



# Greening the Campus



Clockwise from top left:

- Furman University
- Rice University
- Ball State University
- University of Oregon



# *Greening the Campus*

Robert Cassidy

Editorial Director

[rcassidy@scgmail.com](mailto:rcassidy@scgmail.com)



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# *Greening the Campus*

Christopher C. Ramey,  
AIA

University of Oregon  
Eugene, Oregon

- University Architect
- Associate Vice President,  
Campus Planning and Real  
Estate



# *Greening the Campus*



Angela C. Halfacre, PhD  
Furman University  
Greenville, S.C.

- Director, Shi Center for Sustainability
- Associate Professor, Dept of Earth and Environmental Sciences

# *Greening the Campus*



Robert J. Koester, PhD,  
AIA, LEED AP  
Ball State University  
Muncie, Indiana

- Professor of Architecture
- Founding Co-Chair,  
Greening of the Campus  
Conference Series

# *Greening the Campus*

Richard R. Johnson  
Rice University  
Houston, Texas

- Director of Sustainability, Facilities Engineering and Planning Dept
- Associate Director, Center for the Study of Environment and Society



# *Greening the Campus*

## AIA CES Webcast - Learning Objectives

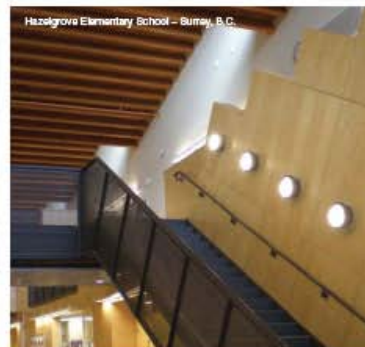
1. How Institutions can involve all stakeholders – students, faculty, staff – in campuswide sustainability efforts.
2. How large-scale green campus planning – beyond single buildings - can be done most effectively – including the creation of comprehensive environmental policies and practices for colleges and universities.
3. How durability and long-term care figure into green campus planning.
4. How design and construction firms can work most effectively with institutions of higher learning to optimize sustainability in campus planning – for energy savings, water conservation, and best use of sustainable materials and building products.



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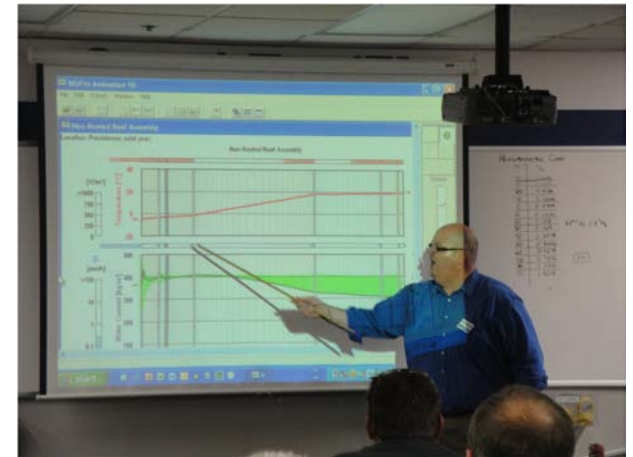
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# *Greening the Campus Faculty*

Angela  
Halfacre

Furman  
University



Richard R.  
Johnson

Rice  
University



Robert J.  
Koester

Ball State  
University



Christopher  
Ramey

University  
Of Oregon



# *Greening the Campus*

## Ball State University Sustainability Initiatives

- ACUPCC: American College and University Presidents Climate Commitment
- Greenhouse Gas Inventory
- Climate Action Plan



Ball State University

# *Greening the Campus*



Greening of the Campus Conference (GOC IX)  
March 18-21, 2012 - Muncie, Indiana

<http://cms.bsu.edu/Academics/CentersandInstitutes/GOC.aspx>

# *Greening the Campus*

## Ball State University Sustainability Initiatives

- Ball State University Strategic Plan 2007-12
  - Greenhouse Gas Inventory
  - Climate Action Plan





