



# Introduction

### **Previous Studies and Results**

- Made different types of clay bricks with algae algae noted that strength properties increased deper on composition, but overall strength was lower
- Added algae to cement at different percentages and found that the compressive strength decre but the load capacity increased<sup>4</sup>
- Found that marine brown algae extract increase the cement mixture's viscosity; tests found it increased yield strength and air space<sup>3</sup>
- Made cob, an earth-based material, made with algae instead of flax, and it had better thermal insulating properties<sup>1</sup>

## **Current Applications**

- Prometheus Materials, a company in Colorado, develops and produces microalgae-based con bricks for construction
- Unfired clay brick with Sargassum muticum is by Sargablock, a company in Mexico, to build structures

## Hypothesis

- We hypothesize the bricks with algae will have lower compressive and flexural strength than the without algae
- To measure this, we created bricks with and with algae

## References

1: Affan, H., Touati, K., Benzaama, M.-H., Chateigner, D., & El Mendili, Y. (202 Earth-Based Building Incorporating Sargassum muticum Seaweed: Mechan and Hygrothermal Performances. *Buildings (Basel)*, 13(4), 932-. https://doi.org/10.3390/buildings13040932

2: Dove, C. A., Bradley, F. F., & Patwardhan, S. V. (2016). Seaweed biopolymers as additives for unfired clay bricks. *Materials and Structures*, 49(11), 4463– 4482. https://doi.org/10.1617/s11527-016-0801-0

3: León-Martínez, F., Cano-Barrita, P. de J., Lagunez-Rivera, L., & Medina-Torres, L. (2014). Study of nopal mucilage and marine brown algae extract as viscosityenhancing admixtures for cement based materials. *Construction & Building* Materials, 53, 190–202. https://doi.org/10.1016/j.conbuildmat.2013.11.068 4: Ramasubramani, R., Praveen, R., & Sathyanarayanan, K. S. (2016). Study on the strength properties of marine algae concrete. Rasayan Journal of Chemistry, 9(4), 706-715.

# Strength properties of clay bricks made with marine algae Aaron Bookstein, Ashley Lawlor, Cody O'Brien, Farhad Farzaneh, and Sungmoon Jung, Ph.D

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# Mothode

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and nding r <sup>2</sup> seased	<ul> <li>The algae was washed, dried, and powder</li> <li>Molds were made according to ine for clay bricks</li> <li>Clay is mixed with water and sand the bricks</li> <li>Algae is added at 0%, 5%, or 8% of volume to the clay and mixed in</li> <li>The clay was added to the mold, so removed</li> <li>The samples were left to harden for and then in a kiln for 24 hours</li> <li>The samples are labeled with algae and curing time</li> <li>The bricks are placed into the equation</li> </ul>				
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Dried algae samples

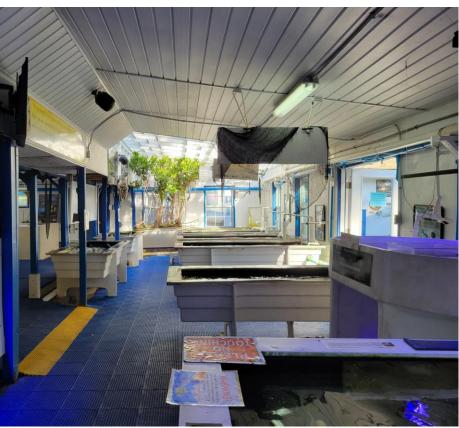


- There are no results or data to report at this time We expect the data to show that the algae bricks will have lower strength compared to the bricks without algae

- d then ground into a
- ndustry/testing standards
- d to create the base for
- of the brick's total
- shaped, and then
- for 3 or 6 days in the sun,
- ae type, percent algae,
- uipment to test its



Agardheilla subulata



Gulf Specimen Marine Lab

Sample	Algae Type	Algae %	Curation Time	Quantity
1	S. filipendula	8	3	3
2	S. filipendula	8	6	3
3	S. filipendula	5	3	3
4	S. filipendula	5	6	3
5	A. subulata	8	3	3
6	A. subulata	8	6	3
7	A. subulata	5	3	3
8	A. subulata	5	6	3
9	S. filipendula	8	3	3
10	S. filipendula	8	6	3
11	S. filipendula	5	3	3
12	S. filipendula	5	6	3
13	A. subulata	8	3	3
14	A. subulata	8	6	3
15	A. subulata	5	3	3
16	A. subulata	5	6	3
Total				48

iple 1-o compression lesting, sample 9-16 flexural testing, curation time in days



- We expect the algae bricks to have lower strength compared to the bricks with no algae
- Previous studies showed that certain properties in algae bricks may increase but overall strength decreases<sup>2</sup>
- more brittle
- The algae can increase the air space inside the Ο mixture<sup>3</sup>, which could lower the strength
- Algae added to cement caused the compressive strength of the sample to lower<sup>4</sup>
- Algae bricks could be a more environmentally sustainable substitute for traditional bricks in low-stress scenarios • For example, algae concrete companies aim to use
- their products in walkways, parking lots, and building construction
- structures
- structure made from flax cob<sup>1</sup>



# Conclusion

• The algae interacting with the clay and sand can make it

• Potential limitations or errors: brick-making process, type of clay and algae used, errors in the testing process Future studies: examining the thermal and insulating properties of the bricks to improve the energy efficiency of

 In a previous experiment, the structure made from algae cob required less energy to heat and cool than the