



COLORADO BUILDING GREEN

The official newsletter of the U.S. Green Building Council - Colorado Chapter

March 2007
// CONTENTS

Project Profile: Habitat for Humanity Zero Energy Home
pg. 1

LEED Update: Value to Developers and Real Estate Market
pg. 4

Regional Roundup: The 2010 Imperative Global Emergency Teach-in
pg. 6

Newsletter Makeover *pg. 6*

Executive Director Corner: Green Mag: Designed for the Future
pg. 7

Membership Update *pg. 7*

Colorado LEED Projects *pg. 8*



Photo courtesy of John Fielder's Colorado

Project Profile // Exploring Highlights of Colorado's Latest Green Designs

Habitat for Humanity Zero Energy Home

Collaboration Makes Zero Energy Affordable



by Daniele Loffreda, LEED AP, Plateau Enviro Associates

How's this for a challenge? Create a zero net source energy (as opposed to site energy) home as defined by the Department of Energy's Building America program. Design it to operate in the extremes of Denver's unpredictable climate, using off-the-shelf, readily available technologies. Keep the mechanical systems as simple and uncomplicated as possible. Incorporate energy-efficiency strategies that don't require the home owners to be experts in sustainable building operations or conduct any maintenance beyond that required of a 'normal' home.

Not overly difficult, you might say?



The NREL/Habitat Zero-Energy Home utilizes double-stud walls that leave more room for insulation than regular single-stud walls.

Photo by Paul Norton

Add that the design must be replicable for future Habitat for Humanity homes, utilize low-cost construction materials, and allow volunteer-friendly construction techniques. Still with me? The clincher: The target market is the affordable housing sector. Impossible, you might say? Challenging yes, but not impossible for an integrated design team of NREL

engineers and Habitat for Humanity staff and volunteers. The finished product is a 1,200 square foot, three-bedroom reduced income home that actually produces more source energy than it consumes!

Design Considerations

The combination of energy engineers, a construction manager a real



Habitat for Humanity Zero Energy Home *continued*

estate development manager and Habitat volunteers on the design helped strike a balance between engineering ideals based on energy modeling, cost realities inherent in affordable housing, and considerations involved in a volunteer construction crew.

Habitat's volunteer labor advantage steered the design team to approaches that favored low materials costs and high labor costs. While this approach minimizes the substantial labor cost, when combined with the affordable housing requirement it restricts the range of sustainable strategies available. For example, strategies such as structured insulated panels (SIPs) and insulated concrete forms were not considered because of their high cost. Similarly, the requirement for volunteer-friendly construction techniques and ease of replication eliminated the option of using Straw Bale. The design simplicity requirement eliminated the possibility of a combined solar space heating and water heating system. Finally, the zero energy requirement, given Denver's cold climate and the current high cost of PV systems, required some trade offs that some 'purists' might consider controversial.

Design Approach - Envelope

Given the considerations described above, the design team decided to



The 1,200 sq ft home uses passive and active solar features to help reach the zero energy goal.

focus first on reducing the home's energy load as much as possible, and then size the PV system to meet the remaining electricity needs. The first place to look? Yes, you guessed it – a passive solar orientation with a 'super insulated' envelope. Starting with a standard Habitat three-bedroom, 26 x 46 square foot design with a crawlspace, the team increased the South-facing glazing area and reduced the North, East and West facing glazing area. Next, a double-stud wall with fiberglass batt construction was selected to take advantage of its relatively low cost, volunteer-friendly technique and Habitat's low construction labor cost. Blown fiberglass installed in the attic achieved an R-60 rating and insulated floors achieved an R-30 rating. While the double stud

wall design, with exterior structural studs spaced at 16 inches O.C. might not achieve LEED Homes Advanced Framing Techniques points, the interior studs spaced at 24 inches O.C. certainly meet the requirement. The R-3 fiberglass batts in the exterior wall cavities and the R-13 filling the space between the exterior and interior walls as well as the interior wall cavities definitely help optimize energy performance. An outer vapor-permeable house wrap and fiber cement siding, with an inner poly vapor barrier plus drywall adds to a very 'tight' whole-wall-R value. Blower tests yielded a natural infiltration rate result of 0.15 ACH, a very 'tight' indication.

