HIGHLIGHTS 2008

CPWR
THE CENTER FOR CONSTRUCTION
RESEARCH AND TRAINING

Contents

COVER PHOTO: Jeff Scheid/Las Vegas Review-Journal

FOREWORD TO HIGHLIGHTS 2008

In every history book chronicling this nation, 2008 will be viewed as a landmark year. Beset by two wars, an economic downturn, and contentious partisan bickering, the nation chose to select its first African-American president – a man with promises of change and a vision to make it happen.

Within the construction industry, 2008 will also be viewed as a watershed year for safety and health. Startling crane collapses and the death of 12 construction workers over 18 months on worksites along the Las Vegas Strip brought the issues of worker safety to the attention of the national media and a busy Congress. In June, I testified before a House committee on construction fatalities and OSHA. We in the Building Trades were best able to address these issues because of the 18-plus years of fine work performed by our research arm, CPWR – The Center for Construction Research and Training.

All U.S. construction workers, contractors and industry observers can benefit from the work CPWR performs in any year. As the recipient of the National Institute of Occupational Safety and Health's Construction Center grant, CPWR conducts research to identify causes and remedies to safety and health hazards workers face on the job. This research is performed by CPWR's internal staff of research scientists and by dedicated academic researchers in universities nationwide. These experts undertake projects to explore obvious as well as emerging worksite problems that can cause fatalities, injuries and illnesses. In addition, CPWR offers programs to train instructors in general and specialized safety and health topics. CPWR staff also administers a free medical screening program for former workers on DOE nuclear sites. All of these areas, and more, are addressed in this *Highlights 2008*.

As you look through this report, you'll see the "highlights" of major challenges and triumphs CPWR faced in the 2008 Year in Review. The three sections Research, Training and Service also highlight activities within those areas in 2008. While CPWR has more than 25 research projects, this *Highlights* profiles selected research efforts and findings.

Yet unanticipated problems arise and demand solutions. As part of a negotiated settlement between general contractor Perini and the Southern Nevada Building Trades, CPWR was given two enormous tasks: a site assessment of safety on two construction projects, one being the $9.2 billion CityCenter project, as well as the coordination of OSHA 10-hour training for thousands of workers. I am aware of the tremendous expenditure of time, talent and resources CPWR invested in its work on behalf of Perini and the Southern Nevada Building Trades. A number of international and local unions also dug deep into their pockets to bring their qualified instructors to participate in this unprecedented training venture.

I am extremely proud of, but not at all surprised by, the detail, quality and scope of CPWR's reports and recommendations on site safety. And, as a union member and leader, I am grateful to local and international leaders who redirected resources and staffed hundreds of hours of safety training with the best trainers in our nation.

It was the deaths of 12 construction workers in 18 months on Las Vegas construction sites that triggered these events. Aware that four construction workers, on average, are killed every day on U.S. jobsites, I invite you to examine CPWR's research findings, consider the training offered to the unionized sector and the services and information for workers. Then, I ask you, to find something that *you* can put into practice – on your jobsite, in your local, within your company. Be sure to visit CPWR's Web site for more information about the offerings of this organization, a world leader in construction safety and health.

We enter 2009 with the promise of rebuilding our nation's crumbling infrastructure and creating structures to power our nation's growth. Let every one of us involved in the construction industry make sure we play our part in making jobsites safe for all.

Mark H. Ayers
President, CPWR
President, Building and Construction
Trades Department, AFL-CIO

JANUARY

CPWR
THE CENTER FOR CONSTRUCTION
RESEARCH AND TRAINING

CPWR – A New Name and Identity

Since its inception, CPWR had been known as The Center to Protect Workers' Rights (CPWR). While that name addressed our intentions, it did not reflect the actual work of the organization. The change to CPWR – The Center for Construction Research and Training gave the organization a new look but did not change its mission of research, training and service to benefit construction workers and all engaged in the construction industry.

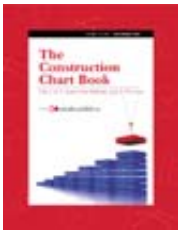
FEBRUARY

Co-sponsors of the 18th Annual Construction Safety and Health Conference

CPWR partnered with Construction Safety Council to produce the Feb. 12-14 national safety and health conference at the Rosemont Convention Center in Rosemont, Ill. The conference had 1,010 registrants, 77 exhibitors, and 172 speakers/moderators. Industry stakeholders convened with researchers Feb. 14 for the Construction Sector Council meeting to provide feedback on the development of strategic goals as part of the National Occupational Research Agenda.

Launched during the Conference:

- ***The Construction Chart Book*, Fourth Edition**



This compilation of construction industry information is a must-have resource for safety professionals, academics and government policy-makers. See Page 17.

- **Construction Solutions**

Designed for contractors, workers, and others involved in construction, this free, online tool gives hazards and solutions by trade and task without a lengthy Internet search. More on Page 27.

construction solutions
work hazards, and options for making work safer

CPWR's mission of Research, Training and Service was on display as a co-sponsor of the Construction Safety and Health Conference Feb. 12-14. Mike Dorsey and Vivian Foggo greet visitors to CPWR's booth.

FEDERAL RULEMAKING

Confined Space

CPWR provided technical assistance to Building Trades in developing comments to a proposed OSHA rule that would provide construction workers with more protections when working in confined spaces.

Promoting Attention to Blood-lead Levels Among Construction Workers

CPWR, in collaboration with NIOSH and 27 state-based programs that collect statistics on the level of lead in the bloodstream of workers, created the most complete information about blood-lead levels in the construction industry. Their results, published in *The Construction Chart Book,* gave the most comprehensive look at occupational lead levels by state and trade ever published.

MARCH

Falling Cranes, Rising Fears

On March 15, a tower crane in Manhattan collapsed, killing six construction workers plus a visitor. Another 13 construction workers were injured, as were 11 first responders. The scale of the collapse and high death toll provoked an action that few construction deaths receive: national media coverage.

Two more high-profile crane collapses March 25 in Miami and May 30 in Manhattan put construction cranes firmly in the national spotlight.

CPWR sensed the opportunity to address overlooked issues: how crane deaths and injuries usually occur and how they can be prevented. Director of Safety Research Michael McCann, PhD, began work.

Las Vegas Sun Publishes First Story on Construction Fatalities Along the Strip

Alexandra Berzon's March 30 story, "Pace is the new peril," became the first of many articles she wrote about construction deaths, OSHA, and the industry and workers affected.

APRIL

Safety Messages on Telemundo's Pecados Ajenos

A popular telenovela, *Pecados Ajenos,* featured a character working construction who didn't use proper safety procedures and fell from a ladder. CPWR, working with NIOSH and University of California's Hollywood Health & Society, helped Spanish-language network Telemundo craft the technical elements of the story line. See Page 28.

MAY

JUNE

Deaths in Las Vegas

After the sixth worker died on the $9.2 billion CityCenter site, local building trades unions ordered a walk-out June 3 of CityCenter and Cosmopolitan jobsites to protest unsafe conditions. In all, 12 construction workers died in jobsite accidents during 18 months along the Las Vegas Strip. The Southern Nevada Building Trades Council and the Perini Building Company, the general contractor for both sites, negotiated a settlement, and workers returned the next day.

As part of the settlement, CPWR was asked to conduct an assessment of safety on both jobsites and provide OSHA 10-hour safety training for thousands of workers.

Justin M. Bowen/Las Vegas Sun

Crane Report with Recommendations Released

CPWR produced its report on construction crane fatalities, using the most recent Bureau of Labor Statistics data available, on June 17. Principal author Michael McCann found electrocutions, not collapses, were the leading cause of death. He and two CPWR colleagues developed eight recommendations to improve crane safety. Read the report at http://www.cpwr.com/research-cranereport.html

JUNE (CONTINUED)

House Hearing on Construction Safety and OSHA

With Las Vegas construction fatalities and crane collapses making national headlines, Rep. George Miller (D-Calif.), chairman of the House Education and Labor Committee, held a hearing June 24 to assess OSHA's performance.

Building Trades and CPWR President Mark Ayers testified before the House committee on the hazards construction workers face, the need for safety and health protections, and the terrible toll on that workforce: an average of four workers a day killed on U.S. construction sites. CPWR provided technical support in developing Ayers' testimony.

Training Begins at CityCenter, Cosmopolitan

Chris Trahan, CIH, worked with Building Trades' international and local unions in June to begin scheduling 5,000 workers needing OSHA 10-hour training and identifying instructors to deliver classes. Trahan filled the enormous need through CPWR trainers and resources, plus the generosity of most building trades unions. Special thanks go to UBC and LIUNA locals and IUPAT, OPCMIA, and Insulators internationals.

JULY

Steve Marcus/Las Vegas Sun

From June through December of 2008, CPWR coordinated OSHA 10-hour safety and health training for 6,000 workers on the complex CityCenter and Cosmopolitan sites.

AUGUST

Site Assessment Begins at CityCenter

Janie Gittleman, PhD, headed a research team who began assessing safety conditions on the CityCenter and Cosmopolitan construction sites after a preliminary site visit in June. The team of researchers from CPWR, NIOSH, West Virginia University, Colorado State, and the University of Illinois at Chicago, evaluated Perini's safety orientation and safety management programs, performed a full Hazard Identification and Control Audit, and conducted face-to-face interviews with workers. To fully understand the attitudes and "temperature" of workers, foremen, superintendents, top management executives toward safety, the team developed safety climate surveys for these groups. See Page 19.

NORA Research Goals Drafted

NIOSH published the 14 goals of the Construction Sector's National Occupational Research Agenda that will drive the work of federal grantees for the next 10 years. The goals, covering topics on injuries and illnesses to safety culture and health disparities, can be found on the NIOSH Web site.

