Origination Form

Specifications

Name:	Rodrigo Herrera	**Standard Specification Section:**	548
Email:	rodrigo.herrera@dot.state.fl.us	**Special Provision:**	
Date:	2025-06-02T17:18:44Z	**Associated Specs:**	

Summary:

Clarification on how to address high water elevations and environmental testing for corrosivity.

Justification:

To provide clarification on how to address high water elevations and environmental testing for corrosivity.

Do the changes affect other types of specifications?

Neither

List Specifications Affected:

Other Affected Documents/Offices	Contacted	Yes/No
Other Standard Plans		No
Florida Design Manual		No
Structures Manual	Ben Goldsberry	Yes
Basis of Estimates Manual		No
Approved Product List		No
Construction Office		No
Maintenance Office		No
Materials Manual		No
Traffic Engineering Manual		No

Are changes in line with promoting and making progress on improving safety, enhancing mobility, inspiring innovation, and fostering talent; explain how?

Some of the proposed updates address requirements for specific backfill material within flood zones, having a direct impact on resiliency, and the ability to maintain access to critical infrastructure after significant storm events.

What financial impact does the change have; project costs, pay item structure, or consultant fees?

No major impact anticipated. The changes made to the Specification in combination with the updates made to the Structures Design Guidelines could results in some cost savings.

What impact does the change have on production or construction schedules?

No major change.

How does this change improve efficiency or quality?

The proposed updates provide clarification on how to address high ground water for Mechanically Stabilized Earth walls, which is an item of significant importance in our State.

Which FDOT offices does the change impact?

Construction

What is the impact to districts with this change?

None.

Does the change shift risk and to who?

No change.

Provide summary and resolution of any outstanding comments from the districts or industry.

Comments and Responses are available on the Track the Status of Revisions hyperlink located on the Specifications landing page: https://www.fdot.gov/programmanagement/Specs.shtm

What is the communication plan?

Through the established specification revision process (e.g., Internal and Industry Review)

What is the schedule for implementation?

The Standard Specifications eBook and Workbook are effective July 1st every year.

RETAINING WALL SYSTEMS
(REV 6-4-25)

SUBARTICLE 548-2.3 is deleted and the following substituted:

548-2.3 Backfill Reinforcement: For walls utilizing backfill reinforcement, use reinforcement consisting of steel wire mesh, metal strips or structural geosynthetics as required for the wall system chosen. Use backfill reinforcement of the same length from top to bottom of wall at any section. For tiered walls, use backfill reinforcement of the same length within the height of each tier at any section.

Use plain steel wire mesh and embedded loops shop fabricated from cold drawn steel wire and weld into the finished mesh fabric meeting the requirements of ASTM A1064. Use longitudinal and transverse wires of equal and constant diameter within a given piece of mesh reinforcement. Use steel strips hot rolled from bars to the required shape and dimensions with physical and mechanical properties meeting ASTM A572 Grade 65 or as shown in the Contract. Use shop-fabricated hot rolled steel tie straps meeting the minimum requirements of ASTM A1011/A1011 M, Grade 50, or as shown in the Contract.

Ensure that steel reinforcing strips, tie strips, reinforcing mesh and connectors used in permanent walls are galvanized in accordance with ASTM A123 or ASTM A153, as applicable. For typical applications, punch or drill holes in metal items before galvanizing. Field drilled holes for bin walls are permitted. Repair field drilled holes; field cut ends and other damage to galvanized surfaces in accordance with Section 562.

Use Type R-3 structural geosynthetics made of polypropylene, select high density polyethylene or high-tenacity polyester fibers having cross-sections sufficient to permit significant mechanical interlock with the backfill. Use geosynthetics having a high tensile modulus in relation to the backfill. Use geosynthetics having high resistance to deformation under sustained long term design load while in service and resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological or chemical degradation normally encountered in the material being reinforced. Do not use uncoated polyester (PET) reinforcements or reinforcements weakened or damaged by high pH environments within any portion of the flowable fill~~, or within coarse aggregate backfill~~ below the ~~design high~~flood elevation or other controlling water elevation ~~(DHW)~~ shown in the Plans.

Store the geosynthetics in conditions above 20ºF and not greater than 140ºF. Prevent mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geosynthetic material. Rolled geosynthetic may be laid flat or stood on end for storage. Cover the geosynthetic and protect from sunlight prior to placement in the wall system.

Carefully inspect all reinforcement, steel and geosynthetics to ensure they are the proper size and free from defects that may impair their strength and durability.

