



# Florida Department of Transportation

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SECRETARY

January 13, 2009

Monica Gourdine  
Program Operations Engineer  
Federal Highway Administration  
545 John Knox Road, Suite 200  
Tallahassee, Florida 32303

Re: Office of Design, Specifications  
Section 160  
Proposed Specification: 1600000, Stabilizing

Dear Ms. Gourdine:

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

These changes were proposed by Tom Malerk of the State Materials Office to delete legacy specifications, eliminating Materials Bulletins and clarifying other issues..

Please review and transmit your comments, if any, within four weeks. Comments should be sent via Email to ST986RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4110.

Sincerely,

Rudy Powell, Jr., P.E.  
State Specifications Engineer

RP/dr

Attachment

cc: Gregory Jones, Chief Civil Litigation  
Florida Transportation Builders' Assoc.  
State Construction Engineer

**STABILIZING.****(REV ~~11-20-08~~ 1-12-09)**

SECTION 160 (of the Supplemental Specifications) is deleted and the following substituted:

**SECTION 160  
STABILIZING**

**160-1 Description.**

Stabilize designated portions of the roadbed to provide a firm and unyielding subgrade, having the required bearing value specified in the plans. ~~When specified in the plans, provide additional strengthening of the subbase by additional stabilizing of the upper portion of the previously stabilized subgrade, within the limits specified. Perform work in accordance with an approved Quality Control Plan meeting the requirements of 6-8~~ *Section 105.*

**160-2 Stabilized Subgrade. *Materials***

~~———— For stabilized subgrade, choose the type of material, *local, commercial, or existing base.* Commercial or Local.~~

~~———— Determine compliance with the bearing value requirements by testing in accordance with FM 5-515. Take responsibility for making the finished roadbed section meet the bearing value requirements, regardless of the quantity of stabilizing materials necessary to be added. The Department will make full payment for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high bearing materials from other sources within the limits of the stabilizing.~~

~~———— After substantially completing the roadbed grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Notify the Engineer of the approximate quantity to be added. Obtain the Engineer's approval for spreading and mixing in of such quantity of materials to achieve uniformity and effectiveness.~~

~~———— The Engineer may allow, at no additional cost to the Department, the substitution of 6 inches of Granular Subbase meeting the requirements of 290-2 & 290-3, when 12 inches of Type B Stabilization requiring an LBR value of 40 is specified.~~

**160-3 Stabilized Subbase.**

~~———— When Stabilized Subbase is required, after the mixing operations for the stabilization of the entire subgrade limits, strengthen the upper portion of the subgrade, within the limits shown, by adding and mixing in a loose depth of commercial stabilizing material as designated in the plans or as may be otherwise designated by the Engineer. Provide a minimum depth of spread 3 inches (loose measurement).~~

**160-4 ~~3~~ Materials.**

~~————~~ **160-4.1 Commercial and Local Materials:** Meet the requirements of Section 914 for the particular type of stabilizing material to be used.

~~—————~~ **160-4.22 Use of Materials from Existing Base:** When the use of materials from an existing base is required as all, or a portion, of the stabilizing additives, the Engineer will direct the location, placement, and distribution of such materials. Perform this work prior to the spreading of any additional commercial or local materials. Do not remove any section of existing base until the need for it in maintaining traffic is fulfilled.

~~—————~~ The Engineer may direct the Contractor to use materials from an existing base.

**160-32.1 Commercial- Material and Local Materials:** *-Meet the requirements of Section 914.*

~~—————~~ **160-32.232.1 Local Material:** *-Meet the requirements of Section 914. Test the material from each source, or if authorized by the Engineer, test blended materials. to ensure the requirements of Section 914 are met.. If the Engineer authorizes the use of blended materials test the blended material to ensure compliance with Section 914. -Submit test results to the Engineer at least 14 days prior to the stabilization operation.*

**160-2.3 Existing Base:** *When the material from an existing base is used as all, or a portion, of the stabilizing additives, no further testing is required unless directed by the Engineer.*

**160-2.4 Granular Subbase:** *The Engineer may allow, at no additional cost to the Department, the substitution of 6 inches of Granular Subbase meeting the requirements of 290-2 and 290-3, when 12 inches of Stabilization requiring an Limerock Bearing Ratio (LBR) value of 40 is specified.*

### **160-5-3 Construction Methods.**

**160-53.1 General:** Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.

~~The Contractor may process the subgrade to be stabilized in one course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction, and other desired results, in which case, the Engineer will direct that the processing be done in more than one course.~~

~~—————~~ Construct mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems meeting the requirements of 120-8.1, except replace “Embankment” with “Subgrade”.

