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The Hot/Wet – Hot/Dry Studio: Investigations in contrast, context, and construction

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Objective:

The objective of this paper is to present a pedagogy which focuses the present into a larger social, cultural, and built context as a means to investigate and respond to unique geographic and environmental conditions. Contrasting climatic locations as a generative strategy in the design process is intrinsic to the studio course pedagogy (Emery McClure et al. 2014 & 2017).

Method:

The framework for this inquiry is an architecture studio, ARCH 3001, focused around hot/wet and hot/dry regional sites. The studio is composed of two projects, one sited in the hot/wet marsh of southern Louisiana and the second sited in the hot/dry desert of western Texas (Emery McClure et al. 2014 & 2017). Both sites are located at 30 degrees latitude and span a distance from 90 to 105 degrees longitude just over 1000 miles apart. This distance is traversed over a submersive field excursion that juxtaposes the two sites and their unique contextual parameters. The journey is traveled by motor coach allowing students to visually experience the gradual environmental transformation from a hot/wet to hot/dry region. The saturated landscape and air of the Mississippi delta progressively converts to the parched terrain and atmosphere of the Chihuahan desert. The topography also transforms vertically from a flat marsh to a steep mountainous surrounding. For many of the students this is the first time that they will travel out of state and experience a new environment with radically different contextual qualities. The ability to alter ones perspective of the landscape through a change in elevation afforded by the Chinati mountain range is a new experience. The contrast of these experiences, one familiar and one unfamiliar, provides a framework from which architectural perceptions can be re-evaluated.

Project 1: Hot/Wet



Figure 1: southern Louisiana hot/wet marsh environment

Site

Project one develops an immersive structure intended to engage researchers in the hot/wet marsh landscape through a distinct procession to promote an expansive experience of the environment and its qualities. Located at Turtle Cove Louisiana, the project learning objectives are oriented around tectonic assemblies and questions of building over a wet landscape (Emery McClure et al. 2014 & 2017). The site is only accessible via Pass Manchac, a waterway that connects Lakes Pontchartrain and Maurepas in southern Louisiana (Fig. 1). The site is explored by boat, allowing students to physically experience the environment and literally feel the sensation of floating through the landscape. The trip to the site across Pass Manchac gradually transitions from a swamp environment with a dense population of Cyprus trees to an expansive marsh environment comprised of only low growing grasses (Fig. 2). The context is vast and open, it is defined by a plane of dark water, a thin band of green grass, and a plane of blue sky with white/grey clouds. In this environment, with an average annual rainfall of 60" or more, water is all encompassing. The heavy humidity is felt in the air and imparts a soft blurred visual quality to the surroundings. Arriving at Turtle Cove students observe the site by further traversing out into the marsh by way of research walkways elevated a foot above the landscape. This contextual experience is documented with a series of timed sketches and photographs.



Figure 2: Pass Manchac gradual transformation from swam to marsh

Program

The parameters for the first project are focused on developing two elevated lookout platforms (one at 10' and a second at 20' in elevation), a choreographed procession, and the use of biodegradable materials in the event the structure is destroyed by a severe weather event. The structure is required to be elevated to provide a vantage over the marsh for researchers and to protect against storm surge. Precedents are introduced to investigate building types suited to hot/wet environments with the field excursion continuing to Pinecote Pavilion at Crosby Arboretum in Picayune Mississippi by Fay Jones. The precedent offers students an opportunity to actively explore the tectonic assembly of the building through on site observational documentation. Questions of structure and assemblage are investigated through drawing the series of layered components (columns, beams, joists, purlins, sheathing) and the techniques by which they are fastened.