SUBARTICLE 548-2.5.4 is deleted and the following substituted:

548-2.5.4 Separation Geotextile: Provide a Type D-2(a) or D-3(a) separation geotextile meeting the requirements of Section 514 between the coarse aggregate and the select backfill/embankment at the bottom, top and sides of the coarse aggregate.

SUBARTICLE 548-2.6.1 is deleted and the following substituted:

548-2.6.1 General: Provide compacted select backfill or coarse aggregate backfill within the retaining wall volume as shown in the Plans. For permanent walls, provide coarse aggregate backfill ~~in lieu of compacted select backfill to an elevation at least one foot above the DHW shown in the Plans when the DHW is above the lowest adjacent ground surface.~~to the elevation shown in the Plans. Provide flowable fill within the retaining wall volume in lieu of compacted select backfill or coarse aggregate backfill only when the option for flowable fill is shown in the Plans. The retaining wall volume is defined to extend from the top of the leveling pad or footing, or bottom of walls which do not have footing or leveling pads, to the finish grade line and from the face of the wall to a vertical plane passing through the end of the extreme wall component (straps, counterforts, etc.) plus one foot.

SUBARTICLE 548-2.6.2 is deleted and the following substituted:

548-2.6.2 Compacted Select Backfill: Meet the requirements of Sections 105 and 120 except as noted within this Section. ~~Have the backfill material tested for every soil type for pH, resistivity, sulfate and chloride content by a Department approved independent testing laboratory prior to placement.~~ Have all backfill material tested for electro-chemical properties as specified in Table 548-1 and 548-2. All electro-chemical testing shall be performed by a Department approved qualified laboratory. Submit a certification, signed and sealed by a Professional Engineer registered in the State of Florida, that the results have met the requirements of this Section.

~~Use backfill material with a pH between 5.0 and 10.0 as determined by FM 5-550. For polyester geosynthetic reinforcement, use backfill material with a pH between 5.0 and 9.0. Sources of select backfill material having a pH low as 4.5 and 5.0 for walls utilizing metallic reinforcement and pH low as 3.0 for walls utilizing geosynthetic reinforcement, may be used provided the interior face of the MSE wall panels have three inches of concrete cover over the reinforcement, the concrete used in the panels contain either an highly reactive pozzolan or the ternary mix design meets the requirements of Table 346-2 with a surface resistivity equal or greater than 29 kOhm-cm and there are no steel piles and metallic elements/pipes other than metallic reinforcement placed within the backfill.~~

~~In addition, for permanent walls utilizing metallic soil reinforcement, use backfill that meets the following electro-chemical test criteria for determining corrosiveness:~~

~~Table 548-1~~ ~~Electro-Chemical Test Criteria~~	
~~Criteria~~	~~Criteria~~
~~Resistivity: > 3,000 ohm-cm~~	~~Resistivity: > 3,000 ohm-cm~~
~~Soluble chloride content < 100 PPM~~	~~Soluble chloride content < 100 PPM~~
~~Soluble sulfate content: < 200 PPM~~	~~Soluble sulfate content: < 200 PPM~~

Table 548-1 Electro-Chemical Requirements for Metallic Reinforcement	
Test Method	Criteria

FM 5-550	5 ≤ pH ≤ 10
	*4.5 ≤ pH ≤ 10
FM 5-551	Resistivity ≥ 3000 Ohm-cm
FM 5-552	Soluble Chlorides ≤ 100 PPM
FM 5-553	Soluble Sulfates ≤ 200 PPM
*Meet the following wall panel requirements: 1. Interior face of the MSE wall panels have three inches of concrete cover over the reinforcement 2. Concrete used in the panels contain either a highly reactive pozzolan or the ternary mix design meeting the requirements of Table 346-2 with a surface resistivity ≥ 29 kOhm-cm and there are no steel piles and metallic elements/pipes other than metallic reinforcement placed within the backfill.	

Table 548-2
Electro-Chemical Requirements for Geosynthetic Reinforcement

Test Method	Base Polymer	Criteria
FM 5-550	Polypropylene (PP) & High Density Polyethylene (HDPE)	5 ≤ pH ≤ 10
		*3 ≤ pH ≤ 10
	Polyester (PET)	5 ≤ pH ≤ 9
		*3 ≤ pH ≤ 9
*See Table 548-1 for wall panel requirements.		

