GREEN BUILDING DESIGN

Leading the way to a more sustainable future.

Walt Kanzler Architect
Director of Architecture and Design

- Licensed Architect
- NJ AIO15559
- NY 029459
- CA A27346
- NCARB Registered
- Member A.I.A.
- LEED 2.0 Accredited Professional
- NJHEPS Green Design Team

Career Background

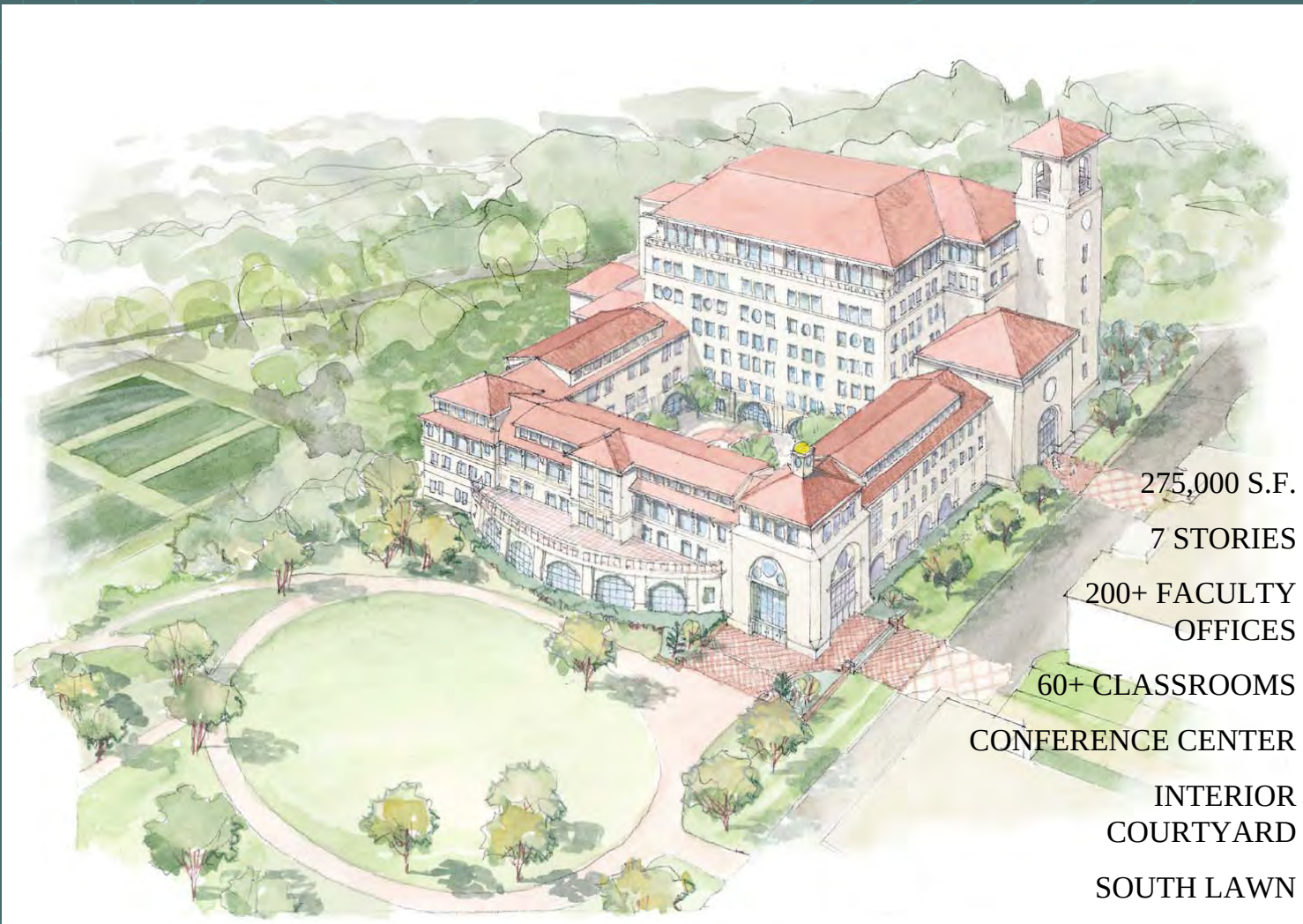
- Port Authority of NY/NJ
- Carrier Johnson Wu
- Ehrlich Rominger
- Frank O. Gehry & Assoc.
- Safdie Rabines Architects
- Montclair State University
- M. Alfieri Company

Current Projects incorporating Sustainable Design Strategies

- University Hall
- Recreation Center
- John J. Cali School of Music
- Finley Hall Renovations
- School of Environmental Science
- School of Business
- BTS-1

University Hall

January 2006



275,000 S.F.

