STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR ALL METAL POLES
ZONE 4 – 90 mph (40 m/s)

ALL COUNTIES WITHIN DIVISIONS 5, 7, 8, 9, 10, AND 12.
ALLEGHANY, CALDWELL, SURRY, WILKES, AND YADKIN COUNTIES IN DIVISION 11.
BUNCOMBE, BURKE, MCDOUGAL, AND RUTHERFORD COUNTIES IN DIVISION 13.
CLAY, HENDERSON, JACKSON, MACON, POLK, RUTHERFORD, AND TRANSYLVANIA COUNTIES IN DIVISION 14.

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

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NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION - ITS AND SIGNALS UNIT

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C.F. ANDREWS - ITS AND SIGNALS JOURNEY STRUCTURAL ENGINEER
# Standard Notes for Metal Strain Poles

## General

1. These notes provide information and requirements for the design, fabrication, and installation of metal strain poles. They are to be used by designers, contractors, and pole manufacturers in the solicitation, fabrication, and installation of metal traffic signals supports in North Carolina. The notes are categorized by sets, or sections, and notes contained therein 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 modification of the specified poles and foundations will be permitted unless it is approved by the ITS and Signals Unit.

3. These metal poles standards are consistent with the most recent "AASHTO Standard Drawings," except January 2013 HERCULES referred to as the standard drawings and to the most recent "standard specifications for roads and structures," dated January 2006 HERCULES referred to as the standard specifications. There is a discrepancy between the standard strain pole specifications and these standards. These drawings and project special specifications shall govern.

4. Poles fabricated on the ITS and Signals qualified products list (QPL) will not require manufacturer's calculations. However, certification of compliance with the manufacturer's preassembly shop drawings or pole with the department shall be furnished to the engineer. If pole poles are not on the QPL, or variations to a case standard has been approved, manufacturer's shop drawings shall be required.

## Design Criteria

1. The metal pole design shall conform to the 2015 AASHTO standard specifications for structural supports for highway signs, luminaires, and traffic signals, and latest approved interim specifications. Design loads and applications shall be in accordance with Section 3.8 and 3.9.3 of the 2013 edition of these specifications.

2. 2½" poles are not acceptable. Exceptions to this design parameter will be due to the pole's decorative design.

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 drawings Sig.SP4) (load cases and design details sheets) of these standards. If design conflicts, use 4% for the spanwire. Residential design clearance range from bottom of signal head to pavement is 17 feet.

4. Provision 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 1038 of the standard specifications and for the latest project special provisions. Pole materials shall:
   - Galvanize all items of the signal support structure per AASHTO M411.
   - Use high zinc material, (50 to 320) equivalent as approved by the engineer.
   - Have a linear taper of 0.14 in/ft.

## Pole Fabrication

1. All other steel hardware material required not specified above shall comply with Sections 1072 and 1038 of the standard specifications.

2. Pole assemblies shall be permanently tagged or engraved with the following:
   - Pole manufacturers name
   - Pole manufacturers date
   - Pole case number
   - Pole case grade of steel.

3. For manufacturing the metal pole, the following criteria must be adhered to:
   - The metal pole 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 documentation of the splice are the sole responsibility of the manufacturer.

4. All welds shall be in accordance with the latest revision of the AWS D1.1 Structural Welding Code-Steel.

5. Provide 2½" factory-drilled holes through the pole wall for nut entrance access to the terminal stop. The holes shall be in the center of the terminal compartment. The holes shall be in the center of the terminal compartment 0 degrees on the pole's radial index located at 26" and 36" from the base of the pole. Use drawing Sig.SP4 (pole fabrication details) of these metal pole standards for graphic details.

6. The metal pole shall be fabricated with 3¼" threaded half couplings and 1½" threaded half coupling installed 0 from the top of the pole to receive the weatherhead for signal wiring. The half couplings shall be welded at the lower 0 degrees on the pole wall at a minimum of 0.25 in. from the top of the pole. Use 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 terminal compartment. Refer to drawing Sig.SP4 (pole fabrication details) of these metal pole standards for graphic 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 cannot 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.

