centerline

Newsletter of the Center for the Built Environment at the University of California, Berkeley

Winter 2015

Doing Well and Doing Good

Director's Note

Contents

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Cover: Employees from WSP San Francisco at a local Habitat for Humanity project. See page 8.

Credits: Concept, writing and design by David Lehrer

Dear Industry Partners and Friends,

We have had a memorable and successful fall. We learned that three of our funding proposals were accepted, a result of some very intense proposal writing. Several current industry partners and new collaborators will serve on the research teams and provide the necessary match funding. This new collaborative work will allow us to grow our work and hire new research staff. The projects address really important topics in the energy and indoor environment fields, and we are very happy to be able to work on them. Details on these projects and collaborators start on page nine.

As an educational organization we are keenly aware of the issues that motivate today's college students, those who will be tomorrow's industry leaders. Compared to previous generations, many Millennials are highly empathetic, and may be more interested in finding work they find meaningful than simply making money. In this issue of *Centerline* we explore the topic of pro bono design and provide snapshots of work being done by CBE industry partners in support of their local communities.

Speaking of students, I am happy to report that a number of graduates from CBE's building science program have recently taken positions with industry partner firms, for example, with P2S Engineering, Taylor Engineering and WSP San Francisco. We look forward to seeing their progress, and are happy to provide the talent that may contribute to the success of these firms. Stay tuned, as we will have many new graduates looking for opportunities this spring.

Sincerely,
Prof. Edward Arens
Director, CBE

Doing Well and Doing Good: CBE Partners Contribute Pro Bono Design and Community Support

Themes of social inequality are prevalent in today's media, from the growing gap between the wealthy and the middle class, to the fatal shootings by police of unarmed men and children that set off angry protests across the U.S. While such challenges are daunting, architects and engineers are problem solvers by nature, and many are applying their professional expertise to assist disadvantaged groups in their communities.

This effort may be based, in part at least, on a common belief that real sustainability must create a "triple bottom line" of environment, economy, and equity. Unfortunately, social equity has historically fallen behind other concerns, as design professionals have focused on core sustainability metrics such as energy, water and materials. Yet many advocates for community-based design maintain an optimistic view of the future of pro bono design – abbreviated from the Latin *pro bono public*, meaning "for the public good."

John Peterson, AIA, founder and president of Public Architecture, says that while socially responsible design practice still trails other aspects of sustainable design, its status today resembles green building design 20 years ago, and it holds the same promise that sustainable design showed back then. While the medical and legal professions have a long history of providing pro bono services, new programs are available to help architects and engineers focus their skills towards charitable purposes.

Peterson founded Public Architecture in 2002 to positively impact health and social equity, and to address things he found lacking in conventional design practice. In 2005, with support from the National Endowment of the Arts, Public Architecture launched the 1% Program, asking firms to commit to donating at least 1% of their working hours to pro bono projects. The program helps to match designers with non-profit organizations, and it tracks and improves the visibility of pro bono projects. (The program will be renamed the 1+ Program to avoid confusion with the current usage of "1%" referring to the top percentile in terms of wealth.)

Over 1300 design firms have committed 1% of their design hours to pro bono projects.

Currently over 1,300 firms have joined the 1% Program, pledging over $60 million in design services, and completing hundreds of projects each year. These design firms and over 800 charitable organizations are listed in an online database used for matching firms with non-profits. The system currently matches approximately a quarter of all completed projects. Many of CBE's member firms have joined the 1% Program, including BuroHappold, EHDD Architects, HOK, LPA Inc., Perkins+Will, RTKL Associates, WRNS Studio, and ZGF Architects. In the book, *The Power of Pro Bono: 40 Stories about Design for the Public Good by Architects and Their Clients,* editor John Cary estimates that if all architects in the U.S. contributed 1% of their design services, the output would be equivalent to a 2,500-person firm working year-round. If we add affiliated design professionals, the output would be equivalent to that of a 10,000-person firm.

top: **AEI staff improving Palou Phelps Mini Park in San Francisco.**

right: **Arup's Afaan Naqvi working with students at Burton High School in San Francisco.**

above: **Auburn University students pose with an 8' Isis fan by Big Ass Fans in Rural Studio's redesigned Greensboro Boys and Girls Club learning center.**

More than just a giveaway

In addition to the obvious benefits to non-profits, pro bono work provides many benefits to professionals, for example, building relationships with clients and community groups, gaining useful publicity, and gaining experience working with new project types.

Pro bono projects may also change how design is viewed in the public eye. As Peterson explains, "There is a sense that design is a luxury, but we are trying to reposition this. The program helps to educate the public that architecture is not only about aesthetics, but it can have direct impacts in terms of health or social justice." There is also the powerful force of the desire to do good. As Peterson writes in *The Power of Pro Bono*, "All generous acts involve self-serving motives. At the very least, they make us feel good."