7 STORIES

200+ FACULTY OFFICES

60+ CLASSROOMS

CONFERENCE CENTER

INTERIOR COURTYARD

SOUTH LAWN

University Hall

January 2006

Firm Selection ‘Green” Experience

- SLAM Architects, PC
- Original RFQ included limited “sustainable design” scope
- SLAM prepared a feasibility study used to convince Administration of viability of “Green” design.
- Feasibility was not highly detailed, based on LEED point system.

- 150 person firm
- 50 Registered Architects
- 5 LEED certified Architects
- Materials Research
- Specification Editing

SLAM Architects, PC LEED Design Team

- SLAM LEED Project Coordinator
  - Dan Harazim
- SLAM Landscape Architect
  - Henry Thomas
- Vanderweil Engineers
  - Thomas Sandford
- Dome-tech Engineering
  - Bruce Curtis
- Yu and Associates
- MSU Project Manager
- General Contractor
  - Terminal Construction Corp.
- Construction Phase LEED Consultant
  - The Chrisner Group

Apply Whole Design Approach

- Site context within the campus, community, and the world.
- Consider the interrelationship of building siting, design elements,energy and resources, building systems and building function.
- Programmatic and Functional goals.
- Sustainable Design integration.

Process

- Vision statement
- Establish Green building goals
- Develop Green design criteria
- Set Priorities
- Develop a building program
  - Owner’s expectations and needs
  - Budget
  - Schedule

Components of Green Architecture

- Building envelope “skin”
  - Windows
  - Insulation
  - Air infiltration
  - Orientation of openings
- Daylighting
- Operable Windows
- HVAC, Electrical, and Plumbing Systems
- Indoor Air Quality
- Acoustics
- Materials
- Landscape Selections

LEED Project Checklist

- Identify possible Sustainable Design strategies
- Review each point for appropriateness to the specific project.
- Evaluate potential strategies in relationship to the project as a whole.
- Track cost associated with point
- Update checklist at each phase of design.
- Assign responsibility for each point as required.
- Coordinate with LEED letter templates.

Designing for LEED

What Level of LEED?

C	S	?	N	Sustainable Sites		Cost
Y	Y			Prereq 1	**Erosion & Sedimentation Control**	N/C
1	1			Credit 1	**Site Selection**	N/C
			1	Credit 2	**Urban Redevelopment**	~
			1	Credit 3	**Brownfield Redevelopment**	~
1	1			Credit 4.1	**Alternative Transportation**, Public Transportation Access	N/C
			1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	~
			1	Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	~
		1		Credit 4.4	**Alternative Transportation**, Parking Capacity	N/C
1	1			Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	N/C
			1	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	~
1	1			Credit 6.1	**Stormwater Management**, Rate and Quantity	N/C
1	1			Credit 6.2	**Stormwater Management**, Treatment	$35K
1	1			Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	N/C
			1	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	~
1	1			Credit 8	**Light Pollution Reduction**	N/C

C	S	?	N	Water Efficiency		Cost
1	1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	N/C
1	1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	N/C
			1	Credit 2	**Innovative Wastewater Technologies**	~
1	1			Credit 3.1	**Water Use Reduction**, 20% Reduction	$11K
	1			Credit 3.2	**Water Use Reduction**, 30% Reduction	$120K

