CET431-101	**AGGREGATE TESTING LAB**
CONSTRUCION TESTING	PROFESSOR WASHINGTON
NAME OF GROUP	**MCC**
GRADING ITEMS	**COMMENTS**
COOPERATIVE LEARNING	ALL MEMBERS OF THE GROUP SEEM TO WORK VERY WELL, WITH THE EXCEPTION THAT A COUPLE OF MEMBERS WERE NOT ALWAYS PRESENT DURING THE ENTIRE SESSION OF THE LAB.
ESSAY QUESTIONS	BELOW AVERAGE WITH ESSAY QUESTIONS - IN GENERAL THERE WAS SOME TIME AND THOUGHT PUT INTO THE ANSWER PROVIDED. IT WAS GREATLY APPRECIATED THAT THE FOR EACH LAB YOU WERE ABLE TO SPELL OUT THE DIFFICULTIES THAT YOU HAD. THE PROBLEM WITH THE ESSAYS WAS THAT THERE WERE ANSWERS THAT DID NOT MAKE SENSE OR WERE NOT TRUE. THE RESULTS WERE NOT TABULATED AS INSTRUCTED IN THE CLASS FOR CONCRETE MIX DESIGN. IN YOUR DISCUSSION QUESTION #3 , THERE WAS A LACK OF FAMILIARITY WITH THE ASTM C33 AGGREGATE DESIGNATIONS. THE #357 STONE SHOULD HAVE BEEN DISCUSSED IN YOUR DISCUSSION SECTION AND NOT IN THE QUALITY CONTROL .VS. ACCEPTANCE QUESTION.
VIDEO QUESTIONS.	AVERAGE JOB - VIDEO QUESTIONS WERE COMPLETED WITH A SOME OMISSIONS AND ERRORS AS NOTED. SOME OF THOSE ANSWERS WERE VERY WEAK.
LAB CALCULATIONS	GOOD JOB ON THE CALCULATION FOR THE LAB. ALL OF THE WORK SEEMED TO BE COMPLETED. AIR DRY CALCULATION WAS NOT PERFORMED FOR LAB #1 IN ORDER TO OBTAIN THE CORRECT SPECIFIC GRAVITY WHICH MOST GROUPS DID NOT DEMONSTRATE.
FINAL LETTER GRADE	C

AGGREGATE TESTING LAB

LAB REPORT

Group Name: MCC

CET 431: Construction Materials Testing

TO: Prof. David Washington

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A. Essay Questions

Objective and Introductory Questions

1. What is the overall objective of this lab? What will be done with the test results of these tests?
   The overall objective of this lab is twofold. Firstly is to become familiar with different ASTM tests that are used in testing coarse and fine aggregate and determine what type of sample we have. Secondly, the results of the test will define how we will make the concrete mix in the next lab.
2. Why is there a need for doing this type of test? How important are these test?
   There is a need for doing these tests because without these tests one cannot determine what type of fine and coarse aggregate one has. Without these tests you cannot design any type of mix design whether being concrete or asphalt. These tests are very important because without them you could not define the difference between any types of aggregate.
3. What is the difference between acceptance and quality control? Which one these apply to the lab work that is being performed?
   Acceptance is when a particular aggregate fits inside the allowable ranges. For e.g., if you are on a job and the spec calls for 357 stone then using ASTM C33 and you do sieve test on the stone that you get on the site and plot the curve, if it fails between the upper and lower bounds of a 357 stone you have a acceptable stone. QC based on testing has to deal with how "good" the test samples are, for instance, a test sample that has been documented every step of the way is much "Better" than that of the one has no documentation. QC, also has to do with how accurate your tests are, if you are sampling coarse aggregate that is about ¾ stone and your results show ¼ stone then something has to be wrong, one cannot just record the results and leave it alone but figure out why the test results are the way they were.

II. Narrative Questions

1. Mention any variations in the method that was used in the lab when compared to the specifications. (i.e. sample was not immersed 24 hrs.)
   LAB. 1) We could not be sure that the sample was submerged in water for 24 hrs prior to our tests.
   LAB. 2) The only variation that we could see was the fact that the sand appeared to be almost dry and we did add water but we could not be sure that the moisture content was 6% when we performed the lab.
   LAB. 3) The only thing that was varied in this lab was the fact that the scale could not hold the total weight of the bucket so we divided the weight up. Also the scales accuracy could not be determined.
   LAB. 4) We followed this test by the book.
   LAB. 5) This lab we had several problems and variations. Firstly we did not sample the aggregate properly. Secondly, the sample appeared to be dry but was not oven dry. Also, the machine was not run for the full 10 mins.

