LRFD CHANGES IMPACTING ALDOT GEOTECHNICAL ENGINEERING

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OUTLINE

- Introduce myself
- What is LRFD?
- Changes in Design
- Changes in Construction

WHO AM I?

- Graduate of Auburn University with MSCE in Geotechnical Engineering
- Professionally Licensed Engineer
- State Geotechnical Engineer for ALDOT
- Board Chairman for ALDOT Leadership Academy
- Wife and mother

WHAT IS LRFD?

- LRFD = Load Resistance Factor Design
- FHWA Mandate as of October 2007
- FHWA – Grace
  - Bridge Bureau
  - Geotechnical

CHANGE IS COMING!!

Lots of changes coming for design as well as for construction personnel

LPA PROJECTS

- Precast bridges - ASD
- ATRIP - mixed but mostly ASD
- AASHTO girder bridges - LRFD
TERMS

- Factor of Safety
- Design Load
- Bearing Capacity

TERMS

- Use:
  - Required Driving Resistance,
  - Required Nominal Resistance,
  - Factored Load,
  - Resistance Factors,
  - NRVP
- NRVP = Nominal Resistance Verification Program

DESIGN

- NRVP = Number of Load Tests
- AASHTO LRFD Design code
- Table 10.5.5.2.3.1

GEOTECHNICAL SITES

EXPLANATION OF NRVP

<table>
<thead>
<tr>
<th>Nominal Resistance Verification Program</th>
<th>Resistance Verification Method</th>
<th>Resistance Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRVP-A</td>
<td>Driving criteria established by successful static load test of at least one pile per Site, quality control by dynamic testing of at least two piles per Site, but no less than 2 percent of the production piles.</td>
<td>0.80</td>
</tr>
<tr>
<td>NRVP-B</td>
<td>Driving criteria established by successful static load test of at least one pile per Site without dynamic testing.</td>
<td>0.75</td>
</tr>
<tr>
<td>NRVP-C</td>
<td>Driving criteria established by dynamic testing conducted on 100 percent of production piles.</td>
<td>0.75</td>
</tr>
<tr>
<td>NRVP-D</td>
<td>Driving criteria established by dynamic load test, quality control by dynamic testing of at least two piles per Site, but no less than 2 percent of production piles</td>
<td>0.65</td>
</tr>
<tr>
<td>NRVP-E</td>
<td>Driving criteria established by wave equation analysis, without pile dynamic measurements but with field confirmation of hammer performance</td>
<td>0.50</td>
</tr>
</tbody>
</table>

FOUN DATION REPORT CHANGES
DEFINITIONS

- Factored Load
- Total Load
- Geotechnical Resistance Factor
- Estimated Pile Tip Elevation
- Required Driving Resistance
  - Static Test Piles
  - Production Piles

PLAN CHANGES

Additional items you can expect to see

<table>
<thead>
<tr>
<th>DRIVEN PILE DATA</th>
<th>SITE 1</th>
<th>SITE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ABUT 1</td>
<td>ABUT 2</td>
</tr>
<tr>
<td>PILE TYPE</td>
<td>HP 12x42</td>
<td>HP 12x72</td>
</tr>
<tr>
<td>CONTROLLING UNIT STATE</td>
<td>STRENGTH 1</td>
<td>STRENGTH 2</td>
</tr>
<tr>
<td>DESIGN FACTORED LOAD (TONS)</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>REQUIRED STATIC LOAD TESTS</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>REQUIRED DYNAMIC LOAD TESTS</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>REQUIRED DRIVING RESISTANCE</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>DYNAMIC TEST PILE (TONS)</td>
<td>37.5</td>
<td>37.5</td>
</tr>
<tr>
<td>PRODUCTION PILE (TONS)</td>
<td>37.5</td>
<td>37.5</td>
</tr>
<tr>
<td>ESTIMATED PILE TIP ELEVATION (FEET)</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>ESTIMATED SOIL ELEVATION (FEET)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ESTIMATED RESISTANCE lost FROM SOIL (TONS)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MINIMUM PILE TIP ELEVATION (FEET)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

CONSTRUCTION
SPECIFICATION CHANGES
Changes you will see in the special provision

ITEM CHANGES

- 505.03(d): Test Pile Location & Installation Plan w/ C-14 submittal
- Ramifications of changing pile driving systems
- 505.03(f): Geotechnical Sites as related to NRVP
- 505.03(g): NRVP A-E defined
- QC dynamic tests for A & D
- Ramifications of Contractor adjustment to NRVP

ITEM & SUBITEM CHANGES

- 505.03(f): Static Test Piles – Driven with PDA
- 505.03(g): Static Load Test – 175% Required Driving Resistance for STP
- 505.03(h): ALDOT adjust required pile lengths
- 505.05(b): Load threshold adjusted

TESTING LOCATIONS

- Number of tests - Expect more testing!
- Moving test pile locations
- Static/Dynamic Location Relationship
- Static load test piles
  - Dynamically monitored during driving
  - Required on LPA projects with AASHTO girder bridges
- All statically loaded piles will require a restrike, whether the load test fails or not.

DRIVING CRITERIA

- Blow Count vs. Nominal Resistance Curve
- Revised Driving Criteria will be established
- All piles driven to that point, may have to be driven further to meet the revised criteria.

STATIC LOAD TEST WAIVERS

- Drops the Resistance Factor
- Additional pile length may be required
- Maximum pile length for pay – contract plan quantity
- Additional pile due to change, furnished and driven at contractors expense
PROJECTS CURRENTLY SCHEDULED

BRF-0167(508) Coffee County - Let to CN 12/2018
BR-0014(536) Pickens County - To Be Let to CN