Project Presentation
11/01/19

Agenda

1. Project Milestones
2. Project Vision and Precedents
3. Sustainability Goals and Energy Targets
4. Program Summary
5. Site Analysis
6. Planning Concepts
7. Conceptual Design
8. Discussion
Project Milestones
Project Vision and Precedents
Project Vision/Goals

- Create a showcase facility that has a positive impact on health-related research activity and the recruitment of faculty and students
- Put research on display
- Support research-based discovery learning
- Encourage interdiscipline teamwork and behaviors through thematic rather than departmental grouping
- Reinforce the MTU culture of collaboration
- Provide quality daylight and views for all
- Orient and shape new addition to reduce energy
- Showcase a highly sustainable approach to STEM education
- Be responsive to the intensity of the Houghton winter season
Project Precedents

Wayne State University
Integrative Bioscience Center (iBio)

Central Michigan University
Biological Sciences

University of Michigan
Biological Sciences Building

Michigan State University
STEM Teaching and Learning Facility
Wayne State University

Integrative Bioscience Center (iBio)
Detroit, MI

205,700 GSF
78,000 GSF addition

$78M

LEED Gold
iBio Laboratory
Wayne State University
HED
• Large, flexible shared lab space
• Shared lab support space
• Collaborative research
• Transparency
• Proximity of office space to lab space
- Large public space (soft space)
- Collaborative space
- Research on display
- Public engagement
- ‘Wow’ factor
- Public engagement
- Transparency
- Collaborative space (soft space)
themes, not departments

the science of team science.
20% of total net area = collaboration / conference / lounge space
68,060 TOTAL GROSS SF
37,856 TOTAL NET SF USEABLE AREA
   INCLUDES 7,200 NET SF (19% OF TOTAL NET AREA) COLLABORATION / CONFERENCE / LOUNGE SPACE

55.6% NET TO GROSS EFFICIENCY (55% LOWEST EFFICIENCY PERMITTED BY DTMB)

19% OF TOTAL NET AREA = COLLABORATION / CONFERENCE / LOUNGE SPACE

55.6% NET TO GROSS EFFICIENCY

REFERENCE PROJECT AREA ANALYSIS
Sustainability Goals and Energy Targets
Ten Measures of Sustainable Design

1. Design for Integration
2. Design for Community
3. Design for Ecology
4. Design for Water
5. Design for Economy
6. Design for Energy
7. Design for Wellness
8. Design for Resources
9. Design for Change
10. Design for Discovery
Sustainable design principles should be used in the design and construction of capital outlay supported projects; the LEED Green Building Rating System is a convenient and industry-accepted standard of reporting and measurement.
### Energy Targets

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>pEUI kBTU/sf/year</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPA average for Research Higher Ed Campuses</td>
<td>162</td>
<td></td>
</tr>
<tr>
<td>MTU campus average</td>
<td>152</td>
<td>Figured is brought down by non-research buildings on campus</td>
</tr>
<tr>
<td>MTU Research Building Average</td>
<td>212</td>
<td>Range of 200 to 225</td>
</tr>
<tr>
<td>Chem-Sci energy use FY2019</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>I2SL benchmarking tool (median)</td>
<td>296</td>
<td>Specific to climate zone 7</td>
</tr>
<tr>
<td>Michigan Energy Code (IECC 2015)</td>
<td>104</td>
<td>*This analyzed for addition only using 25,000 Lab and 61,400 sf higher education baseline data from AIA 2030</td>
</tr>
<tr>
<td>IECC 2018</td>
<td>98</td>
<td>*This analyzed for addition only using 25,000 Lab and 61,400 sf higher education baseline data from AIA 2030</td>
</tr>
<tr>
<td><strong>AIA 2030 Commitment Goal</strong></td>
<td><strong>58</strong></td>
<td>*This analyzed for addition only using 25,000 Lab and 61,400 sf higher education baseline data from AIA 2030</td>
</tr>
<tr>
<td><strong>Case Study Buildings:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flint Murchie</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>MSU STEM</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>WSU IBio</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Central Michigan U Bio Sciences</td>
<td>?</td>
<td></td>
</tr>
</tbody>
</table>