Several current business trends are driving socially responsible project development. Many institutional investors are showing greater awareness of environmental, social and governance (ESG) considerations in their investment decisions. Companies may now become registered in many states as Public Benefit Corporations, or "B Corps." The B Corp designation signals to investors that ESG considerations will be important factors in business decisions, and that profits alone will not override the social and environmental goals of a company. Over 1,200 for-profit companies around the globe have been certified as B Corps by the B Lab organization, including well-known brands such as Patagonia, Ben and Jerry's, and Plum Organics.

Emerging green building systems are also contributing to social equity causes. The International WELL Building Institute, created by CBE Partner Delos Living to administer the new WELL Building Standard, is a B-corporation that has committed to donating 51% of its net profits towards charitable causes. The Living Building Challenge, which provides certification of zero-net energy and water projects, also includes points for social equity. Points are awarded by designing for universal access to nature, contributions to a charity, or through a team member having a "JUST" certification label from the International Living Future Institute. (Both of these green building rating systems will be discussed in detail in an upcoming symposium described on page 16.)

How CBE members are making a difference

We asked CBE industry partners to tell us about pro bono and other charitable activities they are supporting, and we were impressed by the number and variety of projects we received.

Affiliated Engineers Inc. began its relationship with Habitat for Humanity in 2013, shortly after relocating from the East Bay to San Francisco. For the past two years, over 30 employees have participated in Habitat's neighborhood revitalization and park beautification programs at Ocean

View Playground and Palou Phelps Mini Park, both located in the Bayview neighborhood of San Francisco. Volunteers worked on clearing weeds, dead plants and garbage, in order to enhance the green spaces in this ethnically and economically diverse community. AEI leaders view their relationship with Habitat as a reflection of the company's philosophy of helping local communities through volunteering and outreach, and working for a greater good.

Numerous community initiatives are supported by **Arup San Francisco**. In 2014 the Arup AEC team raised $20,000 in the Leap Sandcastle Competition in support of Leap, an organization that promotes arts and architecture education in Bay Area elementary and middle schools. Arup is also a corporate partner with the Phillip & Sala Burton Academic High School in San Francisco. For over six years Arup staff have volunteered time and professional expertise in the school's Academy of Engineering to reinforce classroom topics with real-world scenarios. Alisdair McGregor, Arup's Global Leader for Mechanical Engineering, has worked on international Habitat projects in Nepal and Thailand, and will be doing work in Sri Lanka this spring. Globally, the firm's Arup Cause provides a structure for community and pro bono projects.

The University Giving Program sponsored by **Big Ass Fans** is a model of next-generation corporate philanthropy, infusing product donation and expertise into innovative architecture and design programs. Students have used Big Ass Fans to improve thermal comfort and reduce energy consumption in several design-build programs, including the DesignBuildBLUFF program at the University of Utah, the Rural Studio at Auburn University, the design/buildLAB at Virginia Tech, and the U.S. DOE's Solar Decathlon. Students also gain access to company application engineers for design review and feedback. Through these programs, "students begin to understand the real-world implications of the lines they draw," says Andrew Freear of Auburn University's Rural Studio. Experience with simple solutions, like flipping on a fan instead of turning up the air-conditioning, creates a generation of professionals ready to use efficient and innovative products.

EHDD Architecture and Mission High School of San Francisco partnered to transform a 5,000 ft^2 empty paved lot into a working student-run farm, integrated with educational programming. Dubbed MY Farm, the work evolved from ongoing school initiatives on sustainability, food justice and student empowerment. A centerpiece of the program is to empower students — especially immigrants, students of color, and low-income students — and their communities to be active and engaged in food justice movements, and to make healthy living decisions within the broader context of the economic, ecological, and social components of food systems. MY Farm creates a site for hands-on, project-based learning, opportunities that are often inaccessible to disadvantaged students. The farm hosts a range of activities, and students are in charge of caring for the farm. Students have also been involved in the construction of both the farm and the tools used on the site.

Before and after the transformation led by EHDD at Mission High School's MY Farm.

top: **HGA's rendering of classroom/kitchen building that opens up to the outdoor amphitheater and fire pit area at Concordia Gardens.**

center: **Subject matter experts discussing the California water crisis during the Nexus Group HOK-a-thon in HOK's San Francisco office.**

bottom: **Interior of LPA Inc.'s "greenovation" classroom at the Davis Magnet School in Costa Mesa, Calif.**

The GLOthink organization (Great Lakes Office + think) is a grassroots initiative made up of employees of **HGA Architects and Engineers** that provides pro bono design and consultation services to groups that have "a dream and a need" within the Milwaukee community. The organization also offers young professionals at HGA the opportunity to build relationships with clients and take on key leadership roles early in their careers. The group has been working with the non-profit Victory Garden Initiative on the development of Concordia Gardens, a project to empower an underserved neighborhood of Milwaukee to grow food and support a socially and environmentally just food system. The team is providing assistance in developing a master plan that will expand a community garden into a complete urban homestead. One design concept includes the transformation of an adjacent foreclosed duplex by converting it into a functional office, community kitchen, and classroom. The master plan focuses on enlivening the community garden space with an amphitheater, children's natural play areas, and a classroom/kitchen that opens to the outdoors. Since 2005, GLOthink has completed nine design and consultation projects for community schools and non-profits.

