Molding Ecologies:
Concrete, Climate and Craft

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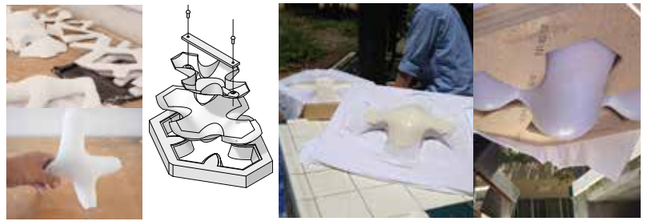
The most cutting edge practices today have moved beyond fetishizing tools to focusing on the aesthetic and ecological performance of material assemblies. Molding Ecologies was developed by a collaborative team of four professors with compatible, yet diverse strengths to develop a design-build course with three primary goals. First, the course investigated efficient molding techniques for plastic materials such as plasters and concrete by developing variation from a single mold. Second, environmental performance was driven through daylighting and thermal mitigation while giving equal priority to aesthetic and atmospheric affects. Third, along with local variation within each proposed system, each system needed to be parametrically defined to respond globally to three different climates.

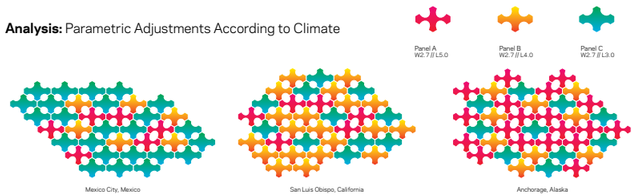
The course began with a sequence of form-finding experiments using fabric formwork and plaster taking cues from Heinz Isler's funicular experiments with freezing fabric in tension, Mark West's fabric-formed concrete, as well as reconfigurable molds from flexible sheet goods. These casting experiments were evaluated for intrinsic structural efficiencies, sunlight reflection and diffusing geometries and textures, and the relationship of material thickness to heat absorption and transfer. These plaster form-finding studies allowed for material experiments to be carried out quickly and inexpensively, with minimal material waste. Formal and performative cues from these experiments informed the digital design process to develop a parametric system from the material primitive incorporating aesthetic, performative, and casting logisitics into the design geometry.

Along with these parameters, the design geometry had to respond globally to environmental inputs from three distinct locations: Anchorage, San Luis Obispo, and Mexico City. This required the students to design for both local variation within the system as well as global variation across the system. This necessitated a highly iterative process between the digital and the physical. Each design cycle necessitated a digital model to investigate formal opportunities and system modularity, a digital evaluation of environmental performance using Geco and Ecotect, and a physical mock-up to develop the molding techniques as well as test material behavior. It was often the case that the digital model and evaluation were successful, only to discover through making that the design had constructability flaws. The final full-scale mock-ups of these robust screen designs mitigate solar heat gain while simultaneously enhancing ambient atmospheric effects achieved through light diffusion and reflectance. These prototypes demonstrate the aesthetic and performative potential of form-finding, modeling and analysis techniques with applications for both small and large scale structures.

Process: Form-Finding and Molding Techniques



Analysis: Parametric Adjustments According to Climate



Mock-Up: Full Scale Testing at Cal Poly's Materials Demonstration Lab

Ideation: Renderings and Sections Demonstrating Atmospheric Potential