Figure 3: Generative concept collages: solitary/shared, objectivity/intimacy, memory/presence

Process

The design process is initiated through a series of generative concept collages. The collages are intended as an analysis and interpretation of site through exploring divergent contextual qualities. Students use their site photographs and sketches along with additional images to articulate opposition or contrasting conditions of light/shadow, memory/presence, solitary/shared, etc. (Fig. 3). The two dimensional collages are then developed into three dimensional concept models as a way to further describe organizational strategies revealed during site analysis. The models are interpreted based on the materials they are constructed out of and the way the materials are connected. Composed of found materials, the models are assembled with mechanical fasteners to explore and express the structural forces inherent to each of the constructions. Glue is explicitly not permitted, this constraint heightens the focus on the attributes and logic of the modeling materials and helps to reveal the organizing characteristics of each component (Fig. 4). From these investigations tectonic models are developed. The programmatic use of biodegradable materials is further defined with maximum dimensions for linear elements (2"x4"x16') and planar elements (4'x8'x1/2"), the models are constructed using only dimensional bass wood and mechanical fasteners.



Figure 4: Generative concept models composed of found materials and mechanical fasteners

Materials & Assemblages

In the same semester as the hot/wet hot/dry studio, students are learning about the properties, performance, and parameters associated with specific materials and assembly techniques in an architectural systems lecture course ARCH 3007 (Holton 2017). In conjunction with studio project one, the architectural systems lecture course explores the qualities of wood as a material and the techniques by which it can be assembled architecturally. The different properties of softwood and hardwood types and their composition of cellulose fibers embedded in a matrix of lignin are explored. Performance characteristics of wood are presented with structural force arrows to describe how the material responds when loaded parallel to the grain and perpendicular to the grain. Performance is also explained in the way wood responds to environmental conditions and how it moves through the processes of expansion and contraction. Industry parameters used to describe processed wood are presented to illustrate sizing nomenclature, maximum standard dimensions, strength, and appearance. In conjunction with material investigations, building assemblages are also explored. Construction techniques using both wood joinery and mechanical fasteners are presented. Varying wood building assembly types are presented relative to contextual topics of location, scale, and program. Through the synchronization of lecture class knowledge and studio application the students have an increased capacity to address the complex issues of environmental context and construction standards in their design proposals.

Proposals

The observed qualities of the site exist throughout the project as generative techniques ultimately guiding the organizational strategies of the light tectonic assemblages of each proposed structure hovering above the landscape (Fig. 5). The projects are focused on the ways in which wood performs in both compression and tension when used in an elevated structure. They utilize the following multiple connection techniques to suspend structures above the landscape.

- *'Hoisted landscape'*, techniques: to –strap, weave, push, and wedge.
- *'Elevating landscape'*, techniques: to –pierce, layer, stagger, pin, pinch, and gather.
- *'Suspended landscape'*, techniques: to –pin, layer, and sandwich
- *'Floating landscape'*, techniques: to –hinge, layer, bifurcate, and overlap
- *'Raised landscape'*, techniques: to –pin, intersect, fold, overlap

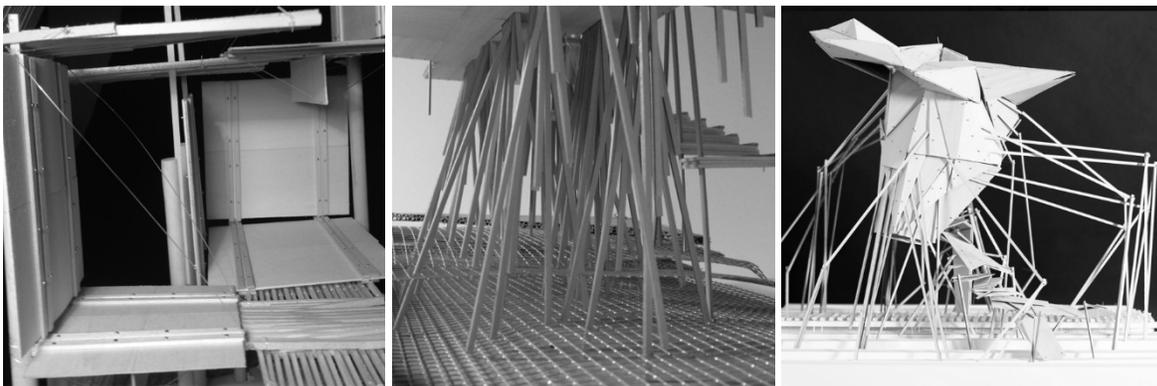


Figure 5: Project one structures suspended above the landscape, *'Hoisted'*, *'Elevating'*, & *'Raised'*