Construct shoulder-only areas, sidewalk, and bike/shared use path areas meeting the requirements of 120-8.1 except replace “Embankment” with “Subgrade” and meet the acceptance criteria of 160-47.2.

Isolated mixing operations will be considered as separate LOTS. Curbs and shoulders compacted separately shall be considered separate LOTS. Isolated compaction operations will be considered as separate LOTS. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

**160-53.2 Application of Stabilizing Material:** *After substantially completing the roadbed grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Notify the Engineer of the approximate quantity to be added before spreading. ~~Spread any additive stabilizing materials uniformly over the area to be stabilized~~ When additive stabilizing materials are required, spread the designated quantity *material* uniformly over the area to be stabilized.*

~~When materials from an existing base are to be used in the stabilizing at a particular location, place and spread all of such materials prior to the addition of other stabilizing additives.~~

~~Spread commercial stabilizing material by the use of mechanical material spreaders, except that where use of such equipment is not practicable, use other means of spreading, but only upon written approval of the proposed alternate method.~~

**160-43.2.1 Sampling and Testing of Local Material:** *Randomly select locations for sampling using a random number generator approved by the Engineer and test at the minimum frequency listed in the table below before mixing. ~~Sample and test at the minimum frequency listed in the table below before mixing. Randomly select locations including station and offset using a random number generator approved by the engineer. The Engineer will reject the material for failing QC test results. The Engineer will sample for Verification and Resolution testing at the minimum frequency listed in the table below. The Engineer will perform Verification tests~~ ~~sampling and testing at a~~ ~~the~~ ~~minimum frequency listed in the table below.~~*

Test Name	Quality Control	Verification	<i>Resolution</i>
<i>Liquid Limit (LL), Plastic Index (PI), and Organics Content</i>	One per two LOTs	One per eight LOTs	<i>One per eight LOTs</i>

**160-43.2.1.1 Verification Comparison Criteria and Resolution Procedures:** *Reject the material for failing QC tests. If the QC and the Department's Verification tests meet the requirements of Section 914 then the Engineer will accept the corresponding LOTs. ~~material. Otherwise, the Engineer will submit the Resolution sample to take one additional sample. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will to perform Resolution testing.~~*

*If the Resolution Test results meet the requirements of Section 914 then the Engineer will accept the LOTs in question. ~~material. Otherwise remove the material and apply reject the material and apply new material meeting the requirements of Section 914 and retest in accordance with 160-3.2.~~*

**160-543.3 Mixing:** Perform mixing using rotary tillers, *a plant*, or other equipment meeting the approval of the Engineer. *The subgrade may be mixed in one course if the equipment and method of construction provides the uniformity, particle size limitation, compaction and other desired results of 160-4. The Contractor may mix the*

~~materials in a plant of an approved type suitable for this work.~~ Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.

Perform the mixing operations, as specified, (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

**160-543.4 Maximum Particle Size of Mixed Materials:** At the completion of the mixing, ensure that the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3 1/2 inch sieve and that the material does not have a plasticity index greater than eight or liquid limit greater than 30. Remove any materials not meeting the plasticity requirements from the stabilized area. ~~The Contractor may break~~ *Break* down or remove from the stabilized area materials, including clay lumps or lumps made of clay-size particles (any particle size 2 microns or less), not meeting the gradation requirements.

*160-3.5 Bearing Value: -Meet the bearing value requirements for the subgrade in accordance with 160-4.*

~~160-543.5-6 Compaction: Except where a stabilized subbase is also to be constructed (as specified in 160-6), a~~ After completing the mixing operations and satisfying the requirements for bearing value, uniformity, and particle size. Compact the materials at a moisture content permitting the specified compaction in 160-754.2.3. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

**160-543.6-7 Finish Grading:** Shape the completed stabilized subgrade to conform with the finished lines, grades, and cross-section indicated in the plans. Check the subgrade using elevation stakes or other means approved by the Engineer.

**160-543.7-8 Requirements for Condition of Completed Subgrade:** After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the plans.

Remove all soft and yielding material, and any other portions of the subgrade which will not compact readily, and replace it with suitable material so that the whole subgrade is brought to line and grade, with proper allowance for subsequent compaction.

