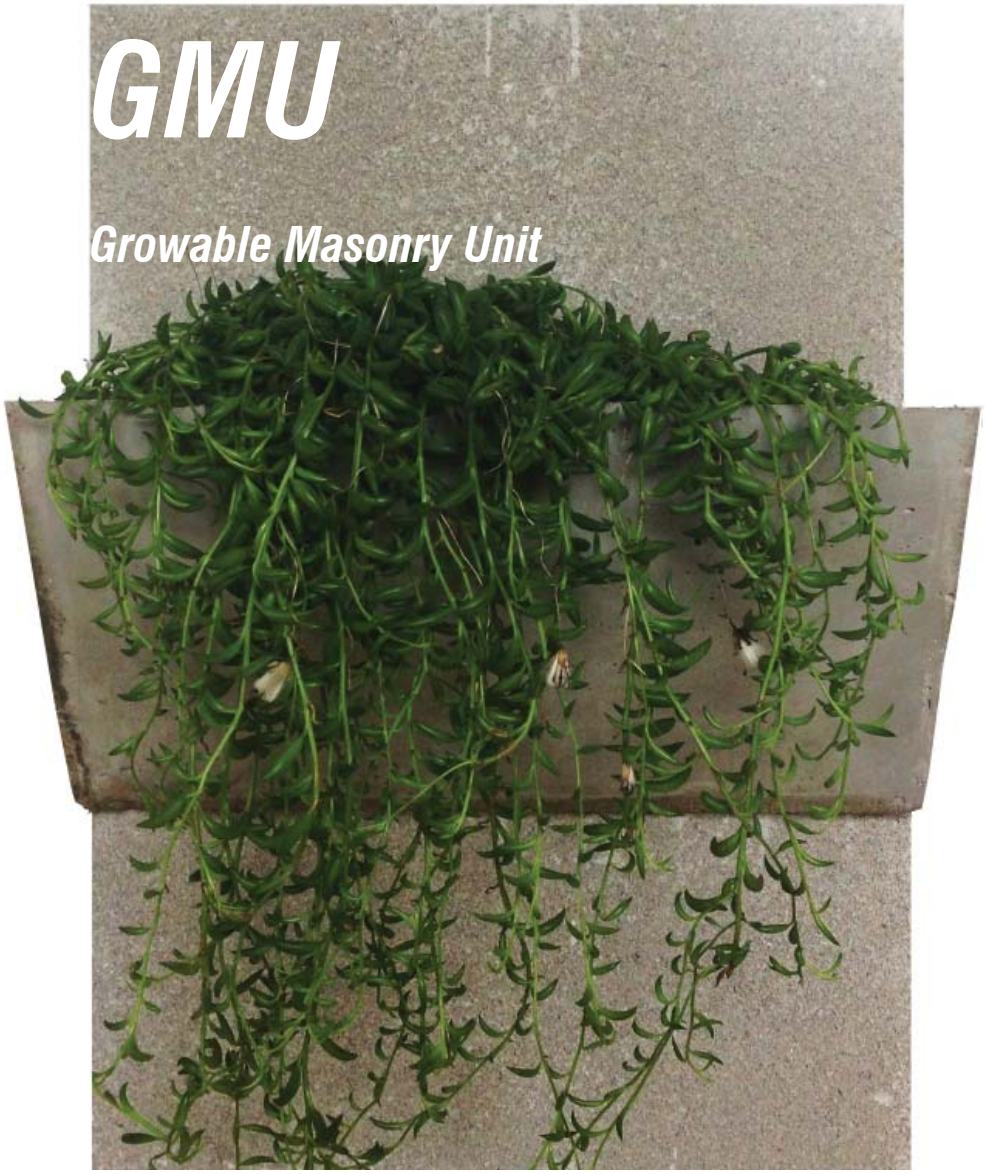
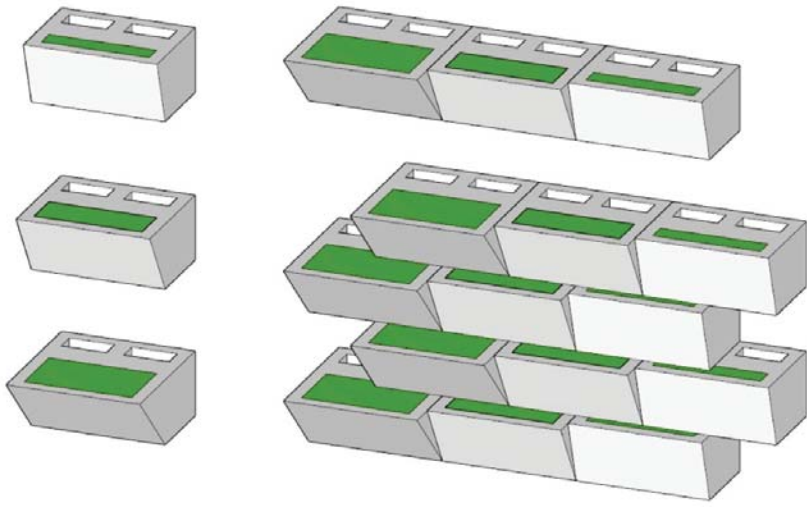
GMU

