

NEW MEXICO DEPARTMENT OF TRANSPORTATION SUPPLEMENTAL REQUIREMENTSⁱ

Introduction

The New Mexico Department of Transportation (NMDOT) maintains a list of approved systems (LAS) for proprietary earth retaining (PER) walls. NMDOT has three categories of PER wall systems:

- A. Precast gravity, semi-gravity, and bin & crib;
- B. Gravity modular and large block; and
- C. Mechanically stabilized earth (MSE).

The procedures to apply for an approval are detailed in the NMDOT Proprietary Earth Retaining Systems Evaluation and Approval Process document, available at [https://www.dot.state.nm.us/content/dam/nmdot/Proprietary_Earth_Retaining_Systems/Proprietary_Earth_Retaining_\(PER\)_Systems_Evaluation_and_Approval_Process.pdf](https://www.dot.state.nm.us/content/dam/nmdot/Proprietary_Earth_Retaining_Systems/Proprietary_Earth_Retaining_(PER)_Systems_Evaluation_and_Approval_Process.pdf). The document provides very detailed information on the review process and on the submittal requirements.

A PER System Evaluation Report, following NMDOT PER Systems Evaluation and Approval Process document (here within referred to as NMDOT PER Systems document), must be submitted by the requesting PER system supplier. The report shall be prepared by an independent, New Mexico registered Professional Engineer that meets the additional requirements stated in the NMDOT Evaluation and Approval Process document.

If the PER System has a current Geo-Institute - Highway Innovations, Developments, Enhancements and Advancements (IDEA) report available, the IDEA report may be included as an attachment to and referenced within the PER System Evaluation Report, but will not replace the independent PER System Evaluation Report.

The NMDOT PER Systems Evaluation and Approval Process document dated September 2017 was used to prepare this report. NMDOT 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.

NMDOT PER Systems Evaluation and Approval Process

NMDOT uses a two-step submittal process for PER Systems, with agency review of each. The first submittal is a Letter of Intent (LOI) Application. NMDOT reviews the LOI Application and if deemed acceptable, the PER system supplier is invited to make the second submittal of detailed information, including the PER Systems Evaluation Report.

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

- AASHTO LRFD Bridge Design Specification, current edition with Interims
- NMDOT Geotechnical Design Manual, current edition

- NMDOT Bridge Design Manual, current edition
- NMDOT Standard Specifications for Highway and Bridge Construction (2019)
- NMDOT Special Provision Modifying Section 506, latest revision
- Federal Highway Administration (FHWA) Publication No. FHWA-NHI-10-024, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Slopes – Volume I*, November 2009
- FHWA Publication No. FHWA-NHI-10-025, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Slopes – Volume II*, November 2009
- FHWA Publication No. FHWA-NHI-07-071 Earth Retaining Structures, June 2008
- Connection strength (ASTM D6638) and seam strength (ASTM D4884) testing for connections with modular block units; pullout resistance (ASTM D6706) and direct shear (ASTM D5321) testing for soil reinforcement (laboratory testing performed by Geosynthetic Accreditation Institute (GAI) accredited test laboratories)
- National Transportation Product Evaluation Program (NTPEP) values for geosynthetic reinforcement
- NMDOT Geogrid Soil Reinforcement – List of Approved Products (NMDOT GSR-LAS) Strength Reduction and MSEW computer software (ADAMA Engineering, Inc.) design parameters

LOI Application

The LOI application from a PER system supplier shall contain the following Items A through F. Note that blank forms for Items B through F are attachments to the NMDOT PER Systems document.

- A. Letter of Intent (LOI) from the PER System requesting approval of the specific PER System Category.
- B. Completed “Declaration of Proprietorship and Point of Contact” form.
- C. Completed “Declaration of Patents and Proprietary Technology” form.
- D. Completed “Declaration of Precast Concrete Manufacturers” form.
- E. Completed “Affirmation of Notification Responsibility” form.
- F. Completed “Authorization for Duplication and Reproduction” form.