LAB. 6) The lab was varied because the sieve stack could not be tightly secured on the machine. The machine was not run for the full 10 mins. The scale was acting erratically.

2. If the test method used in the lab varied from the specification, how will it affect the results? (i.e. absorption value would be less if voids were only partially filled with water)
   LAB. 1) If the aggregate was not submerged for the 24 hrs then all the voids would not be filled with water then the absorption would be low. If the proper water temperature was not used the volume of water would be different affecting the absorption which could make it either high or low based on if the water was too hot or cold.
   LAB. 2) If the sand was too wet or dry the absorption would have changed either high or low.
   LAB. 3) If there was a loss of stone while dumping out the partial bucket onto the scale then the dry rodded density would be lower than actual.
   LAB. 4) There were no modifications.
   LAB. 5) Since the lab was not sampled properly we believe that we go too much small aggregate and not enough of the large aggregate thus, making a bad sieve analysis. With the machine not running 10 min. may have not allowed all the smaller sizes to get into their correct trays.
   LAB. 6) Since the sieve stack could not be tightened properly the loss of soil would affect the gradation curve. With the erratically operating scale, the weights could have been wrong.

3. What factors contributed to possible errors in your results?

Some of the scales were reading one number and would change without any added weight. Also in lab #5 we picked up stone that had already went through the sieve and had separated which caused errors. We will be performing this lad over to correct our results.

4. How do you verify your results and show some consistency? Can your results be verified?
   Some other tests that could be performed to verify our results:
   AASHTO T85
   AASHTO T27
   AASHTO T19
   AASHTO T19M
   AASHTO T84

III. Discussion Questions

1. Did you repeat some of these tests? Explain
   Yes, we did repeat the sieve analysis on the coarse grained aggregate over because our numbers seemed way too small for what was there. However, for our purposes the rest of the results would be satisfactory.
2. How will these results be useful in making concrete?
   We will use these results in order to properly proportion the aggregates, and the amount of Portland, and water necessary to make the correct strength concrete mix.
3. What was the classification of your aggregate?
   It was a coarse aggregate.

4. Did it meet ASTM specifications or standards?
   The coarse aggregate did not fall within any ASTM C33 standard; we believe this duo to a mistake in the sieve analysis.

   is due

5. How will the concrete industry benefit from these tests?
   The concrete industry can benefit greatly from these tests because it sets a standard as to what type and size rock one has. Additionally, it enables a set of standards to be set that make concrete design uniform in the industry without every company having to do it all alone.

IV. Conclusion Questions

Did you achieve your objective or goal? What factors or parameters that you obtained in this lab, have a direct effect on the performance or the strength of your concrete mix design? Explain

We believe that we did achieve our goal. One of our goals was to learn how to perform the tests that we were assigned, which we did. Another goal was to complete the lab and analyze the results. We believe that we accomplished this as well because we can use the results to make a concrete mix.

One major observation can be made about aggregates as a result of performing these tests is that not one aggregate is alike. Each aggregate has its own physical properties however, how, where and when the aggregate is stored before its use also changed its properties. For instance, a concrete mix could be designed for a 6am when a batch plant opens but, needs to be redesigned for at 10am when the sun has evaporated the moisture out of the sand. Another important observation with the aggregates is that you can never assume anything because the slightest difference can dramatically change the mix design.

Explain

Table is missing for concrete mix design Parameters!!

B. Video Questions

I. ASTM C702 Reducing Field Samples of Aggregate to Testing Size

1. Why was the field sample test method developed?

The field test sample method was developed in order to minimize the variation between large samples taken in the field and the sample used for individual testing. It would be impractical to test the entire pile so this method was developed in order to get the best possible results with least amount of work.

2. What two factors determine the method to be used in reducing a field sample?

The two factors that determine the method to be used in reducing filed sample is the dimensions of the various gradations tests and the relative to number

field ?? What

3. Name three methods for reducing field samples?

Three methods used in reducing field samples are using a mechanical splitter, the quartering technique, and miniature sampling.

5. Which method is mandatory for samples of fine aggregate drier than Saturated Surface Dry (SSD)?

The mechanical splitter method should be used for fine aggregates drier that Saturated Surface Dry (SSD)

6. What kind of aggregate samples are only used with Miniature Stockpile Sampling?

Fine aggregates are used with Miniature Stockpile Sampling.

