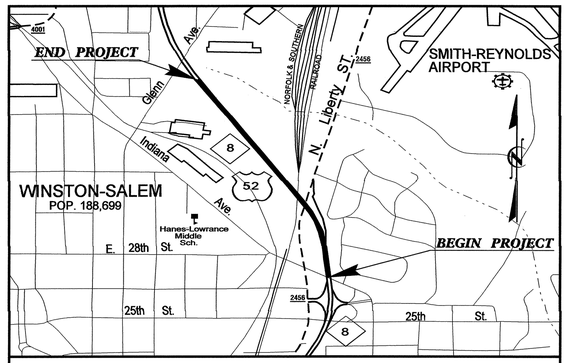
Project No.	Sheet No.
U–2826A	Sig. 1

Project: U–2826A

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

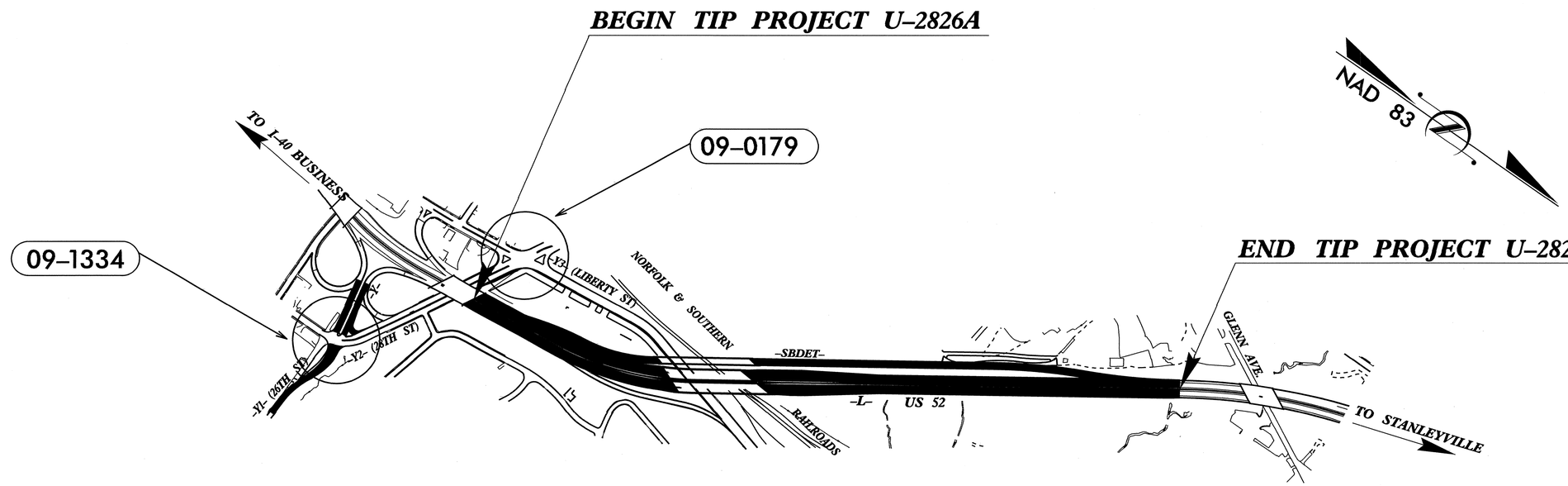
Forsyth County



VICINITY MAP

LOCATION: *US 52 over the Norfolk Southern Railroad in Winston–Salem*

TYPE OF WORK: *Traffic Signals & Communications Cable Routing Details*



Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.

Index of Plans

Sheet #	Reference #	Location/Description
Sig. 1	--------	Title Sheet
Sig. 2–4	09–1334	Cleveland Avenue/28th Street at US 52/NC 8 NB Ramp & 26th Street
Sig. 5–8	09–0179	SR 2456 (Liberty Street) at 28th Street
Sig. 9–11	N/A	Inductive Detection Loops Details
Sig. 12–13	N/A	Communications Cable and Conduit Routing Plans

INTELLIGENT TRANSPORTATION SYSTEMS AND SIGNALS UNIT

Contacts:

Robert J. Ziemba, P.E. – Central Region Signals Project Engineer
John T. Rowe, Jr., P.E. – Signal Equipment Design Engineer
I. Neil Avery – Signal Communications Project Engineer

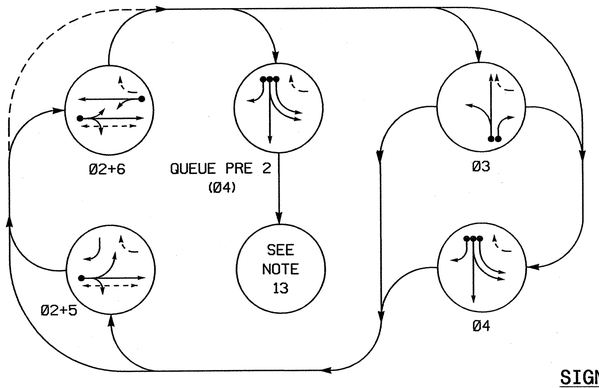
Prepared In the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION

Intelligent Transportation Systems & Signals Unit
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway, Garner, NC 27529

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

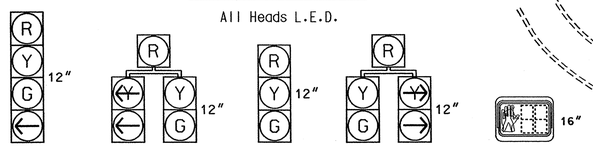
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3	Ø4	QUEUE PRE 2	FLASH
21	G	G	R	R	R	Y
22	G	G	R	R	R	Y
31	R	R	G	R	R	R
32	R	R	G	R	R	R
41	R	R	R	G	G	R
42	R	R	R	G	G	R
61, 62	R	G	R	R	R	Y
P21, P22	W	W	DW	DW	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



QUEUE PREEMPTION 2

FUNCTION	SECONDS
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	7
MIN. GREEN BEFORE PREEMPT	1
YELLOW CLEAR BEFORE PREEMPT	0.0*
RED CLEAR BEFORE PREEMPT	0.0*
PREEMPT DWELL MIN. GREEN	40
YELLOW CLR AFTER PREEMPT	0.0*
RED CLEAR AFTER PREEMPT	0.0*
PED CLEAR THRU YELLOW	Y

* Time defaults to time used for phase during normal operation.

TIMING CHART
NEMA CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6
MINIMUM GREEN*	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.
PASSAGE/GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	30 SEC.	15 SEC.	30 SEC.	20 SEC.	30 SEC.
RED CLEARANCE	3.1 SEC.	3.0 SEC.	4.3 SEC.	3.0 SEC.	3.3 SEC.
MAX. 1*	2.7 SEC.	2.6 SEC.	1.4 SEC.	2.8 SEC.	2.4 SEC.
RECALL POSITION	SOFT RECALL	NONE	NONE	NONE	SOFT RECALL
VEHI. CALL MEMORY	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK
WALK*	4 SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	14 SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A	6X6	70	4	X		2	X		——	——	NO
3A	6X40	0	2-4-2	X		3	X		——	——	NO
3B	6X40	0	2-4-2	X		3	X		DELAY	15	YES
4A	6X40	0	2-4-2	X		4	X		——	——	NO
4B	6X40	0	2-4-2	X		4	X		——	——	NO
4C	6X40	0	2-4-2	X		4	X		DELAY	15	YES
5A	6X15	50	3	X		5	X		DELAY	15	YES
6A	6X6	70	4	X		6	X		——	——	NO
Q1	6X15	400	4	X		PRE	X		DELAY	5	NO

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole With Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
N/A	Wheelchair Ramp	
DD	Directional Drill	N/A
A	"YIELD" Sign (R1-2)	A
B	Keep Right Sign (R4-7)	B
C	Left Arrow "ONLY" Sign (R3-5L)	C
D	Combined Through and Left Arrow Sign (R3-6L)	D

New Installation

4 Phase
Fully Actuated
w/ Queue Preemption
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 5 during phase 6 on.
4. Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4 (see Electrical Details).
5. Program phase 2 and phase 6 for dual entry.
6. The order of phase 3 and phase 4 may be reversed.
7. Set all detector units to presence mode.
8. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
9. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Loop Q1 serves as a queue backup detector. After 5 seconds of constant actuation, the detector unit places a call to the controller to preempt normal operation to clear out the storage lanes.
12. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
13. Upon completion of Queue Preemption, the controller resumes normal operation based on vehicle demand.

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

Cleveland Ave./28th Street at US 52/NC 8 NB Ramp & 26th St.

Division 9 | Forsyth County | Winston-Salem
PLAN DATE: January 2009 | REVIEWED BY: T. S. Thigpen
PREPARED BY: O. G. Williams | REVIEWED BY:

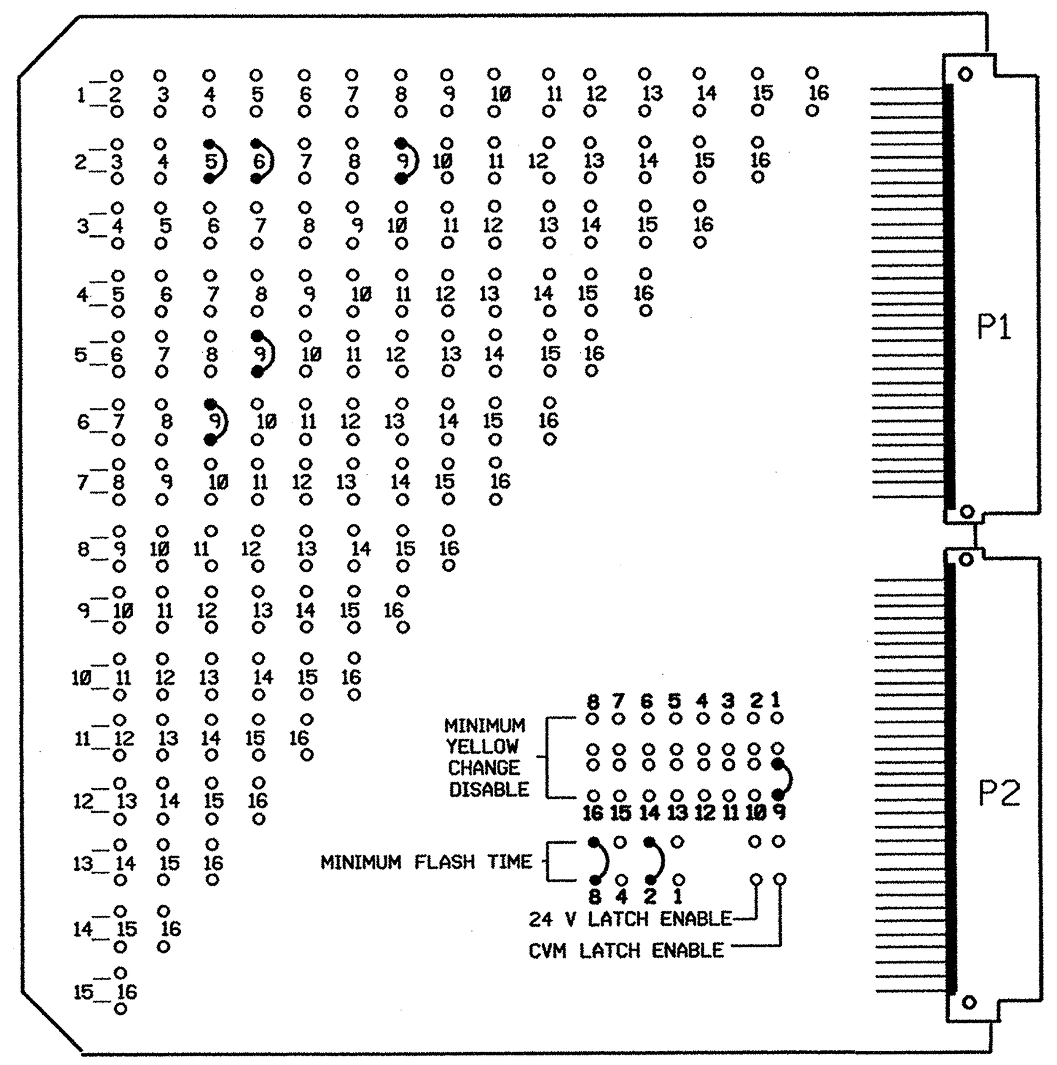
SCALE 1"=50' (0 — 50)

