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U.S. EPA Administrator announces green building design competition winners

SAN FRANCISCO – During a ceremony at the West Coast Green Conference in San Francisco, U.S. Environmental Protection Agency Administrator Stephen Johnson announced winners of the inaugural Lifecycle Building Challenge competition.

EPA Administrator Johnson, along with the American Institute of Architects President RK Stewart, and Building Materials Reuse Association President Brad Guy, recognized award winners for their cutting-edge green building ideas that aim to reduce environmental and energy impacts of buildings.

Ideas from the design contest will jumpstart the building industry to help reuse more of the 100 million tons of building-related construction and demolition debris sent each year to landfills in the United States.

The “Lifecycle Building Challenge” – partners the U.S. EPA, the Building Materials Reuse Association, the American Institute of Architects and West Coast Green – invited professionals and students nationwide to submit designs and ideas that support cost-effective disassembly and anticipate future use of building materials. Green Building Blocks, the competition sponsor, provided cash awards to student winners, and Green Building in Alameda County provided the awards.

Lifecycle building maximizes material recovery to reverse the trend of disposing of large quantities of construction and demolition debris in landfills. Reusing building components also reduces energy and greenhouse gas emissions associated with producing and transporting materials.

In the United States, buildings consume 60 percent of total materials flow (excluding food and fuel) and account for 33 percent of the solid waste stream. Building renovation and demolition accounts for 91 percent of the construction and demolition debris generated each year, while new construction accounts for only 9 percent. Between 2000 to 2030, 27 percent of existing buildings will be replaced and 50 percent of the total building stock will be constructed.

These issues can be addressed by planning for a building or building component's eventual deconstruction or adaptation. By creating building components that can be easily recovered and

reused, materials are kept at their highest value, resulting in reduced consumption of energy and resources.

The challenge grew out of a project that the EPA helped fund at the Chartwell School in Seaside, Calif. that demonstrates lifecycle building concepts. The school tested new systems including nail free paneling, centralized utility raceways, structural insulated panel roofing, and cold joint sidewalks that can be easily moved for reuse. Results from Chartwell's case study are available on the challenge's Web site.

The challenge, open to built and un-built work, was launched in January and open for four months. The categories include:

- **Building**—an entire building from foundation to roof
- **Component**—a single building assembly, system, or connector
- **Service**—a tool, method, or other idea

The winners, selected by a panel of expert judges, are listed below and include contact information:

Building category

Pavilion in the Park (Professional – Built)

Erin Silva, architectural designer, The Miller|Hull Partnership, Seattle, Wash.

Building that separates into four modules and can be moved by truck

The 11,100 square foot Pavilion in the park's entire structure is designed for future transportation, reassembly and reuse in a new location. The building's parts separate at three integrated joints to break into four separate modules that can be moved on trucks by surface street. The building sits lightly on the land atop short concrete piers allowing the grade and vegetation to run uninterrupted beneath. Gangway ramps with integrated hinged joints allow the ramps to adapt to the topography of future locations. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=35>

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GreenMobile Factory-built Housing Units for SE USA (Professional – Unbuilt)

Michael Berk, professor, Mississippi State University School of Architecture, Mississippi State, Miss.

Adaptable mobile home unit for disaster relief and permanent use

The GreenMobile™ envisions affordable, factory-built energy efficient mobile home units that meet International Residential Code for housing with structurally-sound foundations, demount for easy relocation, and can function in a place with a limited infrastructure or no utility grid in place. They can be used for immediate disaster relief housing, including first responders, and later converted to permanent housing. The project incorporates systematic strategies for growth and change as family structures also grow and change. "Pre-fabricated plug-in" rooms, plug-in porches, and surface mounted wiring are also featured in the design. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=96>

Michael Berk

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The groHome (student)

Adam Fenner, Jason Bond, Thomas Gerhardt, Josh Canez, Nick Schaidler, students, Texas A&M University, 2007 Solar Decathlon Team, College Station, Texas

Open source housing modules to meet changing family and community needs

The open source concept used in the software community is adapted in this entry to develop open source building systems allowing anyone to design and incorporate elements into the building system if grid protocols and standard joint connections are used. Using a library of pre-manufactured components brought to a site and assembled efficiently, the structure is designed with a specialized bolted connector joint that allows for components to be unplugged easily and without damage. Radio Frequency Identification Tags (RFID) can be embedded to take inventory and check the history of components. The project includes a community building game, Utopia 2.0, to allow neighbors to swap building modules as family and community needs change.