10-year Strategic Plan for Blood-lead Levels

As a result of the publication of occupational blood-lead levels in the *Chart Book*, NIOSH held a national meeting in Cincinnati to develop a 10-year strategic plan for data collection on lead levels among workers, with an emphasis on construction.

SEPTEMBER

FEDERAL RULEMAKING

PPE/Training

CPWR provided technical support to the Building Trades in developing comments to an OSHA-proposed rule that would obligate employers to pay for personal protective equipment (PPE) and hazard training for each worker.

FEDERAL RULEMAKING

Toxins

CPWR provided technical assistance and guidance to the Building Trades' response to DOL's proposed rule that would make it much more difficult for OSHA to protect workers from exposure to health hazards on the job.

OCTOBER

"Implications for Safety and Health Training in a Green Economy" was the topic of NIEHS' technical workshop mid-October for Worker Education and Training Program grantees. CPWR's Associate Director of Science and Technology Jim Platner, PhD, was a panelist discussing green remediation, new hazards and training needs, and green construction and retrofitting issues.

FEDERAL RULEMAKING

Cranes

OSHA published its proposed rule on cranes and derricks, based on a standard developed by a committee of industry and labor in 2004. CPWR provided technical assistance to the BCTD's response, due January 2009.

NOVEMBER

Safety Climate Survey and Site Assessment Delivered to Perini

CPWR delivered two reports to Perini and the Southern Nevada Building Trades: Preliminary Results of the Worker Safety Climate Survey and the Report of the Worksite Assessment Team. The reports identified areas for improvement and recommendations. The safety climate survey was distributed to workers during the on-site OSHA 10-hr. training; 85 percent of workers volunteered and took the survey.

National Academies Gives NIOSH/CPWR High Marks

Relevance
Impact

An independent scientific panel, convened by the National Academies of Science, released an extensive report Nov. 6 citing "significant progress" within NIOSH's research program for preventing occupational injuries, illnesses, and deaths in the construction industry. The program was rated "5" out of a possible 5 in relevance and addressing priority needs, and "4" out of 5 in impact, or getting research incorporated on worksites. Two of the panel's recommendations address continuing and expanding the role of the external "National Construction Center," the work performed by CPWR.

DECEMBER

BTMed Adds Five Sites

By year's end, the Building Trades National Medical Screening Program (BTMed) had five new outreach offices near DOE nuclear sites. More on Page 26.

FEDERAL RULEMAKING

PPE/Training

OSHA published its "Each Employee" PPE/training final rule Dec. 12: It is the employer's obligation to provide PPE and hazards training for each employee covered by the standards, effective Jan. 12, 2009. *OSHA ultimately agreed with the BCTD/CPWR position.*

CPWR Completes Training Stint at Las Vegas Sites

CPWR completed its work of managing daily OSHA 10-hr. classes for workers who lacked that training on the CityCenter and Cosmopolitan sites. Chris Trahan, CPWR's director of OSHA training and disaster response, coordinated the staffing, logistics and management of daily OSHA 10 classes, drawing first on the resources of the organization's internal training staff and international and local union training instructors. From June through December 2008, Trahan's staff ensured daily classes were delivered appropriately and OSHA 10 cards were processed. More than 6,000 workers were trained. Near the end of the year, Perini hired trainers and requested CPWR assume responsibility for overseeing appropriate delivery of their OSHA 10 classes.

Jeff Scheid/Las Vegas Review-Journal

CPWR extends its utmost thanks to the international unions' leadership and international and state training instructors who participated in this extraordinary endeavor in Las Vegas.

BEST TO ALL OF YOU IN 2009!

Reducing Traumatic Injuries

Falls are the leading cause of death on U.S. construction sites. But workers face many hazards that lead to severe injuries. CPWR research covers a gamut of study. In 2008, we are highlighting several projects with significant findings.

Preventing Nail Gun Injuries

Researcher: *Hester Lipscomb, PhD, Duke University*
Partners: *James Nolan and Dennis Patterson, Locals 2119 and 1310; Carpenters District Council of Greater St. Louis and Vicinity; Home Builders Association of Greater St. Louis*

Nail guns are a staple of residential housing construction – and injuries from these tools are just as common. Unintentional firings, ricocheting nails, nails going through work surface, and airborne nails are just a few of the ways workers (and sometimes bystanders) are injured.

Hester Lipscomb of Duke University and her research team set out to investigate this under-recognized problem among residential carpenters, focusing on apprentices. They quickly found that most nail guns (framing, finishing, flooring, etc.) use one of two common triggers. Sequential trigger guns avoid inadvertent discharge of nails in their design, while contact trip trigger nail guns allow the tool to fire any time the nose of the gun and trigger are both depressed. However, the triggers look exactly alike, so a worker cannot tell which trigger is used until he/she fires it.

The research team took on a number of projects aimed at finding ways to curb injuries from this commonly used tool.

The majority of injuries from unintentional firings could be prevented if workers used sequential triggers.

Injury Rates Among Apprentices

Researchers conducted a three-year study of nail gun injuries in apprenticeship schools in St. Louis and Bellville, Ill. During that same time, apprentice instructors, working with researchers, delivered a training program to these apprentices on safe use of the tool. The first year, 44 percent of all apprentices were injured by nail guns. The second year 32 percent were injured, and the third year 28.3 percent were injured. Two journeymen carpenters conducted detailed interviews with 385 injured apprentices about circumstances surrounding their injury.

KEY FINDINGS

Injury rates based on actual hours of tool use were…

- Two-times higher among apprentices using a contact trip trigger nail gun.
- Higher among apprentices who had no training in nail gun safety.
- Lowest among apprentices who had training plus hands-on mentoring.
- Declined 31 percent during the research period and start of training.

"Faster" Trigger No Real Difference in Productivity

To measure productivity of sequential triggers versus contact trip triggers, researchers monitored construction of two identical carpentry projects under controlled conditions. Ten journeymen carpenters with an average of 13 years experience in the trade built a wooden yard shed, once using sequential trigger nail guns and once using contact trip trigger guns.

RESULTS

- The "faster" contact trip triggers showed less than 1 percent difference in productivity.
- No significant difference between the two tools in nail count and placement was found.
- The determining factor in productivity was found to be the skill of the worker, not the tool used.

Preventing Falls Among Residential Carpenters

Researcher: *Bradley Evanoff, PhD, Washington University in St. Louis*
Partners: *Carpenters Joint Apprenticeship Program; Carpenters District Council of St. Louis and Vicinity*

Dr. Evanoff and his research team began with an assessment of the fall prevention training needs of apprentices through focus groups, worksite audits, and a survey of more than 1,000 apprentices. He didn't expect to uncover two surprising traits: Apprentices performed tasks that put them at risk before they received training, and journeymen discouraged apprentices from using fall prevention measures after they were trained. Researchers, working with the union's joint apprenticeship program, developed a fall prevention curriculum using innovative educational methods proven to reinforce training messages in other industries.

Apprenticeship instructors, Evanoff and his team put considerable time and effort into meeting apprentices' needs yet matching their training preferences. They used hands-on practice, problem-solving activities, and storytelling to increase personal awareness of hazards. They wanted instruction to empower apprentices in identifying and choosing safe working methods. But researchers and instructors also wanted apprentices to take jobsite hazards more seriously and accept the threats they encounter.

KEY FINDINGS

Apprentices responded favorably to the training:

- 98% said they were confident they could set-up, inspect and climb ladders using the methods they were taught.
- 86% agreed that seeing images of potential work hazards taught them ways to work safely.
- 81% said they will change their stepladder work habits as a result of the training.
- 60% thought hearing journeymen's stories of falls made them feel like it could happen to them.

Researchers also gave a 20-hour fall prevention seminar to 11 contractors in the Residential On-Site Safety Initiative, a partnership between OSHA and the Home Builders Association of Greater St. Louis, in conjunction with the Carpenters District Council. A follow-up survey found that 16% of apprentices had fallen from a height in the past year. Those who had fallen worked with fewer experienced carpenters and reported more unsafe behaviors by crewmembers.

Additional Traumatic Injuries Research

Ladder Falls
Melissa Perry, PhD, Harvard University

Leading Edge Decking Fall Protection
Michael McCann, PhD, CPWR

Worker Electrical Inspections/ Development of Hand-held Device to Conduct Safety Audits
Mark Fullen, EdD, West Virginia University

Ironworkers Fall Hazard Recognition
Michael McCann, PhD, CPWR

Don't Fall For It!

The 11-minute ladder safety DVD, *Don't Fall For It!,* found new audiences during 2008. The California State Building Trades Council presented the DVD to training directors, who included it in training more than 480 workers. Additional trainers have requested copies for use. The Massachusetts Public Health Department sent the state's Public Works Department a link to the *Don't Fall For It!* video online and the Department's commissioner sent out the link to public works offices state-wide to strengthen safety training of their workforce. In April of 2008, the chair of OSHA Training Institute's annual meeting invited CPWR to present the DVD to 60 OSHA training directors who serve up to 30 OTI Education Centers nationwide, further broadening its reach. The DVD continues to be requested by union instructors because "it hits home," as one apprenticeship instructor said.

Investigating MSDs and Ergonomics

More than a third of all of construction injuries that require time off to heal are caused by the punishing physical demands workers endure – heavy materials to lift, contorted body positions to reach the work, and repetitive motion.

Reducing MSDs Among Masonry Workers

Researchers: *Laura Welch, MD, CPWR, Dan Anton, PT, PhD, Eastern Washington University, Jennifer Hess, DC, PhD, MPH, University of Oregon*
Partners: *Bricklayers union, University of Iowa*

Workers in the masonry trades suffer one of the highest rates of back injury among all the construction trades. Dr. Anton and his research team are investigating various solutions for reducing risk of MSDs among masonry workers.

Do "lift teams" make a difference when laying block?

Large concrete masonry units (CMUs), such as 12" block, can weigh in excess of 65 lbs.

