Highlights 2023

CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

CPWR At A Glance

Research

13 WEBINARS

4,890 ATTENDEES

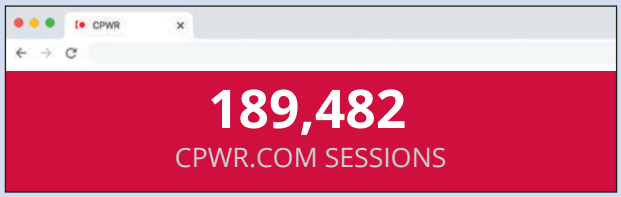
16,619 ON-DEMAND VIEWS

7 KEY FINDINGS

13 UPDATE NEWSLETTERS

17,234 SUBSCRIBERS

11% SUBSCRIBER INCREASE



189,482 CPWR.COM SESSIONS

9 INFOGRAPHICS

4,540 LINKEDIN FOLLOWERS

54% LINKEDIN FOLLOWERS INCREASE

730 INSTAGRAM FOLLOWERS

40% INSTAGRAM FOLLOWERS INCREASE

Training

6,547 +14% COURSES OFFERED

2,602 +10% TRAINERS TRAINED

79,584 +23% WORKERS TRAINED

Service

SINCE BTMED PROGRAM BEGAN:

46,000 CONSTRUCTION WORKER SCREENINGS

10,000 LOW-DOSE CT SCANS

100% SATISFACTION RATE IN 2023

All figures cover the 12 months since Highlights 2022.

Contents

Foreword

This year again showed CPWR's importance to the construction industry. At the end of 2023, the influx of new projects, contractors, and workers into our industry means there remains much to be done to reach the goal of every worker going home safely every day.

CPWR is crucial to continued progress towards that goal. Its leadership in both the Campaign to Prevent Falls in Construction and the National Stand-Down to Prevent Struck-by Incidents includes developing guidance that addresses these two leading causes of injuries and fatalities. The research projects described in this report respond to other persistent hazards, such as musculoskeletal disorders and chemical exposures.

Other projects recognize emerging risks workers face. By studying areas such as nanomaterials and exoskeletons, CPWR helps firms and workers understand how to improve safety while taking advantage of innovations that can benefit them and the structures they're creating.

CPWR also helps those already affected by jobsite exposures. As part of the Building Trades National Medical Screening Program, clinics across the country conduct thousands of health screenings each year for former construction workers who built and maintained our nation's nuclear weapons sites. These screenings identify work-related conditions at an early, more treatable stage.

There are other ways CPWR is a force that enables all workers—experienced or new—to stay on the job because they can recognize

and control hazards. The Training Department not only offers courses directly to workers; it also trains trainers, who then share good practices with thousands. The Environmental Career Worker Training Program provides un- and under-employed community residents opportunities for meaningful careers in remediation and construction. The current research project on mentorship for female Sheet Metal Workers and resources in Spanish and for women are additional ways CPWR supports non-traditional and at-risk workers so they can enjoy careers in the trades.

CPWR's commitment to multiple approaches to improving safety and health is clear through its ongoing work on mental health. It is developing guidance to prevent bullying and harassment and continues to refine its resources for preventing suicide and opioid overdoses. Five new research projects are examining access to naloxone, how public policies affect mental health, and peer and member support programs.

There are many ways CPWR shares its expertise. Its Data Center provides insights and analysis on key topics. Its 13 webinars this year attracted nearly 10,000 viewers. Its staff speaks regularly at conferences, and its mailing list of 17,000 disseminates new research, new tools, and new opportunities. Its family of more than a dozen websites offer guidance on topics like hazard control measures, safety culture, and silica.

Finally, CPWR is an unparalleled connector of people across the industry. It collaborates with key federal agencies (including NIOSH, OSHA, and NIEHS), state and local governments, contractors, unions, consultants, and others to pursue common goals.

Together, these activities explain why people across our industry are fortunate we have a resource like CPWR.

SEAN MCGARVEY
Chairman of the Board and President, CPWR
President, NABTU

Executive Director's Message

Too often people in construction talk as though safety and productivity are in competition. They actually can and should work together, since both depend on two interrelated attributes: preparation and planning.

The most obvious example of how CPWR prepares workers is the training we offer. Last year our Training Department reached more than 80,000 people, from the OSHA 10- and 30-Hour Construction Safety and Health courses to the 500-level classes that more than 2,600 trainers took, in topics like hazardous waste clean-up, confined space, and fall prevention, to gain knowledge they share with future students.

Our commitment to training also includes our current research projects. Researchers are exploring with instructors and students how to better convey content and delivery of the OSHA 10 and will use those findings to develop recommendations for an enhanced version of the course. The Foundations for Safety Leadership for Residential Construction has adapted the successful Foundations for Safety Leadership training to address falls.

Other research focuses on planning. One project's interviews and surveys with electrical contractors and those in other trades showed that better pre-task planning (PTP) both improved efficiency and reduced hazardous situations. These findings helped researchers create a comprehensive guide to improving PTP, including checklists and other applied tools. The evaluation of the Best Built Plans (BBP) program is using contractor feedback to improve BBP's guidance for safer manual materials handling while maintaining productivity. The Safety Culture-Safety Management Information System has as its foundation our proven materials for improving safety climate. Our Research to Practice program continues to produce materials that support the Campaign to Prevent Falls in Construction's focus on "Plan. Provide. Train." Our Small Study program often funds research on how to address emerging hazards or benefit from new technologies.

Material preparing nontraditional employees to work safely in construction grew again this year. We recently posted two documents—another of our Physicians' Alerts and a list of tasks by trade—that can help pregnant workers talk with their doctors and stay safely on the job. Our collection of PPE resources for female, non-binary, and transgender workers addresses the need highlighted by a recent survey showing that only one in five of those workers were always provided properly fitting PPE.

The research project developing a mentorship program through local unions of the Sheet Metal Workers highlights how to improve both safety and production. In addition to facing typical safety and health risks, tradeswomen are subjected to discrimination, harassment, and skills under-utilization. As a result, they have increased risk for injury, stress-related health effects, and high attrition rates, reducing the workforce at a time when it needs to grow. This project aims to reduce women's health and safety risks, including work stress, and improve retention.

