POST ROCK

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Plastiglomerate, a combination of waste plastics and rock, is the first material of the anthropocene. Post Rock captures this geological phenomenon through design and experimental fabrication, offering new aesthetic and tectonic possibilities for sustainable construction in the 21st century.

2016-2017 ACSA Faculty Design Award Submission

Each year, 270 million tons of plastic are produced worldwide. This amount is roughly equivalent to the total weight of the earth's human population. In other words, for every person on earth, a corresponding mass of plastic is added to the environment year after year after year....*

* Erik R. Zettler, Tracy J. Mincer, Linda A. Amaral-Zettler, "Life in the 'Plastisphere': Microbial Communities on Plastic Marine Debris," Environmental Science and Technology 47 (2013): 7,137–46.

...so is it any wonder that entire islands of trash have formed in our oceans?

While these monumental gyres have captured the attention of designers and environmentalists alike, they remain a distant and intangible testament to a throw-away culture.

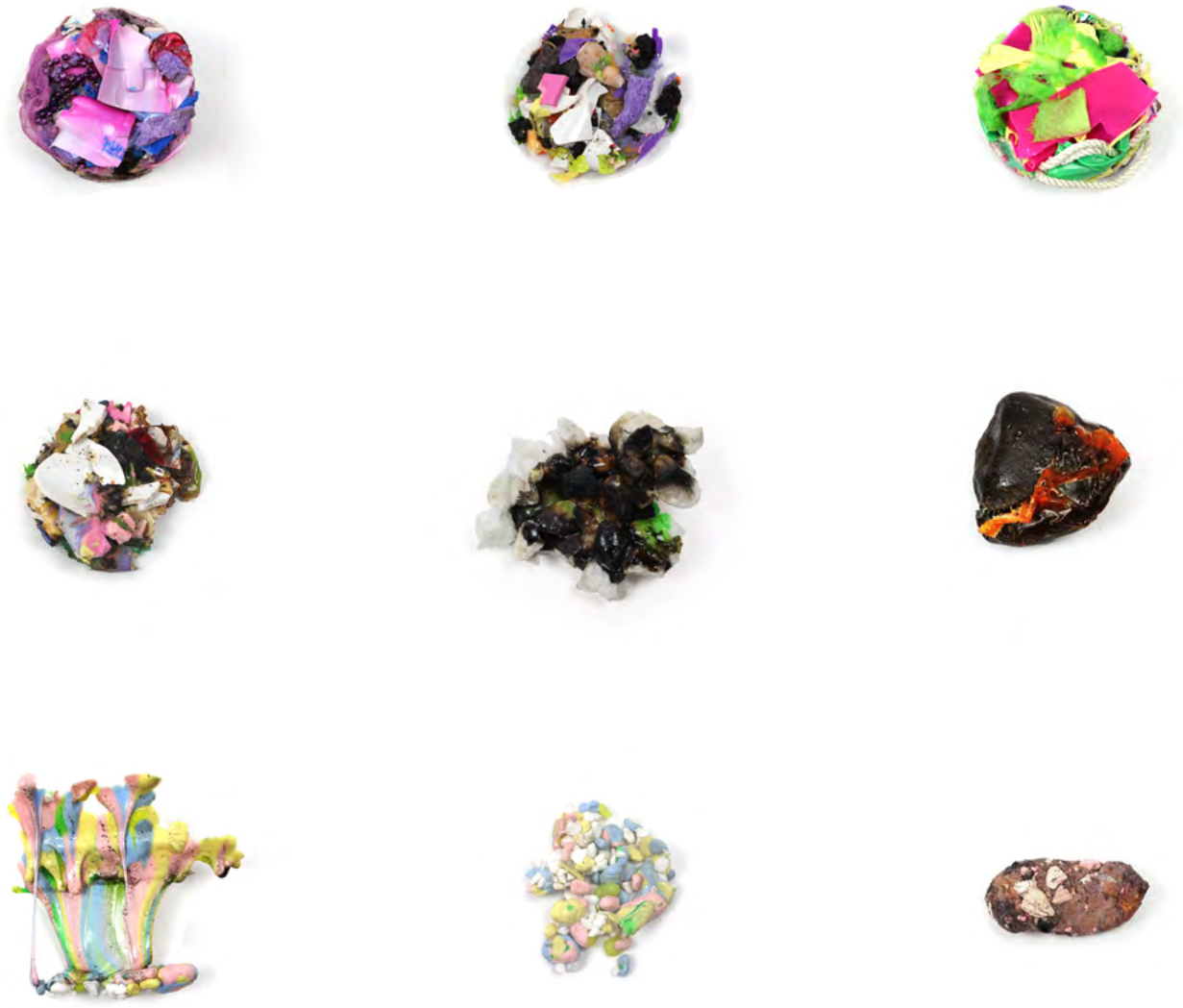
Plastic flotsam in the Pacific Ocean

Sample of plastiglomerate discovered by scientists at Kamilo Beach, Hawaii

Meanwhile, the earth has responded to this global proliferation of plastic by making a new material. Waste polymers in oceans and coastal ecosystems are fusing with sand, rock, and other inorganic materials. The resulting "rocks" have recently compelled scientists to establish a new classification of stone called "plastiglomerate." They define plastiglomerate as "an indurated, multi-composite material made hard by agglutination of rock and molten plastic." In other words, a plastiglomerate is an emergent product of both human and geological processes.*

* Patricia L. Corcoran, Charles J. Moore, Kelly Jazvac, "An anthropogenic marker horizon in the future rock record," Geological Society of America Today, v. 24, no. 6 (June 2014): 4-8.

To claim this emerging geological resource as a building material for architecture, Post Rock recreates plastiglomerate.



By fabricating our own version of plastiglomerate called Post Rock, we aimed to understand its material capacities and to speculate on its architectural applications.

This process requires not just the technical know-how for converting waste product to building product, but also an attention to the aesthetic effects of blending fragments of plastic objects with elements from nature. Post Rock emulates geological processes at a small scale: breaking down, mixing, heating, and fusing.

