05/08/09

CONTRACT: TIP PROJECT: U-4012

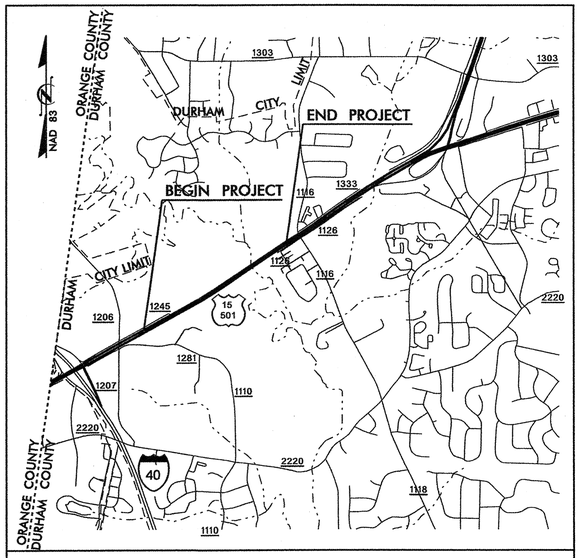
Project No.	Sheet No.
U-4012	SIG. 1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

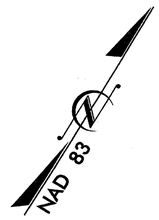
DURHAM COUNTY

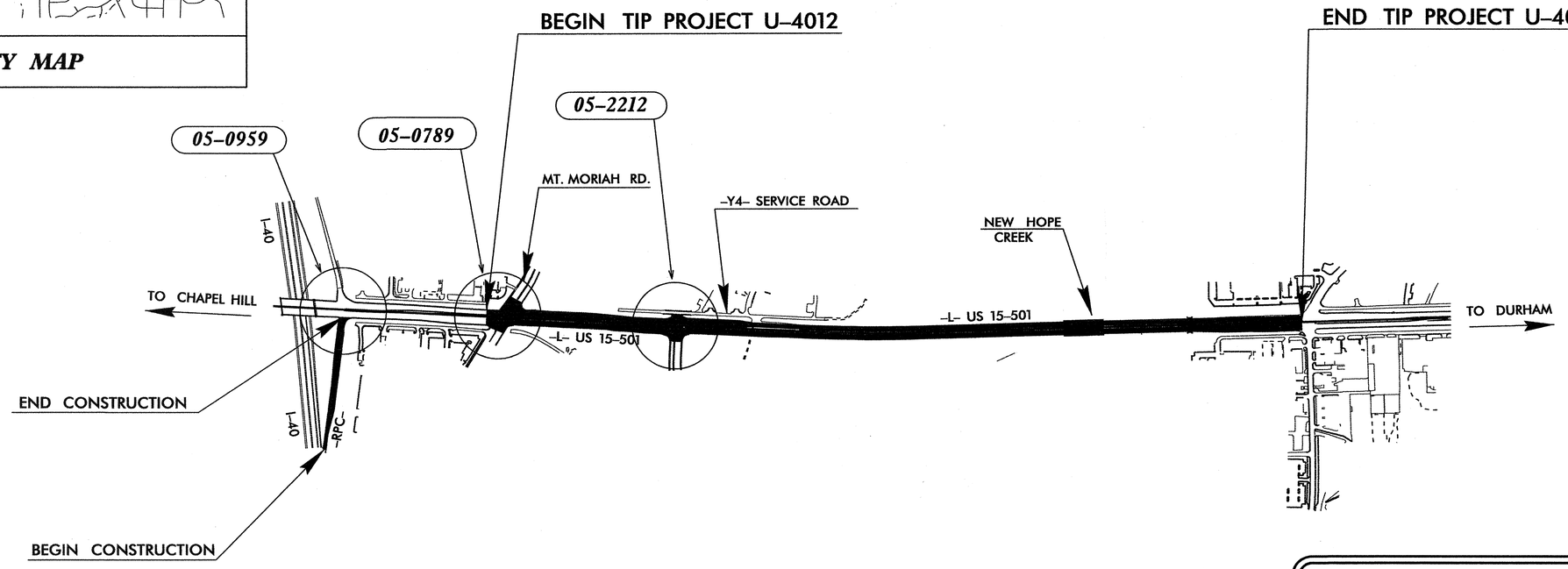
LOCATION: US 15-501 FROM NORTH OF MT MORIAH ROAD TO SOUTH OF GARRETT ROAD

TYPE OF WORK: SIGNALS (MOD)



VICINITY MAP





THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE CITY OF DURHAM.

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	N/A	Title Sheet
Sig. 2–3	05–0959	US 15–501 (Chapel Hill Blvd) @ I–40 WB Off–Ramp
Sig. 4–5	05–0789	US 15–501 (Chapel Hill Blvd) @ SR 2294 (Mt. Moriah Rd)
Sig. 6–11	05–2212	US 15–501 (Chapel Hill Blvd) @ SW Durham Dr/US 15–501 Service Rd.
Sig. 12–17	N/A	Standard Drawings for Metal Poles

TRAFFIC MANAGEMENT AND SIGNAL SYSTEMS UNIT

Contacts:

D. Y. Ishak – Signals and Geometrics Contracts Engineer
G. C. Brown, PE – Signal Equipment Design Engineer
G. G. Murr, Jr., PE – Traffic Management Systems Engineer

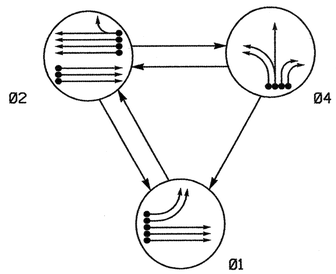
Prepared in the Office of:
DIVISION OF HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Traffic Management and Signal Systems Unit
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

122 N. McDowell St., Raleigh, NC 27603

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

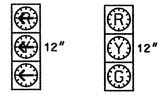
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1	Ø2	Ø4	FLASH
11, 12	~~-~~	~~R~~	~~R~~	~~R~~
21, 22	G	G	R	Y
23, 24, 25	R	G	R	Y
41, 42, 43	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



11, 12 — 21, 22; 23, 24, 25; 41, 42, 43

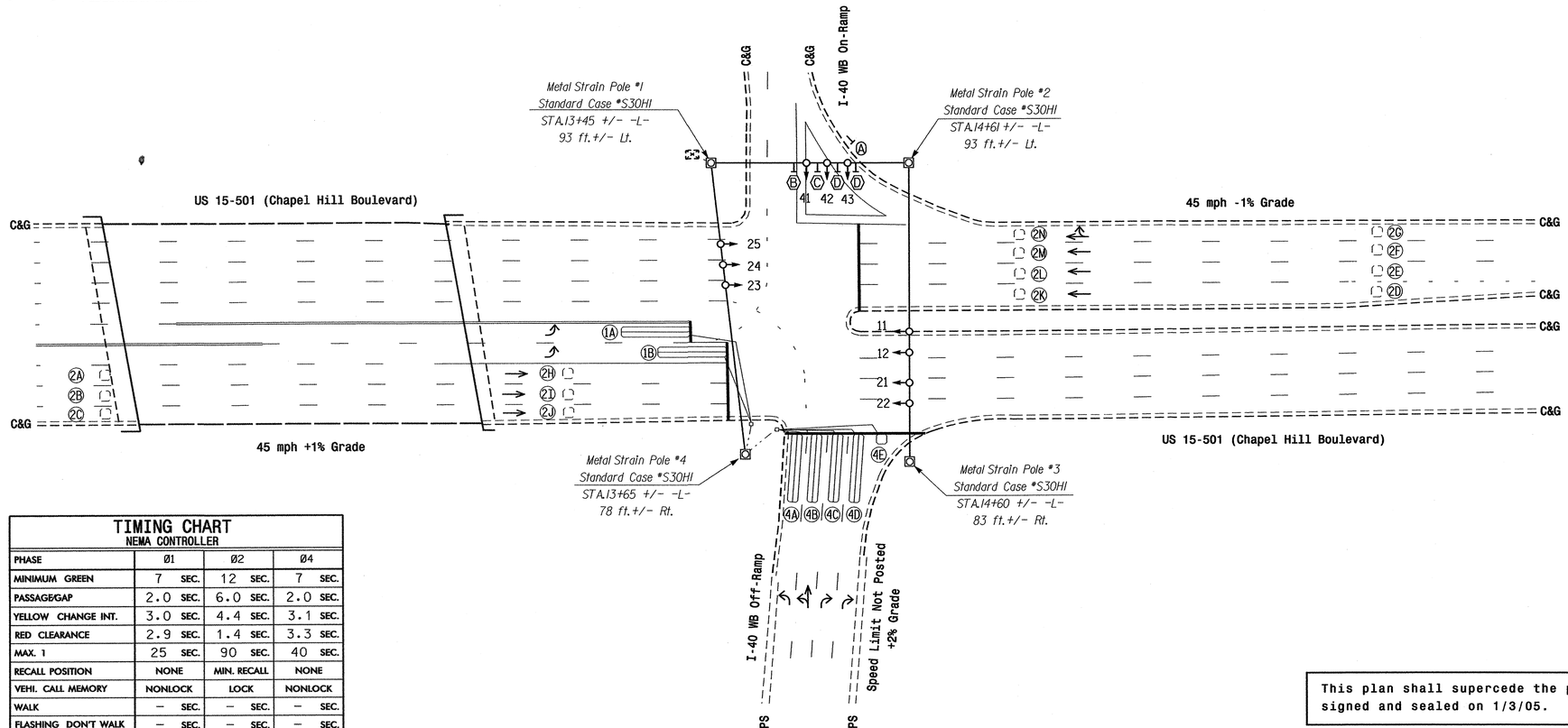
NEMA LOOP & DETECTOR UNIT INSTALLATION CHART
with TS-1 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS							
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW	EXISTING	UNIT NO.	NEW	EXISTING	NEMA PHASE	CHANNEL	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	X	-	3	X	-	1	1	-	- SEC.	ALL	NO
1B	6X40	0	2-4-2	X	-	3	X	-	2	1	-	- SEC.	ALL	NO
2A,2B,2C	6X6	360	6	-	X	1	-	X	1	2	EXTEND	2.75 SEC.	ALL	NO
2D,2E,2F,2G	6X6	300	6	-	X	1	-	X	2	2	EXTEND	1.75 SEC.	ALL	NO
2H,2I,2J	6X6	90	6	-	X	2	-	X	1	2	-	- SEC.	ALL	NO
2K,2L,2M,2N	6X6	90	4	-	X	2	-	X	2	2	-	- SEC.	ALL	NO
4A	6X40	0	2-4-2	X	-	4	X	-	1	4	-	- SEC.	ALL	NO
4B	6X40	0	2-4-2	X	-	4	X	-	2	4	-	- SEC.	ALL	NO
4C	6X40	0	2-4-2	X	-	5	X	-	1	4	DELAY	15 SEC.	ALL	YES
4D	6X40	0	2-4-2	X	-	5	X	-	2	4	DELAY	15 SEC.	ALL	YES
4E	6X6	0	4	X	-	6	X	-	1	4	DELAY	15 SEC.	ALL	YES

3 Phase
Fully Actuated
(Chapel Hill City 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. Phase 5 may be lagged.
4. Install backplates for signal heads numbered 21, 22, 11, 12, 23, 24, and 25.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



TIMING CHART
NEMA CONTROLLER

PHASE	Ø1	Ø2	Ø4
MINIMUM GREEN	7 SEC.	12 SEC.	7 SEC.
PASSAGE/GAP	2.0 SEC.	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.4 SEC.	3.1 SEC.
RED CLEARANCE	2.9 SEC.	1.4 SEC.	3.3 SEC.
MAX. 1	25 SEC.	90 SEC.	40 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK
WALK	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION	- SEC.	- SEC.	- SEC.
MAX. INITIAL	- SEC.	- SEC.	- SEC.
TIME B4 REDUCTION	- SEC.	- SEC.	- SEC.
TIME TO REDUCE	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	- SEC.	- SEC.

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	
	Pavement Marking Arrow	
N/A	Guardrail	
	Metal Strain Pole	
Ⓐ	"YIELD" Sign (R1-2)	Ⓐ
Ⓑ	Left Arrow "ONLY" Sign (R3-5L)	Ⓑ
Ⓒ	Combined Through and Left Arrow Sign (R3-6L)	Ⓒ
Ⓓ	Right Arrow "ONLY" Sign (R3-5R)	Ⓓ

This plan shall supercede the plan signed and sealed on 1/3/05.

Signal Upgrade

Prepared in the Offices of
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
122 N. McDowell St., Raleigh, NC 27603

US 15-501 (Chapel Hill Blvd.) at I-40 Westbound Off-Ramp

Division 5 Durham County Durham

PLAN DATE: March 2007 REVIEWED BY: DY Ishak

PREPARED BY: TS Thigpen REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

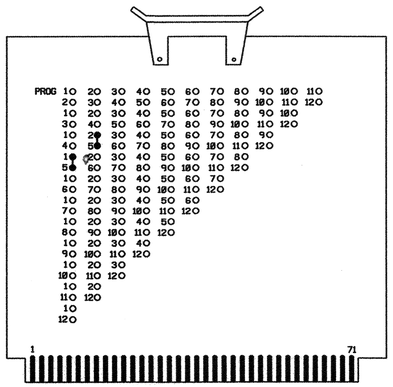
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 22027 EDWARD E. MOLLINAX
SIGNATURE DATE
SIG. INVENTORY NO. 05-0959

20-MAR-2007 14:52
s:\traffic\signals\workgroups\tip projects\w-4012\signals\05-0959\05959.sig_dsn.20070201.dgn
smithtgn

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 3

(EXISTING)

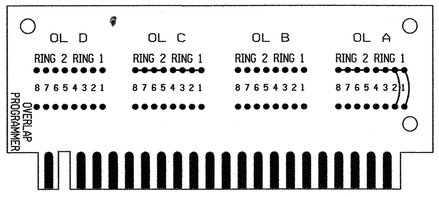
NEMA CONFLICT MONITOR PROGRAMMING CARD



(INSTALL JUMPERS AS SHOWN)

(EXISTING)

NEMA OVERLAP CARD



(INSTALL JUMPERS AS SHOWN)

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED PHASES AND OVERLAPS 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: 3 AND 6 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 CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE CONFLICT MONITOR. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. WIRE DETECTORS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.
7. SET ALL DETECTOR UNIT CHANNELS TO 'PRESENCE' MODE.
8. PROGRAM CONTROLLER AND WIRE CABINET TO BE PART OF THE CITY OF CHAPEL HILL'S COMPUTERIZED SIGNAL SYSTEM. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INTERCONNECTION AND OPERATION OF THIS SIGNAL WITHIN THE SYSTEM.

EQUIPMENT INFORMATION

*CONTROLLER.....TRACONEX TMP-390-8
*CABINET.....IDC 4-PHASE (CHAPEL HILL SPEC'S)
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....8
LOAD SWITCHES USED.....1,2,4,5
PHASES USED.....1,2,4
OVERLAP A.....1+2
OVERLAP B.....NOT USED

EXISTING TO REMAIN IN USE*

TYPICAL CONNECTION CHART FOR DETECTORS

PIN FUNCTION	LOOP PANEL TERMINATION
AC+	AC+
AC-	AC-
CHASSIS GROUND	CHASSIS GROUND
LOOP INPUT	LOOP
LOOP INPUT	LOOP
RELAY NORMALLY OPEN	VEHICLE CALL INPUT
RELAY COMMON	LOGIC GROUND
TIMER INHIBIT	ASSOCIATED PHASE GREEN

NOTES:
1. CONNECT THE TIMER INHIBIT WIRE TO THE ASSOCIATED PHASE GREEN LOAD SWITCH OUTPUT WHEN ONLY DELAY OPERATION IS REQUIRED UNLESS OTHERWISE SPECIFIED BY THE LOOP AND DETECTOR UNIT INSTALLATION CHART.
2. IF EXTEND OPERATION IS REQUIRED, DO NOT CONNECT THE DELAY INHIBIT WIRE.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	OLA	OLB	1 PED	2 PED
SIGNAL HEAD NO.	11,12	23,24, 25	NU	41,42, 43	21,22	NU	NU	NU
RED		4		10	13			
YELLOW		5		11	14			
GREEN		6		12	15			
RED ARROW	1							
YELLOW ARROW	2							
GREEN ARROW	3							

NU = NOT USED

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0959
DESIGNED: MARCH 2007
SEALED: 14 MARCH 2007
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED DECEMBER 2004 AND SEALED 1/5/05

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 15-501 (CHAPEL HILL BLVD.)
at
I-40 WESTBOUND OFF-RAMP

DIVISION 05 DURHAM COUNTY DURHAM
PLAN DATE: MARCH 2007 REVIEWED BY: JTT
PREPARED BY: F.E. RUSS REVIEWED BY:

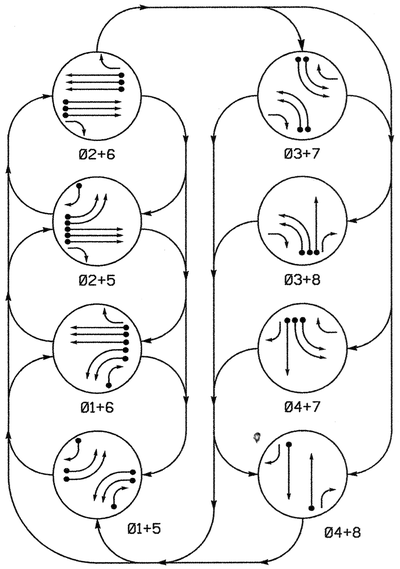
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR
John T Rowe Jr 3-23-07
SIGNATURE DATE
SIG. INVENTORY NO. 05-0959

23-MAR-2007 08:08
u:#Plot-Print#050959_sm_ele.200703xx.dgn
#enuse

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig.4

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

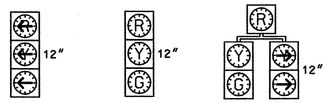
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11, 12	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
23	R	R	G	G	R/→	R/→	R	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51, 52	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
63	R	G	R	G	R/→	R	R/→	R	Y
71, 72	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	←	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R

SIGNAL FACE I.D.

