

A Cross-Continental Innovative & Replicable Sustainability Journey

from
Vancouver, British Columbia to Atlanta, Georgia

HOWARD S. WERTHEIMER, FAIA, LEED AP, AUA

Georgia Institute of Technology
Institute Architect

Gerry McGeough, AUA

University of British Columbia
Director, Planning & Design/University Architect

The Kendeda Building for Innovative Sustainable Design

Project Vision:

The vision for the Kendeda Building is to **create the most environmentally advanced education and research building on a college campus in the Southeast**, leveraging our enterprise to guide others across the region toward more sustainable materials and processes.

The Kendeda Building for Innovative Sustainable Design



Sustainable Campus Design

Georgia Institute of Technology



*Buildings currently seeking LEED certification and anticipated to achieve levels as listed.

**Buildings with sustainable features were designed using sustainable practices however did not seek LEED certification.

New Metric:

~3M sf of LEED Certified/
Certifiable Buildings

23,107 students
128 LEED sf/student

LEED square footage: ~3M

Total square footage: ~16M

Total %: 18.75%



Living Building

at Georgia Tech



Kendeda Building for Innovative Sustainable Design (2020)

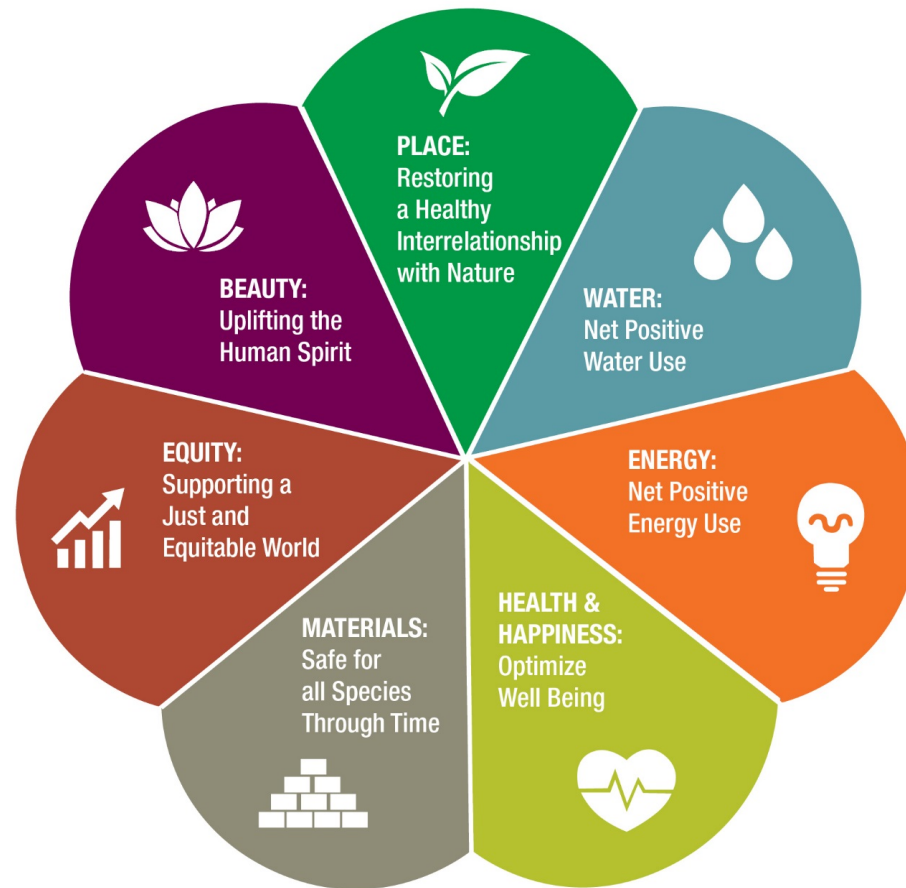
Architect: Lord Aeck Sargent / Miller Hull Partnership; CM: Skanska, TPB: \$25M



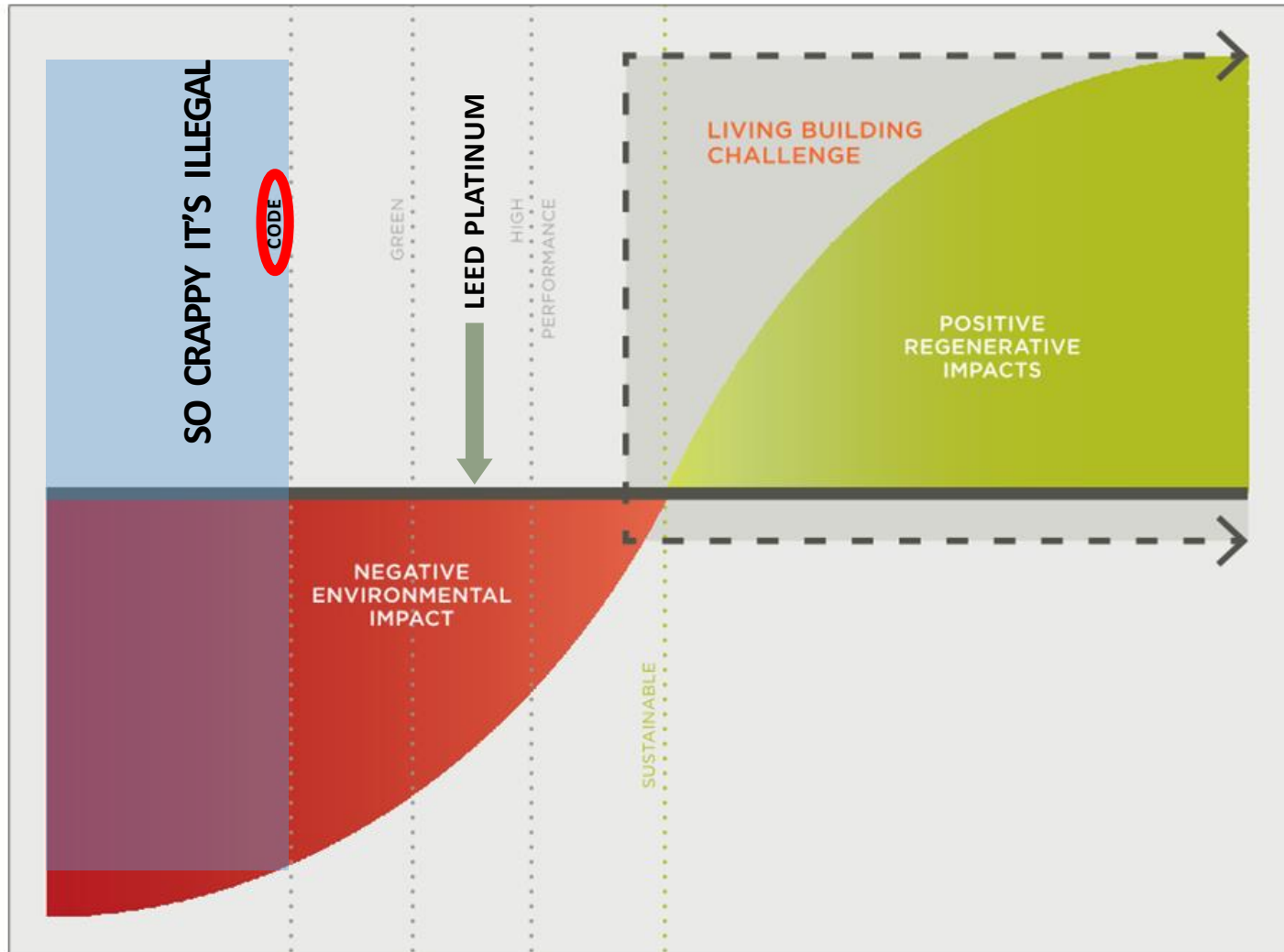
LIVING BUILDING CHALLENGESM 3.1

**A Visionary Path to a
Regenerative Future**

20 Imperatives within a 7 Petal Structure



Integrated Holistic Planning & Design



Source: Living Building Challenge Standard



LIVING
BUILDING
CHALLENGE™

FULL CERTIFICATION

All Imperatives are mandatory

Certification is based on actual performance



PETAL CERTIFICATION

Three Petals or more

One of which must be either Water, Energy or the Materials Petal &

01: Limits to Growth

20: Inspiration + Education



NET ZERO ENERGY BUILDING CERTIFICATION

Four Imperatives

01: Limits to Growth

07: Net Positive Energy (100% only)

19: Beauty + Spirit

20: Inspiration + Education

Partnering with Georgia Tech

The Kendeda Fund invests in transformative leaders and ideas.

- **Immediate aim:** To design and construct a fully certifiable Living Building in Atlanta and the greenest building on a Southeastern college campus



- **Broader objective:** To **leverage** the project so that the region will be prepared for the increasing environmental challenges facing the building sector.