Selection of early Post Rock prototypes demonstrating varied fusing strategies.

Post Rock is post-modern.
It recombines fragments of visual culture and disparate material ecologies.

Post Rock responds to a large-scale environmental concern through its focused attention to issues that are endemic to architecture: tectonics, material process, form, and part-to-whole relationships. Recognizable components like household objects, packaging, or building materials, fuse together with sand and stone, making each rock a representation of the cultural and geological forces behind its making.

Early prototype emulating a marine based material palette

Post Rock is post-natural.
It is a product of a new geological age defined by human intervention: the anthropocene age.

As designers, we recognize that what makes plastic pollution a problem is precisely what make it an opportunity for building. Durable, cheap, and plentiful, post-consumer and post-industrial plastics present not just an unsolvable problem but a tremendous resource. Post Rock diverts plastics from waste streams and applies them toward a new building material.

Image: sample of found plastiglomerate

Post Rock architecture stages intimate encounters between people and the global condition of excess plastic. The following designs for Post Rock architecture all target an important social impact: reframing post-consumer plastic changes its perceived value as a waste product to a viable and aesthetic building resource.

The three design proposals advance different tectonic capacities of Post Rock, as monolithically cast building elements (wall panels or columns). Each proposal is sited within a different environment found in the Great Lakes region, necessitating a distinct material composition specific to its local waste stream. Thus, each of the three designs proposes a particular aesthetic adapted to its context. Much like geology tells the history of interactions between climate, hydrology, and living things, Post Rock draws on the cultural and ecological processes of its Post Natural Geography: URBAN BEACH, AGRICULTURAL ENTERPRISE, SUBURBAN DOMESTIC.

Three tests for rotational thermoforming Post Rock; compositions based on agricultural waste stream

URBAN BEACH

Polymer Sources
Erosion netting, Solo cups, water bottles, beach toys, flotation devices, fishing implements, food containers, plastic bags, beach wear

Inorganic Sources
Sand, seashells

AGRICULTURAL ENTERPRISE

Polymer Sources
Tarps, water barrels, twine, poly rope, hosing and fittings, crates, food storage, fuel containers, protective sheeting, sacks

