

OHIO DEPARTMENT OF TRANSPORTATION SUPPLEMENTAL REQUIREMENTSⁱ

Introduction

The Ohio Department of Transportation (ODOT) maintains an approved product list (APL) for prefabricated retaining wall systems (PRWS) walls. ODOT has three categories of PRWS:

- Precast gravity and semi-gravity
- Prefabricated modular
- Mechanically stabilized earth (MSE)

The procedures to apply for an approval are detailed in the ODOT Prefabricated Retaining Wall Systems, Approval Process document, available at http://www.dot.state.oh.us/Divisions/Engineering/Geotechnical/Geotechnical_Documents/PRWS_Approval.pdf. The document provides very detailed information on the review process and on the submittal requirements.

A PRWS Submittal, following ODOT Prefabricated Retaining Wall Systems, Approval Process document (here within referred to as ODOT PRWS document), must be submitted by the requesting PRWS system supplier. The report shall be prepared and sealed by an Ohio registered Professional Engineer.

The ODOT PRWS document dated October 13, 2020 was used to prepare this report. ODOT 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.

ODOT PRWS Approval Process

ODOT uses a two-step submittal process for PRWSs, with agency review of each step. The first submittal is a Letter of Intent (LOI) Application. ODOT reviews the LOI Application and if deemed acceptable, the PRWS supplier is invited to make the second submittal of detailed information, prepared by an Ohio Professional Engineer.

Note that the PRWS shall meet the design and construction requirements of the following specifications and manuals, as applicable:

- AASHTO LRFD Bridge Design Specification, current edition with Interims
- ODOT Bridge Design Manual, latest edition
- ODOT Construction and Materials Specifications, latest edition
- ODOT Construction Manual of Procedures, latest edition
- ODOT Supplemental Specification 840, Mechanically Stabilized Earth Wall
- ODOT Supplemental Specification 867, Temporary Wire Faced MSE Wall
- ODOT Supplemental Specification 870, Prefabricated Modular Retaining Wall

LOI Application

The LOI application from a PRWS supplier shall contain the following Items A through I. Note that blank forms for Items B through I are attachments to the ODOT PRWS document.

- A. A Letter of Intent (LOI) from the Wall Supplier requesting approval of the specific PRWS.
- B. Completed “Declaration of Proprietorship and Point of Contact” form.
- C. Completed “Declaration of Design Responsibility” form.
- D. Completed “Implied and Proffered Warranties” form.
- E. Completed “Declaration of Understanding of ODOT’s Design and Construction Specifications” form.
- F. Completed “Declaration of Patents and Proprietary Technology” form.
- G. Completed “Declaration of Fabricators or Precast Concrete Manufacturers” form.
- H. Completed “Affirmation of Notification Responsibility” form.
- I. Completed “Authorization for Duplication and Reproduction” form.

Furthermore, note that:

- The application for approval must be for a single PRWS. A single PRWS may include only one wall type. A single PRWS may include only one facing type, one type of reinforcement, and one facing connection type.
- The applicant must either a) own the PRWS or act as the representative of the PRWS owner for the purpose of obtaining ODOT approval, b) be the Design Engineer, working with a specified Fabricator, or c) be the Fabricator, working with a specific Design Engineer.).
- The LOI should provide a basic description of the system, design approach, and sequence of construction.

PRWS System Submittal of Detailed Information

ODOT reviews the LOI Application and if deemed acceptable, the PRWS submitter is invited to make the second submittal of detailed information. The detailed submittal shall contain the following Items J through S (as listed in the ODOT PRWS document) and Attachment J or K (to ODOT PRWS document and to this document) based on the wall type.

- J. A sample set of shop drawings for a recently completed project.
- K. A sample set of long hand design calculations for the type of retaining wall system being submitted. See the ODOT PRWS document for geometry and properties for the design cases for the category of the PRWS being submitted.
- L. Experimental field and laboratory test data supporting the design methodology and the design parameters of the PRWS.
- M. A complete list of PRWS specific design requirements that must be incorporated into ODOT Design and Construction Specifications.
- N. Design drawings and structural design calculations for all elements of the PRWS.
- O. Recommended Construction Specifications. If the PRWS falls under any existing ODOT Construction Specifications (including Supplemental Specifications), provide a marked-

up document highlighting proposed revisions to the applicable ODOT Construction Specifications.