Our Building Trades National Medical Program offers a reminder of what happens when there's insufficient planning. Its screenings of former construction workers on U.S. Department of Energy nuclear weapons sites are needed largely because hazards went uncontrolled on those sites.

Finally, good planning makes it much easier to bring others into important efforts. We are proud to work closely—with contractors, unions, government agencies, insurance firms, and others—to create safer workplaces. This collaboration benefits everyone in our industry.

CHRIS TRAHAN CAIN, CIH
Executive Director

Research

Using Research to Improve Worker Safety

Conducting research and analyzing data remains at the center of how our Research Program addresses hazards facing construction workers across the county. Collaborations with contractors, unions, government officials, businesses, university researchers, and others help turn these findings into products and knowledge that make workers safer on and off the jobsite.

Safety Program for Residential Construction Reaches Builders

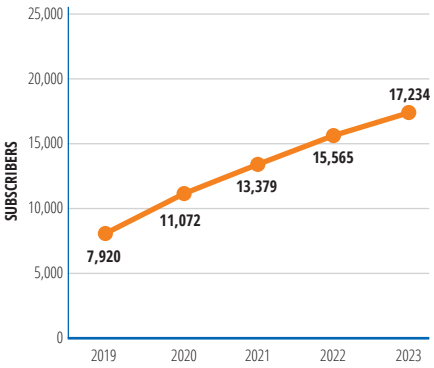
The Foundations for Safety Leadership for Residential Construction (FSL4Res) focuses on reducing fall risks, which cause two-thirds of job site fatalities in that sector. Based on CPWR's successful Foundations for Safety Leadership (FSL) training, the FSL4Res teaches key leadership skills that frontline crew leaders and supervisors can use to strengthen safety climate and improve crew safety behaviors. This year the research team adapted the original materials so the FSL4Res—2.5 hours overall—can be delivered in several shorter sessions at the worksite. As the materials have reached the field, including through nearly 1,200 downloads from cpwr.com, contractors are recognizing its benefits. Said the safety director of an integrated design and construction firm in Arizona, "The information is useful in safety, as well as in daily communication with employees and subcontractors."

PROJECT: Improving Safety Leadership and Fall Prevention Training in Residential Work (Washington University in St. Louis)

Developing More Targeted Outreach

CPWR uses a wide range of communications channels—including email, websites, social media, webinars, and direct mail—to share knowledge that will benefit both workers and their employers. A key part of our work this year was to better target our outreach, mainly by improving our understanding of our audiences. Recognizing that nearly one in three construction workers is Hispanic, our contact database is now identifying Spanish speakers; because small firms experience a disproportionately high rate of injuries, the database has begun to collect data on company size. Accompanying those efforts is our ongoing work to expand the number people we reach: our LinkedIn followers increased more than 50%, our Instagram followers nearly 40%, and, for the ninth consecutive year, subscribers to our main email list grew more than 10%.

PROJECT: Communications, Outreach, and Education Core (CPWR)



Growth in CPWR's email list since 2019.

A construction worker using an arm-support exoskeleton during short-term field testing. Workers wear a variety of exoskeletons while performing different construction tasks and provide feedback on exoskeleton benefits and potential limitations.

Moving Exoskeleton Research into the Field

The research team completed laboratory evaluations of how arm (ASE) and back (BSE) support exoskeletons (EXOs) affected balance and maneuverability. Participants conducted tasks such as climbing stairs and ladders, walking on single beams, and maneuvering through constrained spaces. The team found the EXOs increased the number of errors only in some maneuverability tasks, and time on task showed slight increases. The team is now examining how the location of work (overhead versus wall) and type of work (static versus dynamic) impact movement, muscle activity, and worker preferences when using the ASE, as well as how both ASEs and BSEs impact the performance of common construction tasks. The researchers are adapting their study results into guidelines that construction managers and workers can use to select EXOs for common tasks; they will also evaluate the guidelines in the field during the coming year.

PROJECT: Evaluation of Trunk and Arm Support Exoskeletons for Construction (University of California, San Francisco and Virginia Tech)

Latest Dodge Report Looks at Jobsite Safety Practices

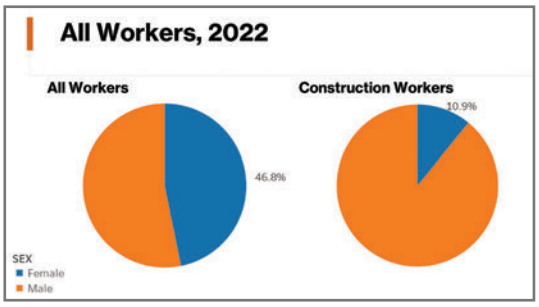
In 2023 CPWR collaborated with the Dodge Construction Network on the partnership's sixth survey about safety management in construction. The new study examined jobsite practices, including pre-task planning, personal protective equipment (PPE) fit, heat exposure, mentoring, training, safety communication, and technology use, as well as strategies to address mental health and substance use concerns. It found that companies that are larger (100+ employees), hire union workers, and are members of trade associations typically report higher use of specific safety practices. For example, large contractors (94%), union contractors (94%), and members of trade associations (89%) had higher percentages of providing PPE designed to fit compared to small contractors (less than 20 employees; 63%), non-union contractors (76%), and non-members of trade associations (62%).

PROJECT: Construction Industry Data and Statistical Core (CPWR)

Evaluation of the OSHA 10-Hour

This year the research team moved from the developmental to the evaluation phase of the project, which is examining the OSHA 10-Hour Construction Safety and Health training program, one of the most common approaches for providing construction workers basic safety training. This phase will collect data—using four questionnaires the researchers developed—from 200 OSHA 10 trainers and 6,000 of their students to determine the current state of OSHA 10 training. Each questionnaire was translated into Spanish to broaden the recruitment of participants so they were more representative of the industry. The findings are currently being analyzed while additional trainers are being recruited; they are also helping the research team structure the next stage of its work, which is developing an enhanced OSHA 10 training and determining if it is more effective in improving workers' safety knowledge.