Although union contracts require two-mason lift teams for these heavy loads, many more contractors believe lift teams reduce productivity and are reluctant to use them. No research existed to show if the risk of MSDs could be reduced, without significant loss of productivity, by using lift teams.

Anton and colleagues began to explore this issue and discovered a disturbing fact: no consistent lifting technique exists among masons. Thus, masons may not be reducing back problems, even with a two-person team. It was also unclear whether current two-mason lifting methods reduced stress on the body.

Using motion-capture methods and surface electromyography, researchers compared masons lifting 12" block individually to two-mason lift teams.

Masons participated in Dr. Anton's tests to examine muscle use when lifting concrete block. The white dots indicate the sensors reading the mason's muscle activity.

KEY FINDINGS

- Two-mason lift teams were most effective when CMU was handled at waist height. Muscle activity of the low back and shoulder was lower when using the lift team.
- Workers laying CMU on higher rows in lift teams had more shoulder muscle activity than those laying CMU alone at the same height, which surprised researchers.
- **Lift teams may increase productivity:** Lift teams completed construction of a 12" CMU wall faster than a single worker.

Saving backs through task modification

This project evaluated the impact of equipment that raises the height of work materials, such as mast climbing scaffolding, on masons' risk factors for low back disorders.

KEY FINDINGS

- Raising the height of work materials from ground level to course 4 tended to improve masons' low back postures and movements.
- Adjustable height or mast climbing scaffolds can help prevent awkward back postures and strenuous movements if the equipment is used to maintain work materials at optimum work heights.

Are workers nationwide practicing the same safety controls?

In 2006, Dr. Hess and her colleagues conducted an in-depth phone survey with masons nationwide and found 10 ergonomic controls were commonly mentioned. The survey also probed the reasons workers used controls – and asked workers not using controls what kept them from doing so. To see how these controls were applied on jobsites, the researchers conducted surveys at 80 worksites from the

Midwest to the West, completing their work in 2008.

Researchers found substantial regional differences in the use of these 10 controls. The variations are due, in part, from differences in regional building codes to comply with seismic and other requirements. Costs and local perceptions affect adoption of controls.

Alternatives to laying block over rebar

In the spring of 2008, researchers began to examine the few alternatives to lifting heavy CMUs over standing rebar: rod repositioners, high wall grouting, and use of H-block and A-block to place around, rather than over, vertical rebar. By year's end, the team had completed half its work with masons.

Developing an Overhead Drilling Device

Researcher: *David Rempel, MD, MPH, University of California, San Francisco*

Workers who drill overhead into concrete or metal to hang pipes, ductwork and electrical equipment face many risks: falls from ladders, acute injuries to the wrist when the drill seizes, and chronic wrist, elbow, shoulder, and back musculoskeletal disorders due to the high loads.

Dr. Rempel and his colleagues from the UCSF and Simon Fraser University developed an overhead drilling device that enables the worker to remain on the ground and monitor the drilling without looking up. Workers have a comfortable posture, reduced muscle fatigue and hand vibration, and increased productivity. He developed and refined the device working with building trades unions and contractors.

Initial trials of the device on worksites were so positive that contractors asked to purchase the tool. Rempel has been working with a small tool fabricator to produce the device, but this fabricator can accommodate only a small number of orders. Rempel and his research team have been seeking collaborators to bring this product to market.

This fall, one contractor was so pleased with the tool's performance that he phoned a representative of Dewalt and insisted the company examine the device. In late November 2008, Rempel met with representatives of both Dewalt and Milwaukee Tool to discuss production and placement of the tool in their product line.

In December 2008, KM Harris Construction, a contractor specializing in bridge work, tested the device on a jobsite. They were so enthusiastic about the performance that they created video demos of the overhead drilling device in action and posted on it You Tube.

Productivity is a key feature. Mark Kasel of KM Harris Construction found that two people using 30 lb. drills worked eight hours on an overhead drilling project, while two people using Rempel's new drills did the same work in three-plus hours.

RESEARCH PARTNERS

General Contractors
Fortis Construction
Layton Construction
Skanska Construction
Turner Construction

Electrical Contractors
Cherry City Electric
Electric Construction Co
Oregon Electric Group
Rosendin Electric
Cupertino Electric
National Electrical Contractors Association

Mechanical and Plumbing Contractors
Apollo Sheetmetal
Interstate Mechanical
JH Kelly Construction
Temp Control Mechanical
Streimer Sheetmetal
Southland Industries
Broadway Mechanical

Unions
IBEW Local 6 and 595
Sheet Metal Workers Local 104
Sprinkler Fitters Local 483
UA Local 38 and 342

Dr. Rempel's overhead drilling device, above, means a more comfortable posture, reduced muscle fatigue, and decreased hand vibration, unlike the traditional method (at right).

PROGRESS

- Commercial contractors who try the tool are eager to purchase or rent the device.
- **Milwaukee Tool and Dewalt** are now considering production of the overhead drilling device within their product lines.
- Productivity: A contractor found that **the tool cut overhead drilling time for a project in half.**

To see the overhead drill in action, visit:
You Tube: *www.youtube.com/watch?v=qsnT72SHS2Q*

Dr. Rempel's university research web site:
www.me.berkeley.edu/ergo (click on overhead drill press)

Dr. Anton's team plans to post videos on You Tube in early 2009 showing the results of their research on two-mason lift teams. *Check the CPWR Web site for details.*

Preventing Work-related Diseases

Silica. Removing mortar, and cutting and/or grinding concrete, cement and masonry produce dust that contains tiny particles of silica. Inhaling it can cause silicosis, which scars the lungs and makes it hard to breathe. Silicosis is sometimes fatal – and it increases the chance of lung cancer.

Hexavalent chromium. Manganese. Modern welding has been around for 60 years, but research demonstrating the potential health effects of breathing welding fume is much more recent. Hexavalent chromium can cause lung cancer and asthma. Manganese in steel can cause neurological illness, including a disease with Parkinson's-like traits. Kidney, liver and other internal organs can be damaged by tiny particles of heavy metals.

Measuring Effectiveness of Controls to Exhaust Welding Fume

Boilermakers, pipefitters, sheet metal workers and ironworkers are all trades that perform welding, but research documenting exposure levels for these workers is scarce.

CPWR has been investigating welders' exposure to manganese and hexavalent chromium, and the effectiveness of local exhaust ventilation (LEV) systems in reducing exposures. CPWR's Exposure Assessment Director Pam Susi, MSPH, led the team conducting the research: Dr. John Meeker of the University of Michigan, an industrial hygienist from Colden Corporation and retired journeyman pipefitter Dave Feldscher.

In 2007, the team conducted air monitoring of pipefitters and boilermakers exposure to hexavalent chromium with and without LEV at a large power plant rehabilitation project. At a second power plant in 2008, researchers collected welders' exposure levels to both manganese and hexavalent chromium when using an LEV system made by VenteX, designed specifically for boiler work. In a third project, they evaluated the impact of training in reducing exposure at UA Local 597 Pipe Fitter Training Center in Mokena, Ill., a state-of-the-art center equipped with LEV in 100 welding booths. Researchers sampled air before and after apprentices were trained on correct use of the LEV.

The University of North Carolina's Dr. Michael Flynn analyzed information on U.S. and U.K. welders' exposure to manganese. Flynn got his U.S. information from CPWR and OSHA (1992-1996). His U.K. data came from The Welding Institute in England.

FUMES: *Hood positioned incorrectly to exhaust fumes. Research showed training on LEV positioning further reduces exposure.*

NO FUMES: *Worker testing portable Lincoln LEV with bell-shaped hood, which reduced exposure to hazardous welding fume.*

KEY FINDINGS

- Using local exhaust ventilation (LEV) significantly lowers the amount of heavy metals that workers breathe.
- Training apprentices on correct use of LEV, such as positioning the hood, further reduces their exposure to hazardous welding fume.
- Construction welders may be exposed to high levels of manganese and hexavalent chromium, particularly when using stick, MIG, or flux core welding.
- The Ventex LEV system reduced hexavalent chromium exposure to welders – in most cases below permissible exposure limits.

RECOMMENDATIONS

- Consider pressing OSHA to update its standards to lower metal fume exposures associated with welding and require use of LEV when welding mild steels.
- Increase training on proper ventilation use.

Silica in Tuck-pointing and Saw Cutting

Tuck-pointing – removing mortar between bricks – creates very high levels of silica-laden dust. Although it's a major health concern for workers, few cities and regions have local codes that require dust controls for masonry projects. CPWR, with Dr. Mark Goldberg of Hunter College, reviewed local building codes and found masonry dust controls were implemented out of pollution concerns, not concerns for workers

When dust control is mandated, workers and contractors find ways to make it work.

The Engineering and Work Practice Controls Work Group (see sidebar) established a sub-group to develop model specifications for silica control when grinding and sawing masonry. Researchers, government officials, union and contractor representatives met in June of 2008 to begin developing the model language that can be used by public building owners and local and state governments. The document will be circulated for wide review to establish a broad consensus among all parties before finalizing the guidance language.

CPWR researchers also investigated the use of dust controls and found they vary widely nationwide. Workers who used a dust control device while tuck-pointing preferred using the control to having none, even when they are not entirely satisfied with the device's performance.

Incentives and barriers to use of dust controls

Susan Woskie, PhD, University of Massachusetts-Lowell and research partner Susan Shepherd, ScD, worked with the Laborers union, a general contractor and concrete subcontractor involved in an overhead grinding operation to explore the barriers and incentives for implementing engineering controls. The study involved use of local exhaust ventilation on a large project in downtown Boston.

RESEARCH PARTNERS

Laborers Local 609
Suffolk Construction
S & F Concrete

They found the biggest factor that determined jobsite safety was a good working relationship between the GC's safety manager and the subcontractor's safety officer. The visibility, plus pressure from the OSHA Special Emphasis Program, influenced use of controls. The contractor also scheduled other work while grinding was being done, which reduced the need for a respiratory protection program.

