



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

June 10, 2011

MEMORANDUM TO: Division Engineers

ATTENTION: Division Bridge Program Managers

FROM: *Njoroge Wainaina*
Njoroge W. Wainaina, PE
State Geotechnical Engineer

SUBJECT: **Geotechnical Investigation Guidelines for Bridges using Structure Design Standard Loads**

Please find attached the Geotechnical Engineering Unit investigation guidelines for bridges that use the Structure Design Standard Loads. We anticipate that these guidelines will apply to most "Division Managed Low Impact Bridges" and therefore will supersede previous investigation guidelines dated May 21, 2010. These guidelines are similar to the previous investigation guidelines for "Division Managed Low Impact Bridges" except that the drilling has been reduced for the Structure Design Standard Loads. Please distribute these guidelines to the proper personnel. The guidelines will also be made available on our website at www.ncdot.org/doh/preconstruct/highway/geotech/contractserv/StandardFoundationGuidelines.pdf

I would like to encourage the Divisions to consider utilizing the Geotechnical Engineering Unit for foundation investigation before letting to subcontractors. In addition to our in-house drilling services, we also have (10) Limited Service Contracts with firms capable of meeting any compressed schedules.

Please let us know if we can be of further assistance.

cc: Art McMillan, PE
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FOUNDATIONS FOR BRIDGES THAT USE STRUCTURE DESIGN STANDARD LOADS (STANDARD BRIDGES)

FIELD INVESTIGATION GUIDELINES (Revised June 10, 2011)

North Carolina is divided into three Physiographic/Geologic Provinces; Coastal Plain, Piedmont and Blue Ridge Mountains. Foundation type within these three provinces varies primarily with regard to depth to rock or the lack thereof.

NCDOT Divisions	Primary Foundation Types		
	Coastal Plain	Piedmont	Mountains
1-4, 6 & part of 8	Piles		
5, 7, 9, 10, 12 & part of 8		Piles & Drilled Piers	
11, 13 & 14			Short End Bent Piles, Drilled Piers & Footings

INVESTIGATION SCOPE

For standard bridges, the following subsurface investigation guidelines should be considered for estimating purposes. Number and depth of borings may vary depending on information required by the foundation design engineer. In all cases the design engineer should be consulted prior to and during the field investigation to ensure adequate and pertinent information is obtained.

Coastal Plain

The subsurface investigation for Coastal Plain standard bridges can be limited to the following;

Number of Spans	Number of Interior Bents	Number of Borings	Number of Interior Bent Borings
1	0	2	0
2	1	2	0
3	2	3	1
4	3	3	1
5	4	4	2
6	5	4	2
7	6	5	3
8	7	5	3
9	8	6	4
10	9	6	4

Boring depths should be based on the depth required to obtain the bearing resistance of the Factored Axial Load from the Structure Design Standard Loads divided by the resistance factor of 0.6 plus ten (10) ft. During the drilling phase the field professional should be in frequent contact with the design engineer to adjust the number and depth of borings as necessary.

Piedmont

Boring depths in the Piedmont can vary greatly. There is the potential to encounter shallow rock which may require coring for drilled pier or footing design (see coring guidelines below). For borings where rock is not encountered, boring depths should be based on the depth required to obtain the bearing resistance of the Factored Axial Load from the Structure Design Standard Loads divided by the resistance factor of 0.6 plus ten (10) ft. For Piedmont standard bridges, at least one (1) boring should be performed per bent location. Depending on the bridge geometry and subsurface conditions additional borings may be necessary. Coring should be performed at the first interior bent and every other interior bent after the first. The field professional should relay boring information to the design engineer during the investigation so boring criteria can be adjusted based on subsurface conditions and design requirements.

Mountains

In the Mountain province the presence of shallow rock is likely and short end bent pile, footing or drilled pier foundations are common. For Mountain standard bridges, two (2) borings per bent to a depth of 20 feet should be used. For rock coring, see coring guidelines below. As in other areas it is important for the field professional to report unexpected changes in subsurface conditions to the design engineer.

Laboratory Testing of Soils Guidelines

Laboratory testing of disturbed and undisturbed soil samples is not required for standard bridges unless it is specifically requested by the design engineer.

Coring Guidelines

When coring rock for standard bridges, Core to a depth of 15 ft below initial SPT refusal.