- P. A complete list of design exceptions taken by the Wall Supplier that do not meet the requirements of the Design and Construction Specifications listed in Section 5, of ODOT PRWS document.
- Q. A complete list of limitations on the use of the PRWS, such as: limiting differential settlement, limiting wall height, alignment turn angles or minimum radius, minimum face batter, abutment applications, etc.
- R. Details of typical frames and frame connections utilized to avoid obstructions.
- S. Detailed repair methods for partial or full replacement of precast concrete elements of the PRWS.

The detailed information should be organized in the order shown and referenced to the given numbering system in Items J through S, above, and in Attachment I, J, or K. Note that duplication of information is not needed or warranted. A simple statement referencing another section is adequate. See the ODOT PRWS document for detailed information and guidance.

IDEA Protocols and Format

The ODOT lists of Submittal Requirements for Approval (i.e., Attachments J and K of the ODOT PRWS document), for two of the ODOT categories of wall types – prefabricated modular and MSE, are reproduced on the following pages. Items that are addressed in an IDEA protocol that can be used to supplement, i.e., referenced within the detailed information submittal, are noted within these two checklists. 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.

The third ODOT wall type category, precast gravity and semi-gravity walls (ODOT Attachment I), is for wall systems with full-height units. IDEA currently does not have a protocol for these types of systems. Therefore, this it is not presented within this report.

Information that addresses specific items within the ODOT lists can be cross referenced to the IDEA report, if the report is included as an attachment to the submittal. Alternatively, information from an IDEA report can be directly pulled into a detailed information submittal to ODOT.

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

Attachment J¹
Submittal Requirements for Approval of
Prefabricated Modular Retaining Wall Systems

The PRWS submittal should include the following sections.

Table of Contents

- 1.0 SYSTEM
 - 1.1 Description of System and Components
 - 1.2 History, Performance, and Maintenance
 - 1.3 Ohio or other State Applications
 - 1.4 System Warranties
 - 1.5 Designated Responsible Parties
 - 1.6 Insurance Coverage for Responsible Party
- 2.0 DESIGN
 - 2.1 Summary of Design Parameters and Design Approach
 - 2.2 Design Responsibility
 - 2.3 Summary of Design Procedures
 - 2.4 Summary of Example Calculations
 - 2.5 Limitations
- 3.0 MATERIALS
 - 3.1 Modular Unit
 - 3.2 Backfill
 - 3.3 Leveling Pad
 - 3.4 Drainage Elements
 - 3.5 Coping
 - 3.6 Traffic Railing / Barrier
 - 3.7 Connections to Appurtenances
 - 3.8 Other Materials
 - 3.9 Quality Control / Quality Assurance of Materials
- 4.0 DETAILS
 - 4.1 Standard Details
 - 4.2 Example Details
- 5.0 SPECIFICATIONS, CONSTRUCTION, AND MAINTENANCE
 - 5.1 Fabrication of Precast Modular Units
 - 5.2 Fabrication of Bin Wall Steel Components
 - 5.3 Field Construction Manual
 - 5.4 Construction Specifications
 - 5.5 Contractor or Subcontractor Prequalification Requirements
 - 5.6 Quality Control / Quality Assurance of Construction
 - 5.7 Construction / In-Service Structure Problems
 - 5.8 Maintenance

¹ From: Revised April 11, 2018 version.

1.0 SYSTEM

1.1 Description of System and Components

- Summarize what the system consists of and what is not included, but necessary, to construct the wall.
- Summarize external materials and variables which will influence the design, construction and performance of the system.
- List each component of the system.
- List material requirements for each component.

1.2 History, Performance, and Maintenance

- Summarize the history of development and application of the system.
- Summarize refinements made to the system, since inception.
- Summarize performance (with photos, where available) of completed structures, including:
 - Oldest [C7: 5.1.2]
 - Tallest [C7: 5.1.3]
 - Projects experiencing maximum measured settlement (total and differential)
 - Measurements of lateral movement / tilt
 - Demonstrated aesthetics
 - Project photos
 - Maintenance and performance history, including improvements that have been made based on the experience with the system
- Summarize any incidents where approval was revoked by a government agency for the system or any component of the system during the past five years. List these incidents if any, and describe the relationship between the rejected or revoked product component and the system being evaluated in this report. Where applicable, include a description of any predecessor product component or system.