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## NCDOT Contacts:

<table>
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<th>Title</th>
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<tbody>
<tr>
<td>G.A. Fuller, P.E.</td>
<td>State ITS and Signals Engineer</td>
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<tr>
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<td>ITS and Signals Senior Structural Engineer</td>
</tr>
<tr>
<td>C.F. Andrews</td>
<td>ITS and Signals Journey Structural Engineer</td>
</tr>
</tbody>
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https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx
1. The foundation size for poles in these metal pole standards is determined by conducting a subsurface soil investigation.

2. To determine the correct standard strain pole foundation depth, please adhere to the following requirements in conjunction with the standards being drawn:
   - Using the statewide county wind zone chart, determine pole load case and design details. Make sure you have the appropriate wind zone selected.
   - Select the soil type that best describes the soil characteristics (either clay or sand).
   - Perform a standard penetration test at each proposed foundation site to determine the N value. (Number of blow per foot from standard penetration test).
   - Using the appropriate pole and load number from the subsurface soil investigation, determine the N value. (Number of blow per foot from standard penetration test).
   - Using the previously determined soil type and N value, select the appropriate column to the chart. The correct depth of the foundation is the value that is shown where the column and the line intersect.

3. The “standard foundation selection form” for each proposed foundation is required to be submitted and approved prior to any work in the field. This form as well as the standard foundation special provisions can be obtained at the following website:

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 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, compacted concrete with a minimum compressive strength of 4500 psi at 28 days in accordance with section 1003 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 3250 psi.

10. Each foundation requires a foundation identification tag. For details see the standard drafts.

11. For other details regarding construction of concrete foundation, see project specific special provisions and drawings.

12. Comply with the provisions of section 1024 of the standard specifications for installation.

13. Refer to standard drawing 1024-01 for pole and hanger installation details.

14. When attaching pole to foundation, the distance between the top part of the pole and the bottom part of the foundation is not to exceed more than one anchor bolt. This top part shall not be greater than 24" from the ground.
### ZONE 4 (90 MPH)

#### LIGHT LOADING

*For one pole and one foundation*

<table>
<thead>
<tr>
<th>CASE No.</th>
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<th>BASE PLATES</th>
<th>ANCHOR BOLTS</th>
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*See Note 1 and 2 "Soil Testing and Standard Soil Foundations" on sheet Sig.SP2 of the Standard Notes.*

Typical Intersection

#### HEAVY LOADING

*For one pole and one foundation*

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*See Note 1 and 2 "Soil Testing and Standard Soil Foundations" on sheet Sig.SP2 of the Standard Notes.*

Typical Intersection

### COUNTY WIND ZONE 4

- **Durham**
- **Chatham**
- **Cabarrus**
- **Iredell**
- **Franklin**
- **Hoke**
- **Mecklenburg**
- **Lincoln**
- **Gaston**
- **Greene**
- **Montgomery**
- **Randolph**
- **Stokes**
- **Rowan**
- **Shelby**
- **Stanly**
- **Cleveland**
- **Transylvania**
- **Rowan**
- **Catawba**
- **Lincoln**
- **McDowell**
- **Gastonia**
- **Yadkin**
- **Surry**
- **Alexandria**
- **Winston**
- **Yancey**
- **Moore**
- **Union**
- **Blue Ridge**
- **Rutherford**
- **Watauga**
- **Alexander**
- **Caldwell**
- **Bladen**
- **Pender**
- **Mitchell**
- **Wigington**
- **Richmond**
- **Rutherford**
- **Wilkes**
- **Tyrrell**
- **Winston**
- **Wicomico**
- **Wayne**
- **Washington**
- **Warren**
- **Windsor**
- **Winston-Salem**
- **Woolwine**
- **Woodbridge**
- **Wythe**
- **Wyoming**
- **Yancey**

### WIND ZONE 4 LOAD CASE AND DESIGN DETAILS

- Designed in accordance with the latest AASHTO Special Report 171
- Standard Specifications for Highway Bridges and Structures
- Designed by David L. Sadler