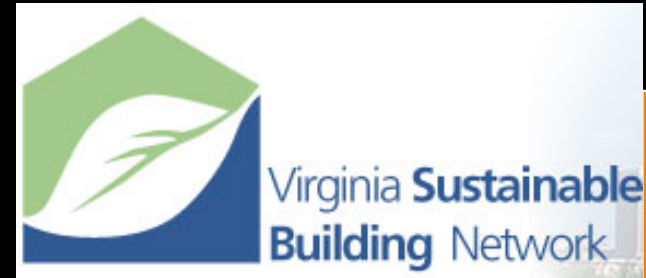


Greening Virginia Universities and Colleges Conference



■ Christopher Gorthy

- Preconstruction, Green Guru
 - Project Engineer
 - LEED Accredited Professional
 - Board Member of the Virginia Sustainable Building Network (VSBN)
- Bachelor of Professional Studies in Architecture
 - State University of New York at Buffalo
 - 8 Years of Construction Experience
 - Labs, Education, Sports, Green Buildings
 - Boston University, Johns Hopkins, Penn State, Maryland, UMBC, UVA, VT
 - Varying Sizes from \$150,000 to \$300 Million



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Overview



- Market Transformation
- High Performance/Green Project Setup
- Costs of “Green”
- Questions



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

COMMERCIAL REAL ESTATE GOING GREEN

Environmental efficiency is actually the hottest trend in real estate. The challenge is creating demand among tenants.

Special
Reprint
Edition

USA
TODAY
NO. 1 IN THE USA

As seen in
USA
TODAY
Money
July 26, 2006

Building 'green' reaches a new level
REAL ESTATE FINANCE

Real Estate's Latest Movement

green
by
DESIGN

The New York Times

Green in the news!

Editorial

FRIDAY, AUGUST 11, 2006

The Green in A

Adobe has turned its headquarters into a green building and is saving millions of dollars.

Build Green, Make Green

New York Times

Education Life

The Greening of America's Campus

CONDOLiving

It's Easy Being Green

...cling anymore. The sustainability movement is changing how campuses are built, and how students live.

REAL ESTATE

The Washington Post
Saturday, April 16, 2005



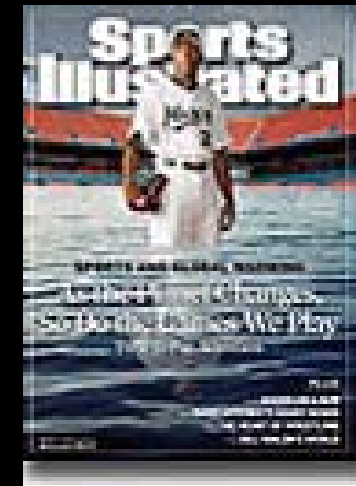
WE EXIST
TO BUILD
GREAT
THINGS



Virginia Sustainable
Building Network



Dealing with design,
cost, and construction
of high performance
campus buildings



Green is Main Stream and a Tremendous Business Opportunity



WE EXIST TO BUILD GREAT THINGS



Dealing with design, cost, and construction of high performance campus buildings

Market Transformation

- Available products are growing
- Education is increasing
 - Design and Engineering
 - CM's and GC's
- Technology
- Legislation and/or campus initiatives
 - American College and University Presidents Climate Commitment, **420 Signatories**



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

High Performance/Green Project Setup

- **Early team selection**
 - more collaborative
 - less adverse relationship
- **Team understanding of university and college goals**
 - reduces poor VE decisions and pricing

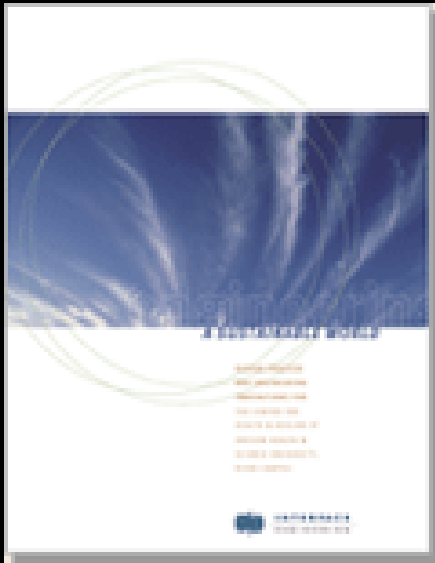


WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design, cost, and construction of high performance campus buildings

Collaboration



**Green Building Breakthrough:
Engineering A Sustainable World**
Interface Engineering, Inc.'s 48-page illustrated
guide reveals engineering secrets of Oregon Health
& Science University's River Campus Project

- Open minded, **outside the box** thinking
- Eliminate pre-conceptions, challenge local codes, and engineering rules of thumb.