*THESE NUMBERS ARE FROM LARRY H. AT MTU.*
AIA 2030 Goal Finder

<table>
<thead>
<tr>
<th>Use Types</th>
<th>Area (GSF)</th>
<th>Baseline (EUI) kBtu/sf/yr</th>
<th>Goal (2030 Challenge) kBtu/sf/yr</th>
<th>Baseline LPD W/sf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education - College/University (campus-level)</td>
<td>61400</td>
<td>120.0</td>
<td>36.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Laboratory</td>
<td>25000</td>
<td>370.0</td>
<td>111.0</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>86400</strong></td>
<td><strong>192.34</strong></td>
<td><strong>57.6996</strong></td>
<td><strong>1.26</strong></td>
</tr>
</tbody>
</table>

**Energy Analysis**

- **Status of Energy Model**: Will be modeled
- **Design Energy Code**: IECC-2015
- **Responsibility Party**: Design Engineer

**Baseline & Target Energy Use Intensity**

- **Predicted**: 103.86 kBtu/sf/yr
- **Baseline**: 192.34 kBtu/sf/yr
- **Goal (2030)**: 57.6996 kBtu/sf/yr
- **Savings**: 46%

**Challenge**

- 2030 = 100% (Carbon Neutral)
- 2025 = 80%
- 2020 = 80%
- 2018 = 70%
- 2014 = 80%

**Additional Inputs**

- Lighting Power Density
- Occupancy Sensors Included?
Program Summary
Targeted Program Area – New Addition

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAB &amp; SUPPORT</td>
<td>32,307 NSF</td>
</tr>
<tr>
<td>OFFICE</td>
<td>39 x 105 NSF</td>
</tr>
<tr>
<td>GRAD STUDENTS</td>
<td>92 x 40 NSF</td>
</tr>
<tr>
<td><strong>SUBTOTAL</strong></td>
<td>40,082 NSF</td>
</tr>
<tr>
<td>COLLABORATION/‘SOFT SPACE’</td>
<td>10,021 NSF</td>
</tr>
<tr>
<td>Meeting/Student Lounge/Conference</td>
<td></td>
</tr>
<tr>
<td>20% TOTAL NSF</td>
<td>50,103 NSF</td>
</tr>
<tr>
<td>55%-65% NET-TO-GROSS</td>
<td>77,000-91,000 GSF</td>
</tr>
</tbody>
</table>
Planning Concepts
Programming Considerations

LAB VS. LAB SUPPORT VS. SHARED SUPPORT (CORE)

• Lab = Bench Space

• Lab Support: e.g. tissue culture, microscopes, fume hood alcove - give number of hoods needed in each lab

• Shared (CORE) Support: e.g. imaging equipment {microscopes, etc.} analytical equipment {GC, mass spec, etc.} common refrigerator rooms

STANDARDIZATION OF PROGRAM AREAS

• Research Laboratories – SF/PI
Grad/tech
6-8
40 nsf x 6 =
240 nsf

PI – 100 nsf

Lab bench
350 nsf

Lab support
350 nsf

1000 nsf/ PI
10’-8” module
Flexible Multidisciplinary Labs
Open Lab: bench space
Specialized infrastructure

Lab Support: Alcoves for a variety of functional spaces. Shared and/or PI designated space.

Shaded spaces are shared lab support.