II. ASTM C117 – Material Finer than No. 200 Sieve in Mineral Aggregate by Washing

1. According to ASTM C33 (Standard Specifications for Concrete Aggregate), what limiting amount by percent weight of the total sample should pass the No. 200 sieve for concrete subject to abrasion? for all other concrete?

The limiting amount by percent weight of the total sample should pass No. 200 sieve for concrete subject to abrasion in 3%. The limiting amount by percent weight of the total sample should pass No. 200 sieve for all concrete except for subject to abrasion in 5%.

2. Should we use the same test sample C117 and C136 for an aggregate with a nominal size of ½ inch or less?

One should use the same test sample C117 and C136 for the aggregate with a nominal size of ½ inch or less according to ASTM.

III. ASTM C136 – Sieve Analysis of Fine and Coarse Aggregate

1. When sieving by mechanical apparatus or by hand, how long should sieving continue?

Sieving should last for 10 minutes without stopping.

not more than 1% of sample passes through in 1 min

2. What is the fineness modulus?

The fineness modulus is an index number which is calculated using the sieve data, it primary use is in designing concrete mixes.

3. What are the U.S. Standard sieve sizes used to calculate fineness modulus? What is the relationship between each consecutive sieve?

The U.S. Standard sieve sizes used to calculate fineness modulus are No. 4, No. 8, No. 16, No. 30, No. 50, and No. 100. The relationship between each sieve is that one above has approximately ½ the size holes as one below.

4. The total weight of the sample after sieving should be within what percent of the total dry weight of sample before sieving?

The total weight of the sample after sieving should be within 0.3% of the total dry weight of sample before sieving.

5. Why is the weight of particles on a given sieve considered "Cumulative"?

The weight of particles on a given sieve is considered "Cumulative" because it shows the total amount that theoretical could be on that sieve if that sieve was at the top of the rack.

IV. ASTM C29 – Unit Weight and Voids in Aggregate

1. What should the moisture content of the test sample be at the time of testing?

The moisture content of the test sample should be 0 because one should use oven dry sample.

2. What minimum capacity unit weight bucket should be used for an aggregate sample with a maximum aggregate size of ¾ in?

The minimum capacity unit weight bucket should be used for an aggregate sample with a maximum aggregate size of ¾ inches is 70 pounds per cubic foot.

V. ASTM C127 –Specific Gravity and Absorption of Coarse Aggregate

1. Should this method be used to determine the specific gravity and absorption of lightweight stones?

ASTM C127 is used to determine the specific gravity and absorption of coarse aggregate not lightweight stones.

2. Define the term Saturated Surface-Dry (SSD).

The Saturated Surface-Dry (SSD) means that the pores inside the stone are completely filled with water, while there is no water on the surface of the stone.

3. Define the term absorption.

Absorption is the percentage of the weight of water needed to fill the pores compared to the oven-dry weight.

4. What difference in calculations are made for Specific Gravity for SSD and Oven Dry stones?

When calculating for specific gravity OD we use OD weight in the numerator divided by SSD weight minus the submerged weight. When calculating for specific gravity SSD we use the SSD weight in the numerator divided by SSD weight minus the submerged weight.

VI. ASTM C128 – Specific Gravity and Absorption of Fine Aggregate

1. How does one know when SSD has been reached in a sand sample?

One knows when SSD has been reached in a sand sample when the sand free flows

2. What decimal place is recommended for recording all of the weights?

The decimal place that is recommended for recording all weight is $1/10^{th}$ of a gram, however it is really based on the scale being used because some scales cannot read that small weight.

VII. ASTM C566 – Total Moisture of Aggregate by Drying

1. Why is it important when drying a sample with a hot plate or electric heat lamps to avoid hot spots?

It is important when drying a sample with a hot plate or electric heat lam to avoid hot spots because when aggregate heats up too quickly it tends to explode and one will loose particles thus, the weight of the sample changes.

2. Define the term total moisture content.

Total moisture is the percentage of water that is the pores of the stone.

3. What is the additional weight loss after further heating, when a sample is considered to be oven dry?

The additional weight loss after further heating, when a sample is considered to be oven dry is .10% of its total weight.