Inorganic Sources
Limestone, perlite, asphalt, concrete

SUBURBAN DOMESTIC

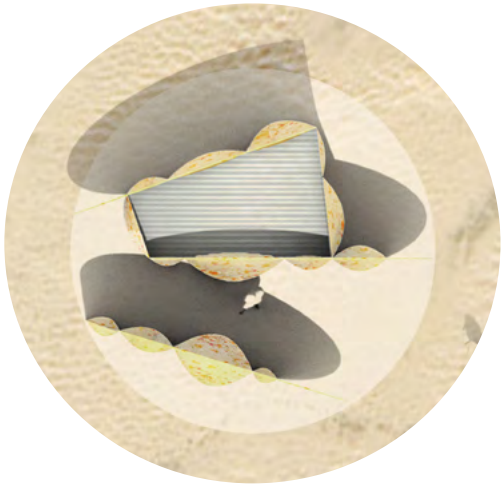
Polymer Sources
Lawn chairs, vinyl window frames, vinyl siding, vinyl gutters, PVC decking, moulding, decorative trim, fencing, plumbing, containers, trash cans

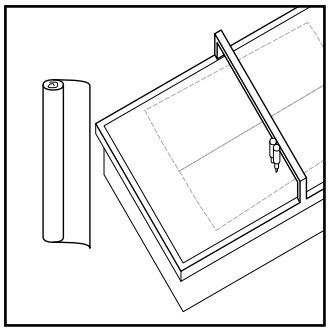
Inorganic Sources
Sheetrock, granite countertops, marble tile, porcelain fixtures

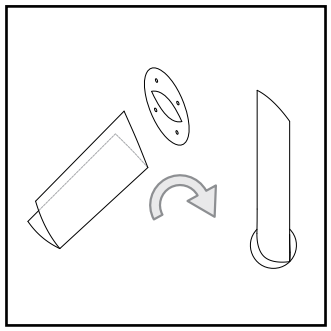
URBAN BEACH: *PLASTIC SUNRISE*

Lake Michigan Shore, Chicago, Illinois

Sourced and sorted by color, urban beach debris approximates the translucent hues of a pink and golden morning sky. The form and surface qualities of this seasonal kiosk, sited along Chicago's lakefront, materialize sunrise over Lake Michigan.





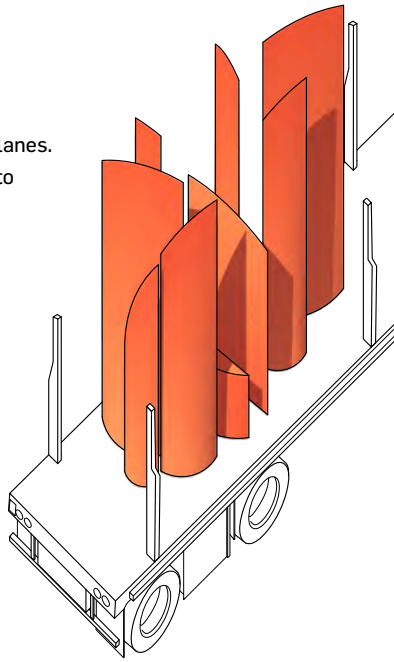


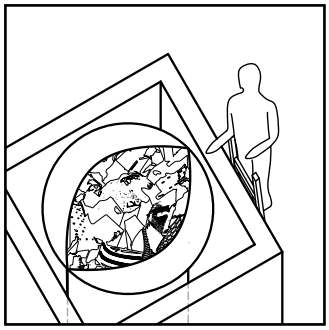
1. Cut mold parts

CNC knife cutting mold elements from thin gauge aluminum sheets allows for minimal material waste.

2. Assemble mold

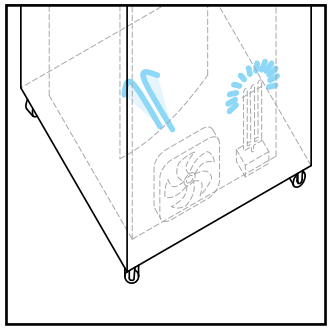
The forms can be made by folding simple planes. This reduces the number of pieces needed to construct the molds.





3. Fill mold

Materials are carefully chosen and sorted, and placed in the mold to produce a form that is opaque and sandy at the bottow while remaining transluscent and colorful at the top.

