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June 3, 2008, was not just another hot day on the Las Vegas Strip. After 12 workers died in 18 months on Strip construction projects (an average of one worker every six weeks), some 7,000 construction workers on the CityCenter and Cosmopolitan work sites walked off the job over safety concerns.

The Southern Nevada Building & Construction Trades Council and Perini Building Company, the general contractor on both projects, quickly sat down to talk. By the end of the day, they had forged an agreement that named CPWR—The Center for Construction Research and Training to conduct a site safety assessment of the two projects. CPWR also would coordinate OSHA 10-hour safety and health training for workers needing certification.

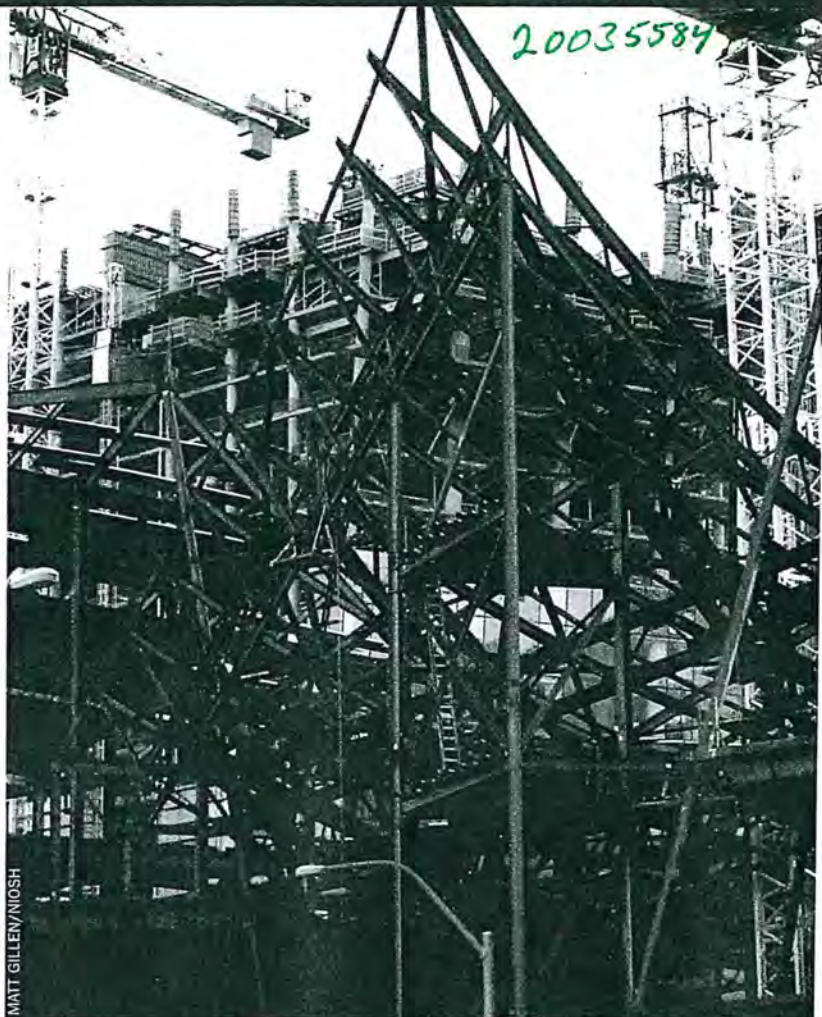
CPWR Executive Director Pete Stafford first met with the Southern Nevada Building Trades and Perini management representatives to put in place an implementation plan. In the months that followed, Perini's top management gave CPWR and the research team assembled and led by Janie Gittleman, CPWR's associate director of safety and health research, full access to the sites and all levels of personnel. The team of experts from NIOSH and university researchers from Colorado State University, the University of Illinois, and West Virginia University got a first-hand experience of the unique sites. At \$9.2 billion, CityCenter is the largest privately owned construction project in U.S. history, covering 76 acres with 18 million square feet of development and employing more than 7,000 construction workers on round-the-clock construction.

"The sheer scale of it all is unlike any other construction project in the nation," Gittleman said. "The trades that usually work at different times now work side by side—and overhead—which can pose scheduling and pace-of-work hazards. There's an average of 7,200 employees in multiple crafts working 24/7. The constant movement of vehicles, materials, equipment, and workers makes negotiating the site a huge safety challenge."