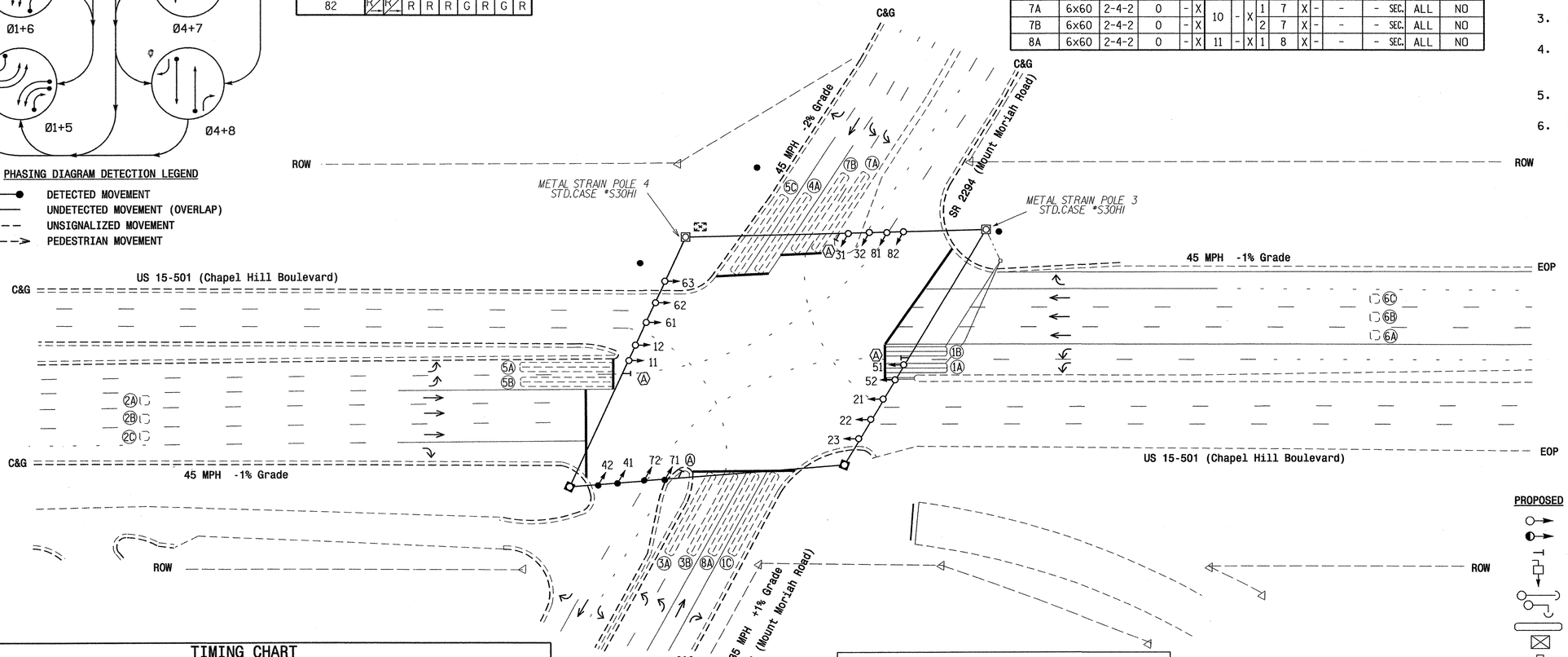
Denotes L.E.D.



LOOP & DETECTOR UNIT INSTALLATION CHART

NEMA CONTROLLER WITH TS-1 CABINET

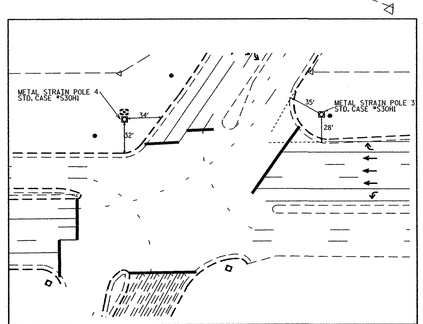
INDUCTIVE LOOPS						DETECTOR UNITS								
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	UNIT NO.	NEW	EXISTING CHANNEL	NEMA PHASE	PRESENCE	PULSE	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN?
1A	6x40	2-4-2	0	X	-	1	-	X	1	X	-	-	- SEC.	ALL	NO
1B	6x40	2-4-2	0	X	-				2	X	-	-	- SEC.	ALL	NO
1C	6x60	2-4-2	0	-	X	3	-	X	2	X	-	DELAY	15 SEC.	ALL	YES
2A	6x6	EXIST	EXIST	-	X	2	-	X	1	X	-	-	- SEC.	ALL	NO
2B	6x6	EXIST	EXIST	-	X				2	X	-	-	- SEC.	ALL	NO
2C	6x6	EXIST	EXIST	-	X	3	-	X	1	X	-	-	- SEC.	ALL	NO
3A	6x60	2-4-2	0	-	X	4	-	X	1	X	-	-	- SEC.	ALL	NO
3B	6x60	2-4-2	0	-	X				2	X	-	-	- SEC.	ALL	NO
4A	6x60	2-4-2	0	-	X	5	-	X	1	X	-	-	- SEC.	ALL	NO
5A	6x60	2-4-2	0	-	X	6	-	X	1	X	-	-	- SEC.	ALL	NO
5B	6x60	2-4-2	0	-	X				2	X	-	-	- SEC.	ALL	NO
5C	6x60	2-4-2	0	-	X	7	-	X	1	X	-	DELAY	15 SEC.	ALL	YES
6A	6x6	4	300	-	X	8	-	X	1	X	-	-	- SEC.	ALL	NO
6B	6x6	4	300	-	X				2	X	-	-	- SEC.	ALL	NO
6C	6x6	4	300	-	X	9	-	X	1	X	-	-	- SEC.	ALL	NO
7A	6x60	2-4-2	0	-	X	10	-	X	1	X	-	-	- SEC.	ALL	NO
7B	6x60	2-4-2	0	-	X				2	X	-	-	- SEC.	ALL	NO
8A	6x60	2-4-2	0	-	X	11	-	X	1	X	-	-	- SEC.	ALL	NO



TIMING CHART

NEMA CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
MINIMUM GREEN	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.	7 SEC.
PASSAGE/GAP	2.0 SEC.	6.0 SEC.	1.0 SEC.	1.0 SEC.	1.0 SEC.	6.0 SEC.	1.0 SEC.	1.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.6 SEC.	3.0 SEC.	4.7 SEC.	3.0 SEC.	4.6 SEC.	3.0 SEC.	3.8 SEC.
RED CLEARANCE	4.4 SEC.	2.4 SEC.	3.3 SEC.	2.2 SEC.	4.6 SEC.	2.2 SEC.	3.3 SEC.	3.0 SEC.
MAX. 1	20 SEC.	90 SEC.	20 SEC.	30 SEC.	30 SEC.	90 SEC.	30 SEC.	30 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK	NONLOCK
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
ACTUATION B4 ADD	– VEH.	4 VEH.	– VEH.	– VEH.	– VEH.	4 VEH.	– VEH.	– VEH.
SEC. PER ACTUATION	– SEC.	1.0 SEC.	– SEC.	– SEC.	– SEC.	1.0 SEC.	– SEC.	– SEC.
MAX. INITIAL	– SEC.	32 SEC.	– SEC.	– SEC.	– SEC.	32 SEC.	– SEC.	– SEC.
TIME B4 REDUCTION	– SEC.	40 SEC.	– SEC.	– SEC.	– SEC.	40 SEC.	– SEC.	– SEC.
TIME TO REDUCE	– SEC.	25 SEC.	– SEC.	– SEC.	– SEC.	25 SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	2.5 SEC.	– SEC.	– SEC.	– SEC.	2.5 SEC.	– SEC.	– SEC.



Metal Strain Pole Locations

8 Phase
Fully Actuated
(Chapel Hill City 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. Phase 1 or phase 5 may be lagged.
4. Install backplates for signal heads numbered 11, 12, 21, 22, 51, 52, 61, 62, and 63.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
⊡↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
	2-in Underground Conduit	
N/A	Right of Way	
→	Directional Arrow	→
→	Pavement Marking Arrow	→
◎	Metal Strain Pole	◘
Ⓐ	U-Turn "MUST YIELD" Sign (R3-27)	Ⓐ

This plan shall supercede the plan signed and sealed on 4/20/05.

Signal Upgrade

US 15-501 (Chapel Hill Blvd)
at
SR 2294 (Mt. Moriah Rd)

Division 5 Durham County Durham

PLAN DATE: March 2007 REVIEWED BY: DY Ishak

PREPARED BY: TS Thigpen REVIEWED BY:

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24007
RICHARD E. MULLINAX

SIGNATURE DATE

SIG. INVENTORY NO. 05-0789

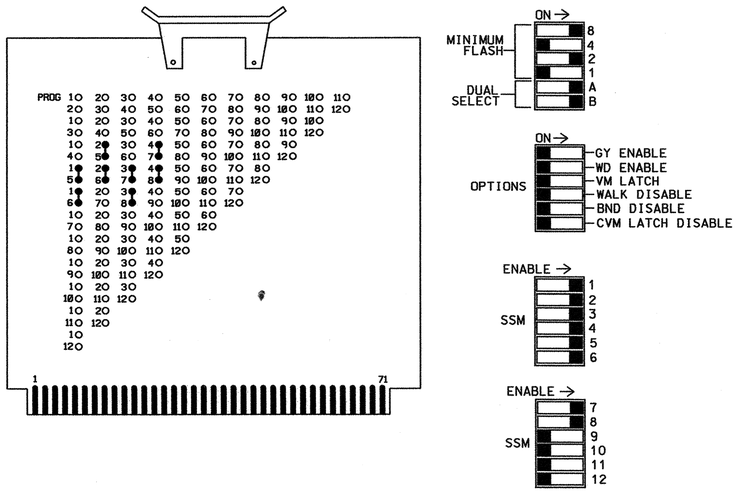
14-MAR-2007 09:48
S:\Traffic Signal Group\projects\u-4012ej\signals\05-0789\050789_sig_dsn_20070201.dgn
thigpen

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 5

(EXISTING)

EDI MODEL SSM-12E CONFLICT - VOLTAGE MONITOR PROGRAMMING DETAIL

(install jumpers and set switches as shown below)



NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED PHASES AND OVERLAPS 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: 9,10,11 AND 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 CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE CONFLICT MONITOR. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. WIRE DETECTORS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.
7. SET ALL DETECTOR UNIT CHANNELS TO 'PRESENCE' MODE.
8. PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR VOLUME DENSITY OPERATION.
9. PROGRAM CONTROLLER AND WIRE CABINET TO BE PART OF THE CITY OF CHAPEL HILL'S COMPUTERIZED SIGNAL SYSTEM. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INTERCONNECTION AND OPERATION OF THIS SIGNAL WITHIN THE SYSTEM.

SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3		4	5		6	7		8	OLA	OLB	OLC	OLD	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11,12	82	21,22, 23	23	31,32	41,42	42	51,52	61,62, 63	63	71,72	81,82	NU	NU	NU	NU	NU	NU	NU	NU
RED			2R			4R			6R			8R								
YELLOW			2Y			4Y			6Y			8Y								
GREEN			2G			4G			6G			8G								
RED ARROW	1R				3R			5R			7R									
YELLOW ARROW	1Y	1Y		3Y	3Y		5Y	5Y		7Y	7Y									
GREEN ARROW	1G	1G		3G	3G		5G	5G		7G	7G									

NU = NOT USED

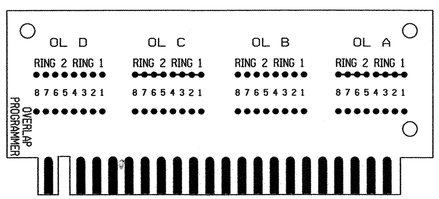
EQUIPMENT INFORMATION

*CONTROLLER.....TRACONEX TMP-390-8
*CABINET.....ECONOLITE 5300-844BR
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,3,4,5,6,7,8
PHASES USED.....1,2,3,4,5,6,7,8
OVERLAP A.....NOT USED
OVERLAP B.....NOT USED
OVERLAP C.....NOT USED
OVERLAP D.....NOT USED

EXISTING TO REMAIN IN USE*

(EXISTING)

NEMA OVERLAP CARD



OVERLAP CARD IS COMPLETELY BLANK (NO JUMPERS)

TYPICAL CONNECTION CHART FOR DETECTORS

PIN FUNCTION	LOOP PANEL TERMINATION
AC+	AC+
AC-	AC-
CHASSIS GROUND	CHASSIS GROUND
LOOP INPUT	LOOP
LOOP INPUT	LOOP
RELAY NORMALLY OPEN	VEHICLE CALL INPUT
RELAY COMMON	LOGIC GROUND
TIMER INHIBIT	ASSOCIATED PHASE GREEN

NOTES:

1. CONNECT THE TIMER INHIBIT WIRE TO THE ASSOCIATED PHASE GREEN LOAD SWITCH OUTPUT WHEN ONLY DELAY OPERATION IS REQUIRED UNLESS OTHERWISE SPECIFIED BY THE LOOP AND DETECTOR UNIT INSTALLATION CHART.
2. IF EXTEND OPERATION IS REQUIRED, DO NOT CONNECT THE DELAY INHIBIT WIRE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0789
DESIGNED: MARCH 2007
SEALED: 14 MARCH 2007
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED APRIL 2005 AND SEALED 4/21/05

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section

122 N. McDowell St., Raleigh, NC 27603

US 15-501 (CHAPEL HILL BLVD) at SR 2294 (MT. MORIAH RD)

DIVISION 05 | DURHAM COUNTY | DURHAM

PLAN DATE: MARCH 2007 | REVIEWED BY: JJP

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

REVISIONS	INIT.	DATE

SEAL

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

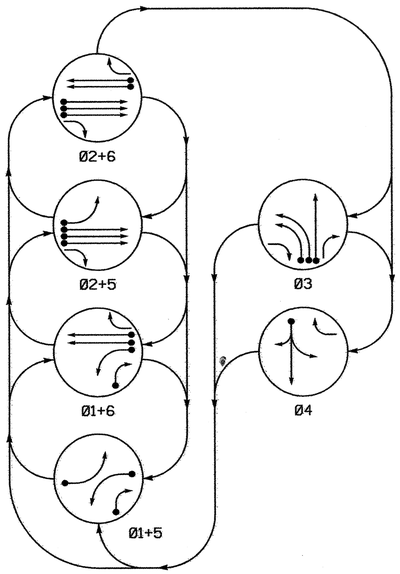
SIGNATURE | DATE

SIG. INVENTORY NO. 05-0789

20-MAR-2007 14:22
u:\Drawings\stldwgs\0S0789_sm_ele_200703xx.dgn
fbruss

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig.6

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

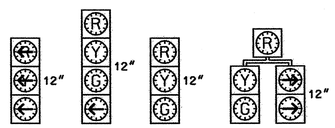
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
11	~~←~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	Y
23	R	R	G	G	R/~~←~~	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~R~~	~~R~~
33	R	R	R	R	G	R	R
34	R/~~R~~	R/~~←~~	R	R	G	R	R
41	R	R	R	R	R	G/~~←~~	R
42	R	R	R	R	R	G	R
51	~~←~~	~~R~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~
61	R	G	R	G	R	R	Y
62	R	G	R	G	R	R/~~←~~	Y

SIGNAL FACE I.D.

Denotes L.E.D.