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Extreme Example

- Carnegie Institution of Washington at Stanford, Global Ecology Center



Architect: EHDD

Volume: \$4.2M

Sq. Ft.: 14,400



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Sustainable Strategies

- **Sunshades and Light shelves**
- **Day lighting and Lighting Controls**
- **Spectrally-Selective Glazing and Roofing**



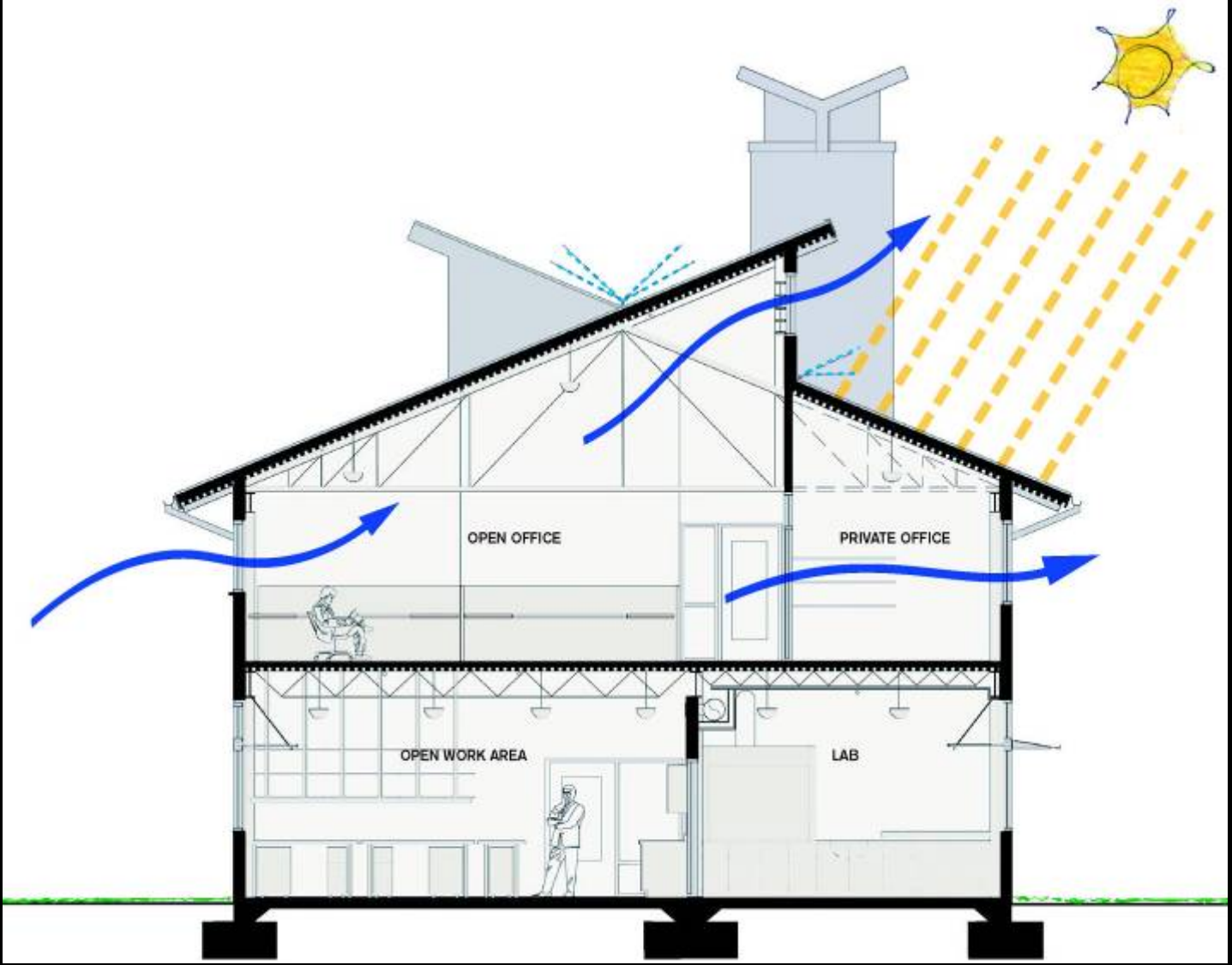
- **Natural Ventilation**
- **Cool Tower**
- **Radiant Heating + Cooling**
- **Night Sky Radiant Cooling**



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design, cost, and construction of high performance campus buildings



