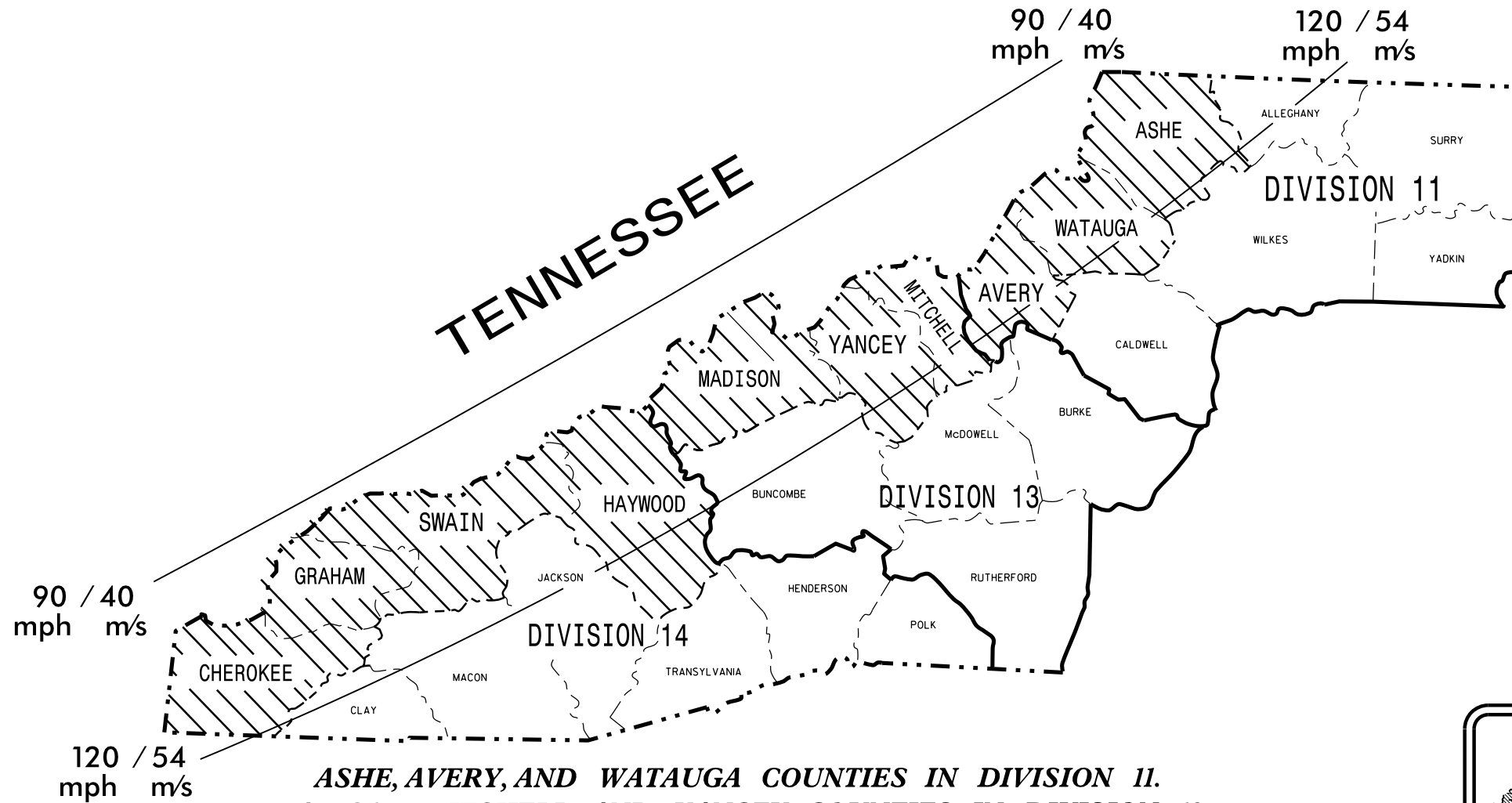


**STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS**

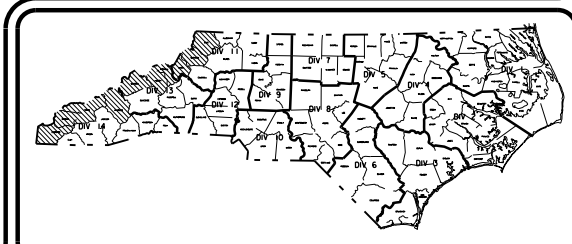
PROJECT ID. NO.	SHEET NO.
	Sig.SP7

**STANDARD DRAWINGS FOR ALL METAL POLES
ZONE 5 – 120 mph (54 m/s) SPECIAL WIND REGION**

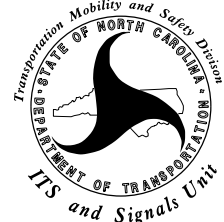


**ASHE, AVERY, AND WATAUGA COUNTIES IN DIVISION 11.
MADISON, MITCHELL, AND YANCEY COUNTIES IN DIVISION 13.
CHEROKEE, GRAHAM, HAYWOOD, AND SWAIN COUNTIES IN DIVISION 14.**

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



Prepared in the Offices of:



750 N. Greenfield Pkwy.
Garner, NC 27529

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AASHTO

Standard Specifications for
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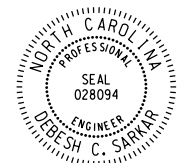
DRAWING NUMBER	DESCRIPTION
Sig.SP 1-2	Standard Strain Pole Notes
Sig.SP 3-7	Statewide Wind Zones
Sig.SP 8	ZONE 1 140 MPH
Sig.SP 9	ZONE 2 130 MPH
Sig.SP 10	ZONE 3 110 MPH
Sig.SP 11	ZONE 4 90 MPH
Sig.SP 12	ZONE 5 120 MPH

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

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



DocuSigned by:

Debesh C. Sarkar

8/2/2016

SIGNATURE

DATE

**STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS**

PROJECT NO.	SHEET NO.
	Sig.SP 1

STANDARD NOTES FOR METAL STRAIN POLES

GENERAL