PROJECT: Evaluation and Improvement of OSHA 10-Hour Construction Safety Training (West Virginia University, Boise State University)



A slide the CPWR Data Center presented during a "Women in Construction" webinar.

"Women in Construction" Highlights 2023 Webinars

This year CPWR's successful webinar series had a three-session mini-series on women in construction. A range of panelists—including staff from NABTU, the Bricklayers and the Iron Workers unions, Alberici Constructors, CPWR, and several non-profits—focused on why construction needs more women, strategies for recruiting and retaining women, and how to be an ally. Each session averaged over 225 live attendees, with hundreds more on-demand views of the recordings. Other popular topics among this year's 13 webinars included an examination of preventing falls through improved design with NIOSH, OSHA, and other partners in the National Campaign to Prevent Falls (875 live attendees, over 1,000 on-demand views) and a session with OSHA on heat-related hazards (750 live attendees). To increase the latter's reach, there was a simultaneous Spanish translation.

PROJECT: Research to Practice (r2p) Core (CPWR)

Partnering to Address Priority Hazards in Construction

CPWR's Research to Practice (r2p) Program works with a wide range of partners—including contractors, unions, OSHA, NIOSH, and the NORA Construction Sector Council—to develop new and improved resources that address persistent and emerging construction hazards. Two new checklists help employers comply with OSHA's National Emphasis Program on heat, guiding them through development of an overall Heat Illness Prevention Program, as well as daily steps to implement a program so workers stay safe in both indoor heat and outdoor hot weather. Our existing Best Built Plans (BBP) program for preventing injuries and improving productivity by reducing manual materials handling was completely updated based on a previous evaluation and input from CPWR's Ergonomics Community of Practice. The BBP materials are now easier to navigate online and include new planning and training resources for contractors and workers.

An infographic on heat safety in Polish, one of nine languages it is available in.

PROJECT: Research to Practice (r2p) Core (CPWR)

Pilot Planning Program to Prevent Struck-by Incidents

Following background research on the use of nudges to influence safety and health decision-making, as well as a survey on struck-by incidents and prevention practices, the r2p Program published new pre-job and pre-task planning guidance for preventing those incidents. Currently being pilot-tested, this guidance is available on CPWR's Struck-by Hazards webpage, cpwr.com/struck-by. It includes information on why planning is so important and a list of guided questions and additional resources to help users create a pre-job plan to address objects that are falling, flying, rolling, and/or swinging on a jobsite. A final section lists nudges and reminders to increase the frequency and effectiveness of planning at the start of every shift or new task.

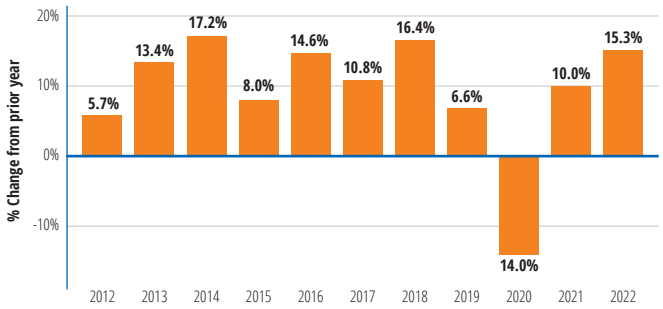
PROJECT: Research to Practice (r2p) Core (CPWR)

Data Center Leader in Construction Industry Statistics

CPWR's Data Center remains a leading source for construction industry statistics. Highlighting its importance were the more than 70 requests for data or statistical consulting from people across the industry and the more than 190 peer-reviewed papers citing its work. This year's six Data Bulletins examined leading causes of death in the industry, Focus Four injuries, women in construction, employment costs, labor force characteristics, and safety practices among contractors. There are now more than 30 Data Dashboards, the interactive online tools that examine specific industry topics and offer filters and easy-to-download data that users can customize based on their interests. New dashboards this year focused on topics such as aging workers, temporary workers, health risk factors, and nanomaterials in construction. Together the Data Dashboards will serve as a framework for the upcoming Interactive Construction Chart Book, the next step in the highly successful Chart Book series.

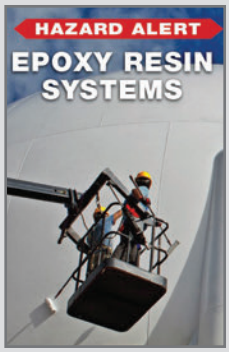
The Data Center has also been more intensively monitoring and tracking the rapidly changing construction workforce. From 2011 to 2022, the largest workforce increases (by percentage) were among those aged 55 years or older (+73.3%), Hispanics (+81.8%), and/or female (+57.1%). The Data Center also found temporary workers—those reporting a temporary or seasonal job—increased from 12.9% of the construction workforce to 13.7% from 2011 to 2020.

Change in construction workers aged 55+



PROJECT: Construction Industry Data and Statistical Core (CPWR)

Identifying and Communicating Hazards from Part B Chemicals



This year the research team took multiple steps towards its goal of developing and disseminating interventions that reduce exposures to hazardous chemicals in Part B of spray polyurethane foam and metal structure coating systems. It continued to generate data through urinary biomonitoring of nanomaterials among industrial painters and examined the association between urinary exposure, oxidative stress, and acute kidney injury markers. It also conducted a systematic review of hazardous chemicals in the qualified list of products used for bridge painting in New England. Its commitment to sharing its findings included working with health and safety trainers at the International Union of Painters and Allied Trades, producing a new Hazard Alert Card on epoxy resin systems, publishing manuscripts, and presenting at national and international conferences. This research is particularly important because many projects funded by the federal government's bipartisan infrastructure bill include Part B chemicals.