The team was up to the challenge. After a site visit in June, the Worksite Assessment Team determined its evaluation would encompass six areas: Perini's safety orientation training program, its safety management programs, and its safety staff. The site assessment also would include a safety climate survey of Perini senior management, superintendents, foremen, and craft workers to assess perceptions and attitudes about safety on the sites. Because most of the fatalities were from falls, researchers would conduct a fall hazard identification and control audit of two randomly selected buildings. Finally, they would conduct face-to-face interviews on both projects in English and Spanish.

What They Found

The team's goal during its Aug. 14-16, 2008, site visit



Lessons Learned from Las Vegas

Site safety assessment yields lessons in construction safety and health programs, practices, and safety climate.

BY MARY WATTERS

CPWR'S RECOMMENDATIONS IN BRIEF: SITE SAFETY ASSESSMENT FOR CITYCENTER AND COSMOPOLITAN

I. Site Safety Orientation

1. Improve safety orientation by addressing safety messages that could be misinterpreted and detract from orientation impact.

2. Improve safety orientation by adding messages that could strengthen the orientation's impact on new hires.

II. Safety Program Management

3. Review daily safety logs to ensure that incident investigations are performed when appropriate.

4. Monitor attendance at monthly safety committee meetings and take steps as needed to ensure attendance.

5. Review safety committee minutes to identify and target recurring problems.

6. Develop a mechanism to communicate incident information to workers job-wide.

7. Use City Center News or equivalent mechanism to communicate injury trends over time to subcontractors

8. Improve incident reporting forms to more comprehensively address relevant root causes

9. Take other steps to ensure that incident investigations are performed at a high standard.

10. Consider on-site clinic to facilitate prompt and efficient attention to injuries and illnesses

III. Worker Climate Survey Responses—Open Ended Questions

11. Address issues raised in climate surveys

12. Consider improvements to traffic control plan in garages and for pedestrians site-wide

13. Notify relevant parties when serious breach of safety could result in serious injury or death

IV. Feedback on Safety Concepts and Climate Survey—Questions

14. Address scheduling conflicts between trades resulting in cross-trade disputes

15. Elevate attention to situation hazards

16. Improvements in housekeeping should be made to minimize risk of falling debris

17. Address ventilation needs arising out of implementation of LEED requirements for indoor containment control during construction

Complete text available at www.cpwv.com.

was to better understand safety management and programs used by the Perini Building Company and to provide constructive feedback to improve worker safety and health on these projects.

Upon arrival, the team attended Perini site safety orientation sessions, reviewed Perini safety program materials and injury tracking systems, and held

discussions with Perini safety and health management staff. Researchers accompanied Perini safety personnel on walk-throughs and conducted unstructured interviews with workers.

To assess fall hazards, West Virginia University researchers used the Fall-Safe audit tool, which they developed with contractors as data collection for research

and as feedback for contractors for continuous improvement. A score of 70 percent or less indicates the work site doesn't properly control fall hazards. Audit results of two buildings, the Aria and the Mandarin, concluded with results that were "starkly different." Employee ladder use on the Mandarin was near-perfect, and hazards identified were not as seri-

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"The sheer scale of it all is unlike any other construction project in the nation. The constant movement of vehicles, materials, equipment, and workers makes negotiating the site a huge safety challenge."

—Janie Gittleman, CPWR associate director of safety and health research

ous as those in the Aria. Mandarin had many more holes, yet they were properly protected more often than the Aria's. The Mandarin scored 82 percent, while Aria rated just 73 percent.

Researchers attended safety orientation training for new hires that provides an overview of Perini's expectations for site safety. However, trainers sometimes undermined their own efforts in the messages they gave inadvertently. One obvious gaffe: Only the opening 15 minutes of orientation training had a Spanish translator. For Spanish-speaking workers, who made up about one-third of the workforce, the message was, "We don't really care about you if you don't know English."

Although workers heard a number of positive messages, such as "Injuries can be prevented—rules and regulations represent accumulated lessons learned on safety and it is important to follow them" and "Workforce diversity and mutual respect are important to Perini," researchers noted some important messages were never delivered. For example, workers were told to report safety concerns but were never given phone numbers, office hours, or names of Perini contacts.

Safety orientation efforts were sometimes skewed by the way the ideas were presented. In one session, a safety officer said others called him "Safety Hitler." He probably thought he sounded tough on

"zero tolerance" for unsafe practices, but new hires could easily assume that workers and foremen reacted negatively to his enthusiasm and were not eager to practice work site safety.

A review of safety program management found areas for improvement. A weekly newsletter reported work site injuries, but it went only to Perini staff, not to subcontractors whose workers often suffered the injuries. Perini held weekly safety meetings sent to Perini staff and subcontractors, but attendance was not mandatory, so many subs didn't know about problems in a timely manner. Also, no joint labor-management safety committee existed.