REVISIONS	INIT.	DATE

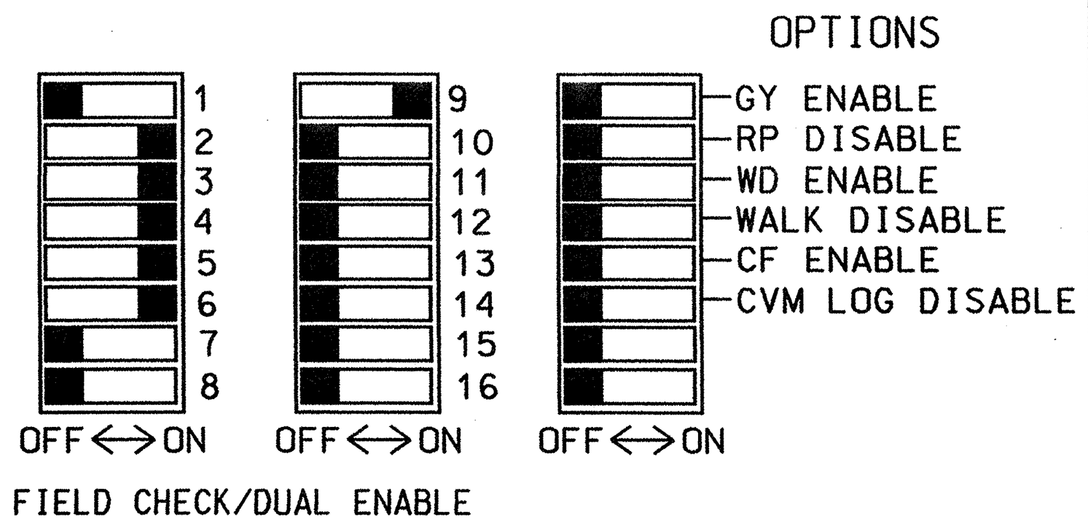
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIELBA
SIGNATURE | DATE
SIG. INVENTORY NO. 09-1334

EDI MODEL MMU-16E MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD



■ = DENOTES POSITION OF SWITCH

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1, 7, 8, 10, 11, & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. ! ---> PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. ! ---> SET CONTROLLER RECALL POSITION, ON PHASES 2 AND 6, FOR 'SOFT RECALL'.
8. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
9. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
10. THIS CONTROLLER AND CABINET ARE A PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	3	4	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	31	32	41	42	21,42	61,62	NU	NU	P21, P22	NU	NU	NU
RED		2R	3R	3R	4R	4R	*	6R						
YELLOW		2Y	3Y	3Y	4Y	4Y		6Y						
GREEN		2G	3G	3G	4G	4G		6G						
RED ARROW														
YELLOW ARROW							5Y							
GREEN ARROW			3G		4G		5G							
(DON'T WALK)											9R			
(WALK)											9G			
											**			

NU = NOT USED

*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS SHEET.

**SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' ON SHEET 2.

DETECTOR RACK SET-UP DETAIL

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

BIU										
BIU	CH1 L3 ø3	CH1 L1 ø2	CH1 L7 ø5	CH1 L5 ø4	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø3	CH2 L8 ø6	CH2 L6 ø4							

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

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A, L1B
3A	L2A, L2B
3B	L3A, L3B
4A	L4A, L4B
4B	L5A, L5B
4C	L6A, L6B
5A	L7A, L7B
6A	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

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

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

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME (SEC)
1	ø2	—	—
2	ø3	—	—
3	ø3	DELAY	15
4	ø4	—	—
5	ø4	—	—
6	ø4	DELAY	15
7	ø5	DELAY	15
8	ø6	—	—
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

EQUIPMENT INFORMATION

CONTROLLER.............CONTRACTOR SUPPLIED
CABINET ....CONTRACTOR SUPPLIED TS2-1
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......12
LOAD SWITCHES USED......2, 3, 4, 5, 6, 9
PHASES USED............2, 3, 4, 5, 6, 2PED
OL/A...................NOT USED
OL/B...................NOT USED
OL/C...................NOT USED
OL/D...................NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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

PH.5 RED FIELD TERMINAL (5R)

AC-

NOTE: THE PURPOSE OF THIS RESISTOR IS TO LOAD THE CHANNEL RED MONITOR INPUT IN ORDER FOR THE MALFUNCTION MANAGEMENT UNIT TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THIS CHANNEL, WHICH DOES NOT USE THE RED DISPLAY IN THE FIELD.

BACK-UP PROTECTION NOTES

1. PROGRAM CONTROLLER TO OMIT PHASE 5 DURING PHASE 6 ON.
2. WHEN TRAFFIC CONDITIONS REQUIRE THE CONTROLLER TO CLEAR FROM PHASE 2+6 TO PHASE 2+5, THE CONTROLLER WILL BE FORCED TO CYCLE THROUGH PHASE 4.
3. BACK-UP PROTECTION FEATURES DESCRIBED IN NOTES 1 AND 2 MUST BE IMPLEMENTED IN THE CONTROLLER SOFTWARE.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-1334
DESIGNED: JANUARY 2009
SEALED: 4/8/09
REVISED: N/A

SEE SHEET 2 FOR QUEUE PREEMPTION WIRING AND PROGRAMMING DETAILS AND PEDESTRIAN PUSH-BUTTON WIRING DETAIL

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Cleveland Ave./28th Street
at
US 52/NC 8 NB Ramp & 26th St.

Division 09 — Forsyth County — Winston-Salem

PLAN DATE: April 2009 — REVIEWED BY: JTR
PREPARED BY: F.E. Russ — REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR
SIGNATURE: John T. Rowe Jr. DATE: 4-22-09

SIG. INVENTORY NO. 09-1334

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 4

QUEUE PREEMPTION 2 CONTROLLER PROGRAMMING DETAIL

(program controller as shown below)

PREEMPTOR SUBMENU

1. PRIORITY PMT 1
2. PRIORITY PMT 2
3. PRIORITY PMT 3
4. PRIORITY PMT 4
5. PRIORITY PMT 5
6. PRIORITY PMT 6
7. BUS PREEMPTORS

PRIORITY PREEMPTOR 2

PHASE.....	1	2	3	4	5	6	7	8	9	10	11	12
TERM PHASE OVLP	.	.	.	.	.	.	.	.	.	.	.	.
TRK CLR PHASE..	.	.	.	.	.	.	.	.	.	.	.	.
HOLD PHASES....	.	.	.	X	.	.	.	.	.	.	.	.
EXIT PHASES....	.	.	.	.	.	.	.	.	.	.	.	.
EXIT CALLS.....	.	.	.	.	.	.	.	.	.	.	.	.

TERM OVERLAP... A: . B: . C: . D: .

ACTIVE.....YES	PED DARK.....	NO
PRIORITY..... NO	PED ACTIVE.....	NO
DET LOCK..... NO	ZERO PC TIME...	NO
HOLD FLASH..... NO	PC THRU YELLOW.	YES
TERM OVLP ASAP. NO	TERM PHASES....	NO

ADDITIONAL PAGE(S)

PRIORITY PREEMPTOR 2

DON'T OVERRIDE FLASH.....	.
FLASH ALL OUTPUTS.....	.
YELLOW-RED GOES GREEN....	.
ENABLE MAX PREEMPT TIME..	.
ACTIVE ONLY DURING HOLD..	.
NO CVM IN FLASH.....	.
FAST FLASH GRN ON HOLD...	.
OUT OF FLASH.....	GREEN

ADDITIONAL PAGE(S)

PRIORITY PREEMPTOR 2

MAX TIME.....	0	DURATION TIME..	0
MIN HOLD TIME.	40	DELAY TIME.....	0
MIN PED CLEAR.	7	INHIBIT TIME...	0
EXIT MAX.....	0	HLD DELAY TIME.	0

	GRN	YEL	RED
MINIMUM.....	1	0.0*	0.0*
TRACK CLEAR...	0	0.0	0.0
HOLD.....		0.0*	0.0*

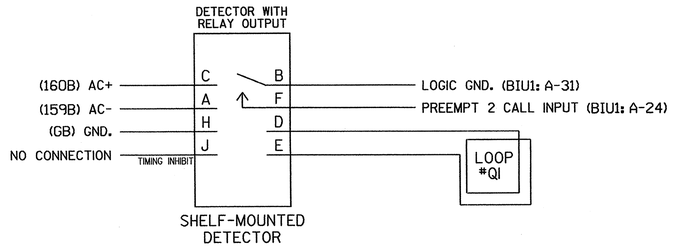
LINKED PREEMPTOR.....0

END OF SUBMENU

*TIME DEFAULTS TO TIME USED FOR PHASES DURING NORMAL OPERATION

QUEUE PREEMPTION 2 WIRING DETAIL

(wire as shown below)

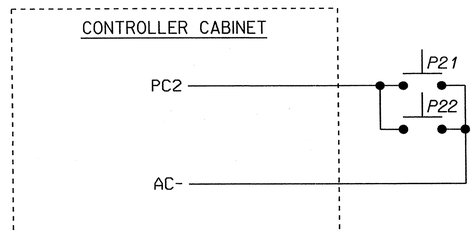


NOTES:

1. SET DETECTOR DELAY TIME FOR 5.0 SECONDS.
2. SET DETECTOR TO 'PRESENCE' MODE.

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



PC = PED CALL

NOTE: 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: 09-1334
DESIGNED: JANUARY 2009
SEALED: 4/8/09
REVISED: N/A

NEMA Controller/TS-2 Type 1 Cabinet — Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

Cleveland Ave./28th Street at US 52/NC 8 NB Ramp & 26th St.