# *Greening the Campus*

## Ball State University Sustainability Initiatives



- Ball State University Council on the Environment (COTE)

***“...a clearinghouse for sustainable activities on campus”***

# *Greening the Campus*

## Rice University Sustainability Initiatives

- University sustainability policy
- Created position of Sustainability Director
- “Trayless dining” initiative
- Bike sharing
- Green building



North College - Rice University

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## Rice University Sustainability Initiatives

- **~1 million** square feet of LEED-certified or LEED-registered buildings
- About **20%** of campus square footage
- Highest = **LEED Gold**

# *Greening the Campus*

## Rice University Sustainability Initiatives

- Committed to **green cleaning**
- **Eliminated all cleaning chemicals** except for one Green Seal-approved chemical
- Use **hot water** and **steam**
- **Daytime cleaning**: since 1981

# Greening the Campus

**Rice** -  
3900  
undergrad,  
2000  
graduate  
students



**Ball State** – ~20,000



**Furman** – 2600 undergrad, 300 graduate



**Oregon:**  
23,500

# *Greening the Campus*

## Furman University Sustainability Initiatives

- **Greening our operations** - through energy conservation and efficiency
- One of the first in the U.S. with “**sustainability**” written into its **university-wide strategic plan** (one of Furman’s “5 Pillars”)
- Renewable energy: **solar arrays** on campus - “great learning laboratories for our students, faculty and community members”
- Federal grant to put **geothermal systems** into our residence areas, over the next 4 years or so

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## Ball State University Sustainability Initiatives

### **Residence Hall Competitions**

9 residential complexes

“Significant reductions by virtue of behavior change”

**“The trick is having the buildings metered.**

In our case, it’s a lot of manual labor to go read them. We don’t have them automated yet.

“That’s a pretty significant opportunity for conservation, and it does integrate quite well with the educational mission.” - Robert Koester

# *Greening the Campus*

## University of Oregon Sustainability Initiatives

Building-integrated  
solar array  
(photovoltaics)



University of Oregon Lillis Center



# *Greening the Campus*

## University of Oregon Sustainability Initiatives

At the Recreation Center, a student initiative – largely student funded – is a large domestic water system that has a dashboard in the lobby where the students can see how that's acting and what it's doing for them.



U of Oregon  
Student  
Recreation  
Center



# *Greening the Campus*

## Furman University Sustainability Initiatives

First institution [of higher learning] in South Carolina to mandate all major renovations and new buildings to be LEED certified – starting in 2003



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## Furman University Sustainability Initiatives

### **Comprehensive “Sustainability Master Plan” (2009)**

- Model for identifying 8 primary goals that the university is seeking to address
- 100 strategies
- 124-member committee
- Climate Action Plan embedded in Sustainability Master Plan

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## Furman University Sustainability Initiatives

### **Key Points of Furman Sustainability Master Plan**

1. Expanding and enhancing curricular activities related to sustainability
2. Creating a more sustainable campus transportation system
3. Sustainability service opportunities connecting to the local and greater communities

# Greening the Campus

## Furman University Sustainability Initiatives

**Goal = carbon neutrality  
by 2026**

- Most of Furman's carbon footprint comes from purchased utilities – purchased electricity



David E. Shi Center for Sustainability

- In the Southeast, electricity tends to be about 1/3 the cost [e.g., compared to New England]
- Fuel mix used by local utility provider is just over 1/2 coal

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## University of Oregon Sustainability Initiatives

- **Environmental Issues Committee** - in force for about 10 years - students, faculty and staff
- Hired a **full-time campus sustainability director**
- **Climate Action Plan**
- Signatory of the **ACUPCC**

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## University of Oregon Sustainability Initiatives

- Student body funded the **recycling efforts** on campus
- Student initiative to **hire their own sustainability coordinator**
- Create a **smoke-free campus** in 2 years
- New initiative - **alternatives to bottled water:**
  - free, reusable water containers
  - drinking fountains with spigots

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## Rice University Sustainability Initiatives

### January 2011 launched “ICE Map” or “RICE Map”

*“Rice Integrated Climate and Energy Master Plan”*

- “What is the future of energy and how will it impact our university?”
- “What can we do to put ourselves in the best position for the future?”