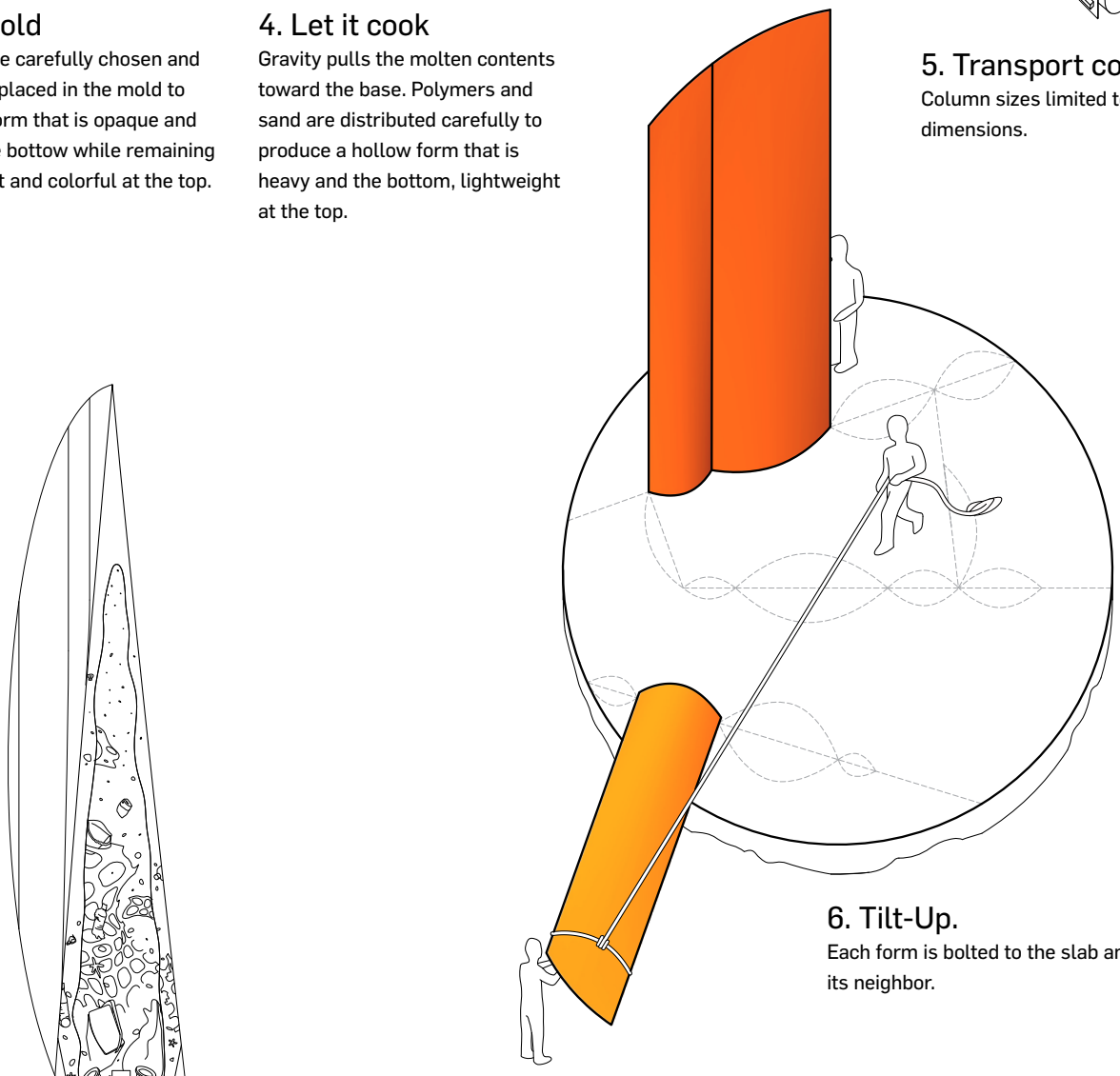


4. Let it cook

Gravity pulls the molten contents toward the base. Polymers and sand are distributed carefully to produce a hollow form that is heavy and the bottom, lightweight at the top.

5. Transport columns to site

Column sizes limited to trailer bed dimensions.