1. THESE NOTES PROVIDE INFORMATION AND REQUIREMENTS FOR THE DESIGN, FABRICATION, AND INSTALLATION OF STANDARD METAL STRAIN POLES. 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, AND ARE NUMBERED CHRONOLOGICALLY. NOTES THAT ARE SPECIFIC TO A PARTICULAR SITUATION, DESIGN DETAIL OR REQUIREMENT ARE SHOWN ON THE APPLICABLE PAGE TO CLARIFY INTENT AND UNDERSTANDING.
2. THE FOLLOWING STANDARD DESIGNS ARE BASED ON LIGHT AND HEAVY LOADING CASES. NO VARIATIONS, SUBSTITUTION OR RE-DESIGN OF THE SPECIFIED POLES AND FOUNDATIONS WILL BE PERMITTED UNLESS IT IS APPROVED BY THE ITS AND SIGNALS UNIT.
3. THESE METAL POLE STANDARDS MAKE REFERENCE TO THE NCDOT "ROADWAY STANDARD DRAWINGS" DATED JANUARY 2012 HEREAFTER REFERRED TO AS THE STANDARD DRAWINGS AND TO THE NCDOT "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" DATED JANUARY 2012 HEREAFTER REFERRED TO AS THE STANDARD SPECIFICATIONS. IF THERE IS A DISCREPANCY BETWEEN THE STANDARD DRAWINGS/SPECIFICATIONS AND THESE STANDARDS, THEN THESE DRAWINGS AND PROJECT SPECIAL SPECIFICATIONS SHALL GOVERN.
4. POLE CASES PREAPPROVED ON THE ITS & SIGNALS QUALIFIED PRODUCTS LIST (QPL) WILL NOT REQUIRE MANUFACTURER'S CALCULATIONS. 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 VARIATIONS TO A CASE STANDARD HAS BEEN APPROVED, MANUFACTURER'S SHOP DRAWINGS SHALL BE REQUIRED.