# *Greening the Campus*

## Rice University Sustainability Initiatives

### Principles for planning in “RICE Map”

- Provide greater reliance on **natural energy flows**
- **Eliminate waste** - e.g., taking advantage of waste heat
- Recognize the **interdependence of systems**, such as how energy and water are interdependent
- Create **safe, resilient facilities of long-term value**, especially given Rice University’s proximity to the Texas Gulf Coast and vulnerability to hurricanes and tropical storms
- Adopt an attitude of **continuous improvement**

# *Greening the Campus*

## Rice University Sustainability Initiatives

### Principles for planning in “RICE Map”

- Identify campus-level and building level **energy-efficiency and energy-generation investments**
- Reduce risk to **future energy prices**
- Reduce risk to **future emissions costs** (tied in with ACUPCC)
- Improve the reliability and resiliency of our **supply [chain]**
- Understand **how technology will evolve** and how we can be prepared for it
- Establish **performance standards** for new facilities

# *Greening the Campus*

University of Oregon Sustainability Initiatives

## “Oregon Model for Sustainable Development”

*Key component:* **Cap campus energy use at current level** [at time of adoption].

“The idea is to strike a line [in energy use] and never use more energy than we’re using at that moment in time.”

**Formula:** Offset new energy use by requiring new projects to pay for energy retrofits in existing buildings, which will equal the new energy that they are going to need in the new development.

# *Greening the Campus*

## University of Oregon Sustainability Initiatives

### “Oregon Model for Sustainable Development”

1. **Setting a baseline:** “LEED Gold is yesterday’s standard. How can we set threshold high enough to mean something?”
2. **The cap process:** Building will be designed to the energy use index, based on the region and type of building.
3. **Target reduction:** At least 60% below the baseline for a similar building in this region.
4. **Team will calculate** how much energy new building needs.
5. **Existing buildings will be retrofitted** to save the energy equal to the “new” energy that the new building will require.

# Greening the Campus

University of Oregon Sustainability Initiatives

## “Oregon Model for Sustainable Development”

1. Funds will be **controlled centrally**
2. **“Attack retrofit projects in a sensible way”**: not all the “simple” ones first - make sure there’s a mix of savings.

U of Oregon Environmental Action Plan found:

- Potential of **\$25 million of “low-hanging fruit”**
- Amount of new energy needed over the next 10 years = **~\$15 million**

“So ... we have plenty of capacity to make this happen.”

- *Chris Ramey*

# *Greening the Campus*

University of Oregon Sustainability Initiatives

## **“Oregon Model for Sustainable Development”**

### **Potential for Stormwater Improvements**

The University will “improve stormwater quality on the campus by **leveraging our advantage as a campus**, so when a new project comes in, the water running off that project is in pretty good shape.

“So [we could] take some of that resource and spend it on existing parking [or] other impervious surfaces on campus, and the **net result** is that we have **improved the water quality across the campus.**” - *Chris Ramey*

# *Greening the Campus*

University of Oregon Sustainability Initiatives

## **“Oregon Model for Sustainable Development”**

### **Potential for End-User Involvement**

“To leverage our people power, coming up with a way to actually **commission the users of the building**, so that the users do not forget what it means to open and close the windows, and how to turn the lights [on and off].” - *Chris Ramey*

This process will continue over ~24 months, to check the **building’s performance** and **provide education** and updates to the users.

# *Greening the Campus*

## Furman University Sustainability Initiatives

### **Addressing Stormwater Issues at Furman University**

#### **Lake restoration project**

- Creating more native species plantings
- 3 rain gardens serving as models for the community
- Encourage more rain gardens across larger area

#### **New stormwater plan**

- Faculty, staff, and students involved
- Southeast US experiencing a series of droughts
- South Carolina has ~8,000 retention ponds



# *Greening the Campus*

## Furman University Sustainability Initiatives

### **Sustainability Science Major**

Approved by faculty in **Fall 2010**

Only private liberal arts institution to offer such a degree

Curriculum examines the **complex relationships** between human, social, and environmental systems.

