WEST MIDDLE SCHOOL, THE SHIPLEY SCHOOL (1993)
FRAMING

You can resist peeping through a little hole to a world beyond. The asymmetrical angling of these windows is a quiet abstraction of medieval architecture, which further emphasizes the wall depth and draws the body into the void of space. Most of these framing moments were found incident by accident. At the stair up to the dining hall balcony, we wanted to create a more generous pause by showing the landing into an existing phone booth and store. By removing the wooden panel, James Gumbleton’s dissemble woodnarrows become transparent and a more modern sense of public spatial depth is infused into formerly introverted rooms. At the bottom of the stair, a body size hole into the multi-purpose room extends the view through that space into the activity hall beyond, continuing the dialogue of circumferential viewing.
refabricating ARCHITECTURE
How Manufacturing Methodologies Are Poised to Transform Building Construction

Stephen Kieran - James Timberlake

MASTER CONTROLLER

LOSING CONTROL The last century witnessed an unprecedented development of new materials and improved environmental systems, as well as a new understanding of old topics, such as acoustics. This expansion of choices has added up to infinitely more complex and specialized buildings that require expertise in more subjects than one architect can master. The architect now coordinates the many diverse consultants who are able to master their own specialities.
LOBOLLY HOUSE (2006)
CELOPHANE HOUSE™ (2008)

BEST 4 PLENARY | FORM VS. FUNCTION

MoMA
1. THERMOCOUPLE
   Measures exterior surface temperatures, reflecting ambient temperatures and heat gain.

2. THERMOCOUPLE
   Measures rate of thermal transfer from interior to exterior.

3. PENDANT SENSOR
   Measures the temperature of the air within the cavity.

4. THERMOCOUPLE
   Monitors the degree to which the cavity space buffers the interior from exterior temperature.

5. THERMOCOUPLE
   Measures the thermal transfer from the cavity to interior surface.
<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>FRAME</th>
<th>SKIN</th>
<th>GLAZING</th>
<th>WALL PANELS</th>
<th>BATHROOM PODS</th>
<th>FLOORS</th>
<th>ROOF</th>
<th>STAIRS</th>
<th>FOUNDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATERIAL</td>
<td>Bosch Aluminum Framing</td>
<td>Steel Connectors</td>
<td>Steel Bolts</td>
<td>NextGen Smart Wrap™ (PET)</td>
<td>Aluminum Louvers</td>
<td>Schüco Glass</td>
<td>Schüco Aluminum Frame</td>
<td>3-Form Varia (PETC)</td>
<td>Fiberglass</td>
</tr>
</tbody>
</table>

| TOTAL EMBODIED ENERGY | 955,631 kWh | 22,224 kWh | 71,423 kWh | 22,577 kWh | 71,448 kWh | 146,008 kWh | 8,214 kWh | 235,001 kWh | 15,264 kWh |
| PERCENT RECOVERED | 99.99% | 100% | 100% | 100% | 100% | 100% | 100% | 0% | 98.95% |
| EMBODIED ENERGY RECOVERED | 954,675 kWh | 22,224 kWh | 71,423 kWh | 22,577 kWh | 71,448 kWh | 146,008 kWh | 8,214 kWh | 235,001 kWh | 0 kWh |

**TOTALS**

- **1,800 sf building:** 1,547,790 kWh 860 kWh/sf
- **98.95%**

**CELLOPHANE HOUSE™ (2008)**

- **1,531,570 kWh**
- **851 kWh/sf**
Introducing Tally
The first LCA app that lets you calculate the environmental impacts of your building material selections directly in an Autodesk® Revit® model.

Click to download a free trial

WHOLE BUILDING LCA
Assess the embodied environmental impact of your entire building. Benchmark your impact throughout design.

DESIGN OPTION COMPARISON
Compare two or more distinct sets of building components side by side.

