ABSTRACT

AN INTERNSHIP WITH YRG SUSTAINABILITY CONSULTANTS

By Whitney Johnson

An internship was undertaken with YRG Sustainability Consultants. The purpose of the internship was to assist in the research and development of projects undertaken by YRG. The majority of the research was focused on assisting clients in obtaining certification from the US Green Building Council’s (USGBC) various Leadership in Energy and Environmental Design (LEED) rating systems. Clients ranged from construction companies to corporate entities. My responsibilities included product research for energy efficient applications, market research, database development, and step-by-step implementation of project elements.
AN INTERNSHIP WITH YRG SUSTAINABILITY CONSULTANTS

An Internship Report

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Master of Environmental Science
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by
Whitney Elizabeth Johnson
Miami University
Oxford, Ohio
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Advisor ________________________
Dr. Sandra Woy-Hazleton

Reader ________________________
Dr. Chris Myers

Reader ________________________
Dr. Hays Cummins
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I. YRG Sustainability Consultants: An Internship

A. Introduction

To fulfill the Institute of Environmental Sciences degree requirements, I completed an internship with YRG Sustainability Consultants in Boulder, Colorado. YRG is a small and fast-growing company that works to manage and facilitate green building practices and certification through the U.S. Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) programs. During August through December 2007, I was an intern with YRG and assisted in a variety of small and large projects that were all aiming for LEED certification. The field continues to grow, as realizations about the impact on the environmental, economic, social, and cultural ramifications are understood through best practices and continued creative approaches with the built environment.

B. Background: YRG Sustainability Consultants

YRG Sustainability Consultants is a fairly new company that started in Colorado. It has offices in Boulder, CO as well as New York City, NY; and has a vast network of consultants who are located in Chicago, Seattle, and other cities around the world. The main focus of their business is as LEED consultants and managers of LEED projects. They also offer services in Organizational Sustainability, Green Living, and Greenhouse Gas Management. They provide numerous trainings and workshops throughout Colorado (as well as their other locations).

YRG has an impressive array of clients including: Timberland, New Songdo City, South Korea, McKenzie House, Starwood Hotels, National Audubon Society, Citigroup, ING Investment Management, Pepsi Co., etc. They have become leaders as both consultants and project managers, and also in creating and defining much of the US Green Building Council’s development of curriculum, content, and reviews.

I contacted YRG after attending a US Green Building Council meeting held in Denver. During the meeting, I began networking for an internship position. YRG was growing and
continues to do so, they took me on as their first intern—which was both exciting and challenging.

**C. Roles and Objectives**

As their first intern, my roles and objectives were largely undefined. I became an assistant and researcher to many of the project managers who were working with clients, doing presentations, and conducting trainings. There were challenges with this: I often jumped from one project to another, without context for many of the jobs I was issued; there wasn’t always a clear chain of command (although eventually there was a system put in place); and I regularly received “jobs” from multiple project managers at once. However, my time there provided me with a glimpse into a fast growing, moving company that is on the leading edge of the green building industry. It was exciting to be around a group of young professionals committed to the work. The work was diverse and kept things exciting for me—projects ranged from large multi-million dollar developments to project proposals and product research. Below is a schematic of the chain of command:

![Figure 1. YRG Sustainability Consultants Chain of Command](image)

Broken into categories, my projects included: tools development, research, and step-by-step implementation of projects with clients. The following report begins with a background on the built environment and green building. This provides the context for the projects, the work of YRG, and the importance of green building practices in the field.
The tools development section describes work undertaken to develop several database systems: for internal use within YRG for staff and external applications including database systems for client use. The research section outlines several projects that assisted project managers with presentations, trainings, a response to a request for proposal, and various projects. Step-by-step implementation consisted of certain objectives used in a particular project for a developer.

II. Green Building and the U.S. Green Building Council

A. Green Building

The “built environment,” manmade elements of our surroundings including roadways, buildings, neighborhoods, has a tremendous impact on the natural world, our relationships between the two, and lasting legacies for the future. Recently a trend in addressing buildings and their impact within the environment has resulted in finding ways to take a more integrated approach to construction and design.

Green building has exploded upon the environmental scene across the United States. In an effort to address energy and resource efficiency, community connectivity, health and comfort of individuals, integrated design and construction, and long-term sustainability (climate impacts, durability, etc) the green building movement has taken all these elements and more into consideration. Humans spend 90% of our time indoors and according to the Environmental Protection Agency, more often than not, this indoor air is laden with contaminants and less healthy than the air outside.¹

Construction has changed dramatically over the years. At the turn of the century, buildings relied more on natural materials and systems than today’s mechanical systems. Paints, cleaning materials, and other manufactured materials contain harmful chemicals that until recently went unnoticed. The building process is often disconnected. Land planners, architects, mechanical engineers, developers, and interior designers all are essential participants in the build/design process, but often separately. Mechanical systems are often

both inefficient and ineffective due to the lack of integration of the process. This disconnect leads to inefficient systems and a lack of synergy within the building.

Today a shift is taking place. Both consumers and developers are taking into account the environment when it comes to buildings. Consumers are more aware and demand more environmentally/community friendly practices and developers recognize the market.

The impact of buildings is enormous. Materials such as glass, concrete, wood, gypsum, and other building material make up 40% of the solid waste stream in the US. Seventy percent of electricity consumed in the U.S. is in the operations of buildings. (See Figure 2 below).

Buildings and their environmental impact can be changed based on design, orientation, using and integrating natural surroundings and systems, and material selection. Reducing and salvaging building construction debris diverts it from landfills. Materials mentioned above can be salvaged, reused, and recycled. The best approach is to rehab a building. Strategies addressing these elements can make a huge difference in greenhouse gas emissions (ghg), the health of residents/occupants, and how efficient the building is in energy and costs.

The United States Green Building Council (USGBC) is a nonprofit founded in 1993 that seeks to advance environmentally responsible and sustainable building practices. They are a member organization composed of architects, consultants, contractors, federal and state
governments, students, and others interested in green building. USGBC provides trainings, research publications, and resources. Most importantly, they have developed and continue developing the principals and practices that define green building through their various LEED rating systems.

**B. LEED Overview**

During the first part of my internship, I had several objectives. One was to familiarize myself with the US Green Building Council and the LEED process. I began by reading and studying the manual defining the LEED system, credits, and intent underlying each credit. I attended a technical training in Fort Collins, Colorado that covered LEED for New Construction.

LEED is a national benchmark program—a consensus based system that develops standards and guidelines for the construction, development, and operations of a building. Administered by the nonprofit US Green Building Council, the LEED guidelines have several different versions and rating systems. Rating systems take on different types of projects and are meant to make the LEED system both more thorough and applicable to a wide-range of projects. Currently, the systems are:

- New Construction
- Existing Buildings
- Commercial Interiors
- Core & Shell
- Schools
- Retail
- Healthcare
- Homes
- Neighborhood Development (in pilot)
- Portfolio Program (in pilot)
Focused largely on the New Construction (NC) version, one of my main tasks was to identify resources for developers, project managers, architects, etc that would assist in their successful achievement of LEED certification. Throughout this paper, References to credits, categories, and requirements come from the USGBC LEED-NC Version 2.2 Reference Manual.² YRG maintains a database of materials, using the credit categories as a guideline (see below).

