

Concrete Testing Plan

P18416 SEAT Team

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Objective:

Validate the concrete mixtures used by previous teams and our guide perform as expected and compare these to our proposed mixture.

Description of Test

Two tests will be used to determine the most effective concrete: a Flexural 3 point test, and a compressive test. We decided to use both tests as each ring will be subject to a different loading. The bottom ring will be under compression, the middle ring will be a mixture of compression and flex, and the top ring will be mostly flexural.

Procedures

There are several procedures that shall be followed to test our samples. First, there is our specimen preparation, that involves preparing our mixture additives, mixing our samples, set/cure time, and clean up. Second is the procedure for each test.

Preparation

1. All require PPE shall be used accordingly.
2. The amount of each additive has been calculated prior, allowing for excess
3. All additives should be properly sized per ER's
 - a. Biochar
 - b. Gravel
4. All additives should be properly cleaned and washed

Mixing

5. Ensure each container used to measure components are clean, placed properly on the scale, and zero'd to ensure proper amounts are added.
6. Ensure there are no clumps in any of the additives. If there are some present, sift them until dispersed.
7. Scoop material into bowl until desired amount is reached. Note each mix calls for different amounts, so be sure to follow the recipe carefully.
8. Repeat steps 5-7 for each material measured.
9. Combine all the dry materials into a bucket, seal it with a lid and then shake vigorously for 30 seconds
10. Transfer dry mix to clean, dry mixing tub
11. Pour the specified amount of water over the dry materials and mix until homogeneous. (about 2 minutes)

Pouring

12. As soon as the mix is ready, place molds onto vibration table and turn on.
13. Slowly fill each mold, pausing to allow settling

14. While filling each mold use a joint knife to manually push the mix to every corner of the mold
15. Once filled, turn off vibration table
16. Use flat edge to remove any excess material from top and create a smooth surface
17. Record observations about mix

Clean Up

18. Empty any remaining concrete into the 5-gallon waste concrete buckets
19. Spray down the mix tub and dump that waste water into same waste concrete buckets
20. Wipe the mix tub with paper towels until it is clean and dry
21. Clean all surfaces, weighing bowls, tools and hands
22. Gather materials and return to storage

Data Collection

Our response variables for this experiment are weight, compressive strength, and flexural strength. The specimens will be removed from the molds 7 days after pouring them and then be tested after a 7-day curing period of air drying within our senior design classroom space. To test flexural strength, a three point load test will be performed on the beam specimen in the packaging science lab. To test compressive strength, the cylindrical specimens will be placed inside the compressive load machine in the concrete lab. We will record the weight of each specimen using a scale to the nearest hundredth of a pound. Each mix will produce one specimen for each test.

Data Analysis Methods

Once data is available we plan to analyze and compare the results using Excel. We will compare flexural strength, compressive strength, and weight directly between the different mixes. From this data we will choose the best mix, and potentially fine tune the mix with further testing.

Risks and Contingencies

By testing our other samples after two weeks from the molding, there is a risk that they have not reached their optimal curing time. This could vary the strength of the mixes to the point where over time, a mix other than the one we selected could prove to be the better design.