FLORIDA DEPARTMENT OF TRANSPORTATION
State Materials Office
5007 NE 39th Avenue
Gainesville, Florida 32609
December 9, 2016

Florida Method of Test
for
LABORATORY DESIGN OF STABILIZED SUBGRADE MIXTURES

Designation: FM 5-560

1. SCOPE

This design procedure is intended for determining the minimum quantity of stabilizing material to be incorporated with any given soil to obtain an acceptable mixture for use in stabilized subgrade or subbase. Minimum design strength requirements are to be determined based on the Limerock Bearing Ratio (LBR) strength test.

FM 5-560 is a modification of the FM 5-515 where noted by the following provisions:

2. Replace sections 3.2 and 3.3 with:

3.2 Stabilizing Material - For limerock and shell materials used as a stabilizer, the material shall be passed through a crusher set at a maximum opening of 19 mm (3/4 inch)(with an under tolerance of 3.175 mm (1/8 inch). The material is then passed through a 4.75 mm (No. 4) sieve, the material retained and the material passing the 4.5 mm (No. 4) sieve is weighed and percentage of each is calculated and recorded.

3.3 Material to be Stabilized - The material shall be passed through the 50, 19 & 4.75 mm (2 inch, 3/4 inch and No. 4) sieves, taking care to thoroughly break up the aggregations in such a manner as to avoid reducing the natural size of the individual particles. Any clay or silt aggregations shall be broken down until they will pass through a 4.75 mm (No. 4) sieve. The material retained on the 50 mm (2 inch) sieve shall be discarded. The material retained on the 19 and 4.75 mm (3/4 inch and No. 4) sieve and the material retained in the pan is weighed and the percentages are calculated and recorded. The material passing the 50 mm (2 inch) sieve and retained on the 19 mm (3/4 inch) sieve shall be removed from the soil and replaced with an equal weight of material passing the 19 mm (3/4 inch) sieve and retained on the 4.75 mm (No. 4) sieve.

3 Replace sections 3.4 with:

3.4 3.2 and 3.3 shall be separated into at least four specimens of each material weighing approximately 5.44 kg (12 pounds), each of which shall be

representative of the total sample.

Representative portions of the materials prepared in Section 3.2 shall also be blended with representative portions of the materials prepared in Section 3.3. These blends shall represent 20, 35 and 50 percent stabilizing material (Section 3.2) and 80, 65 and 50 percent of the material to be stabilized (Section 3.3) respectively. These percentages represent dry weight. (Other percentages of stabilizer contents may be permitted if prior experience indicate it would be advantageous, however a minimum of three different percentages will be required). Each of the three blends shall then be separated into at least four portions weighing approximately 3.44 kg (12 pounds), each of which shall be representative of the respective blend.

4 Replace section 3.5 with:

3.5 Each of the five sets of samples prepared (stabilizing material, material to be stabilized, and 20-80, 35-65 and 50-50 blends) shall be prepared for moisture-density and LBR determinations. Each of the separate portions of each set of samples shall be thoroughly mixed with amounts of water sufficient to cause each of the moisture contents of the samples to vary by approximately one percent with the lowest moisture content being approximately three percentage points below the optimum moisture content. The moisture contents selected shall bracket the optimum moisture content, thus providing samples which, when compacted, will increase in weight to the maximum density and these decrease in weight. The samples of soil-water mixtures shall be placed in covered containers and allowed to stand prior to compaction a minimum of 12 hours.

5 Add at the end of section 6.1:

If any swelling or bulking is observed, the test shall be repeated using additional surcharge weights not to exceed a total of 6.8 kg (15 pounds) for stabilized subgrade or 9.1 kg (20 pounds) for embankment.

6 Remove section 6.3.

7 Replace section 9 with:

9. STABILIZER CONTENT-LBR RELATIONS

9.1 The maximum LBR value for each stabilizer content (0, 20, 35, 50, and 100 percent) shall be determined as described in Section 8.2. The maximum LBR values shall then be plotted as ordinates and the percent stabilizer content plotted as abscissas (Fig. 13).

9.2 When the maximum LBR values and the corresponding stabilizer contents (in percentages) have been plotted as indicated in Section 9.1, connect all the points with a smooth curve. A horizontal line is then extended from the point on the ordinate at which the minimum required LBR value is located until it intersects the curve. The line is then extended vertically downward from the intersection of the curve and the required LBR value line to the abscissa. The point at which the vertical line intercepts the abscissa is the stabilizer content in percent corresponding to the minimum required LBR value design strength. The stabilizer content to be specified is then adjusted upward by 15 percent of the graph value and then rounded upward to the next whole percent for factor of safety (see the example in Figure M).

9.3 Confirmation Check – The specified stabilizer content determined in Section 9.2 shall be used as a trial content and prepared and tested as specified in Section 3.2 through 8.2. After having obtained Maximum Density and Optimum Moisture Content as well as maximum LBR value with corresponding moisture content, the two curves may be reviewed to determine the moisture range that will produce both the high density and high LBR value.

