

# QPL 38: RETAINING WALL SYSTEMS

## GENERAL

TDOT Contract Plans will specify retaining wall locations and specific retaining wall type(s) which must be utilized for the given wall location. For a given retaining wall, a single wall type or several wall types may be listed. For non-proprietary retaining walls such as cast-in-place concrete cantilever walls or soldier pile lagging walls (no anchors) there will not be an approved QPL 38 list. General requirements for design and construction for the non-proprietary walls are summarized below. Further details regarding design and construction requirements can be seen in the project contract plans and Special Provision 624.

## SPECIFICATIONS

- TDOT Special Provision SP624 – Special Provision Regarding Retaining Walls

## PROCEDURE

### **Non-Proprietary Walls: Cast-in-Place Concrete Cantilever Walls, Cast-in-Place Gravity Walls, Soldier Pile Lagging Walls (No Anchors)**

See contract plans and SP624 for design requirements of these walls and for contractor prepared plans, shop drawings, and calculations. These walls will not appear on the Qualified Products List. Wall designers, contractors and material suppliers must conform to applicable TDOT requirements.

### **Approval Process for Proprietary Gravity Wall Systems (QPL38, Section A) and Mechanically Stabilized Earth Wall Systems (QPL38, Section B)**

Includes the following:

- Section A, 38.001** – Precast Large Format Blocks
- Section A, 38.002** – Gabion Walls
- Section B, 38.003** – MSE Wall (Segmental, Precast Facing)
- Section B, 38.004** – MSE Wall (Modular Block Facing)
- Section B, 38.008** – MSE Wall (other facing types)

The following procedure outlines the requirements for proprietary retaining wall systems as listed for Sections A and B that are to be TDOT-approved retaining wall systems. All proprietary retaining walls constructed within TDOT right-of-way or maintained by TDOT must be on this QPL.

### **Wall System Submittal**

**Option I, FHWA IDEA:** A system evaluation final report of technical evaluation by the FHWA Highway Innovations, Developments, Enhancements and Advancements (IDEA) program.

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**Option II, History/Reciprocity (this option will sunset on March 1, 2024):** If the wall system owner has obtained approval from two other State DOT offices, the wall system owner may submit documentation from each approval. The documentation will include the following:

1. Wall system history, including the year it was first used.
2. Wall system theory and how the theory was developed.
3. Laboratory and field experiments which support the theory.
4. Practical applications with descriptions, color photos, and/or videotape.
5. Details of wall elements, including facing unit, metallic/geosynthetics reinforcement, connection devices, backfill, leveling pad, bearing pad, filter fabric, drainage elements, coping traffic barrier, etc..
6. Analysis of structural elements, design calculations, factors of safety, estimated life.
7. Corrosion design procedure for metallic reinforcement, including procedures and data for field and laboratory evaluation.
8. Creep, durability, installation damage factors for geosynthetics reinforcement, including procedures and data for field and laboratory evaluation.
9. Detailed long-hand internal and external design calculations for the design cases, using LRFD methodology.
10. Explanation of computer software used in the design process along with sample printout of input and output results, using LRFD methodology for the design cases.
11. Limitations and disadvantages of the system.
12. Performance history, any known problems or failures of the system, including where, when, how, and why it failed.
13. List of users (other states, etc.) including contact names, addresses, and phone numbers.
14. Documentation that at least 25,000 square feet of the specific wall system has been completed on either a federal or state highway project.
15. Sample material and construction control specifications-showing material type, quality, certifications, field testing, acceptance and rejection criteria (tolerances and placement procedures).
16. A well-documented field construction manual describing in detail, and with illustrations where necessary, the step by step construction sequence, and any special equipment required.
17. Typical unit costs, supported by data from actual projects.
18. Quality control/quality assurance procedures for materials, wall system, and engineering.
19. An explanation of the design process used for actual project designs. That is, does the Wall System owner have in-house engineers who provide the designs for specific projects or does the Wall system Owner allow independent engineers to provide designs of the wall system. If the latter, does the wall system owner provide any quality control measures for design oversight. Is the Engineer-of-Record properly defined for the wall design?
20. Information on wall system warranties and insurance coverage for responsible party.
21. Independent Design Review: At no expense to TDOT, the wall system owner must have the total wall system reviewed by an independent professional engineer(s), who is registered in Tennessee and is acceptable to TDOT engineers. The independent

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professional engineer(s) shall review all wall components, materials specifications, design concept, calculations, and construction procedures, for compliance with AASHTO and TDOT criteria. The independent professional engineer shall submit a formal evaluation report which determines if the wall system meets AASHTO and TDOT design, construction and material property criteria.

Regardless of the option under which a retaining wall system is submitted to TDOT for review, TDOT reserves the right to request additional information regarding both technical and/or non-technical aspects of the wall system as deemed necessary for review and approval.

### **Department Action**

The Product Evaluation Section will notify the wall system owner of receipt of the submittal package including any additional information as requested by TDOT officials subsequent to the original submittal. The submittal package will be disseminated by the Product Evaluation Section to representatives of the Materials and Tests Geotechnical Section and the Division of Structures, . .

After final review and approval by the appropriate TDOT officials, the wall system submitted under either option will be placed on the Qualified Products List by the Product Evaluation Section.