The Nexus Group at **HOK San Francisco** was created to bring together thought leaders from diverse disciplines to cross-pollinate ideas and transform their practice. The program goal is to rethink major environmental problems and contribute positively to the involved communities. Through a series of community-oriented, pro bono forums held throughout 2014, the Nexus Group has laid the foundation to develop sustainable solutions addressing the state's water crisis. Last fall HOK hosted a full-day workshop, an "HOK-a-thon," tackling water scarcity in California. The goal of the event

was to generate realistic, actionable ideas and concepts for small California communities seeking a more resilient water supply. Cross-disciplinary experts in science, research, art, policy, and engineering gathered to brainstorm creative ideas that will redefine the conversation regarding water use and reuse. The workshop findings will be published at an HOK public open house this spring.

LPA Inc. recently participated in the completion of a pro bono "greenovation" at the Davis Magnet School in Costa Mesa, Calif. The LPA team upgraded a classroom with an energy-efficient displacement ventilation system, recycled and low-VOC finishes, a lighting dimming system, and Solatubes to bring in additional daylight. With generous donations in the form of grants, labor and building materials, LPA partnered with several companies in USGBC's Orange County Chapter to fully cover the renovation costs, an estimated value of up to $175,000. The project team also installed energy sub-meters, indoor temperature sensors, and CO_2 monitors in both the green renovated classroom and an adjacent control classroom that was not changed. Overall, the retrofit classroom used 15 percent less energy compared to the pre-retrofit data.

Since 2007, **Perkins+Will** has committed 1% of its billable resources to pro bono projects. In 2011, they teamed with the non-profit Los Angeles River Revitalization Corporation to prepare a feasibility analysis and conceptual design for the historic Lincoln Heights Jail, a designated Los Angeles Historic-Cultural Monument. The team explored new uses for the abandoned building and neglected site in order to revitalize the surrounding neighborhood. The proposed program includes creative tenant clusters, community services, clean tech, open space, and a rooftop urban farm.

These economically and environmentally sustainable programs will serve as catalysts for the adjacent Los Angeles River and the surrounding neighborhood. The project's water conservation strategies include two innovative on-site water loops: a food production loop that combines aquaculture and hydroponic crop production into a highly sustainable aquaponic system, and a stormwater loop that collects water on the roof and the surrounding site and funnels it into a cistern. Grey water from lavatories is treated in a biofiltration tank before entering the cistern for reuse in toilet fixtures and for irrigating non-edible planting areas.

Soon after the founding of **WRNS Studio** in San Francisco in 2005, the firm had the opportunity to design an expansion for the Bridge School, a non-profit school that has operated

top: **WRNS Studio designed a covered deck to provide year-round outdoor access for Bridge School students.**

bottom: **Rendering of Perkins+Will's proposed design for Lincoln Heights Jail adjacent to the Los Angeles River.**

since 1986 for children with severe speech and physical impairments. The school provides education and communication training for students and their families that allows those students to more easily transition into non-specialized schools. The school is well known locally, in part due to benefit concerts organized by two founding board members, Peggy and Neil Young. The Bridge School needed to expand their facilities in a manner that would allow for a more gracious and flexible learning environment for students and teachers. The mission of the school captured the hearts of the design team, and all professional services were donated: architecture, structural, civil, landscape, mechanical, plumbing and electrical. To meet the challenging budget, two pre-fabricated office and classroom buildings were connected with a covered deck providing teachers and children with a flexible space to meet, educate and relax outside even in bad weather. This deck is connected to the elementary school play courts, and to an area known as "the jungle" - a much beloved play area. The deck is a comfortable communal and private space that reflects the heart of the school. The project is featured in *The Power of Pro Bono*.

Building on its corporate principle to think globally and act locally, **WSP San Francisco** has been involved in a long list of activities benefitting Bay Area communities since 1982. WSP donates annually to numerous reputable youth-focused organizations, such as the Boys & Girls Club, Boy Scouts of America and Leap. WSP also actively participates in the Architectural Foundation and the ACE Mentorship programs, which aim to provide students who have expressed an interest in the architecture, construction, and engineering industry to intern and get first-hand experiences. The office welcomes high school students every year to its office and gives them the chance to shadow the technical staff. In addition, WSP has a policy that gives staff eight additional hours of paid time off for volunteer work. This time has been used to organize trips to the SF Food Bank, City Impact, to support Habitat for Humanity Bay Area projects, and to organize holiday food and clothes drives.

left: **Employees from WSP San Francisco at the Habitat for Humanity's project at Habitat Terrace, in San Francisco's Outer Mission neighborhood.**

These diverse projects illustrate the commitment of many firms and individuals working together to help members of our society who may lack resources to reach their goals and aspirations. Our nation's socioeconomic safety nets continue to be challenged by both political ideologies and economic realities, putting the contributions of such programs increasingly in demand. As the sustainable design movement has become a core part of design practice over the last 20 years, in part driven by LEED, we hope that the 1% Program and other support systems will continue to drive the growth of design for the public good.