Heating and Ventilation

With the house's heating energy

needs drastically reduced through this super-insulated shell, the design team then focused on the heating and ventilation system. Note that I didn't mention heating, cooling and ventilation system. Yet another design challenge! Habitat for Humanity Metro Denver has a policy of not equipping its homes with air conditioning. This meant that the final design had to maximize heat reduction (for example by maximizing solar gain) without increasing the cooling energy load.

To supply a proper amount of fresh air to the house while minimizing potential for energy loss, the team opted for an energy recovery ventilation (ERV) system with efficient electronically commutated motors. The system exhausts air from the kitchen and bathroom, and supplies fresh air to the living room and bedrooms. Heat loss from ventilation is reduced because the ERV system heats the incoming air with warmth from the exhaust air.

The design team soon discovered that a very low heating load is a double edged sword. On the one hand very little energy is required to heat the house. On the other hand, most commonly available heating systems are oversized for such low heating needs, and overly complicated or expensive systems cannot be cost-justified. After



Habitat for Humanity Zero Energy Home *continued*

carefully considering a variety of high-efficiency heating systems, and much internal debate, the team decided to follow a hybrid approach of electricity from the PV system, and natural gas.

Controversial Approach

Some of us who are 'purists' may turn up our noses at the thought of a zero energy home using natural gas. However, the economics involved convinced the design team that a hybrid approach was the best solution.

The hybrid approach allowed the team to size the PV system that is affordable, offsets the use of natural gas as well as any grid generated electricity, and thus allows the home to achieve (and even surpass) the goal of net zero source energy. The hybrid space heating system combines a pointsource direct-vent natural gas furnace in the dining room and living area, with small baseboard electric-resistance heaters in the bedrooms.

Water Heating

The design team selected a solar water heating system – rather than a combined space/water hearing system – for simplicity, backed up by a natural gas tankless water heater. The team calculated that the 96 square foot collector area and 200 gallon water storage would result in an annual solar-savings

fraction of 88%. They opted for the tankless natural gas back up heater after finding that the tankless system uses zero heating energy whenever the solar water tank is at or above 115 degree water delivery temperature.

The Crowning Element

Having reduced all possible energy loads as much as possible, the design team zeroed in on the lighting, appliances and miscellaneous electric loads (MELs). They installed compact fluorescent light bulbs throughout the house, and ENERGY STAR label appliances. This left the miscellaneous electric loads, from TV, hair dryer, toasters, computers, and anything else that could be plugged in by the occupants. Using Built America benchmark assumptions on MELs, the team settled on a 4kW PV system. Because the Built America assumptions on based upon a national average of a 'typical' American household, the actual occupant use and local climate may either block the home from achieving zero energy usage, or propel it to the ranks of 'net energy producer.'

The Verdict

Initial test results were encouraging. From the February to July of 2006, the PV system produced 1,600 kWh more electricity than the house

consumed. Factoring in the natural gas used for space heating and water heating backup, the house produced 75% more source energy than it consumed. Although a longer testing period is required, it's a safe bet to say that the house will be an annual net energy producer rather than just achieve net zero energy user. However, this could change if the occupants begin using more than the average calculated into the Built America benchmark.

And the home owners? While it is true that the house is a net energy producer, they unfortunately are not free from utility bills. There is the monthly charge for the natural gas, as well as fixed charges for the electric grid and natural gas connection fees. From October of 2005 to May of the 2006, the owners shelled out an average of \$18.25 per month in energy bills. Because the fixed monthly charges averaged 80% of those bills, in actuality the family used on average \$14.60 worth of energy.