- **“Leverage Activities”** that will popularize advanced green building in our region



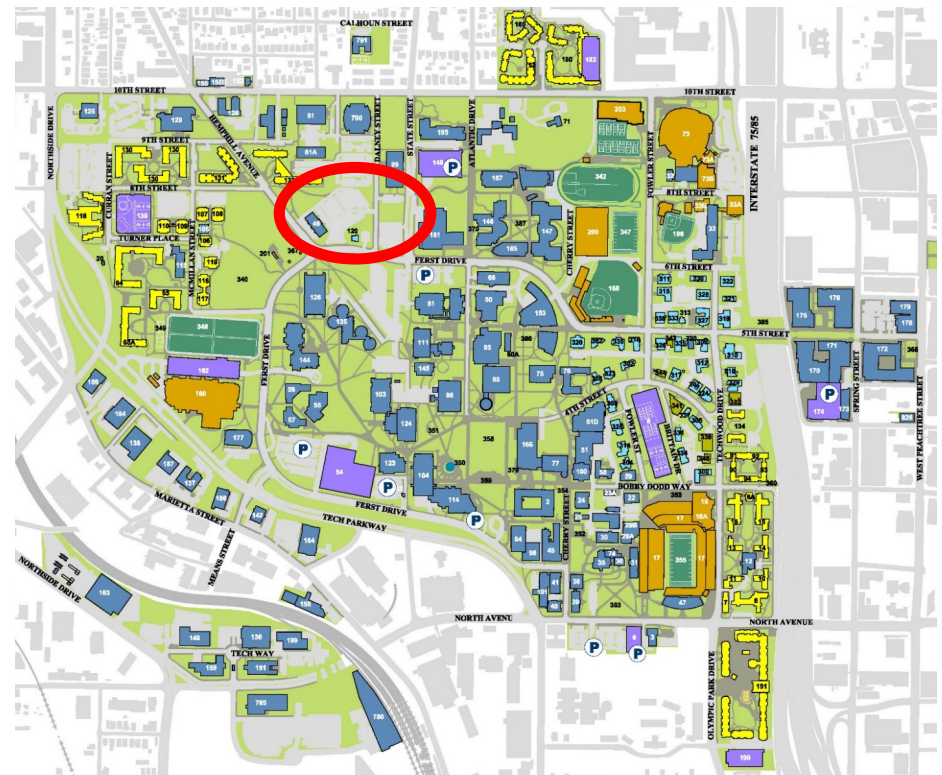
- Be the **“Pebble in the Pond”** and inspire owners, architects, engineers and contractors to create **Positive Transformation** as they address environmental challenges facing the Southeast’s building sector...**Replicability**

Ideas Competition

- Stipend to each team
- Two sets of workshops at each team office:
 - Perkins + Will
 - LAS/Miller Hull
 - Collins Cooper Carusi/Eskew Dumez Ripple/Hellmuth Bicknese
- Georgia Tech representatives
- GT Facilities Inc. representatives
- The Kendeda Fund representatives
- Georgia Tech College of Architecture students and faculty

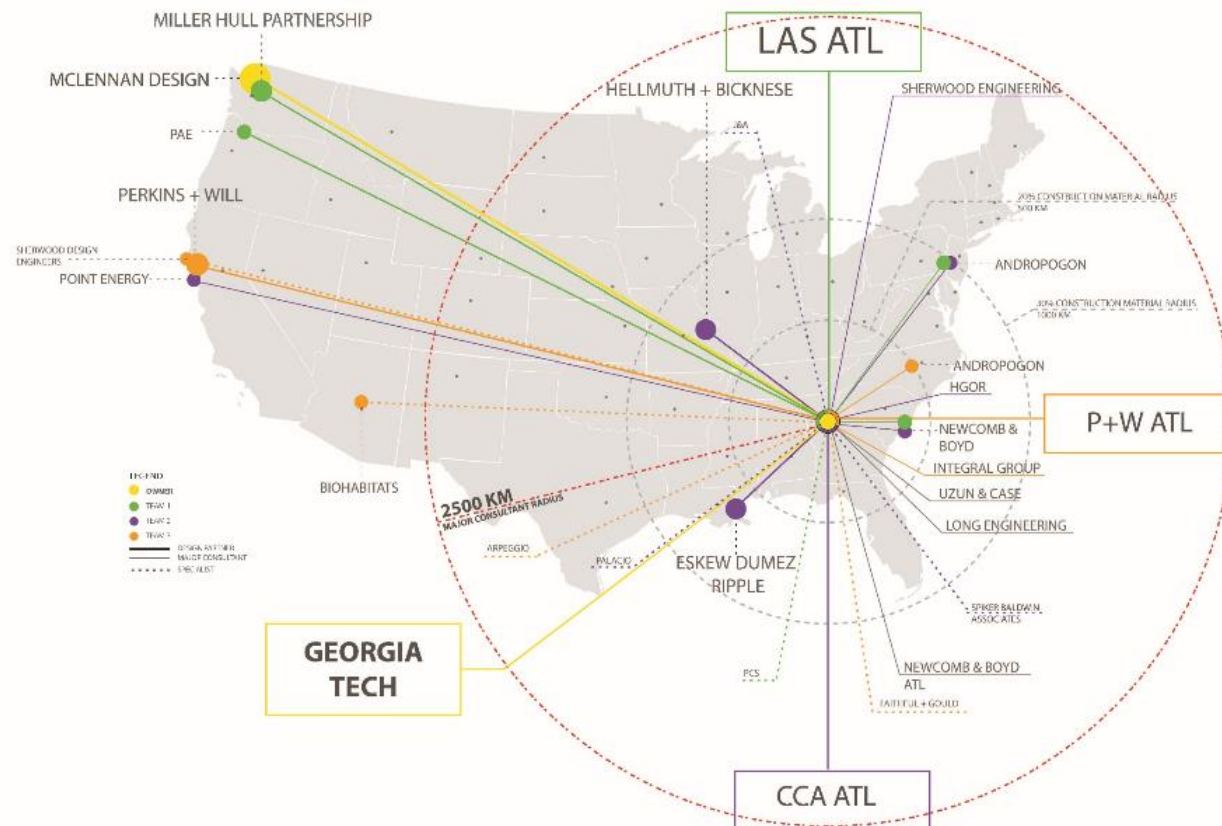
Ideas Competition: Goals

- Determine the most appropriate building site within an 8-acre parcel
- Educate Georgia Tech on the Living Building Challenge
- Knowledge transfer to the Southeast
- Jump start the design process
- Connection to EcoCommons
- Student engagement
- Begin transformation of AEC industry
- Open and transparent
- Think and act holistically
 - Every project is 400 acres



Expertise: National and Local

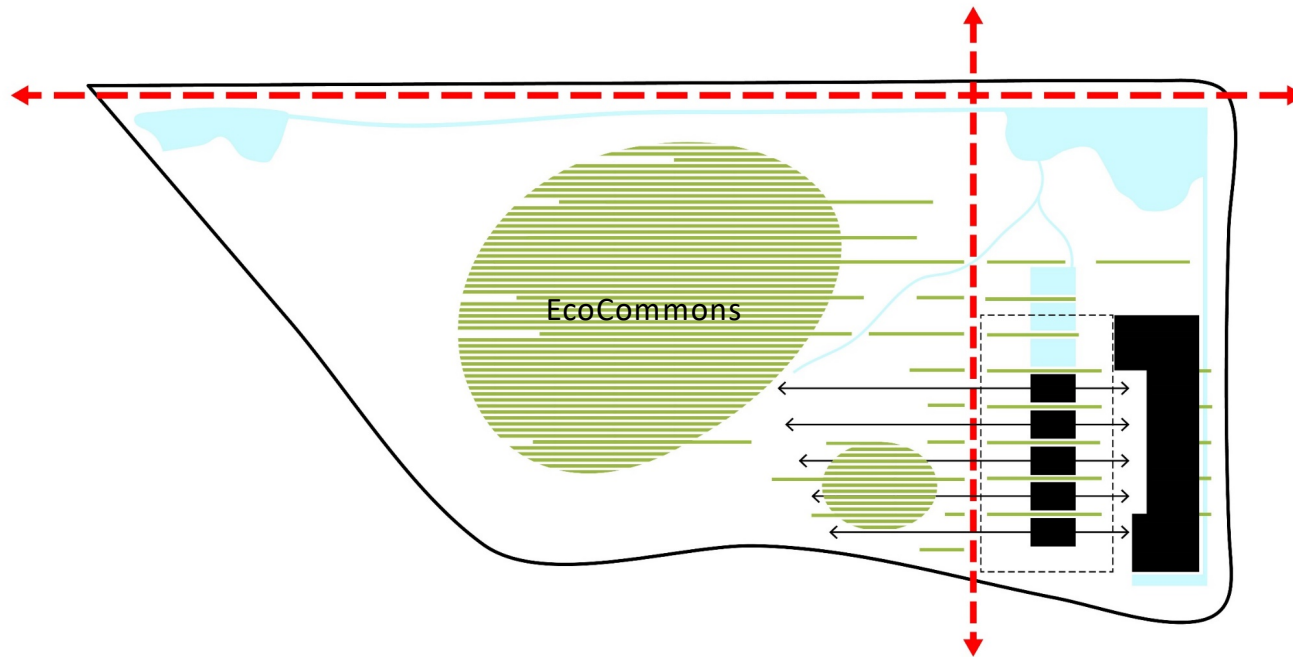
THE LIVING BUILDING AT GEORGIA TECH : 2016 IDEAS COMPETITION