C	S	?	N	Energy & Atmosphere		Cost
Y	Y			Prereq 1	**Fundamental Building Systems Commissioning**	$375K
Y	Y			Prereq 2	**Minimum Energy Performance**	N/C
Y	Y			Prereq 3	**CFC Reduction in HVAC&R Equipment**	N/C
2	2			Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	N/C
			2	Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	~
			2	Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	~
			2	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	~
			2	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	~
		1		Credit 2.1	**Renewable Energy**, 5%	$500K
			1	Credit 2.2	**Renewable Energy**, 10%	~
			1	Credit 2.3	**Renewable Energy**, 20%	~
1	1			Credit 3	**Additional Commissioning**	$20K
1	1			Credit 4	**Ozone Depletion**	N/C
	1			Credit 5	**Measurement & Verification**	$500K
1	1			Credit 6	**Green Power**	N/C

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

C	S	?	N	Indoor Environmental Quality		Cost
Y	Y			Prereq 1	**Minimum IAQ Performance**	N/C
Y	Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	N/C
	1			Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	$500K
			1	Credit 2	**Increase Ventilation Effectiveness**	N/C
1	1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	$100K
1	1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	
1	1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	N/C
1	1			Credit 4.2	**Low-Emitting Materials**, Paints	N/C
1	1			Credit 4.3	**Low-Emitting Materials**, Carpet	N/C
1	1			Credit 4.4	**Low-Emitting Materials**, Composite Wood	N/C
1	1			Credit 5	**Indoor Chemical & Pollutant Source Control**	$100K
			1	Credit 6.1	**Controllability of Systems**, Perimeter	N/C
			1	Credit 6.2	**Controllability of Systems**, Non-Perimeter	N/C
	1			Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	N/C
	1			Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	N/C
		1		Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	N/C
		1		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	N/C

C	S	?	N	Innovation & Design Process		Cost
		1		Credit 1.1	**Innovation in Design**: Specific Title	TBD
		1		Credit 1.2	**Innovation in Design**: Specific Title	TBD
		1		Credit 1.3	**Innovation in Design**: Specific Title	TBD
		1		Credit 1.4	**Innovation in Design**: Specific Title	TBD
1	1			Credit 2	**LEED™ Accredited Professional**	N/C

LEED™ RATING SYSTEM	
Certified	26 to 32 points
Silver	33 to 38 points
Gold	39 to 51 points
Platimum	52 to 69 points

	TOTAL PROJECT SCORE - NEW ACADEMIC BUILDING
27	NUMBER OF POINTS FOR PROPOSED CERTIFIED RATING
34	NUMBER OF POINTS FOR PROPOSED SILVER RATING
10	POINTS FOR POSSIBLE CONSIDERATION
25	POINTS NOT UNDER CONSIDERATION

Designing for LEED

Estimated Cost / Benefit

28 Pts	LEED Certified			
Design / Administration Fees	$143,000			
Comissioning / IAQ Management	$295,000			
Construction Hard Costs		$596,000		
NJ Smart Start Credits	$ (16,000)	$ (100,000)		
Total	$422,000	$496,000		
Total (Hard & Soft Costs)		$918,000		

34 pts	LEED Silver			
Design / Administration Fees			$205,000	
Comissioning / IAQ Management			$295,000	
Construction Hard Costs				$1,316,000
NJ Smart Start Credits			$ (16,000)	$ (100,000)
Total			$484,000	$1,216,000
Total (Hard & Soft Costs)				$1,700,000

Demonstrate Value

- Energy efficiency
  - Heating and cooling 20%-35%
  - Lighting T-5 lamps 50%
  - Daylighting
- Water efficiency 20%-30%
  - Fixtures
  - No Irrigation system
  - Native plants
- Storm Water quality
  - Decreased run-off
  - Removal of solids and pollutants
- Waste reduction
  - Recycling
  - Divert 50% Construction Waste
- IAQ
  - Improved attendance
  - Increased performance

Evaluate cost and ROI

- Life Cycle Cost Analysis
  - 20 points and 6 prerequisites at no additional cost.
  - Remaining 6-8 points design and construction
  - Estimated initial cost $843,000 incl. soft cost
  - Actual cost significantly less
  - Payback period 9 years conservative estimate
  - Utility Incentives
  - Improved Quality HP Building