For future use in epidemiologic studies, the research team also gathered personal experience and insights from laborers and carpenters on jobsite exposures to respirable dust, silica, wood dust, welding fumes, diesel exhaust, solvents and man-made mineral fibers during specialized and general tasks.

Silica Dust: *Above, workers are tuck-pointing, or removing mortar between bricks, without a control device. Below, use of a dust control device significantly reduces hazardous dust.*

Water attachment reduces exposures when cutting concrete

Dr. Woskie's research team worked with the Laborers union and its New England Laborers Training Center to test three different gas-powered concrete saws with five different 14" diameter blades. The researchers found that all showed marked reductions in respirable dust (from 54% to 99% among the various saws and blades) when using a water attachment to the saw. Using a portable pressurized water tank did not achieve the same dust reductions as using a water supply connected hose at an estimated three gallons per minute.

With a spread of almost 50% difference in dust reduction among the different saws and blades when using a water attachment, it is clear that the use of water may not completely solve the dust problem. The team is now testing a portable vacuum system and a built-in dust control system with gas chop saws.

KEY FINDING

- Using water while cutting concrete pipe reduced respirable dust exposure by an average of 87%.
- Respirable crystalline silica dropped from 8.50 mg/m^3 to an average of 1.41 mg/m^3 during the testing time.

Mast scaffolds enable workers to work at the desired height for the work they need to perform. But with few regulations and no training, this device can be deadly for workers.

Engineering Controls Work Group

Engineering controls for tools and equipment could reduce or prevent long-term illnesses and fatal diseases, such as lung cancer, silicosis and neurological illnesses, but a robust market for such controls is lacking.

To tackle this issue, CPWR convened, and has co-chaired with NIOSH, an Engineering Controls Work Group. Researchers, government officials, manufacturers and end users have collaborated on research to develop effective and practical construction hazard controls for 14 years. The group has transferred their findings into construction applications for industry practitioners. During 2008, officials from government agencies in Boston, the state of New Jersey, and OSHA's Directorate of Training and Education used the group's findings to develop local specifications on silica, information on control technology costs, and training material. In recent years, the Engineering Controls Work Group has spawned additional sub-groups to focus on hazards, including one on mast scaffolds.

2008 PROJECTS

- Examine various engineering controls (local exhaust ventilation – LEV) to reduce welding fumes.
- Test effectiveness of engineering controls (LEV) to reduce dust generated when grinding and cutting masonry.
- Measure impact of ventilation on hexavalent chromium exposure during welding.
- Conduct testing of noise reduction devices.

Mast Scaffold Work Group

These devices raise and lower work platforms via hydraulic and/or motorized lifts, enabling workers to be at the desired height for their work. But with few regulations and no training, this device can be deadly for workers.

In 2006, CPWR tapped representatives from organizations with a vested interest in safe use of mast scaffolds. The group's goal was to develop recommendations that lead to safer use of equipment through training, improved engineering control measures, and better oversight and coordination of equipment use. The work group intends to publish a "white paper" of their recommendations and provide it to decision makers to incorporate into regulations, local building codes, training programs and job requirements.

RECOMMENDATIONS

Final draft recommendations include:

- Requirements for 4-hour training for all scaffold users, with an additional 8-hour training for erector/dismantlers, supplemented by on-site, equipment-specific training.
- Require a person qualified in structural engineering to inspect the scaffold before operation when it is supported on a cantilevered base or frames not provided by the manufacturer, or when supported on a shored floor slab.
- Develop load tables that can be easily understood by users.
- Create requirements for anchorage systems.
- Require daily inspections and a written maintenance program.
- Limit vertical climbs and require fall protection.

RESEARCH PARTICIPANTS

International Union of Painters and Allied Trades
International Union of Bricklayers and Allied Craftworkers
Laborers Health & Safety Fund of North America
International Masonry Institute
Scaffold Industry Association
International Powered Access Federation
OSHA
NIOSH

Labor/management co-chairs:
Steve Martini, International Masonry Institute
Jim Kinateder, Fred Kinateder Masonry, Inc.

Guarding Against Hearing Loss

By age 50, more than half the construction workforce has hearing loss from excessive exposure to noise on the job. Hearing loss surely affects the quality of life for workers, but it also puts them at risk of injuries when they can't hear approaching vehicles or warning signals.

Reducing Noise When Cutting Concrete Pipe

Researcher: Susan Woskie, PhD, University of Massachusetts-Lowell
Partners: New England Laborers Training Center, Laborers Local 609

Dr. Woskie and research partner Susan Shepherd, ScD, conducted evaluations on reducing both dust exposure and noise levels when cutting reinforced concrete pipe with a portable, gas-powered concrete "chop" saw. Reducing dust exposures appear in "Preventing Work-related Diseases."

Noise reduction of power tools is hard to come by. The team began by having a tool manufacturer create a gas saw blade similar to a masonry saw blade that reduced noise by 10 dB as tested by the manufacturer. Researchers tested five different blades, including the specially manufactured blade, for noise levels. Partnering with the Laborers' union, laborers from Local 609 tested the blades using three different saws to cut concrete pipe at the New England Laborers Training Center in Hopkinton, Massachusetts. The research team collected 95 noise dosimeter samples for 23 different workers with a microphone attached to the workers' collar.

In a separate test of noise generated by the saw's small gas-powered motor, researchers used only one blade and one saw in a lab setting and used a tachometer to measure the rpm of the blade.

RESULTS

There was no statistical difference in reducing the decibel level among the five blades, including the blade specially manufactured to reduce noise.

- **Decibel levels dropped** when cutting the reinforced concrete pipe. The motor runs slower with the load of cutting concrete. Noise, a form of vibration, may also be absorbed by the pipe.
- **Decibel levels remained** unacceptably high throughout testing.
- **Decibel levels were highest** when blades and saws were free-running at full throttle.
- In the lab tests, **decibel levels dropped** when the saws ran at partial throttle.
- The **gas-powered saw motor is the major contributor** to noise; little reduction is possible by modifying the blades. Saw blade modification on electric- or pneumatic-powered saws may reduce noise. Testing is planned.

On-going Research

COPD Risk Among Construction Workers
John Dement, PhD, Duke University

Diffusing Ergonomic Solutions in Construction
Marc Weinstein, PhD, Jennifer Hess, PhD, University of Oregon

Sheet Metal Worker Mortality
Laura Welch, MD, CPWR

FACE Data Analysis
Janie Gittleman, PhD, CPWR

Masonry Ergonomics Best Practices
Laura Welch, MD, CPWR

Inherently Safer Aerial Lift and Crane Design Engineering
David V. MacCollum, Hazard Information Foundation, Inc. (HIFI)

Owners' Role in Facilitating Design for Construction Safety
Michael Toole, PhD, Bucknell University
John Gambetese, PhD, Oregon State University

A laborer cuts a concrete pipe at the New England Laborers Training Center to test noise levels of a blade and gas-powered saw.

Tracking Industry Change

The CPWR Data Center provides detailed data on construction employment, economics, and safety and health using multiple public and private data sources. These data are used by safety and health professionals, academics, and goverment officials at home and abroad.

Targeted Studies

Data Center Director Xiuwen (Sue) Dong, DrPH, oversees all statistical research and is the principal investigator on these projects.

Who pays the bill for worksite injuries?

Using seven years of pooled data from a large national population survey, CPWR researchers examined medical costs of occupational injuries and sources of payment among Hispanic construction workers, and compared them to the experience of white, non-Hispanic workers.

RESULTS

- Medical costs of work-related injuries in construction (including self-employment) totaled **$1.4 billion** (2002 dollar value) annually.
- 46% of the total medical cost was paid by workers' compensation ($630 million).
- Hispanic workers were 53% more likely to have a work-related injury than their white counterparts.
- **Workers' compensation paid less than 30%** of medical costs **among Hispanic workers,** significantly lower than the 50% paid for white workers.

RECOMMENDATION

This study suggests an urgent need to reform the current workers' compensation system to reduce the burden shifted to injured workers, "honest contractors," and society.

What's the cost of work-related injuries and fatalities in construction?

Partner: *Pacific Institute for Research and Evaluation*

This project quantifies direct (such as medical costs) and indirect costs (such as losses in wage and household productivity, the quality of life) due to work-related injuries in construction using a comprehensive cost model and several data sources including data from the U.S. Bureau of Labor Statistics. This is the first study of its kind on the construction industry.

RESULTS

- Total costs of fatal and nonfatal injuries in the construction industry were estimated at **$13 billion** (2002 dollar value). Deaths are estimated to be 40% of the total and nonfatal injuries, with days away from work represent 60%.
- The cost, per case, of the death of a construction worker results in losses valued at $4 million. A nonfatal injury costs approximately $42,000 per case.
- Construction laborers and carpenters, together, made up 40% of the industry's injury costs – the most of any trade.

RECOMMENDATION

- Study results provide evidence-based cost estimates for targeting preventive interventions.

On-Going Research

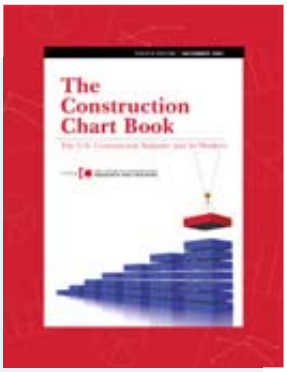
How can you measure safety and health performance?

Performance metrics are a way of measuring an organization's effectiveness in reaching critical goals. In corporations, metrics are used to drive improvement and characterize progress made.