Links and Further Reading

The Power of Pro Bono: 40 Stories about Design for the Public Good by Architects and Their Clients. Edited by John Carey and Public Architecture, Metropolis Books, New York, NY, 2010
http://www.artbook.com/9781935202189.html

The 1% Program of Public Architecture
http://www.theonepercent.org

AIA resources for pro bono services
http://www.aia.org/practicing/akr/AIAB090175

Information on B-corporations
http://www.bcorporation.net

Environmental, social and governance (ESG) considerations
http://en.wikipedia.org/wiki/Environmental,_social_and_corporate_governance#Social_concerns

Research Updates

CBE Wins Major Research Awards with Industry Partner Support

Late last fall CBE received the exciting news that three of our major proposals were accepted. This new funding of close to $8 million will support core CBE research topics including radiant systems and task/ambient approaches to comfort in the workplace, and will also fund R&D on new technologies that hold promise to improve monitoring and control of commercial buildings.

Two projects will be funded by the California Energy Commission under the Electric Program Investment Charge (EPIC). This program has awarded close to $25 million for building technology research, using funds from California utility customers. Among the dozens of projects submitted, CBE's proposals were the two highest ranked. This is quite an accomplishment considering the quality of the competing institutions, and it confirms the importance of CBE's research direction as well as our past results. A third award from the U.S. Department of Energy's Advanced Research Projects Agency (ARPA-E) will support development of the next generation of CBE's low-energy personal comfort systems.

It's important to note that the ongoing collaboration and support from CBE's Industry Partners makes our proposals highly competitive.

Rendering of recently completed Anaheim Regional Transportation Intermodal Center (architecture by HOK and mechanical engineering by BuroHappold). CBE research has demonstrated that in-slab radiant systems are highly efficient for conditioning such spaces. Image: HOK

Several partners are involved as team members, as we list below, and the financial support from all partners will be leveraged as match funding. Updates on all the projects will be provided in our next Advisory Board meeting in April, and below we summarize key points of each award.

Optimizing Radiant Systems for Energy Efficiency and Comfort

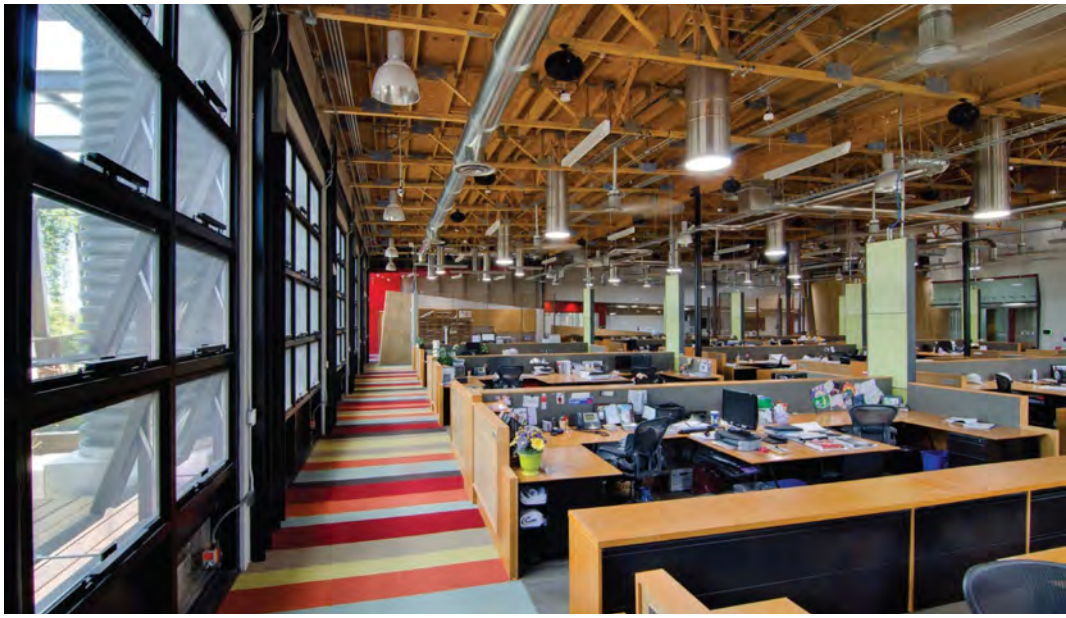
An award from the EPIC program will greatly expand the scope of CBE's research on radiant systems in commercial buildings. The new research will lead to an improved understanding of this emerging technology and develop tools for industry professionals to optimize the design and operation of buildings with radiant conditioning. The work will be led by Fred Bauman, along with Paul Raftery and Stefano Schiavon, and is expected to begin this summer and continue for four years. The award of $2.9 million will support multiple research activities, following the successful approach that CBE used in its industry-leading work on underfloor air distribution.

The work will include full-scale

testing of energy and heat transfer fundamentals of radiant systems, working in Lawrence Berkeley National Laboratory's new FLEXLAB facility, and in the Hydronic Test Chamber in Winnipeg of CBE Industry Partner Price Industries. These lab tests will study the cooling load and capacity of radiant systems, and investigate solar gain and control strategies. CBE will also use EnergyPlus to develop simplified sizing tools for design that will be available to the public in a user-friendly web interface, and develop control strategies that can be easily implemented in common building automation systems.

