Texas A&M University-Kingsville

The Frank H. Dotterweich COE

CEEN 3145-102 Construction Material Laboratory

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Term project

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Ayat Hamide	Apparatus, Temperature & humidity, Preparation of samples.
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Soud Alzufairi	Process, Method (summary), Procedure
Marissa De Leon	Scope, Significance & Use, Materials
Omar Chavarria	Method, Theories, Analysis, Report, & Calculation

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Section I

Method

The method proposed was similar to how a flow table works. Where the cement will be dropped and experience a force that will disperse the cement until we can measure the diameter of the cement mix. Our method was to instead of dropping the cement multiple times was to place the cement onto a non-porcelain slab then drop a rubber mallet from a fixed height onto the slab an equal amount of times on each side of the square slab. When this method was tested through trial and error of dropping the slab a certain amount of times and testing which height will be good we finalized the correct method on the sixth attempt. The final method was to drop the rubber mallet from 23 in high and let it free fall onto the square slab 20 times on each side of the slab for a total of 80 drops all from 23 inches above the slab.

Theories

Our primary goal was to create a new test procedure in order to replace ASTM C1437, by doing so we needed to apply a similar method towards our proposed test procedure. Our main theory towards this method was it will evenly disperse the cement mix since we have three constants and no variables in our method. This consisted of dropping a rubber mallet onto glass which had our cement mortar mix in the middle. The three constants were the height, number of times dropped, and dropped on each side. With this method, cement will evenly be dispersed by dropping the mallet 20-25 times on each of the four corners which will get us to our target diameter we looked for. So in theory the cement won't splatter, it won't spread too much, and it will spread to the correct diameter showing the cement mix was good.

Analysis

First we started with 650 g of mortar mix and 105mL of water mixed together to form the cement mix. After placing the cement mix into the mortar table and testing the mix the diameter came out to an average of 227.5 cm. Then came our proposed method in the first trial the height was at 25 inches which caused the cement to splatter which meant no results. The same issue came for our 2nd and 3rd attempt when the hammer was raised to higher heights. Then for the 4th and 5th tests the results were coming out inconsistent and the cement wouldn't flow much since there was foam under the slab softening the vibration. Lastly, for the 6th attempt, I dropped the hammer on each side from a fixed height and 20 times got the results we were looking for which was 227.5 cm in diameter.

Process

After several researches and discussions with group members to find an idea for this term project, we finally came out with an idea that helps us to develop and design our new test. The idea was that to find the flow of cement mortar without using the mortar-flow table. First, we collected the wood, small and large glass flat surface, rubber mallet, a long roller, and we created a mold from a small disposed pipe so we can fill it with our cement mortar mix and that all we needed to create our new project idea. The first idea was to put the cement mortar mix in the mold with a small glass under the mold in a specific height of the roller and then we pull the glass so the mortar mix will drop in the large glass. However, this test failed because the mortar mix spread out all around the place. Then, we came out with our new idea which was we place the mold on top of a 12”x12” glass surface and we fill the mold with a mortar mix and tamp it and remove the mold, then we placed the rubber mallet in a height of 23” using a long roller and drop the rubber

mallet 20 times in each side of the glass. This idea worked perfectly fine so we decided to use this idea to demonstrate our term project test.

Section II

Scope

The method described in this report is a test our group came up with to determine Mortar Mix flow. Units are to be measured and calculated in SI units. It is important to handle your mixture with safety standards in mind when working with mortar mix. These standards include, but are not limited to: maintaining coverage of skin, wearing gloves when handling mix, and disposing of mix properly.

Method (summary)

After we created our project device for mortar mix testing, we started working on the test. First, we took 0.65 kg of mortar cement and 105 ml of water and we mixed them properly. Then, we used the flow-table to test our cement mortar mix and we got the diameter results as 180, 185, 180, and 182 with an average of 181.75. Then, we used our project device to test our mortar mix. First, we took the mortar mix back to the bowl and then we set up our project device by centering the plastic mold in the flat surface (glass plate). Then, we filled the mold with the cement mortar mix and tamped 25 times. We removed the mold and we dropped the rubber mallet at height 23" 80 times. We dropped the rubber mallet 20 times on each side. Then, we got our method's results for the diameter as 175, 175, 165, and 168 with an average of 170.75. We compared our project device data with the flow-table data and they were close and that means our project device is valid for testing the cement mortar mix.