2. BASE PLATE SHALL:
 - CONFORM TO ASTM A572 GR 50 OR EQUIVALENT.
 - MECHANICALLY GALVANIZED IN ACCORDANCE WITH AASHTO M111.
3. ANCHOR BOLTS, NUTS, AND WASHER MATERIAL:
 - ANCHOR BOLTS - USE AASHTO M 314 GRADE 55 MATERIAL OR APPROVED EQUIVALENT.
 - NUTS - USE AASHTO M291 GRADE 2H, DH, OR DH3 MATERIAL OR APPROVED EQUIVALENT.
 - WASHERS - USE AASHTO M293 MATERIAL OR EQUIVALENT.
4. ALL ANCHOR BOLTS, NUTS, WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 OR M298.

POLE FABRICATION

1. ALL OTHER STEEL HARDWARE MATERIAL REQUIRED BUT NOT SPECIFIED ABOVE SHALL COMPLY WITH SECTIONS 1072 AND 1098 OF THE STANDARD SPECIFICATIONS.
2. POLE ASSEMBLIES SHALL BE PERMANENTLY TAGGED OR ENGRAVED WITH THE FOLLOWING:
 - POLE MANUFACTURERS NAME
 - MANUFACTURE DATE
 - POLE CASE NUMBER
 - THICKNESS AND GRADE OF STEEL
3. FOR MANUFACTURING THE METAL POLE THE FOLLOWING CRITERIA MUST BE ADHERED TO:
 - 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.
 - CIRCUMFERENTIAL WELDING OF THE POLES IS NOT ALLOWED.
4. ALL WELDS SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF THE AWS D1.1 STRUCTURAL WELDING CODE-STEEL.
5. 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 (0 DEGREES ON THE POLES RADIAL INDEX) LOCATED AT 26" AND 36" FROM THE BASE OF THE POLE. SEE DRAWING Sig.SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
6. THE METAL POLE SHALL BE FABRICATED WITH 3-2" THREADED HALF COUPLINGS AND 1-1" THREADED HALF COUPLING INSTALLED 9" FROM THE TOP OF THE POLE TO RECEIVE THE WEATHERHEADS FOR SIGNAL WIRE ENTRANCES TO THE POLE. THE HALF COUPLINGS SHALL BE WELDED AT NO LESS THAN A 45 DEGREE ANGLE FROM HORIZONTAL TO PROPERLY INSTALL THE WEATHERHEADS. THE 1" HALF COUPLING FOR ELECTRICAL SERVICE ENTRANCE SHALL BE LOCATED AT 0 DEGREES ON THE POLES RADIAL INDEX. ALL OTHER 2" HALF COUPLINGS SHALL BE LOCATED AT 90 DEGREE INCREMENTS. PROVIDE WEATHER TIGHT BUSHING CAPS FOR ALL HALF COUPLINGS. REFER TO DRAWING Sig.SP4 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR GRAPHIC DETAILS.
7. PROVIDE A FACTORY STANDARD "C" HOOK FOR CABLE SUPPORT WELDED INSIDE THE TOP OF THE POLE AT 225 DEGREES ON THE POLES RADIAL INDEX. REFER TO DRAWING M3 (POLE FABRICATION DETAILS) OF THESE METAL POLE STANDARDS FOR DETAILS.
8. FOR ALL OTHER NON-STRUCTURAL DETAILS AND REQUIREMENTS, REFER TO APPLICABLE SECTIONS OF THESE STANDARDS, THE TRAFFIC SIGNAL PLANS AND SPECIFICATIONS.
9. AT THE TIME OF SHIPMENT FROM THE FACTORY, ENSURE THE POLE IS PACKAGED SO THAT WATER CAN NOT GET INSIDE THE POLE.
10. SHIP ALL POLE ACCESSORIES FOR EACH POLE IN A SEPARATE WATERTIGHT CONTAINER WITH A LABEL THAT IDENTIFIES THE SPECIFIC POLE AND DESCRIBES THE CONTENTS.

