

09/15/2020 - MSO I - Feasibility Assignment

Q- What is the dry time of concrete?

↳ P. 4. Is it feasible to premix concrete before printing without it drying out without intervention (i.e. add more water, no setting additives)

Best method of study - Analytically

Assumptions: - full print area is used

- reservoir is large enough to hold enough + waste
- printing is conducted at 70°F
- concrete does not shrink
e.g. volume of concrete is print area volume

After doing research for an hour and a half I was unable to find any equations or rules of thumb for workable time of concrete. But was able to find that if more than 25-30% of a concrete mixture is water it will be more workable (i.e. more fluid like) but more prone to cracking.

We

In order to check the feasibility of not needing any outside interaction after the mixing of the concrete we will have to do the experimentally while also experimenting at - what % mass of water will be ideal for printing.

Our test should be conducted such that different volumes of concrete with

The same hydration levels are left in buckets to set and the workable time for each volume is to be measured.

this is to be repeated with different hydration levels from 20% - 50% to give plots of curves that dry time vs. volume for multiple hydration levels.

These two test samples will work to simulate the dry time as the reservoir is emptied as well as the working time for various hydrations for us to be able to have data to best select hydration for concrete printing

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Feasibility Assignment (3 Questions)
From rubric

Analysis Question: how long is concrete workable assuming it is mixed prior to starting the print?

Benchmarking Question: At what moisture content is concrete the most ideal for extruding & holding its shape?

Prototyping Question: What additives result in a stronger concrete mixture while not creating a clog hazard in the extrusion system?