This L-shaped addition to top of old Rapson Hall, is made up of several interlocking L-shaped spaces. The "L" shape is meant to play on Steven Holl’s Rapson addition made of two much larger “L’s.”

Translucent concrete rainscreen carried on exterior of insulated wall panels brings protection from elements and diffused light into the building where it is carried over the front of glazing.

Ceiling Plan with light scoops bring daylight into spaces through clerestory windows, providing daylight to wash over ceilings and down into rooms.

Reveal between light scoops and walls leave area for recessed artificial lights to be installed.

Circulation diagram shows how circulation in new addition follows above same circulation as existing Rapson Hall (around court yard). It also utilises existing elevators and stairwells.

New entry allows the new labs to have their own entrance and identity, while the entry also serves as combined entrance to Rapson Hall allowing for a sense of integration of the labs within the School of Architecture.

Site Wind + Solar Context

Rapson Hall is oriented on the north-south axis with a substantially taller building (Engineering Building) directly south, oriented east-west. Despite having buildings located on the east and west edges of Rapson Hall, they are substantially below grade, thus minimally affecting Rapson Hall. The site receives prevailing winds from the northwest in the winter months and southeast in the summer months. As for daylighting levels, the site receives much lower levels of daylight in winter months than in the summer months.
Daylighting Program

Target Month // March

WHO
Students
Researchers
Faculty
Employees

WHAT
Education
Research
Design Assistance
Demonstration
Collaboration

WHERE
CSBR Offices
Energy and Indoor Air Quality

WHEN
Classroom + studio spaces
must be lit or have the abil-
ty to be lit all hours of the
day.

Footcandles Desired

Daylighting Factor Required

Labs // CAT E_70-75fc
Office // CAT E_60fc
Conference // CAT E_60fc
Class // CAT E_50fc
Reception / Lounge // CAT B_30fc
Circulation / CAT A_2-6fc
Restroom / Mechanical / Service // CAT A_2-6fc
Outdoor Class + Demo

To utilize passive measures, design concentrates on
orientation, roof lines, roof heights (to open cleresto-
des combined with light sources), and placing design
placement (combined with wall thickness). Artificial
lighting will be necessary where daylighting is insuffi-
cient and during evening hours.

Create dramatic top lighting
strategy in entry

Lounge Area // CAT D_30-40fc
Floor-to-ceiling operable openings
Maintain comfortablity light
levels throughout the year

Sections studies of various roof conditions utilizing clerestories
to optimize desired daylighting effects

1. Diffused Nature 1
2. Diffused Nature 2
3. Direct Nature 1
4. Direct Nature 2
5. T Space // Steven Holl
6. Christ Church Lutheran // Eliel Saarinen
7. Johnson Chapel at Trinity School // Louise Nevelson
8. Heming Museum // Steven Holl

Bibliography
**Room + Envelope Studies**

**Ceiling Light Scoop Detail**
- Detail to show interior light scoop to draw in light from clerestory windows. This detail is being further developed and integrated into our design.

**Bevelled Window Wall Detail**
- Examination of wall thickness and interior views. By beveling the exterior of the openings we wanted to see if it improved views to the outside. After evaluating this idea we decided that the wall thickness was enough and the bevel was unnecessary.

**Wall System Detail**
- Insulated wall panel with air gap and stud framing on interior with gypsum board. Insulated wall panel to hang on interior columns. Triple glazed window openings. Overall this is the wall system we plan to go with but with the addition of an exterior rain screen. The average wall thickness with insulated panel, air gap and interior stud framing will be 2 feet 8 inches.

**Exterior Louvres Detail**
- Wall system detail as before with insulated wall panel but with exterior glazing with exterior louvres to provide sun shading. We have decided not to use louvres but it did point us in the direction of using a rainscreen system instead.

**Ecotect // Radiance Room Studies**

March/Sept 21st-Noon
- 1260 foot candles
  - Room + Envelope Studies
  - Final Design
  - Wall System Detail
  - Exterior Louvres Detail
  - Bevelled Window Wall Detail
  - Ceiling Light Scoop Detail
  - Detail Model with Wall System, Glazing & Translucent Concrete Rain Screen

**Detail Model with Wall System, Glazing & Translucent Concrete Rain Screen**
- Detail showing similar insulated wall panel with interior stud framing to give our building thick walls. View windows inset to inside of wall system while punched windows are placed at outside of wall system. The punched windows are to allow diffused light to sift through our translucent concrete rainscreen which is mounted to the building with a steel tubing grid running up from and following the lines of old Rapson Hall’s vertical slit windows.