<http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=84>

Adam Fenner

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Sustainability by Design: Deconstruction and Adaptive Reuse (People's Choice Award)

Mitch Boucher, Haworth, Inc., Holland, Mich.

Comprehensive 99 percent reuse and recycling construction project

When Haworth, a global designer and manufacturer of adaptable workspace environments, planned major renovations on its headquarters, the company set a goal to recycle or salvage up to 75 percent of the materials. The project diverted more than 99 percent of construction materials through reuse and recycling: 321 tons of steel were recycled; 75 workstations were donated; and door locksets were removed intact and reused in other facilities. More than 58,000 tons of carpet tiles were removed for re-installation, donated to local schools, or recycled.

<http://www.lifecyclebuilding.org/entries/106331text.htm>

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Component Category

Green-Zip-Tape™ Demountable Tape (Professional - Built)

Frank Little, founder, Tax Advantage Design, Magnolia, Texas

Drywall tape attachment system to support easy deconstruction and reuse

Patented demountable tape provides an alternative method for hanging sheetrock for later deconstruction and reuse. Drywall has traditionally been a barrier to gaining easy access to structural components of the building for repair or reuse. This tape and associated screw connectors allow drywall to be easily removed and replaces the traditional nailing mechanism, which can damage the drywall and inhibit reuse. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=90>

Frank Little

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Deconstructable and Reusable Composite Slab (Professional – Unbuilt)

Mark D. Webster, Dirk M. Kestner, James C. Parker, Matthew H. Johnson, structural engineers, Simpson Gumpertz & Heger, Inc., Auburndale, Mass.

Reusable structural floor system

The composite component system uses specialized bolts, serrated clamps, and cast-in channels to create a more easily disassembled system, allowing reuse of the composite slab. A serious problem with conventional composite slabs is that it is a "throw-away" system; most of the parts are completely non-reusable at the end of the building's life. The team developed a composite slab system that maintains the efficiency benefits offered by composite action, while adding near 100 percent reusability. The structure allows the slab and beam to work together to resist bending due to floor loads. The size of the steel beam can be reduced by over 30 percent providing both economic and environmental benefits. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=46>

Mark Webster

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Guidelines for Building with Reusable Materials (Student)

Aaron Tvrdy, University of Nebraska, Lincoln, Neb.

Creative designs from reused building materials collected regionally

This project foresees waste materials gathered in bulk, refurbished, and stored in regional design centers where designers can create components out of former waste. One example uses discarded railroad track and ties to create a superstructure for a wood pallet wall system. With a creative design approach, reclaimed material kits can be used to create attractive components that can either celebrate or conceal their original identity. <http://lifecyclebuilding.org/gallery-detail.php?EntryID=56>

Aaron Tvrdy

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Tool and Service Category

ATHENA Assembly Evaluation Tool (Professional – Built)

Wayne Trusty, ATHENA Institute, Portland, Ore.

Software on the lifecycle environmental impacts of building assemblies

Life Cycle Analysis (LCA) is one tool for determining environmental impacts of various building materials through all phases of its life, from extraction through use and disposal. The ATHENA software tool adopts LCA methodology to measure the climate-changing potential and other environmental impacts of more than 400 common building assemblies. A generic version will be made available, free of charge, to the entire sustainable construction community.

<http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=13>

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Deconstruction Engineer (Student)

Keith Cullum and Paul Sargent, California Polytechnic State University, Yorba Linda, Calif.

Proposed new profession to support building deconstruction

The project proposes a new degree program and profession: the deconstruction engineer. These professionals would consult throughout a building's lifecycle to ensure that adaptation and deconstruction occur in the most effective way. During the first stages of planning a structure, the engineer offers design suggestions to anticipate efficient deconstruction. At the end of a building's life, the deconstruction engineer evaluates and assesses safe reverse construction procedures for salvaging materials. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=75>

Keith Cullum

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Honorable Mentions

Modular 3

Dan Rockhill, Studio 804, University of Kansas, Lawrence, Kan.