Division 09 | Forsyth County | Winston-Salem

PLAN DATE: April 2009 | REVIEWED BY: JP

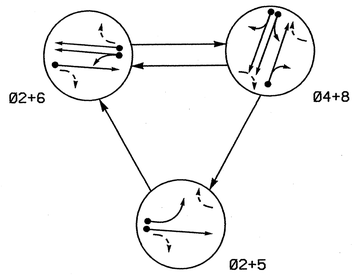
PREPARED BY: F.E. Russ | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 4-22-09 DATE
SIG. INVENTORY NO. 09-1334

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 5

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

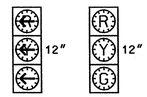
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

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

SIGNAL FACE I.D.

Denotes L.E.D.



51

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

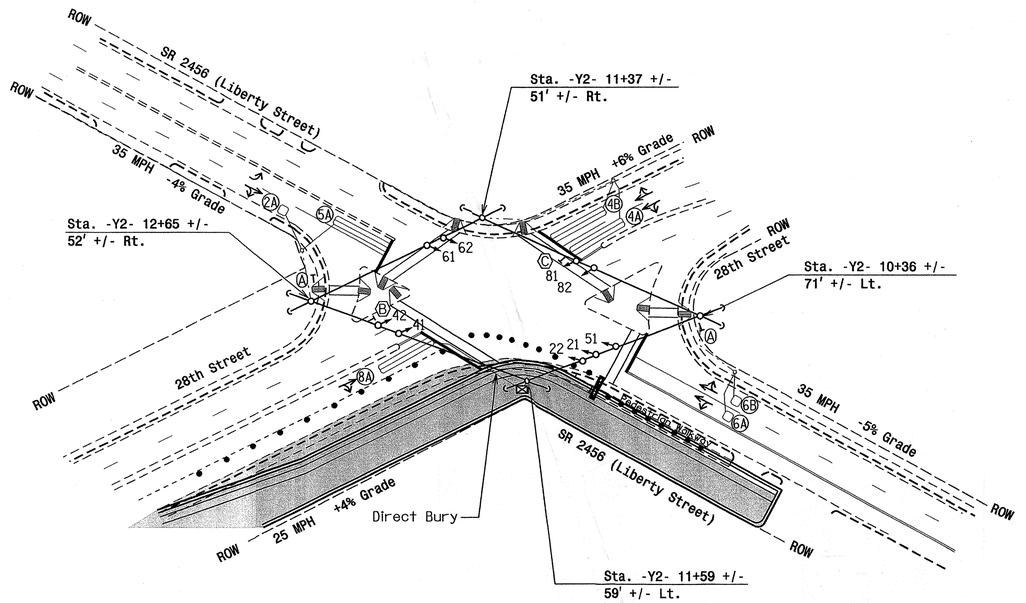
NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS					
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?
2A	6X6	70	4	X	-	2	X	-	-	-	NO
4A	6X40	0	2-4-2	X	-	4	X	-	-	-	NO
4B	6X40	0	2-4-2	X	-	4	X	-	-	-	NO
5A	6X40	0	2-4-2	X	-	5	X	-	-	-	NO
6A, 6B	6X6	70	4	X	-	6	X	-	-	-	NO
8A	6X40	0	2-4-2	X	-	8	X	-	DELAY	5	YES

3 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 5 during phase 6 on.
4. Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
5. Program phase 4 and phase 8 for dual entry.
6. Set all detector units to presence mode.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Wheelchair Ramp	N/A
	Construction Zone Drums	
	Construction Zone	
Ⓐ	"YIELD" Sign (R1-2)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ

TIMING CHART
NEMA CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN*	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.2 SEC.	3.0 SEC.	3.1 SEC.	4.1 SEC.	3.5 SEC.
RED CLEARANCE	3.2 SEC.	3.2 SEC.	3.7 SEC.	3.1 SEC.	2.1 SEC.
MAX. 1*	45 SEC.	20 SEC.	20 SEC.	45 SEC.	20 SEC.
RECALL POSITION	MIN RECALL	NONE	NONE	MIN RECALL	NONE
VEHI. CALL MEMORY	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

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

Signal Upgrade - Temporary Design (Construction Phase I)

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

SR 2456 (Liberty Street) at 28th Street

Division 9 Forsyth County Winston-Salem
PLAN DATE: February 2009 REVIEWED BY: TS Thigpen
PREPARED BY: OG Williams REVIEWED BY:

SCALE 0 50 1"=50'

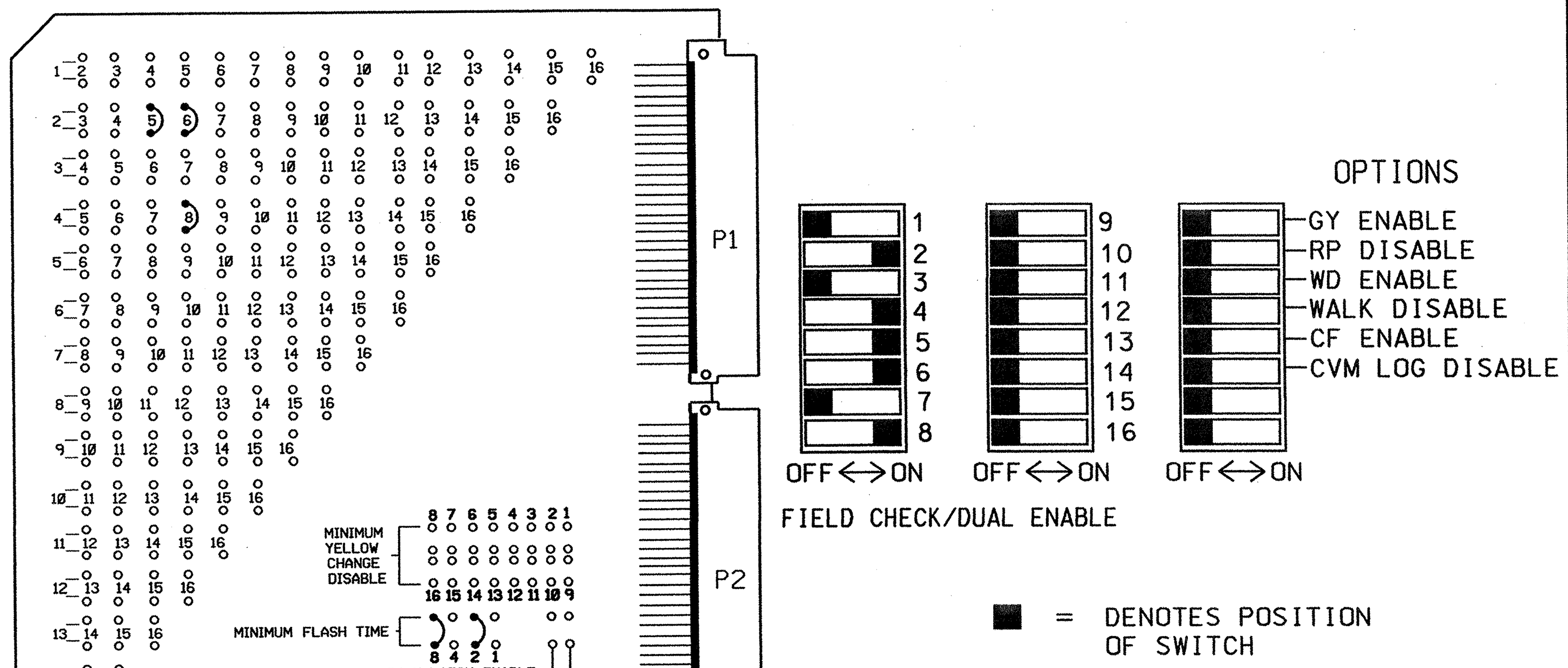
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE DATE 4/8/09
SIG. INVENTORY NO. 09-0179T

08-APR-2009 17:52
s:\traffic signals\workgroups\ttip projects\tu-2826a\signals\design signals\09-0179\09-0179_sig_dsn_20090408.dgn
rziemba

EDI MODEL MMU-16E MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE THE UNUSED LOAD SWITCH RED OUTPUTS: 1, 3, 7, 9, 10, 11 & 12 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE A PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	41,42	51	61,62	NU	81,82	NU	NU	NU	NU
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW					5R							
YELLOW ARROW					5Y							
GREEN ARROW					5G							

NU = NOT USED

DETECTOR RACK SET-UP DETAIL

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

BIU											
	CH1 L3 ∅4	CH1 L1 ∅2	CH1 L7 FUTURE USE	CH1 L5 ∅5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ∅4	CH2 L2 ∅8 *	CH2 L8 FUTURE USE	CH2 L6 ∅6							

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

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A, L1B
8A*	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
5A	L5A, L5B
6A,6B	L6A, L6B
—	L7A, L7B
—	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

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

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

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

! *FUTURE LOOP '3A' DURING FINAL DESIGN WILL CALL ∅3

EQUIPMENT INFORMATION

CONTROLLER.............CONTRACTOR SUPPLIED
CABINET ....CONTRACTOR SUPPLIED TS2-1
CABINET MOUNT..........BASE
LOADBAY POSITIONS.......12
LOAD SWITCHES USED......2, 4, 5, 6, 8
PHASES USED.............2, 4, 5, 6, 8
OL/A....................NOT USED
OL/B....................NOT USED
OL/C....................NOT USED
OL/D....................NOT USED

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	∅1
2	∅2
3	∅3
4	∅4
5	∅5
6	∅6
7	∅7
8	∅8
9	∅2 PED
10	∅4 PED
11	∅6 PED
12	∅8 PED

BACK-UP PROTECTION NOTES

1. PROGRAM CONTROLLER TO OMIT PHASE 5 DURING PHASE 6 ON.
2. WHEN TRAFFIC CONDITIONS REQUIRE THE CONTROLLER TO CLEAR FROM PHASE 2+6 TO PHASE 2+5, THE CONTROLLER WILL BE FORCED TO CYCLE THROUGH PHASE 4.
3. BACK-UP PROTECTION FEATURES DESCRIBED IN NOTES 1 AND 2 MUST BE IMPLEMENTED IN THE CONTROLLER SOFTWARE.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 09-0179T
DESIGNED: FEBRUARY 2009
SEALED: 4/8/09
REVISED: N/A

TEMPORARY DESIGN - Construction Phase I
NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 2456 (Liberty Street) at 28th Street

Division 09 Forsyth County Winston-Salem

PLAN DATE: February 2009	REVIEWED BY: JJP
PREPARED BY: F.E. Russ	REVIEWED BY:

REVISIONS	INIT.	DATE

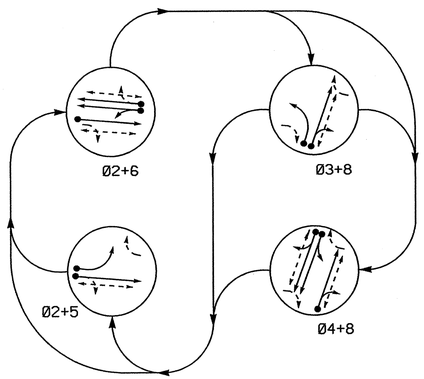
Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section, State of North Carolina Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR
John T. Rowe, Jr. 4-27-09
SIGNATURE DATE

SIG. INVENTORY NO. 09-0179T

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 7

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

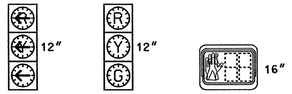
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3+8	Ø4+8	FLASH
21, 22	G	G	R	R	Y
31	~~R~~	~~R~~	←	~~R~~	~~R~~
41, 42	R	R	R	G	R
51	←	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	R	Y
81, 82	R	R	G	G	R
P21, P22	W	W	DW	DW	DRK
P41, P42	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	DW	DRK
P81, P82	DW	DW	W	W	DRK

SIGNAL FACE I.D.

