

Arch 463
ECS
Fall 2020

Name _____

Quiz #3

"Summer and Winter in the Winter Center"

For this problem you are a sustainable architecture critic for AIA COTE who wants to understand the active and passive heating and cooling strategies in the new Winter Visual Arts Building on the Franklin & Marshall College campus in Lancaster, PA.

In their design intent statement before construction Steven Holl Architects declared, "The billowing suspended lightweight architecture of the new building is articulated with thin in-wall trusses—like a box kite. The concrete walls at the ground level articulate the light and heavy distinction similar to the heavy trunks and light canopies of the nearby trees. The opaque skin was to be made of a new recycled glass aggregate material called "Poraver" with natural light to all studios provided by Okalux-insulated channel glass and clear skylights. There are operable view windows in every studio.

"The state-of-the-art geothermal heating and cooling of the new building, and its super-insulated envelope are part of the aspirations for future architecture of near "net zero" energy. A large reflecting pool doubles as campus stormwater overflow. The reflections of the hovering building at night glowing in the water add to the special articulation of this place defining the new Arts Quad."

During the construction process some compromises were made.

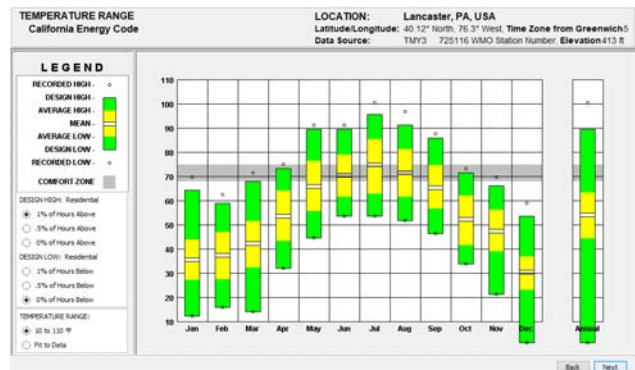
Climate context: Lancaster, PA, has a typical US Eastern climate with hot humid summers and cold winters. Prevailing winds are from the NW.



Final building design vs. schematic design sketch by Steven Holl.



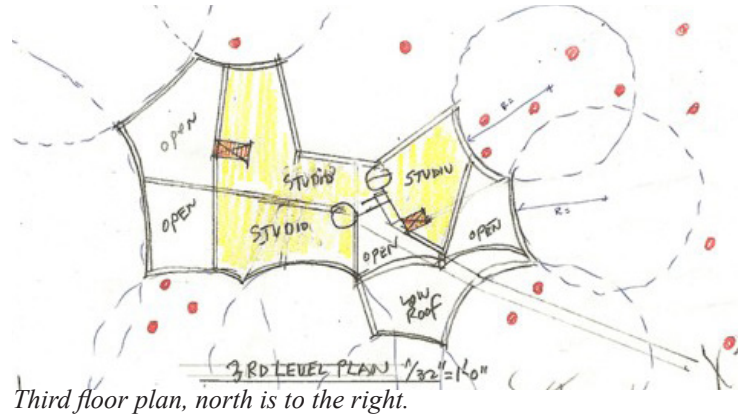
Photos and drawings: Steven Holl Architects 2019



This project uses a two layer U-Plank system that has never been done before. Rather than the traditional interlocking of structural U-shaped glass, the façade is composed of two U-Plank extrusions where the cavity between them is filled with Okalux translucent insulation, which creates luminous facades that allow light into the studio spaces while achieving excellent thermal performance. The translucent façade reduces the electrical use in the building and offers daylight into the working spaces. This along with the radiant flooring for heating and cooling and the operable windows and skylights creates a building equipped to maximize thermal performance and occupant comfort.

Constructible, Sustainable, and Economical

The concept of a two story “box kite” is exemplified by the building. Cast-in-place concrete walls on ground level anchor the floating kite with the white stucco walls and translucent channel glass windows that floats above within the tree tops. The trusses are the kite structure that allow for the double-height studio spaces. The concrete walls on the ground level hold up steel trusses, allowing openness to Buchanan park behind the building. Ground-level glazing is all transparent to gain that connection to the park while the studios float above with views to the park through the operable windows and from the mezzanine balcony.



We used 3-D modelling to develop and coordinate the construction documents with the team, allowing contractors to build the complex geometry efficiently and precisely. The entire roof structure is exposed and the steel tubes are rolled at one radius and then tilted in place to create the curved roof geometry. The tongue and groove wood planks that rest on the bent tubes create a billowing ceiling. They are simply fastened to the top of the bent steel and, given the tolerance of wood, they create this soft curved ceiling for an inspiring learning space.

—Steven Holl Architects



Schematic design exterior vs. final studio interior.



Passive Strategies

3 points 1. Identify three passive heating and/or cooling strategies used in the Winter Visual Arts Center. Explain each strategy and discuss how effective each one is in meeting the design goal—aspirations for future architecture of near “net zero” energy.

1

2

3

Active and mechanical strategies

3 points

2. Identify three active or mechanical heating and/or cooling strategies used in the Winter Visual Arts Center. Explain each strategy and discuss how effective each one is in meeting the design goal—aspirations for future architecture of near “net zero” energy.

1

2

3

Material choices

3 points 3. Identify three construction materials used in the building and **critique** them based on their ability to reduce embodied carbon for a near net carbon-neutral building. **Suggest** ways to reduce their embodied carbon.

1

2

3

Detective work

1 points

4. Find a feature of the design that was lost between schematic design intent and the completion of the building. Opine whether the loss or substitution of this feature/strategy was crucial to the building's performance. Explain your point-of-view.



Winter Center during construction last year (2019).



Extra Credit. (1pt.) Is the placement of the PVs on this proposed roof section okay? Explain why or why not.