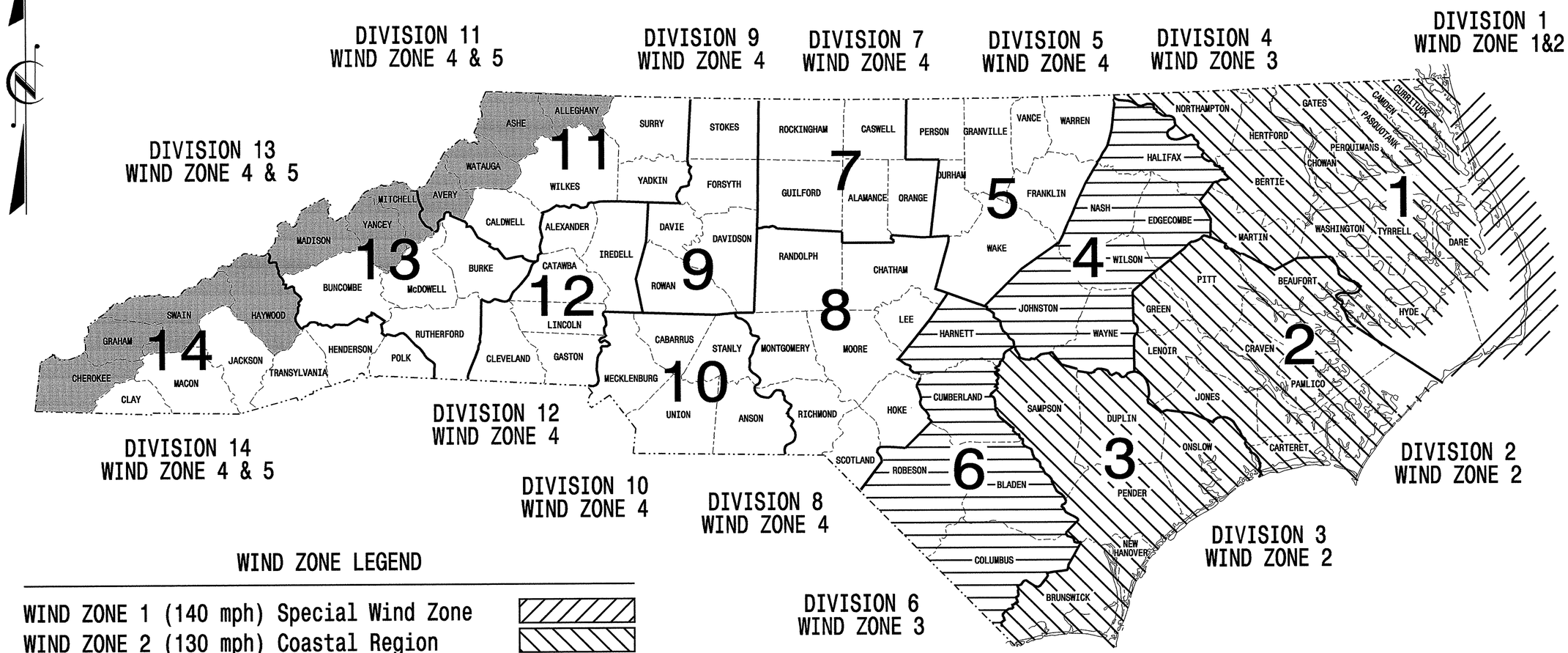
| STATE | PROJECT NO. | SHEET NO. |
|---|---|---|
| N.C. | | Sig. |
| F. A. PROJ. NO. | | dwg.MP1 |
| PROJECT ID. NO. | | |

# STATE OF NORTH CAROLINA
# DIVISION OF HIGHWAYS

## STANDARDS FOR METAL POLES WITH MAST ARMS

POLE STANDARDS

NCDOT METAL




### 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

| REVISIONS | INITIALS | DATE |
|---|---|---|
| ▽ Removed Drawings MP 10&11. Refer to interim plate drawings for MetalPole fabrication and Standard Foundation construction details. The interim Plate drawings are available at the NCDOT website shown below. | | 9.24.03 |
| http://www.doh.dot.state.nc.us/preconstruct/traffic/tmssu/SMS/metal_pole/poles.htm | | |

*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*

*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 |
|---|---|
| MP1 | Title Sheet |
| MP2 | Standard Notes |
| MP3–MP7 | Load Case and Foundation Selection |
| MP8–MP9 | Pole Fabrication Details |
| ~~▽MP10–MP11~~ | ~~Standard Foundation Details~~ |
| MP12 | Luminaire Extension Details (Future) |
| MP13 | Dual Mastarm Details (Future) |

### NCDOT CONTACTS:

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*C. F. ANDREWS, JR. – SIGNALS AND GEOMETRICS PROJECT ENGINEER*

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar — SIGNATURE
6.3.03 — DATE

# STANDARD NOTES

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP2 |

## METAL POLES WITH MAST ARMS

### GENERAL

1. THESE NOTES PROVIDE INFORMATION AND REQUIREMENTS FOR THE DESIGN, FABRICATION, AND INSTALLATION OF STANDARD METAL POLES WITH MASTARMS. THEY ARE TO BE USED BY DESIGN ENGINEERS, CONTRACTORS, AND POLE MANUFACTURERS IN THE SELECTION, FABRICATION, AND INSTALLATION OF METAL TRAFFIC SIGNAL SUPPORTS IN NORTH CAROLINA. THE NOTES ARE CATEGORIZED FOR EASE OF USE. NOTES THAT ARE SPECIFIC TO A PARTICULAR SITUATION, DESIGN DETAIL OR REQUIREMENT MAY BE SHOWN ON AN APPLICABLE DRAWING TO CLARIFY INTENT AND UNDERSTANDING.
2. THESE METAL POLE STANDARDS ARE BASED ON 5 LOADING CASES. NO VARIATIONS, SUBSTITUTION OR RE-DESIGN OF THE SPECIFIED POLES AND FOUNDATIONS WILL BE PERMITTED UNLESS THEY ARE APPROVED BY THE TRAFFIC ENGINEERIING BRANCH.
3. THESE METAL POLE STANDARDS MAKE REFERENCE TO THE NCDOT "ROADWAY STANDARD DRAWINGS" DATED JANUARY 2002 HERE IN AFTER REFERED TO AS THE STANDARD DRAWINGS AND TO THE NCDOT "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2002 HERE IN AFTER REFERED TO AS THE STANDARD SPECIFICATIONS. IF THERE IS A DISCREPANCY BETWEEN THE STANDARD DRAWINGS/SPECIFICATIONS AND THESE STANDARDS, THEN THESE DRAWINGS AND SPECIFICATIONS SHALL GOVERN.
4. POLE CASES PREAPPROVED ON THE DEPARTMENTS QUALIFIED PRODUCTS LIST (QPL) WILL NOT REQUIRE MANUFACTURER'S SHOP DRAWINGS. HOWEVER, CERTIFICATION OF COMPLIANCE WITH THE MANUFACTURER'S PREAPPROVED SHOP DRAWING ON FILE WITH THE DEPARTMENT SHALL BE FURNISHED TO THE ENGINEER. IF POLE CASES ARE NOT ON THE QPL, OR IF VARIATIONS TO A CASE STANDARD HAVE BEEN APPROVED, MANUFACTURER'S SHOP DRAWINGS SHALL BE REQUIRED.
5. THESE STANDARDS CALL FOR A RING STIFFENED GUSSET ASSEMBLY WELDED TO THE POLE FOR THE ATTACHMENT OF STRAIGHT MAST ARMS. BECAUSE OF THE HIGHER MOUNTING HEIGHT AND MINIMAL DESIGN RAKE REQUIRED FOR STRAIGHT ARM ATTACMENT, THESE POLES ARE NOT RECOMMENDED OR ALLOWED FOR USE WITH ARCHED OR CURVED ARMS.
6. SEE MAST ARM AND POLE IDENTIFICATION LEGEND ON DRAWINGS MP3 THRU MP7 FOR PROPER IDENTIFICATION NUMBERING OF METAL POLES WITH MAST ARMS THAT WILL BE USED IN THESE STANDARDS.

### DESIGN CRITERIA

7. ALL DESIGNS SHALL CONFORM TO THE 2001 4TH EDITION "AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS" CODE INCLUDING THE LATEST INTERIM SPECIFICATIONS. DESIGN WIND PRESSURES AND APPLICATIONS ARE IN ACCORDANCE WITH SECTION 3.8 AND 3.9 OF THE 2001 AASHTO SPECIFICATIONS.
8. FATIGUE IMPORTANCE CATEGORY II IS TO BE USED FOR FATIGUE DESIGN PER SECTION 11 OF THE 2001 AASHTO SPECIFICATION. TRUCK-INDUCED GUST PRESSURE RANGE IS BASED ON A TRUCK SPEED OF 55 MPH UNLESS THE TRUCK ALLOWABLE SPEED IS SPECIFIED IN THE CONTRACT PLAN BASED ON THE ACTUAL POSTED SPEED LIMIT ON THE ROADWAY. THE NATURAL WIND GUST PRESSURE RANGE IS NOT APPLIED TO AREAS OF THE SIGNAL ARM COINCIDING WITH AREAS OF SIGNALS AND SIGNS.
9. THE FULL-PENETRATION GROOVE WELD CONNECTION AT THE BASE OF THE SIGNAL ARMS AND POLES IS A STRESS CATEGORY E DETAIL FOR THE BACKING RING ATTACHED TO THE BASE PLATE WITH A CONTINUOUS INTERIOR FILLET WELD. FOR DETAILS, SEE SECTION 11 OF THE 2001 AASHTO SPECIFICATION.
10. STRESS CATEGORY $K_2$ IS NOT APPLICABLE FOR THE RING-STIFFENED BUILT-UP BOX. THE BUILT-UP BOX IS DESIGNED FOR STRESS CATEGORY ET. THE POLE IS DESIGNED FOR STRESS CATEGORY E USING THE SECTION MODULUS OF THE POLE AND MOMENT JUST BELOW THE CONNECTION OF THE BUILT- UP BOX.
11. THE NATURAL WIND GUST SPEED OF 11.2 MPH (5 M/S) IS TO BE USED FOR ALL DESIGNS.
12. ZONE 1 AND ZONE 5 ARE CONSIDERED SPECIAL WIND ZONE CASES DUE TO THEIR HIGH WIND SPEED.
13. DEFLECTION CRITERIA:
    a. THE MAXIMUM ALLOWABLE DEFLECTION AT THE TIP OF THE MAST ARM DUE TO THE COMBINED DEFLECTION OF THE POLE AND THE ARM SHALL NOT EXCEED 3.0% OF THE TOTAL MAST ARM LENGTH UNDER MAXIMUM DEAD LOADING CONDITIONS.
    b. AS PROVIDED IN ARTICLE 11.8 OF THE 2001 AASHTO SPECIFICATION, THE TOTAL DEFLECTION AT THE FREE END OF ALL TRAFFIC SIGNAL ARMS SHALL BE LIMITED TO 8 INCHES (200 MM) VERTICALLY, WHEN THE EQUIVALENT STATIC DESIGN WIND EFFECT FROM TRUCK-INDUCED GUSTS ARE APPLIED TO THE STRUCTURE, AND ALSO CONFORM TO ARTICLE 10.4.2 OF THE 2001 AASHTO SPECIFICATION.
14. THE THICKNESS OF A SINGLE PLY POLE MAY BE SUBSTITUTED BY USING A 2 PLY POLE AS LONG AS THE POLE BASE DOES NOT EXCEED THE SPECIFIED MINIMUM DIAMETER BY MORE THAN 1.25". NO EXCEPTIONS TO THIS DESIGN PARAMETER WILL BE ALLOWED.
15. A MAST ARM MAY BE CONSTRUCTED USING TELESCOPING SLIP FIT SECTIONS TO ACHIEVE THE SPECIFIED ARM LENGTH. THE OUTBOARD SECTION MAY USE A SMALLER GAGE METAL TO LIGHTEN THE DEAD WEIGHT OF THE ARM AS LONG AS THE ARM SECTIONS ARE DESIGNED TO HANDLE THE SPECIFIED LOADING. CALCULATIONS ARE REQUIRED TO VERIFY THAT ALL COMPONENTS OF THE STRUCTURE MEET THE DESIGN CRITERIA STATED ABOVE.
16. PROVISIONS SHALL BE MADE FOR DRAINAGE OF WATER FROM INSIDE THE METAL POLE AND MAST ARM.