DESIGN CRITERIA

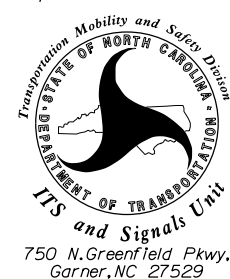
1. THE METAL POLE DESIGN SHALL CONFORM TO THE "2013 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS" AND LATEST APPROVED INTERIM SPECIFICATIONS. DESIGN WIND PRESSURES AND APPLICATIONS ARE IN ACCORDANCE WITH SECTION 3.8 AND 3.9 OF THE 2013 AASHTO SPECIFICATIONS.
2. 2 PLY POLES ARE NOT ACCEPTABLE. EXCEPTIONS TO THIS DESIGN PARAMETER WILL BE DUE TO THE USE OF DECORATIVE POLES.
3. THESE STRAIN POLE STANDARDS ALLOW FOR SIGNAL HEADS TO BE PLACED ANYWHERE ALONG THE SPANWIRE. THE MOST CRITICAL LOCATIONS ARE SHOWN IN THE TYPICAL INTERSECTION LOADING CASES SHOWN ON DRAWING SP8-SP12 (LOAD CASE AND DESIGN DETAILS SHEET) OF THESE STANDARDS. FOR DESIGN PURPOSES, USE 4% SAG FOR THE SPANWIRE. ROADWAY DESIGN CLEARANCE RANGE FROM BOTTOM OF SIGNAL HEADS TO PAVEMENT IS 17 FEET.
4. PROVISIONS SHALL BE MADE FOR DRAINAGE OF WATER FROM INSIDE THE METAL POLE.

POLE MATERIALS

1. PROVIDE MATERIALS FOR STEEL METAL POLES THAT COMPLY WITH SECTION 1072 AND 1098 OF THE STANDARD SPECIFICATIONS AND PER THE LATEST PROJECT SPECIAL PROVISIONS.
- POLE MONOTUBE SHALL:
- GALVANIZE ALL ITEMS OF THE SIGNAL SUPPORT STRUCTURE PER AASHTO M111.
 - USE ASTM A595 MATERIAL (55 KSI) OR EQUIVALENT AS APPROVED BY THE ENGINEER.
 - HAVE A LINEAR TAPER OF 0.14 IN/FT.