1.3 Ohio or other State Applications

- Summarize the history of application of the system.
- Summarize the history of application of the system on Ohio projects.
- Summarize design issues specific to Ohio applications.
- Summarize construction issues specific to Ohio applications.
- Provide a list of non-ODOT users, including a contact person for each user with their telephone number, email address and a summary of all projects where the system has been used.

1.4 System Warranties

Provide a copy of any system warranties

1.5 Designated Responsible Parties

Summarize responsibilities for:

- System performance
- Material performance

- Project-specific design and construction details
- 1.6 Insurance Coverage for Responsible Party
List insurance coverage types (e.g., professional liability, product liability, performance), limits, and basis (i.e., per occurrence, claims made) provided by each responsible party.
- 2.0 DESIGN [C7: 2.1.2]**
- 2.1 Summary of Design Parameters and Design Approach
Provide a summary of the following, and note applicable standard and / or test method used to quantify value:
- Wall elements materials properties
 - Connections between modular units (friction, passive, or combination)
 - Wall soil interaction parameters
 - Wall restraints and design lateral earth pressures (active and at-rest) and minimum design lateral pressure
 - Direct shear interaction coefficient between modular units
 - Direct shear interactions at base of wall
 - Foundation bearing resistance or strength parameters
 - Pre-stressing steel or reinforcing steel
 - Connection materials and requirements for composite or multi-part connected walls (laterally and vertically)
- 2.2 Design Responsibility
- State designated responsible party for project-specific design.
 - List professional liability insurance coverage limits and basis (i.e., per occurrence, claims made) provided by the design responsible party.
 - Detail the system designer's Quality Control / Quality Assurance programs for project designs.
 - List those items of a project design that you understand, or assume, are the responsibility of ODOT.
- 2.3 Summary of Design Procedures
- Summarize all deviations from the most current ODOT design specifications or requirements and the American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, along with theoretical or empirical information which support such deviations.
 - Summarize wall shape and size requirements.
 - Summarize when and how external stability (global stability, bearing resistance, sliding resistance, and limiting eccentricity) is assessed.
 - Summarize when and how internal stability is assessed.
 - Summarize seismic design considerations.
 - Detailed design for connectors between wall elements, if applicable.
 - Detail design modification for tiered structures.
 - Detail design modification for acute corners.

- Detail design to overcome obstructions (e.g., drainage structures, deep foundations, etc.) in backfill zones.
- 2.4 Summary of Example Calculations
- Provide detailed calculations for the external stability of the wall.
 - Provide detailed calculations for the internal stability of the wall material and connectors, if any.
 - Provide detailed calculations for stability at the interface between modular units, with respect to sliding and overturning failure modes.
- 2.5 Limitations
- List all design limitations, including seismic loading; environmental restraints; wall height; external loading; foundation bearing resistance, settlement, differential settlement; impact/crash loads, and others.

3.0 MATERIALS

Provide material specifications describing the material type, quality, certifications, lab and field testing, and acceptance and rejection criteria, along with support information (and where noted, a sample of the material) for each of the following material items. Include representative test results (lab and field) clearly referencing the date, source, and method of test, and where required, the method and detailed explanation of interpretation and extrapolation. Note the source of the supplied information, include a listing of facilities normally used for testing (e.g., in-house and independent). Clearly identify the materials listed below that do not apply to the product being submitted.

3.1 Modular Unit

- Standard dimensions and tolerances [C7: 1.1.4]
- Reinforcing steel details
- Joint sizes and details
- Modular unit material requirements
 - Concrete strength (minimum) [C7: 1.1.2]
 - Wet cast concrete % air (range) [C7: 1.1.2]
 - Freeze thaw durability [C7: 1.1.2]
 - Galvanization
 - requirements (bin wall steel shall be galvanized according to CMS 610.03B)
- Bearing pads (joints)
- Spacers (pins, etc.)
- Joint filter requirements: geotextile or graded granular
- Other facing materials
- Aesthetic choices (textures, relief, color, graffiti treatment)
- Other facing materials