### POLE MATERIALS

17. PROVIDE MATERIALS FOR STEEL METAL POLES THAT COMPLY WITH SECTION 1098-15 OF THE STANDARD SPECIFICATIONS.
18. POLE MONOTUBE AND MAST ARMS SHALL:
    - BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
    - USE ASTM A595 MATERIAL (55 KSI) OR EQUIVALENT AS APPROVED BY THE ENGINEER.
    - HAVE A LINEAR TAPER OF 0.14 IN/FT OR LESS.
19. BASE PLATE SHALL:
    - BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.
    - CONFORM TO AASHTO M270 GRADE 36 OR EQUIVALENT.
20. ANCHOR BOLTS, NUTS, AND WASHER MATERIAL:
    - ANCHOR BOLTS - USE AASHTO M 314 GRADE 55 MATERIAL OR EQUIVALENT.
    - NUTS - USE AASHTO M291 GRADE 2H, DH, OR DH3 MATERIAL OR EQUIVALENT.
    - WASHERS - USE AASHTO M293 MATERIAL OR EQUIVALENT.
21. ALL ANCHOR BOLTS, NUTS, WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 OR M298.
22. ALL OTHER STEEL HARDWARE MATERIAL REQUIRED BUT NOT SPECIFIED ABOVE SHALL COMPLY WITH SECTION 1098-15 OF THE STANDARD SPECIFICATIONS.

### POLE FABRICATION

23. POLE AND ARM ASSEMBLIES SHALL BE PERMANENTLY TAGGED OR ENGRAVED WITH THE FOLLOWING:
    - POLE MANUFACTURERS NAME
    - MANUFACTURE DATE
    - POLE CASE NUMBER
    - THICKNESS AND GRADE OF STEEL

    WHEN TELESCOPING ARM SECTIONS ARE USED, PROVIDE AN IDENTIFICATION TAG FOR EACH SECTION. REFER TO DRAWING MP-8&9 FOR LOCATION DETAILS OF I.D. TAGS. FOR NON-STANDARD POLES AND MASTARMS, PROVIDE ALL INFORMATION ABOVE AND ANCHOR BOLT MATERIAL, SIZE, AND LENGTH.
24. CIRCUMFERENTIAL WELDING OF THE POLES ARE ALLOWED PROVIDED THE FOLLOWING CONDITIONS ARE MET:
    - THE METAL POLES SHALL NOT BE SPLICED WITHIN 5 FEET FROM BASE NOR WITHIN 2 FEET FROM ANY CONNECTION.
    - ONLY ONE SPLICE PER UPRIGHT WILL BE PERMITTED.
    - THE QUALITY CONTROL AND WORKMANSHIP OF THE SPLICE WELDS ARE THE SOLE RESPONSIBILITY OF THE POLE MANUFACTURER.
25. ALL WELDING SHALL BE IN ACCORDANCE WITH THE LATEST "AWS D1.1 STRUCTURAL WELDING CODE-STEEL", AND AICS MANUAL OF STEEL CONSTRUCTION.
26. WELDED SPLICES FOR POLE OR ARM SECTIONS SHALL USE FULL-PENETRATION WELDS AND SHALL HAVE THE SURFACE OF THE ENTIRE WELD CIRCUMFERENCE GROUND FLUSH WITH THE BASE METAL. THE MINIMUM LENGTH OF WELD SHALL BE 2'-0" FROM THE END OF A POLE OR ARM SECTION.
27. PROVIDE 2- 3" FACTORY DRILLED HOLES THROUGH THE POLE WALL FOR WIRE ENTRANCE ACCESS TO THE TERMINAL STRIP INSIDE THE TERMINAL COMPARTMENT. THE HOLES SHALL BE IN THE CENTER OF THE TERMINAL COMPARTMENT (135 DEGREES ON THE POLES RADIAL INDEX) LOCATED AT 26" AND 36" FROM THE BASE OF THE POLE. SEE DRAWING MP8 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
28. PROVIDE A PERMANENT MEANS OF IDENTIFICATION ON THE MAST ARM ATTACHMENT PLATE TO IDENTIFY THE CORRECT ATTACHMENT ORIENTATION OF THE ARM TO THE POLE FLANGE PLATE TO PREVENT FITUP PROBLEMS IN THE FIELD DURING INSTALLATION. SEE MAST ARM ATT. PLATE CONNECTION DETAILS ON DWG. MP8.
29. PROVIDE A FACTORY STANDARD "J" HOOK FOR CABLE SUPPORT LOCATED A MINIMUM OF 10" BELOW THE TOP OF THE POLE AT 90 DEGREES ON THE POLE'S RADIAL INDEX TO FACILLITATE THE INSTALLATION OF A RING STIFFENER INSIDE THE TOP OF THE POLE FOR A FUTURE LIGHTING EXTENSION. SEE DRAWING MP8 FOR DETAILS.
30. THE INSIDE DIAMETER OF THE ACCESS HOLE ON THE POLE BASE PLATE SHALL BE LARGE ENOUGH TO ACCOMMODATE 5-2" CONDUITS.
31. AT THE TIME OF SHIPMENT FROM THE FACTORY, ENSURE THE POLE AND ARM IS PACKAGED SO THAT WATER CAN NOT GET INSIDE.
32. EACH POLE IS TO INCLUDE POLE TOP CAPS, ARM END CAPS, ANCHOR BOLT NUT COVERS, COVERS FOR ALL ACCESS POINTS ON THE POLE, AND ALL MOUNTING HARDWARE FOR THESE ITEMS AS WELL AS ALL MOUNTING HARDWARE FOR THE MAST ARM AND POLE.
33. PROVIDE TWO STEEL BASE PLATE TEMPLATES, ONE OF WHICH WILL BE USED AS AN ANCHOR BOLT LOCK PLATE TO PROPERLY POSITION AND SECURE THE BOTTOM ENDS OF THE ANCHOR BOLTS TOGETHER INSIDE OF THE STEEL REINFORCING CAGE.
34. SHIP ALL POLE ACCESSORIES FOR EACH POLE IN A SEPARATE WATERTIGHT CONTAINER WITH A LABEL THAT IDENTIFIES THE SPECIFIC POLE AND DESCRIBES THE CONTENTS.

### SOILS & FOUNDATIONS

35. THE FOUNDATION SIZE FOR POLES IN THESE METAL POLE STANDARDS IS DETERMINED BY CONDUCTING A SUBSURFACE SOIL INVESTIGATION. FOR DETAILS OF THE SUBSURFACE INVESTIGATION, AND PROPER SELECTION/DETERMINATION OF THE METAL POLE FOUNDATIONS, REFER TO AND COMPLY WITH THE "METAL POLE STANDARD FOUNDATIONS" SPECIAL PROVISION WHICH IS TO BE CONSIDERED AN INTEGRAL PART OF THESE METAL POLE STANDARDS.
36. POLE FOUNDATIONS DEPTHS HAVE BEEN PRE-DESIGNED BASED ON 5 DIFFERENT LOAD CASES. TO DETERMINE THE CORRECT DEPTH OF EACH FOUNDATION, REFER TO THE APPROPRIATE LOAD CASE DRAWINGS MP3 THRU MP7.
37. SOME FOUNDATIONS WILL REQUIRE WING WALLS TO MINIMIZE POTENTIAL TORSIONAL ROTATION. IF WING WALLS CAN NOT BE INSTALLED BECAUSE OF UNDERGROUND OBSTRUCTIONS, THE CONTRACTOR OR ENGINEER SHOULD CONTACT THE TRAFFIC ENGINEERING BRANCH WHERE A STRUCTURAL ENGINEER WILL ANALYZE AND PROVIDE A REVISED FOUDATION DEPTH.
38. A "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION IS REQUIRED TO BE SUBMITTED AND APPROVED PRIOR TO ANY DRILLING IN THE FIELD. THIS FORM CAN BE OBTAINED AT THE FOLLOWING WEBSITE:

    http://www.doh.dot.state.nc.us/preconstruct/highway/dsn srvc/soils/form/default.htm
39. REFER TO STANDARD DRAWING 1742.01 FOR FOR FOUNDATION INSTALLATION DETAILS.
40. 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.
41. THE ANCHOR BOLT LOCK PLATE TEMPLATE USED TO POSITION AND SECURE THE BOTTOM ENDS OF THE ANCHOR BOLTS MAY BE COPED AS REQUIRED TO AVOID INTERFERENCE WITH THE VERTICAL REINFORCEMENT BARS OF THE DRILL PIER SHAFT.
42. THE CONCRETE SHALL BE DRILL PIER CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS IN ACCORDANCE WITH SECTION 1000 OF THE NORTH CAROLINA STANDARD SPECIFICATIONS. FOR DETAILS, SEE SPECIAL PROVISIONS.
43. PROVIDE A 1" CHAMFER ON ALL FOUNDATIONS INSTALLED ABOVE GROUND LEVEL TO PREVENT CHIPPING OF THE EDGES.
44. THE TOP OF EACH FOUNDATION SHALL BE PERMANENTLY MARKED (WITH STAMP OR EMBEDDED PLATE) TO IDENTIFY THE TYPE AND DEPTH OF THE FOUNDATION.
45. THE TRAFFIC SIGNAL SUPPORT STRUCTURE SHALL NOT BE ERECTED BEFORE THE CONCRETE IN THE FOUNDATION HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
46. NON-SHRINK GROUT SHALL BE A MIX CONSISTING OF 1 PART CEMENT, 3 PARTS SAND BY WEIGHT, AND 2 GRAMS OF ALUMINUM POWDER PER 94 LBS. OF CEMENT USED. WATER SHALL BE LIMITED TO THAT AMOUNT REQUIRED TO PRODUCE A WORKABLE MIX. PROVIDE SMALL PIPE TO DRAIN WATER PER STANDARD SPECIFICATIONS.
47. FOR OTHER DETAILS REGARDING CONSTRUCTION OF CONCRETE FOUNDATION, SEE PROJECT SPECIAL PROVISIONS.

