WBS: 33879.2.70

CVISN 2014

ROADWAY STANDARD DRAWINGS

THE FOLLOWING ROADWAY STANDARDS AS APPEAR IN "ROADWAY STANDARD DRAWINGS" ROADWAY DESIGN UNIT – N.C. DEPARTMENT OF TRANSPORTATION – RALEIGH, N.C., DATED JULY 2012 ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREBY ARE CONSIDERED A PART OF THESE PLANS:

STD. NO.	TITLE
862.01	GUARDRAIL PLACEMENT
862.02	GUARDRAIL INSTALLATION
1101.01	WORK ZONE WARNING SIGNS
1101.02	TEMPORARY LANE CLOSURES
1101.03	TEMPORARY ROAD CLOSURES
1101.04	TEMPORARY SHOULDER CLOSURES
1101.11	TRAFFIC CONTROL DESIGN TABLES
1110.02	PORTABLE WORK ZONE SIGNS
1115.01	FLASHING ARROW BOARDS
1130.01	DRUM
1135.01	CONES
1165.01	WORK VEHICLE LIGHTING SYSTEMS AND TMA DELINEATION
1180.01	SKINNY – DRUM
1261.01	GUARDRAIL AND BARRIER DELINEATORS – INSTALLATION SPACING
1261.02	GUARDRAIL AND BARRIER DELINEATORS – TYPES AND MOUNTING
1262.01	GUARDRAIL AND DELINEATION
1700.01	ELECTRICAL SERVICE OPTIONS
1715.01	UNDERGROUND CONDUIT
1716.01	JUNCTION BOXES
1725.01	INDUCTIVE DETECTIVE LOOPS
1740.01	METAL POLES
1742.01	METAL POLE FOUNDATIONS
1751.01	CONTROLLERS AND CABINETS – ELECTRICAL SERVICE GROUNDING
1751.02	CONTROLLERS AND CABINETS – ELECTRICAL SERVICE DETAILS
1752.01	CONTROLLERS AND CABINETS – POWER, GROUND AND AUXILIARY POWER SYSTEMS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

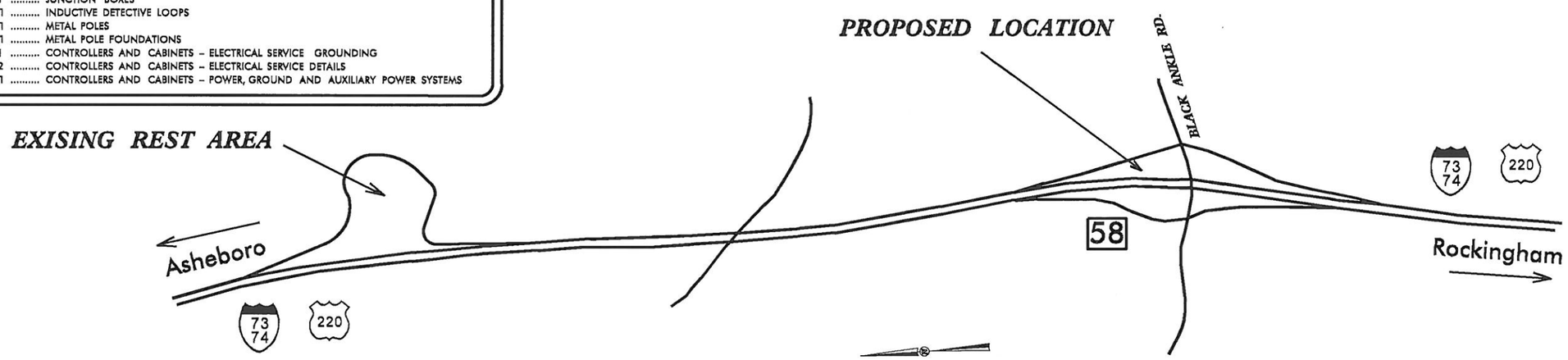
MONTGOMERY COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.
N.C.	33879.2.70	ITS-1

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

PLANS FOR PROPOSED
I–73/I–74 VIRTUAL WEIGH STATION

THIS PROJECT CONSISTS OF FURNISHING AND INSTALLING EQUIPMENT AND MATERIALS FOR THE INSTALLATION OF A NEW VIRTUAL WEIGH IN MOTION SYSTEM NEAR SEAGROVE, NORTH CAROLINA. RELATED MATERIALS CONSIST OF LOCAL CABINETS AND CONTROLLERS, WEIGH IN MOTION SENSORS, ALPR CAMERAS, SOFTWARE, INFRARED ILLUMINATORS, DATABASE INTERFACE, METAL POLES, METAL POLES WITH MAST ARMS, METAL POLE FOUNDATIONS, SNAPSHOT OVERVIEW CAMERA ASSEMBLIES AND GUARDRAIL.



INDEX OF PLANS

SHEET NUMBER	LOCATION / DESCRIPTION
ITS–1	TITLE SHEET
ITS–2	LEGEND, GENERAL NOTES, AND ABBREVIATIONS
ITS–3	SYSTEM BLOCK DIAGRAM
ITS–4	CONSTRUCTION NOTES
ITS–5	VIRTUAL WEIGH STATION PLAN
ITS–6	SNAPSHOT OVERVIEW CAMERA AND AUTOMATED LICENSE PLATE RECOGNITION SYSTEM PLAN
ITS–7	METAL POLE WITH FOLDING MAST ARM DETAIL
ITS–8	ELECTRICAL SERVICE AND GROUNDING DETAIL
M 1, 2, 4, 5, 7	METAL POLE STANDARDS
1725.01 (1 OF 3)	INDUCTIVE DETECTION LOOPS
1725.01 (2 OF 3)	INDUCTIVE DETECTION LOOPS
1725.01 (3 OF 3)	INDUCTIVE DETECTION LOOPS

2012 STANDARD SPECIFICATIONS

NCDOT CONTACTS:
TRANSPORTATION MOBILITY AND SAFETY

G.A. FULLER, P.E.
STATE ITS & SIGNALS ENGINEER

Prepared in the Offices of:
TRANSPORTATION MOBILITY AND SAFETY DIVISION
750 N. Greenfield Pkwy., Garner, NC 27529

ENGLISH

ALL DIMENSIONS IN THESE PLANS ARE IN FEET UNLESS OTHERWISE NOTED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 2-24-15
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
33878.2.70	ITS-2

LEGEND

PROPOSED		EXISTING
DD	DIRECTIONAL DRILLED CONDUIT	N/A
	TRENCHED CONDUIT	N/A
	6" X 6" WOOD PEDESTAL	N/A
	WOOD POLE	●
	CAMERA POLE	N/A
	ALPR CAMERA WITH MASTARM	N/A
	JUNCTION BOX	N/A
	STANDARD INDUCTIVE LOOP DETECTOR	N/A
	CAMERA ASSEMBLY	N/A
	EQUIPMENT CABINET	N/A
	PIEZOELECTRIC QUARTZ SENSOR	N/A
×	DRILL THROUGH SHOULDER FOR CONDUIT	N/A
	GUARDRAIL	

GENERAL NOTES

1. OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO INSTALLATION FOR ITEMS TO BE INSTALLED AS PART OF THIS PROJECT.
2. BURIED UTILITIES AND STRUCTURES: PIPELINES, STORM SEWERS, POWER CABLES, UTILITY CABLES, AND OTHER PUBLICLY AND PRIVATELY OWNED UNDERGROUND OBSTRUCTIONS MAY EXIST ADJACENT TO AND WITHIN THE ROADWAY RIGHT-OF-WAY WITHIN THE CONSTRUCTION LIMITS OF THIS PROJECT. INVESTIGATE THE LOCATION OF SUCH BURIED UTILITIES AND STRUCTURES WITH PUBLIC AND PRIVATE UTILITIES.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE OWNER OF ALL AFFECTED UTILITIES FOR WORK THAT MAY IMPACT ANY UTILITY FACILITY.
4. ALL WORK SHOWN ON THESE PLANS IS TO BE PERFORMED BY THE CONTRACTOR UNLESS IT IS SPECIFICALLY NOTED THAT THE WORK WILL BE PERFORMED BY OTHERS.

ABBREVIATIONS

ALPR	AUTOMATED LICENSE PLATE RECOGNITION
HDPE	HIGH DENSITY POLYETHYLENE
L	LOOP DETECTOR
N.T.S.	NOT TO SCALE
WIM	WEIGH IN MOTION
PQS	PIEZOELECTRIC QUARTZ SENSOR
S	SENSOR
NCSHP	NORTH CAROLINA STATE HIGHWAY PATROL
VWSS	VIRTUAL WEIGH STATION SYSTEM

Prepared in the Offices of:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Transportation Mobility and Safety Division
Intelligent Transportation Systems Section

750 N. Greenfield Pkwy., Garner, NC 27529

LEGEND, GENERAL NOTES AND ABBREVIATIONS

DIVISION 08 MONTGOMERY CO. SEAGROVE

PLAN DATE:	FEBRUARY 2015	REVIEWED BY:	S. C. YOW
PREPARED BY:	G. A. GREEN	REVIEWED BY:	T. G. PARKER

REVISIONS	INIT.	DATE

SCALE: 0 — N/A

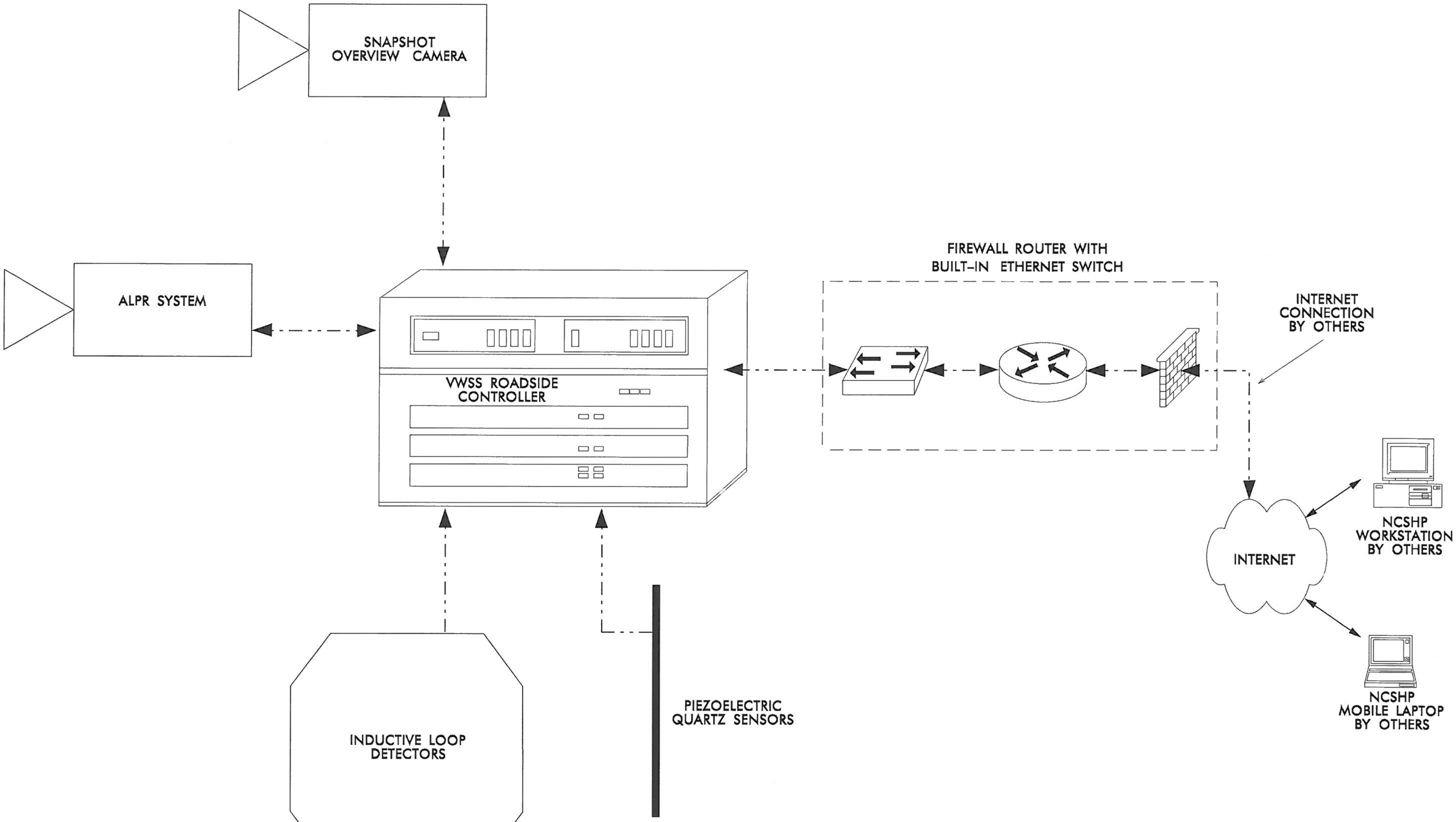
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 2-24-15
SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
33879.2.70	ITS-3