For constructing the retaining wall volume, do not use backfill material containing more than 2.0% by weight of organic material, as determined by FM 1-T267 and by averaging the test results for three randomly selected samples from each stratum or stockpile of a particular material. If an individual test value of the three samples exceeds 3%, the stratum or stockpile will not be suitable for constructing the retaining wall volume.

Ensure that the material is non-plastic as determined by AASHTO T 90 and the liquid limit as determined by AASHTO T 89 is less than 15.

For walls using soil reinforcement, use backfill that meets the following gradation limits determined in accordance with AASHTO T 27 and FM 1-T011:

Table 548-~~2~~3
Gradation Limits

Sieve Size	Percent Passing
3-1/2 inches	100
3/4 inch	70-100
No. 4	30-100
No. 40	15-100
No. 100	0-65
No. 200	0-12

For walls not using soil reinforcement, use backfill that meets the following gradation limits determined in accordance with AASHTO T 27 and FM 1-T 011:

Table 548-~~3~~4 Gradation Limits Not Using Soil Reinforcement	
Sieve Size	Percent Passing
3-1/2 inches	100
No. 200	0-12

SUBARTICLE 548-2.6.4 is deleted and the following substituted:

548-2.6.4 Coarse Aggregate Backfill and Drainage Aggregate: Provide coarse aggregate comprised of natural stones meeting the requirements of Section 901 with a size distribution of any of the listed aggregate gradations from Size No 57 through Size No 89, inclusive, except as noted on the Plans. Have all coarse aggregate backfill materials tested for ~~pH, resistivity, sulfate and chloride content by a Department approved independent testing laboratory prior to placement~~electro-chemical properties as specified in Table 548-1 and 548-2 prior to placement, except replace FM 5-550 with ASTM D8262. All electro-chemical testing shall be performed by a Department qualified laboratory. Submit a certification, signed and sealed by a Professional Engineer registered in the State of Florida, that the results of these tests meet the requirements of 548-2.6.2.

For SBW systems, provide drainage aggregate comprised of coarse aggregate backfill and a drainage geotextile to separate the drainage aggregate from the reinforced backfill as specified for each approved wall system.

ARTICLE 548-3 is deleted and the following substituted:

548-3 Approved Product List (APL).

All proprietary retaining wall systems shall be listed on the APL. Manufacturers seeking evaluation of products for inclusion on the APL shall submit an application in accordance with Section 6, independently certified test reports, and calculations and drawings in accordance with the latest edition of the AASHTO LRFD Bridge Design Specifications and the Department's Structures Design Guidelines (SDG) signed and sealed by a Professional Engineer registered in the State of Florida. Submit calculations and drawings showing details, notes, materials, dimensions, sizes, and other information as described below for a complete description of the retaining wall system.

1. Soil reinforcement durability and/or corrosion data;
2. Differential settlement the wall system can tolerate without exceeding normal stress range of the soil reinforcement and wall facing, or the construction tolerances in this Section;
3. The effects of water flow;
4. Applicable environmental classifications as outlined in the SDG;
5. Signed and sealed design calculations. Design calculations may be either by hand or by a wall company program with hand calculations verifying the program output. It is only necessary to include sample hand calculations for a 20 foot height for each soil condition.
6. Corrosion and durability design procedures for soil reinforcement elements;
7. Provide 11 inch x17 inch drawings showing:

a. Notes specific to the wall system;
b. Panel sizes and reinforcing;
c. Soil reinforcement connection to wall facings;
d. Wall panel abutment interfacing;
e. Slip joints;
f. Steps in leveling pad;
g. Soil reinforcing details around all vertical obstructions;
h. Geotextile placement at panel joints and around all obstructions;
i. Details for skewing soil reinforcement (15 degrees maximum) without cutting;
j. Corner elements (required at all angle breaks greater than 5 degrees);
k. Bin wall details for acute corners (required at all acute corners where interior corner angle is less than 70 degrees);
l. Details showing how to accommodate long term (post construction) wall settlement in excess of four inches without attaching soil reinforcement to the abutment; and,
m. Details of how to ground the wall system.

8. Pull-out test data for the proposed wall/reinforcement connection, and size and type of soil reinforcement for the wall system. Testing shall be done by an independent soil testing laboratory or testing agency certified by the Department. Ensure test data includes all sizes and types of soil reinforcement to be utilized on Department projects. Default AASHTO values may be used for conventional soil reinforcement. For soil reinforcement grids, include all various configurations and combinations of longitudinal and transverse wires.

