

- P1: Strength and Durability of Concrete with Recycled Concrete Aggregates
- P2: Permeability of Concrete with Porous Aggregates
- P3: Innovative Techniques And Materials For Preventing Concrete Shrinkage Cracking
- P4: 3D Printing of Mortar

ENGINEERING CLINIC PROJECTS – SPRING 2022

Strength and Durability of Concrete with Recycled Concrete Aggregates – Lomboy, Cleary, Abubakri

Natural Aggregate

NOT UNLIMITED



Waste Concrete

RECYCLE



Crushed Concrete
Coarse Aggregate

Recycled product



Mix Concrete



Concrete Compression

**Measure aggregate properties and
concrete strength and durability**

Strength and Durability of Concrete with Recycled Concrete Aggregates – Lomboy, Cleary, Abubakri

Dwindling supplies of natural coarse aggregates, the cost of landfilling construction waste, and benefits in sustainable design have led to significant interest in the use of Recycled Concrete Aggregate (RCA), in new concrete. This projects intent is to study the properties of concrete with recycled concrete coarse aggregates.

THIS PROJECT REQUIRES LABORATORY WORK! –

- You should be able to come to campus to do this work if you sign up for this project.
- If you have questions about these requirements please contact Dr. Lomboy.
lomboy@rowan.edu

WHAT YOU WILL BE DOING –

Laboratory Activities

- Measure the physical and mechanical properties of aggregates
- Mix concrete
- Test hardened concrete: compressive strength, flexural strength , abrasion, permeability

Reports and Presentations

- Write a final report or paper and present at the end of the semester

Permeability of Concrete with Porous Aggregates – Lomboy, Aragoncillo

Water penetration



concrete



**AASHTO T358 Surface
Resistivity Test**



**German's water
permeability test**

Measure concrete permeability

Permeability of Concrete with Porous Aggregates – Lomboy, Aragoncillo

Several studies found a strong correlation between the electrical resistivity of concrete and the other concrete permeation properties, such as water permeability and rapid chloride penetrability. However, most of these comparisons used conventional concrete in which dense natural aggregates were used. This research measures the permeation properties of concrete with porous aggregate concrete, particularly lightweight aggregate and recycled aggregate concrete.

THIS PROJECT REQUIRES LABORATORY WORK! –

- You should be able to come to campus to do this work if you sign up for this project.
- If you have questions about these requirements please contact Dr. Lomboy.
lomboy@rowan.edu

WHAT YOU WILL BE DOING –

Laboratory Activities

- Measure the physical properties of aggregates
- Mix concrete
- Test permeability properties of concrete using different methods

Reports and Presentations

- Write a final report or paper and present at the end of the semester

Innovative Techniques And Materials For Preventing Concrete Shrinkage Cracking – Lomboy, Cleary, Zhu, Wagner



Concrete shrinks due to reduction and movement of water in the material.

This can lead to:

- Cracks
- Early deterioration
- Costly repairs

Techniques and materials for preventing shrinkage cracking

- **Reduce surface tension** by using admixtures
- **Expansive agents** to compensate for the reduction in volume
- **Internal curing** agents that supplies additional water from within the concrete
- **Coatings** that seals to reduce water evaporation
- **Fibers** that resists cracking

Study the shrinkage of concrete mixtures with various additives

Innovative Techniques And Materials For Preventing Concrete Shrinkage Cracking – Lomboy, Cleary, Zhu, Wagner

Modern concrete mixtures used in transportation infrastructure can have a high risk of shrinkage cracking because of the high cementitious content, finer portland cement, low water-to-cementitious material ratio, and various admixtures in the concrete. The overall goal of the study is to improve the longevity and performance of New Jersey transportation infrastructure through reducing the concrete shrinkage and cracking potential, which will prevent the ingress of water and other deleterious substances into the concrete.