CPWR, in collaboration with NIOSH and Minnesota OSHA, conducted a pilot study that marks the starting point for developing construction safety and health metrics. Researchers classified metrics into one of seven categories: Management Leadership, Employee Involvement, Worksite Hazard Analysis, Contractor/ Subcontractor Worker Coverage, Hazard Prevention and Control, Health and Safety Training, and General Program Indicators. Representatives of small, medium and large residential construction firms rated the metrics in focus group discussions. CPWR's Janie Gittleman, PhD, was a lead researcher for this preliminary analysis.

Results demonstrate the feasibility of collecting safety and health metrics easily at construction worksites.

The Construction Chart Book



CPWR launched the fourth edition of *The Construction Chart Book: The U.S. Construction Industry and Its Workers* during the 18th Annual Construction Safety Conference in mid-February 2008. This edition, like previous editions, presents the most complete data available on all facets of the U.S. construction industry: economic, demographic, employment/income, education/training, and safety and health issues.

The fourth edition includes a number of new topics: chronic illnesses among construction workers, use of health care services, data on blood lead levels in construction workers from the NIOSH Adult Blood Lead Epidemiology and Surveillance (ABLES) program, and estimated costs of work-related injuries in construction. Hispanic construction workers are prominently featured, comparing insurance coverage, safety and health, and other issues. *The Construction Chart Book* is widely used within the construction industry and research circles nationally and internationally. More than 1,600 copies of the fourth edition have been distributed and/or purchased, and countless pages and PowerPoint chart files have been downloaded through the CPWR and eLCOSH Web sites. This book is also collected by the U.S. Department of Labor's Wirtz Labor Library. For the first time, CPWR made the book available through Amazon.com and also through a bookseller service to university libraries.

Hispanic Construction Workers

With the steady influx of Hispanic workers on U.S. construction sites, Hispanic construction workers became a major focus of the Data Center's work. The last three years of research uncovered a number of facts. Here are just a few of them:

EMPLOYMENT

- There were 3 million Hispanic construction workers in 2007, accounting for a quarter of the total construction employment.
- More than 90% of these Hispanic workers were employed in blue-collar/production occupations. In some occupations, such as drywallers, concrete workers, roofers, and construction laborers/helpers, Hispanic workers are 40% or more of the workforce.
- Less than 8% of Hispanic construction workers are union members.

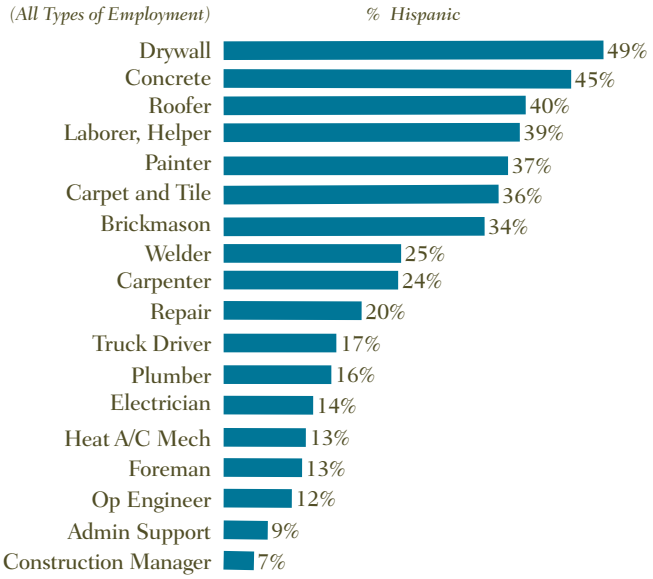
HEALTH INSURANCE

- Only 30% of Hispanic workers received health insurance through their employment, compared with 61% of white, non-Hispanic construction workers.
- About 60% of Hispanic construction workers are uninsured.

USE OF HEALTH SERVICES

- Health insurance makes a great difference for care among construction workers. In 2005, 60% of uninsured Hispanic workers and 53% of uninsured white, non-Hispanic workers had not seen a doctor or health professional in more than a year, compared with 25% and 24% for insured Hispanic and white, non-Hispanic workers, respectively.
- 6% of uninsured Hispanic construction workers report using an emergency room as their "usual place of health care" when sick.

Percentage of Hispanic workers in selected construction occupations, 2003-2005 average



COMING SOON

Health care, Hispanics and their children

Detailed information on these issues will be available in a book to be published in spring of 2009. CPWR researchers contributed the chapter, "Expanding Access to Health Care for Hispanic Construction Workers and Their Children," to appear in the book, *Expanding Access to Health Care: A Management Approach*, edited by Terry F. Buss and Paul N. Van de Water.

Improving Safety Culture

Safety practices learned in training should be a given – but they aren't. Safety norms vary widely from site to site. So how can you go about improving attention to safety on a jobsite? Researchers found it starts with attitudes and communication.

Training Workers and Foremen to Talk Frankly About Safety

Researchers: *Peter Chen, PhD, John Rosecrance, PhD, April Smith, MS, and others at Colorado State University*
Partners: *Pipefitters Locals 208, 290, & 420, Mechanical Contractor Associations in Denver, Portland, and Philadelphia, and Pinnacle Assurance*

Tight schedules, late delivery of materials, conflicting needs for space and equipment can make construction sites a potboiler of stress. Unfortunately, safety often takes a back seat to immediate priorities.

Drs. Chen and Rosecrance, and their Safety Management Applied Research Team (SMART), looked at organizational factors that play vital roles in changing safety climate/culture and safety practices. They developed "Proactive Management," a program to train workers, foremen and superintendents to stop the chain of events that leads to an accident. The program involves discussing worksite safety issues respectfully, sharing near misses, and providing constructive feedback on performance.

Over the past four years, the SMART developed and field-tested three variations of the program: one for training facilities, a train-the-trainer module, and a third to be used on jobsites.

Apprentices from Pipe Fitters Local 420 participate in a discussion activity as part of Proactive Management program training.

The more feedback and positive recognition the employees experienced, the fewer injuries occurred.

The team delivered their Proactive Management program at Saunders Construction in Centennial, Colo., between 2007 and 2008, after getting the support of the senior management, a critical element in jobsite safety. Researchers trained foremen to give timely and specific feedback to workers, to recognize good practices, and engage in daily communication with workers. Superintendents were the driving force, and they received a brief training to encourage foremen to adopt the skills. Finally, workers were given safety information through foremen and other channels.

RESULTS

- Saunders Construction experienced a statistically **significant decline in the number of work-related injuries** during the six months following the training.
- The more feedback and positive recognition the employees experienced, the fewer injuries occurred.
- Foremen found the **training boosted their confidence in recognizing good work.** They rated the program an average of 8 out of 10 in usefulness, although most were skeptical of the program's usefulness at the beginning.
- Nearly **70% of workers remembered the toolbox talks on safety,** and more than 30% reported they would do work differently because of the talks.
- More than 80% of workers remembered the posters and 50% liked them. Paycheck stuffers with safety messages were not as well received.
- Workers reported that **they felt comfortable sharing their mistakes** with foremen.

NEXT STEPS

Once the research is complete, the team plans a campaign to get the "Proactive Management" model to other contractors, industry partners and academics.

Designing and Delivering a Large-scale Safety Climate Survey

Dr. Janie Gittleman, CPWR's associate director of safety and health research, and biostatistician Elizabeth Haile, also of CPWR, initiated the development of a tool to measure the safety climate (the attitudes, beliefs and perceptions about safety) of those involved on the $9.2 billion Las Vegas CityCenter and Cosmopolitan construction sites. CityCenter, a 76-acre, 18-million-sq-ft development, is the largest privately financed project in U.S. history.

Working with national experts in the field of safety culture, including Dr. Peter Chen and his team, Dr. Gittleman created four standardized surveys targeting the perceptions of workers, foremen, superintendents and senior executives. The surveys, available in English and Spanish, were given to more than 3,700 individuals.

KEY FINDINGS

- 86% of the workers, foremen, superintendents and top executives completed the 10-minute safety climate survey.
- Sixteen out of 24 questions revealed the four groups had significant differences in perception of safety on the jobsite.
- Although workers' responses regarding safety were favorable in many cases, workers reported less positive perceptions of jobsite safety than foremen, superintendents and top executives.

Analyzing Economic and Industry Factors

Economic and employment factors drive many decisions that affect the safety and health of construction workers. Yet research on construction economics is scarce, and researchers in this specialized field have few opportunities to share information on a timely basis.

Construction Economics Research Network (CERN)

CPWR saw a need to connect economists and social scientists engaged in construction-related research. In cooperation with former Secretary of Labor and Harvard Professor John Dunlop, CPWR developed the Construction Economics Research Network (CERN) in 1995 to bring together leading researchers to present ongoing construction research and foster collaboration.

CERN members also wanted to hear construction industry leaders discuss topics of like concern. In 2008, the CERN held two meetings.

The Economics of Construction Training

April 17-18, 2008, Washington, D.C.

CERN members heard presentations from training directors from within joint labor-management apprenticeship programs, open shops, the public sector, and the military. Presenters included Don Whyte of the National Center for Construction Education and Research, and apprenticeship program updates from the Laborers and Pipe Fitters unions. CERN member Cihan Bilginsoy, PhD, of the University of Utah presented findings on union and non-union apprenticeship programs that he co-authored with CERN member Robert Glover, PhD, of the University of Texas at Austin. Among the findings: completion rates were 14% higher in labor-management apprenticeship programs than in non-union programs.

Productivity in the Construction Industry

November 13-14, 2008, Washington, D.C.

A panel of experts and government representatives discussed issues and opportunities to measure productivity within the construction industry. Presentations followed addressing demographics, recruitment and retention of new workers, and the variety of factors affecting construction productivity. Dean Findley of The Construction Users Roundtable (CURT) presented an analysis of labor productivity in high-wage regions.

