This project investigates the design of structural and performative facades as a means to limit requirements for internal building structure and systems. This enables a building to be more easily adaptable to future program changes, and improves the lifespan resilience of the architecture. Typical building structures and facade systems do not integrate with site eco-systems. This investigation studies how aggregating modules of structural solar collecting walls can passively heat the building through the recirculation of solar-heated rainwater, thus integrating the architecture into the environmental milieu. This method challenges typical building construction, favoring the integration of structure, envelope, and climate to optimize resiliency in functionality, performance, flexibility, and energy use.

**PROBLEM**

<table>
<thead>
<tr>
<th>CAPITAL COSTS</th>
<th>STRUCTURE</th>
<th>SPACE PLAN</th>
<th>SERVICES</th>
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</thead>
<tbody>
<tr>
<td>TIME</td>
<td>TYPICAL CONSTRUCTION</td>
<td>columns and core</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STRUCTURAL PERFORMATIVE FACADE</td>
<td>maximum flexibility</td>
<td></td>
</tr>
</tbody>
</table>

**CONCEPT**

**SOURCES**

- ENERGY STAR TARGET FINDER: https://www.energystar.gov/buildings/tools-and-resources/target-finder
- NOBERT LECHNER - Heating, Cooling, Lighting: Sustainable Design Methods for Architects
- ENERGY EQUIVALENCY: http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results

Faculty Recognition: Michael LeBlanc, David Fannon, Michelle Laboy, Ivan Rupnik, and Dan Adams

**RESILIENCE BY USE ADAPTABILITY**

By integrating structural and facade systems, the interior building space is cleared of walls, columns, and cores that typically divide spaces.

**RESILIENCE BY STRUCTURAL PERFORMANCE**

By integrating structural and thermal systems, the building harnesses solar energy, converting it to electricity, and heating.

**UNIT AGGREGATION**

- SIMPLE OVERLAPPING
  - maximized fenestration
- SOLAR ANGLED
  - maximized solar angle
- CLUSTERED
  - programmatic + performative
- SAWTOOTH VARIATION
  - performance + daylight

**ENERGY DISTRIBUTION**

- PHOTOVOLTAIC
  - LIVRES
  - PER UNIT ACRES SAVED
  - PH ROOF
  - PH SOLAR FACADE
  - 19% 51%
  - 16% 24%

- PHOTOHYDROIC
  - LIVRES
  - PER UNIT ACRES SAVED
  - PH ROOF
  - PH SOLAR FACADE
  - 2 ACRES
  - 1 ACRE

**TIME**

- 1988
- 1998
- 2008
- 2018
- 2028
- 2038

**SPACE PLAN**

- 5 - 7 YRS
- 15 - 20 YRS
- 50 YRS

**STRUCTURE**

- 50 YRS

**SERVICES**

- 50 YRS

**COSTS**

- CAPITAL COSTS
- TYPICAL CONSTRUCTION
- STRUCTURAL PERFORMATIVE FACADE
- maximum flexibility
- SPACE PLAN
- SERVICES