Prepared in the Offices of:

Transportation Mobility and Safety Division
State of North Carolina Department of Transportation
Intelligent Transportation Systems Section

750 N. Greenfield Pkwy., Garner, NC 27529

SCALE
0
N/A

SYSTEM BLOCK DIAGRAM

DIVISION 08	MONTGOMERY CO.		SEAGROVE
PLAN DATE:	FEBRUARY 2015	REVIEWED BY:	S. C. YOW
PREPARED BY:	G. A. GREEN	REVIEWED BY:	T. G. PARKER

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller — SIGNATURE
2-24-15 — DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
33679.2.70	ITS-4

1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE – 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL THREE #3 COPPER SERVICE ENTRANCE CONDUCTORS
3A. INSTALL THREE #14 CONDUCTOR POWER CABLE(S)
3B. INSTALL AVI CABLE(S) *
3C. INSTALL OVERHEIGHT DETECTOR CABLE(S) *
3D. INSTALL PIEZOELECTRIC QUARTZ SENSOR CABLES *
3E. INSTALL LOOP WIRE
3F. INSTALL LEAD–IN CABLE
3G. INSTALL CCTV VIDEO CABLES *
3H. INSTALL THREE #4 COPPER FEEDER CONDUCTORS
4. INSTALL FOUR #8 COPPER FEEDER CONDUCTORS
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH
8A. SAW CUT PAVEMENT
9. INSTALL NEW 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 STUBOUTS
21A. INSTALL CABLE(S) IN NEW CONDUIT STUBOUTS
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 CABINET
32. INSTALL BASE MOUNTED CABINET WITH EXTENDER
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 40' WOOD POLE
43. INSTALL 6" X 6" WOOD PEDESTAL
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS CABLE AND MESSENGER CABLE
49. REMOVE EXISTING COMMUNICATIONS CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 50 FEET OF COMMUNICATIONS CABLE
54. INSTALL ISOLATION TRANSFORMER
55. INSTALL INDUSTRIAL ETHERNET SWITCH
56. INSTALL VIDEO ENCODER
56A. INSTALL VIDEO DECODER
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE
58A. INSTALL EQUIPMENT CABINET DISCONNECT
59. INSTALL PIEZOELECTRIC QUARTZ SENSORS
60. INSTALL AUTOMATED LICENSE PLATE RECOGNITION SYSTEM
61. INSTALL SNAPSHOT CAMERA POLE AND FOUNDATION
62. INSTALL SNAPSHOT OVERVIEW CAMERA ASSEMBLY
63. INSTALL STANDARD INDUCTIVE LOOP
64. INSTALL OVERHEIGHT DETECTOR ASSEMBLY WITH METAL POLE AND FOUNDATION
65. INSTALL STEEL POLE, FOLDING SINGLE MASTARM AND FOUNDATION

* CABLES SHALL BE PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS

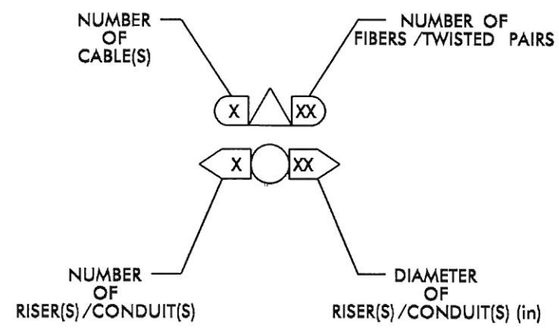
CONSTRUCTION NOTE SYMBOLOGY KEY

(X) INDICATES NUMBER OF CABLES, LOOPS, ETC.

(XX) INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.

<X INDICATES NUMBER OF RISER(S)/CONDUIT(S)

<XX INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (in)



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

CONSTRUCTION NOTES

DIVISION 08 MONTGOMERY CO. SEAGROVE

PLAN DATE: FEBRUARY 2015 REVIEWED BY: S. C. YOW

PREPARED BY: G. A. GREEN REVIEWED BY: T. G. PARKER

SCALE: 0 N/A

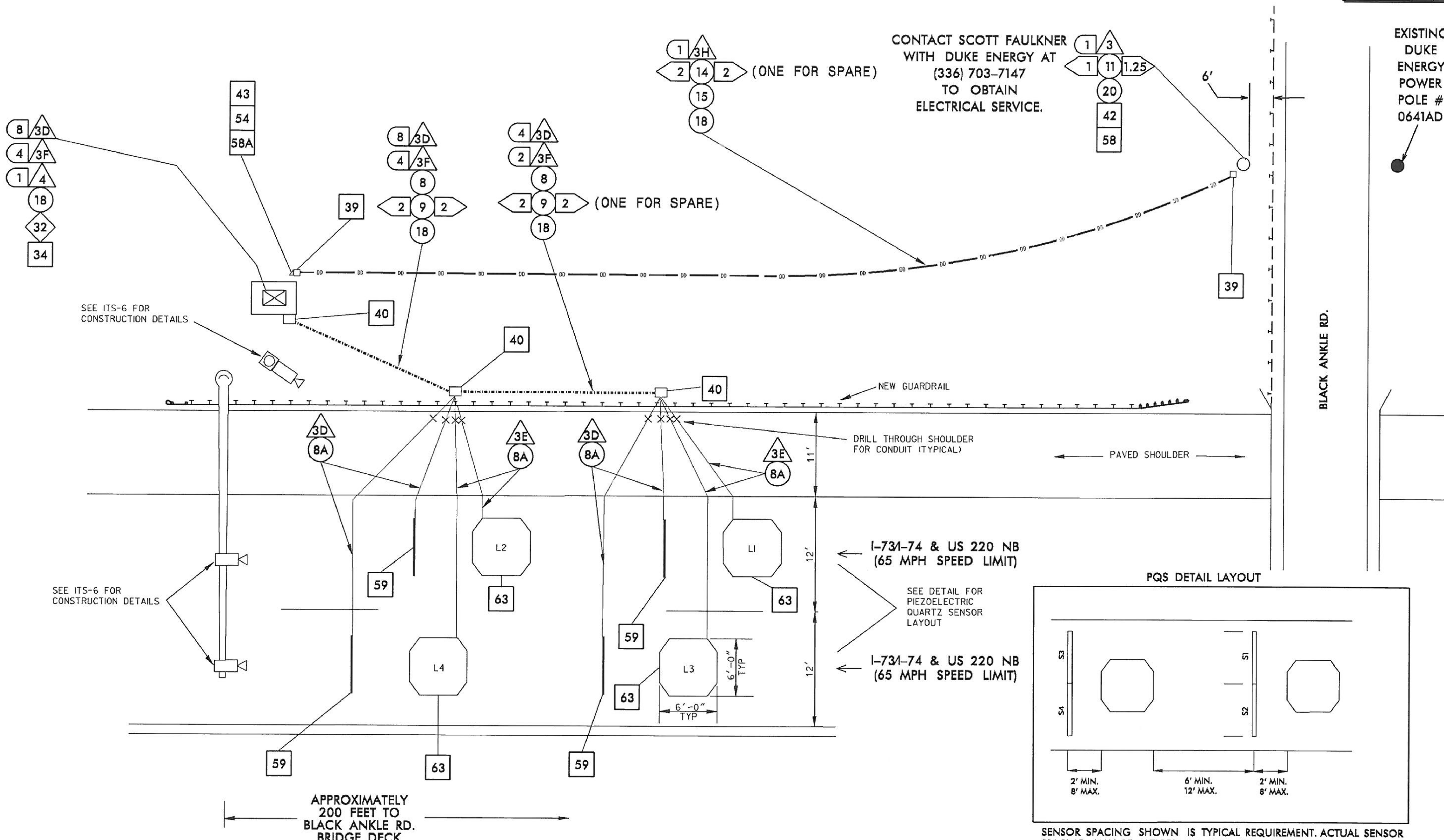
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 2-24-15
SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
33879.2.70	ITS-5



SENSOR SPACING SHOWN IS TYPICAL REQUIREMENT. ACTUAL SENSOR SPACING MAY BE ALTERED TO SUIT SITE CONDITIONS AND MANUFACTURER'S SPECIFICATIONS UPON APPROVAL BY THE ENGINEER.

NOTES:

1. CALL NORTH CAROLINA 811 BEFORE YOU DIG.
2. PIEZOELECTRIC QUARTZ SENSOR AND INDUCTIVE LOOP SAW SLOTS, INCLUDING TAIL AND LEAD-IN SECTIONS, MUST BE DRY CUT.
3. CONTACT SCOTT FAULKNER (DUKE ENERGY) AT (336) 703-7147 TO OBTAIN ELECTRICAL SERVICE.

