MEMORANDUM
Department of Transportation

TO: Robert A. Burnett, P.E., Director, Geotechnical Engineering Bureau, Mail Pod 31
FROM: Donald F. Dwyer, P.E., Geotechnical Engineering Bureau, Mail Pod 31
SUBJECT: LESSONS LEARNED
SECTION 554 – FILL TYPE RETAINING WALLS
WALL SELECTION PROCESS & HIGHWAY WORK PERMITS
DATE: October 7, 2011

The field of geotechnical engineering is complex and ever-changing. In order to rapidly disseminate knowledge gained from geotechnical design and construction activities, as well as to help preserve institutional knowledge, the following is a “Lessons Learned” memorandum to document concerns and reinforce the stipulations in the recently issued revised Standard Specification Section 554 Fill Type Retaining Walls.

I. Executive Summary

The Geotechnical Engineering Bureau (GEB) was informed by Region 8 of a Highway Work Permit (HWP) recently issued, which included the construction of two retaining walls to retain the slopes below the north and south I84 bridge abutments in order to construct the widening of Route 311, and, due to the developments within that permit, has expressed dissatisfaction with the new selection process contained in the Standard Specifications for Fill Type Retaining Walls.

The retaining walls were originally detailed by the Permitee as a specific type of Prefabricated Wall System. However, with the issuance of EI 10-031 Section 554 – Fill Type Retaining Walls, the Permitee allowed the Contractor to choose a wall system from the Approved List. The Contractor chose a Mechanically Stabilized Wall System, of which the reinforcing straps extended beyond the originally envisioned excavation limits, which halted construction.

Two aspects seem to cloud the development and construction of this project. One aspect is that this is a HWP and the other is the concern with the selection process within the new specification which allows the Contractor to choose the type of wall to be installed. As for the latter, applying the new specification is not simply a matter of denoting an item number. It is incumbent upon the Department to properly define the site conditions and limitations in the contract documents. This is thoroughly explained in the Design Guidance, Engineering Issuances, the FAQ’s, and in the several presentations given by the GEB. The Standard
Sheets, issued via EB 10-041, identify the acceptable volume depiction for all proprietary fill type retaining walls.

The involvement of the HWP aspect in this project slightly complicates the matter (due to the submittal approval process during the construction of a project not under the Departments control). However, considering that a HWP projects are not part of the State or Local Programs (which utilizes the design-bid-build process), the intent of the Approved List selection process to obtain a competitively bid product is not an issue as the Permitee is funding the project. Therefore, the Permitee could actually identify a particular wall system as long as it appears on our Approved List and the design submitted and approved in the permit process addresses any concerns identified by the Department.

II. Report

A. The Problem
The HWP proposed a roadway widening that required two (2) short walls, one (1) each along the north and south side of Route 311 to hold up the slopes below both bridge abutments of BIN 1052771 & 1052772 I-84 over Rte 311 in the Town of Patterson, Putman County. These structures are founded on spread footings.

![I-84 over Route 311](image1.png)

![I-84 over Route 311](image2.png)
Throughout the HWP’s initial design reviews, a specific Prefabricated Wall System (Stone Strong) was specified. The design details identified units that were 44” (3.6 ft) wide (front to back), requiring an assumed back of excavation approx. 5 ft +/- back. It was assumed that this excavation could be excavated vertically. Knowing the depth of the wall that was to be placed, the Regional Geotechnical Group did not have concerns about the excavation depth or limits affecting the support soils for the bridge, or any concerns regarding global stability. However, after the Region informed the Permittee of the specification change for Fill Walls, the Permittee allowed the Contractor’s Engineer to choose the wall. The Contractor chose a Mechanically Stabilized Wall System (Rockwood Classic 8 with StrataGrid SG 200 reinforcement) which uses 6 ft long straps (back of excavation extends approx. 7.5 ft back but also must be laid back). When the Regional Geotechnical Group investigated the requirements to install 6 ft long straps, it resulted in a much larger excavation within the 1V on 2H slope below the abutments and it is possible that the global stability calculations may have to require inclusion of the bridge surcharge, which it did not.
Mechanically Stabilized Wall System: Section View

A. Situation
As often happens with HWP’s, the wall construction was started because the permit was approved and the Permitee chose a wall system that appears on the Departments Approved List. The wall was partially installed when concerns regarding the extent of the excavation arose. Considering the situation of such a large, open excavation, the Regional Construction Group directed the Contractor to finish the wall. The GEB was notified of the situation and the Regional Geotechnical Group forwarded the permit to the GEB for Approval in accordance with §554-3.01 B.2. Mechanically Stabilized Wall System.

The Region has stated that there was no way for them to know up front what issues were involved because there is no way to know what wall system was to be built.