11, 31, 32, 51 — 41 — 21, 22, 33, 42, 61 — 23, 34, 62

LOOP & DETECTOR UNIT INSTALLATION CHART

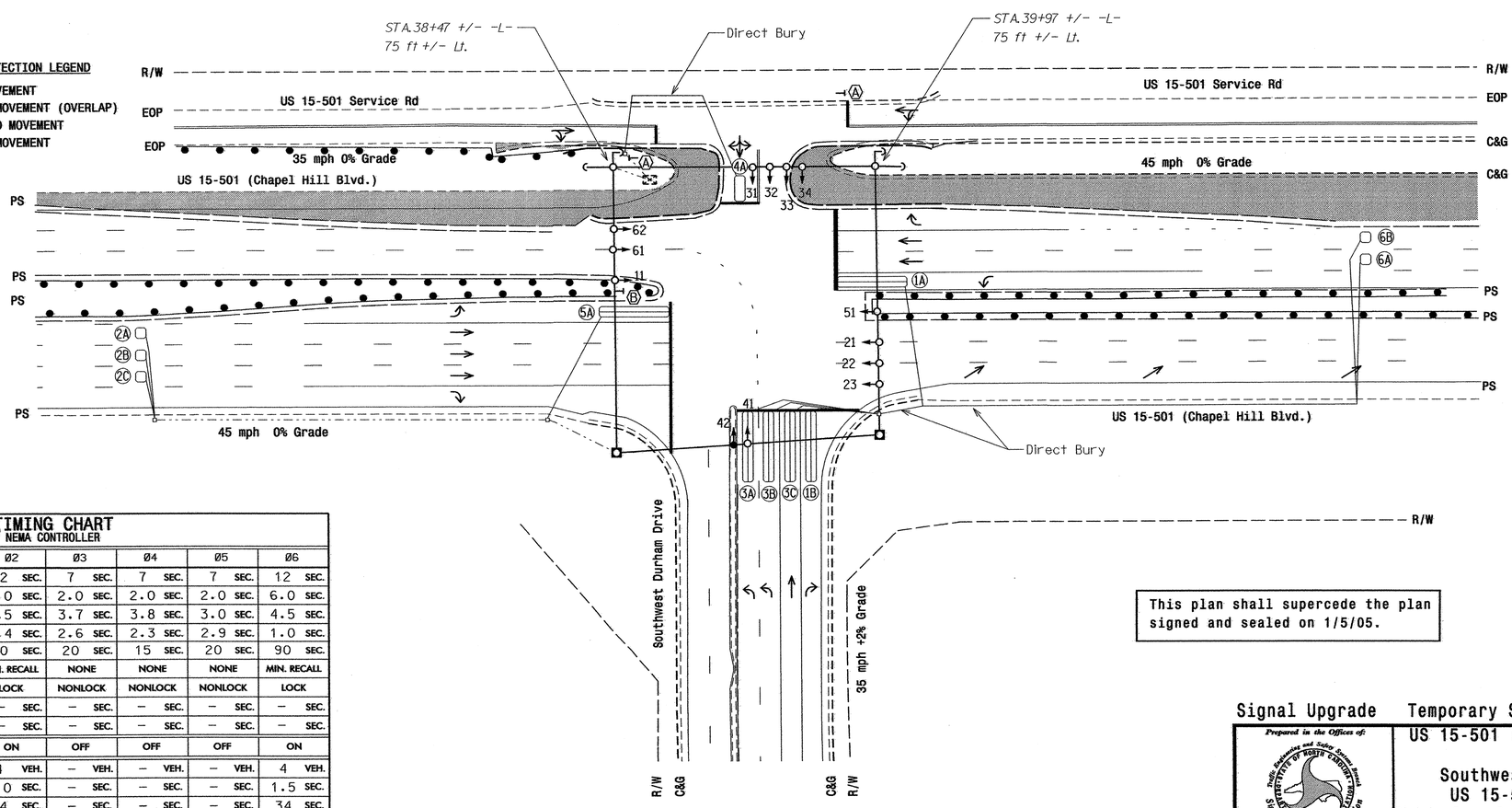
NEMA CONTROLLER WITH TS-1 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS							
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	UNIT NO.	NEW	EXISTING	CHANNEL	NEMA PHASE	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN?
1A	6X40	2-4-2	0	X	-	1	-	X	1	1	-	- SEC.	ALL	NO
1B	6X40	2-4-2	0	X	-	1	-	X	2	1	DELAY	15 SEC.	ALL	YES
2A	6X6	5	300	X	-	2	-	X	1	2	-	- SEC.	ALL	NO
2B	6X6	5	300	X	-	2	-	X	2	2	-	- SEC.	ALL	NO
2C	6X6	5	300	X	-	3	-	X	1	2	-	- SEC.	ALL	NO
3A	6X40	2-4-2	0	X	-	4	-	X	1	3	-	- SEC.	ALL	NO
3B	6X40	2-4-2	0	X	-	4	-	X	2	3	-	- SEC.	ALL	NO
3C	6X40	2-4-2	0	X	-	9	-	X	1	3	-	- SEC.	ALL	NO
4A	6X15	4	0	X	-	5	-	X	1	4	DELAY	5 SEC.	ALL	YES
5A	6X40	2-4-2	0	X	-	6	-	X	1	5	-	- SEC.	ALL	NO
6A	6X6	5	300	X	-	7	-	X	1	6	-	- SEC.	ALL	NO
6B	6X6	5	300	X	-	7	-	X	2	6	-	- SEC.	ALL	NO

6 Phase
Fully Actuated
(Chapel Hill City 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. Phase 1 or phase 5 may be lagged.
4. Reposition existing signal head numbered 42.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▭↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way with Marker	△
→	Directional Arrow	→
→	Pavement Marking Arrow	→
▣	Metal Strain Pole	▣
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓑ
▭	Construction Zone	▭
●——●	Construction Zone Drums	●——●

This plan shall supercede the plan signed and sealed on 1/5/05.

TIMING CHART

NEMA CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6
MINIMUM GREEN	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.
PASSAGE/GAP	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.5 SEC.	3.7 SEC.	3.8 SEC.	3.0 SEC.	4.5 SEC.
RED CLEARANCE	3.3 SEC.	1.4 SEC.	2.6 SEC.	2.3 SEC.	2.9 SEC.	1.0 SEC.
MAX. 1	20 SEC.	90 SEC.	20 SEC.	15 SEC.	20 SEC.	90 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK
WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON
ACTUATION B4 ADD	- VEH.	4 VEH.	- VEH.	- VEH.	- VEH.	4 VEH.
SEC. PER ACTUATION	- SEC.	1.0 SEC.	- SEC.	- SEC.	- SEC.	1.5 SEC.
MAX. INITIAL	- SEC.	34 SEC.	- SEC.	- SEC.	- SEC.	34 SEC.
TIME B4 REDUCTION	- SEC.	15 SEC.	- SEC.	- SEC.	- SEC.	15 SEC.
TIME TO REDUCE	- SEC.	30 SEC.	- SEC.	- SEC.	- SEC.	30 SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	- SEC.	- SEC.	- SEC.	3.0 SEC.

Signal Upgrade Temporary Signal 1

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

US 15-501 (Chapel Hill Blvd) at Southwest Durham Drive/ US 15-501 Service Rd

Division 5 Durham County Durham

PLAN DATE: March 2007 REVIEWED BY: DY Ishak

PREPARED BY: TS Thigpen REVIEWED BY:

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL — NORTH CAROLINA PROFESSIONAL SEAL 030271 ENGINEER RICHARD E. MULLINAX — 14 March 2007

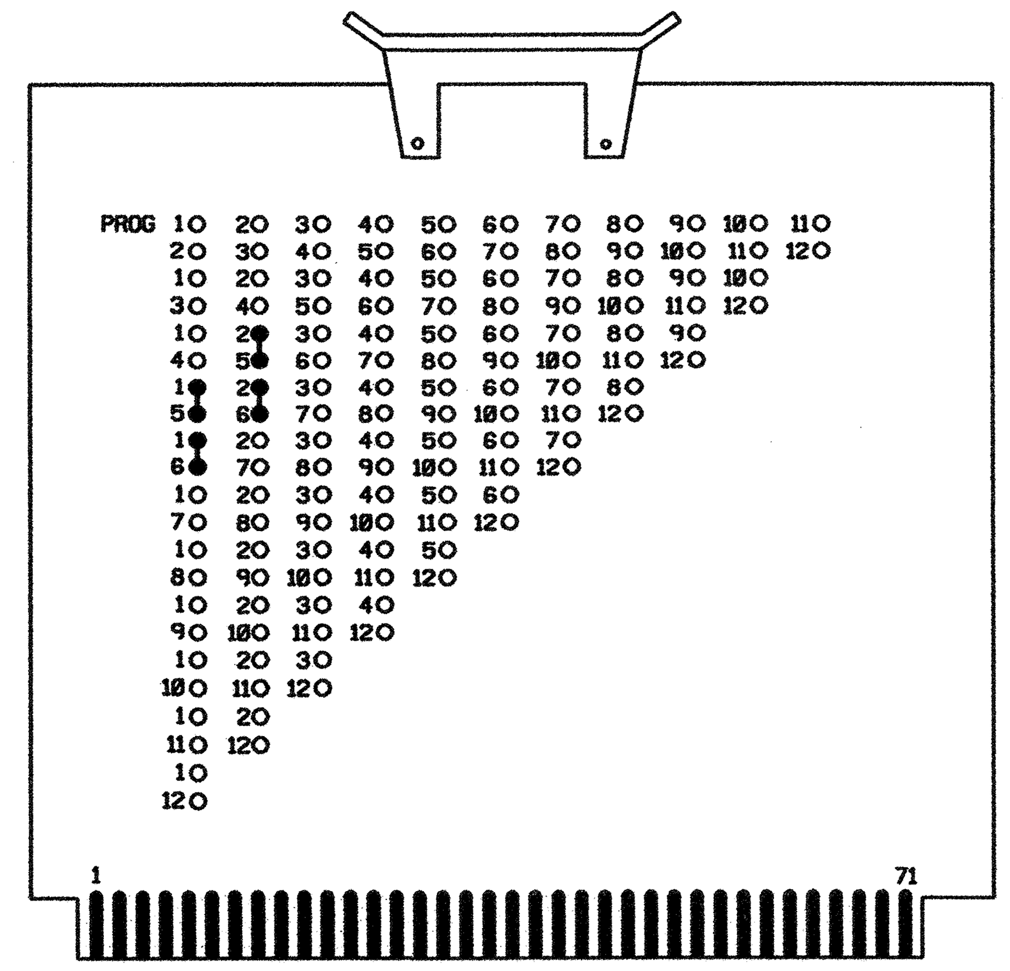
SIGNATURE DATE

SIG. INVENTORY NO. 05-2212 T1

14-MAR-2007 09:51
s:\traffic signals\workgroups\mtp projects\u-4012\signals\05-2212\052212_sig_dsn_20070201.dgn
tthigpen

(EXISTING)

NEMA* CONFLICT MONITOR PROGRAMMING CARD



(INSTALL JUMPERS AS SHOWN)

* NOTE: PROGRAM MONITOR FOR FULL SIGNAL SEQUENCE MONITORING. (NEMA+)

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED PHASES AND OVERLAPS 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: 7,8,9,10,11 AND 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 CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE CONFLICT MONITOR. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. WIRE DETECTORS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.
7. SET ALL DETECTOR UNIT CHANNELS TO 'PRESENCE' MODE.
8. PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR VOLUME DENSITY OPERATION.
9. PROGRAM CONTROLLER AND WIRE CABINET TO BE PART OF THE CITY OF CHAPEL HILL'S COMPUTERIZED SIGNAL SYSTEM. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INTERCONNECTION AND OPERATION OF THIS SIGNAL WITHIN THE SYSTEM.

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 7

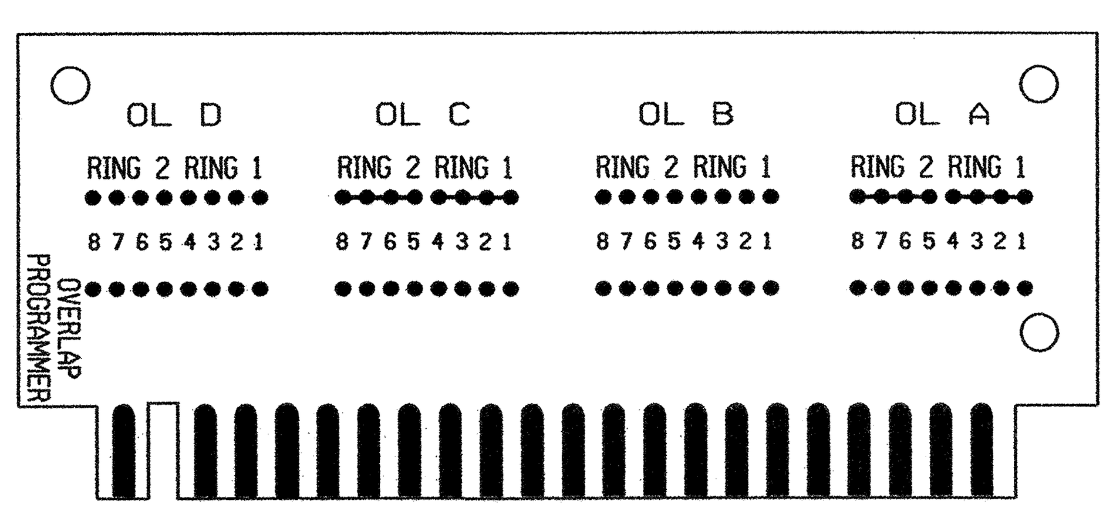
SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3			4			5	6	7	8	OLA	OLB	OLC	OLD	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	34	21,22, 23	23	31,32	33,34	41	42	62	51	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED			356			359	362	362			368										
YELLOW			357			360	363	363			369										
GREEN			358			361	364	364			370										
RED ARROW	353				359					365											
YELLOW ARROW	354	354		360	360				363	366											
GREEN ARROW	355	355		361	361		364		364	367											

NU = NOT USED

(EXISTING)

NEMA OVERLAP CARD



OVERLAP CARD IS COMPLETELY BLANK
(NO JUMPERS)

EQUIPMENT INFORMATION

*CONTROLLER.................TRACONEX TMP-390-8
*CABINET....................IDC TYPE 'P44'(CHAPEL HILL SPEC.'S)
CABINET MOUNT..............BASE
LOADBAY POSITIONS..........16
LOAD SWITCHES USED.........1,2,3,4,5,6
PHASES USED................1,2,3,4,5,6
OVERLAP A..................NOT USED
OVERLAP B..................NOT USED
OVERLAP C..................NOT USED
OVERLAP D..................NOT USED

EXISTING TO REMAIN IN USE*

TYPICAL CONNECTION CHART FOR DETECTORS

PIN FUNCTION	LOOP PANEL TERMINATION
AC+	AC+
AC-	AC-
CHASSIS GROUND	CHASSIS GROUND
LOOP INPUT	LOOP
LOOP INPUT	LOOP
RELAY NORMALLY OPEN	VEHICLE CALL INPUT
RELAY COMMON	LOGIC GROUND
TIMER INHIBIT	ASSOCIATED PHASE GREEN

NOTES:
1. CONNECT THE TIMER INHIBIT WIRE TO THE ASSOCIATED PHASE GREEN LOAD SWITCH OUTPUT WHEN ONLY DELAY OPERATION IS REQUIRED UNLESS OTHERWISE SPECIFIED BY THE LOOP AND DETECTOR UNIT INSTALLATION CHART.
2. IF EXTEND OPERATION IS REQUIRED, DO NOT CONNECT THE DELAY INHIBIT WIRE.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-2212 T1
DESIGNED: MARCH 2007
SEALED: 14 MARCH 2007
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED DECEMBER 2004 AND SEALED 1/6/05

TEMPORARY 1

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 15-501 (CHAPEL HILL BLVD) at SOUTHWEST DURHAM DRIVE/ US 15-501 SERVICE RD

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

DIVISION 05 DURHAM COUNTY DURHAM

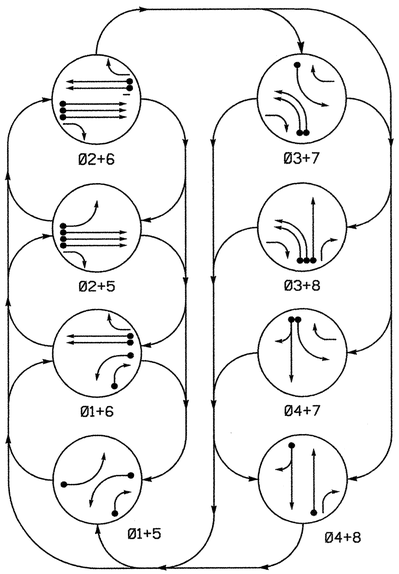
PLAN DATE: MARCH 2007	REVIEWED BY: JTR
PREPARED BY: F.E. RUSS	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
John T. Rowe Jr. 3-23-07
SIGNATURE DATE
SIG. INVENTORY NO. 05-2212 T1

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig.8

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

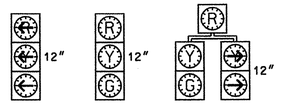
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	03+07	03+08	04+07	04+08	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
23	R	R	G	G	R/→	R/→	R	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
41, 42	R	R	R	R	R	R	G	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R/→	R	R/→	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