**160-543.8-9 Maintenance of Completed Subgrade:** After completing the subgrade as specified above, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, tools, etc. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs, replacement, etc., of curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the Department. Construct and maintain ditches and drains along the completed subgrade section.

**160-6 Stabilized Subbase (Additional Strengthening of Upper Portion).**

When a stabilized subbase is to be constructed in conjunction with the stabilization operations, after the mixing of the stabilization area as specified in 160-5.3, and determination that the bearing value requirements specified in 160-7.2.1 have been met, shape the area over which the stabilized subbase is to be constructed as provided in 160-5.1, and compact it sufficiently to provide a firm surface for the operations to follow. Spread the amount of commercial stabilizing material specified in 160-3 for this operation, in accordance with 160-5.2, and mix it to the depth indicated in the plans, in accordance with 160-5.3. Allow a tolerance of 1 inch in excess of the plan depth in this mixing. The Engineer will not perform any additional tests for bearing value after the mixing of materials for the Stabilized Subbase.

Compact and finish grading, as specified in 160-5.5 and 160-5.6, and meet the provisions of 160-5.4, 160-5.7, and 160-5.8 for this work.

When commercial materials are used as the stabilizing additives for the initial subgrade stabilization, the Engineer may eliminate the work of Stabilized Subbase, either entirely or in designated sections of the overall limits for this work as may be specified in the plans.

**160-7-54 Acceptance Program.**

**160-754.1 General Requirements:** Meet the requirements of 120-10, except use 160-74.2 instead of 120-10.2, 160-74.3 instead of 120-10.3, and 160-74.4 instead of 120-10.4.

**160-754.2 Acceptance Criteria:****160-754.2.1 Bearing Value Requirements:**

**160-754.2.1.1 General:** Within the entire limits of the width and depth of the areas to be stabilized, obtain the required minimum bearing value for each LOT. For any area where the bearing value obtained is deficient from the value indicated in the plans, in excess of the tolerances established herein, spread and mix additional stabilizing material in accordance with 160-5160-43.3. Perform this reprocessing for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

Determine the quantity of additional stabilizing material to be used in reprocessing.

**160-754.2.1.2 Under-tolerances in Bearing Value**

**Requirements:** *The following under-tolerances are allowed for the following specified required Bearing Values:* Use the following undertolerances from the specified bearing value, as based on tests performed on samples obtained after completing mixing operations:

Specified Bearing Value	‡Under-tolerance
LBR 40	5.0
LBR 35	4.0
LBR 30 (and under)	2.5

The following unsoaked bearing value requirement is based on tests performed on samples obtained after completing mixing operations:

Specified Bearing Value	Unsoaked Bearing Value Required	<i>Under-Tolerance</i>
LBR 40	LBR 43	0.0

**160-754.2.2 Mixing Depth Requirements:** Do not exceed individual plan depth thickness by more than 2 inches or exceed LOT-average depth thickness by more than 1 inch measured to the nearest 0.25 inch. No undertolerance of mixing depth is allowed.

As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may waive the mixing operations (and the work of stabilizing), and the Department will not pay for stabilization for such sections of the roadway.

**160-754.2.3 Density Requirements:**

**160-754.2.3.1 General:** Within the entire limits of the width and depth of the areas to be stabilized, other than as provided in 160-754.2.3.2, obtain a minimum density at any location of 98% of the Modified Proctor maximum density as determined by FM 1-T 180, Method D.

**160-745.2.3.2 Exceptions to Density Requirements:** The Contractor need not obtain the minimum density specified in 160-74.2.3.1 if within the following limits:

(a) The width and depth of areas which are to be subsequently incorporated into a base course under the same contract.

(b) The upper 6 inches of areas to be grassed under the same contract. Compact these areas to a reasonably firm condition as directed by the Engineer.

**160-754.2.4 Frequency:** Conduct QC 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 the table below.

Test Name	Quality Control	Verification	Verification for Shoulder-Only, Bike/Shared Use Path and Sidewalk Construction
Modified Proctor Maximum Density	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs
Density	One per LOT	One per four LOTs	One per two LOTs
Stabilizing Mixing Depth	Three per 500 feet	Witness <i>one per LOT</i>	Witness <i>one per LOT</i>
<del>LBR</del> Limerock Bearing Ratio	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs
<i>Gradation, LL/PI &amp; Soil Classification (Local materials)</i>	<i>Not Required</i>	<i>One per eight consecutive LOTs</i>	<i>One per four LOTs</i>

### **160-745.3 Additional Requirements:**

#### **160-745.3.1 Quality Control Testing:**

**160-745.3.1.1 Bearing Values:** Test the Stabilized Subgrade sample collected in 160-754.3.1.3. Determine the Limerock Bearing Ratio (LBR) in accordance with FM 5-515 and 160-754.2.4.