CERN chair: David Weil, PhD, Boston University
CERN coordinator: Dale Belman, PhD, of Michigan State University

CPWR's CERN has 31 academicians and researchers from universities across the nation. View the list at **www.cpwr.com.**

Addressing Health Disparities Among Workers

Day laborers are vulnerable to multiple abuses in the construction trades. Many workers never receive overtime pay, are paid below minimum wage and often not paid for work already performed.

But even worse, these workers endanger themselves and co-workers because many day laborers have never received proper safety and health training for the hazardous jobs they perform. In fact, many day laborers entering a construction site have no experience in the trades at all.

Training Day Laborers in Safety and Health

Researcher: *Michele Ochsner, PhD, Rutgers University*
Partners: *New Labor, Laborers International Union of North America (LIUNA – NJ), Laborers Health & Safety Fund*

Dr. Ochsner partnered with New Labor, a worker center in New Jersey, and the Laborers union to offer safety and health training to day laborers working construction in six New Jersey communities. Rather than only offer the training at worker centers, they decided to take the training to the day laborers – right on the corners where they met.

Beginning February of 2008, New Labor staff and peer trainers conducted 30 and 45 minute safety demos on corners to hundreds of day laborers. Trainers brought fall protection harnesses for workers to try on, and they demonstrated safe ladder techniques to teach fall protection.

Researchers took on several challenges: developing health and safety curriculum designed to meet the needs of Latino day laborers in construction; teaching day laborers how to mentor their peers through a train-the-trainer program; teaching fall protection methods and other skills to day laborers waiting at corners for work; and, with the assistance of trained peer researchers, investigating day laborers' attitudes, experiences and responses to the health and safety training.

Day laborers waiting for work gather to hear a New Labor representative deliver construction safety training. Later, they would try on fall protection harnesses and safety glasses.

KEY FINDINGS

- Although Hispanic day laborers are eager to learn safety practices, their need to work often makes them take on jobs they believe are dangerous. Only 9% of more than 300 survey participants reported "often" leaving a jobsite because it is dangerous, while 54% have "never" left a site because the work was dangerous.
- **More than 80% had asked co-workers about a hazardous situation** at work.
- 19% "often" seek out information on their own concerning a jobsite hazard.
- Approximately one third of the pre-intervention group had been injured on the job.
- Many workers reported abusive bosses, a "rush to finish" that caused their injury, and employers who failed to pay wages.

RESULTS OF RESEARCH ACTIVITIES

- More than 380 day laborers participated in New Labor's construction safety and health training classes.
- Ten day laborers earned OSHA 10 cards for their participation in a two-day OSHA 10 hr. class based on the Rutgers/New Labor participatory curriculum.
- After the training, day laborers were more likely to report that they sought out information on construction health and safety issues (a 21% increase).
- The **vast majority of day laborers also reported referring back to their health and safety workbook and sharing workbook information** with friends and co-workers.

PROGRESS

The research team's work is spreading to new locations and more workers. NIOSH is funding a three-year project led by Rosemary Sokas, MD, of the University of Illinois to further the dissemination of the training curriculum and continue testing the intervention. Dr. Ochsner also shared project methods and curriculum with the day labor project coordinator of the Labor Occupational Health Project of the University of California, Berkeley.

Small Grants for Big Ideas

CPWR's Small Studies program provides a unique way to improve workplace safety. These pilot research grants can help define jobsite problems, initiate research quickly, identify needed policy changes or potential interventions, and determine whether large-scale investigation is warranted.

Small Studies

CPWR seeks partnerships between researchers and people working in the construction industry, whether they are unions or workers, contractors or owners, or other stakeholders. Researchers can include staff of hospitals, universities, and other public and private sector institutions. Topics of interest are equipment design, safety controls, economic studies, training evaluation, or potential safety and health hazards that affect the lives and livelihood of construction workers.

Each study is expected to last from one to two years and is funded at a maximum of $30,000. CPWR staff and outside experts, including members of CPWR's Technical Advisory Board and NIOSH researchers, review proposals. Complete details on how to apply can be found at www.cpwr.com/smallstudies.

In the 16 years of its operation, the Small Studies program has received more than 140 letters of intent and funded 67 studies. The funded projects have provided an impressive diversity in terms of scientific aims, the types of applicant organizations, and geographic representation. New investigators have entered the field of construction safety and health research, and innovative prevention measures have been explored through the program.

Selected Small Studies

Ready Mixed Concrete Truck Drivers: Work-related Hazards and Recommendations for Controls. Mount Sinai School of Medicine, N.Y.

Nail Gun Injuries Treated in Emergency Rooms, Duke University Medical Center, Durham, N.C.

Strategies to Prevent Trenching-Related Injuries and Deaths, University of California, Berkeley.

Construction Work Organization: Developing a Representative Survey, Michigan State University, East Lansing, Mich.

Genetic Testing for Beryllium: Worker Knowledge, Beliefs and Attitudes, East Tennessee State University.

SELECTED 2008 RESEARCH

Identifying factors of hand grip and force on ladders

Falls are the leading cause of death among construction workers. Dr. Tom Armstrong and researchers at the University of Michigan studied hand and foot forces while climbing fixed ladders. The researchers reported that most of the bodyweight

A specially built ladder and infra-red motion tracking system were used to record movements up and down a fixed ladder in a lab setting.

is supported by the feet (at peak: 94% to 100%), while the hands stabilize the body and prevent falling. Reaching to the side of the ladder required sustained hand forces of 34% of body weight. Working with the free hand, such as lifting or painting, would significantly increase the force required to hold onto the ladder. More findings and 11 recommendations are available on www.cpwr.com.

Reducing fatal and severe injuries among construction workers in Illinois

Researchers from the University of Illinois at Chicago's School of Public Health/Division of Environmental and Occupational Health Sciences are comparing and merging Illinois workers' compensation datasets on fatal and non-fatal injuries to better understand the magnitude and nature of injuries among construction workers in Illinois, especially the level of disability and financial compensation following an injury.

Preparing the Best Workforce

With more than three million organized construction workers on U.S jobsites, union instructors have a major task. CPWR's Training Department develops safety and health training programs then trains the instructors who will deliver these programs to apprentices, journeyworkers and other trainers.

Recertifying Master Trainers

CPWR has a team of 50 "Master Trainers," or trainers in the building trades, who train union instructors in construction safety and health topics. Master Trainers meet once a year to recertify their own credentials and increase their expertise and knowledge. In 2008, Master Trainers met with CPWR at the National Labor College to learn about changes to the OSHA 500 curricula. An OSHA 500 course enables instructors to conduct OSHA 10- and 30-hour training.

Master Trainers also received updates to CPWR's Disaster Response Training program. The updates included the newly revised DVD and a complete set of lesson plans for the program. In addition, trainers were briefed on regulatory developments involving confined space, hexavalent chromium, cranes, personal protective equipment (PPE), and the DOL risk rule on exposure to toxins in the workplace. The trainers leave their yearly meetings with new tools, techniques and information that they will deliver to the 1,200 to 1,400 instructors they train annually.

In 2008, CPWR's Master Trainers trained 1,197 instructors in OSHA 500 courses.

Six New Topics Added to OSHA Training Program

Smart Mark, the training curriculum for OSHA 10- and 30-hour programs offered by the Building and Construction Trades Department to building trades unions, now has six new topics.

- Silica
- Electrical Safety 2
- Motor Vehicles
- Residential Construction Hazards
- Residential Construction Fall Protection
- Residential Construction Scaffold Safety

THE SMART MARK THE SIGN OF A SMARTER WORKPLACE

Chris Trahan, CIH, CPWR's director of OSHA and disaster response training, worked with union trainers over the past two years to develop curricula covering important new safety and health topics that speak to the hazards workers face on a daily basis. Union instructors now have 19 ready-made modules to use in their OSHA training.

BCTD President Mark Ayers sent a letter to international union presidents announcing the addition. He added that Smart Mark has been a tremendous success: "Just in the 10-hour program alone, an average of 10,000 union members

Bilingual OSHA 500 Classes

Building trades members completed a seven-day bilingual OSHA 500 Train-the-Trainer in March 2008 in Las Vegas, Nev. Along with several sessions on training techniques, each student had to deliver two practice teaching sessions in Spanish.

are being trained every month, and we expect more and more workers will be trained as a result of updating the program."

And training got greener ...

Instructors using the Smart Mark program will now receive all instructor materials, such as PowerPoint slides and the instructor manual, on one CD. The electronic media replaces printed instructor manuals and overhead transparencies. Worker training booklets are still available from the BCTD through international unions.

All topics on the CD are in English and Spanish.

Training Workers to Respond to Disasters – Safely

When hurricanes, tornadoes, floods or catastrophes like a building collapse happen in this nation, trained construction workers can become "Skilled Support Personnel," an essential part of the emergency response. They can be called on to assist emergency responders in a variety of ways: assessing damage to buildings, clearing debris, and aiding in search and rescue within a pile of rubble.

In 2003, CPWR introduced a dynamic Disaster Response Training Program to prepare construction workers to perform these difficult tasks, while staying safe in dangerous environments.

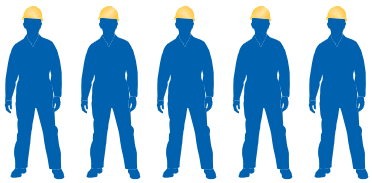
In 2008, Spencer Schwegler, CPWR's disaster response field coordinator, completed development of lesson plans to make it easier for trainers to deliver the training. He introduced the lesson plans during the Master Trainers' meetings in June. In addition, the program's DVD has been

A scene from CPWR's Disaster Response Training DVD demonstrates the Incident Command System in a dramatic search-and-rescue operation.