Focus: Problem identification and problem solving, using **multiple disciplines**.

**Example:** food systems, social justice implications of food supply and food access, food deserts, sustainable agriculture, the economics of sustainable food supply.

# *Greening the Campus*

## Ball State University Sustainability Initiatives

### **BSU Geothermal Energy Project**

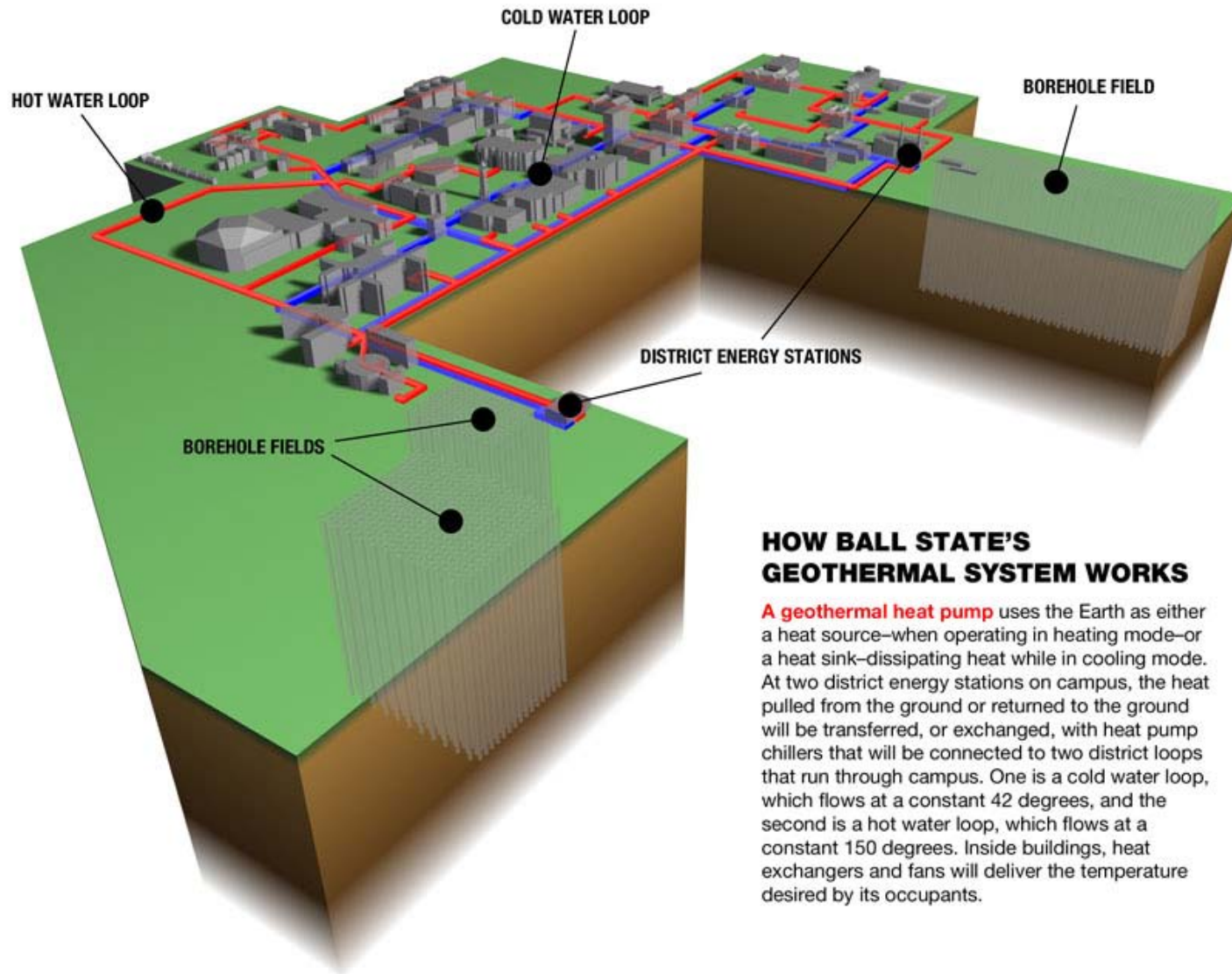
Will bring the entire campus - 45 buildings - online to a single district heating/cooling system, driven by ground-source heat pump technology.

