Card Counting:

Case Study in the Application of LEED™ Guidelines

SCUP 37

San Diego, California

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SCUP Western Conference Regional Best

Presented by:

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Special thanks to Charles Dorn and Stephanie Coyle for providing important technical material for this presentation.

Lewis & Clark College Portland, Oregon USA

THOMAS HACKER ARCHITECTS INC.

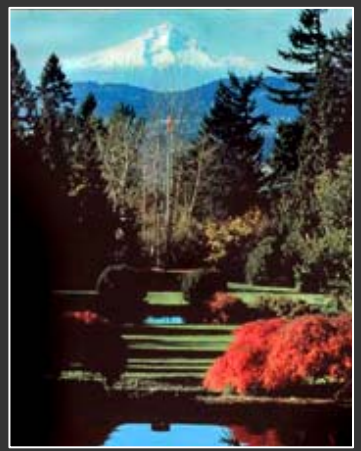
Presentation Outline

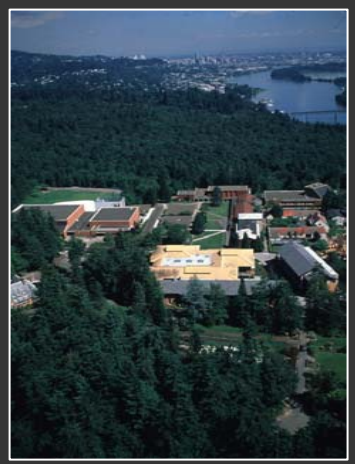
- L&C College with Thomas Hacker Architects Inc.
- USGBC & LEED™
- L&C Green Projects
- T•H•A Develops Green Design Process
- Howard Hall Case Study
- Lessons Learned

Neither Lewis & Clark College or T·H·A are certified LEED™ designers. The LEED™ equivalent scores for projects profiled in this presentation represent the opinion of Lewis & Clark College and its consultants and may not reflect actual or final USGBC decisions.

Lewis & Clark's Commitment to Sustainability

- Natural Setting
- E-Zones All Around
- Nature in the City
- Environmental Law
- Environmental Studies
- Environmental Council





Finding a Sustainable Development Standard

- Alternative Standards
  - Natural Step
  - MSDG
  - Earth Advantage
  - LEED™
- Why L&C choose LEED™
  - National Standard
  - Comprehensive
  - Objective

the NATURAL STEP

http://www.naturalstep.org/direct/

Minnesota Sustainable Design Guide

http://www.msgd.umn.edu/

earth advantage

http://www.portlandgeneral.com/

U.S. GREEN BUILDING COUNCIL

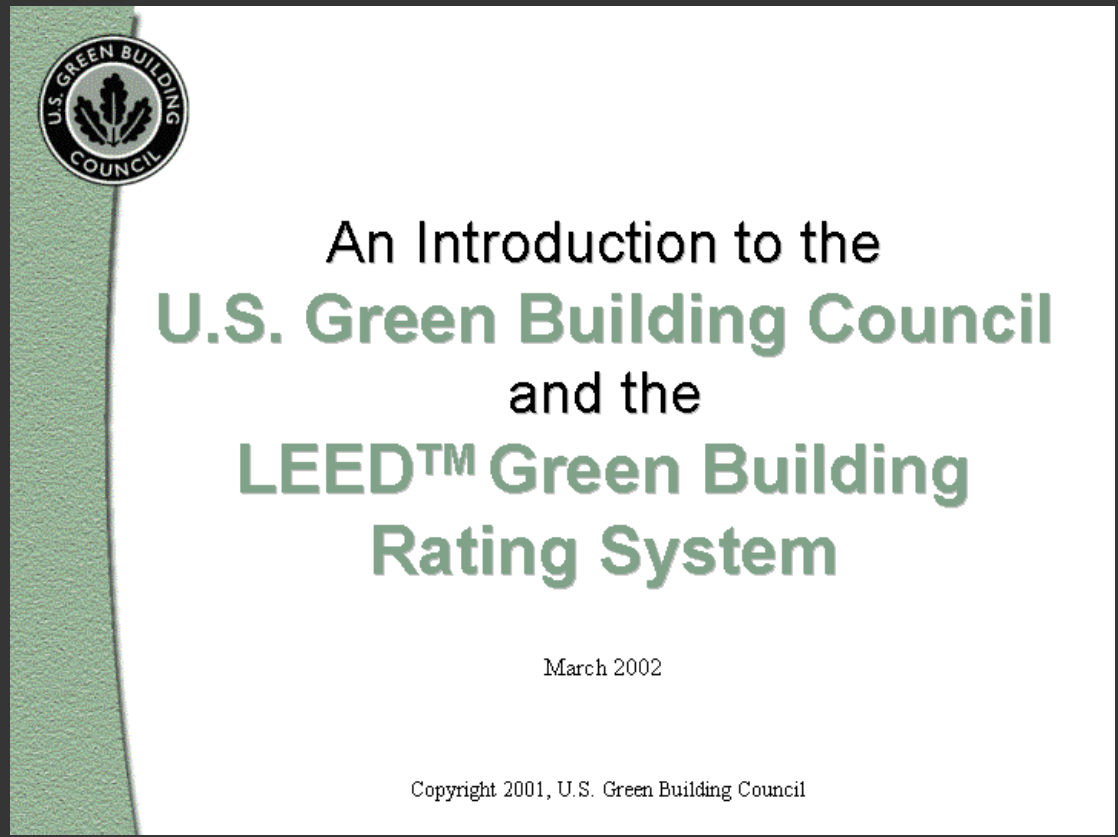
LEED

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

http://www.usgbc.org/

LEED™ Green Building Rating System

The purpose of the USGBC is to integrate building industry sectors, lead market transformation and educate owners and practitioners.



For an overview of the USGBC and the LEED™ rating system please visit the USGBC website at www.usgbc.org and download their free introductory power point presentation.

LEED™ Scoring Categories

Six Categories (69 Points)

- Sustainable Site
  - (14 Points)
- Water Efficiency
  - (5 Points)
- Energy & Atmosphere
  - (17 Points)
- Materials & Resources
  - (13 Points)
- Indoor Environmental Quality
  - (15 Points)
- Innovation & Design Process
  - (5 Points)

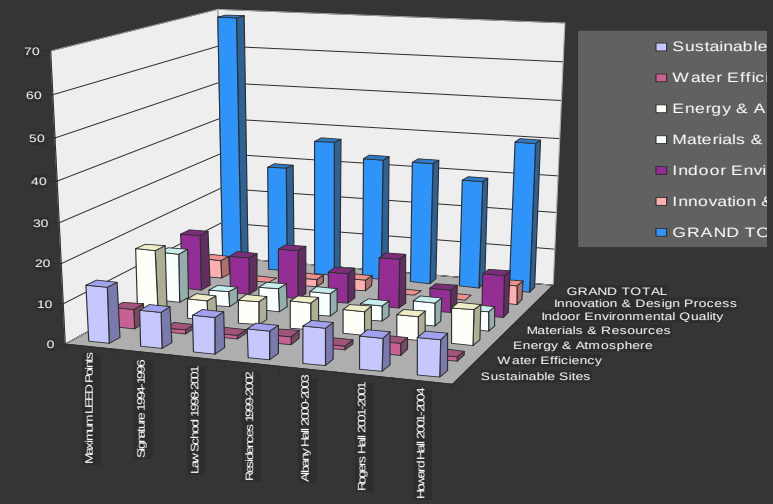
Lewis & Clark's Green Approach

"Our basic approach will be to implement sustainable development strategies to the maximum extent possible without increasing baseline construction costs. If the first costs of implementing a particular sustainable development strategy exceed the costs of "traditional" technology, then the sustainable development strategy will be evaluated on the basis of life cycle cost/benefit analysis and evaluated against other project priorities."

The above statement will be proffered to the Lewis & Clark Environmental Council as the basis for adoption as a policy for sustainable construction. This statement was written in 1997 and used as the guideline for design and engineering work at the Law School expansion. Lewis & Clark College Sustainable Development Guidelines, 1997

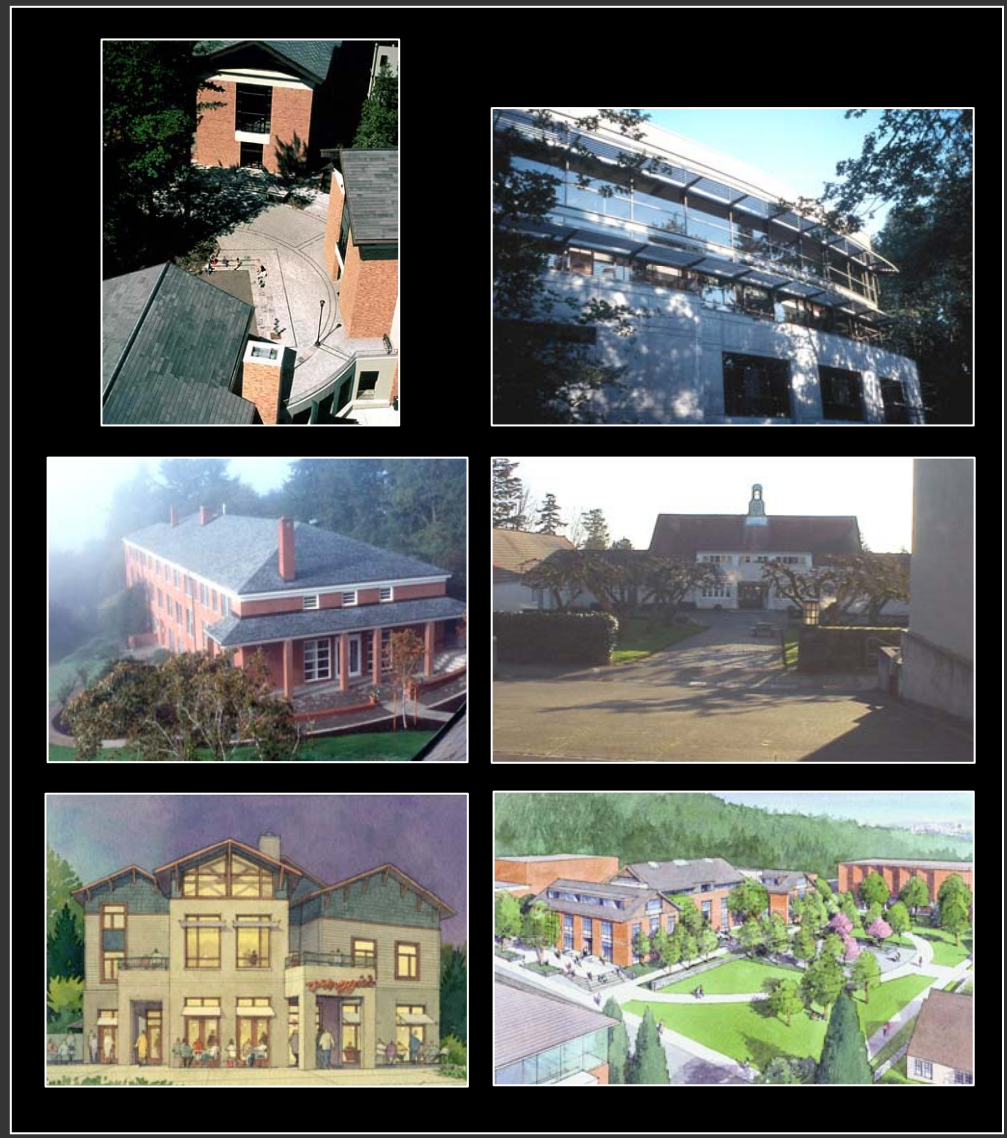
How Lewis & Clark Uses LEED™

- As benchmark.
- As evaluation tool for program decisions.
- As contractual requirement for AE Team.
- As consistent way to measure progress towards goals.
- As a way to balance cost and benefit.
- As a way to analyze trends and re-align priorities.

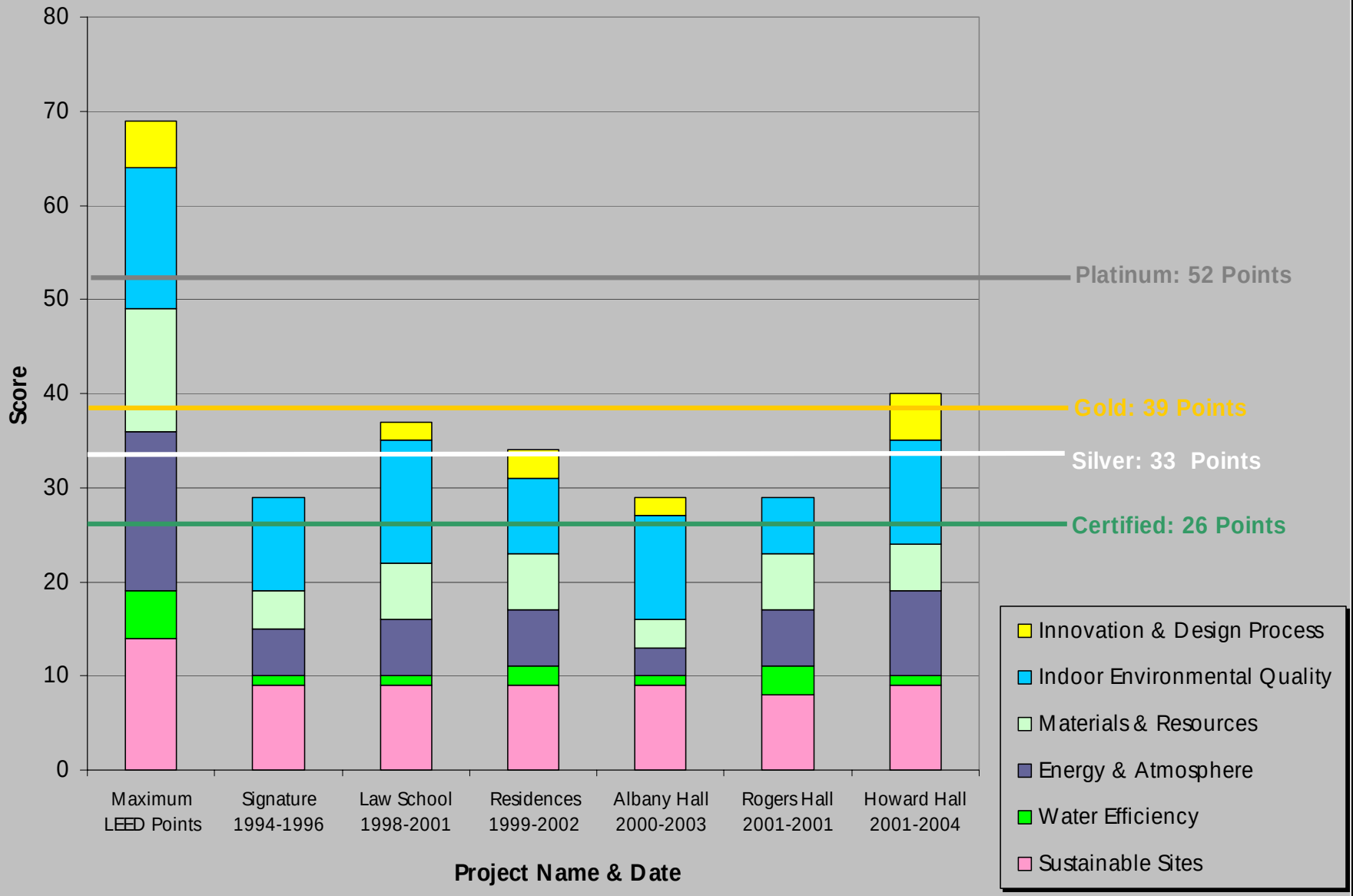


Project LEED™ Scores 1993- 2002

- *Signature Project*
  Pre-LEED™ (29)
- Wood Hall (37)
- Rogers Hall (29)
- Albany Hall (29)
- Residence Halls (34)
- Howard Hall (40)



