WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

PROCEDURE FOR DETERMINING A REDUCED UNIT PRICE TO BE PAID FOR UNDERDRAIN AGGREGATE WHICH DOES NOT CONFORM TO THE GRADING REQUIREMENTS OF THE GOVERNING SPECIFICATIONS

1. PURPOSE

1.1 This procedure will define a range of non-conformance in the grading of underdrain aggregate that would not be expected to affect its performance to an extent which would necessitate its removal from the project, and will provide a method for reducing the price to be paid for said nonconforming aggregate. Grading characteristics of underdrain aggregate shall be evaluated in accordance with MP300.00.51.

2. SCOPE

2.1 This procedure shall apply only to those aggregates specified for use for underdrains.

3. DEFINITION OF TERMS

3.1 Sublot: The quantity of material represented by a single test value. In the case where only one sample is needed for the total plan quantity, the sublot may be considered the LOT.

3.2 Lot: The quantity of material represented by an average test value not to exceed five individual test values, calculated in accordance with MP 300.00.51.

3.3 Single test value: The results of testing a sample in accordance with AASHTO test methods T11 and T27.

4. ACCEPTANCE FOR GRADATION

4.1 The material shall be sampled and tested in accordance with MP 700.00.06. Acceptance for gradation shall be based on test results of consecutive random samples from a lot. A sublot is the quantity of material represented by a single gradation test as defined in MP 700.00.06. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. In the case where only one sample is needed for the total plan quantity, the sublot shall be considered the lot.

4.2 The average shall start on the second sample result. The average is continued for the third through fifth sample result, averaging all previous sample results. Thereafter, only the last consecutive five sample results will be averaged, i.e., second test value through sixth test value, third test value through seventh test value, and so forth as defined in MP 300.00.51.

4.3 When the test value of a lot and the test value of the last sublot, or when the last three consecutive individual test values of a lot fall outside the gradation limits of Table 704.6.2A in the current West Virginia Standard Specifications for Roads and Bridges, the lot of material represented will be considered nonconforming to the extent that the last of its sublots are nonconforming.

4.4 When a sublot is non-conforming and material in the sublot has been incorporated into the work, the sublot shall be tested in accordance with Section 6 to determine the necessity for removal and the price for the quantity of material represented by the nonconforming sublot shall be reduced in accordance with section 8. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment which is determined shall apply.

5. SAMPLING FREQUENCY AND TESTING

5.1 Sampling frequency and testing shall be in accordance MP 307.00.50.

6. ACCEPT OR REMOVE BASED ON DIAMETER OF PERCENT PASSING

6.1 When a sublot of material is nonconforming, the average value representing said sublot shall be plotted such that the relative size can be determined for the 85 percent passing (D_{85}) and the 15 percent passing (D_{15}). Plot the percent finer from the sieve analysis results on a graph with the particle size on the horizontal axis decreasing from left to right and the percent passing on the vertical axis increasing from bottom to top. Draw horizontal lines on the chart representing fifteen percent and eighty five percent passing. Draw vertical lines from the intercept of the gradation lines with fifteen and eighty five percent of the passing curve to the horizonal axis and read the diameter on the horizontal scale.

Thus determined, these values shall be entered in the following formulas:

$D_{85} < 4 \times D_{15}$

$D_{85} >$ size of pipe opening (perforation)

Where: D_{85} = 85 percent passing size
D_{15} = 15 percent passing size

If the above formulas are met such that the size at 85 percent passing is less than four (4) times the size at 15 percent passing, and the size at 85 percent passing is greater than the perforation size, then the following procedure shall apply. If one or both formulas are not met, then the material shall be removed from the project site at the Contractors' expense.

6.2 A sample calculation is shown in Attachment 1

7. DEGREE OF NONCONFORMANCE

7.1 When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming. The total measure of non-conformance is the sum of all non-conformances on the various sieves for that sublot When the total degree

of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 1.

Table 1

% of Non-Conformance	% Reduced Price
1.0 to 3.0	2%
3.1 to 5.0	4%
5.1 to 8.0	7%
8.1 to 12.0	11%

7.2 When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed. Pending resolution of the matter, additional lifts of base or pavement shall not be placed over the nonconforming material.

8. DETERMINATION OF EQUITABLE ADJUSTMENT

8.1 When the total percent of non-conformance has been established and it is 12.0 or less, Table 1 shall be initiated. When the total percent of non-conformance is greater than 12.0, each nonconforming situation will be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

8.2 Method of Equitable Reduction: Dollar reduction shall be calculated by the following formula:

$$A \times B \times C = D$$

(A) - Quantity of Nonconforming Sublot

(B) - Percent Reduction from Table 1

(C) - Unit Contract Price

(D) - Price Reduction.

