Report 1

Engineering

Sieve analysis Introduction Sieve analysis is a process applied on coarse grained soil in order to establish the distribution of the size of the grain. As the sample of soil under investigation goes progressively via the consecutively smaller sieves, the weight percentage of the sample collected in each of the sieves is calculated. The entire percentage passing via each of the sieves is calculated as well and plotted against the size of the grains. A semi-log plot is used for this. The x-axis is representative of the grain size logarithm and the y-axis is representative of the weight percent of sample by-passing each of the sieves. This plot is known as the grain distribution plot and will be used for purposes of this report. More often, a relatively distributed curve shows well graded or a soil which is poorly sorted whilst an extremely steep distribution curve, a curve with steep distribution shows poor grade or sufficiently sorted soil. Objectives of the experiment This lab was developed to determine the distribution of grain size for Concrete & Asphalt materials. This is achieved by determination of the coefficient of uniformity,, as well as the coefficient of curvature, . These describe general slope and shape of the curve respectively for the grain distribution curve. Consequently, how good or poorly sorted a given soil sample is can be obtained using and. The equations are as shown below; , showing the coefficient of Uniformity; and , which shows the coefficient of Curvature As per the equation D10 represents the size of the grain size where 10% of soil sample passes, as shown in the grain size distribution curve. D30 and D60 correspond to size of the grain size whereby 30% and 60% by weight of sample of the soil passes through. D10 also refers to effective size. Grain size as well as distribution is vital given that it directly affects stability of slope as well as the soils drainage abilities. Equipment and Procedures This

experiment was done in line with the instructions availed in the lab handout manual. The instructions are based on ASTM, AASHTO or University standards. The equipment used includes the following: Sieves Trays Oven which should be able to maintain a 110° uniform temperature Brush Weighing balance The standards are referenced in appendix 1. The experiment layout and procedure Experiment layout The layout of the experiment is as shown in the diagram below: Figure 1: Experimental set up The sample is passed through the consecutive set of sieves as indicated in the diagram. Each sieve is then weighed using the weigh balance availed within the lab. Analysis procedure 1. Obtain around 15 lbs. of oven dried concrete and asphalt sample. 2. Use a pestle to brakes break the sample into individual soil particles. 3. Measure the sample's weight to the nearest gram and record the value obtained. 4. Make a stack of sieves as shown in figure 1 above. Sieves with larger openings are placed on top of the ones with smaller openings. 5. Pour the concrete/asphalt sample into the stack and use the brush to move around and facilitate sieving. Do this gently to avoid forcible moving particles. Do this for approximately 10 minutes. 6. The amount retained in each sieve is then weighed and the value recorded in each case. The same is done for the fine material obtained at the bottom placed tray. 7. Perform relevant calculations and draw the relevant plots. Results and discussion The results are as displayed in the table below: Sieve Size (in.) Weight retained in each Sieve (g) Cumulative Weight Passed (g) Total Percent Passed 0. 750 108. 50 1179. 40 91. 6% 0. 625 114. 20 1065. 20 82. 7% 0. 500 68. 00 997. 20 77. 4% 0. 375 75. 30 921. 90 71. 6% 0. 250 121. 70 800. 20 62. 1% 0. 187 57. 10 743. 10 57. 7% 0. 079 210. 70 532. 40 41. 3% 0. 033 155. 90 376. 50 29. 2% 0. 017 93. 90 282. 60 21. 9% 0. 010

65. 50 217. 10 16. 9% 0. 006 57. 30 159. 80 12. 4% 0. 003 83. 90 75. 90 5. 9% 0. 000 75. 90 0. 00 0. 0% Figure 2: Results table Based on these results the following grain distribution graph was derived, The % passed graph plot shown above reveals a mid-ranged curve indicating that the sample is neither well graded nor poorly graded. The sample shows a relatively extensive variety of grain sizes which are fairly spread out across the entire sieve arrangement. The D10 value is obtained from and is estimated at 0. 006 inches, while the D30 value as obtained from the graph is 0. 033 inches. On the other hand, D60 is set at 0. 250 inches. These values are estimated based on the graph. = 41. 67 0. 726 Based on these values, the coefficient of uniformity, Cu, was calculated as 41. 67 while the coefficient of curvature, Cc is obtained as 0. 726. Conclusions From the experiment, the sample of soil as obtained is considered as being neither well graded nor poorly graded. This is further reinforced by the values of the coefficient of uniformity and coefficient of curvature, which are determined as 41. 67 and 0. 729 respectively. Reference Rayhani, M. T. (2010). Analysis of particles. Carleton Learning Management System Appendix 1: Standards ASTM Standards C117 Test Method for Materials Finer than 75-m (No. 200) Sieve in Mineral Aggregates by Washing C125 Terminology Relating to Concrete and Concrete Aggregates C637 Specification for Aggregates for Radiation-Shielding Concrete C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials C702 Practice for Reducing Samples of Aggregate to Testing Size D75 Practice for Sampling Aggregates E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves AASHTO Standard AASHTONo. T27 Sieve Analysis of Fine and Coarse Aggregates Available from American Association of State Highway and

Transportation Officials, 444 North Capitol St. N. W., Suite 225, Washington, DC 20001 Appendices ASTM No. Sieve Size (in.) Sieve Size (mm) Weight retained in each Sieve (g) Cumulative Weight Passed (g) Total Percent Passed -- 0. 7500 19. 000000000 108. 5 1179. 4 91. 58% -- 0. 6250 16. 000000000 114. 2 1065. 2 82. 71% -- 0. 5000 12. 700000000 68. 0 997. 2 77. 43% -- 0. 3750 9. 500000000 75. 3 921. 9 71. 58% -- 0. 2500 6. 350000000 121. 7 800. 2 62. 13% No. 4 0. 1870 4. 750000000 57. 1 743. 1 57. 70% No. 10 0. 0787 2. 000000000 210. 7 532. 4 41. 34% No. 20 0. 0331 0. 000000850 155. 9 376. 5 29. 23% No. 40 0. 0165 0. 000000425 93. 9 282. 6 21. 94% No. 60 0. 0098 0. 000000250 65. 5 217. 1 16. 86% No. 100 0. 0059 0. 000000150 57. 3 159. 8 12. 41% No. 200 0. 0030 0. 000000075 83. 9 75. 9 5. 89% Pan 0. 0000 0. 000000000 75. 9 0. 0 0. 00% SUM (g) 1287. 9