11	21, 22	23
31, 32	41, 42	62
51	61	82
71	81	

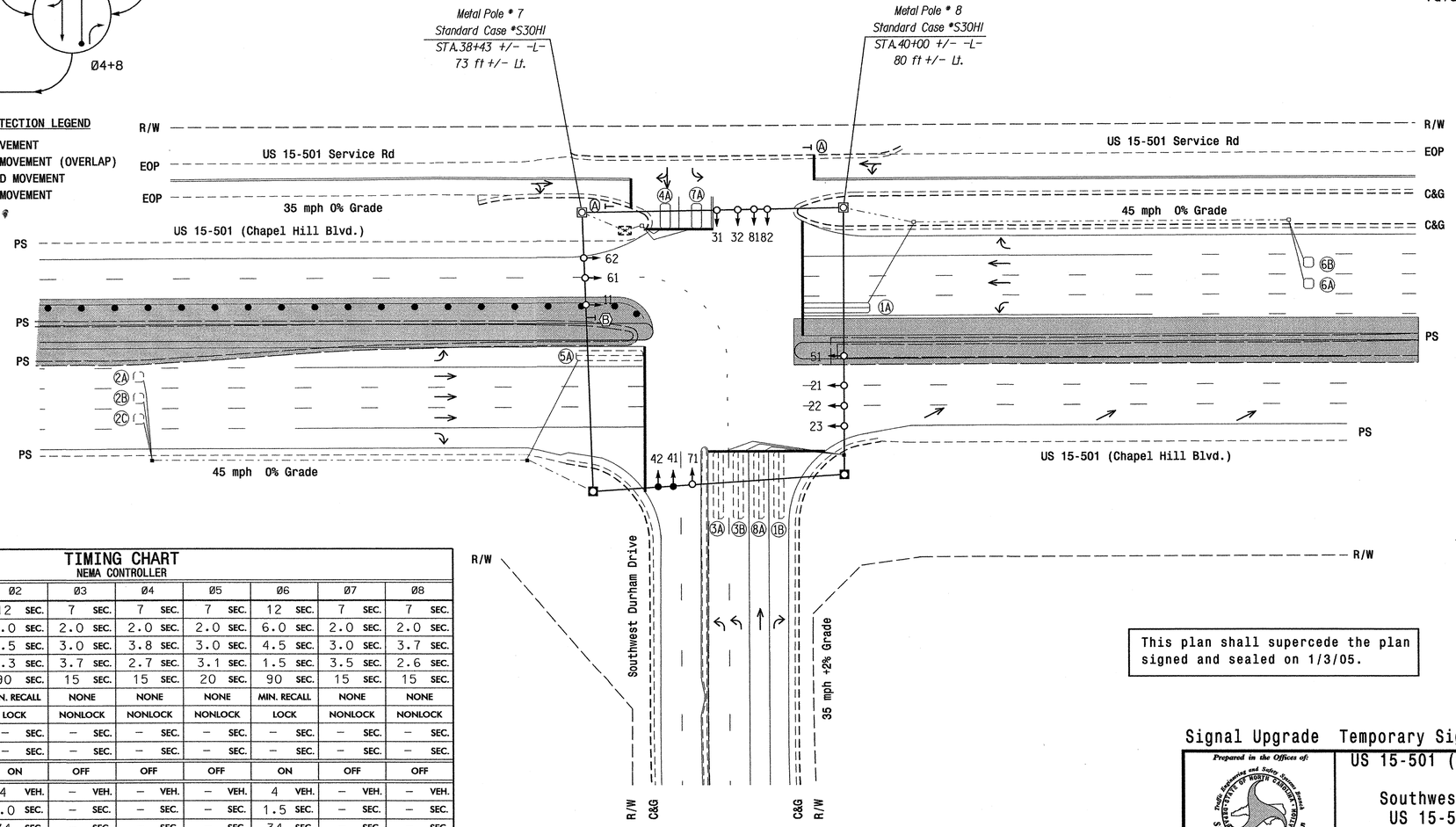
LOOP & DETECTOR UNIT INSTALLATION CHART
NEMA CONTROLLER WITH TS-1 CABINET

INDUCTIVE LOOPS						DETECTOR UNITS							
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	UNIT NO.	NEW	EXISTING	CHANNEL	NEMA PHASE	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN?
1A	6X40	2-4-2	0		X	1	-	X	1	1	-	- SEC.	ALL	NO
1B	6X40	2-4-2	0	-	X	1	-	X	2	1	DELAY	15 SEC.	ALL	YES
2A	6X6	5	300	-	X	2	-	X	1	2	-	- SEC.	ALL	NO
2B	6X6	5	300	-	X	2	-	X	2	2	-	- SEC.	ALL	NO
2C	6X6	5	300	-	X	3	-	X	1	2	-	- SEC.	ALL	NO
3A	6X40	2-4-2	0	-	X	4	-	X	1	3	-	- SEC.	ALL	NO
3B	6X40	2-4-2	0	-	X	4	-	X	2	3	-	- SEC.	ALL	NO
4A	6X15	4	0	X	-	5	-	X	1	4	DELAY	10 SEC.	ALL	YES
5A	6X40	2-4-2	0	-	X	6	-	X	1	5	-	- SEC.	ALL	NO
6A	6X6	5	300	X	-	7	-	X	1	6	-	- SEC.	ALL	NO
6B	6X6	5	300	X	-	7	-	X	2	6	-	- SEC.	ALL	NO
7A	6X15	4	0	X	-	8	-	X	2	7	-	- SEC.	ALL	NO
8A	6X40	2-4-2	0	-	X	9	-	X	1	8	-	- SEC.	ALL	NO

8 Phase
Fully Actuated
(Chapel Hill City 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. Phase 1 or phase 5 may be lagged.
4. Phase 3 or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



TIMING CHART
NEMA CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
MINIMUM GREEN	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.	7 SEC.
PASSAGE/GAP	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.5 SEC.	3.0 SEC.	3.8 SEC.	3.0 SEC.	4.5 SEC.	3.0 SEC.	3.7 SEC.
RED CLEARANCE	3.4 SEC.	1.3 SEC.	3.7 SEC.	2.7 SEC.	3.1 SEC.	1.5 SEC.	3.5 SEC.	2.6 SEC.
MAX. 1	20 SEC.	90 SEC.	15 SEC.	15 SEC.	20 SEC.	90 SEC.	15 SEC.	15 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK	NONLOCK
WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
ACTUATION B4 ADD	- VEH.	4 VEH.	- VEH.	- VEH.	- VEH.	4 VEH.	- VEH.	- VEH.
SEC. PER ACTUATION	- SEC.	1.0 SEC.	- SEC.	- SEC.	- SEC.	1.5 SEC.	- SEC.	- SEC.
MAX. INITIAL	- SEC.	34 SEC.	- SEC.	- SEC.	- SEC.	34 SEC.	- SEC.	- SEC.
TIME B4 REDUCTION	- SEC.	15 SEC.	- SEC.	- SEC.	- SEC.	15 SEC.	- SEC.	- SEC.
TIME TO REDUCE	- SEC.	30 SEC.	- SEC.	- SEC.	- SEC.	30 SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	- SEC.	- SEC.	- SEC.	3.0 SEC.	- SEC.	- SEC.

This plan shall supercede the plan signed and sealed on 1/3/05.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
T	Sign	T
	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	→
→	Pavement Marking Arrow	→
	Metal Strain Pole	
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓑ
	Construction Zone	
	Construction Zone Drums	

Signal Upgrade Temporary Signal 2

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

US 15-501 (Chapel Hill Blvd) at Southwest Durham Drive/ US 15-501 Service Rd

Division 5 Durham County Durham

PLAN DATE:	March 2007	REVIEWED BY:	D Y Ishak
PREPARED BY:	TS Thigpen	REVIEWED BY:	

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

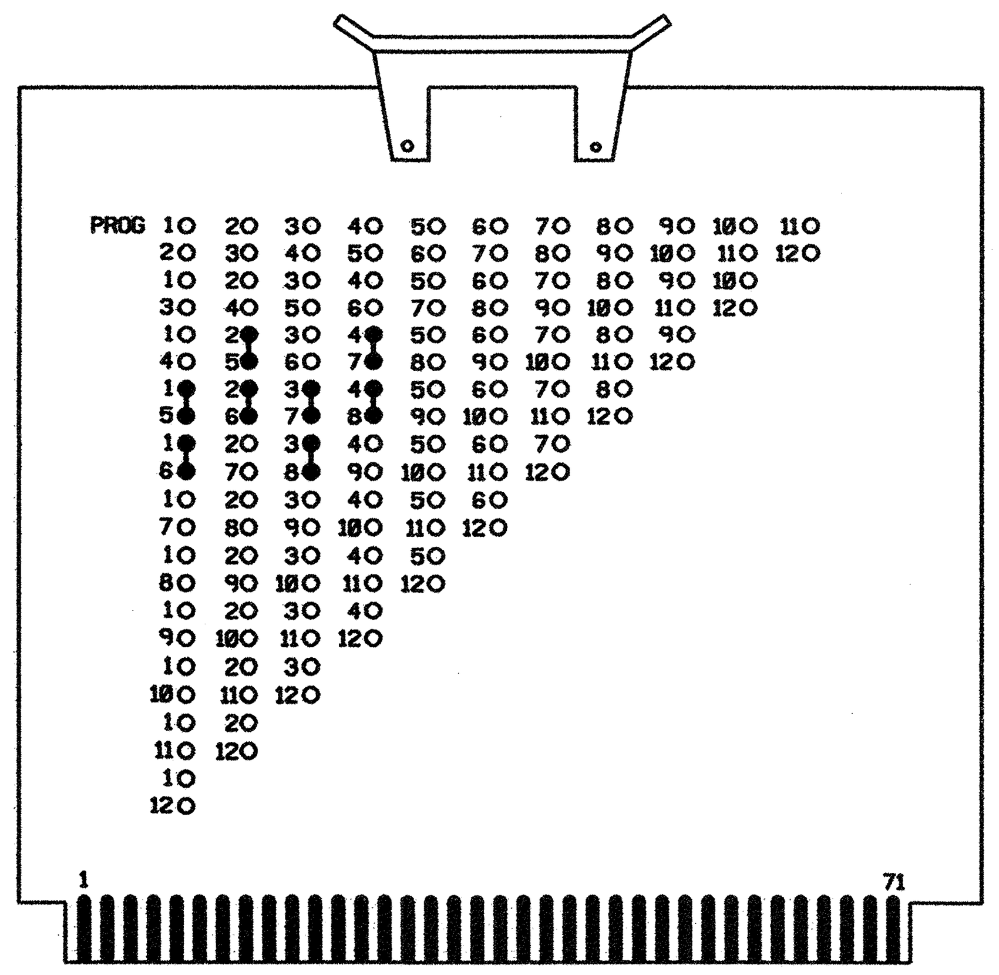
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 024061 ENGINEER RICHARD E. MULLINAX
SIGNATURE DATE
SIG. INVENTORY NO. 05-2212 T2

14-MAR-2007 10:33
c:\mtb_signals\workgroups\mtip projects\mu-4012#s\signals\#05-2212#052212_sig_dsn_20070201.dgn
mtb_user

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig.9

(EXISTING)

NEMA* CONFLICT MONITOR PROGRAMMING CARD



(INSTALL JUMPERS AS SHOWN)

* NOTE: PROGRAM MONITOR FOR FULL SIGNAL SEQUENCE MONITORING. (NEMA+)

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED PHASES AND OVERLAPS 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: 9,10,11 AND 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 CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE CONFLICT MONITOR. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. WIRE DETECTORS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.
7. SET ALL DETECTOR UNIT CHANNELS TO 'PRESENCE' MODE.
8. PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR VOLUME DENSITY OPERATION.
9. PROGRAM CONTROLLER AND WIRE CABINET TO BE PART OF THE CITY OF CHAPEL HILL'S COMPUTERIZED SIGNAL SYSTEM. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INTERCONNECTION AND OPERATION OF THIS SIGNAL WITHIN THE SYSTEM.

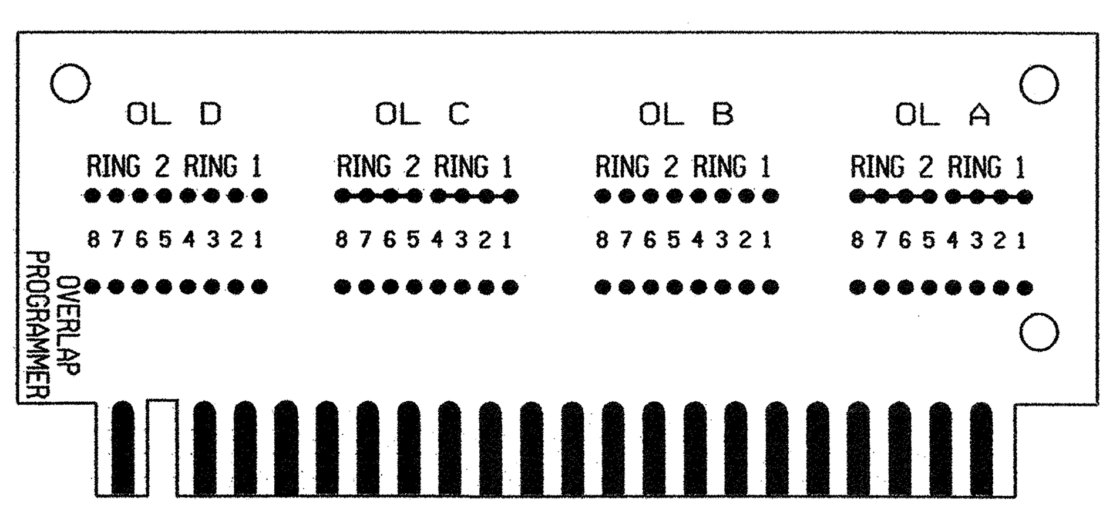
SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3		4	5	6	7		8	OLA	OLB	OLC	OLD	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	82	21,22, 23	23	31,32	41,42	51	61,62	62	71	81,82	NU	NU	NU	NU	NU	NU	NU	NU
RED			356			362		368			374								
YELLOW			357			363		369			375								
GREEN			358			364		370			376								
RED ARROW	353				359		365			371									
YELLOW ARROW	354	354		360	360		366		372	372									
GREEN ARROW	355	355		361	361		367		373	373									

NU = NOT USED

(EXISTING)

NEMA OVERLAP CARD



OVERLAP CARD IS COMPLETELY BLANK
(NO JUMPERS)

EQUIPMENT INFORMATION

*CONTROLLER.................TRACONEX TMP-390-8
*CABINET....................IDC TYPE 'P44'(CHAPEL HILL SPEC.'S)
CABINET MOUNT..............BASE
LOADBAY POSITIONS..........16
LOAD SWITCHES USED.........1,2,3,4,5,6,7,8
PHASES USED................1,2,3,4,5,6,7,8
OVERLAP A..................NOT USED
OVERLAP B..................NOT USED
OVERLAP C..................NOT USED
OVERLAP D..................NOT USED

EXISTING TO REMAIN IN USE*

TYPICAL CONNECTION CHART FOR DETECTORS

PIN FUNCTION	LOOP PANEL TERMINATION
AC+	AC+
AC-	AC-
CHASSIS GROUND	CHASSIS GROUND
LOOP INPUT	LOOP
LOOP INPUT	LOOP
RELAY NORMALLY OPEN	VEHICLE CALL INPUT
RELAY COMMON	LOGIC GROUND
TIMER INHIBIT	ASSOCIATED PHASE GREEN

NOTES:

1. CONNECT THE TIMER INHIBIT WIRE TO THE ASSOCIATED PHASE GREEN LOAD SWITCH OUTPUT WHEN ONLY DELAY OPERATION IS REQUIRED UNLESS OTHERWISE SPECIFIED BY THE LOOP AND DETECTOR UNIT INSTALLATION CHART.
2. IF EXTEND OPERATION IS REQUIRED, DO NOT CONNECT THE DELAY INHIBIT WIRE.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-2212 T2
DESIGNED: MARCH 2007
SEALED: 14 MARCH 2007
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED DECEMBER 2004 AND SEALED 1/6/05

TEMPORARY 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 15-501 (CHAPEL HILL BLVD) at SOUTHWEST DURHAM DRIVE/ US 15-501 SERVICE RD

DIVISION 05 | DURHAM COUNTY | DURHAM

PLAN DATE: MARCH 2007	REVIEWED BY:
PREPARED BY: F.E. RUSS	REVIEWED BY:

REVISIONS	INIT.	DATE

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

SIGNATURE: John T. Rowe Jr. DATE: 3-23-07

SIG. INVENTORY NO. 05-2212 T2

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig.10

PHASING DIAGRAM

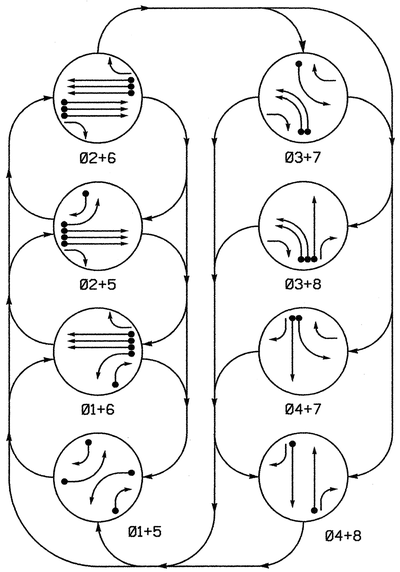
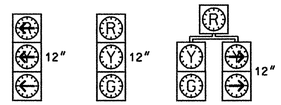


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
23	R	R	G	G	R/→	R/→	R	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
63	R	G	R	G	R/→	R	R/→	R	Y
71	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	←	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



11	21, 22	23
31, 32	41	42
51	61, 62	63
71	81	82

LOOP & DETECTOR UNIT INSTALLATION CHART
NEMA CONTROLLER WITH TS-1 CABINET

INDUCTIVE LOOPS					DETECTOR UNITS								
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW / EXISTING	UNIT NO.	NEW / EXISTING	CHANNEL	NEMA PHASE	TIMING FEATURE	TIMING TIME	PLACE CALL DURING PHASE	INHIBIT DELAY DURING GREEN?
1A	6X40	2-4-2	0	X / -	1	- / X	1	1	-	- SEC.	ALL	NO
1B	6X40	2-4-2	0	- / X	1	- / X	2	1	DELAY	15 SEC.	ALL	YES
2A	6X6	5	300	- / X	2	- / X	1	2	-	- SEC.	ALL	NO
2B	6X6	5	300	- / X	2	- / X	2	2	-	- SEC.	ALL	NO
2C	6X6	5	300	- / X	3	- / X	1	2	-	- SEC.	ALL	NO
3A	6X40	2-4-2	0	- / X	4	- / X	1	3	-	- SEC.	ALL	NO
3B	6X40	2-4-2	0	- / X	4	- / X	2	3	-	- SEC.	ALL	NO
4A	6X15	4	0	X / -	5	- / X	1	4	-	- SEC.	ALL	NO
5A	6X40	2-4-2	0	- / X	6	- / X	1	5	-	- SEC.	ALL	NO
5B	6X15	4	0	X / -	6	- / X	2	5	DELAY	15 SEC.	ALL	YES
6A	6X6	5	300	X / -	7	- / X	1	6	-	- SEC.	ALL	NO
6B	6X6	5	300	- / X	7	- / X	2	6	-	- SEC.	ALL	NO
6C	6X6	5	300	- / X	8	- / X	1	6	-	- SEC.	ALL	NO
7A	6X15	4	0	X / -	8	- / X	2	7	-	- SEC.	ALL	NO
8A	6X40	2-4-2	0	- / X	9	- / X	1	8	-	- SEC.	ALL	NO