**Credit Categories (LEED NC)**

**Sustainable Sites**

SS Prerequisite 1: Construction Activity Pollution Prevention

SS Credit 1: Site Selection
SS Credit 2: Development Density & Community Connectivity
SS Credit 3: Brownfield Redevelopment
SS Credit 4.1: Alternative Transportation: Public Transportation Access
SS Credit 4.2: Alternative Transportation: Bicycle Storage & Changing Rooms
SS Credit 4.3: Alternative Transportation: Low Emitting & Fuel Efficient Vehicles
SS Credit 4.4: Alternative Transportation: Parking Capacity
SS Credit 5.1: Site Development: Protect or Restore Habitat
SS Credit 5.2: Site Development: Maximize Open Space
SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control
SS Credit 7.1: Heat Island Effect: Non-Roof
SS Credit 7.2: Heat Island Effect: Roof
SS Credit 8: Light Pollution Reduction

**Water Efficiency**

WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%
WE Credit 1.2: Water Efficient Landscaping: No Potable Water Use or No Irrigation
WE Credit 2: Innovative Wastewater Technologies
WE Credit 3.1: Water Use Reduction: 20% Reduction
WE Credit 3.2: Water use Reduction: 30% Reduction

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Energy & Atmosphere

EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
EA Prerequisite 2: Minimum Energy Performance
EA Prerequisite 3: Fundamental Refrigerant Management
EA Credit 1: Optimize Energy Performance
EA Credit 2: On-Site Renewable Energy
EA Credit 3: Enhanced Commissioning
EA Credit 4: Enhanced Refrigerant Management
EA Credit 5: Measurement & Verification
EA Credit 6: Green Power

Materials & Resources

MR Prerequisite 1: Storage & Collection of Recyclables
MR Credit 1.1: Building Reuse: Maintain 75% of Existing Walls, Floors & Roof
MR Credit 1.2: Building Reuse: Maintain 95% of Existing Walls, Floors & Roof
MR Credit 1.3: Building Reuse: Maintain 50% of Interior Non-Structural Elements
MR Credit 2.1: Construction Waste Management: Divert 50% from Disposal
MR Credit 2.2: Construction Waste Management: Divert 75% from Disposal
MR Credit 3.1: Materials Reuse 5%
MR Credit 3.2: Materials Reuse 10%
MR Credit 4.1: Recycled Content: 10%
MR Credit 4.2: Recycled Content 20%
MR Credit 5.1: Regional Materials: 10% Extracted, Processed, & Manufactured Regionally
MR Credit 5.2: Regional Materials: 20% Extracted, Processed, & Manufactured Regionally
MR Credit 6: Rapidly Renewable Materials
MR Credit 7: Certified Wood

Indoor Environmental Quality

EQ Prerequisite 1: Minimum IAQ Performance
EQ Prerequisite 2: Environmental Tobacco Smoke Control
EQ Credit 1: Outdoor Air Delivery Monitoring
EQ Credit 2: Increased Ventilation
EQ Credit 3.1: Construction IAQ Management Plan: During Construction
EQ Credit 3.2: Construction IAQ Management Plan: Before Occupancy
EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants
EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings
EQ Credit 4.3: Low-Emitting Materials: Carpet Systems
EQ Credit 4.4: Low-Emitting Materials: Composite Wood & Agrifiber Products
EQ Credit 5: Indoor Chemical & Pollutant Source Control
EQ Credit 6.1: Controllability of Systems: Lighting
Innovation in Design

ID Credit 1-1.4: Innovation in Design
ID Credit 2: LEED Accredited Professional

One of the important facets of LEED is its integrated approach to the construction of a building. Oftentimes on a project, the various teams do not come to the table to coordinate or integrate the elements of the building. LEED brings the architects, construction teams, developers, and even marketing to the table to develop a systems-based approach. This integration, more often than not, results in a more efficient building, with energy savings and environmental impact guiding the development.

III. Summary of Projects

A. Tools Development

Resources were a big part of the YRG value—both for internal educational purposes and for client deliverables. I was responsible for identifying upcoming trainings, new products and practices, and assisting with client projects

1. Product Database

The expansion of the YRG database is a long-term goal of the company. Due to the green market, there is constant growth and change within the industry. One of my goals was to develop and maintain a database that identified not only local resources, but also new technology and products.

As a means to facilitate the LEED process, YRG has developed and is developing tools to give to project teams as they define elements of their buildings. One of the first tools I developed was a guideline for the Materials and Resources section, credit 7, “Certified
Wood”. The document contains a summary of the credit, with local, Colorado-based distributors of Forest Stewardship Council (FSC) wood products (see Appendix A).

As a means to also gather market research on the availability, market demand, and overall knowledge of FSC products, I conducted telephone and face-to-face interviews with local suppliers. The interviewees varied; from custom design products to lumber yards and large scale distributors (see Appendix B).

Materials databases were also created for energy efficient lighting systems, recycled-content products, green cleaning products, urea-formaldehyde free products, and various others relevant for design and construction teams.

2. Client Database Development: Citibank

Citibank, one of the largest banks in the United States decided to commit to a pilot project of the USGBC in their Portfolio Program. The Portfolio Program is a result of pushing building and business owners towards a streamlined, volume-based effort of greening their operations. Projects may include new or existing buildings, neighborhoods, homes, retail operations, etc. The chart below graphs the current rating system of the portfolio projects.
The pilot program began in late November 2006 and YRG was contracted to work with Citibank in their efforts of obtaining LEED certification in throughout their branch offices over time (also known as volume-build). The goal is threefold: 1) that these industry participants will become market leaders in energy efficiency and savings, 2) that this streamlined approach can provide metrics and recognition for their achievements and 3), that this volume approach will result in significant savings for the certification process.

**Commercial Interiors for Retail Pilot**

In 2007, USGBC established a pilot program for Commercial Interiors for Retail (CI). Design features for commercial buildings can have tremendous impact on efficiencies, cost savings, worker productivity and comfort, and overall environmental impact. The CI rating system takes into account: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation in Design. These guidelines are provided for tenant spaces in private, public, and government offices.
Fast-growing businesses often construct new facilities every year (or more). Starbucks, Target, or any other big retailer one is familiar with often has a “cookie cutter” approach to their buildings: same look, same feel, easily replicable. So it would make sense that they now begin to look at incorporating green practices into their approach. LEED certification is complex, time consuming, and expensive. The volume-based approach integrates green principles into a standard “model” for the company’s construction, growth, and operations.

**Application of a Volume-Build Approach**

In 2007 Citibank North American (CBNA) and CitiFinancial North America (CFNA) planned to build an initial 40 locations with two registered prototypes. The long-term goal will be a permanent integration of green practices within the construction, operations, and education of Citi employees and contractors.

My role in this huge project was a tedious, arduous, detailed editing of a massive Excel database system that would provide Citi branches a tool for tracking their progress toward LEED certification. The “Scorecard” is a series of sheets within the Excel database to track, monitor, and assist in the submission to USGBC their points in each of the above-mentioned categories. The sheets are linked page by page, as well as to a database to both store and tally points achieved.

The workbook starts with an Overview page that includes the project details: location, a narrative, project team contacts (architects, owner, landscaping, commissioning agent, energy modeler, interior, contractor, etc). It also asks for response to the vision of their sustainability, and basics such as materials budget, construction budget, number of stories, area of greenspace.

From there, project managers are able to select a scorecard, such as the CI Scorecard (YRG also created scorecards for New Construction and Core & Shell certifications). Here you will find a list of every credit under all the categories (Sustainable Sites, Water Efficiency, etc), a description of the requirements for that element, whether it takes place during the design or construction phase, notes for the cost and marketability of the feature/credit,
space for notes and action items, a list of the project team and who is responsible for the particular credit, and points available/achieved.

The workbook contains a page of calculations important for the Energy and Atmosphere credits, as well as the Water Efficiency calculations (see below).