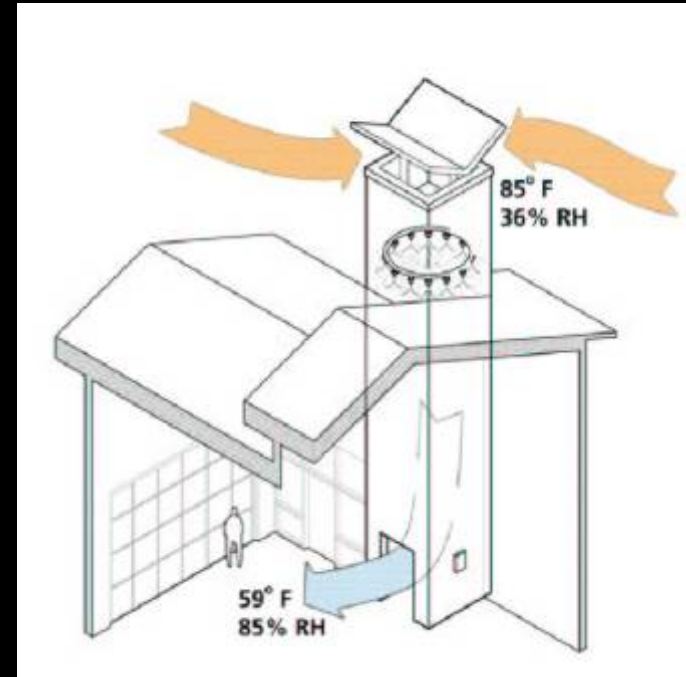
WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Cool Tower

- Wind catcher directs cool air downwards
- Atomizing spray nozzles through evaporation cool the air and create thermal downdraft



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Cooling

- “Night Sky” roof spray system
- No air-conditioning compressors required
- Chilled water supplied at 55-60°F using only .04 kW/ton
- Uses ½ as much water as conventional water cooled chiller
- 20 ton air cooled chiller for back-up on hottest days



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Heat Recovery

- Radiant floor
 - Reduced HP for pumps in lieu of fans
- Larger diameter duct
 - Lower pressure – reduced HP for fans
- Room exhaust (not fume exhaust)
- Heat pipe heat exchanger to preheat or pre-cool outside air
- Night time setback: Reduce boiler size



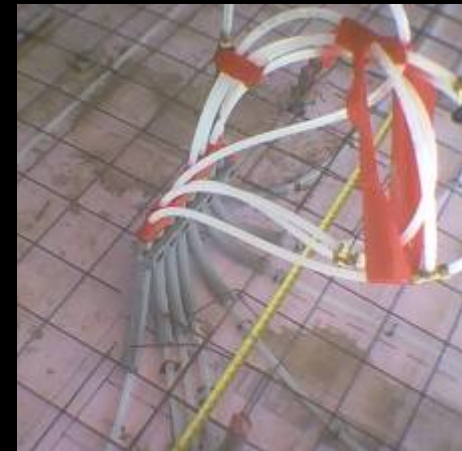
WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Thermal Comfort

- Radiant cooling works with natural ventilation
- Radiant cooling affects surfaces
 - Broader range of air temperature to be comfortable