Prepared in the Offices of:
Transportation Mobility and Safety Division, Intelligent Transportation Systems Section
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0 N/A

VIRTUAL WEIGH STATION
DETAIL

DIVISION 08 MONTGOMERY CO. SEAGROVE

PLAN DATE: FEBRUARY 2015	REVIEWED BY: S. C. YOW
PREPARED BY: G. A. GREEN	REVIEWED BY: T. G. PARKER

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

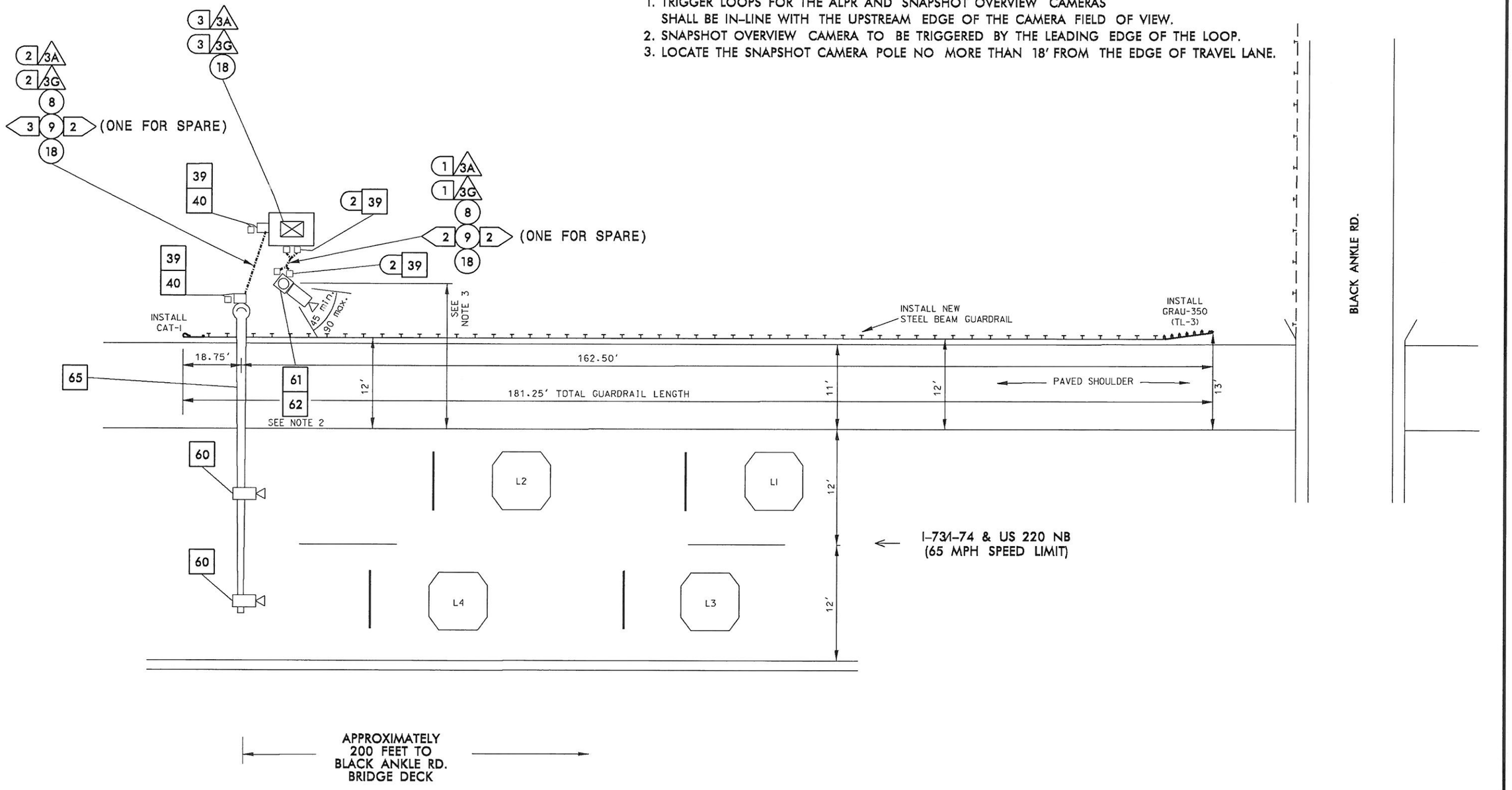
SIGNATURE: Gregory A. Fuller DATE: 2-24-15

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
33879.2.70	ITS-6

ALPR AND SNAPSHOT OVERVIEW CAMERA NOTES:

1. TRIGGER LOOPS FOR THE ALPR AND SNAPSHOT OVERVIEW CAMERAS SHALL BE IN-LINE WITH THE UPSTREAM EDGE OF THE CAMERA FIELD OF VIEW.
2. SNAPSHOT OVERVIEW CAMERA TO BE TRIGGERED BY THE LEADING EDGE OF THE LOOP.
3. LOCATE THE SNAPSHOT CAMERA POLE NO MORE THAN 18' FROM THE EDGE OF TRAVEL LANE.



NOTE: CALL NORTH CAROLINA 811 BEFORE YOU DIG.

Prepared in the Offices of:
NCDEPARTMENT OF TRANSPORTATION
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE
0
N/A

SNAPSHOT OVERVIEW CAMERA AND AUTOMATED LICENSE PLATE RECOGNITION SYSTEM DETAIL

DIVISION 08 MONTGOMERY CO. SEAGROVE

PLAN DATE: FEBRUARY 2015	REVIEWED BY: S. C. YOW
PREPARED BY: G. A. GREEN	REVIEWED BY: T. G. PARKER

REVISIONS	INIT.	DATE

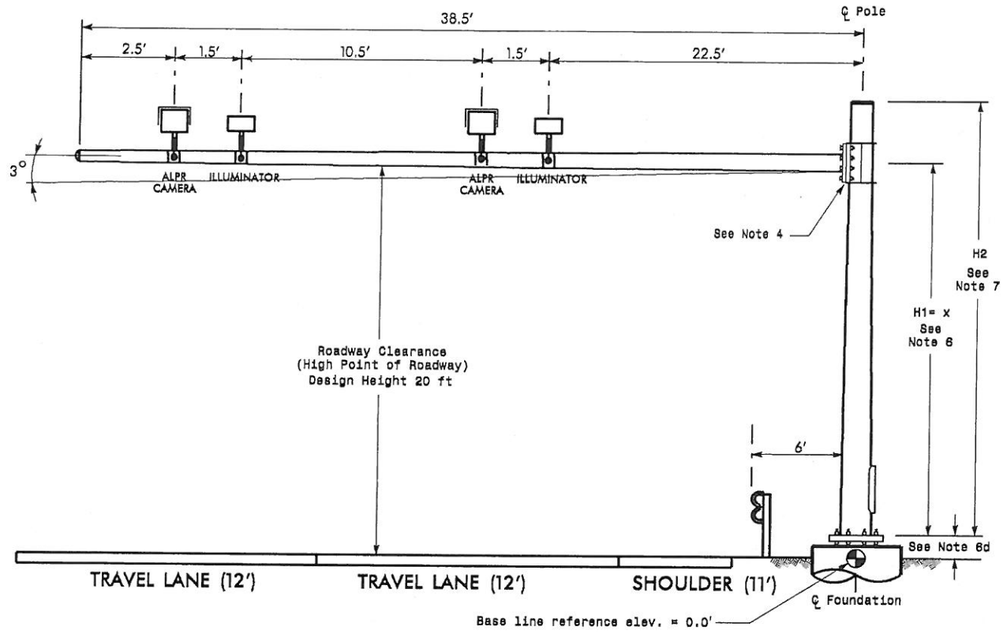
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 2-24-15
SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
33879.2.70	ITS-7

DESIGN LOADING FOR METAL POLE WITH FOLDING MAST ARM



Elevation View

SPECIAL NOTES

1. The contractor is responsible for determining the mast arm attachment height (H1). Ensure that the mast arm attachment height will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval.
2. ALPRs and Infrared Illuminators are shown on top of the mast arm for illustration purposes. If the contractor elects to install these devices under the mast arm then, the 20 Ft. roadway clearance applies to the lowest device.

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	SIZE	WEIGHT
▭	ALPR CAMERA	13.0" W x 6.0" L x 5.5" D	16 LBS
▭	INFRARED ILLUMINATOR	3.0" W x 3.0" L x 3.0" D	5 LBS

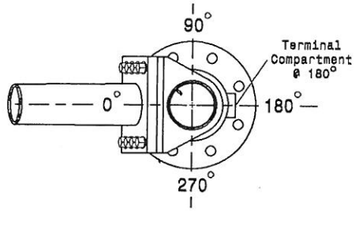
NOTES

Design Reference Material

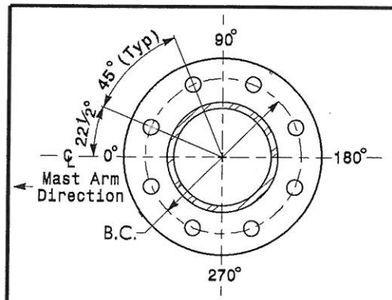
1. Design the metal pole structure and foundation in accordance with:
   - The 5th Edition 2009 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2012 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the ITS and Signals project special provisions.
   - The 2012 NCDOT Roadway Standard Drawings.
   - The project plans and the latest special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Design Requirements

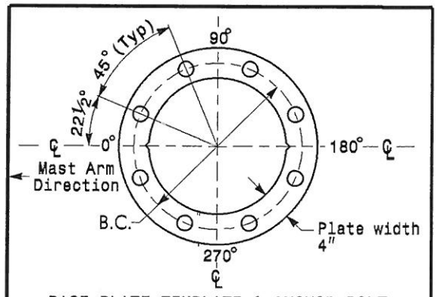
2. Design the metal pole structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads".
3. Design all metal pole supports using stress ratios that do not exceed 1.0.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Attachments to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
7. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the ITS & Signals Structural Engineer for assistance at (919) 661-4830.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the attached equipment over the roadway.
10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL
See Note 5



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

NCDOT Wind Zone 4 (90 mph)

Prepared in the Offices of: Transportation Mobility and Safety Division, NCDOT, 750 N. Greenfield Pkwy., Garner, NC 27529

METAL POLE WITH FOLDING MAST ARM

DIVISION 08 MONTGOMERY CO. SEAGROVE

PLAN DATE: FEBRUARY 2015 REVIEWED BY:

PREPARED BY: S. C. YOW REVIEWED BY: C. F. ANDREWS

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

SIGNATURE D. Sarkar DATE 2/24/15

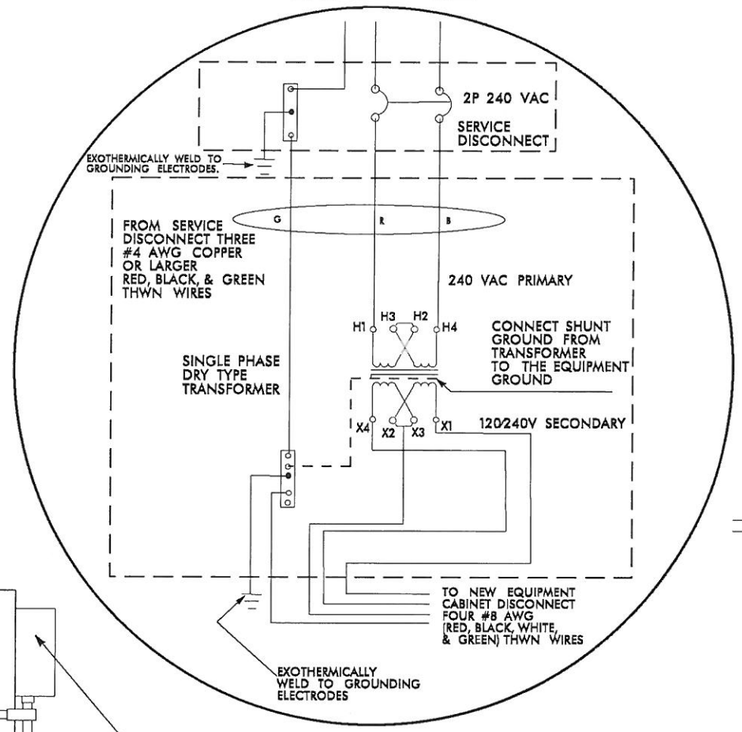
08-7000

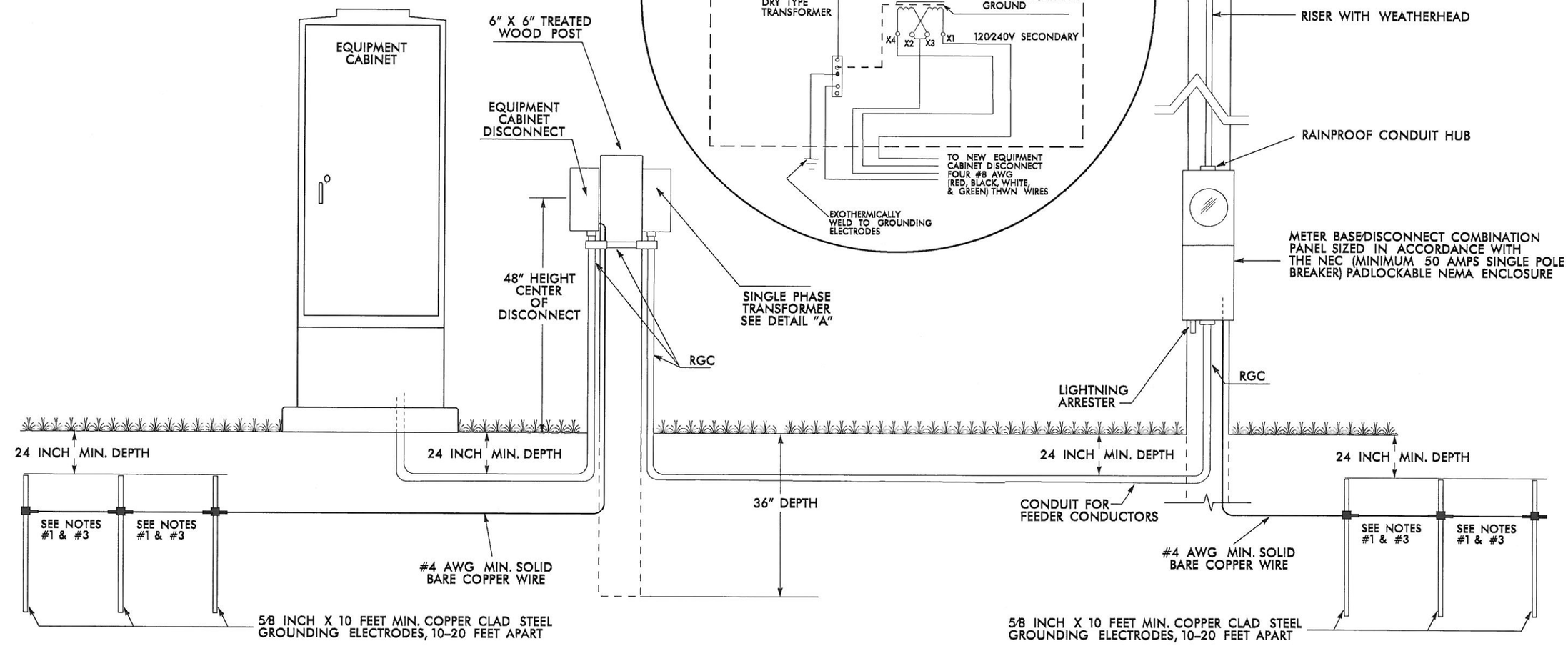
PROJECT REFERENCE NO.	SHEET NO.
33879.2.70	ITS-8

NOTES

1. INSTALL A MINIMUM OF THREE GROUND RODS SPACED A MINIMUM OF 10 FEET APART. ENSURE THAT EXISTING UNDERGROUND FACILITIES ARE NOT DAMAGED DURING INSTALLATION.
2. TEST GROUNDING SYSTEM USING AN APPROVED METHOD. SYSTEM SHALL MEASURE TWENTY (20) OHMS OR LESS. ADDITIONAL GROUND RODS SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER TO MEET THIS REQUIREMENT.
3. EXOTHERMICALLY WELD ALL CONNECTIONS TO GROUND RODS.
4. INSTALL MARKER TAPE DIRECTLY ABOVE ALL GROUNDING ELECTRODES AND CONDUCTORS AT A DEPTH OF 12 INCHES.
5. REMOVE BONDING JUMPER BETWEEN EQUIPMENT GROUND AND AC NEUTRAL IN THE EQUIPMENT CABINET.
6. BOND ALL RIGID GALVANIZED STEEL CONDUITS ENTERING THE CABINET TO EQUIPMENT GROUND.
7. ALL ABOVE GROUND CONDUITS MUST BE RIGID GALVANIZED. PVC CONDUITS ARE ALLOWED FOR UNDERGROUND INSTALLATIONS.
8. ENSURE EQUIPMENT GROUND IS ELECTRICALLY BONDED TO EQUIPMENT CABINET.
9. CONNECTIONS TO ISOLATION TRANSFORMER AS SHOWN IN DETAIL "A" ARE GENERIC.

DETAIL "A"





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

SCALE 0 N/A

ELECTRICAL SERVICE AND GROUNDING DETAIL WITH ISOLATION TRANSFORMER

DIVISION 08	MONTGOMERY CO.		SEAGROVE
PLAN DATE:	FEBRUARY 2015	REVIEWED BY:	S. C. YOW
PREPARED BY:	G. A. GREEN	REVIEWED BY:	T. G. PARKER

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY G. FULLER

Gregory G. Fuller 2-24-15
SIGNATURE DATE

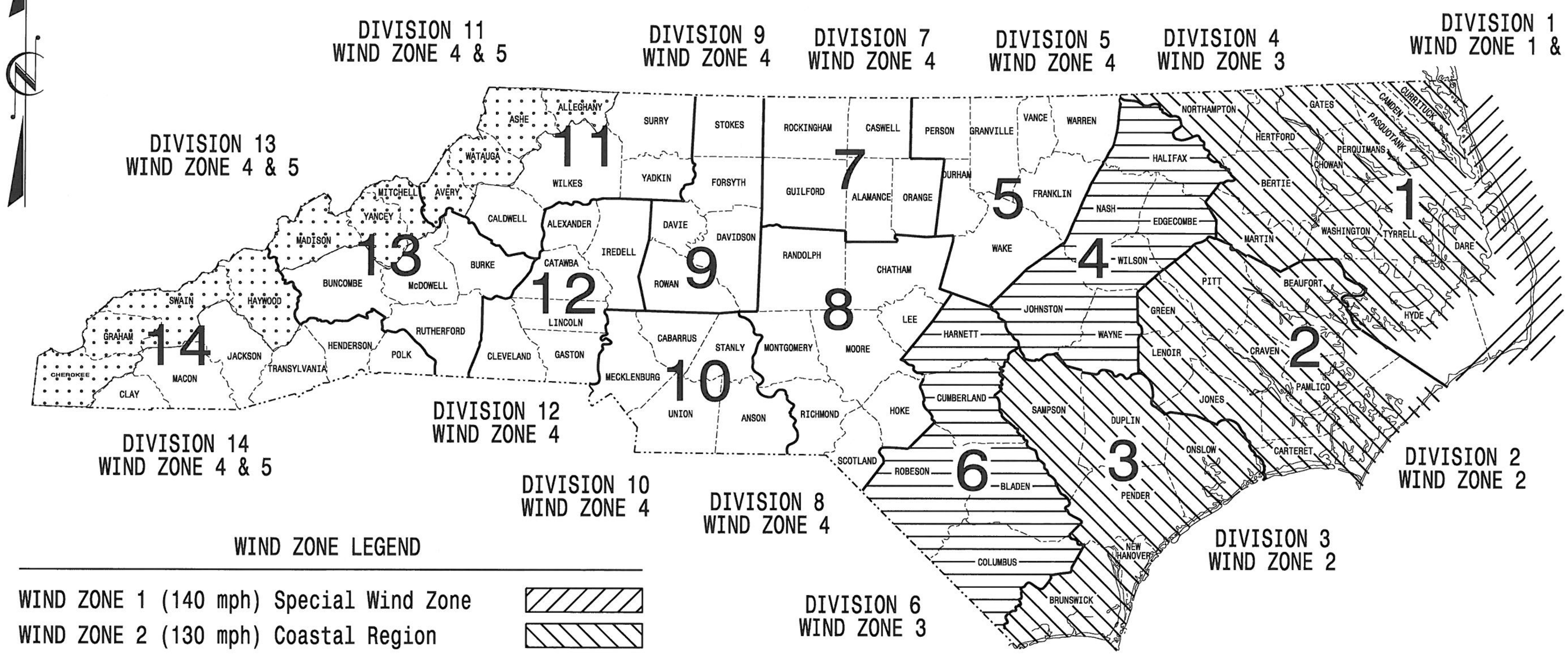
CADD Filename:

NCDOT METAL POLE STANDARDS

PROJECT NO.	SHEET NO.
	Sig. M1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR METAL POLES



WIND ZONE LEGEND

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

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

Prepared In the Offices of:

Transportation Mobility and Safety Division
Signal Design Section
STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION

750 N.Greenfield Pkwy,Garner,NC 27529

Designed in conformance with the latest 2012 Interim to the 5th Edition 2009

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 8,9	Standard Strain Pole Foundations

