Ron Allen, P.E.

ROADWAY DESIGN UNIT

AUG 15 2005

✓ ALLEN ✓ BLEVINS ✓ SYKES
✓ BREW ✓ C. HOUSER ✓ T. HOUSER
✓ LOVERING ✓ D. TAYLOR ✓ GOODNIGHT
✓ J. MOORE ✓ C. HAIRE ✓ SPEER
✓ R. MOORE ✓ THOMAS
✓ MUMFORD ✓ WALLS
THOMPSON

PREPARE REPLY FOR ___ SIGNATURE
✓ F.Y.I.
REVIEW/DISCUSS WITH ___

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

cc:

July 29, 2005

MEMORANDUM TO: Highway Design Branch Unit Heads

FROM: Mr. Art McMillan, P.E.
State Highway Design Engineer

SUBJECT: Retaining Walls and Sound Barrier Walls

The purpose of this memorandum is to assign and clarify the responsibilities and roles related to both retaining walls and sound barrier walls. Many policies and processes regarding retaining walls are unclear and others need to be revised. In general, the responsibility for retaining walls lies with either the Roadway or Structure Design Units prior to requesting the geotechnical work and with the Geotechnical Engineering Unit after the geotechnical work has been requested. The Structure Design Unit, Roadway Design Unit and Geotechnical Engineering Unit are the predominant Units involved with walls. The responsibilities for each Unit are assigned below. An "abutment wall" is defined as a retaining wall at a bridge end bent and a "roadway wall" is used to define all other retaining walls.

Structure Design Unit Responsibilities:

- Identify possible abutment walls and assist in determining preliminary wall type/alternatives and developing initial cost estimates
- Develop preliminary retaining wall envelope for all abutment walls (graphically) and submit envelope to Geotech at the same time geotechnical work is requested
- Adjust preliminary retaining wall envelope for development of final abutment wall envelope and determine quantity (exposed face area)
- Show abutment wall on General Drawing
- Prepare sound barrier wall plans
- Include both retaining wall and sound barrier wall plans in the Structure plans and submit for printing except when walls are the only structures on the project
- Include both retaining wall and sound barrier wall special provisions and pay items in the proposal as structure pay items
- Convert and update current Roadway Standard Drawings 842.01, 842.02 & 842.03 for gravity walls to Structure Standard Drawings with assistance from Geotech
- Move Section 842 entitled "Gravity Retaining Walls" from Division 8 (Incidentals) to Division 4 (Major Structures) in the Standard Specifications and update, if necessary, with assistance from Geotech
- Maintain standard special provision, details and notes on plans for sound barrier walls

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Roadway Design Unit Responsibilities:

- Identify location of possible retaining walls and assist in determining preliminary wall type/alternatives and developing initial cost estimates
- Develop preliminary retaining wall envelope for all roadway walls (graphically) and submit envelope to Geotech at the same time geotechnical work is requested (to Hydro stage)
- Include right-of-way requirements for retaining walls on plans as received from Geotech in the Roadway Foundation Recommendations
- Adjust preliminary retaining wall envelope for development of final roadway wall envelope and determine quantity (exposed face area)
- Review Noise Report to determine sound barrier wall requirements, i.e., station location (right or left) and top elevation
- Determine location of sound barrier wall on cross sections such as at the shoulder in fill sections or at the top of cut sections
- Prepare the sound barrier wall envelope for the roadway plans (shown in 2-series sheets) and submit the information used to prepare the envelope to Structures for their use in developing the sound barrier wall plans
- Show retaining walls and sound barrier walls on the roadway plans and cross-sections

Geotechnical Engineering Unit Responsibilities:

- Assist in determining preliminary wall type/alternatives and developing initial cost estimates
- Perform subsurface investigation and prepare retaining wall inventory
- Include right-of-way requirements for retaining walls in the Roadway Foundation Recommendations*
- Coordinate with Hydraulics, Utilities, Traffic Control, PDEA, Roadway, Structures, Construction and Divisions to address/resolve the following issues for retaining walls*:

• Drainage above, below and around wall
• Utility and drainage conflicts
• Constructability issues including temporary shoring
• Aesthetic requirements/commitments

- Determine retaining wall type and analyze global stability
- Calculate settlement and bearing pressure for fill walls and provide this information to Structures for cast-in-place concrete cantilever retaining walls designed in house
- Prepare retaining wall plans*
- Coordinate multi-unit review of retaining wall plans*
- Seal and submit retaining wall plans to Structures*
- Provide special provisions, quantities and unit costs for retaining walls to Structures*
- Submit retaining wall inventory for printing
- Provide sound barrier wall foundation recommendations
- Receive and review retaining wall submittals during construction
- Develop and maintain a retaining wall manual for the Highway Design Branch
- Develop and maintain standard special provisions, details and notes on plans for retaining walls

*The Structure Design Unit is responsible for these activities for cast-in-place concrete cantilever and permanent sheet pile retaining walls designed in house.

Note that a "wall envelope", which is essentially a profile view of the exposed wall area, is required for all retaining walls. A wall envelope is defined as a scaled plot of the top and bottom of wall elevations as well as the existing ground elevation (if it falls within the vicinity of the wall) and temporary grade elevation (if applicable) on some frequent station interval. Each elevation should be shown both graphically and numerically. The top of wall is defined as the point where the grade intersects the back of the wall. The bottom of wall is defined as the point where the grade intersects the front of the wall. Use a wall thickness of 12 inches for all retaining walls when developing the wall envelope. The final retaining wall envelope will be shown in the retaining wall plans only and should not be shown in the roadway plans with the exception noted below.

A wall envelope for a sound barrier wall is similar to that for a retaining wall except that the top of wall is defined as the minimum wall elevation stated in the Noise Report. Sound barrier wall envelopes should be prepared on detail sheets and included in the 2-series of the roadway plans.

With this new process, there may be occasional situations when a project does not include any structures except for walls (retaining walls and/or sound barrier walls). When this occurs, the Structure Design Unit should transfer the wall plans to the Roadway Design Unit to be included as a part of the roadway plans.

These new wall policies must be in accordance with the new plan and permit review processes. Therefore, 3 months before right-of-way acquisition (either final design field inspection or combined field inspection), the subsurface investigation must be complete, the right-of-way requirements and wall type known and any issues with drainage, utilities, constructability and aesthetics should be resolved. No design changes should occur after this point.

Please implement these new policies on projects with walls as feasible. If there are any questions, let me know.

cc: Ms. Deborah Barbour, P.E., Director of Preconstruction
Mr. Steve DeWitt, P.E., Director of Construction
Mr. Stuart Bourne, P.E., Work Zone Traffic Control Engineer
Mr. Victor Barbour, P.E., State Project Services Engineer
Mr. Cecil Jones, P.E., State Materials Engineer
Mr. Ellis Powell, P.E., State Construction Engineer
Mr. John Williamson, Right-of-Way Branch Manager
Mr. Greg Thorpe, Ph.D., Director of Project Development and Environmental Analysis
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cc (continued):

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