9.4 Stabilizer Spread Thickness Calculations – The stabilizer content selected in Section 9.2 is the percentage of stabilizer by dry weight. This stabilizer content must be converted to loose spread depth using the following equation.

Loose Spread Depth Calculations:

$$X = \frac{A}{B} x\, C\, x\, D$$

where:
X = Loose spread depth of stabilizer
A = Max. dry density of 50/50 blend
B = Loose density of stabilizer
C = Percent stabilizer (decimal) from section 9.2
D = Plan depth of finished subgrade

Note 1: Round loose spread thickness upward to nearest ½ inch. Use the loose density of the recommended blend, subgrade soil and stabilizer and the maximum density of the recommended blend to estimate mixing depth.

Note 2: The mixing depth and stabilizer spread depth is intended for the width and

depth of finished subgrade under the base or pavement. If the contractor intends to over-mix and then blade out extra material for curb pads, stabilized shoulder, etc., then spread depth of stabilizer and mixing depth shall be adjusted upward accordingly.

10. REPORT

10.1 The report shall adequately define the project or job for which the design(s) is being issued, including such information as project number, WPI number, road number (or name), city and county etc. The parent soil(s) used in the mix design shall be well defined to include gradation, LL, PL, color, etc., since the design recommendations pertain to that material only. The stabilizing material shall also be well defined (FDOT Mine Number, Color, top or bottom rock, etc.) since a change in source of material will require a new design. A description of the mixing and testing techniques used in the design procedure or any other helpful information should be included.

10.2 The report shall include the maximum density, optimum moisture and LBR values with all laboratory worksheets and calculation for each material and each blend. Also included shall be the percent stabilizer design curve, all spread and mixing depth calculations, the recommended percentage of stabilizing material by mass, the recommended mixing depth, the recommended spread of stabilizing material to be used in kilograms per square meter (pounds per square yard) and whether these recommendations will produce excess material to be used for curb pads, stabilized shoulder material etc.

Appendix M:

FLORIDA D.O.T.

PROJECT No. 99900-9000

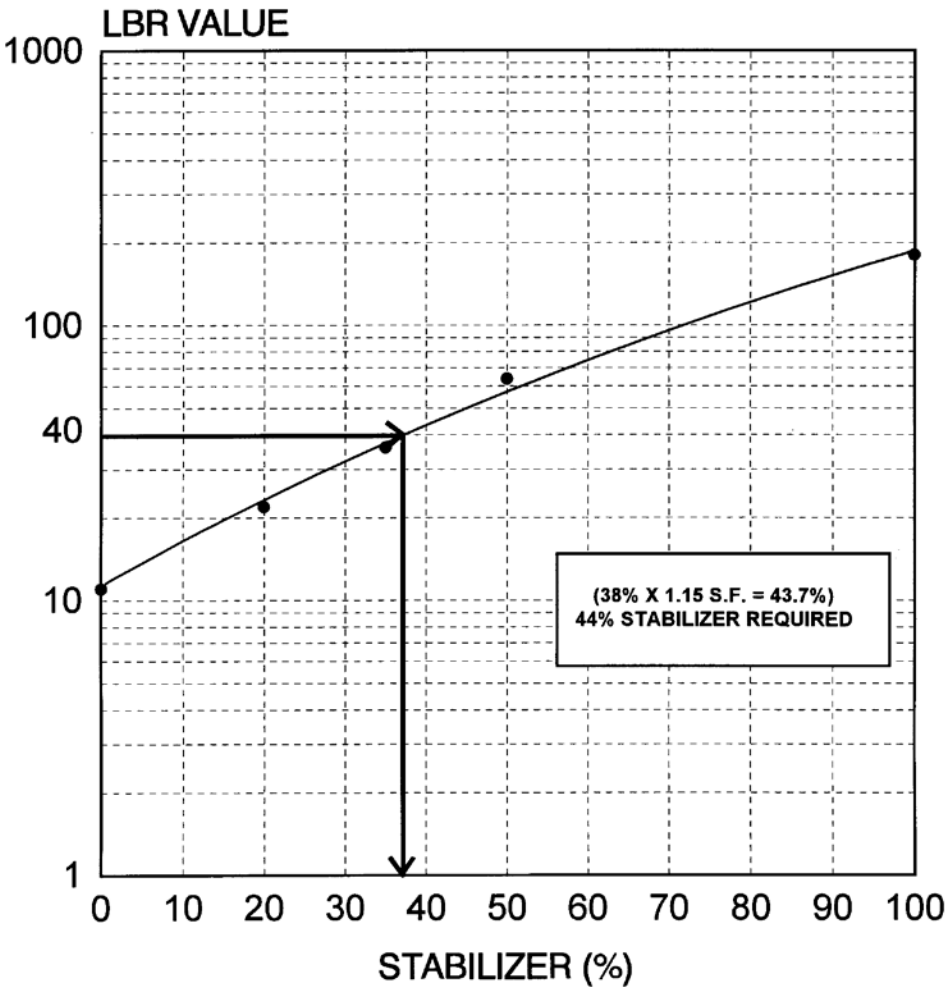

FIGURE 13

MIN. REQUIRED LBR=40