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

G. A. FULLER, P.E. – STATE ITS AND SIGNALS ENGNEER

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

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

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

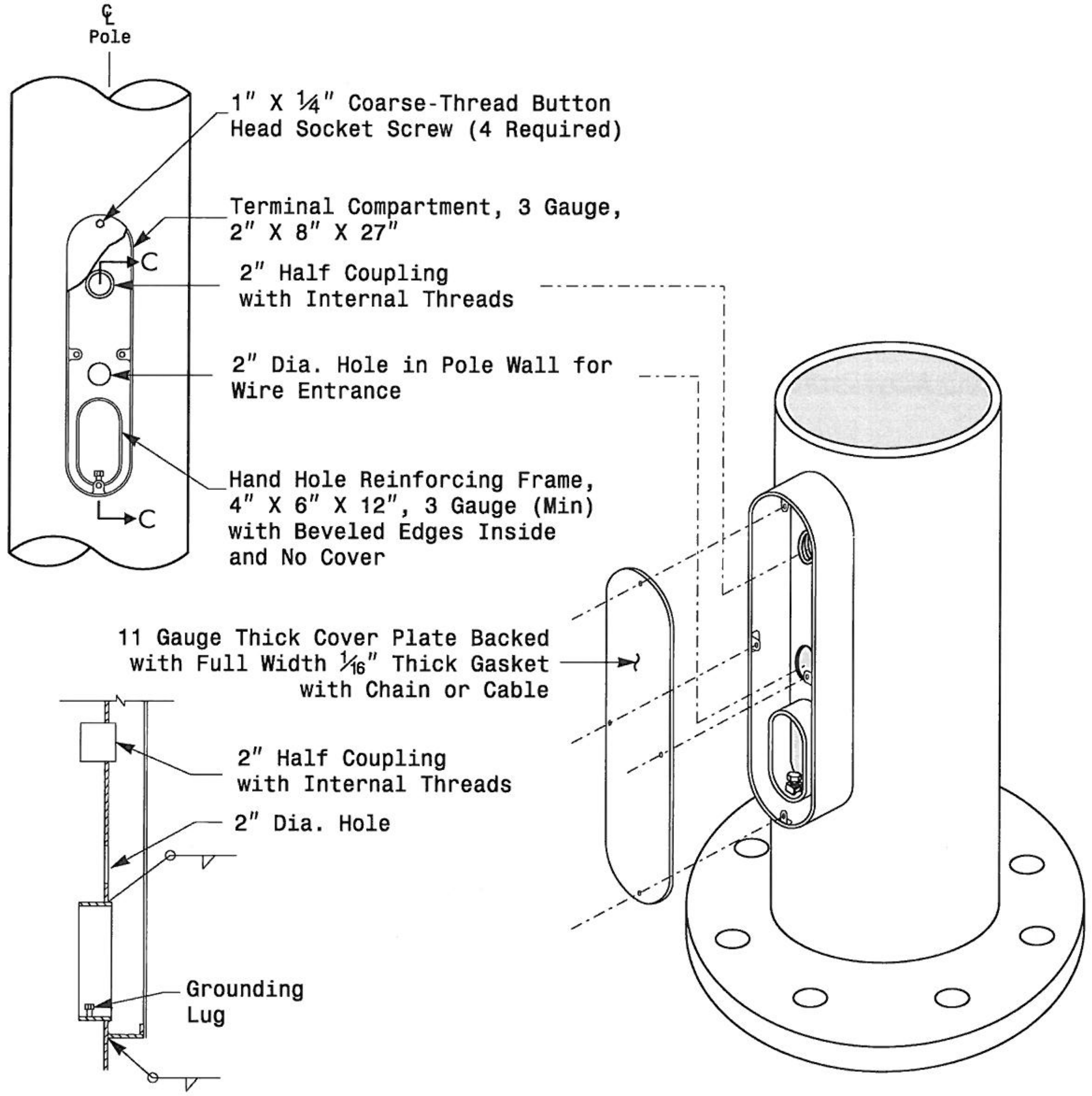
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar
44E8E32E147E4C4...

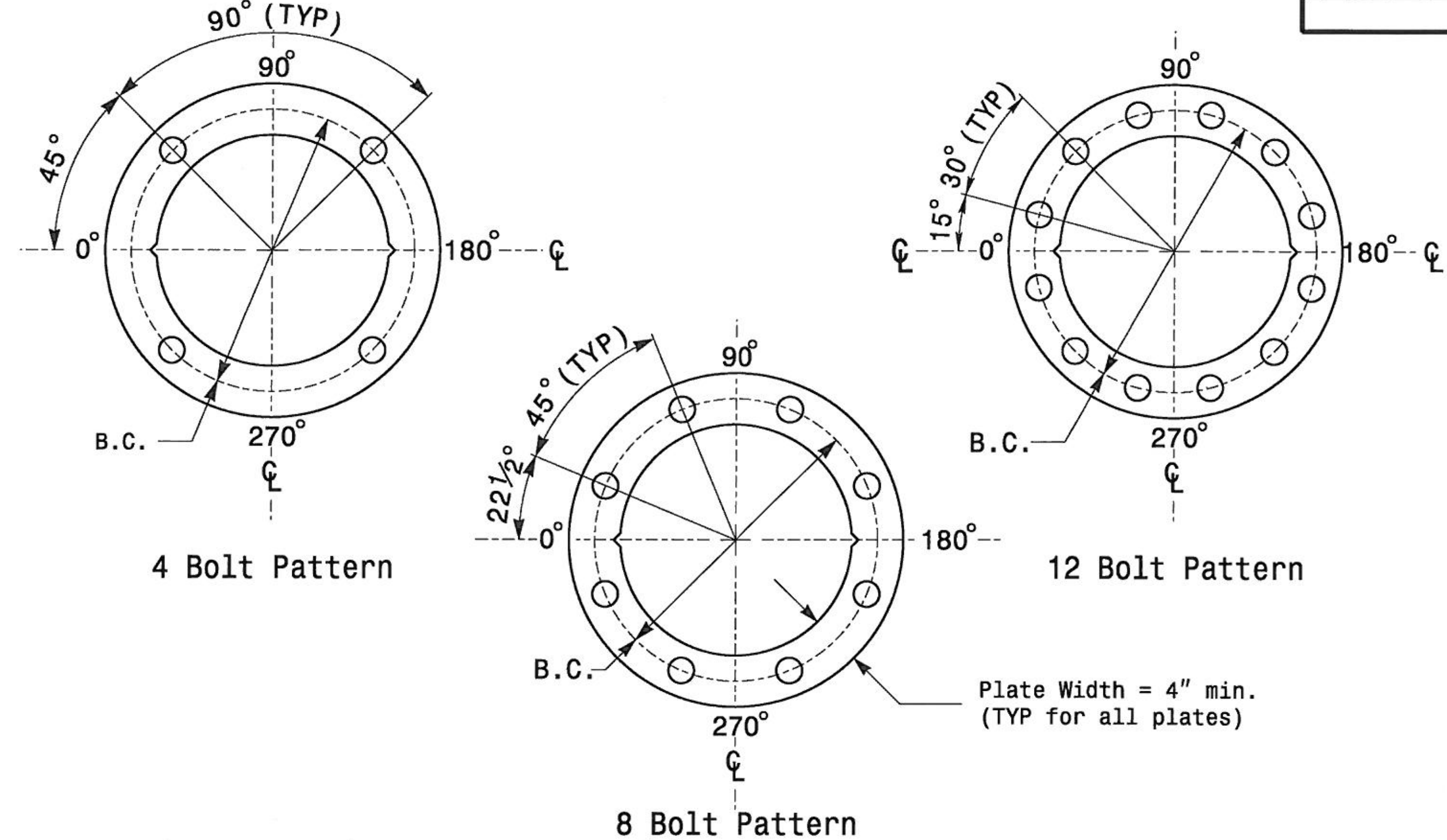
8/26/2014
DATE

Fabrication Details – All Poles



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



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

Base Plate Template and Anchor Bolt Lock Plate Details

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	----------------

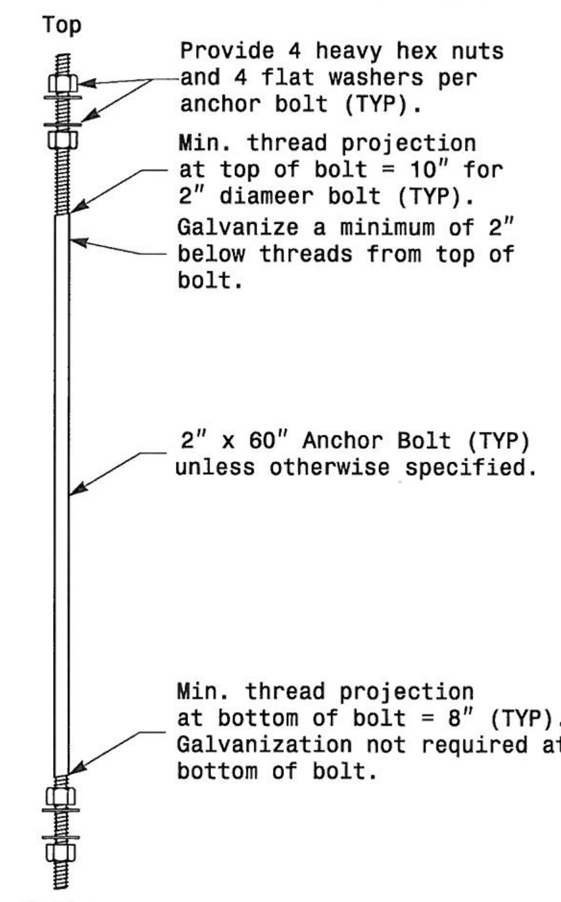
Shaft I.D. Tag
(Provide on Strain Poles and Mast Arm Poles)

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)

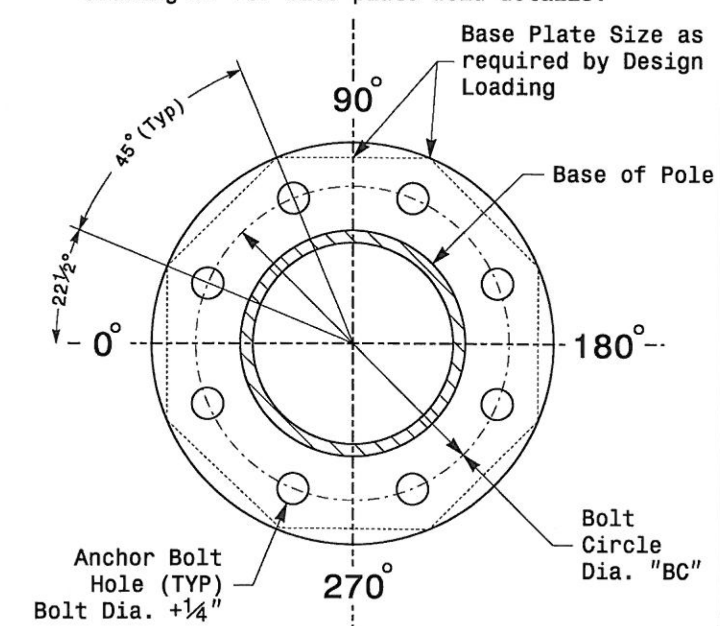
Notes:
1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
2) A.B. = Anchor Bolt
3) B.C. = Bolt Circle of Anchor Bolts
4) If Custom Design, use "NCDOT STANDARD" line for pole I.D. number and Signal Inv. Number.
5) See drawing M4 for mounting positions of I.D. tags.

Identification Tag 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

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

Typical Fabrication Details
Common To
All Metal Poles

PLAN DATE:	AUGUST 2013	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

SCALE 0 NA NONE

REVISIONS	INIT.	DATE

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

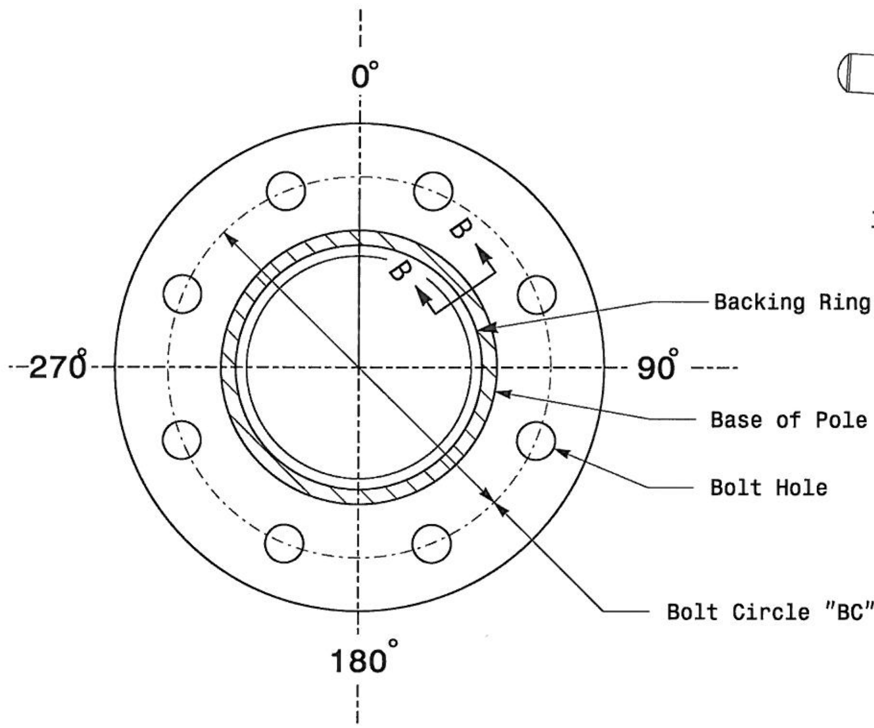
DocuSigned by: Debesh C. Sarkar 8/26/2014 DATE
44E6E32E147E4C4...

