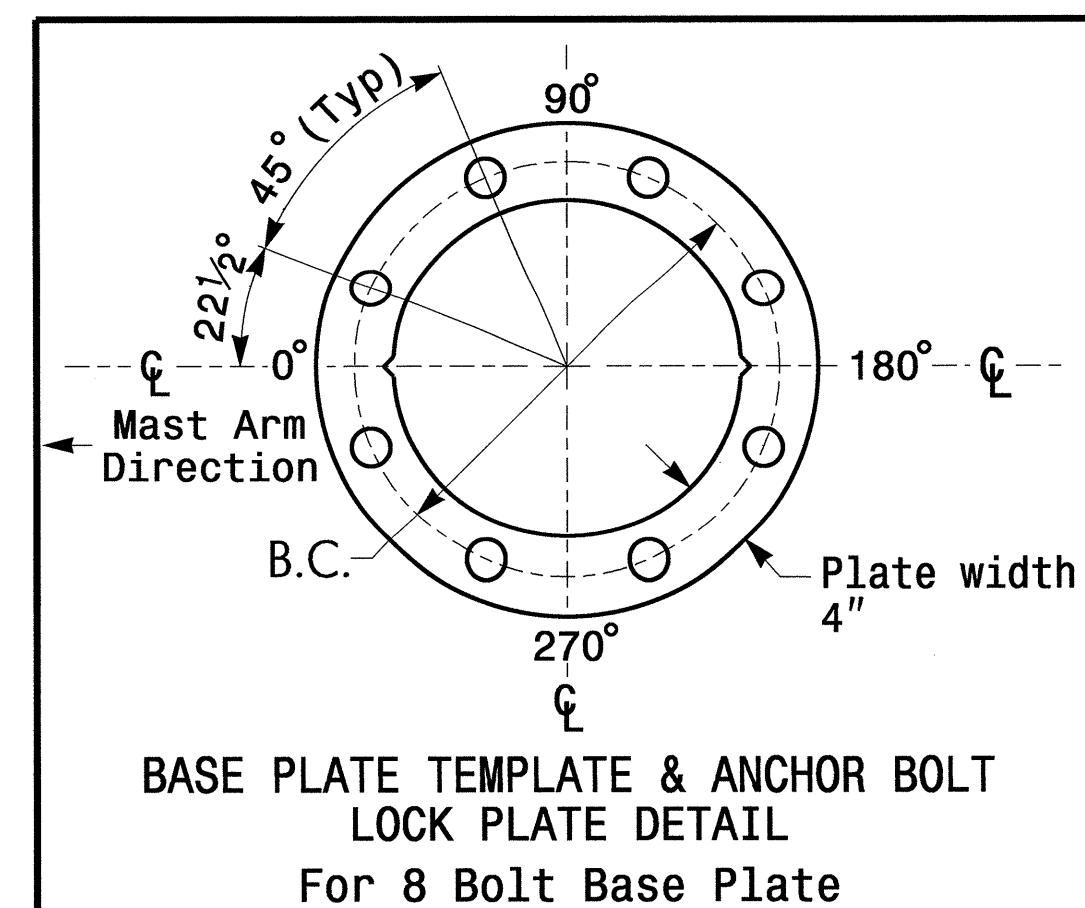
| Elevation Differences for: | Pole 5 | Pole 6 |
|--|----------|----------|
| Baseline reference point at ϕ Foundation @ ground level | 0.0 ft. | 0.0 ft. |
| Elevation difference at High point of roadway surface | -0.7 ft. | +0.9 ft. |
| Elevation difference at Edge of travelway or face of curb | -0.7 ft. | +0.1 ft. |



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL
See Note 6



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

MAST ARM LOADING SCHEDULE

| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
|----------------|--|----------|-------------------------|--------|
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |

NOTES

Design Reference Material

- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2012 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.

Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
 - Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
- The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals Design Section Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

| | | | |
|--|--|-------------------------------|-----------------------------------|
| <p>Prepared In the Offices of: TRANSPORTATION MOBILITY AND SAFETY DIVISION SIGNALS DESIGN SECTION 750 N. Greenfield Pkwy, Garner, NC 27529</p> | <p>NC 280 (Airport Road) at I-26 Eastbound Ramps</p> | | |
| | <p>Division 13 Buncombe County Fletcher</p> | <p>PLANNED BY: April 2013</p> | |
| <p>SCALE: 0 N/A</p> | <p>PREPARED BY: Z.M. Little</p> | <p>REVIEWED BY:</p> | <p>DATE: 5/30/13</p> |
| <p>SCALE: N/A</p> | <p>REVISIONS:</p> | <p>INIT. DATE:</p> | <p>SIG. INVENTORY NO. 13-0814</p> |

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

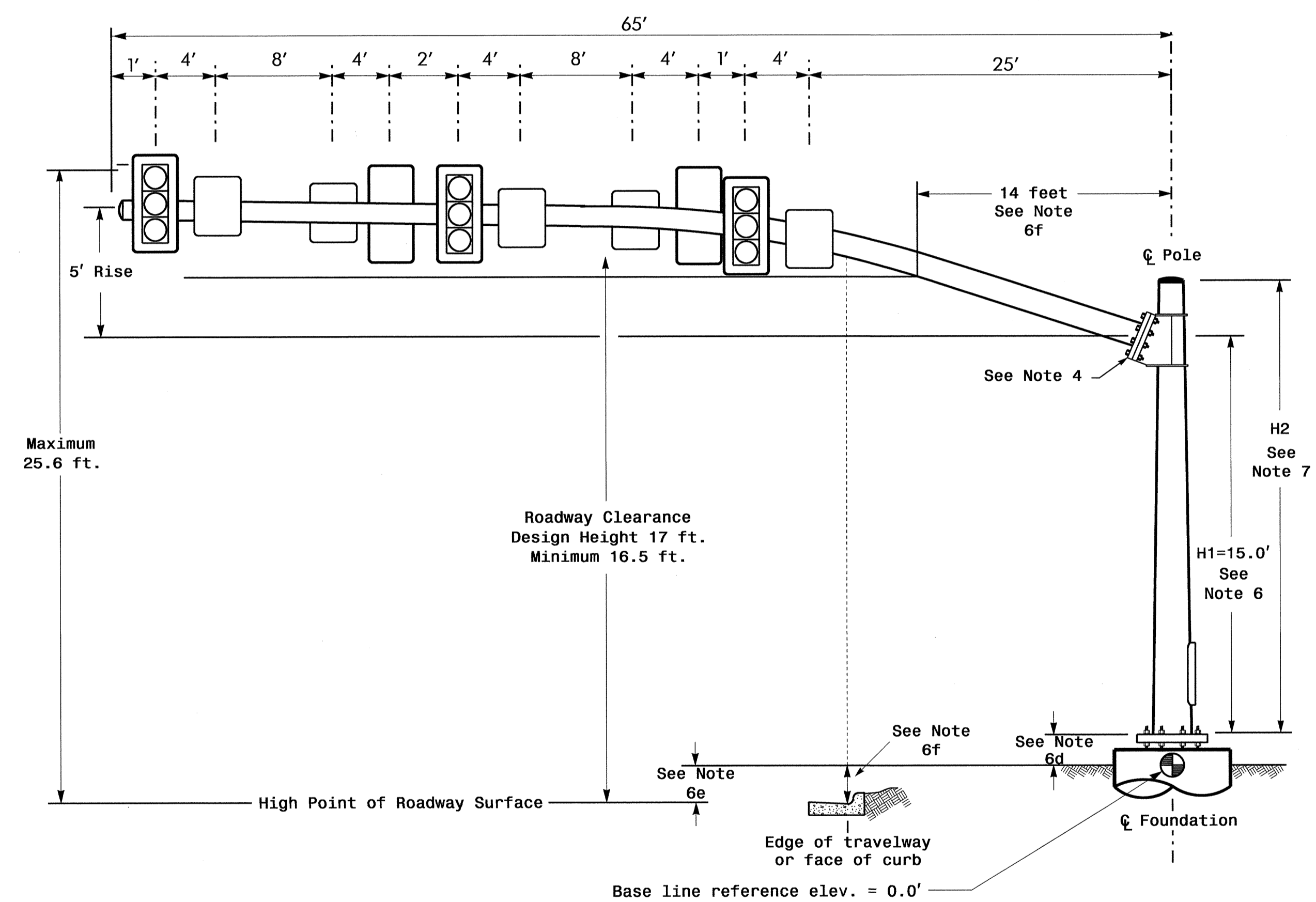
Elevation Data for Mast Arm Attachment (H1)

| | |
|--|----------|
| Elevation Differences for: | Pole 7 |
| Baseline reference point at ϕ Foundation @ ground level | 0.0 ft. |
| Elevation difference at High point of roadway surface | +0.9 ft. |
| Elevation difference at Edge of travelway or face of curb | +0.4 ft. |

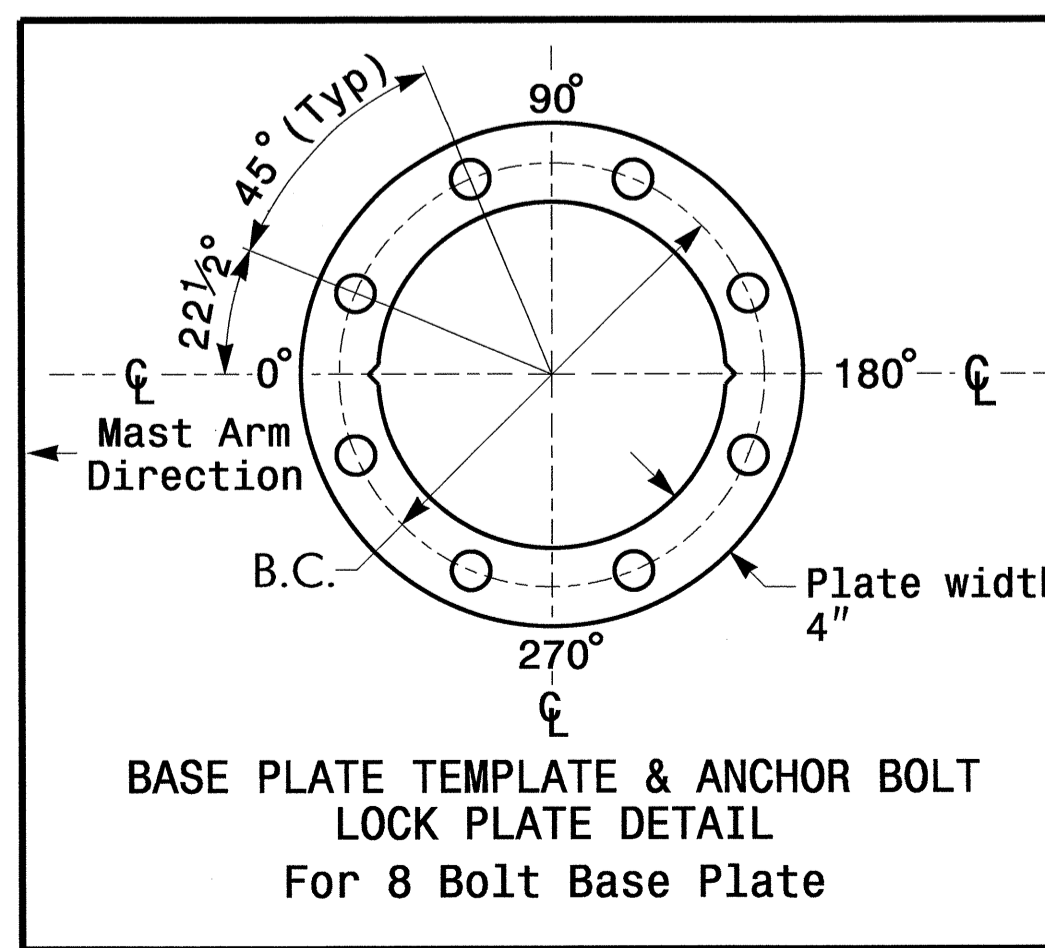
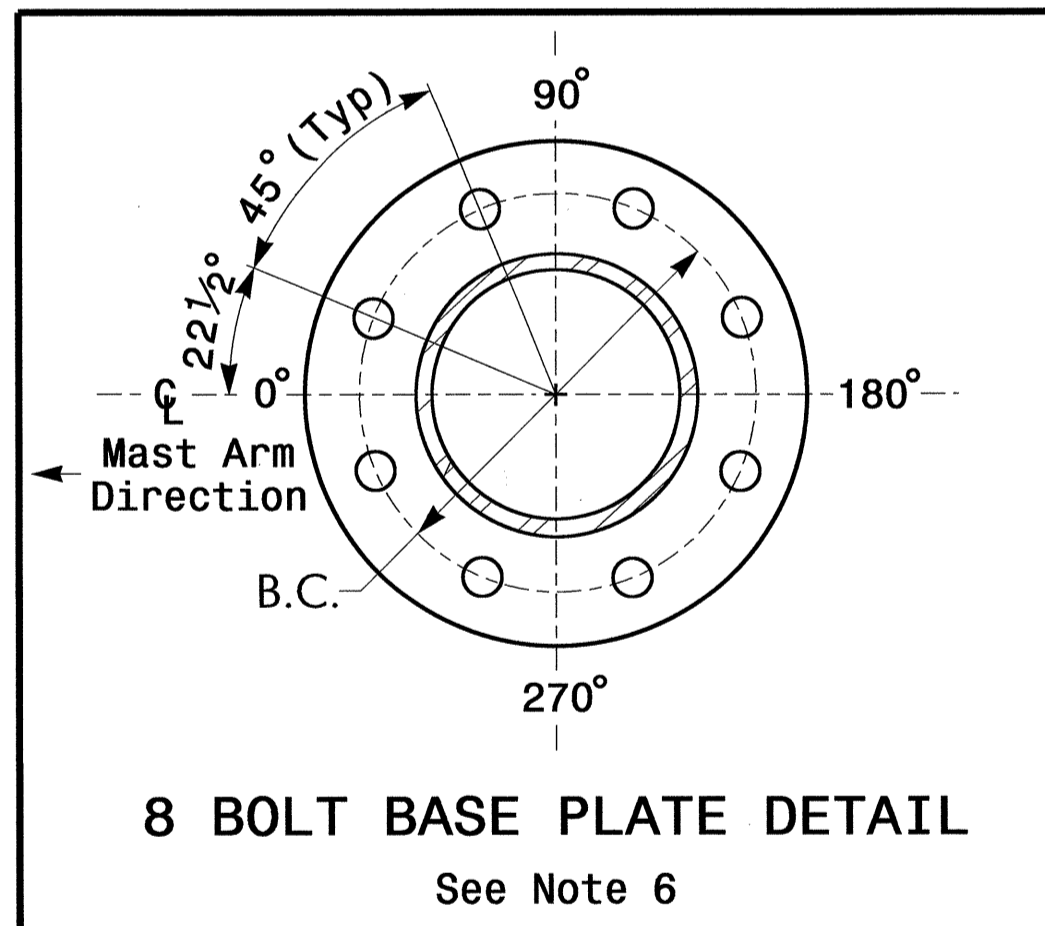
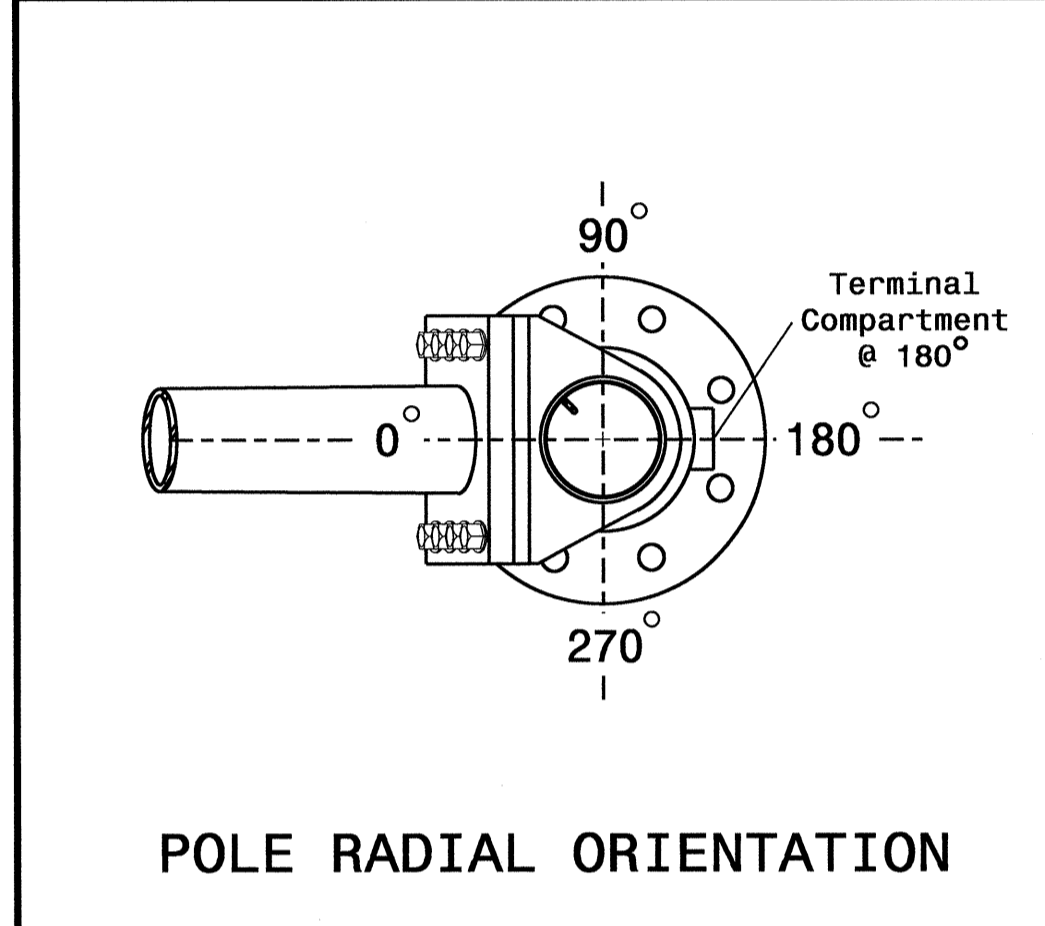
MAST ARM LOADING SCHEDULE

| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
|----------------|--|----------|-------------------------|--------|
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |

Design Loading for METAL POLE NO. 7



Elevation View



Design Reference Material

- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2012 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.

Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
 - Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
- The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals Design Section Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

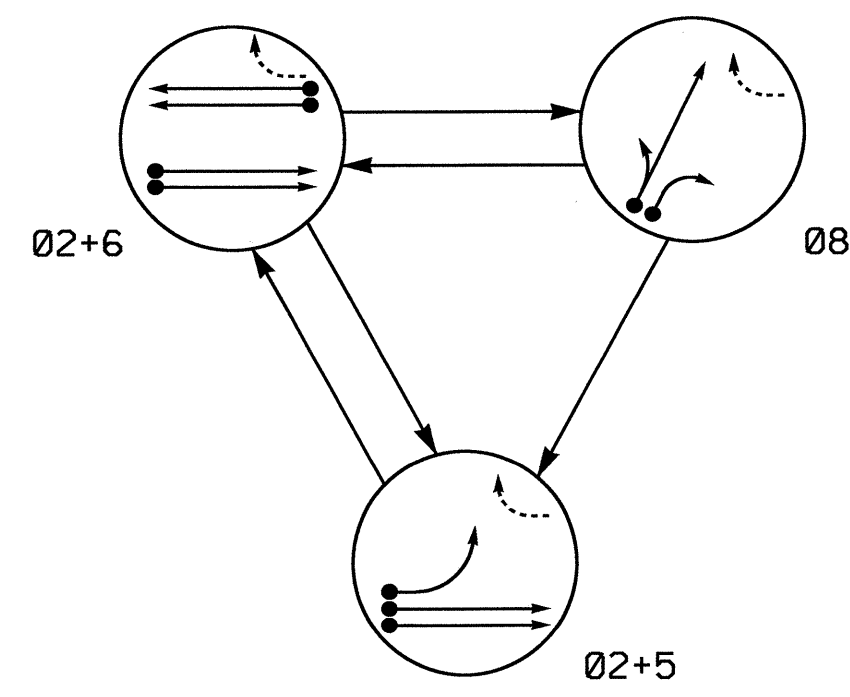
NOTES

NCDOT Wind Zone 4 (90 mph)

| | | | | |
|-------------------------------|-----------------------------|----------------------------|--------------------------------------|--|
| | Prepared In the Offices of: | | SEAL | |
| | NC 280 (Airport Road) | | NORTH CAROLINA PROFESSIONAL ENGINEER | |
| | at | | 24393 | |
| | I-26 Eastbound Ramps | | TWOOTHY WILLIAMS | |
| Division 13 - Buncombe County | | Fletcher | | |
| PLAN DATE: April 2013 | | REVIEWED BY: I.J. Williams | | |
| PREPARED BY: Z.M. Little | | REVIEWED BY: | | |
| SCALE: 0 N/A | | REVISIONS | | |
| N/A | | INIT. DATE | | |
| 7. J. Williams | | 5/30/13 | | |
| SIGNATURE | | DATE | | |
| SIG. INVENTORY NO. 13-0814 | | | | |

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Zmlittle

PHASING DIAGRAM



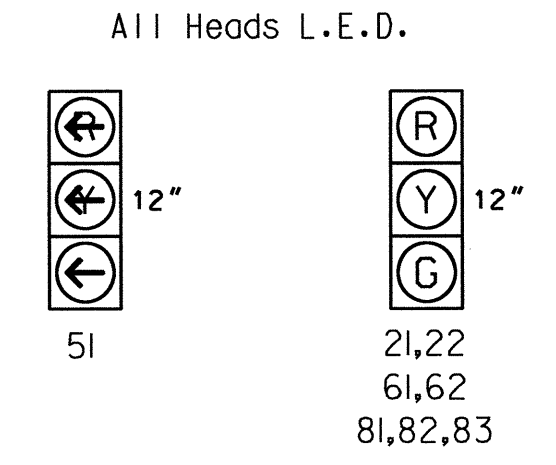
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

| SIGNAL FACE | PHASE | | | |
|-------------|-------|------|----|----|
| | 02+6 | 02+5 | 08 | 08 |
| 21,22 | G | R | R | Y |
| 51 | ← | ← | ← | ← |
| 61,62 | R | G | R | Y |
| 81,82,83 | R | R | G | R |

SIGNAL FACE I.D.



OASIS 2070L LOOP & DETECTOR INSTALLATION CHART

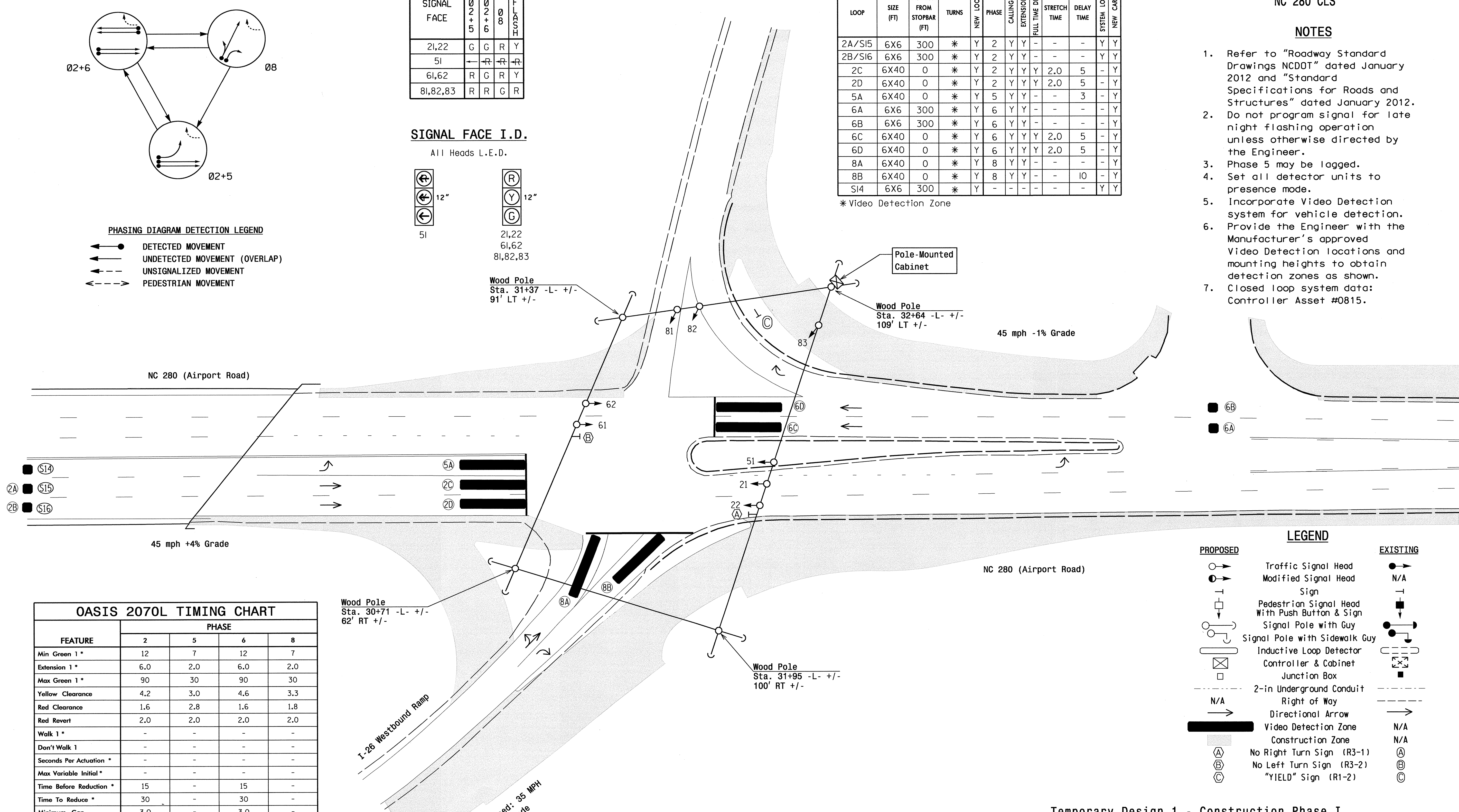
| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | DETECTOR PROGRAMMING | | | | | SYSTEM LOOP | NEW CARD | |
|--------|-----------|----------------------------|-------|----------|----------------------|---------|-----------|-----------------|--------------|-------------|----------|------------|
| | | | | | PHASE | CALLING | EXTENSION | FULL TIME DELAY | STRETCH TIME | | | DELAY TIME |
| 2A/S15 | 6X6 | 300 | * | Y | 2 | Y | Y | - | - | - | Y | Y |
| 2B/S16 | 6X6 | 300 | * | Y | 2 | Y | Y | - | - | - | Y | Y |
| 2C | 6X40 | 0 | * | Y | 2 | Y | Y | 2.0 | 5 | - | Y | Y |
| 2D | 6X40 | 0 | * | Y | 2 | Y | Y | 2.0 | 5 | - | Y | Y |
| 5A | 6X40 | 0 | * | Y | 5 | Y | Y | - | - | 3 | - | Y |
| 6A | 6X6 | 300 | * | Y | 6 | Y | Y | - | - | - | - | Y |
| 6B | 6X6 | 300 | * | Y | 6 | Y | Y | - | - | - | - | Y |
| 6C | 6X40 | 0 | * | Y | 6 | Y | Y | 2.0 | 5 | - | Y | Y |
| 6D | 6X40 | 0 | * | Y | 6 | Y | Y | 2.0 | 5 | - | Y | Y |
| 8A | 6X40 | 0 | * | Y | 8 | Y | Y | - | - | - | - | Y |
| 8B | 6X40 | 0 | * | Y | 8 | Y | Y | - | - | 10 | - | Y |
| S14 | 6X6 | 300 | * | Y | - | - | - | - | - | - | Y | Y |

* Video Detection Zone

3 Phase Fully Actuated NC 280 CLS

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 5 may be lagged.
- Set all detector units to presence mode.
- Incorporate Video Detection system for vehicle detection.
- Provide the Engineer with the Manufacturer's approved Video Detection locations and mounting heights to obtain detection zones as shown.
- Closed loop system data: Controller Asset #0815.



OASIS 2070L TIMING CHART

| FEATURE | PHASE | | | |
|-------------------------|-------|-----|-----|-----|
| | 2 | 5 | 6 | 8 |
| Min Green 1 * | 12 | 7 | 12 | 7 |
| Extension 1 * | 6.0 | 2.0 | 6.0 | 2.0 |
| Max Green 1 * | 90 | 30 | 90 | 30 |
| Yellow Clearance | 4.2 | 3.0 | 4.6 | 3.3 |
| Red Clearance | 1.6 | 2.8 | 1.6 | 1.8 |
| Red Revert | 2.0 | 2.0 | 2.0 | 2.0 |
| Walk 1 * | - | - | - | - |
| Don't Walk 1 | - | - | - | - |
| Seconds Per Actuation * | - | - | - | - |
| Max Variable Initial * | - | - | - | - |
| Time Before Reduction * | 15 | - | 15 | - |
| Time To Reduce * | 30 | - | 30 | - |
| Minimum Gap | 3.0 | - | 3.0 | - |
| Recall Mode | - | - | - | - |
| Vehicle Call Memory | - | - | - | - |
| Dual Entry | - | - | - | - |
| 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 | ● → Traffic Signal Head |
| ○ → Modified Signal Head | N/A |
| ⊥ Sign | ⊥ Sign |
| ⊥ Pedestrian Signal Head With Push Button & Sign | ⊥ Pedestrian Signal Head With Push Button & Sign |
| ○ Signal Pole with Guy | ● Signal Pole with Guy |
| ○ Signal Pole with Sidewalk Guy | ● Signal Pole with Sidewalk Guy |
| □ Inductive Loop Detector | □ Inductive Loop Detector |
| □ Controller & Cabinet | □ Controller & Cabinet |
| □ Junction Box | □ Junction Box |
| --- 2-in Underground Conduit | --- 2-in Underground Conduit |
| N/A Right of Way | N/A Right of Way |
| → Directional Arrow | → Directional Arrow |
| Video Detection Zone | N/A |
| Construction Zone | N/A |
| ⓐ No Right Turn Sign (R3-1) | ⓐ No Right Turn Sign (R3-1) |
| ⓑ No Left Turn Sign (R3-2) | ⓑ No Left Turn Sign (R3-2) |
| ⓒ "YIELD" Sign (R1-2) | ⓒ "YIELD" Sign (R1-2) |

Temporary Design 1 - Construction Phase I

Prepared In the Offices of:

 TRANSPORTATION MOBILITY AND SAFETY SOLUTIONS, INC.
 ENGINEERS OF TRANSPORTATION SIGNAL DESIGN SECTION
 750 N. Greenfield Pkwy, Garner, NC 27529

NC 280 (Airport Road) at I-26 Westbound Ramps

Division 13 Buncombe County Fletcher

PLAN DATE: April 2013 REVIEWED BY: T.J. Williams

PREPARED BY: Z.W. Little REVIEWED BY:

REVISIONS

SCALE: 0 30 1"=30'