One of the difficulties in navigating the LEED certification process is the process of tracking and submission requirements. This tool aims to alleviate that through a series of step-by-step credit checks, drop down menus, and interlinking sheets that will find and catch errors. One of my first steps was to go through the document, and check for consistency: fonts, spacing, labeling, etc. This proved to be made difficult by the number of YRG consultants working on the project, each sending in edits and new workbooks weekly.

The next phase of the project was text edits; five hundred and sixty-five of them. These ranged from grammatical to structural to correcting numbers and calculations. Needless to
say, it was a tedious endeavor—but one that made me realize how professional and thorough the project managers were.

The last part of my contribution to the project was to hyperlink every single credit to the “credit directory”. The process took over 2 weeks, made even lengthier by a computer malfunction that erased the database from my files, so I had to start over. While it is best understood via viewing the “live” workbook, I’ll do my best to explain. If we are in the CI scorecard and we want to read more about a particular credit—for example, under Energy & Atmosphere, Credit 1.7: “Optimizing Energy Performance”. We would click on this credit that would then lead us to a detailed credit directory (see Appendix A).

**Other Applications of the Volume-Build Approach**

Numerous other businesses have since joined Citi in pursuing the volume-build Portfolio Program including Office Depot, Wachovia, Toyota, Wells Fargo, several universities, and numerous other entities. Results so far have shown considerable savings: cutting energy usage by 20% and water use by 40%. And taken as a whole, the pilot program has huge potential to impact the million of square footage involved across all these sectors and their impact with greenhouse gas emissions, changing the market, and making environmental practices an integrated part of how business is conducted throughout the US and the rest of the globe.

The “Tools Development” projects gave me the opportunity to learn about the constantly changing field of green building. Research both online and in the field (meetings, interviewing suppliers, etc) allowed me to take a particular credit in the LEED rating system and delve into its practical applications in the real world. This was the best way to learn more about the detailed and complex series of credits that our clients were pursuing. It also allowed me to contribute to building an internal database for YRG. When I came on board, the company was less than a year old. Therefore, building the infrastructure and resources for future staff and clients was essential to putting ourselves above the

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competition. Materials I created were used in Colorado and in other YRG offices and the staff very much appreciated being able to have an online file of products, retailers, and costs for materials they were encouraging clients to use.

B. Research Efforts

One of my primary roles while at YRG was to be “on hand” for any research or resource development project managers might need. The research I generated was used for presentations, responding to request for proposals, and for internal education with YRG staff. The following section outlines several projects that fall into this category.

1. Museums

One of our project managers was asked to present to a group of museum directors at an annual conference that was taking place in New Jersey. The goal was to provide information on the steps being taken already in terms of museums going green, as well as to explore the potential that museums have for reducing greenhouse gas emissions and becoming leaders in their operations. My goal was to provide context and background information and to identify several museums as case studies and outline the steps they took or are taking in become green.

In 2005, the United Nations launched the Decade on Education for Sustainable Development, with a focus on formal and non-formal education and capacity building being “key components of the successful implementation of sustainable development…participants include school teachers, university professors, experts in research institutions and museums, local government, media, local NGOs, and local industries.”

Museums are time-honored institutions and they are leaders in thought, design, and educational opportunities. According to the American Association of Museums their purpose is in making ”a unique contribution to the public by collecting, preserving, and

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Museums have varying degrees of engagement with their visitors, but have always been an important part of community. Deepening this engagement, creating stronger connections, and empowering citizens to become active is something more and more museums are seeking to do.

Millions of Americans visit museums every year. The American Association of Museum’s 2006 *Museum Financial Information* survey found that the median annual attendance for different types of museums is as follows:

- Arboretum/Botanic Garden: 106,235
- Art Museum: 59,822
- Children’s/Youth Museum: 78,500
- General Museum: 43,500
- Historic House/Site: 16,000
- History Museum: 10,750
- Natural History/Anthropology: 62,803
- Nature Center: 52,850
- Science/Technology Museum: 244,589
- Specialized Museum: 20,000
- Zoo: 440,502

These institutions play a crucial role in the non-formal education sector, contributing to a community’s learning about and action for sustainability. In order to offer viable choices to take action, and to empower citizens, this education must accurately reflect each community and its surroundings. Therefore, besides the study, preservation, and conservation of objects, museums may also serve to highlight interactions between and among people, cultures, and nature. The difficulty lies in presenting sustainability and

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green building in a holistic, interdisciplinary way. As Glenn Sutter observes, “we may need to revisit the definition of a curator” and develop a model of curator as “storyteller” and one who not only archives, but who is able to adapt and develop programs and institutions that reflect society.⁷

It is interesting given the context above, to look at museums through the lens of green building practices and principles. These institutions normally have very energy-intensive buildings—special lighting requirements, specific heating and cooling, as well as the external design. Museums can provide an interesting parallel of how they are seeking to adapt and develop, alongside building practices. Science has been studied largely through reductionism, much like building practices have focused on specific components and not a holistic, integrated approach.

Below are case studies of museums throughout the US that have or are pursuing LEED certification through a variety of standard and creative measures, many of the examples are taken from a presentation entitled, “Creating the Green Museum”.⁸

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Oklahoma Museum of Natural History

Registered (Sep 2007) LEED certified. So far, they have expanded their recycling program, changed products in their café, and registered 20 acres of natural area with the Oklahoma Biological Survey as a now-protected area.¹⁹

Museum of Broadcast Communications (Chicago)

The first public museum in the nation to earn gold status from LEED. The museum partnered with the Illinois Clean Energy Community Foundation and sustainable design architect Helen Kessler to implement measures such as:

- White, soy based roof
- CO2 sensors
- Daylighting and dimming sensors
- Water efficient plumbing fixtures
- Building materials that included recycled content, renewable materials, and locally manufactured material
- Window glazing
- Extra insulation for walls and the roof
- HVAC system with an automated energy management system¹⁰

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¹⁹ The Sam Noble Oklahoma Museum of Natural History Natural Science Collections Alliance Annual Meeting
www.snomnh.ou.edu/nsca-spnhc/documents/NSCA_SPNHC_Program.pdf

¹⁰ The Museum of Broadcast Communications. “Green Design”
The Art Institute of Chicago, North Wing Addition

The new wing contains art collections, storage, architectural galleries, educational resources, and large public areas. The floor area is 230,000 sq feet. The following elements have been incorporated:

- Extensive window glazing
- “Flying Carpet” roof: an innovative design incorporating energy consumption with the requirements of the preservation of art; daylight is allowed in w/out the harmful effects of direct sunlight
- Double layer exterior envelope: to prevent condensation on exterior glass and maintain required temperatures
- Water-side economizer system: uses outside air without humidification impact
- CO2 monitoring
- HVAC with direct digital control technology; relative humidity control is the primary driver (as opposed to temperature control)\(^\text{11}\)

Gardens will add 20,000 sq ft of green space to the museum campus.