North and south halves of the campus will each have:

- Its own energy station
- 2 high-performance geothermal heat pumps
- ~2000-2500 bore hole placements of closed groundwater piping looping down into the earth

The system will be linked laterally to run energy, both heating or cooling, into the network from either energy station.

# Greening the Campus



## HOW BALL STATE'S GEOTHERMAL SYSTEM WORKS

A **geothermal heat pump** uses the Earth as either a heat source—when operating in heating mode—or a heat sink—dissipating heat while in cooling mode. At two district energy stations on campus, the heat pulled from the ground or returned to the ground will be transferred, or exchanged, with heat pump chillers that will be connected to two district loops that run through campus. One is a cold water loop, which flows at a constant 42 degrees, and the second is a hot water loop, which flows at a constant 150 degrees. Inside buildings, heat exchangers and fans will deliver the temperature desired by its occupants.

# *Greening the Campus*

## Ball State University Sustainability Initiatives

### **BSU Geothermal Energy Project**

**Replacement cost** for existing coal-fired boilers = \$45 million  
(covered by state appropriation)

**Incremental cost** for groundwater system = \$25 million

**Total cost** of groundwater system = \$70 million

**Annual savings: \$2 million/year** in avoided fuel costs

\$2 million/year over \$25 million incremental cost = **8% Return on Investment**

# *Greening the Campus*

## **'Payback Periods' for Green Campus Projects**

### **Ball State groundwater program**

- 8% ROI (12-13 year payback period)

### **University of Oregon**

- Implement projects with payback of 10 years or less
- Climate Action Plan - 18-year payback for “low-hanging fruit”

### **Rice University**

- Implement projects with paybacks of <5 years
- “Think about” projects with paybacks of 5-10 years
- “Wait till more attractive financially” for projects >10-year paybacks

### **Furman University**

- Implement projects with 5-10 year paybacks
- Consider specific projects with 18-20 year paybacks

# *Greening the Campus*

## **'Payback Period' vs. 'Return on Investment' (ROI)**

At Ball State, in our Climate Action Plan, all decisions [are] based on return on investment (ROI).

“What’s good about that is you can go out 40 years and you’re still getting 2.5% on your money.

“That’s a better way equate what would seem like a very long time horizon.” - Robert J Koester

# *Greening the Campus*

## **Green Campus Transportation Strategies**

### **University of Oregon Sustainable Transportation Initiatives**

- Free transit passes for students, faculty, staff – 15-20 years
- Only ~11% of students drive to campus
- Less than half of faculty and staff drive to campus

“You have less need to park cars on campus, and you can dedicate more of your **precious land** to open space and buildings and other aspects of the campus” - even stormwater retention.

- Chris Ramey

# *Greening the Campus*

## Green Campus Transportation Strategies

### **Rice University Sustainable Transportation Initiatives**

Located adjacent to 3 light-rail stations

Free passes for light rail and metro bus system

Zipcar program - provides “mobility on demand”

With a 30% increase in the number of students at Rice in recent years, the number of student on-campus vehicle registrations has declined



# *Greening the Campus*

## Green Campus Transportation Strategies

### **The End of Surface Parking Lots on Campus?**

“From a master planning standpoint, it’s fair to say that surface parking lots are going to be a thing of the past.

“We’re looking to structured parking, whether underground or aboveground.