LEED Equivalent Project Scores



Thomas Hacker Architects

Design Qualities

- Timeless Design
- Natural Materials
- Craftsmanship
- Sustainable Design

Sustainable Design

“Modern buildings, like other artifacts of industrial civilization, represent an extraordinary achievement with a hidden cost. They make life easier for many today, but their construction and operation inflict harm upon the environment, threatening to degrade the future habitability of the planet…

Buildings account for one-sixth of the world’s wood harvest, and two fifths of its material and energy flows…

There are cost effective ways to avoid almost all of the damage that a new structure does, and still preserve the security, comfort, and amenities that people expect of modern buildings.”

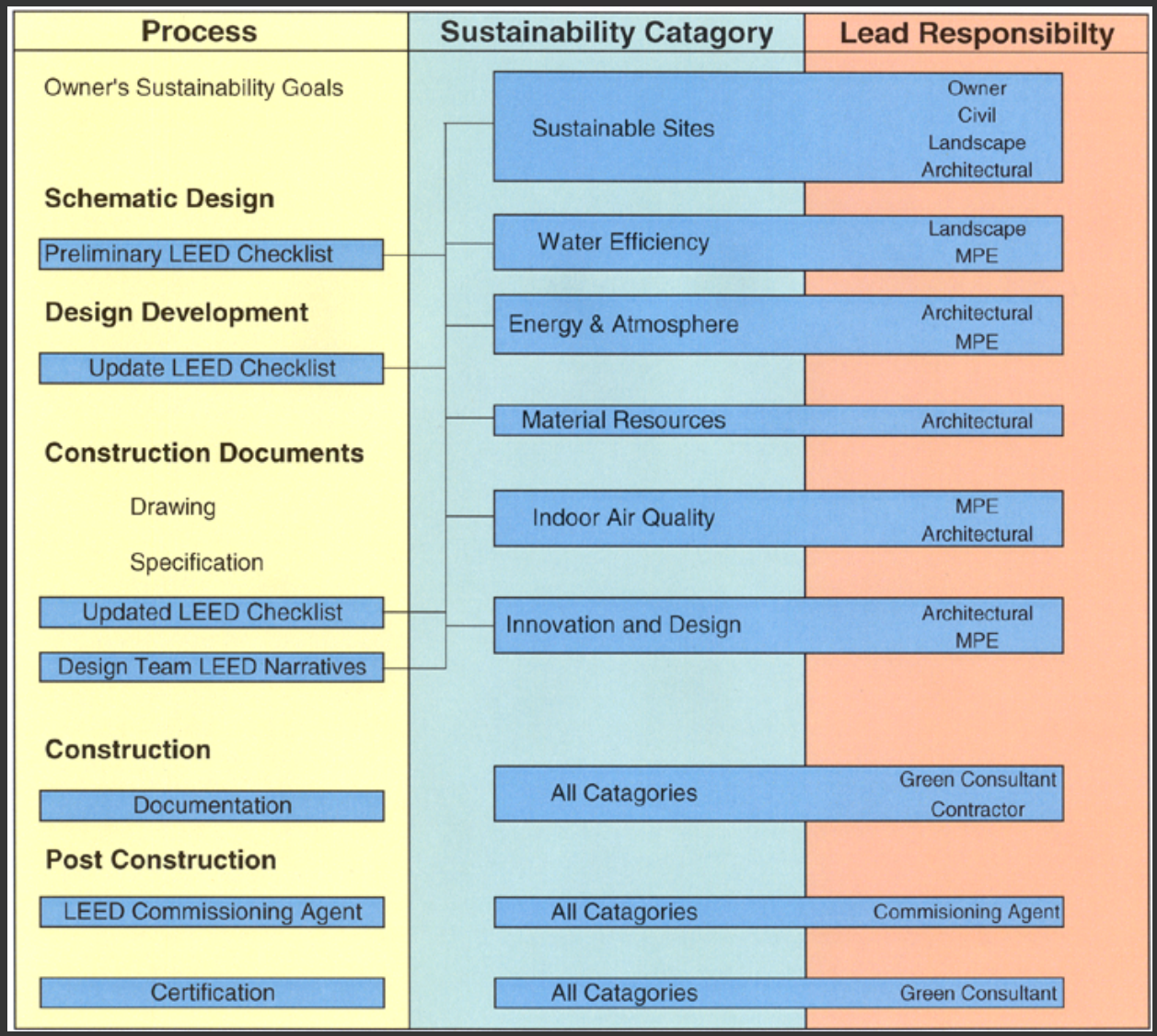
World Watch Paper, “A Building Revolution How Ecology and Health Concerns Are Transforming Construction”

T•H•A Sustainable Design Objectives

- Minimize site development upon natural systems.
- Practice pollution prevention.
- Maximize building durability.
- Use energy and natural resources efficiently.
- Provide ecologically sound and healthy building materials.
- Develop partnerships to achieve sustainable design goals.
- Foster dialogue and education.

Columbia Gorge
Interpretive Center

How LEED™ has been integrated into T•H•A's office process…



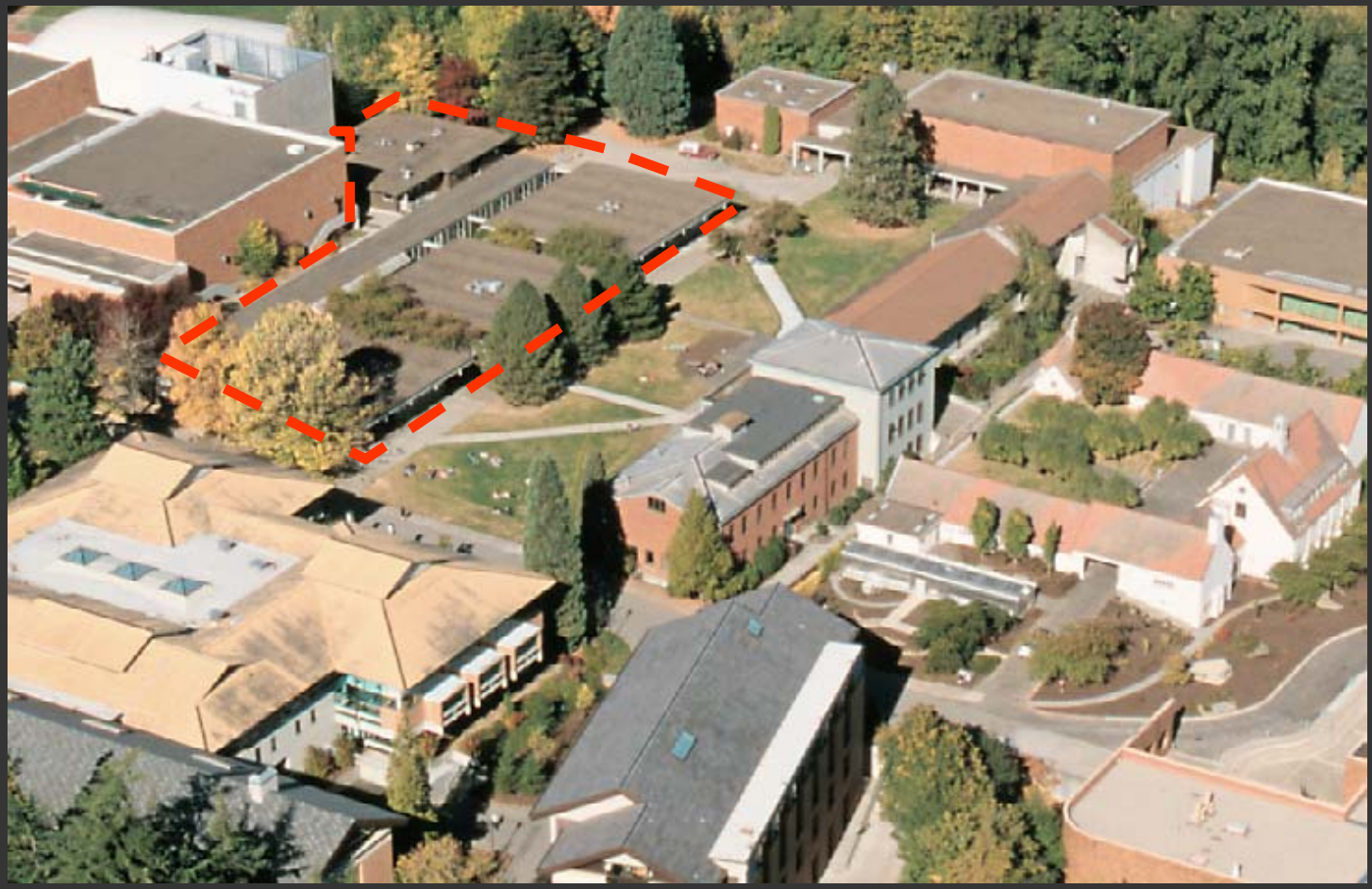
Current LEED™ Projects

- University of California Merced
  Classroom Building
- Multnomah County Libraries
  Hillsdale Branch Library
- Balfour-Guthrie Building
  Office Renovation

Above projects all pending certification

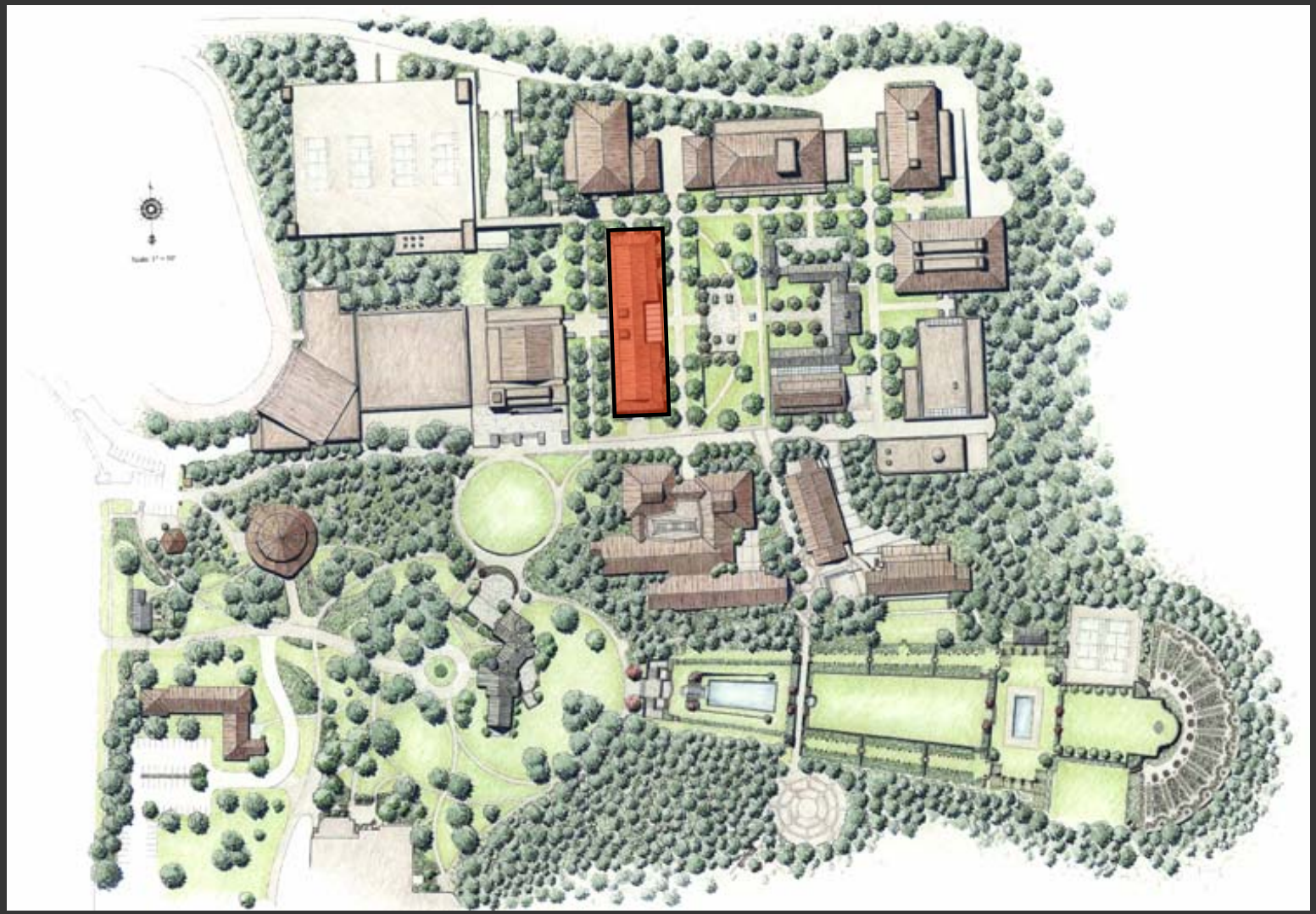
Case Study: Howard Center for the Social Sciences