Denotes L.E.D.



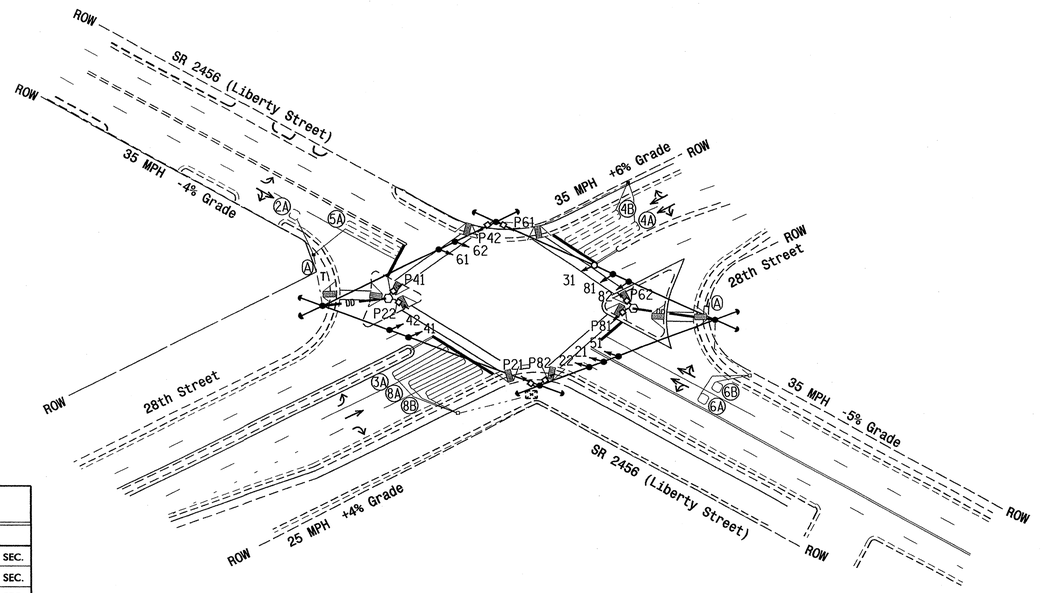
31
51

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

P21, P22
P41, P42
P61, P62
P81, P82

NEMA LOOP & DETECTOR INSTALLATION CHART
with TS-2 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN
2A	6X6	70	4	-	X	2	-	X	-	-	NO
3A	6X40	0	2-4-2	X	-	3	-	X	-	-	NO
4A	6X40	0	2-4-2	-	X	4	-	X	-	-	NO
4B	6X40	0	2-4-2	-	X	4	-	X	DELAY	10	YES
5A	6X40	0	2-4-2	-	X	5	-	X	-	-	NO
6A, 6B	6X6	70	4	X	-	6	-	X	-	-	NO
8A	6X40	0	2-4-2	X	-	8	X	-	-	-	NO
8B	6X40	0	2-4-2	X	-	8	X	-	DELAY	15	YES



TIMING CHART
NEMA CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8
MINIMUM GREEN*	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE/GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.2 SEC.	3.0 SEC.	3.0 SEC.	3.1 SEC.	4.1 SEC.	3.5 SEC.
RED CLEARANCE	2.6 SEC.	2.1 SEC.	3.0 SEC.	3.6 SEC.	2.3 SEC.	2.0 SEC.
MAX. 1*	45 SEC.	20 SEC.	20 SEC.	20 SEC.	45 SEC.	20 SEC.
RECALL POSITION	MIN RECALL	NONE	NONE	NONE	MIN RECALL	NONE
VEHI. CALL MEMORY	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK*	7 SEC.	– SEC.	7 SEC.	– SEC.	7 SEC.	7 SEC.
FLASHING DON'T WALK	14 SEC.	– SEC.	10 SEC.	– SEC.	11 SEC.	9 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.	– VEH.
SEC. PER ACTUATION*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAX. INITIAL*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME B4 REDUCTION*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TIME TO REDUCE*	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.

* 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.

4 Phase
Fully Actuated
(Winston-Salem Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 5 during phase 6 on.
4. Omit phase 3 during phase 4 on.
5. Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
6. Program phase 8 for dual entry.
7. Reposition existing signal heads numbered 81 and 82.
8. Set all detector units to presence mode.
9. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▭↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·	2-in Underground Conduit	·-·-·
N/A	Right of Way	———
→	Directional Arrow	→
⩘	Wheelchair Ramp	N/A
⬡	Signal Pedestal	⬢
—DD—	Directional Drill	N/A
Ⓐ	"YIELD" Sign (R1-2)	Ⓐ

Signal Upgrade - Final Design

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

SR 2456 (Liberty Street) at 28th Street

Division 9 Forsyth County Winston-Salem

PLAN DATE: February 2009 REVIEWED BY: TS Thigpen

PREPARED BY: OG Williams REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

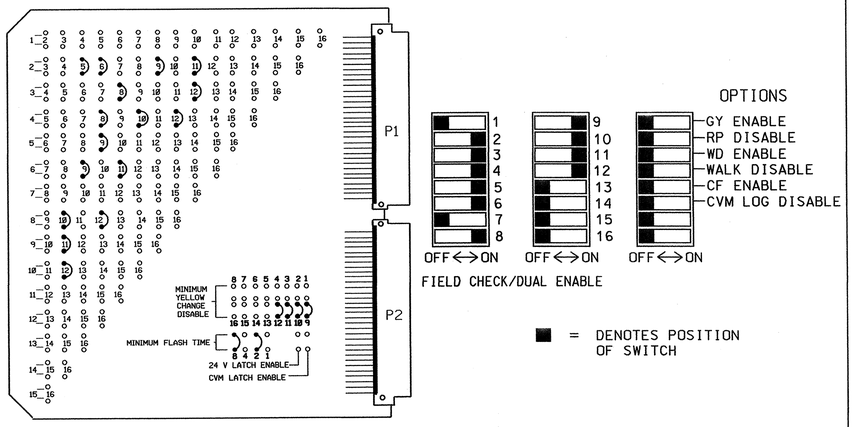
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 4/8/09 DATE

SIG. INVENTORY NO. 09-0179

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 8

EDI MODEL MMU-16E
MALFUNCTION MANAGEMENT UNIT
PROGRAMMING DETAIL

(program card and set switches as shown below)



MMU PROGRAMMING CARD

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED LOAD SWITCHES TO FLASH RED. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED LOAD SWITCH RED OUTPUTS: 1 & 7 TO LOAD SWITCH AC+ BY INSERTING A JUMPER PLUG IN THE UNUSED LOAD SWITCH SOCKET FROM PIN 1 (LS AC+) TO PIN 3 (RED OUT). MAKE SURE ALL FLASH TRANSFER RELAYS ARE IN PLACE.
3. PROGRAM THE CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE MALFUNCTION MANAGEMENT UNIT. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. ! PROGRAM PHASE 8 ONLY, ON CONTROLLER UNIT, FOR DUAL ENTRY.
7. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
8. UNLESS OTHERWISE SPECIFIED, PROGRAM DETECTOR CALL DELAY AND EXTENSION TIMING ON THE CONTROLLER.
9. THIS CONTROLLER AND CABINET ARE A PART OF THE WINSTON-SALEM SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	NU	21,22	31	41,42	51	61,62	NU	81,82	P21, P22	P41, P42	P61, P62	P81, P82
RED		2R		4R		6R		8R				
YELLOW		2Y		4Y		6Y		8Y				
GREEN		2G		4G		6G		8G				
RED ARROW			3R		5R							
YELLOW ARROW			3Y		5Y							
GREEN ARROW			3G		5G							
✋									9R	10R	11R	12R
🚶									9G	10G	11G	12G

NU = NOT USED

* * * *

*SEE COUNTDOWN NOTE ON 'PEDESTRIAN PUSH-BUTTON WIRING DETAIL' THIS SHEET.

BACK-UP PROTECTION NOTES

1. PROGRAM CONTROLLER TO OMIT PHASE 3 DURING PHASE 4 ON, AND TO OMIT PHASE 5 DURING PHASE 6 ON.
2. WHEN TRAFFIC CONDITIONS REQUIRE THE CONTROLLER TO CLEAR FROM PHASE 2+6 TO PHASE 2+5, THE CONTROLLER WILL BE FORCED TO CYCLE THROUGH PHASE 4.
3. BACK-UP PROTECTION FEATURES DESCRIBED IN NOTES 1 AND 2 MUST BE IMPLEMENTED IN THE CONTROLLER SOFTWARE.

LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø1
2	ø2
3	ø3
4	ø4
5	ø5
6	ø6
7	ø7
8	ø8
9	ø2 PED
10	ø4 PED
11	ø6 PED
12	ø8 PED

DETECTOR RACK SET-UP DETAIL

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

BIU	CH1 L3 ø4	CH1 L1 ø2	CH1 L7 ø8	CH1 L5 ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	CH2 L4 ø4	CH2 L2 ø3 *	CH2 L8 ø8	CH2 L6 ø6							

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

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A, L1B
3A*	L2A, L2B
4A	L3A, L3B
4B	L4A, L4B
5A	L5A, L5B
6A,6B	L6A, L6B
8A	L7A, L7B
8B	L8A, L8B
—	L9A, L9B
—	L10A, L10B
—	L11A, L11B
—	L12A, L12B
—	L13A, L13B
—	L14A, L14B
—	L15A, L15B
—	L16A, L16B

NOTE

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

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

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø2	—	—
2*	ø3	—	—
3	ø4	—	—
4	ø4	DELAY	10
5	ø5	—	—
6	ø6	—	—
7	ø8	—	—
8	ø8	DELAY	15
9	—	—	—
10	—	—	—
11	—	—	—
12	—	—	—
13	—	—	—
14	—	—	—
15	—	—	—
16	—	—	—

! *PREVIOUS LOOP '8A' DURING TEMPORARY DESIGN CALLED ø8

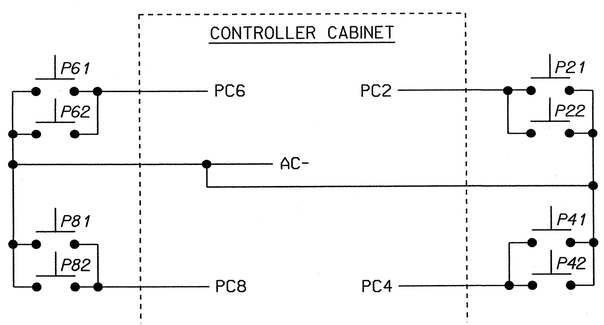
EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED*
CABINET.....CONTRACTOR SUPPLIED TS2-1 *
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....12
LOAD SWITCHES USED.....2, 3, 4, 5, 6, 8, 9, 10, 11, 12
PHASES USED.....2, 3, 4, 5, 6, 8, 2PED, 4PED, 6PED, 8PED
OL/A.....NOT USED
OL/B.....NOT USED
OL/C.....NOT USED
OL/D.....NOT USED

*EXISTING - INSTALLED UNDER TEMPORARY DESIGN

PEDESTRIAN PUSH-BUTTON WIRING DETAIL

(wire push-buttons as shown below)



PC = PED CALL

NOTE: 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: 09-0179
DESIGNED: FEBRUARY 2009
SEALED: 4/8/09
REVISED: N/A

FINAL DESIGN
NEMA Controller/TS-2 Type 1 Cabinet

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Management Section

750 N.Greenfield Pkwy.,Garner,NC 27529

SR 2456 (Liberty Street)
at
28th Street

Division 09 | Forsyth County | Winston-Salem

PLAN DATE: February 2009 | REVIEWED BY:
PREPARED BY: F.E. Russ | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SIGNATURE | DATE: 4-27-09

SIG. INVENTORY NO. 09-0179

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 9

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

11-08

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

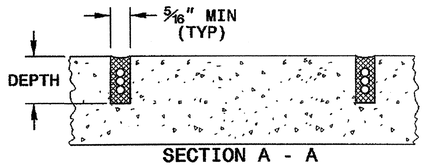
SHEET 1 OF 3

1725D01

CONVENTIONAL 4-SIDED LOOP

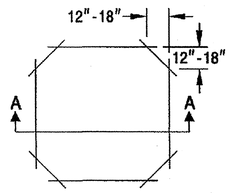
SAW SLOT DEPTH CHART

DEPTH (IN)	NO. OF WIRE TURNS				
	2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0

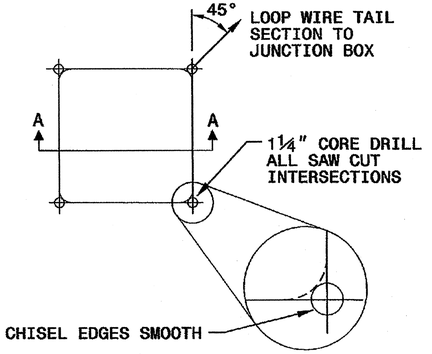


SAW CUT OPTIONS

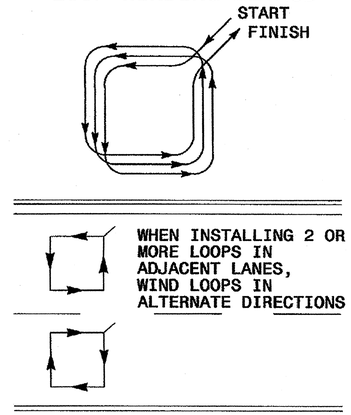
OPTION 1



OPTION 2 (POOR PAVEMENT)



LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE

CORRECT WAY TO TWIST WIRE

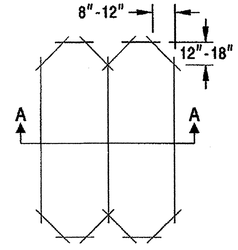
NOTES

1. OVERLAP SAW CUTS AT CORNERS AND INTERSECTION POINTS TO ENSURE UNIFORM SAW SLOT DEPTH.
2. MAINTAIN 12" SPACING BETWEEN LOOP WIRE TAIL SECTIONS.
3. WIRE LOOPS CONNECTED TO THE SAME DETECTOR CHANNEL IN SERIES.
4. LOCATE LOOPS IN CENTER OF LANES UNLESS OTHERWISE SHOWN ON PLANS OR APPROVED BY ENGINEER.

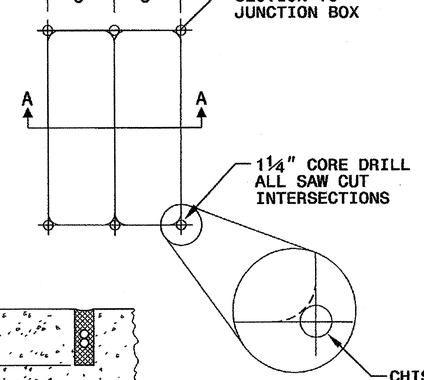
QUADRUPOLE LOOP

SAW CUT OPTIONS

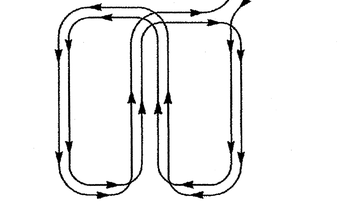
OPTION 1

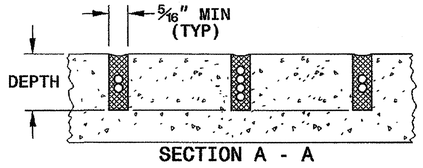


OPTION 2 (POOR PAVEMENT)



LOOP WINDING METHOD





DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

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ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3

1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON L DEAN

SIGNATURE

11/24/08

DATE

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	Sig. 10

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RALEIGH, N.C.

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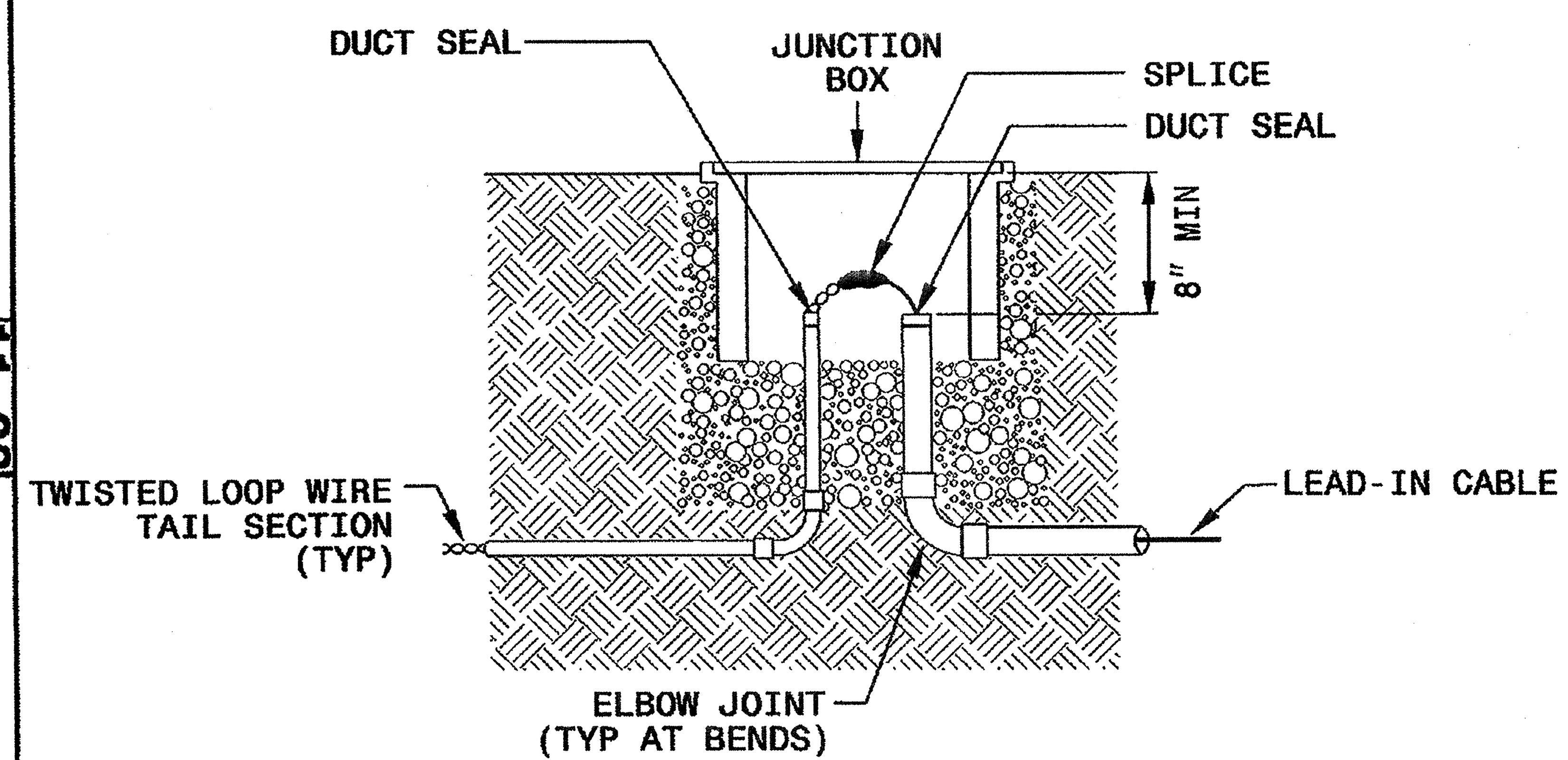
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