### INSTALLATION

48. COMPLY WITH THE PROVISIONS OF SECTION 1072 & 1742 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
49. REFER TO STANDARD DRAWING 1742.01 FOR FOR POLE AND HARDWARE INSTALLATION DETAILS.
50. APPLY 100% SILICONE CAULK (EXTERIOR USAGE) AT THE TOP OF THE BACKING RING ALONG THE ENTIRE INTERIOR CIRCUMFERENCE OF THE ARM AND POLE WALL. FOR LOCATION OF WHERE CAULK IS TO BE APPLIED, SEE FULL PENETRATION GROOVE WELD DETAIL ON DRAWING MP8
51. WHEN ATTACHING POLE TO FOUNDATION, THE DISTANCE BETWEEN THE BOTTOM OF THE LEVELING NUT TO THE TOP OF THE CONCRETE FOUNDATION SHOULD NOT BE GREATER THEN ONE ANCHOR NUT HEIGHT. THE TOP OF EACH ANCHOR BOLT SHOULD NOT EXTEND MORE THAN ONE ANCHOR NUT HEIGHT ABOVE TOP NUT TO FACILITATE THE INSTALLATION OF A NUT COVER.
52. A RING OF EXPANDING FOAM SEALER SHALL BE PLACED THROUGH THE HAND HOLE OPENING AT THE BASE OF THE POLE TO PROVIDE A SEAL AGAINST BLOWN DUST. THE ENTIRE FRONT WIDTH OF THE LEVELING NUTS SHALL BE VISIBLE AFTER ITS PLACEMENT. A NON SHRINK GROUT SHALL BE PLACED UNDER THE ENTIRE BASE PLATE AFTER POLE HAS BEEN LEVELED AND SECURED TO THE FOUNDATION AND THE FOAM SEALER HAS CURED.
53. FOR OTHER DETAILS REGARDING METAL POLE INSTALLATION, SEE PROJECT SPECIAL PROVISIONS.

### TABLE OF STATEWIDE COUNTY WIND ZONES

| ZONE 1 *140 mph /63 m/s* | ZONE 2 *130 mph /58 m/s* | | ZONE 3 *110 mph /49 m/s* | ZONE 4 *90 mph /40 m/s* | | | | ZONE 5 *120 mph /58 m/s* |
|---|---|---|---|---|---|---|---|---|
| CURRITUCK (1) | BERTIE (1) | BEAUFORT (2) | EDGECOMBE (4) | DURHAM (5) | CHATHAM (8) | CABARRUS (10) | IREDELL (12) | ASHE (11) |
| DARE (1) | CAMDEN (1) | CARTERET (2) | HALIFAX (4) | FRANKLIN (5) | HOKE (8) | MECKLENBURG (10) | LINCOLN (12) | AVERY (11) |
| HYDE (1) | CHOWAN (1) | CRAVEN (2) | JOHNSTON (4) | GRANVILLE (5) | LEE (8) | STANLY (10) | BUNCOMBE (13) | WATAUGA (11) |
| | CURRITUCK (1) | GREEN (2) | WAYNE (4) | PERSON (5) | MONTGOMERY (8) | UNION (10) | BURKE (13) | MADISON (13) |
| | DARE (1) | JONES (2) | WILSON (4) | VANCE (5) | MOORE (8) | ALLEGHANY (11) | McDOWELL (13) | MITCHELL (13) |
| | GATES (1) | LENOIR (2) | BLADEN (6) | WARREN (5) | RANDOLPH (8) | CALDWELL (11) | RUTHERFORD (13) | YANCEY (13) |
| | HERTFORD (1) | PAMLICO (2) | COLUMBUS (6) | WAKE (5) | RICHMOND (8) | SURRY (11) | CLAY (14) | CHEROKEE (14) |
| | HYDE (1) | PITT (2) | CUMBERLAND (6) | ALAMANCE (7) | DAVIDSON (9) | WILKES (11) | HENDERSON (14) | GRAHAM (14) |
| | PASQUOTANK (1) | BRUNSWICK (3) | HARNETT (6) | CASWELL (7) | DAVIE (9) | YADKIN (11) | JACKSON (14) | HAYWOOD (14) |
| | NORTHAMPTON (1) | DUPLIN (3) | ROBESON (6) | GUILFORD (7) | FORSYTH (9) | ALEXANDER (12) | MACON (14) | SWAIN (14) |
| | MARTIN (1) | ONSLOW (3) | | ORANGE (7) | ROWAN (9) | CATAWBA (12) | POLK (14) | |
| | PERQUIMANS (1) | NEW HANOVER (3) | | ROCKINGHAM (7) | STOKES (9) | CLEVELAND (12) | TRANSYLVANIA (14) | |
| | TYRRELL (1) | PENDER (3) | | SCOTLAND (8) | ANSON (10) | GASTON (12) | | |
| | WASHINGTON (1) | SAMPSON (3) | | | | | | |


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


SCALE: 0 NA — NONE

STANDARD NOTES FOR METAL POLES WITH MAST ARMS

| PLAN DATE: APRIL 2003 | REVIEWED BY: R. E. MULLINAX |
|---|---|
| PREPARED BY: C. F. ANDREWS | REVIEWED BY: D. C. SARKAR |

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

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

SIGNATURE: D. Sarkar DATE: 6.3.03

SIG. INVENTORY NO.

# LOAD CASE 1 – ULTRA LIGHT LOADING

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP3 |

## FOUNDATION SELECTION TABLE

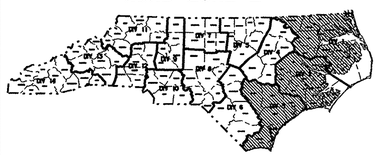
42″ Diameter Drilled Pier Length (L) - Feet

CONCRETE VOLUME (cubic yards)=.356xL

### WIND ZONE 1

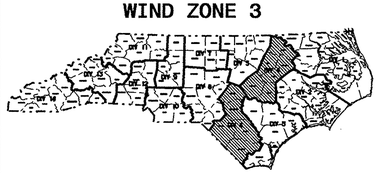
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC1-10 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-15 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-20 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |

### WIND ZONE 2



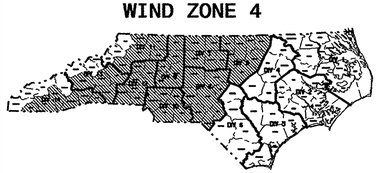
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC1-10 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-15 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-20 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |

### WIND ZONE 3



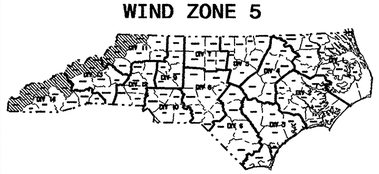
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC1-10 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-15 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-20 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |

### WIND ZONE 4



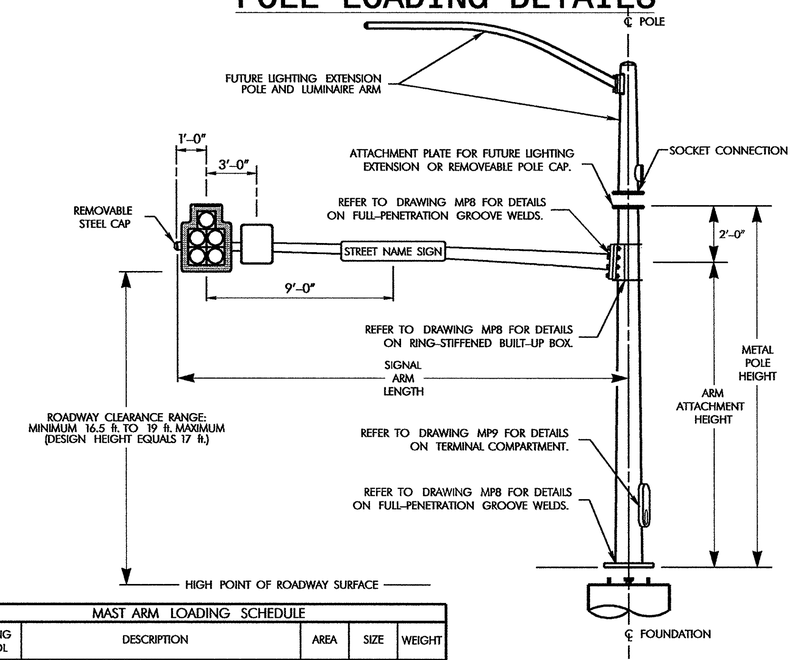
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC1-10 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| LC1-15 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-20 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-25 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |

### WIND ZONE 5



| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC1-10 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC1-15 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-20 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC1-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |

## POLE LOADING DETAILS




SIGNAL POLE WITH PROVISION FOR LIGHTING EXTENSION

### MAST ARM LOADING SCHEDULE

| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
|---|---|---|---|---|
| | SIGNAL HEAD 12″-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0″ W X 56.0″ L | 103 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0″ W X 30.0″ L | 11 LBS |
| STREET NAME SIGN | STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 12.0 S.F. | 18.0″ W X 96.0″ L | 27 LBS |

