

Goizueta Foundation Center For Research And Doctoral Education

Emory University, Atlanta, GA



Outline

Background

Overview

Additional LEED
Points

Façade Redesign –
Precast

Research – Mold &
Moisture Detection

Summary &
Recommendations

Credits

- I. Project Background
- II. Analysis I - Additional LEED Points
- III. Analysis II - Façade Redesign
- IV. Analysis III - Research – Mold & Moisture Detection
- V. Summary & Recommendations
- VI. Credits

Project Team

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Owner: Emory University



CM @ Risk: Holder Construction



Architect: The Sizemore Group



General Building Information

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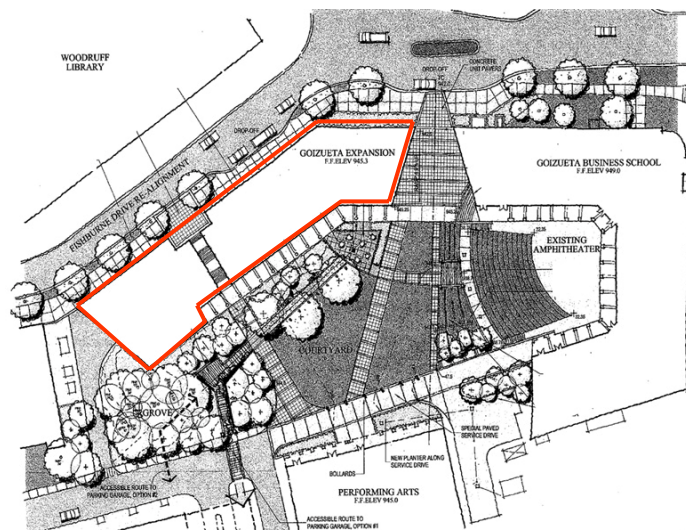
Additional LEED Points

Façade Redesign – Precast

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General Building Information

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- 5 Story Steel Structure
- EIFS Façade & Clay Tile Roof
- 91,054 sf
- \$33.4 million
- LEED Accredited



- Houses PhD Program
- Catering Kitchen
- Indoor/Outdoor Café
- Bridge Connecting to Existing Building



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**Additional LEED
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Analysis I - Additional LEED Points

LEED Point Distribution

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Category	Possible Points	Points Awarded
Sustainable Sites	14	10
Water Efficiency	5	4
Energy & Atmosphere	17	5
Materials & Resources	13	1
Indoor Environmental Quality	15	9
Innovation & Design Process	5	2
	Total:	31

Rating Breakdown:	Certified	Silver	Gold	Platinum
	26-32	33-38	39-51	52 +

Materials & Resources

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Rapidly Renewable Materials:

- Harvest cycle of 10 years or less
- Must account for 5% of total building material

Material Choices:

Current Material	Proposed Alternative
Porcelain and Quarry Tile	Bamboo Flooring
Millwork: Cherry Wood	Poplar Wood
Wood Door Frames Wood Base	Wood Door Frames Wood Base
Particleboard Core Doors	Particleboard Core Doors (Aspen, Poplar, Basswood Core)

Rapidly Renewable Materials

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Bamboo Flooring

- Durable
- Cost Effective
- Life Cycle of 30-50 years



Rapidly Renewable Materials

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Poplar Wood

- Same Hardness as Cherry
- Roughly 60% Cheaper
- Same Appearance as Cherry Once Stained



Cherry



Poplar



Rapidly Renewable Materials

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Particleboard Core Doors

- Same Appearance
- 55% Cheaper
- Core Contains Aspen, Poplar & Basswood



Marshfield Signature Series™

Environmental Class™ Doors

Scientific Certified Systems (SCS) Certified Particleboard Core Doors



Rapidly Renewable Materials

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Millwork

Material	Quantity	Unit	Unit Cost	Total Cost
Cherry Door Frames	42	frame	\$1,000.00	\$42,000.00
Cherry Wood Base	2150	lf	\$14.00	\$30,100.00
Poplar Door Frames	42	frame	\$400.00	\$16,800.00
Poplar Wood Base	2150	lf	\$5.60	\$12,040.00

Doors

Material	Quantity	Unit	Unit Cost	Total Cost
Particleboard Core Doors	213	door	\$450.00	\$95,850.00
Particleboard Core Doors (Aspen, Poplar, Basswood)	213	door	\$200.00	\$42,600.00

Flooring

Material	Quantity	Unit	Unit Cost	Total Cost
Quarry Tile	1450	sf	\$4.04	\$5,858.00
Porcelain Tile	4500	sf	\$5.16	\$23,220.00
Bamboo Flooring	5950	sf	\$4.83	\$28,738.50
Original Materials		Grand Total:		\$197,028.00
Alternative Materials		Grand Total:		\$100,178.50
		Savings:		\$96,849.50