\(^{11}\) Art Institute of Chicago
[http://www.artic.edu/aic/aboutus/newbuilding/features.html](http://www.artic.edu/aic/aboutus/newbuilding/features.html)
California Academy of Sciences (San Francisco)

A new museum, aquarium, planetarium and tropical rainforest now boasts the “highest sustainability rating in the world” with LEED Platinum certification. It consists of:

- A living roof (to keep 2 million gallons of rainwater from becoming stormwater runoff)
- Natural lighting from floor-to-ceiling glass on east and west side of the building
- Use of natural building materials
- A small building footprint
- Low building heights
- And an additional 3 acres of new green space

Boston Children’s Museum

Has made a commitment to green building and with their new addition, will qualify for LEED certification. They are implementing the following:

- Green roofs (staff, guest scientists, children and parents will install plants to form the roof); there are 3, tiered green roofs covering 6,400 sq ft
- Storm water reclamation will be used for toilets and landscaping
- Recycled, local, low-emitting materials
- CO2 monitoring

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12 California Academy of Sciences. [www.calacademy.org](http://www.calacademy.org)
- Efficient lighting and water fixtures
- Recycling for visitors and staff

Museums play an important and contributing role to society. They are a cultural resource, provide historical documentation, and are able to inform debates of yesterday and today. Clearly some museums are beginning to view sustainability organizationally: in terms of their management, the economic bottom line, and as stewards to society. Culture is an expression of society’s values, and museums serve as institutions that capture elements of culture and transmit this into knowledge, debate, and forward thinking. This social learning can lead to behavior change, innovation, and a shift of values.

These museums truly are revolutionary and relevant. Economically, culturally, and morally museums must continue to discuss and pursue sustainability if they want to be culturally authoritative.

“It would be perverse to preserve evidence of the natural world and human society without regard to the protection of the wider environment.”

—Museums Association

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Cotton Inc Response to Request for Proposal

The Consumer Marketing division of Cotton Inc put out a request for proposals for a project that would develop an action plan that would evaluate COTTON’s environmental and social sustainability measures as an organization. My goals were to do background research into COTTON: who they are as an organization, agricultural practices, their sustainability model thus far, and general environmental trends and practices around cotton as a raw product and as an end product.

COTTON Inc, headquartered in Cary, North Carolina is a consumer and trade-focused organization. They work both in the US and abroad with mills, importers, and textile centers. Their services vary from technical: fiber processing, product development, dyeing, and quality control; as well as information through consumer research and marketing.

Organic cotton is on the rise both in terms of availability and popularity, but it is a niche market, estimated at 0.1% of global cotton production. Set by United States Department of Agriculture, organic standards require a three-year conversion for land before organic crops are harvested. This translates into higher costs for production, up to 50-100% premiums in prices for raw fiber. Although COTTON Inc has compiled a list of suppliers of sourcing, there is no guarantee to determine claims from the supplier. The US has seen significant use of genetically modified organism (GMO) crop varieties. Both herbicide-tolerant and insect-resistant varieties have been planted on US acreage: 52% of cotton acreage farmed was insect-resistant and 58% was herbicide-tolerant varieties.

COTTON Inc has developed a guarantee with their Seal of Cotton, COTTON Natural to highlight the steps the company is making in terms of environmental responsibility. Their

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agricultural research has produced analysis on cotton water usage and how to maximize water consumption. They are using enzymes in the dyeing processes to lessen the amount of chemicals used. They have conducted outreach to the public—“From Blue to Green” encouraged students to donate their denim to convert into fiber insulation for construction rebuilding material in Louisiana.

Several other market-based organizations and businesses have stepped into research and standard-setting for cotton. Wal-Mart has become the largest purchaser of organic cotton in the world, purchasing some 10 million pounds. World Wildlife Fund has a Sustainable Cotton Project targeting sustainable production and more biologically sound approaches to farming. And the Better Cotton Initiative serves as a governing body on global principles and criteria to leverage buyers.

After compiling this report, YRG constructed a report outlining the steps we would take to conduct an evaluation, strategy, and analysis for COTTON. The project would include an evaluation report card consisting of the following impact areas:

Climate/energy

- Agriculture
- Manufacturing
- Offices/Other facilities (Green Building)
- Labor/Employee Satisfaction
- Product Health

And Product Life Cycle Impacts

All of these were framed within the context of leadership, market perception, action, reporting, and messaging. The YRG RFP outlined a series of plans, implementation timetables, measurables, and deliverables for COTTON. Unfortunately I finished my internship before a decision was made on COTTON’s choice for the contract. However, the steps taking in creating the report were important and I was able to see how the Willeke
wheel is very aptly suited to a project like this—one that needed thoroughness, but the ability to be flexible once the project was put in place.

**Alternative Building Certification Systems**

The purpose of identifying alternative building certification systems was to be able to respond to clients in understanding different systems. Although LEED is the most recognized entity for certification, there are other entities both in-country and abroad seeking to define their own regulations around green building practices. Built Green, outlined below was relevant because it is a system based in Colorado as an alternative to LEED. The other example was relevant to YRG because of a project in Singapore, Green Mark was a certification system designed and used by the government there.

**Green Mark**

Green Mark was established in 2005 by the Singapore government and their Building and Construction Authority (BCA). Much like LEED, it provides a framework for moving the building and construction industry towards a more sustainable and energy efficient model. The system uses an evaluation and points system to reward degrees of efficiency. The program is endorsed by the National Environment Agency and has grown increasingly popular in the few years that it has been in existence (see below).
The framework and point system are based on:

- Energy Efficiency
- Water Efficiency
- Site/Project Development & Management
- Good Indoor Environmental Quality & Environmental Protection
- Innovation

Currently the government has focused on New Buildings and Existing Buildings. The ratings consist of Platinum, Gold Plus, Gold, and Certified.\(^\text{17}\)

Although Green Mark is very similar to and based on LEED standards, there are two significant differences in the structure. For one thing, there are triennial assessments (in

other words, you have to submit operational performance 3 times per year), and is administered by the government.

The government and BCA has an extensive training program, the BCA Academy that offers degrees and training around the Green Mark system including certification for Green Mark Managers and Green Mark Professionals.

Clearly with support from the government both in terms of education, management, and implementation, the Green Mark program is poised to lead Singapore on the green building front. Business owners and citizens alike have embraced the program and as seen from the chart above, Green Mark buildings will continue to be certified throughout Singapore. A quote from a developer of private residences says of Green Mark, “it will reduce the long term costs of building management and occupation; to the benefit of both owners and developers. We are already noticing a higher level of enquiry about the Green mark among potential buyers and tenants, and see our investment in the Green Mark process as an opportunity to ‘future-proof’ our landmark development.”

**Built Green**

Established in 1995 by the Home Builders Association of Metro Denver, Built Green is a green building program for residential homes. The LEED equivalent of LEED for Homes. Built Green is one of the best-known city and industry led programs for residential building.

Once again, based on a series of categories and relevant points, Built Green homes must achieve a minimum of 75 points to be accredited. Builders are required to meet certain Energy Efficiency requirements, as well as at least one option from the following required categories:

- Energy Efficiency: Mechanical Heating and Cooling Systems
- Energy Efficiency: Air Distribution Systems
- Health and Safety: Improved Indoor Air Quality

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• Health and Safety: Moisture Management
• Energy Efficiency: Lighting
• Material Resource Efficiency: Framing
• Resource Conservation: Water\(^\text{19}\)

 Builders must provide verification documents as specified and must be registered with the Built Green program.

At the time of my internship, the USGBC had begun a pilot program of LEED for Homes. (In January 2008, they released the full program that is now the standard.) LEED uses the following eight categories to base their certification:

• Innovation and Design Process (ID)
• Location and Linkages (LL)
• Sustainable Sites (SS)
• Water Efficiency (WE)
• Energy and Atmosphere (AE)
• Materials and Resources (MR)
• Indoor Environmental Quality (EQ)
• Awareness and Education (AE)

The certification levels are:

Cities, counties, state and federal entities have all come up with building practices to encourage, reward, and sometimes require better building systems. Cities like Denver and Boulder are passing legislation that requires new municipal buildings to be built green, using the LEED systems. However, other systems argue for improvement without regulation. The key is that whatever system people use, that it has the right balance of flexibility and stringent standards. While the LEED system is focused more on performance-based measures, Built Green has more of a prescriptive approach. Built Green homes are inspected randomly, while LEED Homes require third party inspection. Costs are another difference between the two programs: because of the inspection and third party regulations, LEED is significantly more expensive than Built Green.