For those of us who suffered through \$200+ monthly energy bills during that same period, those results are very compelling.

*Sources: Clayton Bartczak, Habitat for Humanity of Metro Denver
Paul Norton, NREL THE LITTLE HOUSE THAT COULD*

The PV system

The PV system selected by the design team uses the local utility grid for storage, thus eliminating the substantial cost of the storage battery. When the system is producing more energy than is being used, it delivers energy to the grid. When the system produces less energy than it produces, it draws electricity from the grid.

When the system draws electricity from the grid, it is likely drawing fossil-fuel generated electricity. Although a larger sized PV system may minimize the volume of electricity drawn from the grid, the cost of larger systems is prohibitive. The design team opted to include natural gas in order to reduce the size of the PV system by 1.1 kW, making it much for affordable for a Habitat Home. The team designed the system to offset the natural gas used, thus achieving, and even surpassing, the goal of net zero source energy.

The hybrid approach allowed the team to size the PV system that is affordable, offsets the use of natural gas as well as any grid generated electricity, and thus allows the home to achieve (and even surpass) the goal of net zero source energy. The hybrid space heating system combines a pointsource direct-vent natural gas furnace in the dining room and living area, with small baseboard electric-resistance heaters in the bedrooms.

Value to Developers and Real Estate Markets

Precertification valuable for LEED - Core & Shell registered projects



by Courtney France,
President France
Sustainable Solutions

It is worthy to acknowledge the U.S. Green Building Council's recent efforts to encourage the owner/developer segment to pursue and market sustainable green features in proposed building projects. LEED tools like LEED-Core & Shell, LEED-Commercial Interiors, and LEED Precertification provide the speculative development and tenant fit-out markets with a means of achieving environmentally responsive buildings within a more defined framework.

In developing this article, I originally planned to feature local Colorado projects participating in the Precertification for LEED-Core & Shell program. However, after doing some research I found that very few people are aware of the program, and even fewer fully understand its unique value.

A Brief History: *It all started with LEED – Core & Shell*

The LEED Core and Shell rating system is intended to provide a set of performance standards for certifying the sustainable design and construction of speculative, and core and shell buildings. LEED defines Core & Shell projects as typically including structure, envelope and building-level systems such as central HVAC. The Core & Shell rating system only applies to speculative building projects for which the developer controls less than 50% of the interior fit-out.

The Hurdle: *Why LEED-CS Was Not Working for Developers*

Although the LEED-CS rating system adequately addresses the limited influence a developer has on speculative building space, certification for the green design and construction practices is not awarded until the project is complete.

For the majority of speculatively developed space, the real estate team is pressured to lease, rent, or sell the building space prior to project completion - and sometimes even before construction commences!

In such cases, building valuers/auditors, leasing agents and real

estate marketing departments struggle to confirm, recognize, and even publicize the sustainable features in the development project. The ultimate question from the developer and real estate markets was, "How can LEED-CS building certification be valued in my marketplace?"

The Solution: *USGBC Offers LEED-CS Precertification*

Precertification provides speculative developers with the ability to market to potential tenants, buyers, and financiers, the valuable green features in the proposed building. When an owner or developer establishes a goal to develop the speculative space to comply with the LEED-Core & Shell design and construction requirements, the USGBC can formally recognize the project with a Precertification award.

The value to the developer/owner is that the project does not have to be under construction or complete in

order to receive the Precertification award that enables them to market the high performance green features of the project. However, the Precertification award is not a confirmation, commitment, or guarantee from the USGBC of a final certification under the Core & Shell rating system.

How it Works: *The LEED Precertification Process*

The Precertification award is based on an early design stage review by the USGBC. Supporting documentation, like pre-formatted templates, calculators, and brief narratives, must be submitted in order to confirm the project's intent to achieve the targeted LEED-CS credits and prerequisites.