Project 2: Hot/Dry



Figure 6: western Texas hot/dry desert environment

Site

Project two develops a work/live structure that gathers a group of multidisciplinary artists around developing large-scale projects within a hot/dry desert terrain. Located in the town limits of Marfa Texas, the project prompts are attuned to stereotomic assemblies and opportunities of building embedded in a dry landscape (Emery McClure et al. 2014 & 2017). The site is positioned in the Chihuahan desert at the edge of the Chinati mountain range in western Texas (Fig. 6). Explored by foot, students traverse out into the landscape to experience first hand the composition, density, and textures of the ground. The trip to the site across the Chihuahan desert gradually transitions from grasslands to a mountainous environment with sparse vegetation (Fig. 7). Again, the context is vast and open, it is defined by a surface of brown/green earth that is contained by a thick band of brown mountains, and a void of blue sky. In this environment, with an average annual rainfall of 15" or less, water is noticeably absent. The dryness is felt in the air and transmits a crisp visual quality to the surroundings. Arriving in Marfa students observe the site by walking out directly across the solid ground. Similar to project one, this contextual experience is documented with a series of timed sketches and photographs.



Figure 7: Chihuahan desert gradual transformation from grasslands to mountains

Program

Project two is focused on developing an artist compound with connections to the adjacent Judd Foundation Block and larger network of work/live galleries in the community. The large-scale subject

matter of the on site artist work and installation also necessitates a connection to the transportation infrastructure. The structure is required to be at least fifty percent stereotomic construction and be embedded into the landscape as a technique to address solar heat gain. Precedents are introduced to investigate building types suited to hot/dry environments with the field excursion continuing to historic adobe structures in Big Bend National Park near Terlingua Texas constructed by local inhabitants. The precedents offer students an opportunity to actively explore stereotomic building assemblies through on site observational documentation. Questions of structure and assemblage are investigated through drawing the stacked and/or poured wall components. Techniques to connect tectonic elements with heavy earthen structures are drawn in section. Qualities of atmosphere and light are experienced by witnessing the milled aluminum works at sunrise during a visit to the Chinati Foundation. At night, the characteristically clear sky is viewed from the nearby McDonald Observatory presenting a crisp picture of our galaxy and the billions of stars it is composed of.