All in all, it’s hard to compare programs. The questions of comparison are many: regulatory vs. mandatory, localized vs. national programs, flexibility vs. stringency, etc. The questions remain and what will determine systems used is a mix of market-driven and regulatory guidance for the certification process.

The “Research” projects were a key part of a consultant’s work to being prepared, competitive, and knowledgeable. I learned the importance of intelligence gathering. Every project and presentation required being on top of the competition, as well as other allies in
the field. Research showed that we put time and effort into understanding a client’s (or potential client’s) place in the market, their challenges and opportunities, and our role in taking them to the next level. The materials I created were used in PowerPoint presentations, in soliciting clients, outreach and educational trainings, and for employee education.

III. Step-by-Step Implementation

Mackenzie House LLC

The goal of the Contractor’s Project is to provide step by step assistance in obtaining LEED certification. The initial aim is to outline the context of the credit and then provide resources to achieve the points attributed to each requirement.

During the month of October, I took part in researching and developing materials related to a specific client of YRG’s. Although the project is still ongoing, it gave me good insight into the step-by-step development of the implementation of the LEED process. This particular project began in the early design phase and YRG was brought in by the developer to sit down and coordinate all aspects of the green building process. Because the project was in the early phases, YRG was able to synchronize as closely as possible the various building aspects—from the electrical standpoint, to landscaping, and to purchasing materials.

Mackenzie House, LLC is a development company that operates in Colorado, Missouri, and Arizona. They focus on residential buildings and neighborhoods and have been deemed by the Denver Business Journal as the "Fastest Growing Large Private Company" in Denver. Mackenzie House came to YRG to seek support and consultation in making their latest apartment complex a candidate for LEED certification. “Asbury Green” will provide student housing for the University of Denver and when completed in August 2009, will consist of 171 green apartments.

Contracting with Kiewit Construction, one of North America’s largest construction companies, as well as architects, and other members of the design teams, YRG sat down
for discussions on green building, LEED credits, and green student apartments. My role was to research existing green student apartments in the U.S. Where are they located? What elements have they incorporated? What certification level did they reach?

**For project insight, we looked at the following developments based on my research:**

American Campus Communities, Inc. one of the nation’s largest owners, developers, and managers of student housing has partnered with KTGY Group, Inc to design and develop 4,000 on-campus beds at University of California Irvine. Construction will begin in 2008 and they are targeting at least a silver LEED rating from the USGBC.

Dundurn Edge Developments (Canada) is seeking LEED platinum for a 107 unit, nine-story student rental building near McMaster University. Some of the elements they are using: solar heating, captured rainwater for toilets, low flush toilets, low-flow fixtures, EnergyStar appliances, electricity meters for every unit, wind turbines, white roof, and native plant landscaping.

Although not specifically designated student housing, Greenbridge Developments is within a block of University of North Carolina and Duke and North Carolina State University are in the area. Greenbridge uses onsite solar power (the building will use 35% less energy than a similar building), water catchment systems, water saving fixtures and appliances, has a green roof, has a computerized system that coordinates for HVAC levels (Building Management System), indoor air exchange, and uses EnergyStar Appliances.

Gerding Elden Development designed and developed a Gold LEED certified building at Pacific University (Oregon), Burlingham Hall. More than 93% of the construction was recycled; the building uses high-performance windows & lighting, energy-saving

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20 “American Campus Communities Selected to Develop 4,000 Beds at University of California, Irvine.” Accessed October 2008. [http://www.thefreelibrary.com/American+Campus+Communities+Begins+Construction+on+LEED+Silver...a0155129044](http://www.thefreelibrary.com/American+Campus+Communities+Begins+Construction+on+LEED+Silver...a0155129044)


appliances, green cleaning products, mechanical and energy recovery systems, and more. The building is 59,000 square feet, with 49 units. Gerding has also worked on projects for Portland State University with the City of Portland:

**LEED Status**: Silver

**Project**: 10-story building

**210,000 sq ft**

**383 urban homes**

This project was implemented with the goal of using 30% less energy than Oregon energy code and have sustainable elements like: high-performance windows, low-flow fixtures, green roof, etc.  

Stuever Bros. Eccles & Rouse developed sustainable student life facilities along the Johns Hopkins University’s Homewood Campus. The site used regional materials, water efficient landscaping, alternative transportation options, and elements addressing heat island effect.

Using this information as well as input from the development company and Kiewit Construction, the team began to discuss which LEED requirements for New Construction the contractor would pursue. Based on these discussions, it was decided that the contractor would be responsible for the following:

- **SSp1**: Construction Activity Pollution Prevention
- **MRc2**: Construction Waste Management
- **MRc4**: Recycled Content
- **MRc5**: Regional Materials

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I then compiled a “Contractor’s Packet” outlining each of these credits: the intent, the requirements, guidelines, strategy, documentation tools, and research outlining material resources in the state that the contractor was responsible for achieving. The Contractor’s Project then serves as a guide for achieving each of these requirements and YRG assists in providing resources, collecting documentation, and navigating the steps for the project to become LEED certified.

**Below is a brief synopsis of each credit that this particular project is pursuing:**

SSp1: Construction Activity Pollution Prevention: This is targeted to limit sediment runoff during construction. May include mulching, temporary barriers, sediment traps, etc.

MRc2: Construction Waste Management: There are two possible points associated with this credit. The first point is for diverting 50% of construction waste from landfills, the additional point is for diverting 75%. This could include recycling, salvage, or reuse of materials.

- MRc4: Recycled Content: see below
- MRc5: Regional Materials: Another credit with the potential for 2 points. The goal of this credit is to increase and support demand for local products and manufacturing. The goal is for products within a 500-mile radius.
- MRc6: Rapidly Renewable Materials: Find and use materials that are grown and can be harvested quickly such as bamboo or cork.
• MRc7: Certified Wood: Minimum of 50% wood harvested with Forest Stewardship Council certification.

• EQc3.1: Construction IAQ Management, During Construction: Protect the HVAC system during construction from various materials such as insulation, etc.

• EQc4.1: Low Emitting Adhesives & Sealants: This credit addresses adhesives used that are irritants such as carpet adhesives, drywall, etc.

• EQc4.2: Low Emitting Paints & Coatings: Based on Green Seal Standards, this credit sets limits for VOC content.

• EQc4.3: Low Emitting Carpet Systems: Uses the Carpet and Rug Institute’s Green Label Plus program to establish guidelines regarding indoor air considerations.

• EQc4.4: Low Emitting Composite Wood & Agrifiber: see below.

Having previously created the resource list for Rapidly Renewable Materials, I turned my focus to researching resources for credit EQc4.4: Low Emitting Composite Wood and Agrifiber. The intent of this credit is to reduce indoor pollutants and contaminants by requiring low-emitting wood and agrifiber products on the internal building. My research required compiling a list of urea-formaldehyde free products in Colorado (see Appendix E). Research was conducted via site visits, phone calls, and interviews with contractors and commercial providers.

Urea-formaldehyde is a common adhesive used that emits the toxic formaldehyde at room temperature. Materials used in this credit consist of agrifiber board which is a paneling product made of recycled waste fibers (this may include sunflower husks and other recovered agriculture products). Composite wood may include door cores, panels, plywood, and particle board. Results of the research are attached at the end of this document.