“Some great examples out there where you combine that structured use with another use.” - *Richard Johnson*

# *Greening the Campus*

Green Campus Strategies: 'Overdesign' Issue



**Richard Johnson's  
blog:**

“Greening the Campus:  
Inside the World of the  
Campus Sustainability  
Professional”

[http://greeningthecampus.  
wordpress.com/about/](http://greeningthecampus.wordpress.com/about/)

# Greening the Campus

## Green Campus Strategies: 'Overdesign' Issue

**“Would you wash your hands with a fire hose?”  
That’s what we’re getting with our designs.”**

### **Case Study**

- ME consultant recommended 2000 tons of cooling
- Internal team recommended 300 tons (85% reduction).
- Actual use: building has not peaked above 40 tons

**Analysis:** ME consultant was off by a factor of 50.



“When it comes to energy, we often get the equivalent of a fire hose to wash our hands, if we’re not careful.”  
- *Richard Johnson*

# *Greening the Campus*

## Green Campus Strategies: 'Overdesign' Issue

### **Fighting Back Against 'Overdesign'**

**Recommendation:** “One way to combat ‘overdesign’ is to bring in the people from your university who are in charge of energy management – your maintenance people on the ground, who have a perspective of how similar buildings on campus will operate.

“They can push back and say, These [consultants] are way off.” - Richard Johnson

# *Greening the Campus*

## Green Campus Strategies: 'Overdesign' Issue

### **Fighting Back Against 'Overdesign'**

**Recommendation:** Think modular.

“The professionals involved in these calculations are often only thinking in terms of a single system. They don't think in terms of a modulated system, so if the calculations indicated you needed 100 tons for a given load, they would scale and size a machine that would deliver that at peak performance, when in fact much of the year it's not running at full load, only part load.”

*- Robert J Koester*

# *Greening the Campus*

## Green Campus Strategies: 'Overdesign' Issue

### **Fighting Back Against 'Overdesign'**

**Recommendation:** Think modular.

1. Take that **design intent** – 100 'units' of delivery.
2. **Slice it** into a 40-unit and a 60-unit package.
3. Run the 40-unit until it **hits its peak**, then **switch** to the 60-unit.

“By modulating the delivery, you can have much more management control – several modules, instead of single unit.” - *Robert J Koester*

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## Green Campus Strategies: Advice for AEC Firms

### **Need for Integrated Practice Model**

Most AEC practice is built on a **railroad-car model**: the work stream is organized into a sequence of activities: programming, site analysis, schematics, design development, construction documentation, building observation during construction, and then perhaps post-occupancy evaluation.

So it's a **very sequenced process**.



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## Green Campus Strategies: Advice for AEC Firms

### **Integrated Practice Model**

1. All parties at the table on Day 1.
2. Ask the **bigger questions** about **whole systems** of the campus as well as the specifics of the building that you are charged to design.
3. Engage all the issues of all the **various disciplines** from the beginning.
4. Exchange to **collectively target** the goals of the project.



# *Greening the Campus*

## Green Campus Strategies: Advice for AEC Firms

### **Integrated Practice Model**

As you move thru time and hit moment for Construction Docs, much of the detailing is already worked out – as part of process of interactive design activity.

An integrated practice model requires more time and budget on the front end to enable Building Team members to be at the table sooner.

But you get savings long-term in both the delivery of the project in terms of fees and also cost management and operations.

*- Robert Koester*

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## Green Campus Strategies: Advice for AEC Firms

### **Integrated Practice Model**

At Furman we certainly are [demanding more team integration].

**Example:** Integrating all master planning processes, everything from student life perspective [in our new Student Life Master Plan], along with Sustainability Master Plan.

The planning process, in terms of integrating all these various plans, including stormwater, is critical.

*- Angela Halfacre*

# *Greening the Campus*

## Green Campus Strategies: Advice for AEC Firms

### **Integrated Practice Model**

**“Hypertrack” delivery** for major capital projects at Rice University

**Concept:** Bring together the architect, engineer, contractor, and major subcontractors from the earliest stages of design.

Make decisions in a **focused manner**, and **tightly scheduled** that allows for a more efficient process.

**Example:** Biosciences Research Collaborative Building

- 477,000 square feet, >\$1 billion budget
- Brought in almost a year early
- Saved 10s of millions of \$\$\$.