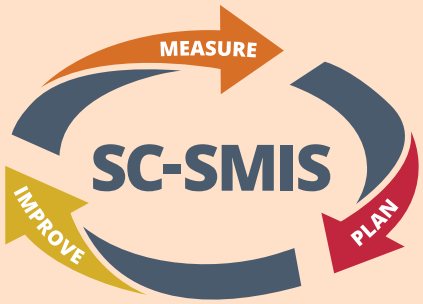
PROJECT: Reactive Chemical Systems: Part B—Developing Data-Driven Interventions (University Massachusetts Lowell)

Protecting Workers from Respiratory Hazards

Because roofers, welders, concrete workers, and masons face some of the most significant respiratory hazards in construction, this project is developing methods that will increase adoption of interventions that reduce exposure to dust and fumes. This year the research team began sharing the dissemination strategy it developed for large firms, including through a paper published in the International Journal of Construction Education and Research. It also completed data collection and analysis for the project's two other aims, creating intervention strategies for small firms and workers. Dissemination to those two groups is now underway.

Health Hazard Controls Industry Diffusion: Evidence-based Intervention Strategy (Virginia Tech)

Thousands Visit SC-SMIS To Improve Safety Climate and Safety Management



The free, online Safety Climate-Safety Management Information System (SC-SMIS), which helps users measure and strengthen safety climate, is still going strong. Since its launch in January 2021, over 20,000 visitors from across the world and a range of industries have accessed its website, scsmis.org. Those visitors have downloaded more than 130,000 safety management resources from the site's extensive repository. In addition, 750 have created an account and 280 have used either the Safety Climate Assessment Tool (S-CAT) or the Safety Climate Assessment Tool for Small Contractors (S-CAT^{SC}) to measure their organization's safety climate. One safety professional from a medium-sized company noted: "This is a great resource and I hope it stays available with even more to come. I can see us using this ongoing in the future. I've told peers about it and will continue to do so!"

PROJECT: Safety Climate-Safety Management Information System (SC-SMIS) (CPWR)

New Efforts to Support Construction Workers' Mental Health

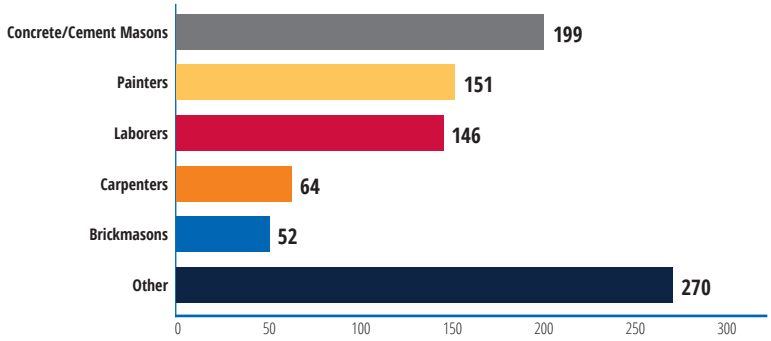
Our steps over the past year built on our previous work to reduce construction worker deaths from suicide and opioid use. We piloted, refined, and released a discussion-based resilience workbook designed to create a culture that both prevents poor health outcomes and enables workers to bounce back when struggles occur. The Topic Area Workgroups on combatting suicide and overdose fatalities, launched after last year's mental health workshop, continued to meet and are producing a study evaluating peer programs and a literature review of stigma. We created a bullying and harassment survey and found an industry partner who enabled us to establish a baseline measurement based on responses from more than 3,300 workers. We are now looking for other partners to conduct baseline surveys of apprentices and journey-level workers to inform interventions. Our outreach efforts included sharing our bullying and harassment study

research methods in a talk at the American Public Health Association's annual meeting, publishing articles in union and trade association magazines about suicide prevention and peer support, and speaking on webinars and at conferences about both the severity of the problem within our industry and CPWR's resources and efforts to reverse the trend.

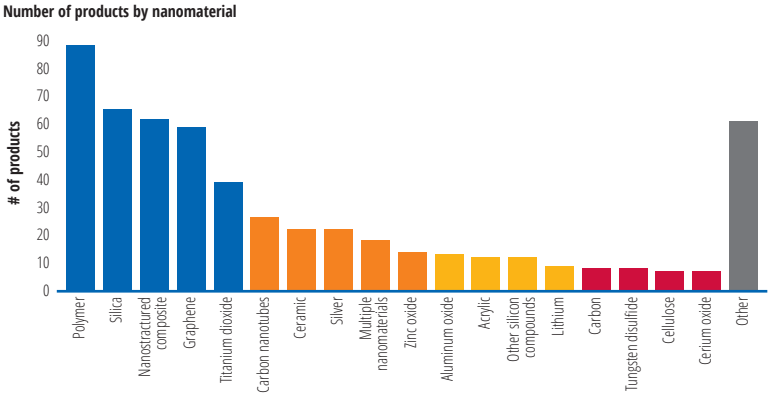
We also invited industry professionals and researchers to propose studies aimed at preventing construction worker deaths from suicide and opioid overdoses. An expert review committee considered 19 proposals, with evaluation of the efficacy and scalability of the programs studied a top priority. The committee selected five projects to receive $50,000 each from funding provided by a private sector donor. They examine development and impact of a local union's member assistance education program; implementation and effectiveness of peer support programs at two building trades unions; impact of employment laws on construction worker suicide; training on and access to naloxone; and suicide prevention practices for Iron Workers. These one-year studies will report their results later this year.

