

Research Through Making Grant Proposal

Taubman College of Architecture and Urban Planning

University of Michigan

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Detail, FitzRoy storm glass before an ice, sleet and snow event

STORM GLASS

(The storm-glass, or camphor glass, is a weather forecasting instrument invented in c. 1750. It consists of a sealed glass bottle containing a mixture of chemicals that undergo unusual crystalline growth and transformations in response to changing weather conditions)

“The purpose of climate engineering is to ensure the highest level of comfort for building occupants with the lowest possible impact on the environment.”

-Matthias Schuler, Transsolar

“Climate is what we expect, weather is what we get.”

- Mark Twain

What if the averaged accumulations of climate were abandoned for the immediacy of weather?

What if optimum comfort levels extended well beyond the range of the generally accepted territory in the psychrometric chart? What if the parameters of the ‘optimum’ were not based on pre-determined assumptions of human physiology?

This proposal aims to explore the dynamic atmospheric conditions that are separated only by the thickness of glass. Architecture’s weather is by and large *invisible*, yet can be explored materially. Like the storm glass, this work seeks to balance the material affect with the environmental interactions it simultaneously mediates and indexes. Similarly, glass in architecture is commonly employed as an invisible material—it is the void against the solid in the architectural mask. This proposal seeks to leverage one invisible condition against the other to elicit physical material properties that register and effect spatial *visibilities*.

The physical properties of glass offer high degrees of visual and thermal transparency. Critics from Alice Friedman to Catherine Ingraham have undertaken deep analyses problematizing the cultural implications of the glass wall’s visual transparency (in particular, see Friedman’s “People who live in Glass Houses,”). Today’s mass media is saturated with information regarding the effects of energy consumption in regards to buildings. The efforts to overcome the loss and gain of heat in search of the well-tempered is now part of mainstream knowledge. As a result, the thermal transparency of glass is an easy target as a contributor to the global environmental crisis.



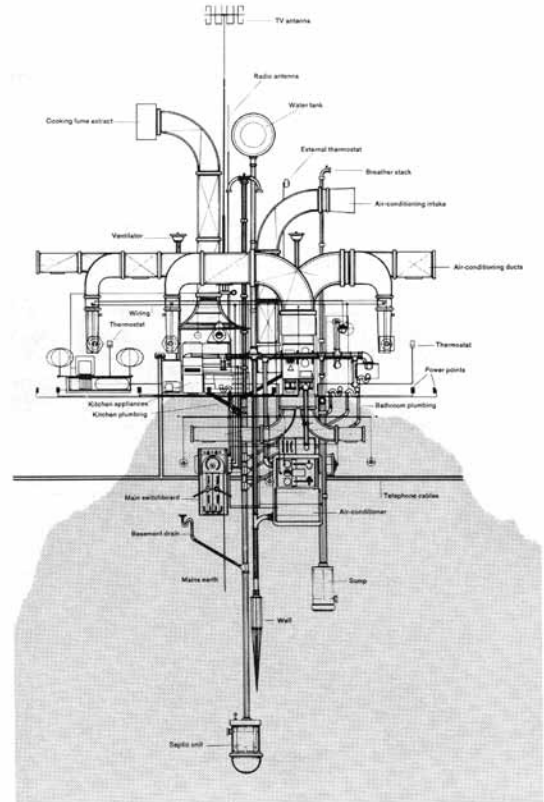
Archigram, Michael Webb, *Cushicle* 1968
Mock up of inflatable suit home for the Archigram exhibition at the 14th Milan Triennale



Mies van der Rohe, *Farnsworth House*, Plano, IL 1948



Buckminster Fuller, *Proposal for Manhattan*, 1972

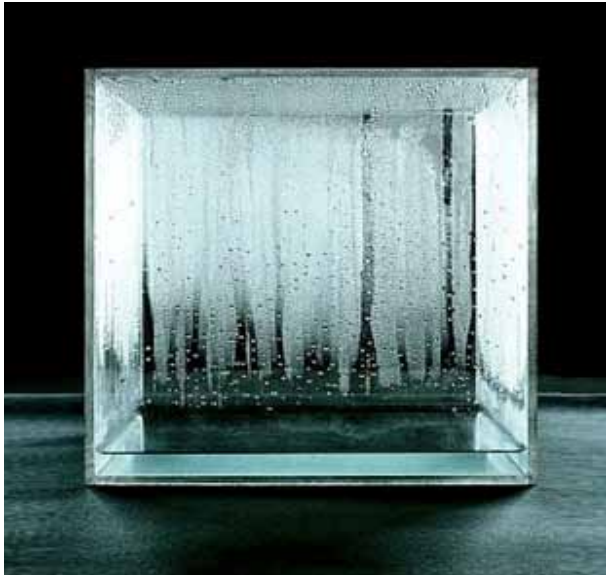


François Dallegret, *The Anatomy of a Dwelling in Reyner Banham*, "A Home is Not a House", in *Art in America*, 1965

