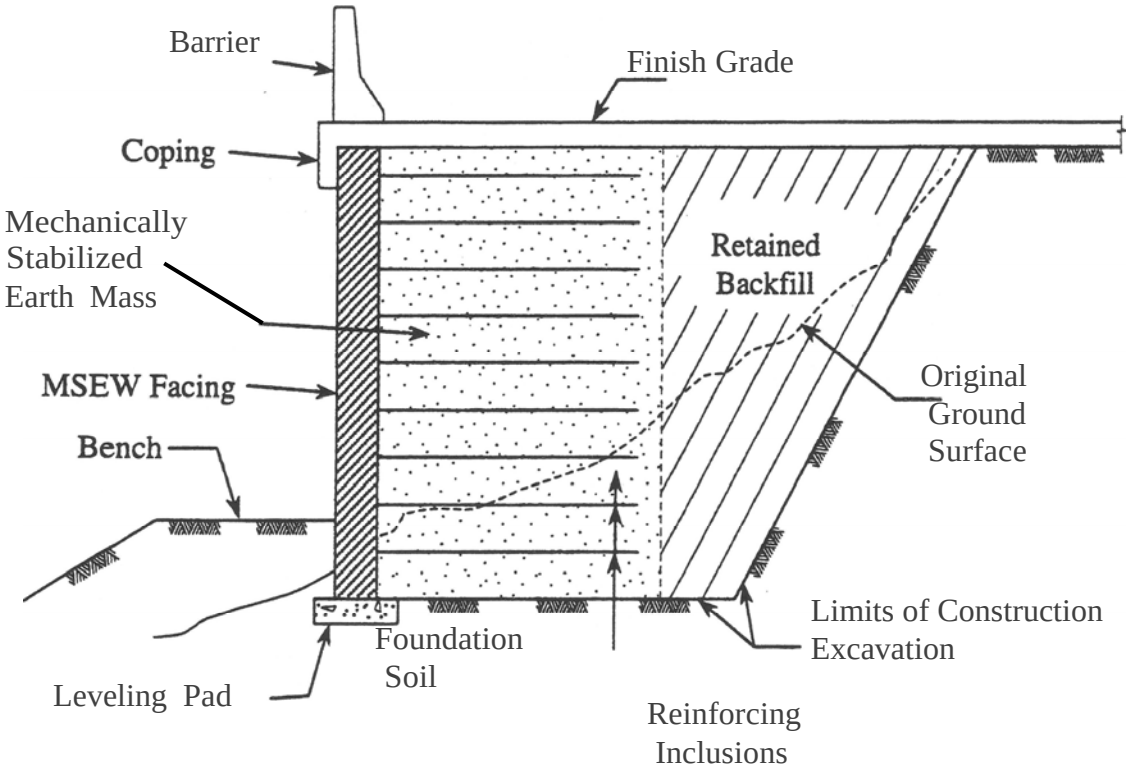
APPROVAL PROCEDURE FOR SUPPLIER BASED RETAINING WALL SYSTEMS

May 2018



Mechanically Stabilized Earth Mass - Principal Elements

Louisiana Department of Transportation and Development
Pavement & Geotechnical Design

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
APPROVAL PROCEDURE FOR
SUPPLIER BASED RETAINING WALL SYSTEMS

I. PURPOSE

This process establishes procedures by which the supplier of a Mechanically Stabilized Earth Wall (MSEW) system or other types of retaining wall systems shall submit their retaining system to the Louisiana Department of Transportation and Development (LA DOTD) for:

A. Approval of the retaining wall system.

B. Inclusion of that retaining wall system on a list of LA DOTD Approved Retaining Wall Systems.

II. SYSTEM APPROVAL PROCESS

A. Retaining wall system suppliers interested in having their retaining wall system approved for use in LA DOTD construction projects shall contact the Retaining Wall Systems Committee of the Department to arrange for receipt of a retaining wall system approval package. The Retaining Wall System Committee is composed of representatives from Bridge Design, Pavement and Geotechnical Design, Road Design, Construction Division, Louisiana Transportation Research Center, and Federal Highway Administration. All correspondence to the Committee should be sent to:

Louisiana Department of Transportation and Development

Attention: Pavement & Geotechnical Services Section 67
Retaining Wall Systems Committee Chairman
P.O. Box 94245
Baton Rouge, LA 70804-9245

B. The supplier shall submit the necessary information as outlined in this document to the Committee.

C. The supplier shall contact the Committee to arrange for a verbal presentation of the retaining wall system. The presentation shall be scheduled to be given not earlier than 14 days after the submittal is received by the Committee. The supplier's representatives should include personnel who are thoroughly familiar with AASHTO retaining wall design and construction specifications and are qualified to answer specific questions regarding design and construction of the proposed wall system.