Estimated Hard Costs

	First Cost	Savings/Year	Payback Period	Savings over 20 Years
Hard Costs				
Stormwater Management (SS Credit 6.2	$ 35,000	Improved water quality downstream from Campus	N/A	N/A
Water Use Reduction (WE Credit 3.1)	$ 11,000	$ 18,400	-.6 yrs	$ 368,000
Optimizing Energy Performance (EA Credit 1.1)	$ 500,000			
Credit from New Jersey SmartStart for Credit 1.1	$ (100,000)			
Subtotal for EA Credit 1.1	$ 400,000	$ 70,000	5.7 yrs	$ 1,400,000
Carbon Dioxide Monitoring (IE Credit 1)	$ 50,000	Improved indoor air quality	N/A	N/A
Total	**$ 496,000**	**$ 88,400**	**5.6 yrs**	**$ 1,768,00**

Designing for LEED

University Hall
Montclair State University
Costs of LEED™ Certification

Point Goal: 28

- **Points with no expected increase in construction cost: 20**
- **Points with no expected increase in design fee: 10**

Prerequisites: 7

- **Prerequisites with no expected increase in construction cost: 6**
- **Prerequisites with no expected increase in design fee: 4**

	First Cost	Savings/Year	Payback Period	Savings over 20 Years
Hard and Soft Costs				
Hard Costs (From Table Above)	$ 496,000			
Soft Costs	$ 347,000			
Total	$ 843,000	$ 88,400	9.5 yrs	$ 1,768,00

Construction Budget	$ 54,881,600			
LEED costs as percentage of Construc Budget	1.54%			

Actual Costs

$117,000*	
$ 54,881,600	0.21% < ¼ of 1 %

30 Pts	LEED Certified			
	Soft Costs Estimated	Hard Costs Estimated	Actual	
Design Fees	$143,000		$117,000 / $(0.00)*	
Commissioning	$295,000		$175,000	
Construction Hard Cost		$546,000	$0.00	
NJ Smart Start	$ (16,000)	$(100,000)	$(175,000)	
Total	$422,000	$446,000	$(0.00)*	
		$918,000	$117,000 / $(0.00)*	

Examples of Points Readily Achievable

- Prerequisite 1 Erosion and Sediment
- SS1 Site Selection
- SS4.1 Alternative Transport
- WE3.2 Water Use Reduction 30%
- SS6.2 Stormwater Management
- EA 1.1 Optimize Energy Performance 20%
- SS 7.1 Landscape Reduce Heat Island
- SS 8 Light Pollution

"Costing Green" Davis Langdon Point by Point Analysis

Smart Start Incentives

- PSEG brainstorming session
- Design assistance
- K-12 commissioning assistance
- Energy Efficiency Measures
- Up to $100K per measure
- Energy Analysis Trace 700
- Early Submittals
- Follow up on paperwork
- Actual value of incentives between $100k and $200k