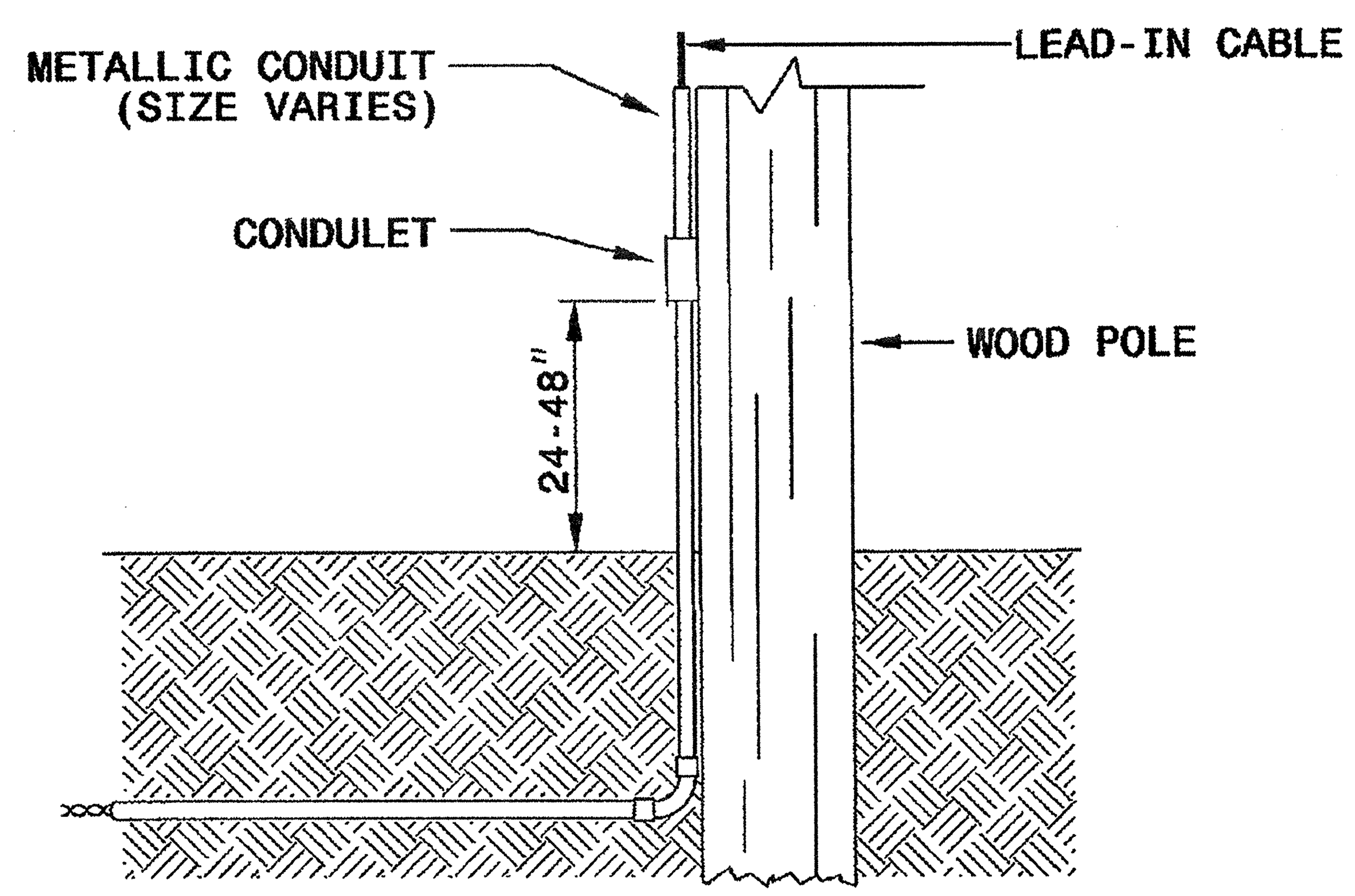
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

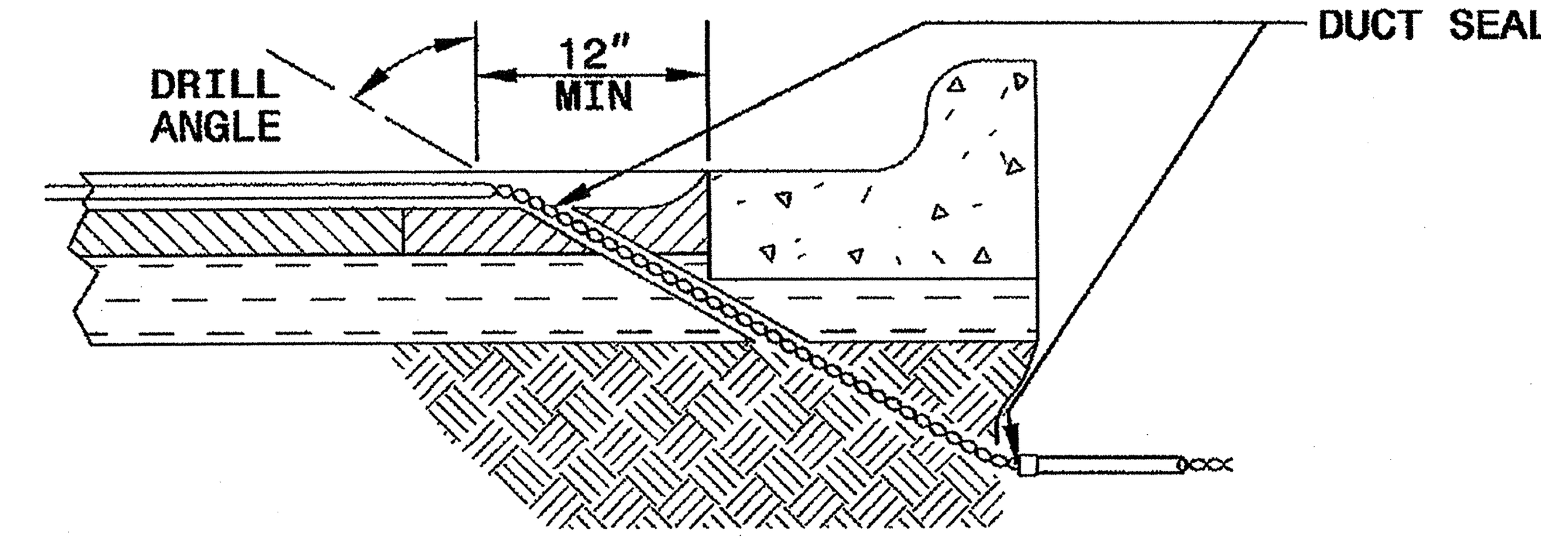


NOTE

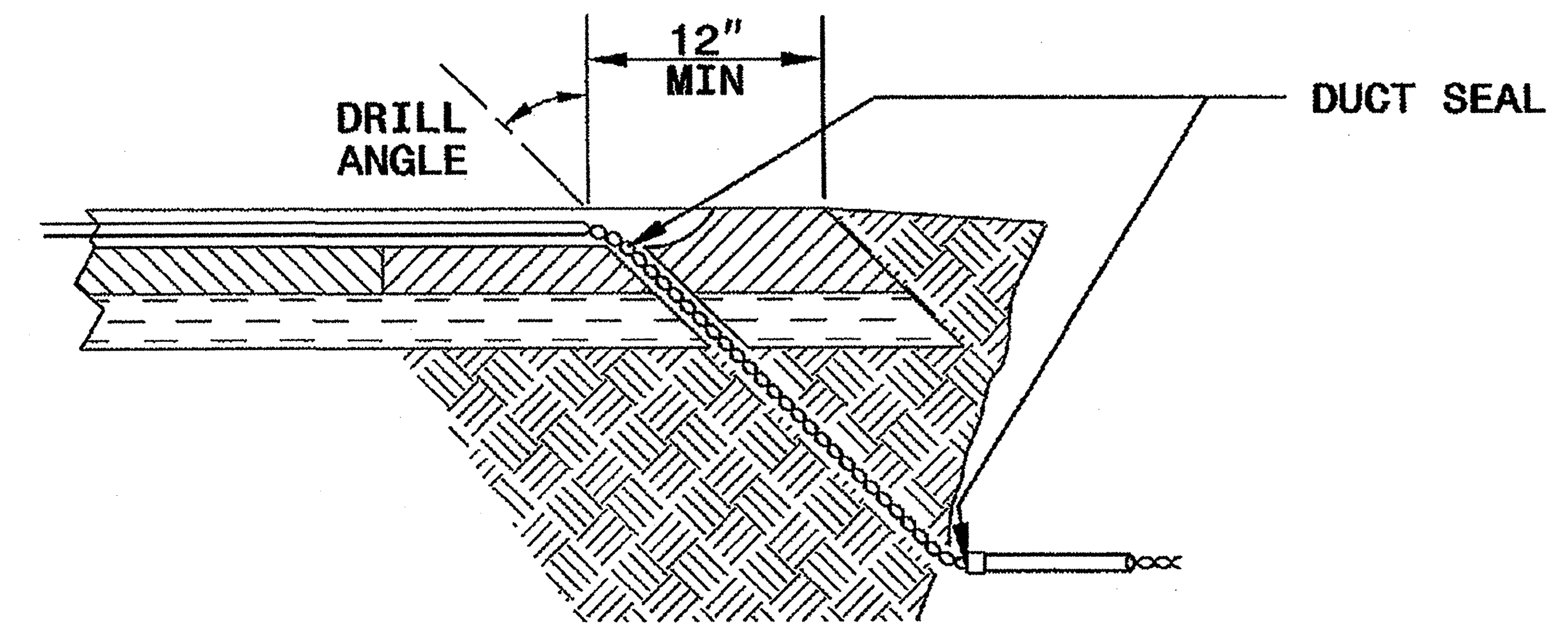
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

1. DO NOT EXCAVATE UNDER CURB AND GUTTER SECTIONS FOR CONDUIT INSTALLATION.
2. TWIST LOOP WIRE TAIL SECTIONS FROM WHERE LOOP WIRE TAIL LEAVES SAW CUT TO JUNCTION BOX, INCLUDING THROUGH CONDUIT.
3. BEFORE SEALING LOOPS, INSTALL DUCT SEAL WHERE LOOP WIRE TAIL SECTION LEAVES SAW CUT IN PAVEMENT AND AT ENTRANCE OF CONDUIT TO JUNCTION BOX.

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ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
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750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON I. DEAN

Milton I. Dean 11/24/08
SIGNATURE DATE

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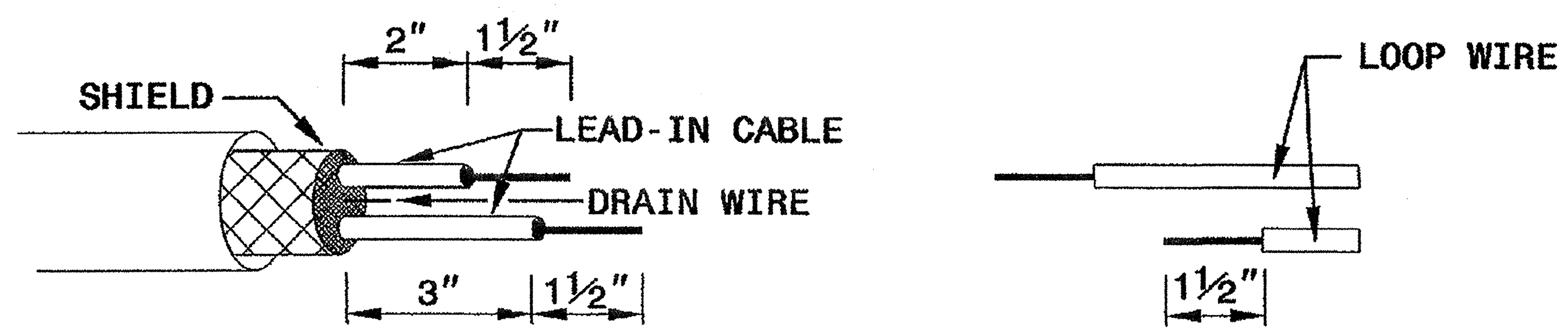
RALEIGH, N.C.

