CET431-101	**AGGREGATE TESTING LAB**
CONSTRUCION TESTING	PROFESSOR WASHINGTON
NAME OF GROUP	**GC**
GRADING ITEMS	**COMMENTS**
COOPERATIVE LEARNING	ALL MEMBERS OF THE GROUP SEEM TO WORK VERY WELL, WITH MONOR EXCEPTIONS.
ESSAY QUESTIONS	POOR JOB WITH ESSAY QUESTIONS - YOU SEEM TO HAVE A VERY GOOD HANDLE ON WHAT THE OBJECTIVES OF THE LAB WERE, HOWEVER, IN GENERAL THERE WAS EITHER VERY LITTLE TIME OR THOUGHT PUT INTO THE ESSAY ANSWERS. IT WAS NOT APPRECIATED THAT FOR EACH EXPERIMENT YOU WERE NOT ABLE TO DEMONSTRATE CRITICAL THINKING AS TO WHAT DIFFICULTIES YOU EXPERIENCED. YOUR RESULTS OR LACK OF RESULTS SUGGESTED THAT THE WRITTEN PORTION OF THE LAB COULD HAVE PROVIDED MORE INSIGHT AS TO WHAT WAS GOING ON. THE RESULTS WERE NOT TABULATED AS INSTRUCTED IN THE CLASS FOR CONCRETE MIX DESIGN.
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	NOT VERY GOOD ON THE CALCULATION FOR THE LAB. MUCH OF THE WORK OR CALCULATIONS SEEMED TO BE MISSING MOSTLY IN THE SIEVE CALCULATIONS. 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-

Goodman / Coleman

AGGREDGATE TESTING LAB

Captain: Scott Goodman

Tom Ansch
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Marcolm Coleman
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Chris Wagner

A. **Essay Questions:**

I. Objective and Introductory Questions

1. What is the overall objective of this lab? What will be done with the results of these tests?

The overall objective of this test is to determine the appropriate size, type and quality of each aggregate; we will then use the results to calculate the ASTM classifications, along with the acceptance and quality of each aggregate. Selecting appropriate aggregates is essential to the mix.

2. Why is there a need for doing this type of test? How important are these tests?

Finding the appropriate size, type and quality of each aggregate used in the building is essential to the mix. Testing the material is very important to the quality of the mix and to determine if the aggregates can even be used.

3. What is the difference between acceptance and quality control? Which one of these applies to the lab work that is being performed?

Acceptance is whether the mix can be accepted at all while quality control is to ensure delivering better quality. This lab applies to whether the material is acceptable or not, however could be used also for quality control by determining how close the results were to the values needed.

Late
12/8/08

II. Narrative Questions

1. Mention any variations in the method that was used in the lab when compared to the specification. (i.e. sample was not immersed 24 hrs)

Weak answer →

Oven-dry may be more than 24 hours.

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)

The samples may have stayed in the oven for about 2 days, but it did not affect the labs much.

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

Any minor errors in our results are attributed to human error such as incorrect weighing or calculation error.

4. How do you verify your results and show some consistency? Can your results be verified?

Good

We could verify the results either by performing the tests several times over with different samples from the stock pile or comparing our results with those of the other groups in the class.

III. Discussion Questions

1. Did you repeat some of these test? Explain

They are referring to repeating la for parameters results calculated

Yes, it was required to repeat lab 2 several times till the SSD was reached.

2. How will these results be useful in making concrete?

Weak →

The results will be useful because every mistake or discovery made will be used to better the concrete.

3. What was the classification of your aggregate?

— The aggregate most closely represents the # 57 stone

4. Did it meet ASTM specifications or standards?

— No, it did not meet the standard, it failed.

5. How will the concrete industry benefit from these tests?

→ It will benefit the industry by ensuring better quality control for the mix designs.

No explanation?? 0P

IV. Conclusion Questions

We achieved our goal for this lab in that we came up with all the parameters required to complete a concrete mix design. All of the parameters found in the aggregate testing lab will have some effect on our concrete mix design, as they will all be used. However, some parameters will have a direct effect on the strength of our mix design. Two of these parameters include total moisture (TM) and absorption (ABS). These parameters will be used in the mix design process to determine the wet weight of the course and fine aggregate, and impacts how much water will be used in the mix. Accuracy of this parameter is critical, as too much or too little water can lower the concrete's strength. The fineness modulus (FM), will also have a direct impact on our mix design, as it will be used to determine the volume of course aggregate for our

Parameters for mix design

Missing!!

Gs(FA) | Gs(CA) | FM(FA)

Those were tabulated to be discussed as discussed in class!!

B. Video Questions:

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?

Video states 3% # 200 Passing 5% - all others

ASTM C33 states that 2.7 % weight of the total sample should pass the No. 200 sieve for concrete subject to abrasion.

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

yes → No, we should not use the same test sample C117 and C136 for an aggregate with a nominal size of ½ inch or less?

I. ASTM C702 Questions are missing!!

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 continue until not more than 1% by weight of the residue on any individual size, will pass that sieve during one minute of continuous sieving.

2. What is the fineness modulus? avg size of sample

Fineness modulus is the sum of the cumulative retained divided by 100.

missing 6" 3" 1.5" 3/4" 3/8"

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

No.4, No.8, No.16, No.30, No.50, No.100, Pan.

The relationship between each consecutive sieve is the difference between the percentages.

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

too big

The total weight of the sample after sieving should be within 3% percent of the total dry weight of sample before sieving.

0.3%

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

This is not worded correctly..

It is considered cumulative because it is the weight retained above the sieve.

all the sieves have to be added above a given sieve

V. ASTM C127 – Specific Gravity and Absorption of course aggregate

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

This method is not intended to be used for lightweight stones, because it tests for the density of the solid portion of the stone and does not take into account the voids within the stone. Since lightweight stones have a higher percentage of voids than regular stone, the calculation would not be accurate for lightweight material.

2. Define the term Saturated Surface Dry.

The term saturated surface dry describes a condition of aggregate in which all of the pores or voids within the aggregate are filled with water; however, the surface of the aggregate is free of any moisture.

3. Define the term absorption.

Absorption can be defined as the weight of water needed to fill the particle holes within the aggregate divided by the weight of solid matter, expressed as a percentage.

4. What difference in calculations are made for specific gravity for SSD and oven dry stones?

When calculating specific gravity for the SSD condition, the SSD weight is divided by the SSD weight minus the submerged weight, whereas the specific gravity for the air dry condition is calculated by dividing the air dry weight by the 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?

Saturated Surface Dry has been reached when the fine aggregate placed in a cone slumps slightly.

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

1/10 of a gram is recommended for recording all of the weights.

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 lamps to avoid hot spots so that uniformity is maintained.

2. Define the term total moisture content.

Total moisture content is obtained by calculating the difference between the weights of the original sample and the weight of the dried sample. The difference is then divided by the weight of the dried sample.

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

The sample is considered to be oven dry when no further weight loss is obtained by further heating.

.10% of its total weight

C. Lab Procedure Questions and Calculations:

I. Lab #1: Specific Gravity and Absorption of Coarse Aggregate (CA) – ASTM C127

Definitions:

Specific Gravity: The ratio of the solid unit weight of that substance to the unit weight of water.

Bulk Specific Gravity: The specific gravity of a substance based on oven-dry weight and saturated, surface-dry volume of the aggregate particles.

Apparent Specific Gravity: The specific gravity of a substance based on oven-dry weight and solid volume of the particles.

Absorption: The percentage of the weight of water needed to fill the pores of aggregate.

Procedure:

An air-dry test sample of coarse aggregate was weighted (g). The test sample was immersed in water at room temperature for ±24 hours. The sample was removed from the water and rolled in a large absorbent cloth until all visible films of water were removed. The sample was weighed to obtain its SSD weight (g). The sample was placed in a wire basket and submerged to obtain its submerged weight (g). Sample was removed from the wire basket. The sample was placed in the oven for ±24 hours and weighed to obtain the oven dry weight (g).

Data:

Weight of Sample – air dry (g) = 4762.72g

Weight of Sample – Submerged (g) = 2993.71g

Weight of Sample – SSD (g) = 4635.71g

Weight of Sample – OD (g) = 4585.82g

How was this calculated!!

Calculations:

Bulk Gs (air dry) = air/SSD – SUB = 4762.72g/4635.71g-2993.71g = 2.90

Bulk Gs (SSD) = SSD/SSD-SUB = 4635.71g/4635.71g-2993.71g = 2.82

Apparent Gs = OD/OD-SUB = 4585.82g/4585.82g-2993.71g = 2.88

Absorption = (SSD – OD/OD) x 100 = (4635.71g – 4585.82g/4585.82g) x 100 = 1.09%

II. Lab#2: Specific Gravity and Absorption of Fine Aggregate (FA) – ASTM C128

Procedure:

A test sample of about 500g of fine aggregate was taken and weighed. To get the air dry weight of the sample it was then covered with water. After mixing the water and fine aggregate together, the sample was spread out on a on a flat nonabsorbent surface and exposed to room temperature air, and was stirred frequently to secure homogeneous drying. These steps were repeated till we had a free flowing condition. The sample was then weight to measure the SSD weight. In the mean while, the pycnometer was filled with water to the top, and weighed. Then part of the water was removed, and the SSD sample put into the pycnometer and it was filled with additional water to approximately 90% of its capacity. The pycnometer was then rolled, inverted, and agitated for about 15 minutes to eliminate all air bubbles. The total weight of the pycnometer, specimen, and water was then measured. The sample was then taken out of the pycnometer and was placed in a container, which was then placed in an oven for 24 hours. After the sample was dried for 24 hours the sample was taken out and measure.

Data:

Air dry weight (AD) = 527.5g

Over dry weight (OD) = 526.68g

SSD weight (SSD) = 530.4g

SUB weight (SUB) = 338.33g

Calculations:

Pycnometer + water + sample weight (PYC) = 1434.6g

Bulk Gs (air dry) = 2.90

Bulk Gs (SSD) = 2.82

Apparent Gs = 2.88

Absorption = 1.09%

Where are these calculations shown??

III. Lab #3: Unit weight and Voids in Aggregate – ASTM C29, C127, C128

Definitions:

Air Voids: The amount of air in a compacted Asphalt Concrete Mixture, expressed as a percentage of total volume of the mixture.

Unit Weight: The weight of an aggregate divided by its volume, expressed as pounds per cubic foot.

Bulk Density: The mass per unit volume of a soil sample expressed as pounds per cubic foot or grams per cubic meter.

Purpose:

The purpose of the lab is to determine the unit weight and voids in aggregate. The result of this experiment will be used in the mixing of asphalt and concrete designs. The percentage voids is determined to obtain the correct volume of fine aggregate needed.

Procedure:

All the weights were measured including the empty weight of the pail. The pail was filled with aggregate in three layers with each layer of aggregate rodded 25 times. The surface of the aggregate is leveled with the tamping rod. The sample is weighed and the net weight of the sample is determined.

Data:

Total weight = 122.8 pounds

Weight of the pail = 19.2 pounds

Net weight of sample = 122.8 – 19.2 = 103.6 pounds

Volume of pail = 1 cubic foot

Calculations:

Dry Rodded Unit weight (DRW) = WT/V

$= (103.6\ \#) / 1\ ft^3$

$= 103.6$ pcf

Void content, $V\% = (Gs_{(AD)} \times 62.4 - DRW) / Gs_{(AD)} \times 62.4$

$Gs = 2.82$

$DRW = 103.6$ pcf

$V\% = (2.82 \times 62.4 - 106.3) / 2.82 \times 62.4$

$= 72.37 / 175.97$

$V\% = 41\ \%$

O.K

IV. Lab #4: Total Moisture Content and Surface Moisture Comtent of Aggregate ASTM C566, C127, and C128

Definitions:

Moisture content: The weight of water expressed as a percentage.
Absorption: The amount of moisture a material can retain.
Surface Moisture: The weight of moisture, present on the exterior of the material.