LAB #1

Where is the Air Dry Wt Calculations??

$$\text{BULK } G_s(\text{AIR DRY}) = \frac{\text{AIR}}{\text{SSD} - \text{SUB}} = \frac{4620.1\,g}{4627.6\,g - 2935.1\,g} = \boxed{2.73}$$

$$\text{BULK } G_s(\text{SSD}) = \frac{\text{SSD}}{\text{SSD} - \text{SUB}} = \frac{4627.6\,g}{4627.6\,g - 2935.1\,g} = \boxed{2.73}$$

$$\text{APPARENT } G_s = \frac{\text{OD}}{\text{OD} - \text{SUB}} = \frac{4613.2\,g}{4613.2\,g - 2935.1\,g} = \boxed{2.75}$$

$$\text{ABSORBTION} = \frac{\text{SSD} - \text{OD}}{\text{OD}} \times 100 = \frac{4627.6\,g - 4613.2\,g}{4613.2\,g} \times 100 = \boxed{0.312}\,\%$$

LAB #2

BULK G_s (AIR DRY) $= \frac{\text{AIR DRY}}{\text{PYC} + \text{SSD} - \text{SUB}} = \frac{802.1g}{1275.3g + 669.8g - 1700.7g} = \boxed{3.28}$

BULK G_s (SSD) $= \frac{\text{SSD}}{\text{PYC} + \text{SSD} - \text{SUB}} = \frac{669.8g}{1275.3g + 669.8g - 1700.7g} = \boxed{2.74}$

APPARENT G_s $= \frac{\text{OD}}{\text{PYC} + \text{OD} - \text{SSD}} = \frac{557.8}{1275.3g + 669.8g - 1700.7g} = \boxed{2.28}$

ABSORBTION $= \frac{\text{SSD} - \text{OD}}{\text{OD}} \times 100 = \frac{669.8g - 557.8}{557.8} \times 100 = \boxed{20.01}$ %

High!!

LAB # 3

(#1) CALCULATE THE UNIT WEIGHT

$$\frac{WT}{V} = \frac{101.9\ \#}{1\ ft^3} = \boxed{101.9\ \#/_{CF}}$$

(#2) VOID CONTENT OR % VOID

$$\text{VOID \%} = \frac{G_s\ (\text{AIR DRY}) \times \gamma_w - DRW}{G_s\ (\text{AIR DRY}) \times \gamma_w}$$

$G_s = 2.75$ (FROM LAB #1)

$\gamma_w = 62.4$

$$\text{VOID \%} = \frac{2.75(62.4) - 101.9}{2.75 \times 62.4} \times 100 = \boxed{0.41\ \%}$$

40%

LAB #4

Fine Aggregate

3.) Calculate Moisture Content

$$\text{Total Moisture} = \frac{Air - OD}{OD} \times 100 = \frac{973.1g - 961.4g}{961.4g} \times 100\%$$

= 1.22 %

Absorption = 20.1%

4.) Surface Moisture Content = .0122 + .21 = .2222 %

Coarse Aggregate

$$MC = \frac{Air - OD}{OD} = \frac{4{,}000g - 3{,}888.4}{3{,}888.4} = \boxed{2.87\%}$$