6. Tilt-Up.

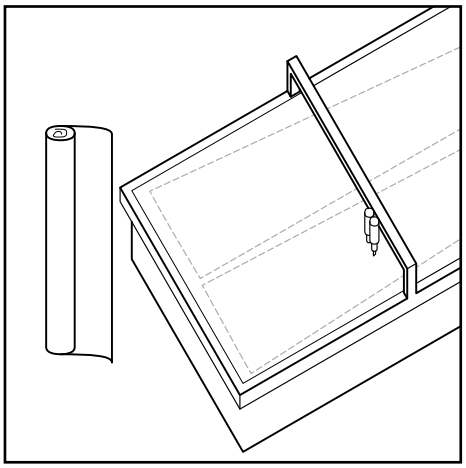
Each form is bolted to the slab and gasketed to its neighbor.

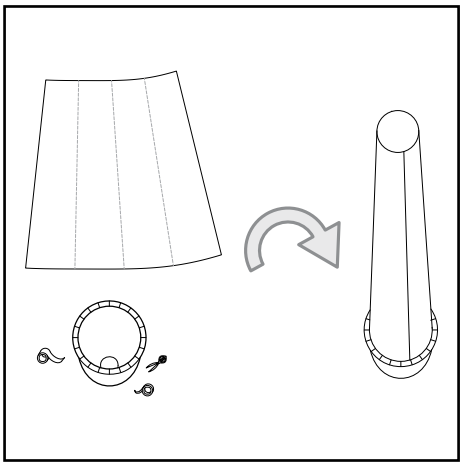
Scale prototype testing sand and plastic ratios

AGRICULTURAL ENTERPRISE: *ERRATICS*

Jardins de Metis, Quebec

In geology, an “erratic” is a rock that is out of place, one that differs greatly from its immediate surroundings. This design proposes a rock garden of erratics that transpose agricultural waste materials to a public garden. These erratics actually move, as well; people can rock the hollow forms like weeble-wobbles or sit within one like a rocking chair.



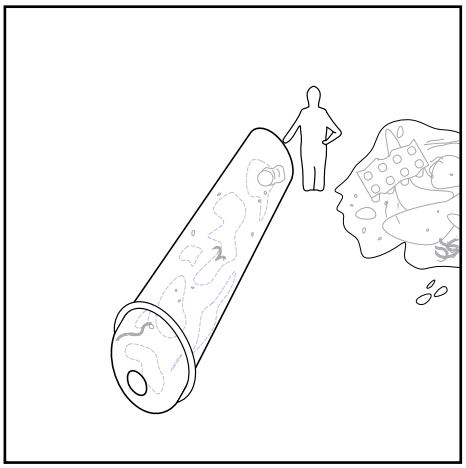


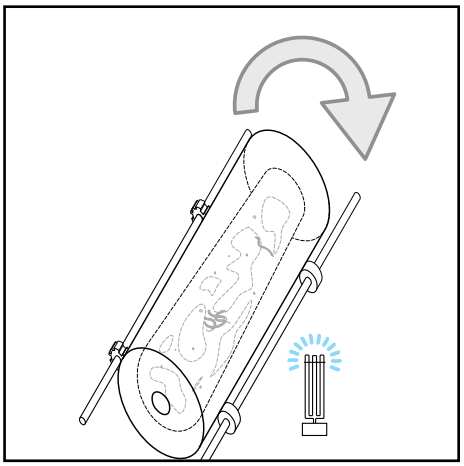
1. Cut mold parts.

CNC knife cutting mold elements from thin gauge aluminum sheets allows for minimal material waste.

2. Assemble mold.

Conic molds attach to prefabricated hemispherical bases



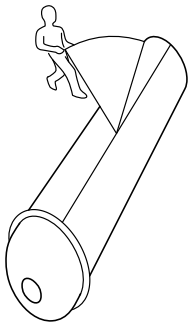


3. Fill mold

Polymer sources vary in scale and form while stone aggregates are more uniform.

4. Let it cook.

The mold is heated in a purpose built oven. It is rotated with custom machinery to ensure an even wall thickness.