SIG. INVENTORY NO.

26-AUG-2014 08:55
S:*ITS&SU*ITS Signals*Signal Design Section*Eastern Region*M Sheets*2012_M2_Fab Details All Poles.dgn
jgalloway

PROJECT REFERENCE NO.	SHEET NO.
	Sig. M4

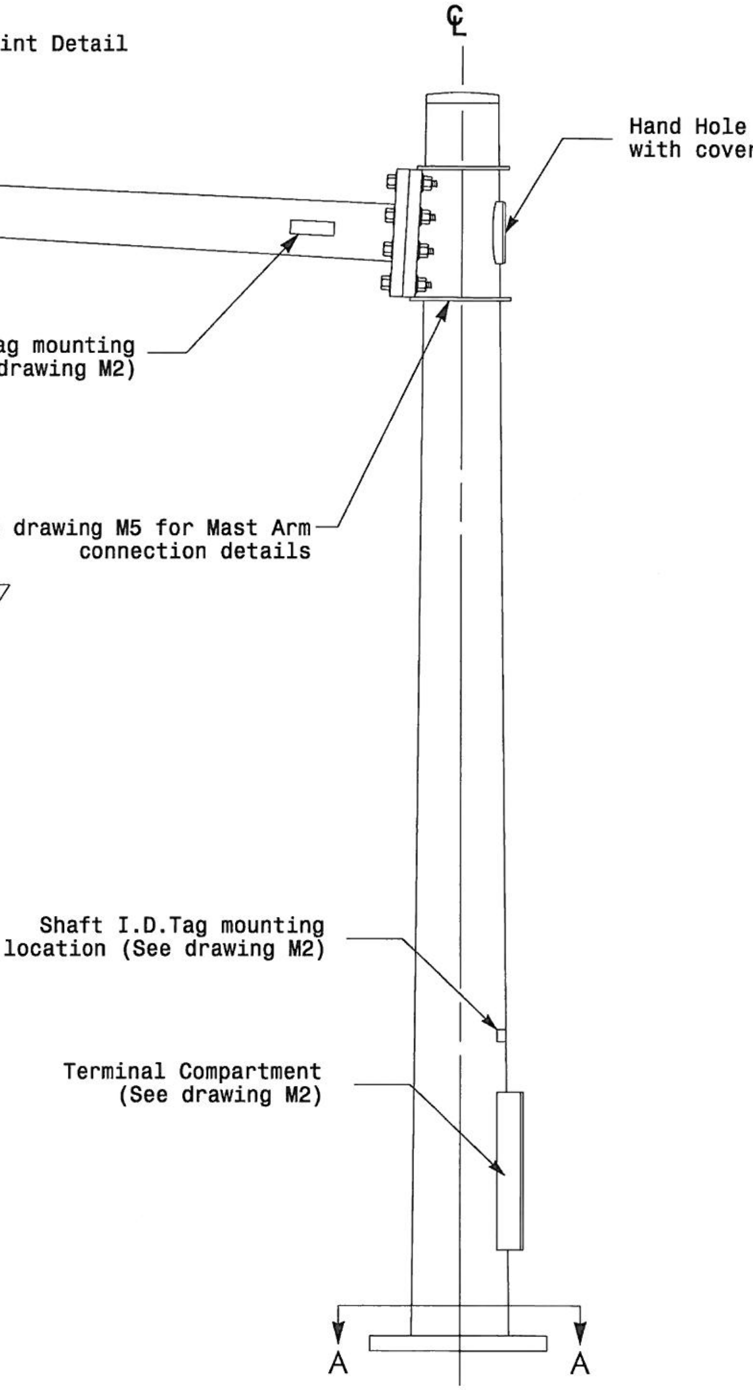
Fabrication Details – Mast Arm Poles



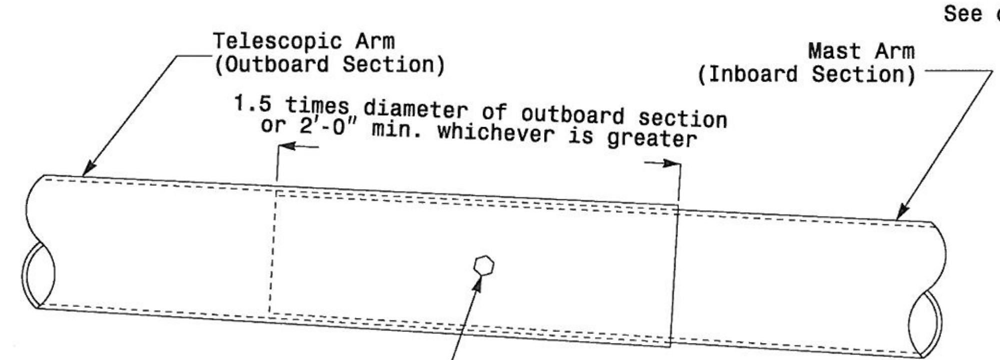
Section A-A

(See drawing M 2)

Pole Base Plate

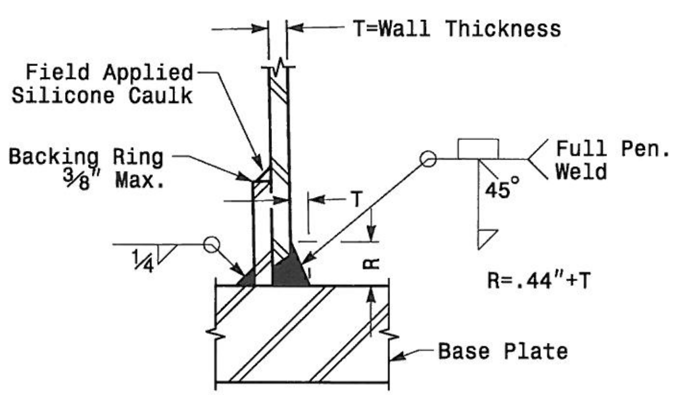


Monotube Mast Arm Pole
(.14in./ft. taper)



3⁄4" Factory Drilled Hole in Outboard Tube.
Field Drill Inboard Tube.
5⁄8" Galvanized Thru Stud with
(2) Hex. Locknuts Each.

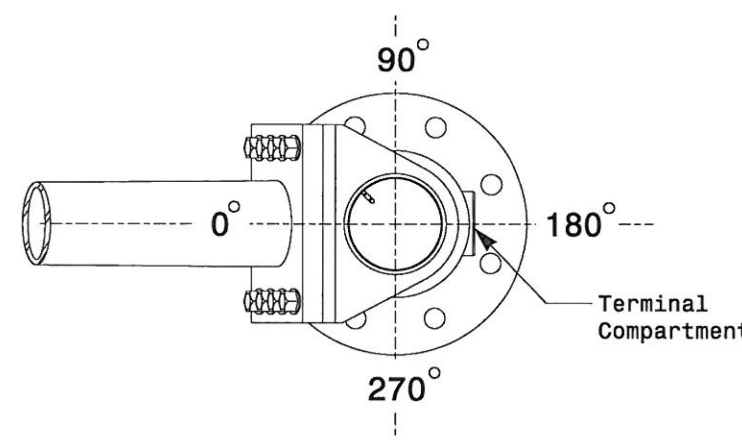
Slip Fit Joint Detail for Mast Arm



Section B-B

(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail



Mast Arm Radial Orientation

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

SCALE: 0 NA – NONE

Typical Fabrication Details
for Mast Arm Poles

PLAN DATE:	AUGUST 2013	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

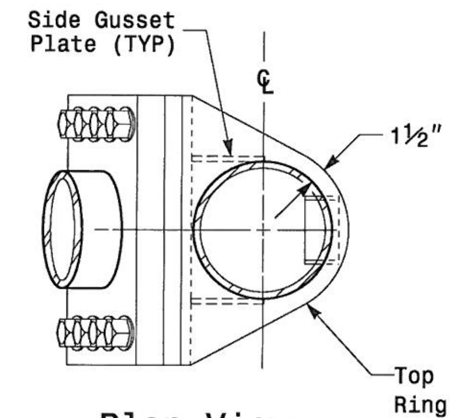
DocuSigned by: Debesh C. Sarkar 8/26/2014
44E8E32E147E4C4...
DATE

SIG. INVENTORY NO.

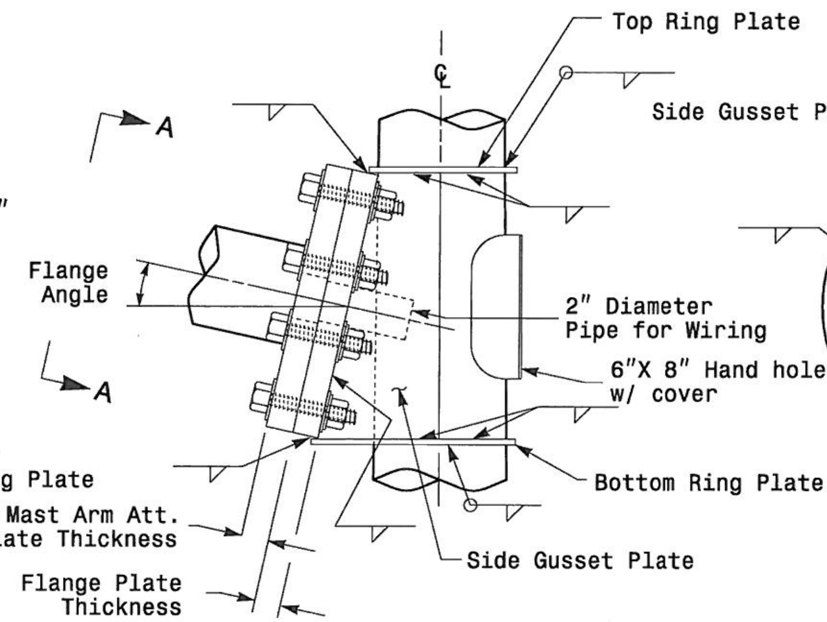
26-AUG-2014 08:50
S:*ITS&SU*ITS Signals*Signal Design Section*Eastern Region*M Sheets*2012_M4_Fab Details Mastarms.dgn
jgalloway

Welded Ring Stiffened Mast Arm Connection

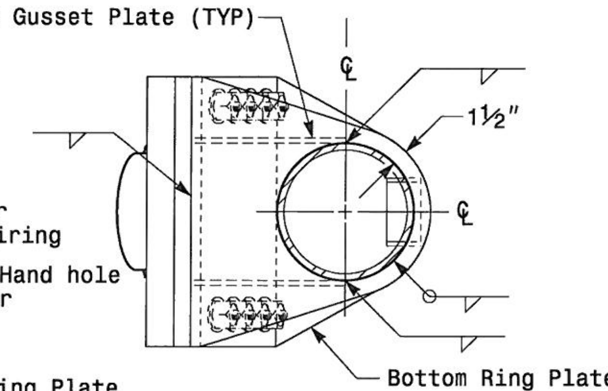
PROJECT REFERENCE NO.	SHEET NO.
	Sig. M5