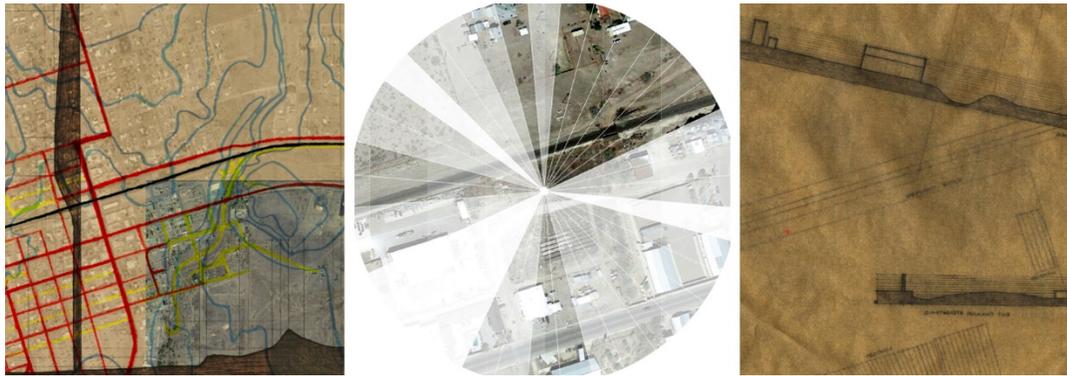


Figure 8: Quantitative and qualitative hybrid drawings

Process

A design charrette immediately following the project site visit is introduced as a way for the students to articulate their initial impressions of the site and program. Issues of massing, form, and adjacencies are explored with quick freehand drawings and diagrams. Perspectives are developed along with plans and sections to express the experiential qualities of the landscape and architectural proposals. The project site is related to the larger contextual area through a series of maps and diagrams. Students develop quantitative and qualitative hybrid drawings at regional, area, and town block scales (Fig. 8). The intent is to simultaneously explore and express the organizational systems of both experiential and measurable aspects of the place. At the same time the site analysis maps and diagrams are being developed, students also explore potential ways to interface with the site through conceptual models. The modeling materials and techniques are specified to encourage methods of engaging with the ground unique to the hot dry desert environment. Foam, clay, and wood are manipulated through techniques of striating, bounding, penetrating, extruding, and evanescing (Fig. 9). Together, the analytical drawings and concept models offer numerous strategies for the students to reevaluate their initial ideas expressed in the charrette. These strategies infuse the pragmatic understanding of site and program with new methods to uniquely develop each design proposal.

Materials & Assemblages

In conjunction with studio project two, the architectural systems lecture course explores the qualities of concrete as a material and the techniques by which it can be assembled architecturally (Holton 2017). The different properties of various mix types and their compositions of cement, water, and aggregates are explored. A further analysis of each component is presented to reveal the more specific elements

of each ingredient. In the case of cement, the technique of processing lime and clay through a series of steps that include heating in a rotary kiln to produce a clinker that is then pulverized into a fine powder are discussed. The process by which cement and water chemically bind together and how their ratio impacts the ultimate strength and workability is addressed. Performance characteristics of concrete constructions are presented by discussing the attributes of both concrete and steel reinforcement acting together. Structural analysis shows the strength of concrete in compression and steel in tension. The unification of the two materials, that have nearly the same thermal expansion and contraction rate, adhere well together, and are chemically compatible, in stereotomic assemblages is shown with construction drawings. Ingredient parameters are discussed and their influence on the strength, weight, fire-resistance, water-resistance, hue, and value of the final assemblage. Types of formwork are introduced to discuss the means of assemblage and the sequential construction steps from setting the forms to the curing of the concrete. Assembly types and their relation to the ground are presented relative to environmental context and soil types. Again, through the layering of lecture class knowledge and studio application the students have an expanded ability to integrate contextual opportunities and construction techniques in their design proposals.