Lab: Lab Support ratio
50-50 - most typical
60-40
70-30

Northwestern University
Site Analysis
Conceptual Design
CONSIDERATIONS

• COST

• QUANTITY OF LABS
  (MOST EXPENSIVE SPACE)
  IN NEW ADDITION

• QUANTITY OF ‘DOUBLE
  MOVES’
  (RELOCATE EXISTING
  SPACE & BUILD NEW THEN
  RENOVATE EXISTING
  VACATED SPACE FOR NEW
  FUNCTION = ADDED COST)

EXISTING CHEM. + CHEM.
ENG. LABS RELOCATED TO
NEW ADDITION AS REQUIRED
TO CREATE SPACE FOR KIP / BME / BIO. / HRI OFFICES

NEW ADDITION

KIP / BME / BIOLOGY / HRI OFFICES

KIP / BME / BIOLOGY / HRI LABS

$$$ CONCEPT EXPLORATION
EXISTING CHEM. + CHEM. ENG. LABS & OFFICES RELOCATED TO NEW ADDITION AS REQUIRED TO CREATE SPACE FOR SUPPORT LABS

CONCEPT EXPLORATION

$\ incentives$

CONSIDERATIONS

• REDUCED QUANTITY OF LABS (MOST EXPENSIVE SPACE) IN NEW ADDITION

• NEW SUPPORT LABS IN EXISTING BUILDING REDUCED COST & LED TO ‘IBIO TYPE’ TEAM SCIENCE SPACE RELATIONSHIPS

• REDUCED QUANTITY OF ‘DOUBLE MOVES’ (RELOCATE EXISTING SPACE & BUILD NEW THEN RENOVATE EXISTING VACATED SPACE FOR NEW FUNCTION = ADDED COST)
LIBRARY MEMORIAL UNION BUILDING

CONCEPT PLAN

LAB
SUPPORT LAB
'MIXING BOWL'
GRAD STUDENTS
FACULTY
LEARNING / COLLABORATION / SOCIAL HUB

THE NEW FACE OF STEM + HEALTH
COLLABORATION / HUB / TRANSPARENT / ENGAGEMENT / MASS TIMBER / SOUTH SUN!

7 STORIES

ANIMAL CARE SPACE
(FUTURE? / BELOW GRADE)

NORTH TO SOUTH
TRANSPARENCY

MORE PRIVATE PUBLIC / PATIENT ACCESS

MECHANICAL ENGINEERING / ENGINEERING MECHANICS

ANIMAL CARE SPACE
(FUTURE? / BELOW GRADE)

NORTH TO SOUTH
TRANSPARENCY

MORE PRIVATE PUBLIC / PATIENT ACCESS

MECHANICAL ENGINEERING / ENGINEERING MECHANICS
LAB SUPPORT
33%
OF TOTAL REQUIRED LABS

RESEARCH & TEACHING LABS
67%
OF TOTAL REQUIRED LABS

THE NEW FACE OF STEM + HEALTH
COLLABORATION / HUB / TRANSPARENT / ENGAGEMENT / MASS TIMBER / SOUTH SUN!

7 STORIES

LIBRARY MEMORIAL UNION BUILDING

CONCEPT PLAN
Chemical Sciences Building

11' Lab Module

Mechanical Engineering – Engineering Mechanics

Conf. / Collab.

Open on Floors 2, 4 & 6

Existing Stair

Lab Support (No Lab Support on 5th Floor)

Labs

Grad. Students

Faculty Offices

Elec.

Data

Potential Upper Floor Additional Space at Various Places in Atrium
MORE OPEN COLLABORATION

ENCLOSED CONF. / TEAM ROOMS + DEPT OFFICES

2 STORY HIGH SPACE

OPEN FEATURE STAIR

ALTERNATE COLLABORATIVE / LEARNING 'BAR' STUDY

WALKWAY

VEST.

EXISTING STAIR

SUPPORT LAB

LAB

GRAD. STUDENTS

SUPPORT

FACULTY

GARDEN / COLLAB.

LOBBY

ELEV.
OPEN FEATURE STAIR

COLLAB. / CONF.

ELEV.

EXISTING STAIR

OPEN TO BELOW

LAB

SUPPORT LAB

LAB

SUPPORT

SUPPORT

FACULTY

GRAD. STUDENTS

GW GRAD. STUDENTS

SUPPORT

GW GRAD. STUDENTS

SUPPORT

FACULTY

CLASSROOM

CLASSROOM

WALKWAY

OPEN FEATURE STAIR

OPEN TO BELOW

COLLAB. / CONF.