Increasing Knowledge about Nanomaterial Use and Safety

Number of Products by Trade



eLCOSH Nanomaterials Dashboard



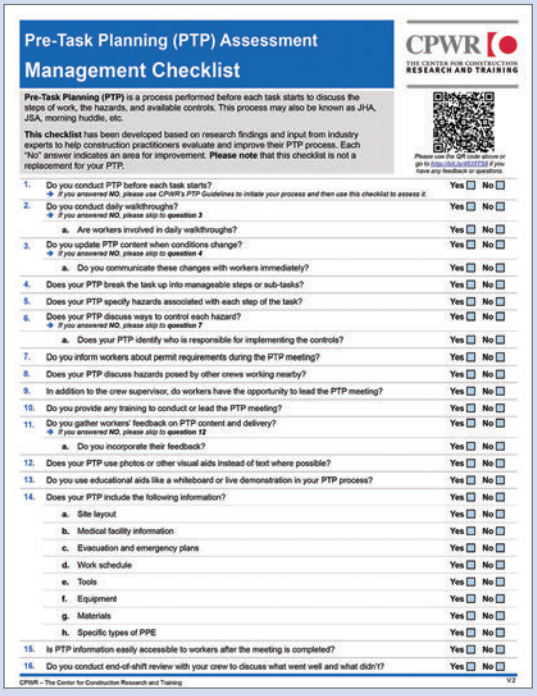
Sharing information about the risks of nanomaterials, including how to control those risks, became an even larger part of this project over the past year. In collaboration with the CPWR Data Center, the research team developed and launched the Nanomaterials Data Dashboard, which allows users to explore data from the project's eLCOSH Nano website, an online inventory of construction products containing nanomaterials that now has over 900 entries. The team also analyzed multiple products from the inventory, initiated a study on the effects of weathering on worker exposure, and presented findings about graphene-reinforced cement to the Inhaled Particles and NanOEH Conference in England. The nanomaterials awareness training curricula and other resources developed by the researchers continued to be shared through train-the-trainer sessions, webinars, and national conferences attended by researchers and trainers.

PROJECT: Manufactured Nanomaterials in Construction: Evaluating Exposures, Controls and Worker Training (CPWR)

New Resources and Tools Guide Better Pre-Task Planning

This project aims to improve workers' safety and health and their overall performance by optimizing the pre-task planning (PTP) process, especially in electrical construction. The research team developed and released a comprehensive package that offers tools and resources to help contractors initiate, implement, assess, and strengthen their PTP process. This year the researchers also conducted an additional 41 interviews on three jobsites, bringing the total number of interviews to 181 and site visits to 10. They used the information from these interviews and jobsite observations to create 10 electrical task analysis documents (to be released later this year) to enable contractors to improve PTP and training. The PTP resources and the task analysis documents served as the basis for two CPWR webinars in 2023; both were among the year's best attended sessions.

PROJECT: Prevention through Augmented Pre-Task Planning (CPWR)



Pre-Task Planning (PTP) Assessment Management Checklist

CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

Pre-Task Planning (PTP) is a process performed before each task starts to discuss the steps of work, the hazards, and available controls. This process may also be known as JHA, JSA, morning huddle, etc.

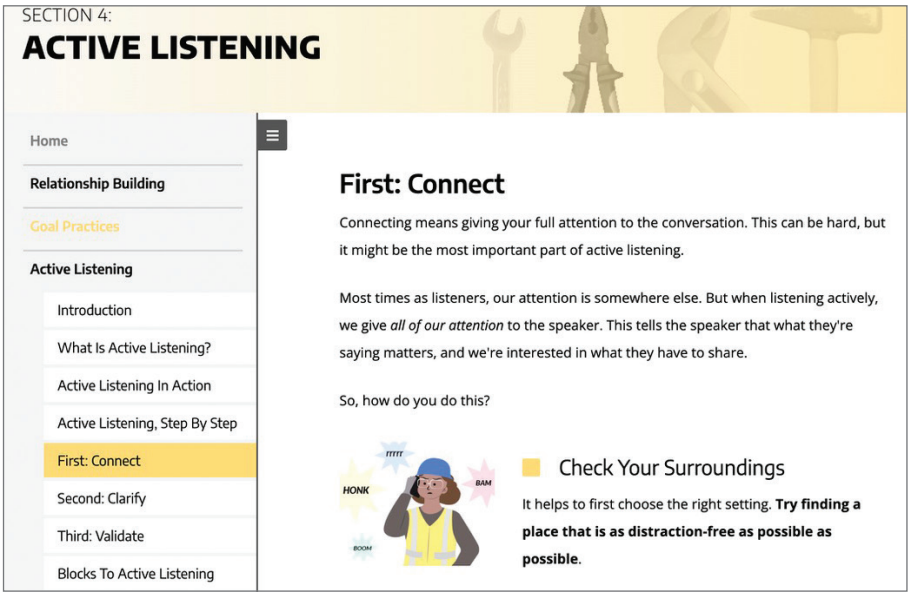
This checklist has been developed based on research findings and input from industry experts to help construction practitioners evaluate and improve their PTP process. Each "No" answer indicates an area for improvement. **Please note** that this checklist is not a replacement for your PTP.

1.	Do you conduct PTP before each task starts? *If you answered NO, please use CPWR's PTP Guidelines to initiate your process and then use this checklist to assess it.*	Yes ☐ No ☐
2.	Do you conduct daily walkthroughs? *If you answered NO, please skip to question 3*	Yes ☐ No ☐
	a. Are workers involved in daily walkthroughs?	Yes ☐ No ☐
3.	Do you update PTP content when conditions change? *If you answered NO, please skip to question 4*	Yes ☐ No ☐
	a. Do you communicate these changes with workers immediately?	Yes ☐ No ☐
4.	Does your PTP break the task up into manageable steps or sub-tasks?	Yes ☐ No ☐
5.	Does your PTP specify hazards associated with each step of the task?	Yes ☐ No ☐
6.	Does your PTP discuss ways to control each hazard? *If you answered NO, please skip to question 7*	Yes ☐ No ☐
	a. Does your PTP identify who is responsible for implementing the controls?	Yes ☐ No ☐
7.	Do you inform workers about permit requirements during the PTP meeting?	Yes ☐ No ☐
8.	Does your PTP discuss hazards posed by other crews working nearby?	Yes ☐ No ☐
9.	In addition to the crew supervisor, do workers have the opportunity to lead the PTP meeting?	Yes ☐ No ☐
10.	Do you provide any training to conduct or lead the PTP meeting?	Yes ☐ No ☐
11.	Do you gather workers' feedback on PTP content and delivery? *If you answered NO, please skip to question 12*	Yes ☐ No ☐
	a. Do you incorporate their feedback?	Yes ☐ No ☐
12.	Does your PTP use photos or other visual aids instead of text where possible?	Yes ☐ No ☐
13.	Do you use educational aids like a whiteboard or live demonstration in your PTP process?	Yes ☐ No ☐
14.	Does your PTP include the following information?	Yes ☐ No ☐
	a. Site layout	Yes ☐ No ☐
	b. Medical facility information	Yes ☐ No ☐
	c. Evacuation and emergency plans	Yes ☐ No ☐
	d. Work schedule	Yes ☐ No ☐
	e. Tools	Yes ☐ No ☐
	f. Equipment	Yes ☐ No ☐
	g. Materials	Yes ☐ No ☐
	h. Specific types of PPE	Yes ☐ No ☐
15.	Is PTP information easily accessible to workers after the meeting is completed?	Yes ☐ No ☐
16.	Do you conduct end-of-shift review with your crew to discuss what went well and what didn't?	Yes ☐ No ☐