*160-54.3.1.1.1 Unsoaked LBR: If Unsoaked LBR is desired, submit request for approval to the Engineer. -Upon approval by the Engineer to consider the use of Unsoaked LBR, randomly sample and test from three locations in the initial Lot for both Soaked and Unsoaked LBR in accordance with FM 5-515. -Ensure all of the tests demonstrate the material achieves the LBR values in 160-4.2.1.2. -Continue testing Unsoaked LBR at the frequency shown in 160-4.2.4. -Discontinue Unsoaked LBR testing if any unsatisfactory QC LBR test result is obtained or resolution determines an unsatisfactory LBR.*

**160-754.3.1.2 Mixing Depths:** Meet required plan mixing-depths by measuring from the proposed Final Grade Line. Determine test locations, including Stations and Offsets, using the Random Number generator approved by the Department. Notify the Engineer a minimum of 24 hours before checking mixing depths. Record results on forms supplied by the Department.

#### **160-754.3.1.3 Modified Proctor Maximum Density**

**Requirement:** Collect enough material to split and create three separate samples. Determine test locations, including Stations and Offsets, using the Random Number generator approved by the Department for the two LOTs under consideration. Retain the Verification and Resolution samples for the Department until the Engineer accepts the LOTs represented by the samples.

#### **160-754.3.2 Department Verification Tests:**

**160-754.3.2.1 Bearing Value & Soil Classification:** The Engineer will sample and test the Stabilized Subgrade for determination of the LBR in accordance with FM 5-515. *-If the Engineer has approved consideration of the Unsoaked LBR, sample and test the initial LOT for one soaked and one unsoaked LBR in addition to the frequency shown in 160-54.2.4.*

*If Local Material is used for stabilizing, the Engineer will determine compliance with embankment utilization requirements by testing and classifying the Stabilized Subgrade in accordance with AASHTO T88 and AASHTO M 145 at the frequency shown in 160-4.2.4.*

The Engineer will select test locations, including Stations and Offsets, using a Random Number generator, based on the LOTs under consideration.

**160-754.3.2.2 Mixing Depth:** The Engineer will witness the Contractor's mixing depth checks to ensure compliance with 160-754.2.2. The Engineer will select test locations, including Stations and Offsets, using a Random Number generator.

**160-754.3.2.3 Modified Proctor Maximum Density:** The Engineer will randomly select one of the retained split samples and test in accordance with FM 1-T 180, Method D.

**160-754.4 Verification Comparison Criteria and Resolution Procedures:**

**160-754.4.1 Bearing Value & Soil Classification:** If the Department's Verification test meets the requirements of 160-754.2.1 *and embankment utilization requirements*, then the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will collect *an additional sample in the same LOT the the Resolution split sample corresponding to the Verification sample tested was obtained*. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing *on the additional sample*. The material will be sampled and tested in accordance with FM 5-515. *If Local Material is used for stabilization, the sample will be tested in accordance with AASHTO T88, and AASHTO M 145.*

If the Resolution Testing results meet the requirements of 160-754.2.1 *and embankment utilization requirements* then the Engineer will accept the LOTs in question. Otherwise reprocess the corresponding LOTs in accordance with ~~160-5~~ *160-43* and retest in accordance with 160-754.3.1.1.

**160-754.4.2 Mixing Depth Thickness:** The Department will witness the mixing depth checks.

1. If the depth checks meet the requirements of 160-754.2.2 the Engineer will accept that 500-foot section.
2. If the depth checks confirm shallow depth, re-mix the 500-foot section to an appropriate Depth and re-measure in accordance with 160-754.3.1.2. The Engineer will repeat the witness process.
3. If the depth checks confirm extra deep mixing, conduct an additional QC density test after compaction for the bottom 12 inches of the subgrade for that 500-foot section in addition to a QC density test for the top 12 inches. The additional Density test must meet the requirements of 160-754.2.3.