MATERIAL SELECTION
Compare LCA impacts and ingredients of materials and assemblies, including information from manufacturer EPDs.
Tally™ pulls material quantities from the Revit model and creates an accurate bill of materials.

**REVIT MODEL**

- Pulls material quantities from the Revit model

**TALLY™ DATABASE**

- Impacts are captured in an LCA database

**TALLY™ REPORTS**

- Are rapidly generated to address questions asked during design and material selection

**TALLY® LCA APP FOR REVIT (2012)**

- Global Warming Potential
- Primary Energy Demand

© KIERANTIMBERLAKE
MODELING & SIMULATION

FIELD ASSESSMENT & DATA COLLECTION

TOOL DEVELOPMENT & DATA PROCESSING

PROTOTYPING & MATERIALS RESEARCH
1. Client Goals

2. Program Analysis
   - Typologies
   - Building occupancy and use
   - Schedule

3. Site
   - Site & campus
   - Regional infrastructure
   - Facilities management

4. Climate
   - Regional climate
   - Micro climate
   - Thermal comfort

5. Landscape and Ecology
   - Geology
   - Stormwater and flooding
   - Vegetation and biodiversity
   - Ecosystem services

6. Local Resources
   - Energy
   - Atmosphere
   - Waste
   - Water
   - Building materials

7. Code/Regulations and Standards
   - Sustainability guidelines
   - Energy policy and incentives
<table>
<thead>
<tr>
<th>Section</th>
<th>Section Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>What is Brown’s local source of energy (natural gas, coal, etc.)? What is the availability of power, gas, or thermal networks? What is the carbon factor of the grid?</td>
</tr>
<tr>
<td>6.2</td>
<td>What is the local utility provider for power and gas? How are the rates structured? Are there provisions for energy buyback?</td>
</tr>
<tr>
<td>6.3</td>
<td>How can sustainable systems or strategies be considered in relation to the other existing and planned buildings on the engineering campus? Are there any opportunities for shared energy infrastructure or load sharing with adjacent buildings/facilities?</td>
</tr>
<tr>
<td>6.4</td>
<td>What is the potential for on-site renewable energy generation (PV, wind, etc.)?</td>
</tr>
<tr>
<td>6.5</td>
<td>What is the anticipated baseline energy consumption for the building based on comparable buildings in this region?</td>
</tr>
<tr>
<td>6.6</td>
<td>Are there emerging technologies or systems relevant to managing the heavy energy use of laboratory buildings?</td>
</tr>
<tr>
<td>6.7</td>
<td>How might alternate energy reporting formats be applicable to the project?</td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td></td>
</tr>
<tr>
<td>6.8</td>
<td>What is Brown’s water source and treatment infrastructure? What are associated costs?</td>
</tr>
<tr>
<td><strong>Atmosphere</strong></td>
<td></td>
</tr>
<tr>
<td>6.90</td>
<td>What are the airborne pollutants present on site? Do any onsite pollutants preclude particular façade materials?</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td></td>
</tr>
<tr>
<td>6.10</td>
<td>What is the solid waste management infrastructure on site?</td>
</tr>
<tr>
<td>6.11</td>
<td>How do we dispose of hazardous laboratory waste?</td>
</tr>
</tbody>
</table>
AFFORDABLE, SOLID, QUICK-TO-BUILD, SUSTAINABLE HOUSING SOLUTION FOR INDIA'S COMPOSITE CLIMATE ZONE
IDEAL CHOICE HOMES™
BEST 4 PLenary | FORM VS. FUNCTION
GREEN ROOF VEGETATION STUDY

BEST 4 PLENARY | FORM VS. FUNCTION
2006
11 SPECIES
100% PLANTED

2011
44 SPECIES
52% PLANTED
48% RUDERAL

2012
54 SPECIES
56% PLANTED
44% RUDERAL

2013
48 SPECIES
60% PLANTED
40% RUDERAL
Values

**INFLUENCE** the industry to design, implement, and operate integrated energy-efficient renovations.

**REPEATABLE DEMONSTRATION** incorporating replicable energy-efficient technology, processes, and procedures that are affordable, workable and efficient.