3.2 Backfill [C7: 1.2.2]

- Soil classification
- Gradation range
- Unit weight (design and representative measured)

- Friction angle (design and representative measured)
- 3.3 Leveling Pad
 - Material type (cast-in-place/precast/granular)
 - Size requirements
 - Concrete strength, minimum, if applicable
 - Gradation range and compaction requirements (for granular leveling pads)
- 3.4 Drainage Elements [C7: 1.2.3]
 - Drainage fill classification and gradation range
 - Surface drainage requirements
 - Subsurface drainage requirements
- 3.5 Coping [C7: 1.2.4]
 - Precast concrete coping
 - Cast-in-place coping
 - Precast and cast-in-place combination
 - Installation/attachment method and details
- 3.6 Traffic Railing / Barrier [C7: 1.2.5]
- 3.7 Connections to Appurtenances
- 3.8 Other Materials
 - Corner elements [C7: 1.1.3]
 - Slip-joint elements [C7: 1.2.6]
- 3.9 Quality Control / Quality Assurance of Materials
 - Material suppliers
 - Modular units [C7: 4.1.1]
 - Foundation or leveling pad
 - Connectors between blocks
 - Backfill
 - Wall drainage elements
 - Fabricator(s)
 - Test facilities (internal and external)

4.0 DETAILS

4.1 Standard Details

Provide detailed drawings of the following standard details electronic copy in pdf and Microstation v8i format, SS3 or later version:

- Leveling pad
- Modular unit sizes and dimensions
- Erection details of blocks including temporary bracing, batter, joint spacing, etc.
- Inter-unit connections
- Top of wall coping
- Top of wall traffic barrier
- Bottom of wall traffic barrier
- Top of wall membrane protection for areas where deicing salts are used

- Construction of cast-in-place traffic barriers
- Joint drainage details
- Surface drainage or weep holes, if needed
- Subsurface drainage (by others)
- Subsurface drain outlets (by others)
- Overhead light standard incorporated into the wall facing
- Slip joint detail
- End of wall
- Connection to appurtenances (e.g., box inlets and large obstructions)
- Fill placement procedures
- Architectural face finish options

4.2 Example Details

Provide detailed drawings illustrating typical examples of the following details:

- Wall drainage system
- Stepping of leveling pad with existing and final grades
- Stepping of top of wall with final grade

5.0 SPECIFICATIONS, CONSTRUCTION, AND MAINTENANCE

Provide the following information related to construction of the system:

5.1 Fabrication of Precast Modular Units

- Curing times
- Form removal
- Concrete surface finish requirements

5.2 Fabrication of Bin Wall Steel Components

- Bolting requirements
- Joint sealing requirements
- Requirements for wall construction on a curve (if applicable)

5.3 Field Construction Manual [C7: 3.1.2]

Provide a documented field construction manual describing in detail, with illustrations as necessary, the step-by-step construction sequence, including requirements for:

- Foundation preparation
- Special tools required
- Leveling pad
- Facing erection
- Facing batter for alignment
- Steps to maintain horizontal and vertical alignment
- Backfill placement / compaction
- Erosion mitigation
- All equipment requirements

5.4 Construction Specifications

Include sample construction specifications which address:

- Materials requirements
 - Field sampling, testing, and acceptance / rejection requirements
 - Installation requirements
 - Maintenance requirements
 - Aesthetics compliance, including texture, color, graffiti treatment, and durability of aesthetic features
- 5.5 Contractor or Subcontractor Prequalification Requirements
List any contractor or subcontractor prequalifications.
- 5.6 Quality Control / Quality Assurance of Construction [C7: 4.2.1]
Detail the quality control and quality assurance measurements required during construction to assure consistency in meeting performance requirements, and responsible parties for each.
- 5.7 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.
- 5.8 Maintenance
Provide a listing of maintenance requirements to maintain performance and repair damage. If available, provide a maintenance manual.

Attachment K²
Submittal Requirements for Approval of Category C
Mechanically Stabilized Earth (MSE) Wall Systems

The PER System submittal should include the following sections.