**160-754.4.3 Modified Proctor Maximum Density Determination:** The Engineer will compare the Verification test results of 160-754.3.2.3 to the corresponding Quality Control test results. If the test result is within 4.5 lb/ft<sup>3</sup> of the QC test result, the LOTs will be verified. Otherwise, the Engineer will collect the Resolution split sample corresponding to the Verification sample tested. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform

Resolution testing. The material will be sampled and tested in accordance with FM 1-T 180, Method D.

The Engineer will compare the Resolution Test results with the Quality Control test results. If the Resolution Test result is within 4.5 lb/ft<sup>3</sup> of the corresponding Quality Control test result, the Engineer will use the Quality Control test results for material acceptance purposes for each corresponding pair of LOTs. If the Resolution test result is not within 4.5 lb/ft<sup>3</sup> of the corresponding Quality Control test, the Engineer will collect the remaining Verification split samples for testing. Verification Test results will be used for material acceptance purposes for the LOTs in question.

**160-754.4.4 Density:** When a Verification or Independent Verification density test does not meet 160-754.2.3 (Acceptance Criteria), retest at a site within a 5 feet radius of the Verification test location and observe the following:

1. If the Quality Control retest meets the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will accept the LOTs in question.

2. If the Quality Control retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, rework and retest the material in that LOT. The Engineer will re-verify the LOTs in question.

3. If the Quality Control retest and the Verification or Independent Verification test do not compare favorably, complete a new equipment-comparison analysis as defined in 120-10.1.2. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

#### **160-8-65 Method of Measurement.**

~~————~~ **160-85.1 Type B Stabilization:** The quantity to be paid for will be the plan quantity, in square yards, completed and accepted.

~~————~~ **160-8.2 Stabilized Subbase:** The quantity to be paid for will be the area, in square yards, completed and accepted.

~~————~~ **160-8.3 Commercial Stabilizing Material:** The quantity to be paid for separately will be determined by measurement, loose volumes, in truck bodies, at the point of unloading.

#### **160-9-76 Basis of Payment.**

~~————~~ **160-96.1 Type B Stabilization:** Price and payment will constitute full compensation for all work *and materials* specified in this Section ~~applicable to these types of stabilization, including furnishing, and spreading~~ *furnishing, spreading and mixing* of all stabilizing material required and any reprocessing of stabilization areas necessary to attain the specified bearing value. *-The Department will make full payment for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources within the limits of the stabilizing.*

~~—————~~ *If the item of Borrow Excavation is included in the Contract, any stabilizing materials obtained from designated borrow areas will be included in the pay quantity for Borrow Excavation.*

~~—————~~ **160-9.2 Stabilized Subbase:** Price and payment will constitute full compensation for the work of incorporating the additional commercial stabilizing material into the designated subbase area.

~~—————~~ **160-9.3 Commercial Stabilizing Material:** Price and payment will be full compensation for furnishing and spreading commercial stabilizing material.

~~—————~~ No separate payment will be made for any commercial stabilizing material which the Contractor may elect to use in Type B Stabilization.

~~—————~~ No separate payment will be made for the work of using materials from an existing base, in the stabilizing section.

~~160-9.47.2 General:~~ The above prices and payments will constitute full compensation for all work and materials specified in this Section, specifically including all costs of the processing and incorporation of existing base materials into the proposed stabilization area when such work is required by the plans.

~~If the item of Borrow Excavation is included in the Contract, any stabilizing materials obtained from designated borrow areas will be included in the pay quantity for Borrow Excavation.~~

~~160-9.5~~ **76.3 Payment Items:** Payment will be made under:

~~Item No. 160- 3~~ Commercial Stabilizing Material per cubic yard.

~~Item No. 160- 44-~~ Type B Stabilization - per square yard.

~~Item No. 160- 6~~ Stabilized Subbase per square yard.

**STABILIZING.****(REV 1-12-09)**

SECTION 160 (of the Supplemental Specifications) is deleted and the following substituted:

**SECTION 160  
STABILIZING****160-1 Description.**

Stabilize designated portions of the roadbed to provide a firm and unyielding subgrade, having the required bearing value specified in the plans. Perform work in accordance with an approved Quality Control Plan meeting the requirements of Section 105.

**160-2. Materials**

**160-2.1 Commercial Material:** Meet the requirements of Section 914.

**160-2.2 Local Material:** Meet the requirements of Section 914. Test material from each source, or if authorized by the Engineer, test blended materials. Submit test results to the Engineer at least 14 days prior to the stabilization operation.