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

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SEAL

DocuSigned by:
Debesh C Sarkar 8/2/2016

SIGNATURE DATE

**STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS**

STANDARD NOTES FOR METAL STRAIN POLES

PROJECT NO.	SHEET NO.
	Sig.SP 2

SOIL TESTING AND STANDARD POLE FOUNDATIONS

1. 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.
2. TO DETERMINE THE CORRECT STANDARD STRAIN POLE FOUNDATION DEPTH, PLEASE ADHERE TO THE FOLLOWING REQUIREMENTS IN CONJUNCTION WITH THE STANDARD M8 DRAWING.
 - a.- USING THE STATEWIDE COUNTY WIND ZONE CHART DERIVE LOAD CASE AND DESIGN DETAILS, MAKE SURE YOU HAVE THE APPROPRIATE WIND ZONE SELECTED.
 - b.- SELECT THE SOIL TYPE THAT BEST DESCRIBES THE SOIL CHARACTERISTICS (EITHER CLAY OR SAND)
 - c.- PERFORM A STANDARD PENETRATION TEST AT EACH PROPOSED FOUNDATION SITE TO DETERMINE "N" VALUE. (NUMBER OF BLOWS PER FOOT FROM STANDARD PENETRATION TEST).
 - d.- GET THE APPROPRIATE POLE CASE LOAD NUMBER FROM THE PLANS OR FROM THE DIVISION TRAFFIC ENGINEER.
 - e.- USING THE PREVIOUSLY DETERMINED SOIL TYPE AND "N" VALUE, SELECT THE APPROPRIATE COLUMN IN THE CHART. SELECT THE APPROPRIATE LINE THAT THE POLE LOAD CASE IS SHOWN ON IN THE CHART. THE CORRECT DEPTH OF THE FOUNDATION IS THE VALUE THAT IS SHOWN WHERE THE COLUMN AND THE LINE INTERSECT.
 - f.- FILL OUT AND SUBMIT FOR APPROVAL TO THE DIVISION THE "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION LOCATION.
3. THE "STANDARD FOUNDATION SELECTION FORM" FOR EACH PROPOSED FOUNDATION IS REQUIRED TO BE SUBMITTED AND APPROVED PRIOR TO ANY DRILLING IN THE FIELD. THIS FORM AS WELL AS THE STANDARD FOUNDATION SPECIAL PROVISIONS CAN BE OBTAINED AT THE FOLLOWING WEBSITE:
https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20POLES%20-%20Standard%20Foundation%20Selection.pdf
4. COMPLY WITH THE PROVISIONS OF SECTION 1742 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
5. REFER TO STANDARD DRAWING 1742.01 FOR FOUNDATION INSTALLATION DETAILS.
6. REINFORCING STEEL SHALL BE DEFORMED AND CONFORM TO ASTM A615 GRADE 60. TIES MAY BE DEFORMED OR PLAIN.
7. 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.
8. THE CONCRETE SHALL BE AIR-ENTRAINED 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.
9. THE TRAFFIC SIGNAL SUPPORT STRUCTURE SHALL NOT BE ERECTED BEFORE THE CONCRETE IN THE FOUNDATION HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI.
10. EACH FOUNDATION REQUIRES A FOUNDATION IDENTIFICATION TAG. FOR DETAILS SEE THE STANDARD M7 DRAWINGS.
11. FOR OTHER DETAILS REGARDING CONSTRUCTION OF CONCRETE FOUNDATION, SEE PROJECT SPECIAL PROVISIONS AND M7 DRAWINGS.
12. COMPLY WITH THE PROVISIONS OF SECTION 1072 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION.
13. REFER TO STANDARD DRAWING 1742.01 FOR POLE AND HARDWARE INSTALLATION DETAILS.
14. 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 THREADED NUT COVER.
15. STRAP ALL SIGNAL CABLES TO THE SIDE OF THE POLE WHEN THE DISTANCE BETWEEN THE SPANWIRE ATTACHMENT CLAMP ON THE POLE AND THE WEATHERHEADS EXCEEDS 36". USE 3/4" STAINLESS STEEL STRAPS TO LASH WIRE TO THE POLE. SEE DRAWING Sig.M6 (POLE FABRICATION DETAILS) OF THESE STANDARDS FOR DETAILS.
16. FOR OTHER DETAILS REGARDING METAL POLE INSTALLATION, SEE LATEST PROJECT SPECIAL PROVISIONS.

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

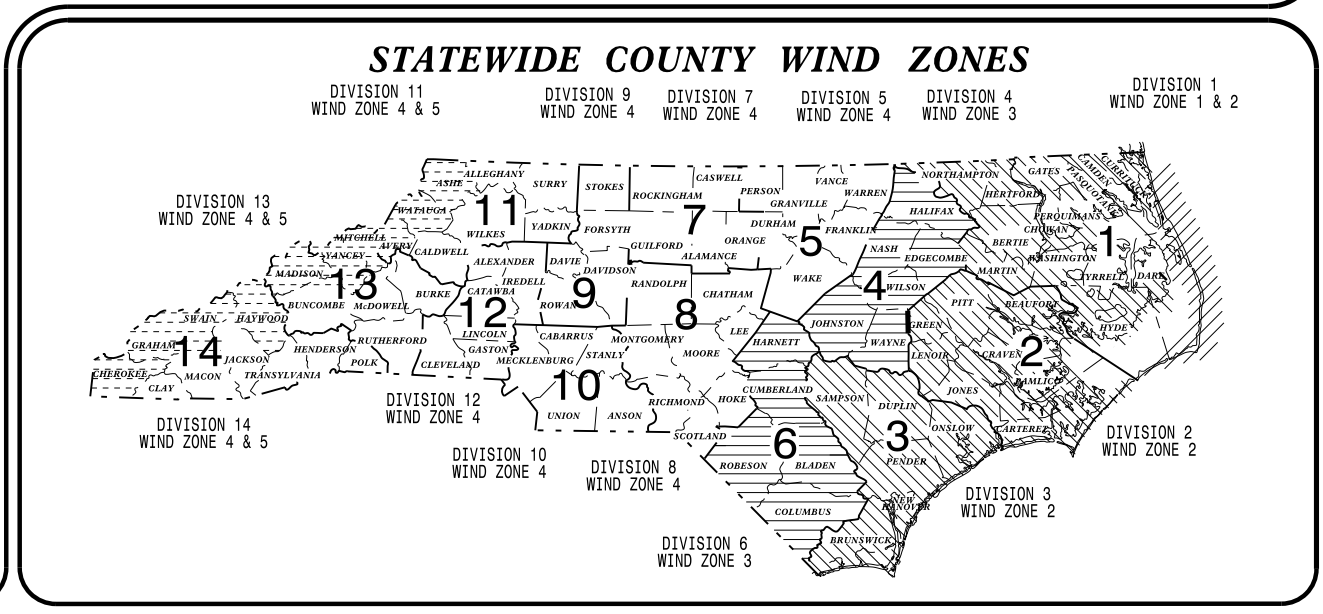
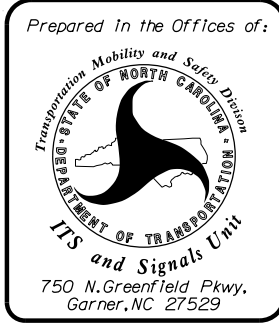