Precertification is only applicable to registered LEED - Core & Shell projects. As of December 18th, 2006, the LEED-Online tool officially featured core & shell project applications. The availability of LEED-CS Online allows the

"After doing some research I found that very few people are aware of the program, and even fewer fully understand its unique value."



Value to Developers and Real Estate Markets *continued*

project to utilize the electronic letter template documents for the Precertification documentation. The USGBC plans to integrate the Precertification submittal documentation into LEED-Online, and expects to have Online Precertification available for use by Summer of 2007.

The Precertification, and eventual LEED-CS Certification, steps are described below:

1. LEED coordinator registers the project with USGBC for LEED Core & Shell v2.0 (CS Registration Fee – see www.usgbc.org for rate table).

2. LEED coordinator accesses project's LEED-CS v2.0 letter templates (via the project's C&Sv2.0 LEED-Online access).

3. LEED coordinator completes all letter templates and supporting narratives applicable to credits being pursued - narratives explain the actions that the project team will undertake to ensure that specific credit intent and requirements will be met upon submission of the formal LEED-CS certification application.

4. LEED coordinator submits two hard copies (or electronic copies) of letter templates, supporting narra-

tives, drawings, site plans, elevations, floor plans, final LEED-CS Scorecard, and Precertification fee (fixed \$2,500.00 USGBC Members, \$3,500.00 Non-members) to USGBC for review.

5. Project is awarded Precertification designation in approximately one month of application submission (certificate & letter provided to team).

6. Project can market Precertification level, and continue with design and construction phase as usual.

If project is seeking LEED-CS certification after Precertification is awarded, the following steps would occur:

7. Project continues design and construction, complying with LEED-CS v2.0 protocols for targeted credits, or level being pursued.

8. Project, led by LEED coordinator, submits Design Phase LEED-CS credit documentation to USGBC for review.

9. Project is notified of the Design Phase LEED-CS credit score.

10. Project continues construction,

complying with LEED-CS v2.0 protocols for targeted construction-related credits.

11. Project submits Construction Phase LEED-CS credit documentation to USGBC for review.

12. Project is notified of the Construction Phase LEED-CS credit score, as well as, awarded the overall LEED-CS Certification level.

Precertification Market Status: *Who is using LEED-CS Precertification?*

To date, the USGBC is actively Precertifying LEED-Core & Shell registered projects. The numbers reported below must be qualified – the total statistics for LEED Precertified projects are based on the number

of projects that have accepted, approved, and resubmitted the acceptance form for formal notification of award. In other words, many more projects have submitted for Precertification, and have been awarded a Precertified certification level from the USGBC, however, the Project Team has not formally accepted the award. Therefore, the project can not be added to the numbers below.

For additional questions related to applying the LEED-CS Precertification process to your project, contact the USGBC's LEED Customer Service at 202-742-3780. Look for Precertification submission updates and release of the new Precertification LEED-Online tool by the USGBC in the near future.

LEED – Core & Shell Precertification

Project List (as of Feb/2007)

LEED-CS Precertified United States Projects = **30**

LEED-CS Precertified Canada Projects = **2**

LEED-CS Precertified China Projects = **4**

LEED-CS Precertified Italy Projects = **1**

The 2010 Imperative Global Emergency Teach-in

by *Conor Merrigan*

On February 22, the USGBC Colorado Chapter, Emerging Green Builders, and AIA student chapter jointly co-sponsored a viewing of the live web cast of the 2010 Imperative: A Global emergency Teach-In.

This live event was held in conjunction with hundreds of other groups across the world, all simultaneously viewing the comments of a panel of highly respected experts discuss climate change and what can be done about it.

The 2010 imperative is a specific challenge to integrate energy efficient design – and eventually carbon neutral design – into our higher edu-



cation programs. The local viewing was held at the CU Denver building on 15th and Larimer and was attended by about 20 participants from the professional and student communities.

