

Progress Report #4

Kate Caulfield, Yenthy Luong, and Haroon Ehsan

Governor's School at Innovation Park

COS120: Introduction to Research

Dr. Ales Psaker

February 12, 2026

Objectives

Due to the unexpected snow days, our progress has been delayed. Now that all of our materials have arrived, we plan to build the apparatus this upcoming February 19th and start collecting data.

Materials & Methods

We have now gathered all of our materials and plan to begin physical apparatus construction on February 19th, 2026. Unfortunately, the concrete color pigment is not available at Walmart, and other suppliers are more expensive, so we decided to not include the pigment in our experiment. We have also refined our method to properly calculate the exact amounts of materials added into the cement. The silicone molds, according to its Amazon page, have 40 ml of volume each. We were also able to find the density of the concrete through its reported yield and mass included in its technical data, as shown in *Figure 1* shown below.

TECHNICAL DATA

PACKAGE SIZE	YIELD	WATER REQUIRED
40 lb 18.1 kg	0.30 ft ³ .008 m ³	1.75 qts 1.7 L
60 lb 27.2 kg	0.45 ft ³ .012 m ³	2.5 qts 2.4 L
80 lb 36.2 kg	0.6 ft ³ .016 m ³	3.5 qts 3.3 L
90 lb 40.8 kg	0.66 ft ³ .02 m ³	4.25 qts 4.0 L
25 kg Canada	0.41 ft ³ .012 m ³	2.4 qts 2.3 L
30 kg Canada	0.50 ft ³ .014 m ³	2.9 qts 2.7 L

Figure 1: The Technical Data for the Sakrete High Strength Concrete

The concrete had a final density of approximately 1440 kg/m^3 , or 1.44 g/ml . Multiplying this density by the volume of 40 ml resulted in 57.6 g . With this information, we were able to determine that the samples would weigh in at around 60 grams each after adding superplasticizer and water, meaning that the weight percentages for each filler may be represented in the table below.

1%	= 0.6g
1.5%	= 0.9g
2%	= 1.2g
2.5%	= 1.5g
3%	= 1.8g
3.5%	= 2.1g
4%	= 2.4g
4.5%	= 2.7g
5%	= 3.0g

Figure 2: Approximated weight percentages for sample add-ins

This will allow us to more efficiently begin our experimentation. We however have not yet validated this expected mass and density, so we will also weigh our control samples to ensure accurate measurements. In addition, we have decided that we will create multiple trials for each sample to ensure accurate results. We plan to create 3 copies of the same sample and take the median result to reduce the chance of any outliers from affecting our final data.

We have also decided that it would be best to only cure the concrete for 7 days rather than the alternative 28 day period before collecting our data.

Cure/Set Time	Compressive Strength
7 Days	2500 psi (17.2 MPa)
28 Days	4000 psi (27.6 MPa)

Figure 3: Curing time for concrete

Although the compressive strength and some other properties may differ, this would be the most efficient option for collecting data- considering our time constraints. We hope to continue to allow the concrete to cure and to re-measure results after the 28 days have passed. This will allow us to collect our initial data quickly while also helping us understand how different curing times may affect the thermal and electric conductivity of the concrete samples.

Data/Results

Unfortunately, we were unable to begin physical experimentation due to weather conditions and delays, which cancelled many of our classes. We are planning to begin the preparation of our concrete samples the Thursday after this progress report and collect data at

that time. Currently, we still have our preliminary experimental data from last progress report, and we hope to have real data about our samples by the next one.

References

Home Depot. “80lb Bag of Cement Listing.” *Homedepot.com*, 2026,

www.homedepot.com/p/Quikrete-80-lb-Concrete-Mix-110180/100318511#see-more-details. Accessed 12 Feb. 2026.

Narasimha R. “Demystifying M20 Concrete: The Right Mix of Cement, Sand, and Aggregate.”

REEA 3D, 18 Dec. 2023,

www.reea3d.com/post/demystifying-m20-concrete-the-right-mix-of-cement-sand-and-aggregate.

Sakrete. “SAKRETE HIGH-STRENGTH CONCRETE MIX.” Jan.

2024. <https://sakrete.com/wp-content/uploads/2024/01/Sakrete-High-Strength-Concrete-Mix-TDS.pdf>.