11-08

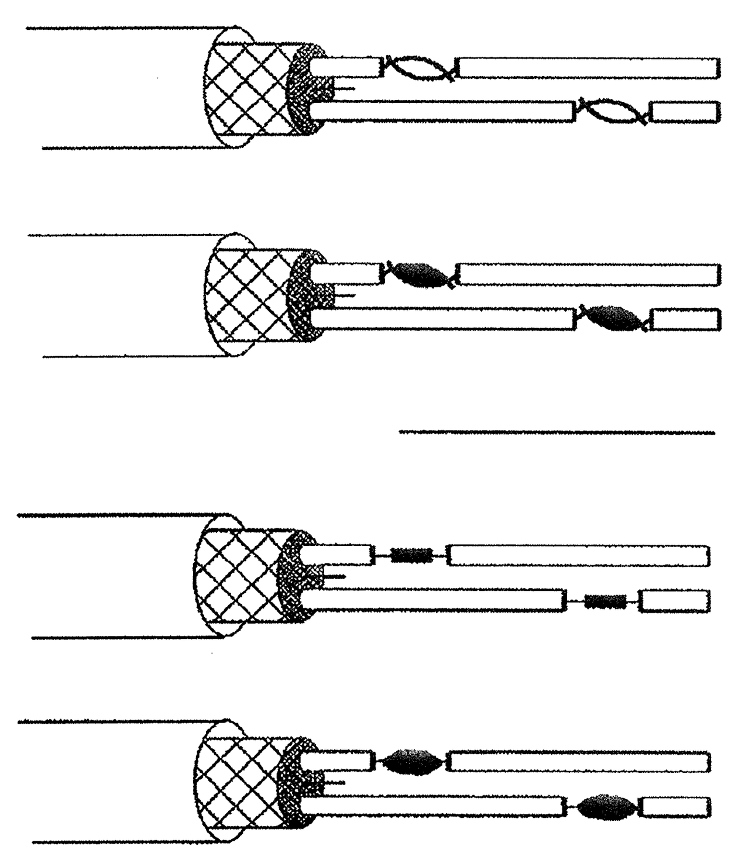
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



STEP 2. CONNECT AND SOLDER



TWIST BARE CONDUCTORS TOGETHER AND SOLDER WITH RESIN CORE SOLDER

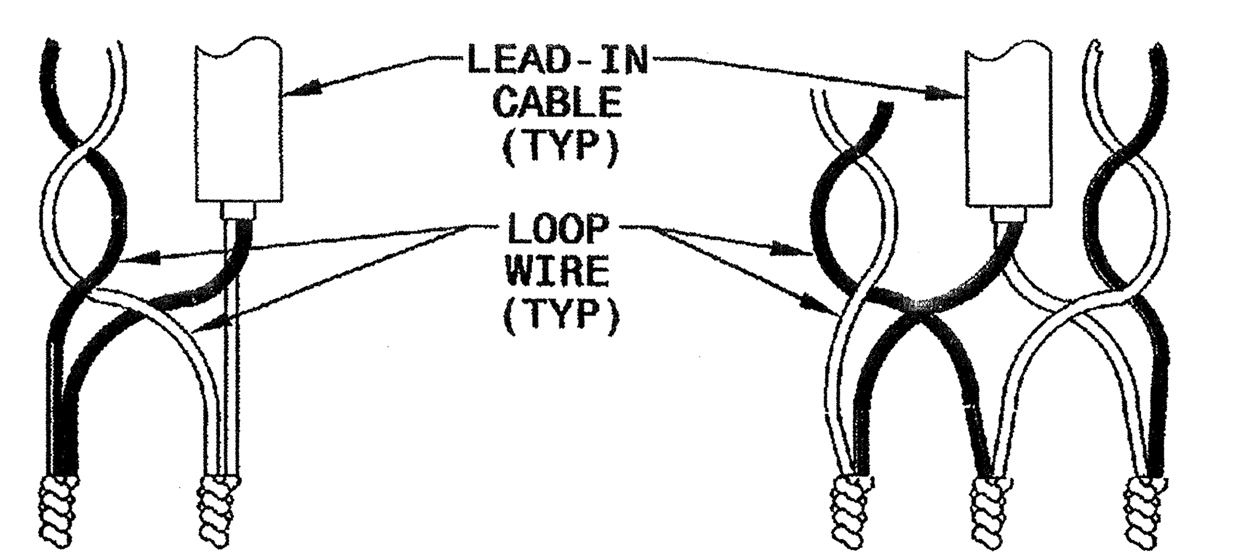
OR

CRIMP BARE CONDUCTORS TOGETHER WITH AN UNINSULATED BUTT CONNECTOR AND SOLDER WITH RESIN CORE SOLDER

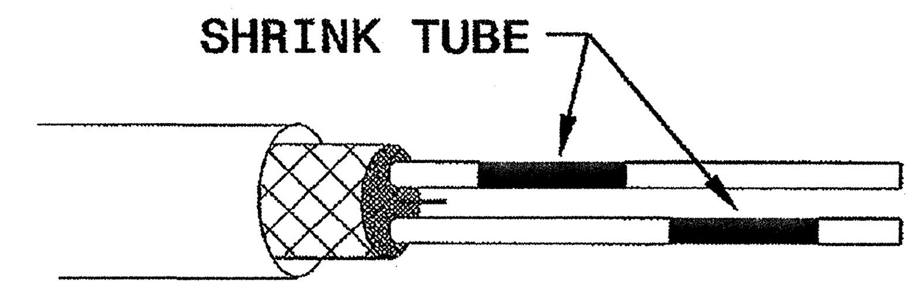
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

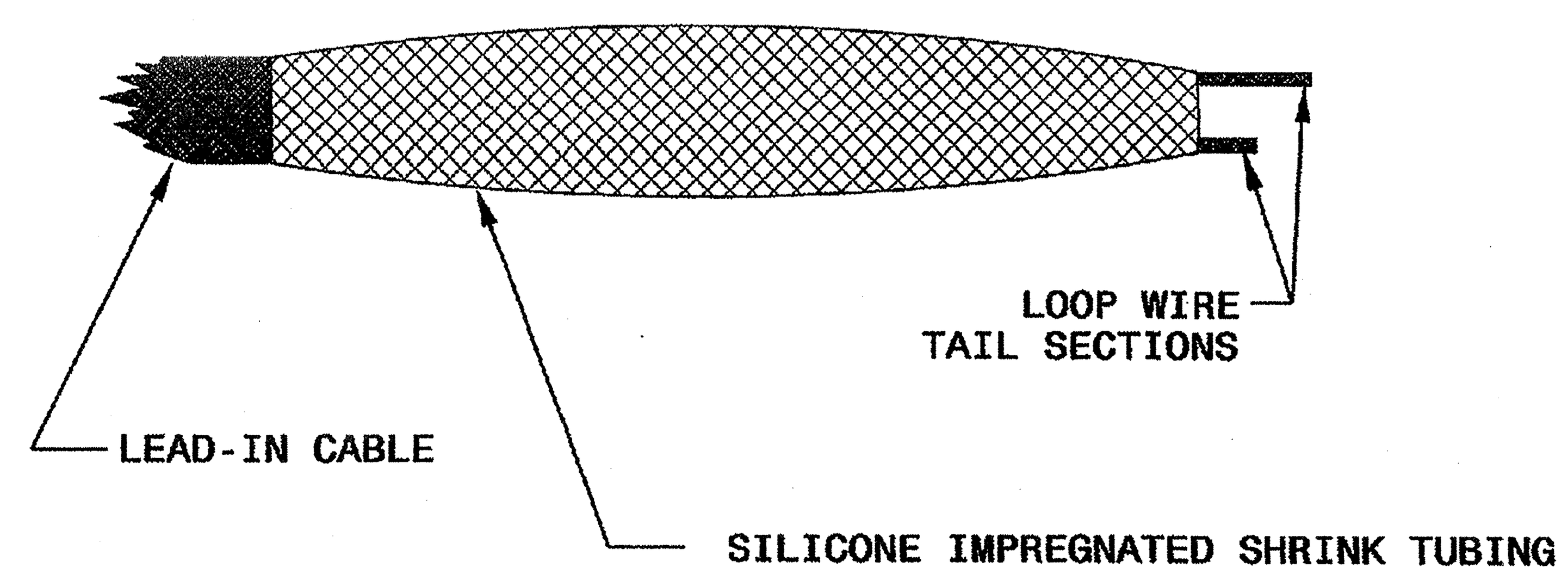
SINGLE CONNECTION | SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON I. DEAN