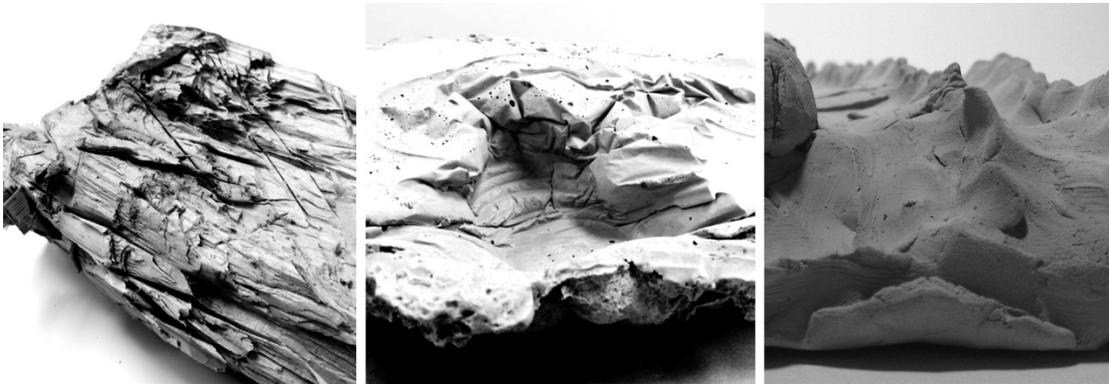


Figure 9: Conceptual models –wood, foam, and clay

Proposals

Expanding on the nature of the site, design proposals for project two are developed utilizing heavy stereotomic assemblages that allow each structure to be embedded in the landscape (Fig. 10). The projects are largely focused on the ways in which concrete performs in compression and in relation to the ground. They utilize a myriad of techniques to shape the landscape as illustrated in the following projects.

- *'Fabricating landscape'*, techniques: to –shape, cut, excavate, retain, hold, mold, and subtract.
- *'Sequential landscape'*, techniques: to –cut, excavate, retain, and subtract.
- *'Voided landscape'*, techniques: to –bury, conceal, cover, overlay, and hide.
- *'Containing landscape'*, techniques: to –excavate, retain, hold, and subtract.
- *'Removing landscape'*, techniques: to –reveal, excavate, retain, and subtract.

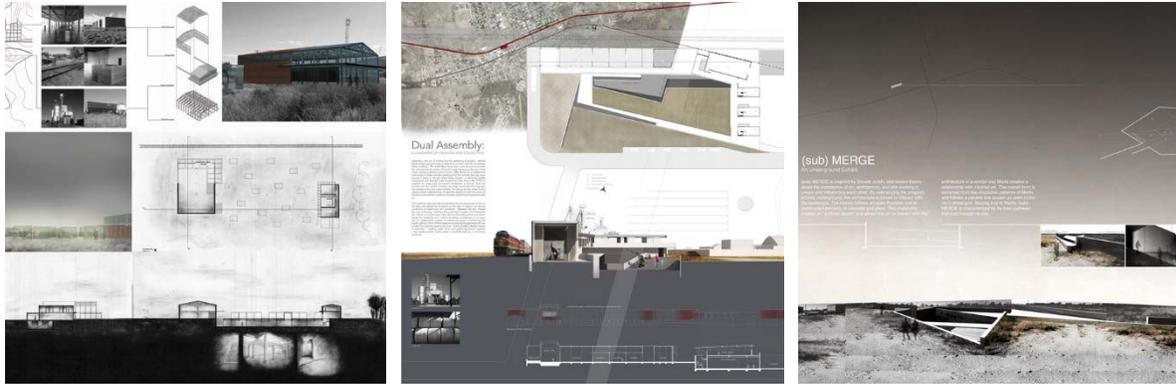


Figure 10: Project two structures embedded within the landscape, 'Fabricating', 'Sequential', & 'Removing'

Concluding results

The results are two distinct projects each focused on a unique set of contextual parameters that guide material, structural, and construction decisions. The models for project one are constructed of stick frame components with a direct measured and proportional relationship to actual standardized dimensional lumber. The components are connected, joined, and assembled with mechanical fasteners absent of traditional modeling glues. The drawings for project two focus on the sectional condition of the site in relation to the stacked and/or poured materiality of the structure. The assemblages illustrate an understanding of building within the earth and address the logic of structural forces. Through the engagement with juxtaposed project sites of similar yet contrasting environmental conditions students have a framework from which they can understand and then apply contextual parameters as generative strategies. The process of developing architectural proposals is infused with the conditions of the present allowing students to focus on the distinct qualities of each project site.

References:

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2. (Emery McClure, U., initiated the course pedagogical approach and co-taught the 2017 semester)
3. (Carney, J., co-taught the 2014 & 2017 semesters)
4. Holton, R., (2017). ARCH3007 Architectural Systems: Detailed treatment of construction materials and systems, with emphasis on large scale application of enclosure systems and steel and concrete structures, Louisiana State University School of Architecture, Baton Rouge, LA, US.

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