Thinness

The desire to de-materialize building enclosure has elevated the representational status of glass to the ultra-modern. Here glass is an emblematic fixture of the future. A future where technological muscle renders architecture's necessity to provide shelter from the weather obsolete. Three visionary proposals illustrate this desire to strip architecture of its of this long held responsibility. Fuller's glass dome covering midtown Manhattan shifts the work of architectural climate control to a scale that assumes the magnitude of landscape. Banham and Dallegret's satire of a possible future captured in the drawing *Anatomy of a Dwelling* omits the house altogether replacing it with a 'baroque ensemble of domestic gadgetry.' Finally, Archigram's long standing project to delaminate the skin from the burden of its representational baggage, embraces the power of technology at the scale of the body. A fourth project, Mies van der Rohe's Farnsworth House celebrates the heightened aesthetic experience of the surrounding natural setting rationalized through the presence of the glass plane. Contemporary skin obsessions tend to fall toward two camps: the hyper surface articulations of the parametric modeler, or the highly technical infatuations with the performance driven double skin façade-- either purely aesthetic or purely technical.

In contrast, this proposal seeks to find spatial bearings in the performance criteria of environmental effects while embracing the thinness of materials. It aims for a thickening of the material/environmental composition of the enclosure, and imagines a new future for glass.



Hans Haacke, Condensation Cube



Fog fences, Mt. Tofo, Chile



Dew Pond, Sussex, England

Condensation

Air holds a certain amount of water vapor. The amount of vapor is relative to temperature whereby warmer air holds more moisture. The temperature at which air is saturated is called the dew point and is when condensation forms. Controlling air temperature also controls relative humidity.

Haacke's condensation cube is a direct register of this condition. The glass cube is held at the dew point due to the museum's highly controlled temperature and humidity. If the temperature were to fluctuate the surfaces of the cube would register that flux with more or less condensation. The cube is a perpetual index of the temperature and humidity of its surrounding.

Likewise, a primary consideration in detailing a wall assembly is predicting where condensation is likely to occur and detailing the assembled layers of the wall to prevent its occurrence.

Using these principles of opposite ends, fog fences and dew ponds are commonly employed to harvest potable water from the air, exploiting this material/environmental relationship, that in turn structures the landscape architecturally and topographically.

This proposal will position condensation as a positive attribute of the building's environmental systems optimization. In doing so the latent material properties of glass can amplify an expanded range of spatial and environmental effects derived from careful engagement with both active and passive environmental building systems.



Spencer Finch, 42 Minutes (After Kawabata)
 This series of photographs created in Whitingham, VT, captures the view through a window as the fading afternoon light turned to night. These photographs follow the window's transformation from a transparent pane of glass to a mirror.

Opacity

"I don't mean 'atmosphere' in the spatially illusionistic sense that I associate with color field painting, rather it is a non-radiating,,,impermeable mist. It feels like, rather than looks like atmosphere. Somehow, the red lines dematerialize the canvas, making it hazy, velvety. Then as you step back even further, the painting closes down entirely, becoming completely opaque."

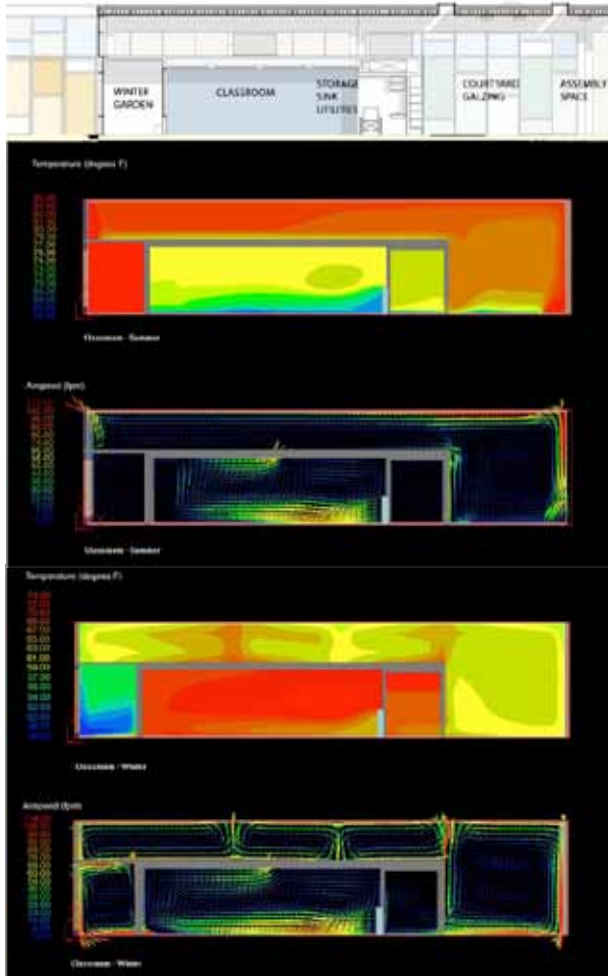
-Kasha Linville, describing the painting, *Red Bird* by Agnes Martin, in *Agnes Martin and Appreciation*, Art Forum 9, 1971



Mies van der Rohe, Friedrichstrasse Skyscraper project, elevation, 1921
 In this drawing strikingly, simple in its form and technique, Mies renders glass as an intensely opaque surface

The close observations revealed in Spencer Finch's photographs describe the relative shift of light and its influence on our reading of a windowpanes materiality. The immateriality of light is therefore able to render transparency and opacity simultaneously. Linville's description of the Agnes Martin painting and Mies' drawing of the glass skyscraper, also acknowledge shifting material perceptions in both drawings. The relative distance of the viewer is critical in revealing that simplicity is born out of complexity rather than reduction.