Another piece of supplemental material that was provided to the contractors was research into MRc4: Recycled Content credit. As stated in the Resource Guide, the intent of this credit is to “increase demand for building products that incorporate recycled content materials, thereby reducing the impacts resulting from extraction and processing of virgin
materials.” (LEED Resource Guide for New Construction). Within this particular credit, there are two options: 1) 10% recycled content, which will result in 1 point toward your LEED status, or 2) 20% recycled content (post-consumer plus 1/2 pre-consumer. The latter would result in an additional point.

The team decided to focus on recycled rubber flooring as a possible option for fulfilling this credit. Research was again conducted to located providers of the appropriate recycled content (see Appendix F). The majority of these products are made from recycled tires, rubber granules, etc. REI’s prototype store in Boulder, Colorado provided a great example of the design and implementation of rubber flooring (see photo below).²⁵

![Boulder REI Prototype store](image)

Attached at the end of this document is the resulting list of resources for rubber flooring options (Appendix F).

The “Step-by-Step Implementation” project was when I was able to put some of the pieces of the puzzle together, after all the studying, the small database projects based on credits, and research into the field. During the Mackenzie House project, I attended meetings, pulled together resources (many of which I had created) and listened to the integrated approach of design and construction teams. My work in turn, assisted the project managers with much needed support—to assist with meeting preparation, continue developing research and resources, and to be “on call” for whatever innovative design ideas needed to be studied or documented. Upon the completion of my internship, Mackenzie House was well on its way to achieving LEED Silver status and will be completing the project in August 2009.

VII. Conclusions

Green building is booming across the nation. Private and public entities are taking on the responsibility to address the built environment in a more integrated approach. YRG is at the forefront of managing and developing partnerships to facilitate and educate in this field.

In reflecting on the experience, there are things I would change if I were to do it again, and as advice for other 1st time interns who might benefit from reading this. I would have liked to have had more context for the projects I worked on—LEED is a complex and detailed system. Many of the project managers were engineers, all were LEED certified practitioners, and my learning curve was steep.

Coming into a new organization, whether one is an intern, an employee, or a CEO, it is important to know the organization’s expectations and goals. Especially as an intern, it is important to know what kind of support will be given—such as training, as well as the reporting lines among staff. This should also be defined by oneself. After leaving this internship and in pursuing other work, I took this lesson to heart and asked many more questions in the interview process than I would have without this experience.

Most importantly, I think I came away from this experience being able to recognize that despite my interest in green building, and recognizing the importance of the YRG team in elevating green building practices, my aptitude is not in this line of work. My strengths are in “people skills” and ideas, whereas this company focused on technical and strategic details. The people I worked with were amazing: energy modelers, engineers, and specialists in design and I learned from all of them.

It was a great privilege to be a part of the YRG team. It was exciting because it was a young company, growing in its staffing, its expertise, and its reputation. It was also challenging, because there wasn’t an established system of integration or support for an intern. However, the experience was an important one and one that very much felt like a practical application of many of the principles of IES’s learning model: interdisciplinary, comprehensive, and integrated approaches to building, construction, and holistic systems.
Appendix A

Intent: Achieve increasing levels of energy performance to reduce environmental and economic impacts associated with excessive energy use.

Points available: 10

LEED Requirements:
Option 1 – Whole building energy simulation (from 1-10 points)
Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 by a whole building project simulation using the Building Performance Rating Method.
- Must comply with mandatory provisions in Standard 90.1-2004
- Must include all the energy costs within and associated with the building project
- Must be compared against a baseline building that compiles with Appendix G to Standard 90.1-2004.

Option 2 – Prescriptive Compliance Path (4 points)
- Building must be under 20k sq.ft.
- Building must be office occupancy
- Project teams must comply with Advanced Energy Guide for the climate zone in which the building is located

Option 3 – Prescriptive Compliance Path (1 point)
- Comply with Basic Criteria and Prescriptive Measures of the Advanced Building Benchmark with exceptions: 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked computer Monitor Control
- Project teams must comply with Advanced Energy Guide for the climate zone in which the building is located

LEED Submittals: Complete the LEED Letter Template incorporating a quantitative summary table showing the energy saving strategies incorporated in the building design. Demonstrate via summary printout from energy simulation software that the design energy cost is less than the energy cost budget as defined in ASHRAE/IESNA 90.1-2004.

LEED Submittal Guidance: Points are earned by exceeding the ASHRAE/IESNA Standard 90.1-2004. The first point is awarded for exceeding an ASHRAE/IESNA Standard 90.1-2004 base case by 10.5%, with an additional point awarded for each 3.5% increment above and beyond that.

Documentation should include a list of energy saving features employed in the building, a completed Energy Cost Budget form and an hourly energy simulation output.
Implementation Notes & Comments: Building energy modeling and energy efficiency analysis typically costs around $10-$20k per building. Once the baseline model is constructed, evaluating various efficiency scenarios is relatively cost effective. Energy efficiency measures often have the fastest payback times. New buildings often realize cost savings with payback times of fewer than two years. In some cases, integrated design can reduce HVAC system sizes and reduce initial costs.

Reviewer Comments: Additional information is required to confirm the projected level of savings.

Fan power for the budget case was not listed on the input comparison table. And the units for proposed case fan power were not reported. Please confirm the units of the proposed case fan power, and verify that the proposed fan power is based on installed system performance. Also indicate the fan power used for the budget case, and confirm that it conforms to Appendix G requirements (G3.1.2.9).

It appears that natural gas preheat coils may have been modeled in the Proposed case, but not in the Baseline case. Please revise the Baseline Case preheat coils to match those modeled in the Proposed Design (per section G3.1.2.3)
It is unclear why the large discrepancy in pump energy between the Baseline and Proposed Design. It appears from the input comparison table that neither case should have any pumping energy.

It is unclear where the auxiliary energy is coming from in the proposed design. The preheat furnace may currently be modeled with a continuous pilot, which would cause excess auxiliary energy. This should be revised for the final submittal.

The proposed design domestic water heating in the LEED Submittal template was not selected as natural gas. Please revise the selection to reflect natural gas.

The units used for natural gas were listed as therms, but the data was input into the Submittal template as MBTU. Please revise the units and data entered to be consistent.
Some of the Baseline Case DOE-2 reports show electric resistance supplemental heating for the heat pumps, but the input comparison table and the outputs results do not reflect this supplemental heating. Please revise the input comparison and submittal templates to reflect the values from the DOE-2 outputs, and confirm that heating is modeled per Appendix G requirements. (MOB)

Benefits:
- Reduce operating costs
- Potential reduction of initial costs.
- Reduced GHG emissions
- Reduced environmental impacts of power plants and fossil fuel use
Improving indoor environmental quality via daylight and occupant-tuned ventilation (which may in turn increase occupant productivity and performance)

Climatic Considerations:
Most of the fundamental energy efficient design strategies, such as building orientation and a preference for elongation on the east-west axis, apply regardless of climate, but may need to be interpreted differently for specific sites.

In hot climates, shading, roof reflectivity and spectrally selective glazing to keep unwanted solar gain out, and innovative and/or high-efficiency cooling systems to meet cooling loads are all essential. Ice storage systems to shave mid-day peak electrical demand for cooling can be particularly effective in reducing power utility demand changes, and thus overall energy cost. Ice storage also permits downsizing of chillers.

In cold climates, a tight and well-insulated building shell is of added importance. Optimized insulative glazing can be particularly high value relative to other building shell improvements. Site selection, building location and orientation on site, and landscape design can contribute to reduced thermal loads.