SEAL: T.J. WILLIAMS, PROFESSIONAL ENGINEER, NO. 24393, STATE OF NORTH CAROLINA

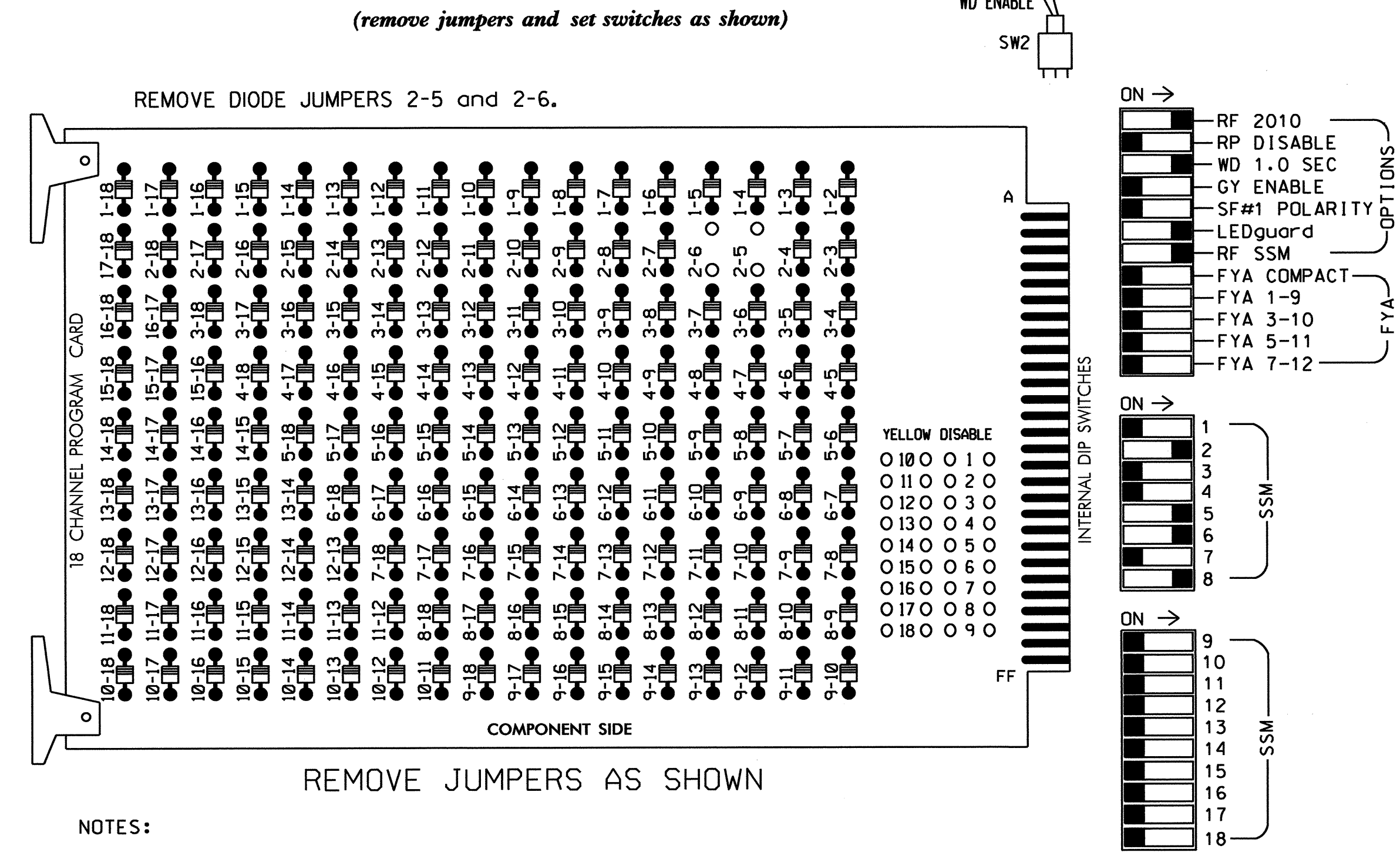
SIGNATURE: Z.W. Little DATE: 5/24/13

SIG. INVENTORY NO. 13-0815 TI

23-MAY-2013 13:25 R:\p1\proj\130815\130815.dgn

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

SIGNAL HEAD HOOK-UP CHART

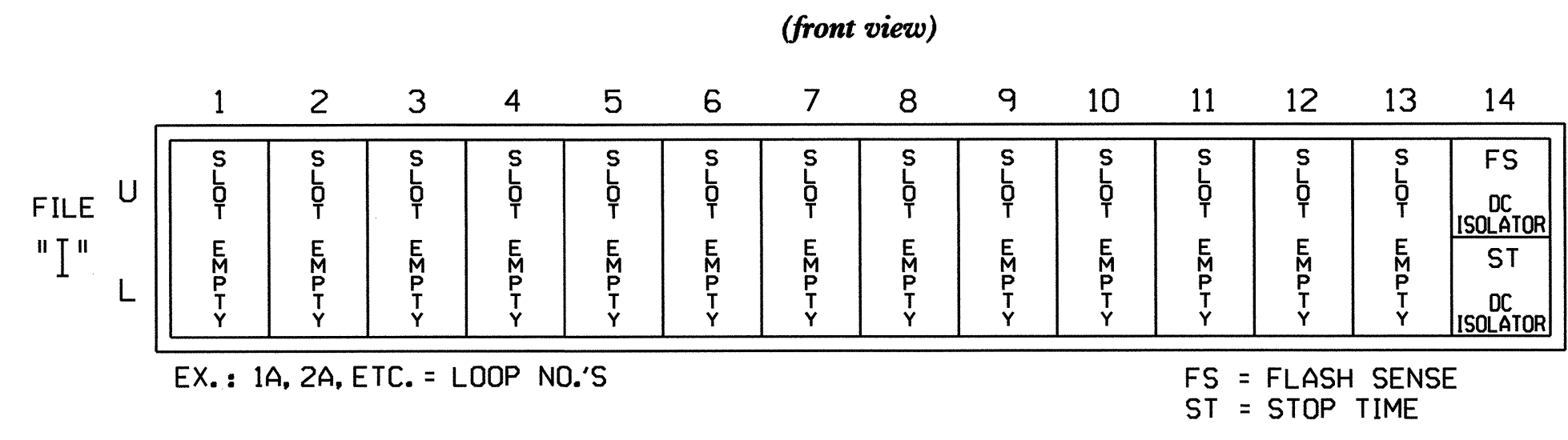
| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 |
|-----------------|----|-------|-------|----|----|-------|----|-------|-------|-----|-------------|-------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED |
| SIGNAL HEAD NO. | NU | 21,22 | NU | NU | NU | NU | 51 | 61,62 | NU | NU | 81,82 83 | NU |
| RED | | 128 | | | | | | 134 | | | 107 | |
| YELLOW | | 129 | | | | | | 135 | | | 108 | |
| GREEN | | 130 | | | | | | 136 | | | 109 | |
| RED ARROW | | | | | | | | 131 | | | | |
| YELLOW ARROW | | | | | | | | 132 | | | | |
| GREEN ARROW | | | | | | | | 133 | | | | |

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....336
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....POLE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S7,S8,S11
 PHASES USED.....2,5,6,8
 OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT



SPECIAL DETECTOR NOTE

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0815T1
 DESIGNED: April 2013
 SEALED: 5/24/13
 REVISED: N/A

Temporary Design 1 - Construction Phase I

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 280 (Airport Road) at I-26 Westbound Ramps

Division 13 Buncombe County Fletcher

Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

PLAN DATE: May 2013 REVIEWED BY: JTR

PREPARED BY: S. Armstrong REVIEWED BY:

| REVISIONS | INIT. | DATE |
|-----------|-------|------|
| | | |

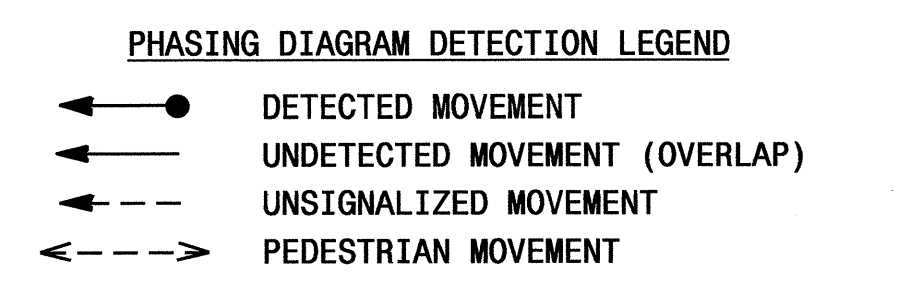
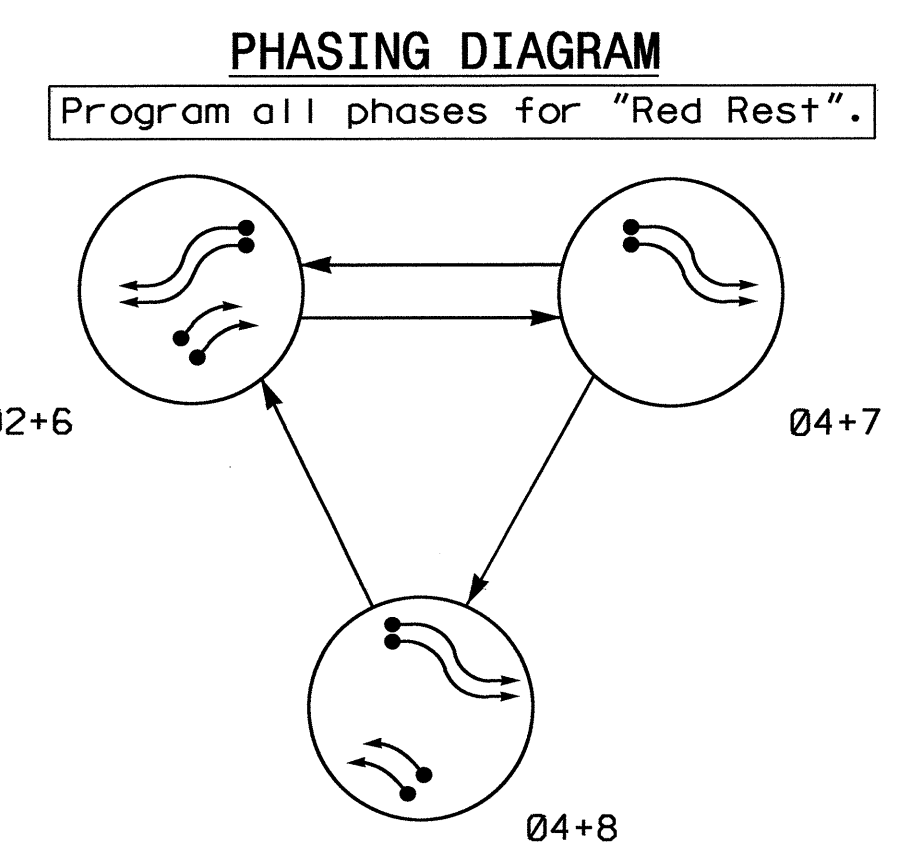
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SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR.

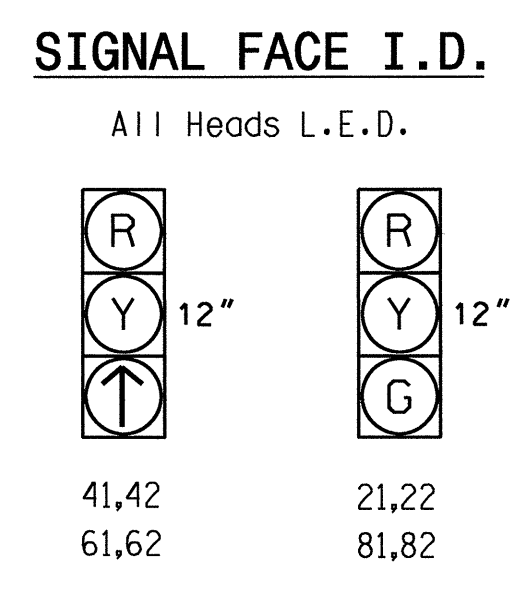
SIG. INVENTORY NO. 13-0815T1

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3 Phase Fully Actuated NC 280 (Airport Road) CLS



| SIGNAL FACE | PHASE | | | |
|-------------|-------|------|------|-------|
| | 02+6 | 04+7 | 04+8 | FLASH |
| 21,22 | G | R | R | R |
| 41,42 | R | ↑ | ↑ | R |
| 61,62 | ↑ | R | R | R |
| 81,82 | R | R | G | R |



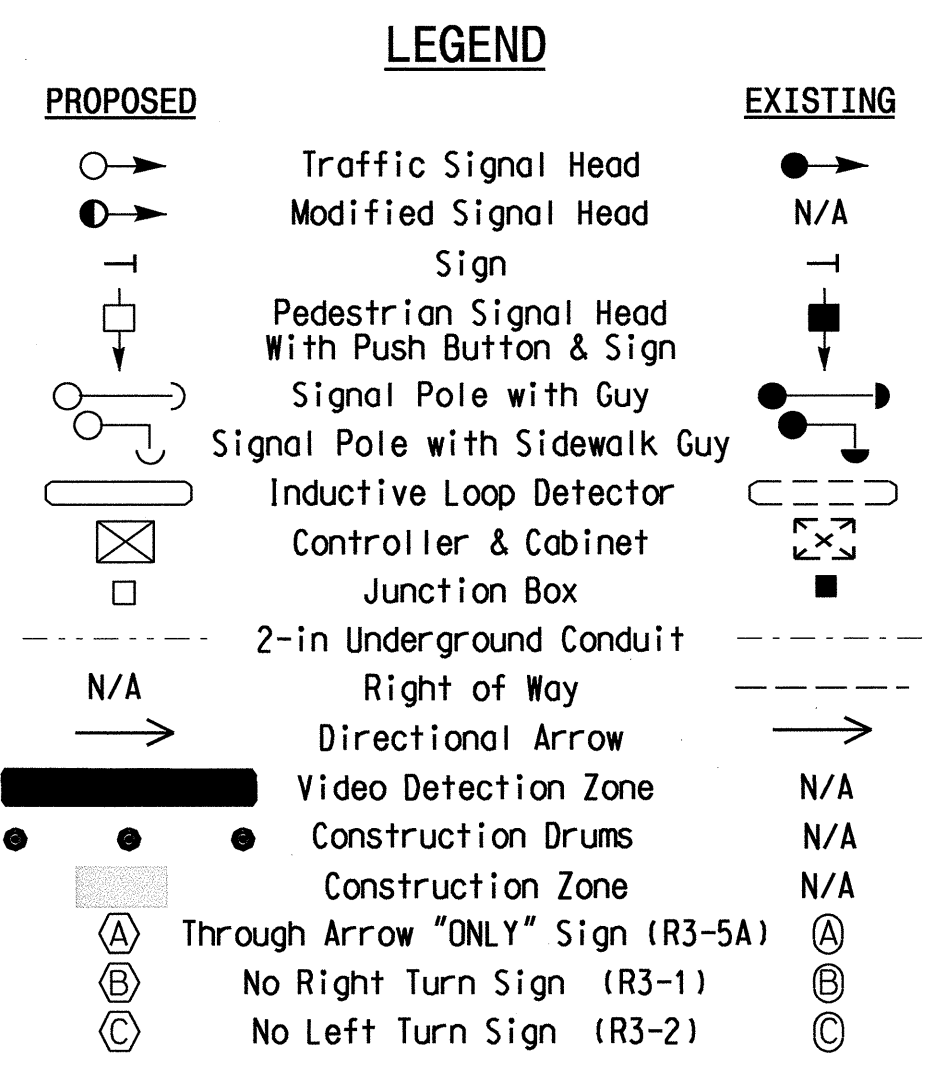
| OASIS 2070L LOOP & DETECTOR INSTALLATION CHART | | | | | | | | | | | |
|--|-----------|----------------------------|-------|----------|-------|----------------------|-----------|-----------------|--------------|------------|-------------|
| INDUCTIVE LOOPS | | | | | | DETECTOR PROGRAMMING | | | | | |
| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | PHASE | CALLING | EXTENSION | FULL TIME DELAY | STRETCH TIME | DELAY TIME | SYSTEM LOOP |
| 2A | 6X6 | 300 | * | Y | 2 | - | Y | - | 2.4 | - | - |
| 2B | 6X6 | 300 | * | Y | 2 | - | Y | - | 2.4 | - | - |
| 2C | 6X40 | 0 | * | Y | 2 | Y | Y | - | - | - | - |
| 2D | 6X40 | 0 | * | Y | 2 | Y | Y | - | - | - | - |
| 4A | 6X40 | 0 | * | Y | 4 | Y | Y | - | - | - | - |
| 4B | 6X40 | 0 | * | Y | 4 | Y | Y | - | - | - | - |
| 6A | 6X40 | 0 | * | Y | 6 | Y | Y | - | - | - | - |
| 6B | 6X40 | 0 | * | Y | 6 | Y | Y | - | - | - | - |
| 8A | 6X40 | 0 | * | Y | 7/8 | Y | Y | - | - | - | - |
| 8B | 6X40 | 0 | * | Y | 7/8 | Y | Y | - | - | - | - |

* Video Detection Zone

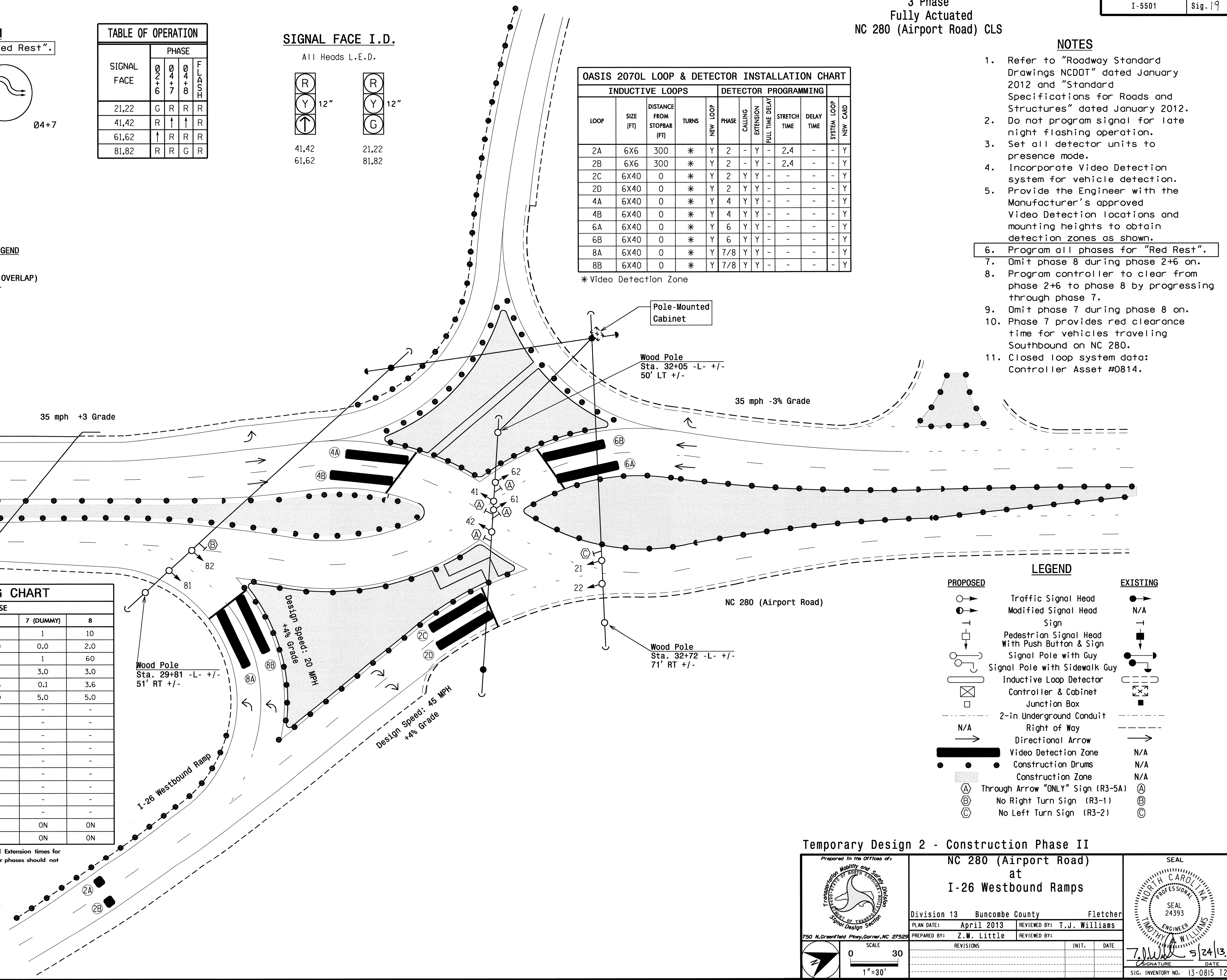
- NOTES**
- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
 - Do not program signal for late night flashing operation.
 - Set all detector units to presence mode.
 - Incorporate Video Detection system for vehicle detection.
 - Provide the Engineer with the Manufacturer's approved Video Detection locations and mounting heights to obtain detection zones as shown.
 - Program all phases for "Red Rest".
 - Omit phase 8 during phase 2+6 on.
 - Program controller to clear from phase 2+6 to phase 8 by progressing through phase 7.
 - Omit phase 7 during phase 8 on.
 - Phase 7 provides red clearance time for vehicles traveling Southbound on NC 280.
 - Closed loop system data: Controller Asset #0814.

| FEATURE | PHASE | | | | |
|-------------------------|-------|-----|-----|-----------|-----|
| | 2 | 4 | 6 | 7 (DUMMY) | 8 |
| Min Green 1 * | 10 | 10 | 10 | 1 | 10 |
| Extension 1 * | 2.0 | 2.0 | 2.0 | 0.0 | 2.0 |
| Max Green 1 * | 60 | 60 | 60 | 1 | 60 |
| Yellow Clearance | 4.2 | 3.7 | 4.1 | 3.0 | 3.0 |
| Red Clearance | 2.5 | 2.9 | 2.6 | 0.1 | 3.6 |
| Red Revert | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Walk 1 * | - | - | - | - | - |
| Don't Walk 1 | - | - | - | - | - |
| Seconds Per Actuation * | - | - | - | - | - |
| Max Variable Initial * | - | - | - | - | - |
| Time Before Reduction * | - | - | - | - | - |
| Time To Reduce * | - | - | - | - | - |
| Minimum Gap | - | - | - | - | - |
| Recall Mode | - | - | - | - | - |
| Vehicle Call Memory | - | - | - | - | - |
| Dual Entry | ON | ON | ON | ON | ON |
| Simultaneous Gap | 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.



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Temporary Design 2 - Construction Phase II

NC 280 (Airport Road) at I-26 Westbound Ramps

Division 13 Buncombe County Fletcher

Prepared by: Z.M. Little Date: 5/24/13

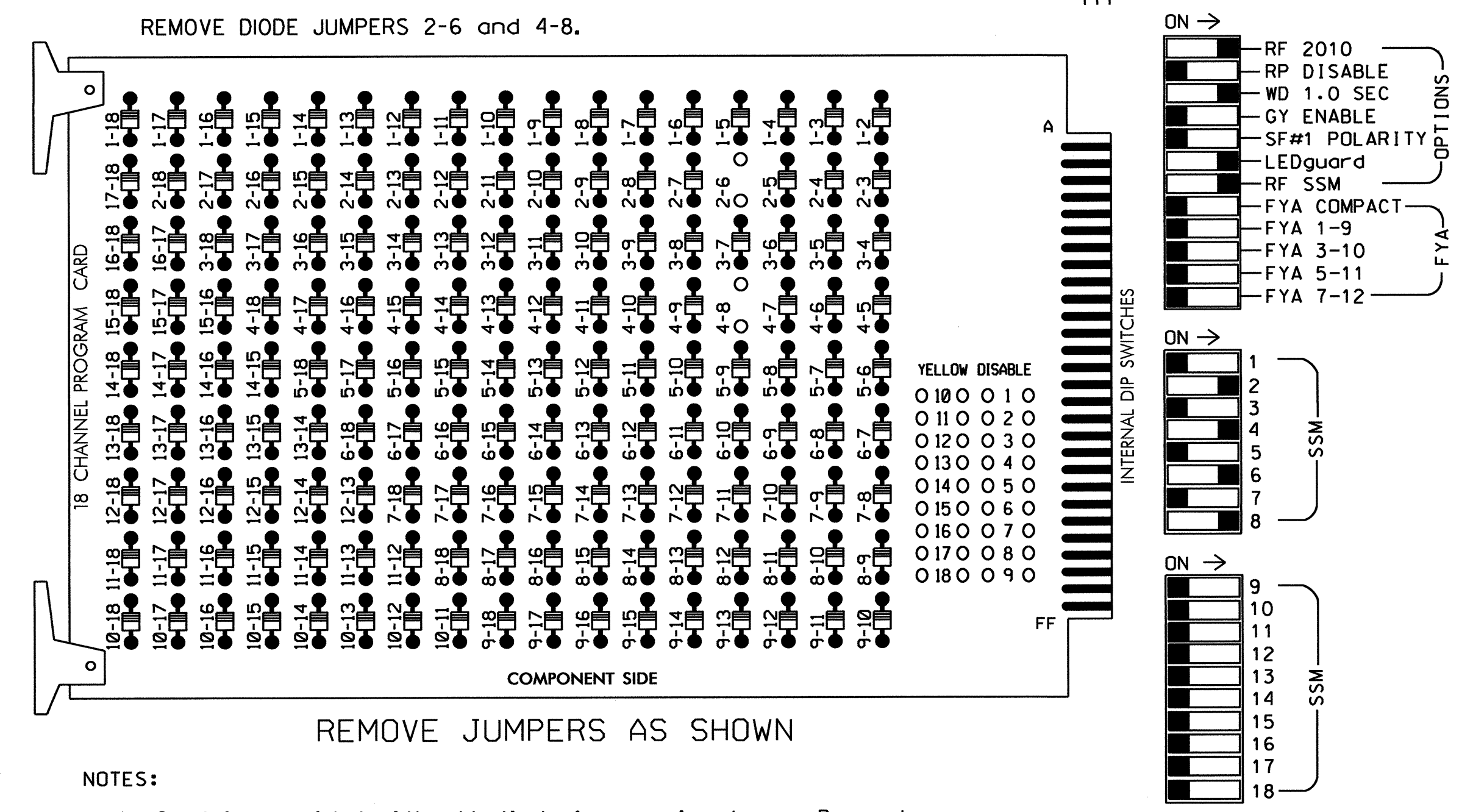
Reviewed by: T.J. Williams

Scale: 1"=30'

Professional Engineer Seal: Z.M. Little, No. 24393

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program phases 2, 4, 6, 7, and 8 for Dual Entry.
3. Enable Simultaneous Gap-Out for all phases.
4. Program phases 2 and 6 for Start Up In Green.
5. Program phases 2, 4, 6, 7, and 8 for Red Rest.
6. The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 |
|-----------------|----|-------|-------|----|-------|-------|----|-------|-------|-----|-------|-------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED |
| SIGNAL HEAD NO. | NU | 21,22 | NU | NU | 41,42 | NU | NU | 61,62 | NU | NC | 81,82 | NU |
| RED | | 128 | | | 101 | | | 134 | | | 107 | |
| YELLOW | | 129 | | | 102 | | | 135 | | | 108 | |
| GREEN | | 130 | | | | | | | | | 109 | |
| RED ARROW | | | | | | | | | | | | |
| YELLOW ARROW | | | | | | | | | | | | |
| GREEN ARROW | | | | | 103 | | | 136 | | | | |

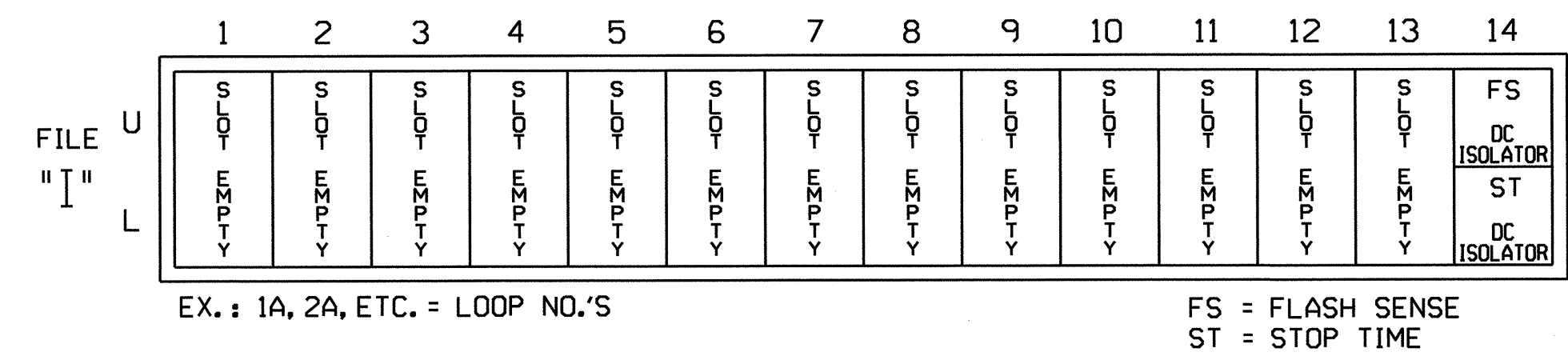
NU = Not Used
NC = Not Connected

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....336
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....POLE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S5,S8,S11
 PHASES USED.....2,4,6,*7,8
 OVERLAPS.....NONE
 * PHASE USED FOR TIMING PURPOSES ONLY

INPUT FILE POSITION LAYOUT

(front view)



SPECIAL DETECTOR NOTE

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

DYNAMIC OMIT CONTROL PROGRAMMING

(program controller as shown below)

1. From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Scroll to the bottom of the menu and enable Dynamic/Backup Control Functions 1 and 2.
2. From Phase Control Functions Menu press '2' (Dynamic/Backup Control Functions).

```

DYNAMIC/BACKUP CONTROL FUNCTION #01
OVERLAPS:; ABCDEFGHIJKLMNPO
IF OVERLAPS ARE ACTIVE ;
OR PHASES:; 12345678910111213141516
IF PHASES ARE ON:; X X
OMIT PHASES ; X
CALL PHASES ; X
    
```

PRESS 'NEXT'

```

DYNAMIC/BACKUP CONTROL FUNCTION #02
OVERLAPS:; ABCDEFGHIJKLMNPO
IF OVERLAPS ARE ACTIVE ;
OR PHASES:; 12345678910111213141516
IF PHASES ARE ON:; X
OMIT PHASES ; X
CALL PHASES ;
    
```

DYNAMIC OMIT PROGRAMMING COMPLETE

NOTE: THIS PROGRAMMING ENSURES THAT PHASE 7 WILL BE SERVED PRIOR TO PHASE 8 WHEN CONTROLLER IS ADVANCING FROM 2+6.

PHASE 7 IS USED TO PROVIDE EXTENDED RED CLEARANCE BEFORE SERVING PHASE 8.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0815T2
 DESIGNED: April 2013
 SEALED: 5/24/13
 REVISED: N/A

Temporary Design 2 - Construction Phase II

ELECTRICAL AND PROGRAMMING DETAILS FOR: **NC 280 (Airport Road) at I-26 Westbound Ramps**

Division 13 Buncombe County Fletcher

PLAN DATE: May 2013 REVIEWED BY: JTR

PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL: JOHN T. ROWE, JR. ENGINEER

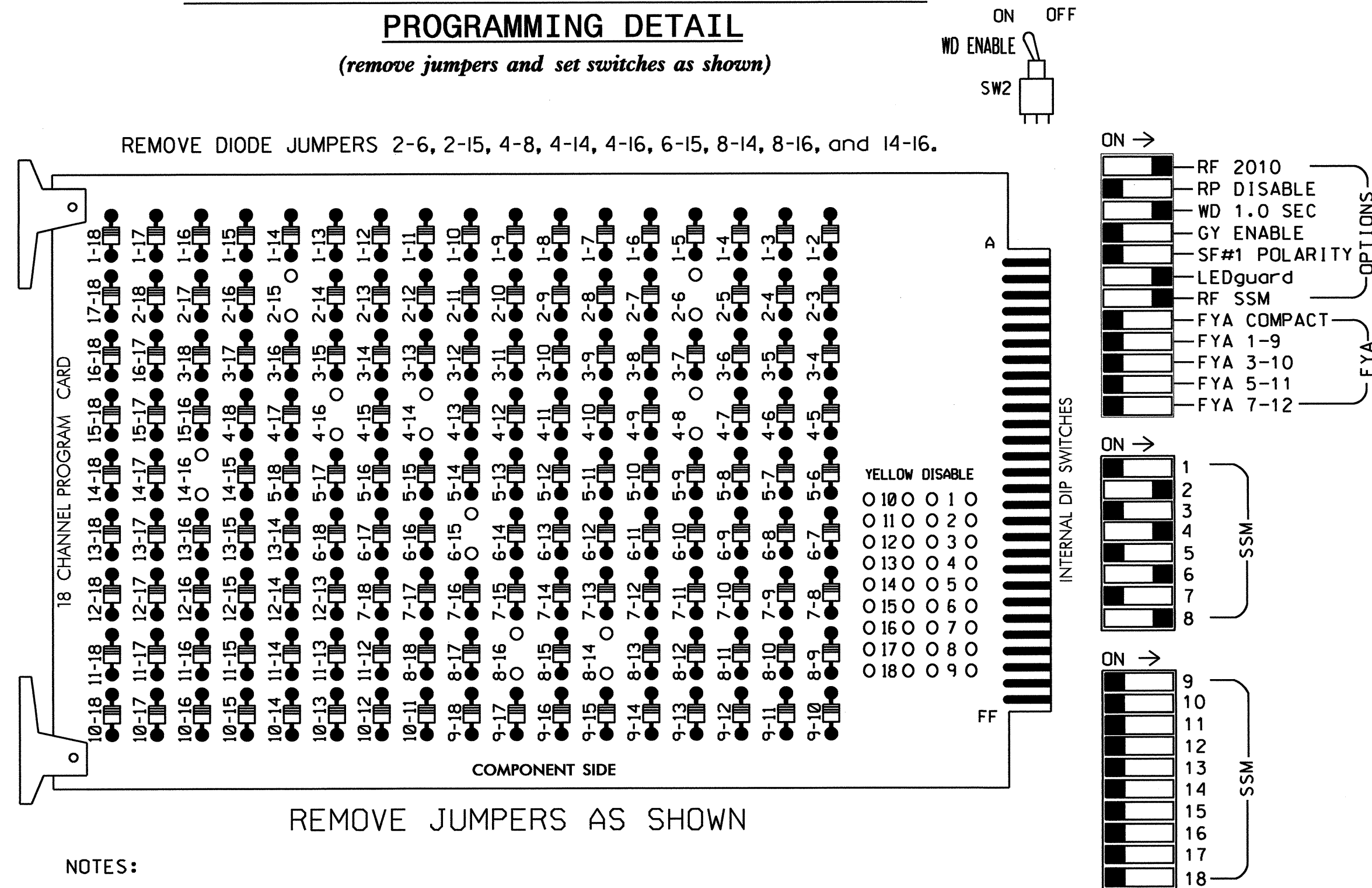
SIGNATURE: John Thoney DATE: 5-29-13

SIG. INVENTORY NO. 13-0815T2

28-MAY-2013 09:28 S:\IT\5501\T5\Sig20\13-0815\nc280\13-0815_elec.dgn sarms@ncdot.gov