Student Engagement: College of Architecture Design Studio



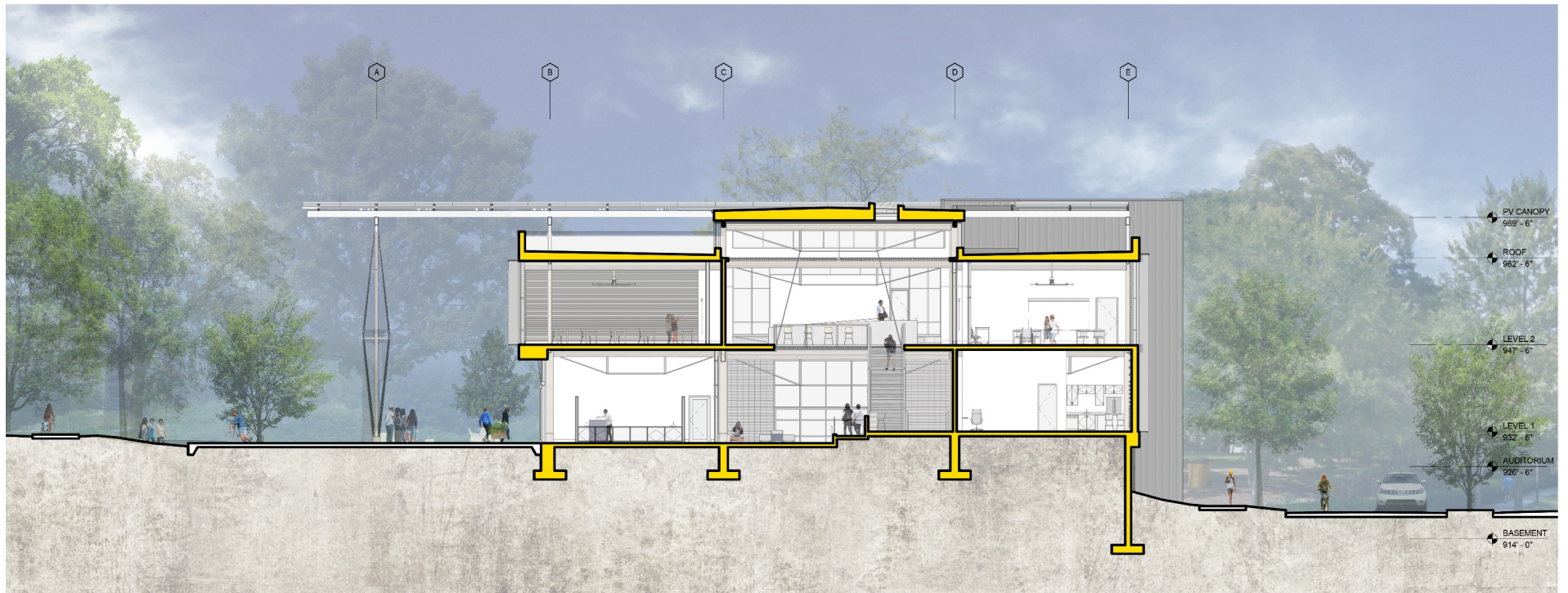
Massing Concept by Miller Hull | Lord Aeck & Sargent