WE EXIST
TO BUILD
GREAT
THINGS

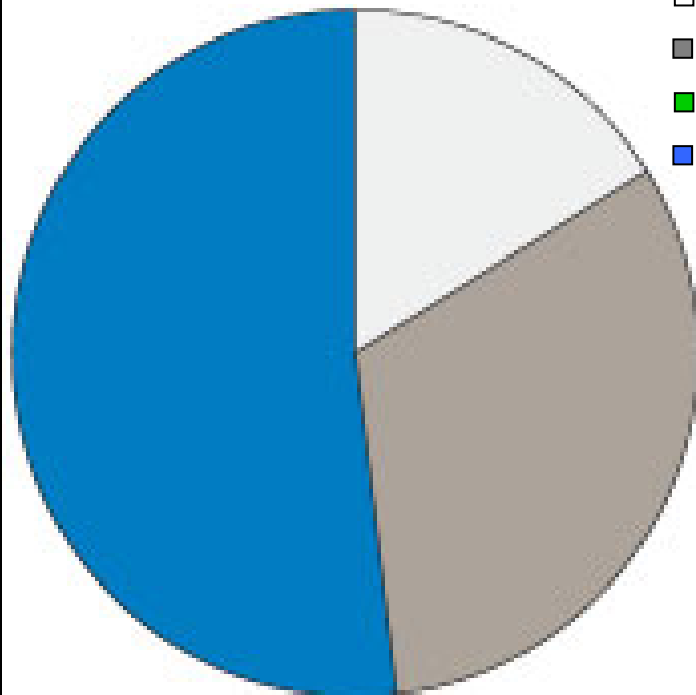


Dealing with design,
cost, and construction
of high performance
campus buildings

Carnegie Results

Typical Lab Lighting and HVAC Electricity

179,000 kW-hr / yr

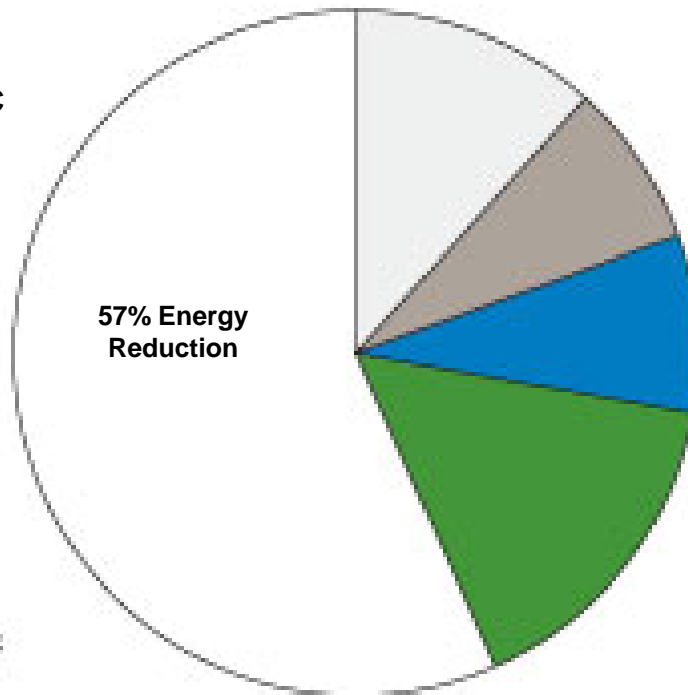


- AREA LIGHTS
- SPACE COOL
- PUMPS & MISC
- VENT FANS

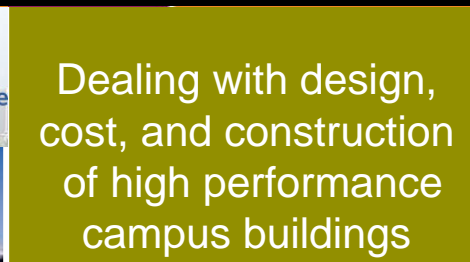
- AREA LIGHTS
- SPACE COOL
- PUMPS & MISC