**160-2.3 Existing Base:** When the material from an existing base is used as all, or a portion, of the stabilizing additives, no further testing is required unless directed by the Engineer.

**160-2.4 Granular Subbase:** The Engineer may allow, at no additional cost to the Department, the substitution of 6 inches of Granular Subbase meeting the requirements of 290-2 and 290-3, when 12 inches of Stabilization requiring a Limerock Bearing Ratio (LBR) value of 40 is specified.

**160-3 Construction Methods.**

**160-3.1 General:** Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.

Construct mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems meeting the requirements of 120-8.1, except replace "Embankment" with "Subgrade".

Construct shoulder-only areas, sidewalk, and bike/shared use path areas meeting the requirements of 120-8.1 except replace "Embankment" with "Subgrade" and meet the acceptance criteria of 160-4.2.

Isolated mixing operations will be considered as separate LOTS. Curbs and shoulders compacted separately shall be considered separate LOTS. Isolated compaction operations will be considered as separate LOTS. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

**160-3.2 Application of Stabilizing Material:** After substantially completing the roadbed grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Notify the Engineer of the approximate quantity to be added before spreading. When additive stabilizing materials are required, spread the material uniformly over the area to be stabilized.

**160-3.2.1 Sampling and Testing of Local Material:** Randomly select locations for sampling using a random number generator approved by the Engineer and test at the minimum frequency listed in the table below before mixing. The Engineer will reject the material for failing QC test results. The Engineer will sample for Verification and Resolution testing at the minimum frequency listed in the table below. The Engineer will perform Verification tests at the minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Resolution
Liquid Limit (LL), Plastic Index (PI), and Organic Content	One per two LOTs	One per eight LOTs	One per eight LOTs

#### **160-3.2.1.1 Verification Comparison Criteria and Resolution**

**Procedures:** If the QC and the Department's Verification tests meet the requirements of Section 914 then the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will submit the Resolution sample to the State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office to perform Resolution testing.

If the Resolution Test results meet the requirements of Section 914 then the Engineer will accept the LOTs in question. Otherwise remove the material and apply new material meeting the requirements of Section 914 and retest in accordance with 160-3.2.

**160-3.3 Mixing:** Perform mixing using rotary tillers, a plant or other equipment meeting the approval of the Engineer. The subgrade may be mixed in one course if the equipment and method of construction provides the uniformity, particle size limitation, compaction and other desired results of 160-4. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.

Perform the mixing operations, as specified, (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

**160-3.4 Maximum Particle Size of Mixed Materials:** At the completion of the mixing, ensure that the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3 1/2 inch sieve and that the material does not have a plasticity index greater than eight or liquid limit greater than 30. Remove any materials not meeting the plasticity requirements from the stabilized area. Break down or remove from the stabilized area materials, including clay lumps or lumps made of clay-size particles (any particle size 2 microns or less), not meeting the gradation requirements.

**160-3.5 Bearing Value:** Meet the bearing value requirements for the subgrade in accordance with 160-4.

**160-3.6 Compaction:** After completing the mixing operations and satisfying the requirements for bearing value, uniformity, and particle size. Compact the materials at a moisture content permitting the specified compaction in 160-4.2.3. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

**160-3.7 Finish Grading:** Shape the completed stabilized subgrade to conform with the finished lines, grades, and cross-section indicated in the plans. Check the subgrade using elevation stakes or other means approved by the Engineer.

**160-3.8 Requirements for Condition of Completed Subgrade:** After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the plans.

Remove all soft and yielding material, and any other portions of the subgrade which will not compact readily, and replace it with suitable material so that the whole subgrade is brought to line and grade, with proper allowance for subsequent compaction.

**160-3.9 Maintenance of Completed Subgrade:** After completing the subgrade as specified above, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, tools, etc. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs, replacement, etc., of curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the Department. Construct and maintain ditches and drains along the completed subgrade section.

#### **160-4 Acceptance Program.**

**160-4.1 General Requirements:** Meet the requirements of 120-10, except use 160-4.2 instead of 120-10.2, 160-4.3 instead of 120-10.3, and 160-4.4 instead of 120-10.4.

#### **160-4.2 Acceptance Criteria:**

##### **160-4.2.1 Bearing Value Requirements:**

**160-4.2.1.1 General:** Within the entire limits of the width and depth of the areas to be stabilized, obtain the required minimum bearing value for each LOT. For any area where the bearing value obtained is deficient from the value indicated in the plans, in excess of the tolerances established herein, spread and mix additional stabilizing material in accordance with 160-3.3. Perform this reprocessing for the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

Determine the quantity of additional stabilizing material to be used in reprocessing.