TABLE OF STATEWIDE COUNTY WIND ZONES

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) DARE (1) HYDE (1)	BERTIE (1) CAMDEN (1) CHOWAN (1) CURRITUCK (1) DARE (1) GATES (1) HERTFORD (1) HYDE (1) PASQUOTANK (1) NORTHAMPTON (1) MARTIN (1) PERQUIMANS (1) TYRELL (1) WASHINGTON (1)	BEAUFORD (2) CARTERET (2) CHAVEN (2) GREEN (2) JONES (2) LENOIR (2) PAMLICO (2) PITT (2) BRUNSWICK (3) DUPLIN (3) ONSLow (3) NEW HANOVER (3) PENDER (3) SAMPSON (3)	EDGECOMBE (4) HALIFAX (4) JOHNSON (4) WAYNE (4) WILSON (4) BLADEN (6) COLUMBUS (6) CUMBERLAND (6) HARNETT (6) ROBESON (6) DURHAM (5) FRANKLIN (5) GRANVILLE (5) PERSON (5) VANCE (5) WARREN (5) WAKE (5) ALAMANCE (7) CASWELL (7) GUILFORD (7) ORANGE (7) ROCKINGHAM (7) SCOTLAND (7)	CHATHAM (8) HOKE (8) LEE (8) MONTGOMERY (8) MOORE (8) RANDOLPH (8) RICHMOND (8) DAVIDSON (9) DAVIE (9) FORSYTH (9) ROWAN (9) STOKES (9) ANSON (10) CABARRUS (10) MECKLENBURG (10) STANLY (10) UNION (10) ALLEGHANY (11) ALLIANCE (11) CALDWELL (11) YADKIN (11) ALEXANDER (12) CATAWBA (12) CLEVELAND (12) GASTON (12) ASHE (11) AVERY (11) WATAUGA (11) MADISON (13) BURKE (13) MCDOWELL (13) RUTHERFORD (13) CLAY (14) HENDERSON (14) JACKSON (14) MACON (14) POLK (14) TRANSYLVANIA (14)



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DocuSigned by:
Debesh C. Sarkar 8/2/2016
SIGNATURE DATE

ZONE 5 (120 MPH) SPECIAL WIND ZONE

PROJECT ID. NO.

SHEET NO.