Procedure:

(The required weights were taken from previous labs. These weights were applied to the given formulas.) A sample of course aggregate was weighed, in its natural environment. A second sample of fine aggregate was also weighed, in its air dry, natural state. These samples were placed in an oven at 110 degrees C for a period of 24 hours. The samples were removed after this period of time and once again weighed.

Data:

Course Aggregate:

Sample weight (air)	4762.72g
Sample weight (oven)	4586.72g

Fine Aggregate:

Sample weight (air)	527.5
Sample weight(oven)	526.68g

Calculations:

Total Moisture = (Air – OD) / OD x 100
Absorption = SSD – OD / OD x 100
Surface Moisture content = Total Moisture – Absorption

Coarse
(Course)
TM = (4762.72 – 4586.72) / 4586.72 x 100 = 3.837 %
ABS = (5117.1 – 4586.72) / 4586.72 x 100 = 11.56 %
Hyg → 3.837 – 11.56 = -7.723
(Fine)
SM → (527.5 - 526.68) / 526.68 x 100 = 0.156
?? → (530.4 – 526.68) / 526.68 x 100 = 0.703

Label your Calculations !!

V. *Lab#5: Sieve Analysis of Coarse Aggregate- ASTM C136*

Procedure:

Dry the sample to constant weight at a temperature of 110° C (230 F) if the sample is lightweight or is suspected of containing appreciable amount s of material finer than a No. 4 sieve. Weigh the dry sample accurately. Weigh each empty sieve and the pan. Nest the suitable sieves in order of decreasing size of opening from top to bottom. Place the pan at the bottom of the set. Sieves: No. 8, No. 4, 3/8 in, ½ in, ¾ in, 1 in, 11/2 in. Place the sample on the top sieve. Place the lid, and agitate the sieves in the mechanical shaker for about 10 min. Weigh the sieves with the material retained. Determining the weight retained in each sieve. The total weight of the material after sieving should check closely with the original weight of the sample. If the amount differs by more than 0.3% (based on the original weight) the results should not be used.

Equipment: *Balance, sieves, mechanical shaker, oven*

Sample: *Coarse Aggregate of weight equal to:*

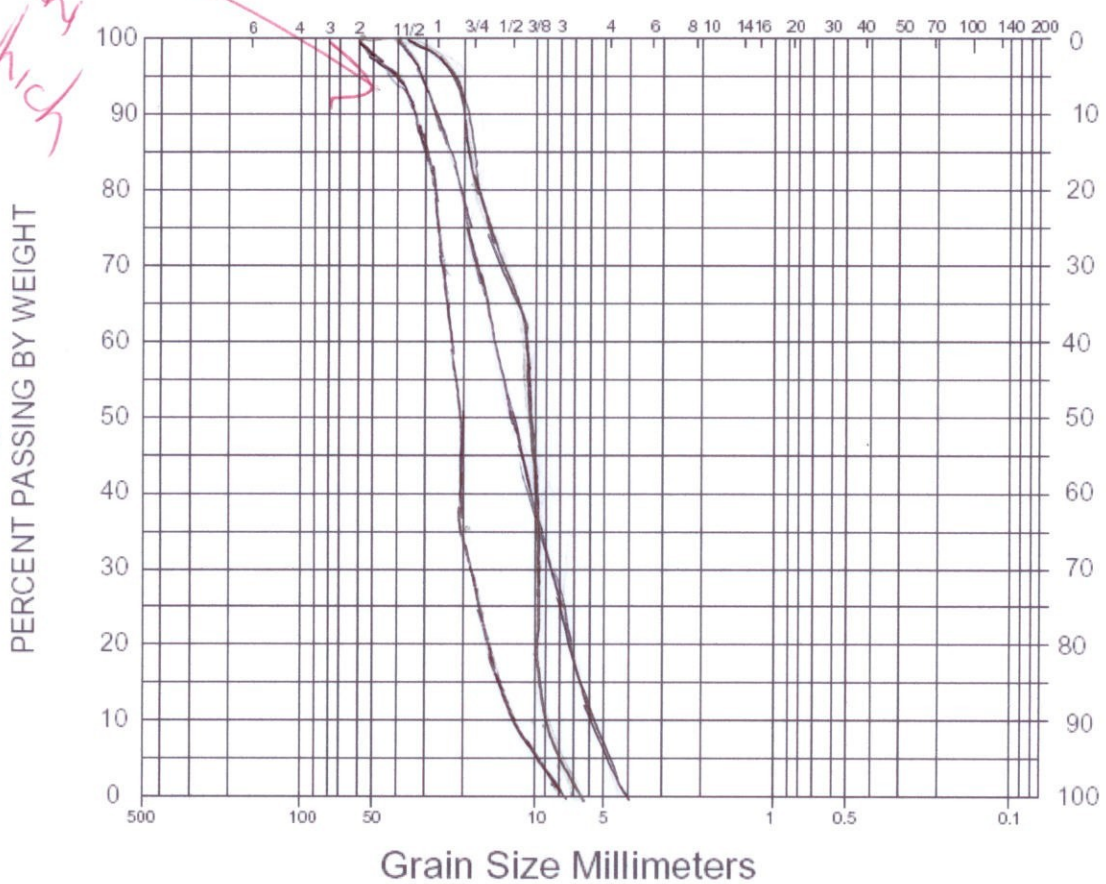
- Tabulate the percentage retained
- Tabulate cumulative percentage
- Tabulate percentage passing
- Draw the gradation curve on the sieve graph
- Draw the upper and lower bound
- Find out the ASTM C33 designation ← Not shown on graph
- Calculate the Fineness Modulus ← Not shown on FM calc sheet
- Find the average sieve
- Find the average size stone ← Not shown
- Determine effective size ← Not shown
- uniformity coefficient ← can't find