##### **160-4.2.1.2 Under-tolerances in Bearing Value Requirements:**

The under-tolerances are allowed for the following specified Bearing Values:

Specified Bearing Value	Under-tolerance
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Specified Bearing Value	Under-tolerance
LBR 40	5.0
LBR 35	4.0
LBR 30 (and under)	2.5

The following unsoaked bearing value requirement is based on tests performed on samples obtained after completing mixing operations:

Specified Bearing Value	Unsoaked Bearing Value Required	Under-tolerance
LBR 40	LBR 43	0.0

**160-4.2.2 Mixing Depth Requirements:** Do not exceed individual plan depth thickness by more than 2 inches or exceed LOT-average depth thickness by more than 1 inch measured to the nearest 0.25 inch. No undertolerance of mixing depth is allowed.

As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may waive the mixing operations (and the work of stabilizing), and the Department will not pay for stabilization for such sections of the roadway.

**160-4.2.3 Density Requirements:**

**160-4.2.3.1 General:** Within the entire limits of the width and depth of the areas to be stabilized, other than as provided in 160-4.2.3.2, obtain a minimum density at any location of 98% of the Modified Proctor maximum density as determined by FM 1-T 180, Method D.

**160-4.2.3.2 Exceptions to Density Requirements:** The Contractor need not obtain the minimum density specified in 160-4.2.3.1 if within the following limits:

(a) The width and depth of areas which are to be subsequently incorporated into a base course under the same contract.

(b) The upper 6 inches of areas to be grassed under the same contract. Compact these areas to a reasonably firm condition as directed by the Engineer.

**160-4.2.4 Frequency:** Conduct QC 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 the table below.

Test Name	Quality Control	Verification	Verification for Shoulder-Only, Bike/Shared Use Path and Sidewalk Construction
Modified Proctor Maximum Density	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs
Density	One per LOT	One per four LOTs	One per two LOTs
Stabilizing Mixing Depth	Three per 500 feet	Witness one per LOT	Witness one per LOT
LBR	One per two consecutive LOTs	One per eight consecutive LOTs	One per four LOTs
Gradation, LL/PI & Soil Classification (Local materials)	Not Required	One per eight consecutive LOTs	One per four LOTs

### 160-4.3 Additional Requirements:

#### 160-4.3.1 Quality Control Testing:

**160-4.3.1.1 Bearing Values:** Test the Stabilized Subgrade sample collected in 160-4.3.1.3. Determine the LBR in accordance with FM 5-515 and 160-4.2.4.

**160-4.3.1.1.1 Unsoaked LBR:** If Unsoaked LBR is desired, submit request for approval to the Engineer. Upon approval by the Engineer to consider the use of Unsoaked LBR, randomly sample and test from three locations in the initial Lot for both Soaked and Unsoaked LBR in accordance with FM 5-515. Ensure all of the tests demonstrate the material achieves the LBR values in 160-4.2.1.2. Continue testing Unsoaked LBR at the frequency shown in 160-4.2.4. Discontinue Unsoaked LBR testing if any unsatisfactory QC LBR test result is obtained or resolution determines an unsatisfactory LBR.

**160-4.3.1.2 Mixing Depths:** Meet required plan mixing-depths by measuring from the proposed Final Grade Line. Determine test locations, including Stations and Offsets, using the Random Number generator approved by the Department. Notify the Engineer a minimum of 24 hours before checking mixing depths. Record results on forms supplied by the Department.

**160-4.3.1.3 Modified Proctor Maximum Density Requirement:** Collect enough material to split and create three separate samples. Determine test locations, including Stations and Offsets, using the Random Number generator approved by the Department for the two LOTs under consideration. Retain the Verification and Resolution samples for the Department until the Engineer accepts the LOTs represented by the samples.

#### 160-4.3.2 Department Verification Tests:

**160-4.3.2.1 Bearing Value & Soil Classification:** The Engineer will sample and test the Stabilized Subgrade for determination of the LBR in accordance with FM 5-515. . If the Engineer has approved consideration of the Unsoaked LBR, sample and test the initial LOT for one soaked and one unsoaked LBR in addition to the frequency shown in 160-4.2.4.