Absorption = **.312 %**

Surface moisture content = .0287 + .00312 = **.03182**

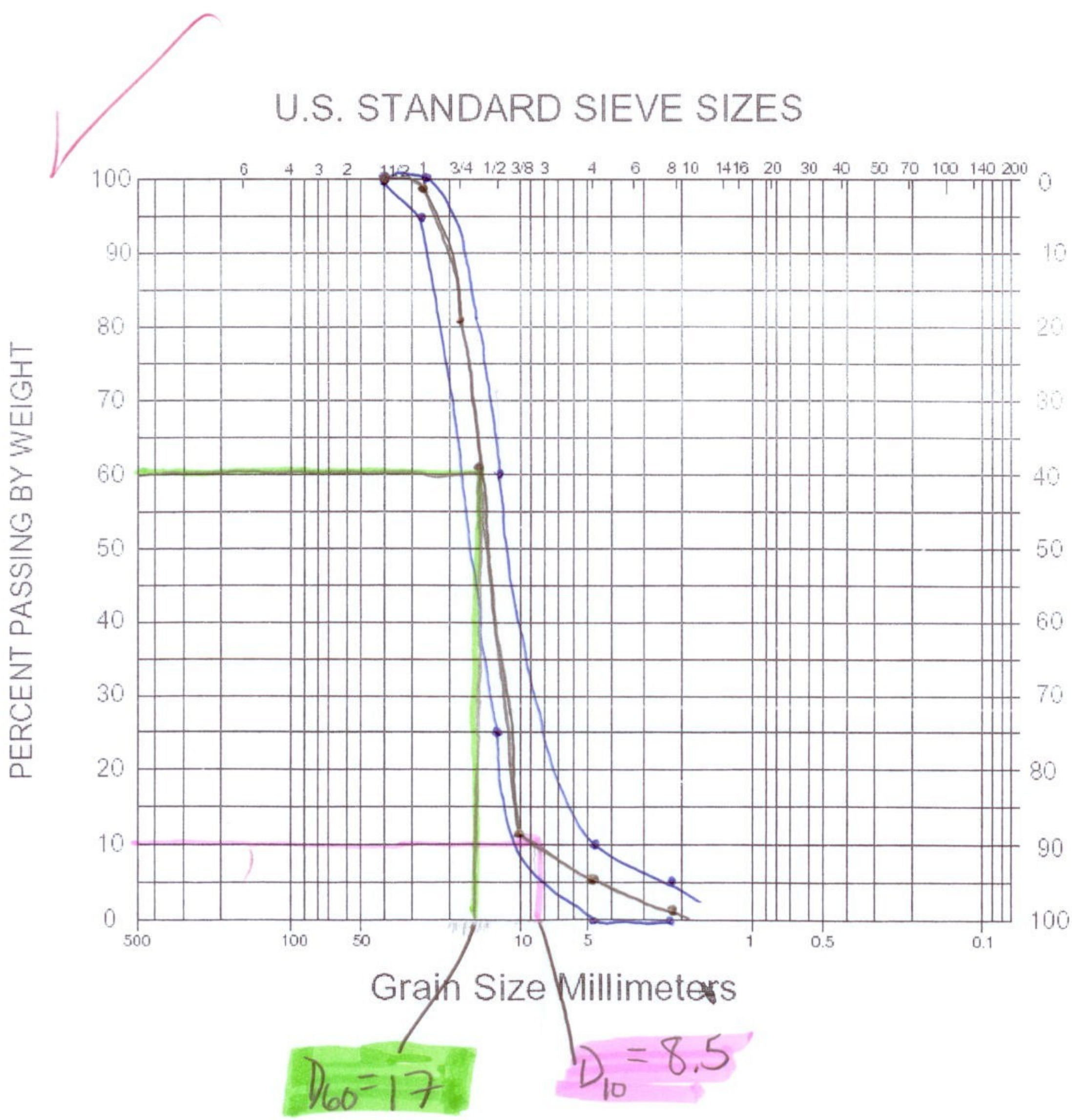
LAB #5

- ASTM C33 designation is #57
- Fineness Modulus $= \frac{18.55 + 88.24 + 94.74 + 97.37 + 4 \times 100}{100} =$ Fineness **6.989**
- No.4 is the average sieve size
- Avg. size stone: 3/8" − 1/4" = 1/8" | Avg. size = 1/4" + (.989) 1/8" = **.374"**

  Avg. size = .374"
- Effective Size = D_{10} = 8.5
- Uniformity Coefficient $= \frac{D_{60}}{D_{10}} = \frac{17}{8.5} = \boxed{2}$

Show sieves that you used in calculation!!

SIEVE	WT. RET.	% RET.	%COARSER	%PASS
1"	.74 lb	1.59	1.59	98.41
3/4"	7.88 lb	16.96	18.55	81.45
5/8"	9.85 lb	21.2	39.75	60.25
3/8"	22.53 lb	48.49	88.24	11.76
1/4"	3.02 lb	6.5	94.74	5.26
1/8"	1.22 lb	2.63	97.37	2.63
Pan	1.22 lb	2.63	100	0
TOTAL	46.46	100		



