

## Sustainable Design & Construction

### Incorporating Worker Safety

**PS:** Please provide a brief description of your professional backgrounds and of your current positions.

**Sathy:** I have been employed as a construction safety specialist for Hoffman Construction Co. of Oregon since 2006. I have managed the safety programs for medium and large construction projects. My construction project experience includes a wide variety of buildings: hospitals, a biopharmaceutical facility, high-rise condominiums and office buildings, airport projects, parking garages and a hotel. I have conducted research in the area of sustainability and safety. My work has been published in American Society of Civil Engineers (ASCE) and ASSE journals.

**John:** I am an associate professor in the School of Civil and Construction Engineering at Oregon State University. I have worked in industry as a structural engineer for Degenkolb Associates, a private structural engineering consulting firm headquartered in San Francisco, and as a project engineer for the construction management firm of O'Brien-Kreitzberg & Associates in Seattle, WA. I started my current position at Oregon State University in 2000 following 3 years on the faculty at the University of Nevada, Las Vegas, and 1 year as acting assistant professor at University of Washington.

I have taught courses on construction contracts and specifications, construction safety and productivity improvement, planning and scheduling, structural analysis and design, temporary construction structures and engineering economics. I have performed research and published many articles on construction worker safety, sustainability, constructability, innovation, construction contracting and lifecycle properties of civil engineering facilities.

**PS:** What unique SH&E hazards can the construction of sustainable buildings pose to workers?

**Sathy/John:** Most of the hazards on regular (nonsustainable) building construction projects are the same as those on sustainable buildings, but there can be increased exposure to the hazards in sustainable buildings.

For example, sustainable buildings put workers at risk of strains, sprains, punctures and cuts due to the increased material handling such as segregation

**Sathy Rajendran, Ph.D., M.S., CSP, LEED AP, CRIS,** is a safety specialist for Hoffman Construction Co. of Oregon. He has managed safety programs for medium and large construction projects, and his experience includes a wide variety of buildings. His research in the area of sustainability and safety has been published in ASCE and ASSE journals. Rajendran holds a Ph.D. and M.S. in Civil Engineering from Oregon State University and a B.E. in Civil Engineering from Anna University in India.

**John Gambatese, Ph.D., M.S., P.E.,** is an associate professor in the School of Civil and Construction Engineering at Oregon State University. He has worked in industry as a structural engineer for Degenkolb Associates and as a project engineer for O'Brien-Kreitzberg & Associates. He is a member of ASCE and ASSE, and actively participates on ASCE's Prevention Through Design, Construction Site Safety and Constructability committees, and Construction Research Council. Gambatese holds B.S. and M.S. degrees in Civil Engineering from the University of California at Berkeley and a Ph.D. in Civil Engineering from the University of Washington.

of different types of materials for recycling. Sustainable buildings also introduce fall hazards (open holes in roofs) due to increased use of atriums and skylights to utilize natural light and reduce energy consumption. The whole idea of safety and health management is to reduce the exposure, not increase it. Sustainable buildings tend to do the latter.

**PS:** On average, how do buildings that are constructed in compliance with the Leadership in Energy and Environmental Design (LEED) rating system measure up when it comes to worker safety and health? Do fewer injuries and accidents typically occur during the construction process?

**Sathy/John:** Based on a pilot study we conducted on a LEED building, we found that the project had both positive and negative impacts on worker safety and health. Indoor air quality and less hazardous material credits of the LEED system help not only occupant health, but also construction worker health. However, the waste material separation and recycling efforts for the project created more congestion on the site and led to a construction worker injury. Based on an analysis of 86 LEED and non-LEED construction projects, it was found that there was not a statistically significant difference in safety performance between the two types of projects.

More detailed research is necessary to analyze each green design aspect of a project and to correlate them to safety performance. According to *Safety+Health* (August 2010), in March 2010, Bureau of Labor Statistics announced it will collect labor data on green jobs. This will help answer these questions.

**PS:** In what ways have sustainable design and construction practices changed as materials, techniques and methodologies have become more advanced?

**Sathy/John:** New information has been made available about materials with regard to their composition and environmental impact. As a result, contractors are able to choose materials based on their impact on sustainability. This has



Sathy Rajendran



John Gambatese

## Hotlinks

**ASSE** American Society of Safety Engineers [www.asse.org](http://www.asse.org)

**BCTD** Building Construction Trades Department [www.buildingtrades.org](http://www.buildingtrades.org)

**CPWR** Center for Construction Research and Training [www.cpwr.com](http://www.cpwr.com)

**NIOSH's PtD** National Initiative on Prevention Through Design [www.cdc.gov/niosh/topics/ptd](http://www.cdc.gov/niosh/topics/ptd)

**USGBC** U.S. Green Building Council [www.usgbc.org](http://www.usgbc.org)

made the use of some materials (such as certain types of paints and sealants) standard practice whereas previously other materials would be used.