If Local Material is used for stabilizing, the Engineer will determine compliance with embankment utilization requirements by testing and classifying the Stabilized Subgrade in accordance with AASHTO T88 and AASHTO M 145 at the frequency shown in 160-4.2.4.

The Engineer will select test locations, including Stations and Offsets, using a Random Number generator, based on the LOTs under consideration.

**160-4.3.2.2 Mixing Depth:** The Engineer will witness the Contractor's mixing depth checks to ensure compliance with 160-4.2.2. The Engineer will select test locations, including Stations and Offsets, using a Random Number generator.

**160-4.3.2.3 Modified Proctor Maximum Density:** The Engineer will randomly select one of the retained split samples and test in accordance with FM 1-T 180, Method D.

**160-4.4 Verification Comparison Criteria and Resolution Procedures:**

**160-4.4.1 Bearing Value & Soil Classification:** If the Department's Verification test meets the requirements of 160-4.2.1 and embankment utilization requirements, the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will collect an additional sample in the same LOT the Verification sample was obtained. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform Resolution testing on the additional sample. The material will be sampled and tested in accordance with FM 5-515. If Local Material is used for stabilization, the sample will be tested in accordance with AASHTO T88, and AASHTO M 145.

If the Resolution Testing results meet the requirements of 160-4.2.1 and embankment utilization requirements then the Engineer will accept the LOTs in question. Otherwise reprocess the corresponding LOTs in accordance with 160-3 and retest in accordance with 160-4.3.1.1.

**160-4.4.2 Mixing Depth Thickness:** The Department will witness the mixing depth checks.

1. If the depth checks meet the requirements of 160-4.2.2 the Engineer will accept that 500-foot section.
2. If the depth checks confirm shallow depth, re-mix the 500-foot section to an appropriate Depth and re-measure in accordance with 160-4.3.1.2. The Engineer will repeat the witness process.
3. If the depth checks confirm extra deep mixing, conduct an additional QC density test after compaction for the bottom 12 inches of the subgrade for that 500-foot section in addition to a QC density test for the top 12 inches. The additional Density test must meet the requirements of 160-4.2.3.

**160-4.4.3 Modified Proctor Maximum Density Determination:** The Engineer will compare the Verification test results of 160-4.3.2.3 to the corresponding Quality Control test results. If the test result is within 4.5 lb/ft<sup>3</sup> of the QC test result, the LOTs will be verified. Otherwise, the Engineer will collect the Resolution split sample corresponding to the Verification sample tested. The State Materials Office or an AASHTO accredited laboratory designated by the State Materials Office will perform

Resolution testing. The material will be sampled and tested in accordance with FM 1-T 180, Method D.

The Engineer will compare the Resolution Test results with the Quality Control test results. If the Resolution Test result is within 4.5 lb/ft<sup>3</sup> of the corresponding Quality Control test result, the Engineer will use the Quality Control test results for material acceptance purposes for each corresponding pair of LOTs. If the Resolution test result is not within 4.5 lb/ft<sup>3</sup> of the corresponding Quality Control test, the Engineer will collect the remaining Verification split samples for testing. Verification Test results will be used for material acceptance purposes for the LOTs in question.

**160-4.4.4 Density:** When a Verification or Independent Verification density test does not meet 160-4.2.3 (Acceptance Criteria), retest at a site within a 5 feet radius of the Verification test location and observe the following:

1. If the Quality Control retest meets the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, the Engineer will accept the LOTs in question.

2. If the Quality Control retest does not meet the Acceptance Criteria and compares favorably with the Verification or Independent Verification test, rework and retest the material in that LOT. The Engineer will re-verify the LOTs in question.

3. If the Quality Control retest and the Verification or Independent Verification test do not compare favorably, complete a new equipment-comparison analysis as defined in 120-10.1.2. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

#### **160-5 Method of Measurement.**

The quantity to be paid for will be the plan quantity, in square yards, completed and accepted.

#### **160-6 Basis of Payment.**

Price and payment will constitute full compensation for all work and materials specified in this Section, including furnishing, spreading and mixing of all stabilizing material required and any reprocessing of stabilization areas necessary to attain the specified bearing value. The Department will make full payment for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources within the limits of the stabilizing.

If the item of Borrow Excavation is included in the Contract, any stabilizing materials obtained from designated borrow areas will be included in the pay quantity for Borrow Excavation.

#### **160-6.3 Payment Items:** Payment will be made under:

Item No. 160- 4- Stabilization - per square yard.

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All Jobs