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Analysis II – Façade Redesign: Architectural Precast Panels

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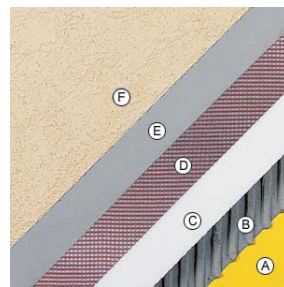
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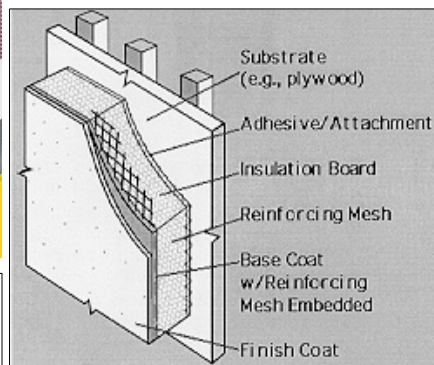


Existing Façade

Exterior Insulation Finish System (EIFS)



- A. Substrate/Sheathing
- B. Adhesive
- C. EPS Insulation Board
- D. Reinforcing Mesh
- E. Base Coat
- F. Finish Coat



Existing Façade

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Benefits:

- Cost Effective: \$10/sf
- Lightweight: 15lb/sf
- Good Insulation: R-value 3.8/in thickness

Downsides:

- Moisture penetration and mold problems
- Labor intensive – requires scaffolding, all work done from exterior
- Only 35 years old
- 5 year warranty
- Higher maintenance – also expensive upkeep

Proposed Façade

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Architectural Precast Panels

- 5” thick solid panels
- 62.5 lb/sf
- \$40/sf



Proposed Façade

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Benefits:

- Very durable
- Non-combustible
- Low maintenance
- Higher quality
- Insulated from interior
- Faster erection time
- Aesthetics

Downsides:

- More expensive: \$40/sf
- Heavy: 62.5lb/sf
- R-value of .1/in thickness



Cost Comparison

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Material	Quantity	Unit	Unit Cost	Total Cost
EIFS façade	57000	sf	\$9.73	\$554,610.00
Architectural Precast	57000	sf	\$40.00	\$2,280,000.00



Structural Analysis

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- Determined smallest column in rear façade that carries a typical load
- Calculated loads from members, floor slabs, roof, and façade that are carried by the column
- Analyzed in RAM Advanse



Structural Analysis

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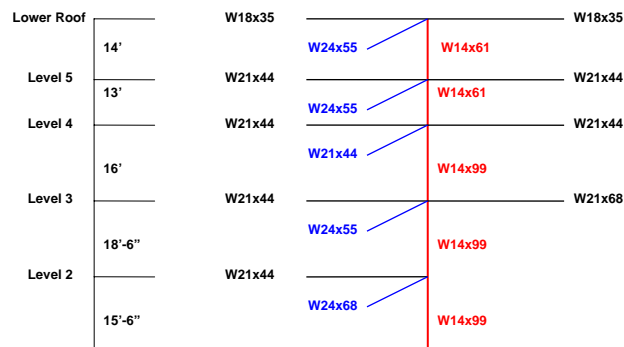
Research – Mold &
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Diagram of the analyzed column with beams, girders, and floor heights shown



Structural Analysis

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Floor Level	Load Type	Loads	Unit	Total Load
Lower Roof	Roof	17.5		36.4
	Façade	17.0	kip	
	Members	1.9		
Level 5	Slab	105.0		122.8
	Façade	15.7	kip	
	Members	2.1		
Level 4	Slab	105.0		125.9
	Façade	19.0	kip	
	Members	1.9		
Level 3	Slab	105.0		129.2
	Façade	21.8	kip	
	Members	2.4		
Level 2	Slab	105.0		106.9
	Façade	0.0	kip	
	Members	1.9		

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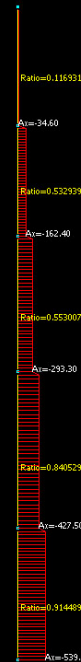
Credits



**Once analyzed – Ran code check
for combination of moments and
axial loads**

**All sections of the column had a stress
ratio < 1**

**Current columns are able to carry
additional façade load**



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Analysis III – Research: Mold & Moisture Detection

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Moisture Detection

Readily Available Information:

- Mold Sources
- Remediation Plans
- Prevention

Needed Information:

- Better Moisture Detection
- Inexpensive, Accurate, Easy Solution

Moisture Detection

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Moisture Sensors:

- Log Temperature and Relative Humidity
- Cost Effective - \$85/ea.
- Very Accurate
- Easy To Install
- Log Large Amounts of Data



Moisture Detection

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Jobsite Experiment:

- Smeal College of Business Building
 - Recently Enclosed
 - Temperature and Moisture Control