Project Overview



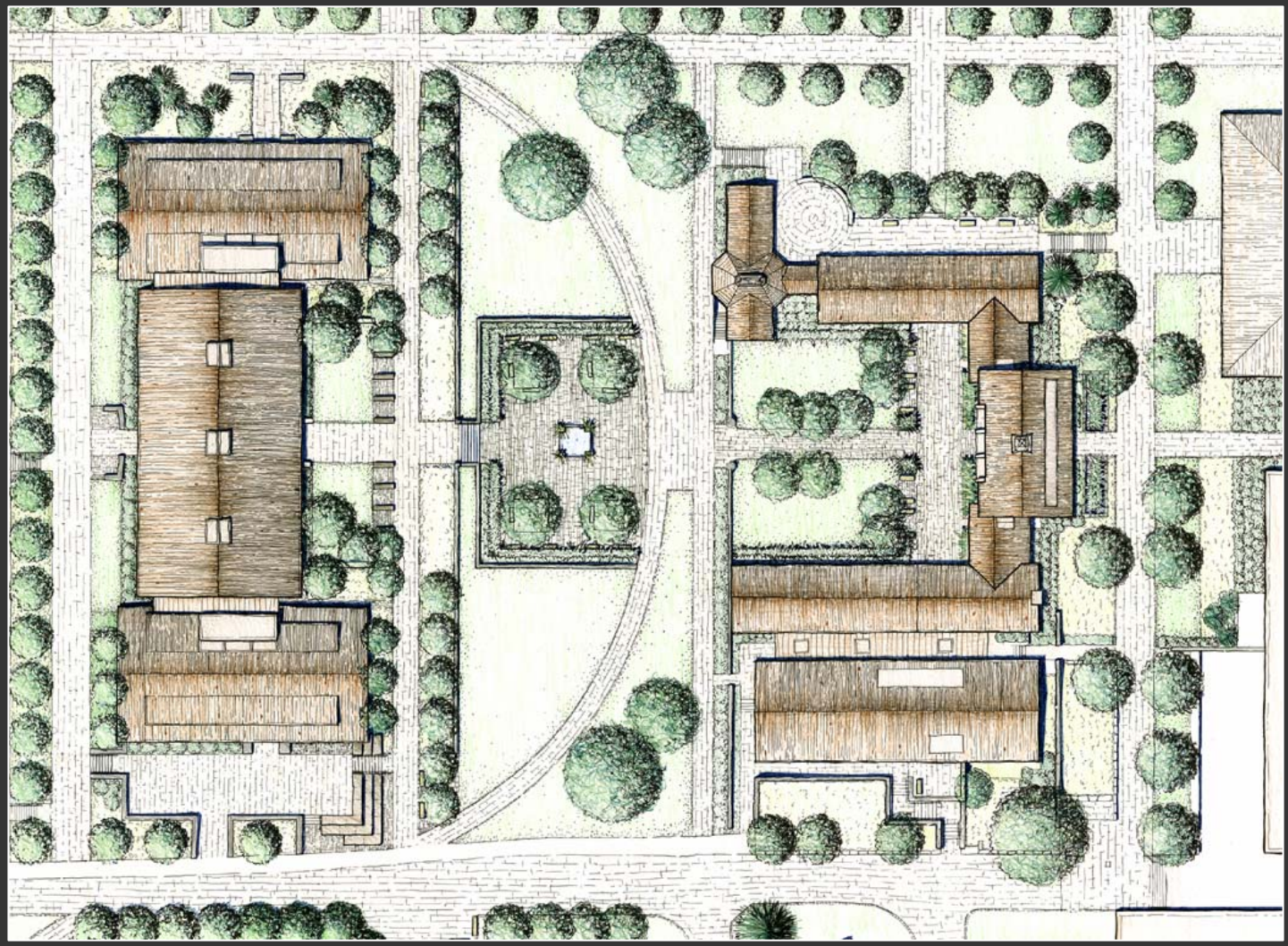
Existing Site Aerial Photo

Project Overview



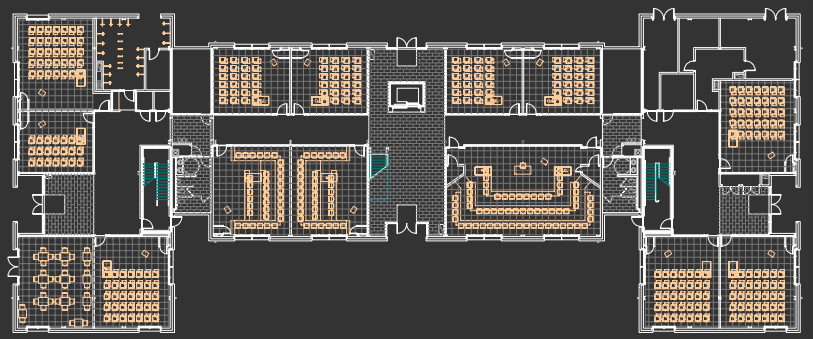
Master Plan, Lewis & Clark College Campus

Project Overview



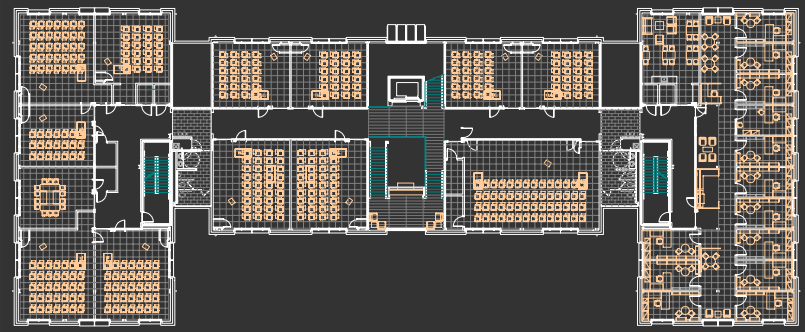
Site Plan for Howard Building with Albany Hall

Project Overview



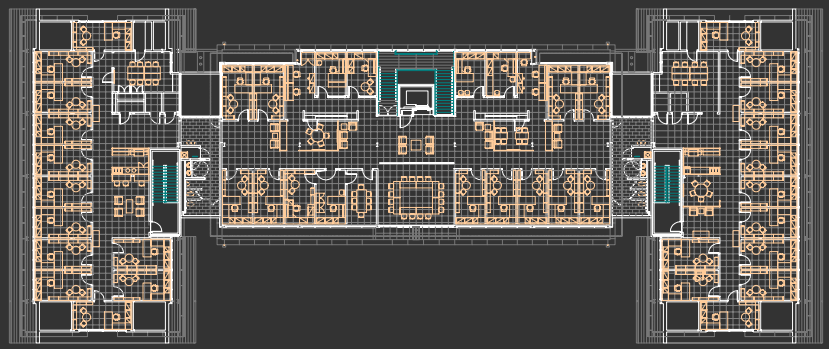
Floor 1

Classrooms, Bike Storage



Floor 2

Classrooms, Offices, Conference Rooms



Floor 3

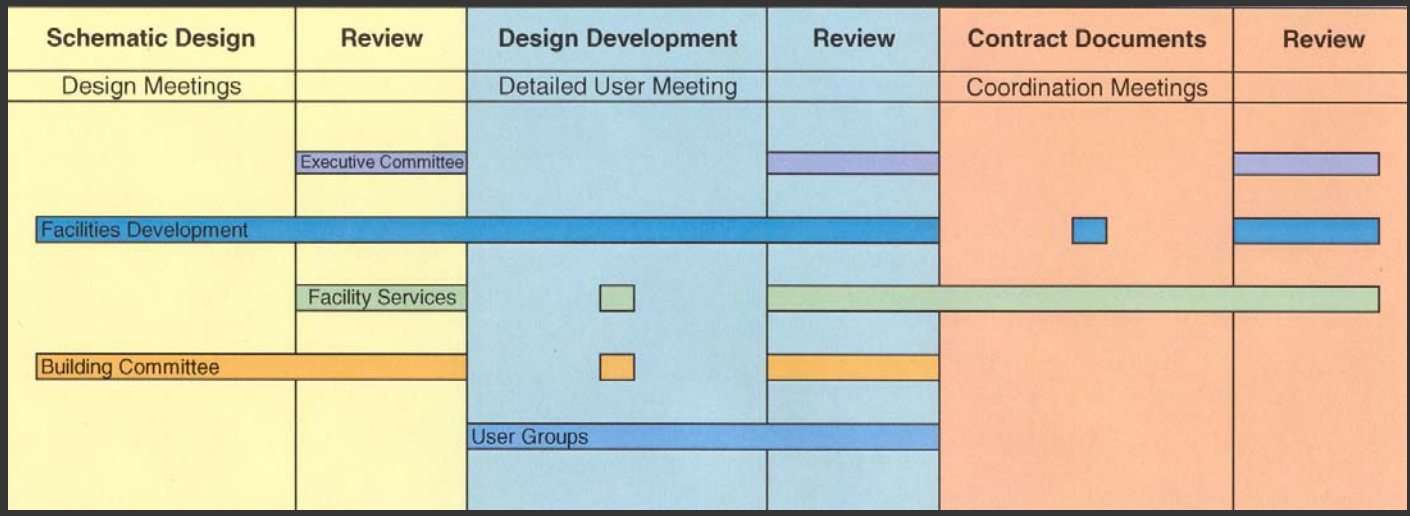
Offices, Conference Rooms

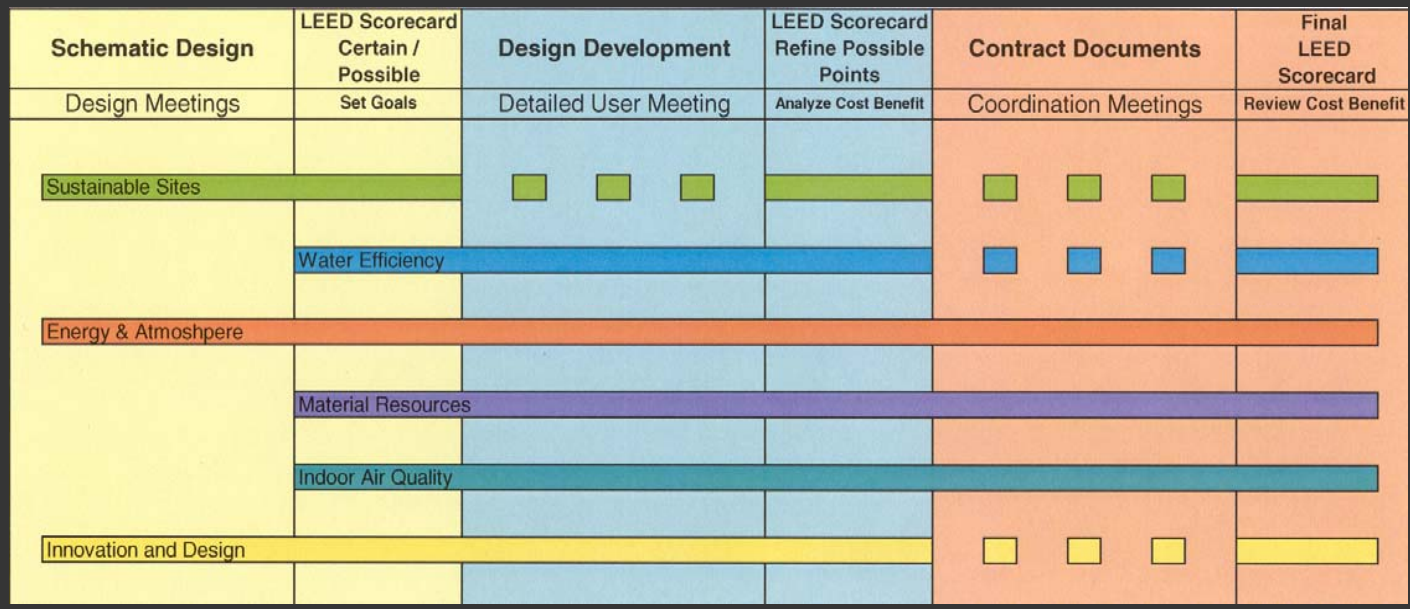
Project Goals: Sustainability

"Consider sustainability in all decisions, including use of natural light, energy systems, material selection, and construction practices. Minimize long-term operations and maintenance costs".