This proposal will exploit the modern expectations for transparent enclosure while actively seeking simultaneous contradictory conditions of opacity in glass.



Chicago Public School Competition: Computational Fluid Dynamic Analysis. The strategy of an occupiable double layered facade was explored and a means to decrease the requirements of HVAC system, leveraging the economy of decrease mechanical systems toward increased occupiable programmed space benefitting the curriculum. (project by the author, in collaboration)



Mies van der Rohe Plaza, Detroit Michigan. precast concrete production facility showing the formwork produced by the author (in collaboration) prepares for one days casting. Forms were tested and produced in the author's studio prior to utilization by the precast mfg company. Iterative forms were produced using CNC fabrication technology allowing for highly efficient use of materials and replication.

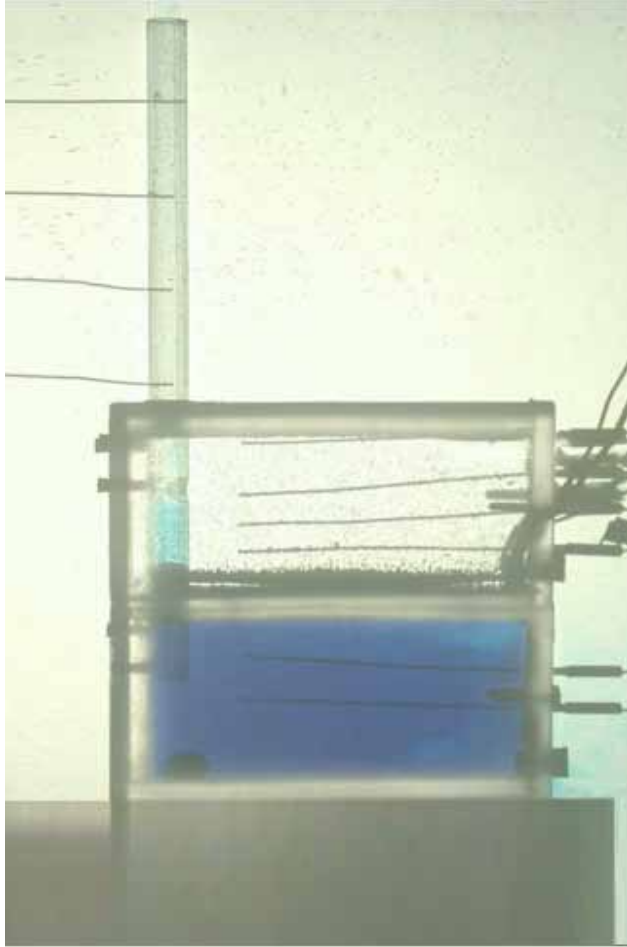
These examples shown above are included in the supplemental portfolio intended to demonstrate the proficiency in carrying out the work of this proposal.

Methods

Glass as an index and mediator of the material conditions of weather will be explored through the production of three material/environmental elements (wall, door and window). The aim is to redefine these elements both metaphorically and literally, as agents of extremity, eschewing convention and seeking radical spatial exploration.

While much of the analysis required to engage the environmental conditions seems highly technical, working methods will employ both hard and soft technologies in the service of direct material experimentation. Using available analysis software (Ecotect, Fluent, IES) and available physical analysis equipment (TCAUP watertable for simulating laminar air flow and the School of Engineering 3D water tunnel for simulating fluid dynamics), the intent is to approach analysis as a designer.

Glass as the primary building material will be manipulated using waterjet cutting equipment in the architecture program Digital Fabrication lab and slumping facilities in the Art School Ceramic Lab facilities.



Water Bath Ventilation Simulator

Materials and Equipment

Equipment to be purchased for the school that will be utilized in course work with students following the completion of the research project:

Edge grinder
 Surface thermometer
 Light meter
 Digital Psychrometer
 Bunsen burner
 Humidifier
 Dehumidifier
 Fan, Heating Coils and Thermostat

Consumable Material Supplies:

Glass tubes
 Glass sheets
 Sealant
 Glues

Budget

Equipment: \$1,000

Student research assistant/labor:

May-August (12 weeks)	
2 students 30 hours a week. \$14/hr	\$10,080
September- December (12 weeks)	
1 student 10 hours a week \$14/hr.	\$1,680

Materials: \$7,000

Total: \$19,760