Furthermore, note that:

- The application for approval must be for a single PER System. A single PER System may include only one PER System type. A single PER System may include only one facing type, one type of reinforcement, and one facing connection type.
- The applicant must own the PER System or act as the sole representative of the PER System owner for the purpose of obtaining NMDOT approval.
- The LOI should provide a basic description of the system, design approach, and sequence of construction.
- The LOI should also include the resume of the Review Engineer, in accordance with Section 5 of the NMDOT PER Systems document.

PER System Submittal of Detailed Information

NMDOT reviews the LOI Application and if deemed acceptable, the PER system supplier is invited to make the second submittal of detailed information. The detailed submittal shall contain the following Items G through O, as listed in the NMDOT PER Systems document.

- G. PER System Evaluation Report endorsed, signed and sealed by the Review Engineer.
- H. A sample set of shop drawings for a recently completed project.
- I. A sample set of AASHTO LRFD analyses and design calculations for the following cases utilizing MSEW computer software; MSEW versions 3.0 with update 14.94 or later, manufactured by ADAMA Engineering, Inc. See the NMDOT PER Systems document for geometry and properties for the five design cases, and for which cases are required based on the NMDOT category of the PER System being submitted.
- J. Experimental field and laboratory test data supporting the design methodology and the design parameters of the PER System.
- K. Design drawings and structural design calculations for all elements of the PER System.
- L. Documentation that PER System meets the Design and Construction Specifications listed in Section 3. For any design and construction exceptions taken by the PER System that do not meet the requirements of NMDOT Design and Construction Specifications listed in Section 3 of the NMDOT PER Systems document, provide a marked-up document, for informational purposes only, highlighting exceptions to the applicable NMDOT Design and/or Construction Specification.
- M. A complete list of limitations on the use of the PER System, such as: limiting differential settlement, limiting wall height, alignment turn angles or minimum radius, minimum face batter, abutment applications, etc.
- N. Details of typical frames and frame connections utilized to avoid obstructions.
- O. Detailed repair methods for partial or full replacement of precast concrete elements of the PER System.

The detailed information should be organized in the order shown and referenced to the given numbering system in Items G through O, above. The PER Systems Evaluation Report, Item G, should be organized in the order shown and referenced to the given numbering system in respective following lists for: gravity modular and large block; and MSE wall systems, respectively. Note that duplication of information is not needed or warranted. A simple statement referencing another section is adequate.

See the NMDOT PER Systems document for detailed information and guidance.

IDEA Protocols and Format

The NMDOT lists of Submittal Requirements for Approval, for two of the NMDOT 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 three 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 NMDOT wall type category, precast gravity and semi-gravity walls (NMDOT Category A), 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 NMDOT 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 NMDOT.

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

**Submittal Requirements for Approval of Category B
Gravity Modular Block and Large Block Retaining 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 NMDOT or other State Applications
 - 1.4 System Warranties
 - 1.5 Designated Responsible Parties
- 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 Backfill
 - 3.3 Leveling Pad
 - 3.4 Drainage Elements
 - 3.5 Coping
 - 3.6 Traffic Railing / Barrier
 - 3.7 Modular Blocks or Large Blocks 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 Modular Blocks and Large Blocks
 - 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

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 NMDOT or other State Applications

- Summarize the history of application of the system.
- Summarize the history of application of the system on NMDOT projects.
- Summarize design issues specific to NMDOT applications.
- Summarize construction issues specific to NMDOT applications.
- Provide a list of non-NMDOT 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 (if any)

1.5 Designated Responsible Parties

Summarize responsibilities for:

- System performance
- Material performance

- Project-specific design and construction details

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
- Inter-block connection (friction only excluded)
- 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 blocks
- Direct shear interactions at base of wall
- Foundation bearing resistance or strength parameters

2.2 Design Responsibility

- State designated responsible party for project-specific design.
- 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 NMDOT.