**PS: What is the Sustainable Construction Safety and Health (SCSH) rating system, and how can it be used to incorporate worker safety and health into sustainable design and construction practices?**

**Sathy/John:** To be truly sustainable, buildings should have superior safety performance in addition to superior environmental performance. Current buildings rated as sustainable may not be truly sustainable when considering worker safety and health. To label a building as sustainable, the construction industry should include worker safety and health in the project life cycle. This can be achieved with the SCSH rating system.

The SCSH rating system consists of 50 safety and health elements, grouped into 13 categories that should be implemented through the combined efforts of the project team.

The system can be used as a tool to help sustain the safety and health of construction workers not only during the project, but during future projects and their post-construction career as well.

**PS: How does the SCSH rating system unify and coordinate the roles of the owner, designer, general contractor and subcontractors in a construction project?**

**Sathy/John:** The elements in the rating system require the joint efforts of all parties involved in a project (owner, designer, general contractor and subcontractors). To become certified through this rating system, some elements need a team effort. Just one party being proactive and safety conscious does not help a project get certified.

For example, consider the requirement of designing for safety for the project. The owner must approve the budget associated with any extra cost related to designing for safety, the designers must include the consideration of construction worker safety and health in their designs, and the contrac-



## From the Blogosphere

Last spring, OSHA hosted a panel discussion on green jobs and the safety and health outlook for workers. In an April 15, 2010, blog post, The Pump Handle quotes CPWR's Don Ellenberger from his panel presentation, during which he talks about the gap in sustainable design practice with regard to worker safety and health.

"There is tremendous focus placed on materials, energy and the environment, but designers typically give little, if any, consideration to the safety and health of the people who install the green features or build the projects," Ellenberger says.

The SCSH rating system attempts to close that gap. The system provides a way to rate "green" projects based on the importance given to worker safety and health, and the degree of implementation of safety and health elements.

The Pump Handle applauds the SCSH rating system. "What a great idea! This takes a LEED-like approach to rating worker safety and health." The article leaves readers with this missive: "How do we roll out this good idea with LEED-like flare and fanfare such that occupational safety and health becomes as attractive and interesting to the masses as the concept of green buildings?"

tors must participate by providing input on constructability and jobsite safety and health hazards.

**PS: Can the SCSH rating system be used in tandem with the LEED rating system?**

**Sathy/John:** It was developed as a standalone rating system to be used alongside LEED, but could also be integrated within that rating system. Integrating it within LEED would require collaboration and support from the U.S. Green Building Council.

**PS: Has the SCSH rating system been used in any construction projects thus far?**

**Sathy/John:** The SCSH system was validated based on 25 real-time construction projects and was found to accurately represent the safety performance of projects. The higher-ranked projects (higher credits) had lower injury rates. The validation effort was after the fact; that is, the projects were already completed but were rated using the SCSH system based on inputs from the project teams. The system has not yet been officially adopted into a project from start to finish. However, we are working to obtain research funding to proceed with this important step.

**PS: Does the SCSH rating system take prevention through design principles into consideration?**

**Sathy/John:** Design for safety is an important part of the sustainable safety and health efforts. Several elements focus on the design for safety efforts: designer selection based on safety experience; safety and health hazard identification in drawings; safety and

health during the conceptual planning phase; constructability review; designing for worker safety and health; life cycle safety design review; safety checklist for designers; safety training for designers; and engineering controls for health hazards.

**PS: How do you predict sustainable design and construction practices will change within the next 5 years? How do you expect this will affect worker safety and health within the construction industry?**

**Sathy/John:** Efforts are underway nationally to integrate worker safety into green jobs. Based on these efforts, and additional training and education, we can counter these hazards. The SCSH rating system would be a good tool to counter these hazards and have a truly sustainable building.

**PS: How does the SCSH rating system help improve the U.S. construction industry and the economy? Has OSHA or any government organization bought into this concept?**

**Sathy/John:** As mentioned, the SCSH rating system will help reduce injuries in the construction industry. Fewer injuries equals a more productive workforce and fewer legal claims, all of which are a boost to the economy.

OSHA has shown interest in this rating system. The Center for Construction Research and Training and NIOSH have shown significant interest as well. NIOSH has embarked on its own program of making green jobs safe. The Building Construction Trades Department, AFL-CIO also has recently approved a resolution to pursue integrating safety into sustainability efforts.