D. Upon completion of the presentation, the supplier shall allow 12 weeks for a detailed review of the submittal. The review period may be extended if delays are incurred due to Committee requests for clarification of the submittal or additional information.

E. After review of the submittal is completed, the Committee will take one of the following actions:

1. A recommendation will be made to the DOTD Chief Engineer that the retaining wall system be approved as submitted and be added to the list of LADOTD Approved Retaining Wall Systems.

2. A recommendation will be made to the DOTD Chief Engineer that the Department reject the wall system.

3. The supplier will be informed that specific changes in design methodology and/or submittal data are required. In this event, resubmittal and review of applicable material shall be required.

F. A supplier whose name and/or product does not appear on the current list of LADOTD Approved Retaining Wall Systems may not use a project currently being advertised for bids as the basis for obtaining retaining wall system approval and inclusion on the list of LADOTD Approved Retaining Wall Systems.

G. A supplier whose name and/or product does not appear on the current list of LADOTD Approved Retaining Wall Systems may not use a value engineering proposal as the basis for obtaining retaining wall system approval and inclusion on the list of LADOTD Approved Retaining Wall Systems.

H. Any changes/modifications to any particular retaining wall system made subsequent to being placed on the list of LADOTD Approved Retaining Wall Systems will necessitate a complete or partial re-submission by that supplier and a re-evaluation by the Department.

III. RETAINING WALL SYSTEM DESIGN CRITERIA

The design of MSEW with pre-cast concrete panel facings or MSEW with modular concrete block facings shall be made in accordance with the Department's *Geotechnical Engineering Design Guide No. 8, Mechanically Stabilized Earth Wall (MSEW) Design Guide.* MSEW designs based on methodology other than as required in the above document shall not be accepted.

Retaining wall systems not addressed by the Department's Geotechnical Engineering Design Guide No. 8 shall be designed based on AASHTO design methods and the current body of technical literature approved by LADOTD. The designer shall provide complete documentation of design methodology for these types of walls.

IV. SUBMITTAL REQUIREMENTS:

A. The supplier shall furnish the LADOTD Retaining Wall Systems Committee, five (5) complete sets of full size standard construction drawings and notes at least 14 days prior to conducting the verbal presentation required in paragraph II-C of the "System Approval Process". The supplier's standard wall details shall include the following:

1. Construction of each type of structural component (i.e. panel, block, struts, etc.) to be used in wall construction

2. Location and type of reinforcement anchorage system

3. Connection of reinforcement to permanent and temporary facing

4. Passage of wall components and/or reinforcement around piling, drainage, structures, etc.

5. Construction, location, and the method of attaching appurtenances (barrier copings, barrier rails, traffic barriers, drainage structures, etc.) to the proposed retaining wall system in conformance with the details furnished in the Department's *Geotechnical Engineering Design Guide No. 8, Mechanically Stabilized Earth Wall (MSEW) Design Guide.*

6. Other miscellaneous details

B. All suppliers shall submit a completed technical evaluation report from the Highway Innovative Technology Evaluation Center (HITEC) for compliance with AASHTO requirements for the system and its components. As an alternate to the HITEC review, the manufacturer shall obtain an independent review similar to HITEC review by an MSE Wall/Earth Retaining system expert approved by LADOTD. Any changes to the system or its components that occur after the technical evaluation shall be reevaluated by HITEC or an MSE Wall/Earth Retaining system expert approved by LADOTD.