5. Remove from mold.

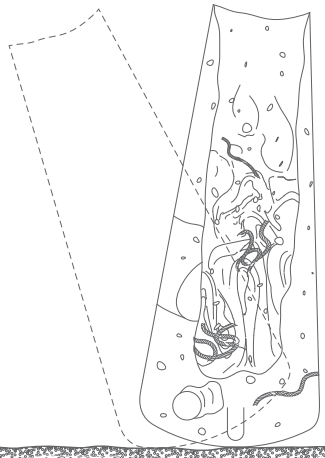
The light gague foil can be peeled off the completed object like a chocolate easter bunny.

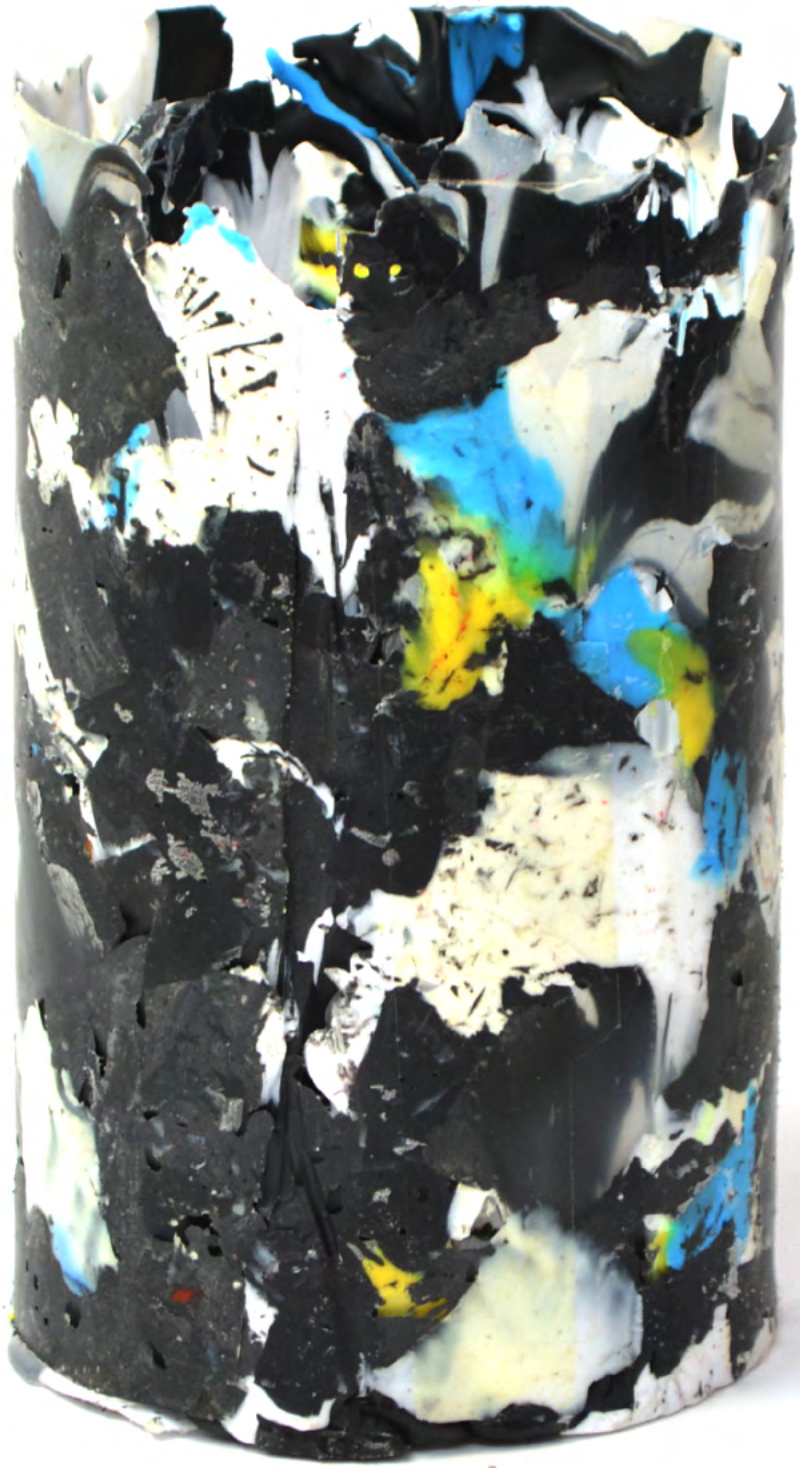
6. Transport columns to site.

