

New Jersey Turnpike Authority

P.O. Box 5042, Woodbridge, NJ 07095



March 18, 2021

Document Change Announcement

2007 Design Manual
Mechanically Stabilized Earth (MSE) Wall Design
DCA2021DM-01

Subject: Revisions to
Section 3 Structures Design, Subsection 3.3.4 Proprietary Wall Design Guidelines

Description of Change:

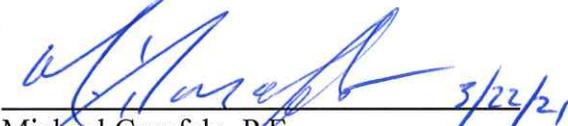
An update to the Proprietary Wall Design Guidelines has been made to incorporate language regarding the corrosion protection of all ferrous materials used in the construction of MSE walls and to ensure there is no steel-to-steel contact between soil reinforcement connections and the concrete facing reinforcement.

Notice to New Jersey Turnpike Authority Staff and Design Consultants

Effective immediately, all contracts currently in the design phase shall incorporate the revisions herein. For advertised contracts awaiting the opening of bids this revision shall be incorporated via addendum. Contact your New Jersey Turnpike Authority Project Manager for instruction.

The revisions may be accessed on the Authority's webpage: <https://www.njta.com/doing-business/professional-services>

Recommended By:



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Distribution: Senior Staff Engineering, Law, Maintenance and Operations Depts., UTCA, AGC, All Prequalified Consultant Firms, File

NOTE: The following text shown in tracked changes are REVISIONS to the latest version of the Design Manual.

3.3.4. Proprietary Wall Design Guidelines

Except as modified by the current New Jersey Turnpike Authority Standard Specifications and the current New Jersey Turnpike Authority Design Manual, Section 3, designs of MSE and Prefabricated Modular Wall retaining wall systems shall conform to the standards noted in Section 6 of this Manual, with the exception of moment slabs supporting barriers, which shall be designed in accordance with the below document:

2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition and as Modified by the 2007 New Jersey Turnpike Authority Design Manual, Section 3, through Current Updates, for Modifications Appropriate to Load Factor Design (LFD).

a. Design Method

Load Factor Design (LFD):

Internal Strength and Stability for Barrier Parapet and Moment Slab System

Allowable Stress Design (ASD): External Stability for Moment Slab

IMPACT LOAD

Load Factor Design (LFD) and Allowable Stress Design (ASD): Vehicular Impact Load applied to the Barrier Parapet and the Moment Slab System shall be per AASHTO Standard Specification, Article 2.7.1.3.

Load and Resistance Factor Design (LRFD): Vehicular Impact Load applied from the barrier parapet and moment slab system to the proprietary wall shall be per AASHTO LRFD Bridge Design Specifications, Article 11.10.10.2.

The impact requirements of AASHTO LRFD Article 3.6.5 are waived for MSE or PM abutment walls which envelop pile supported abutment seat beams and for full height cast in place conventional abutments.

- b. Design Engineers shall be responsible for developing preliminary design and Contract Documents for MSE Walls including all geometry and loading conditions. Generally speaking, it is the responsibility of the Design Engineer to define the alignment of the retaining wall, indicate anticipated leveling pad steps below the grade, establish Common Structure Volume criteria, and establish elevations of the grade and top of wall at regular stations along its length. Constructability and coordinating with external conflicts such as utilities and adjacent structures is also the responsibility of the Design Engineer. Establishing

internal wall design parameters, backfilling requirements, and internal material Specifications is the responsibility of the Geotechnical Engineer. Evaluating external and internal stability (where appropriate) and any associated ground improvements is also the responsibility of the Geotechnical Engineer.

- c. Contractors, material suppliers and/or wall vendors will be responsible for developing the final design for MSE Walls including but not limited to, the following:
- Evaluate Internal Stability for Strength limit state and extreme event, and Confirm External Stability
 - Select type of soil reinforcement
 - Define critical failure surface (for selected soil reinforcement type)
 - Define unfactored loads
 - Establish vertical layout of soil reinforcements
 - Calculate factored horizontal stress and maximum tension at each reinforcement level
 - Calculate nominal and factored long-term tensile resistance of soil reinforcements
 - Select grade (strength) of soil reinforcement and/or number of soil reinforcement elements at each level
 - Calculate nominal and factored pullout resistance of soil reinforcements, and check established layout
 - Check connection resistance requirement at facing
 - Estimate lateral wall movements (at service limit state)
 - Check vertical movement and compression pads
 - Design of Facing Elements
 - Confirm Overall Global Stability
 - Confirm Compound Stability
 - Confirm Wall Drainage System – working drawings
 - Subsurface drainage
 - Surface drainage

- Where design parameters are modified by the Contractor, material supplier and/or vendor, they shall also evaluate the external stability for revised wall configurations.

Review of shop drawings and designs as provided by the Contractor is the shared responsibility of the Design Engineer and the Geotechnical Engineer.

- d. For additional guidance and information, the Design Engineer is referred to the following resources:
- Section 6 of this Design Manual
 - Standard Specifications
 - NJTA Sample Plans and Exhibits 3-500 Series of the Manual
- e. For MSE wall systems that are located under roadways, a high density polyethylene geo-membrane shall be placed below the pavement and just above the first row of reinforcements to intercept any flows that may contain deicing chemicals. The membrane shall be sloped to drain away from the wall facing. Reference is made to NJTA Standard Specifications for type of material to be used. Refer to the Exhibits at the end of this Section for further details.

Drainage considerations for MSE Walls are discussed in Subsection 6.6.2.3 of this Design Manual.

Where MSE Walls will be constructed in or adjacent to salt or brackish water, refer to Subsection 6.6.2.9 of this Manual for guidance regarding corrosion life estimation or use of stainless / nonmetallic reinforcement.

- f. The metallic elements within an MSE wall system are subject to a higher potential for corrosion than other wall types due to the nature of their construction and susceptible to both microcell and macrocell (galvanic) corrosion. The Design Engineer shall consider the effects that the electrochemical environment has on these elements before recommending the use of an MSE wall on a project. When MSE wall systems are recommended, the Contract Documents shall include language that all ferrous component materials, including the mild reinforcement in the concrete facing panels, connection elements, soil reinforcement, and all related hardware, have sufficient corrosion protection. The Contract Documents shall also stipulate there is to be no steel-to-steel contact between soil reinforcement connections and the concrete facing reinforcement and the proper backfill materials must be specified in accordance with the current NJTA Standard

Specifications, regardless of whether the wall is built using single-stage or two-stage construction methods.

During working drawing review, the Design Engineer shall ensure the MSE wall fabricator / supplier has included appropriate notes and language for the required material specifications so that the above noted items are properly addressed.