11/24/08

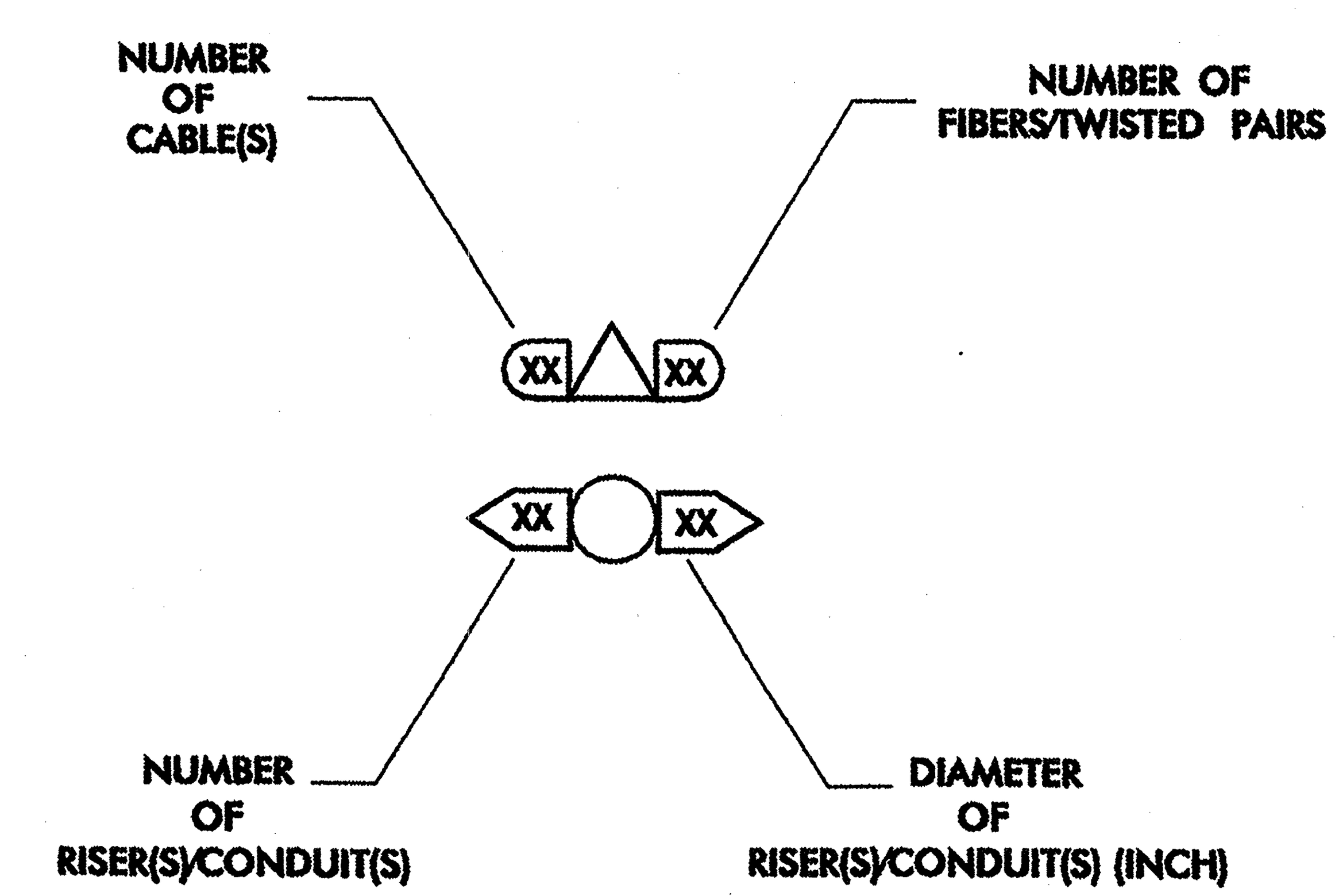
1	INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2	INSTALL REA, PE – 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3	INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4	INSTALL SMFO CABLE
5	INSTALL MMFO CABLE
6	INSTALL FIBER OPTIC DROP CABLE
7	INSTALL TRACER WIRE
8	TRENCH
9	INSTALL PVC CONDUIT
10	INSTALL RIGID, GALVANIZED STEEL CONDUIT
11	INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12	INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
13	INSTALL OUTER–DUCT POLYETHYLENE CONDUIT
14	INSTALL POLYETHYLENE CONDUIT
15	DIRECTIONAL DRILL CONDUIT
16	BORE AND JACK CONDUIT
17	INSTALL CABLE(S) IN EXISTING CONDUIT
18	INSTALL CABLE(S) IN NEW CONDUIT
19	INSTALL CABLE(S) IN EXISTING RISER
20	INSTALL CABLE(S) IN NEW RISER
21	INSTALL CABLE(S) IN EXISTING CONDUIT STUB–OUTS
22	INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB–OUTS WHEN AVAILABLE)
23	INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB–OUTS WHEN AVAILABLE)
24	INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25	INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26	TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27	INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28	INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
29	INSTALL UNDERGROUND SPLICE ENCLOSURE
30	INSTALL AERIAL SPLICE ENCLOSURE
31	INSTALL POLE MOUNTED SPLICE CABINET
32	INSTALL BASE MOUNTED SPLICE CABINET
33	REMOVE EXISTING SPLICE CABINET
34	INSTALL CABINET FOUNDATION
35	REMOVE EXISTING CABINET FOUNDATION
36	INSTALL CCTV CAMERA ASSEMBLY
37	INSTALL CCTV CAMERA WOOD POLE
38	INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39	INSTALL JUNCTION BOX
40	INSTALL OVERSIZED JUNCTION BOX
41	REMOVE EXISTING JUNCTION BOX
42	INSTALL WOOD POLE
43	REMOVE EXISTING WOOD POLE
44	INSTALL AERIAL GUY ASSEMBLY
45	INSTALL STANDARD GUY ASSEMBLY
46	INSTALL SIDEWALK GUY ASSEMBLY
47	INSTALL MESSENGER CABLE
48	REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
49	REMOVE EXISTING MESSENGER CABLE
50	INSTALL TELEPHONE SERVICE
51	INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52	INSTALL DELINEATOR MARKER
53	STORE 20 FEET OF COMMUNICATIONS CABLE
54	LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55	LASH CABLE(S) TO EXISTING MESSENGER CABLE
56	LASH CABLE(S) TO NEW MESSENGER CABLE
57	MODIFY EXISTING ELECTRICAL SERVICE
58	INSTALL NEW ELECTRICAL SERVICE

LEGEND

FO	NEW FIBER OPTIC COMMUNICATIONS CABLE
TWIST PR	NEW TWISTED PAIR COMMUNICATIONS CABLE
EXI	EXISTING COMMUNICATIONS CABLE
REM	EXISTING COMMUNICATIONS CABLE TO BE REMOVED
	NEW AERIAL GUY ASSEMBLY
	NEW CONDUIT
	EXISTING CONDUIT
DD	NEW DIRECTIONAL DRILLED CONDUIT
B&J	NEW BORED AND JACKED CONDUIT
	NEW JUNCTION BOX
	EXISTING JUNCTION BOX
	NEW WOOD POLE
	EXISTING WOOD POLE
S	AERIAL SPLICE ENCLOSURE
	NEW METAL POLE
	EXISTING METAL POLE
	NEW CCTV ASSEMBLY
	NEW STANDARD GUY ASSEMBLY
	NEW SIDEWALK GUY ASSEMBLY
	NEW CABLE STORAGE RACKS (SNOW SHOES)
X	EXISTING CONTROLLER AND CABINET
S	EXISTING SPLICE CABINET
S	NEW SPLICE CABINET
SP	SIGNAL POLE
XX–XXXX	SIGNAL INVENTORY NUMBER

CONSTRUCTION NOTE SYMBOLOGY KEY

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



Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
State of North Carolina Department of Transportation
Traffic Management Systems
122 N. McDowell St., Raleigh, NC 27603

CONSTRUCTION NOTES

PLAN DATE:	REVIEWED BY:
PREPARED BY:	REVIEWED BY: G. A. FULLER

REVISIONS	INIT.	DATE

SCALE 0

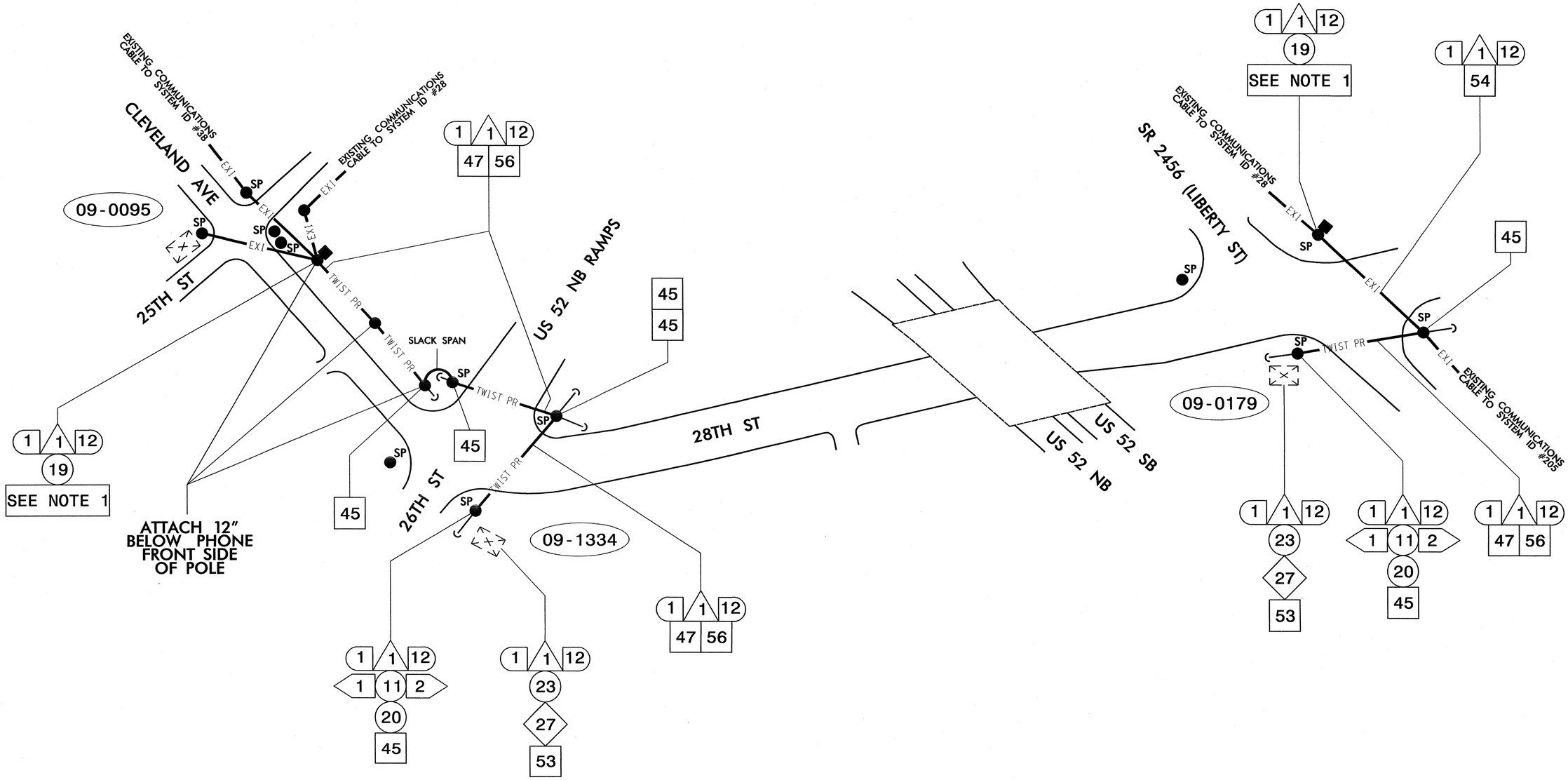
N

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 10/31/02
SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-2826A	SIG. 13



NOTES:

1. INSTALL NEW TWISTED PAIR CABLE IN EXISTING RISER AND POLE-MOUNTED SPLICE BOX.

ALL NCDOT ATTACHMENT POINTS ARE 12" ABOVE SIGNAL CABLE, FRONT SIDE OF POLE, UNLESS OTHERWISE NOTED.

CABLE TERMINATIONS TO BE PERFORMED BY THE CITY OF WINSTON-SALEM. CONTACT LARRY WALKER AT (336) 727-2380.

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Intelligent Transportation Systems
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

COMMUNICATIONS
CABLE ROUTING
ALONG CLEVELAND AVENUE

DIVISION 09 FORSYTH CO. WINSTON-SALEM

PLAN DATE:	FEBRUARY 2009	REVIEWED BY:	I.N. AVERY
PREPARED BY:	S.C. WARDLE	REVIEWED BY:	G.A. FULLER

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

SIGNATURE 2/27/09 DATE

CADD File/ate: