| | |
|---|---|
| CET431-101 | **CONCRETE TESTING LAB** |
| CONSTRUCION TESTING | PROFESSOR WASHINGTON |
| **NAME OF GROUP** | **IDEAL TESTING LABS** |
| GRADING ITEMS | **COMMENTS** |
| COOPERATIVE LEARNING | ALL MEMBERS OF THE GROUP SEEM TO WORK VERY WELL, WITH MONOR EXCEPTIONS. |
| ESSAY QUESTIONS | GOOD JOB WITH ESSAY QUESTIONS - YOU SEEM TO HAVE A VERY GOOD HANDLE ON WHAT THE OBJECTIVES OF THE LAB. SOME COMMENTS WERE MADE CONCERNING ITEMS THAT WERE MISSING. FOR EXAMPLE IN THE DISCUSSION AND THE CONCLUSION YOU COULD HAVE MENTIONED YOUR LAB RESULTS COMPARED TO THE THE DESIGN, OR EXPLAINED THE TREND OIF CONCRETE BEHAVIOR WHEH COMPARED TO OTHER GROUP BATCHING FOR DIFFERENT STRENGTHS. |
| VIDEO QUESTIONS. | SEPARATE GRADE |
| LAB CALCULATIONS | YOUR GRAPHS WERE VERY CONFUSING BUT I DID APPRECIATE YOUR ATTEMEPT TO SHOW A TREND IN EXCEL. YOUR CALCULATIONS DID NOT SHOW HOW YOU USE YOUR RAW DATA FROM THE EXPERIMENTS. YOU SHOWED GRAPHS THAT I DID NOT REQUEST AND THERE WAS NO EXPLAINATION AS TO WHAT YOU WERE DEMONSTRATING. YOUR E SHOULD HAVE BEEN CLOSE TO $3X10^6$ PSI |
| FINAL LETTER GRADE | B+ |

# CONCRETE LAB

NAME OF GROUP: Ideal Testing Labs

LIST OF OTHERS IN YOUR GROUP:

Peter Cecko
Valerie Lopez
Rob Sgobbo
John Wesley
Hillary Zaenchik (captain)
Sasa Zonie

Directions: The following formal lab write-up will be used to put together your final report for concrete. Each GROUP is responsible for submitting this write-up for grading. Answer all of the following sections and submit your work along with this document. Each write-up should be done TOGETHER with shared data from other GROUPS. The final grade for this write-up will partially be based on the correct use of grammar.

Directions: Answer the following essay type questions justifying your explanations with the appropriate references and standards as needed. Please type or print all of your answers for the following section.

A. Essay Questions

I. Objective and Introductory Questions

(Try to answer these question before performing the test)

1. What is the overall objective of this lab? What will be done with the results of these tests?
   - The overall objective of this lab is to determine if the test sample of concrete is within the desired specifications. Also to familiarize ourselves with ASTM testing procedure for concrete mixing and sampling.

Mention ACI 211

2. Why is there a need for doing these type of test? How important are these test?
   - These tests are needed to ensure that an acceptable quality concrete product is produced. This means that the concrete product will perform as needed and as defined in the design specifications. For example, to ensure that the desired compressive strength is obtained. These tests are a method of quality control for the concrete producers. These tests are important for quality control.

3. What is the relationship of water to cement ratio to the design of concrete strength?
   - Water is the key ingredient, which when mixed with cement, forms a paste that binds the aggregate together. The water causes the hardening of concrete through a process called hydration. The role of water is important because the water to cement ratio is the most critical factor in the production of quality concrete. Excess water reduces concrete strength, while too little will make the concrete unworkable. Concrete needs to be workable so that it may be consolidated and shaped into different forms. Concrete must be both strong and workable, a careful balance of the cement to water ratio is required when making concrete.

Very good

**II. Narrative Questions**

**(Try to answer these questions during or after performing the test)**

1. List all the tests that were performed with its related specifications.
   - Lab#1: Slump test of Portland Cement Concrete ASTM C143,C172
   - Lab#2:Compression Test of Concrete Cylinders ASTM C39,C192,C617
   - Lab#3: Static Modulus of Elasticity and Stress-Strain Curve of Concrete ASTM C469, C39, C192, C617
   - Lab#4:Splitting Tensile Strength of Concrete ASTM C496,C192

2. 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)
   - The aggregate was mot immersed for 24 hours prior to the experiment. How does it effe your mix design
   - The aggregate properties were taken from our prior experiments. If we were doing this correctly I would assume that we would need to have calculated the properties of the current sand and aggregates. We assumed that the aggregates have not changed since that experiment.

3. 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)
   - We did not use a sample splitter machine. The moisture content at the time of mixing the concrete was not taken. Over the course of the several weeks conditions may have changed such as moisture content, new batch of aggregate may have been delivered, etc.

4. Are there any test that can be performed another way or using another method?
   - In obtaining a smaller sample we could have used quartering or we could have used the splitter machine.
   - Instead of determining the proportions by volume we could have determined the proportions by mass.

5. What factors contributed to possible errors in your results?
   - Current aggregrate properties were assumed to be the same as before. The smaller sample was not correctly obtained. A small portion of water was added at the last minute as it appeared that there was insuficient moisture in the mix.. This additional water was not measured. The concrete that was supplied was 'High Early Strength'. The calculations did not take this in to account.

6. What other test can be performed to verify your results? Can your results be verified?
   - The results can be verified by specification books. What is this? Explain

**III. Discussion Questions**

1. Were all of your results accurate enough or is there a need to repeat some these tests? Explain.
   - All of the tests done with the samples from our group were within the expected range. Some of the cylinders that broke earlier than the theoretical expected numbers had a problem.

2. How will these results be useful for determining concrete strength and durability?
   - These numbers can be used to project the expected performance characteristics of the concrete.

3. Does your concrete pass or fail the specifications or standards?
   - The numbers for our concrete falls within the expected parameters, therefore it passes the criteria. Tell us those values!

4. How will the industry benefit from these tests?
   - Having concrete perform as expected will give the industry more credibility. If a product is requested we can be sure that it would conform with the specifications and expectations.

**IV. Conclusion Questions**

Compare your design values to your actual values!!

1. Did you achieve your objective or goal? Why or Why not?
   - Our goals were achieved as our numbers were within the expected parameters.

2. What important observation can be made about concrete as a result of performing these tests?
   - Concrete can be used for a wide range of conditions. Depending on what is need the mix design can be altered to fit the condition.

**B. Concrete**

**Lab Procedure Questions and Calculations**

**I. *Lab#1: Slump test of Portland Cement Concrete ASTM C143,C172***

1. What is the purpose of this test?
   - The purpose of the Slump Test is for workability and consistency of meeting the psi required for new and fresh concrete mix. If the sample concrete repeatedly breaks away or slumps downward from the cone shape, then the sample fails the test, thus lacking cohesion properties in the mix. Hence, if the Slump Test is greater than the ASTM standards, then this is not an acceptable mix.

2. Define Slump for concrete.
   - Slump in concrete is defined as the downward movement of the concrete as the cone (mold) is removed from the concrete. It is measured from the original top of concrete location down to the location where the top of concrete ended up.

*Procedure:*

*Equipment: Slump Mold, Tamping Rod (5/8 in. dia) , pan, scale, shovel ,hand scoop*
*Sample: Minimum 0.3 $ft^3$ of plastic concrete.*

*a. Start the test within 5 min. after obtaining the final portion of the composite sample*
*b. Dampen the mold and place it on a flat moist pan.*
*c. Hold the mold firmly in place during filling ( by the operator standing on the two foot pieces)*
*d. Fill the mold in three layers, each approximately one -third the volume of the mold.*
*e. Rod each layer with 25 strokes of the tamping rod. In filling and rodding the top layer, heap the concrete above the mold before rodding is started.*
*f. Strike off the surface by screeding and a rolling motion of the tamping rod.*
*g. Remove the mold immediately by raising it in a vertical direction. ( The entire test , from the start of the filling through removal of the mold, should be completed within 2.5 min)*

***Lab#1-continued***

*h. Place the empty mold (upside down) adjacent to the concrete sample and measure the vertical difference between the top of the mold and the displaced original center of the top surface of the specimen. This is slump.*

3. What is the slump in inches to the nearest .25 in.? Was it the same as your design slump?
   - Our slump was 4.50 inches. Our expected slump was 5"

**II. *Lab#2:Compression Test of Concrete Cylinders ASTM C39,C192,C617***

1.What is the purpose of this test?
- This test determines whether the concrete will have quality performance, quality control, quality assurance and customers' request and requirement by testing the concrete in its compressive strength.
- *Given the plan specification of a given psi, a cylinder meeting its guidelines will have an acceptable design mix, thus an acceptable quality assurance.*

2.Define compressive strength as it pertains to concrete?
- Compressive Strength is imperative to this test. It is defined as the measured maximum resistance to axial loading, expressed as force per unit of cross-sectional area in pounds per square inch (psi).

*Procedure:*

*Equipment: Universal testing machine or compressometer.*
*Sample: A concrete cylinder*

*a. Compression tests are made as soon as practicable after removal from moist storage. The specimens are tested in moist condition.*
*b. Wipe clean the bearing faces of the upper and lower bearing blocks and of the test specimen.*
*c.Place the specimen on the lower bearing block.*
*d. Carefully align the axis of the specimen with the center of thrust of the spherically seated upper block.*
*e. Bring the upper block to bear on the specimen. Adjust the load to obtain uniform seating.*
*f. Apply the load at a loading rate of 20 to 50 psi/s. (Time to failure for 3000-psi concrete is 1 to 2.5 m, and for 6000-psi concrete is 2 to 5m.)*
*g. Apply the load ( at the designated rate) until the specimen fails*

3. What is the recorded maximum load? Is it the same as your design load?
   - 1st Cylinder Test: theoretical # = 113080, Breakpoint # 145820

4. What is the type of failure for each sample that was crushed?(i.e. cone, shear, split or columnar, cone and shear , cone and split)
   - 1st Cylinder Test was a CONE BACK split.

**III.***Lab#3: Static Modulus of Elasticity and Stress-Strain Curve of Concrete ASTM C469, C39, C192, C617*

1. What is the purpose of this test ?
   - The purpose of this test is to record the result of our concrete cylinder samples, which will aid the data obtained. The test will also give us the necessary information and relationship to stiffness. Such data will support Young's modulus of Elasticity = E = s/ϵ.

–

2. Define Young's modulus of Elasticity?
   - Young's Modulus of Elasticity is constant value of stress divided by strain.

     E = s/ϵ thus $\frac{\text{lbs./per sq. in}}{\text{ratio}}$ = lbs./per sq. in.

     E = Modulus of Elasticity
     s = Stress
     ϵ = Strain

O,K

   - The modulus of elasticity indicates the stiffness or resistance to movement of a material. A stiff material deforms les under a given stress than does a material of les stiffness.

***Lab#3- continued***

*Procedure:*

*Equipment: Compression testing machine, compressometer.*

*Sample: 6x12 concrete cylinders, capped and kept in moist condition*

*a. Determine the compression strength and unit weight of the sample using the compression specimens.*
*b. Attach the compressometer to the test cylinder.*
*c.Place the specimen (with the compressometer) on the lower platen of the testing machine.*
*d. Carefully align the axis of the specimen with the center of thrust of the upper block of the testing machine*
*e. Lower the upper block slowly to bear on the specimen, and rotate the block gently by hand so that uniform seating is obtained.*
*f. Get the compressometer set up ready for deformation reading*
*g. Load the specimen at a rate of 35+/- 5 psi/s.*
*h. Upon reaching a load of about 20% of ultimate load, reduce the load to zero(at the same rate as the loading rate), and note down the dial gage reading.*
*i. If the dial gage reading (deformation) is not zero, repeat g and h until the dial gage, upon loading, is zero.*
*j. Start the final loading cycle and continue the loading until the maximum.*
*k. Record, without interruption in loading, applied load and longitudinal deformation at set intervals.*
*l. Calculate stress and strain follows:*

$$stress = \frac{load}{cross-sectional\ area\ of\ cylinder}$$

$deformation, d = g \times I$

where $g$ is the dial gage reading and

$I = \frac{e_1}{e_1 + e_2}$ where $e_1$ is the eccentric-ity of the axis of the specimen and $e_2$ is the eccentricity of the dial gage from the axis of the specimen

$$Strain = \frac{d}{gage\ length}$$

*Note: Gage length is the length between gage points(generally equal to 6 in.)*

***Lab#3-continued***

~~m. Plot the stress- strain curve.~~ ***Per Dr. Washington. Could not attain other lab group data.*** you don't need it for this portion of the lab!!

n. Calculate E to the nearest 50, 000psi as follows:

$$E = \frac{S_2 - S_1}{\varepsilon_2 - 0.00005}$$

where $S_2$ is the stress corresponding to 40 % of ultimate load, $S_1$ the stress corresponding to a strain of 0.00005, and $\epsilon_2$ the strain at a stress of $S_2$

3. What is the compressive strength, and unit weight of the concrete?

- Ideal's compressive strength for 7-day is 5158 psi, and on its 28-day is 5595 psi.
- Ideal's Unit Weight is 150 pcf.

4. Show the stress-strain diagram and determine measurement of E.

- Ideal's stress-strain diagram (**please see attached excel sheet**).
- The measurement of E for Ideal is: **8.10 psi**

→ should be 10^6 inpsi

**IV. *Lab#4:Splitting Tensile Strength of Concrete ASTM C496,C192***

1.What is the purpose of this test?

- The purpose of this test is to show how tensile stress will effect at a different rate than compression stress. It will help aid the group in comprehending the forces or load placed upon the concrete in different areas, as well as design the appropriate methods of the mix.

2.Define splitting tensile strength as it pertains to concrete?

- Splitting tensile strength pertaining to concrete is used to evaluate the shear stress of the concrete. The force applied to the cylinder is lengthwise as oppose to a vertical force.

*Procedure:*
*Equipment: Compression testing machine, 1/8 inch thick plywood bearing strips (of length slightly longer than that of the specimens and 1in. wide); two needed.*

*Sample: A concrete cylindrical specimen*

*a. Determine the unit weight and the compressive strength of concrete cylindrical specimens.*
*2. Draw diametral lines on each end of the specimen so that they are in the same axial plane.*
*3. Center one of the plywood strips along the center of the lower bearing block.*
*4. Place the specimen on the plywood strip and align so that the lines marked on the ends are vertical and centered over the plywood strips.*
*5. Place the second plywood strip lengthwise4 on the cylinder, centered on the lines marked on the ends.*
*6. Apply the load continuously at a constant rate of 100 to 200 psi/m of splitting tensile stress until the failure(about 3 to 6 min./test)*
*7. Record the maximum load at failure, P.*
*8. Calculate the splitting tensile strength, $f_t$, as*

***Lab#4- continued***

$$f_t = \frac{2P}{\pi l d}$$

o.k

**IDEAL**: 53,000lbs

$$f_t = \frac{(2)(53{,}000\text{lbs})}{3.14(12\text{in.})(6\text{in.})} = \mathbf{468.86psi}$$

3. What is the splitting tensile strength?

- Developed in Brazil and standardized by ASTM C95, the test gives a splitting tensile strength value which is about 15 percent higher than values obtained through direct tensile test.

ok

- Splitting tensile strength is a method utilizes standard 6-by-12 in. cylinders which are loaded along the length of the cylinder. The splitting tensile strength is determined by using a formula based on the theory of elasticity.

Where $f'_{sp}$ = splitting tensile strength, psi
$P$ = maximum load, lb
$l$ = length of cylinder, in.
$d$ = diameter of cylinder, in.

**C. APPENDIX**

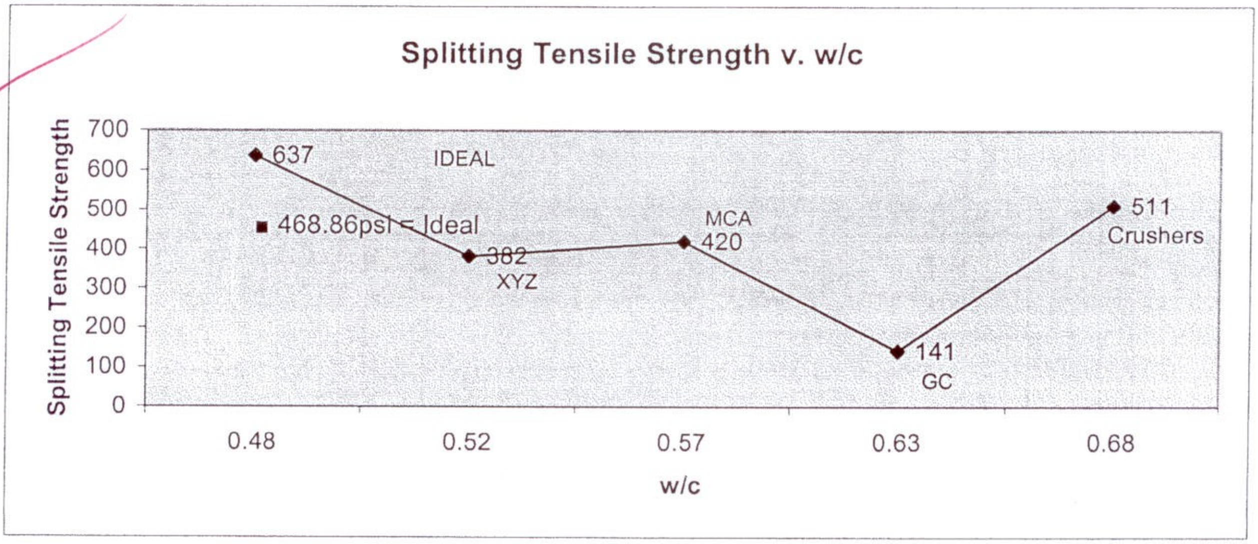
**INCLUDE FIVE GRAPHS, INCORPORATING THE DATA FROM ALL THE GROUPS IN YOUR APPENDIX AND DISCUSS THE SIGNIFICANCE OF THEM IN YOUR DISCUSSION:**

**SLUMP VS. W/C**
**STRENGTH VS. W/C**
**SPLITTING TENSILE STRENGTH VS. W/C**
**STRESS VS. STRAIN**
**7- DAY STRENGTH VS. W/C**

# SPLITING TESNILE STRENGTH vs. w/c
ASTM C496, ASTM C192

| | | | | | LAB NO. 2 | LAB NO. 4 | | |
|---|---|---|---|---|---|---|---|---|
| Group | Break | f'c | Slump | | Compression | Split | | Pel |
| Name | Point | | inches | w/c | Stress | Tensile (lbs) | 28 Day | 0.00005 |
| Crushers | 110730 | 3000 | 2 | 0.68 | 3917 | 511 | 4133 | |
| GC | 26207 | 3500 | 3 | 0.63 | 927 | 141 | comparable | |
| Ideal | 145820 | 5000 | 5 | 0.48 | 5158 | 637 | 5595 | 1.1E+08 |
| MCA | 90500 | 4000 | 3 | 0.57 | 3201 | 420 | 4270 | 1.03E+08 |
| XYZ | 2673 | 4500 | 5 | 0.52 | 2450 | 382 | 3475 | |
| | | | | | | | | Ec 40% |
| | | | | | | | | |

| | |
|---|---|
| 0.48 | 637 |
| 0.52 | 382 |
| 0.57 | 420 |
| 0.63 | 141 |
| 0.68 | 511 |




***Splitting tensile strength pertaining to concrete is used to evaluate the shear stress of the concrete. The force applied to the cylinder is lengthwise as oppose to a vertical force.***

1) GC failed its splitting tensile strength as it broke immediately after more than the 7-day test.

$$f_t = \frac{2P}{\pi l d}$$

**IDEAL**: 53,000lbs

$$f_t = \frac{(2)(53{,}000\text{lbs})}{3.14(12\text{in.})(6\text{in.})} = \mathbf{468.86psi}$$

There are three typical definitions of tensile strength:

Yield strength: The stress at which material strain changes from elastic deformation to plastic deformation, causing it to deform permanently.

Ultimate strength: The maximum stress a material can withstand.

Breaking strength: The stress coordinate on the stress-strain curve at the point of rupture.

# Ideal Aggregate Data

Air Entrained, f'c = 5000 psi
Max agg = 3/4"
Slump = 5' - Non-air entrained
Non-air Entrained MODERATE EXPOSURE

| | Gs | FM | DRW | %Abs | MC |
|---|---|---|---|---|---|
| CA | 2.77 | | 109.7 | 1.14 | 0.271 |
| FA | 2.7 | 2.44 | | 0.4 | 1.1 |

**Step 1:** Table 6.3.1 = Slump 5"
**Step 2:** Max agg. = 3/4"
**Step 3:** Table 6.3.3., Estimate water = 340 + 360/2
**Step 4:** Table 6.3.4a = .48
**Step 5:** w/c ratio 350/.48 729.17
**Step 6:** from FM (6.3.6) 2.44 0.65
(.65)(27cft/cy)(109.7) 1925.24
**Step 7:** a) 2% x 27 0.54
b) 350/62.4 5.61

c) 729.17/3.15(62.4) 3.71
d) 1925.24/2.77(62.4) 11.14
e) 27-0.54-5.61-3.71-11.14=
f) 2.70*6*62.4 1010.88

**Step 8:** CA = 1925.24(1 + .0114+.00271)
1952.405

FA = 1011(1+.004+.011)
1026.165

Net Water
CA = 1952.405(.00271)
5.29263
FA = 1026.165(.011)
11.286

16.57863
298.4214

350 Air = 2%

| | 11 | 7 | | 8 | | 10 | 9 |
|---|---|---|---|---|---|---|---|
| | Vol. Dry Basis Flyash (cft) | Vol. Dry Basis w/o Flyash (cft) | | Weight Dry Basis w/o Flyash (lbs) | Weight Wet Basis w/o Flash (lbs) | Weight Wet Basis w/ Flyash (lbs) | Weight Wet Basis w/o flyash (lbs) |
| | | 0.54cft | Air | 0 | 0 | | 0 |
| | | 5.61cft | Water | 350 | 298 | | 12 |
| | | 0 | flyash | 0 | 0 | | 0 |
| | | 3.71cft | Cement | 729 | 729 | | 29 |
| 6 | | 11.14cft | CA | 1925 | 1953 | | 78 |
| | | 6cft | FA | 1011 | 1026 | | 41 |
| | | | | | | | |

**Step 9:** Cylindar
vol. = 3.14r2h 1.05 / 27 0.038889 0.04
Vol. x5x1.05

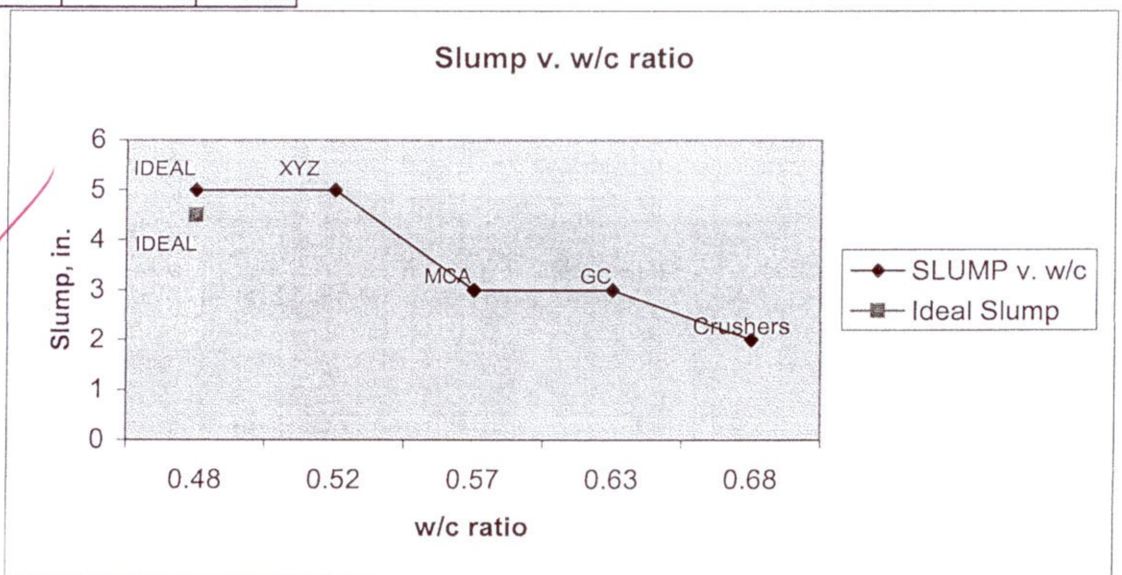
**Step 10:** Flyash none given
**Step 11:** Volume none given

SLUMP v. w/c
ASTM C143 and ASTM C172



| | | | | | LAB NO. 2 | LAB NO. 4 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Group | Break | f'c | Slump | | Compression | Split | | Pel | |
| Name | Point | | inches | w/c | Stress | Tensile (lbs) | 28 Day | 0.00005 | Ec 40% |
| Crushers | 110730 | 3000 | 2 | 0.68 | 3917 | 511 | 4133 | | |
| GC | 26207 | 3500 | 3 | 0.63 | 927 | 141 | comparable | | |
| Ideal | 145820 | 5000 | 5 | 0.48 | 5158 | 637 | 5595 | 1.1E+08 | |
| MCA | 90500 | 4000 | 3 | 0.57 | 3201 | 420 | 4270 | 1E+08 | |
| XYZ | 2673 | 4500 | 5 | 0.52 | 2450 | 382 | 3475 | | |

| Data for Slump v. w/c | | | |
|---|---|---|---|
| Ideal | 5 | 0.48 | 4.5 |
| XYZ | 5 | 0.52 | |
| MCA | 3 | 0.57 | |
| GC | 3 | 0.63 | |
| Crushers | 2 | 0.68 | |




**NOTE:**

*Slump test is necessary in concrete mix for* *consistency*, *workability*, *and* *air content*.
*If the slump of concrete is controlled, the consistency and workability necessary for proper placement and indirectly the water-cement ratio. Changes in water content have a pronounced effect on slump.*
*1) Ideal's theoretical aggregate data for slump was 5". After removing the cone Ideal slump data is 4.5".*

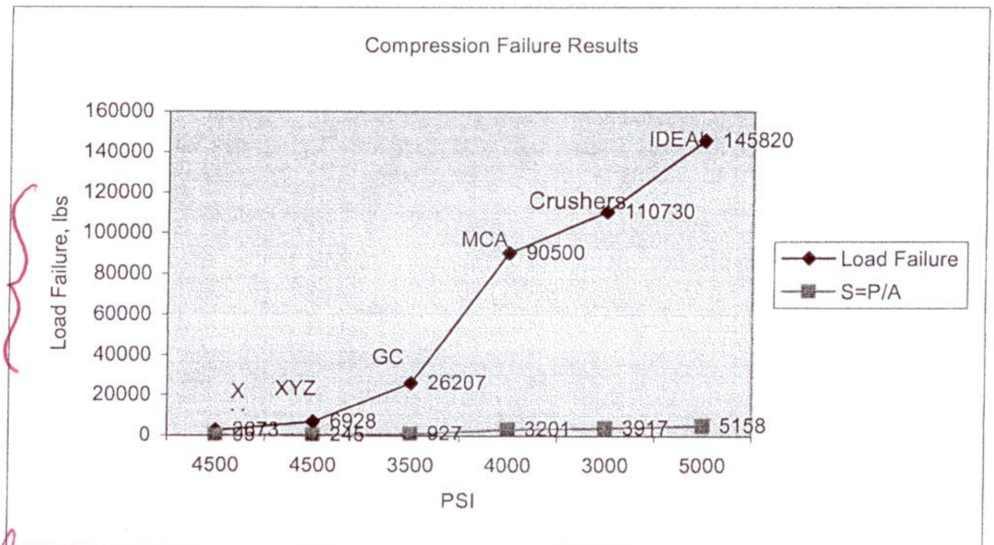
*Possible data error: No Data acquired from other lab groups after the cone test. Thus our slump data is the theoretical # as oppose to the exact slump #. Error in this particular lab is that there was NO control person assigned to take data from all the lab groups.*

Lab #2

## COMPRESSION FAILURE RESULTS
## ASTM C39, ASTM C192, ASTM C617

| Group | Theroretical number | Load Failure | f'c | Type of Break Break | S = P/A (sq. in) 28.27 |
|---|---|---|---|---|---|
| Crushers | 67848 | 110730 | 3000 | Shear | 3917 |
| GC | 76384 | 26207 | 3500 | | 927 |
| MCA | 90464 | 90500 | 4000 | cone & shear | 3201 |
| XYZ | 101772 | 2673 | 4500 | | 95 |
| | | 6928 | 4500 | | 245 |
| Ideal | 113080 | 145820 | 5000 | Cone | 5158 |

| Load Failure | f'c | S=P/A(28.27sq.in) | |
|---|---|---|---|
| 2673 | 4500 | 95 | XYZ |
| 6928 | 4500 | 245 | XYZ |
| 26207 | 3500 | 927 | GC |
| 90500 | 4000 | 3201 | MCA |
| 110730 | 3000 | 3917 | Crushers |
| 145820 | 5000 | 5158 | Ideal |



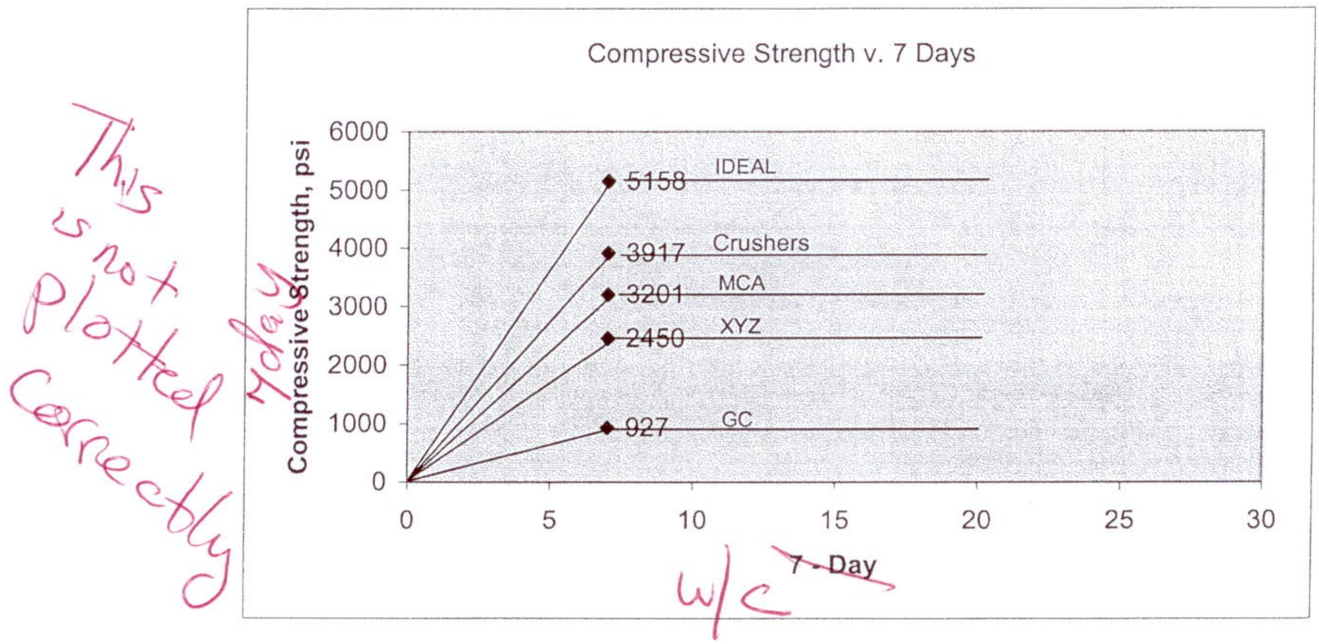

This is not one of the requested graphs

**NOTE:**

1) Compression Strength: S=P/A, P = Load in lbs, A= Are in sq. in = 28.27 sq.in.
2) XYZ's compression test **failed** immediately in the 7-days compression test.
3) XYX did not meet its group concrete mix requirements.
4) Whereas, Ideal, GC, MCA, and Crushers met their group specification under ASTM C143 and C172.

COMPRESSION FAILURE RESULTS
ASTM C39, ASTM C192, ASTM C617

| | | | | | LAB NO. 2 | LAB NO. 4 | | |
|---|---|---|---|---|---|---|---|---|
| Group | Break | f'c | Slump | | Compressio | Split | | Days |
| Name | Point | | inches | w/c | Stress-7day | Tensile (lbs | 28 Day | 0 |
| Crushers | 110730 | 3000 | 2 | 0.68 | 3917 | 511 | 4133 | 7 |
| GC | 26207 | 3500 | 3 | 0.63 | 927 | 141 | comparabl | 7 |
| Ideal | 145820 | 5000 | 5 | 0.48 | 5158 | 637 | 5595 | 7 |
| MCA | 90500 | 4000 | 3 | 0.57 | 3201 | 420 | 4270 | 7 |
| XYZ | 2673 | 4500 | 5 | 0.52 | 2450 | 382 | 3475 | 7 |
| | | | | | | | | 28 |

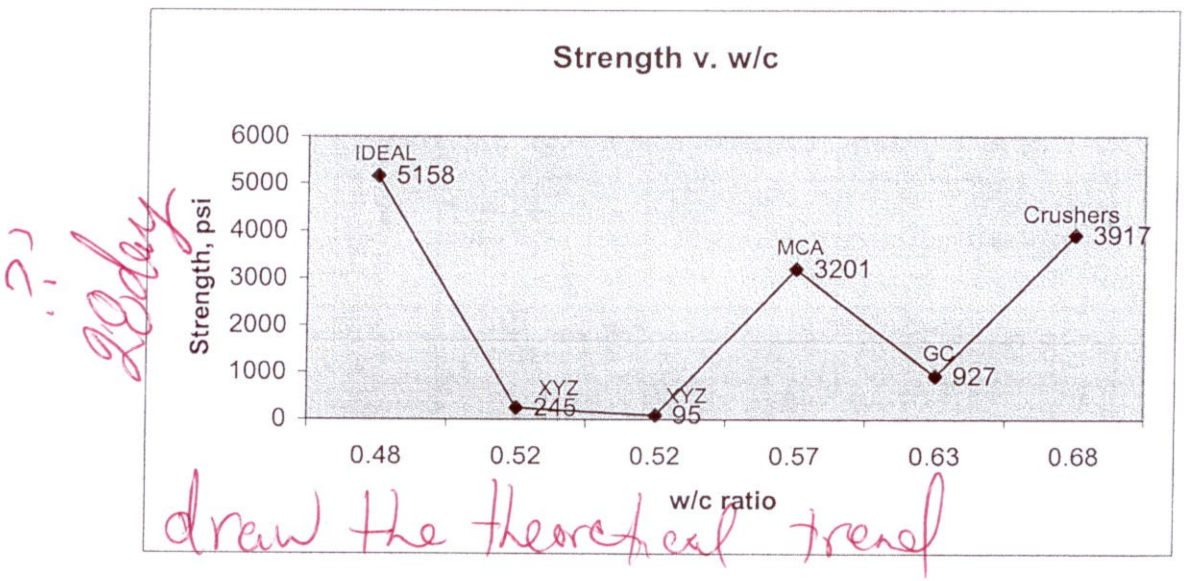



**NOTE:**

1) 7 Day test for compressive strength.
2) Formula: s = P/A, s= compressive strength, P = load in l, A = area in sq. in, = 28.27sq. In.
3) Cylinder 6in. X 12in.
4) XYZ **failed** immediately in its 7-day compression test.
5) XYX did not meet its group concrete mix requirements.
6) GC also **failed** in its 7-day compression test.
7) Whereas, Ideal, MCA, and Crushers met their group specification under ASTM C143 and C172.

