



Florida Department of Transportation

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JARED W. PERDUE, P.E.
SECRETARY

November 1, 2023

Khoa Nguyen
Director, Office of Technical Services
Federal Highway Administration
3500 Financial Plaza, Suite 400
Tallahassee, Florida 32312

Re: State Specifications Office
Section: 548
Proposed Specification: **5480206 Retaining Wall Systems.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Dino Jameson to clarify pH requirements and add missing language for averaging thick lift test wall to obtain target compaction for the thick lift.

Please review and transmit your comments, if any, within two weeks (10 business days). Comments should be sent via email daniel.strickland@dot.state.fl.us.

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on File

Daniel Strickland, P.E.
State Specifications Engineer

DS/dh

Attachment

cc: Florida Transportation Builders' Assoc.
State Construction Engineer

RETAINING WALL SYSTEMS.**(REV 10-31-23)**

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. 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, shall not be lower than 5.0 and not higher than 9.0, when metallic elements or pipes are placed within the backfill. Sources of select backfill material having a pH between low as 4.5 and 5.0 for walls utilizing metallic reinforcement and between pH low as 3.0 and 5.0 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, and the concrete used in the panels contains 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.~~the following ingredients and proportions:~~

- ~~1. The quantity of cement replaced with Type F fly ash is 10% to 20% by weight.~~
- ~~2. The quantity of cement replaced with slag is 50% to 60% by weight.~~
- ~~3. Portland cement is 30% by weight of total cementitious material.~~
- ~~4. The total weight of the Type F fly ash and slag does not exceed 70% of total cementitious material.~~

~~In lieu of the mix design described above, a mix design with a highly reactive pozzolan meeting the requirements of 346-2.3 can be substituted. Examples of mix designs meeting this requirement are:~~

- ~~1. 8% silica fume plus 20% fly ash~~
- ~~2. 10% metakaolin plus 20% fly ash.~~

~~Provide proper curing for these materials to prevent surface cracking.~~

~~Do not place metallic pipe in backfill materials having a pH less than 5.0.~~

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	Test Method
Resistivity: > 3000 ohm ·cm	FM 5-551
Soluble sulfate content: < 200 PPM	FM 5-553
Soluble chloride content < 100 PPM	FM 5-552
<u>Soluble sulfate content: < 200 PPM</u>	<u>FM 5-553</u>

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

SUBARTICLE 548-8.5.2 is deleted and the following substituted:

548-8.5.2 Thick Lift Option for Compacted Select Backfill: If through field tests, the Contractor can demonstrate that the compaction equipment can achieve density for the full depth of a thicker lift, the backfill may be constructed in successive courses of not more than 10 inches compacted thickness.

Based on the results of a full-height test wall constructed by each Contractor or MSE wall sub-contractor, the Engineer will approve each Contractor's or MSE

wall sub-contractor's specified compaction procedures. The length of the test wall shall be the length required to produce one LOT of 500 feet at the top of the wall. When all individual walls using this option are less than 500-feet long, the test wall may be broken into two segments comprising separate LOTs. Both segments must be accepted to determine the required percent compaction for the remaining walls. For each Contractor or MSE wall sub-contractor, the height of the test wall shall be 20 feet or the highest wall using this option, whichever is less. Lower height walls may be constructed using these procedures until a full height test wall is constructed. Notify the Engineer prior to beginning construction of a test wall.

Perform one set of QC density tests per thick lift of the test wall on the backfill within three feet behind the wall face and one set of QC density tests per thick lift of the test wall on the backfill placed beyond three feet behind the wall face, at random locations within each LOT. At each QC density test, the set will include testing the entire lift thickness and a dig down test of the bottom 6 inches. Excavate materials as needed to allow testing of the bottom 6 inches, at no ~~cost~~~~expense~~ to the Department. Maintain the exposed surface as close to undisturbed as possible; no further compaction will be permitted during the test preparation. The Department will perform verification testing of density for the bottom 6 inches and the entire lift thickness at the frequency indicated in 548-9.6. All QC tests and a Department Verification test must meet the density required by 548-9.4.

Identify the test wall with the required percent compaction effort and thickness in the Earthwork Records System (ERS) portion of the Department's database. For the material within three feet behind the wall face, the minimum density required on the thick lift will be the average of all the passing QC results obtained on the thick lifts of the test wall within the three feet behind the wall face. For the material placed beyond three feet behind the wall face, the minimum density required will be the average of all the passing QC results obtained on the thick lifts of the test wall beyond three feet behind the wall face. If the thick lift density does not meet or exceed the thick lift density results during the test wall, perform dig-down density tests to verify the density of the bottom 6 inches of the lift. The Contractor may elect to place material in 6 inches compacted thickness at any time. Once approved, a change in the source of backfill material will require the construction of a new test wall. Do not change the compaction effort once the test wall is approved. The Engineer will periodically verify the density of the bottom 6 inches during thick lift operations. If unable to achieve the required density, remove and replace or repair the test wall to comply with the specifications at no additional expense to the Department. The Engineer may terminate the use of thick lift construction and instruct the Contractor to revert to the 6 inches maximum lift thickness if the Contractor fails to achieve satisfactory results or meet the requirements of this Section.

SUBARTICLE 548-9.3 is deleted and the following substituted:

548-9.3 Density Testing Requirements: Meet the requirements of 120-10.1.4.2 except as modified herein. ~~Ensure compliance with the requirements of nuclear density testing in accordance with FM 1-T238. Determine the in-place moisture content for each density test. Use FM 1-T238, FM 5-507 (Determination of Moisture Content by Means of a Calcium Carbide Gas Pressure Moisture Tester), or FM 5-535 (Laboratory Determination of Moisture Content of Granular Soils by Use of a Microwave Oven) for moisture determination.~~

————— Perform these tests at a minimum frequency of one set of tests per LOT.

Determine test locations including stations and offsets, using the random number generator provided by the Engineer. Do not use notepads or worksheets to record data for later transfer to the ERS section of the Department's database. Notify the Engineer upon successful completion of QC testing on each LOT.

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 548-4 below.

Table 548-4 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
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
<i>*Verification testing for pH will be performed on samples taken at the point of placement.</i>		

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.

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