- VENT FANS

Global Ecology Lab Lighting and HVAC Electricity

78,000 kW-hr / yr



57% Energy Reduction



Design Documents

- Varying levels of education
 - Division 1
 - Bullet proof specs and drawings
 - Documentation requirements
 - If required
 - Clarity = Reduced risk of inflated costs



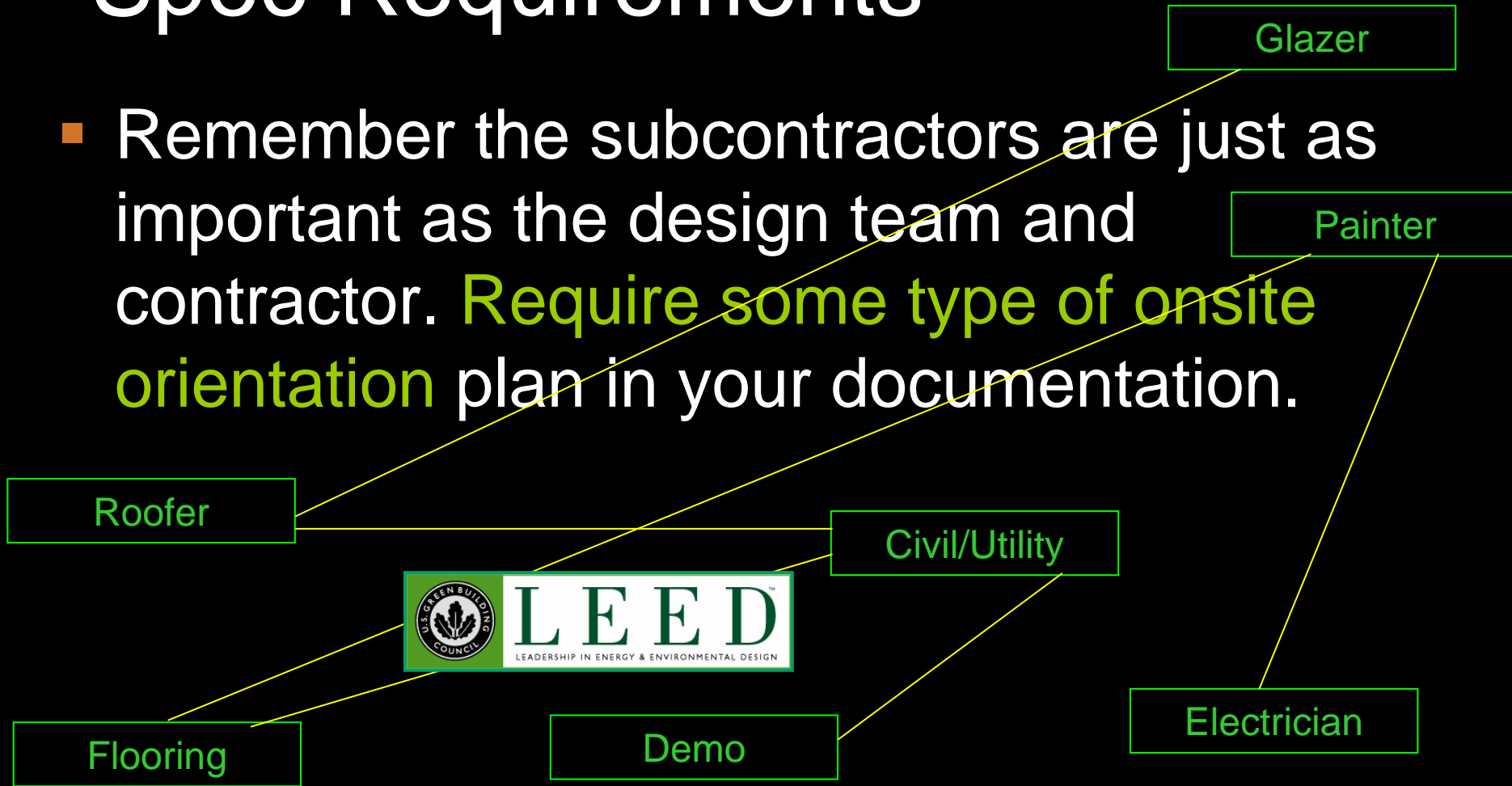
WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Spec Requirements

