Arch 3690 | Spring 2019
Intermediate Computation and Fabrication

Wed: 10:30am - 12:35pm V-834B | Fri: 10:30am - 12:35pm V-817

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ASSIGNMENT 03: SCAFFOLDING SKIN

Building upon the scaffolding structure developed in the previous assignment, you are tasked with developing a scaffolding skin (or cladding) system based on your original concept that also addresses the environmental properties of the site. Through iterative prototypes, you will explore material properties using techniques of CNC milling, casting and mechanical connections.

MATERIAL RESEARCH:

Fig. 1 - Clockwise from top left corner: a) Vaulted Willow metal panels, b) Nova dichroic film, c) Wooden Waves laser-cut veneer, d) Lecture Hall concrete panel, e) Endesa World Fab Condenser canvas scrim, f) Armadillo Vault limestone panel.

The properties of a given material often dictate the method in which it can be altered to achieve a given performative affect. Casting concrete, stitching canvas and perforating plywood are all examples of material construction that are employed in modern industries. These methods and other combinations of materials are to be tested through direct interaction.

Your research will focus on testing materials through the use of digital fabrication techniques. These tools will enable you to cast / stitch / cut / combine different materials in order to develop you own distinct material language. You are encouraged to use the Roland CNC machines in the fabrication lab as a primary tool to fabricate your cladding panels. Specific properties of materials will inform the overall affect of you final prototype.

Please refer to the Page 3 for further resources to help aid your research.

Fig. 2 - Roland MDX-540 3-Axis CNC Mill

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In addition to shielding park visitors from potential debris falling from the Manhattan Bridge, your scaffolding skin will also mediate two other variables: sound and light. These two properties are to be addressed through the preformative characteristics of your cladding system. Lastly, how your skin attaches to the previously developed scaffolding structure will be explored through further development of your 3D printed structural nodes.

ACOUSTICS:

Sound is a form of energy which is made when air molecules vibrate and move in patterns called waves. It is measured through amplitude (volume), frequency (pitch) and wavelength (speed).

The measurement of how well a contructed assembly attenuates sound is knows as its Sound Tranmission Class (STC) rating. This number relates the preformance of different assemblies (wall, ceiling, roof, door, window, etc) against each other. The Tranmission Loss (TL) from one side of a partition to the other is measured be a difference in the decibel level of sound.

Using the basic principles of sound attenuation, your cladding is to mitigate loud sounds from the subway trains travelling on the Manhattan Bridge overhead.

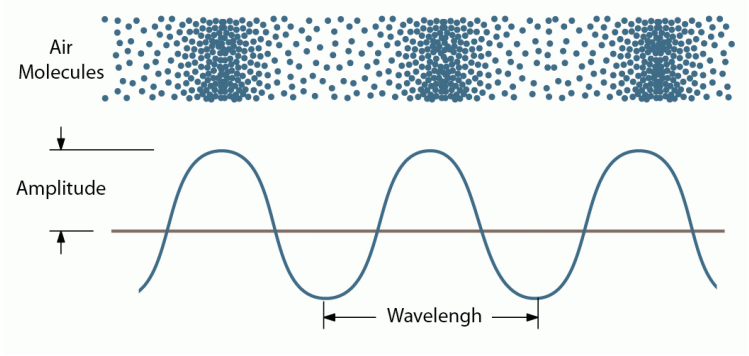

Fig. 3 - Diagram of properties of sound.

LIGHTING:

Another key variable your cladding systems will address is how to provide both natural and artificial lighting for those below. Natural light can be filtered either directly or indirectly through both the geometric and material properties of your scaffolding skin.

Secondly, your system will also address how to provide artificial lighting at night. Lighting may be integrated into the nodes of the structure or the cladding itself. Also, the material properties of your cladding might also be used to reflect/emit light.

Fig. 4 - Example of artificial lighting components.

CONNECTIONS:

Returning to your first scaffolding structure prototypes, you also will address how the scaffolding skin connects to the tubes or nodes previously developed.

Connections to nodes, to pipes and to cladding will test the tolerances of your system both structurally and tectonically. Rigid and flexible properties of each joint are to be intelligently designed into your scaffolding / node connections.

Lastly, the method in which the scaffolding system is erected also will inform the type of connections made.

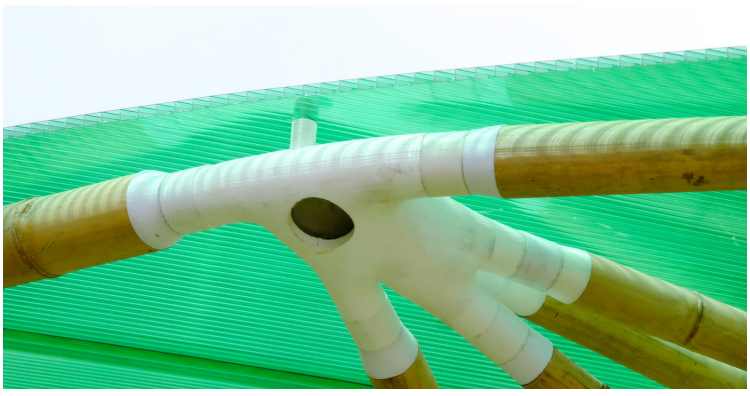

Fig. 4 - Example of node connection to panel.

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ASSIGNMENTS:

Part 1 - Material Matrix

Students are to chose three different materials and diagram within a matrix how each material relates to the following properties: a) acoustics, b) natural / artificial lighting, and c) connections to structure. Each students is to bring examples of each material to class. Material matrices (PDFs) are to be uploaded to the Google Drive student folders.
Due date: Wednesday, April 10

Part 2A - Milling Prototype 1

Using the material research as a basis for exploration, student's will develop an initial prototype of a scaffolding panel using 1" thick insulation foam. Each prototype is to relate to the initial scaffolding concept through material and formal properties including the given performative criteria. Students are to bring their prototypes to class.
Due date: Wednesday, April 17

Part 2B - Casting Prototype 2

Using the first foam prototype, each student will cast a material into / onto their initial prototype using the medium of their choice. The resulting prototype will again be studied for it's performative qualities. Students are to bring their prototypes to class.
Due date: Wednesday, May 1

Part 2C - Panel Connection Prototype

In addition to the first two material prototypes, each student will develop a system of connection to the scaffolding structure. Connections may be integrate into the initial nodes or be a separately attached (or both). Students are to bring their prototypes to class.
Due date: Wednesday, May 8

FINAL REVIEW

Students will make a comprehensive presentation exhibiting their final project combining the scaffolding structure + skin. Specific requirements will be outlined at a later date.

Final Presentation date: Wednesday, May 22 [subject to change]

REFERENCES / SOURCES:

Tutorials:
RhinoCAM - https://www.nycctfab.com/tutorialsrhinocam

Materials:
Compleat Sculptor - http://www.sculpt.com/