GW GRAD. STUDENTS

SUPPORT

FACULTY

2nd FLOOR

MORE OPEN COLLABORATION

ENCLOSED CONF. / TEAM ROOMS + DEPT OFFICES + DISPLACED CHEM. & CHEM. ENG OFFICES

ALTERNATE COLLABORATIVE / LEARNING ‘BAR’ STUDY

OPEN TO BELOW

MRI

MRI
OPEN FEATURE STAIR
COLLAB. / CONF. ELEV.
OPEN TO BELOW
EXISTING STAIR
SUPPORT LAB
LAB
GRAD. STUDENTS
SUPPORT FACULTY
WALKWAY
COLLAB. / CONF.
OPEN FEATURE STAIR
ELEV.
ENCLOSED CONF. / TEAM ROOMS + DEPT OFFICES + DISPLACED CHEM. & CHEM. ENG OFFICES
MORE OPEN COLLABORATION
ALTERNATE COLLABORATIVE / LEARNING ‘BAR’ STUDY
3RD – 7TH FLOOR
ALTERNATE COLLABORATIVE / LEARNING ‘BAR’ STUDY
2ND FLOOR CLASSROOMS

ALTERNATE COLLABORATIVE / LEARNING ‘BAR’ STUDY
# Proposed Conceptual Design Program

<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>AREA</th>
<th>NEW</th>
<th>RENOVATED</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LAB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME/KIP/BIO/HRI</td>
<td>32,307 NSF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISPLACED CHEM/CHEM ENG</td>
<td>6,520 NSF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL LAB PROVIDED</strong></td>
<td>38,827 NSF</td>
<td></td>
<td></td>
<td>13,920 NSF</td>
</tr>
<tr>
<td><strong>RENOVATION LAB SUPPORT</strong></td>
<td></td>
<td></td>
<td>13,920 NSF</td>
<td>13,920 NSF</td>
</tr>
<tr>
<td><strong>NEW RESEARCH &amp; TEACHING LAB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFFICE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME/KIP/BIO/HRI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISPLACED (ASSUME ALL GRADS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL OFFICES</strong></td>
<td>39 OFFICES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x 105 NSF EACH</td>
<td></td>
<td>4,095 NSF</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRAD STUDENTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME/KIP/BIO/HRI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISPLACED CHEM/CHEM ENG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL GRADS</strong></td>
<td>188 GRADS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x 40 NSF EACH</td>
<td></td>
<td>7,520 NSF</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SOFT SPACE</strong></td>
<td></td>
<td></td>
<td></td>
<td>11,000 NSF</td>
</tr>
</tbody>
</table>

| **LAB SUPPORT**                |          | 13,920 NSF |            |             |
| **LAB**                        |          | 24,907 NSF |            | 24,907 NSF  |
| **OFFICE (39)**                | 4,095 NSF |            |            | 4,095 NSF   |
| **GRAD STUDENTS (188)**        | 7,520 NSF |            |            | 7,520 NSF   |
| **SOFT SPACE**                 | 11,000 NSF|            |            | 11,000 NSF  |
| **CLASSROOM** (DISPLACED)      | 1,200 NSF | 1,160 NSF  |            | 2,360 NSF   |
| **TOTAL**                      | 48,722 NSF| 15,080 NSF | 63,802 NSF |             |

**NEW ADDITION**
- 82,000 GSF
- 50% NET-TO-GROSS EFFICIENCY

**RENOVATION**
- 15,080 NSF
Potential Additional Scope Items

- ANIMAL CARE SPACE
- 5TH AND 6TH FLOOR TEACHING LABS RENOVATED
- MECHANICAL UPDATES /‘FIXES’ TO EXISTING BUILDING
- PARTIALLY CONDITIONED WALKWAY CONNECTOR
- LOBBY AT WEST PARKING LOT
Discussion