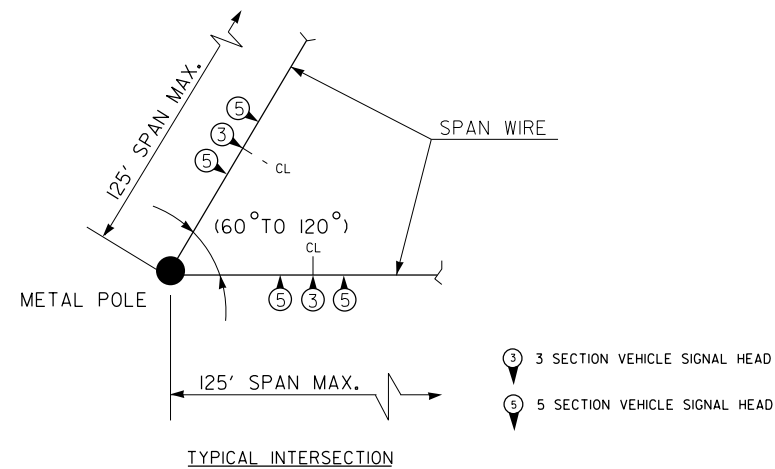
Sig.SP 12

LIGHT LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE		BASE PLATES			ANCHOR BOLTS		CONCRETE FOOTING		
		WALL THICKNESS TH GAGE, (IN.)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	NO. OF BOLTS	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)
S26L2	26	0.3125	16	29	23	2	8	2 X 60	48	*	*
S30L2	30	0.3125	17	29	23	2	8	2 X 60	48	*	*
S35L2	35	0.375	17	29	23	2	8	2 X 60	48	*	*

*SEE NOTE 1 AND 2 "SOIL TESTING AND STANDARD SOIL FOUNDATIONS" ON SHEET Sig.SP2 OF THE STANDARD NOTES.

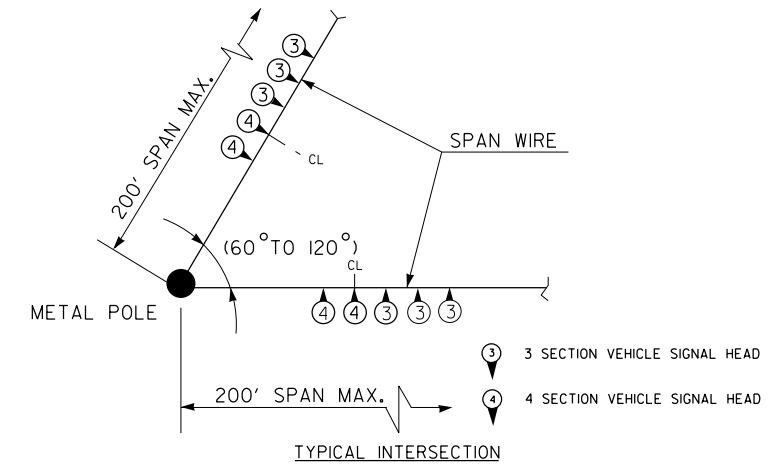


HEAVY LOADING

(FOR ONE POLE AND ONE FOUNDATION)

CASE No.	POLE HEIGHT IN (FT.)	METAL POLE		BASE PLATES			ANCHOR BOLTS		CONCRETE FOOTING		
		WALL THICKNESS TH GAGE, (IN.)	BASE DIAMETER (IN.)	D (IN.)	BC (IN.)	T (IN.)	NO. OF BOLTS	DIAMETER X TOTAL LENGTH (IN.)	DIAMETER d (IN.)	DEPTH L (FT.)	VOLUME (CU. YDS.)
S30H2	30	0.3125	21	35	29	2	12	2 X 60	48	*	*
S35H2	35	0.375	21	35	29	2	12	2 X 60	48	*	*

*SEE NOTE 1 AND 2 "SOIL TESTING AND STANDARD SOIL FOUNDATIONS" ON SHEET Sig.SP2 OF THE STANDARD NOTES.



METAL STRAIN POLES

COUNTY WIND ZONE 5

120 mph / 58 m/s

- ASHE
- AVERY
- WATAUGA
- MADISON
- MITCHELL
- YANCEY
- CHEROKEE
- GRAHAM
- HAYWOOD
- SWAIN

Prepared In the Offices of:



750 N. Greenfield Pkwy, Garner, NC 27529

Designed in conformance with the latest 2015 Interim to the 6th Edition 2013 **AASHTO** Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

WIND ZONE 5 LOAD CASE AND DESIGN DETAILS

PLAN DATE: JUNE 2016	DESIGNED BY: K.C. DURIGON
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

SEAL



DocuSigned by:

Debesh C Sarkar

8/2/2016