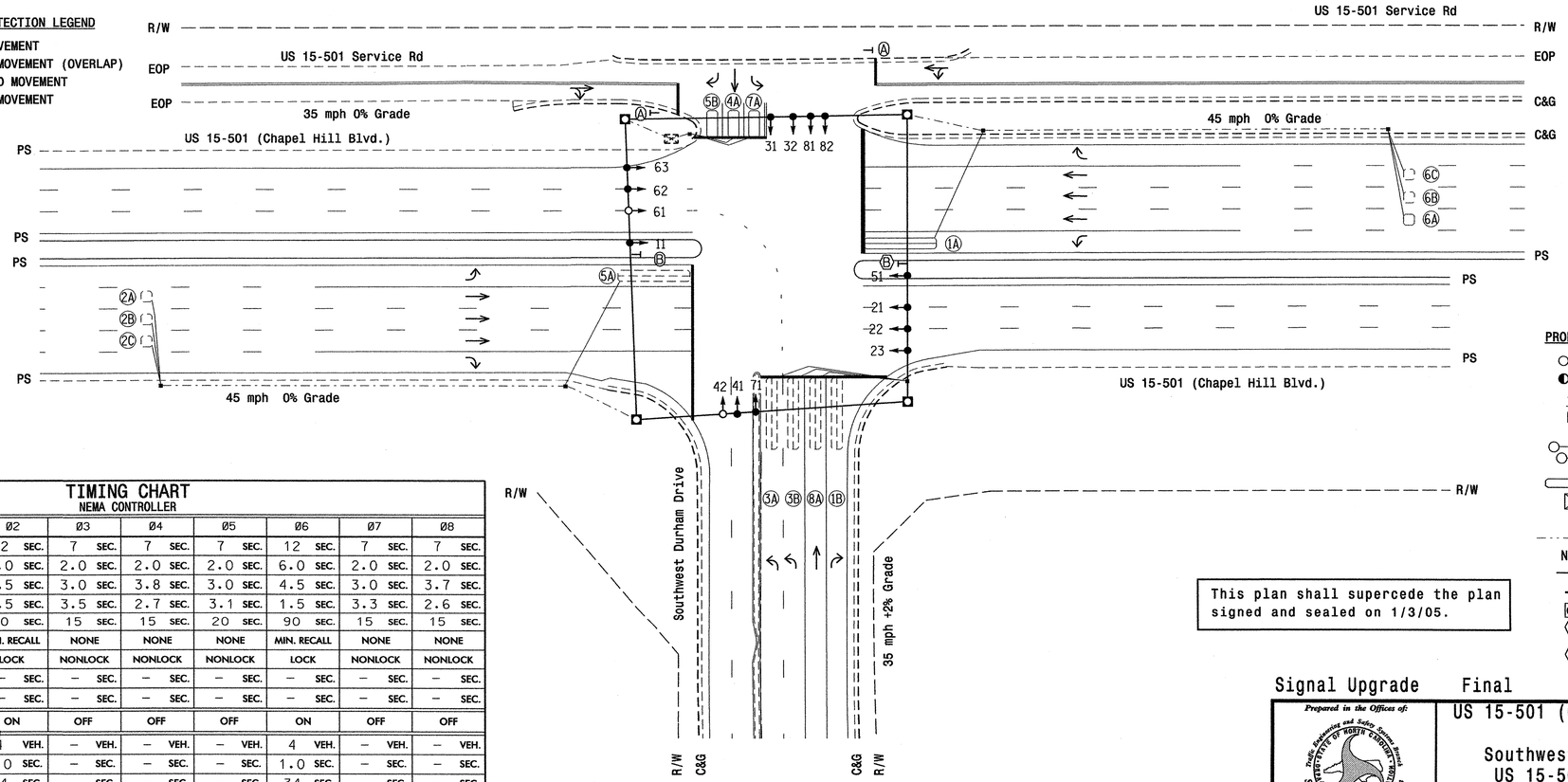
8 Phase
Fully Actuated
(Chapel Hill City System)

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. Phase 1 or phase 5 may be lagged.
4. Phase 3 or phase 7 may be lagged.
5. Reposition existing signal heads numbered 11, 41 and 71.
6. Set all detector units to presence mode.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND

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



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
☐	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○⤵	Signal Pole with Sidewalk Guy	●⤵
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
	2-in Underground Conduit	
N/A	Right of Way with Marker	△
→	Directional Arrow	→
→	Pavement Marking Arrow	→
◎	Metal Strain Pole	◘
Ⓐ	"STOP" Sign (R1-1)	Ⓐ
Ⓑ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓑ

TIMING CHART
NEMA CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
MINIMUM GREEN	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.	7 SEC.
PASSAGE/GAP	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.5 SEC.	3.0 SEC.	3.8 SEC.	3.0 SEC.	4.5 SEC.	3.0 SEC.	3.7 SEC.
RED CLEARANCE	3.4 SEC.	1.5 SEC.	3.5 SEC.	2.7 SEC.	3.1 SEC.	1.5 SEC.	3.3 SEC.	2.6 SEC.
MAX. 1	20 SEC.	90 SEC.	15 SEC.	15 SEC.	20 SEC.	90 SEC.	15 SEC.	15 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK	NONLOCK
WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
ACTUATION B4 ADD	– VEH.	4 VEH.	– VEH.	– VEH.	– VEH.	4 VEH.	– VEH.	– VEH.
SEC. PER ACTUATION	– SEC.	1.0 SEC.	– SEC.	– SEC.	– SEC.	1.0 SEC.	– SEC.	– SEC.
MAX. INITIAL	– SEC.	34 SEC.	– SEC.	– SEC.	– SEC.	34 SEC.	– SEC.	– SEC.
TIME B4 REDUCTION	– SEC.	15 SEC.	– SEC.	– SEC.	– SEC.	15 SEC.	– SEC.	– SEC.
TIME TO REDUCE	– SEC.	30 SEC.	– SEC.	– SEC.	– SEC.	30 SEC.	– SEC.	– SEC.
MINIMUM GAP	– SEC.	3.0 SEC.	– SEC.	– SEC.	– SEC.	3.0 SEC.	– SEC.	– SEC.

This plan shall supercede the plan signed and sealed on 1/3/05.

Signal Upgrade Final

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

US 15-501 (Chapel Hill Blvd) at Southwest Durham Drive/ US 15-501 Service Rd

Division 5 Durham County Durham

PLAN DATE:	March 2007	REVIEWED BY:	DY Ishak
PREPARED BY:	TS Thigpen	REVIEWED BY:	

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24602 — RICHARD E. MULLINAX — 14 March 2007

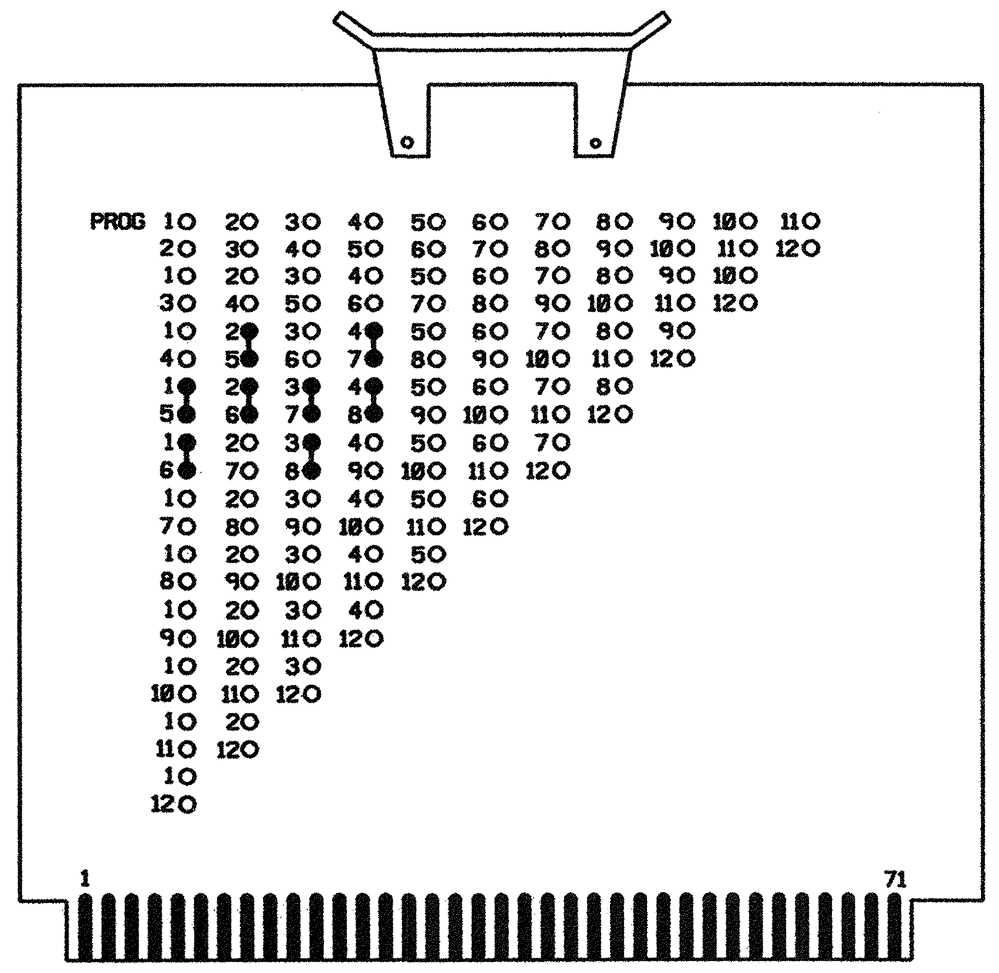
SIGNATURE DATE

SIG. INVENTORY NO. 05-2212

14-MAR-2007 10:53
s:\ets_signals\workgroup\setup projects\mu-4012#\signals#05-2212#05212_sig_dsn_20070201.dgn
jthigpen

(EXISTING)

NEMA* CONFLICT MONITOR PROGRAMMING CARD



(INSTALL JUMPERS AS SHOWN)

* NOTE: PROGRAM MONITOR FOR FULL SIGNAL SEQUENCE MONITORING. (NEMA+)

NOTES

1. TO PREVENT "FLASH-CONFLICT" PROBLEMS, WIRE ALL UNUSED PHASES AND OVERLAPS 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: 9,10,11 AND 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 CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT ON THE CONFLICT MONITOR. SET CONTROLLER POWER-UP FLASH TIME TO 0 SECONDS.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. WIRE DETECTORS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.
7. SET ALL DETECTOR UNIT CHANNELS TO 'PRESENCE' MODE.
8. PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR VOLUME DENSITY OPERATION.
9. PROGRAM CONTROLLER AND WIRE CABINET TO BE PART OF THE CITY OF CHAPEL HILL'S COMPUTERIZED SIGNAL SYSTEM. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER INTERCONNECTION AND OPERATION OF THIS SIGNAL WITHIN THE SYSTEM.

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 11

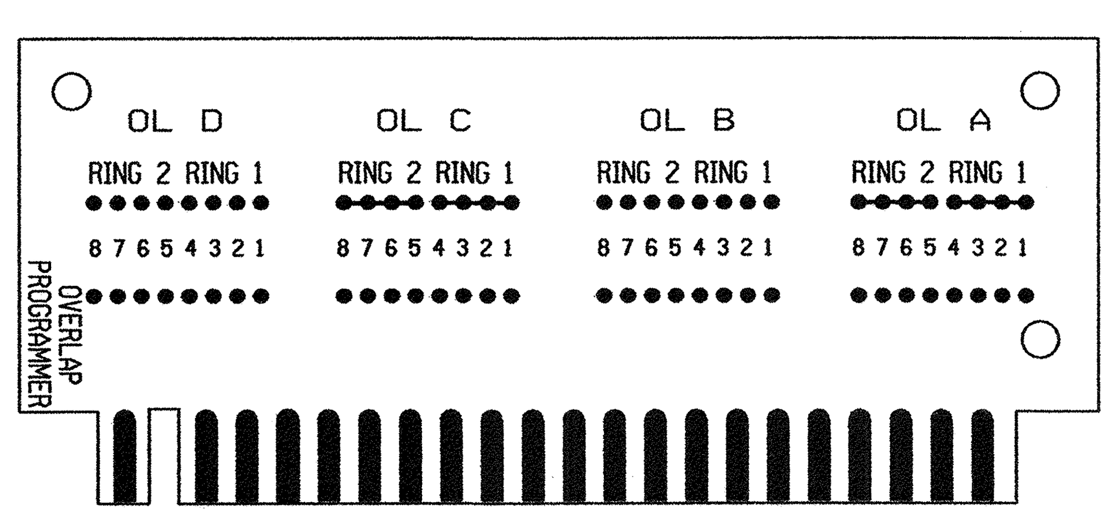
SIGNAL HEAD HOOK-UP CHART

PHASE	1		2	3		4	5		6	7		8	OLA	OLB	OLC	OLD	2 PED	4 PED	6 PED	8 PED
SIGNAL HEAD NO.	11	82	21,22, 23	23	31,32	41,42	42	51	61,62, 63	63	71	81,82	NU	NU	NU	NU	NU	NU	NU	NU
RED			356			362			368			374								
YELLOW			357			363			369			375								
GREEN			358			364			370			376								
RED ARROW	353				359			365			371									
YELLOW ARROW	354	354		360	360		366	366		372	372									
GREEN ARROW	355	355		361	361		367	367		373	373									

NU = NOT USED

(EXISTING)

NEMA OVERLAP CARD



OVERLAP CARD IS COMPLETELY BLANK
(NO JUMPERS)

EQUIPMENT INFORMATION

*CONTROLLER.................TRACONEX TMP-390-8
*CABINET....................IDC TYPE 'P44'(CHAPEL HILL SPEC.'S)
CABINET MOUNT..............BASE
LOADBAY POSITIONS..........16
LOAD SWITCHES USED.........1,2,3,4,5,6,7,8
PHASES USED................1,2,3,4,5,6,7,8
OVERLAP A..................NOT USED
OVERLAP B..................NOT USED
OVERLAP C..................NOT USED
OVERLAP D..................NOT USED

EXISTING TO REMAIN IN USE*

TYPICAL CONNECTION CHART FOR DETECTORS

PIN FUNCTION	LOOP PANEL TERMINATION
AC+	AC+
AC-	AC-
CHASSIS GROUND	CHASSIS GROUND
LOOP INPUT	LOOP
LOOP INPUT	LOOP
RELAY NORMALLY OPEN	VEHICLE CALL INPUT
RELAY COMMON	LOGIC GROUND
TIMER INHIBIT	ASSOCIATED PHASE GREEN

NOTES:
1. CONNECT THE TIMER INHIBIT WIRE TO THE ASSOCIATED PHASE GREEN LOAD SWITCH OUTPUT WHEN ONLY DELAY OPERATION IS REQUIRED UNLESS OTHERWISE SPECIFIED BY THE LOOP AND DETECTOR UNIT INSTALLATION CHART.
2. IF EXTEND OPERATION IS REQUIRED, DO NOT CONNECT THE DELAY INHIBIT WIRE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-2212
DESIGNED: MARCH 2007
SEALED: 14 MARCH 2007
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED DECEMBER 2004 AND SEALED 1/6/05

FINAL

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 15-501 (CHAPEL HILL BLVD)
at
SOUTHWEST DURHAM DRIVE/
US 15-501 SERVICE RD

DIVISION 05 DURHAM COUNTY DURHAM

PLAN DATE: MARCH 2007	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 3-23-07
SIG. INVENTORY NO. 05-2212