- Remember the subcontractors are just as important as the design team and contractor. **Require some type of onsite orientation plan** in your documentation.



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design, cost, and construction of high performance campus buildings

Pitfalls

- **Specifying single source products**
 - Sometimes necessary
 - Are there other alternatives?
 - Communication is key with contractor and university
 - Example: FSC certified, urea-formaldehyde free wood doors. One or two manufacturers.
- **Long lead materials**
 - Limits flexibility, limits pricing
 - Substantial benefits



FOREST STEWARDSHIP COUNCIL
Because forests matter



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

MR LEED Credit Strategies

Materials & Resources

13 Points

Y	Prereq	Credit	Strategy	Points
	Prereq 1		Storage & Collection of Recyclables	Required
	Credit 1.1		Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2		Building Reuse, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3		Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
	Credit 2.1		Construction Waste Management, Divert 50% from Disposal	1
	Credit 2.2		Construction Waste Management, Divert 75% from Disposal	1
	Credit 3.1		Materials Reuse, 5%	1
	Credit 3.2		Materials Reuse, 10%	1
	Credit 4.1		Recycled Content, 10% (post-consumer + 1/2 pre-consumer)	1
	Credit 4.2		Recycled Content, 20% (post-consumer + 1/2 pre-consumer)	1
	Credit 5.1		Regional Materials, 10% Extracted, Processed & Manufactured Regionally	1
	Credit 5.2		Regional Materials, 20% Extracted, Processed & Manufactured Regionally	1
	Credit 6		Rapidly Renewable Materials	1
	Credit 7		Certified Wood	1



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design, cost, and construction of high performance campus buildings

EQ LEED Credit Strategies

Indoor Environmental Quality			15 Points
Y	Prereq 1	Minimum IAQ Performance	Required
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increased Ventilation	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
	Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
	Credit 4.3	Low-Emitting Materials, Carpet Systems	1
	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Lighting	1
	Credit 6.2	Controllability of Systems, Thermal Comfort	1
	Credit 7.1	Thermal Comfort, Design	1
	Credit 7.2	Thermal Comfort, Verification	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1



Dealing with design, cost, and construction of high performance campus buildings

Costs of Green

- So if it's main stream...
- If it's everywhere....
- And the market is expanding...



What are the costs and why does everyone say it costs too much.....?



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design, cost, and construction of high performance campus buildings

Costs of Green

- Concerns w/ Benchmarking
 - Not Enough Data
 - Public vs. Private, Costs of construction are often confidential.
 - Location and conditions of the existing site.
 - Team expertise and education
 - Owner/University goals