This model represents decisions made from our earlier detail model studies. We utilized ideas from all models in order to come up with our final envelope strategy. Wall thickness were established to test bevels and decided they were unnecessary. The louver study helped inform our final decision for a rain screen however with more examination we ultimately decided upon a translucent concrete rain screen over a louvered system.
Daylight Illuminance Studies

**Daylight Levels**

Contour Range: 0 - 200 fc
In Steps of: 50 fc

**Baseline**

- **March/Sept 21st-Noon**: 1260 foot candles
- **June 21st-Noon**: 2260 foot candles

**Final**

- **March/Sept 21st-Noon**: 1380 foot candles
- **June 21st-Noon**: 2380 foot candles

Day lighting studies revealed substantial gains to most program areas from baseline case. The average foot candles for December 21st is nearly 53 foot candles and day lighting goals are met throughout the structure. Some areas (especially areas with southern exposure) will need to have day lighting controls installed to maximize user comfort.
How It All Works

Renewable Energy Systems Integration

Radiant floor systems are much more efficient and comfortable because they actually heat the floor rather than the air. Since warm air rises, the floors will maintain a relatively constant temperature and won’t produce large blasts of hot and cold air. Since heating the floor does not provide fresh air, radiant floors do require a ventilation system and this typically requires a separate cooling system.

PV Panels
- Since proposal includes a substantial amount of green roof area, the roof of the Steven Holl addition will be utilized for the installation of panels.
- Panels will be kept away from edges of structure to limit visibility from the ground and maintain Holl’s intent for how the structure meets the sky.
- Square footage needed to offset power needs - 9,555 square feet for a 35 degree mounted array.

Final Net Energy Use - 603,253 kBtu
Total Renewable Energy Production - 472,113 kBtu
Final Site Energy Use Intensity 4 kBtu/Sf

Automated Equipment Controls
- Works well with radiant floor system
- Will still need ventilation for fresh-air circulation during winter months
- Lower heating loads from Ecotect ‘full air-conditioning’ by 70%

Geo-Source Heat Loop Configuration
- Hydronic System
- Works well with radiant floor system
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Walls and structure grid show how space is broken up. The addition lined up with the existing column grid of Rapson Hall. Exterior wall panels hang from roof which is supported by column grid. The translucent concrete rainscreen hangs from wall panels held on by steel tubing grid.

Passive ventilation diagram showing cold air moving in through low operable windows and warm air exiting through upper operable clerestory windows.

Artificial lighting condition showing light systems recessed within void between ceiling lightscoop and wall.

Active ventilation diagram showing air flow from ducts within wall cavity and out through vents within ceiling light scoops.

L shaped windows serve dual purpose - low windows allow for natural ventilation while vertical windows allow for views and direct natural light. These windows are glazed at inside of wall system to allow for wall thickness to act as shading.

Punched windows are glazed at exterior of wall system with translucent concrete screen running on outside of glazing allowing for diffused light to come in.

Ground Source Heat Pump
- Provides radiant heat for 100% of program spaces
- 3.9 ton system reading 7800 BTU of vertical load
- Reducing EUI by 38 kBtu/Sf

Automated Lighting Controls
- Ultrasonic ceiling mount occupancy sensors
- Dimming Day lighting Sensors with daylight autonomy adjusted for design advantages
- Reducing EUI by 4 kBtu/Sf

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- Lower heating loads from Ecotect ‘full air-conditioning’ by 70%
Green roof absorbs sunlight during summer months to reduce cooling loads when they are at their highest.

Natural light is brought deep into the proposal with the use of multi-ceiling height design and placement of clerestory glazing throughout the structure.

Natural light is maintained throughout existing courtyard by directing it through proposed circulation areas.

Radiant floor system delivers heat at the level of the users.

Direct sunlight will enter circulation space in winter months to provide passive heating gains.

Orientation allows for maximum amount of direct sunlight through winter months.

Natural light will enter circulation space in winter months to provide passive heating gains.

Section A-A / Summer

Eastern winds will be ventilated from low on the proposed facade and circulate throughout the structure.

Evening view from south west

View from South West