Georgia Department of Transportation
Office of Materials and Research

Standard Operating Procedure (SOP 33)
Certification of Mechanically Stabilized Embankment Retaining Walls

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I. General

This Standard Operating Procedure (SOP) provides guidelines to certify qualified Mechanically Stabilized Embankment Wall systems for inclusion on QPL 107.

Products that appear on QPL 107 have been evaluated by the Office of Bridges and Structures (the Bridge Office) and have proven their capability of meeting material and design requirements defined here in and under Section 627 of the Georgia Department of Transportation (GDOT) Standard Specifications.

Products covered by this SOP will be re-evaluated every five years, or as deemed necessary by the Department based on product performance or accepted industry design practice. Recertification will be required when significant modifications or revisions have been made to the product, there is a change in ownership of the product, or upon request from GDOT.

Submissions for certification should be made to the Bridge Office via BridgeOffice@dot.ga.gov.

II. Initial Evaluation

A. Submission Requirements

1. Provide a catalogue or library of standardized concrete wall elements clearly labeled with the product line name and release date. Include example design calculations for each barrier coping detail, and no less than 3 precast panel designs to include the following:
    - Primary panel
    - Top out panel
    - Panel including a utility or drainage opening

    Catalogue or library and design calculations shall be stamped by a professional engineer licensed in the state of Georgia.

    Perform design work in conformance with the AASHTO LRFD Bridge Design Specifications utilized by the Department as defined in the current GDOT Bridge and Structures Design Manual.

    The Department reserved the right to request additional calculations deemed necessary for review.

2. Provide step by step example design calculations for each of the following wall configurations:
    - Wall greater than 15ft tall retaining an infinite 2:1 slope.
    - Wall greater than 15ft tall retaining an infinite 2:1 slope with a design flood elevation equal to 0.5H.
    - Wall greater than 15ft tall retaining a broken back slope consisting of a finite 2:1 slope that breaks over to horizontal at .5H beyond the walls pressure surface.
    - Wall retaining a live load surcharge and including a moment slab coping with a 42in tall barrier section with a top width of 12in and 5.25:1 sloped face. Evaluate the external and internal stability of the wall for a vehicular collision load. Evaluate the external stability

of the barrier and moment slab for the same vehicular collision load. The reinforcement design of the barrier and moment slab is not required for this example.

- Wall retaining a pile supported abutment and live loads from approach roadway. Include the design of additional soil reinforcement devices to be connected to the abutment to resist rotation and displacement caused by a lateral bridge load, applied at the top of a 2ft tall abutment cap.

Use the following assumptions for design:

- The reinforced backfill is the material used for submitted pull out testing.
- Retained backfill has a unit weight of 0.120 k/ft^3 with an internal angle of friction equal to 28^o.
- The live load surcharge is 0.250 k/ft^2.
- The vehicular collision load is a 15kip load applied at the top of the barrier shape over a distance of 5ft, with distribution to a maximum length equal to the minimum joint spacing in the moment slab.
- The lateral load from the bridge is 1.0kips/ft of abutment.

Catalogue or library and design calculations shall be stamped by a professional engineer licensed in the state of Georgia.

Perform design work in conformance with the AASHTO LRFD Bridge Design Specifications utilized by the Department as defined in the current GDOT Bridge and Structures Design Manual. Present calculations in a manner that all calculations can be recreated by the Department. Spreadsheets are acceptable if formulas are provided for reference.

The Department reserves the right to request additional calculations deemed necessary for review.

3. Provide details illustrating how soil reinforcement devices are connected to panels.
4. Provide reinforcement splicing details.
5. Provide third party tension testing of reinforcement, connectors, and fasteners.
6. Provide third-party pull-out test results for soil reinforcement installed in representative course aggregate and fine aggregate backfill materials. Backfill materials shall meet the requirements in the most current version of Georgia Standard Specification 812.2.04. Geogrid soil reinforcements must meet the requirements in the most current version of Georgia Standard Specification 809.
7. Provide calculations demonstrating both 75-year and 100-year service life for the wall and its components.
8. Provide details and description of joints including bearing pad and filter fabric requirements.
9. Provide written explanation of construction techniques. A copy of any construction manual applicable to the product should be provided, if available.
10. Provide a minimum of 2 complete plan sets for walls that have been part of completed projects. Include contact information for the owner's representative and clear reference to the structure's locations.
11. Provide typical example details addressing the interaction of wall system with drain pipes, junction boxes, and catch basins.

B. Materials for Reference

1. Panel connector mechanism (1 complete connection assembly, including reinforcement a minimum of 6 inches in length)
2. Bearing pad (1 of each potential type)

C. Notarized Warranty Letter

The warranty letter shall be submitted on company letterhead with the QPL # and title in the subject line, a brief description of the retaining wall system and its proposed uses and the following statement in the body.

"This is to warrant that the product (*Product Trade Name*) as manufactured and sold by (*Company Name*) is a Mechanically Stabilized Embankment Wall meeting the current requirements of Section 627 of the Georgia Department of Transportation Standard Specifications".

The letter shall include the signature of a person legally responsible to bind the company.

III. Recertification Evaluation

Submittal requirements for recertification will depend on the reason for recertification.

- For 5 year routine re-evaluation, submit an updated Notarized Warranty Letter that not only states that the product meets the current requirements of Section 627 of the Georgia Department of Transportation Standard Specifications, but also states that the previously certified submission is still representative of the product.
- For change in product ownership, submit an updated version of all the items outlined in the Initial Evaluation section above.
- For significant modifications to the product, submit all pertinent calculations and details associated with the change for review. Additional items may be requested upon review.
- For minor product modifications, such as additions to a standard library or catalogue of panel shapes, submit a full revision of the item for the record. Additional items may be requested upon review.

The Department reserves the right to request a re-evaluation package, to be defined at time of request, if deemed necessary by changes in Section 627 of the Georgia Department of Transportation Standard Specifications or pertinent sections of the AASHTO LRFD Bridge Design Specifications.