C. The Department shall consider eliminating or requiring a partial submittal of this portion of the submittal if the Technical Evaluation Report satisfactorily addresses the issues presented in this item. Six (6) complete sets of submittal documents shall be furnished in a loose leaf binder, tabbed and arranged as follows:

Tab Letter	Topic/Description
A	Retaining Wall System History
B	Retaining Wall Design Methodology
C	Design and Construction Limitations & Special Details
D	Computer Design Software and User's Manual
E	Design Case I – Level back slope w/Live Load
F	Design Case II – Level back slope w/Live Load and Foundation Obstruction at Abutment
G	Design Case Ill – 3H:1V Broken Back slope w/Live Load
H	Wall Component Structural Design
I	Laboratory/Field Testing Documentation
	Construction Manual

1. Tab "A" shall contain a brief history of the retaining wall system including the following:
    a. A Retaining Wall System Product Data sheet (see Attachment A) shall be required which briefly summarizes the retaining wall system.
    b. Practical applications with descriptions and photographs.
    c. Limitations and disadvantages of the retaining wall system.
    d. A representative list of previously completed projects using the proposed retaining wall system. The list should include a variety of applications (i.e. traffic live load, bridge abutments, channel applications, etc.) Listed projects shall include the year built, location, design, method, maximum wall height, and the owner's address, telephone number, and contact person.

2. Tab "B" shall contain a description of the MSEW supplier's design methodology in accordance with the Department's *Geotechnical Engineering Design Guide No. 8, Mechanically Stabilized Earth Wall (MSEW) Design Guide.* Retaining wall systems not addressed by the Department's Geotechnical Engineering Design Guide No. 8 shall require full documentation of the supplier's retaining wall design methodology.

   The following design issues and construction details shall also be addressed under this item:

   a. Height design limitations
   b. Component selection
   c. Subgrade settlement design limitations
   d. Temporary facing details
   e. Wall drainage issues
   f. Foundation and other obstructions
   g. Special designs and details
   h. Field performance (i.e. limiting differential settlement, field wall batter, etc.)

3. Tab "C" shall be used for suppliers that have developed computer assisted design programs for analysis of the internal stability of the retaining wall system. As a requirement for retaining wall system acceptance, the supplier shall furnish a registered version of the supplier's computer program to the LADOTD along with any applicable usage licenses. Any changes to the program's source code as required by the Department shall be made prior to acceptance of the retaining wall system. The software user's manual documenting input/output and any design limitations inherent in the software shall also be furnished. Hand design calculations provided in Tabs "D", "E", and "F" shall be used to verify the computer program output. When computer program designs are provided in Tabs "D", "E", and "F", all hard copies shall be legible and shall be summarized for proper interpretation.

4. Tab "D" shall have a complete set of, legible, hand design calculations for MSEW Case I shown in Figure 1. In addition to the hand calculations, computer generated designs shall also be included when applicable. See Attachment B for MSEW design criteria.

5. Tab "E" shall have a complete set of, legible, hand design calculations for MSEW Case II shown in Figure 2. The wall reinforcement required for internal stability of MSEW Case I shall be modified to satisfy internal stability requirements when an MSEW is to be constructed with a single row of deep foundations at a bridge abutment. Foundation elements at abutments shall not be used to retain soil or as a soil reinforcement when analyzing the stability of the retaining wall. In addition to the hand calculations, computer generated designs shall also be included when applicable. See Attachment B for MSEW design criteria.

6. Tab "F" shall have a complete set of, legible, hand design calculations for MSEW Case III shown in Figure 3. In addition to the hand calculations, computer generated designs shall also be included when applicable. See Attachment B for MSEW design criteria.

7. Tab "G" shall contain complete, legible, hand calculations verifying the structural adequacy of each structural wall component to be incorporated into the supplier's wall system. Facing design shall include verification of the adequacy of the proposed facing element reinforcement connection system.

8. Tab "H" shall contain the Certification Package for MSEW designs (Tabs "D", "E", and "F") in accordance with the Department's Geotechnical Engineering Design Guide No. 8, Mechanically Stabilized Earth Wall (MSEW) Design Guide.

   Retaining wall systems not addressed by the Geotechnical Engineering Design Guide No. 8 shall be submitted with certified copies of all laboratory and field testing performed to establish/verify design values used in Tabs "D", "E", and "F" above. To be acceptable, test results must bear the legible signature and seal of the responsible engineer, the name and address of the testing agency, and a description of the test method employed. Tests performed using a recognized procedure of an established testing agency (AASHTO, ASTM, etc.) may be identified by procedure number only.

9. Tab "I" shall contain a well documented field construction manual describing in detail, and with illustrations where necessary, the step-by-step construction sequence.