Each object is sized to fit easily into a box truck.

7. Install

Each erratic is teathered to the ground to constrain movement while allowing rocking.



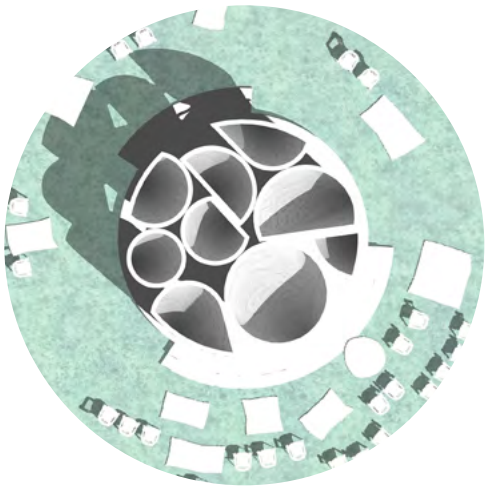


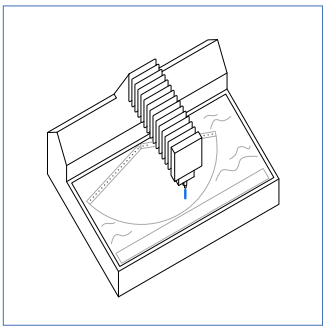
Scale prototype testing rotational molding and size of plastic aggreagates

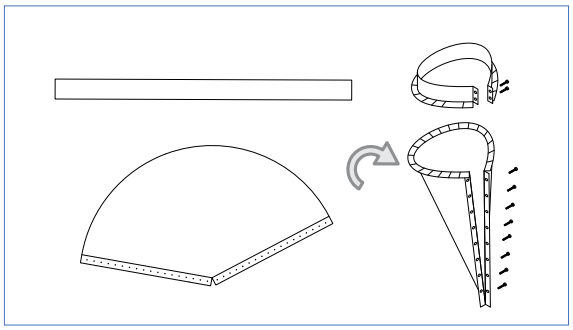
SUBURBAN DOMESTIC: *SUMMERHOUSE*

Lake Forest, Illinois

This temporary stage is a contemporary take on the historic typology of the summerhouse or gazebo. Here, the white-on-white palette is derived from the residential building products native to the project's suburban context. The material effects of the tapered columns evoke the backyard classicism of a 19th-century summerhouse.





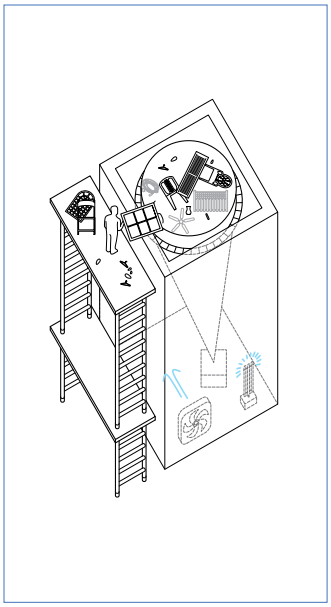


1. Cut mold parts.

CNC knife cutting mold elements from thin gauge aluminum sheets allows for minimal material waste.

2. Assemble mold.

The conic forms of the columns can be made by folding simple planes. This reduces the number of pieces needed to construct the molds.