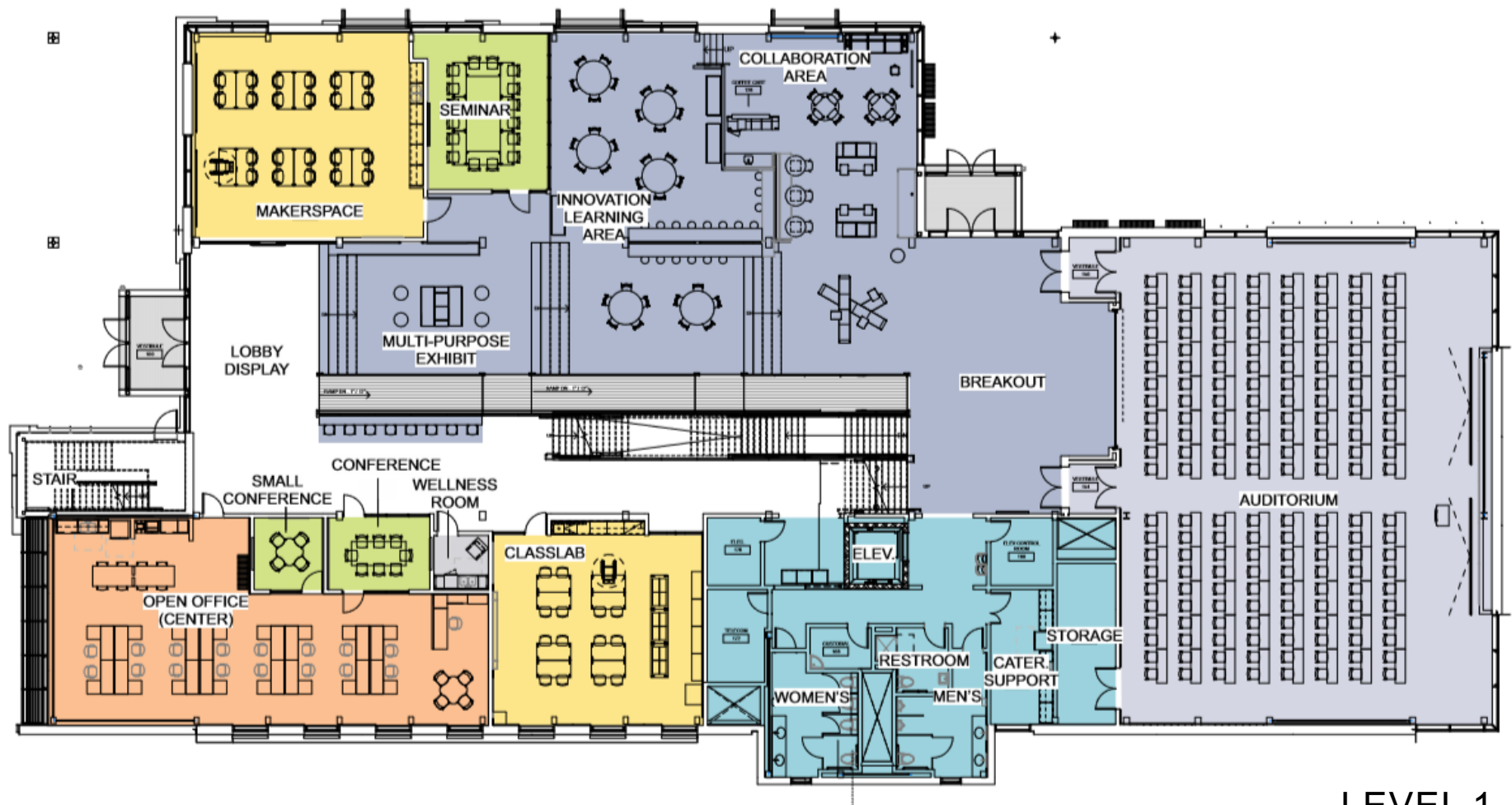


Architect: Lord Aeck Sargent / Miller Hull Partnership; CM: Skanska

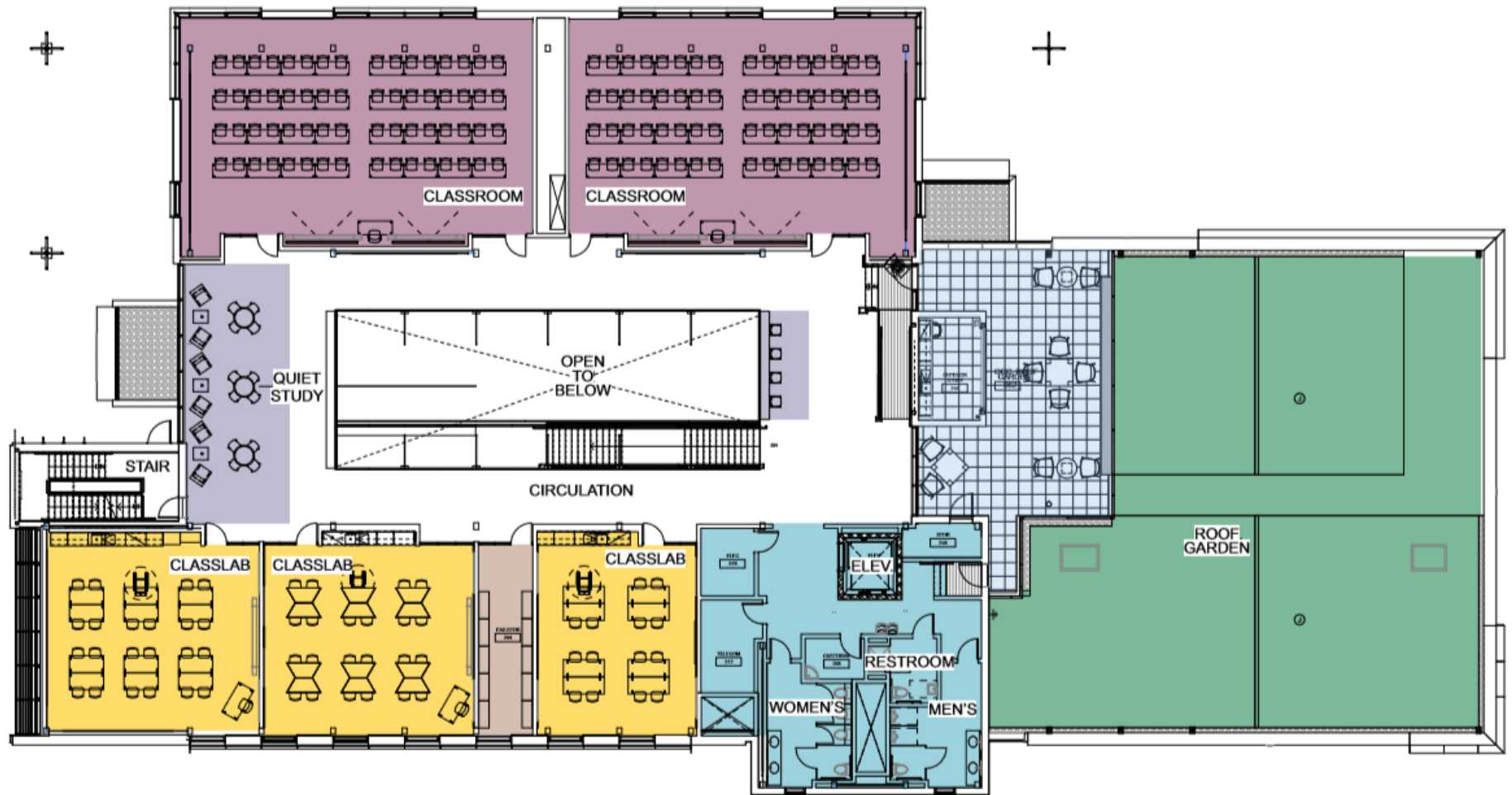


SECTION





LEVEL 1



LEVEL 2

Key Metrics: (as of June 12, 2018)

Programmed Spaces:

- Loading dock and covered bicycle storage area:
- Outdoor learning area under the porch:
- Roof Garden (not public):
- Roof Deck
- Enclosed/conditioned area:

TOTAL:

1,905 gsf	}	9,870 gsf
2,618 gsf		
4,347 gsf		
1,000 gsf		
<u>36,978 gsf</u>		
46,848 gsf		

- **Total Construction Cost: \$18,600,000**