### SIGNAL MAST ARM DATA / MIN. POLE DATA

| MAST ARM NUMBER | SIGNAL ARM LENGTH | MINIMUM ARM BASE DIAMETER | MINIMUM ARM WALL THICKNESS | MASTARM ATT. PLATE SIZE | | ATT. PLATE BOLT SPACING | | ATT. PLATE TO FLANGE PLATE ATTACHMENT BOLT SIZE | MAST ARM ATT. PLATE THICKNESS | FLANGE PLATE THICKNESS | POLE BASE DIAMETER | POLE WALL THICKNESS "T" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | W | H | A | B | | | | | |
| LC1-10 | 10′-0″ | 6″ | .179″ | 16″ | 20″ | 10″ | 14″ | 1.25″x 6″ | 1.5″ | 1.5″ | 12.5″ | .25″ |
| LC1-15 | 15′-0″ | 7″ | .179″ | 16″ | 20″ | 10″ | 14″ | 1.25″x 6″ | 1.5″ | 1.5″ | 12.5″ | .25″ |
| LC1-20 | 20′-0″ | 8″ | .179″ | 16″ | 20″ | 10″ | 14″ | 1.25″x 6″ | 1.5″ | 1.5″ | 12.5″ | .25″ |
| LC1-25 | 25′-0″ | 9″ | .179″ | 16″ | 20″ | 10″ | 14″ | 1.25″x 6″ | 1.5″ | 1.5″ | 12.5″ | .25″ |

### POLE BASE PLATE AND ANCHOR BOLT DATA

| SIGNAL POLE HEIGHT | BASE PLATE DIMENSION "D" | BASE PLATE BOLT CIRCLE "BC" | BASE PLATE THICKNESS | ANCHOR BOLT SIZE (4 PER POLE) |
|---|---|---|---|---|
| 22′-0″ | 27″ | 20″ | 2″ | 2″ x 66″ |
| 24′-0″ | 27″ | 20″ | 2″ | 2″ x 66″ |
| 26′-0″ | 27″ | 20″ | 2″ | 2″ x 66″ |

REFER TO DRAWING MP8 AND MP9 FOR DETAILS ON POLE AND ARM FABRICATION.

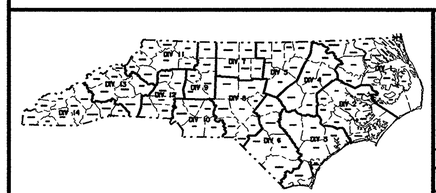
### MAST ARM AND POLE IDENTIFICATION LEGEND

MAST ARMS AND METAL POLES SELECTED FOR USE FROM THESE STANDARDS SHOULD BE IDENTIFIED USING THE FOLLOWIING ALPHA NUMERIC IDENTIFICATION NUMBER:

LCX-XX-XX

- Load Case Number (1 THRU 5)
- Mast Arm length
- Pole Height

# METAL POLES WITH MAST ARMS



Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
1122 N. McDowell St., Raleigh, NC 27603

SCALE: 0 NA — NONE

POLE LOADING DETAILS AND FOUNDATION SELECTION TABLES FOR LOAD CASE 1

| PLAN DATE: APRIL 2003 | REVIEWED BY: D.C. SARKAR |
|---|---|
| PREPARED BY: C.F. ANDREWS | REVIEWED BY: R.E. MULLINAX |

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

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

SIGNATURE: D. Sarkar — DATE: 6.3.03

SIG. INVENTORY NO.

03-JUN-2003 08:54
W:\MPG\3140-Unit\Workgroups\andrews 2003 Mast Arms\PenTestmp31thru7.dgn
candrews

# LOAD CASE 2 – LIGHT LOADING

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP4 |

## FOUNDATION SELECTION TABLE

42″ Diameter Drilled Pier Length (L) - Feet

CONCRETE VOLUME (cubic yards)=.356xL

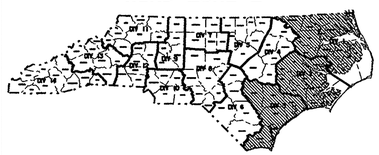
Denotes Wing Wall Required SEE NOTE 37.

USE TYPE-1 WING WALL. FOR DETAILS, SEE DRAWING NO. MP-11.

### WIND ZONE 1

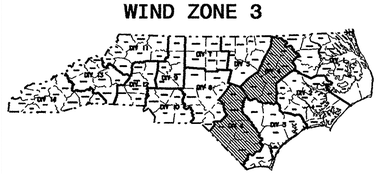
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC2-25 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC2-30 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC2-45 | 14.5 | 10.5 | 9.0 | 9.0 | 14.0 | 12.0 | 11.0 |

### WIND ZONE 2



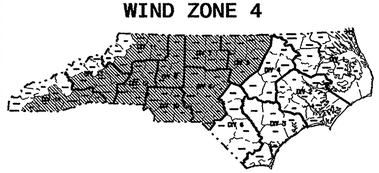
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC2-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC2-30 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC2-45 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |

### WIND ZONE 3



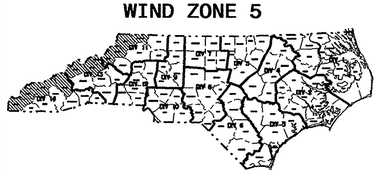
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC2-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC2-30 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC2-45 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |

### WIND ZONE 4



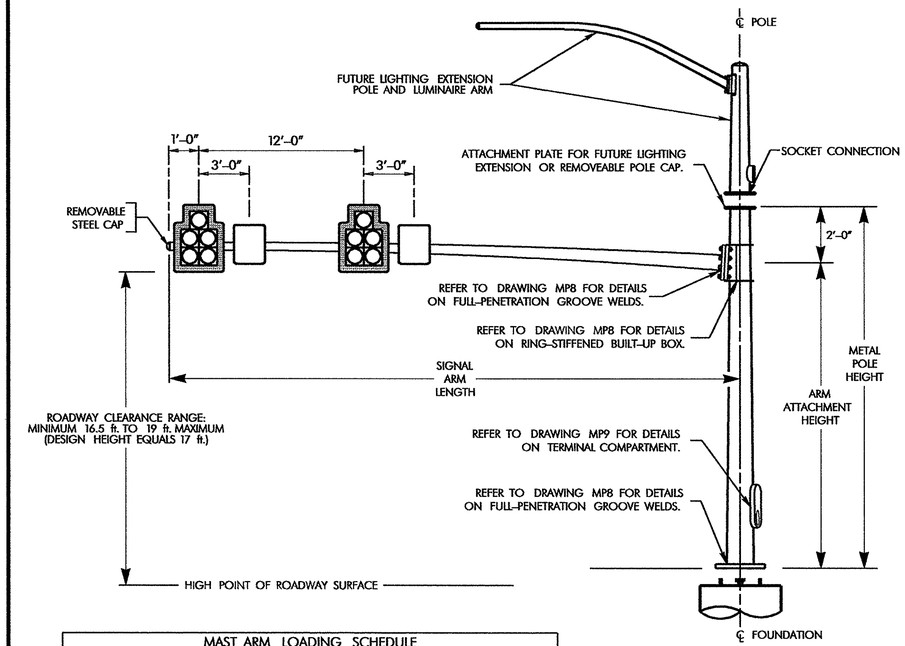
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC2-25 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC2-30 | 9.5 | 9.0 | 9.0 | 9.0 | 10.0 | 9.0 | 9.0 |
| LC2-45 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |

### WIND ZONE 5



| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC2-25 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC2-30 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC2-45 | 11.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |

## POLE LOADING DETAILS




SIGNAL POLE WITH PROVISION FOR LIGHTING EXTENSION

| MAST ARM LOADING SCHEDULE | | | | |
|---|---|---|---|---|
| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
| | SIGNAL HEAD 12″-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0″ W X 56.0″ L | 103 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0″ W X 30.0″ L | 11 LBS |

| SIGNAL MAST ARM DATA | | | | | | | | | | | | MIN. POLE DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAST ARM NUMBER | SIGNAL ARM LENGTH | MINIMUM ARM BASE DIAMETER | MINIMUM ARM WALL THICKNESS | MAST ARM ATT. PLATE SIZE | | ATT. PLATE BOLT SPACING | | ATT. PLATE TO FLANGE PLATE ATTACHMENT BOLT SIZE | MAST ARM ATT. PLATE THICKNESS | FLANGE PLATE THICKNESS | | POLE BASE DIAMETER | POLE WALL THICKNESS "T" |
| | | | | W | H | A | B | | | | | | |
| LC2-25 | 25′-0″ | 11″ | .25″ | 24″ | 27″ | 15″ | 21″ | 1.5″x 7″ | 2″ | 2″ | | 15″ | .3125″ |
| LC2-30 | 30′-0″ | 11″ | .25″ | 24″ | 27″ | 15″ | 21″ | 1.5″x 7″ | 2″ | 2″ | | 15″ | .3125″ |
| LC2-45 | 45′-0″ | 14″ | .25″ | 24″ | 27″ | 18″ | 21″ | 1.5″x 7″ | 2″ | 2″ | | 18″ | .3125″ |

| POLE BASE PLATE AND ANCHOR BOLT DATA | | | | |
|---|---|---|---|---|
| SIGNAL POLE HEIGHT | MAX. BASE PLATE DIAMETER "D" | MAX. BASE PLATE BOLT CIRCLE "BC" | BASE PLATE THICKNESS | ANCHOR BOLT SIZE (8 PER POLE) |
| 22′-0″ | 32″ | 25″ | 2″ | 2″x 66″ |
| 24′-0″ | 32″ | 25″ | 2″ | 2″x 66″ |
| 26′-0″ | 32″ | 25″ | 2″ | 2″x 66″ |

REFER TO DRAWING MP8 AND MP9 FOR DETAILS ON POLE AND ARM FABRICATION.

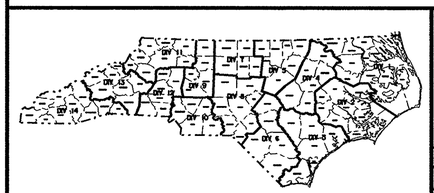
### MAST ARM AND POLE IDENTIFICATION LEGEND

MAST ARMS AND METAL POLES SELECTED FOR USE FROM THESE STANDARDS SHOULD BE IDENTIFIED USING THE FOLLOWIING ALPHA NUMERIC IDENTIFICATION NUMBER:

LCX-XX-XX

Load Case Number (1 THRU 5) — Mast Arm length — Pole Height

# METAL POLES WITH MAST ARMS



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

SCALE: 0 NA — NONE

POLE LOADING DETAILS AND FOUNDATION SELECTION TABLES FOR LOAD CASE 2

| PLAN DATE: APRIL 2003 | REVIEWED BY: D.C. SARKAR |
|---|---|
| PREPARED BY: C.F. ANDREWS | REVIEWED BY: R.E. MULLINAX |

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

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

SIGNATURE: D. Sarkar DATE: 6.3.03

SIG. INVENTORY NO.