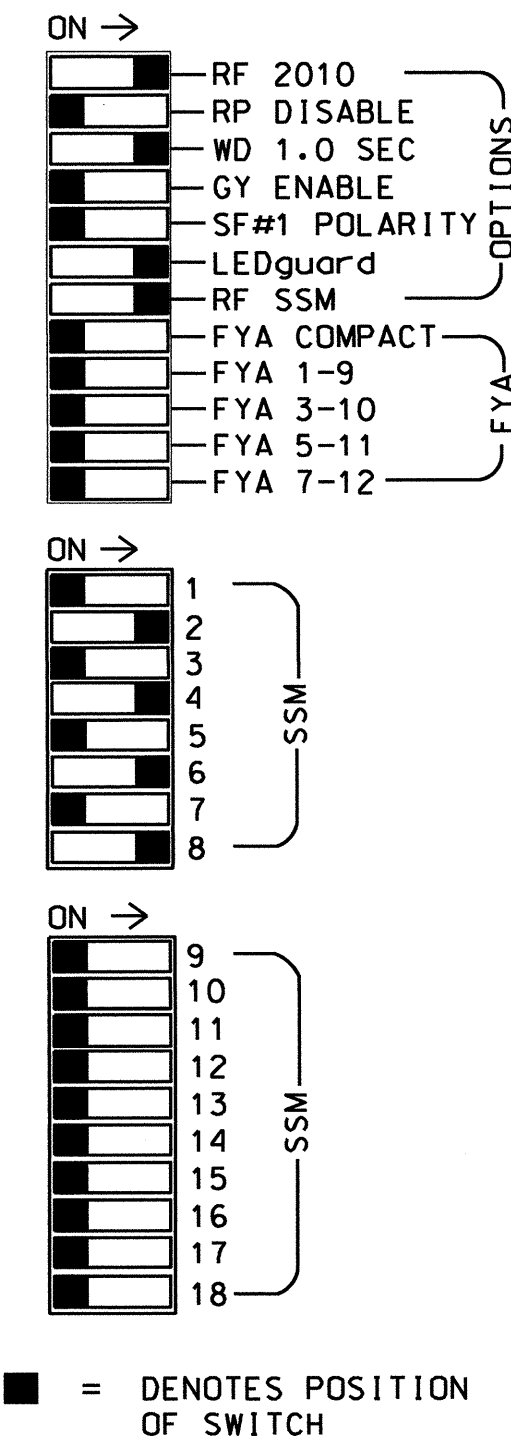
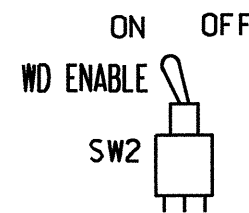
**EDI MODEL 2018ECL-NC CONFLICT MONITOR
PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



NOTES:

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



NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program phases 2, 4, 6, 7, and 8 for Dual Entry.
3. Enable Simultaneous Gap-Out for all phases.
4. Program phases 2 and 6 for Start Up In Green.
5. Program phases 4, 6 and 8 for 'STARTUP PED CALL'.
6. Program phases 2, 4, 6, 7, and 8 for Red Rest.
7. The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S5,S6,S8,S9,S11,S12
 PHASES USED.....2,4,4PED,6,6PED,*7,8,8PED
 OVERLAPS.....NONE
 * PHASE USED FOR TIMING PURPOSES ONLY

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | | | | |
|-----------------|----|-------|-------|----|-----|-------|-------|----------|-------|-------|-------|----------|----|-------|-------|----------|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 | | | | |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED | | | | |
| SIGNAL HEAD NO. | NU | 21,22 | 23,24 | NU | NU | 41,42 | 43,44 | P41, P42 | NU | 61,62 | 63,64 | P61, P62 | NC | 81,82 | 83,84 | P81, P82 |
| RED | | 128 | | | 101 | | | | 134 | | | 107 | | | | |
| YELLOW | | 129 | | | 102 | | | | 135 | | | 108 | | | | |
| GREEN | | 130 | | | | | | | | | | 109 | | | | |
| RED ARROW | | | 128 | | | 101 | | | 134 | | | 107 | | | | |
| YELLOW ARROW | | | 129 | | | 102 | | | 135 | | | 108 | | | | |
| GREEN ARROW | | | 130 | | | 103 | 103 | | 136 | 136 | | 109 | | | | |
| Hand icon | | | | | | | | 104 | | | 119 | | | | | 110 |
| Person icon | | | | | | | | 106 | | | 121 | | | | | 112 |

NU = Not Used
 NC = Not Connected

INPUT FILE POSITION LAYOUT

(front view)

| FILE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------|----|----|----|----|------|---------------|---------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| U | S | ∅2 | ∅2 | S | S | ∅4 | SYS. DET. S16 | S | SYS. DET. S18 | S | S | NOT USED | ∅6 PED DC ISOLATOR | FS |
| L | ∅2 | ∅2 | ∅2 | ∅2 | ∅4 | SYS. DET. S17 | SYS. DET. S41 | ∅4 PED DC ISOLATOR | ∅8 PED DC ISOLATOR | ∅8 PED DC ISOLATOR | ∅8 PED DC ISOLATOR | ∅8 PED DC ISOLATOR | ∅8 PED DC ISOLATOR | ∅8 PED DC ISOLATOR |
| U | S | ∅6 | S | S | ∅7/8 | SYS. DET. S42 | SYS. DET. S44 | S | S | S | S | S | S | S |
| L | ∅6 | ∅6 | ∅6 | ∅6 | ∅7/8 | SYS. DET. S43 | SYS. DET. S45 | ∅7/8 PED DC ISOLATOR | ∅7/8 PED DC ISOLATOR | ∅7/8 PED DC ISOLATOR | ∅7/8 PED DC ISOLATOR | ∅7/8 PED DC ISOLATOR | ∅7/8 PED DC ISOLATOR | ∅7/8 PED DC ISOLATOR |

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

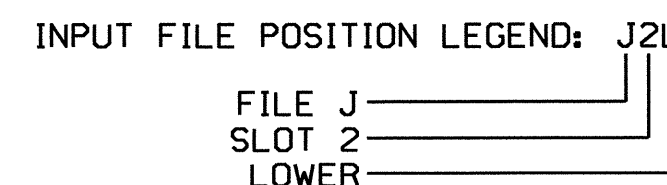
FS = FLASH SENSE
 ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

| LOOP NO. | LOOP TERMINAL | INPUT FILE POS. | PIN NO. | INPUT ASSIGNMENT NO. | DETECTOR NO. | NEMA PHASE | CALL | EXTEND | FULL TIME DELAY | STRETCH TIME | DELAY TIME |
|------------------|---------------|-----------------|---------|----------------------|--------------|------------|------|--------|-----------------|--------------|------------|
| 2A | TB2-5,6 | I2U | 39 | 1 | 2 | 2 | | Y | | 2.4 | |
| 2B | TB2-7,8 | I2L | 43 | 5 | 12 | 2 | | Y | | 2.4 | |
| 2C | TB2-9,10 | I3U | 63 | 25 | 32 | 2 | Y | Y | | | |
| 2D | TB2-11,12 | I3L | 76 | 38 | 42 | 2 | Y | Y | | | |
| 4A | TB4-9,10 | I6U | 41 | 3 | 4 | 4 | Y | Y | | | |
| 4B | TB4-11,12 | I6L | 45 | 7 | 14 | 4 | Y | Y | | | |
| 6A | TB3-5,6 | J2U | 40 | 2 | 6 | 6 | Y | Y | | | |
| 6B | TB3-7,8 | J2L | 44 | 6 | 16 | 6 | Y | Y | | | |
| 8A | TB5-9,10 | J6U | 42 | 4 | 8 | 7/8 | Y | Y | | | |
| 8B | TB5-11,12 | J6L | 46 | 8 | 18 | 7/8 | Y | Y | | | |
| *S16 | TB6-1,2 | I7U | 65 | 27 | 34 | SYS | | | | | |
| *S17 | TB6-3,4 | I7L | 78 | 40 | 44 | SYS | | | | | |
| *S18 | TB6-9,10 | I9U | 60 | 22 | 11 | SYS | | | | | |
| *S41 | TB6-11,12 | I9L | 62 | 24 | 13 | SYS | | | | | |
| *S42 | TB7-1,2 | J7U | 66 | 28 | 38 | SYS | | | | | |
| *S43 | TB7-3,4 | J7L | 79 | 41 | 48 | SYS | | | | | |
| *S44 | TB7-9,10 | J9U | 59 | 21 | 15 | SYS | | | | | |
| *S45 | TB7-11,12 | J9L | 61 | 23 | 17 | SYS | | | | | |
| PED PUSH BUTTONS | | | | | | | | | | | |
| P41,P42 | TB8-5,6 | I12L | 69 | 31 | PED 4 | 4 PED | | | | | |
| P61,P62 | TB8-7,9 | I13U | 68 | 30 | PED 6 | 6 PED | | | | | |
| P81,P82 | TB8-8,9 | I13L | 70 | 32 | PED 8 | 8 PED | | | | | |

NOTE:
 INSTALL DC ISOLATORS IN INPUT FILE SLOTS 112 AND 113.

* System detector only. Remove the vehicle phase assigned to this detector in the default programming.



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: 13-0815
 DESIGNED: April 2013
 SEALED: 5/24/13
 REVISED: N/A

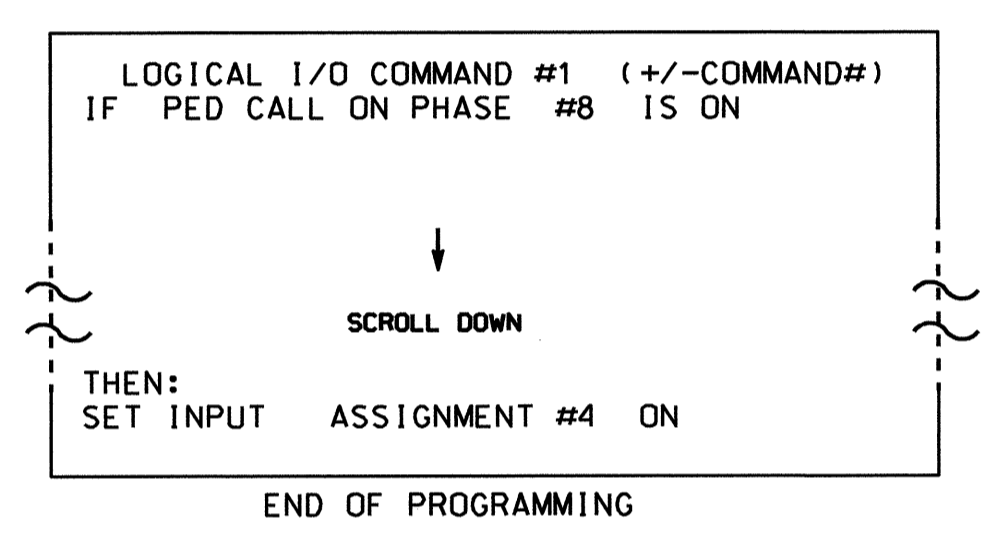
Final Design - Sheet 1 of 2

| | NC 280 (Airport Road) at I-26 Westbound Ramps | | | | | | | |
|--|--|------------------|-------|------|--|--|--|---|
| | Division 13 Buncombe County Fletcher | | | | | | | |
| | PLAN DATE: May 2013 | REVIEWED BY: JTK | | | | | | |
| | PREPARED BY: S. Armstrong | REVIEWED BY: | | | | | | |
| <table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> | | REVISIONS | INIT. | DATE | | | | SIGNATURE: <i>John T. Rowe</i> DATE: 5-28-13 SIG. INVENTORY NO. 13-0815 |
| REVISIONS | INIT. | DATE | | | | | | |
| | | | | | | | | |

**LOGICAL I/O PROCESSOR PROGRAMMING DETAIL
TO APPLY PHASE 8 VEH. CALL WITH PHASE 8 PED CALL**

(program controller as shown below)

1. FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMAND 1.
2. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).



NOTE: THIS LOGIC ENSURES THAT WHENEVER A PHASE 8 PED CALL EXISTS, A PHASE 8 VEH. CALL WILL ALSO BE PLACED.

THIS IS NECESSARY SO THAT THE "DYNAMIC" PROGRAMMING OPERATES PROPERLY WHEN ONLY A PED CALL EXISTS IN THE FIELD ON PHASE 8.

INPUT REFERENCE
INPUT 4 = VEH. DET. 8

DYNAMIC OMIT CONTROL PROGRAMMING

(program controller as shown below)

1. From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Scroll to the bottom of the menu and enable Dynamic/Backup Control Functions 1 and 2.
2. From Phase Control Functions Menu press '2' (Dynamic/Backup Control Functions).

```

    DYNAMIC/BACKUP CONTROL FUNCTION #01
    OVERLAPS: ABCDEFGHIJKLMNPO
    IF OVERLAPS ARE ACTIVE:
    OR PHASES: 12345678910111213141516
    IF PHASES ARE ON: X X
    OMIT PHASES: X
    CALL PHASES: X
  
```

PRESS 'NEXT'

```

    DYNAMIC/BACKUP CONTROL FUNCTION #02
    OVERLAPS: ABCDEFGHIJKLMNPO
    IF OVERLAPS ARE ACTIVE:
    OR PHASES: 12345678910111213141516
    IF PHASES ARE ON: X
    OMIT PHASES: X
    CALL PHASES:
  
```

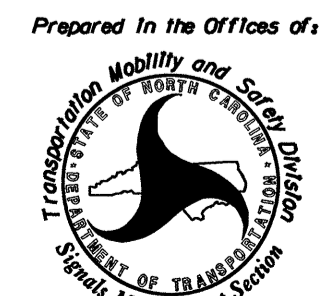
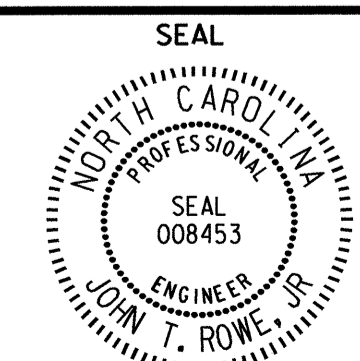
DYNAMIC OMIT PROGRAMMING COMPLETE

NOTE: THIS PROGRAMMING ENSURES THAT PHASE 7 WILL BE SERVED PRIOR TO PHASE 8 WHEN CONTROLLER IS ADVANCING FROM 2+6.

PHASE 7 IS USED TO PROVIDE EXTENDED RED CLEARANCE BEFORE SERVING PHASE 8.

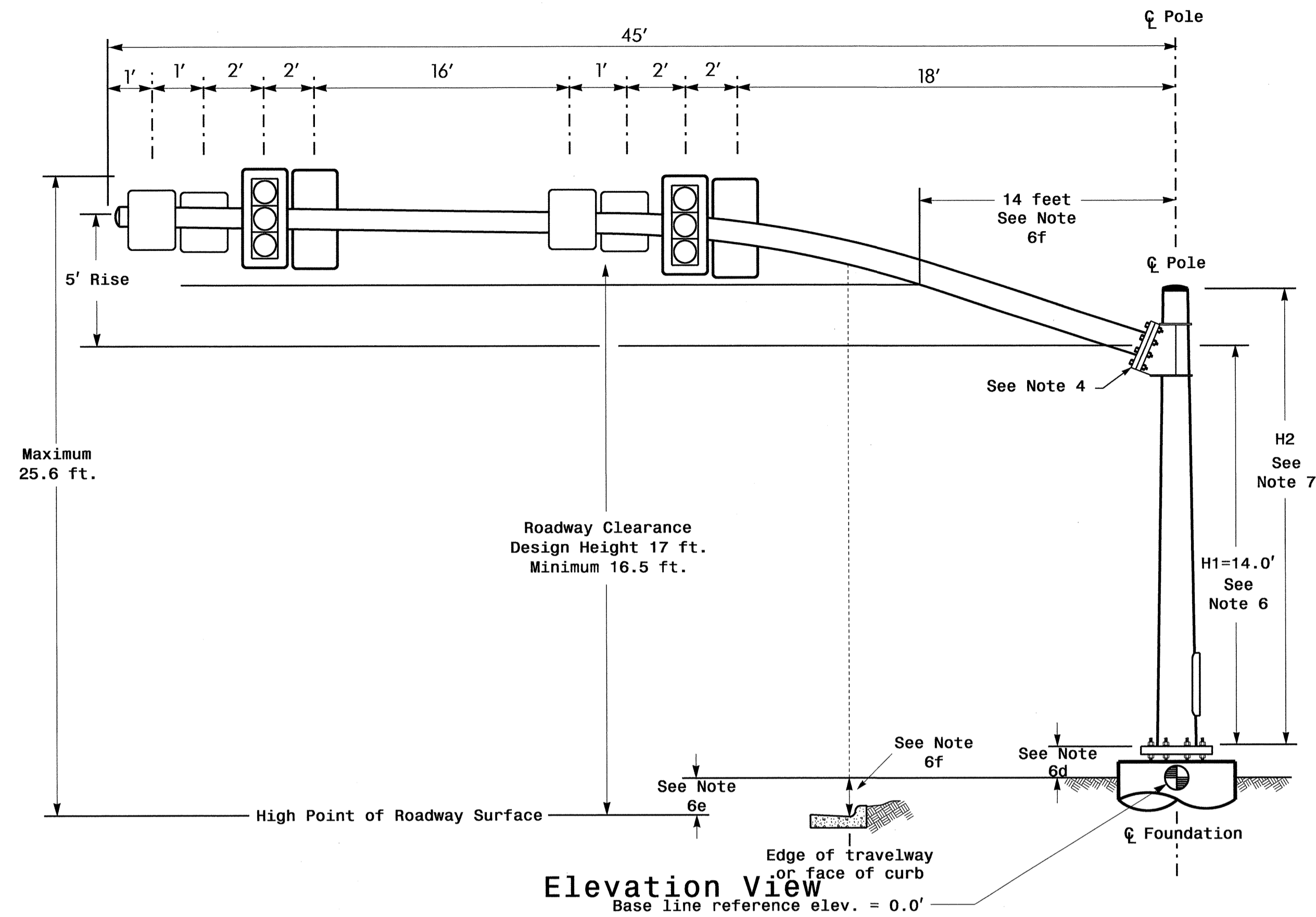
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 13-0815
DESIGNED: April 2013
SEALED: 5/24/13
REVISED: N/A

Final Design - Sheet 2 of 2

| | | | |
|--|--|---|--|
| ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529 | NC 280 (Airport Road) at I-26 Westbound Ramps | | SEAL  ENGINEER JOHN T. ROWE, JR. |
| | Division 13 Buncombe County Fletcher | PLAN DATE: May 2013 REVIEWED BY: JTR | PREPARED BY: S. Armstrong REVIEWED BY: |
| REVISIONS | INIT. | DATE | SIGNATURE: <i>John T. Rowe</i> DATE: 5-28-13 |
| SIG. INVENTORY NO. 13-0815 | | | 13-0815 |

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Design Loading for METAL POLE NO. 8



Elevation View
Base line reference elev. = 0.0'

SPECIAL NOTE

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

Elevation Data for Mast Arm Attachment (H1)

| Elevation Differences for: | Pole 8 | Pole 9 |
|--|----------|----------|
| Baseline reference point at ϕ Foundation @ ground level | 0.0 ft. | 0.0 ft. |
| Elevation difference at High point of roadway surface | 0.0 ft. | +1.7 ft. |
| Elevation difference at Edge of travelway or face of curb | -0.5 ft. | +0.8 ft. |

MAST ARM LOADING SCHEDULE

| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
|----------------|--|----------|-------------------------|--------|
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |

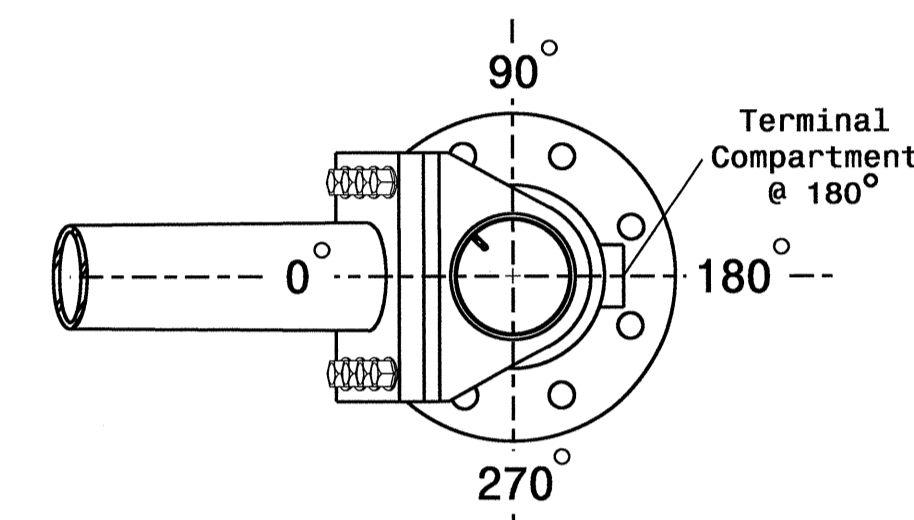
NOTES

Design Reference Material

- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2012 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.

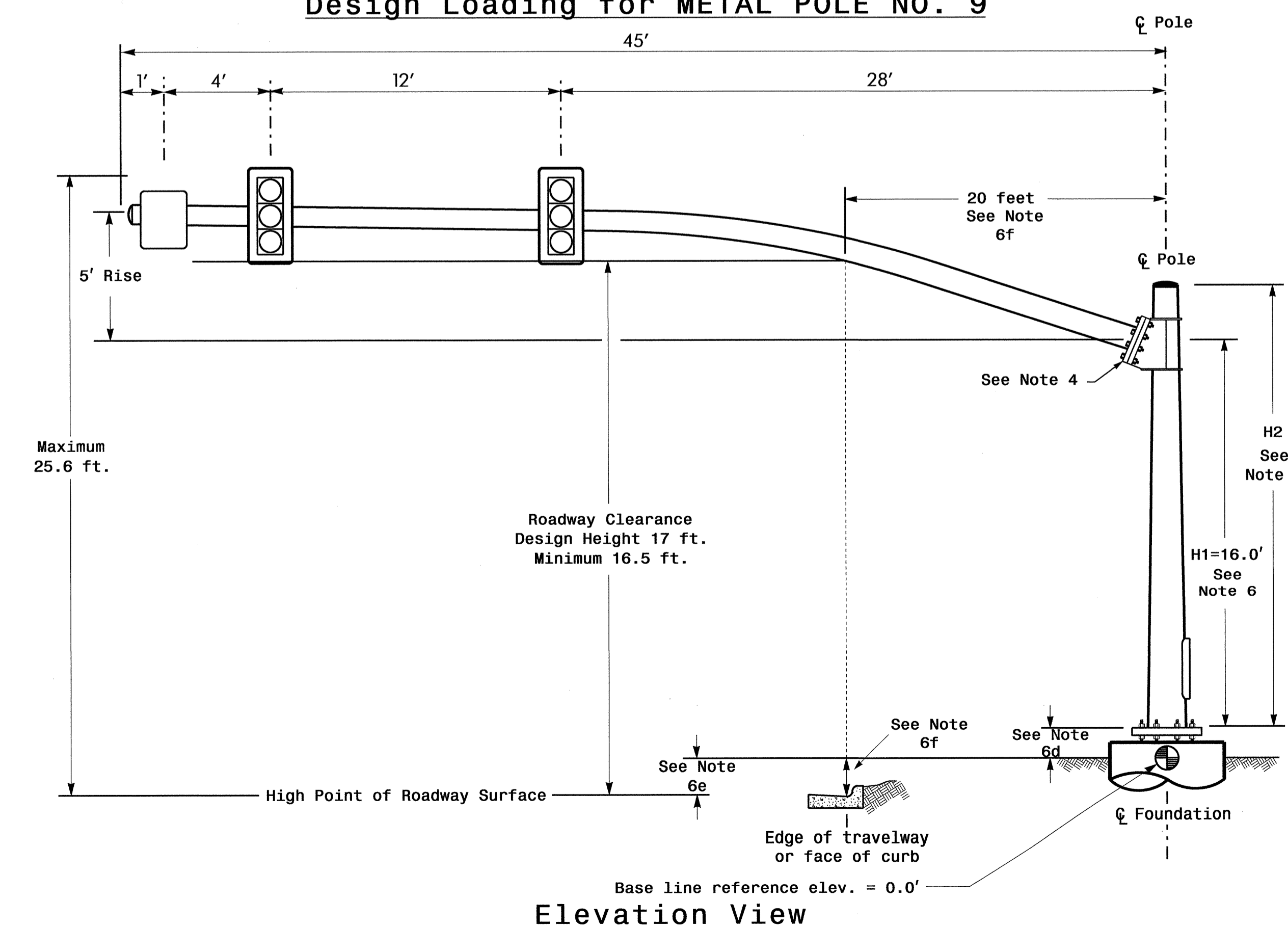
Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
 - Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
- The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals Design Section Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

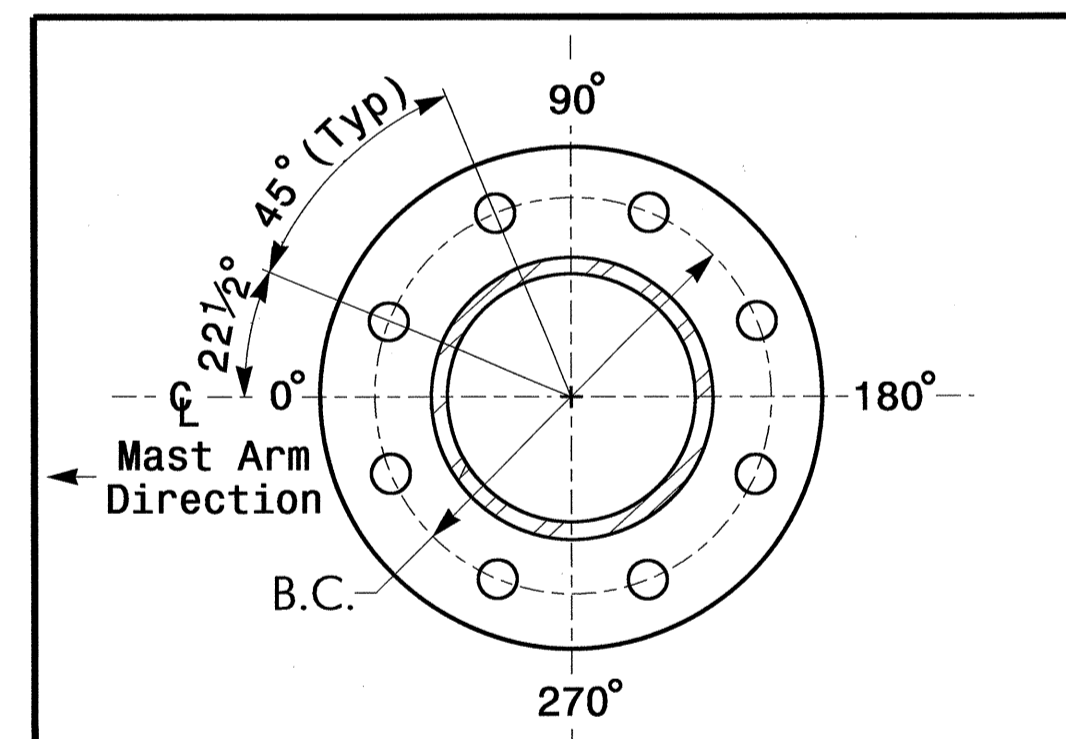


POLE RADIAL ORIENTATION

Design Loading for METAL POLE NO. 9

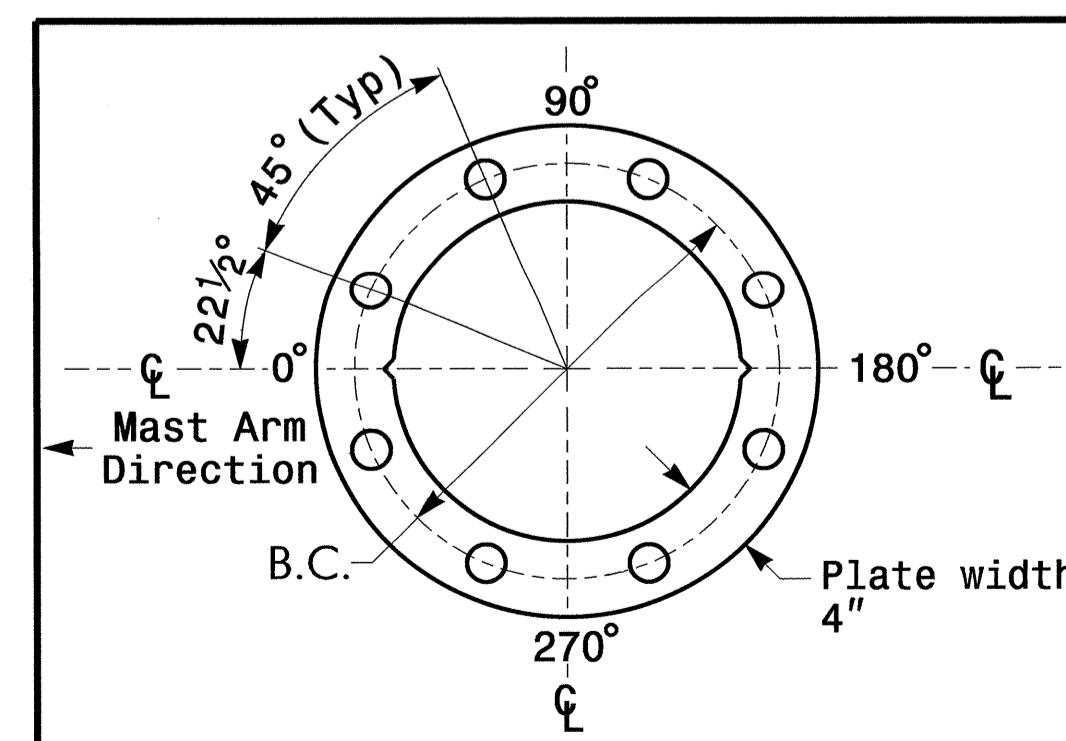


Elevation View
Base line reference elev. = 0.0'



8 BOLT BASE PLATE DETAIL

See Note 6



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

NCDOT Wind Zone 4 (90 mph)

| | <p>Prepared In the Offices of:</p> <p>NC 280 (Airport Road) at I-26 Westbound Ramps</p> | | <p>SEAL</p> <p>TWOOTH WILLIAMS</p> <p>ENGINEER</p> <p>SEAL 24393</p> <p>DATE 5/30/13</p> | | | | |
|---|--|---|---|-----|-------|------|--|
| | <p>Division 13 Buncombe County Fletcher</p> <p>PLAN DATE: April 2013 REVIEWED BY: T.J. Williams</p> <p>PREPARED BY: Z.M. Little REVIEWED BY:</p> | <p>REVISIONS</p> <table border="1"> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table> | | NO. | INIT. | DATE | |
| NO. | INIT. | DATE | | | | | |
| | | | | | | | |
| <p>750 N. Greenfield Pkwy, Garner, NC 27529</p> <p>SCALE: 0 N/A</p> | | <p>SIG. INVENTORY NO. 13-0815</p> | | | | | |

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

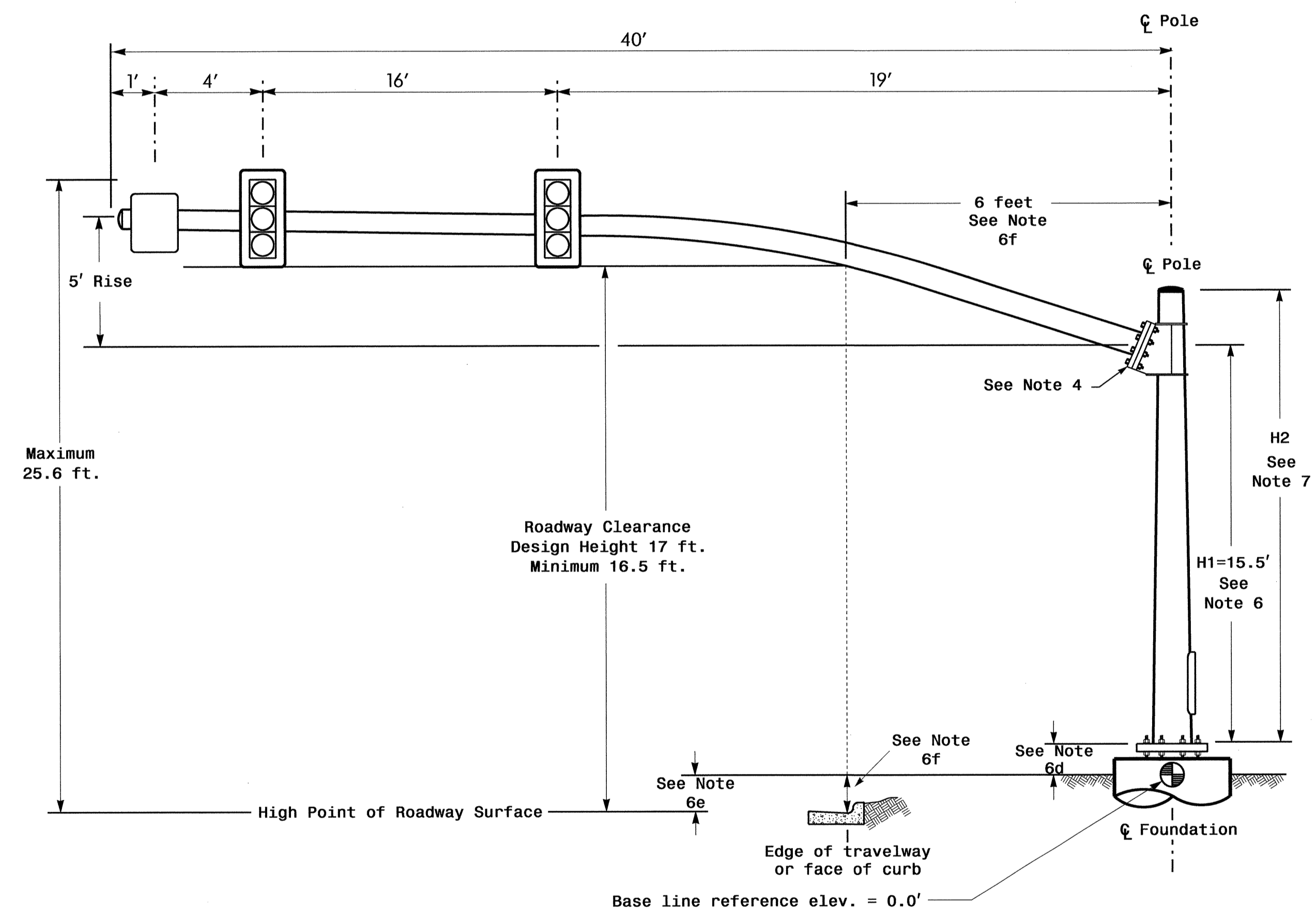
Elevation Data for Mast Arm Attachment (H1)

| | |
|--|----------|
| Elevation Differences for: | Pole 10 |
| Baseline reference point at ϕ Foundation @ ground level | 0.0 ft. |
| Elevation difference at High point of roadway surface | +1.2 ft. |
| Elevation difference at Edge of travelway or face of curb | +0.6 ft. |