In dry climates there are expanded opportunities for alternative cooling (e.g., evaporative or night-venting) and use of thermal mass to conserve cooling and/or heating energy while improving thermal comfort. Cold dry climates require vapor retarder be applied to the inside of the insulative elements of the building shell to prevent interior moisture migration into walls and roof, thus maintaining the insulative value of the materials. Conversely, hot and humid climates require a vapor retarder just to the inside of the siding or rain screen system to prevent ambient moisture migration into the walls.

Resources:
- Advanced Buildings Benchmark v1.1, New Buildings Institute
- Building Energy Use and Cost Analysis Software; [www.doe2.com](http://www.doe2.com)
- ENERGY STAR; [www.energystar.gov](http://www.energystar.gov)
Appendix B

LEED PROCESS & DOCUMENTATION
MRc7: Certified Wood

CONTRACT FOR SERVICES
This packet outlines the process of implementing, tracking, and documenting the LEED credit for Certified Wood.

Contents:

1. Process / Steps
2. LEED Requirements Overview
3. List of Wood Suppliers
4. Certified Wood Tracking Sheet
5. LEED Documentation Template

Process / Steps

1. Calculate total materials budget of all wood-based products.
2. Complete the LEED Letter Template for submission to the USGBC.
3. The projects goal is to target 50% of all wood-based materials to be Forest Stewardship Council (FSC) certified.

LEED Requirements Overview

Intent
Encourage environmentally responsible forest management.
Requirements

Use a minimum of 50% of wood-based materials and products, which are certified in accordance with the Forest Stewardship Council’s (FSC) Principles and Criteria, for wood building components. These components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors, and finishes.

Include materials permanently installed in the project. Wood products purchased for temporary use on the project (e.g., framework, bracing, scaffolding, sidewalk protection, and guard rails) may be included in the calculation at the project team’s discretion. If any such materials are included, all such materials must be included in the calculation. If such materials are purchased for use on multiple projects, the applicant may include these materials for only one project, at its discretion. Furniture may be included, providing it is included consistently in MR Credits 3-7.

Potential Technologies & Strategies

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed.

FSC Product Suppliers- Colorado Resources

Austin Hardwoods of Denver, Incorporated
975 W. Mississippi, Ave
Denver, CO 80223
www.austinhardwoods.com
Contact: Randy Hass
Phone: 303-733-1292
Fax: 303-744-8604
Email: Randy@austinhardwoods.com

Boise Building Material Distribution
1351 East 66th Avenue
Denver, CO 80229
www.bc.com
Contact: Mike Slater
Phone: 303-289-3271
Fax: 303-289-5572
Email: mikeslater@boisebuilding.com

Lam-Wood Systems Inc.
1736 Boulder Street
Denver, CO 80211
Phone: 303-458-1736
Fax: 303-458-1739
www.LamWood.com

New World Millwork, Inc.
7128 Reynolds Drive
Sedalia, CO 80135
www.newworldmill.com
Contact: Eric Peterson
Phone: 303-791-9003
Fax: 303-791-9013
Email: epeterson@newworldmill.com

Strait Lumber Company
11150 E. Colfax Avenue
Aurora, CO 80010
Contact: Mark Strait
Phone: 303-366-3561
Fax: 303-366-3119
Email: lumberdoc@aol.com

Sutherlands Friendly Home Improvement Center, Inc.
3390 Valmont Road
Boulder, CO 80301
Contact: Steve MacBeth
Phone: 303-443-8891
Fax: 303-443-0468
Email: SteveMac@sutherlandswest.com

Boulder Lumber
2990 Sterling Court
Denver, CO 80306
Contact: Al Jamieson
Phone: 303-443-0582
Fax: 303-443-0343
Email: boulderlumber1@qwest.net

Timber Mountain Hardwoods
14492 E. 33rd Place
Aurora, CO 80011
www.timbermountain.com
Contact: Merlin Miller
Phone: 303-468-8338
Fax: 303-468-8343
Email: mmiller@timbermountain.net
APPENDIX C

NOTES: FSC INTERVIEWS

Boise Building Material (Mike Slater)

- Stock: 2/4, 2/6 species: doug fir (used for framing walls and mostly goes to city of boulder (boulder lumber distributes)
- FSC has additional cost. Same product not FSC and is considerably less priced b/c of cost involved being FSC distributor. Retailer has that cost, and all the way thru
- SFI doesn’t have chain of custody=no additional cost
- Certified wood has grown over the years, FSC to smaller extent due to additional cost
- Can also get plywood
- Osb (poplar) pretty green
- The need for certified==none, osb recognized as being green
- Osb more accepted in market, plywood interchangeable
- Not that many mills that are FSC=limited to what they make and what they specialize in
- McStain==framing package, but no green studs
- Only 3 domestic mills that are certified that he deals with out of 30
- Most mills done with SFI (more industry sponsored certification)
- Timber industry need to present a better image=SFI
- Builders in boulder using FSC (aspen, steamboat), Greenpoints
- Most points found in other avenues due to prices, availability

Lam –Wood

- FSC timbers, glue end beams, and I joists
- Up charge for timber is about 40%, probably
- Rarely private home owner
- Mainly deal with contractors, architects
- FSC seeing more inquiries
Strait Lumber Company (Jeff)

- 2/4, 2/6, plywood
- Customer base is commercial: architecturally driven, some civil/govt, a lot driven by architects
- Growing, but horrible time for wood (building down so bad right now)
- More requests than 5 years ago
- Manufacturers have expanded the product line, which is good, but difficult to gauge right now
- Not sure how long lived the concept will be, b/c manufacturing will incorporate into their processes anyway. Once becomes norm==no need for additional oversight; wwp
- Manufacturers involved in process and controlling it-----
- Any grading agents don’t manufacture, they oversee.
- Along same lines of transition of structural connections---I joists, etc
- No huge benefit for selling, not a bigger profit, time consuming, more expensive, availability a problem
- Speciality
- Market not being driven correctly. FSC linked to green. So much phony green out there, it’s being lumped together with a lot of other stuff.
- Green 18,000 sq foot==only thing “green” is the money
- From mkt/arch/eng/manu/cons == how do we make housing that is more sensible for the avg person?
- Does avg person respond to those sensibilities?
- Doesn’t translate across the board.
- Concept of I joists---make sense, value added, more controllable
- People don’t see it, don’t know what it is, don’t care about it.
- To get people on board---need honest data that can show them a good option
- 10% of housing costs go to dump. 500,000 and 50,000 goes to landfill
- FSC in terms of marketing, better use of resources. Not about saving the planet.
- Save ourselves
- Architects need to know: can’t build 5 million dollar mansion….idea is to cut down and use tree.
- Change design, utilize material correctly
- All FSC in world won’t save anything if people don’t learn how to use the product
- Mapleton Mobile park lot (21st at 4pm)—Michael Hughes, arch school
- FSC what value does it have? If only benefit is for arch that wants LEED points?
- Must go beyond
- 6 trillion used computers—what’re we gonna do with them?
- Consumerism: answer is changing people’s habits
- Side tracked in commercialism. How do we get it thru this cycle where it adds more value to people’s lifestyles?
- No easy answers, need imagination
- Theory: once I learn the right way until someone shows me a new better right way.
- Still building houses same way we’ve done for 500 years.
- Time to take a look at new stuff

**Boulder Lumber**
- 2/4, 2/6 (framing)
- arch firm in golden going thru LEED
- interest is there, more educated about it
- brochures on counter, buildgreen (boulder green building guild)
- 20-25% more than standard
APPENDIX D

