

Integrated Science Center

College of William & Mary
Meghan Graber



Construction Management

Dr. Riley

AE Senior Thesis 2009



Presentation Outline

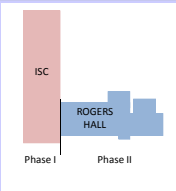
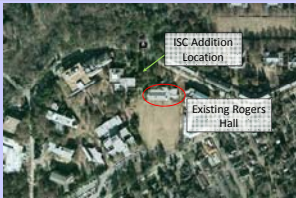
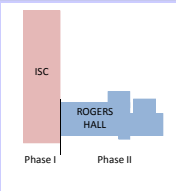
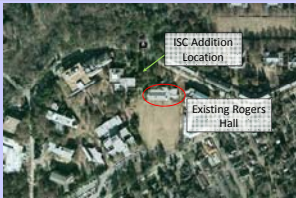
- **Project Overview**
 - Client information, building information, cost & schedule
- **Overall Theme – Energy Saving Options**
 - Problem statement & goal
- **Energy Conservation through Retrofitting**
 - Research, applying to Rogers Hall, lamp and energy comparison, construction impacts
- **Implementation of Daylighting**
 - Lighting layouts, energy comparison, construction impacts
- **Solar Heat Gain and Cooling Load Reduction**
 - Logistics, cooling load comparison, construction impacts
- **Recommendations & Lessons Learned**
- **Questions**

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Construction Management

4/14/09

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Presentation Outline	Building Information		
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Presentation Outline	Applying to Rogers Hall	
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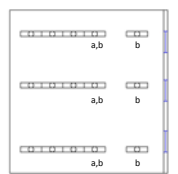
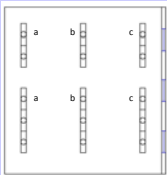
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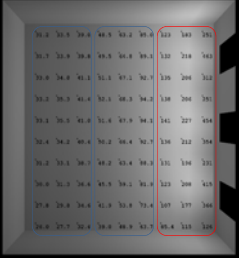
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<p>Implementation of Daylighting</p> <p>“Daylighting helps to provide an interior work environment that stimulates creativity and discovery” - Labs21</p>
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Construction Management
4/14/09

Presentation Outline	Designed Lab Lighting Plan	Proposed Lab Lighting Plan
<ul style="list-style-type: none"> Project Overview <ul style="list-style-type: none"> Client information, building information, cost & schedule Overall Theme – Energy Saving Options <ul style="list-style-type: none"> Problem statement & goal Energy Conservation through Retrofitting <ul style="list-style-type: none"> Research, applying to Rogers Hall, lamp and energy comparison, construction impacts Implementation of Daylighting <ul style="list-style-type: none"> Lighting layouts, energy comparison, construction impacts Solar Heat Gain and Cooling Load Reduction <ul style="list-style-type: none"> Logistics, cooling load comparison, construction impacts Recommendations & Lessons Learned Questions 	 <ul style="list-style-type: none"> Room size: 31'-0" x 29'-0" Windows: (3) 7'-0" x 4'-0" double pane windows Light fixtures: 15 cable-mounted light fixtures each requiring (2) T8 lamps 	
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Presentation Outline	Illuminance Levels																																																					
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Presentation Outline
Energy Cost Comparison

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	Proposed: sensors	Designed: no sensors	Difference
Number of Fixtures On/day	135	180	-45
Actual Energy Use/Fixture	55 W	55 W	-
Total Wattage/Room	7,425 W	9,900 W	-2,475 W
Cents /kw	7.31	7.31	-
Energy Cost/Room	\$0.54	\$0.72	-\$0.18
Number of Rooms	33	33	-
Electric Cost/day	\$17.91	\$23.88	-\$5.97
Average Number of Partly Cloudy or Nicer Days/year	209*	209*	-
Estimated Annual Electricity Costs	\$3,743.47	\$4,991.29	-\$1,247.82


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Presentation Outline
Construction Cost
Schedule Impacts

- Project Overview
 - Client information, building information, cost & schedule
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- 2 sensors per lab space
- 66 sensors total
- \$150 per sensor (installation included)

Materials and Installation Cost = \$9,900



- Design phase most impacted
- Sensors readily available through a manufacturer
- No delay or extra time to construction schedule

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Solar Heat Gain and Cooling Load Reduction
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Meghan Graber

Proposed Overhang

The small offices facing the south each contain one large window which results in significant heat gain and glare caused by sunlight streaming into the building

- Office size: 12'-6" x 10'-0"
- Ceiling Height: 9'-0"
- Windows: (1) 5'-0" x 6'-0" double pane windows

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Proposed Overhang

Original intent was to calculate the annual cooling loads for the two window designs and then determine the energy cost savings per year

The Cooling Load Temperature Difference/ Solar Cooling Load/ Cooling Load Factor Method was used to calculate the cooling loads manually

The Cooling and Heating Load Calculation Manual Second Edition (1992) by Faye McQuiston and Jeffery Spitler contained SCL tables for one month, July. According to this source, supplementary tabular data would have to be generated for other months.

A footnote below the SCL table says that the "data will suffice for about 2 weeks from the 21st day of the given month."

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	$Q_{cool}(Btu/hr)$ Proposed - Window with Shade Device	$Q_{cool}(Btu/hr)$ Designed - Window without Shade Device	Difference (Btu/hr)
1 AM	328.80	328.80	0
2 AM	328.80	328.80	0
3 AM	278.40	278.40	0
4 AM	256.40	256.40	0
5 AM	256.40	256.40	0
6 AM	424.80	424.80	0
7 AM	624.20	624.00	12.10
8 AM	828.67	828.40	10.27
9 AM	1097.93	1100.40	-2.43
10 AM	1462.97	1552.80	-89.83
11 AM	1795.48	1928.40	-242.92
12 PM	2176.40	2448.40	-496.10
1 PM	1938.20	2308.80	-710.60
2 PM	1665.95	2236.00	-460.05
3 PM	1502.12	1928.40	-322.59
4 PM	1443.45	1524.40	-76.95
5 PM	1147.20	1147.20	0
6 PM	1077.90	1043.60	34.3
7 PM	792.50	722.20	70.30
8 PM	597.97	572.00	25.97
9 PM	520.80	520.80	0
10 PM	444.00	444.00	0
11 PM	402.60	402.60	0
12 AM	367.20	367.20	0
Daily Total	21083.67 Btu	23332.80 Btu	-2249.13 Btu

558.4 Btu/hr reduction in peak cooling load

9.6% reduction

Presentation Outline	Construction Impacts
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Presentation Outline	Conclusion
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Presentation Outline	Recommendations
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Questions?



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