THIS PROJECT REQUIRES LABORATORY WORK! –

- You should be able to come to campus to do this work if you sign up for this project.
- If you have questions about these requirements please contact Dr. Lomboy.
lomboy@rowan.edu

WHAT YOU WILL BE DOING –

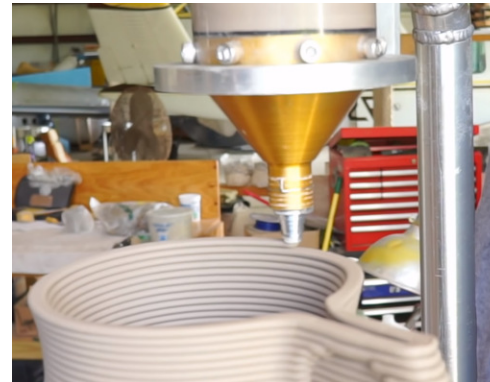
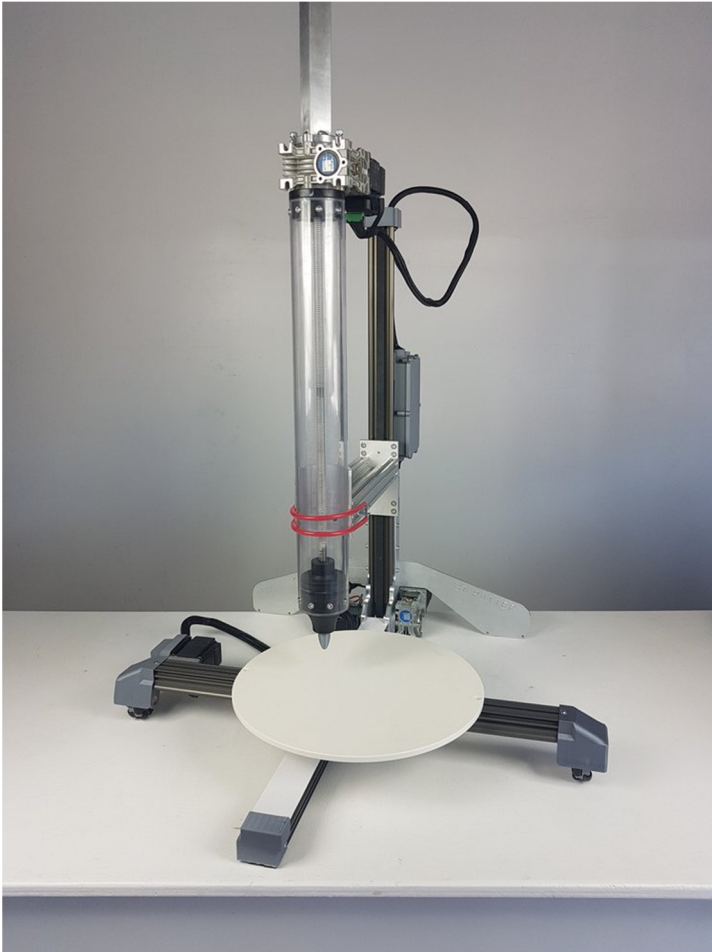
Laboratory Activities

- Mix concrete
- Test shrinkage and cracking potential of concrete mixtures

Reports and Presentations

- Write a final report or paper and present at the end of the semester

3D Printing of Mortar – Lomboy



<https://www.youtube.com/watch?v=gpt0ItCLr-k>

Determine the parameters that are suitable for 3D printing of mortar

3D Printing of Mortar – Lomboy

3D printing in construction is a rapidly developing technology. A structure is cast by extruding a concrete mixture over layers until a defined form is built. In the present clinic research, clay and mortar will be used in 3D printing. The mortar will be printed using a 3D potter printer.

THIS PROJECT REQUIRES LABORATORY WORK! –

- You should be able to come to campus to do this work if you sign up for this project.
- If you have questions about these requirements please contact Dr. Lomboy.
lomboy@rowan.edu

WHAT YOU WILL BE DOING –

Laboratory Activities

- Mix mortar mixtures
- 3D print specimens
- Test mortar compression and flexure strength

Reports and Presentations

- Write a final report or paper and present at the end of the semester