SUMMARY: INTERVIEW NOTES, COLORADO FSC SUPPLIERS

The bullet points listed below were taken from various interviews with staff at Colorado lumber yards who have FSC products:

• Most lumber yards stock FSC 2x4, 2x6s and a couple other pieces all for framing purposes
• Can order other FSC products
• There is an additional cost to FSC: this is largely based on the market at the time, quantity, and quality
• FSC also has an increased cost due to the Chain-of Custody regulations: retailer and consumer pay more
• Availability is an issue: out of all the mills the lumber yards deal with, very few process FSC timber
• More people using SFI (Sustainable Forestry Initiative); no additional costs to this program
• SFI: program of the timber industry; many differences between the 2 programs (see: http://www.crest.org/discussion/greenbuilding/200201/msg00520.html)
• There have been increasing inquiries for FSC products over the years (however, currently the housing market is not great and it’s hard to gauge current interest)
• Most requests come from architects, contractors, civil/govt (rarely private home owners)
• Marketing & Education are the big missing link in the success of FSC in the market
• Most people don’t know what FSC is, why it matters, etc
APPENDIX E

COLORADO – Urea Formaldehyde Free Wood Distributors

MANUFACTURER
Marshfield Door Systems, Inc

PRODUCT
12 options, 8 with FSC certification

APPLICATION
Doors

COLORADO DISTRIBUTOR
Colorado Doorways Inc
Sales Department
3333 East 52nd Ave
Denver, CO
80216-2322
Phone #1: 303-291-0900
Phone #2: 800-321-6448
Fax: 303-291-011

MANUFACTURER
Panel Source International

PRODUCT
PureKor Products: including particleboard, door core, MDF, plywood
*Also have FSC certified varieties

APPLICATION
Doors, Millwork, Casework

COLORADO DISTRIBUTOR
Timber Mountain Hardwoods
Contact: Angela Stauffer
14492 E 33rd Place
Aurora, CO 80011
P: 303-468-8338  
F: 303-468-8343  
E-mail: astauffer@timbermountain.net

 Strait Lumber  
Contact: Jeff Wagner  
11150 East Colfax Way  
Aurora, CO 80010-5088  
P: 303-366-3561  
F: 303-336-3119

PRODUCT
Arreis (MDF)

MANUFACTURER
Sierra Pine

APPLICATION
Casework, Millwork

COLORADO DISTRIBUTOR
Consolidated Hardwoods
738 West 119th Avenue  
Broomfield, CO 80038  
Tel: 303-466-1839

Hardwoods, Inc
11402 East 53rd Ave #100  
Denver, CO 80239  
Tel: 303-373-5300

National Wood Products
4747 Ivy Street  
Denver, CO 80216  
Tel: 303-293-8660  
Fax: 303-293-2275

PRODUCT
Core Wood Fiber Particleboard

MANUFACTURER
Roseburg Forest Products
APPLICATION
   Casework, Millwork

COLORADO DISTRIBUTOR
   National Wood Products
   4747 Ivy St
   Denver, CO 80216
   (303) 293-8660

PRODUCT
   PureBond: Veneer Core and Particleboard, JayKore and KayCore

MANUFACTURER
   Columbia Forest Products

APPLICATION
   Casework, Millwork

COLORADO DISTRIBUTOR
   Austin Hardwoods
   975 West Mississippi
   Denver, CO 80223
   303-733-1292

   Consolidated Hardwood
   11850 Vance Street
   Broomfield, CO 80020
   303-466-1839

PRODUCT
   Tru-Spec

MANUFACTURER
   Huber Engineered Woods

APPLICATION
   Millwork

COLORADO DISTRIBUTOR
   Blue Linx
   360 Inverness Dr South
   Englewood, CO 80112
   303.706.8160
   www.bluelinx.com
## APPENDIX F
Rubber Flooring

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product</th>
<th>Environmental Overview</th>
<th>Product Notes</th>
<th>Warranty Info</th>
<th>Website &amp; Contact Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnsonite</td>
<td>Replay</td>
<td>Rubber tiles and rolls</td>
<td>Offers thermal comfort</td>
<td>2 years from date of installation</td>
<td><a href="http://www.johnsonite.com">http://www.johnsonite.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manufactured from recycled, post-consumer truck tires</td>
<td>Minimizes noise</td>
<td></td>
<td>Johnsonite 16910 Munn Road Chagrin Falls, Ohio 44023 Toll Free: 800.899/8916 Phone: 440.543.8916 Fax: 440.543.8920 or 440.543.5774</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No PCB, CFC, asbestos or formaldehyde additives</td>
<td>Ease of tile replacement saves material and labor costs</td>
<td></td>
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<td></td>
<td></td>
<td>Can be installed w/VOC free Power Tape or adhesives that meet/exceed regulatory VOC limits</td>
<td>Shipped in bulk on returnable pallets; no packaging</td>
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<td></td>
<td></td>
<td>Interlocking tile option requires no adhesives</td>
<td></td>
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<td></td>
<td></td>
<td>No phosphates or solvents required for cleaning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecosurfaces</td>
<td>EcoEarth</td>
<td>Supports ASTM E2129-01 Sustainability Assessment</td>
<td>Stain resistance</td>
<td>5 year warranty</td>
<td>Ecosurfaces <a href="http://www.ecosurfaces.com">http://www.ecosurfaces.com</a></td>
</tr>
<tr>
<td></td>
<td>EcoStone</td>
<td>Meets State of Washington standard for low VOCs</td>
<td>Easy install &amp; maintenance</td>
<td></td>
<td>Commercial Flooring c/o Gerbert Limited 119 South Tree Drive, Lancaster, PA 17603 Tel: (877) 326-7873 or (717) 299-5035 Fax: (717) 394-1937</td>
</tr>
<tr>
<td></td>
<td>EcoNights</td>
<td>Composed of 100% post-consumer and 30% post-industrial material</td>
<td>Single-ply, non-laminated</td>
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<td></td>
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<td>E-Grip™ II one-component urethane adhesive delivers 50% lower VOCs than most demanding standard in the industry (SCAQMD)</td>
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</tr>
<tr>
<td>To Market</td>
<td>Atmosphere</td>
<td>Recyclable and sustainable product (recycled, post-consumer fire rubber granules)</td>
<td>Exceptional durability</td>
<td>2 year warranty</td>
<td>TO MARKET 3844 N. W. 8th Street, Oklahoma City, Oklahoma 73107 1(866) 772-4772</td>
</tr>
<tr>
<td></td>
<td>Recycled Rubber Flooring</td>
<td>Passes VOC Emissions for Washington State</td>
<td>Tiles can be flipped or replaced for double life</td>
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<tr>
<td></td>
<td></td>
<td>No adhesives required</td>
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<tr>
<td>Expanko</td>
<td>Reztec</td>
<td>Made from recycled tires, post industrial waste rubber and virgin rubber</td>
<td>Durable</td>
<td>5 year warranty</td>
<td>Expanko, Inc. 1129 West Lincoln Hwy Coatesville, PA 19320, USA Phone: 800.345.6202</td>
</tr>
<tr>
<td>(*used in the Boulder REI store)</td>
<td></td>
<td>post consumer waste depends on color (ranges from 0% to 90%)</td>
<td>Easy to maintain</td>
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<td></td>
<td></td>
<td>VOC standards below South Coast Air Quality Management District</td>
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<td></td>
<td></td>
<td>All Expanko adhesives, sealers, and polyurethane meet VOC limits</td>
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</tbody>
</table>

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