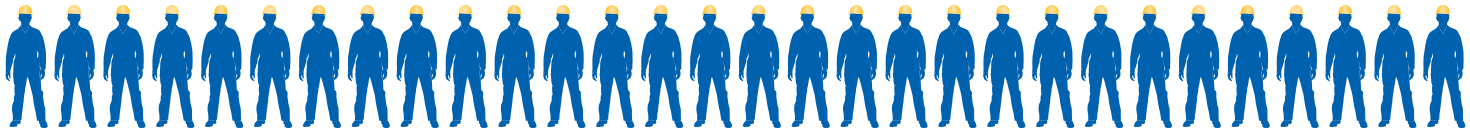
expanded to show the immediate life-and-death decisions trained workers face when deployed to a disaster. It also shows the awful price workers can pay if they are not trained and rush into a disaster situation.

CPWR includes disaster response in its modified OSHA 500 training. Trainers who complete this curriculum have dual credentials and may teach OSHA 10 and 30, plus OSHA 7600: Disaster Site Training for Construction Workers.

CPWR
maintains a team of



50 MASTER TRAINERS
who have trained



5,000 INSTRUCTORS
who train

120,000 WORKERS A YEAR
in OSHA 10- and 30-hour safety and health training

Specialized Training for Hazardous Jobs

When hazardous materials are identified in a building or jobsite, they must be removed or controlled. CPWR training ensures that workers in these dirty (and deadly) jobs know the correct procedures to protect their health – and the precautions to take when entering a hazardous worksite.

Confined Space Entry

Applying coatings, torch cutting, welding, remodeling, or servicing equipment in confined spaces can put a worker at risk of sudden death. Testing a confined space for toxic or combustible fumes and other hazards is essential before entering the area. A worker needs to know the correct precautions to work safely in these situations.

CPWR delivers hands-on confined space training, either directly with our own instructors or by funding the training of partners who use our curriculum. The National Institute for Environmental Health Sciences funds the training program.

In the past year, CPWR funded the following training for the **16-hour Permit-Required Confined Space Entry course:**

- 54 training courses delivered
- 851 workers trained

These classes were conducted by or for the following building trades organizations:

- Insulators
- Plumbers & Pipefitters
- Carpenters
- Painters
- Bricklayers
- Plasterers & Cement Masons
- Electrical Workers
- CPWR's Minority Worker Training Program

Training the Trainers

Maintaining a national corps of capable confined space instructors is crucial. To that end, CPWR offers Confined Space Train-the-Trainer courses across the nation. These courses are a combination of the CPWR 16-hr Permit-Required Confined Space Entry training and the OSHA 226 Confined Space course.

CPWR held four Confined Space Train-the-Trainer courses from May through August of 2008. Instructors gathered at training centers in Little Canada, Minn., Mobile, Ala., Kansas City, Mo., and Ann Arbor, Mich., to gain their certification with the five-day course and begin training workers.

In those months, CPWR trained 79 instructors from building trades unions, including two safety directors of organized contractors. Instructors will train hundreds of workers annually in identifying and following appropriate procedures for entering and working in a confined space.

Environmental Hazard Training

CPWR offers 40-hour train-the-trainer courses in Hazardous Waste (HAZMAT), Asbestos Abatement, Lead Abatement, and Confined Space Entry, along with the more common OSHA 500 courses. Building trades instructors who complete this training are prepared to train workers and supervisors, using set curriculum and coursework. A grant from the National Institute of Environmental Health Sciences (NIEHS) funds these training activities.

Last year, 380 building trades trainers received training through CPWR: 250 took OSHA 500 coursework so they can teach OSHA 10 and OSHA 30-hour courses, 50 received train-the-trainer instruction, and 80 attended CPWR's Trainer Enhancement.

U.S. Trainers Meet Workers in Mexico

CPWR provides an annual instructor development training to upgrade their environmental hazard instructors. Don Ellenberger, director of hazardous waste training program, held his Trainer Enhancement near the U.S./Mexico border. U.S. building trades members spent a day in Matamoros, exchanging personal experiences of worksite hazards with Mexican construction workers represented by the Matamoros Regional Federation of Workers. The two groups learned how "the other side" works, trains and confronts hazards. CPWR trainers returned with better skills for working with limited- and non-English speaking workers, plus a much better idea of what Mexican workers' expectations and experiences are relative to construction safety and health.

Training produces solid results. More than 90 percent of students said CPWR's environmental hazards training made a difference in their workplace behavior – making them more likely to discontinue work in unsafe conditions, change tasks due to unsafe conditions, identify and report unsafe working conditions, as well as request MSDS, PPE, and monitoring of a confined space.

DURING THE GRANT YEAR, CPWR:

- Improved and updated HAZMAT training curriculum, including the completion of the Asbestos Worker/ Contractor/Supervisor manual.
- Completed development of Mold Awareness training curriculum, including a comprehensive student manual, accompanying PowerPoint slides and instructor guidelines.
- Translated the hazardous waste and asbestos curriculum into Spanish to better serve the large percentage of Spanish-speaking construction workers.
- Funded 527 peer-led courses across this nation to more than 9,000 building and construction trades workers from 14 international unions.

Minority Worker Training

Through targeted federal grants, CPWR reaches into underserved communities to provide residents with pre-apprenticeship and specialty training that will equip them for gainful employment.

CPWR's Minority Worker Training (MWT) program, which began in 1999, forms partnerships with local building trades councils and community-based organization to provide training and life-changing career opportunities.

RESULTS

Since 2000, MWT consortium partners:

- Trained 1,690 minorities for construction and environmental cleanup work
- Graduated 96 percent of all students
- Report 1,300 former students gainfully employed in construction and environmental cleanup industries.

The program also adjusts to shifting needs. After Katrina, the MWT program geared up to train Gulf Coast residents in cleanup. As cleanup efforts around New Orleans slowed, the MWT retooled to train residents interested in hands-on rebuilding of their communities – and transferring those skills to apprenticeship programs for full-time employment.

Residents of New Orleans and surrounding parishes were trained in:

- Basic construction skills
- Job readiness/life skills
- Hazardous waste worker training
- Asbestos abatement worker training
- Scaffold erection training

In April 2008, the New Orleans City Council honored the MWT for its work in "providing job training and placement services that hundreds of unemployed and under-employed New Orleans residents have used to launch long-term, well-paying, and meaningful careers in the construction and environmental remediation fields."

Due to reduced federal funding effective July 2008, CPWR closed three locations and is now managing four MWT programs. Working with its community partners, CPWR is providing comprehensive training for 75 minorities, and will place and track 80 percent of graduates. Students receive training in introduction to pre-apprentice construction skills and life-skills along with environmental worker courses.

Rikefe, a 2007 graduate of the St. Paul, Minn., MWT program, received tremendous praise from his first employer for the high quality of his work. The 19 year old, who takes great pride in his accomplishments, has been promoted to supervisor.

MWT PROGRAMS AND PARTNERS

New Orleans program administered by the Louisiana Regional Council of Carpenters Pension Trust Services

East Palo Alto, Calif., program administered by JobTrain

St. Paul, Minn., program administered by Merrick Community Services

Los Angeles program administered by the Los Angeles Conservation Corps

Building Trades National Medical Screening Program (BTMed)

More than 700,000 building trades workers' put themselves at risk for life-threatening ailments on construction jobs while serving our nation's nuclear weapons programs in World War II and afterward. They may have had significant exposures to asbestos, beryllium, cadmium, chromium, lead, mercury, radiation, silica, solvents or other health hazards.

Managing the Free Screening Program

CPWR coordinates the Building Trades National Medical Screening Program (BTMed) to provide free medical screenings for these workers. Trish Quinn has been at the helm since the Department of Energy funded the program in 1996.

A network of BTMed outreach offices near DOE sites works with local unions and the community to promote the free screening program and its benefits. Workers start with a work-history interview. They are offered a free medical screening examination and tests if their history indicates possible exposure to hazardous substances. The worker will receive a written summary of all medical results and a nurse is available to explain them.

Savannah River site, Aiken, S.C.

CPWR also supports a website, www.btmed.org, to provide information and guidance to workers and their families.

IN 2008

- BTMed added five new sites to the program in 2008: Argonne West, Idaho; Piqua, GE Evendale, Ohio; Yucca Mountain, Nev.; Huntington Pilot Plant, W.Va.
- More than 29,800 former workers have signed up to participate in the program since it began in 1996.

PROGRAM ACHIEVEMENTS OF BTMED

- Was the first program to document that construction workers are at risk for beryllium disease.
- Enabled hundreds of workers to get better medical care by identifying medical problems that were untreated or poorly treated.
- Provided key evidence that led Congress to enact the Energy Employees Occupational Illness Compensation Program Act in 2000 and include construction and maintenance workers.
- Provided NIOSH and DOL with valuable work-history and DOE site information from many sources to support workers' claims.
- Became the largest medical study of older construction workers in the United States. Screenings highlighted need for better medical care for maintenance, repair, renovation, and demolition workers.
- Helped make DOE workplaces safer for today's workers. BTMed's work demonstrated that construction workers are at significant risk for illnesses as a result of exposure to health hazards in DOE facilities, so DOE now emphasizes health protection.

Employment Verification

Congress created a program in 2000 to compensate workers sickened by hazardous materials while working on DOE nuclear sites. The Department of Labor (DOL) began administering the program in 2001. To receive compensation, workers must prove their medical problems are a result of their DOE-related work. They must also show employment on a site, which can prove difficult, as the DOE lacks records for subcontractors.

The DOL asked CPWR to work with local building trades unions and subcontractors to obtain union and union-employer trust funds records, such as dispatch cards or pension contribution receipts, to help with employment verification.