| Group Name | Break Point (P,lbs) | f'c (psi) | Slump inches | w/c | LAB NO. 2 Compression Stress S=P/(A,sq.in) A = 28.27sq.in. | LAB NO. 4 Split Tensile (psi) | 7 Day (psi) | 28 Day (psi) |
|---|---|---|---|---|---|---|---|---|
| Crushers | 110730 | 3000 | 2 | 0.68 | 3917 | 511 | 3917 | 4133 |
| GC | 26207 | 3500 | 3 | 0.63 | 927 | 141 | 927 | comparable |
| Ideal | 145820 | 5000 | 5 | 0.48 | 5158 | 637 | 5158 | 5595 |
| MCA | 90500 | 4000 | 3 | 0.57 | 3201 | 420 | 3201 | 4270 |
| XYZ | 2673 | 4500 | 5 | 0.52 | 95 | 382 | 95 | 3475 |
| XYZ | 6928 | | | | 245 | | 245 | |

| Data for S=P/A - 7 days | | |
|---|---|---|
| Ideal | 0.48 | 5158 |
| XYZ | 0.52 | 245 |
| XYZ | 0.52 | 95 |
| MCA | 0.57 | 3201 |
| GC | 0.63 | 927 |
| Crushers | 0.68 | 3917 |




**NOTE:**

1) Strength was performed in Lab #2 utilizing the 7-day cylinder compression test.

2) This graph indicates that the Strength v. w/c of XYZ failed its 7-day compressive strength. The group measured its Strength v. w/c ratio at 245psi/0.52 and a second test at 95psi/0.52. Thus, failing to meet its group theoretical requirement of 3500psi.

***Its concrete mix is unacceptable at the 7-day compressive test.***

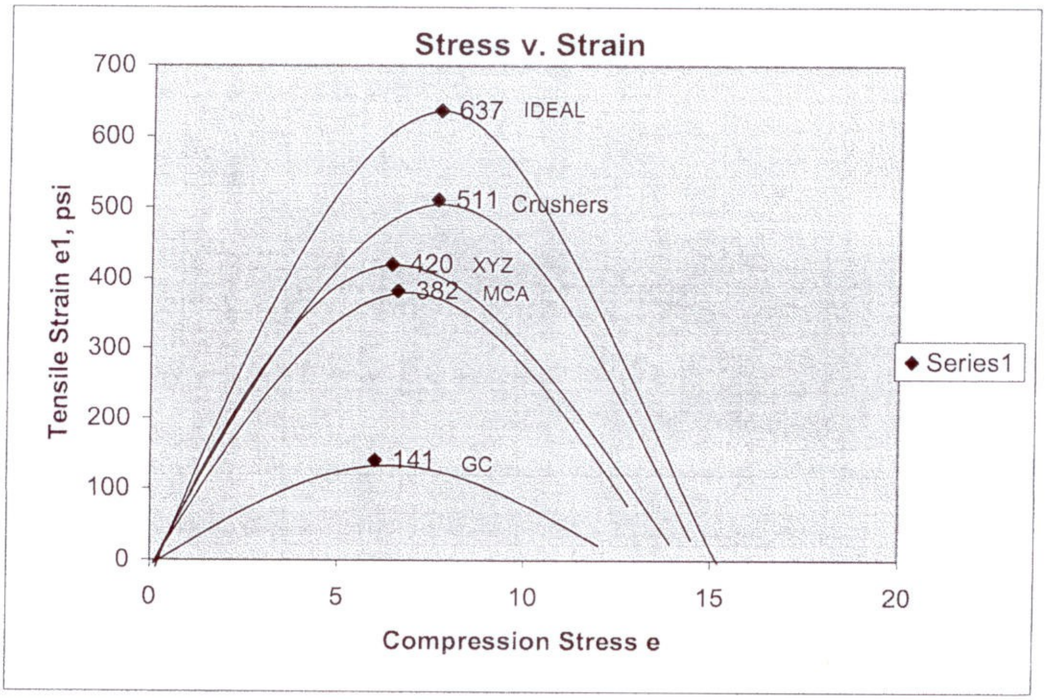
3) Moreover, GC failed its 7-day compressive strength. The group measures its Strength v. w/c ratio at 927psi/0.63. Whereas the group's theoretical measure was at 3500psi.

***Its concrete mix is unacceptable at 7-day compressive test.***

STRESS v. STRAIN
ASTM C469, ASTM C39, ASTM C192

| | LAB NO. 2 | LAB NO. 4 | |
|---|---|---|---|
| Group | Compression | Split | |
| Name | Stress-7 Day | Tensile (lbs) | $\epsilon$ = Stress/Strain |
| | $\epsilon_2$ | $\epsilon_1$ | $\epsilon = (\epsilon_2)/(\epsilon_1)$ |
| | | | 6 |
| GC | 927 | 141 | 6.57 |
| XYZ | 2450 | 382 | 6.41 |
| MCA | 3201 | 420 | 7.62 |
| Crushers | 3917 | 511 | 7.67 |
| Ideal | 5158 | 637 | 8.10 |
| | | | 15 |

O.K.




$$E = \frac{S_2 - S_1}{\varepsilon_2 - 0.00005}$$

**NOTE:**

1) We were unable to obtain other lab group datas for this particular part of the lab.