Flexible single family home with movable walls

This two bedrooms and one bath residence uses all of the 1,200 square foot of living space that is composed of six modules. The proportions of Modular 3 have been tailored to dimensions of a standard city lot, and a raised pier foundation allows for low-impact implementation in nearly any single-family residential context. A movable storage wall permits splitting an area such as a single bedroom into a separate office and storage space at the homeowner's whim.

<http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=74>

Dan Rockhill

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Re-use of Cleveland Iconographic Structure

Dru McKeown, TOI Studio, Lakewood, Ohio

Transit stations and street furniture made from a building façade

Instead of creating new building systems, designs for bus and light rail transit stations and street furniture were created out of the façade of a building slated for demolition. The project recaptures the materials and embodied energy that were spent creating the initial structure. The entrant calculated that the average building's embodied energy is equivalent 10 – 15 gallons of gasoline per square foot and that materials in an average American home have embodied energy equal to 29.25 autos weighing 1.5 tons. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=81>

Dru McKeown

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Transformative Multi-family Housing

Koji Saida, Mimi Sullivan, Hyun Joo Choi, Keiko Ito, architect, Saida + Sullivan Design Partners, San Francisco, Calif.

Shape shifting residential and office space

The transformative multi-family housing is a mixed use project with 12 residential units and one retail space on the ground level. By standardizing all the building components and using a simple

connection system, the entire building's components can be easily deconstructed, reused and recycled. By exchanging some standardized wall panels, a 2-bedroom unit transforms into a 3-bedroom unit and by removing all non-bearing walls, the three residential units that are grouped as typical can be transformed into office use. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=17>

Koji Saida

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Nine Components to Residential Architecture

Anthony Piede, student, Georgia Tech, Atlanta, Ga.

Flexible modular housing with steel bearing pin foundation

An integrated system that simplifies design, construction, and disassembly with a pyramid foundation raised on steel bearing pins to allow easy assembly and disassembly without poured concrete. Other featured components include modular decking frame, reclaimed wood decking, flitch beams and columns with simple screw and bolt connections, prefabricated structurally insulated panels, insulated glass units with optimal thermal performance, and snap-on panel aluminum roofing. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=25>

Anthony Piede

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Community Revival Shelter

Greta Modesitt, student, University of Virginia, New York, N.Y.

Innovative structures for community rebuilding in disaster areas

The concept creates transitional community spaces to support cooperation amongst the inhabitants while they renovate their post-disaster neighborhoods. An umbrella superstructure protects rebuilders from the elements while temporary steel web, cardboard, and fabric structures designed for off-the-grid living are erected and used until rebuilding of permanent structures is complete.

<http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=80>

Greta Modesitt

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Joist Lock

David Wilson and Michael Kozel, engineer, AVAVA Systems, LLC, Berkeley, Calif.

Rigid wood connecting system alternative to conventional framing

The joist-lock component is a strong, reusable alternative to conventional wood framing. This patent-pending device connects manufactured wood I-joists intersecting from two different planes and locks, creating rigid connection at the intersection. The rigid connection creates a force-resistant frame out of the wood shell of a building, eliminating the need for braces or shear walls to support the shell against wind and earthquake forces. The joist lock creates a rigid tube that can span from end to end, eliminating the need for continuous foundations used in traditional construction.

<http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=61>

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Expansive Panel System

Sean Dorsy, Catholic University of America, Miami, Fla.

Reusable, waste reducing alternative to traditional wood framing

Inspired from the efficiency of pizza boxes, the Expansive Panel System [EPS] is an alternative to traditional wood framing. EPS uses Digital Fabrication and Computer Numerical Controlled machinery to fabricate with minimal material waste while allowing for a simple assembly using precise components. The EPS has a "zig-zagging" pattern that allows panels to expand from a single sheet of plywood without added fasteners, which conserves material, time, and money. A projection comparing the EPS to traditional light-frame construction found a cost savings of \$597 and material weight reduction of 4,406 pounds. These components are also designed for disassembly and for reuse in future structures. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=88>

Sean Dorsy

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Low-tech Pre-fabricated Structural Building System

Siobhan Rockcastle, Cayley Lambur, Dana Cupkova-Myers, and Kevin Pratt, Cornell University, Ithaca, N.Y.