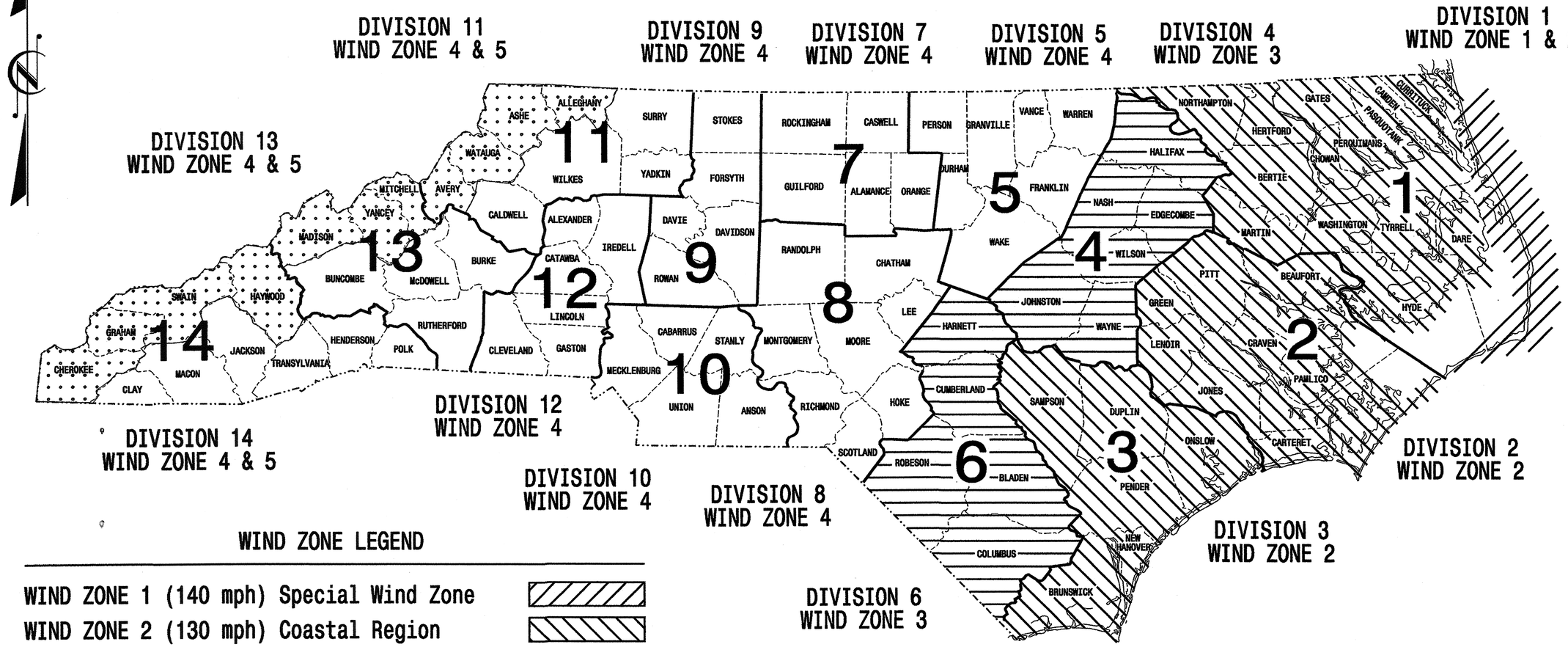
STATE	PROJECT NO.	SHEET NO.
N.C.	U-4012	Sig. 12
F. A. PROJ. NO.		M 1
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR METAL POLES

POLE STANDARDS

NCDOT METAL P



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:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION • MOTION
Signals and Geometrics Section

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, Luminares, and Traffic Signals

INDEX OF PLANS

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

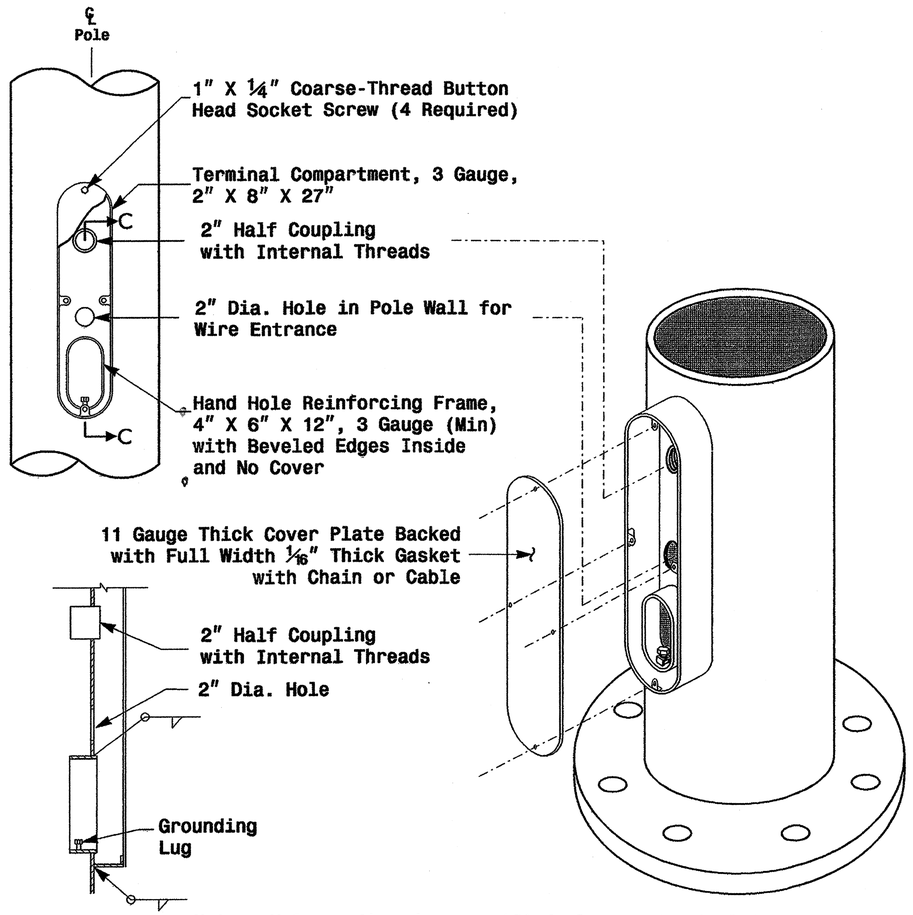
G. A. Fuller, P.E. – State ITS and Signals Engineer
R. E. Mullinax, P.E. – Signals and Geometrics Engineer
P. L. Alexander, P.E. – Signals and Geometrics Special Projects Engineer
D. C. Sarkar, P.E. – Signals and Geometrics Structural Engineer
A. M. Esposito, P.E. – Signals and Geometrics Project Engineer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

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar — SIGNATURE

9.2.2005 — DATE



Section C-C

Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail

MFG _____ MFG. DATE: MM/YY
SHAFT D/T/L/Y ----/----/----/----
ARM-A D/T/L/Y ----/----/----/----
----/----/----/----
ARM-B D/T/L/Y ----/----/----/----
----/----/----/----
A.B. DIA./B.C./L/Y ----/----/----/----
NCDOT STANDARD ----------

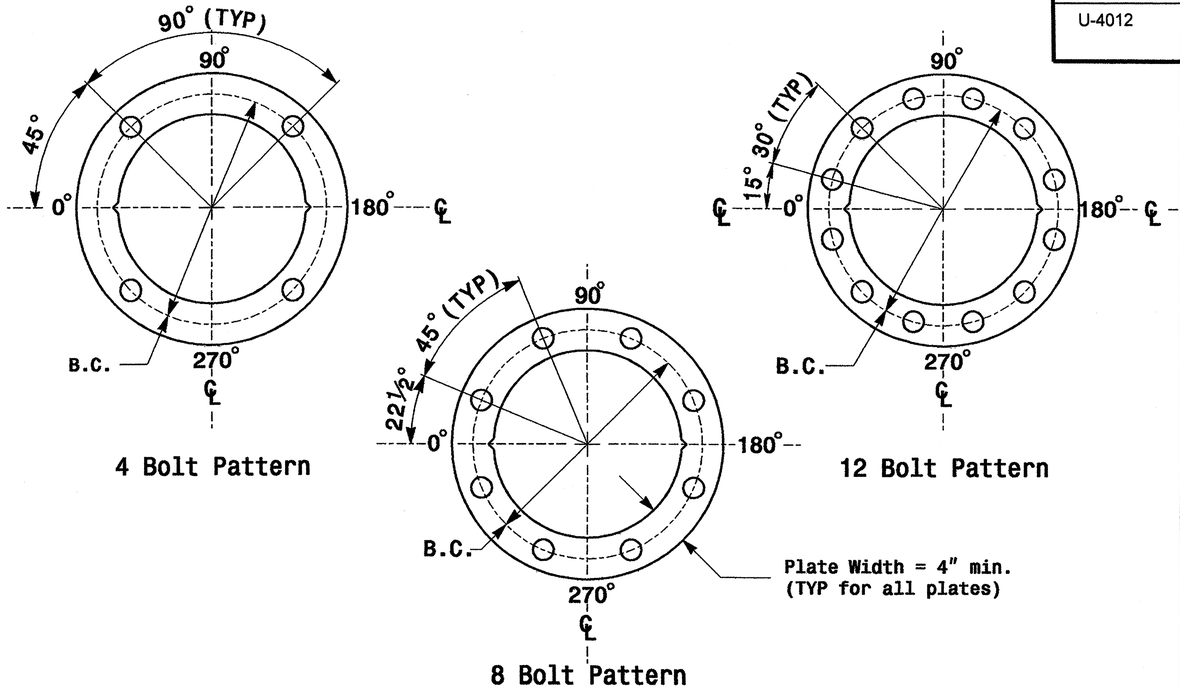
Shaft I.D. Tag
(Provide on Strain Poles and Mast Arm Poles)

MFG _____ MFG. DATE: MM/YY
SECTION D/T/L/Y ----/----/----/----
NCDOT STANDARD ----------

Arm I.D. Tag
(Provide on each section of a multi-section mast arm)

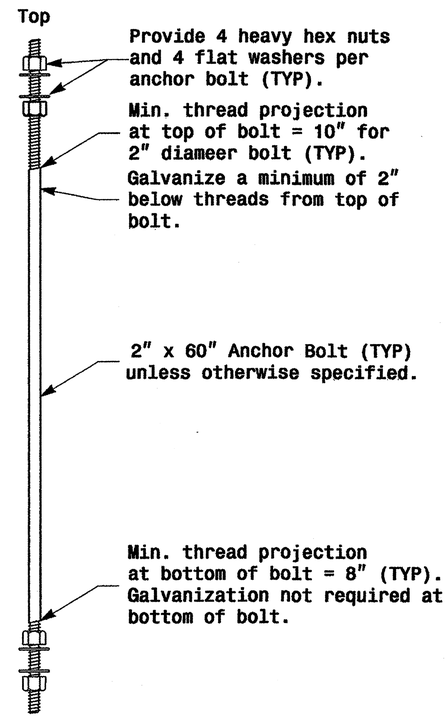
Notes:
1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
2) A.B. = Anchor Bolt
3) B.C. = Bolt Circle of Anchor Bolts
4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
5) See drawing M4 for mounting positions of I.D. tags.

Identification Tag Details



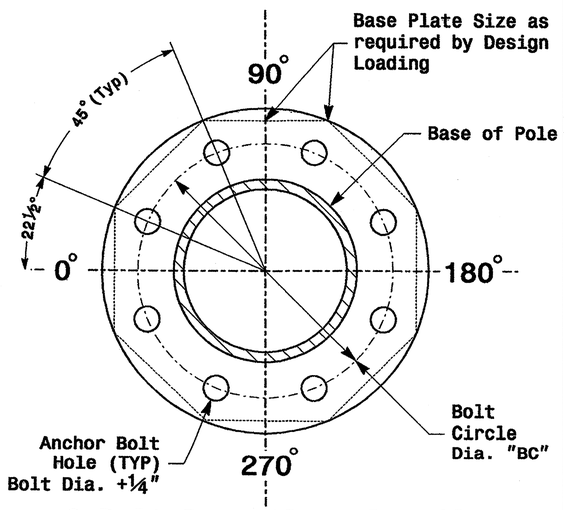
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

Base Plate Template and Anchor Bolt Lock Plate Details



Anchor Bolt Detail

Note: See Strain Pole drawing M3 and Mast arm drawing M4 for base plate weld details.



8 Bolt Base Plate Detail

Fabrication Details – All Poles

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 13 M 2

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, North Carolina Department of Transportation, 1122 N. McDowell St., Raleigh, NC 27603

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: 0 NA NONE

REVISIONS	INIT.	DATE

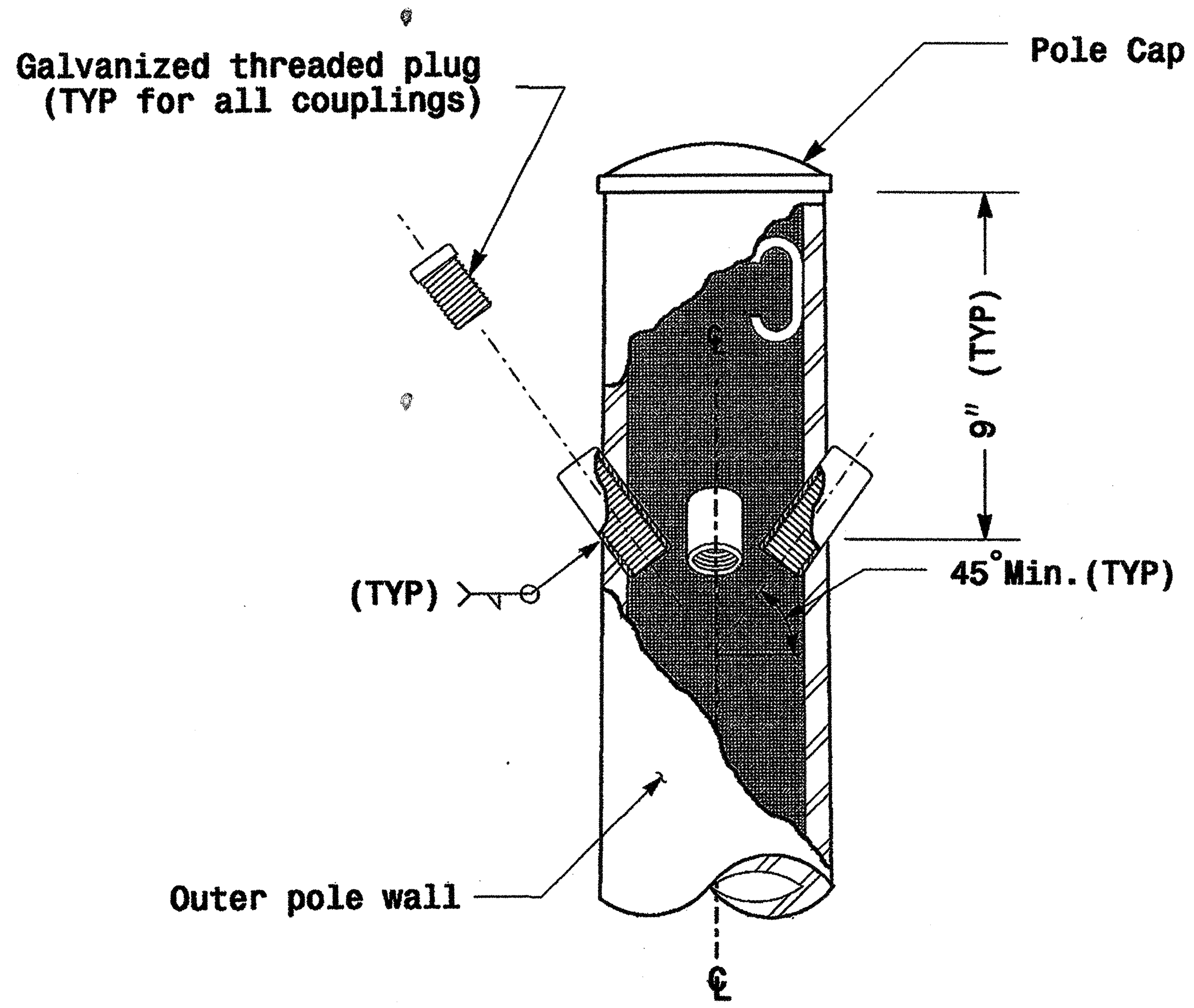
SEAL — NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DIBESH C. SARKAR

SIGNATURE D. Sarkar 9.2.2005 DATE

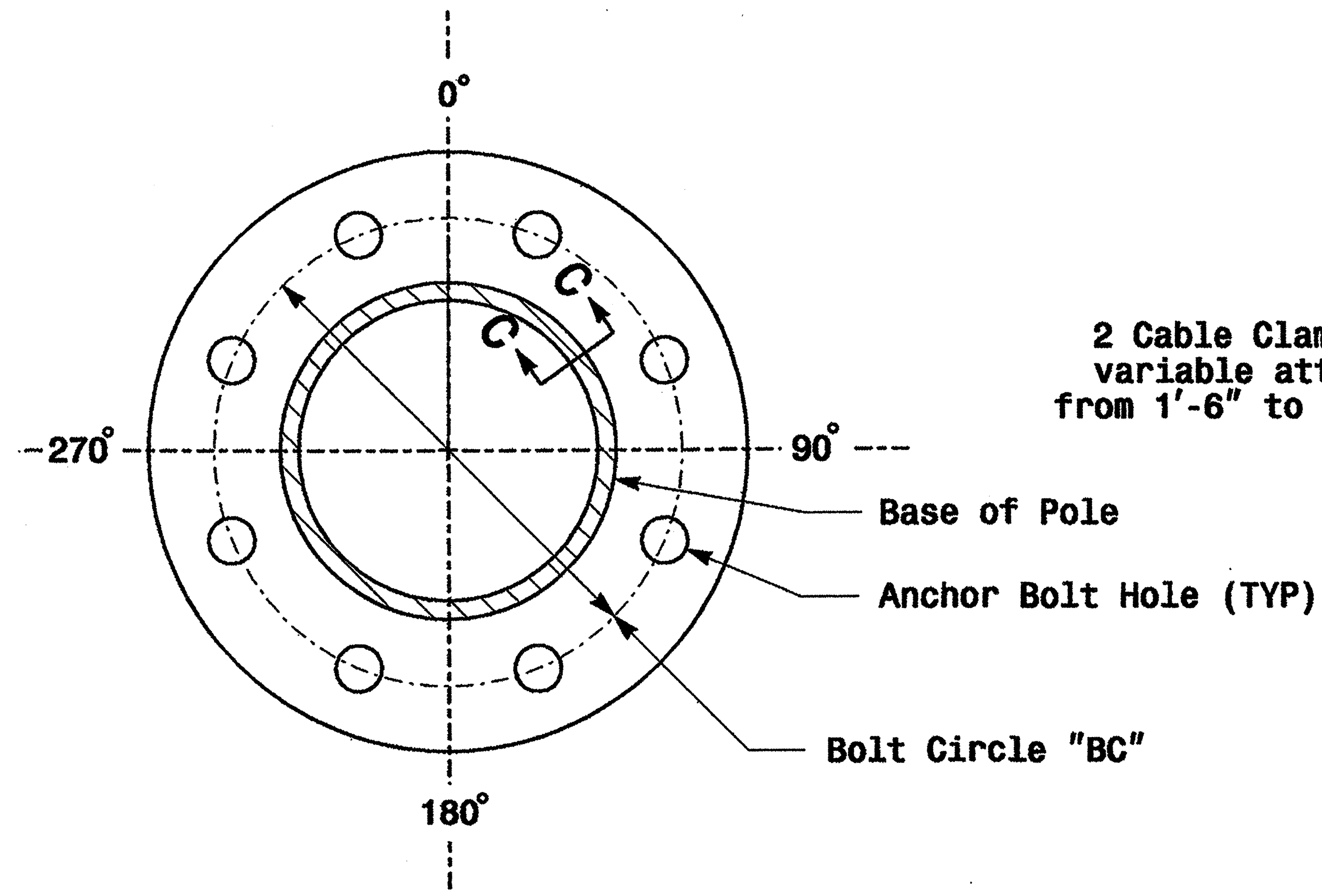
SIG. INVENTORY NO.