03-JUN-2003 06:59
M:\Proj01\dc\Sill Relocrkgroups\Andrews 2003 Mast Arms\PenTest\mp3thru7.dgn
cdandrews

# LOAD CASE 3 – MEDIUM LOADING

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP5 |

## FOUNDATION SELECTION TABLE

42"/48" Diameter Drilled Pier Length (L) - Feet

Denotes Wing Wall Required SEE NOTE 37.

CONCRETE VOLUME (cu. yds): 42" DIA.=.356xL 48" DIA.=.465xL

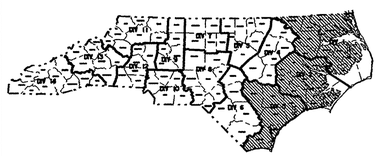
Denotes 48" Dia. Foundation required for all soil types

USE TYPE-2 WING WALL. FOR DETAILS, SEE DRAWING NO. MP-11.

### WIND ZONE 1

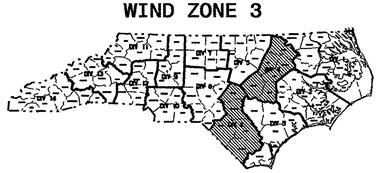
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC3-35 | 14.5 | 10.5 | 9.0 | 9.0 | 14.0 | 12.0 | 11.0 |
| LC3-40 | 15.5 | 11.0 | 9.0 | 9.0 | 14.5 | 13.0 | 11.5 |
| LC3-45 | 15.5 | 11.0 | 9.0 | 9.0 | 14.5 | 13.0 | 11.5 |
| LC3-50 | 14.5 | 10.0 | 9.0 | 9.0 | 13.5 | 12.0 | 10.5 |
| LC3-65 | 18.0 | 12.0 | 9.5 | 9.0 | 16.0 | 14.0 | 12.5 |
| LC3-75 | 18.0 | 12.0 | 10.0 | 9.0 | 16.0 | 14.0 | 12.5 |

### WIND ZONE 2



| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC3-35 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC3-40 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC3-45 | 14.5 | 10.5 | 9.0 | 9.0 | 14.0 | 12.0 | 11.0 |
| LC3-50 | 13.5 | 9.5 | 9.0 | 9.0 | 13.0 | 11.0 | 10.0 |
| LC3-65 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC3-75 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |

### WIND ZONE 3

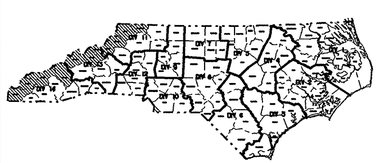


| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC3-35 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC3-40 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC3-45 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC3-50 | 12.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.0 |
| LC3-65 | 15.0 | 10.5 | 9.0 | 9.0 | 14.0 | 12.5 | 11.0 |
| LC3-75 | 15.0 | 10.5 | 9.0 | 9.0 | 14.0 | 12.5 | 11.0 |

### WIND ZONE 4

| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC3-35 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC3-40 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC3-45 | 11.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.5 |
| LC3-50 | 10.5 | 9.0 | 9.0 | 9.0 | 11.0 | 9.5 | 9.0 |
| LC3-65 | 15.0 | 10.5 | 9.0 | 9.0 | 14.0 | 12.5 | 11.0 |
| LC3-75 | 15.0 | 10.5 | 9.0 | 9.0 | 14.0 | 12.5 | 11.0 |

### WIND ZONE 5

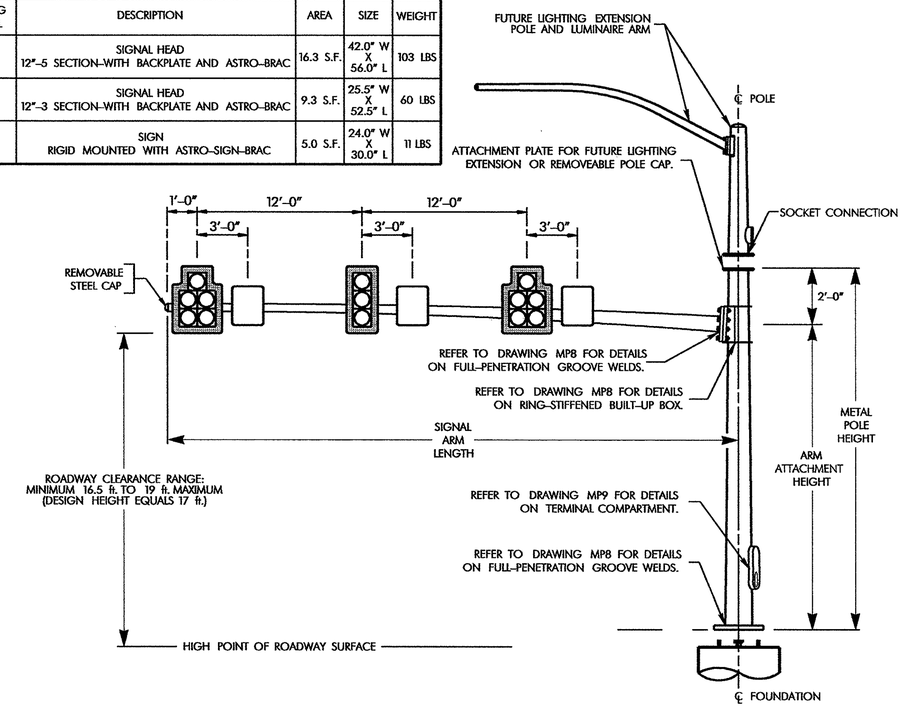


| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC3-35 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC3-40 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC3-45 | 13.5 | 10.0 | 9.0 | 9.0 | 13.0 | 11.5 | 10.0 |
| LC3-50 | 12.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.0 |
| LC3-65 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC3-75 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |

## POLE LOADING DETAILS

MAST ARM LOADING SCHEDULE

| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
|---|---|---|---|---|
| | SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0" W X 56.0" L | 103 LBS |
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |




SIGNAL POLE WITH PROVISION FOR LIGHTING EXTENSION

| MAST ARM NUMBER | SIGNAL ARM LENGTH | MINIMUM ARM BASE DIAMETER | MINIMUM ARM WALL THICKNESS | MAST ARM ATT. PLATE SIZE | | ATT. PLATE BOLT SPACING | | ATT. PLATE TO FLANGE PLATE ATTACHMENT BOLT SIZE | MAST ARM ATT. PLATE THICKNESS | FLANGE PLATE THICKNESS | MIN. POLE DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | W | H | A | B | | | | POLE BASE DIAMETER | POLE WALL THICKNESS "T" |
| LC3-35 | 35'-0" | 11" | .3125" | 22" | 30" | 16" | 24" | 1.5"x 7" | 2" | 2" | 16" | .3125" |
| LC3-40 | 40'-0" | 12" | .3125" | 22" | 30" | 16" | 24" | 1.5"x 7" | 2" | 2" | 16" | .3125" |
| LC3-45 | 45'-0" | 13" | .3125" | 25" | 30" | 19" | 24" | 1.5"x 7" | 2" | 2" | 19" | .3125" |
| LC3-50 | 50'-0" | 15" | .3125" | 25" | 30" | 19" | 24" | 1.5"x 7" | 2" | 2" | 19" | .3125" |
| LC3-65 | 65'-0" | 18" | .3125" | 31" | 30" | 25" | 24" | 1.5"x 7" | 2" | 2" | 25" | .3125" |
| LC3-75 | 75'-0" | 21" | .3125" | 31" | 30" | 25" | 24" | 1.5"x 7" | 2" | 2" | 25" | .3125" |

POLE BASE PLATE AND ANCHOR BOLT DATA

| SIGNAL POLE HEIGHT | MAX. BASE PLATE DIAMETER "D" | MAX. BASE PLATE BOLT CIRCLE "BC" | BASE PLATE THICKNESS | ANCHOR BOLT SIZE (8 PER POLE) |
|---|---|---|---|---|
| 22'-0" | 39" | 32" | 2" | 2"x 66" |
| 24'-0" | 39" | 32" | 2" | 2"x 66" |
| 26'-0" | 39" | 32" | 2" | 2"x 66" |

REFER TO DRAWING MP8 AND MP9 FOR DETAILS ON POLE AND ARM FABRICATION.

MAST ARM AND POLE IDENTIFICATION LEGEND

MAST ARMS AND METAL POLES SELECTED FOR USE FROM THESE STANDARDS SHOULD BE IDENTIFIED USING THE FOLLOWIING ALPHA NUMERIC IDENTIFICATION NUMBER:

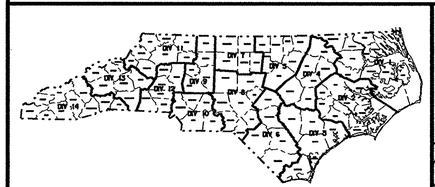
LCX-XX-XX

Load Case Number (1 THRU 5)

Mast Arm length

Pole Height

# METAL POLES WITH MAST ARMS



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

SCALE 0 NA NONE

POLE LOADING DETAILS AND FOUNDATION SELECTION TABLES FOR LOAD CASE 3

| PLAN DATE: APRIL 2003 | REVIEWED BY: D.C. SARKAR |
|---|---|
| PREPARED BY: C.F. ANDREWS | REVIEWED BY: R.E. MULLINAX |

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

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 6.3.03

SIGNATURE DATE

SIG. INVENTORY NO.

03-JUN-2003 09:23
N:\Proj\1065\Dh11\Workgroups\kandrews 2003 Mast Arms\PenTestmp31thru7.dgn
kandrews

# LOAD CASE 4 – HEAVY LOADING

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP6 |

## FOUNDATION SELECTION TABLE

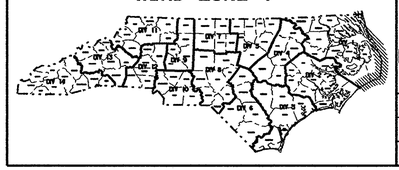
48" Diameter Drilled Pier Length (L) - Feet

CONCRETE VOLUME (cubic yards)=.465xL

Denotes Wing Wall Required SEE NOTE 37.