Moisture Detection

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Installed 5 Sensors

- Atrium
- Basement
- 3rd Floor East Wall
- 4th Floor North Wall
- 1st Floor North West Corner



Sensor on Atrium Windowsill



Interior View of Atrium

Moisture Detection

Background

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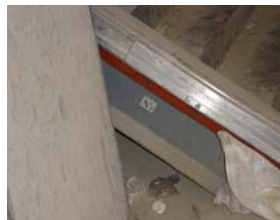
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Basement Stairwell



1st Floor NW Corner



3rd Floor East Wall



4th Floor North Wall

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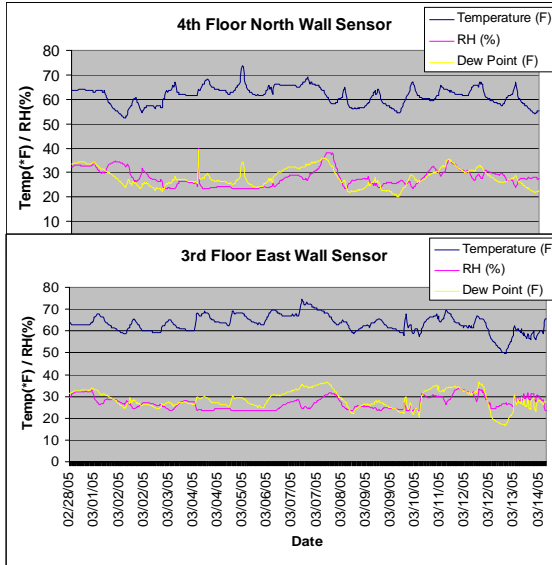
**Research – Mold &
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Moisture Detection



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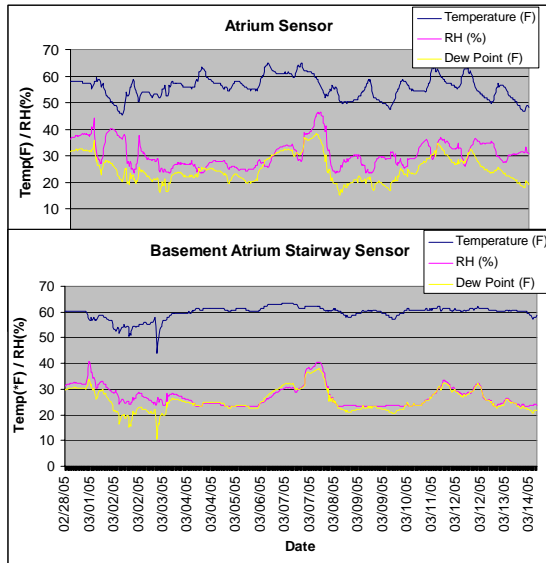
**Research – Mold &
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Moisture Detection

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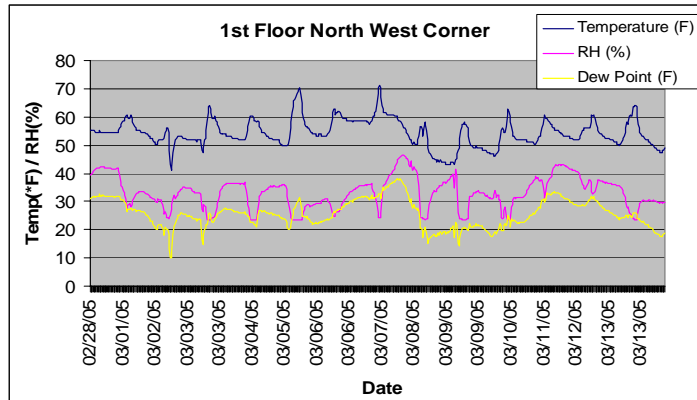
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Summary & Recommendations

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**Summary &
Recommendations**

Credits

Analysis I – Additional LEED Points: Materials & Resources

- Materials alternatives must be of same quality
- Green doesn't have to be more expensive

Analysis II – Façade Redesign – Precast

- Able to last for life of building
- Much higher quality façade
- Low maintenance

Analysis III – Research – Mold & Moisture Detection

- Moisture detection is essential to avoid problems
- Inexpensive & Easy to install
- Log large amounts of data, Easy to retrieve data from



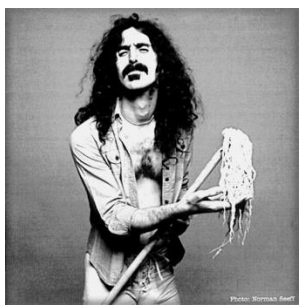
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- Credits**



Thank You



- Holder Construction:** Bob Campbell
- Gilbane Construction:** Steve O'Connor
- AE Faculty:** Dr. Riley
- Friends**
- Family**
- Frank Zappa**



Fin