Howard Hall Building Committee "Project Goals Statement", February 2001

Process of User Involvement





Case Study: Howard Center for the Social Sciences

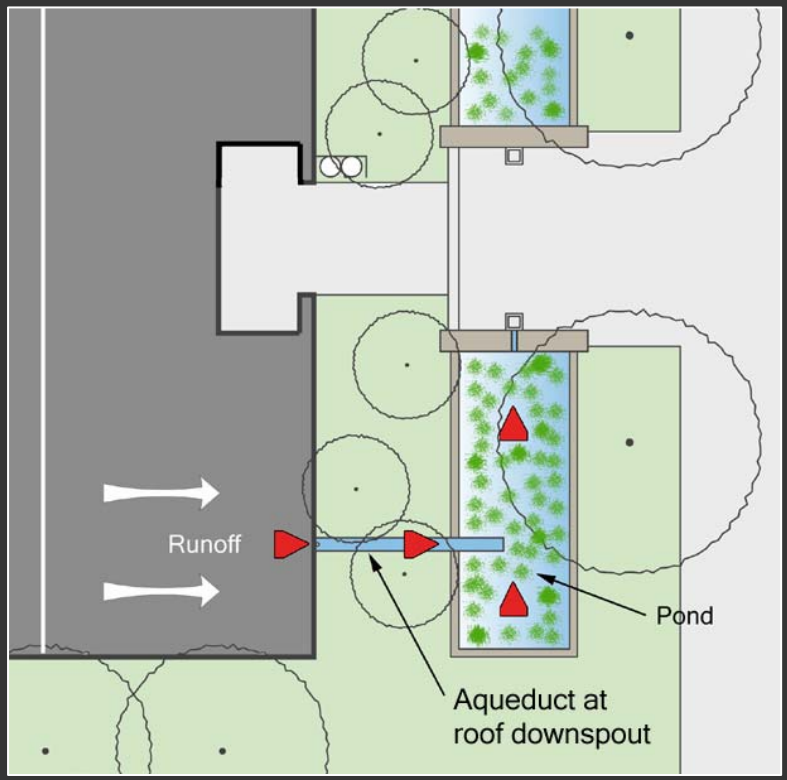
T•H•A Sustainable Design Elements for Howard Center for the Social Sciences

- Site Design
- Energy Conservation
- Indoor Air Quality
- Building Material Selection
- Recycling and Waste Management
- Ecological Education

T•H•A Sustainable Design Elements

Site Design

- Storm Water Filtration (LEED™ Category: Sustainable Sites)
- Storm Water Collection
- Bicycle Parking
- Reduce Site Disturbance



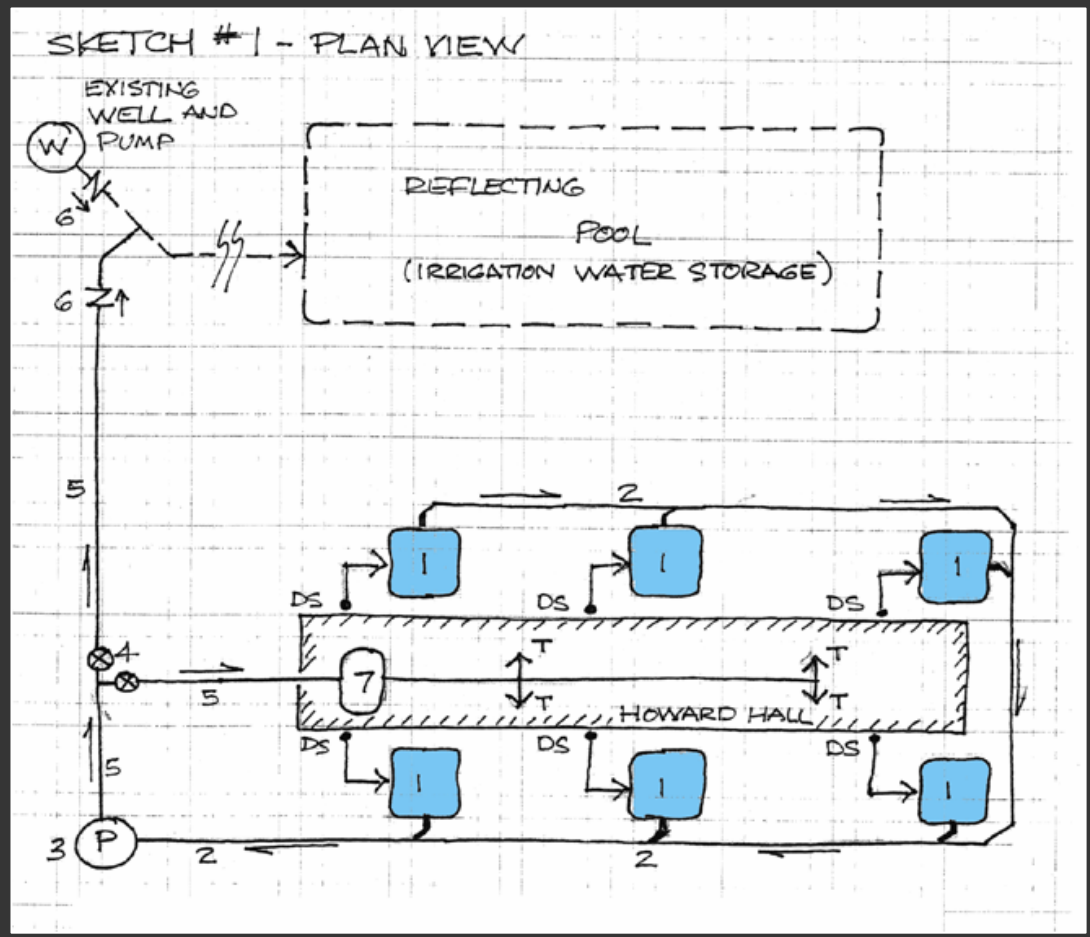
Water Quality Garden

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Site Design

- Storm Water Filtration
- Storm Water Collection (LEED™ Category: Water Efficiency – Innovation & Design Process)
- Bicycle Parking
- Reduce Site Disturbance



Case Study: Howard Center for the Social Sciences

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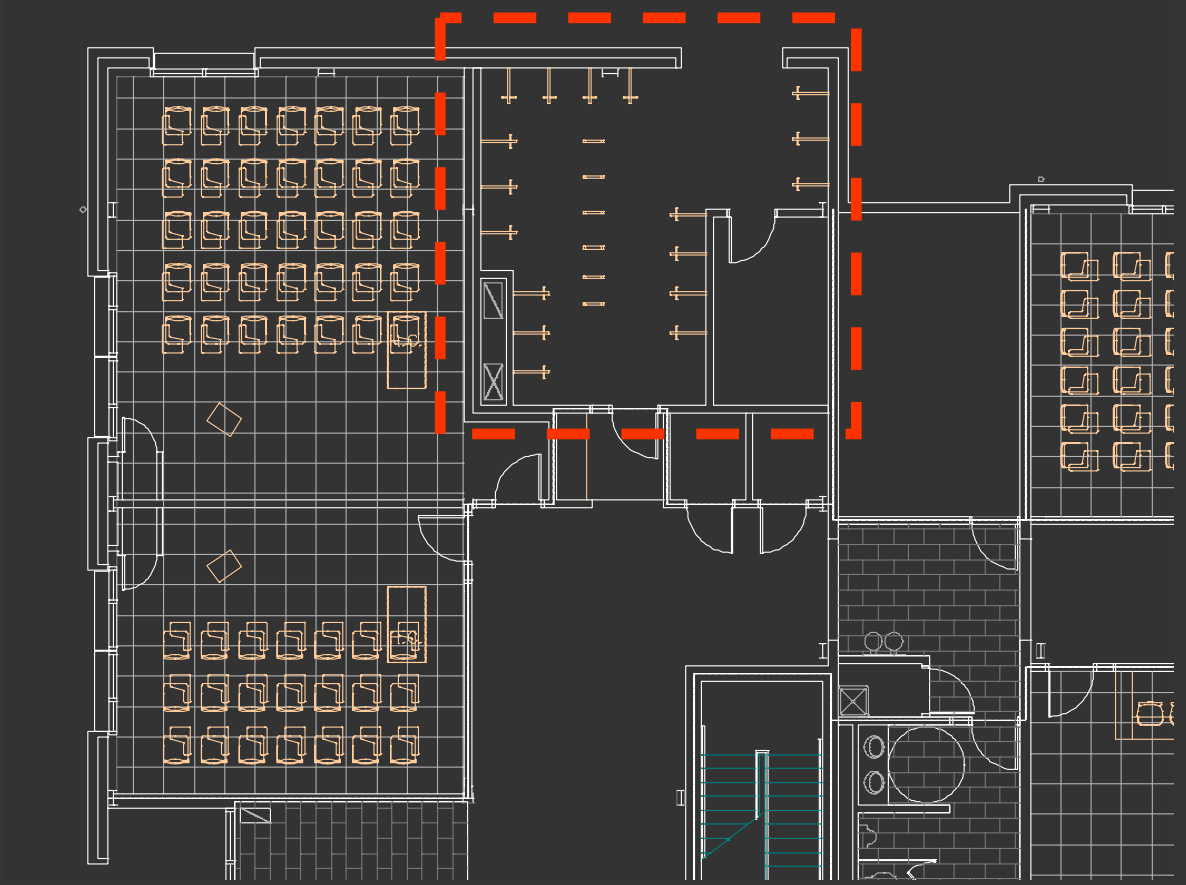


Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Site Design

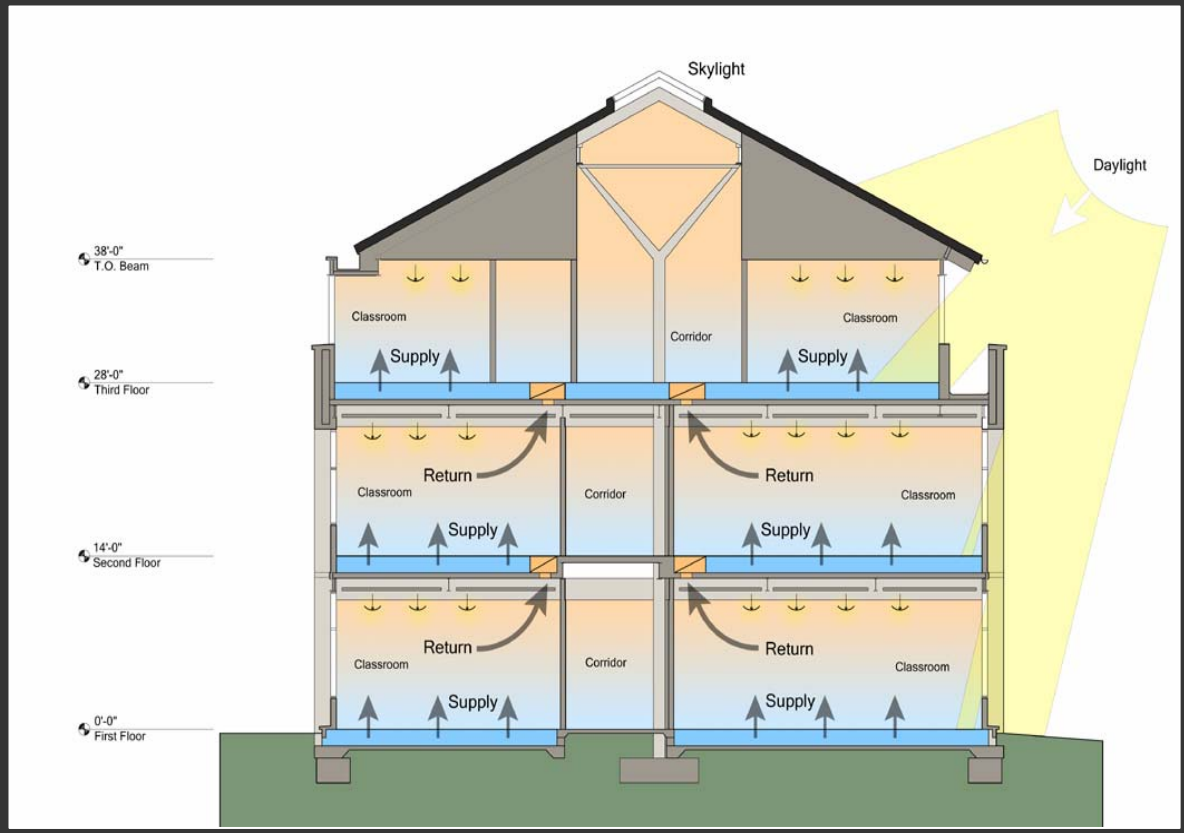
- Storm Water Filtration
- Storm Water Collection
- Bicycle Parking
- Reduce Site Disturbance (LEED™ Category: Sustainable Sites)

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Energy Conservation

- Displacement Ventilation with Raised Floor (LEED™ Category: Energy & Atmosphere)
- Radiant Heating
- Natural Ventilation
- Lighting and Daylighting
- Other Energy Efficient Systems
- Replacement of Inefficient Existing Facilities



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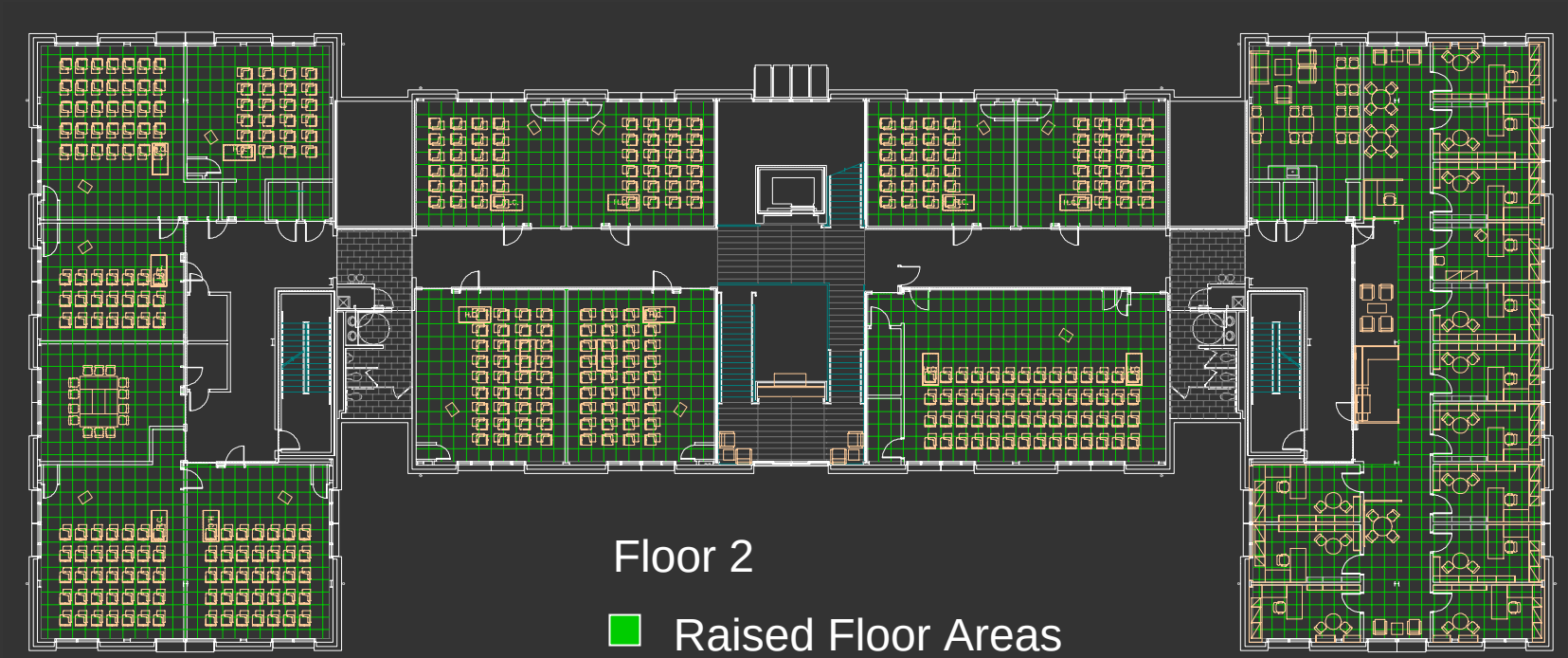