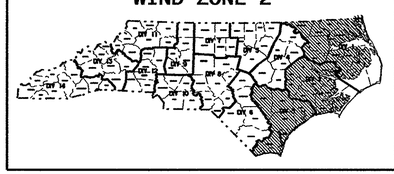
USE TYPE-2 WING WALL. FOR DETAILS, SEE DRAWING NO. MP-11.

### WIND ZONE 1



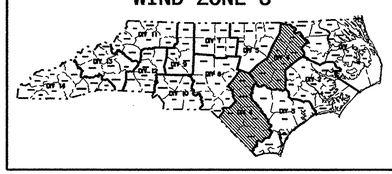
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC4-50 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC4-65 | 19.5 | 12.5 | 10.0 | 9.0 | 17.0 | 15.0 | 13.0 |
| LC4-75 | 20.0 | 14.0 | 12.0 | 9.0 | 17.5 | 15.5 | 13.5 |

### WIND ZONE 2



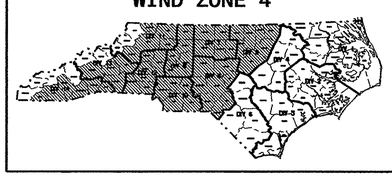
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC4-50 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC4-65 | 19.5 | 12.5 | 10.0 | 9.0 | 17.0 | 15.0 | 13.0 |
| LC4-75 | 20.0 | 14.0 | 12.0 | 9.0 | 17.5 | 15.5 | 13.5 |

### WIND ZONE 3



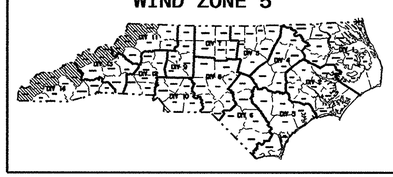
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC4-50 | 14.5 | 10.0 | 9.0 | 9.0 | 13.5 | 12.0 | 10.5 |
| LC4-65 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC4-75 | 18.0 | 12.0 | 9.5 | 9.0 | 16.0 | 14.0 | 12.5 |

### WIND ZONE 4



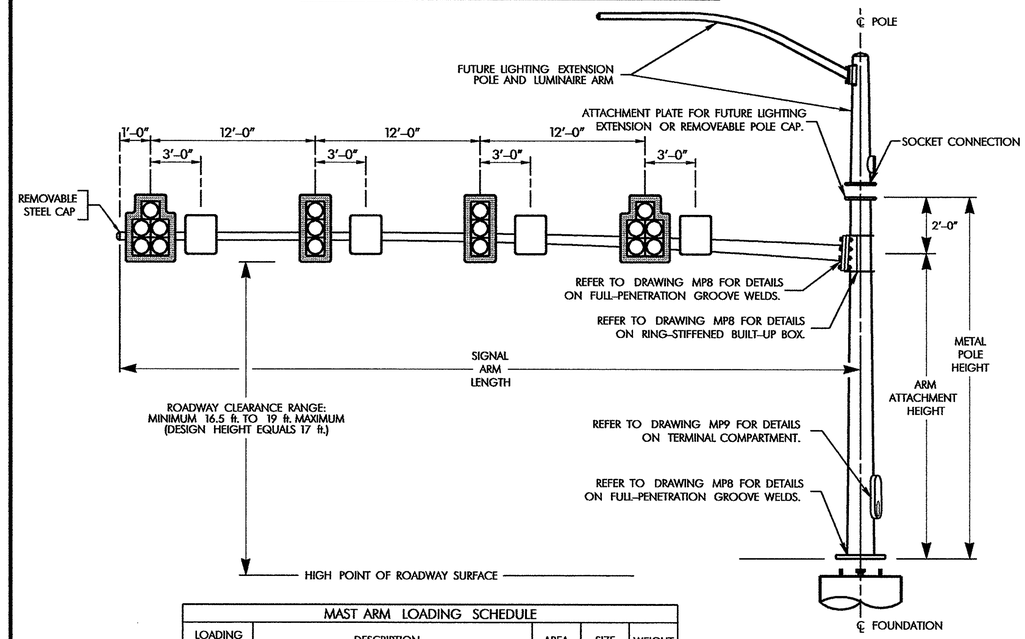
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC4-50 | 12.5 | 9.0 | 9.0 | 9.0 | 12.0 | 10.5 | 9.0 |
| LC4-65 | 15.0 | 10.5 | 9.0 | 9.0 | 14.0 | 12.5 | 11.0 |
| LC4-75 | 16.5 | 11.0 | 9.0 | 9.0 | 15.0 | 13.5 | 11.5 |

### WIND ZONE 5



| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC4-50 | 14.5 | 10.0 | 9.0 | 9.0 | 13.5 | 12.0 | 10.5 |
| LC4-65 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC4-75 | 18.0 | 13.0 | 11.0 | 9.0 | 16.0 | 14.0 | 12.5 |

## POLE LOADING DETAILS




SIGNAL POLE WITH PROVISION FOR LIGHTING EXTENSION

| MAST ARM LOADING SCHEDULE | | | | |
|---|---|---|---|---|
| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
| | SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0" W X 56.0" L | 103 LBS |
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |

| SIGNAL MAST ARM DATA | | | | | | | | | | | | MIN. POLE DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAST ARM NUMBER | SIGNAL ARM LENGTH | MINIMUM ARM BASE DIAMETER | MINIMUM ARM WALL THICKNESS | MAST ARM ATT. PLATE SIZE | | ATT. PLATE BOLT SPACING | | ATT. PLATE TO FLANGE PLATE ATTACHMENT BOLT SIZE | MAST ARM ATT. PLATE THICKNESS | FLANGE PLATE THICKNESS | | POLE BASE DIAMETER | POLE WALL THICKNESS "T" |
| | | | | W | H | A | B | | | | | | |
| LC4-50 | 50'-0" | 16" | .3125" | 26" | 34" | 20" | 27" | 1.5"x 7" | 2" | 2" | | 20" | .3125" |
| LC4-65 | 65'-0" | 20" | .3125" | 30" | 34" | 24" | 27" | 1.5"x 7" | 2" | 2" | | 24" | .3125" |
| LC4-75 | 75'-0" | 24" | .3125" | 34" | 34" | 28" | 27" | 1.5"x 7" | 2" | 2" | | 28" | .3125" |

| POLE BASE PLATE AND ANCHOR BOLT DATA | | | | |
|---|---|---|---|---|
| SIGNAL POLE HEIGHT | MAX. BASE PLATE DIAMETER "D" | MAX. BASE PLATE BOLT CIRCLE "BC" | BASE PLATE THICKNESS | ANCHOR BOLT SIZE (8 PER POLE) |
| 22'-0" | 42" | 35" | 2½" | 2"x 66" |
| 24'-0" | 42" | 35" | 2½" | 2"x 66" |
| 26'-0" | 42" | 35" | 2½" | 2"x 66" |

REFER TO DRAWING MP8 AND MP9 FOR DETAILS ON POLE AND ARM FABRICATION.

### MAST ARM AND POLE IDENTIFICATION LEGEND

MAST ARMS AND METAL POLES SELECTED FOR USE FROM THESE STANDARDS SHOULD BE IDENTIFIED USING THE FOLLOWIING ALPHA NUMERIC IDENTIFICATION NUMBER:

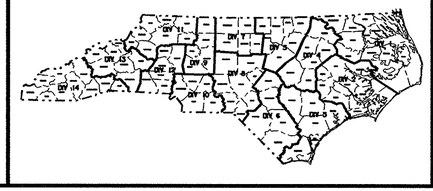
LCX-XX-XX

Pole Height

Load Case Number (1 THRU 5)

Mast Arm length

# METAL POLES WITH MAST ARMS



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

POLE LOADING DETAILS AND FOUNDATION SELECTION TABLES FOR LOAD CASE 4

| PLAN DATE: APRIL 2003 | REVIEWED BY: D.C. SARKAR |
|---|---|
| PREPARED BY: C.F. ANDREWS | REVIEWED BY: R.E. MULLINAX |

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

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

SIGNATURE D. Sarkar DATE 6.3.03

SIG. INVENTORY NO.

03-JUN-2003 09:25
M:\MPdwg\ist-lnin\Workgroups\Andrews 2003 Mast Arms\PenTests\mp3thru7.dgn
condrews

# LOAD CASE 5 – ULTRA HEAVY LOADING

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP7 |

## FOUNDATION SELECTION TABLE

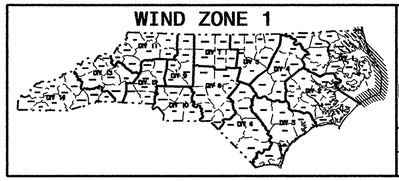
48" Diameter Drilled Pier Length (L) - Feet

CONCRETE VOLUME (cubic yards)=.465xL

Denotes Wing Wall Required SEE NOTE 37.

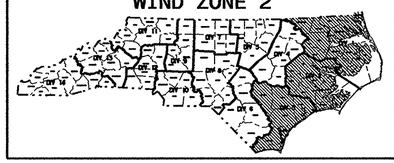
USE TYPE-2 WING WALL. FOR DETAILS, SEE DRAWING NO. MP-11.