- **\$397.02/gsf** (includes all programmable areas)
- **\$503.00/gsf** (conditioned areas only)
- **Total Project Budget: \$25,000,000**

Other:

Cistern: 50,000 gallons

PV's: 328 kw; 913 panels; Projected PV generation 40 EUI

EUI: Projected 34 EUI; Net Positive Energy



ECO-COMMONS APPROACH



SOUTH ENTRANCE - LOBBY



QUIET STUDY



LEVEL 2 - ROOF GARDEN

Integrated Sustainability Charrette



Biophilia Charrette



ENERGY

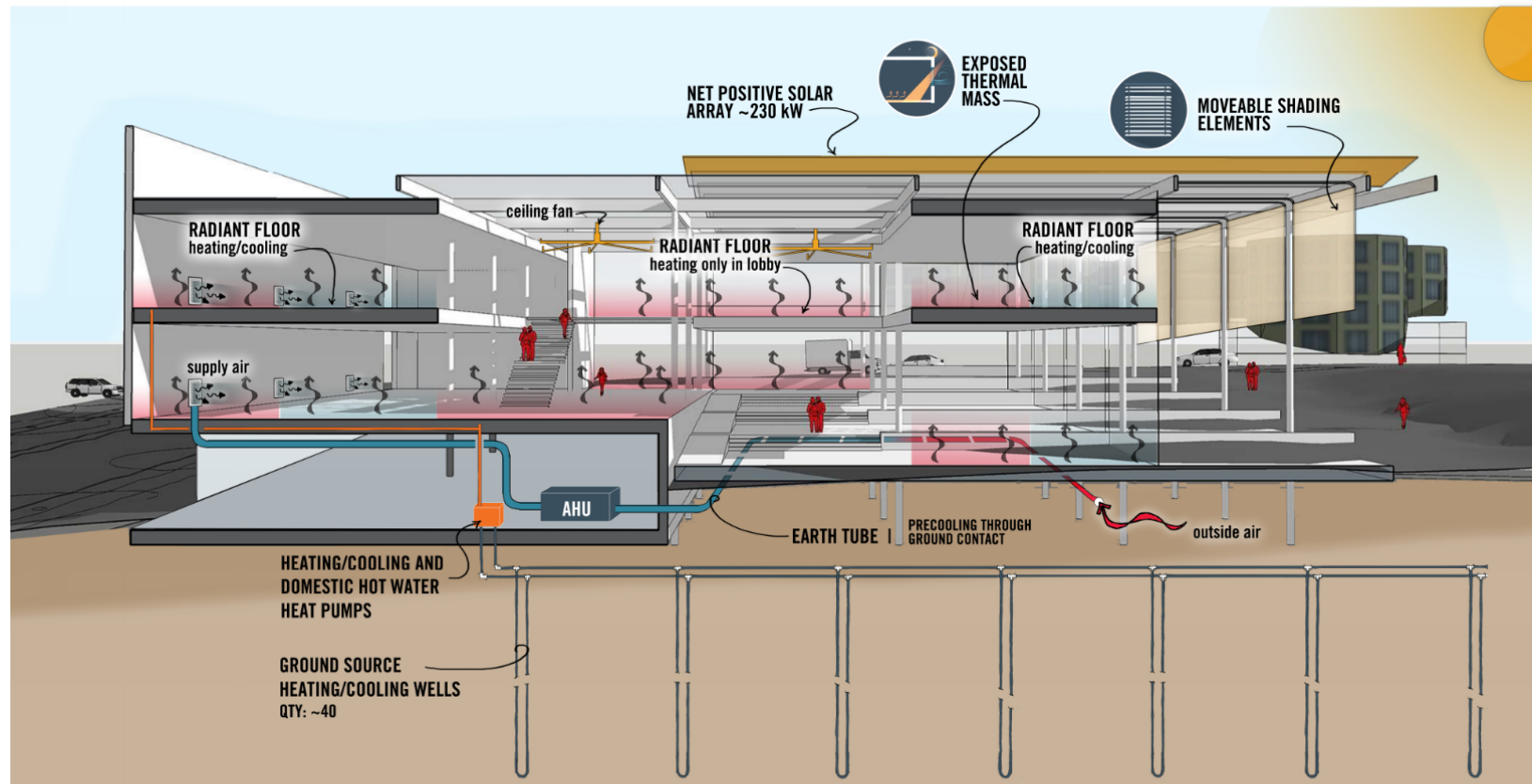


06: NET POSITIVE ENERGY

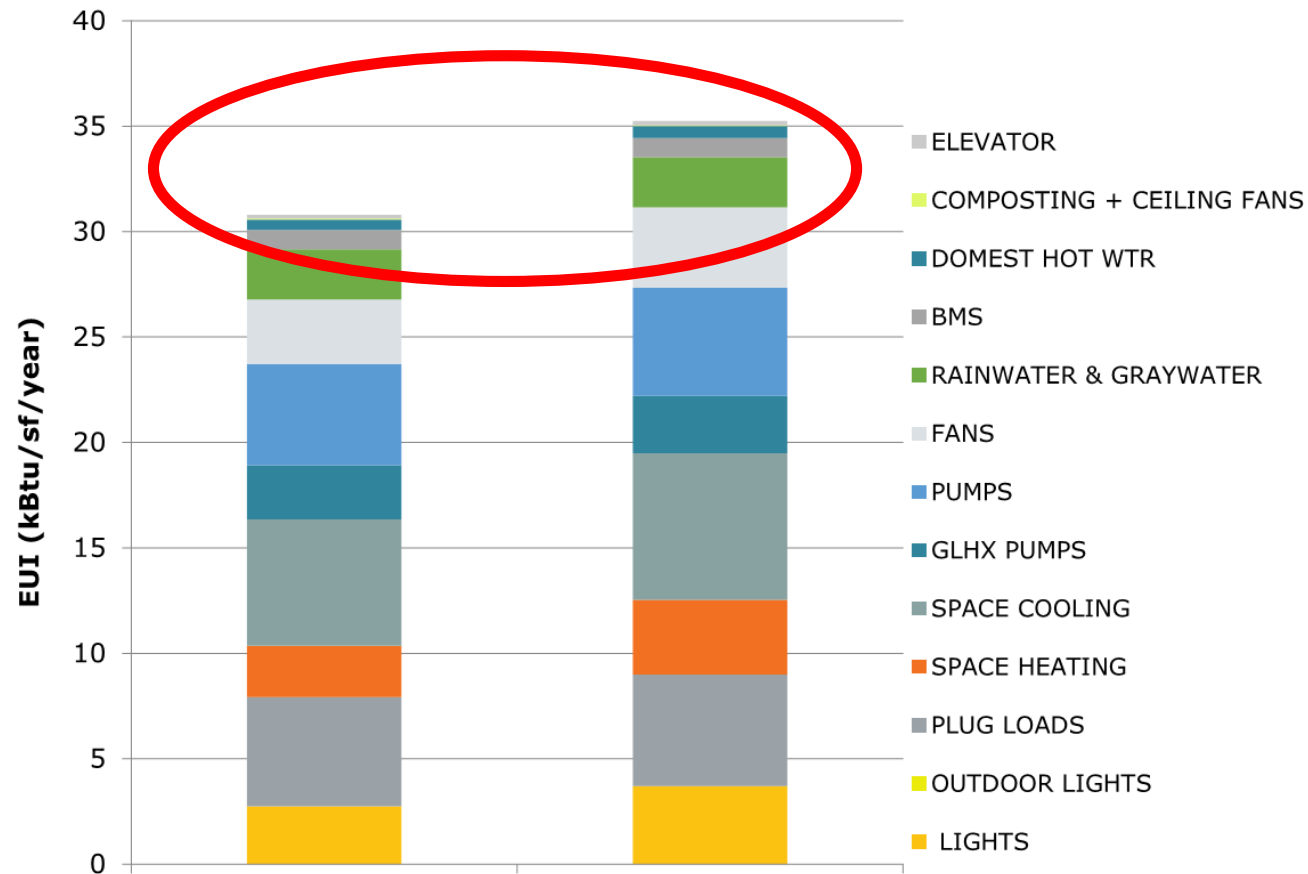
© 2014 International Living Future Institute