**LEARNING** about the efficacy, affordability, repeatability and constructability of efficient and effective energy retrofits.

**COLLABORATIVE ENVIRONMENTS** to provide a nexus for regional demonstration, learning, and influence.

**SYSTEMS INTEGRATION** for efficient and effective energy retrofits through synergistic integration of dependable components and subsystems.

**COST CERTAINTY** to use available funds to maximize scope and minimize long-term facility costs with constant consideration of premium and affordability.

**TIME RELIABILITY** make decisions at the most responsible moment and create a safe and quality work environment.
**TRADITIONAL WORK PLAN**

Cost estimating at **end of phase** results in value engineering and **redesign effort**

![Traditional Work Plan Diagram]

**INTEGRATED WORK PLAN**

Cost modeling to **inform design** results in **target value design**

![Integrated Work Plan Diagram]
THERMAL PERFORMANCE ANALYSIS – EXISTING BUILDING ENVELOPE
Baseline: 71 kBtu/sf-yr
Energy Reduction: 52.5% (+75% than target)
EUI: 34 kBtu/sf-yr
E Cost Reduction: 37.5% (+25% than target)
LEED EAcl: 15 out of 19 points
Energy Star Rating: 94-97
Baseline: 53 kBtu/sf-yr
Energy Reduction: 36.2% (+20% than target)
EUI: 34 kBtu/sf-yr
E Cost Reduction: 39.3% (+31% than target)
LEED EA: 14 out of 19 points
### Rainscreen Design (Reduced R-Value)

<table>
<thead>
<tr>
<th></th>
<th>North (Level 1)</th>
<th>North (Level 2)</th>
<th>West (Level 1)</th>
<th>West (Level 2)</th>
<th>South</th>
<th>East</th>
<th>Building Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Façade</td>
<td>3,550</td>
<td>5,550</td>
<td>850</td>
<td>850</td>
<td>9,100</td>
<td>1,700</td>
<td>21,600</td>
</tr>
<tr>
<td>Opaque Wall</td>
<td>1,825</td>
<td>1,790</td>
<td>510</td>
<td>275</td>
<td>6,605</td>
<td>1,085</td>
<td>7,690</td>
</tr>
<tr>
<td>Clear Glazing</td>
<td>1,725</td>
<td>1,035</td>
<td>340</td>
<td>160</td>
<td>2,495</td>
<td>615</td>
<td>3,110</td>
</tr>
<tr>
<td>Translucent Insulated Glazing</td>
<td>2,725</td>
<td>49%</td>
<td>49%</td>
<td>49%</td>
<td>415</td>
<td>340</td>
<td>13.6</td>
</tr>
<tr>
<td>Average R-Value</td>
<td>12.2</td>
<td>11.4</td>
<td>13.6</td>
<td>11.4</td>
<td>15.6</td>
<td>14.2</td>
<td>13.6</td>
</tr>
</tbody>
</table>

**Systems**
- 12,090 Solid wall
- 9,510 Curtainwall / Storefront

**Building 7R Facade Studies**
BUILDING 7R CLASSROOM DAY LIGHTING ANALYSIS
EXPERIMENTAL ZONES

Zone 1: Amendment Study

Zone 3: Plant dynamics & Soil Amendments

Zone 2: Plant dynamics

Zone 4: PV performance

PLANTING PLAN

PLANTING ZONES
- mixed grasses / forbs
- meadow mix
- gravel bed
- sedum_full sun
- sedum_part sun

SENSOR DEPLOYMENT PLAN

61 sampling locations

- Temperature/RH
- Soil moisture

BUILDING 7R GREEN ROOF DESIGN & MONITORING
DO NOT PULL WIRES
KIERANTIMBERLAKE
215-922-6600