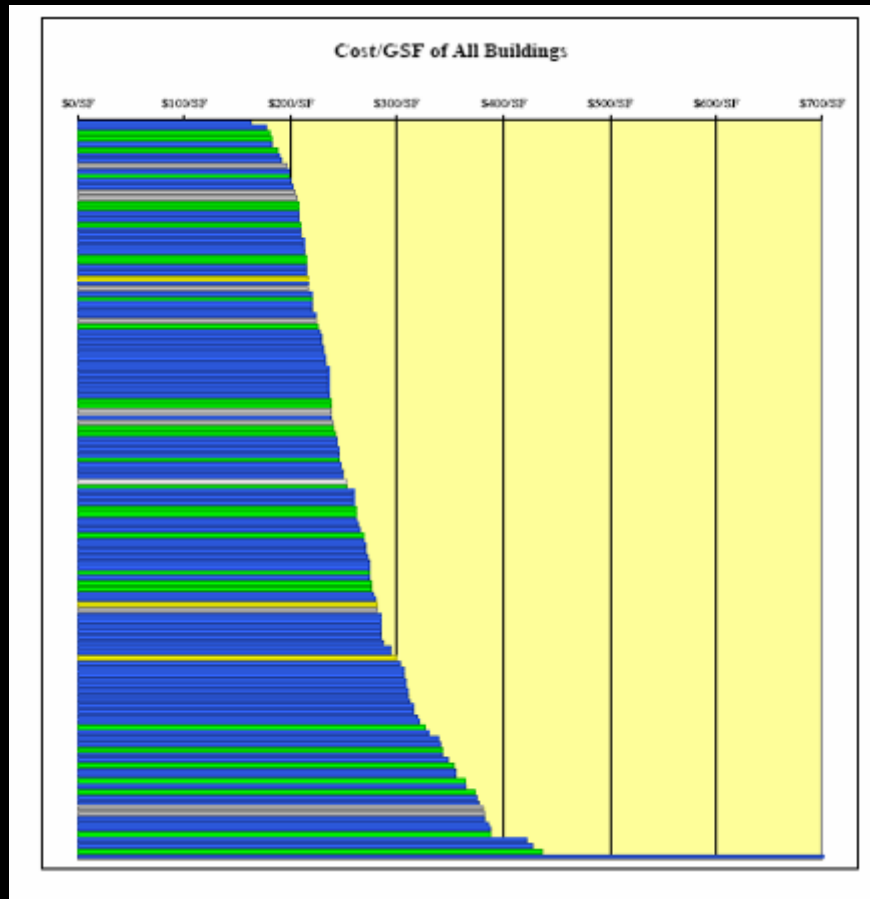


WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

However



Blue Lines = Non LEED projects

Green Lines = LEED projects

Taken From:
Costing Green: Davis Langdon

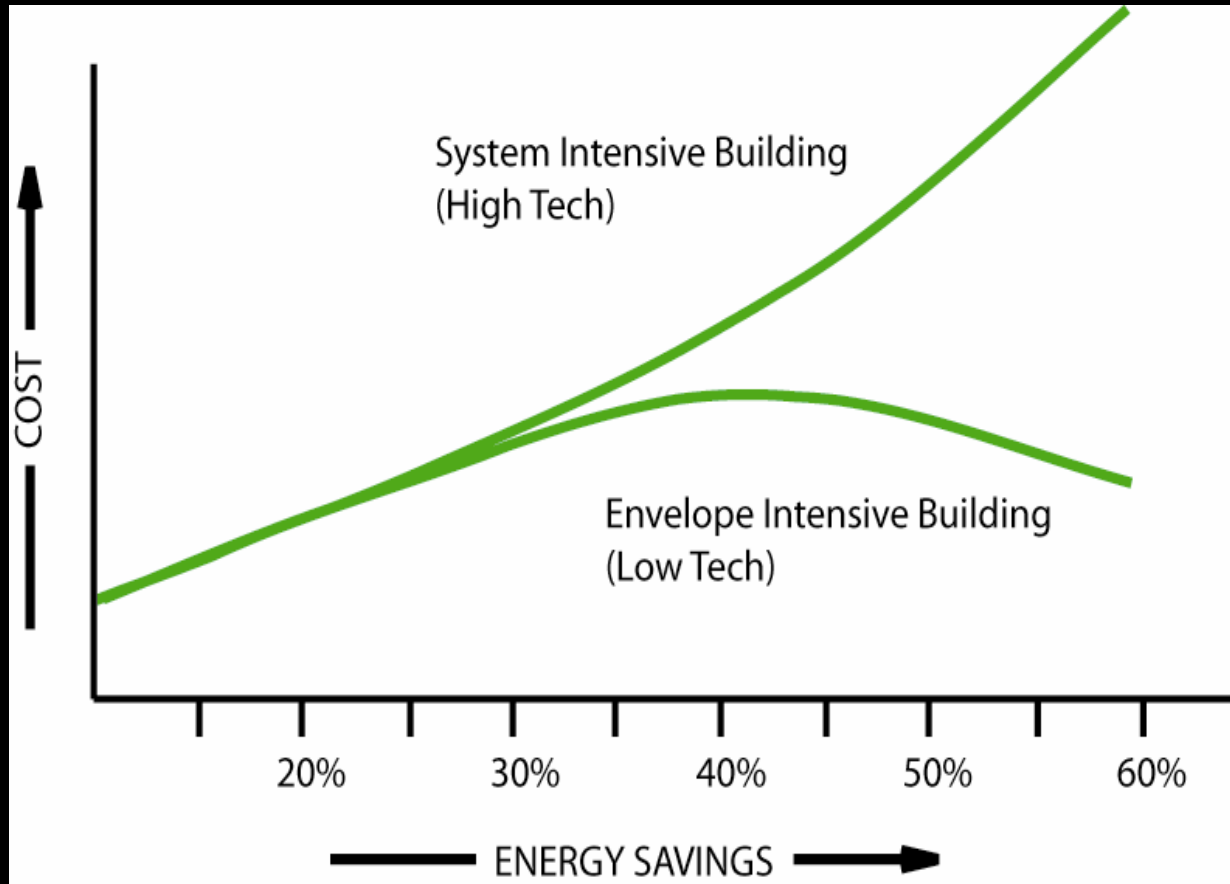


WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Cost & Performance



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design, cost, and construction of high performance campus buildings

Cost Studies

Contract No. GS-11P-99-MAD-0565
Order No. P-00-02-CY-0065



LEED® Cost Study

Final Report

Submitted to:
U.S. General Services Administration

Submitted by:
Steven Winter Associates, Inc.

Date:
October 2004

The Costs and Financial Benefits of Green Buildings

A Report to California's
Sustainable Building Task Force

October 2003

Principal Author: Greg Katz, Capital E

Contributing Authors:
Leon Alvarado, Department of General Services
Adam Barman, Capital E
Evan Mills, Lawrence Berkeley National Laboratory
Jeff Perkins, Capital E

This report was developed for the Sustainable Building Task Force (Task Force), a group of over 40 California state government agencies. Funding for this study was provided by the Air Resources Board (ARB), California Integrated Waste Management Board (CIWMB), Department of Finance (DOF), Department of General Services (DGS), Department of Transportation (Caltrans), Department of Water Resources (DWR), and Division of the State Architect (DSA). This collaborative effort was made possible through the contributions of Capital E, Future Resources Associates, Task Force members, and the United States Green Building Council.



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Case Study - DPR/ABD Office Building, Sac. CA



Architect
LPA Sacramento, Inc.

Project Value
\$6.2M
52,000 SF

Project Duration
9.8 Months

LEED Certification:
New Construction – LEED
Silver (38 Points)
Commercial Interiors –
LEED Gold(35Points)