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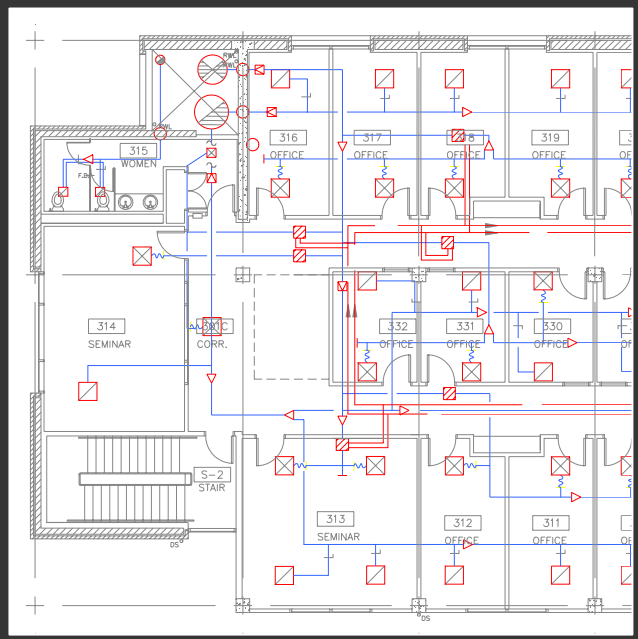
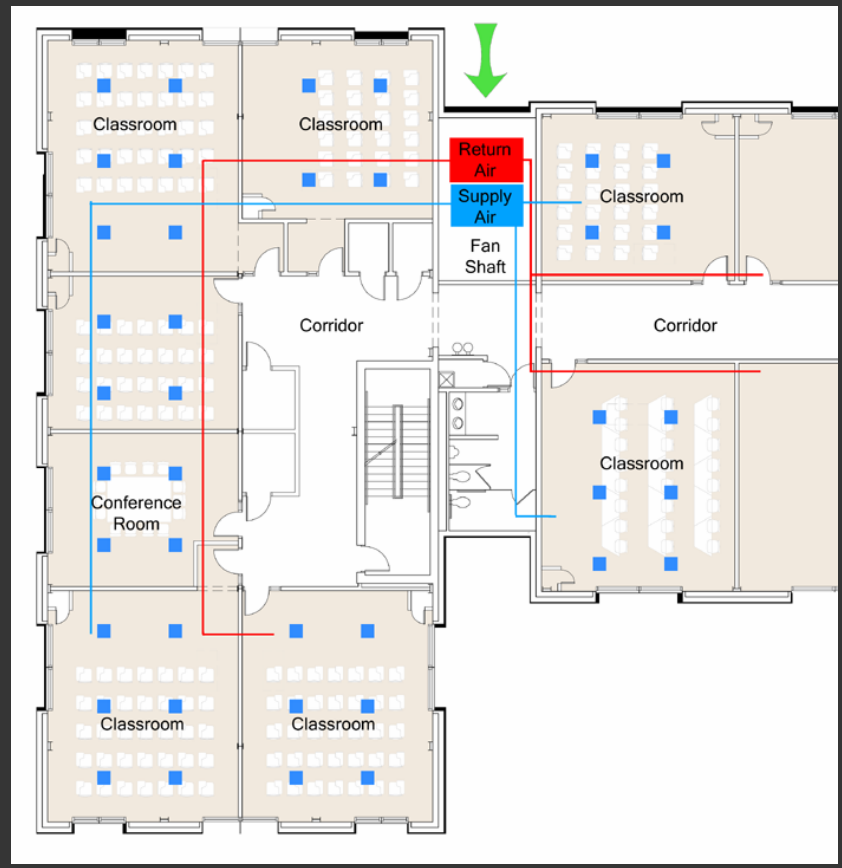


Traditional HVAC Systems



Displacement Ventilation

Case Study: Howard Center for the Social Sciences

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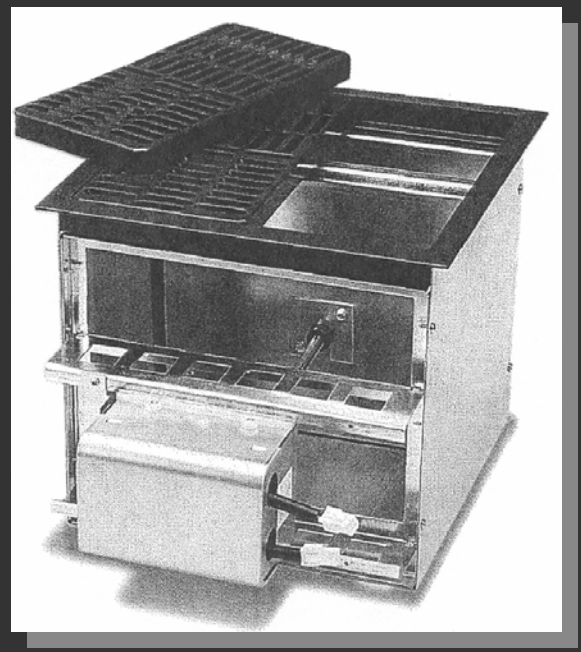

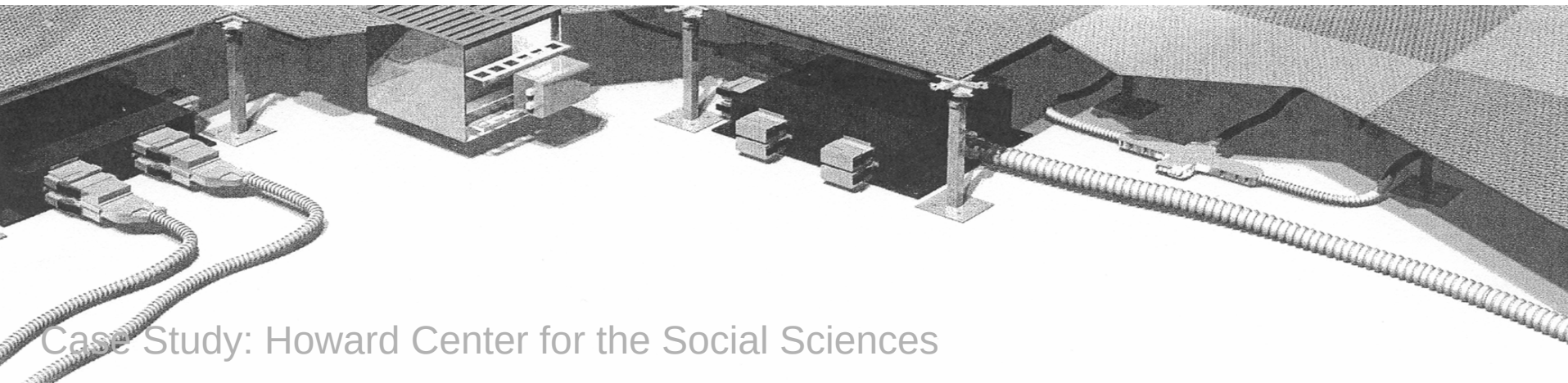

Case Study: Howard Center for the Social Sciences

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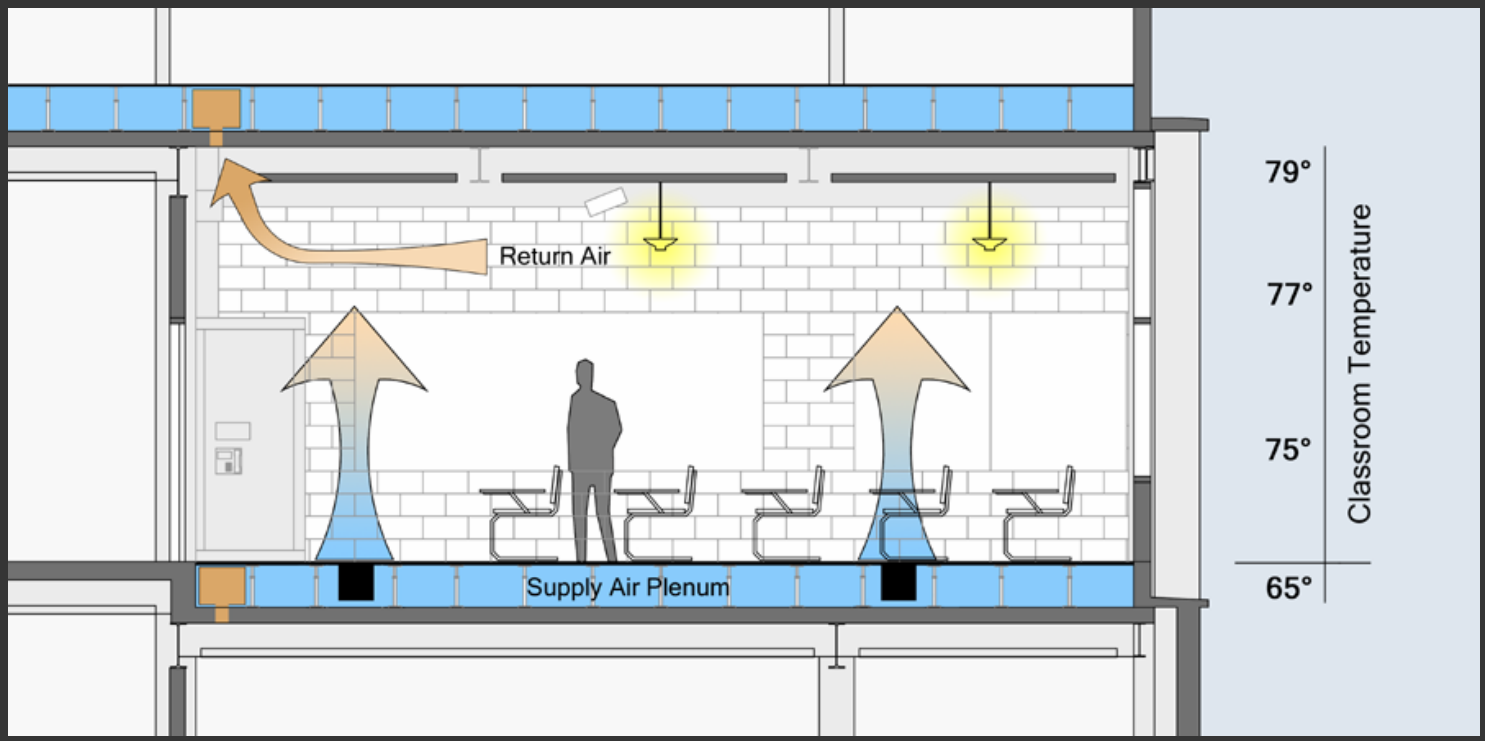

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Energy Conservation

- Displacement Ventilation with Raised Floor
- Radiant Heating (LEED™ Category: Energy & Atmosphere - Indoor Environmental Quality)
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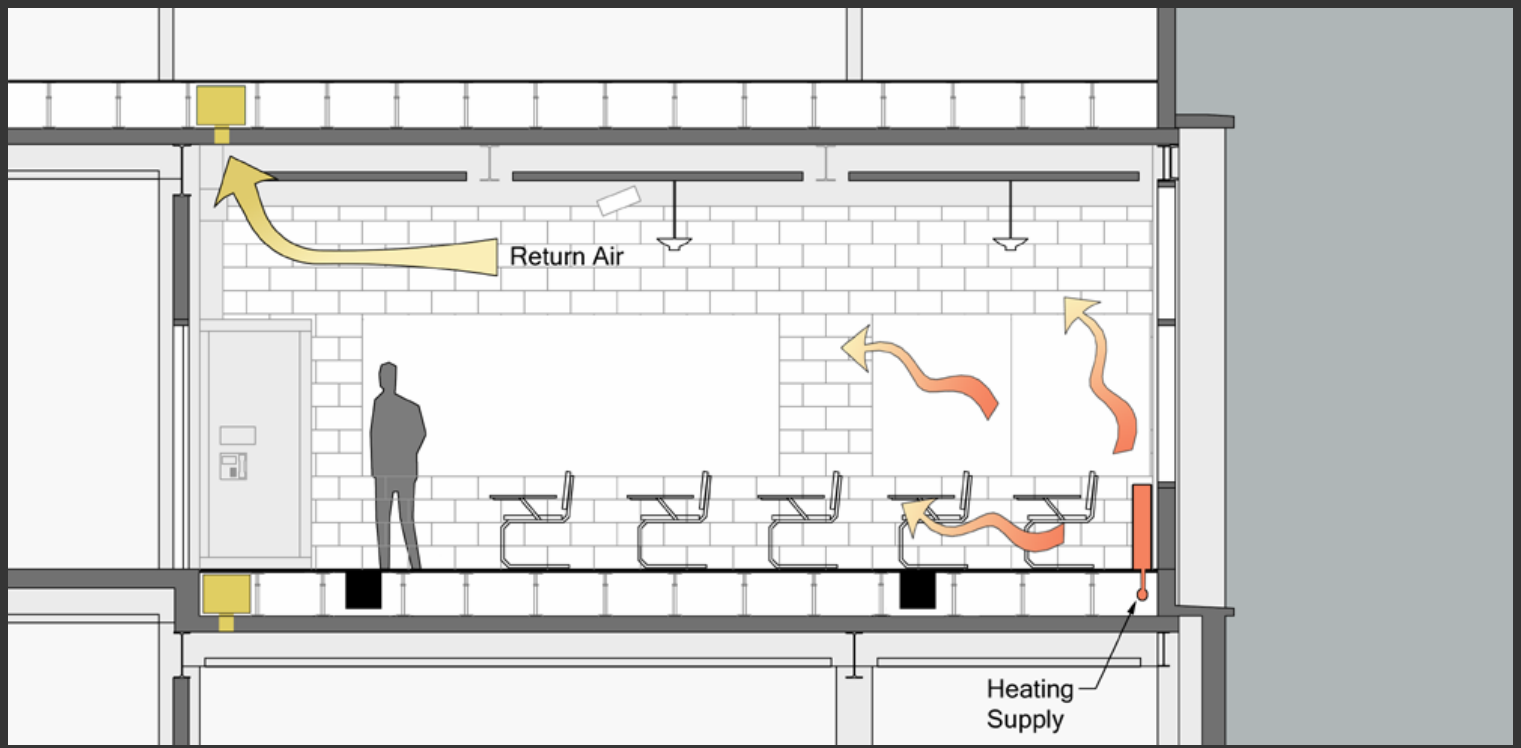