CPWR – The Center for Construction Research and Training V.2

Mentorship Program for Female Sheet Metal Workers Works with New Set of Mentors and Apprentices

The second round of yearlong mentor-mentee pairings organized by this project, which promotes safety and well-being among female apprentices with the Sheet Metal, Air, Rail and Transportation Workers (SMART), are now underway. Before, during and after the mentorship program, the research team conducts surveys with both people in the pairing to evaluate how mentorship has affected their health, safety, and wellbeing. In preparation for disseminating the training program to unions and tradeswomen-supportive organizations (such as Chicago Women in Trades), the team is refining the mentor handbook and facilitator guide, incorporating skill-based example videos, developing a best practices guide, and completing interviews with mentors and program coordinators. The researchers are also collaborating with partners to identify avenues to highlight this open-access program. The researchers will begin sharing these resources, which can both increase the number of women in the construction trades and improve their well-being, in the next year.



PROJECT: Promoting Safety and Well-being among Sheet Metal Worker Women through Mentoring (University of Washington)

Improving Contractor Resources for Reducing MSDs

This project, which is evaluating the Best Built Plans (BBP) program's resources for reducing risks to workers doing manual material handling, shifted its focus this year to strengthening those materials. After analyzing the first set of comments from contractors about manual material handling risks and the use of the BBP materials, the research team and CPWR's Research-to-Practice (r2p) staff reconvened the Ergonomics Community of Practice. Comprising staff from contractors, insurance firms, equipment vendors, and universities, this group made recommendations to improve the usability of and content on the BBP webpages, feedback that supplemented the ideas the contractors provided in the research's first stage. The research team and CPWR's r2p staff have modified the materials and posted them on cpwr.com. Next, a new group of contractors will test and provide comments on those resources and the revised website.

PROJECT: Evaluation of the Best Built Plans Manual Material Handling Tool for Construction (Washington University in St. Louis)

Building Bloc Building Services, LLC

Small Studies Examine Mental Health, Technology, More

Our Small Study Program provides researchers with up to $30,000 to research topics such as new technologies, reaching high-risk sectors, and small employers, and advancing research-to-practice. Seven studies issued final reports this year:

- **Assessment of construction workers' mental health to improve wellbeing** (Colorado State University) reviewed the literature about construction workers' mental health, conducted a survey to assess and identify their mental health issues/concerns, and developed recommendations for organizational and individual responses to these issues.
- **Improving the Assessment of Noise Exposure and Warning Signal Audibility on Construction Sites** (Lawrence Technological University) examined whether binaural (two-ear) measurements provided a more accurate assessment of jobsite noise exposure and warning signal audibility than traditional single-channel systems. The study found that binaural measurements were always higher, important information for preventing job-related hearing loss.
- **Safety meetings in small construction companies** (University of Utah) found that positive safety climate is directly related to positive safety meeting processes (i.e., participation) and outcomes (i.e., effectiveness and satisfaction).
- **SETU: A smartphone-based training for worker safety in excavation trenching** (Carnegie Mellon University) used a mixed methods framework to understand reasons for the limited adoption of proven protective systems during trenching and excavation. Two surveys obtained industry feedback, and primary and secondary data analysis helped build a training and decision-making application to improve excavation and trenching safety.
- **Sheet metal and HVAC safety intervention adoption and best practices** (Arizona State University) developed a comprehensive list of welding safety interventions to mitigate worker exposure to fumes and nanomaterials, classifying them into five categories: general PPE, ventilation equipment, policies and procedures, materials and equipment, and other.

A laser scan of a Baltimore row house from the study of using Building Information Modeling in residential renovation.

- **Using Building Information Modeling (BIM) for job hazard analysis of renovating residential buildings** (Morgan State University) developed a case study that used BIM in the renovation of a Baltimore rowhouse. The work included laser scanning the rowhouse to create a three-dimensional digital model and working with safety professionals to develop a risk assessment database that analyzed the frequency and severity of hazards associated with residential renovation.
- **Using community-based organizations and partnerships to enhance reach and engagement of small construction establishments** (Sarpy and Associates, LLC) worked with CPWR's Environmental Career Worker Training Program (ECWTP) to develop and test a community-based process to reach small construction businesses about safety and health. Although it was not effective with the firms, it did reach at-risk individuals in underserved communities about their safety needs.
- **Using immersive storytelling to create engagement and motivation during fall prevention training** (Michigan Technological University) created a fall hazard training methodology for residential construction workers featuring immersive storytelling, which puts participants into a digital environment and delivers job site safety story narratives. The study focused on how the inclusion of storytelling-driven narratives affects safety training engagement and motivation.

Training

Preparing Workers for Safety and Careers

Training is central to CPWR's commitment to planning and preparation. This year more than 80,000 construction workers, including 2,500 trainers, benefitted from the courses offered by our training consortium, which we lead in coordination with NABTU.

Participants in this year's Trainer Enhancement Conference work with fall prevention equipment.

Making Instruction More Interactive

This year CPWR's training consortium began updating the curriculum of two important courses: Disaster Response Training and Asbestos Abatement Worker Training. Both are becoming less reliant on PowerPoint presentations, instead adopting more interactive approaches and activities proven effective with adult learners. The PowerPoints that will be used for each—content, photos, and diagrams—will also be improved, as will instructor guides and participant manuals. The disaster response class will also gain an additional final exercise scenarios and a first-aid training module. Trainers are already using the revised disaster response curriculum in both the trainer and rank-and-file programs, and the new material for asbestos training will be implemented this year.