LAB #6

- SAMPLE MEETS ASTM C33 ACCEPTANCE CRITERIA

- FINENESS MODULUS = $\frac{2.49 + 7.9 + 19.3 + 47.16 + 87.92 + 99.38}{100}$

= **2.64**

OK

- AVERAGE SIEVE SIZE = #50

- AVERAGE SIZE STONE 300 μm - 300 μm

$\Delta = 300 \mu m$

$300 \mu m + (.0163 m) \times 300 \times 10^{-6} m$ = **.00305 m**

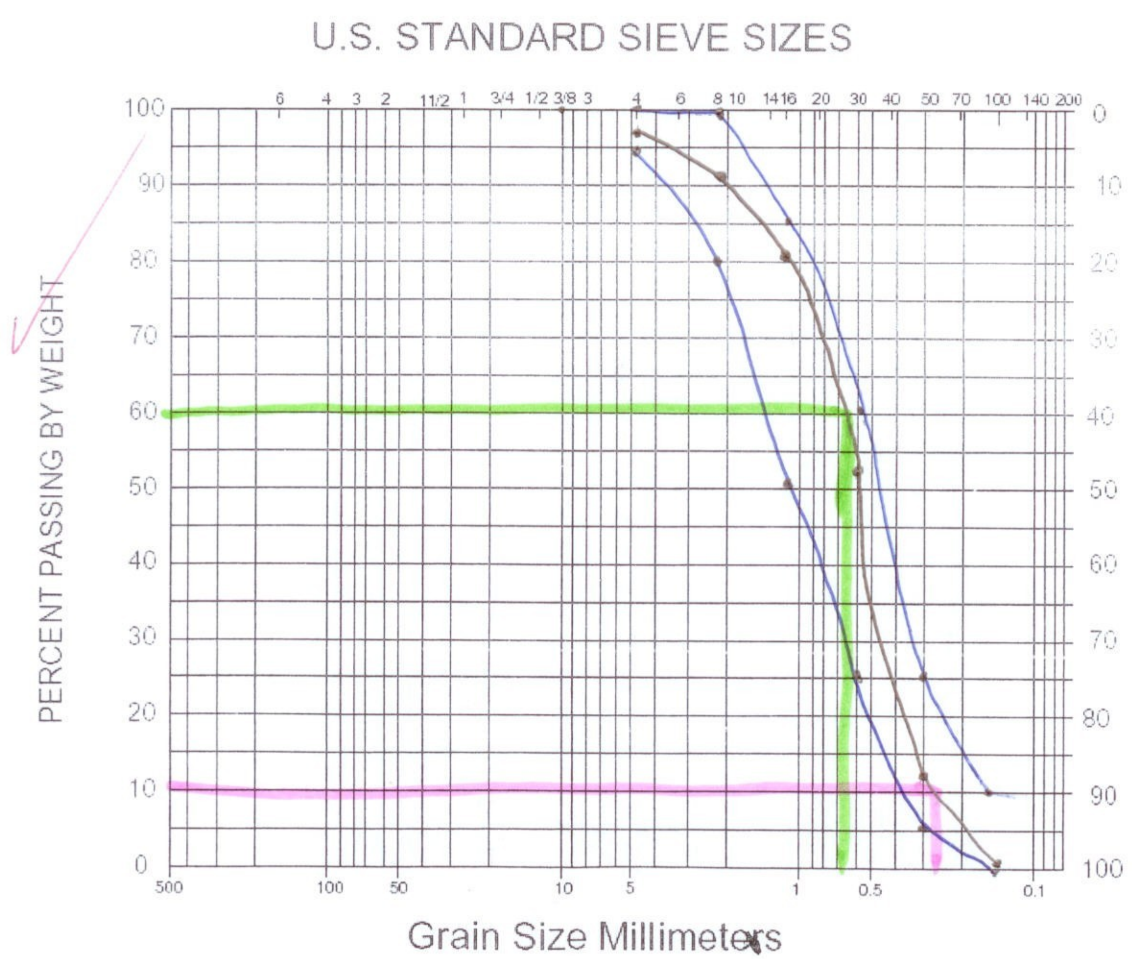
✓

EFFECTIVE SIZE = D_{10} = **0.27**

UNIFORMITY COEFFICENT = D_{60}/D_{10} = $.65/.27$ = **0.1755**

LAB #6

SIEVE	WT. RET.	% RET.	%COARSER	%PASS
#4	24.9 g	2.49 %	2.49 %	97.51 %
#8	54.1 g	5.41 %	7.90 %	92.10 %
#16	114.0 g	11.40 %	19.30 %	80.70 %
#30	278.6 g	27.86 %	47.16 %	52.84 %
#50	407.6 g	40.76 %	87.92 %	12.08 %
#100	114.6 g	11.46 %	99.38 %	0.62 %
PAN	6.2 g	0.62 %	100.00 %	0 %
TOTAL	1000.0g	100 %		



D_{60} = 0.65

D_{10} = 0.27