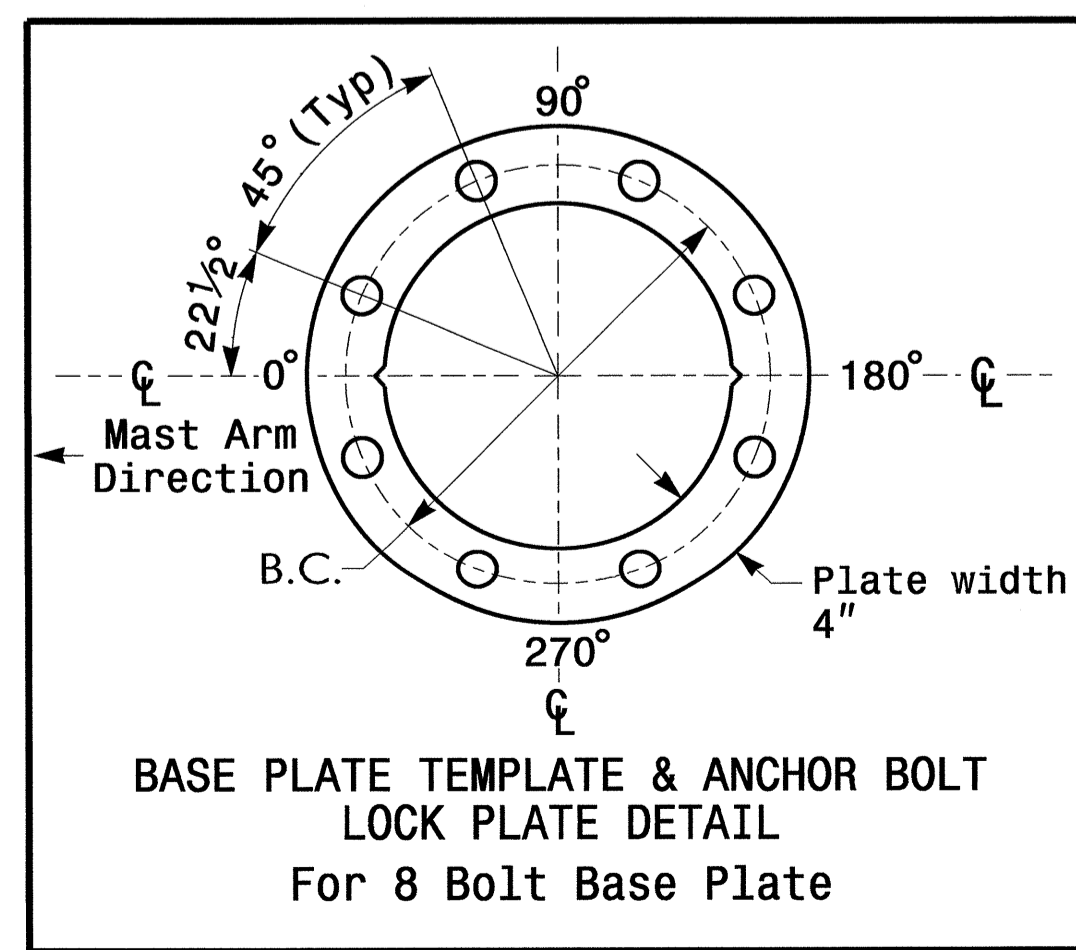
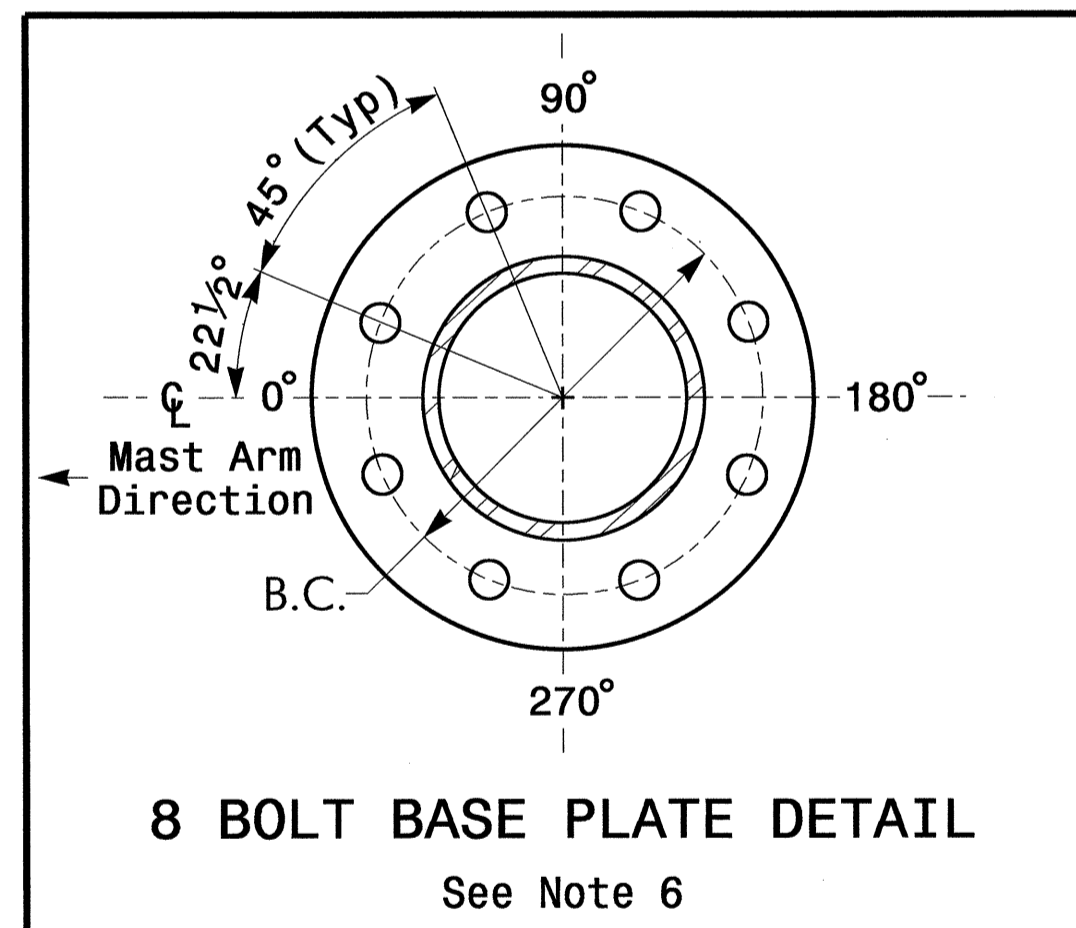
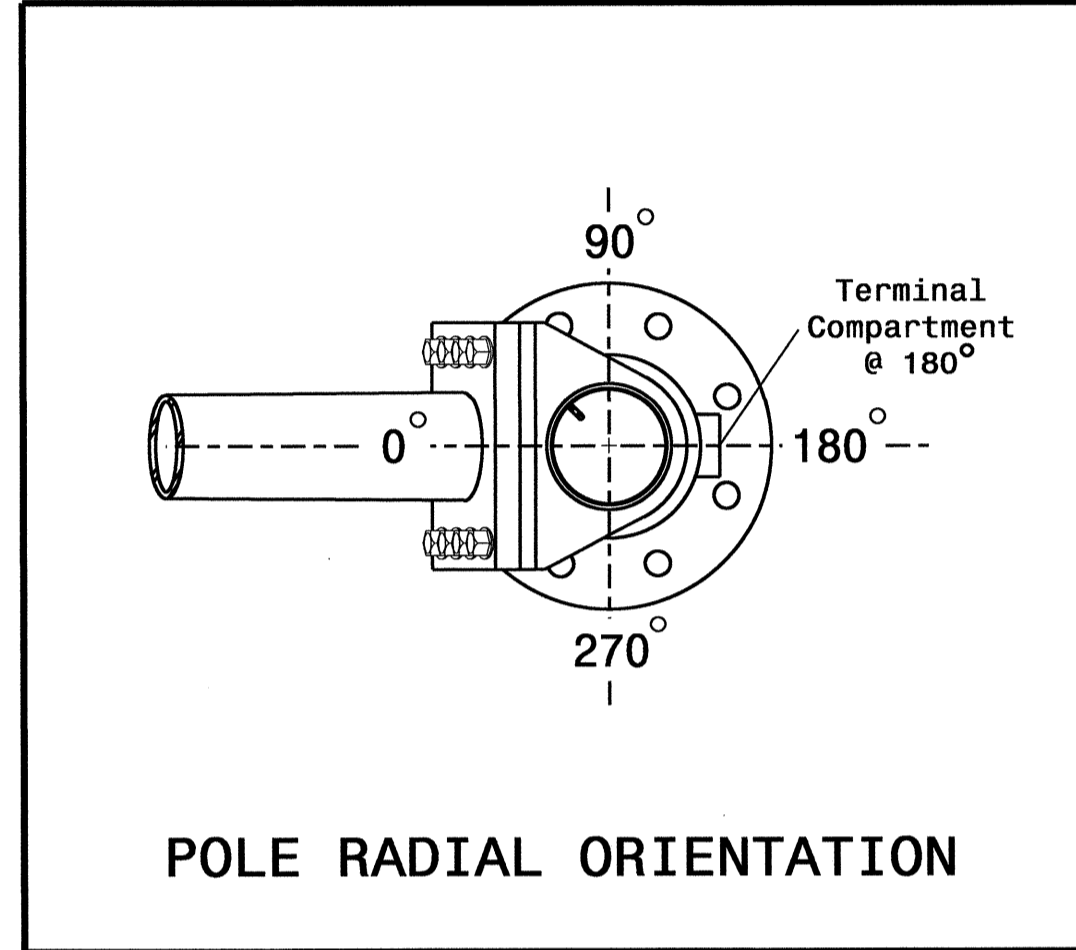
MAST ARM LOADING SCHEDULE

| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
|----------------|--|----------|-------------------------|--------|
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |

Design Loading for METAL POLE NO. 10



Elevation View



Design Reference Material

- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2012 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.

Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
 - Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
- The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals Design Section Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

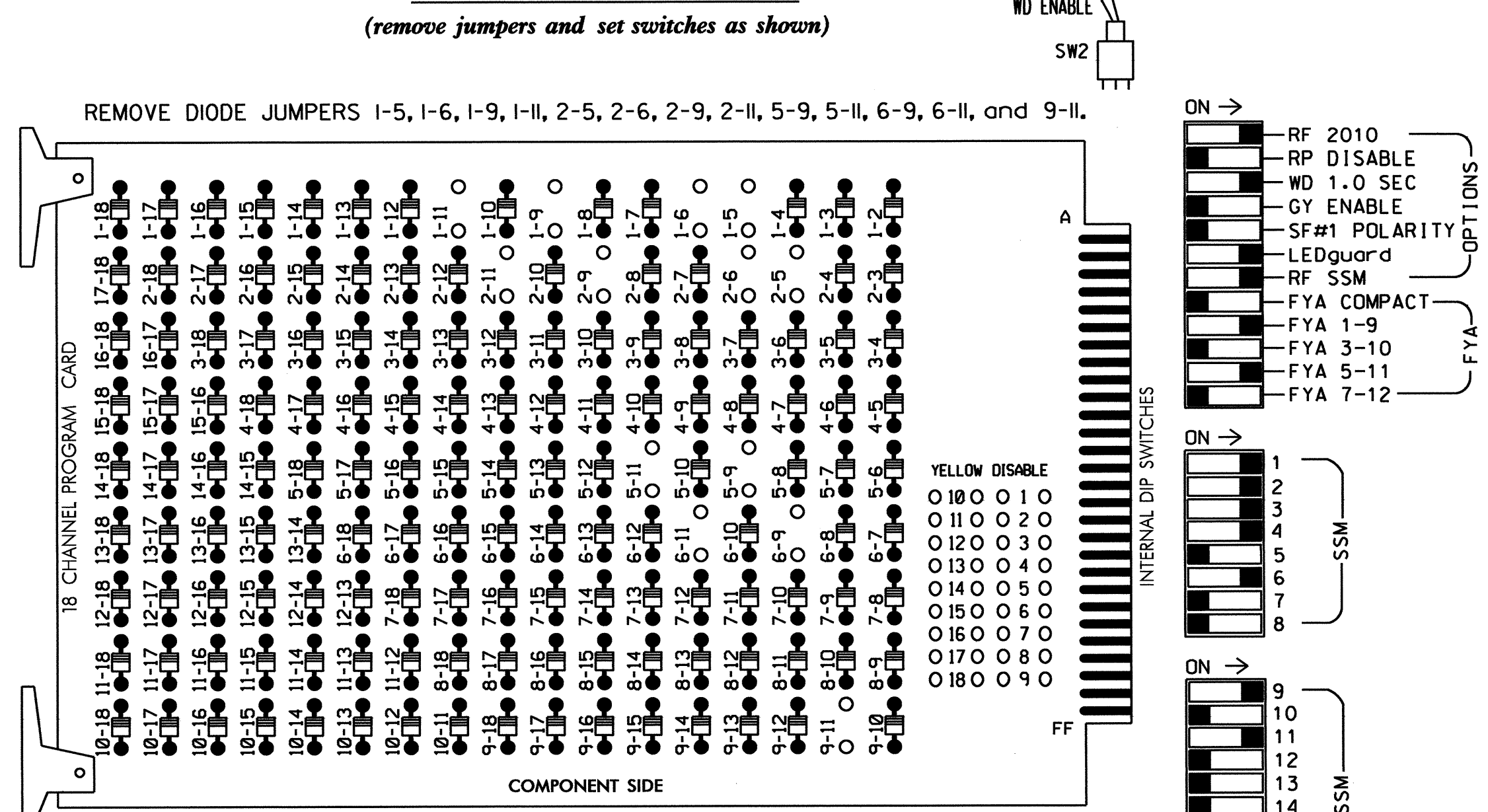
NOTES

NCDOT Wind Zone 4 (90 mph)

| | | |
|--|--|---|
| | Prepared In the Offices of: NC 280 (Airport Road) at I-26 Westbound Ramps | |
| | Division 13 Buncombe County Fletcher PLAN DATE: April 2013 PREPARED BY: Z.M. Little SCALE: 0 N/A DATE: N/A | REVIEWED BY: T.J. Williams REVIEWED BY: T.J. Williams DATE: 5/30/13 |

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 Zmlittle

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL
(remove jumpers and set switches as shown)



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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phase 6 for Variable Initial.
- Program phases 2 and 6 for Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

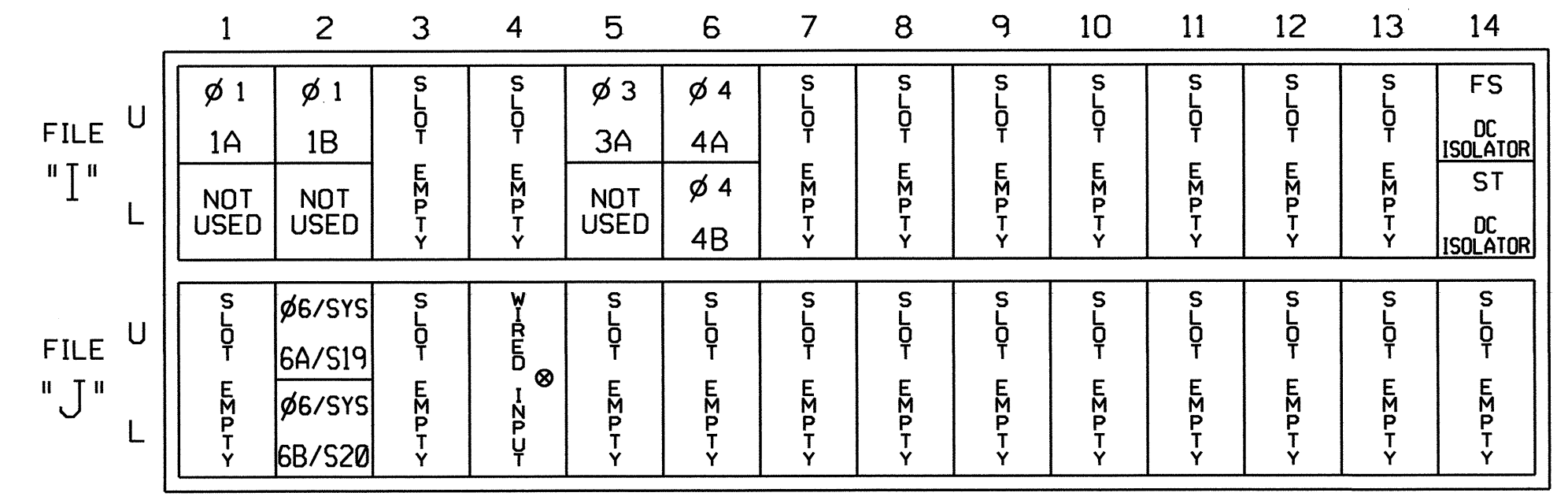
CONTROLLER.....2070L
 CABINET.....332 W/ AUX
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
 LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,AUX S1,AUX S4
 PHASES USED.....1,2,3,4,5,6
 OVERLAP "A".....1+2
 OVERLAP "B".....NOT USED
 OVERLAP "C".....5+6
 OVERLAP "D".....NOT USED

SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | AUX S1 | AUX S2 | AUX S3 | AUX S4 | AUX S5 | AUX S6 | |
|-----------------------|-----|-----|-------|-----|-----|-------|-----|----|-------|-----|-------|-------|--------|--------|--------|--------|--------|--------|----|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 | 9 | 10 | 17 | 11 | 12 | 18 | |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED | OLA | OLB | SPARE | OLC | OLD | SPARE | |
| SIGNAL HEAD NO. | 11* | 32 | 21,22 | NU | 31 | 32 | 41 | 42 | NU | 51* | 61,62 | NU | NU | NU | NU | 11* | NU | 51* | NU |
| RED | * | 128 | | 116 | 116 | 101 | 101 | | | 134 | | | | | | | | | |
| YELLOW | | 129 | | 117 | 117 | 102 | 102 | * | 135 | | | | | | | | | | |
| GREEN | | 130 | | 118 | 118 | 103 | 103 | | 136 | | | | | | | | | | |
| RED ARROW | | | | | | | | | | | | | | | | A121 | | A114 | |
| YELLOW ARROW | 126 | | | | | | | | | | | | | | | A122 | | A115 | |
| FLASHING YELLOW ARROW | | | | | | | | | | | | | | | | A123 | | A116 | |
| GREEN ARROW | 127 | 127 | | 118 | 103 | | 133 | | | | | | | | | | | | |

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

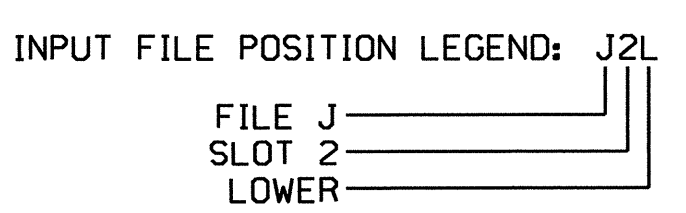
INPUT FILE POSITION LAYOUT
(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

| LOOP NO. | LOOP TERMINAL | INPUT FILE POS. | PIN NO. | INPUT ASSIGNMENT NO. | DETECTOR NO. | NEMA PHASE | CALL | EXTEND | FULL TIME DELAY | STRETCH TIME | DELAY TIME |
|-----------------|---------------|-----------------|---------|----------------------|--------------|------------|------|--------|-----------------|--------------|------------|
| 1A ¹ | TB2-1,2 | 11U | 56 | 18 | 1 | 1 | Y | Y | | | 15 |
| | | J4U | 48 | 10 | 26 | 6 | Y | Y | Y | | 3 |
| 1B | TB2-5,6 | 12U | 39 | 1 | 2 | 1 | Y | Y | | | 15 |
| *2A/S17 | | | | | | 2/SYS | Y | Y | | | |
| *2B/S18 | | | | | | 2/SYS | Y | Y | | | |
| *2C | | | | | | 2 | Y | Y | Y | 2.0 | 5 |
| *2D | | | | | | 2 | Y | Y | Y | 2.0 | 5 |
| 3A | TB4-5,6 | 15U | 58 | 20 | 3 | 3 | Y | Y | | | 3 |
| 4A | TB4-9,10 | 16U | 41 | 3 | 4 | 4 | Y | Y | | | 3 |
| 4B | TB4-11,12 | 16L | 45 | 7 | 14 | 4 | Y | Y | | | 15 |
| *5A | | | | | | 5 | Y | Y | | | 15 |
| | | | | | | 2 | Y | Y | Y | | 3 |
| 6A/S19 | TB3-5,6 | J2U | 40 | 2 | 6 | 6/SYS | Y | Y | | | |
| 6B/S20 | TB3-7,8 | J2L | 44 | 6 | 16 | 6/SYS | Y | Y | | | |

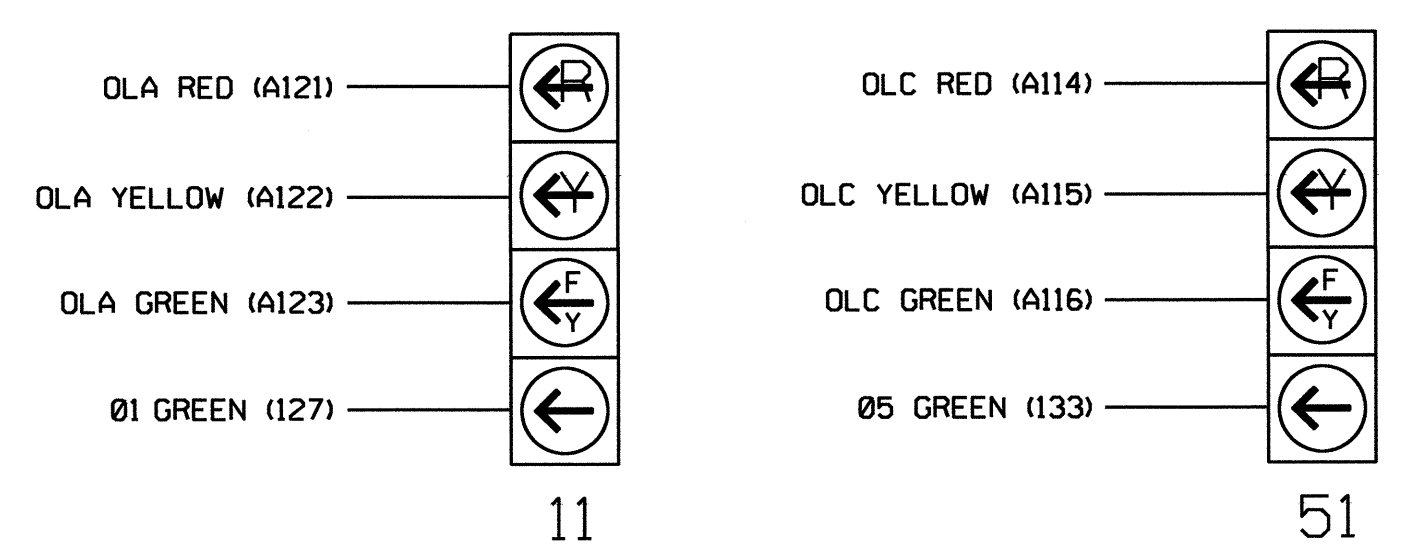
¹Add jumper from I1-W to J4-W, on rear of input file.



*** SPECIAL DETECTOR NOTE**

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

FYA SIGNAL WIRING DETAIL
(wire signal heads as shown)

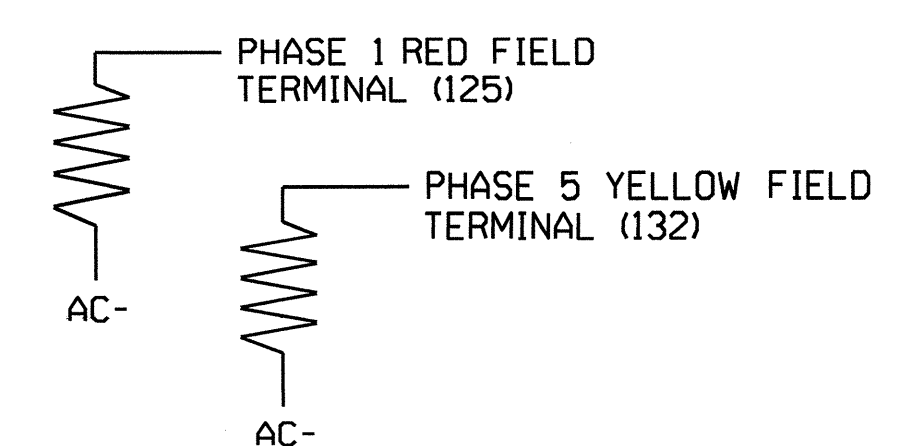


NOTE
 The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 for programming instructions.

LOAD RESISTOR INSTALLATION DETAIL
(install resistors as shown below)

ACCEPTABLE VALUES

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



Temporary Signal - Construction Phases I & II - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 280 (Airport Road) at SR 3568 (Rockwood Road)

Division 13 Buncombe County Fletcher

PLAN DATE: May 2013 REVIEWED BY: JTR

PREPARED BY: S. Armstrong REVIEWED BY:

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR.

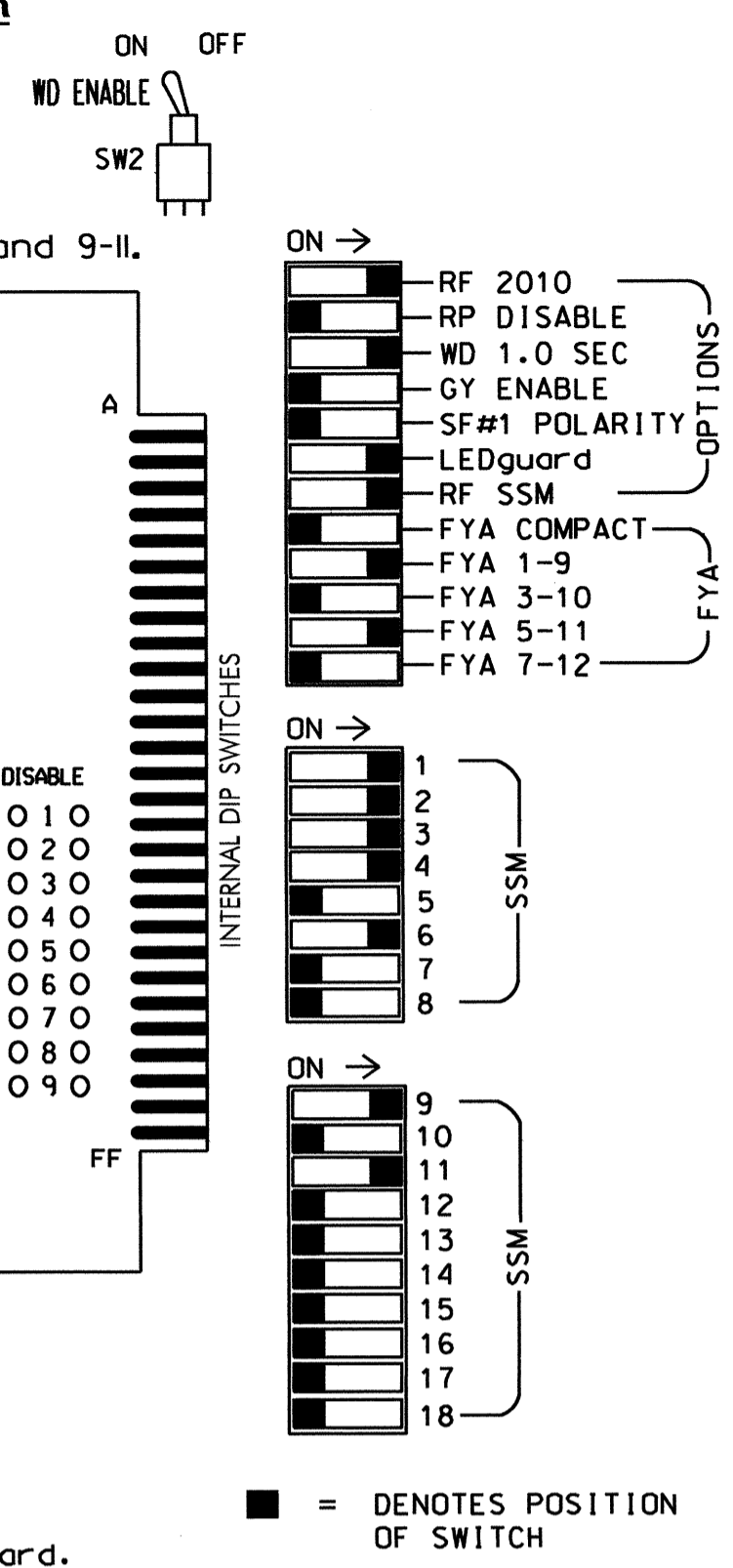
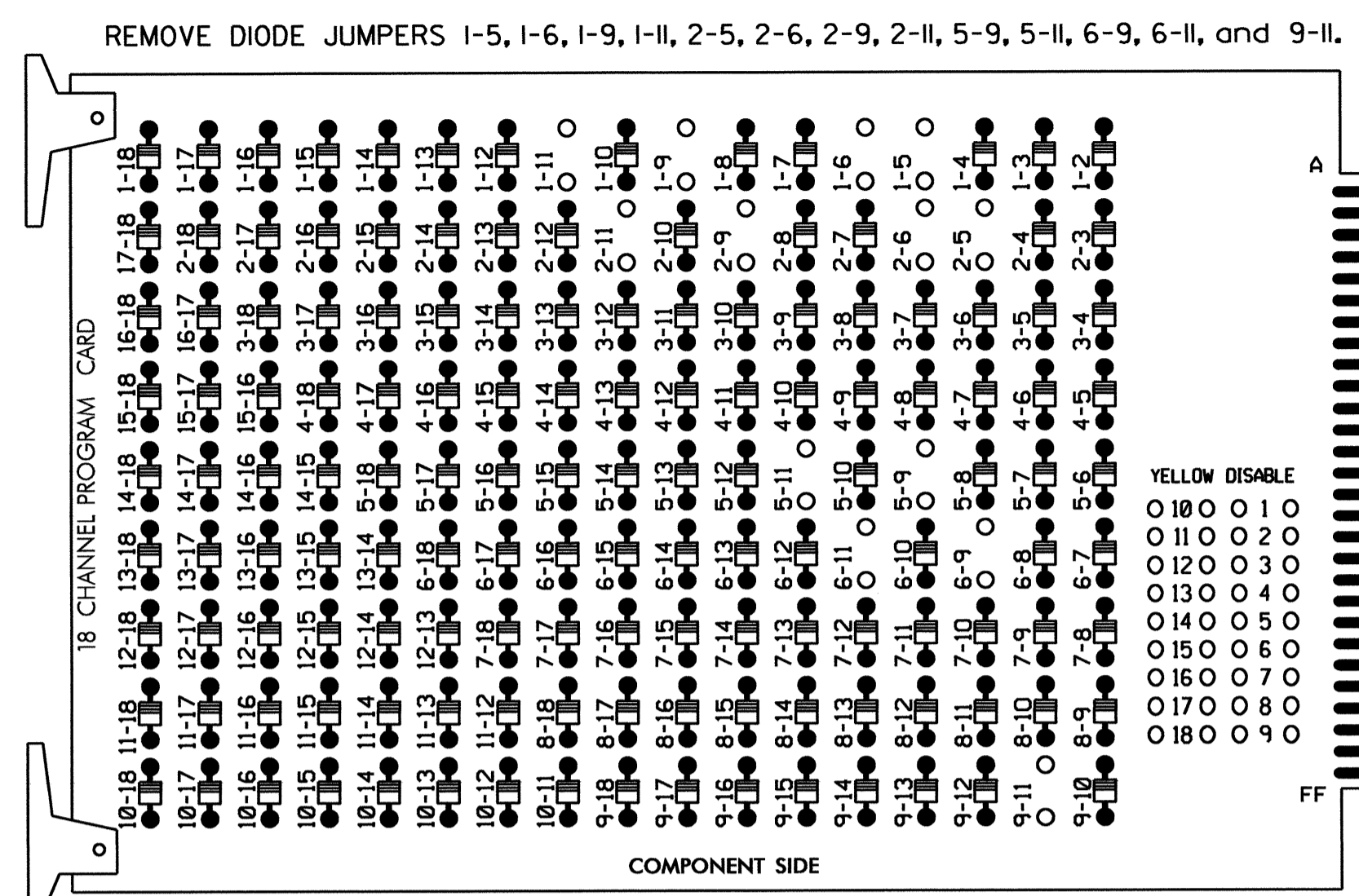
Signature: John T. Rowe, Jr. 5-28-13

SIG. INVENTORY NO. 13-0820T

28-MAY-2013 11:31 S:\IT\ASU\ITS_Signals\workgroups\sig_Mgmt\mstr\cong\30820_sm_e1e.xxx.dgn

**EDI MODEL 2018ECL-NC CONFLICT MONITOR
PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



NOTES:

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

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Variable Initial and Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.
- The cabinet and controller are part of the NC 280 (Airport Road) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332 W/ AUX
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
 LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,AUX S1,AUX S4
 PHASES USED.....1,2,3,4,5,6
 OVERLAP "A".....1+2
 OVERLAP "B".....NOT USED
 OVERLAP "C".....5+6
 OVERLAP "D".....NOT USED