01-SEP-2005 18:22
D:\e2004 Metal Pole Standards\e2004 m2 thru m6.dgn
candrews

Fabrication Details – Strain Poles



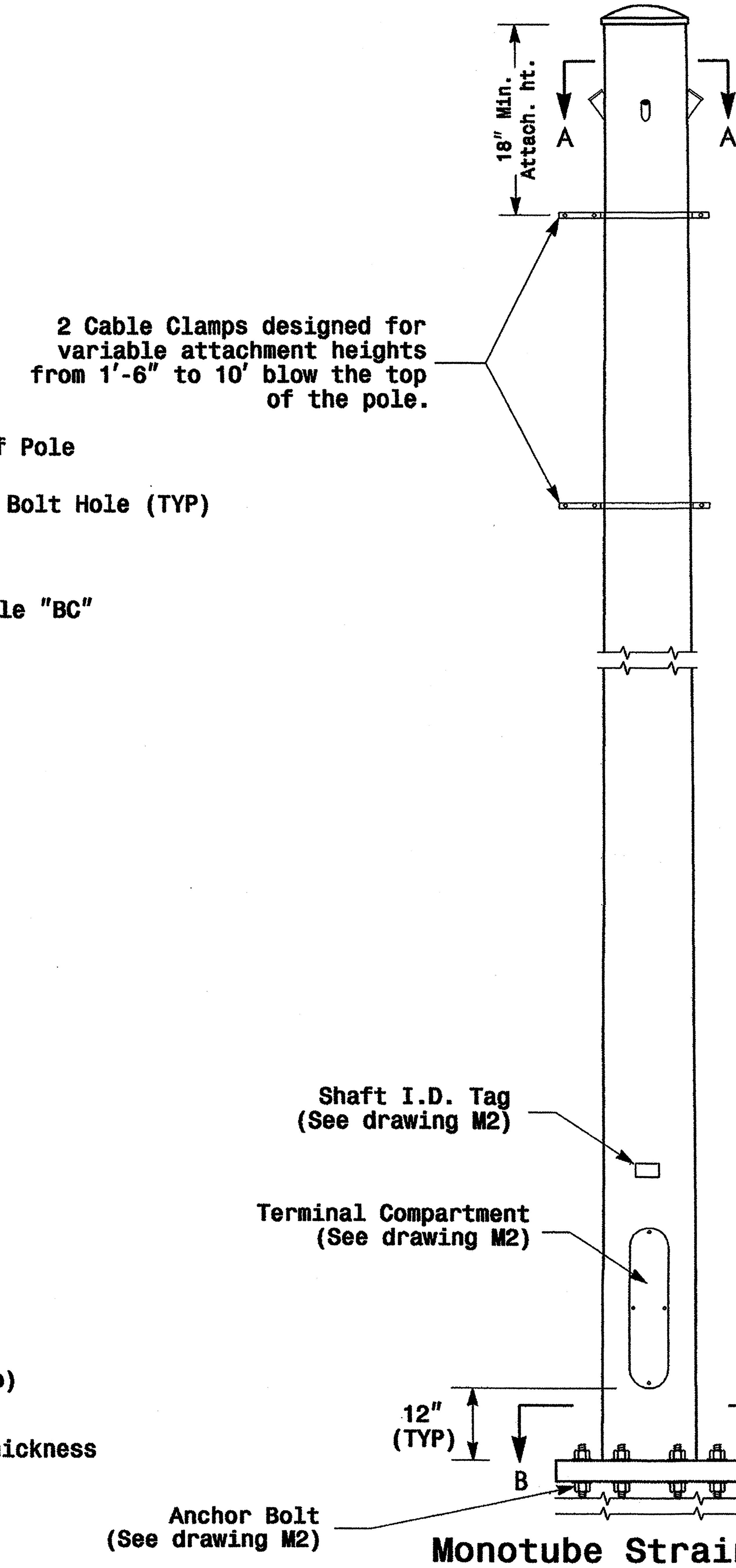
Cable Entrances at Top of Pole



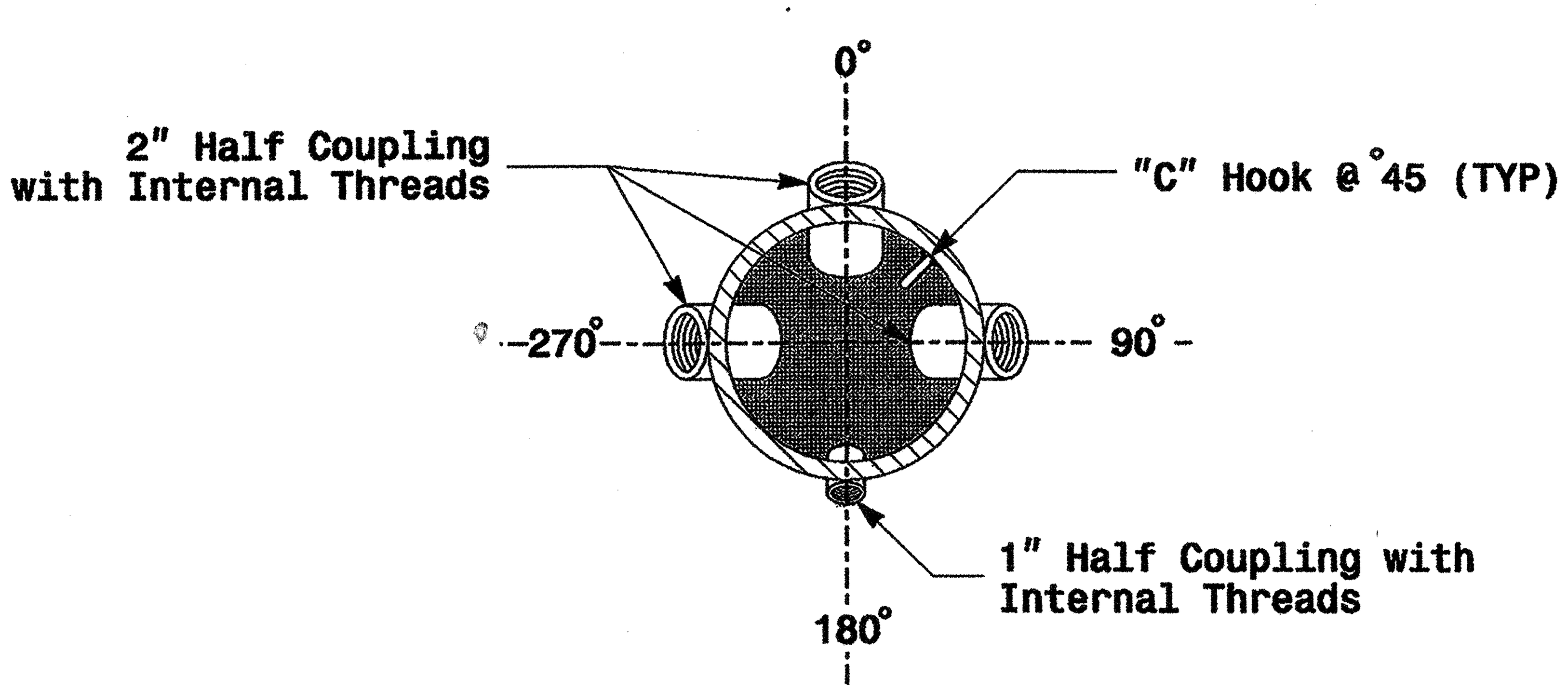
Section B-B

(See drawing M2)

Pole Base Plate

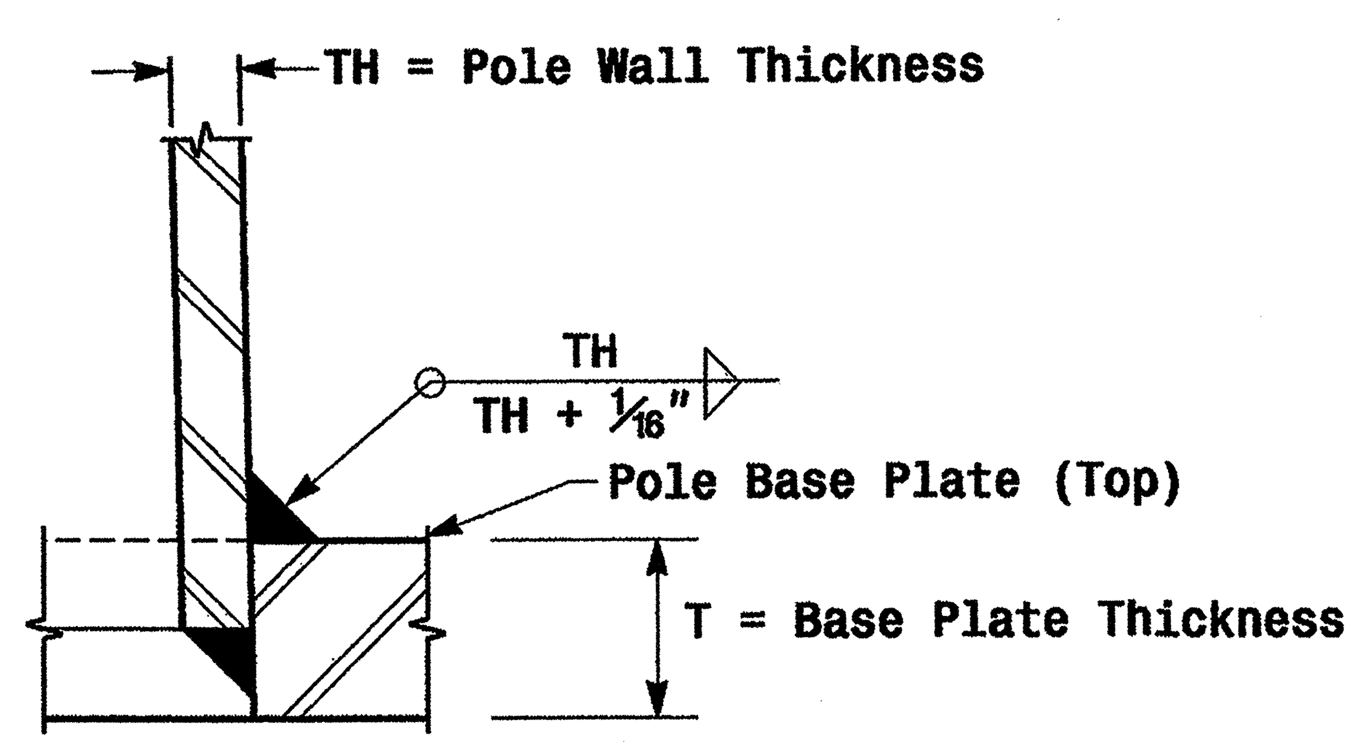


Monotube Strain Pole (.14"/Foot Taper)



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

Socket Connection Weld Detail

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

Typical Fabrication Details For Strain Poles

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

SCALE: 0 NA — NONE

REVISIONS | INIT. | DATE

SEAL: North Carolina Professional Engineer, Seal 028094, Debesh C. Sarkar

D. Sarkar 9.2.2005

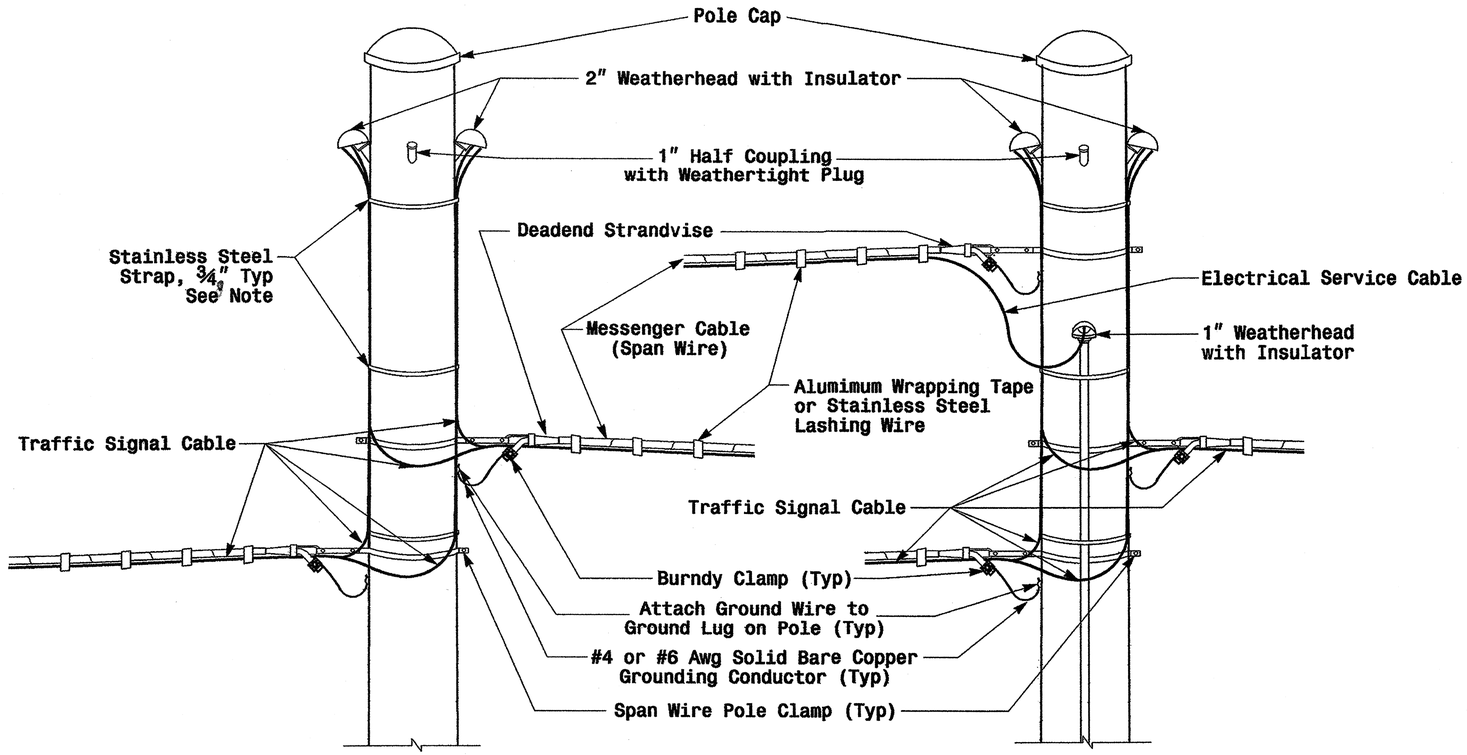
SIGNATURE | DATE

SIG. INVENTORY NO.