Michael Mance

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MP 606.03.50 Steward – Materials Control Section
MAM:Bb
ATTACHMENTS

Example Calculation

1. First, plot the gradation curve as shown in Figure 1.
2. On this Gradation Curve, draw a horizontal line at both 85% and 15% (the percent passing axis).
    a. These are shown in Red (85%) and Green (15%) in Figure 1.
3. Draw a vertical line at the intersection of the plot (Blue) and 85% line (Red)
4. Draw a vertical line at the intersection of the plot (Blue) and 15% line (Green)
5. Record the value along the horizontal axis as D_{85} and D_{15}.
    a. In Figure 2, these values are 21.5 mm and 3.5 mm. Excel may be used to calculate these values more precisely.

Figure 1

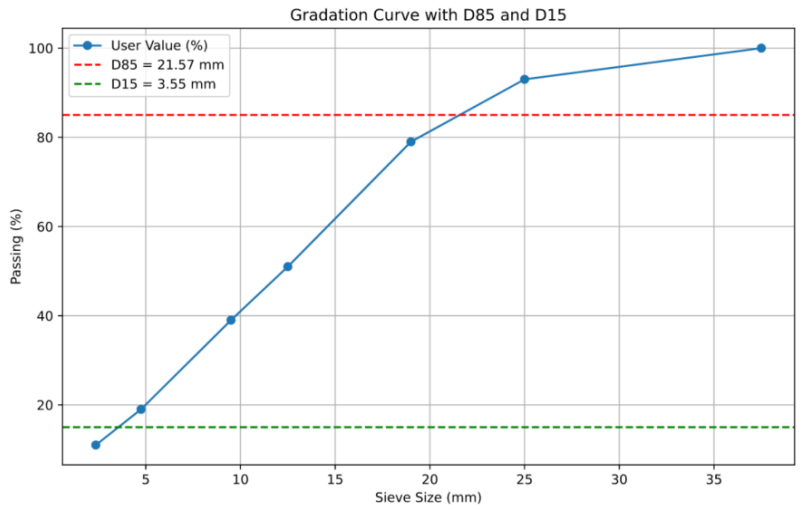
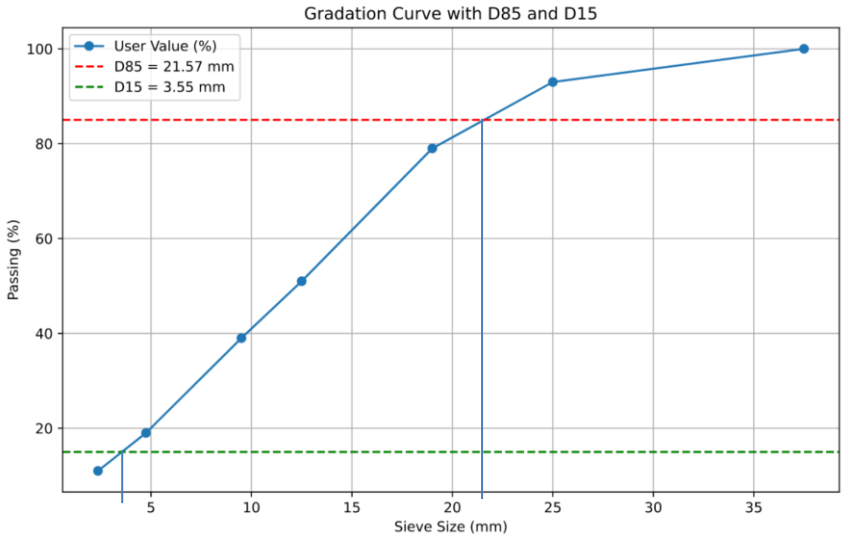


Figure 2



The calculations are as follows:

D_{85} = 21.5 mm

D_{15} = 3.5

Check 1:

Is D_{85} < 4 x D_{15}?

21.5 mm < 4 x 3.5 mm?

21.5 mm < 14 mm?

No – This does not meet.

Check 2:

Is D_{85} > Pipe Perforations

Pipe Perforations = 1.5 mm

21.5 mm > 1.5 mm?

Yes – This meets.

In order for this to remain in place both checks must be Yes. In this case, Check 1 is No, therefore this is remove and replace.