Table of Contents

- 1.0 SYSTEM
 - 1.1 Description of System and Components
 - 1.2 History, Performance, and Maintenance
 - 1.3 Ohio or other State Applications
 - 1.4 System Warranties
 - 1.5 Designated Responsible Parties
 - 1.6 Insurance Coverage for Responsible Party
- 2.0 DESIGN
 - 2.1 Summary of Design Parameters and Design Approach
 - 2.2 Design Responsibility
 - 2.3 Summary of Design Procedures
 - 2.4 Summary of Example Calculations
 - 2.5 Limitations
- 3.0 MATERIALS
 - 3.1 Facing Unit
 - 3.2 Soil Reinforcement
 - 3.3 Facing Connection Components
 - 3.4 Reinforced Wall Fill
 - 3.5 Leveling Pad
 - 3.6 Drainage Elements
 - 3.7 Coping
 - 3.8 Traffic Railing / Barrier
 - 3.9 Precast Connections to Appurtenances
 - 3.10 Other Materials
 - 3.11 Quality Control & Quality Assurance Systems
- 4.0 DETAILS
 - 4.1 Standard Details
 - 4.2 Example Details
- 5.0 SPECIFICATIONS, CONSTRUCTION, AND MAINTENANCE
 - 5.1 Fabrication of Facing Units
 - 5.2 Field Construction Manual
 - 5.3 Construction Specifications
 - 5.4 Contractor or Subcontractor Prequalification Requirements
 - 5.5 Quality Control / Quality Assurance of Construction
 - 5.6 Construction / In-Service Structure Problems
 - 5.7 Maintenance

² From: Revised April 11, 2018 version.

1.0 SYSTEM

1.1 Description of System and Components

- Summarize what the system consists of and what is not included, but necessary, to construct the wall.
- Summarize external materials and variables which will influence the design, construction and performance of the system.
- List each component of the system.
- List material requirements for each component.

1.2 History, Performance, and Maintenance

- Summarize the history of development and application of the system.
- Summarize refinements made to the system, since inception.
- Summarize performance (with photos, where available) of completed structures, including:
 - Oldest [C1 through C4: 5.1.2]
 - Tallest [C1 through C4: 5.1.3]
 - Projects experiencing maximum measured settlement (total and differential)
 - Measurements of lateral movement / tilt
 - Demonstrated aesthetics
 - Project photos
 - Maintenance and performance history, including improvements that have been made based on the experience with the system
- Summarize any incidents where approval was revoked by a government agency for the system or any component of the system during the past five years. List these incidents if any, and describe the relationship between the rejected or revoked product component and the system being evaluated in this report. Where applicable, include a description of any predecessor product component or system.

1.3 Ohio or other State Applications

- Summarize the history of application of the system.
- Summarize the history of application of the system on Ohio projects.
- Summarize design issues specific to Ohio applications.
- Summarize construction issues specific to Ohio applications.
- Provide a list of non-ODOT users, including a contact person for each user with their telephone number, email address and a summary of all projects where the system has been used.

1.4 System Warranties

- Provide a copy of all system warranties

1.5 Designated Responsible Parties

Summarize responsibilities for:

- System performance
- Material performance

- Project-specific design and construction details
- 1.6 Insurance Coverage for Responsible Party
List insurance coverage types (e.g., professional liability, product liability, performance), limits, and basis (i.e., per occurrence, claims made) provided by each responsible party.

2.0 DESIGN

- 2.1 Summary of Design Parameters and Design Approach
Provide a summary of the following, and note applicable standard and/or test method used to quantify value: Nominal strength of soil reinforcement element(s)
- Nominal strength of soil reinforcement element(s)
 - Long-term factored strength of soil reinforcement element(s)
 - Direct shear interaction coefficient
 - Normalized pullout resistance factors, F^* and α [C1 & C3: 1.2.7] [C2: 1.2.9] [C4: 1.2.16]
 - Galvanization or other protective coating requirements and thickness [C2: 1.2.4 & 1.2.6] [C4: 1.2.4 & 1.2.11]
- 2.2 Design Responsibility
- State designated responsible party for project-specific design.
 - List professional liability insurance coverage limits and basis (i.e., per occurrence, claims made) provided by the design responsible party.
 - Detail the system designer's Quality Control / Quality Assurance programs for project designs.
 - List those items of a project design that you understand, or assume, are the responsibility of ODOT.
- 2.3 Summary of Design Procedures [C1 through C4: 2.1.2]
- Summarize all deviations from the most current ODOT design specifications or requirements and the AASHTO LRFD Bridge Design Specifications, along with theoretical or empirical information which support such deviations.
 - Summarize when and how external stability (global stability, bearing resistance, sliding resistance, and limiting eccentricity) is assessed.
 - Summarize when and how internal stability is assessed.
 - Summarize seismic design considerations.
 - Detail design modification for tiered structures.
 - Detail design modification for acute corners.
 - Detail design to overcome obstructions (e.g., drainage structures, deep foundations, etc.) in reinforced zones.
- 2.4 Summary of Example Calculations
- Provide detailed calculations for the external stability of the wall.
 - Provide detailed calculations for the long-term factored tensile strength of the soil reinforcement and at the connection of the soil reinforcement to