In some instances a wall system may be given conditional approval which may limit the wall system to projects with a limited quantity of wall, a limited height of wall, or some other special limitation (i.e. wall is not approved for use in front of a bridge abutment.) The wall system owner will be informed of any conditional approval and the means by which the conditional approval will be removed.

Any changes/modifications to any particular wall system made subsequent to being on the approved list may necessitate a complete or partial re-submission by that proprietor/contractor and a re-evaluation by the Department. The modified system may also require an evaluation of the modification through the FHWA IDEA program. The wall system owner shall be responsible for informing the Department of any changes in a timely manner. The Department can disallow a particular wall system for let projects – even if it has been placed on the Qualified Products List – if there have been changes made to the wall system that have not been evaluated by the Department.

The Department reserves the right to remove a wall system/supplier from the approved wall systems list if, in the opinion of the Department, the wall system is not performing adequately, design and/or construction procedures are not being followed, or other reason that the Department deems justifiable cause for removal from the list. The Department will inform the wall system/supplier of the reasons for removal and will provide a means by which the wall system/supplier can request to be reinstated to the approved wall systems list.

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## Approval Process for Specialty Wall Types – Anchor Walls, Soil Nail Walls, Secant/Tangent Walls (QPL38, Section C)

Firms requesting to be on approved List QPL 38.005 shall submit required information as described below to the Product Evaluation Section. The information will be distributed to the appropriate persons in the Structures Division, the Materials and Tests Division and the Construction Division for review. Based on the results of review the Product Evaluation Section will either place the firm on QPL 38.005 or inform the firm that they are not approved or that additional information is required.

Approval and placement on QPL 38.005 will be based on Qualifications Requirements and will consist of the following three sub-categories:

**Section C, 38.005** – Firms that have in-house personnel and equipment resources consisting of engineers/designers, technicians and subcontracting specialists associated with all aspects of Specialty Retaining Wall Construction. These firms are capable of completing wall designs, installing all components of the wall, provide required instrumentation/testing and demonstrate the ability to be responsible for all aspects of wall design and construct. Note: Firms meeting 38.005 automatically qualify for QPL.38.006 and QPL.38.007. Qualification Requirements 1,2,3,4 and 5 shown below must be met.

**Section C, 38.006** – Engineering firms that have in-house personnel that are qualified in accordance with the applicable requirements below to provide specialty retaining wall design including all aspects and details of a wall design and oversight of implementation of the wall design. Qualification Requirements 2 and 5 must be met.

**Section C, 38.007** – Specialty contractors/subcontractors/installers that have personnel and equipment resources which are qualified and capable of constructing and installing and testing ground anchors and/or soil nails. Qualification Requirements 3, 4 and 5 must be met.

### Qualification Requirements for Specialty Walls (QPL38, Section C)

1. The firm performing the design and construction of the work shall have a minimum of three (3) years of experience in anchored wall, soil nail, secant/tangent pile wall design and construction and shall submit evidence of successful completion of at least three (3) similar projects.
2. The firm's staff shall include at least one registered Professional Engineer licensed to perform work in the State of Tennessee. The Firm shall assign an engineer to supervise the work with at least three (3) years of experience in the design and construction of the specialty type walls for which qualification is desired.
3. The firm performing the work shall have installed permanent ground anchors,, soil nails or other applicable specialty ground improvement element for a minimum of three (3) years.

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4. The firm shall assign a superintendent or foreman with a minimum of two (2) years of experience in the supervision of anchored wall, soil nail or the specialty type walls for which qualification is desired. The firm may not use consultants or manufacturer's representatives in order to meet the requirements of this section.
5. The firm shall submit a list containing at least three (3) projects completed within the last three (3) years. For each project, the firm shall include with this submittal at a minimum: (1) name of client contact, address, and telephone number; (2) location of project; (3) contract value; (4) range of retaining wall dimensions for submitted projects. Resumes of the firm's staff shall be submitted to TDOT for review. Only those individuals designated as meeting the qualifications shall be used for the project. The firm cannot substitute for any of these individuals without written approval of the TDOT.

### **Additional Information for Specialty Walls (QPL38, Section C)**

TDOT shall approve or reject the firm's qualifications and staff within fifteen (15) working days after receipt of the submission.

Work shall not be started on any wall system nor materials ordered until the firm's qualifications have been verified by TDOT. TDOT may suspend the work if the firm substitutes unqualified personnel for approved personnel during design or construction. If work is suspended due to the substitution of unqualified personnel, the general contractor shall be fully liable for additional costs resulting from the suspension of work and no adjustment in contract time resulting from the suspension of work will be allowed.

All firms must also be approved in accordance and applicable with TDOT Consultant Pre-qualification requirements as administered by the Design Division or contractor/subcontractor pre-qualification requirements as administered by the Construction Division.

### **QPL 38 Time Limitations**

Placement on the Qualified Products List is valid for a three-year time period. The entity requesting original approval shall submit a request to the Product Evaluation Section at [TDOT.ProductSubmittal@tn.gov](mailto:TDOT.ProductSubmittal@tn.gov) for re-qualification every three years. This submission shall consist of either:

1. A certified letter that states that the basis of original qualification, regarding product material properties, design details, software, or personnel (for those qualifications based on personnel requirements), has not changed.
2. A submittal package clearly explaining the nature of any changes made to the product, design details or qualified personnel. TDOT will review the submission and determine if re-qualification is approved.