WE EXIST
TO BUILD
GREAT
THINGS

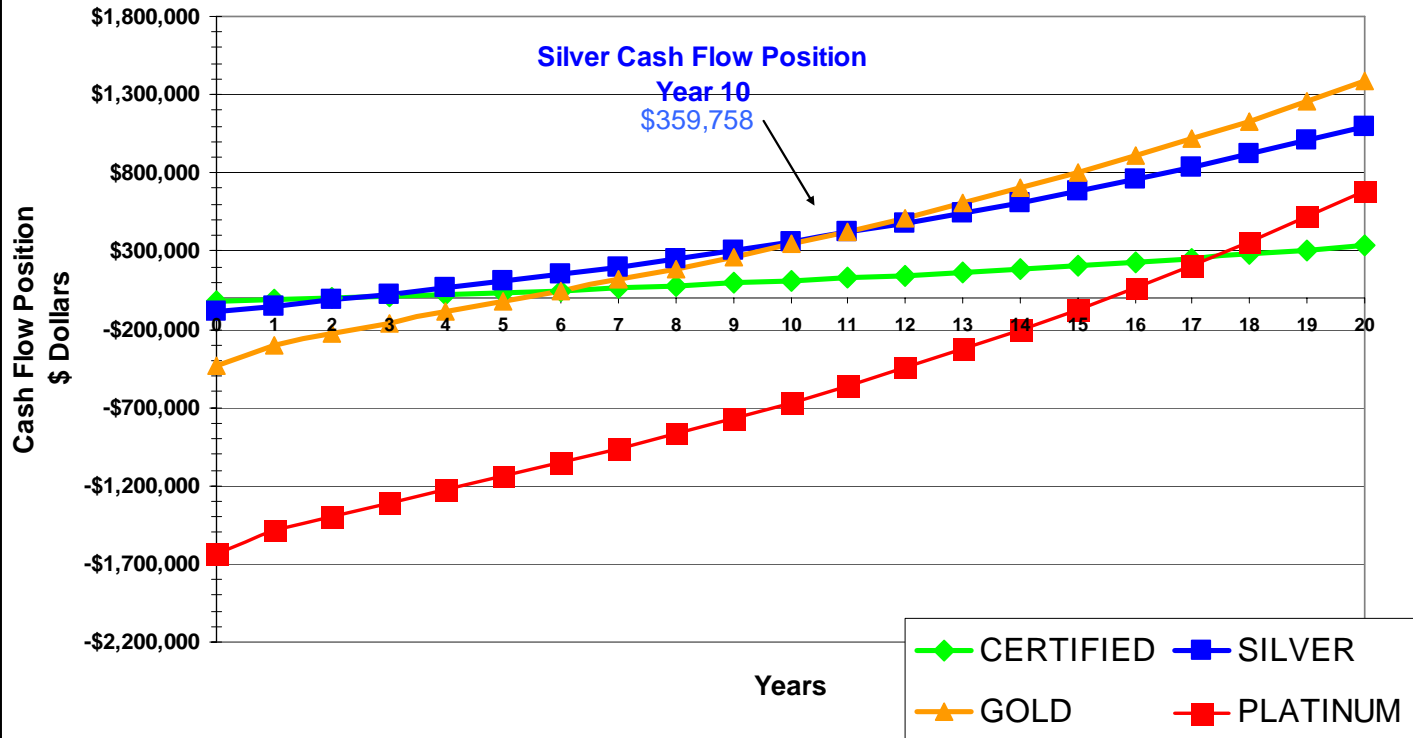


Dealing with design,
cost, and construction
of high performance
campus buildings

ROI

LEED NC Silver Premium First Cost(Direct and Indirect)= \$85,112
10-Year Life Cycle Savings = \$85,112+\$359,758 = **\$444,870**

DPR/ABD Project Cash Flow Analysis:
LEED Certified, Silver, Gold, Platinum Rating Levels



Dealing with design, cost, and construction of high performance campus buildings

Case Study - NSTA, Arlington, VA

Architect

Davis Carter Scott

Projected Value

\$17M

100,000 SF

Projected Duration

18 Months

Targeted LEED Certification:

Core and Shell – LEED Gold



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

ROI - NSTA

National Science and Teachers Association LEED CS

Credit Impact Summary



Energy Escalation 7%
 Water Escalation 5%
 Maintenance 3%
 Operations 3%

Date: 2/19/2007
 Created by: Christopher Gorthy

Definition: Cumulative Cash Flow is the value of an investment (measured in terms of the cash you will put into and receive from it) adjusted for the time value of money. In Ecologic3 the first costs associated with the 4 levels of LEED Certification are totaled together in Year 0. The \$ values in subsequent years are subtotals of the previous year's cash flow position and that year's benefit value.

Length of Analysis	Certified	Silver	Gold	Platinum
Year 0	(\$144,515.00)	(\$186,265.00)	(\$415,695.00)	(\$707,752.00)
Year 1	(\$125,735.00)	(\$167,485.00)	(\$368,492.00)	(\$654,825.00)
Year 2	(\$105,789.64)	(\$147,539.64)	(\$318,462.89)	(\$598,671.21)
Year 3	(\$84,603.85)	(\$126,353.85)	(\$265,426.82)	(\$539,081.73)
Year 4	(\$62,097.59)	(\$103,847.59)	(\$209,190.92)	(\$475,833.68)
Year 5	(\$38,185.54)	(\$79,935.54)	(\$149,549.48)	(\$408,689.25)
Year 6	(\$12,776.73)	(\$54,526.73)	(\$86,283.11)	(\$337,394.67)
Year 7	\$14,225.84	(\$27,524.16)	(\$19,157.75)	(\$281,679.13)
Year 8	\$42,925.60	\$1,175.60	\$52,076.28	(\$181,253.61)
Year 9	\$73,432.86	\$31,682.86	\$127,685.35	(\$95,809.64)
Year 10	\$105,865.24	\$64,115.24	\$207,953.66	(\$5,017.99)
Year 11	\$140,348.21	\$98,598.21	\$293,184.47	\$91,472.79
Year 12	\$177,015.56	\$135,265.56	\$383,701.38	\$194,037.87
Year 13	\$216,010.04	\$174,260.04	\$479,849.72	\$303,077.76
Year 14	\$257,483.87	\$215,733.87	\$581,998.05	\$419,020.04
Year 15	\$301,599.48	\$259,849.48	\$690,539.72	\$542,321.24
Year 16	\$348,530.14	\$306,780.14	\$805,894.59	\$673,468.81
Year 17	\$398,460.68	\$356,710.68	\$928,510.83	\$812,983.23
Year 18	\$451,588.34	\$409,838.34	\$1,058,886.84	\$961,420.31
Year 19	\$508,123.56	\$466,373.56	\$1,197,473.38	\$1,119,373.57
Year 20	\$568,290.88	\$526,540.88	\$1,344,875.69	\$1,287,476.89



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
 cost, and construction
 of high performance
 campus buildings

Conclusion

- Universities and colleges can drive change in design and construction
- In the midst of **market change**
- **Collaborative** approach
- Accurate and **reduced costs becoming available**
- Increased benefits

- **FUTURE Developments**
 - (3D) Modeling - BIM



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings

Questions



 **Greening**
Virginia Universities
and Colleges Conference



WE EXIST
TO BUILD
GREAT
THINGS



Dealing with design,
cost, and construction
of high performance
campus buildings