9. Other information pertinent to the design and performance of the wall system as necessary.

10. A field construction manual describing construction requirements and sequencing for the wall system. Submit manual in 8-1/2 inch x 11 inch format in either pdf or MS Word format.

SUBARTICLE 548-9.4 is deleted and the following substituted:

548-9.4 Acceptance Criteria: For select backfill, obtain a minimum density of 90% of the maximum dry density as determined by FM 1-T180 within ~~three~~ 3 feet behind the wall face zone and obtain a minimum density of 95% of the maximum dry density as determined by FM 1-T180 from beyond three feet behind the wall face zone.

For flowable fill, meet the requirements of 121-6. For coarse aggregate backfill, compact with a minimum of three passes of a vibratory compactor weighing between 600 and 1,000 pounds or two passes of a vibratory compactor weighing over 1,000 pounds. Use the highest vibration level that does not cause excessive fracture of the aggregate in the opinion of the Engineer. Continue compaction until there is no additional movement.

548-9.4.1 Optional Acceptance Criteria for A-3 and A-2-4 Materials: Obtain a minimum density of 95% of the maximum dry density as determined by FM 1-T099 within 3- feet behind the wall face zone and obtain a minimum density of 100% of the maximum dry density as determined by FM 1-T099 beyond 3- feet behind the wall face zone.

The combined width from both MSE wall backfill (excluding the 3-foot zone from the panels) and embankment material may be considered the same LOT if the same material is used; the material in both wall backfill and embankment is compacted with the same

procedure, equipment and compacting effort; and the maximum lift thickness after compaction in both wall backfill and embankment is 6- inches.

548-9.4.2 Acceptance Criteria for Wall Backfill Supporting Spread Footings: When spread footings at bridge abutments are shown in the Plans, obtain a minimum of 95% of the maximum dry density as determined by FM 1-T180 on the material within 3 feet behind the wall face, and underneath the footing as defined by the following limits:

1. All lifts below the bottom of the footing for a depth equal to at least the footing width
2. A minimum distance of 3 feet beyond the edges of the footing width

If the optional criteria specified in 548-9.4.1 is used, compact the backfill material within the limits specified above to obtain a minimum density of 100% of the maximum dry density as determined by FM 1-T099. Compact the remainder of the backfill in accordance with 548-9.4 or 548-9.4.1 as applicable. Do not use compaction equipment larger than permitted in 548-8.5 within 3 feet behind the wall face; decrease the lift thickness if necessary.

SUBARTICLE 548-9.6 is deleted and the following substituted:

548-9.6 Frequency: Conduct sampling and testing at a minimum frequency listed in the table below. The Engineer will perform verification sampling and tests at a minimum frequency listed in Table 548-45 below.

Table 548-45
Minimum Frequency Testing

Test Name	Quality Control (QC)	Verification
Maximum Density	One per soil type	One per soil type
Density	One per LOT	One per four LOTs for each ~~type of QC test~~wall zone
Gradation	One per Maximum Density	One per Maximum Density
LL&PI	One per Maximum Density	One per Maximum Density
Soil Classification	One per Maximum Density	One per Maximum Density
Organic Content	One per soil type	One per soil type
pH	One per soil type	One per soil type
Direct Shear	Three per soil type when required by 548-9.5	One per soil type

In addition, for permanent walls utilizing metallic soil reinforcement, test for corrosiveness at a minimum frequency of one test per soil type at point of placement according to the electro-chemical table in 548-2.6. The Engineer will collect enough material to split and create two separate samples and retain one for resolution at point of placement until LOTs represented by the samples are accepted. The Engineer will perform verification tests for corrosiveness at a minimum frequency of one test per soil type.

SUBARTICLE 548-9.7.6 is deleted and the following substituted:

548-9.7.6 Corrosiveness: The Engineer will verify the QC results if the verification result satisfies the electro-chemical and pH test criteria set forth in 548-2.6. Otherwise, the Engineer will test the sample retained in 548-9.7.1. The SMO or an AASHTO accredited laboratory designated by the SMO will perform resolution testing. The material will be sampled and tested in accordance with FM 5-550, FM 5-551, FM 5-552 and FM 5-553. For coarse aggregate backfill, the material will be sampled and tested in accordance with ASTM D8262 in lieu of FM 5-550 for pH.

If the resolution test result satisfies the required criteria, material of that soil type will be verified and accepted. If the resolution test results do not meet the required criteria, reject the material and reconstruct with acceptable material.