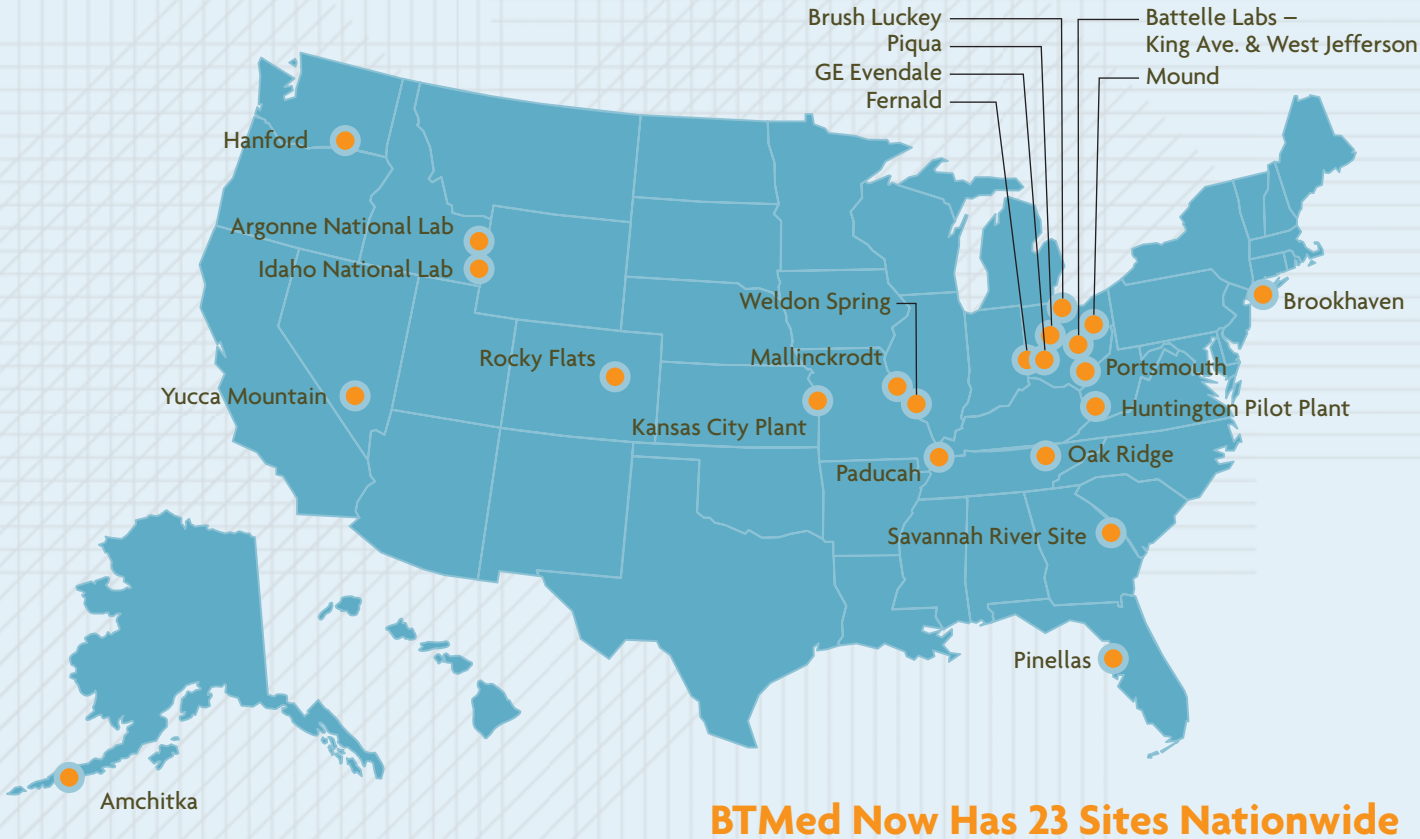
Since 2003, CPWR has assisted with more than 11,580 verification requests.

BTMED PARTNERS

State and Local Building and Construction Trades Councils
Augusta, Ga.
Central Washington
Colorado
Florida Gulf Coast
Greater Cincinnati
Greater Kansas City, Mo.
Idaho
Knoxville/Oak Ridge, Tenn.
Nassau and Suffolk Counties, N.Y.
Tri-State (Kentucky, Ohio, West Virginia)
Western Kentucky
Various others councils

Universities
Duke University Medical Center
University of Cincinnati Medical Center

Business
Zenith Administrators



BTMed Now Has 23 Sites Nationwide

Getting Research to Practitioners

CPWR has made getting research into the hands of practitioners a major focus for 16 years. CPWR published research findings through journals and CPWR Reports. More than 1.5 million CPWR Hazard Alert cards have been distributed. Brochures, fliers, and magazine articles have been produced on a wide range of topics. CPWR's outreach continues, via online communication, media relations, and other ventures.

Instant Access to Hazard Control Solutions

Construction Solutions is a free, online site designed for workers, contractors, designers and owners that identifies specific construction hazards by trade and task then gives solutions that can reduce or eliminate those hazards. This new tool, launched Feb. 12, 2008, at the 18th Annual Construction Safety Conference in Rosemont, Ill., will eventually cover all construction trades, but the first section released addresses hazards for masonry, cement and plaster.

In May of 2008, the Solutions team added tasks for sheet metal and HVAC work, with various solutions for controlling hazards commonly associated with those tasks, like working overhead on vents or installing gutters. In short order, the team added hazards and solutions for reinforced concrete, plumbing/pipefitting, boilers, and electrical tasks.

CPWR senior staff created the database of hazards and solutions using the expertise of numerous safety and health professionals, union instructors, construction workers, and university researchers. Building the Solutions database can continue online. The Web site enables users to share comments and add new solutions for handling worksite hazards.

You can find the site at www.cpwr.com or go to:

www.cpwrConstructionSolutions.org

Electronic Media

Expanding eLCOSH

Our electronic Library of Construction Occupational Safety and Health, www.elcosh.org, is CPWR's way to share new materials and important construction safety and health information with the world. Since the site launched in 2000, eLCOSH has had more than three million visitors.

In 2008, CPWR began development of an online photo collection of construction safety and health images to be accessed through eLCOSH. Safety Research Director Michael McCann, PhD, worked with Norman Zuckerman, CIH, of Mt. Sinai Hospital to develop a system for cataloguing and searching more than 400 construction photographs donated by NIOSH. Conceptual Arts, the Web design firm that created and maintains eLCOSH, designed and built the site: **eLCOSH Images**. The photos, all taken by Maryland industrial hygienist John Rekus, were digitized, and the site will be beta-tested in 2009.

Creating a Spanish-language Safety Web Site

On April 1, 2008, Telemundo's popular telenovela "Pecados Ajenos" aired the first of several episodes with characters working in construction and discussing safety issues on the job. CPWR, NIOSH and Hollywood Health & Society helped craft the technical elements for the story line about a construction worker who suffers a ladder fall.

"Mi trabajo seguro" means "my safe worksite."

"Seven Steps to Ladder Safety" is an interactive feature of the site and is available as a PDF to be printed and distributed.

CPWR wrote a PSA that aired during the show and directed viewers to www.MiTrabajoSeguro.org, which means "my safe worksite." CPWR created the Web site, working with Conceptual Arts.

Revising CPWR's Web Site

CPWR began revising www.cpwr.com in early 2008 to make important information and materials easier to find. The home page changed to announce to every visitor that the newest edition of *The Construction Chart Book* was available online. Next came revisions to the "Resources and Publications" section so users could see examples of CPWR materials. Orders of DVDs increased.

Print Media

CPWR researchers published their findings in a number of peer-review journals and trade publications and disseminated their research through dozens of presentations to professional and trade groups, academic meetings, and small, informal settings with industry stakeholders.

Selected articles of 2008:

"The Effect of Project Labor Agreements on the Cost of School Construction in New England." Industrial Relations, June, 2008. *Authors:* Belman D, Ormiston R, Scriver, W Kelso, R, Frank, K.

"Ergonomic evaluation of an extension screw gun to improved work postures." Occupational Ergonomics, Vol.8, No.1, 2008. *Authors:* Hess JA, Kincl LD, Albers JT, High RR.

"Contractors Learn About Apprentice Fall Prevention Training." The Cutting Edge, The Carpenters' District Council of Greater St. Louis and Vicinity, September, 2008. *Authors:* Kaskutas V, Drendell-Mueller L.

Find more articles at www.cpwr.com/rp-journalarticles.html

In 2008, CPWR researchers published in:

- The American Journal of Industrial Medicine
- Journal of Occupational and Environmental Health
- New Solutions: Journal of Environmental and Occupational Health Policy
- Proceedings of the NORA New Researcher Symposium
- Accident Analysis and Prevention
- Occupational Ergonomics
- Safety Science
- Public Health Reports
- Industrial Relations
- Labor Studies Journal
- The Cutting Edge
- Masonry Construction
- Modern Contractor
- The Journal (Sheet Metal Workers Union)
- Contractor Talk
- The Journeyman Roofer and Waterproofer
- The Plasterer and Cement Mason

CPWR research information was used in:

- The New York Times
- The Wall Street Journal
- The Washington Post
- CDC's MMWR
- The Sacramento Bee
- NORA Construction Sector News
- BCTD eNewsletter
- Las Vegas Sun
- Houston Chronicle
- Professional Safety
- Baltimore Sun
- Engineering News Record
- Equipment World Magazine
- Many more publications

For example, a Congressional Research Service Report to Congress and the Web site LiveScience.com referenced CPWR's June 17 Crane Report, as did numerous safety blogs and Web sites. The Association of Equipment Manufacturers and the Construction Users Roundtable both posted information about the report with a link to CPWR's site.

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International Construction Unions and Affiliates

Contractor Associations

The Association of Union Constructors

International Masonry Institute

Mechanical Contractors Association

National Association of Construction Boilermaker Employers

National Electrical Contractors Association

North American Contractors Association

Sheet Metal and Air Conditioning Contractors National Association

U.S. Government Agencies

U.S. Department of Energy

U.S. Department of Labor

Environmental Protection Agency

National Institute for Occupational Safety and Health, CDC

National Institute of Environmental Health Sciences, NIH

State Agencies

State Departments of Health

Business

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