Architecture student and emerging green builder Sergio Preston had this to say: “Although the information

and message of the speakers was great, what was particularly cool was feeling involved in a simultaneous, global event. The threat of impending climate change is frightening, but I feel encouraged knowing that there are other people around the world who are also thinking and acting on solutions.”

The event featured presentations given by prominent experts, including Susan Szenasy, Editor of Metropolis magazine, Dr. James Hansen, Director of the NASA Goddard Institute for Space Studies, AIA Founder Edward Mazria, and Chris Luebke-

“What was particularly cool was feeling involved in a simultaneous global event.”

man, Director Global Foresight and Innovation Initiative. Following the presentation, the worldwide audience e-mailed questions to the panel members that were answered live after being sorted for relevance.

Questions came from all sorts of people, and ranged from highly technical issues, to a second grader asking what he could do to help his parents correct their non-sustainable habits. The

idea of personal change was stressed throughout the event, along with a number of challenges specific to the built environment.

Newsletter Makeover

Colorado Building Green gets redesigned for 2007 and beyond

This month, the newsletter has been reformatted with green in mind. The new horizontal orientation is designed to maximize size for on-screen viewing. The hope is that readers will view the newsletter on

their screens in lieu of printing it out to read it.

Included on the cover are images corresponding to the current season by Colorado photographer, John Fielder. Readers can also easily find

and navigate to their articles of choice by clicking on them in the Contents column.

Other changes will be less obvious, like color changes for each season to compliment the John

Fielder images and the addition of pull quotes in articles.

The newsletter’s redesign can be credited to Sarah Rege of RNL Design and her husband, Josh Rege of Liquid Inc.

Green Mag: Designed for the Future



by Amy Jiron,
USGBC, Colorado

While Colorado volunteers were soliciting publishers for a local green magazine to launch at Greenbuild, Tom Brock of Brock Publishing had his own ideas about sustainability and green. He had been an advocate of environmental issues since the first Earth Day in the 70s, taking an environmental slant in most of his publications including Boulder Magazine and Home & Garden Magazine.

When the opportunity opened up to partner with USGBC-Colorado in a new sustainability magazine, he enthusiastically applied. Brock sought out information from the community to assess the market for this type of information. From this research, he determined that within the Rocky Mountain region there was a desire and need. And so Green Magazine: Solutions for a Sustainable World was born to communicate a broad spectrum of information about what's happening in the world of green, focused on educating people about what sustainability means: from energy and recycling

to organizational management and financial investing.

In attempt to 'walk the talk', the new magazine would be assembled with Forest Stewardship Council certified wood, and/or 100% post-consumer recycled non-chlorinated paper, soy-based inks, and with hopes of a better than carbon-neutral footprint. But with environmental responsibility in mind, Brock came to the conclusion that a physical, paper product was not a necessary element of a successful magazine. In fact, the ONLY way to reduce the environmental footprint of the magazine was to bypass most of the materials, manufacturing and transportation impacts completely.

Now, a highly innovative, socially, environmentally and economically responsible (yes, that's the triple bottom line) way to distribute information, Green is designed for the future, including interactive capabilities and real-time reporting. Upcoming articles include a cross-disciplinary column and corresponding blogs covering a new green hospital development. The article will feature links to green products and resources used as part of the project, straight from the article



Cover, Green Magazine

website.

You can check out Green without impacting your own carbon footprint at greenmagonline.com. Subscribe to the free Green e-newsletter (which consequentially had a very successful opening rate of 40% within the first 24 hours).

Green Magazine: Solutions for a Sustainable World
<http://www.GreenMagOnline.com/greenmag@brockpub.com>
Brock Publishing, 303.443.0600

Membership Update

Welcome New USGBC Colorado Chapter Members!