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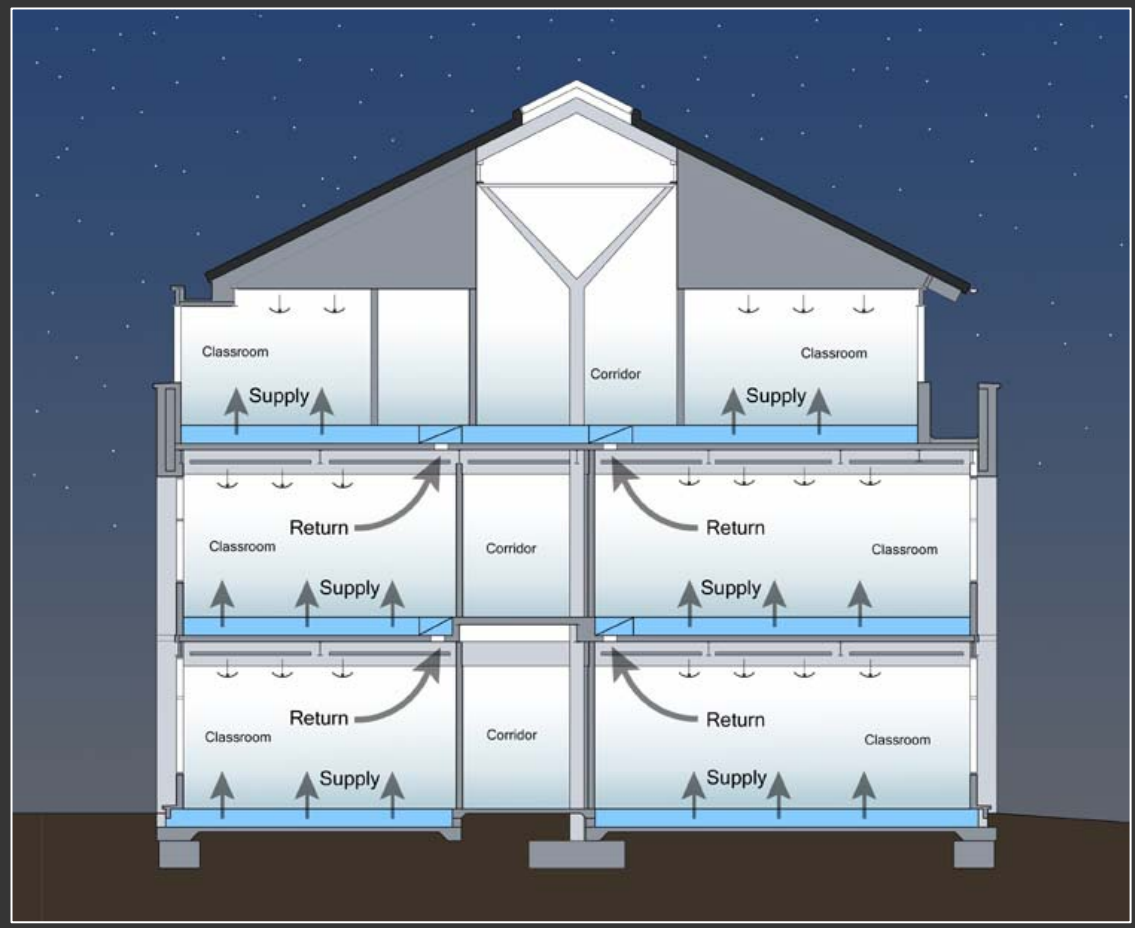

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

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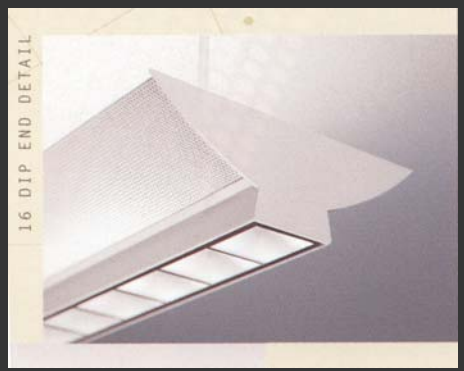

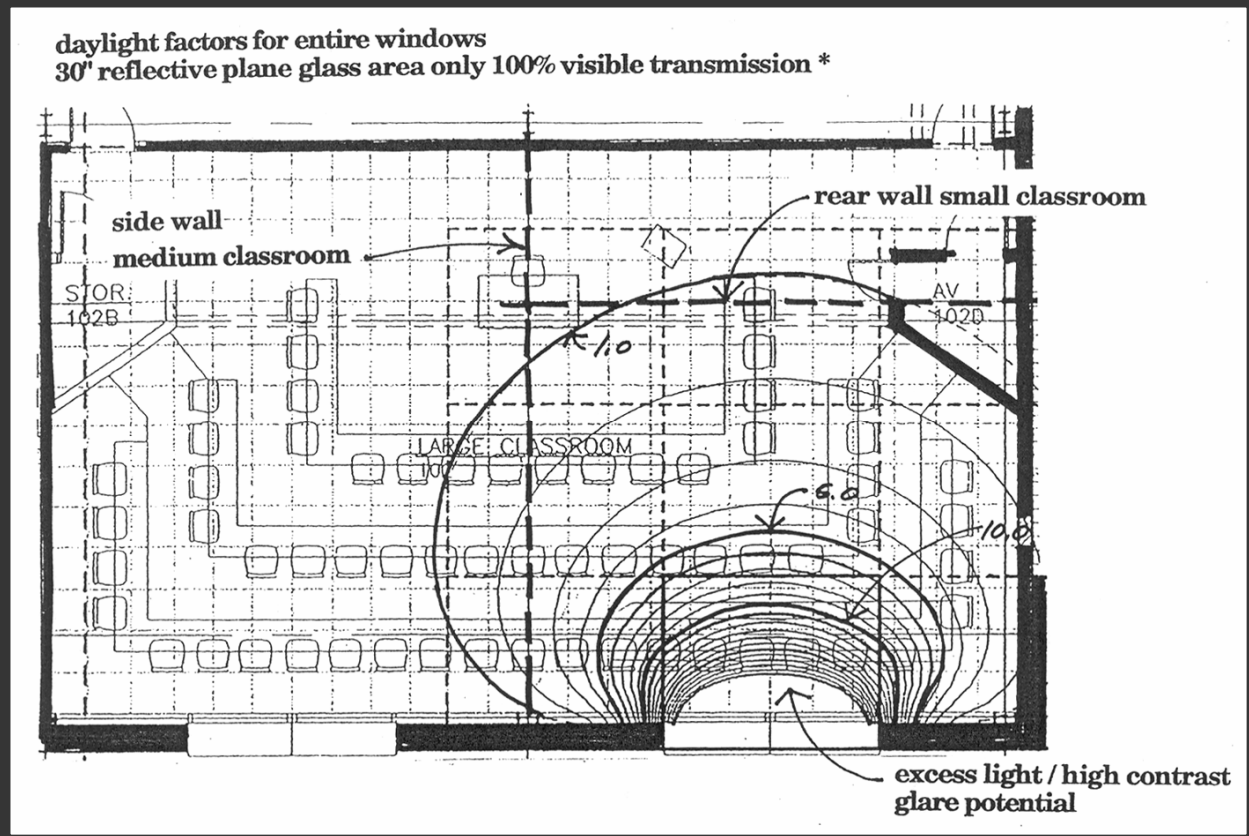

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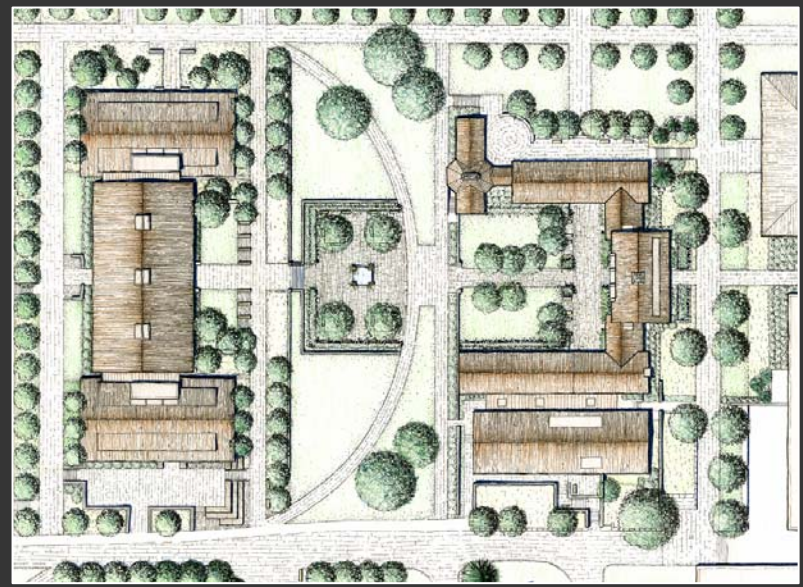
- Other Energy Efficient Systems
- Replacement of Inefficient Existing Facilities (LEED™ Category: Innovation & Design Process)

Existing Conditions



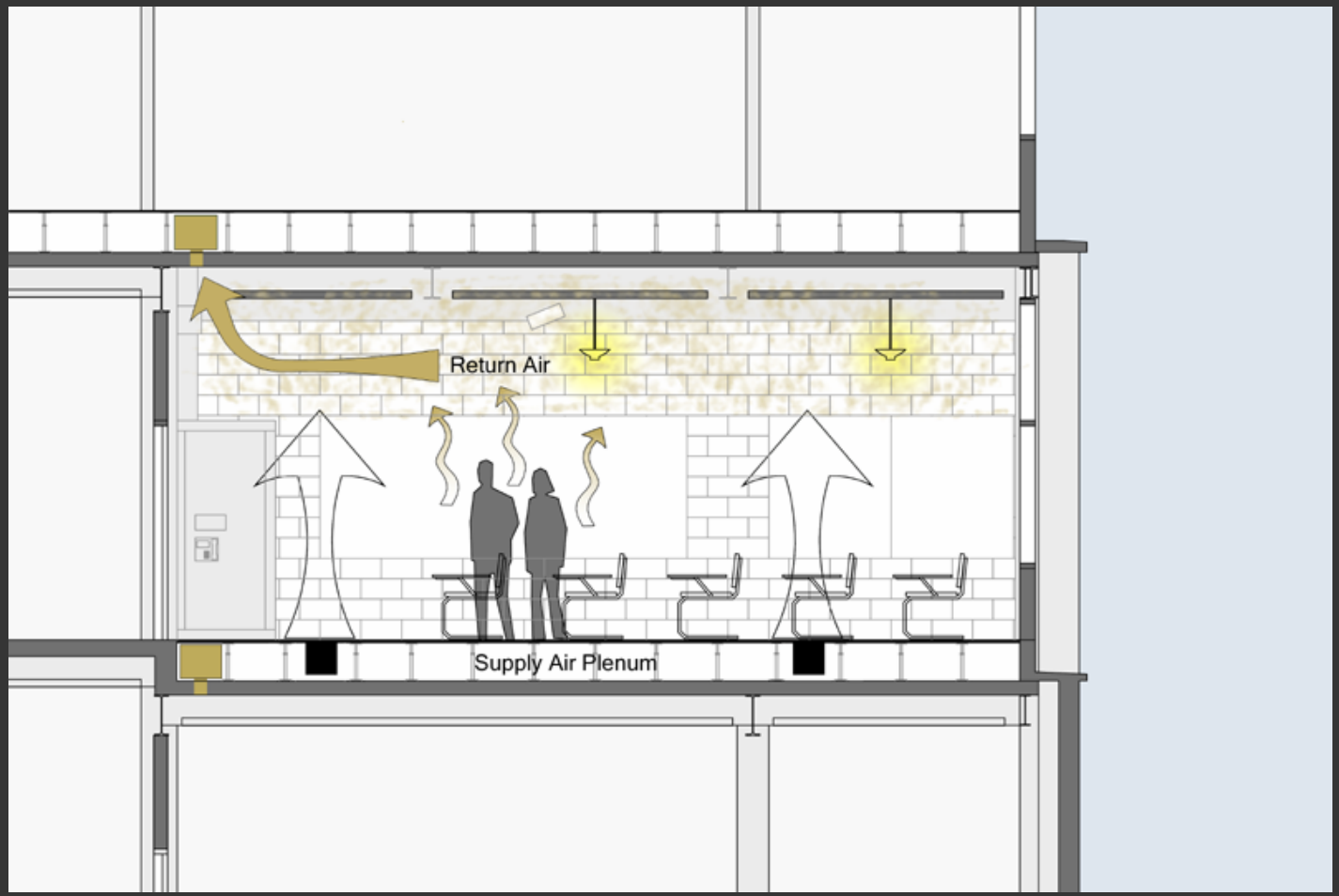
Site Plan

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Indoor Air Quality

- Displacement Ventilation with Raised Floor
- Natural Ventilation
- Low Toxicity Materials