Environmental Career Worker Training Program Continues to Serve Underserved Communities

The Environmental Career Worker Training Program (ECWTP) continued to provide comprehensive training and job placement assistance to low-income, unemployed or underemployed residents in four communities: Boston; East Palo Alto, California; Flint, Michigan; and New Orleans. Funded by the National Institute of Environmental Health Sciences (NIEHS), the ECWTP prepares its participants for entry into registered apprenticeships and careers in construction. This year, 81% of 95 students who graduated from the four programs found jobs, with an average starting hourly wage of $22.03.

The ECWTP serving New Orleans was retooled this year into NOLA Trades (nolatrades.org), a multi-trade apprenticeship readiness program that uses NABTU's Multi-Craft Core Curriculum, which introduces students to the different building trades and teaches them the skills necessary to successfully apply for a registered apprenticeship, debt-free education. Community residents now can pursue a broader range of career paths, and the local building trades' apprenticeship programs will benefit from a pipeline of diverse, qualified applicants ready to help revitalize their communities. NOLA Trades' first training cohort began last fall.

Department of Energy Labor Training Working Group Examines How to Improve Its Work

For the first time since the start of the pandemic, the U.S. Department of Energy (DOE) Labor Training Working Group (LTWG) met to address issues that complicate providing effective safety and health training to workers at DOE facilities. CPWR's Gary Gustafson co-chairs the group with Gabe Pugh, executive director of DOE's National Training Center. The meeting, which included many people new to the work group, included representatives from the International Brotherhood of Teamsters, International Association of Firefighters, Steelworkers Charitable and Education Organization, International Chemical Workers Union Council Center for Worker Health and Safety Education, and the Partnership for Environmental Technology Education. Staff from the NIEHS National Clearinghouse also participated.

The meeting addressed several issues, beginning with the continuing struggle to get employers to release trainers from their day-to-day assignments to teach courses at DOE facilities. This difficulty hampers the ability of the organizations represented on the workgroup to provide health and safety training to their members. Another challenge for LTWG members is getting their trainers approved by the site's subject matter experts in a timely way that allows scheduling courses.

U.S. Department of Energy National Training Center in Albuquerque, New Mexico.

The work group also addressed several topics that were active prior to the pandemic but have not been reported on since 2020. They include updates on the status of DOE's revisions to the Radiation Worker Training program; DOE's position on maintaining the *Information Book: Active Labor Unions Interfacing with DOE*; and updates and revisions to the work group's charter so its scope of work is clear and supports needed training.

Preparing the Construction Industry for Disaster Response

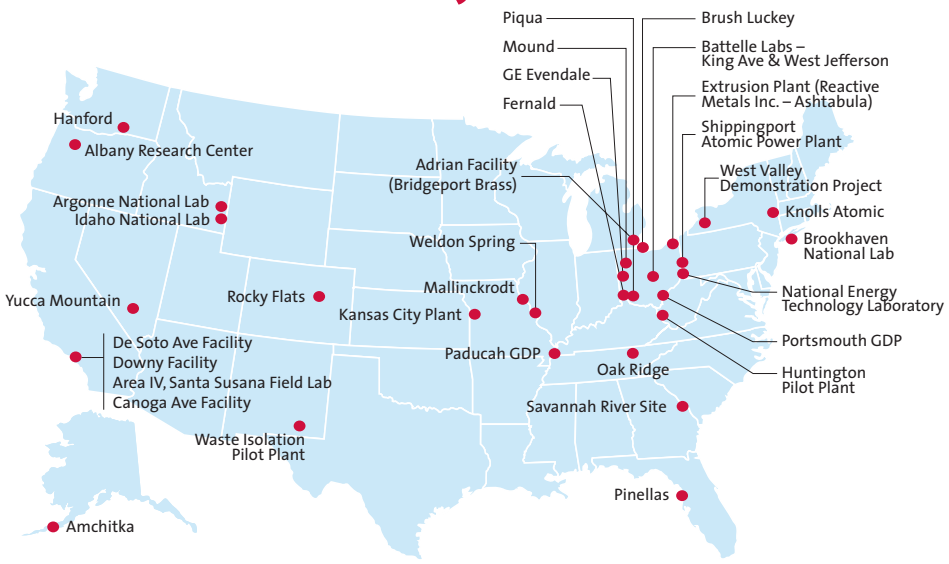
CPWR continues to build a cadre of union building trades instructors who can deliver our NIEHS-funded Disaster Response Training Program to their members. With the increase in both the frequency and severity of natural disasters, such as wildfires, hurricanes, tornadoes, and floods, this program—funded through NIEHS's HAZMAT and Disaster Preparedness Training Program—is vital for preparing the construction workforce to serve as skilled support personnel to first responders. This year, the program exceeded its projections, with more than 1,500 students being trained to respond to both natural and man-made disasters.

Service

Serving Former DOE Construction Workers

The Building Trades National Medical Screening Program (BTMed) continues to provide free, ongoing medical screening services to construction workers previously employed at U.S. Department of Energy (DOE) nuclear weapons sites. Over its quarter-century of work, BTMed has completed 46,000 screening exams, as well as 10,000 CT scans for early detection of lung cancer. These exams are provided by over 225 medical clinics across the country, who this year conducted 1,700 exams and 1,000 CT scans. Funded by a cooperative agreement from DOE, BTMed is administered by CPWR in partnership with Stoneturn Consultants, Duke University Medical Center, University of Maryland Medical Center, and Zenith American Solutions.

DOE Sites served by BTMed



BTMed kicked off the year by bringing its team together for a planning meeting to discuss screening schedules, medical protocols, outreach, and the efficiency of our process. Joining the meeting were Kevin Dressman and Greg Lewis from DOE, who highlighted BTMed's importance to the agency.