Rooftop Solar Array at The Bullitt Center
Seattle, WA
Photo: Ben Benschneider

Net Positive Energy - 328kW Photovoltaic Array



Expanded Operational Schedule = +5 EUI



DEFINE COMFORT

GLAZED ALUMINUM CURTAIN WALL SYSTEM WITH OPERABLE WINDOW FRAMES AND GLAZES TYP

ALUM. POWERED GLAZED CANOPY

PV PANELS TYP

EXISTING STATE STREET TREES

LEVEL 15

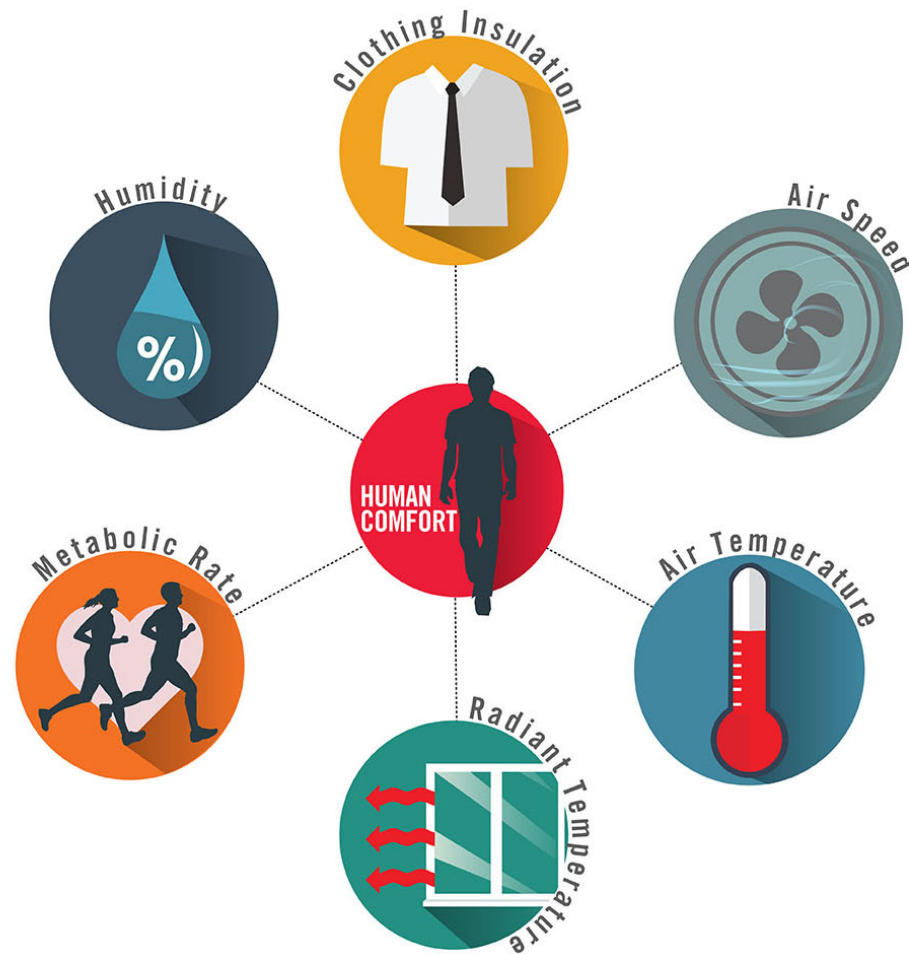
LEVEL 16

AUDITORIUM

BASEMENT

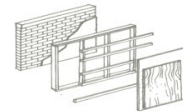
WEST ELEVATION

Six Factors Influence Thermal Comfort





MATERIALS



10: RED LIST

11: EMBODIED CARBON FOOTPRINT

12: RESPONSIBLE INDUSTRY

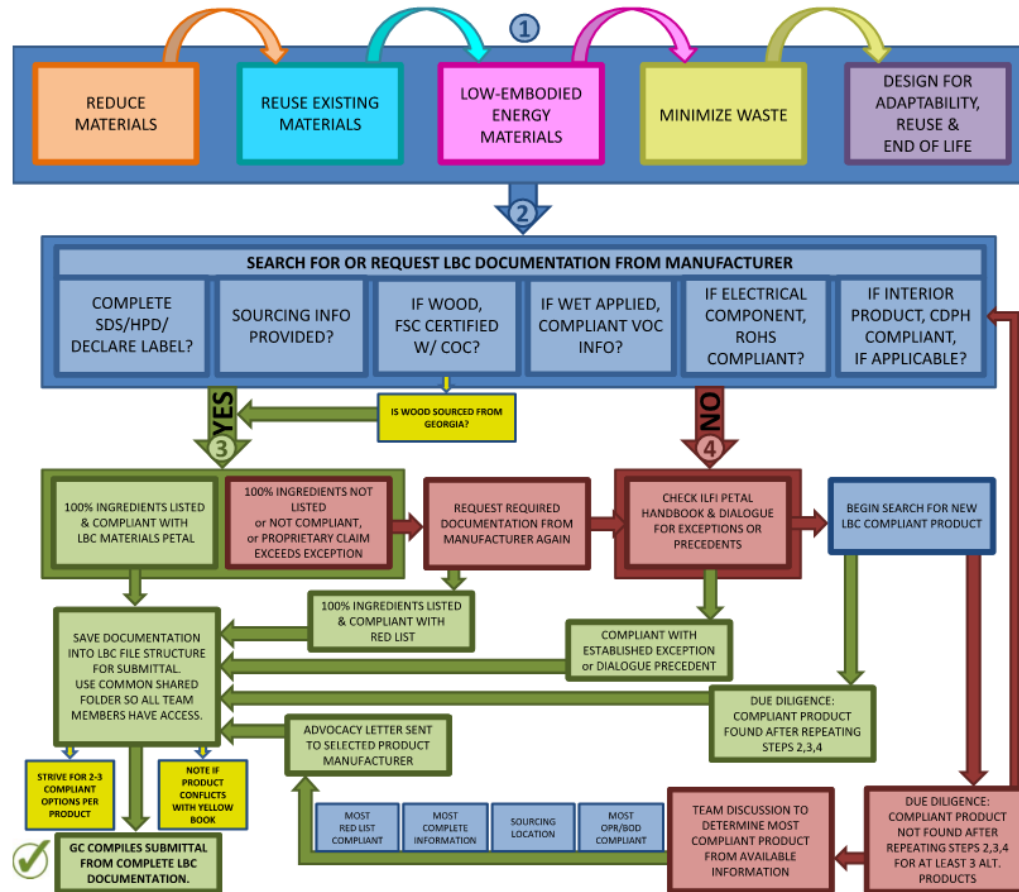
13: LIVING ECONOMY SOURCING

14: NET POSITIVE WASTE

© 2014 International Living Future Institute

UniverCity Childcare Centre, Burnaby, BC
Courtesy: space2place

Red List Material Documentation Process



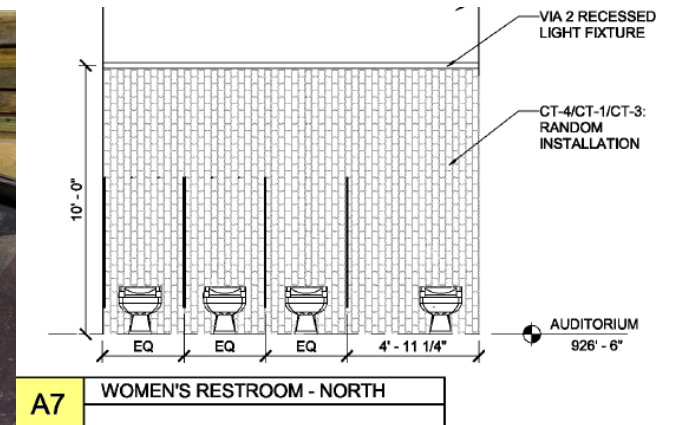
Net Positive Waste



Slate Roof



Salvaged



A7

WOMEN'S RESTROOM - NORTH

Wall Tile

Net Positive Waste

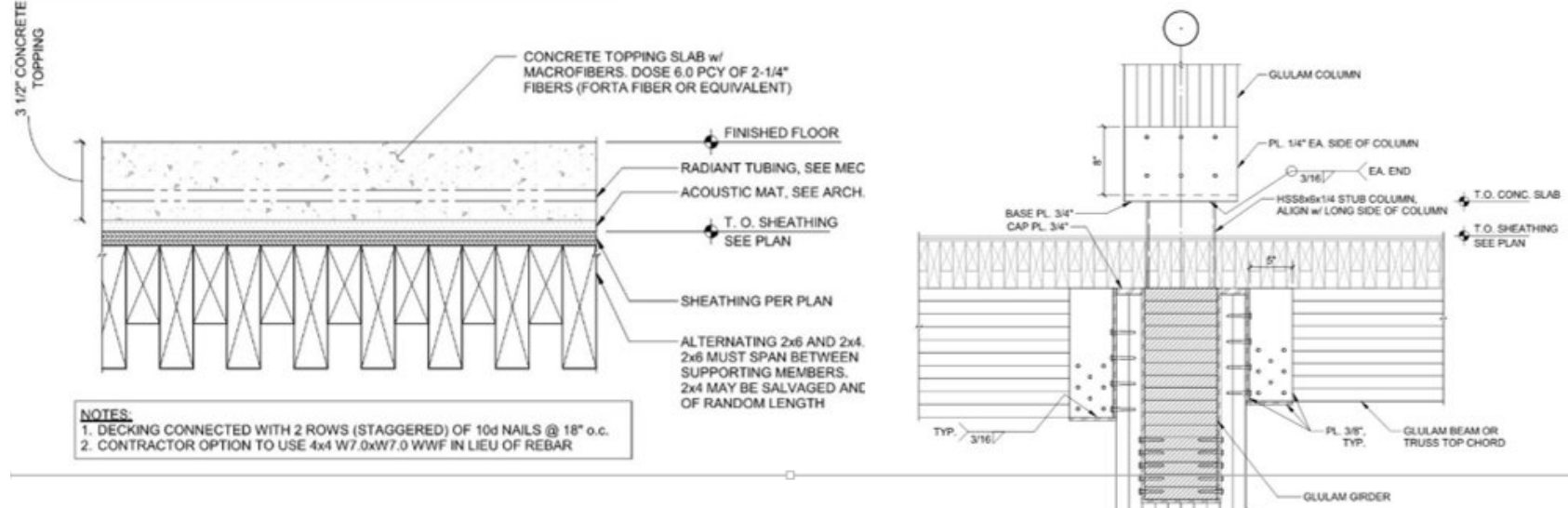


Movie set waste



Salvaged

Net Positive Waste

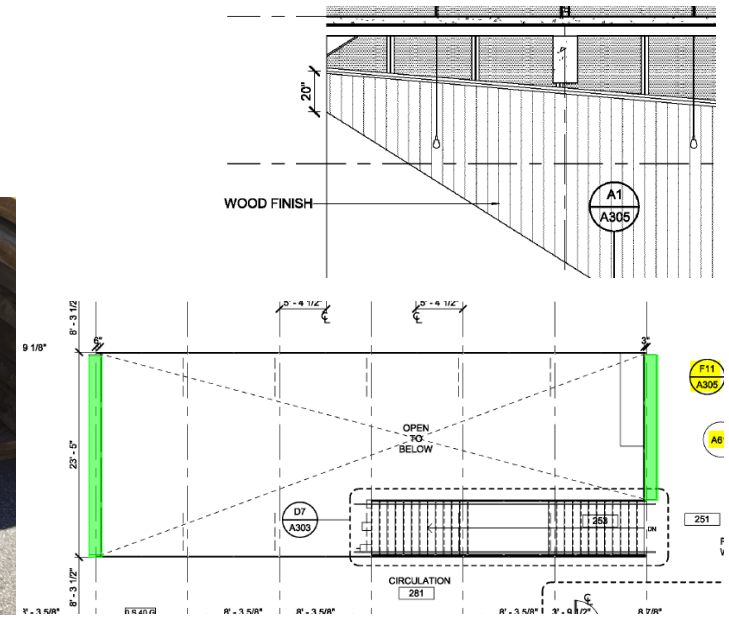


Nail Laminated Timber

Net Positive Waste: Treecycling



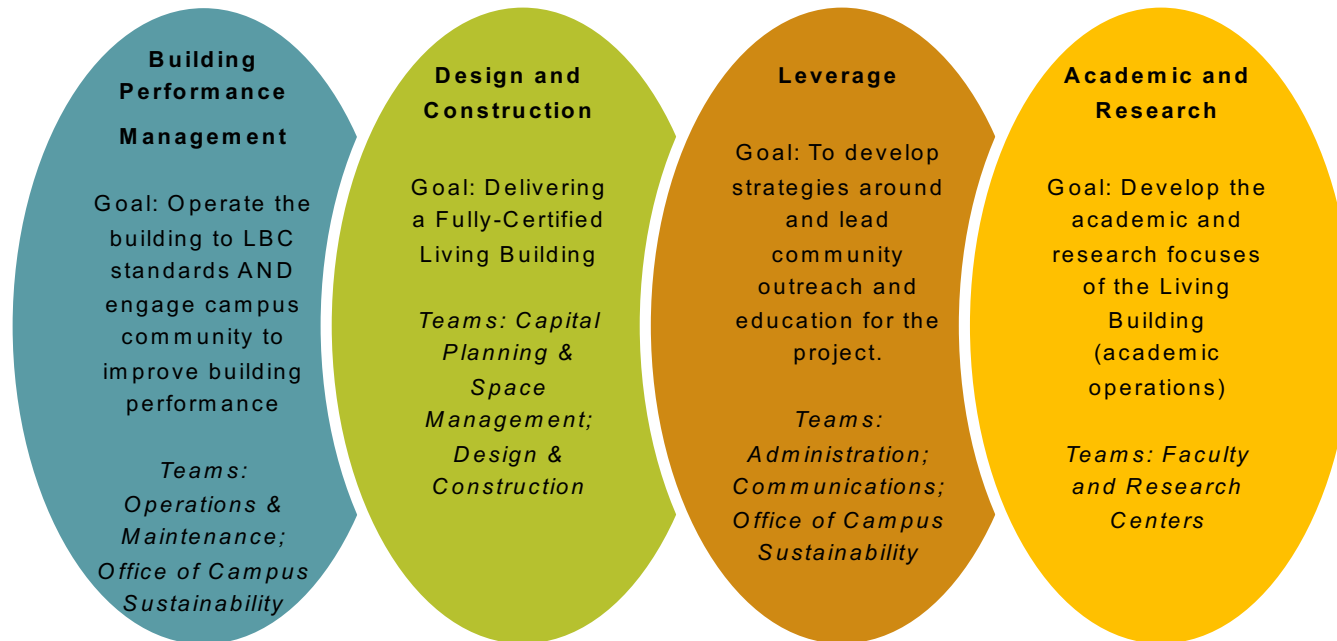
Storm Fallen



Counter/Tables

Structure of Living Building Workgroups

Four separate, but connected, workstreams compose the project team for the Living Building at Georgia Tech: Design and Construction, Leverage, Academic and Research, and Building Performance.



O&M Working Group Pilot Projects

BUILDING-LEVEL COMPOSTING

The pilot anticipates adding composting infrastructure, education and messaging across the following programmatic areas: food waste (breakrooms, common spaces, classrooms, special events, outdoors), paper towels (breakrooms, bathrooms) and landscape trimmings.



HUMAN COMFORT TESTING

Pilot will test and rate different temperature, RH, radiant, and air speed conditions in an on-campus environmental chamber



NET-POSITIVE LANDSCAPE

This pilot project is to maintain multiple landscape conditions (turf and garden bed) utilizing LBC criteria: non-combustion equipment, no use of petrochemicals in weed, disease and insect control, potable-water only irrigation, and landscape waste composting.



LBC Operations Manual Intent

- Provide a guideline for the ***achievement of LBC certification and the on-going maintenance*** of the certification.
- Provide a guide for ***understanding and operating the various building systems*** for the Owner's operations team, though this document is not intended to replace the required Operations & Maintenance documents provided by the Construction Professional.
- Inform routine end-users of ***how the building systems and assemblies are to be utilized*** during their time in the facility.
- ***Identify the intended educational components*** of the facility for students and visitors that will utilize the facility.