the facing units. Note any deviation from the most current AASHTO LRFD Bridge Design Specifications.

- Provide detailed calculations for soil reinforcement pullout resistance.
- Provide detailed calculations for reinforcing steel in facing units, as applicable.

2.5 Limitations

List all design limitations, including seismic loading; environmental restraints; wall height; external loading; foundation bearing resistance; settlement; differential settlement; and others.

3.0 MATERIALS

Provide material specifications describing the material type, quality, certifications, lab and field testing, and acceptance and rejection criteria, along with support information (and where noted, a sample of the material) for each of the following material items. Include representative test results (lab and field) clearly referencing the date, source, and method of test, and where required, the method and detailed explanation of interpretation and extrapolation. Note the source of the supplied information, include a listing of facilities normally used for testing (e.g., in-house and independent). Clearly identify the materials listed below that do not apply to the product being submitted.

3.1 Facing Unit

This section should include the following:

For wet-cast, steel-reinforced panels or unreinforced masonry units

- Standard dimensions and tolerances [C1 & C2: 1.1.5] [C3 & C4: 1.1.4]
- Reinforcing steel details, if applicable
- Joint sizes and details
- Concrete strength (minimum) [C1 & C2: 1.1.7]
- Wet cast concrete % air (range) [C1 & C2: 1.1.9]
- Freeze thaw durability
- Bearing pads (joints) [C1 & C2: 1.1.11]
- Spacers (pins, etc.)
- Joint filter requirements: geotextile or graded granular
- Aesthetic choices (texture, relief, color, graffiti treatment) [C1 & C2: 1.1.13]
- Other facing materials

(Dry-cast concrete masonry units will not be allowed)

3.2 Soil Reinforcement

For Metallic soil reinforcement [C2 & C4: 1.2]

- Manufacturing sizes, tolerances and lengths
- Ultimate and yield strength of steel
- Minimum galvanization thickness for 100 year design life
- Sacrificial steel thicknesses for 100 year design life
- Pullout interaction coefficients for range of backfill

For Geosynthetic Soil Reinforcement [C1 & C3: 1.2]

- Polymer resin and grade
- High Density Polyethylene (HDPE): resin type, class, grade, and category
- Polypropylene (PP): resin type, class, grade, and category
- Polyester (PET): minimum intrinsic viscosity correlated to number average molecular weight and maximum carboxyl end groups
- Mass per unit area
- Post-consumer recycled material, if any
- Nominal strength minimum average roll value and coefficient of variation for nominal strength
- QC strength (e.g., single rib, grab or strip) minimum average roll value
- Creep reduction factors for 100 year design life, including effect of temperature (20° C to 40° C)
- Durability reduction factor (chemical, hydrolysis, oxidative) for 100 year design life
- Additional durability reduction factor for high biologically active environments
- Installation damage reduction factor for range of backfill (e.g., sand, sandy gravel, gravel, coarse gravel) for allowable gradation criteria
- Junction strength (geogrids) for quality control
- Pullout interaction coefficients/pullout resistance factors for range of backfills
- Scale effect correction factor
- Coatings (type and amount)
- UV inhibitors, coatings, etc.
- UV resistance