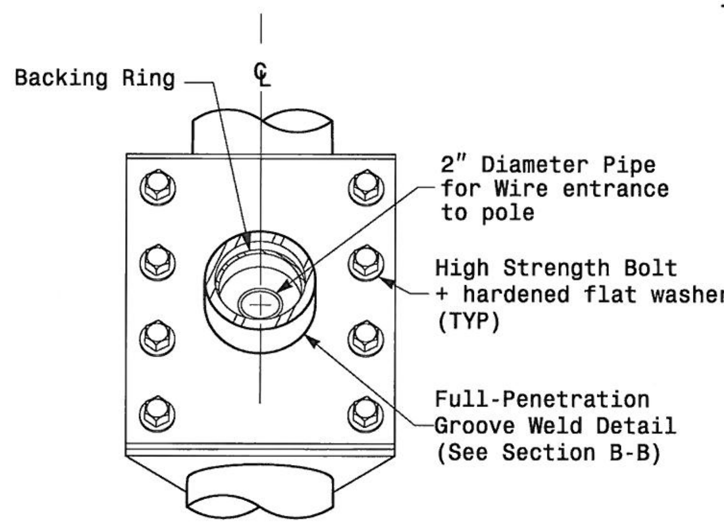
Plan View



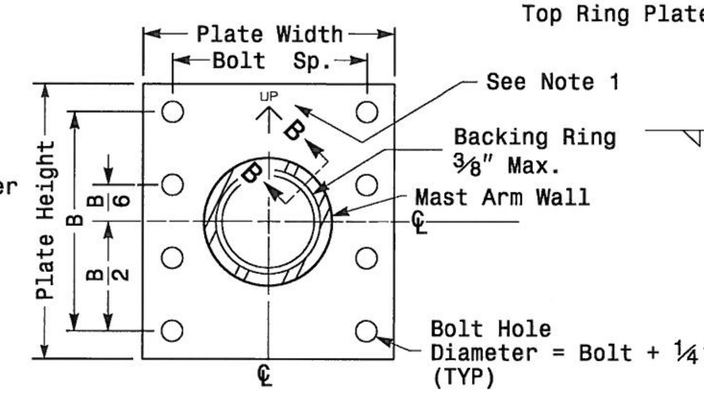
Side Elevation View



Bottom View

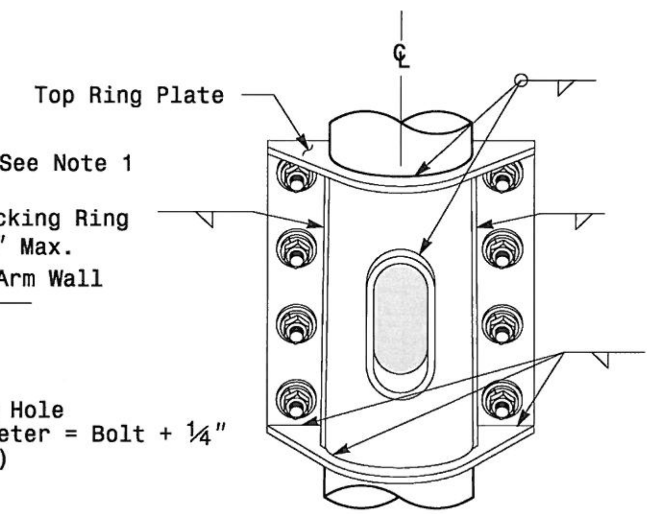


Front Elevation View

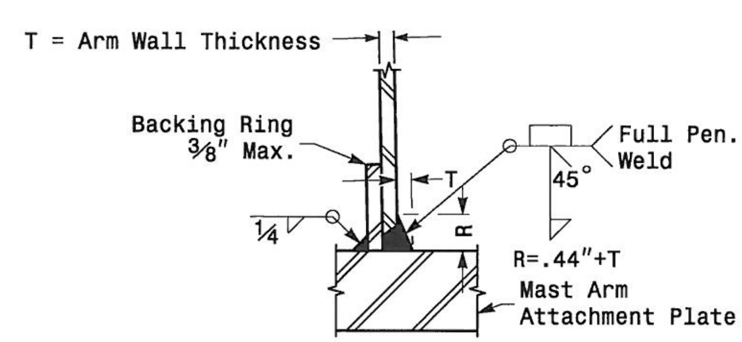


Section View A-A

Mast Arm Attachment Plate



Back Elevation View



Section B-B

Full-Penetration Groove Weld Detail

Notes:

1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
3. Designer is responsible for providing appropriate drainage points.

Fabrication Details – Mast Arm Poles

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

Fabrication Details For Mast Arm Connection To Pole

PLAN DATE:	AUGUST 2013	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

SCALE: 0 NA — NONE

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 028094 DEBESH C. SARKAR

DocuSigned by: Debesh C. Sarkar 8/26/2014 DATE

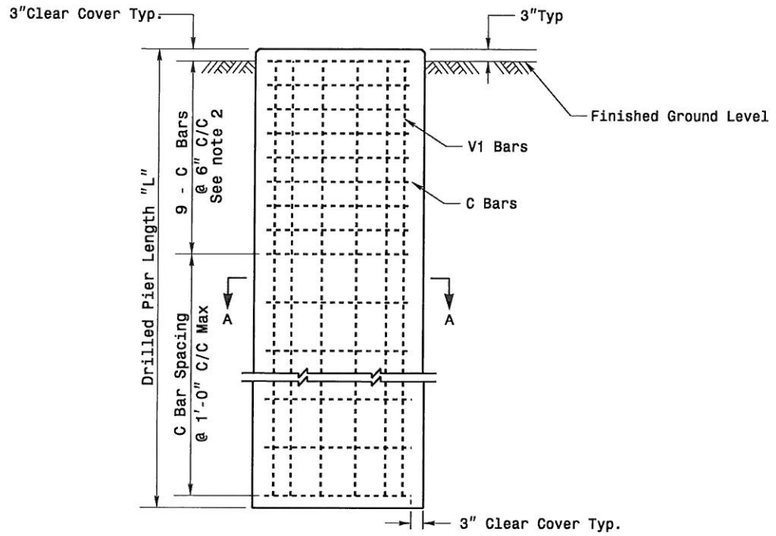
SIG. INVENTORY NO.

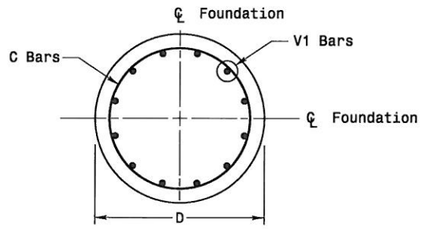
26-AUG-2014 08:47
S:\ITS\Units\ITS Signals\Signal Design Section\Eastern Region\M Sheets\2012_M5_Fab Details Mastarms.dgn
jgalloway

PROJECT REFERENCE NO.	SHEET NO.
	Sig. M7

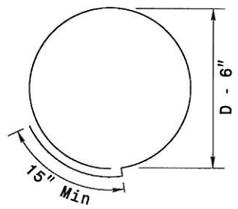
Construction Details – Foundations

Reinforcing Steel Bars





Section A-A



Typical "C" Bars

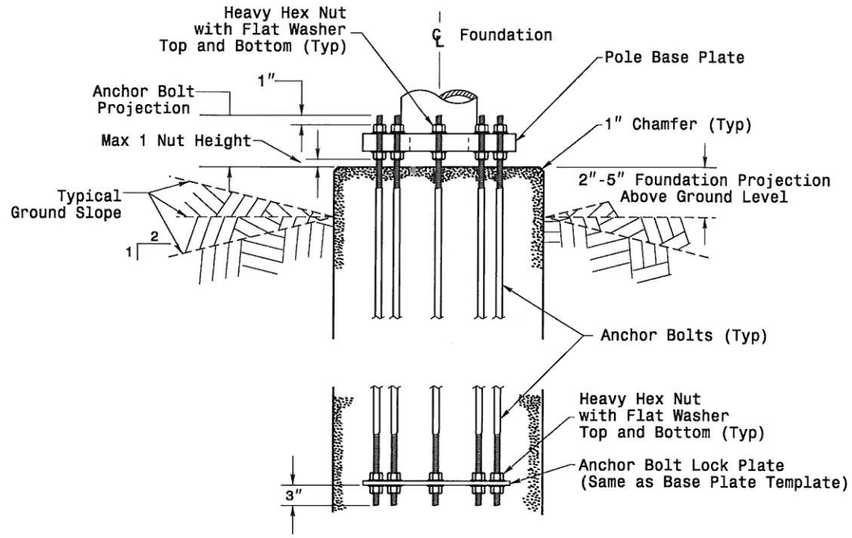
REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4'–0" DIAMETER)

Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	MIN.	Size	Type	Length
48"	.465 x L	V1	***	#8	STR.	**
		C	*	#4	CIR.	12'-6"

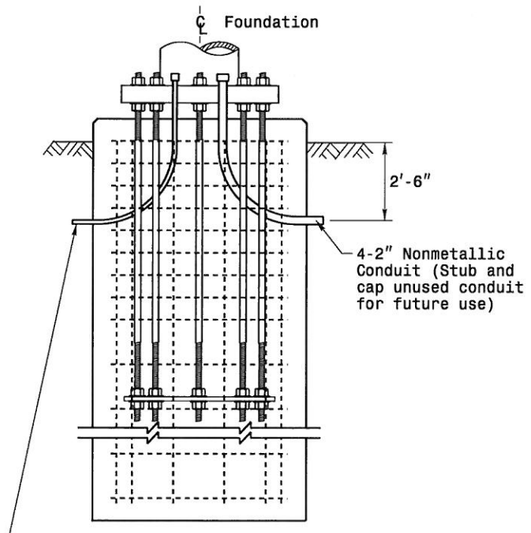
* See Note No. 1
** See Note No. 3
*** See Note No. 4

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 and/or as required. For standard foundations, see sheets M 8 and M 9 for details.
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 sheets M 8 and M 9 for details. Vertical reinforcing bars (V1) may be horizontally adjusted by +/-3"to facilitate the installation of electrical conduit entering into the cage.
4. Provide vertical reinforcement as required per design. See sheets M 8 and M9 for details.

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF TRANSPORTATION
Signal Design Section
1750 N.Greenfield Pkwy,Garner,NC 27529

Construction Details
Foundations

PLAN DATE:	AUGUST 2013	DESIGNED BY:	K.C. DURIGON
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE
0 NA
NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

Docusigned by: Debesh C. Sarkar 8/26/2014
DATE

SIG. INVENTORY NO.