To better understand real building performance, CBE will conduct detailed field studies and control demonstrations in three or more buildings. We will also conduct energy analysis, cost assessments and occupant surveys in approximately 50 radiantly conditioned buildings to assess if these buildings in practice have higher energy efficiency and occupant satisfaction than conventional buildings. The final task will be to leverage the impact of this research by positively impacting codes and standards, including ASHRAE standards and California's Title-24.

Project team members include Taylor Engineering, the New Buildings Institute, TRC and Price Industries. CBE's Industry Partners and Price Industries will provide match funding, and Delta Products has offered their new Fremont, Calif. headquarters building as a study site. CBE also wishes to thank industry partners Integral Group and REHAU for their letters of support for the proposal.

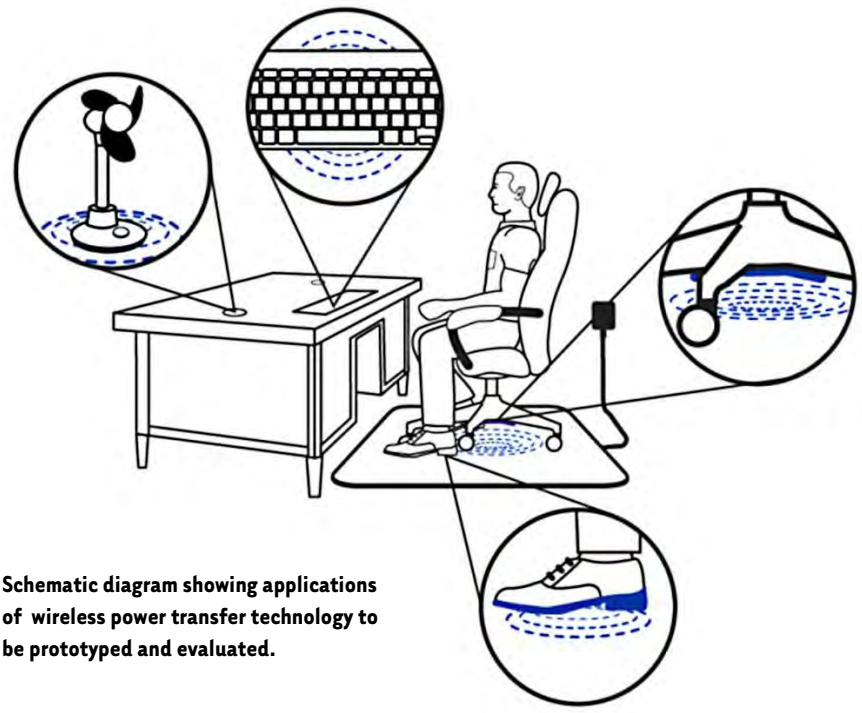


CBE will develop MEMS-based airflow sensors that will be useful for monitoring and controlling ultra-low energy conditioning systems. DPR Construction's Phoenix office integrates ceiling fans, natural ventilation, evaporative cooling towers and a "solar chimney." Image: Courtesy of DPR

Low-Cost MEMS-Based Ultrasonic Airflow Sensors for Rooms and HVAC Systems

Our second EPIC project will support the development of devices to provide inexpensive and accurate measurement of airflow, using recently invented microelectromechanical systems (MEMS) technologies. A greatly expanded ability to monitor airflow within rooms in buildings, laboratories, hospitals, and data centers can provide important energy, indoor environment, and safety implications. Likewise, better airflow monitoring in ducts and terminal boxes will improve HVAC system control and energy performance, as airflow is the one environmental variable that cannot currently be cheaply and accurately monitored. The project will be led by CBE Director Edward Arens, and Professor David Culler of UC Berkeley's Department of Electrical Engineering and Computer Science (EECS).

One of the project goals will be to create disruptively inexpensive devices, costing as little as $20 per device. Using MEMS technology allows for batch fabrication in large quantities, using the same methods and tools used to create microphones, gyroscopes and accelerometers that are now ubiquitous in smartphones and tablets. It is expected that the devices will be able to operate for years on battery power, communicate wirelessly, and not require any calibration. The work will create two versions of the



Schematic diagram showing applications of wireless power transfer technology to be prototyped and evaluated.

anemometers, one for in-room use that can be mounted on a workstation or suspended from the ceiling, and one for use in ducts. The project team will develop the hardware with integrated processing, communications, and power, and conduct lab and field validation. The team will create practical applications for the anemometers, addressing diverse airflow-related issues in buildings and assessing them in real spaces. Finally, the project creates a production readiness plan to facilitate commercializing the technology. The award of $2.5 million will support work beginning this summer and continuing through 2017.

The project team includes CBE, EECS, Taylor Engineering and Chirp Microsystems. Match funding will be provided by Chirp Microsystems, Big Ass Fans, Price Industries, Vigilent, and CBE's Industry Partners.