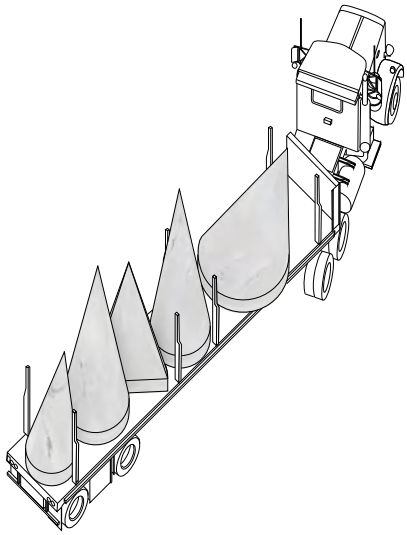


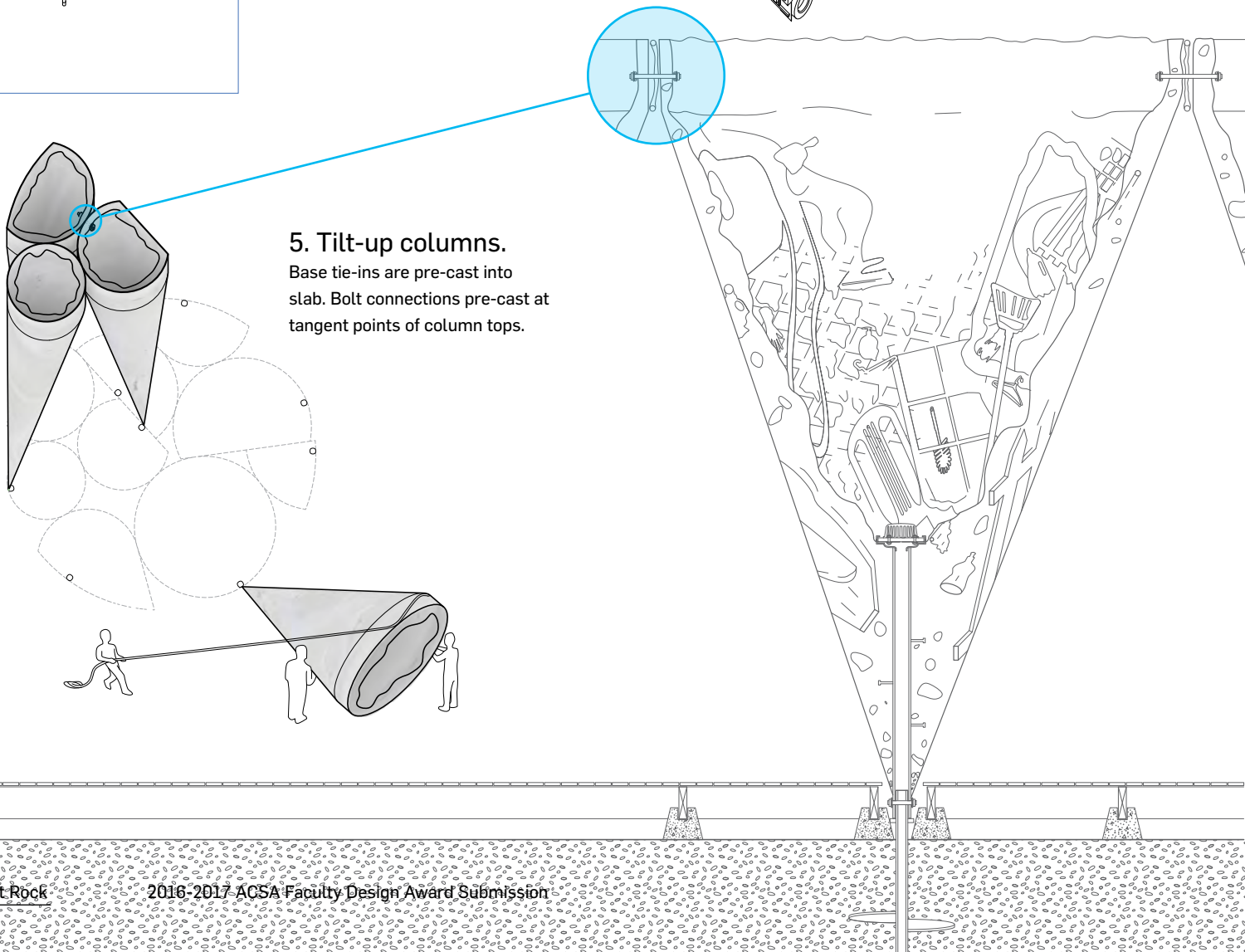
3. Fill mold and let it cook.

Extensive prototyping yielded the ideal ratio of polymers to inorganics such as granite, marble, plaster, and gypsum. Gravity pulls the molten contents toward the base, producing a structural column that is hollow, bottom-heavy.

4. Transport columns to site.

Column sizes limited to trailer bed dimensions.





5. Tilt-up columns.

Base tie-ins are pre-cast into slab. Bolt connections pre-cast at tangent points of column tops.

Prototype testing structural and tectonic performance of multiple units

Exhibition of material research and the three design speculations