III. Conclusion
A few aspects seem to cloud the development and construction of this project. One aspect is that this is a HWP and the other is the concern with the selection process within the new specification which allows the Contractor to choose the type of wall to be installed. The latter will be assessed first:

A. Selection Process

i. Design
The design process is outlined in the HDM Ch. 9 Section 9.4 Retaining Walls and Reinforced Soil Slopes and the GEB has published some frequently asked question’s (FAQ’s) and other supporting documents regarding the subject matter. Applying the new specification is not simply a matter of denoting an item number. It is incumbent
upon the Department to properly define the site conditions and limitations in the contract documents. The original proprietary system may well have fit into a slightly smaller area. However, since we have expanded the Approved List and provided a selection process to the Contractors, the generic Standard Specification and Standard Sheets now require the designer to provide enough area to construct any type of wall, or to identify Special Notes which must be addressed in the submittal process. The limits of all proprietary fill wall systems (reinforced and gravity) were “equalized” as shown in the Standard Sheets, to include in the volume of wall the units, backfill, drainage, etc. in order to make it possible to compare unit costs of different wall systems.

ii. Construction

The requirements for the construction process are identified in the Standard Specification. The concerns identified by the Region are in regards with the selection process outlined in §554-3.0A. Fill Type Retaining Wall Selection. It allows the Contractor to select a designer appearing on the Approved List for Fill Type Retaining Walls. The selection is based on the maximum wall height, along with any Special Notes, identified in the contract documents. Although this subsection is identified as a source of concern, it is only one feature in the entire specification and the remainder of the specification does have controls which appear not to have been followed. For example, §554-3.01 B.2. Mechanically Stabilized Wall System states to submit the design package to the Deputy Chief Engineer Technical Services (DCETS) Attn: Geotechnical Engineering Bureau. The Permit was not submitted to the GEB for approval prior to the start of construction. In addition, §554-3.03 A. Pre-Operation Meeting states that a Pre-Operation Meeting will be held between the Engineer, Contractor, Regional Geotechnical Engineer, Geotechnical Engineering Bureau and other appropriate Department representatives to discuss the Contractors proposed construction methods. The GEB is unaware if this Pre-Operation meeting was held or if construction methods were discussed. This subsection additionally stipulates that work will begin work only after receiving the DCETS written approval and holding the Pre-Operation Meeting. As mentioned, work began without review by or approval of the DCETS.

B. Highway Work Permit

The permit process is outlined in a guide on the Departments website: https://www.dot.ny.gov/regional-offices/region4/other-topics/region-four-highway-work-permit-process/process-guide

The Operations Division Office of Traffic Safety and Mobility has been assigned continuing responsibility for all powers and duties related to permits to work on State Highways. Inspection during the performance of the work is normally the responsibility of the Resident Engineers in the Operations Division’s Office of Transportation Maintenance. For major permits requiring more than three (3) man-days of inspection or for permits of a type that should be inspected by the
Construction Group, the Regional Construction Group normally performs the inspection activity. The intent of the Department is to only seek reimbursement from private individuals, Corporations or Contractors for inspection costs that exceed four (4) man-hours of employees’ time.

i. Control
The issuance of a permit grants permission to proceed with the work, transferring control to the Permitee. Although the Department may inspect at any time, State personnel are not assigned to specific permits throughout their duration, as is done with State-let projects. This can cause problems in situations where a specification contains a submittal approval process.

ii. Cost
The intent of this new Standard Specification Section 554 is to: (1) realize a more competitively bid product and (2) have all the systems on the Approved List suitable for the site conditions and available to bid, unless otherwise spelled-out in Special Notes concerning potential design concerns. HWP projects are not part of the State or Local Programs, where the design-bid-build process is instituted to ensure taxpayers money is being appropriately spent on properly designed and constructed projects, with safeguards against collusion. Since a HWP design is submitted and the Department’s responsibility is to ensure it meets our Standards, the concern regarding a competitively bid product is not an issue. In fact, in lieu of the Contractor choosing the type of fill wall system to be installed, the Permitee (who is paying for the roadway improvements) could actually identify a particular wall system as long as it appears on our Approved List and the design addresses any concerns identified by the Department (as originally done on this permit).

IV. Recommendation

Recommendations on the identified aspects within this project are addressed separately as follows:

A. Selection Process in a Design-Bid-Build Scenario

The Department needed to review the submittals and no allow work to commence until the work plan was approved. This is thoroughly outlined in the specification and explained in the Engineering Issuances, the FAQ’s, Design Guidance and in the several presentations given by the GEB.

During the design phase, as with any retaining wall design, the Department needs to investigate the subsurface conditions, analyze global stability and incorporate site-specific details to the wall volume. The Designer shall outline the (1) location, (2) a general layout of the proposed wall for bidding purposes, and (3) all Special Notes to address potential design concerns into the contract documents. The Special Notes are
developed from the same thought process previously used in selecting a particular wall type. In the past, wall systems were rejected from further consideration and the list of available systems was pruned based on personal preferences and/or potential ignorance of capabilities. The Special Notes should not eliminate wall systems but rather enumerate the Departments design concerns. Given the opportunity and an understanding of the concerns, the wall system Designer-Supplier may augment the wall design to fit the wall system in the designed volume, given the project constraints, or opt not to bid.

There are advantages and disadvantages to each individual wall system. However, it would be presumptuous to assume that all advantages and disadvantages are known for each wall system simply based on past experience. The specific capabilities and recent developments and innovations in any wall system are best known by the individual Designer-Suppliers, who should have a say in whether or not their system is appropriate for the site conditions identified in the contract documents. In aspects where there are design concerns identified by the Department, individual Designer-Suppliers may see an avenue to modify current materials/members/connections etc. and/or incorporate/marry other products into their own to address the concerns while developing their product. The arena of open competition will spur innovation.

**B. Highway Work Permit**

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