

WASHINGTON DEPARTMENT OF TRANSPORTATION SUPPLEMENTAL REQUIREMENTSⁱ

Introduction

The Washington Department of Transportation (WSDOT) maintains a list preapproved proprietary wall systems. The submittal requirements for seeking preapproval of a wall system are listed in Appendix 15-C of the WSDOT Geotechnical Design Manual (GDM), available at <https://wsdot.wa.gov/Publications/Manuals/M46-03.htm>. The appendix provides very detailed information on the on the submittal requirements. The listing of submittal items from Appendix 15-C are provided on the following pages. Refer to the full appendix in the WSDOT GDM for instructions and submittal notes.

The WSDOT submittal process does not note use of an IDEA report. Furthermore, the instructions state that a submittal should be organized in the order shown and referenced to the given numbering system, in Appendix 15-C. Therefore, information contained within an IDEA report that is on the WSDOT list of requested items, can be pulled from the IDEA report into, and as a supplement to, a WSDOT specific submittal.

The WSDOT GDM dated July 2019 was used to prepare this report. WSDOT should contact the IDEA webmaster and update this Supplemental Requirements report when their policies, etc. change. This report is readily updateable, and a revision number and date should be noted.

IDEA Protocols and Format

The WSDOT list of Submittal Requirements (one list that covers multiple wall types) is reproduced on the following pages. Items that are addressed in an IDEA protocol that can be used (supplement) in a WSDOT-specific submittal are noted within this list. References to the current IDEA protocols are noted in brackets. The protocol number (see Table 1) followed by protocol section are listed within the brackets.

Table 1. IDEA Wall System Evaluation Protocols

PROTOCOL NUMBER	TYPE	FACING	SOIL REINFORCEMENT
C1	MSE	Concrete modular block	Extensible
C2	MSE	Concrete modular block	Inextensible
C3	MSE	Precast concrete panel	Extensible
C4	MSE	Precast concrete panel	Inextensible
C5	MSE	Steel mat	Extensible
C6	MSE	Steel mat	Inextensible
C7	Gravity	Precast modular block	n/a

List of Wall/Reinforced Slope Systems Evaluation: Submittal Requirements¹

Part One: Wall System Overview

Provide an overview of the wall system. Product brochures will usually fulfill the requirements of this section.

Part Two: Plan Details

As a minimum, provide the following plan sheet details:

1. All system component details.
2. Typical plan, profile, and section views.
3. Details that show the facing batter(s) that can be obtained with the wall system (example details that illustrate the permissible range are acceptable).
4. Corner details
 - Acute inside corner
 - Obtuse inside corner
 - Orthogonal inside corner
 - Obtuse outside corner
 - Orthogonal outside corner
5. Radius Details (inside and outside radii, include system limitations).
 - Inside radii
 - Outside radii
 - System limitations for inside and outside radii
6. Traffic barrier systems
 - Guardrail
 - Moment slab barrier
7. Horizontal obstruction details for obstructions
 - Horizontal obstructions up to 24 inches oriented parallel to the wall face
 - Horizontal obstructions up to 48 inches oriented perpendicular to the wall face
8. Vertical obstruction details for obstructions up to 48 inches.
9. Culvert Penetration
 - Up to 48 inch culverts oriented perpendicular to the wall face.
 - Up to 24 inch culverts oriented up to a 45 degree skew angle as measured from perpendicular to the wall face.
10. Leveling pad details in accordance with Section 6-13 of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction.
 - Minimum dimensions
 - Steps
 - Corners
11. Coping and gutter details.

¹ From: Appendix 15-C, WSDOT Geotechnical Design Manual, M 46-03.12, July 2019.

Part Three: Materials and Material Properties

1. For facing units, provide the following information:
 - Standard dimensions and tolerances [C1 & C2: 1.1.5] [C3 through C7: 1.1.4]
 - Joint sizes and details
 - Facing unit to facing unit shear resistance [C1 7 C2: 1.1.1] [C3 & C4: 1.1.8] [C6 & C6: 1.1.9] [C7: 1.1.7]
 - Bearing pads (joints) [C1 7 C2: 1.1.1] [C3 & C4: 1.1.8] [C6 & C6: 1.1.9] [C7: 1.1.7]
 - Spacers [C1 7 C2: 1.1.1] [C3 & C4: 1.1.8] [C6 & C6: 1.1.9] [C7: 1.1.7]
 - Connectors (pins, etc.)
 - Joint filler requirements: geotextile or graded granular
 - Other facing materials, such as for reinforced slopes, or other materials not specifically identified above
2. For the soil reinforcement (applies to structural earth walls and reinforced slopes), provide the following information:
 - Manufacturing sizes, tolerances, lengths [C1 & C2: 1.2.3] [C3 through C6: 1.2.2 & 1.2.3]
 - Ultimate and yield strength for metallic reinforcement [C2, C4, C6: 1.2.3]
 - Corrosion resistance test data for metallic reinforcement (for metallic materials other than those listed in the GSP's) [C2, C4, C5 & C6: 1.2.4]
 - Pullout interaction coefficients for WSDOT Gravel Borrow (Standard Specification 9-03.14(4)), or similar gradation, if default pullout requirements in the AASHTO *LRFD Bridge Design Specifications* are not used or are not applicable.
3. For the connection between the facing units and the soil reinforcements (applies to structural earth walls and reinforced slopes), provide the following information:
 - Photographs/drawings that illustrate the connection
 - Ultimate connection strength, $T_{ultconn}$, at various confining pressures up to the anticipated preapproved wall height (typically 33 ft or less) for each reinforcement product, connection type, and facing unit, and connection test specific reinforcement strength, T_{lot} , for all connection tests. [C1, C2 & C3: 1.2.6]
 - Provide connection data in an editable format using the table below:

Facing Unit	Geogrid Product	Wall Height, H (ft)	Normal Load, N (lbs/ft)	$T_{ultconn}$ (lbs/ft)	T_{lot} (lbs/ft)
List	List	Provide range of H for which each $T_{ultconn}$ equation applies	Provide range of N for which each $T_{ultconn}$ equation applies	Provide regression equation(s) here	List

4. For the coping, provide the following information:
 - Dimensions and tolerances [C1 through C6: 1.3.4] [C7:1.2.4]
 - Material used (including any reinforcement)

- Method/details to attach coping to wall top
5. For the traffic railing/barrier, provide the following information:
 - Dimensions of precast and cast-in-place barriers and reaction slabs [C1 through C6: 1.3.5] [C7:1.2.5]
 - How barrier/railing is placed on/in and/or attached to wall top
 - How guard railing is placed on/in and/or attached to wall top
 6. Regarding the quality control/quality assurance of the wall system material suppliers, provide the following information:
 - QC/QA for metallic or polymeric reinforcement [C1 through C6: 4.1.2]
 - QC/QA for facing materials and connections [C1 through C7: 4.1.2]
 - QC/QA for other wall components [C1 through C7: 4.1.2]
 - Backfill (unit core fill, facing backfill, etc.)

Part Four: Design

Provide detailed design calculations for a 25 feet high wall with a 2H:1V sloping soil surcharge (extending from the back face of the wall to an infinite distance behind the wall).

In addition, a 25 feet high example wall shall be performed with no soil surcharge and a traffic barrier placed on top of the wall at the wall face. The barrier is to be of the “F shape” and “single slope” configuration and capable of resisting a TL-4 loading in accordance with LRFD BDM Section 10.2.1 for barrier height and test level requirement.

The calculations should address the technical review items listed below. The example designs shall be completed with seismic forces (assume a PGA of 0.50g).

1. Assumed failure surface used for design
2. Distribution of horizontal stress
3. How surcharge loads are handled in design
 - Concentrated dead load
 - Sloped surcharge
 - Broken-back surcharge
 - Live load
 - Traffic impact
4. Determination of the long-term tensile strength of reinforcement
5. Pullout design of soil reinforcement or facing components that protrude into wall backfill
6. Determination of vertical and horizontal spacing of soil reinforcements (including traffic impact requirements)
7. Facing design
 - Connections between facing units and components
 - Facing unit strength requirements
 - Interface shear between facing units
 - Connections between facing and soil reinforcement/reinforced soil mass
 - How facing batter is taken into account for the range of facing batters available for the system

- Facing compressibility/deformation, if a flexible facing is used
8. Seismic design considerations
 9. Design assumptions/parameters for assessing mobilization of backfill weight internal to wall system (primarily applies to prefabricated modular walls as defined in the AASHTO LRFD Bridge Design Specifications)

List all wall/slope system design limitations, including:

- Seismic loading
- Environmental constraints
- Wall height
- External loading
- Horizontal and vertical deflection limits
- Tolerance to total and differential settlement
- Facing batter
- Other

Quality Control/Quality Assurance for design of the wall/slope systems:

Include the system designer's Quality Assurance program for evaluation of conformance to the wall supplier's quality program.

Part Five: Construction

Provide the following information related to the construction of the system:

1. Provide a documented field construction manual describing in detail and with illustrations as necessary the step-by-step construction sequence, including requirements for: **[C1 through C7: 3.1.2]**
 - Foundation preparation
 - Special tools required
 - Leveling pad
 - Facing erection
 - Facing batter for alignment
 - Steps to maintain horizontal and vertical alignment
 - Retained and backfill placement/compaction
 - Erosion mitigation
 - All equipment requirements
2. Include sample construction specifications, showing field sampling, testing and acceptance/rejection requirements. Provide sample specifications for:
 - Materials
 - Installation
 - Construction
3. Quality Control/Quality Assurance of Construction: **[C1 through C7: 4.2.1]**
Describe the quality control and quality assurance measurements required during construction to assure consistency in meeting performance requirements.

Part Six: Performance

Provide the following information related to the performance of the system:

1. Provide a copy of any system warranties.
2. Identify the designated Responsible Party for:
 - System performance
 - Material performance
 - Project-specific design (in-house, consultant)
2. List insurance coverage types (e.g., professional liability, product liability, performance) limits, basis (i.e., per occurrence, claims made) provided by each responsible party
3. Provide a well documented history of performance (with photos, where available), including:
 - Oldest [C1 through C7: 5.1.2]
 - Highest [C1 through C7: 5.1.3]
 - Projects experiencing maximum measure settlement (total and differential)
 - Measurements of lateral movement/tilt
 - Demonstrated aesthetics
 - Project photos
 - Maintenance history
4. Provide the following types of field test results, if available:
 - Case histories of instrumented structures
 - Construction testing
 - Pullout testing
5. Regarding construction/in-service structure problems, provide case histories of structures where problems have been encountered, including an explanation of the problems and methods of repair.
6. Provide a list of state DOT's that have used this wall system, including contact persons, addresses and telephone numbers.

ⁱ Report Ver 1, December 2020.