Case Study: Howard Center for the Social Sciences

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Indoor Air Quality

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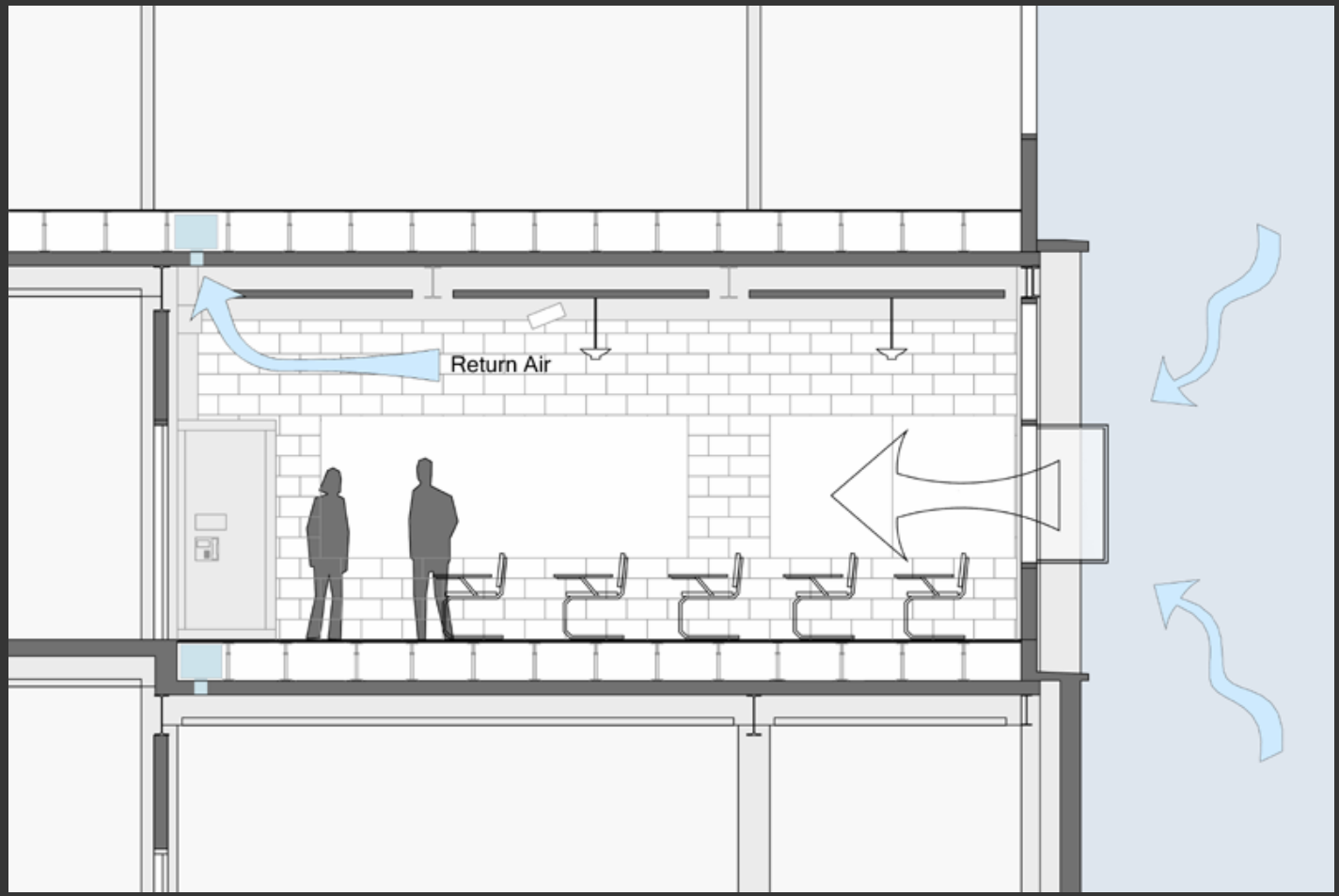
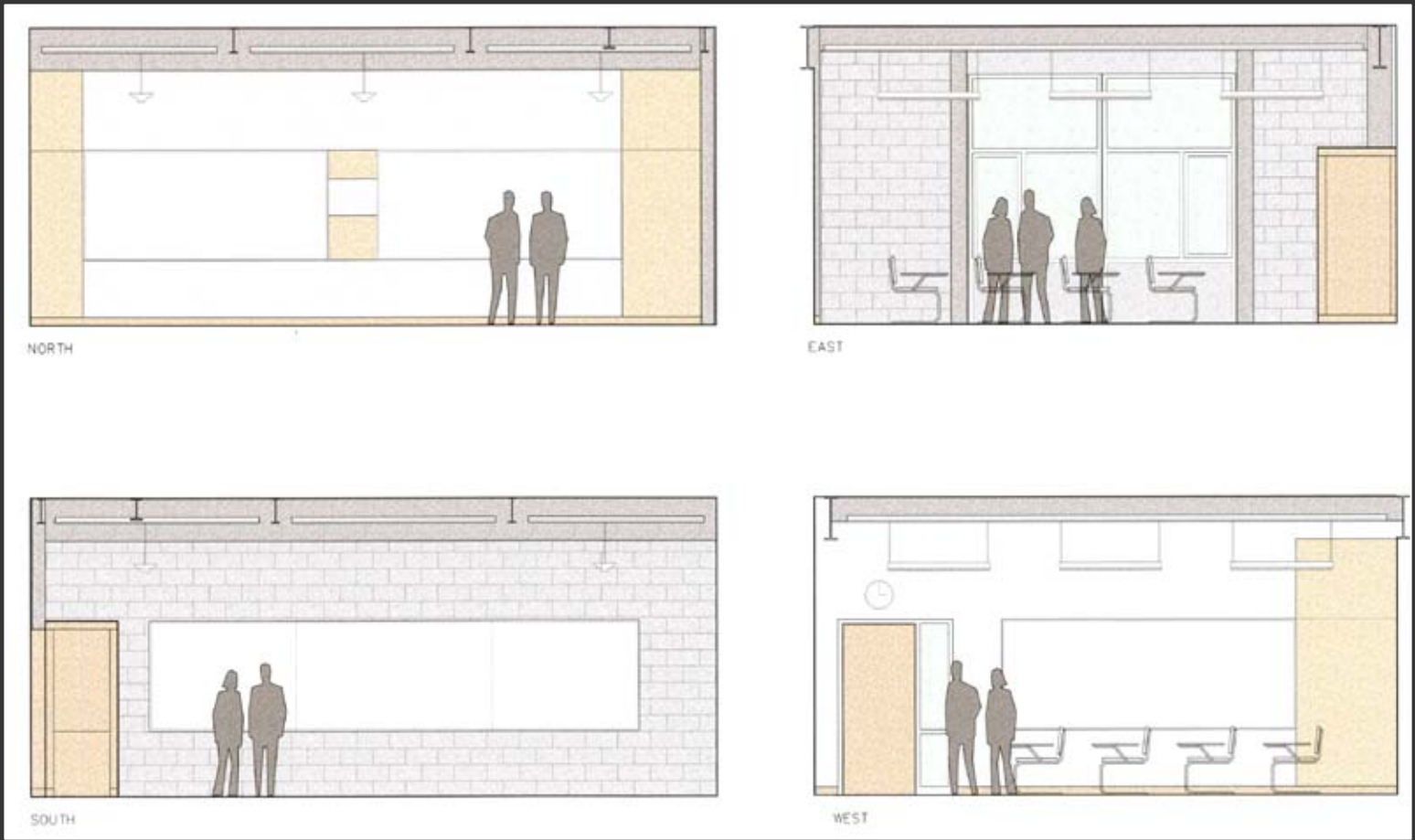


Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Building Material Selection

- Minimal Use of Materials (LEED™ Category: Innovation & Design Process)
- Durability
- Low Embodied Energy Materials



Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Building Material Selection

- Minimal Use of Materials
- Durability (LEED™ Category: Innovation & Design Process)
- Low Embodied Energy Materials (LEED™ Category: Materials & Resources)

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Recycling & Waste Management

- Recycling Facilities (LEED™ Category: Materials & Resources)
- Deconstruction (LEED™ Category: Materials & Resources)
- Construction Debris Recycling (LEED™ Category: Materials & Resources - Innovation & Design Process)

T•H•A Sustainable Design Elements

Recycling & Waste Management

- Recycling Facilities (LEED™ Category: Materials & Resources)
- Deconstruction (LEED™ Category: Materials & Resources)
- Construction Debris Recycling (LEED™ Category: Materials & Resources - Innovation & Design Process)

Case Study: Howard Center for the Social Sciences

T•H•A Sustainable Design Elements

Ecological Education

- Operate in an Environmentally Friendly Manner
- Prepare Students to be Ecologically Literate (LEED™ Category: Innovation & Design Process)

Case Study: Howard Center for the Social Sciences

LEED Scorecard:

39	11	19	**Total Project Score**	Possible Points	**69**

Certified 26 to 32 points **Silver** 33 to 38 points **Gold** 39 to 51 points **Platinum** 52 or more points

8	**1**	**5**	**Sustainable Sites**	Possible Points	**14**		
C	P	NL					
Y			Prereq 1	**Erosion & Sedimentation Control**	**0**		
1			Credit 1	**Site Selection**	**1**		
		1	Credit 2	**Urban Redevelopment**	**1**		
		1	Credit 3	**Brownfield Redevelopment**	**1**		
1			Credit 4.1	**Alternative Transportation**, Public Transportation Access	**1**		
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	**1**		
		1	Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	**1**		
1			Credit 4.4	**Alternative Transportation**, Parking Capacity	**1**		
1			Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	**1**		
1			Credit 5.2	**Reduced Site Disturbance**, Development Footprint	**1**		
1			Credit 6.1	**Stormwater Management**, Rate and Quantity	**1**		
1			Credit 6.2	**Stormwater Management**, Treatment	**1**		
	1		Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	**1**		
		1	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	**1**		
		1	Credit 8	**Light Pollution Reduction**	**1**		

1	**4**	**0**	**Water Efficiency**	Possible Points	**5**		
C	P	NL					
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	**1**		
	1		Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	**1**		
	1		Credit 2	**Innovative Wastewater Technologies**	**1**		
	1		Credit 3.1	**Water Use Reduction**, 20% Reduction	**1**		
	1		Credit 3.2	**Water Use Reduction**, 30% Reduction	**1**		

10	**0**	**7**	**Energy & Atmosphere**	Possible Points	**17**		
C	P	NL					
Y			Prereq 1	**Fundamental Building Systems Commissioning**	**0**		
Y			Prereq 2	**Minimum Energy Performance**	**0**		
Y			Prereq 3	**CFC Reduction in HVAC&R Equipment**	**0**		
2			Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	**2**		
2			Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	**2**		
2			Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	**2**		
		2	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	**2**		
		2	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	**2**		
		1	Credit 2.1	**Renewable Energy**, 5%	**1**		
		1	Credit 2.2	**Renewable Energy**, 10%	**1**		
		1	Credit 2.3	**Renewable Energy**, 20%	**1**		
1			Credit 3	**Additional Commissioning**	**1**		
1			Credit 4	**Ozone Depletion**	**1**		
1			Credit 5	**Measurement & Verification**	**1**		
1			Credit 6	**Green Power**	**1**		

4	**3**	**6**	**Materials & Resources**	Possible Points	**13**		
C	P	NL					
Y			Prereq 1	**Storage & Collection of Recyclables**	**0**		
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	**1**		
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Shell	**1**		
		1	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	**1**		
1			Credit 2.1	**Construction Waste Management**, Divert 50%	**1**		
1			Credit 2.2	**Construction Waste Management**, Divert 75%	**1**		
		1	Credit 3.1	**Resource Reuse**, Specify 5%	**1**		
		1	Credit 3.2	**Resource Reuse**, Specify 10%	**1**		
1			Credit 4.1	**Recycled Content**, Specify 25%	**1**		
	1		Credit 4.2	**Recycled Content**, Specify 50%	**1**		
	1		Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	**1**		
	1		Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	**1**		
		1	Credit 6	**Rapidly Renewable Materials**	**1**		
1			Credit 7	**Certified Wood**	**1**		

14	**0**	**1**	**Indoor Environmental Quality**	Possible Points	**15**		
C	P	NL					
Y			Prereq 1	**Minimum IAQ Performance**	**0**		
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	**0**		
1			Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	**1**		
1			Credit 2	**Increase Ventilation Effectiveness**	**1**		
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	**1**		
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	**1**		
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	**1**		
1			Credit 4.2	**Low-Emitting Materials**, Paints	**1**		
1			Credit 4.3	**Low-Emitting Materials**, Carpet	**1**		
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood	**1**		
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	**1**		
1			Credit 6.1	**Controllability of Systems**, Perimeter	**1**		
1			Credit 6.2	**Controllability of Systems**, Non-Perimeter	**1**		
1			Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	**1**		
		1	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	**1**		
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	**1**		
1			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	**1**		

2	**3**	**0**	**Innovation & Design Process**	Possible Points	**5**		
C	P	NL					
1			Credit 1.1	**Innovation in Design**: Green Education Demonstration	**1**		
	1		Credit 1.2	**Innovation in Design**: 95% Construction Waste recyling	**1**		
	1		Credit 1.3	**Innovation in Design**: Replacement efficiency/reduction	**1**		
	1		Credit 1.4	**Innovation in Design**: Materials minimization & durability	**1**		
1			Credit 2	**LEED™ Accredited Professional**	**1**		

LEED™ self assessment report prepared by Campus Planning in consultation with design architect, contractor

Case Study: Howard Center for the Social Sciences

Thomas Hacker Architects

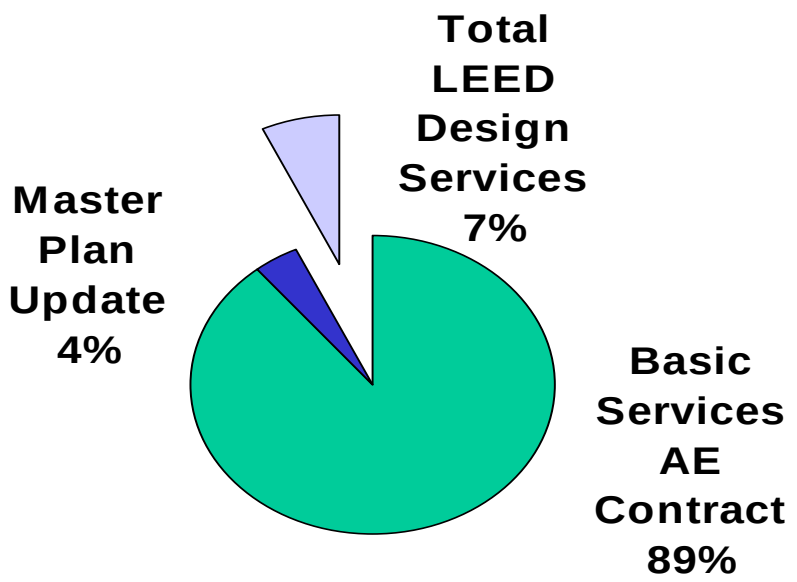
The goal is to make every T•H•A building sustainable.