Using Wireless Power for Personal Comfort Devices

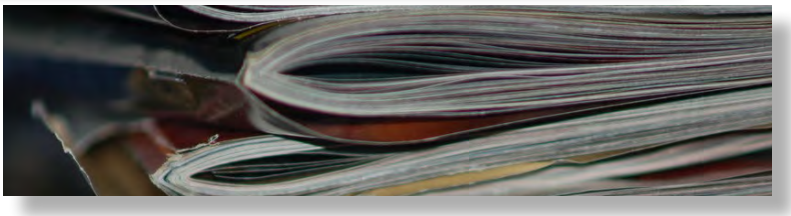
Through an ARPA-E initiative dubbed DELTA (Delivering Efficient Local Thermal Amenities), CBE will develop and test cordlessly powered personal comfort devices. We will be partnering with WiTricity, a maker of wireless power transfer (WPT) technology. This technology is already being used in many consumer electronics products, for example to wirelessly charge phones, tablets and laptops, and it shows potential for use in other industries, for example in implanted medical devices. The system is based on concepts of magnetic induction — used in common electric generators and transformers — combined with resonant magnetic coupling to transfer power over distances many times larger than the devices themselves. The power transfer goes through many common materials and can be up to 95 percent efficient.

The project team, led by Profs. Edward Arens, David Culler and Researcher Hui Zhang, with PhD student Michael Anderson, will develop office chairs and wrist pads that provide heating and cooling, heated insoles, and desktop cooling fans. The chairs and fans will be innovative advances on the personal comfort devices now being field tested by CBE, while the insoles and wrist pads represent completely new innovations. The overarching goal of this research is to make individual thermal comfort effortless and ubiquitous, so that there can be a wider range of comfortable indoor temperatures, which greatly reduces the energy used for building conditioning.

The award of $2.6 million will support a three-year effort to develop the power transfer devices, integrate them with functional prototypes, conduct laboratory tests with human subjects, and evaluate the energy saving potential of the devices. The final phase includes working with project partners Dr. Scholls, Staples and Personal Comfort Systems, who will provide in-kind support for defining the technology-to-market strategy.

These projects build on CBE's past experience in evaluating emerging building technologies, and strengthen our effort to develop new innovations in collaboration with other UC Berkeley departments and technology startups. A media release is available to provide additional awareness of this work. We are excited about the opportunities offered by these awards to engage with new collaborators, and bring in new technical staff to assist in this work.

New Report Documents Water, Waste and Transportation Benefits of Green Buildings



Compared to conventional buildings, those designed and operated according to the U.S. Green Building Council's LEED rating system save water, produce less waste, and reduce transportation related emissions, according to new research conducted by UC Berkeley researchers at the Center for Resource Efficient Communities (CREC) and CBE.

The research team compared buildings certified under LEED's Existing Building Operations and Maintenance (LEED-EBOM) system to conventional California office buildings, and to predicted values based upon current California standards for green buildings.

The study was funded by the California Air Resources Board (CARB), as part of the state's response to Assembly Bill 32 that requires reductions of greenhouse gas to 1990 levels by 2020. Taken together, water use, decomposition of waste in landfills, and transportation contribute 40 percent of California's greenhouse gas (GHG) emissions, according to the report.

The research used data from hundreds of LEED-EBOM buildings in California, and found that these buildings reduced GHG emissions by 50 percent due to water saving strategies, by 45 percent due to solid waste management, and by 5 percent from transportation impacts. Although the percentage reductions for transportation are much lower than those for water and waste, transportation is so GHG-intense that the total avoided emissions from even a 5% reduction far outweigh the GHG effects of the water and waste measures. On-site transportation strategies and smart development show great potential for continued major GHG reductions.

The results are expected to be valuable to state, city and regional planning agencies, to policy makers, and to building industry professionals.

The full report, with slides, a video seminar and press release are available on the website of the Air Resources Board.

The lead researchers were William Eisenstein, Executive Director of CREC; Kimberly Seigel and John Goins. The principal investigators were Profs. Louise Mozingo and Edward Arens. Additional support was provided by UC Berkeley graduate students Gwen Fuertes, Soazig Kaam, Bin Chen, Michelle Gonzales, and Joe Zissman.