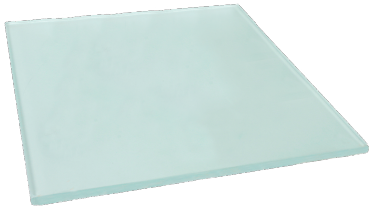
Significance & Use

The test method we created is significant because it is useful and simple to determine mortar mix flow without the use of a mortar flow table. Not only is it simple, but it contains materials individuals may already own, or can easily purchase for a low enough cost. The use of this test method is to ensure mortar flow is meeting the requirements of water content and flow level for the project at hand.

Apparatus

Hydraulic flow Apparatus

- 12” x 12” Glass plate



- Rubber mallet

- mole (PVC pipe)

- Yardstick

Materials

- Mixing Bowl
- Spoon
- Mortar Mix
- Bolt as tamping rod

- Scraper
- Large Glass surface
- Ruler
- Yardstick
- Rubber mallet
- Homemade mole (cut piece of PVC pipe)

Temperature & Humidity

The recommendation will be to work at room temperature to protect the samples from excessive temperatures, air currents, and humidity variations. Also samples need to be given a proper time and space to be prepared to minimize moisture losses.

Preparation of Samples

First, prepare a test sample by adding the recommended amount of cement and water in a bowl, make sure to weigh all the materials using balance. Mix properly the cement with water till you get a decent cement paste. Fill the mole (PVC Pipe) with cement paste to half and tamp it for 20 times then fill the second half with cement paste again till it reaches the top and tamp it for 20 times. Finally, pour your mixture from the mole into a 12''x12'' glass plate and begin with the hydraulic flow procedure.

Procedure

1. Clean the flow table carefully.
2. Centroid the flow mold in the center of the flow table.
3. Add 0.65 kg of mortar cement to a bowl.
4. Add 105 ml of water.

5. Mix the mortar with water.
6. Fill the mold with two layers of mortar mix and tamp 25 times for each layer.
7. Carefully remove the mold and immediately drop the table 25 times in 15 seconds.
8. Use a roller to get the diameter of the mortar mix.
9. Record the data.
10. Place the mix back in the bowl.
11. Centroid plastic mold in the middle of the flat surface (glass plate).
12. Fill the plastic mold with the mortar mix and tamp 25 times for each layer.
13. Remove the plastic mold and grab the rubber mallet at the height 23".
14. Drop the mallet 20 times on each side of the flat glass surface with a total of 80 drops.
15. Use the roller to record the diameter of the mortar mix.
16. After recording the diameter, compare it with the flow-table.

Calculation

The average diameter for the mortar flow table is 227.5 mm and when using our method the average came out to 170.75 mm which is significantly smaller when 170.75 is divided by 227.5 then multiplied by 100 it is a 11% difference in the diameter of the two tests. This means that the diameter when using our method must be increased in order to match or get closer to the diameter of the flow table. When adding the four results for the flow table and our method we get 627mm/ 810mm which equals 11% difference.

Report

The goal of this experiment was to recreate the flow table without using the flow table which is difficult. However, through trial and error we found that dropping a rubber mallet onto a glass slab will evenly spread the concrete when dropping and rotating the slab. When tested the mallet was dropped from 23 inches high 20 times on each corner of the slab for a total of 80 drops, moreover when the experiment occurred our results didn't come out as expected the cement mix didn't spread to the desired diameter. When looking at it there is some things that can be improved on to reach the desired diameter of the cement mix, one was a heavier mallet can be drop, second is more than 20 drops onto each corner, third could be a higher height, and lastly reduce human error by taking it slow and letting the mallet free fall onto the slab. Overall this isn't the most effective since it is time consuming however it is affordable and works for the most part.

Precision & Bias

With the needed and correct amount of water, mortar mix, and the test conditions that accompanied, the average targeted diameter that should be read should be between 190 to 200 mm. The targeted value flow should consist of a reading between 108 and 112. Based on the testing conditions, if changed, the results show vary as well. Human error may be expected as we are students who are still learning about the process, therefore that may affect the direct precision towards this experiment. Concludingly, we fell several millimeters short of our expected results due to the rubber mallet encountering disturbances during several drops, yet our method worked well.

Reference

Gilson SA-66 Square Glass Plate for Liquid & Plastic Limits, 12 x 12 x 3/8". (2022). Certified Material Testing Products. https://www.certifiedmtp.com/square-glass-plate-for-liquid-plastic-limits-12-x-12-x-3-8/