WATER



05: NET POSITIVE WATER

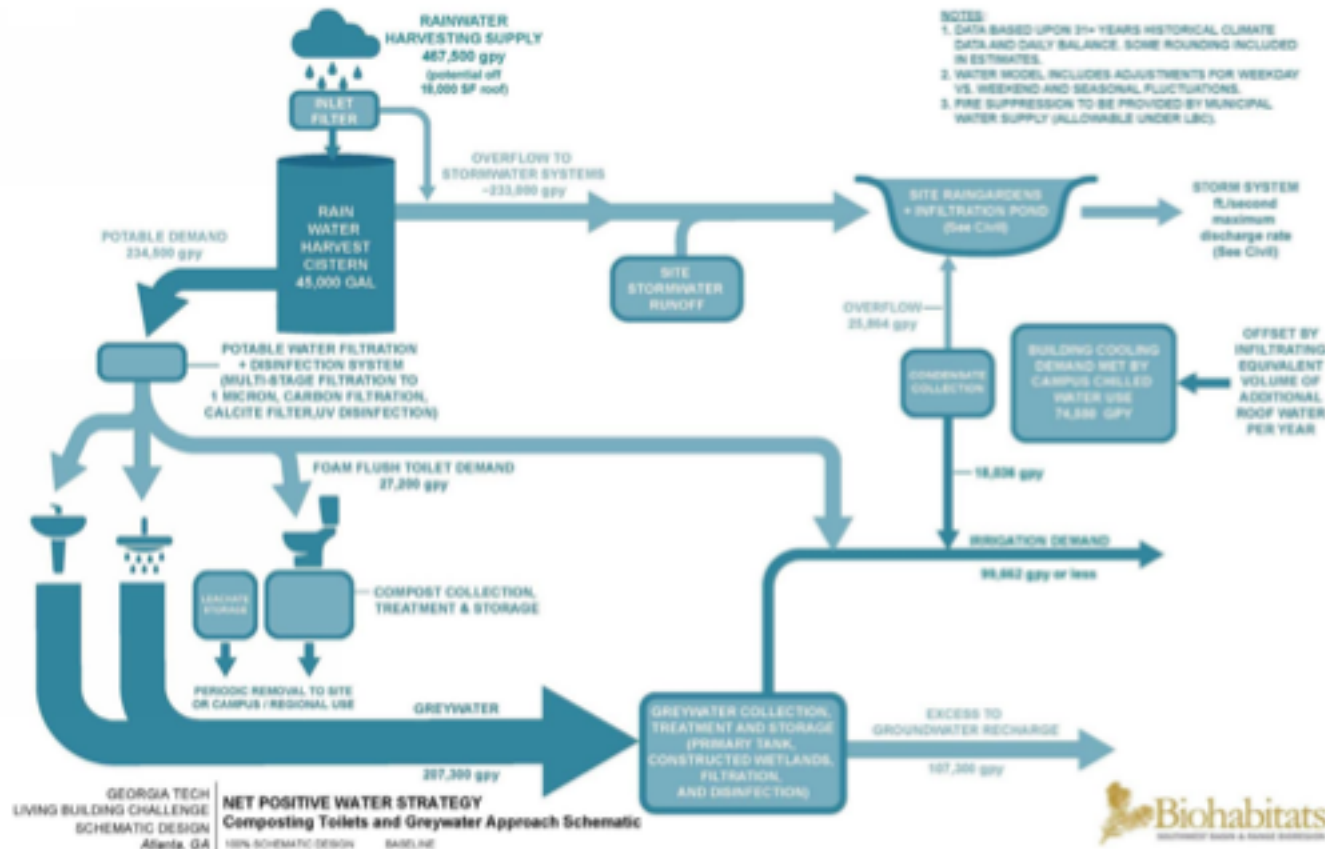
Pilot Project: Rainwater to Potable



Net Positive Water (45,000 gallon cistern)

BASELINE WATER CONSERVATION SCENARIO

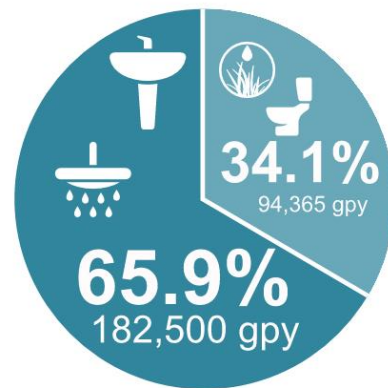
Net Positive Water Balance Diagram - proposed system connections and annual quantities



Water Demand

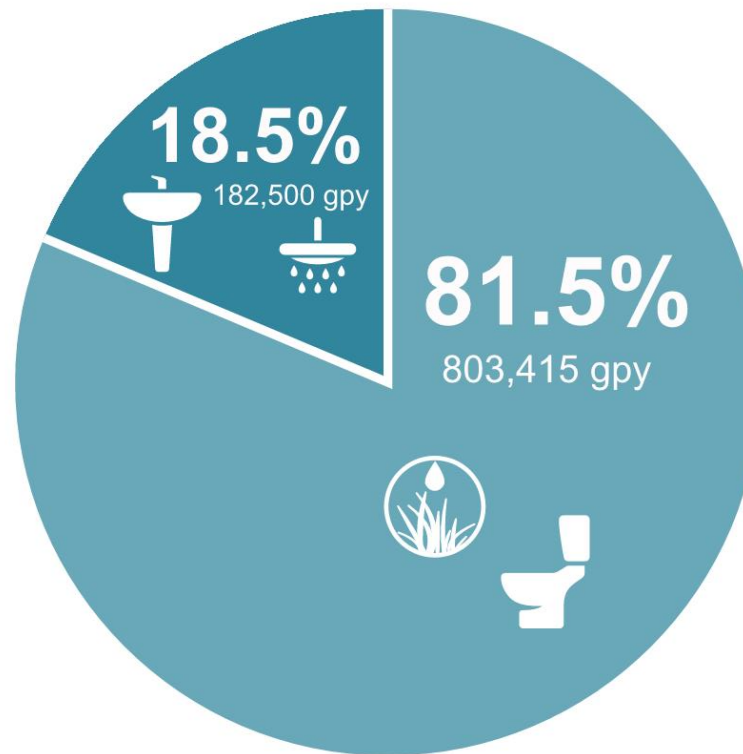
COMPOST TOILET SCENARIO

Total Water Footprint: 276,865 gpy



BLACKWATER SCENARIO

Total Water Footprint: 985,915 gpy



■ Potable demand
■ Non-potable demand

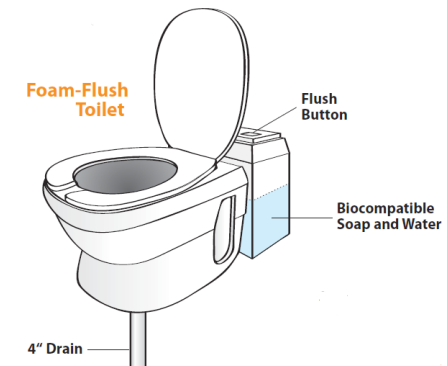
Recommended Wastewater Strategy

Composting Toilets Benefits:

- \$350k compared to \$2.1m 15 year life-cycle cost
- Smaller “water footprint”
- Lower energy requirement
- Simple to operate
- Extensive Purple Pipe supply network not needed
- Potential beneficial reuse of leachate

Greywater System Benefits:

- Lower design flow to treat
- Less intensive treatment needed
- Multiple end uses
- Less monitoring required
- Comparatively lower public health risk
- Less or no land application required





EQUITY



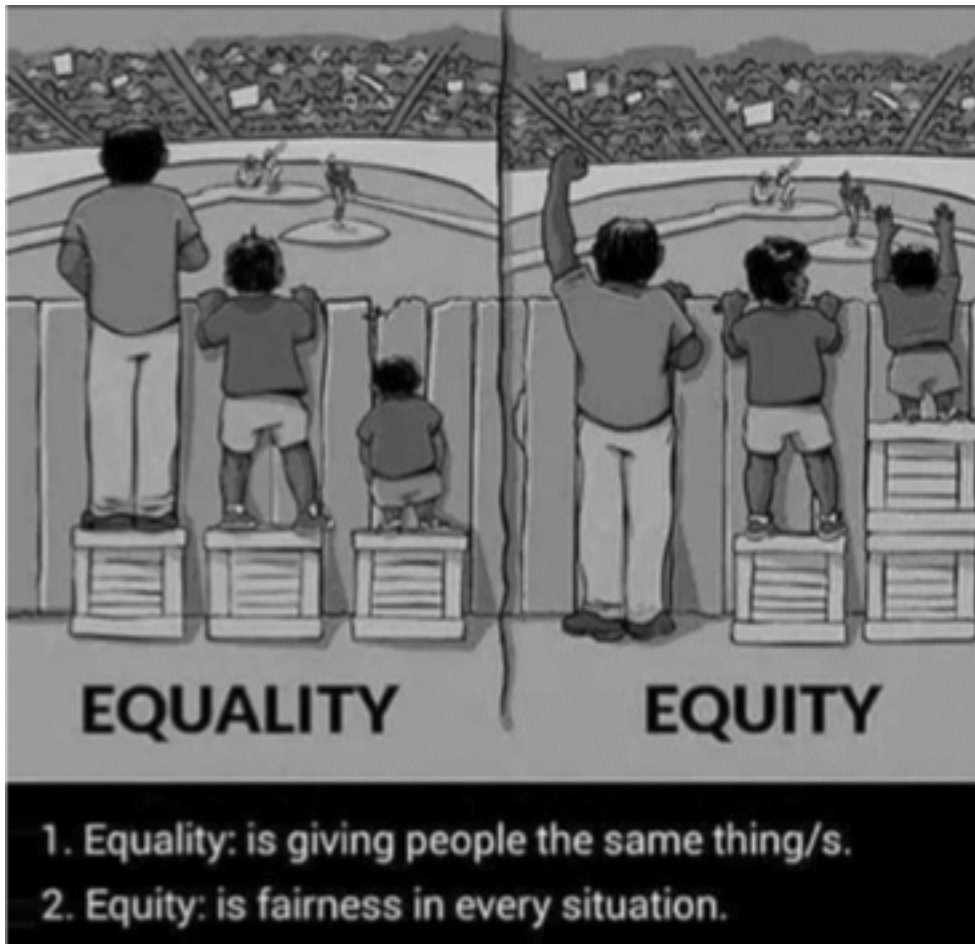
- 15: HUMAN SCALE AND HUMANE PLACES
- 16: UNIVERSAL ACCESS TO NATURE & PLACE
- 17: EQUITABLE INVESTMENT
- 18: JUST ORGANIZATIONS

5 Reasons to Focus on Equity at GT

1. **Serve the State of Georgia:** advance STEM and technology education among underrepresented populations (women, students of color)
2. **Lead on innovation:** greater diversity of people increases innovation for everyone at the table
3. **Demonstrate a model of holistic sustainability:** achieving equity is key to achieving sustainability
4. **Advance equity:** in one of the most inequitable cities in the country
5. **Accreditation - Put Serve-Learn-Sustain into action:** through a demonstration site on campus showing how technology can influence holistic sustainable development



Equity



Equity



EQUALITY



EQUITY



1. Equality: is giving people the same thing/s.
2. Equity: is fairness in every situation.

Academic & Research Faculty Council

- Provide thought leadership throughout the process.
- Integrate into teaching and research pedagogy.
- Great teaching is contagious!