### WIND ZONE 1



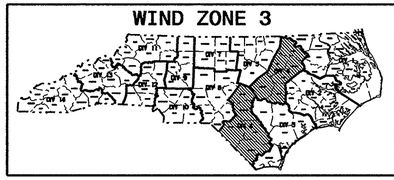
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC5-65 | 19.5 | 12.5 | 9.5 | 9.0 | 17.0 | 15.0 | 13.0 |
| LC5-75 | 21.0 | 13.5 | 10.5 | 9.0 | 18.0 | 16.0 | 14.0 |

### WIND ZONE 2



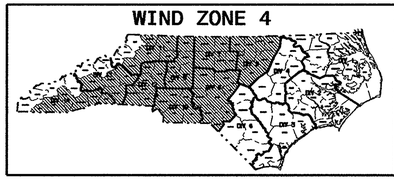
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC5-65 | 19.5 | 12.5 | 9.5 | 9.0 | 17.0 | 15.0 | 13.0 |
| LC5-75 | 21.0 | 13.5 | 10.5 | 9.0 | 18.0 | 16.0 | 14.0 |

### WIND ZONE 3



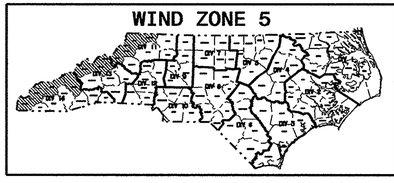
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC5-65 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC5-75 | 19.5 | 12.5 | 9.5 | 9.0 | 17.0 | 15.0 | 13.0 |

### WIND ZONE 4



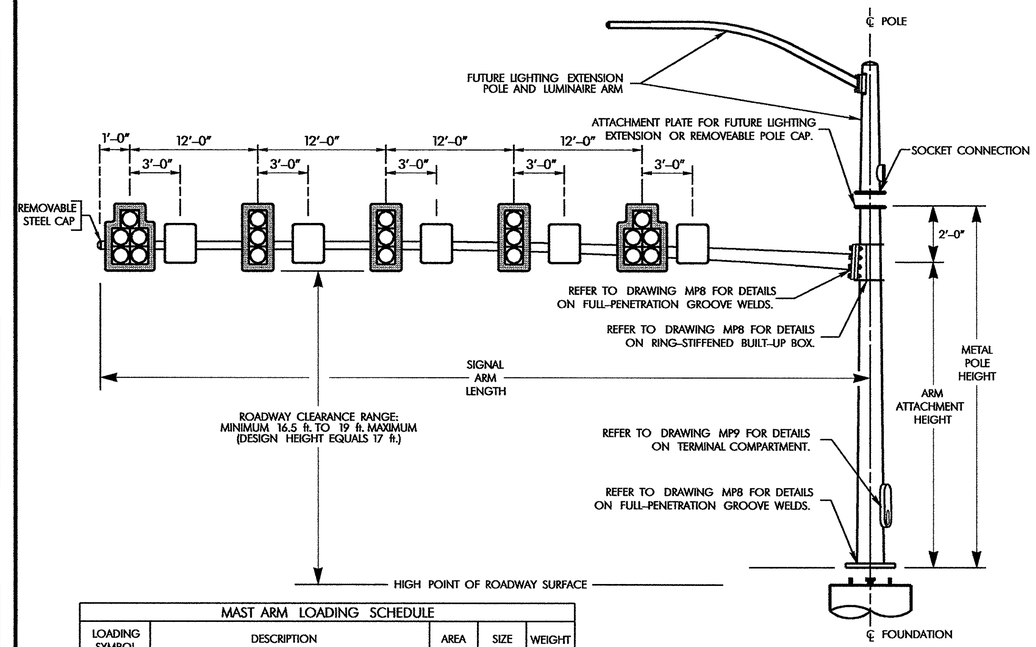
| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC5-65 | 15.0 | 10.5 | 9.0 | 9.0 | 14.0 | 12.5 | 11.0 |
| LC5-75 | 16.5 | 11.0 | 9.0 | 9.0 | 15.0 | 13.5 | 11.5 |

### WIND ZONE 5



| MAST ARM NUMBER | SOIL TYPES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Clay | | | | Sand | | |
| | Medium N-Value 4-8 | Stiff N-Value 9-15 | Very Stiff N-Value 16-30 | Hard N-Value >30 | Loose N-Value 4-10 | Medium N-Value 11-30 | Dense N-Value >30 |
| LC5-65 | 16.5 | 11.0 | 9.0 | 9.0 | 15.5 | 13.0 | 11.5 |
| LC5-75 | 19.5 | 12.5 | 9.5 | 9.0 | 17.0 | 15.0 | 13.0 |

## POLE LOADING DETAILS




SIGNAL POLE WITH PROVISION FOR LIGHTING EXTENSION

| MAST ARM LOADING SCHEDULE | | | | |
|---|---|---|---|---|
| LOADING SYMBOL | DESCRIPTION | AREA | SIZE | WEIGHT |
| | SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0" W X 56.0" L | 103 LBS |
| | SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W X 52.5" L | 60 LBS |
| | SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W X 30.0" L | 11 LBS |

| SIGNAL MAST ARM DATA | | | | | | | | | | | MIN. POLE DATA | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAST ARM NUMBER | SIGNAL ARM LENGTH | MINIMUM ARM BASE DIAMETER | MINIMUM ARM WALL THICKNESS | MAST ARM ATT. PLATE SIZE | | ATT. PLATE BOLT SPACING | | ATT. PLATE TO FLANGE PLATE ATTACHMENT BOLT SIZE | MAST ARM ATT. PLATE THICKNESS | FLANGE PLATE THICKNESS | POLE BASE DIAMETER | POLE WALL THICKNESS "T" |
| | | | | W | H | A | B | | | | | |
| LC5-65 | 65'-0" | 21" | .3125" | 31" | 31" | 25" | 25" | 2"x 7" | 2" | 2" | 25" | .3125" |
| LC5-75 | 75'-0" | 25" | .3125" | 35" | 35" | 29" | 29" | 2"x 7" | 2" | 2" | 29" | .3125" |

| POLE BASE PLATE AND ANCHOR BOLT DATA | | | | |
|---|---|---|---|---|
| SIGNAL POLE HEIGHT | MAX. BASE PLATE DIAMETER "D" | MAX. BASE PLATE BOLT CIRCLE "BC" | BASE PLATE THICKNESS | ANCHOR BOLT SIZE (12 PER POLE) |
| 22'-0" | 43" | 36" | 2½" | 2"x 66" |
| 24'-0" | 43" | 36" | 2½" | 2"x 66" |
| 26'-0" | 43" | 36" | 2½" | 2"x 66" |

REFER TO DRAWING MP8 AND MP9 FOR DETAILS ON POLE AND ARM FABRICATION.

### MAST ARM AND POLE IDENTIFICATION LEGEND

MAST ARMS AND METAL POLES SELECTED FOR USE FROM THESE STANDARDS SHOULD BE IDENTIFIED USING THE FOLLOWIING ALPHA NUMERIC IDENTIFICATION NUMBER:

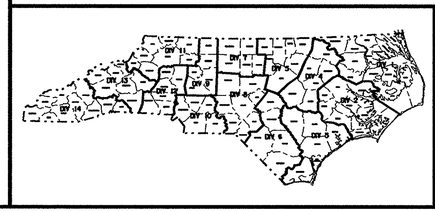
LCX-XX-XX

Pole Height

Load Case Number (1 THRU 5)

Mast Arm length

# METAL POLES WITH MAST ARMS



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

POLE LOADING DETAILS AND FOUNDATION SELECTION TABLES FOR LOAD CASE 5

| PLAN DATE: APRIL 2003 | REVIEWED BY: D.C. SARKAR |
|---|---|
| PREPARED BY: C.F. ANDREWS | REVIEWED BY: R.E. MULLINAX |

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

SEAL

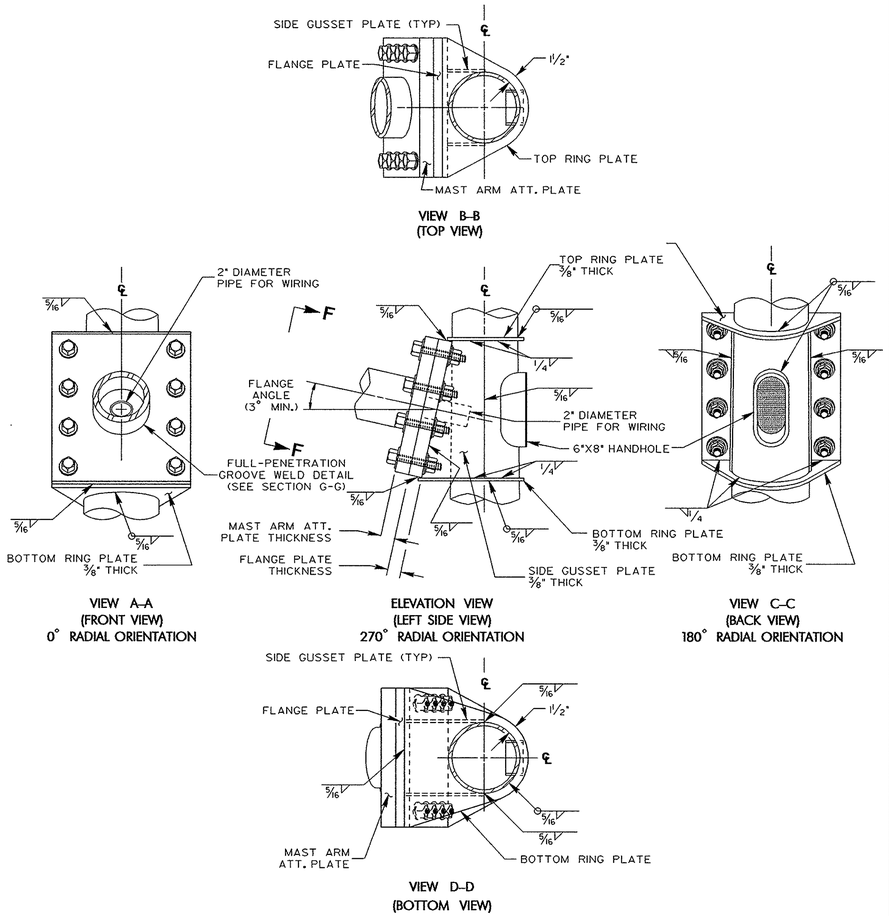
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 6.3.03
SIGNATURE DATE