Growable Masonry Unit



Objective: GMU (Growable Masonry Unit

The goal of the GMU is to create a form of green wall that integrates into a preexisting structural system.



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Course: Construction V
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Semester: Spring 2016

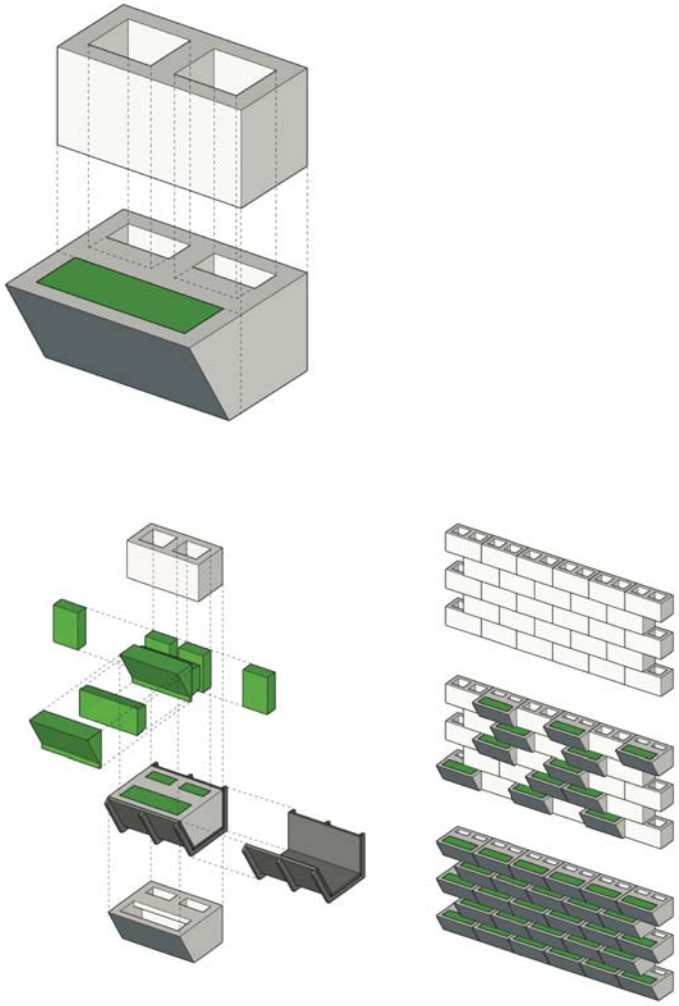
Materials	Tools	Programs
Concrete	Table Saw	Rhino
Masonite	Band Saw	SketchUp
Plywood	Clamps	
Styrofoam	Knife	
	Wood Glue	
	Hot Glue	
	Screws	
	Electric Drill	
	Petroleum Jelly	

Material determinant:

The majority of green walls that exist today are superficial – they are literally applied to the surface of an existing structure rather than integrating within it. They are non-structural and have no real architectural purpose besides being aesthetic. Although explorations of modular planter units exist in varying capacities, the goal of the GMU is to create a form of green wall that integrates into a preexisting structural system. Specifically, the GMU is a standalone, replicable masonry unit that fits within a standard CMU wall and provides space for the housing of plants.

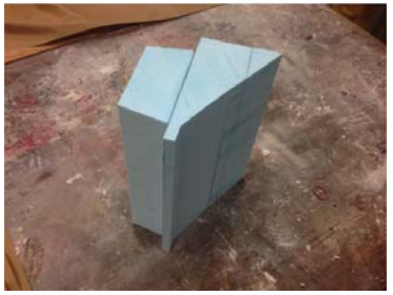
Innovation:

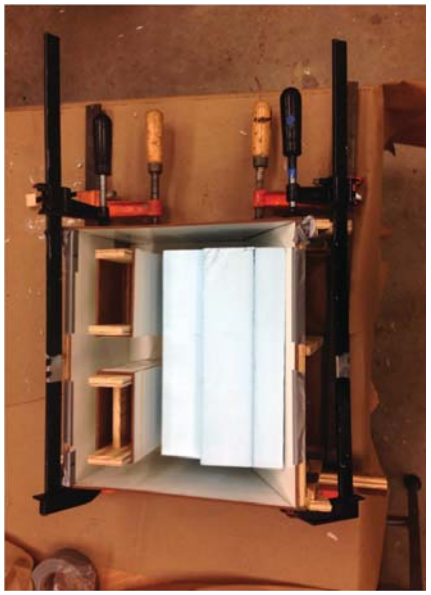
The innovation of our project primarily exists in its ability to be integrated within the standard existing CMU wall. Although planter bricks have been explored in a variety of capacities ranging from ceramic to terra-cotta, we have created a unit that is able to operate within the context of a pre-existing structural system, thereby permitting its use at a variety of scales and applications. We were primarily interested in exploring a design that is both innovative in its form and function, but otherwise universally applicable beyond the context of its own creation. Essentially, the GMU innovates on the front of accessibility. We hoped to created a well-designed product that is both accessible and practical in its application.



Step 1

Unit designed to fit within standard 8”x16” CMU module wall. Includes two internal cores that align with standard CMU for rebar support. Internal void designed to maximize volume of planter





Step 2

Create initial formwork out of plywood supported by ribs (shown in dark grey in diagram above). This will not be destroyed in the casting process and can be used for the generation of future GMU blocks. Cut Masonite to fit inside formwork and enclose volume. Ideally, use masonite that has white-board texture on the interior to create a smooth finish and to water-proof the mold. Cut internal cores from blue foam and secure to Masonite with removable screws and/or hot glue. Encase all seams of enclosure with duct-tape and coat inside corners with Vaseline to prevent leakage. Clamp entire mold together to tighten seals, prevent warping and expansion during casting, and to secure foam pieces.

Step 3

Cast formwork with generic concrete (ex. Quickrete). Ideal mixture is 4 parts concrete, 1 part water. Shake formwork to make sure entirely filled. Allow at least 2 days for drying before removing formwork.

Step 4

Remove plywood formwork and Masonite once concrete is fully set, and melt out Styrofoam cores using acetone. Wrapping cores in cellophane before casting prevents adhesion of foam to concrete.

Step 5

Finish inside of planter with concrete waterproofing sealer, put metal mesh over weep-holes, and assemble as a part of CMU wall. Plant as desired.

Unresolved issues:

Although much of our formwork is reusable, the majority of the Masonite and Styrofoam are lost during each casting iteration. Ideally, simplified methods of replication and standardization would make the GMU significantly more successful in commercial production. Potential explorations could include slip casting or the use of reusable silicone molds. The downside of these alternatives is that they require more advanced skills of production and less-accessible resources, so innovation in terms of accessible reproduction is necessary.

In retrospect, we are also undecided about the necessity to incorporate the additional soil space with the extended mold. We wonder if the additional soil is worth the amount of extra labor required to remove the foam from inside the casted unit, or whether the triangular piece would be sufficient. Similarly, we are unsure whether the concrete waterproofing is fully necessary as a supplement to the weep holes, and whether the extra expense and labor is worth the outcome.

Conclusions:

The GMU is a good first step toward a modularized planter that can be integrated into a pre-existing method of construction, although there is much potential for further exploration in terms of the form itself and its methods of production. It would be interesting to see future iterations of the GMU that still operate within the constraint of integration within a CMU wall, but continue to innovate and challenge the way the planter looks, functions and is replicated.

When considering how the GMU could potentially move forward as a product, we can perceive it taking one of two different paths:

The first path would be to create a refined product that is sold as completed unit. This end goal would require a much more refined and industrialized process of creation with careful attention to uniformity and precision. In this case, the visual appearance of the internal voids and surfaces (which are either filled with soil or covered by other CMU blocks in application) would be important, as the product will need to be desirable as a standalone product. There is also potential for this design to be sold/given to a CMU manufacturer and let them industrialize the fabrication process.

A second path for the GMU could see its interpretation as a self-assembled product that is sold in Ikea-style flat-packs for a more universally-accessible approach. This product could include the formwork and molds, and simply require concrete and water on the part of the buyer. This product would be an interesting alternative in that it could be used in more remote settings where material access is limited, potentially in humanitarian or disaster-relief scenarios. This process would support our initial goal to make simple, functional design accessible.
An even more radical alternative to the second path would be to make the entire product DIY, with specific step-by-step instructions and CAD files that allow the user to laser cut the components from their own materials. One ultimate success of the GMU is that it has potential to move forward as a product along any of these paths with the end goal of providing a simple, accessible design alternative to green wall construction.