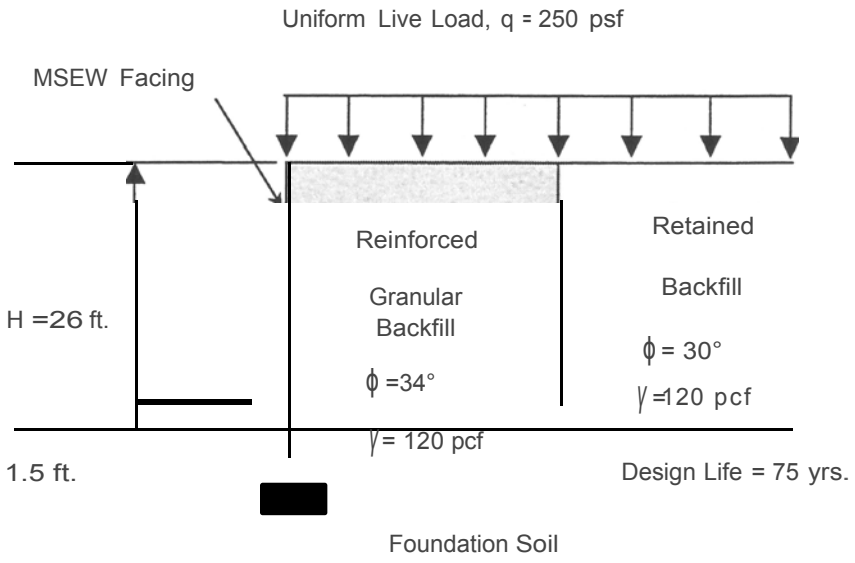


Figure 1- Level Backslope with Uniform Live Load (CASE I)

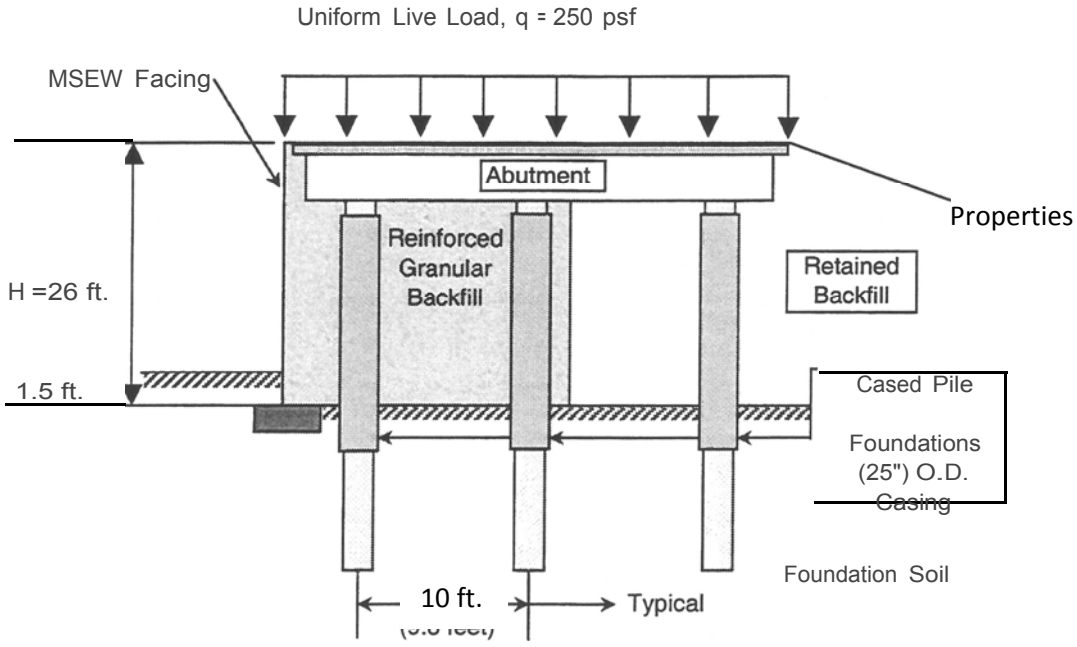


Figure 2 - Level Backslope with Uniform Live Load & Cased Pile Obstructions (CASE II)