2.3 Summary of Design Procedures

- Summarize all deviations from the most current NMDOT 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 when and how agency external stability requirements (global stability, bearing resistance, sliding resistance, and limiting eccentricity) are incorporated.
- Summarize seismic design considerations.
- 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 inter-block stability against sliding and eccentricity.

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, referencing NMDOT Standard Specifications where applicable, 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

For Large Block - wet-cast, unreinforced masonry units:

- Standard dimensions and tolerances [C7: 1.1.4]
- Joint sizes and details
- Concrete strength (minimum) [C7: 1.1.2]
- Wet cast concrete % air (range) [C7: 1.1.2]
- Freeze thaw durability [C7: 1.1.2]
- Bearing pads (joints)
- Spacers (pins, etc.)
- Joint filter requirements: geotextile or graded granular
- Other facing materials

For Modular Block – dry-cast, unreinforced masonry units:

- Standard dimensions and tolerances
- Thickness at front face
- Joint sizes and details
- Concrete strength (minimum)
- Dry cast concrete density (minimum or range)
- Moisture absorption (percent and by weight)
- Salt scaling
- Freeze thaw durability
- Facing unit to facing unit shear resistance
- Bearing pads
- Spacers, pins, etc.
- Joint filler requirements: geotextile or graded granular
- Maximum recommended vertical joint opening
- 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]
- How incorporated
- 3.7 Modular Blocks or Large Blocks 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 Block units [C7: 4.1.1]
 - Large Block units
 - 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 Autodesk 2016 or later as required per NMDOT (see NMDOT PER Systems document):

- Leveling pad
- Block unit sizes and dimensions
- Erection details of blocks including temporary bracing, batter, joint spacing, etc.
- Interblock 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 Modular Blocks and Large Blocks

- Curing times
- Form removal
- Concrete surface finish requirements

5.2 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 (during construction)
- Specialized equipment requirements or methods

5.3 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
- 5.4 **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.
- 5.5 **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.
- 5.6 **Maintenance**
Provide a listing of maintenance requirements to maintain performance and repair damage. If available, provide a maintenance manual.

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 NMDOT or other State Applications
 - 1.4 System Warranties
 - 1.5 Designated Responsible Parties
- 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

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: 5.13]
 - 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 NMDOT or other State Applications

- Summarize the history of application of the system.
- Summarize the history of application of the system on NMDOT projects.
- Summarize design issues specific to NMDOT applications.
- Summarize construction issues specific to NMDOT applications.
- Provide a list of non-NMDOT 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
- 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)
- 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.
 - 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 NMDOT.
- 2.3 Summary of Design Procedures [C1 through C4: 2.1.2]
- 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 Large Block 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

For Modular Block – dry-cast, unreinforced masonry units

- Standard dimensions and tolerances [C1 & C2: 1.1.5]
- Thickness at front face
- Joint sizes and details
- Concrete strength (minimum) [C1 & C2: 1.1.7]
- Dry cast concrete density (minimum or range) [C1 & C2: 1.1.8]
- Moisture absorption (percent and by weight) [C1 & C2: 1.1.8]
- Salt scaling
- Freeze thaw durability
- Facing unit to facing unit shear resistance [C1 & C2: 1.1.10]
- Bearing pads [C1 & C2: 1.1.11]
- Spacers, pins, etc.
- Joint filler requirements: geotextile or graded granular
- Maximum recommended vertical joint opening
- Aesthetic choices (textures, relief, color, graffiti treatment) [C1 & C2: 1.1.13]
- Other facing materials

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: 1.26] [C2: 1.2.8] [C4: 1.2.15]
- Composition of devices, dimensions, tolerances [C1, C2 & C3: 1.2.5] [C4: 1.2.13]
- Full scale connection test method / results [C1 & C3: 1.26] [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: 1.15**] [**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 AutoCAD/CIVIL 3D 2013 as required per NMDOT (see NMDOT PER Systems document):

- 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.