January–March

Elizabeth Leary
Hayden Hirschfeld
Marc Perusse
Sonrisa Lucero
Tatyana Lemon
Marcey Bonnett
Richard McCutcheon
Peter Szilagyi
David Witte
Bethany Utke
Sally Ranney
Jennifer Allison
Courtney Harms
Tony Casey
Katie Cunningham
Tina Oster
Lary LaMette
Gerry McNally
Craig Niemeyer
Shelly Renee Gerritsma
Jill Dalglish
Jennifer Chaplin

Colorado LEED Projects

Certified Projects

BUILDING	CITY
Sundeck Restaurant (NC 1.0 Bronze)	Aspen
CH2M Hill South Building (NC Certified)	Englewood
CH2M Hill West Building (NC Certified)	Englewood
CH2M Hill North Building (NC Certified)	Englewood
North Boulder Recreation Center (NC Silver)	Boulder
Boulder Community Hospital (NC Silver)	Boulder
U.S. Department of Transportation (NC Silver)	Lakewood
Denver Place (EB 1.0 Gold)	Denver
Russell T. Tutt Science Center (NC Certified)	Colorado Springs
Snowmass Golf Clubhouse (NC Silver)	Aspen
Colorado Springs Utilities Laboratory (NC Silver)	Colorado Springs
Fossil Ridge High School (NC Silver)	Fort Collins
University of Denver, College of Law (NC Gold)	Denver
Belmar 2M3 (NC Silver)	Lakewood
State of CO Dept. of Labor and Empl. (NC Cert)	Denver
Boulder Associates, Inc. (CI Gold)	Boulder
Pikes Peak Regional Development Center (NC Silver)	Colorado Springs
ProLogis (NC Cert)	Denver
Univ. of Colorado Memorial Center (EB Silver)	Boulder
Classrooms of Guggenhiem Hall (CI 1.0 Silver)	Fort Collins
Alliance Center (EB Gold)	Denver
Porter Industries Building (EB Gold)	Loveland
City of Fort Collins Vehicle Storage Building (NC Silver)	Fort Collins
DTJ Design Office Expansion (CI Gold)	Boulder
RMI Offices (CI Platinum)	Boulder
Byron G. Rogers U.S. Courthouse (EB 1.0 Gold)	Denver
Main Street @ NorthField Stapleton (CS 1.0 Silver)	Denver

Certified LEED H Projects

BUILDING	CITY
Harvard Communities	Denver
McStain Neighborhoods	Denver
New Town Builders	Denver



Harvard Communities, Denver



McStain Neighborhoods, Denver



VISION

Promote responsibility for Colorado's environmental legacy.

MISSION

Advance and promote sustainable planning, design, construction and operation of the built environment through education, improving industry guidelines, policy advocacy, and information and resource sharing.

BOARD OF DIRECTORS

Tom Hootman, President

RNL Design

Amy Jiron

USGBC, Colorado

Tim Carey

Johns Manville

Dana Kose

A. Mortenson

Jeff Pring

Aardex

Jay Griffin

Norris Design

Rick Gulick

Rocky Mountain Foam

Michael Haughey

Silvertip Integrated Engineering Consultants

Peter D'Antonio

PCD Engineering

Greg Borst

Swinerton Builders

Christy Woodward

Tetra Tech EM, Inc.

Conor Merrigan

Daniele Loffreda

Palteau Enviro

Colorado Building Green is the official newsletter of the U.S. Green Building Council – Colorado Chapter, and is published monthly. The newsletter is distributed electronically via e-mail. To add or remove your name from the mailing list, or to submit story ideas and other information for publication, please contact the editor at tom.hootman@rnldesign.com.

100 Friends of Colorado

Platinum \$5000

MORTENSON

**JOHN FIELDER'S
COLORADO**
johnfielder.com



East West Partners
A FAMILY OF RELATED COMPANIES



STRUCTURAL ASSOCIATES



CONSTRUCTION LEADERS



Joint Platinum Supporter



Joint Platinum Supporter



Gold \$2500



Silver \$1000

Gensler



Joint Silver Supporter



Join the 100 Friends of Colorado. For more information please contact Amy Jiron at (303) 229-9424 or amy@usgbccolorado.org.