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## Green Campus Strategies: Advice for AEC Firms

### **Integrated Practice Model**

We've been using an **eco-charrette**, a kickoff session right from the start, where all the disciplines are together with the users, with several goals.

**One of most important goals:** Have the users understand what it means to be in a sustainable building, and whether they can tolerate some of the resulting environments, and to see the values that come from that as well. - *Chris Ramey, AIA*

# *Greening the Campus*

## Green Campus Strategies: Advice for AEC Firms

### **Choosing the Complete Team**

“As facilities owners, we tend to spend a lot more time selecting our architects than we do our engineers.

“If the engineering firm does not have the talent to deliver the innovative sustainable solutions that we’re seeking, then the university’s design aspirations will be at risk.

“Universities will spend a lot of time seeking the gold standard of architecture firms that are known for green design, but a similar respect is not paid to the MEP firms. We should be looking for that “star” engineer as well. - Richard Johnson

# *Greening the Campus*

## Green Campus Strategies: Advice for AEC Firms

### **Value Engineering ≠ Performance Design**

“Value engineering’ should not be considered equivalent to performance design.”

**Recommendation:** The eco-charrette is the way to get the architect and the other allied professions working together early enough that they can establish the benchmarks of performance that they’re going to try to achieve as a team.

**Caution:** “You don’t ‘value engineer’ things out to get there, you actually have to ‘value engineer’ things in – so it’s a whole different mindset.”

- Robert Koester

# *Greening the Campus*

## Green Campus Strategies: Advice for AEC Firms

### **Value Engineering $\neq$ Performance Design**

**Recommendation:** Think in terms of the **bundling of options**.

**Example:** If you properly daylight a building, you have less need for electrical lighting requirement. That dials down the amount of waste heat, which reduces the amount of cooling required.

“It all starts linking together and that’s performance design, not value engineering reduction.” - Robert Koester

# *Greening the Campus*

Green Campus Strategies: Advice for AEC Firms

## **U of Oregon Process for Hiring Consultants**

“We’ve changed the way we hire consultants.

“We hire the architect, then we sit with them as a team and interview the MEPs, so each MEP [candidate] has to come over the same hurdle that the architect did.

“We stole that [idea] from the private sector, and it seems to be working pretty well.” - *Chris Ramey*



# Greening the Campus

## Green Campus Strategies: Advice for AEC Firms

**How can Building Teams educate university clients about savings and quality of life?**

**Recommendation:** Tell the [sustainability] story in a way where [clients] can see the value.

All of us in the [design] process have to do a better job of carefully explaining the value [of sustainable design].

**The design field has to take the leadership.** They've got to push back to us as owners and say, That's not as good as you can do. I don't think there's as much responsibility for these kinds of issues as there could be. - *Chris Ramey*

# *Greening the Campus*

## Green Campus Strategies: Advice for AEC Firms

**How can Building Teams educate university clients about savings and quality of life?**

**Recommendation:** Use a facilitator.

“Sometimes it helps to have a 3rd-party facilitator in those eco-charrettes ... [a] person speaking on behalf of all parties. The ‘pushing’ can be made more comfortable by having a third party asking for it and cultivating it and getting that conversation out on the table.” - Robert Koester

# Greening the Campus

## Green Campus Strategies: Advice for AEC Firms

“We’ve had great experiences including the users of a particular [new] building in the process, along with the other members of the [Building] Team.”

- *Angela Halfacre*

Example: including faculty in the design of Furman’s new Science Center



Charles H. Townes Center for Science [with Clemson University]

# Greening the Campus

## Green Campus Strategies: Advice for AEC Firms

Science Center houses the Earth and Environmental Services department along with the Physics department.

“Faculty wanted more connection across departments, rather than seemingly around a disciplinary approach - to reflect science and sustainability across departments. This was incorporated in the design.”

- *Angela Halfacre*



Townes Center for Science,  
Furman University

# *Greening the Campus Faculty*

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