Individual interviews with site personnel identified interesting and competing testimonies on job site safety. A foreman of a sheet metal crew described an incident where a piece of iron grating being installed by ironworkers fell into an area where his crew had been cleared to work but had not yet arrived. He said that it was just lucky the material had fallen before

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they arrived because it could have seriously injured them. He believed the pressure to get work done was responsible for this and other safety incidents. That same day, a Spanish-speaking carpenter said she had no safety concerns and that her foremen were very strict about safety compliance because they didn't want trouble with Perini. She was "happy to be doing carpentry work" on the site.

Measuring Safety Climate

Researchers measured the "temperature" or climate on the site to assess the perceptions and beliefs all levels of personnel held about site safety. A good safety climate could lead to improved communication, safer work practices, better morale, and increased productivity and profits by reducing direct costs of lost work days, work stoppages, and work-related injuries and illness.

Gittleman, working with Colorado State professor Peter Chen, drafted safety climate surveys and gathered comments from construction safety professionals. They developed separate safety climate surveys that were given to 3,500 workers, 134 foremen, 61 superintendents, and 17 top management executives.

Workers' responses were generally positive, with 70 percent approval on 32 of the 36 items surveyed. However, when responses were compared across the four groups surveyed, 16 of the 24 comparable questions (67 percent) revealed significant differences. Overall, workers' perceptions about site safety were less positive than those of foremen, superintendents, and top management.

Gittleman and Chen developed four specific recommendations and actions to remedy the situation and improve safety climate issues. Seventeen overall recommendations from the site safety assessment can be found on page 16 ("CPWR's Recommendations"). The complete text of the reports and recommendations can be found on CPWR's Web site, www.cpwrr.com.

Perini Takes Action

Craig Shaw, chairman and CEO of Perini Building Company, reviewed the reports and recommendations. In a Feb. 17 release when the reports were made public, Shaw said, "While we believe Perini work-sites are among the safest in the world, we

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continuously seek to identify methods by which we can adjust and strengthen worker safety, and to that end, we are already implementing many of the CPWR's recommendations."

According to Steve Ross, Southern Nevada Building Trades executive secretary-treasurer, Perini Building Company has implemented a plan to respond. These measures include, but are not limited to:

Increased direct worker participation in site safety through a formal craft work site hazard identification program

Timely management feedback on raised concerns

Establishment of joint craft-management safety planning committees

Improved communications with all workers by better organizing on-site bilingual resources and providing separate new-hire orientations in Spanish

Establishment of a toll-free telephone number to accept work-related reports, questions, or concerns that individuals wish to communicate in confidence

Greater emphasis on recognizing workers engaged in safe work practices, including increased emphasis and involvement of subcontractor personnel in safety recognition and/or safety incentive programs and also solicitation of on-site craft workers to share site safety lessons learned during new-hire orientations

Because most of the fatalities were from falls, researchers would conduct a fall hazard identification and control audit of two randomly selected buildings. Finally, they would **conduct face-to-face interviews** on both projects in English and Spanish.

Prioritizing the need for corrective action on confirmed hazards, housekeeping, sanitation, and traffic control issues

Continued efforts to address site ingress, egress, and traffic concerns voiced by workers, in addition to reported vehicle/equipment congestion that workers believe challenges site safety

Perini Building Company also has instituted mandatory OSHA-10 training for all workers on the CityCenter and Cosmopolitan job sites. CPWR coordinated all site training and ensured appropriate delivery of the OSHA training from June through the end of 2008. Perini, CPWR, and members of the Building Trades taught the OSHA 10-hour classes to more than 10,000 workers in less than six months.

Perini began total management of the OSHA-10 training in January 2009. The company's goal is to train all of the approximately 11,000 workers currently employed at both projects by midyear.

CPWR's Stafford expressed gratitude

to the researchers who participated in the site safety assessment and to Perini's staff and management. "Perini demonstrated its desire for strengthening its current worker safety programs by giving our research staff and visiting professionals unfettered access," Stafford said. "We're glad we could make a contribution to improve the safety and health of workers on this most challenging job site." Read all of the full site safety assessment reports at www.cpw.com or on the electronic Library of Construction Occupational Safety & Health, www.elcosh.org. **OKS**

MARY WATTERS is director of communications for CPWR—The Center for Construction Research and Training. Janie Gittleman, Ph.D., contributed to this article. Research for this article was funded by CPWR using grant OH008307 from the National Institute for Occupational Safety and Health. The contents are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH.



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