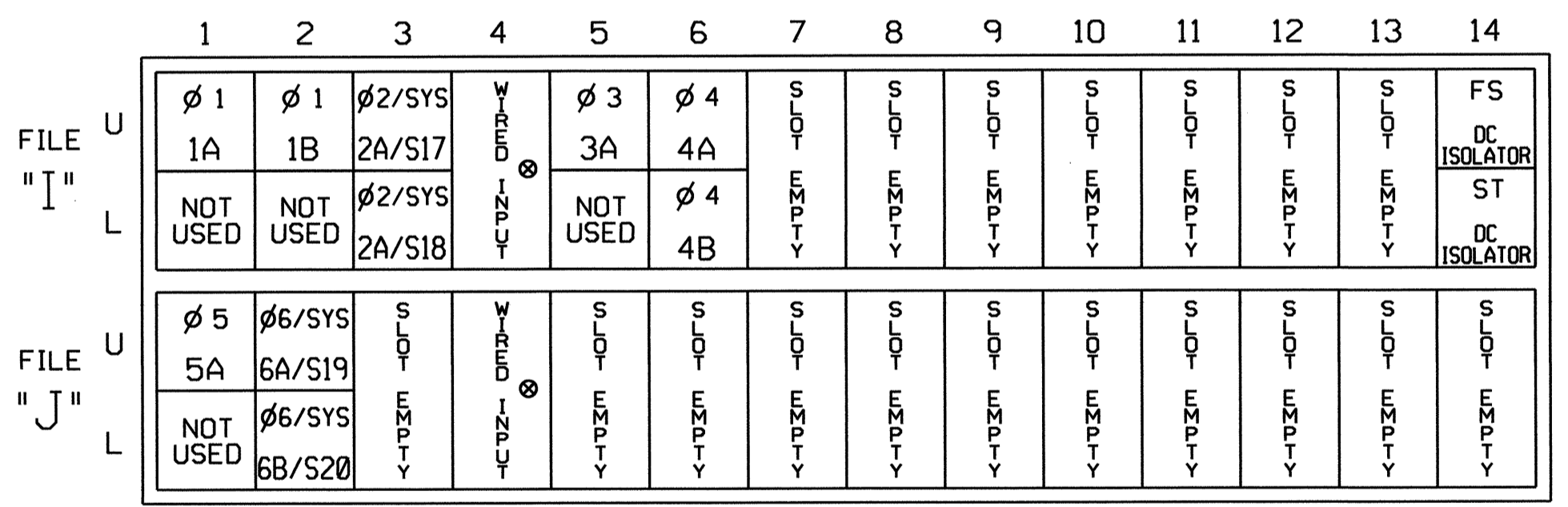
SIGNAL HEAD HOOK-UP CHART

| LOAD SWITCH NO. | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | AUX S1 | AUX S2 | AUX S3 | AUX S4 | AUX S5 | AUX S6 | |
|-----------------------|-----|-----|-------|-----|-----|-------|-----|----|-------|-----|-------|-------|--------|--------|--------|--------|--------|--------|----|
| CMU CHANNEL NO. | 1 | 2 | 13 | 3 | 4 | 14 | 5 | 6 | 15 | 7 | 8 | 16 | 9 | 10 | 17 | 11 | 12 | 18 | |
| PHASE | 1 | 2 | 2 PED | 3 | 4 | 4 PED | 5 | 6 | 6 PED | 7 | 8 | 8 PED | OLA | OLB | SPARE | OLC | OLD | SPARE | |
| SIGNAL HEAD NO. | 11* | 32 | 21,22 | NU | 31 | 32 | 41 | 42 | NU | 51* | 61,62 | NU | NU | NU | NU | 11* | NU | 51* | NU |
| RED | * | 128 | | 116 | 116 | 101 | 101 | | | | 134 | | | | | | | | |
| YELLOW | | | 129 | 117 | 117 | 102 | 102 | | * | 135 | | | | | | | | | |
| GREEN | | | 130 | 118 | 118 | 103 | 103 | | | 136 | | | | | | | | | |
| RED ARROW | | | | | | | | | | | | | | | | A121 | | A114 | |
| YELLOW ARROW | | 126 | | | | | | | | | | | | | | A122 | | A115 | |
| FLASHING YELLOW ARROW | | | | | | | | | | | | | | | | A123 | | A116 | |
| GREEN ARROW | 127 | 127 | | | 118 | 103 | | | 133 | | | | | | | | | | |

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

INPUT FILE POSITION LAYOUT

(front view)



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

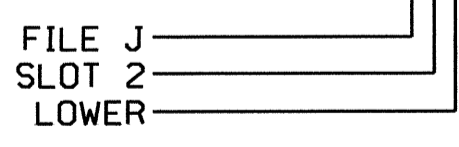
Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

| LOOP NO. | LOOP TERMINAL | INPUT FILE POS. | PIN NO. | INPUT ASSIGNMENT NO. | DETECTOR NO. | NEMA PHASE | CALL | EXTEND | FULL TIME DELAY | STRETCH TIME | DELAY TIME |
|-----------------|---------------|-----------------|---------|----------------------|--------------|------------|------|--------|-----------------|--------------|------------|
| 1A ¹ | TB2-1,2 | I1U | 56 | 18 | 1 | 1 | Y | Y | | | 15 |
| | - | J4U | 48 | 10 | 26 | 6 | Y | Y | Y | | 3 |
| 1B | TB2-5,6 | I2U | 39 | 1 | 2 | 1 | Y | Y | | | 15 |
| 2A/S17 | TB2-9,10 | I3U | 63 | 25 | 32 | 2/SYS | Y | Y | | | |
| 2B/S18 | TB2-11,12 | I3L | 76 | 38 | 42 | 2/SYS | Y | Y | | | |
| 3A | TB4-5,6 | I5U | 58 | 20 | 3 | 3 | Y | Y | | | 3 |
| 4A | TB4-9,10 | I6U | 41 | 3 | 4 | 4 | Y | Y | | | 3 |
| 4B | TB4-11,12 | I6L | 45 | 7 | 14 | 4 | Y | Y | | | 15 |
| 5A ² | TB3-1,2 | J1U | 55 | 17 | 5 | 5 | Y | Y | | | 15 |
| | - | I4U | 47 | 9 | 22 | 2 | Y | Y | Y | | 3 |
| 6A/S19 | TB3-5,6 | J2U | 40 | 2 | 6 | 6/SYS | Y | Y | | | |
| 6B/S20 | TB3-7,8 | J2L | 44 | 6 | 16 | 6/SYS | Y | Y | | | |

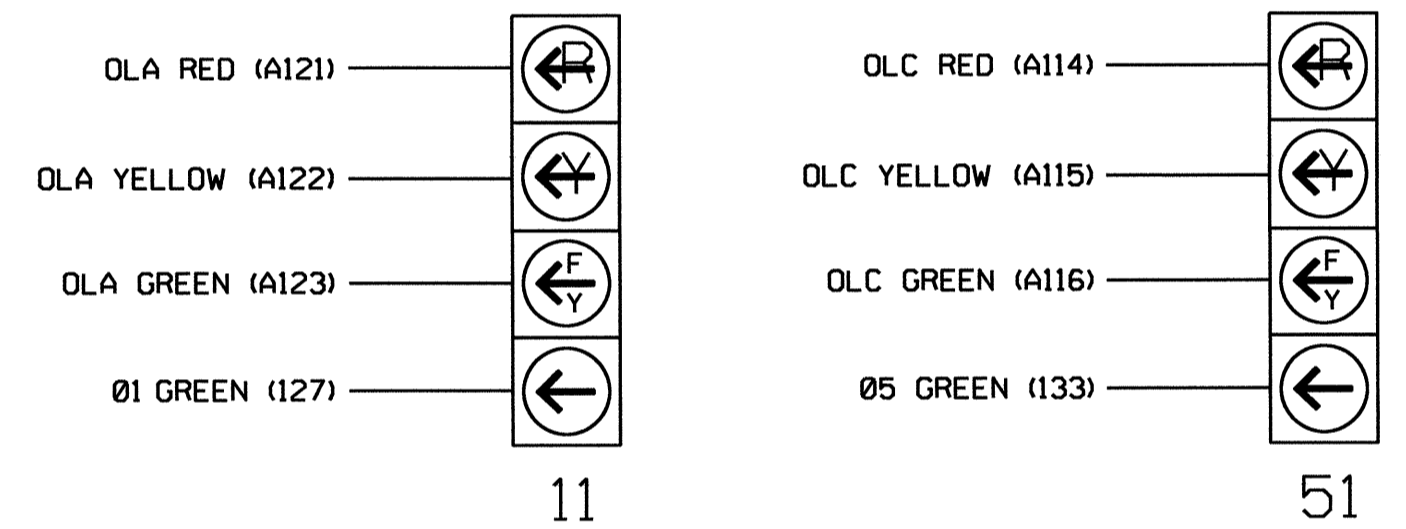
- Add jumper from I1-W to J4-W, on rear of input file.
- Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L



FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



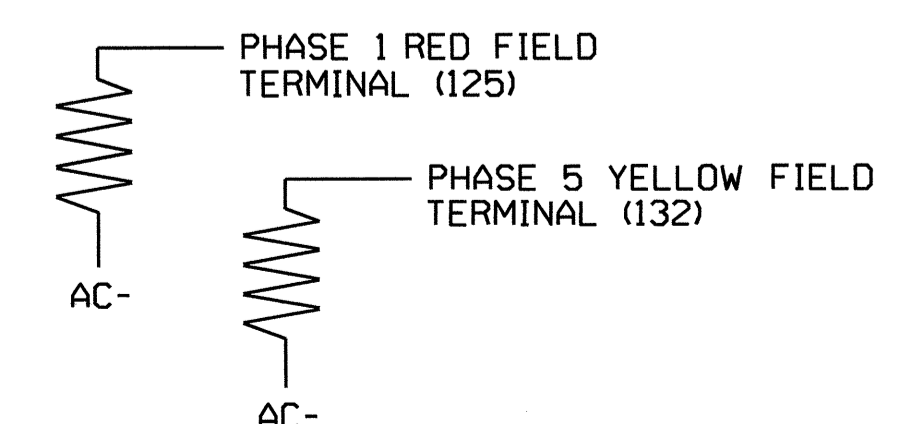
NOTE

The sequence display for signal heads 11 and 51 requires special logic programming. See sheet 2 for programming instructions.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

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



Final Design - Sheet 1 of 2

| | | | |
|---|--|---|---|
| | <p>NC 280 (Airport Road) at SR 3568 (Rockwood Road)</p> | | |
| | <p>Division 13 Buncombe County Fletcher</p> | <p>Prepared In the Offices of: S. Armstrong</p> | |
| <p>PLAN DATE: May 2013</p> | <p>REVIEWED BY: JTR</p> | <p>PREPARED BY: S. Armstrong</p> | <p>REVIEWED BY:</p> |
| <p>REVISIONS</p> | <p>INIT.</p> | <p>DATE</p> | <p>SIGNATURE: <i>John T. Rowe</i> 5-29-13</p> |
| <p>750 N. Greenfield Pkwy, Garner, NC 27529</p> | | | <p>SIG. INVENTORY NO. 13-0820</p> |

28-MAY-2013 11:32 S:\ITS\ASMTS\S1\gpi\swkr\groups\sig.Mam\mstr\ong\130820.sm.ea.e....xxx.dgn

| LEGEND | |
|--------|--|
| | YAGI ANTENNA (DOUBLE) FOR REPEATER OPERATION |
| | YAGI ANTENNA (SINGLE) |
| | OMNI ANTENNA |
| | EXISTING CONTROLLER AND CABINET |
| | EXISTING MASTER CONTROLLER AND CABINET |
| | SIGNAL INVENTORY NUMBER |
| | NEW METAL POLE W/MAST ARM |
| | EXISTING WOOD POLE |
| | NEW METAL POLE |
| SP | SIGNAL POLE |
| | EXISTING METAL POLE |
| | NEW OVERSIZED JUNCTION BOX |
| | EXISTING OVERSIZED JUNCTION BOX |
| | EXISTING CONDUIT |
| | EXISTING COMMUNICATIONS CABLE |

NOTES FOR WIRELESS COMMUNICATIONS:

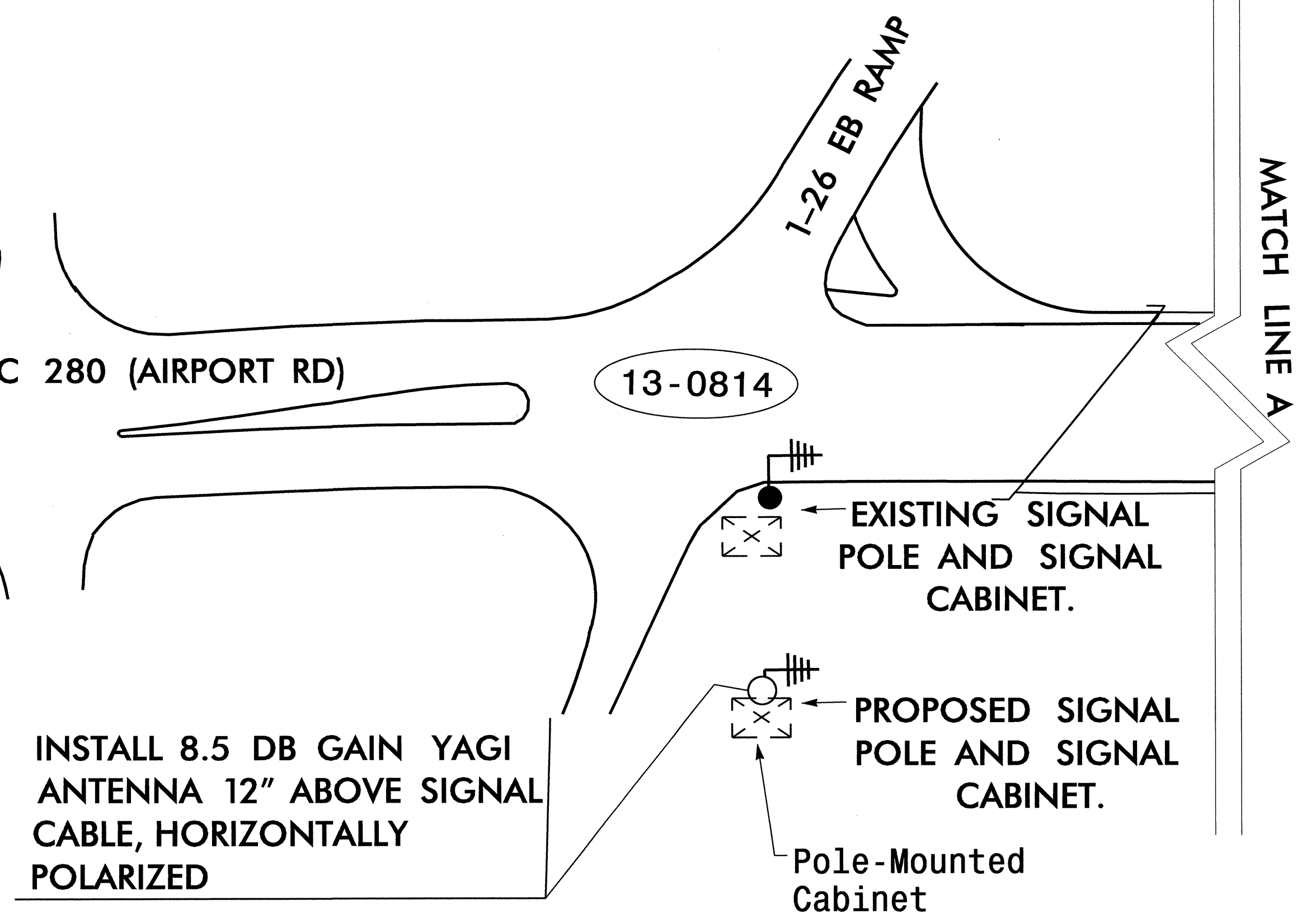
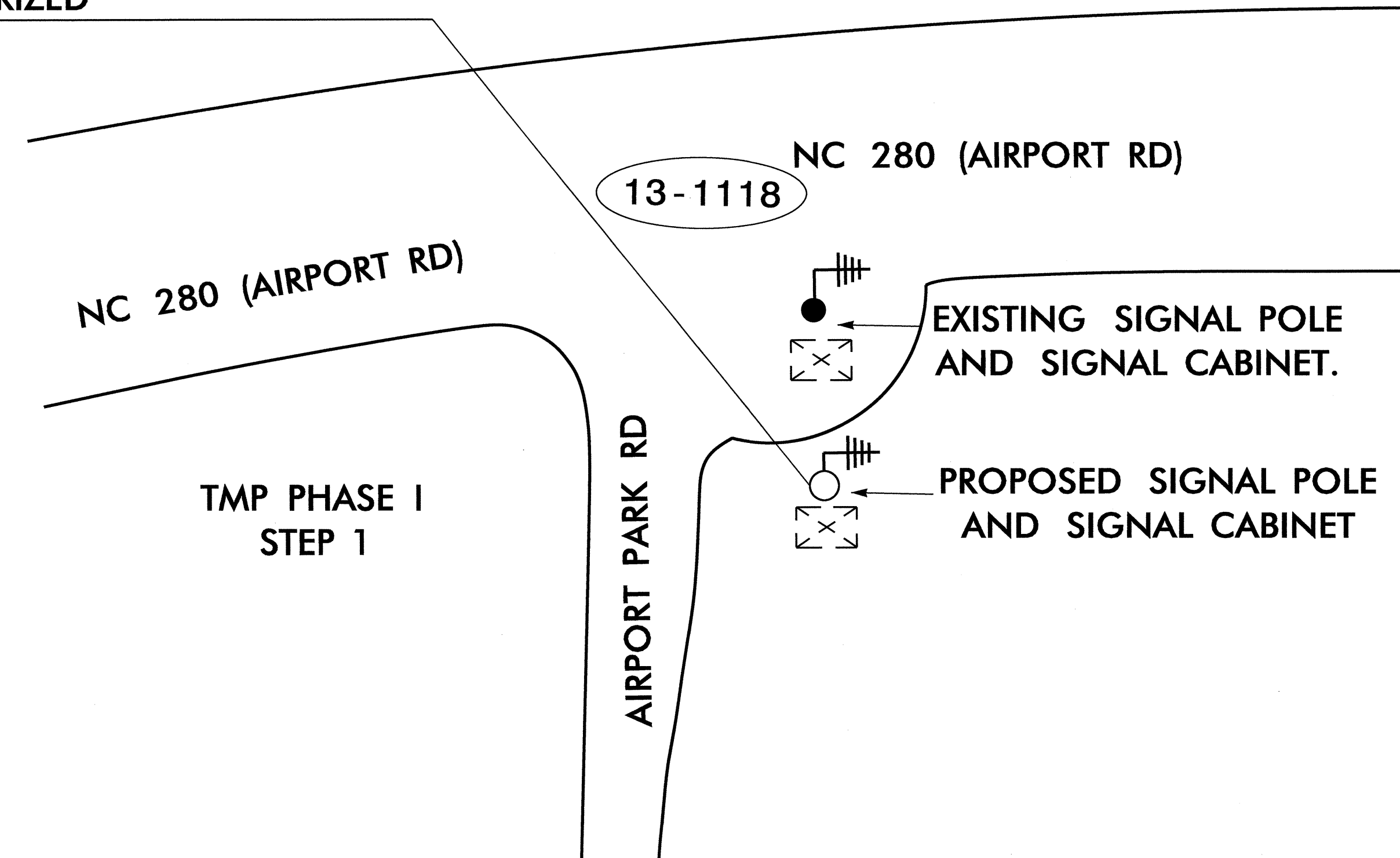
1. INSTALL COAXIAL CABLE:
 - A. ON WOOD POLES, REQUIRING A NEW RIGID GALVANIZED STEEL RISER, INSTALL A 2" RISER WITH WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
 - B. ON METAL POLES WITH MAST ARMS, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL A 1/2" HOLE UP THROUGH THE BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
 - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
 - D. BETWEEN THE POINT OF EXITING THE RISER, METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
2. IF AN EXISTING 2" SPARE RIGID GALVANIZED STEEL RISER IS AVAILABLE, INSTALL THE COAXIAL CABLE IN THE SPARE RISER.
3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN.
(NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET.
(NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

| | | | |
|--|--|-------|--|
| | WIRELESS COMMUNICATIONS PLANS ALONG NC 280 (AIRPORT ROAD) | | |
| | DIVISION 13 BUNCOMBE COUNTY FLETCHER | | |
| PLAN DATE: MAY 2013 REVIEWED BY: I. N. AVERY | | | SIGNATURE: <i>G. A. Fuller</i> DATE: 5-21-13 |
| PREPARED BY: P. C. LOUDER REVIEWED BY: G. A. FULLER, PE | | | |
| SCALE: 0 | REVISIONS | INIT. | DATE |
| CADD Filename: | | | |

- 1) RELOCATE EXISTING RADIO SYSTEM (RADIO, ANTENNA, AND ANTENNA MOUNTING HARDWARE) TO NEW POLE AND PROPOSED CABINET.
- 2) INSTALL NEW 2" RISER WITH WEATHERHEAD, CONDUIT AND COAXIAL CABLE BETWEEN RELOCATED RADIO AND RELOCATED ANTENNA.
- 3) INSTALL NEW COAXIAL CABLE SHIELD GROUNDING AND WEATHERPROOFING KIT.

- 1) RELOCATE EXISTING RADIO SYSTEM (RADIO, ANTENNA, AND ANTENNA MOUNTING HARDWARE) TO NEW POLE AND PROPOSED CABINET.
- 2) INSTALL NEW 2" RISER WITH WEATHERHEAD, CONDUIT AND COAXIAL CABLE BETWEEN RELOCATED RADIO AND RELOCATED ANTENNA.
- 3) INSTALL NEW COAXIAL CABLE SHIELD GROUNDING AND WEATHERPROOFING KIT.

INSTALL 8.5 DB GAIN YAGI ANTENNA 12" ABOVE SIGNAL CABLE, HORIZONTALLY POLARIZED

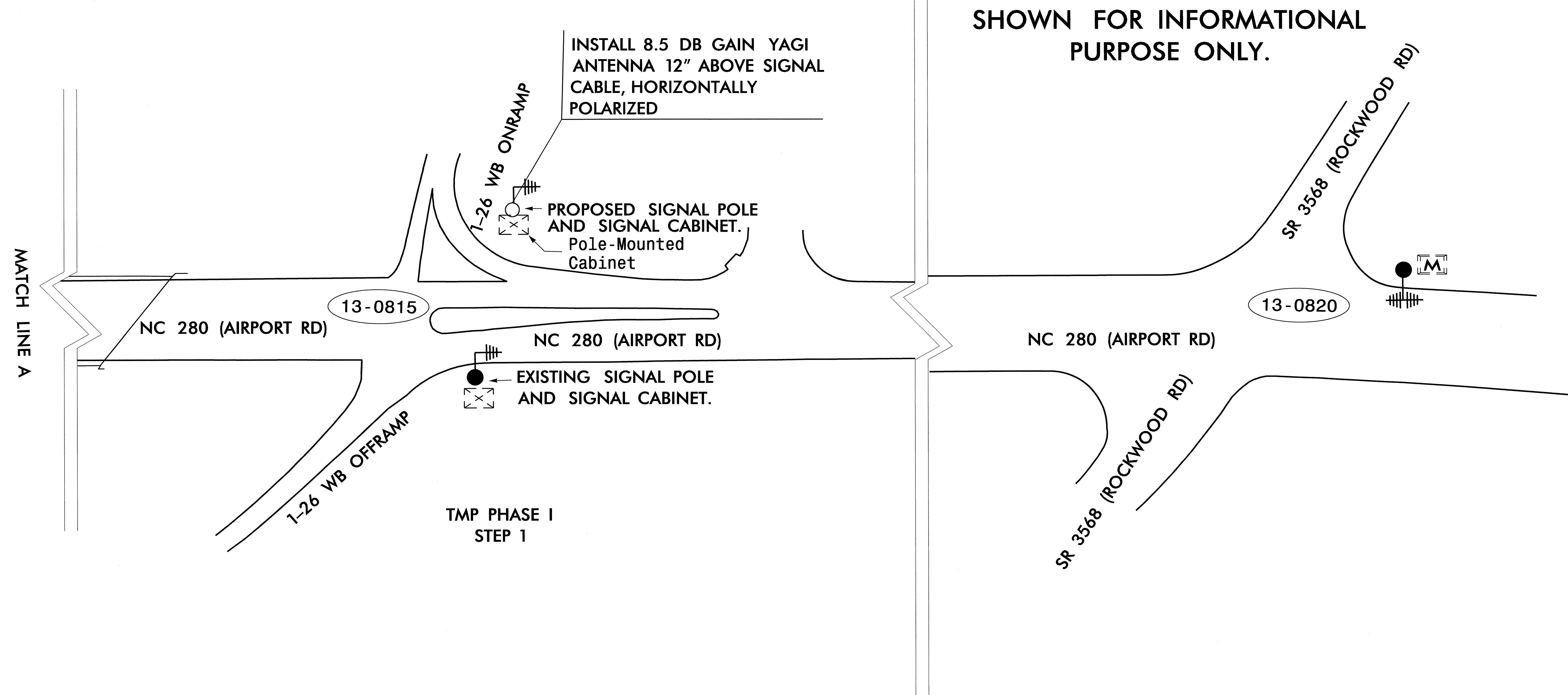


TMP PHASE I
STEP 1

TMP PHASE I (MAINTAIN RADIO SYSTEM)

| | | | |
|----------|--|------------------------------|---|
| | WIRELESS COMMUNICATIONS PLANS ALONG NC 280 (AIRPORT ROAD) | | |
| | DIVISION 13 BUNCOMBE COUNTY FLETCHER | | |
| | PLAN DATE: MAY 2013 | REVIEWED BY: I. N. AVERY | |
| | PREPARED BY: P. C. LOUDER | REVIEWED BY: G.A. FULLER, PE | |
| SCALE: 0 | REVISIONS | INIT. DATE | SIGNATURE: <i>Gregory A. Fuller</i> DATE: 5/21/13 |

- 1) RELOCATE EXISTING RADIO SYSTEM (RADIO, ANTENNA, AND ANTENNA MOUNTING HARDWARE) TO NEW POLE AND PROPOSED CABINET.
- 2) INSTALL NEW 2" RISER WITH WEATHERHEAD, CONDUIT AND COAXIAL CABLE BETWEEN RELOCATED RADIO AND RELOCATED ANTENNA.
- 3) INSTALL NEW COAXIAL CABLE SHIELD GROUNDING AND WEATHERPROOFING KIT.



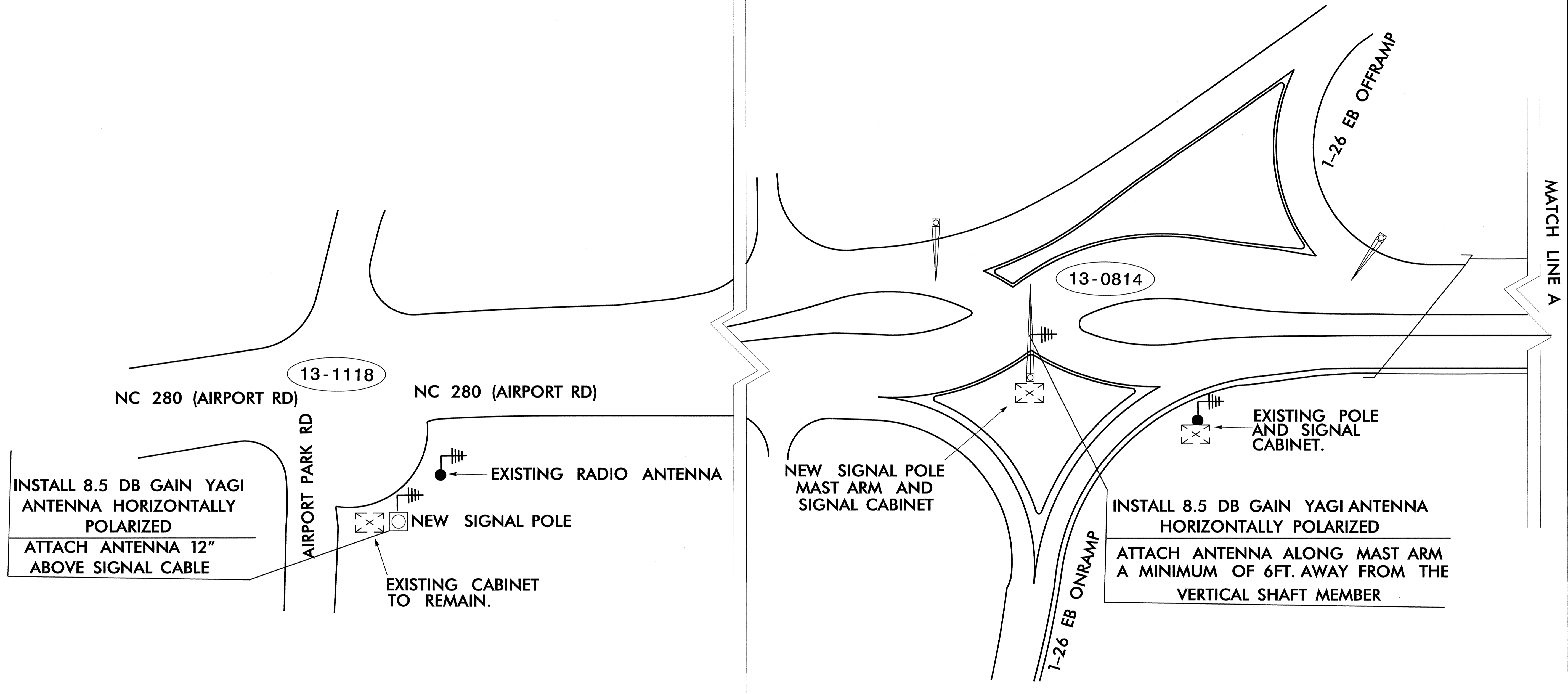
SHOWN FOR INFORMATIONAL PURPOSE ONLY.

TMP PHASE I (MAINTAIN RADIO SYSTEM)

| | | | |
|---|--|--|---|
| | WIRELESS COMMUNICATIONS PLANS ALONG NC 280 (AIRPORT ROAD) | | |
| | DIVISION 13 BUNCOMBE COUNTY FLETCHER | PLAN DATE: MAY 2013 REVIEWED BY: I. N. AVERY | |
| 750 N. Greenfield Place, Garner, NC 27529 | PREPARED BY: P. C. LOUDER | REVIEWED BY: G. A. FULLER, PE | |
| | REVISIONS | INIT. | DATE |
| CADD File name: | | | SIGNATURE: <i>Gregory A. Fuller</i> DATE: 5-21-13 |

- 1) RELOCATE EXISTING RADIO ANTENNA FROM EXISTING SIGNAL POLE TO NEW METAL STRAIN POLE.
- 2) INSTALL NEW 2" RISER WITH WEATHERHEAD, CONDUIT AND COAXIAL CABLE BETWEEN RADIO AND RELOCATED ANTENNA.
- 3) INSTALL NEW COAXIAL CABLE SHIELD GROUNDING AND WEATHERPROOFING KIT.

- 1) RELOCATE EXISTING RADIO SYSTEM (RADIO, ANTENNA, AND ANTENNA MOUNTING HARDWARE) TO NEW POLE AND PROPOSED CABINET.
- 2) INSTALL NEW 2" RISER WITH WEATHERHEAD, CONDUIT AND COAXIAL CABLE BETWEEN RELOCATED RADIO AND RELOCATED ANTENNA.
- 3) INSTALL NEW COAXIAL CABLE SHIELD GROUNDING AND WEATHERPROOFING KIT.



INSTALL 8.5 DB GAIN YAGI ANTENNA HORIZONTALLY POLARIZED
ATTACH ANTENNA 12" ABOVE SIGNAL CABLE

EXISTING RADIO ANTENNA
NEW SIGNAL POLE
EXISTING CABINET TO REMAIN.