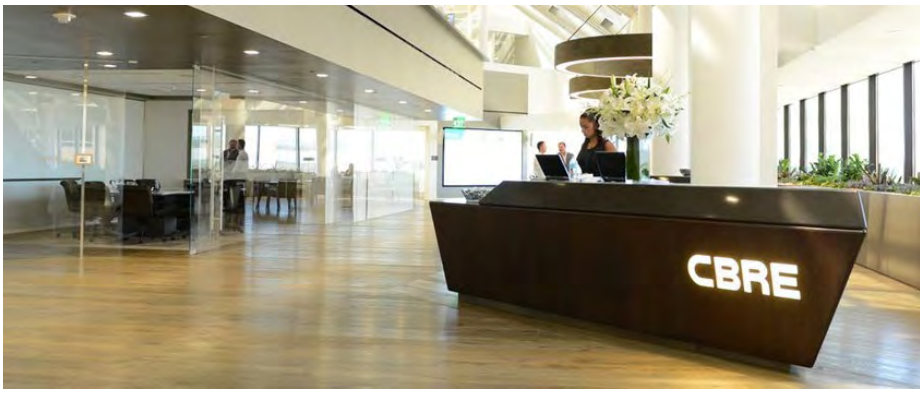
Partner News

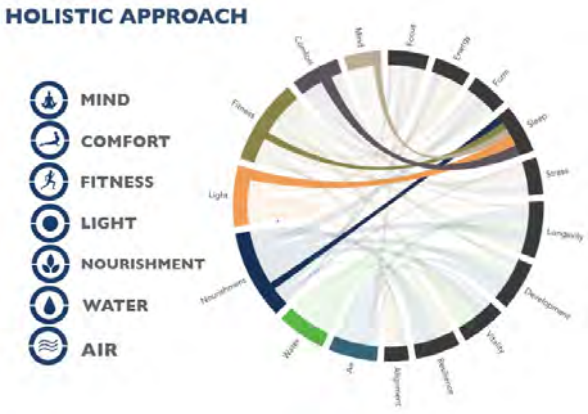
New Additions to CBE Industry Consortium

CBE would like to welcome our new industry partners, who have joined since fall of 2014. They reflect the diversity of the commercial building industry, and we look forward to partnering with them.

The primary objective of **Delos Living** is to provide healthier places for people by positioning health and wellness as a critical element of business planning, building design, and programming decisions. Knowing that people spend well over 90 percent of their time in buildings, Delos believes that commercial real estate has a unique opportunity to support health and wellness, including preventative health. They developed the WELL Building Standard, an evidence-based performance standard for measuring, certifying and monitoring the performance of building features that impact occupant health and wellness (air, water, nourishment, light, fitness, comfort and mind).

The company is comprised of four core areas: (1) Delos Labs: The central research hub. They collaborate with scientific, medical, and design/research groups to review, assemble, publish, and evaluate the technical and performance data of the WELL Building Standard; (2) Delos Project Delivery and Project Management: Provides advisory support to industry (owners, developers, architects, engineers, contractors, and manufacturers) for the WELL Building Standard; (3) Delos Ventures: Identifies and brings innovative wellness real-estate products and technologies to market; and (4) STAYWELL and WELL SIGNATURE: Provides health and wellness lifestyle amenities, products and programs designed to enhance and improve the hospitality and multi-family living experience. CBE is currently working with Delos to develop a survey tool to be used for the WELL Standard, to measure worker health, productivity, and satisfaction with their environment.





above: **CBRE's Los Angeles headquarters was the first WELL Certified office in the world.**

left: **The WELL Building Standard covers many health and wellness categories not traditionally addressed by green building standards.** Images: Delos.

above left: **Stantec was part of the design team for the National Renewable Energy Laboratory in Golden, Colorado.**
Image: Courtesy NREL.

above right: **The EGWW Federal Building in Portland, Oregon, mechanical engineering by Stantec.**
Image: Courtesy SERA Architects.

With over 15,000 employees in more than 250 offices around the world, **Stantec** offers professional consulting with a wide variety of expertise — including engineering, planning, architecture, interior design, environmental sciences and more. They collaborate across disciplines and industries to bring buildings, energy and resource, and infrastructure projects to life. They currently have 649 LEED accredited professionals and 293 LEED certified projects.

They have been involved in many high-profile projects, including: Sacramento Municipal Utility District's (SMUD) East Campus Operations Center, one of the nation's largest projects to target zero net energy (and a field study location for CBE's research on radiant systems); a full-scale renovation of the EGWW Federal Building in Portland, Oregon, which received the 2014 Best Tall Building Award from the Council on Tall Buildings and Urban Habitat; NREL's LEED Platinum, ZNE Research Support Facility in Golden, Colo.; LA's first ZNE visitor center for the Department of Recreation & Parks, the Audubon Visitor's Center at Debs Park and the Lawrence Berkeley National Lab's FLEXLAB test bed facility.

Motivated by research, Stantec's R&D Fund Program has awarded $4.8 million through 170 research grants to their team members. Through this research, they are finding creative ways to explore problems faced by their peers and clients. Stantec was inspired to join CBE because of their shared passion to be a diverse think tank, where sustainability and resilient design are embraced, and they are driven by the process that takes them there.

"We look forward to the thought provoking and inspiring discussion with the members of the Center for the Built Environment community," notes Porus Antia, Associate and Manager at Stantec.

The Davis Building at the University of Findlay in Findlay, Ohio, installed a Viega radiant mat system and won first place in the 2014 ASHRAE Technology Awards. Image: Viega.

Founded in 1899, **The Viega Group** manufactures and distributes plumbing, heating, and pipe-joining systems, and offers more than 3,000 products in North America. Viega is best known for innovative press technology systems for industrial, commercial, and residential projects, including everything that is needed for a complete radiant heating or cooling installation. They provide the tools, training, and technical support needed for a radiant project, and their products can be easily integrated into building designs for overall energy efficiencies. Viega's extensive product offerings provide system designers with many options and choices, and include tubing, fittings, manifolds, controls, mixing stations, sensors, mats, panels, tracks, and plates.