01-SEP-2005 14:07 w:\peoples-unit\workgroups\2004 metal pole standards\2004 m3.dgn polexander

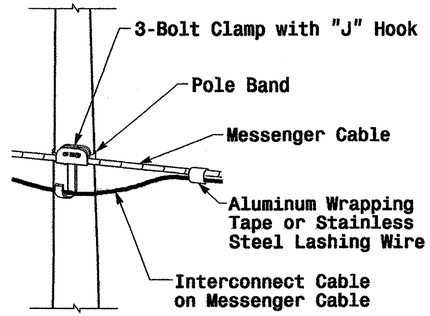
PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 15 M 6

Construction Details – Strain Poles

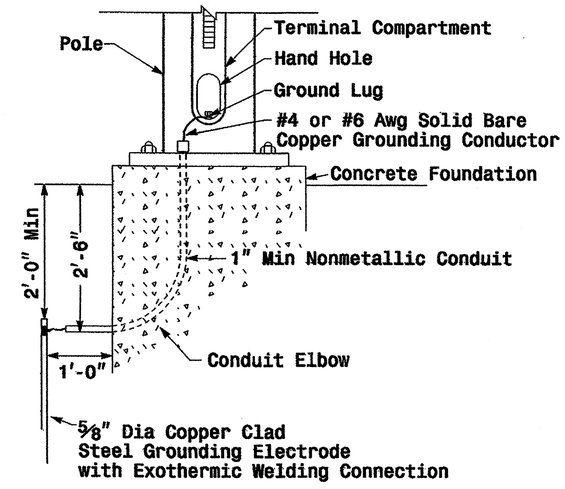


Note: Strap all signal cables to the side of the pole with ¾" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 36"

Strain Pole Attachments



Attachment of Cable to Intermediate Metal Pole



Metal Pole Grounding Detail

Prepared in the Offices of
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
1122 N. McDowell St., Raleigh, NC 27603

Construction Details
Strain Poles

PLAN DATE:	May 2005	REVIEWED BY:	P.L. ALEXANDER
PREPARED BY:	C.F. ANDREWS	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE
0 NA
NONE

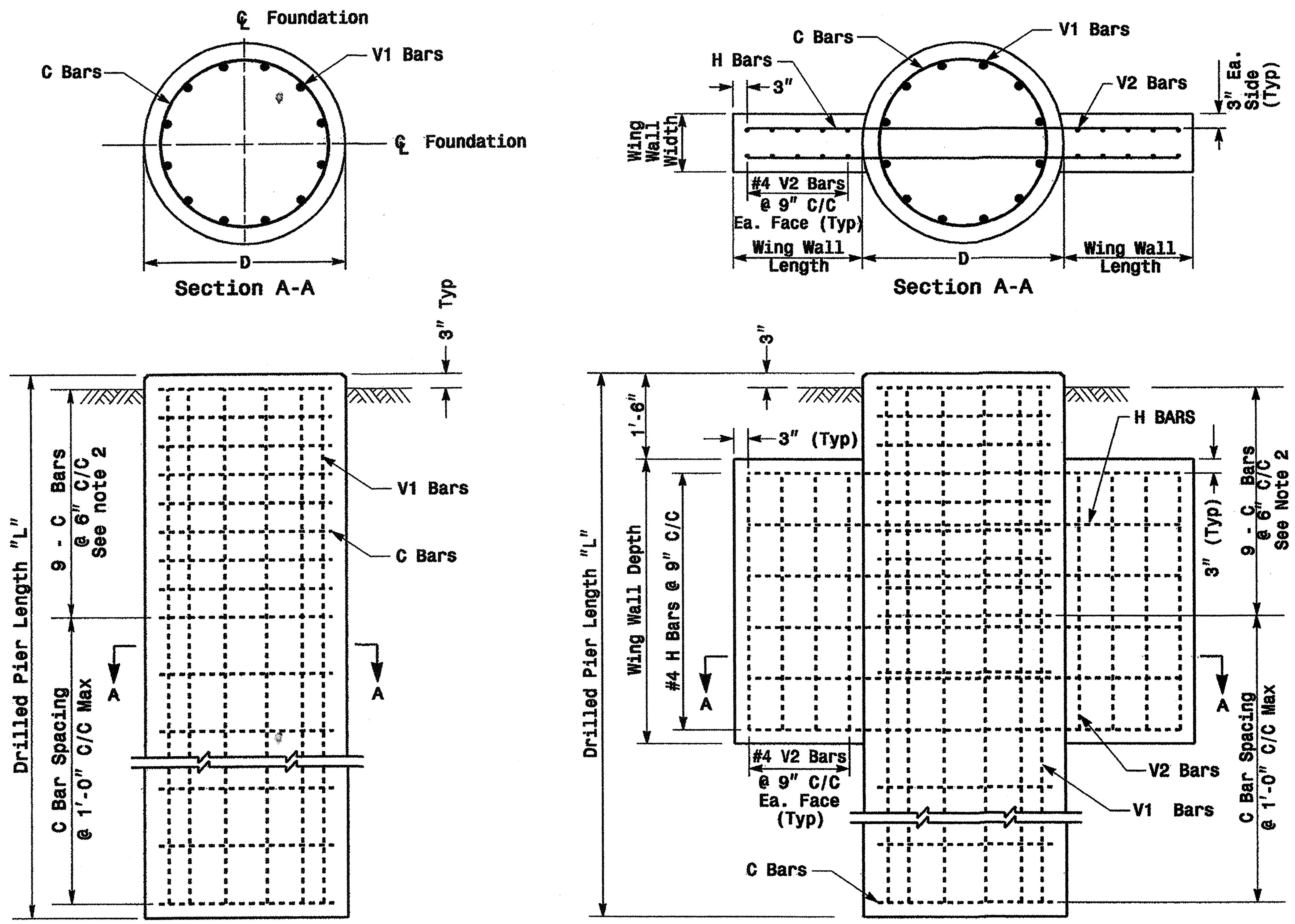
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I DEAN

SIGNATURE milton i dean DATE 9-1-05

SIG. INVENTORY NO.

01-SEP-2005 16:13
w:\traffic\projects\workgroups\2004 metal pole standards\2004 m6.dgn
palexander

Reinforcing Steel Bars

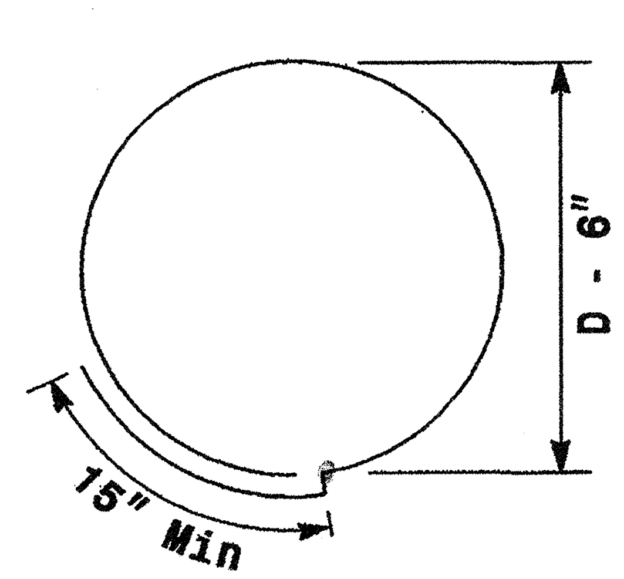


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

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

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"
		C	*	#4	CIR.	10'-9"
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



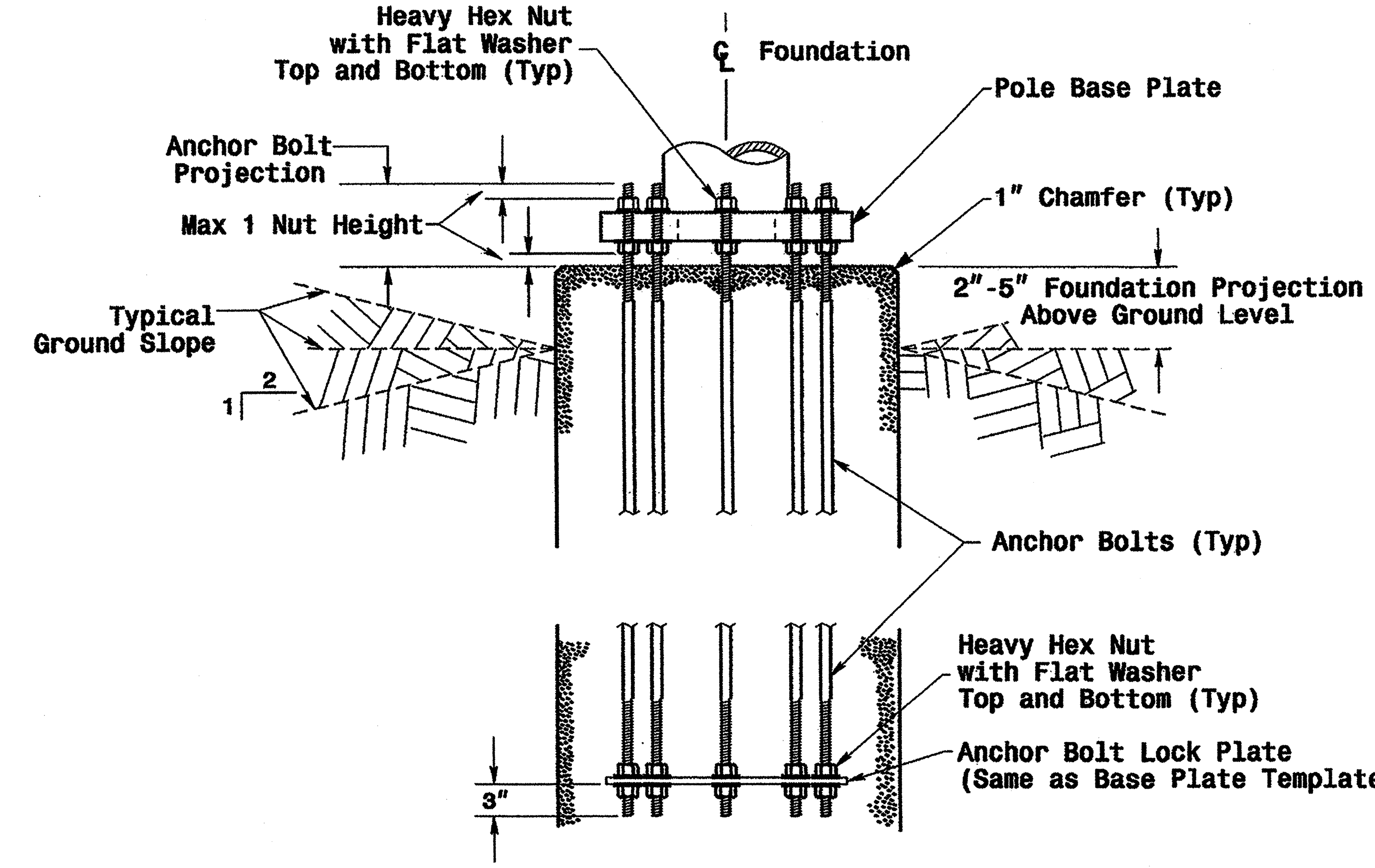
Typical "C" Bars

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

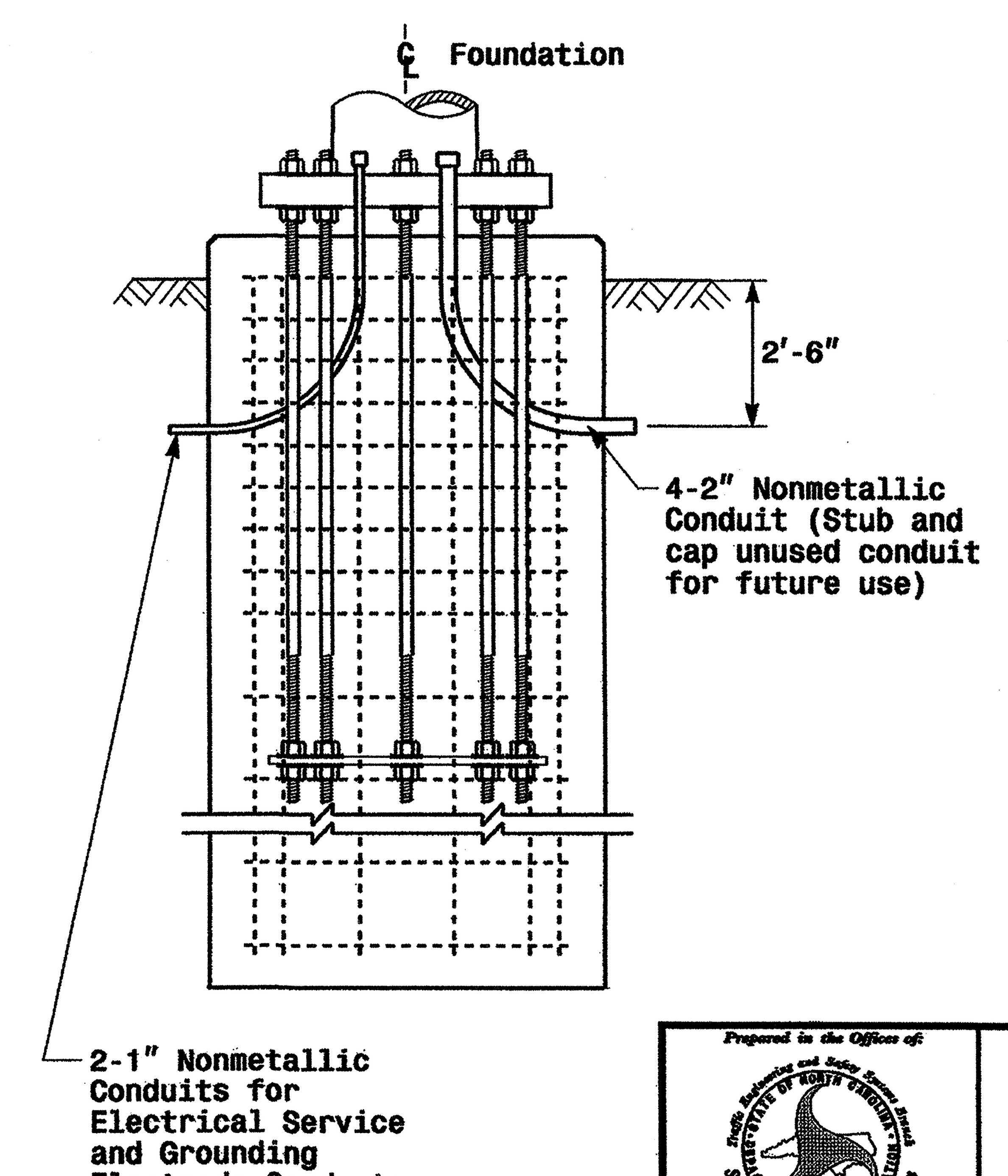
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

1. The number of C-bars is based on foundation depth. For standard foundations, see sheet M 8.
2. Circular tie reinforcing rings may be vertically adjusted by +/- 3" at a depth between 2'-0" and 3'-0" to facilitate the installation of electrical conduit entering in the cage.
3. The length of V1-bars is based on foundation depth. For standard foundations, see sheet M 8.
4. 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.)

Construction Details - Foundations

PROJECT REFERENCE NO.	SHEET NO.
U-4012	Sig. 16 M 7

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

Construction Details
Foundations

PLAN DATE: May 2005 | REVIEWED BY: P.L. ALEXANDER
PREPARED BY: C.F. ANDREWS | REVIEWED BY: A.M. ESPOSITO
REVISIONS | INIT. | DATE

SCALE 0 NA
NONE

SEAL
North Carolina Professional Engineer Seal 028094 Debesh C. Sarkar
D. Sarkar 9.2.2005
SIGNATURE | DATE
SIG. INVENTORY NO.

01-SEP-2005 17:48
w:\peoples-unit\workgroups\2004 metal pole standards\2004 m7.dgn
palexander

Wind Zone	Load	Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Moment at the Pole Base (ft-kp)	Clay: Medium N-Value 4-8	Clay: Stiff N-Value 9-15	Clay: Very Stiff N-Value 16-30	Clay: Hard N-Value >30	Sand: Loose N-Value 4-10	Sand: Medium N-Value 11-30	Sand: Dense N-Value >30
		STANDARD STRAIN POLES				**STANDARD FOUNDATIONS** 42" Diameter Drilled Pier Length (L) – Feet						
WIND ZONE 1	LIGHT	S26L3	26	25	280	20.5	14.0	11.5	9.5	18.0	16.0	14.0
WIND ZONE 1	LIGHT	S30L3	30	25	310	21.0	14.5	11.5	9.5	18.5	16.5	14.5
WIND ZONE 1	LIGHT	S35L3	35	25	350	22.5	15.0	12.0	10.0	19.5	17.5	15.5
WIND ZONE 1	HEAVY	S30H3	30	29	450	25.5	16.5	13.0	11.0	21.0	18.5	16.5
WIND ZONE 1	HEAVY	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	14.0
WIND ZONE 2	LIGHT	S30L2	30	23	290	20.0	14.0	11.5	9.5	18.5	16.0	14.0
WIND ZONE 2	LIGHT	S35L2	35	23	315	21.0	14.5	11.5	9.5	19.0	16.5	14.5
WIND ZONE 2	HEAVY	S30H2	30	29	415	24.5	16.0	13.0	10.5	21.0	18.5	16.0
WIND ZONE 2	HEAVY	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	13.5
WIND ZONE 3	LIGHT	S30L2	30	23	290	19.5	13.5	11.0	9.0	18.0	15.5	14.0
WIND ZONE 3	LIGHT	S35L2	35	23	315	20.0	14.0	11.5	9.5	18.5	16.0	14.5
WIND ZONE 3	HEAVY	S30H2	30	29	415	23.0	15.5	12.5	10.0	20.5	17.5	16.0
WIND ZONE 3	HEAVY	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	13.0
WIND ZONE 4	LIGHT	S30L1	30	22	225	18.5	13.0	10.5	9.0	17.0	15.0	13.5
WIND ZONE 4	LIGHT	S35L1	35	22	255	19.0	13.5	11.0	9.0	17.5	15.5	14.0
WIND ZONE 4	HEAVY	S30H1	30	25	330	22.0	15.0	12.0	9.5	19.5	17.0	15.0
WIND ZONE 4	HEAVY	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	13.5
WIND ZONE 5	LIGHT	S30L2	30	23	290	20.0	14.0	11.0	9.5	18.0	16.0	14.0
WIND ZONE 5	LIGHT	S35L2	35	23	315	21.0	14.5	11.5	10.0	19.0	16.5	14.5
WIND ZONE 5	HEAVY	S30H2	30	29	415	23.5	15.5	12.5	10.5	21.0	18.0	16.0
WIND ZONE 5	HEAVY	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

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603
SCALE 0 NA None

Standard Strain Poles
and
Standard Foundations

PLAN DATE: May 2005 | REVIEWED BY: C.F. Andrews
PREPARED BY: P.L. Alexander | REVIEWED BY: A.M. Esposito
REVISIONS | INIT. | DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR
D. Sarkar 9.2.2005
SIGNATURE DATE

02-SEP-2005 12:42
w:*peoples-unit*workgroups*2004 metal pole standards*2004 m8 std strain pole.dgn
palexander