NEW SIGNAL POLE MAST ARM AND SIGNAL CABINET

EXISTING POLE AND SIGNAL CABINET.
INSTALL 8.5 DB GAIN YAGI ANTENNA HORIZONTALLY POLARIZED
ATTACH ANTENNA ALONG MAST ARM A MINIMUM OF 6FT. AWAY FROM THE VERTICAL SHAFT MEMBER

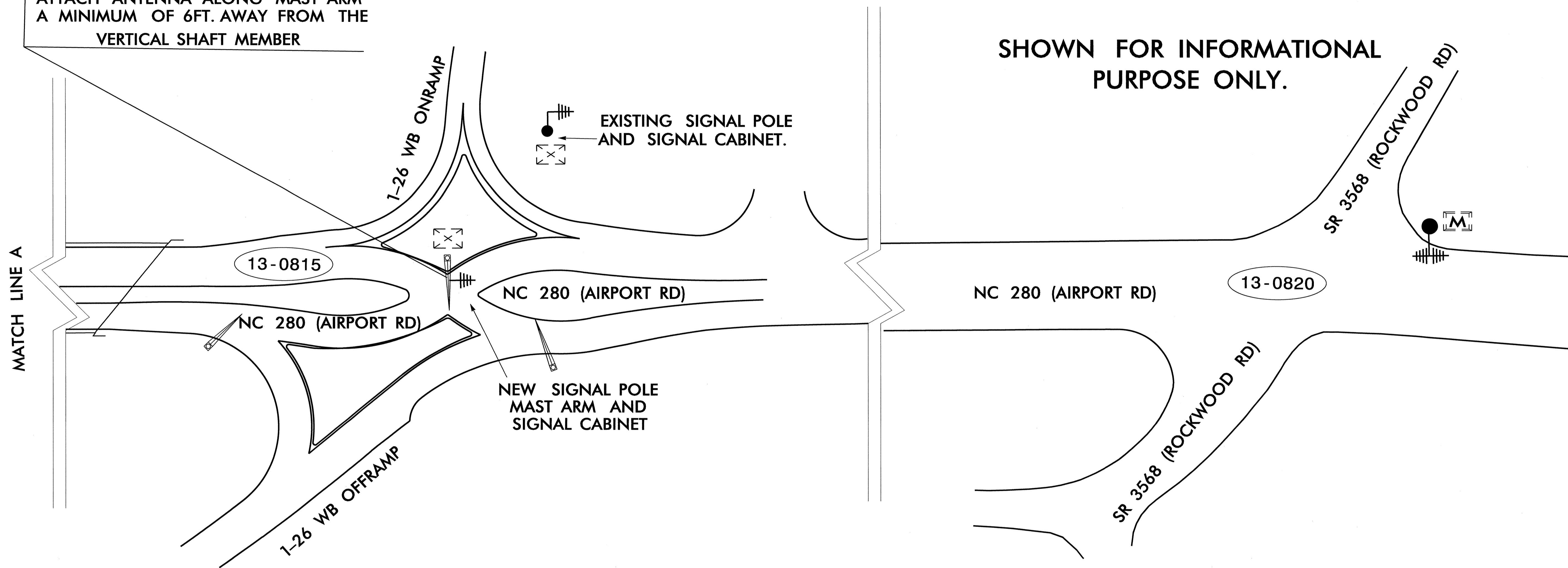
TMP PHASE FINAL

| | | | |
|--|--|---|------------------------|
| | <p>WIRELESS COMMUNICATIONS PLANS ALONG NC 280 (AIRPORT ROAD)</p> | | |
| | <p>DIVISION 13 BUNCOMBE COUNTY FLETCHER</p> | <p>PLAN DATE: MAY 2013 REVIEWED BY: I. N. AVERY</p> | |
| <p>750 N. Greenfield Place, Garner, NC 27529</p> | <p>PREPARED BY: P. C. LOUDER</p> | <p>REVIEWED BY: G. A. FULLER, PE</p> | <p>SIGNATURE DATE</p> |
| <p>SCALE 0</p> | <p>REVISIONS</p> | <p>INIT. DATE</p> | <p>CADD File name:</p> |

- 1) RELOCATE EXISTING RADIO SYSTEM (RADIO, ANTENNA, AND ANTENNA MOUNTING HARDWARE) TO NEW POLE AND PROPOSED CABINET.
- 2) INSTALL NEW 2" RISER WITH WEATHERHEAD, CONDUIT AND COAXIAL CABLE BETWEEN RELOCATED RADIO AND RELOCATED ANTENNA.
- 3) INSTALL NEW COAXIAL CABLE SHIELD GROUNDING AND WEATHERPROOFING KIT.

INSTALL 8.5 DB GAIN YAGI ANTENNA
HORIZONTALLY POLARIZED

ATTACH ANTENNA ALONG MAST ARM
A MINIMUM OF 6FT. AWAY FROM THE
VERTICAL SHAFT MEMBER



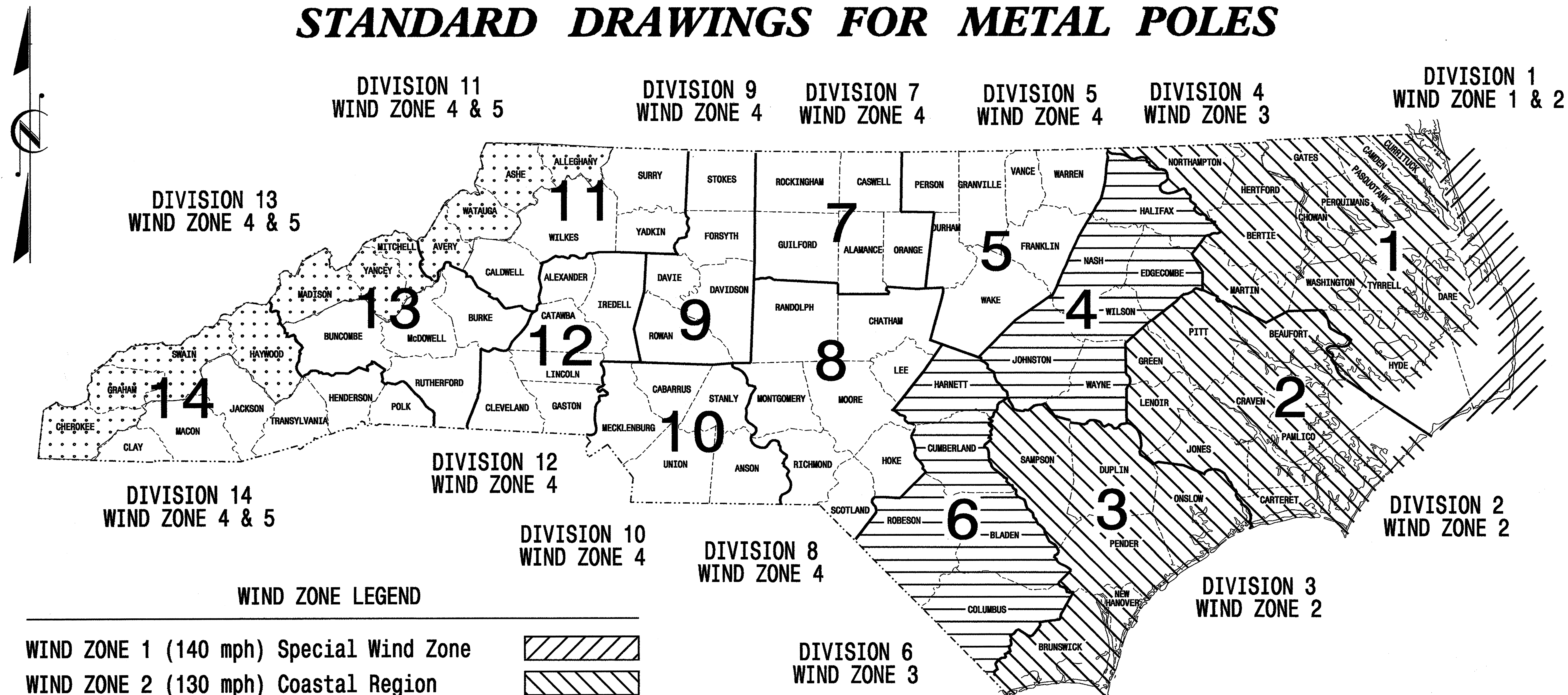
TMP PHASE FINAL

| | WIRELESS COMMUNICATIONS PLANS ALONG NC 280 (AIRPORT ROAD) | | | | | | | | | | |
|--|---|--|---|-----------|-------|------|--|--|--|--|--|
| | DIVISION 13 BUNCOMBE COUNTY FLETCHER PLAN DATE: MAY 2013 REVIEWED BY: I. N. AVERY PREPARED BY: P. C. LOUDER REVIEWED BY: G. A. FULLER, PE | <table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> | | REVISIONS | INIT. | DATE | | | | | |
| REVISIONS | INIT. | DATE | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 750 N. Greenfield Place, Garner, NC 27529 SCALE 0 | SIGNATURE: <i>Gregory A. Fuller</i> DATE: 5-21-13 CADD Filename: | | SEAL NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER | | | | | | | | |

STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

| | | |
|-----------------|-------------|-----------|
| STATE | PROJECT NO. | SHEET NO. |
| N.C. | I-5501 | Sig. 37 |
| F. A. PROJ. NO. | M 1 | |
| PROJECT ID. NO. | | |

STANDARD DRAWINGS FOR 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 | | |

<http://www.ncdot.org/doh/preconstruct/traffic/tmssu/ws/default.htm>

Prepared in the Offices of:

122 N. McDowell St., Raleigh, NC 27603

Designed in conformance
with the
2002 Interim to the
4th Edition 2001
AASHTO
Standard Specifications for
Structural Supports for
Highway Signs, Luminaires,
and Traffic Signals

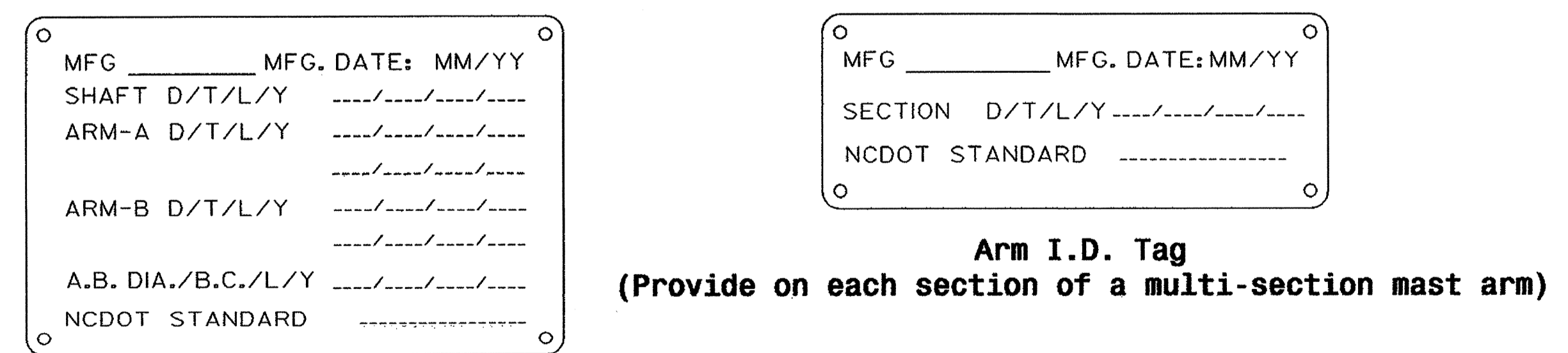
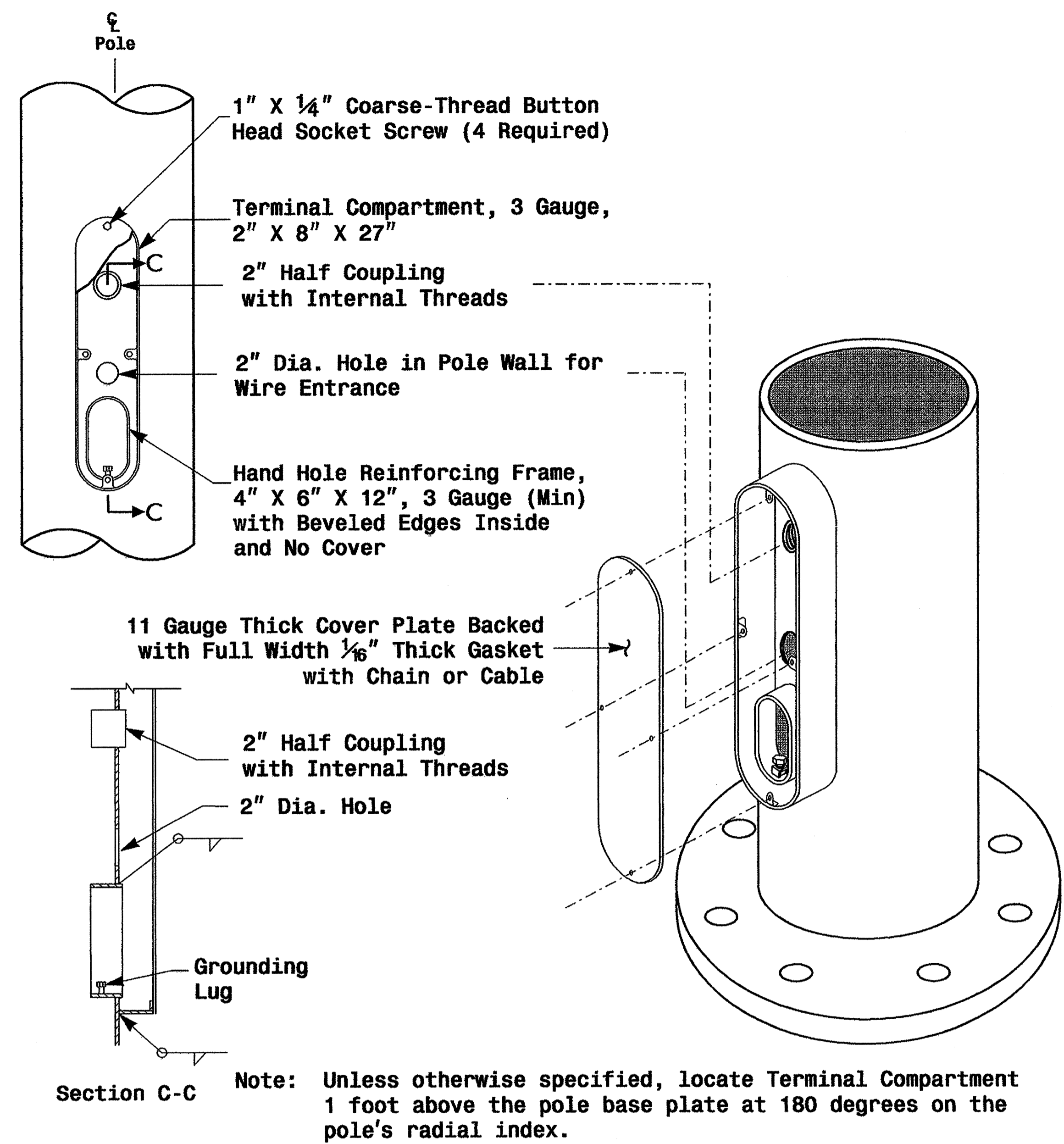
| DRAWING NUMBER | DESCRIPTION |
|----------------|--------------------------------------|
| M 1 | Title Sheet |
| M 2 | Fabrication Details - All Poles |
| M 3 | Fabrication Details - Strain Poles |
| M 4,5 | Fabrication Details - Mast Arm Poles |
| M 6 | Construction Details - Strain Poles |
| M 7 | Construction Details - Foundations |
| M 8 | Standard Strain Poles |

NCDOT CONTACTS:
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

G. A. Fuller, P.E. - State ITS and Signals Engineer
 R. E. Mullinax, P.E. - Signals and Geometrics Engineer
 P. L. Alexander, P.E. - Signals and Geometrics Special Projects Engineer
 D. C. Sarkar, P.E. - Signals and Geometrics Structural Engineer
 A. M. Esposito, P.E. - Signals and Geometrics Project Engineer
 C. F. Andrews, Jr. - Signals and Geometrics Project Engineer

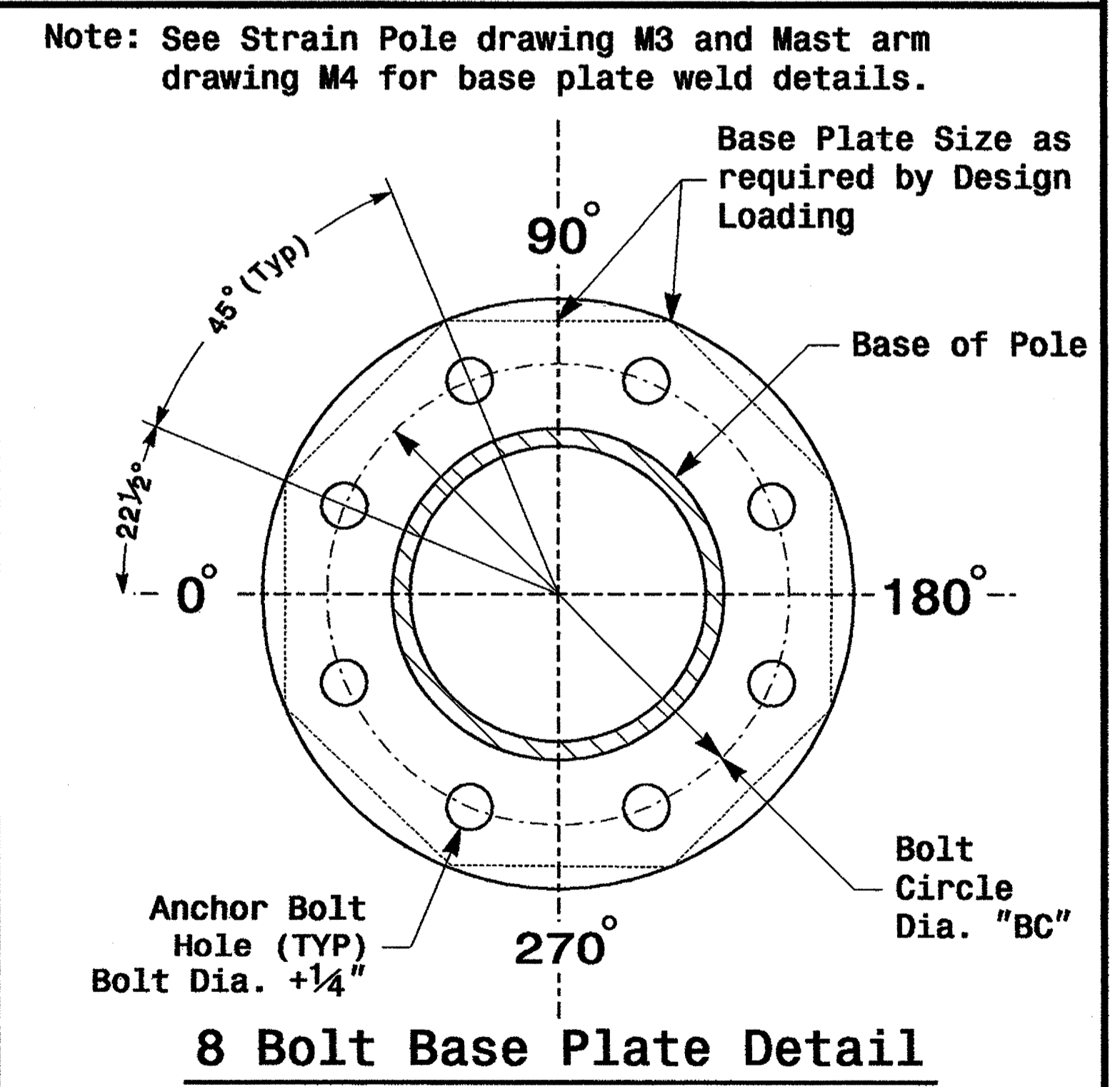
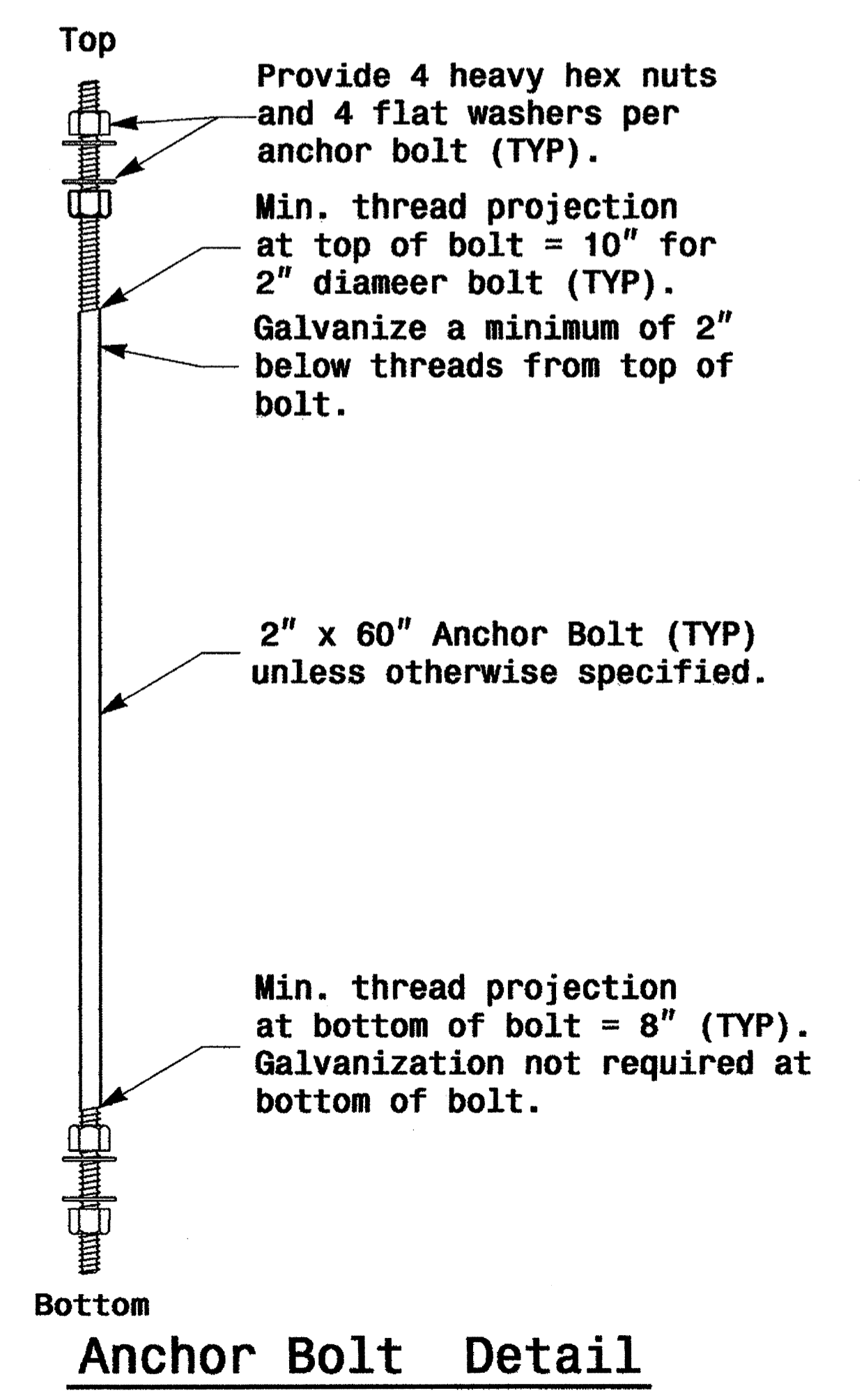
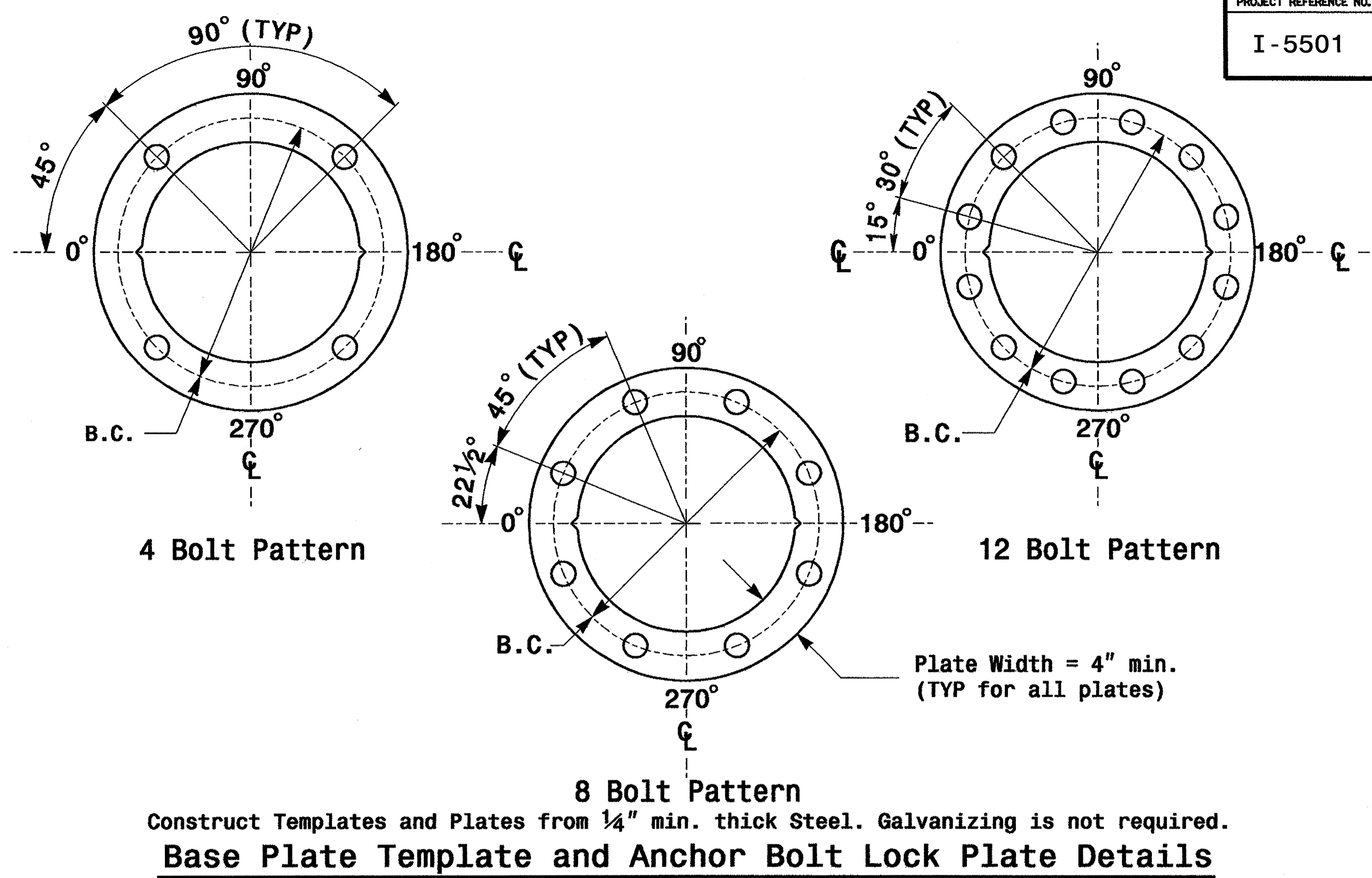
SEAL

9.2.2005
DATE



- Notes:**
- 1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
 - 2) A.B. = Anchor Bolt
 - 3) B.C. = Bolt Circle of Anchor Bolts
 - 4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
 - 5) See drawing M4 for mounting positions of I.D. tags.

Identification Tag Details



Prepared in the Office of:

Typical Fabrication Details Common To All Metal Poles

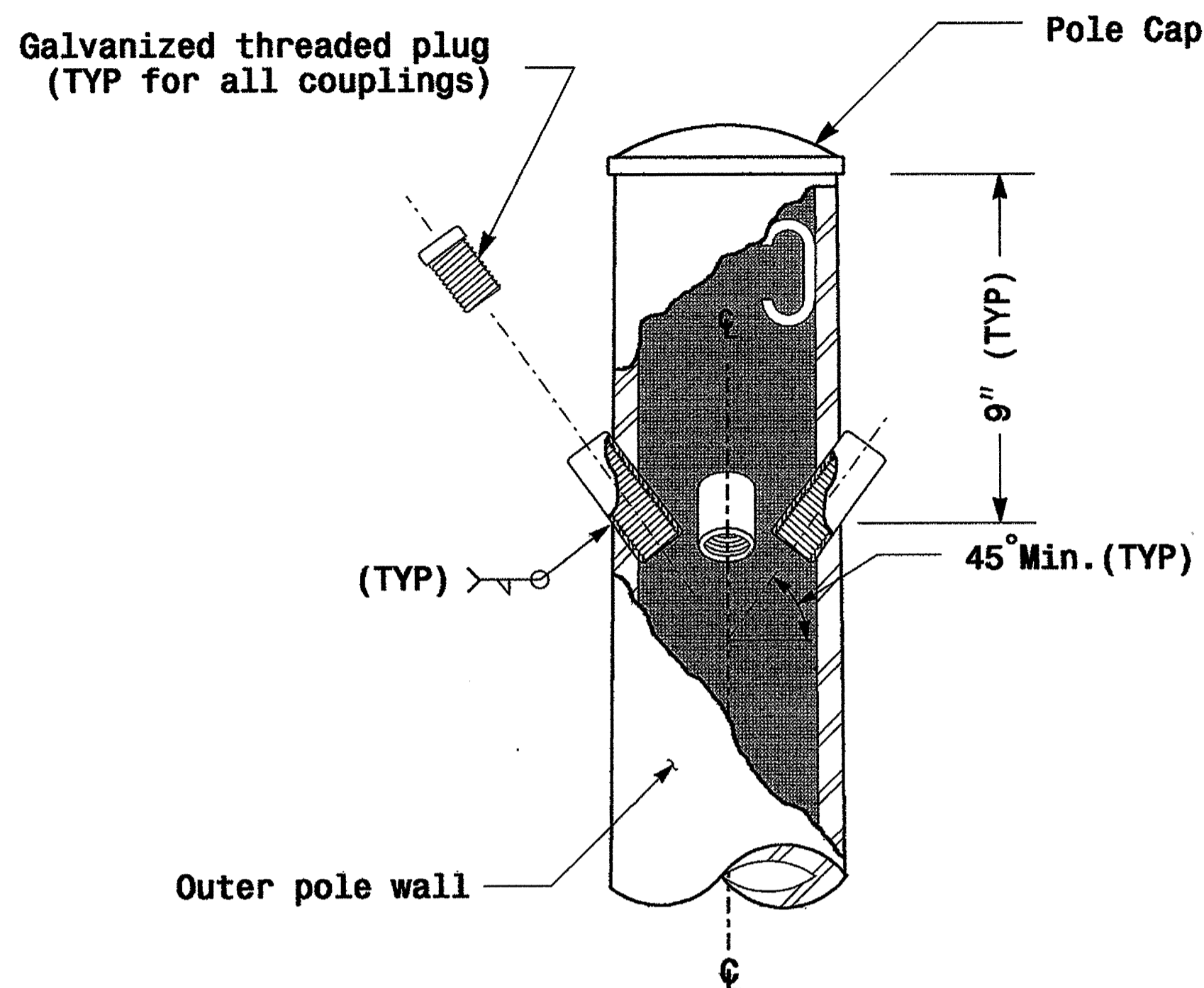
PLAN DATE: May 2005 REVIEWED BY: C.F. Andrews
 PREPARED BY: P.L. Alexander REVIEWED BY: A.W. Esposito