"We are honored to be associated with CBE," said Mark Parent, Director of Product Management. "There is a lack of industry knowledge when it comes to radiant heating and cooling. Our hope is to help educate the industry on newer and more efficient technologies when designing commercial integrated hydronic systems."

CBE's recently received grant will be funding work related to radiant slab cooling, researching how to optimize radiant systems for maximum energy efficiency and comfort (page 9). This research will provide performance data to develop design and control guidelines. Viega and CBE are also collaborating to provide training sessions to leverage these research results to create innovative product advancements and design guidelines. Sessions are planned for May and November on both coasts, see page 17 for details and additional information.

Events

What Multiple Metrics Mean for Practitioners: LEED, the WELL Building Standard and the Living Building Challenge

Wednesday, April 22, 2015
1:00 pm – 5:00 pm

Pacific Energy Center
851 Howard Street,
San Francisco, CA 94103

Also available by live webcast.

Register for San Francisco class:
Symposium registration link

Register for the live webcast:
Internet registration link

Green building performance ratings are commonly used by professionals and government agencies for both benchmarking and as design tools. While LEED has become widely adopted over the past decade or more, newer alternatives are available to expand the professional's toolkit. In this event leading experts will discuss existing and emerging rating systems, including benefits, processes, and best practices, followed by a moderated panel discussion in which participants can engage with thought leaders on this topic.

This event is organized CBE and the PG&E Pacific Energy Center. Additional partners include Integral Group, International Living Future Institute, the AIA San Francisco and the USGBC Northern California Chapter. Additional details will be available in March, see the CBE conference page for more information.

Jason McLennan
LEED Fellow, Assoc. AIA, WELL AP
LF AP; CEO of the International Living Future Institute

Lynn N. Simon
FAIA, LEED Fellow
Senior Vice President, Thornton Tomasetti

Phil Williams
PE, LEED AP
Executive Director, Delos Living

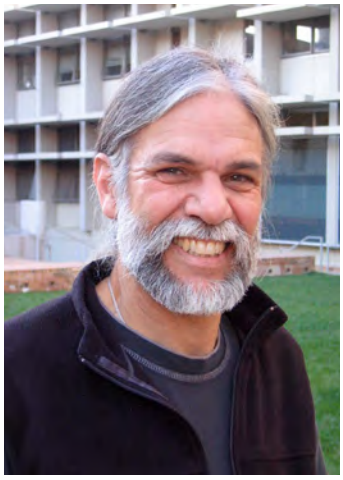
Erik Ring *moderator*
PE, LEED Fellow
Principal, LPA, Inc.

Seminars on Energy and Comfort Performance of Radiant Slab Systems

One of CBE's primary goals is facilitating technology transfer, disseminating the results of our research widely and providing design guidance and resources for practitioners. Project Scientist Fred Bauman, PE, is leading a series of seminars this year that will summarize recent findings on slab-integrated radiant systems. The first of these seminars was planned to coincide with the ASHRAE winter meeting in Chicago.

Attendees included many CBE industry partners and others, and several provided positive feedback. John Pulley, Principal and Director of Technical Engineering with BuroHappold Engineering, told us by email that he and colleagues wished that all of the seminars at the winter meeting were of such high quality.

Future sessions are scheduled to take place in Washington D.C. on May 12th, and in San Francisco on November 3rd. The seminars will cover the key advantages and differences between radiant and air systems, including fundamentals, energy use and practical considerations of in-slab radiant systems. CBE will send more information and registration via email as the dates approach. This seminar series is sponsored by CBE Industry Partner **Viega**. If you have questions or would like more information please email Fred Bauman.



above: **Checking the slab temperature at Infosys "SDB-1" in Hyderabad, India during a facility tour. This case study is unique as it provided a comparison of in-slab radiant with VAV systems, as described in this *ASHRAE Journal* article.**

left: **Project Scientist Fred Bauman leads CBE's multi-project research on radiant systems.**

Industry Partners at the Center for the Built Environment

CBE's research is supported and guided by a consortium of industry partners, a diverse group of building industry leaders who are working to advance the design and operation of commercial buildings through their collaborations with CBE.

The Center's membership is comprised of the following firms and organizations (as of February 2015):

Affiliated Engineers, Inc.
Armstrong World Industries
Arup*
BASF Corporation
Big Ass Fans
BuroHappold
California Energy Commission
Charles M. Salter Associates
Delos Living LLC
DIALOG
EHDD Architecture
Google, Inc.
HGA Architects and Engineers
Ingersoll Rand
Integral Group Membership Team:
- Integral Group
- CPP
- DPR Construction
- P2S Engineering
- Perkins+Will

LPA Inc.
Pacific Gas & Electric Company
Price Industries
REHAU
RTKL Associates
Skidmore, Owings & Merrill (SOM)
Southern California Edison
Stantec
Syska Hennessy Group
Taylor Membership Team:
- Taylor Engineering
- Atelier Ten
- HOK
- Southland Industries
- WRNS Studio

U.S. Department of Defense
U.S. General Services Administration
Viega
Webcor Builders*
WSP
ZGF Architects

* founding partner

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