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

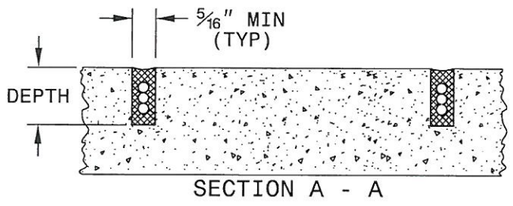
1-12

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

CONVENTIONAL 4-SIDED LOOP

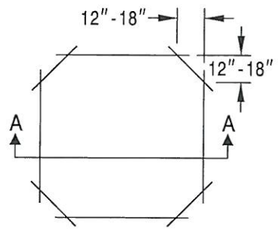
SAW SLOT DEPTH CHART

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

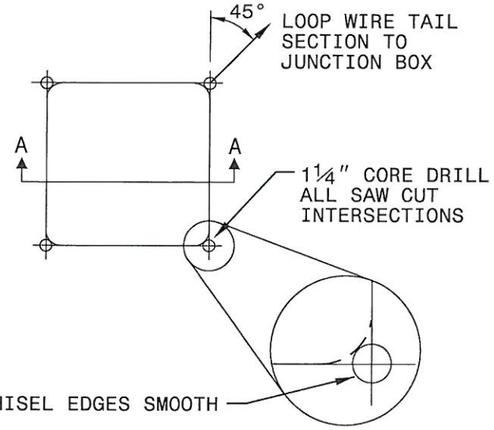


SAW CUT OPTIONS

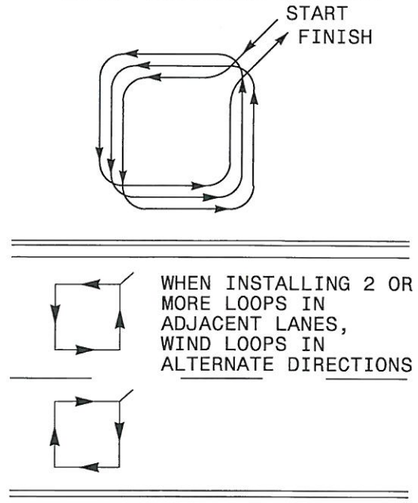
OPTION 1



OPTION 2
(POOR PAVEMENT)



LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE

CORRECT WAY TO TWIST WIRE

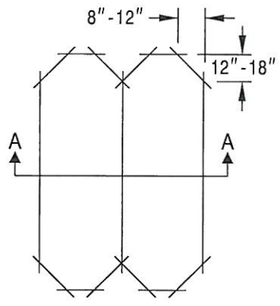
NOTES

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.

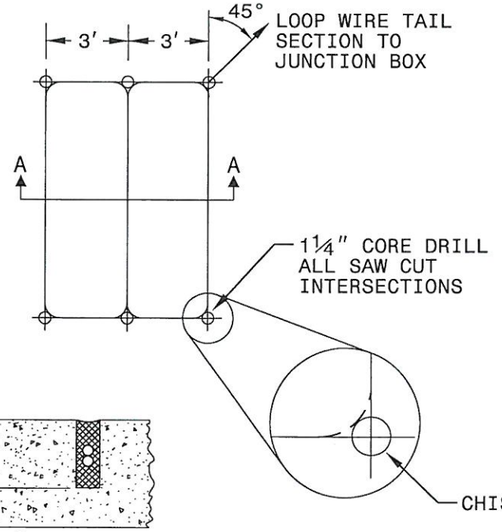
QUADRUPOLE LOOP

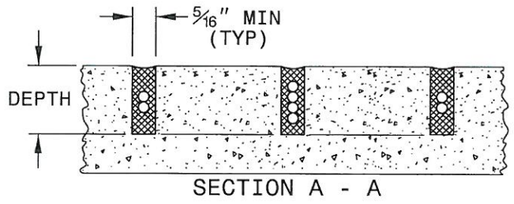
SAW CUT OPTIONS

OPTION 1



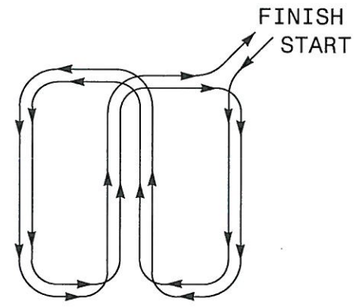
OPTION 2
(POOR PAVEMENT)





DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

LOOP WINDING METHOD



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

1-12

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3
1725.01

SHEET 1 OF 3
1725.01

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

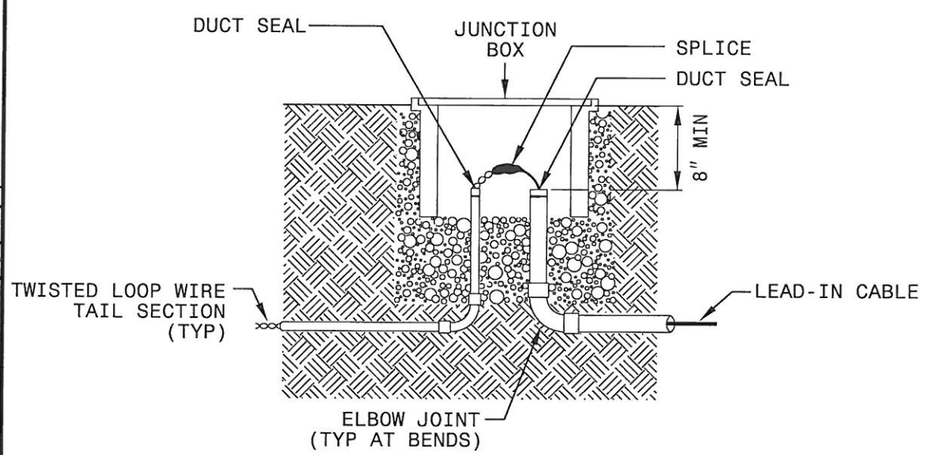
1-12

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

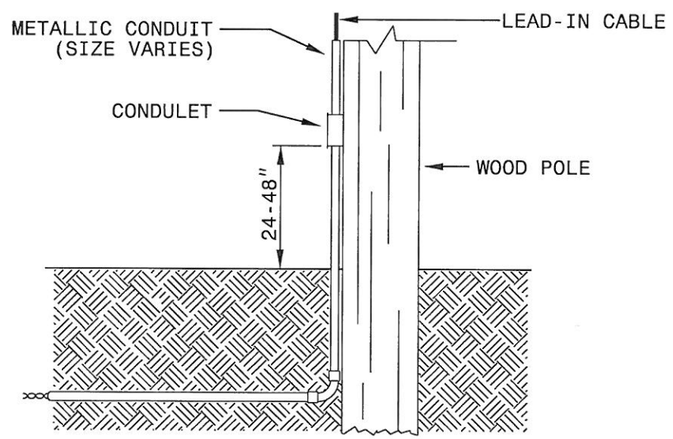
SHEET 2 OF 3
1725.01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

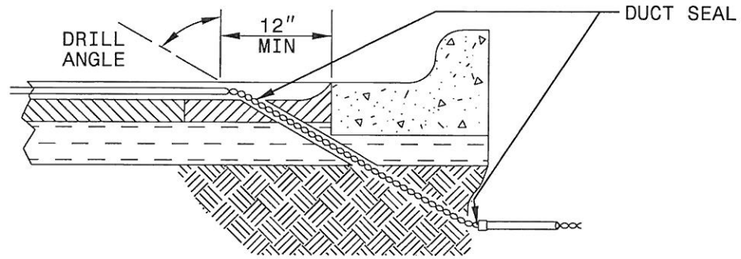


NOTE

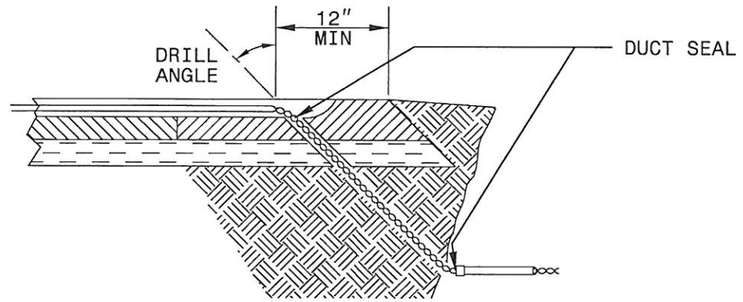
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

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.

STATE OF
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-12

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3
1725.01

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

1-12

ENGLISH DETAIL DRAWING FOR

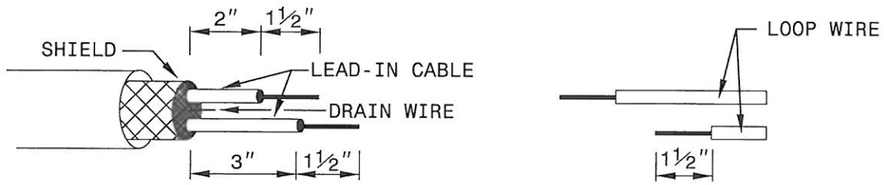
INDUCTIVE DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

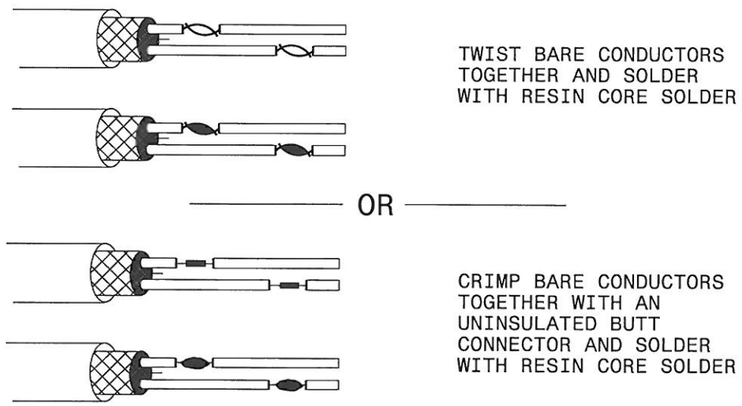
SHEET 3 OF 3

1725.01

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

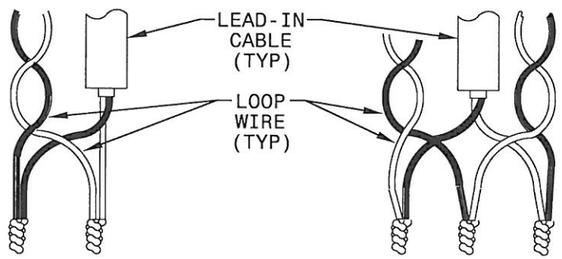
CRIMP BARE CONDUCTORS TOGETHER WITH AN UNINSULATED BUTT CONNECTOR AND SOLDER WITH RESIN CORE SOLDER

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

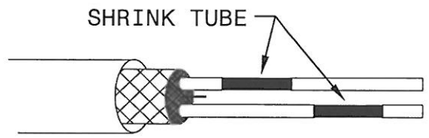
LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

SINGLE CONNECTION

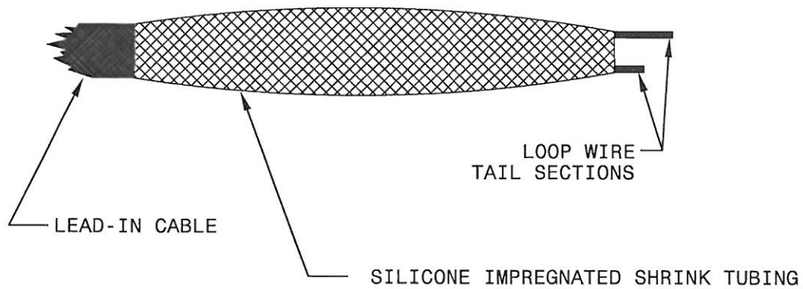
SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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

1-12

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3

1725.01