SIEVE	WT. RET.	% RET.	%COARSER	%PASS
1 ½"	0.00 lbs	0.0 %	0.0 %	100 %
1"	0.30 lbs	1.42 %	1.42 %	98.58 %
¾"	3.86 lbs	18.22 %	19.64 %	80.36 %
5/8"	3.62 lbs	17.08 %	36.72 %	63.28 %
3/8"	9.61 lbs	45.35 %	82.07 %	17.93 %
¼"	1.87 lbs	8.82 %	90.89 %	9.11 %
1/8"	1.07 lbs	5.05 %	95.94 %	4.06 %
Pan	0.86 lbs	4.06 %	100 %	0.00 %
TOTAL	21.19 lbs	100 %		

Mention here which limits or size designation you are using!!

DR. DAVID WASHINGTON
ASSOCIATE PROFESSOR

U.S. STANDARD SIEVE SIZES



VI. Lab # 6 Sieve Analysis of Fine Aggregate- ASTM C136

Objective:

The main object of this lab is for the students to find the sieve analysis of fine aggregate sieve analysis is a basic essential test for all aggregate technicians. The sieve analysis determined the distribution of aggregate particles, by size within a given sample in order to determine compliance with design and verification specification. The gradation data can be use to calculate relationship between various aggregate and predict trend during production in a nut shell the sieve analysis is a powerful quality control and quality acceptance tool.

Producer:

Dry the sample to constant weight at a temperature of 110 celcius(230F). Weigh the dry sample. Weigh each empty sieve and the pan. Arrange them in decreasing size of opening from largest on top to smallest on bottom. Put sample in the shaker for about 10 min. weigh the sieves with the material retained. Determining the weight of each sieve

Data & Calculations:

% RET = WT. RET / Total Weight x 100

% COARSER = coarser + % ret

% PASS = 100 - % coarser

SIEVE	WT. RET	% RET	% COARSER	% PASS
# 4	27.51	3.74	3.74	96.29
# 8	39.27	5.34	9.08	90.29
# 16	92.21	12.54	21.62	78.38
# 30	208.31	28.32	49.94	50.06
# 50	282.4	38.32	88.33	11.67
# 100	77.87	10.59	98.92	1.08
PAN	7.79	1.08	100	0
TOTAL	735.53	100	271.63	

0, 1<