SCALE: NONE

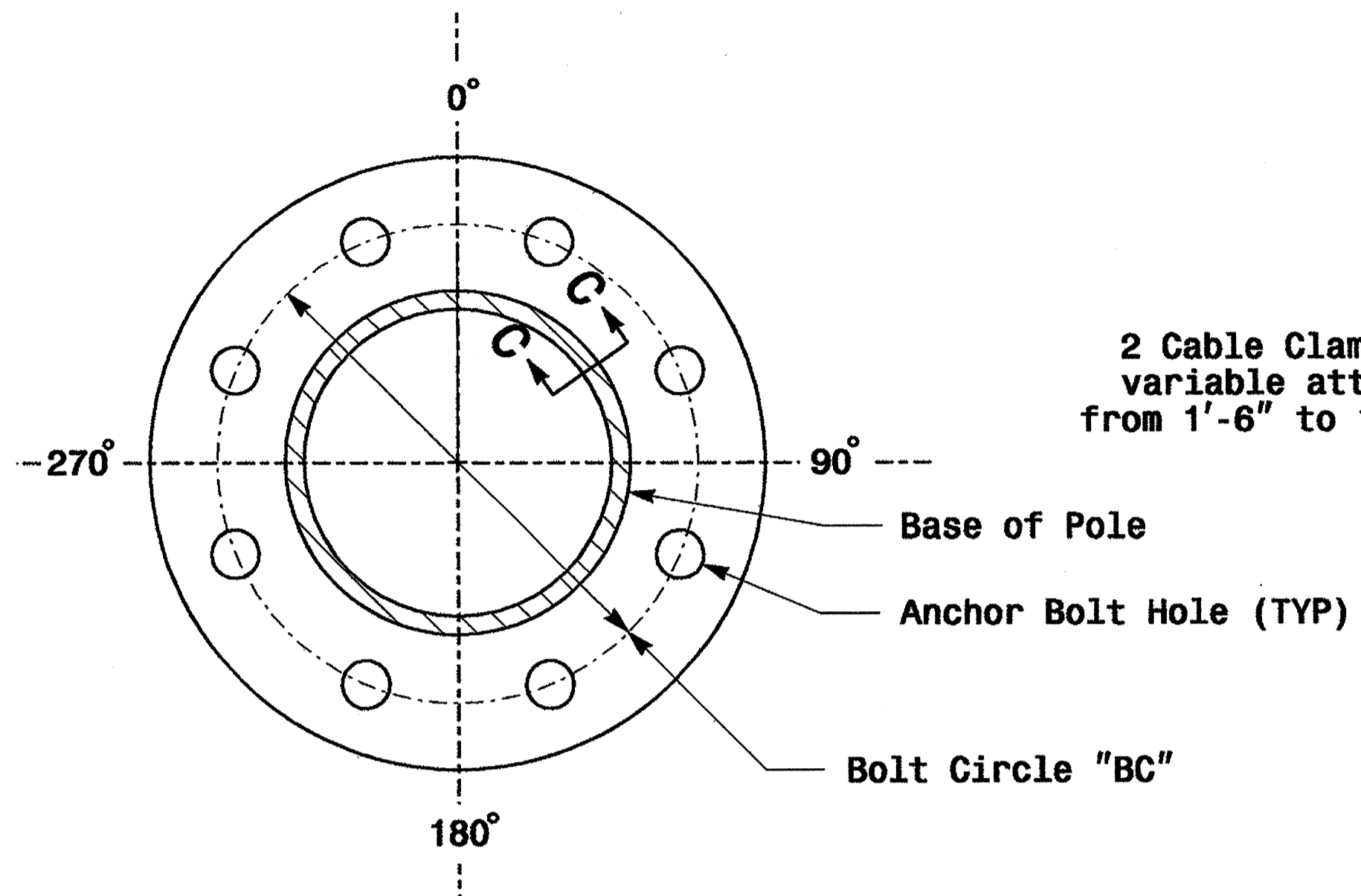
Signature: D. Sankar, 9.2.2005

Fabrication Details - All Poles

01-SEP-2005 18:22 D:\2004 Metal Pole Standards\2004.mf.tpr.mf.dgn

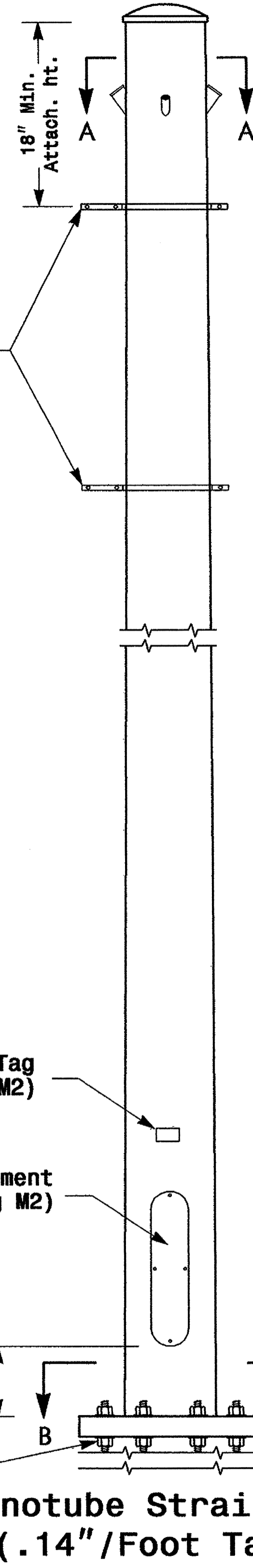


Cable Entrances at Top of Pole

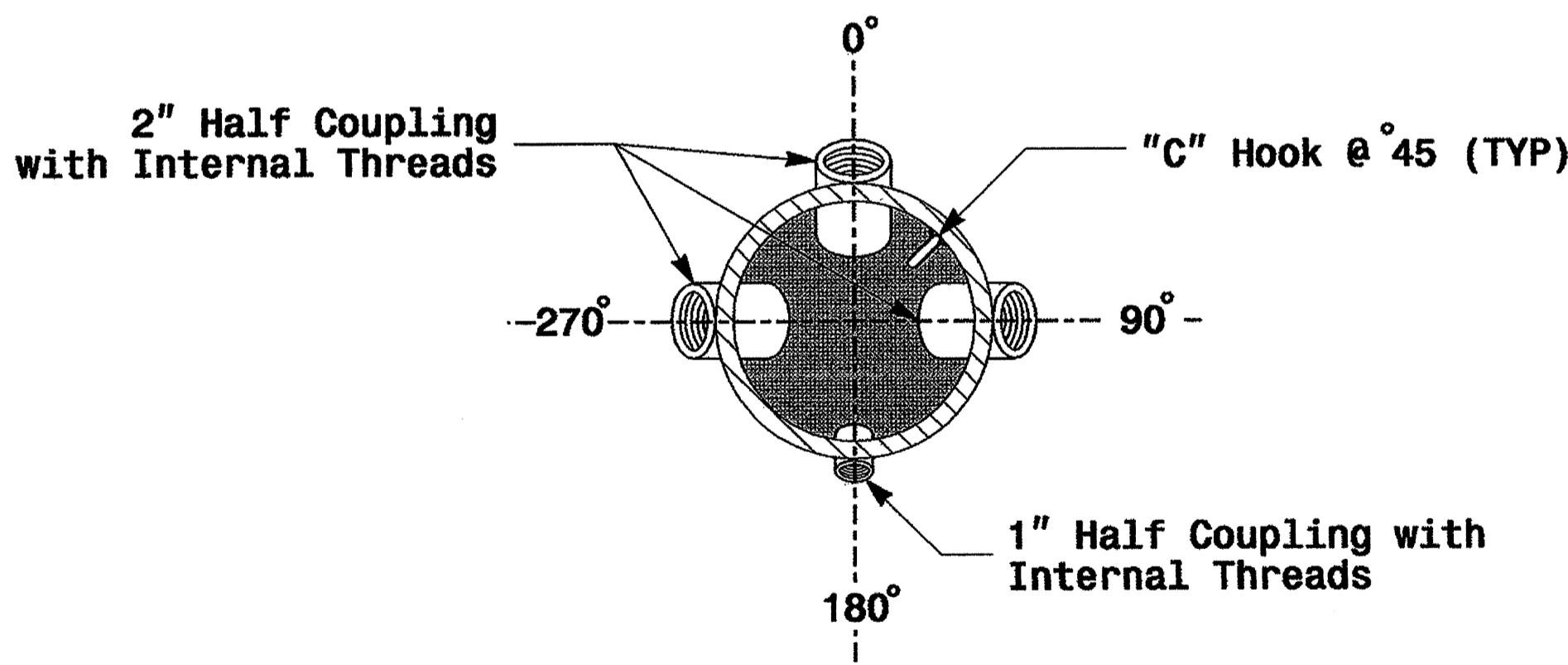


Section B-B
(See drawing M2)
Pole Base Plate

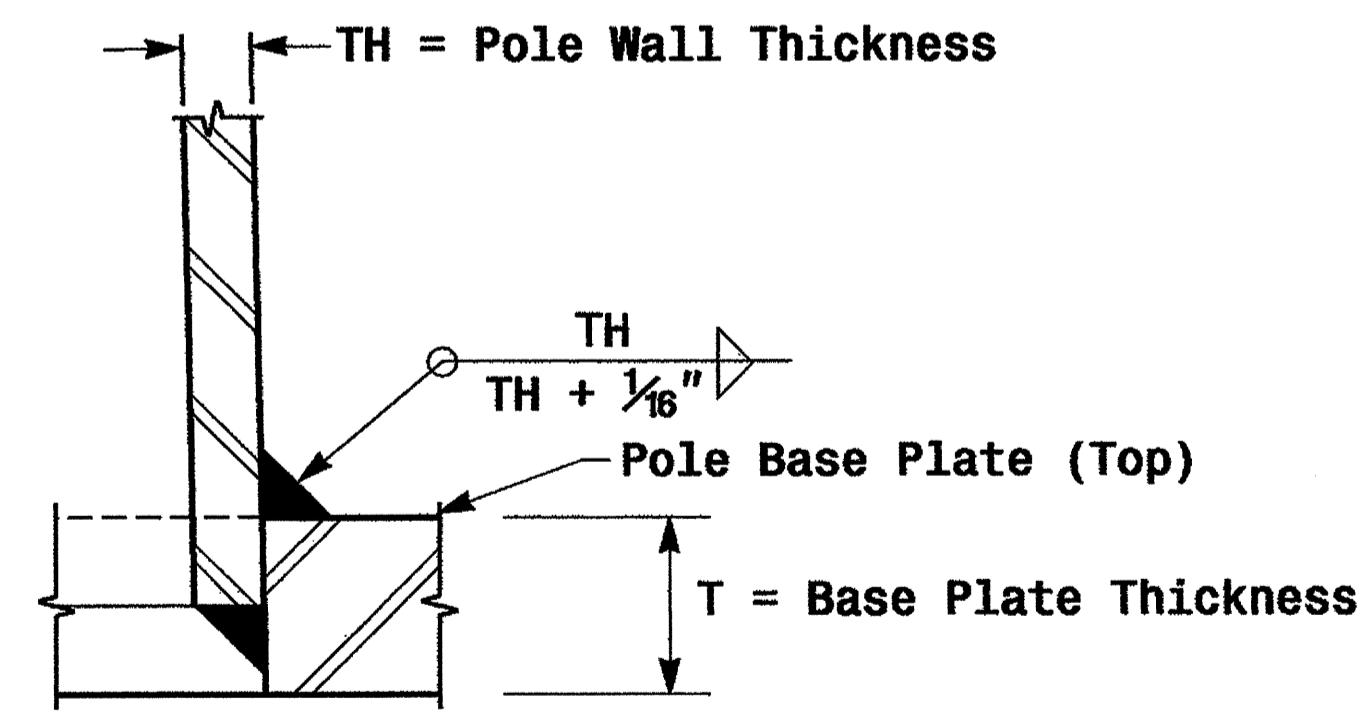
2 Cable Clamps designed for variable attachment heights from 1'-6" to 10' below the top of the pole.



Monotube Strain Pole
(.14"/Foot Taper)



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

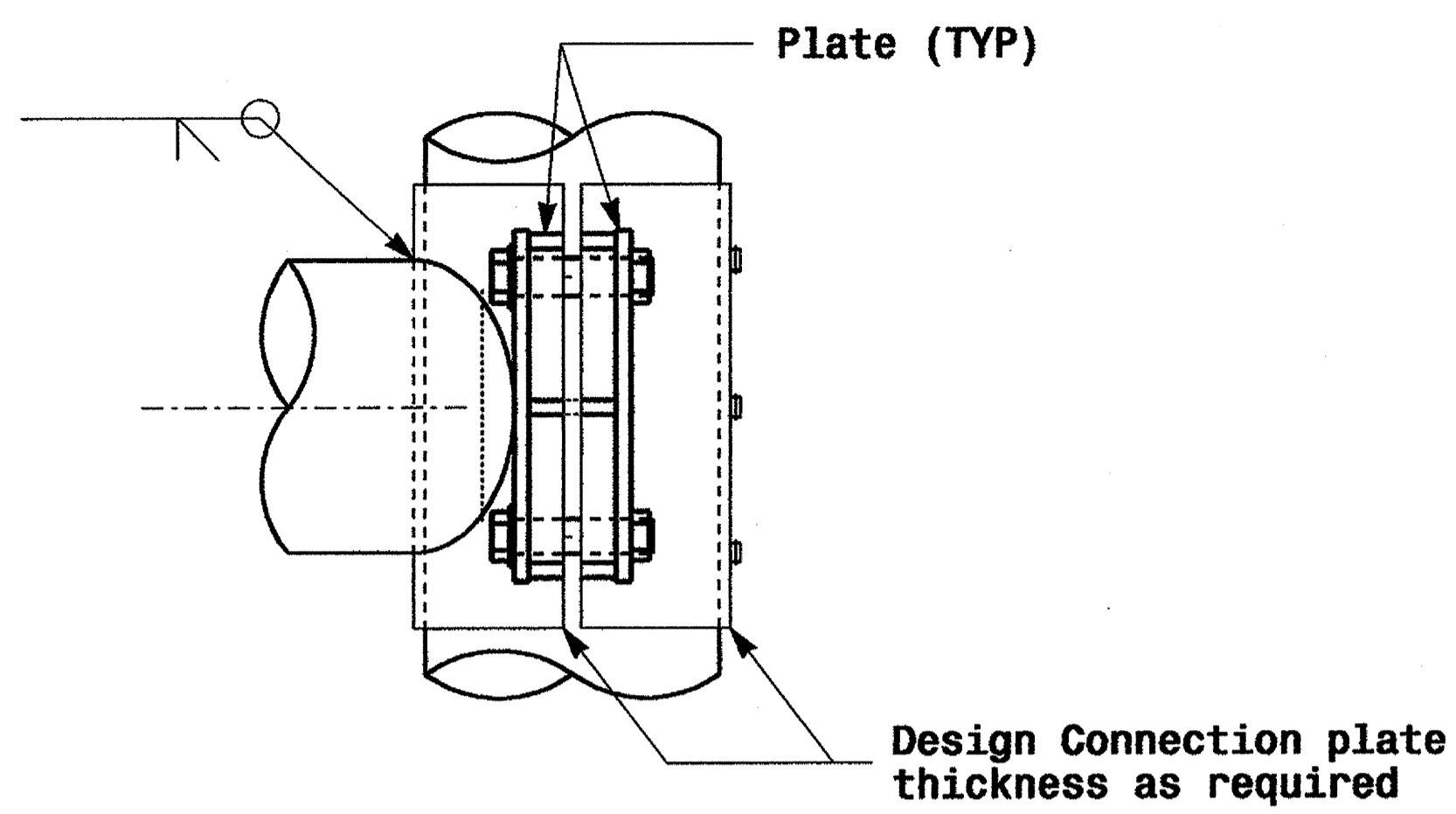


Section C-C
Socket Connection Weld Detail

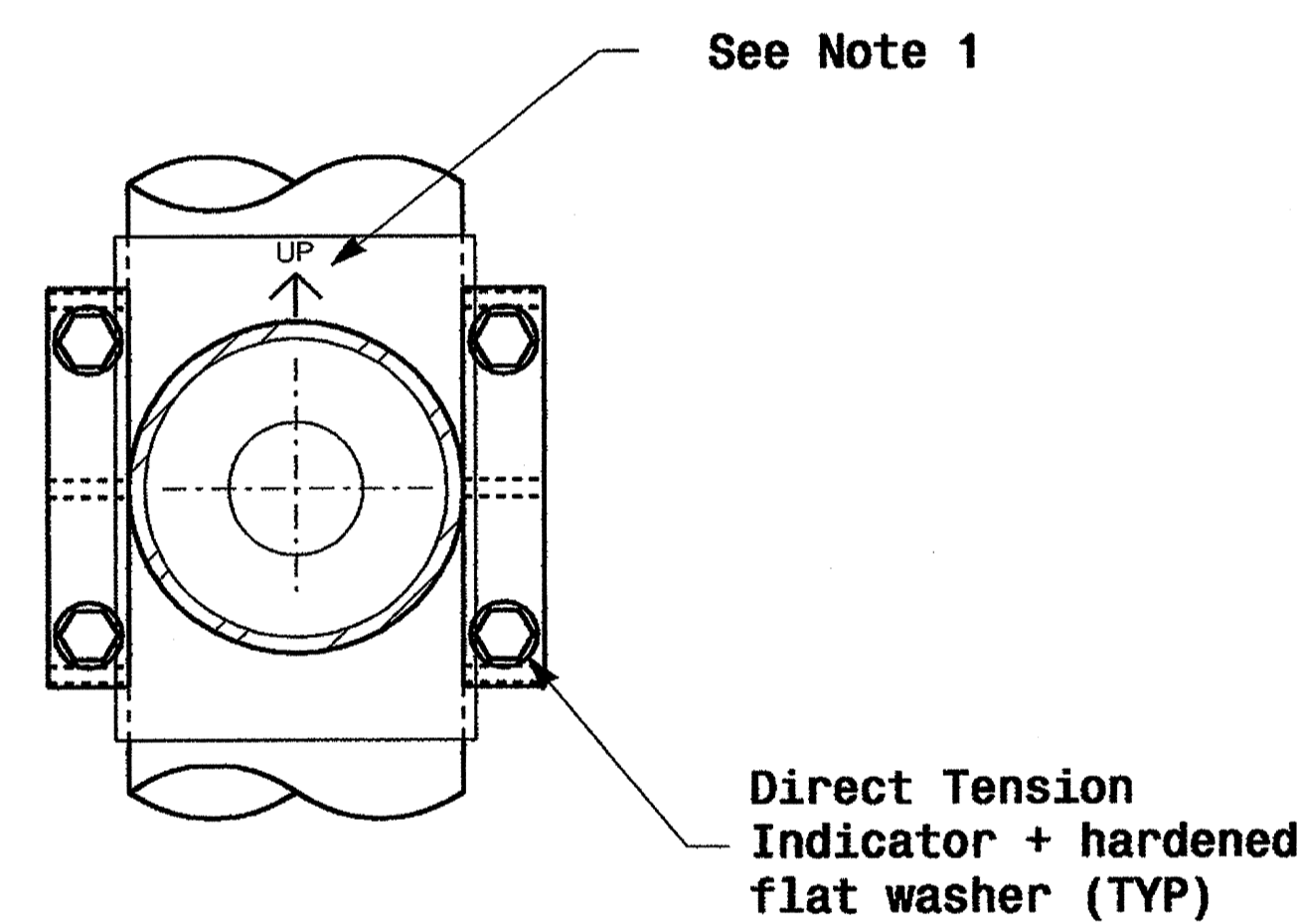
| | | | |
|----------------------------|--|---|--|
| | Typical Fabrication Details For Strain Poles | | |
| | PLAN DATE: May 2005 PREPARED BY: P.L. Alexander | REVIEWED BY: C.F. Andrews REVIEWED BY: A.M. Esposito | |
| SCALE: 0 NA NONE | REVISIONS: _____ INIT.: _____ DATE: _____ | STG. INVENTORY NO. _____ | |

01-SEP-2005 14:07 w:\peop\lss-unit\work\grc\usa2004 metal pole standard\m3.dgn pd Alexander

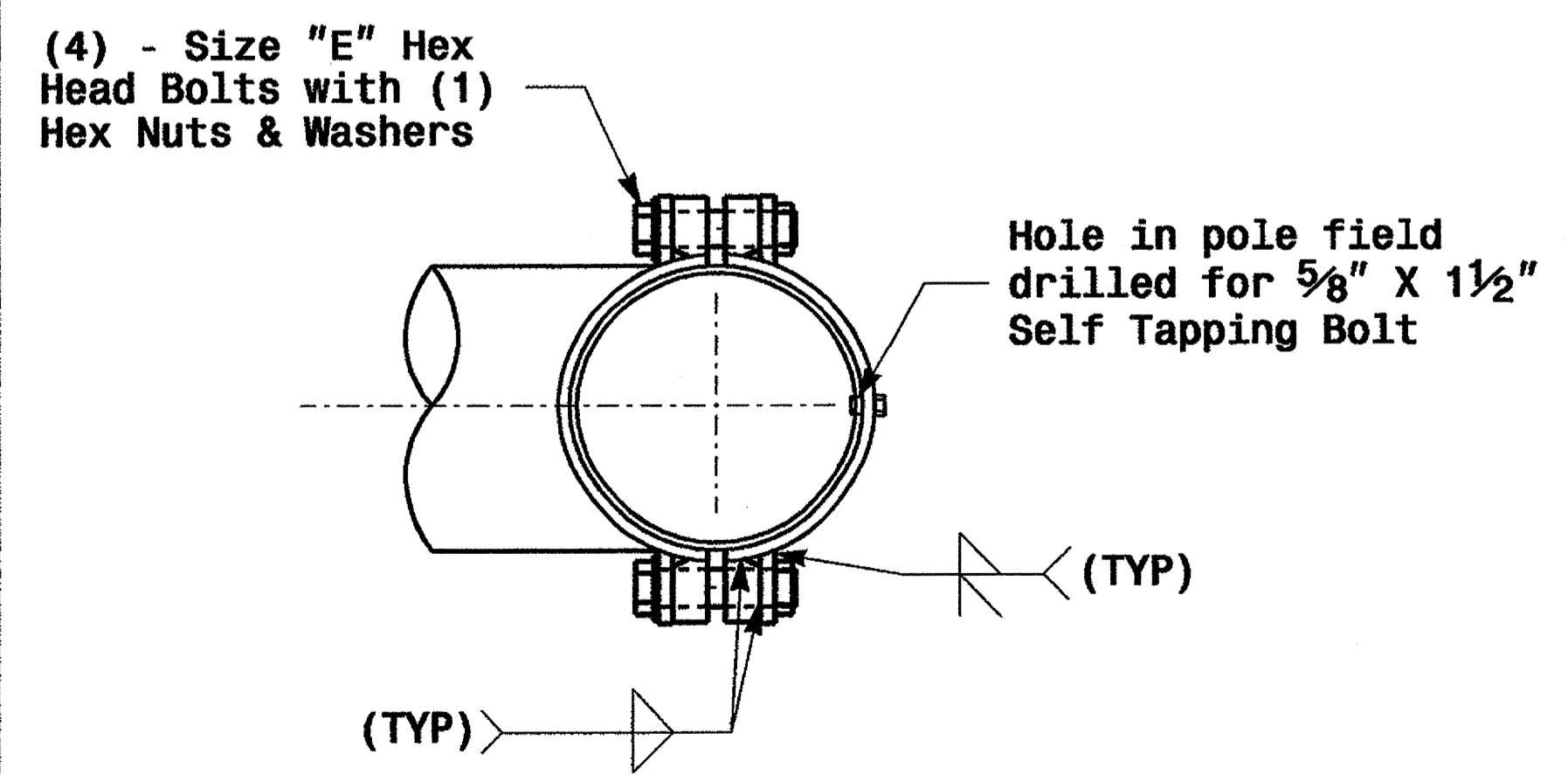
Adjustable Clamp Type Bolted Mast Arm Connection



Side Elevation View

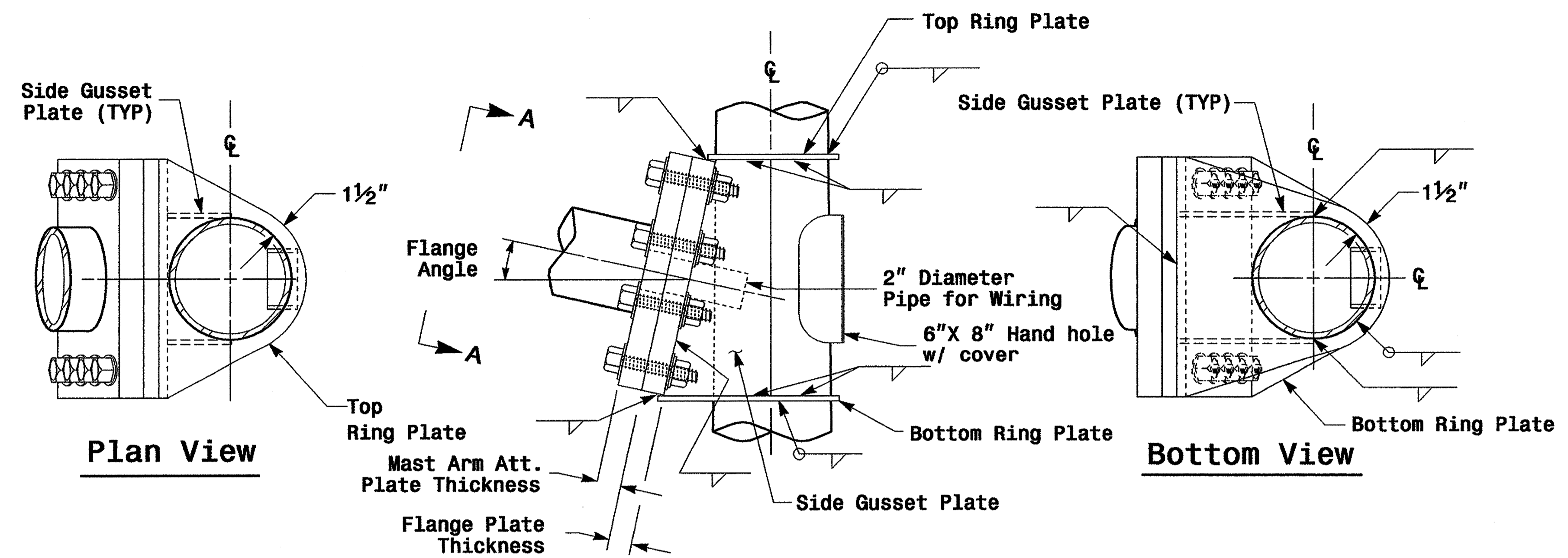


Front Elevation View

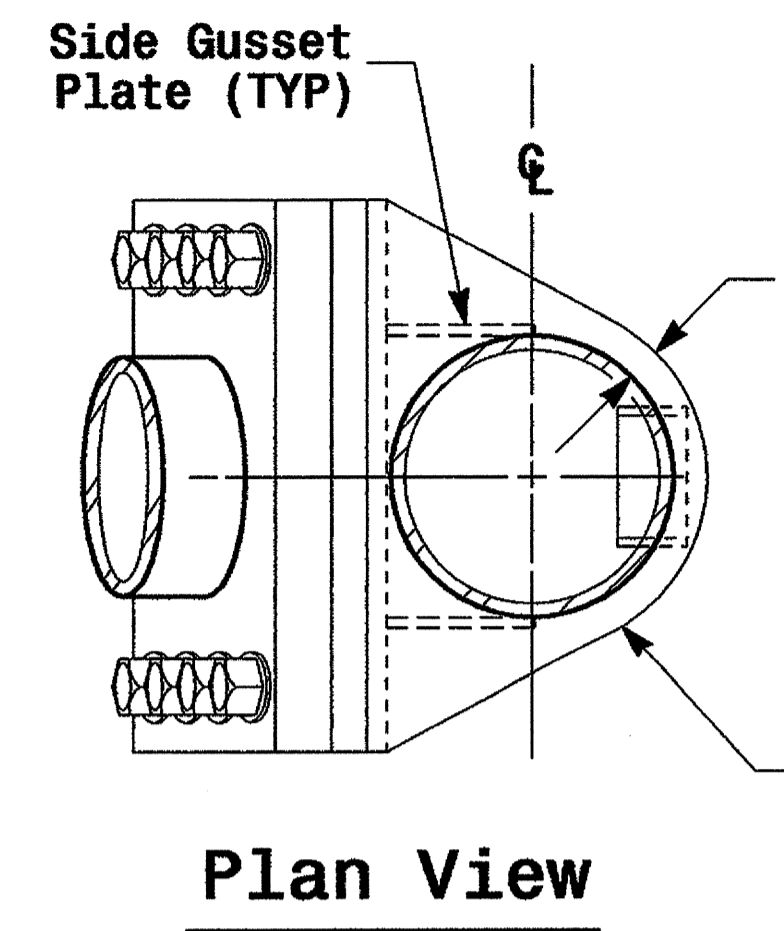


Plan View

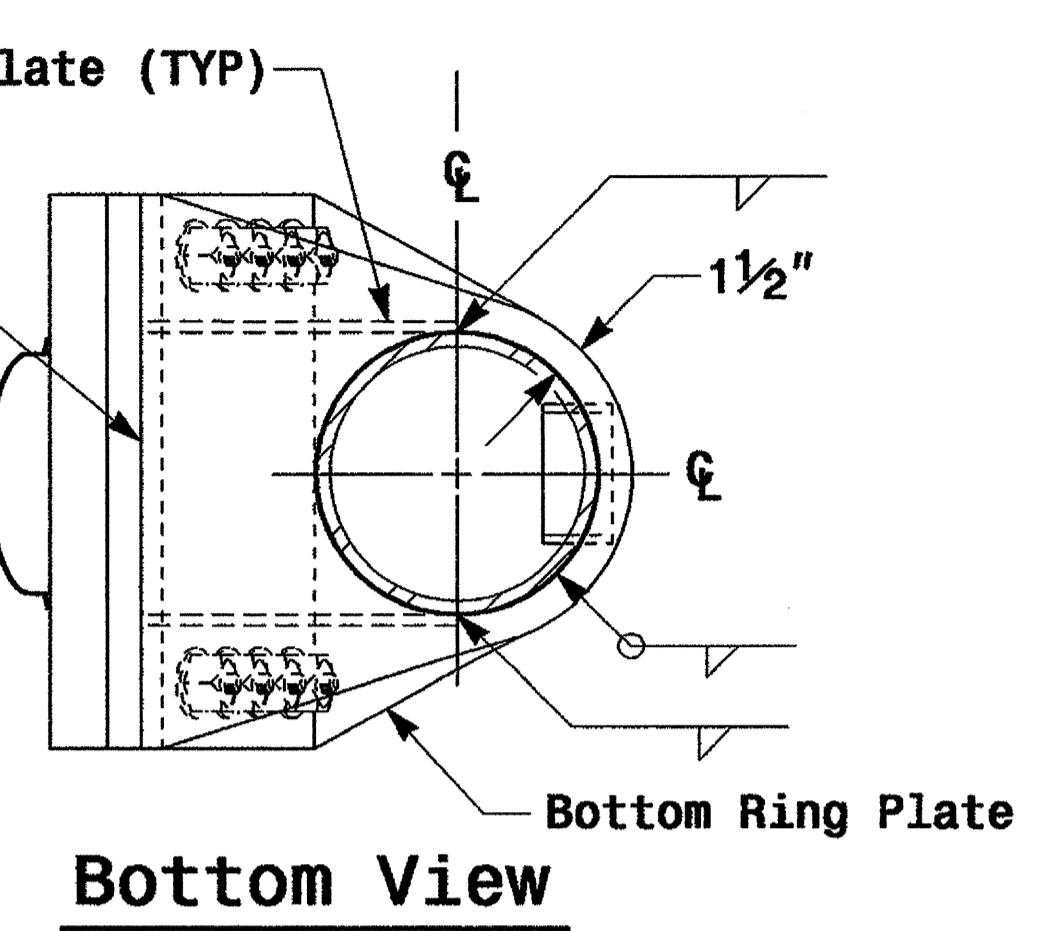
Welded Ring Stiffened Mast Arm Connection



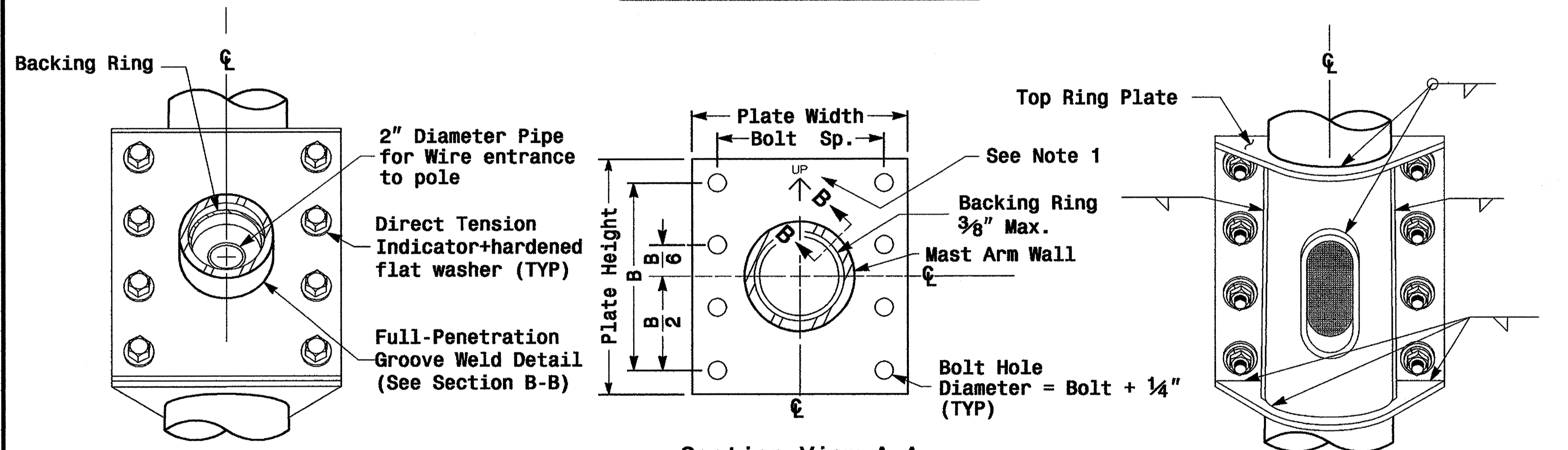
Side Elevation View



Plan View



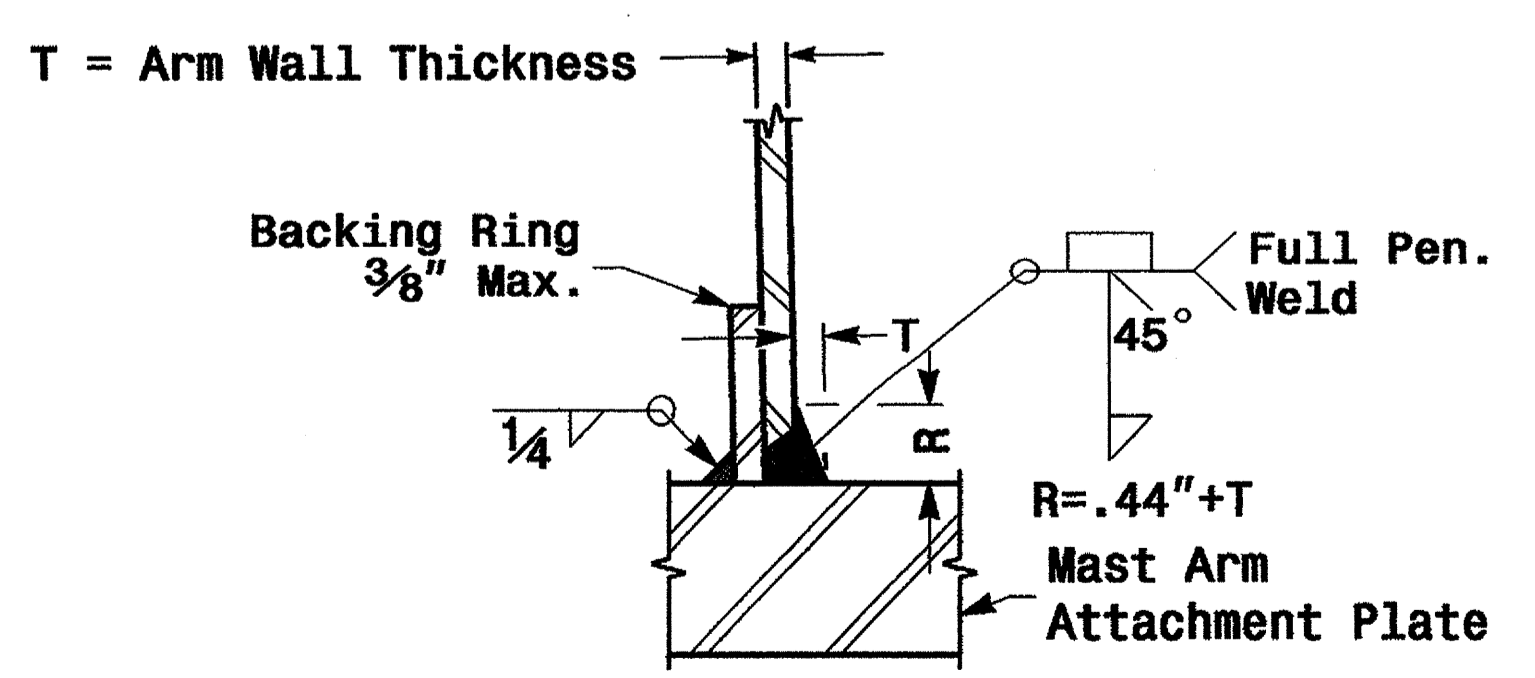
Bottom View



Front Elevation View

Mast Arm Attachment Plate

Back Elevation View

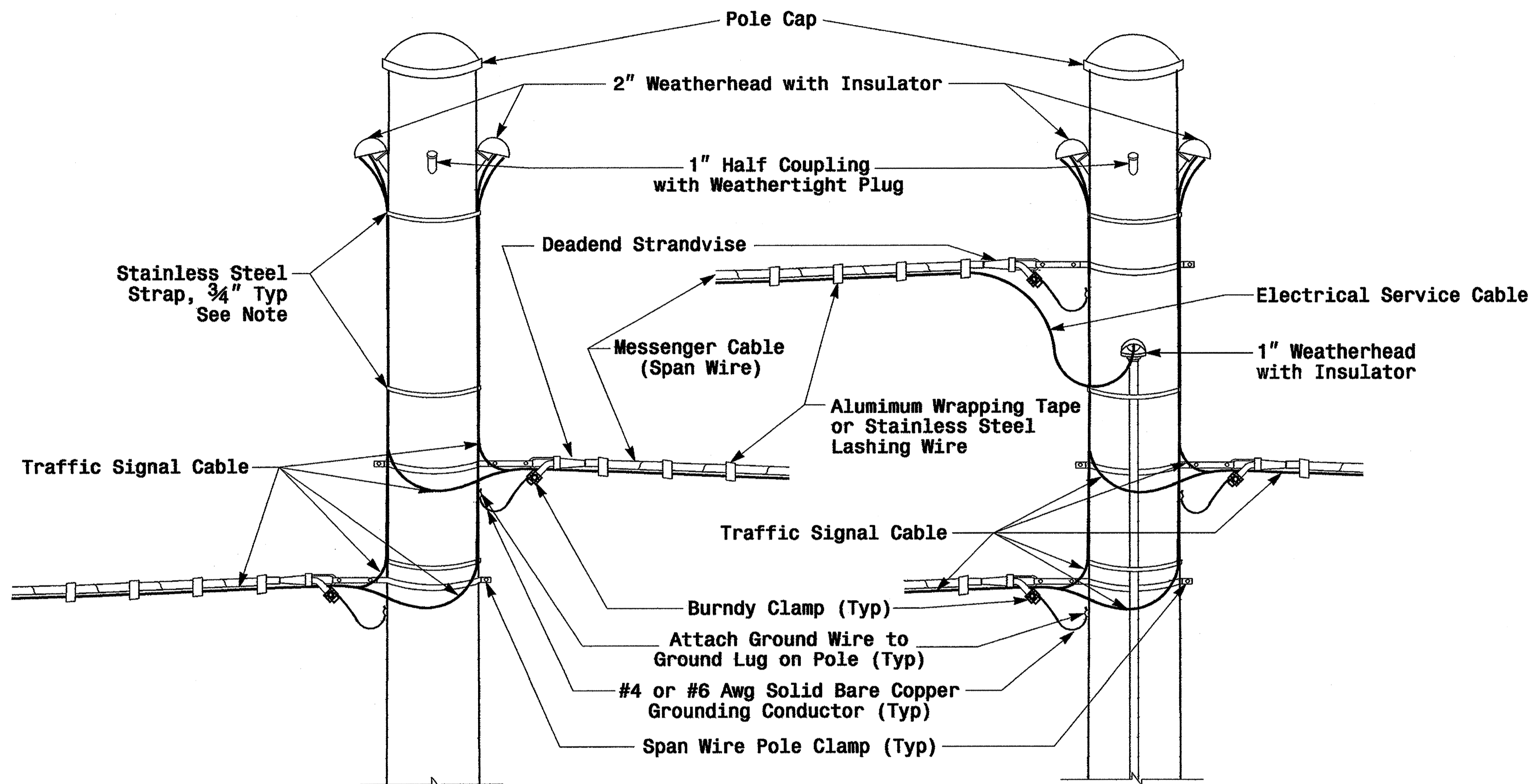


Section B-B Full-Penetration Groove Weld Detail

- 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. Designer is responsible for providing appropriate drainage points.