Living Building – Student Pilot Projects

TREE-CYCLING

- Urban wood reuse program to recycle the wood from fallen trees on campus.
- Routine landscape management can result in an increased supply of urban wood waste.
- Red List Materials Research

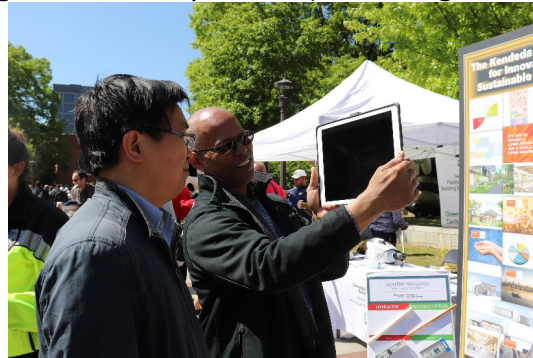


URINE SEGREGATION

- Urine Diversion and the opportunities for repurposing what is typically a “waste” product.
- Separate approximately 50% of the urine and potentially more with some creative toilet designs.
- Process the urine to create fertilizers (Nitrogen and Phosphorous) resulting in cleaner water for the gray water system.

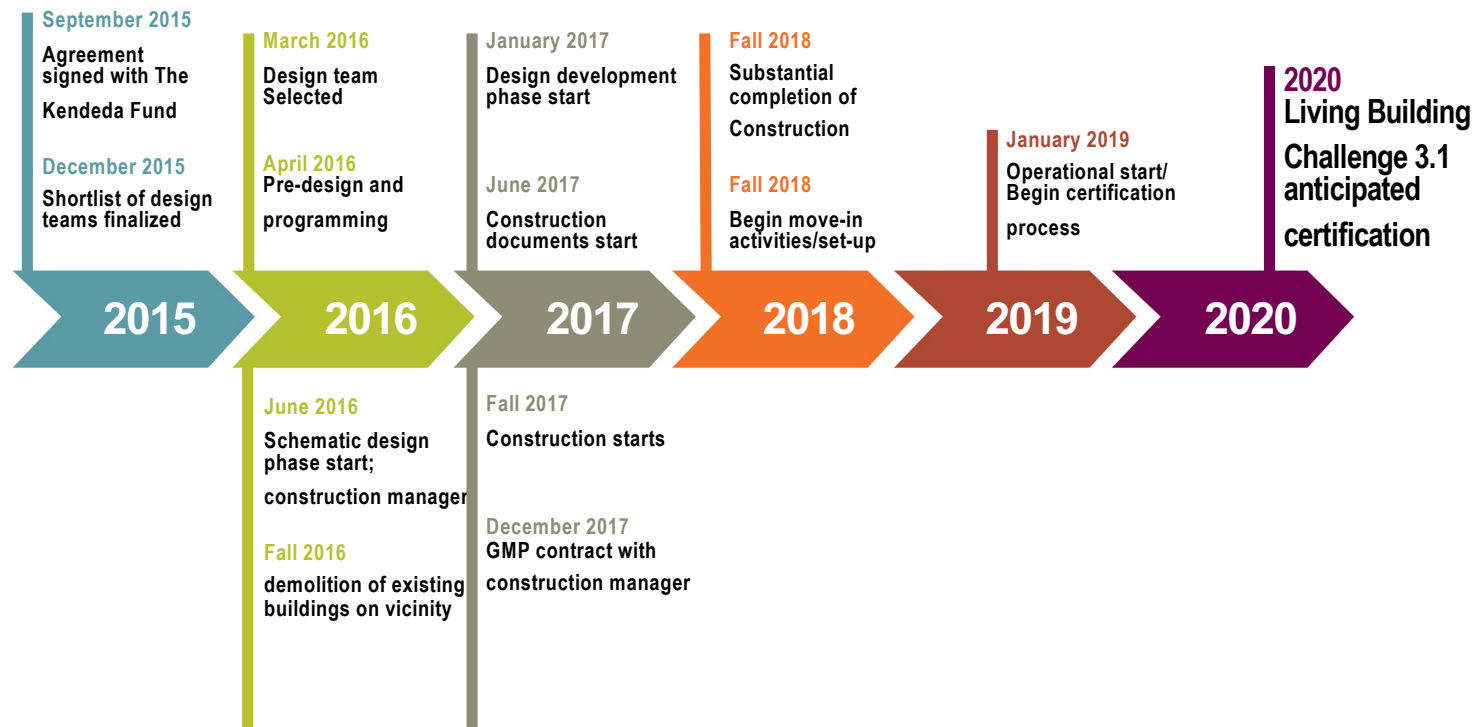
AUGMENTED REALITY

- Building augmented reality viewer

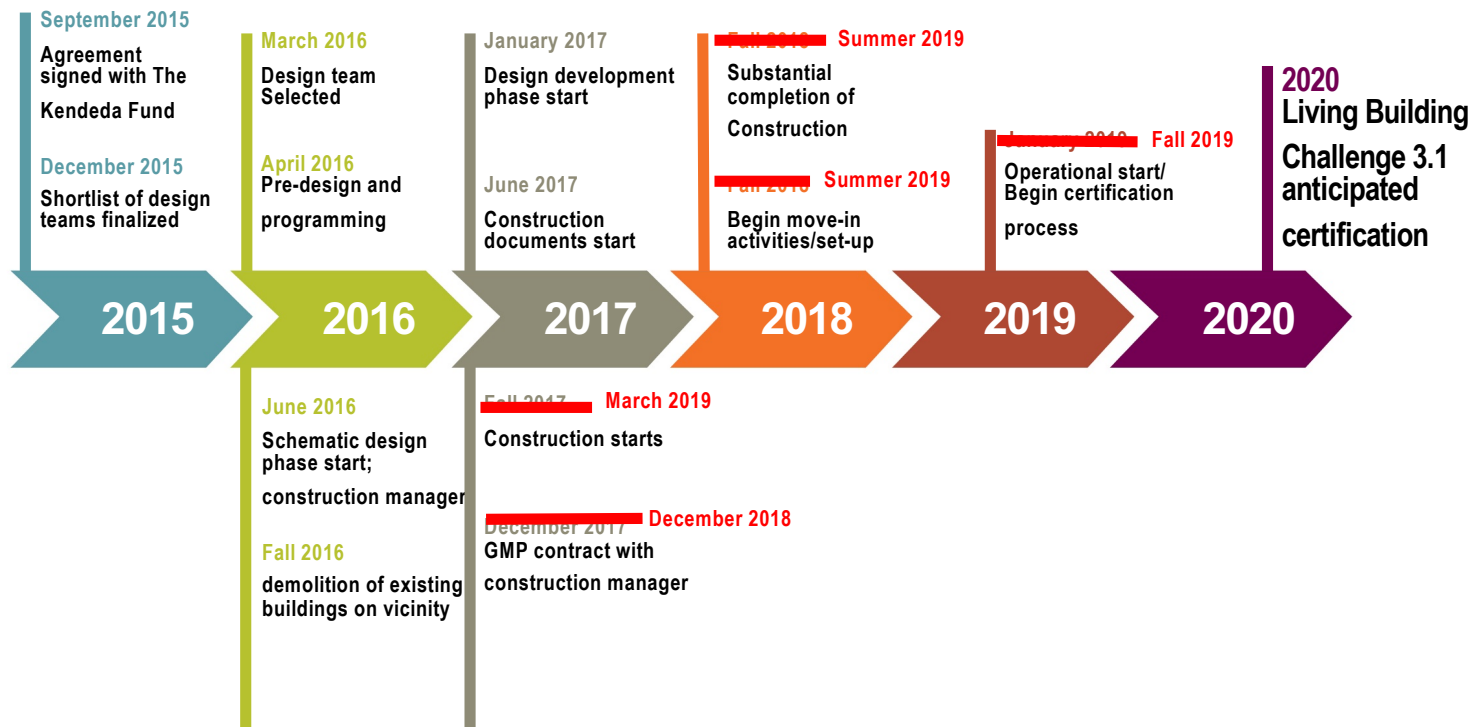


© Christopher Moore /Georgia Institute of Technology

(Original) Project Schedule



Revised Project Schedule





Lessons Learned:

- Campus-wide engagement is critical, especially with O&M staff...
- Invest in pilot projects...
- It's complicated...be patient, be deliberate and be transparent...
- You can't unlearn what you've learned...apply this knowledge to all campus projects...

Resources:

www.livingbuilding.gatech.edu

<https://twitter.com/KendedaLBC>

<https://livingbuilding.kendedafund.org/>

<https://living-future.org/>

Webcams:

<https://app.oxblue.com/open/skanska/livingbldggatech>

<https://oxblue.com/open/gatech/ecocommons>