LEED Costs for Howard

Cost Center	Basic Project	Green Premium	Total	% Green
Construction	$ 10,795,025	$ 619,220	$ 11,414,245	5.74%
Design	$ 1,315,182	$ 99,888	$ 1,415,070	7.59%
Equipment	$ 893,782	$ -	$ 893,782	0.00%
Furniture	$ 1,007,146	$ -	$ 1,007,146	0.00%
Owner	$ 489,205	$ 28,062	$ 517,267	5.74%
PM	$ 245,734	$ 14,096	$ 259,830	5.74%
Contingency	$ 465,933	$ 26,727	$ 492,660	5.74%
Project Total	$ 15,212,008	$ 787,992	$ 16,000,000	5.18%

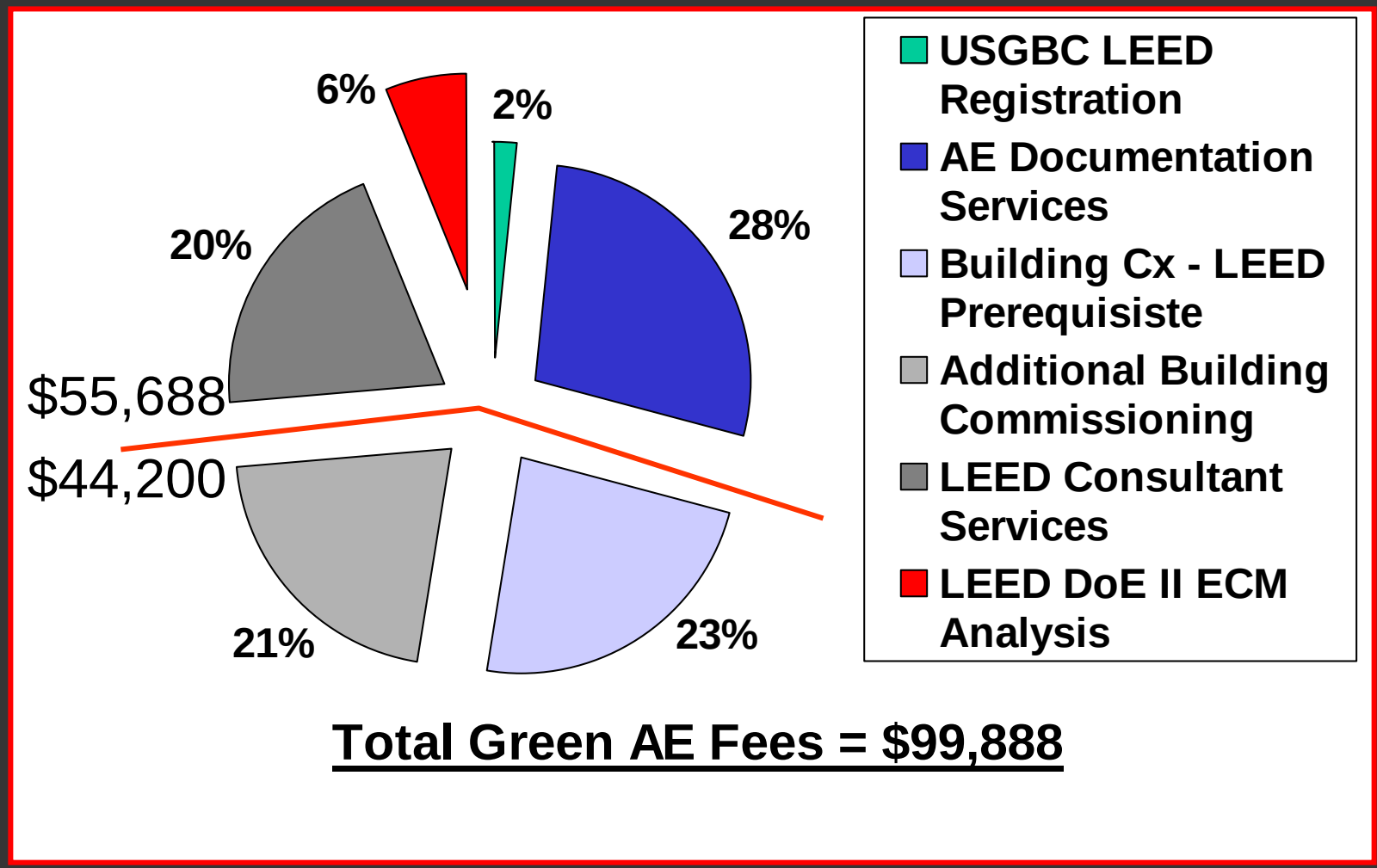
- Registration Fees
- AE Design Fees
- Construction
  - Sustainable Site, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, Innovation & Design Process
- Other
  - Permits, Fees, Site Surveys, Project Management, Contingency

Design Fees Premium



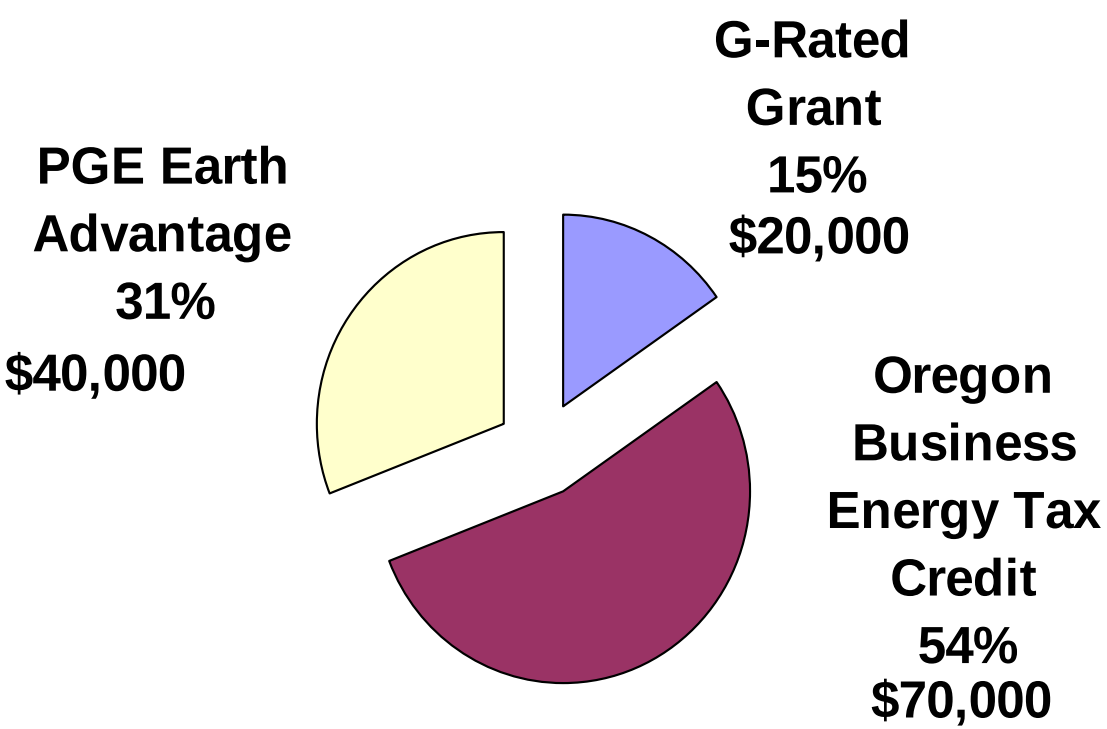
Summary of AE Fees

Green AE Fees Breakout



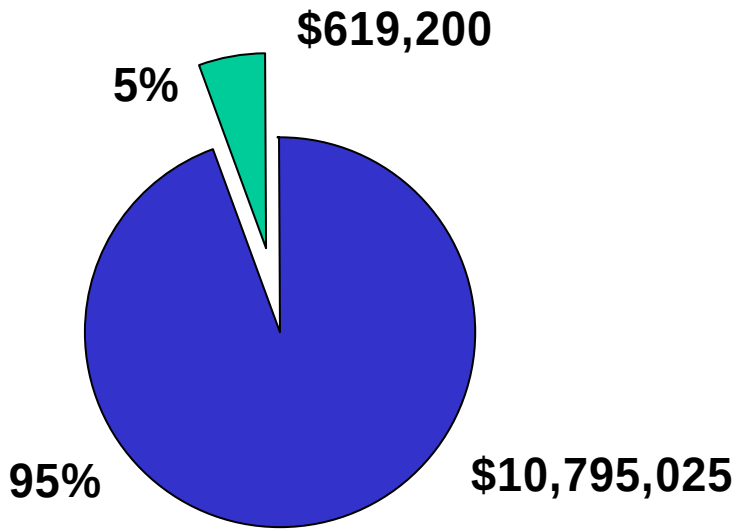
Total Green AE Fees = $99,888

Design Fees Offsets



Design Fees Offsets = $130,000

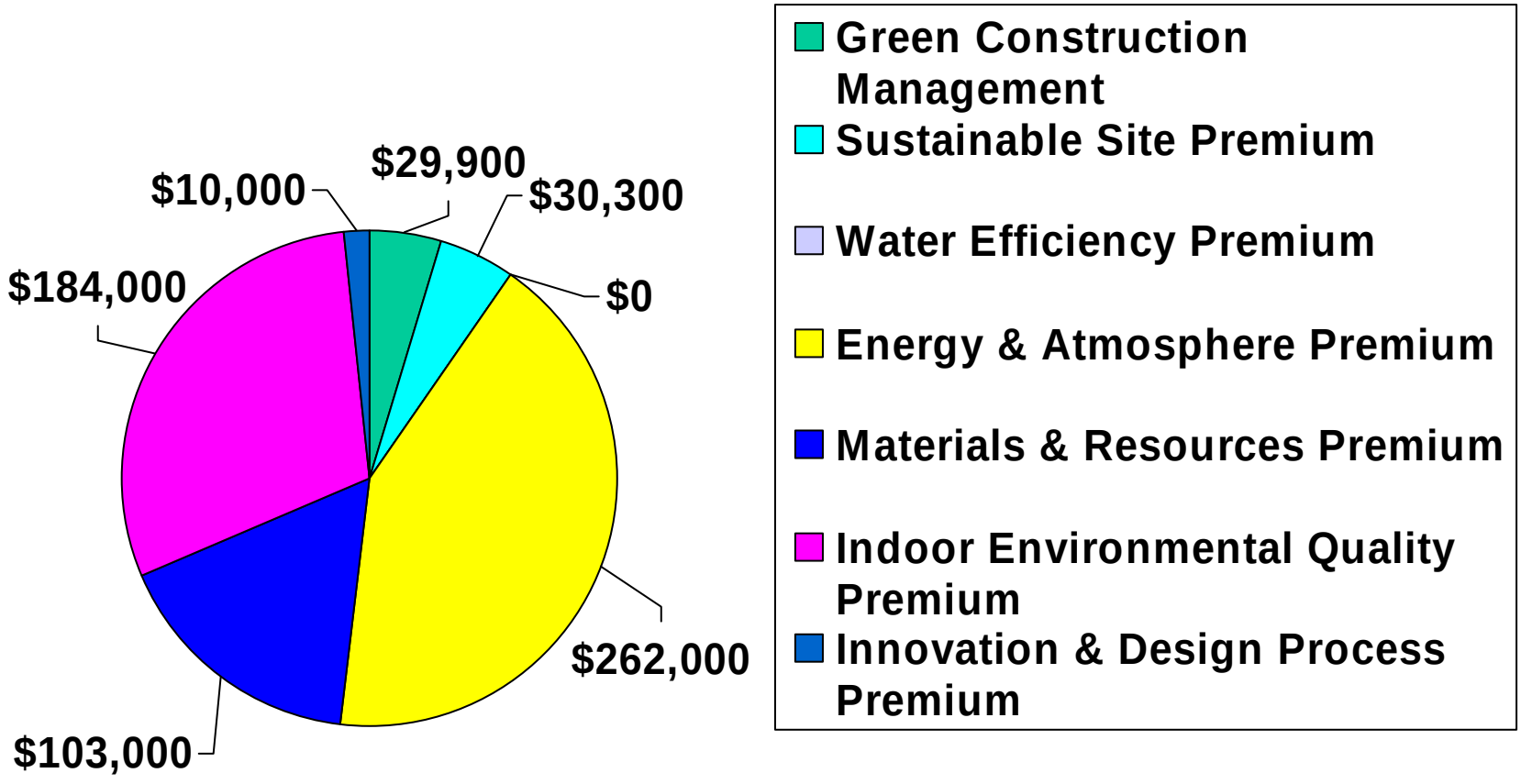
Cost of Green Construction



Total Direct Construction

$ 11,414,225

Cost of Green Construction



Green Construction = 619,000

Benefits to Green

- Qualitative
  - ✓ Offers opportunities in support of educational programs.
  - ✓ Helps create a positive image with students & community.
  - ✓ Brings discipline to the design team and owner involvement process.
- Quantitative
  - ✓ Reduced energy costs. Energy conservation savings = $23,210/year.
  - ✓ Adaptability of systems to changing pedagogical methods = reduced future renovation costs.
  - ✓ Improved building performance in M/E systems w/
    - ✓ Better lighting in classrooms and offices.
    - ✓ Better temperature and humidity controls.
    - ✓ Better ventilation and cleaner air.
  - ✓ Supports regional growth management plan

Lessons Learned

- There is a cost for sustainability that may range from 4% or 5% of total project costs to the sky's the limit.
- Paybacks may be longer than traditional energy conservation programs.
- Energy modeling and life cycle costing are essential for understanding costs and benefits.
- AE fees may not reflect sustainable design as "standard practice".
- Discrepancies between local government and USGBC standards may result in duplicate expenditures.
- Educational opportunities may connect real world problems to pedagogical objectives.
- Pick the "low-hanging" fruit, let go of the "not-likelys" and focus on the "maybes".
- Takes a real team effort to stay focused on the overall objective.

…….and finally

"Sustainability enthusiasts share a belief that higher education institutions must play a special role in society's efforts to be wise stewards of our dwindling natural resources. Universities influence the thinking of future leaders and alumni, they reason, and have freedom to act boldly and creatively."

*2000 Article: "Campuses Move Toward Sustainability" from **Priorities**, a publication of the Association of Governing Boards.*

Credits

Client: Lewis & Clark College

Architect: Thomas Hacker Architects Inc.

Structural Engineers: KPFF Consulting Engineers

Mechanical / Electrical Engineers: CBG Consulting Engineers

Civil Engineers: Harper Houf Righellis, Inc.

Landscape Architect: Walker Macy

Lighting: Architectural Lighting Design

Acoustical: Altermatt Associates, Inc.

Telecommunication Consultant: Northwest Information Services, Inc.

AV Consultant: CompView

Commissioning Agent: Engineering Economics, Inc.

Earth Advantage and LEED™ Consultant: Portland General Electric Green Building Services

Energy Efficiency Consultant: SOLARC

Daylighting Consultant: Center for Housing Innovation

Interior Designers: Williamson McCarter + Associates

Construction Manager: Hoffman Construction Co of Oregon