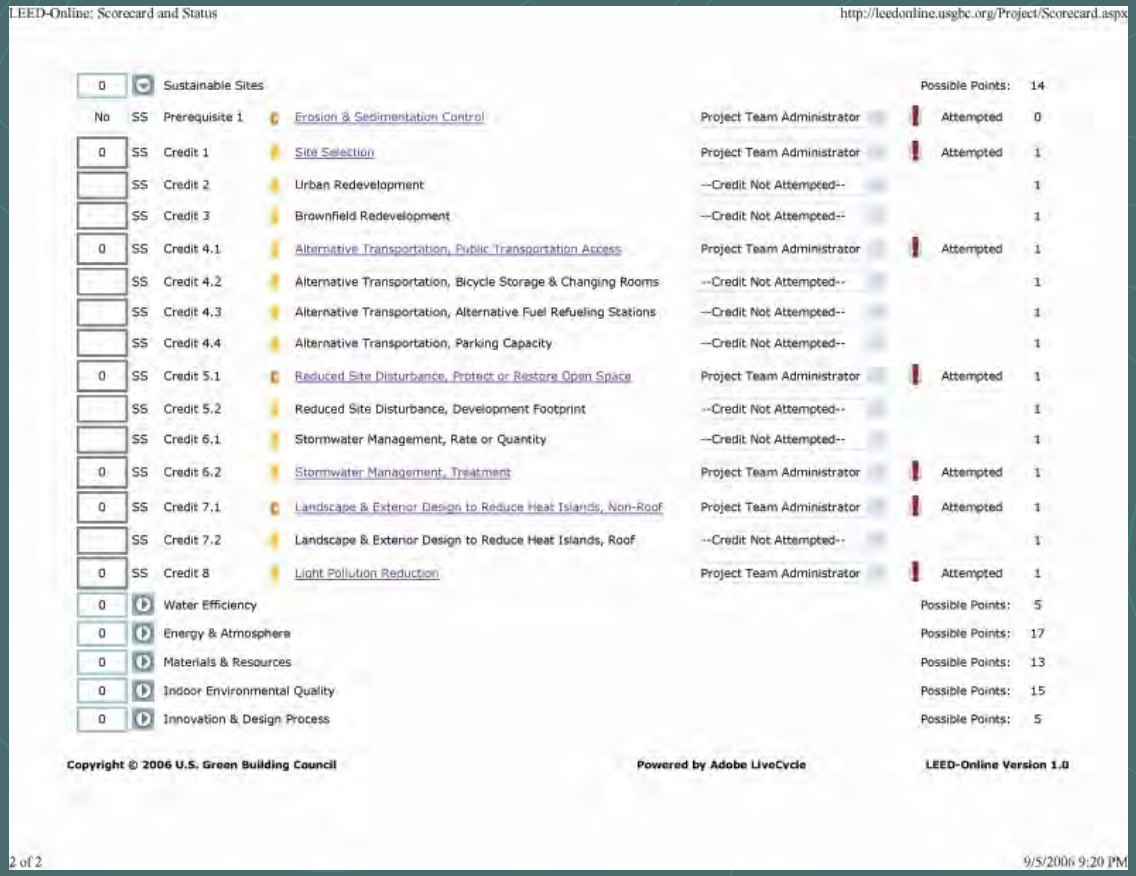
Commissioning

- Pre-requisite
- Primary cost hurdle $$
- Demonstrate Value to stakeholders
- ASHRAE 90.1 requires commissioning on buildings greater than 50,000 S.F.
- DCA does not require commissioning
- Develop RFQ
- Interview and evaluate
- Incorporate commissioning specifications into Bid Documents
- Review project during design.

Review scope of work

- Determine who is responsible for each point.
- Track progress through design and construction.
- Assess scope of work related to contract.
- Insure contract language supports the design process.
- Track cost associated with point through design.
- Review contract documents for content as it relates to all LEED requirements.
- Require LEED Consultant or team member for General Contractor.

Submit final documentation to USGBC for LEED Certification



LEED-Online: Scorecard and Status — http://leedonline.usgbc.org/Project/Scorecard.aspx

0		Sustainable Sites				Possible Points:	14
No	SS	Prerequisite 1	Erosion & Sedimentation Control	Project Team Administrator		Attempted	0
0	SS	Credit 1	Site Selection	Project Team Administrator		Attempted	1
	SS	Credit 2	Urban Redevelopment	--Credit Not Attempted--			1
	SS	Credit 3	Brownfield Redevelopment	--Credit Not Attempted--			1
0	SS	Credit 4.1	Alternative Transportation, Public Transportation Access	Project Team Administrator		Attempted	1
	SS	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	--Credit Not Attempted--			1
	SS	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	--Credit Not Attempted--			1
	SS	Credit 4.4	Alternative Transportation, Parking Capacity	--Credit Not Attempted--			1
0	SS	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	Project Team Administrator		Attempted	1
	SS	Credit 5.2	Reduced Site Disturbance, Development Footprint	--Credit Not Attempted--			1
	SS	Credit 6.1	Stormwater Management, Rate or Quantity	--Credit Not Attempted--			1
0	SS	Credit 6.2	Stormwater Management, Treatment	Project Team Administrator		Attempted	1
0	SS	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	Project Team Administrator		Attempted	1
	SS	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	--Credit Not Attempted--			1
0	SS	Credit 8	Light Pollution Reduction	Project Team Administrator		Attempted	1
0		Water Efficiency				Possible Points:	5
0		Energy & Atmosphere				Possible Points:	17
0		Materials & Resources				Possible Points:	13
0		Indoor Environmental Quality				Possible Points:	15
0		Innovation & Design Process				Possible Points:	5

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LEED-Online Version 1.0

Green architecture is one way to make a difference.