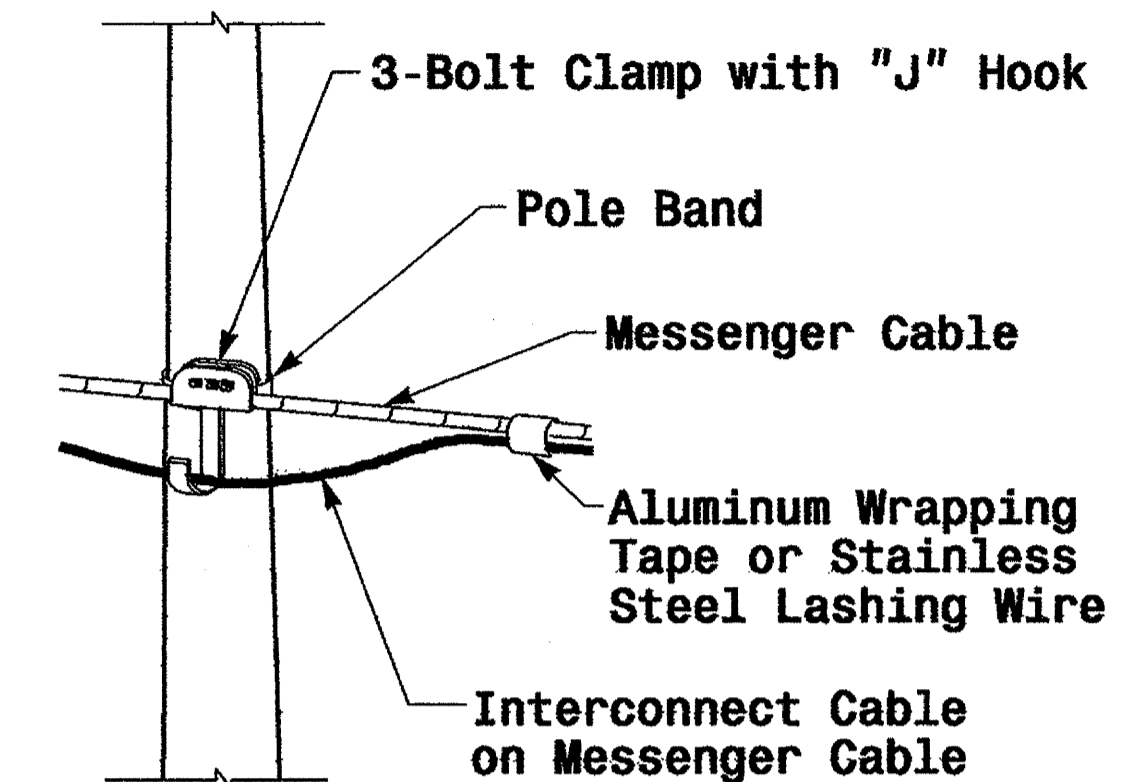
| | | | |
|-----------------------------------|--|---|--|
| | Fabrication Details For Mast Arm Connection To Pole | | |
| | PLAN DATE: May 2005 PREPARED BY: P.L. Alexander | REVIEWED BY: C.F. Andrews REVIEWED BY: A.M. Esposito | |
| REVISIONS: _____ INIT. DATE _____ | | | SIGNATURE: <i>D. Sarkar</i> DATE: 9.2.2005 SIG. INVENTORY NO. |

01-SEP-2005 14:11 c:\n\work\groups\2004 metal pole standard\04_05.dgn

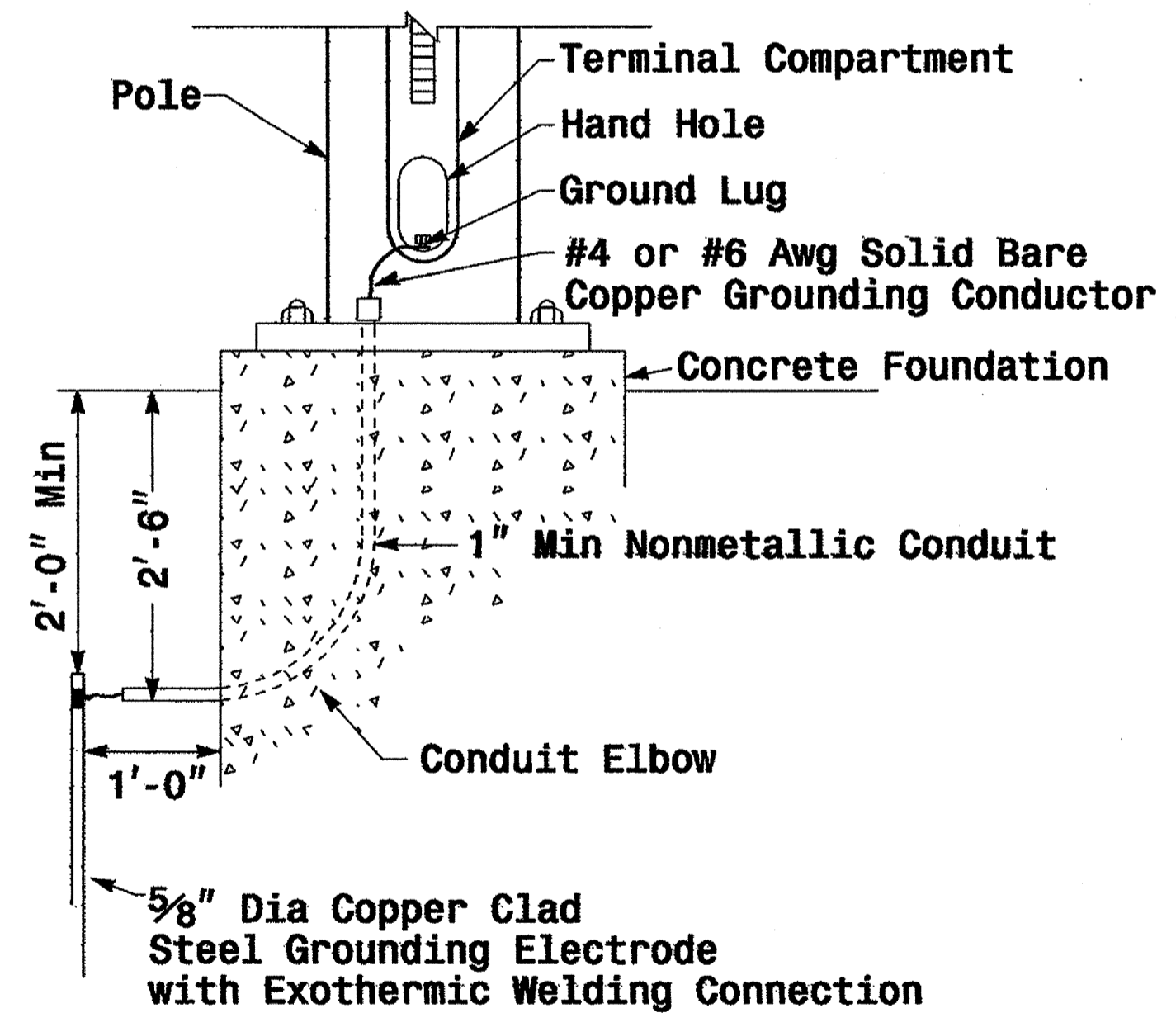


Note: Strap all signal cables to the side of the pole with 3/4" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 36"

Strain Pole Attachments



Attachment of Cable to Intermediate Metal Pole

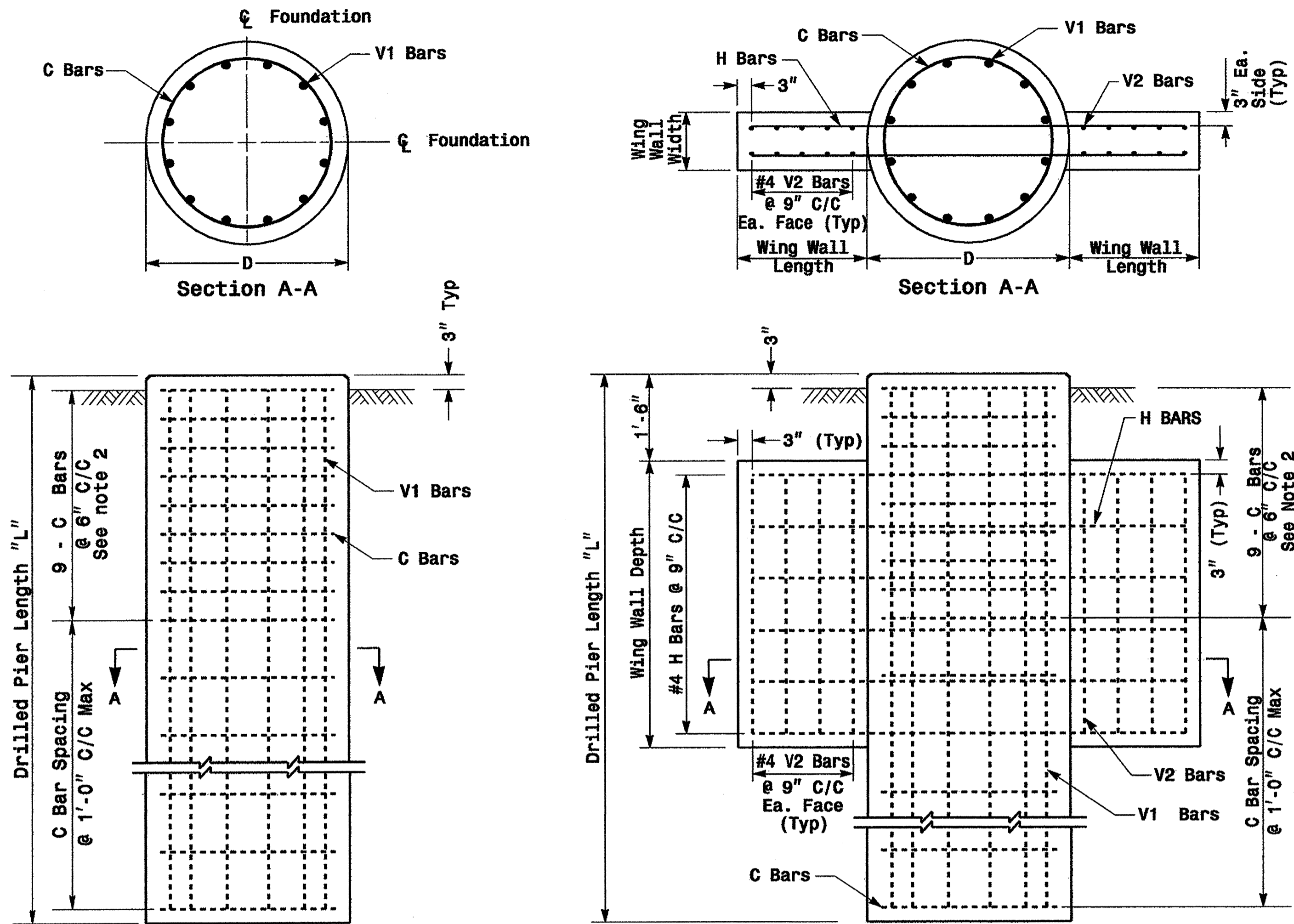


Metal Pole Grounding Detail

01-SEP-2005 16:13 v:\peopl\es-un\1\work\groups\2004\metal pole stender\cs2004.m6.dgn pdl alexander

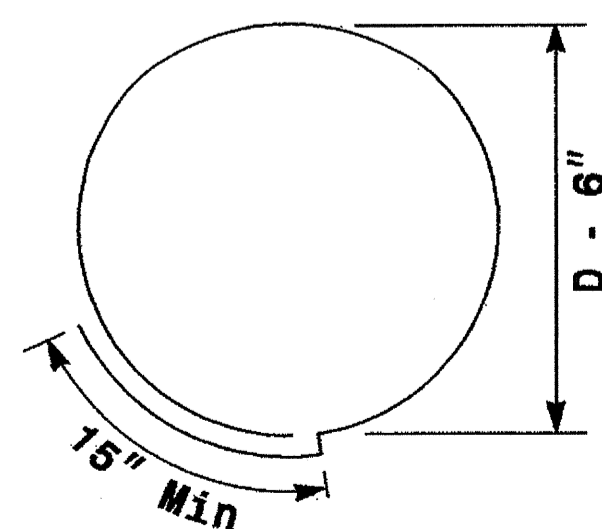
| | | | |
|------------------|--|---|---------------------|
| | Construction Details Strain Poles | | |
| | PLAN DATE: May 2005 PREPARED BY: C.F. ANDREWS | REVIEWED BY: P.L. ALEXANDER REVIEWED BY: D.C. SARKAR | |
| SCALE: 0 NA NONE | REVISIONS: | INT. DATE: | SIG. INVENTORY NO.: |

Reinforcing Steel Bars



| REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER) | | | | | | |
|--|-------------------------|----------|-----|------|------|--------|
| Shaft Dia. (in.) | Conc. Volume (cu. yds.) | Bar Name | No. | Size | Type | Length |
| 42" | .356 x L | V1 | 9 | #8 | STR. | ** |
| | | C | * | #4 | CIR. | 10'-9" |
| 48" | .465 x L | V1 | 12 | #8 | STR. | ** |
| | | C | * | #4 | CIR. | 12'-6" |

* See Note No. 1
 ** See Note No. 3



Typical "C" Bars

| REINFORCING STEEL TABLE FOR STANDARD 42" and 48" DRILL PIER SHAFT WITH TYPE 1 AND TYPE 2 WING WALLS | | | | | | |
|---|-----------------------------|-------------------|-----|------|------|--------|
| Wing Wall Type | Drill Pier Shaft Dia. (in.) | Reinforcing Steel | | | | |
| | | Bar Name | No. | Size | Type | Length |
| TYPE 1 | 42" | V1 | 9 | #8 | STR. | ** |
| | | V2 | 12 | #4 | STR. | 2'-6" |
| | | H | 8 | #4 | STR. | 6'-0" |
| | | C | * | #4 | CIR. | 10'-9" |
| TYPE 2 | 42" | V1 | 9 | #8 | STR. | ** |
| | | V2 | 16 | #4 | STR. | 4'-6" |
| | | H | 12 | #4 | STR. | 9'-0" |
| TYPE 2 | 48" | V1 | 12 | #8 | STR. | ** |
| | | V2 | 16 | #4 | STR. | 4'-6" |
| | | H | 12 | #4 | STR. | 9'-6" |
| | | C | * | #4 | CIR. | 12'-6" |

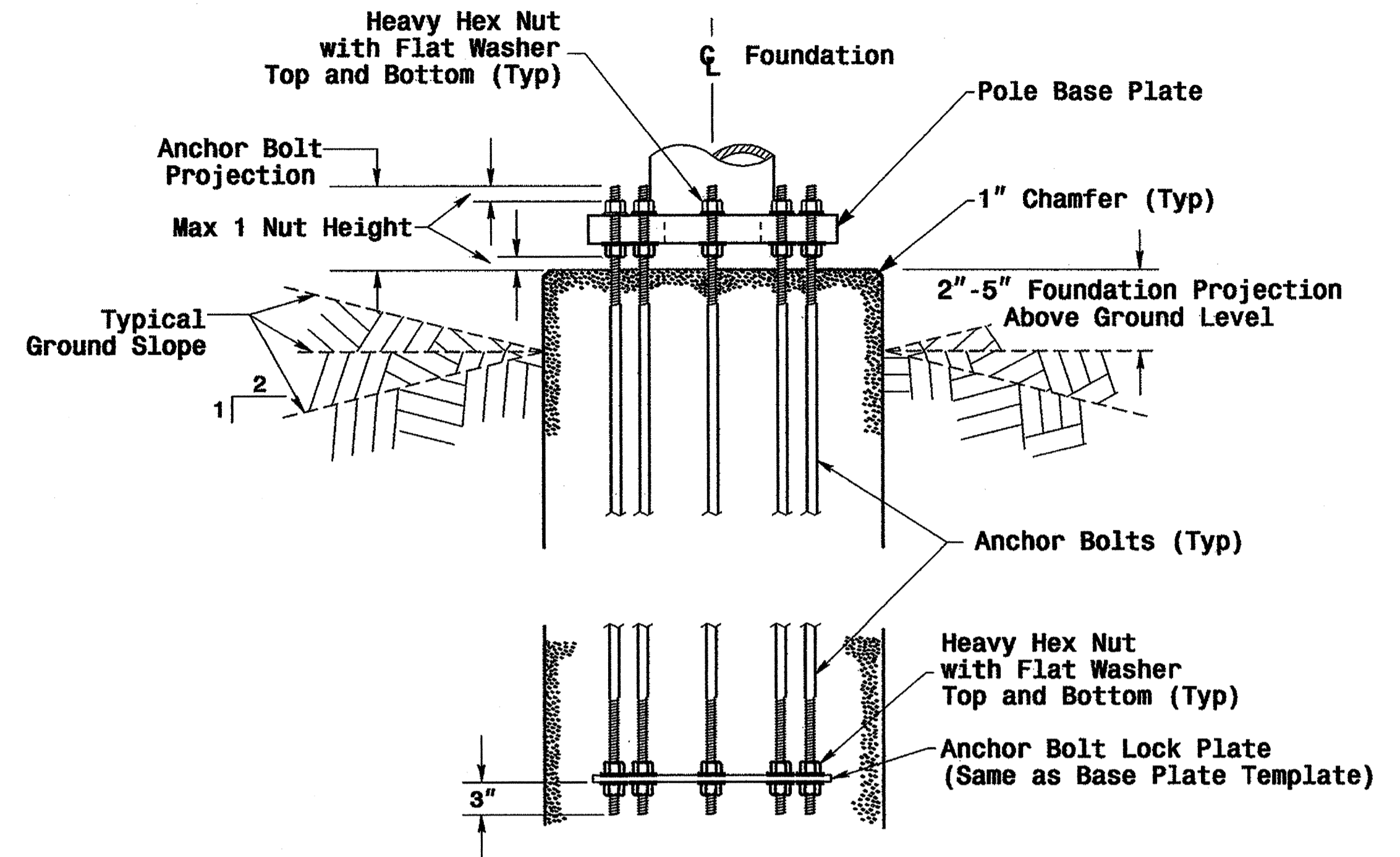
* See Note No. 1
 ** See Note No. 3

| WING WALL DETAILS | | | | |
|-------------------|------------------------|-----------------------|-----------------------|----------------------------|
| Wing Wall Type | Wing Wall Length (Ft.) | Wing Wall Width (Ft.) | Wing Wall Depth (Ft.) | Concrete Volume (Cu. Yds.) |
| TYPE 1 | 1'-6" | 1'-0" | 3'-0" | .4 |
| TYPE 2 | 3'-0" | 1'-0" | 5'-0" | 1.2 |

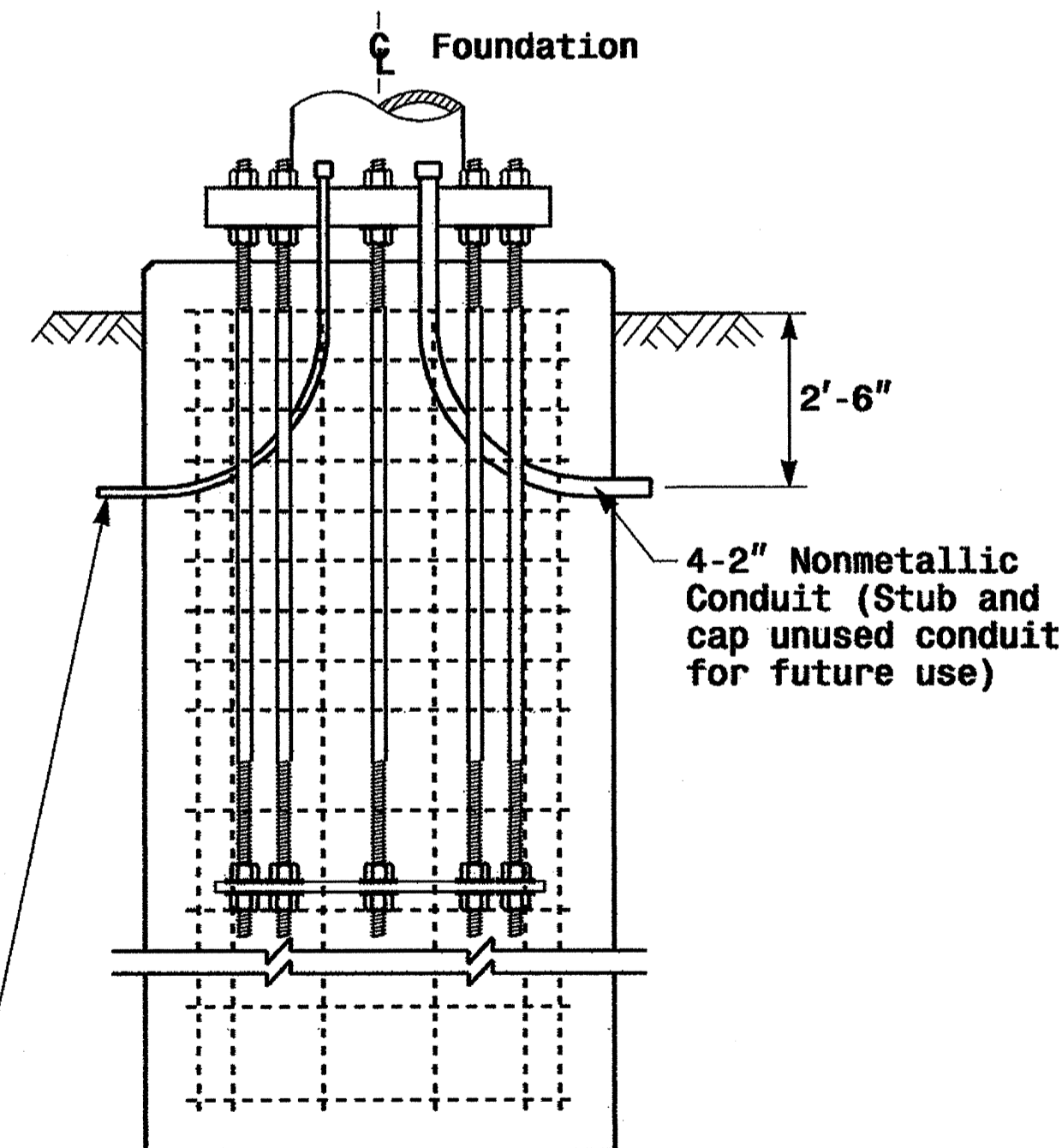
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

- The number of C-bars is based on foundation depth. For standard foundations, see sheet M 8.
- 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.
- The length of V1-bars is based on foundation depth. For standard foundations, see sheet M 8.
- The quantities for steel and concrete shown in the Wing Wall Details Chart reflect the amount of material for 1 pair of wing walls (2 wing walls per drilled pier shaft.)

PROJECT REFERENCE NO. I-5501
 SHEET NO. Sig.43 M 7

Construction Details - Foundations

| | | | |
|--|--|---|--|
| | Construction Details Foundations | | |
| | PLAN DATE: May 2005 PREPARED BY: C.F. ANDREWS SCALE: 0 NA NONE | REVIEWED BY: P.L. ALEXANDER REVIEWED BY: A.M. ESPOSITO | |

| | | STANDARD STRAIN POLES | | | | STANDARD FOUNDATIONS 42" Diameter Drilled Pier Length (L) - Feet | | | | | | |
|-------------|-------------|-----------------------|-------------------|---------------------|---------------------------------|---|--------------------|--------------------------|------------------|--------------------|----------------------|-------------------|
| | | Case No. | Pole Height (Ft.) | Base Plate BC (In.) | Moment at the Pole Base (ft-kp) | Clay | | | | Sand | | |
| | | | | | | 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 |
| WIND ZONE 1 | LIGHT | S26L3 | 26 | 25 | 280 | 20.5 | 14.0 | 11.5 | 9.5 | 18.0 | 16.0 | 14.0 |
| | | S30L3 | 30 | 25 | 310 | 21.0 | 14.5 | 11.5 | 9.5 | 18.5 | 16.5 | 14.5 |
| | | S35L3 | 35 | 25 | 350 | 22.5 | 15.0 | 12.0 | 10.0 | 19.5 | 17.5 | 15.5 |
| | HEAVY | S30H3 | 30 | 29 | 450 | 25.5 | 16.5 | 13.0 | 11.0 | 21.0 | 18.5 | 16.5 |
| | | S35H3 | 35 | 29 | 540 | 26.0 | 17.0 | 13.5 | 11.5 | 22.0 | 19.5 | 17.0 |
| | WIND ZONE 2 | LIGHT | S26L2 | 26 | 23 | 250 | 19.5 | 13.5 | 11.0 | 9.0 | 18.0 | 15.5 |
| S30L2 | | | 30 | 23 | 290 | 20.0 | 14.0 | 11.5 | 9.5 | 18.5 | 16.0 | 14.0 |
| S35L2 | | | 35 | 23 | 315 | 21.0 | 14.5 | 11.5 | 9.5 | 19.0 | 16.5 | 14.5 |
| HEAVY | | S30H2 | 30 | 29 | 415 | 24.5 | 16.0 | 13.0 | 10.5 | 21.0 | 18.5 | 16.0 |
| | | S35H2 | 35 | 29 | 485 | 25.5 | 16.5 | 13.5 | 11.0 | 21.5 | 19.0 | 16.5 |
| WIND ZONE 3 | | LIGHT | S26L2 | 26 | 23 | 250 | 18.5 | 13.0 | 10.5 | 9.0 | 17.5 | 15.0 |
| | S30L2 | | 30 | 23 | 290 | 19.5 | 13.5 | 11.0 | 9.0 | 18.0 | 15.5 | 14.0 |
| | S35L2 | | 35 | 23 | 315 | 20.0 | 14.0 | 11.5 | 9.5 | 18.5 | 16.0 | 14.5 |
| | HEAVY | S30H2 | 30 | 29 | 415 | 23.0 | 15.5 | 12.5 | 10.0 | 20.5 | 17.5 | 16.0 |
| | | S35H2 | 35 | 29 | 485 | 24.0 | 16.0 | 13.0 | 10.5 | 21.0 | 18.0 | 16.5 |
| | WIND ZONE 4 | LIGHT | S26L1 | 26 | 22 | 195 | 18.0 | 13.0 | 10.5 | 9.0 | 16.5 | 14.5 |
| S30L1 | | | 30 | 22 | 225 | 18.5 | 13.0 | 10.5 | 9.0 | 17.0 | 15.0 | 13.5 |
| S35L1 | | | 35 | 22 | 255 | 19.0 | 13.5 | 11.0 | 9.0 | 17.5 | 15.5 | 14.0 |
| HEAVY | | S30H1 | 30 | 25 | 330 | 22.0 | 15.0 | 12.0 | 9.5 | 19.5 | 17.0 | 15.0 |
| | | S35H1 | 35 | 25 | 385 | 23.0 | 15.5 | 12.5 | 10.0 | 20.0 | 17.5 | 15.5 |
| WIND ZONE 5 | | LIGHT | S26L2 | 26 | 23 | 250 | 19.0 | 13.5 | 10.5 | 9.0 | 17.5 | 15.5 |
| | S30L2 | | 30 | 23 | 290 | 20.0 | 14.0 | 11.0 | 9.5 | 18.0 | 16.0 | 14.0 |
| | S35L2 | | 35 | 23 | 315 | 21.0 | 14.5 | 11.5 | 10.0 | 19.0 | 16.5 | 14.5 |
| | HEAVY | S30H2 | 30 | 29 | 415 | 23.5 | 15.5 | 12.5 | 10.5 | 21.0 | 18.0 | 16.0 |
| | | S35H2 | 35 | 29 | 485 | 25.0 | 16.5 | 13.0 | 11.0 | 21.5 | 18.5 | 16.5 |

Concrete Volume (cubic yards) = .356 X L

Fabrication Design Notes:

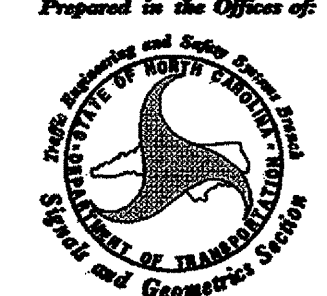
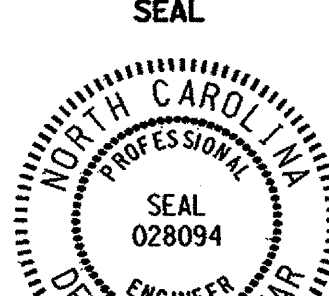
1. Values shown in "Moment at the Pole Base" column represents the minimum acceptable capacity allowable for design using a design CSR of 1.
2. Base plate thickness (T) is 2.0 inches.

Foundation Selection:

1. Perform a standard penetration test at each proposed foundation site to determine "N" value.
2. Select the appropriate wind zone from sheet M 1.
3. Select the soil type (Clay or Sand) that best describes the soil characteristics.
4. Get the appropriate pole case load number from the plans or from the Engineer.
5. Select the appropriate column in the chart based on soil type and "N" value. Select the appropriate row based on the pole load case. The foundation depth is the value where the column and the row intersect.

Standard Strain Poles

02-SEP-2005 12:42 v:\p001\ee-un1\work\p001\std strain pole.dgn

| | | | |
|---|--|---|---|
|  | Standard Strain Poles and Standard Foundations | |  |
| | PLAN DATE: May 2005 PREPARED BY: P.L. Alexander SCALE: 0 NA None | REVIEWED BY: C.F. Andrews REVIEWED BY: A.W. Esposito REVISIONS: | |