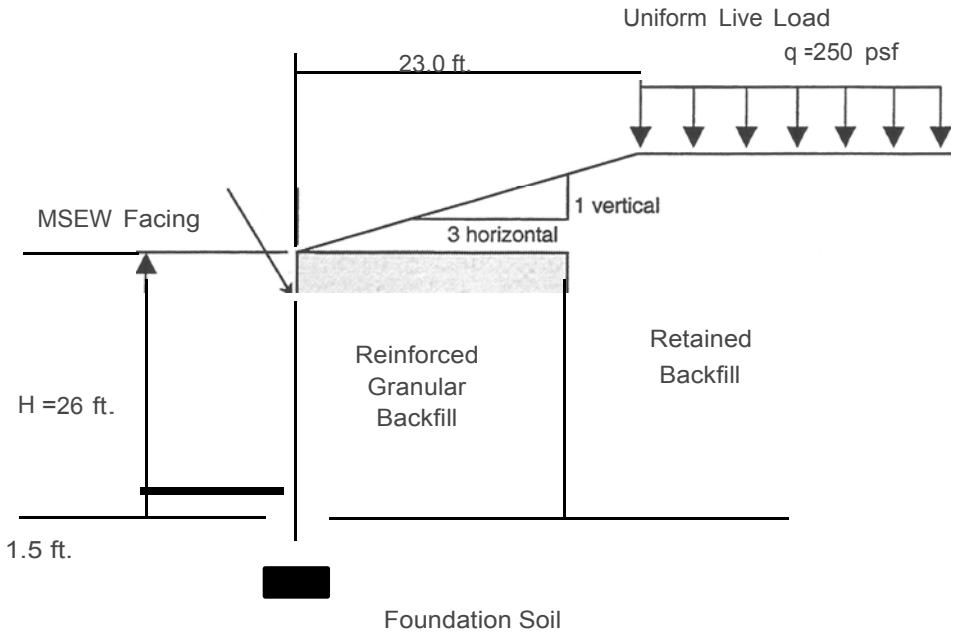


Figure 3 - Broken Backslope (CASE III)

ATTACHMENT A

PROPRIETARY MSE WALL
SUMMARY PRODUCT DATA

TRADE NAME: _____

Is the Trade Name Registered? 0 Yes 0 No 0 Not Yet
Is the Trade Name Patented? 0 Yes 0 No 0 Not Yet
Date patented: _____ Date expired: _____ Date applied for: _____

COMPANY: _____
0 Proprietor 0 Supplier 0 Manufacturer 0 Engineering Firm

Representative: _____

Address: _____

City: _____ State: _____ Zip: _____
Phone: _____ Fax: _____

Brief description of product or components of system: _____

Recommended Uses: _____

Advantages: _____

Disadvantages: _____

Cost:
Typical installed cost (range) $ _____
Typical materials only cost (range) $ _____
Typical equipment only cost (range) $ _____
Typical labor only cost (range) $ _____

FOR LADOTD USE ONLY

(To be completed by LADOTD MSE Retaining Structures Committee)

Product: _____ Status: _____ Initials: _____ Date: _____

ATTACHMENT B

MSEW DESIGN CRITERIA
DESIGN CASES I, II, & III

Design Life:

75 years (Permanent MSEW Structure)

Estimated Settlement:

Maximum Differential Settlement = 1:200 (MSEW Identification)
Maximum Settlement @ (STA. 0+000.00) = 3 inches

Reinforced Backfill Material:

Granular Backfill
Internal Friction Angle, ϕ = 34°
Wet Unit Weight = 120 pcf

Retained Backfill:

Internal Friction Angle, ϕ = 30°
Wet Unit Weight = 120 pcf

Foundation Soils:

Cohesive Material
Undrained Shear Strength-Cohesion = 2000 psf
Drained Shear Strength – Internal Friction Angle, ϕ = 30°
Ultimate Bearing Capacity = 10000 psf

External Stability:

Global Stability Safety Factor, FSoverall	= 1.3
Sliding Stability Safety Factor, FSsliding	= 1.5
Overturning Safety Factor, FSoverturn	= 2.0
Eccentricity	≤ L/6
Bearing Capacity Safety Factor, FSbearing	= 2.5

Internal Stability:

Pullout Safety Factor, FSpo = 1.5

Minimum Required Base Width, BReq:

BReq = 19 feet