3.3 Facing Connection Components

- Mode (e.g., structural, frictional, or combined)
- Connection strength as a % of reinforcement strength at various confining pressures for each reinforcement product and connection type submitted [C1 & C3: 1.2.6] [C2: 1.2.8] [C4: 1.2.15]
- Composition of devices, dimensions, tolerances [C1, C2 & C3: 1.2.5] [C4: 1.2.10]
- Full scale connection test method / results [C1 & C3: 1.2.6] [C2: 1.2.8] [C4: 1.2.15]

3.4 Reinforced Wall Fill [C1 through C4: 1.3.2]

- Soil classification
- Gradation range
- Unit weight (design and representative measured)
- Friction angle (design and representative measured)

3.5 Leveling Pad

- Size requirements

- Concrete strength, minimum
- 3.6 Drainage Elements [C1, C2 & C3: 1.3.3]
 - Weep holes
 - Drainage fill classification and gradation range
 - Surface drainage components
 - Subsurface drainage components
- 3.7 Coping [C1 through C4: 1.3.4]
 - Precast concrete coping
 - Cast-in-place coping
 - Precast and cast-in-place combination
 - Installation/attachment method and details
- 3.8 Traffic Railing / Barrier [C1 through C4: 1.3.5]
- 3.9 Precast Connections to Appurtenances
- 3.10 Other Materials
 - Corner elements [C1 & C2: 1.1.5] [C3 & C4: 1.1.4]
 - Slip-joint elements [C1 through C4: 1.3.6]
- 3.11 Quality Control & Quality Assurance Systems
 - Material suppliers
 - Metallic soil reinforcement
 - Geosynthetic soil reinforcement
 - Concrete products
 - Foundation or leveling pad
 - Connectors between facing units
 - Reinforced Wall fill
 - Fabricator(s)
 - Test facilities (internal and external)

4.0 DETAILS

4.1 Standard Details

Provide detailed drawings of the following standard details (electronic copy in pdf and Microstation v8i format, SS3 or later version):

- Leveling pad
- Facing unit reinforcing steel and connection inserts
- Erection details of facing units including temporary bracing, batter, joint spacing, etc.
- Connection
- Top of wall coping
- Top of wall traffic barrier
- Bottom of wall traffic barrier
- Construction of cast-in-place traffic barriers
- Joint drainage details
- Weep holes
- Subsurface drainage

- Subsurface drain outlets
- Slip joint detail
- End of wall
- Connection to appurtenances (e.g., box inlets and large obstructions)
- Fill placement procedures at soil reinforcement elevation
- Architectural face finish options

4.2 Example Details

Provide detailed drawings illustrating typical examples of the following details:

- Stepping of leveling pad with existing and final grades
- Stepping of top of wall with final grade
- Placement of soil reinforcement around steel piles
- Placement of soil reinforcement around drop inlet structures
- Placement of soil reinforcement around pipe penetrations

5.0 SPECIFICATIONS, CONSTRUCTION, AND MAINTENANCE

Provide the following information related to construction of the system:

5.1 Fabrication of Facing Units

- Curing times
- Form removal
- Concrete surface finish requirements

5.2 Construction Manual [**C1 through C4: 3.1.2**]

Provide a documented field construction manual describing in detail, with illustrations as necessary, the step-by-step construction sequence, including requirements for:

- Foundation preparation
- Special tools required
- Leveling pad
- Facing erection
- Facing batter for alignment
- Steps to maintain horizontal and vertical alignment
- Reinforced wall fill and backfill placement / compaction
- Erosion mitigation
- All equipment requirements

5.3 Construction Specifications

Include sample construction specifications that address:

- Materials requirements
- Field sampling, testing, and acceptance / rejection requirements
- Installation requirements
- Maintenance requirements
- Aesthetics compliance, including texture, color, graffiti treatment, and durability of aesthetic features

5.4 Contractor or Subcontractor Prequalification Requirements

- List any contractor or subcontractor prequalification requirements
- 5.5 Quality Control / Quality Assurance of Construction [**C1 through C4: 4.2.1**]
Detail the quality control and quality assurance measurements required during construction to assure consistency in meeting performance requirements, and responsible parties for each.
- 5.6 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.
- 5.7 Maintenance
Provide a listing of maintenance requirements to maintain performance and repair damage. If available, provide a maintenance manual

ⁱ Report Ver 1, December 2020.