Flexible, recyclable cardboard and foam dome structure

The flexible dome shaped system uses laser-cut recyclable cardboard, high-density polystyrene foam, and a waterproof fabric membrane, which can be separated, readapted, and recycled as needed. The basic bracing structure can be sequentially erected very quickly: pre-fabricated cardboard bracing is folded along seams; waterproof glue with a catalytic release is applied to lower ridges of the bracing; hexagonal/triangular lightweight foam panels are then adhered; and a compressible foam rod is inserted between panels to eliminate the need for sealant.

<http://lifecyclebuilding.org/gallery-detail.php?EntryID=58>

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Light Switch/Geodesic Dome

Thomas Hagerty, Iowa State University, Muscatine, Iowa

Simple structures examining design for disassembly

This submission examined the question: "Why aren't buildings already designed to be disassembled?" A simple structure was made of light switch mounting brackets, an object from which many different structures could be built, and the project grew to include joint details, connection diagrams, and alternative spaces and elevations to support the concept of lifecycle building. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=63>

Thomas Hagerty

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The Nail Extractor

Jeff Wagner, The Nail Extractor, Charleston, S.C.

Nail and staple removal tool eases building disassembly

These extracting pliers were invented to aid in building restoration and renovation by removing fasteners without bending or cutting the exposed materials. During a renovation or salvage project, the amount of fastener removal that is required can be extensive and time-consuming. Though the nail extractor was originally designed to pull brittle older nails, it can also remove modern-day pneumatic nails and staples, with their slender shanks and undersized heads. The tool allows for easy, single-handed operation, using jaws that exert increasing gripping pressure in proportion to the

resistance encountered during extraction. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=44>

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Promoting Reuse of Building Materials While Protecting Public Health

Jennifer Voichick, Habitat for Humanity of Dane County, Madison, Wis.

Proposal to examine lead-paint building material reuse options

This project explores options to divert building materials with potential lead-paint hazards from landfills in a manner that is both environmentally responsible and addresses public health concerns. Under Wisconsin state law, all items with paint or other coatings produced before 1978 are presumed to present lead hazards unless tested to prove otherwise. The proposal would identify alternatives to landfills that allow reuse of materials with lead-based coatings and address concerns about lead poisoning that could serve as a national model for other businesses promoting reuse of building materials. <http://www.lifecyclebuilding.org/entries/106316text.htm>

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AHP-Based Selection Model for Best Sustainable Practices for Construction Projects

Suhasini Hyderabad, University of New Mexico, Albuquerque, New Mex.

Model to train contractors on sustainable construction priorities

This Analytical Hierarchy Process (AHP) Model allows contractors to evaluate sustainable construction methods against a set of criteria to help educate contractors on sustainable construction practices and their potential benefits. Reusable concrete forms are evaluated in the model. Benefits to contractors using sustainable methods include: savings on construction costs, increased competitiveness between contractors in sustainable construction, and reduced impact on the environment. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=78>

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Living Homes Studio

Julie Phanstiel, Art Center College of Design, Los Angeles, Calif.

Sustainable building prototype to demonstrate new housing technologies

The Living Homes Studio has designed and built a full scale architectural prototype demonstrating the use of new technologies in creating a sustainable living environment. This photovoltaic powered prototype integrates prefabricated components with passive heating, cooling, and air exchange systems to create a model for sustainable housing. Through the use of pre-fabricated components, design for disassembly, and sustainable systems, the project creates a project sensitive to its users and the natural environment. <http://www.lifecyclebuilding.org/gallery-detail.php?EntryID=92>

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For more information on the competition, the winners, and to view images, please visit the Lifecycle Building Challenge Web site at <http://www.epa.gov/region09/lifecyclebuilding/>. The Web site is

password-protected and is not available to the public until Sept. 20. Login and password information is below:

Login: Lifecycle

Password: winnerlist

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