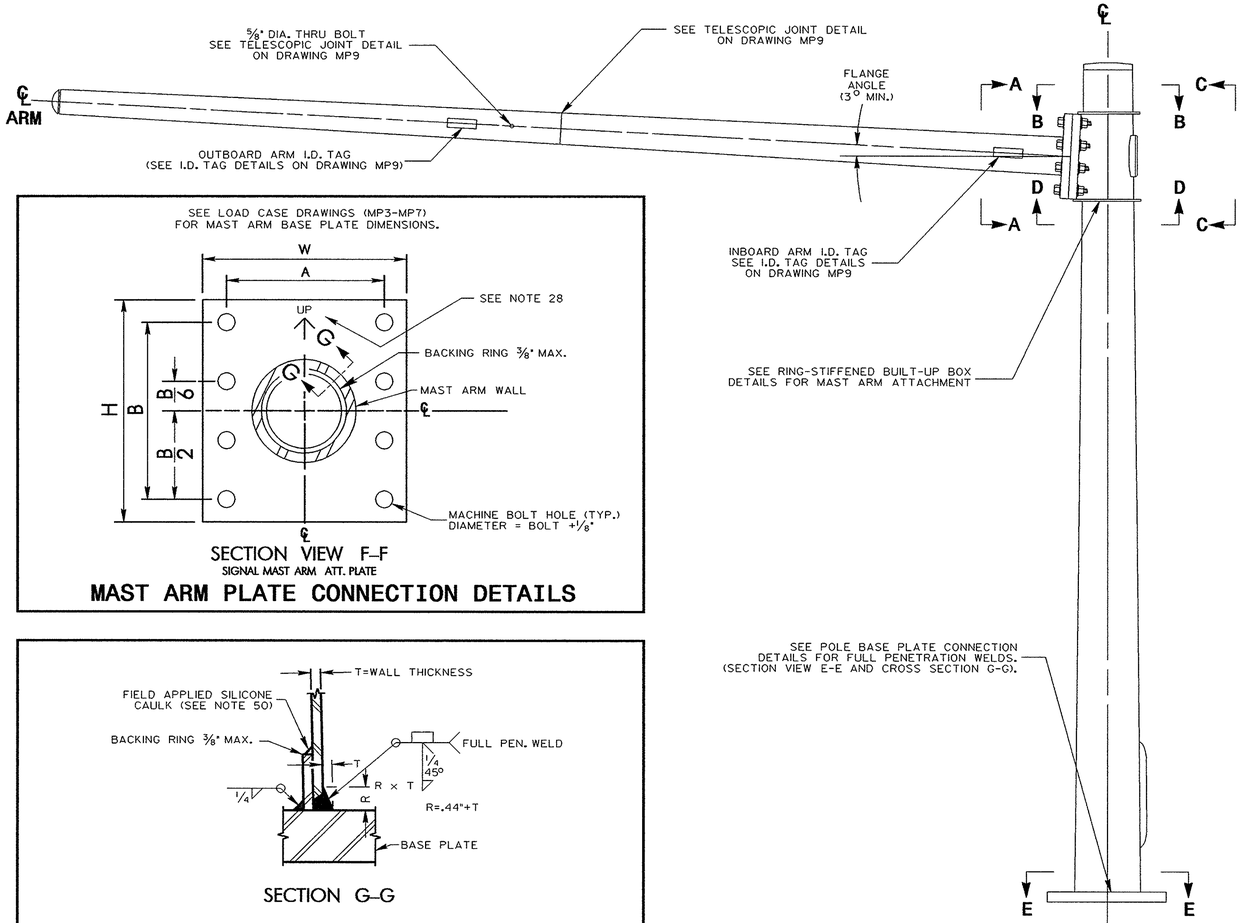
SIG. INVENTORY NO.

# POLE AND MAST ARM FABRICATION DETAILS

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg.MP8 |




## RING STIFFENED BUILT UP BOX DETAILS FOR MAST ARM ATTACHMENT



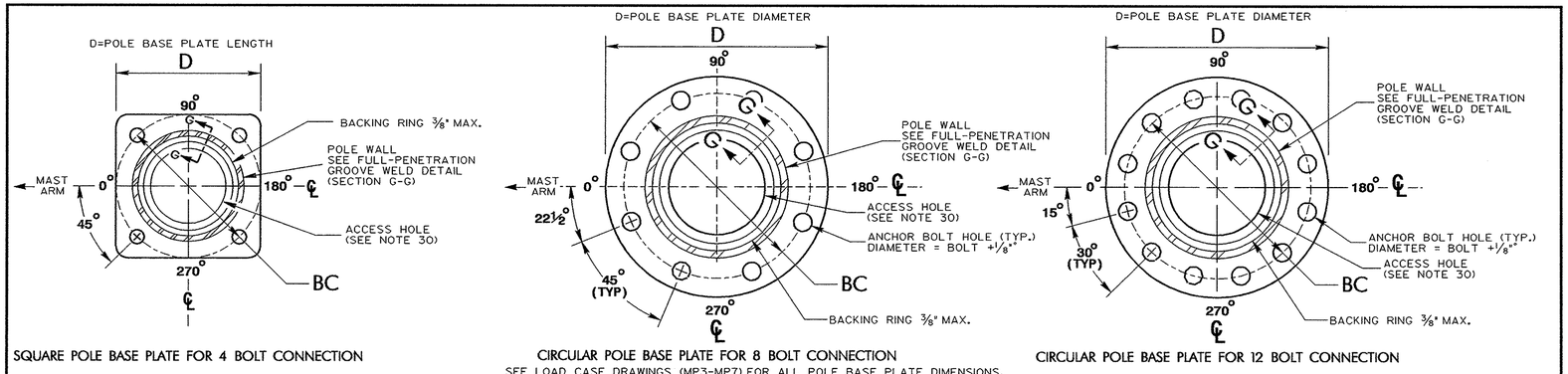




## MAST ARM PLATE CONNECTION DETAILS




FULL–PENETRATION
GROOVE WELD DETAIL
(SIGNAL ARM ATT. AND POLE BASE PLATES)



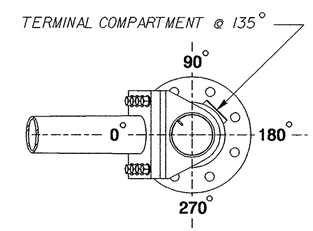

SQUARE POLE BASE PLATE FOR 4 BOLT CONNECTION

CIRCULAR POLE BASE PLATE FOR 8 BOLT CONNECTION

CIRCULAR POLE BASE PLATE FOR 12 BOLT CONNECTION

SEE LOAD CASE DRAWINGS (MP3-MP7) FOR ALL POLE BASE PLATE DIMENSIONS.

## POLE BASE PLATE CONNECTION DETAILS (SECTION VIEW E-E)




PLAN VIEW
RADIAL ORIENTATION

# METAL POLES WITH MAST ARMS

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

METAL POLE AND MAST ARM FABRICATION DETAILS

| | | | |
|---|---|---|---|
| PLAN DATE: | APRIL 2003 | REVIEWED BY: | D.C. SARKAR |
| PREPARED BY: | C.F. ANDREWS | REVIEWED BY: | R.E. MULLINAX |

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

SCALE: 0 NA — NONE

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

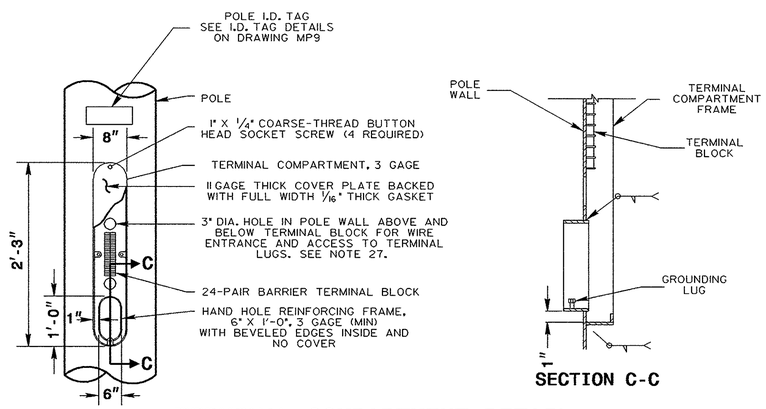
D. Sarkar 6.3.03
SIGNATURE DATE

SIG. INVENTORY NO.

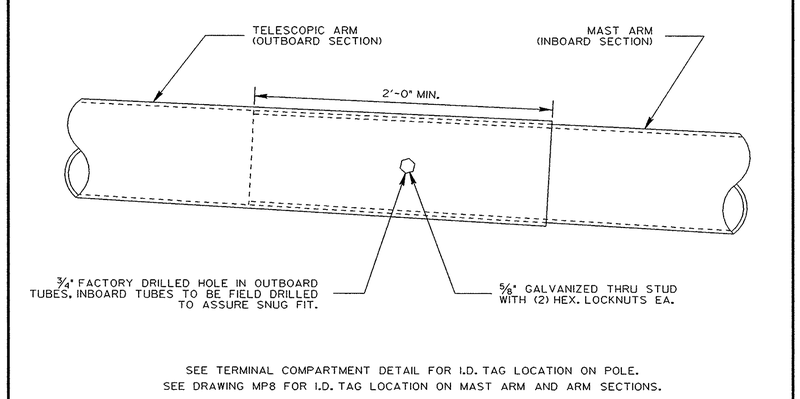
03-JUN-2003 09:51
W:\Projects\Unit1\Workgroups\andrews 2003 Mast Arms\mp8.dgn
candrews

# POLE AND MAST ARM FABRICATION DETAILS

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| | Sig. dwg. MP9 |

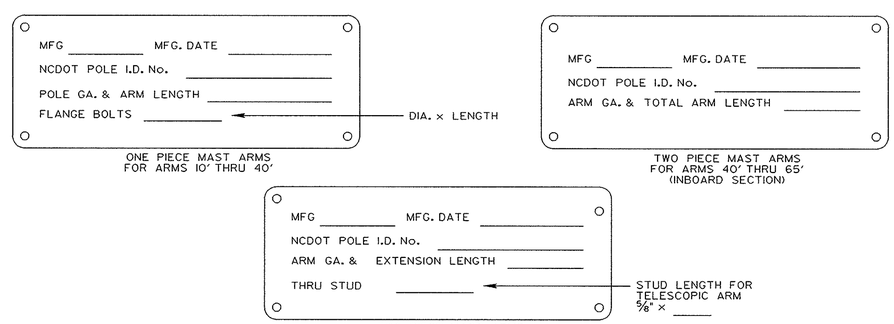



## TERMINAL COMPARTMENT DETAIL



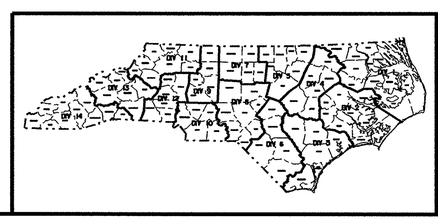

SEE TERMINAL COMPARTMENT DETAIL FOR I.D. TAG LOCATION ON POLE.
SEE DRAWING MP8 FOR I.D. TAG LOCATION ON MAST ARM AND ARM SECTIONS.

## TELESCOPIC JOINT DETAIL FOR MAST ARM




## IDENTIFICATION TAG DETAILS

# METAL POLES WITH MAST ARMS



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

**METAL POLE AND MAST ARM FABRICATION DETAILS**

| PLAN DATE: SEPTEMBER 2002 | REVIEWED BY: D.C. SARKAR |
|---|---|
| PREPARED BY: C.F. ANDREWS | REVIEWED BY: R.E. MULLINAX |

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

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

D. Sarkar 6.3.03
SIGNATURE DATE

SIG. INVENTORY NO.

03-JUN-2003 09:58
W:\Peoples-Unit\Workgroups\Andrews 2003 Mast Arms\mp8.dgn
candrews