Reaching the Workers

BTMed staff remained busy enrolling new participants and engaging existing ones. Highlights from the past year included:

- Participation in 60 in-person events—building trades meetings, retiree meetings, and community fairs.
- A visit to the Portsmouth Gaseous Diffusion Plant to meet with workers and pass out BTMed materials—all to boost awareness of the benefits of participating.
- An appearance on a local news channel at the DOL/DOE-sponsored meeting in Richland, Washington.
- BTMed hosting another webinar in the DOE Former Workers webinar series. More than 360 people attended a presentation on hearing loss given by Dr. Marianne Cloeren, BTMed medical director, who emphasized prevention and the importance of taking protective measures to safeguard one's hearing. The session also tackled the complicated issue of compensation and the guidelines for filing a hearing loss claim.

BTMed Assistant Director Miles Fisher describes the program to a local TV station after an outreach event near the Hanford plant.

Using Research to Improve Health

This year our researchers published two peer-reviewed journal articles based on BTMed participants' data in the American Journal of Industrial Medicine:

- **How much have adverse occupational health outcomes among construction workers improved over time? Evidence from 25 years of medical screening.** The researchers examined how health outcomes for construction workers have changed over the past 60 years. They found that stronger occupational health protections have had a significant impact, as shown by the reduced risk of occupational disease over that period. The greatest reductions came when there were strong regulatory and legal incentives to reduce exposures, such as illnesses associated with asbestos, silica, and vapors, gases, dusts, and fumes. The smallest improvement was for hearing impairment, for which there has been little regulatory enforcement.
- **Restrictive spirometry pattern (RSP) among construction trade workers.** RSP, or low total lung volume, is relatively common in the general U.S. population but has not been associated with workplace exposures. BTMed researchers have previously documented that construction trade workers are exposed to many substances that cause scarring of the lungs or have other effects associated with RSP. This new study found that RSP was significantly associated with most construction trades, even after adjustment for other known risk factors for restrictive lung disease, such as obesity, smoking, hypertension, diabetes, and cardiovascular disease. Because individuals with RSP are likely to die prematurely from respiratory diseases, cardiovascular diseases, and lung cancer, medical professionals should pay more attention to RSP.

"I took advantage of this health screening as soon as possible. That way, I have a baseline, and every three years I can come back to see where my health's at."

– Phil Hamer, Former Portsmouth GDP Worker, Laborers Local 83

"I have been doing BTMed every three years for a long time. The staff have always been professional, efficient, polite, and easy to work with to schedule appointments. I am totally happy with the program."

– Pat Loftus, Former Hanford Worker, UA Local 598 and IUOE Local 370

"I wouldn't have been diagnosed with lung cancer as early as I was if it hadn't been for BTMed. I was a boilermaker for a long time, and there's no way that you work around all that we did and not need to be checked out. It could mean your life."

– Frank Rose, Former Savannah River Site Worker, Boilermakers Local 687

CPWR Research Project Leads

2019-2024 EXTERNAL

Evaluation and Improvement of OSHA 10-Hour Construction Safety Training
Mark Fullen, EdD
West Virginia University
Kimberly Rauscher, ScD, MA
Boise State University

Evaluation of the Best Built Plans Manual Material Handling Tool for Construction
Ann Marie Dale, PhD
Bradley Evanoff, MD, MPH
Washington University in St. Louis

Evaluation of Trunk and Arm Support Exoskeletons for Construction
Carisa Harris-Adamson, PhD, CPE, PT
University of California, San Francisco
Maury Nussbaum, PhD, *Virginia Tech*

Health Hazard Controls Industry Diffusion: Evidence-based Intervention Strategy
Deborah Dickerson, PhD, MS, CIH
Virginia Tech

Improving Safety Leadership and Fall Prevention Training in Residential Work
Bradley Evanoff, MD, MPH
Ann Marie Dale, PhD
Washington University in St. Louis

Promoting Safety and Well-being among Sheet Metal Worker Women through Mentoring
Marissa Baker, PhD
University of Washington

Reactive Chemical Systems: Part B—Developing Data-Driven Interventions
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Anila Bello, ScD
University of Massachusetts Lowell

2019-2024 INTERNAL

Communications, Outreach and Education Core
Bill Wright

Construction Industry Data and Statistical Core
Amber Trueblood, DrPH

Manufactured Nanomaterials in Construction: Evaluating Exposures, Controls and Worker Training
Gavin West, MPH

Prevention through Augmented Pre-Task Planning
Babak Memarian, PhD

Research to Practice (r2p) Core
Jessica Bunting, MPH

Safety Climate-Safety Management Information System (SC-SMIS)
Linda Goldenhar, PhD

SMALL STUDY PROJECTS

Assessment of construction workers' mental health to improve wellbeing
Mohammed S. Hashem M. Mehany, PhD
Colorado State University

Contribution of state consultants to preventing fatalities in construction
Wayne Gray, PhD
Clark University

Designing a high-accurate fast-response electrical work zone alerting system
Morteza Nazari-Heris, PhD
Lawrence Technical University

Development of rule-based safety checking system for autonomous heavy construction equipment
Kyungki Kim, PhD
University of Nebraska Lincoln

Effects of subcontracting on construction injuries
Peter Philips, PhD
University of Utah

Heatwave, traumatic injuries, and barriers to heat safety program implementation
Miranda Dally, MS
University of Colorado

Improving the assessment of noise exposure and warning signal audibility on construction sites
Nikolina Samardzic, PhD
Lawrence Technological University

SMALL STUDY PROJECTS
(cont.)

Safety meetings in small construction companies
Joseph Allen, PhD
University of Utah

SETU: A smartphone-based training for worker safety in excavation trenching
Erica Cochran Hameen, PhD
Carnegie Mellon University

Sheet metal and HVAC safety intervention adoption and best practices
Kenneth Sullivan, PhD
Arizona State University

Using 360-VR narrative communication to boost small employers' safety practices
Jin Wen, PhD
Georgia Tech

Using Building Information Modeling (BIM) for job hazard analysis of renovating residential buildings
Mohammad Gharipour, PhD
Morgan State University

Using community-based organizations and partnerships to enhance reach and engagement of small construction establishments
Sue Ann Sarpy, PhD, MS
Sarpy and Associates, LLC

Using immersive storytelling to create engagement and motivation during fall prevention training
Ricardo Eiris, PhD
Michigan Technological University

Virtual boundaries: Investigating ethical and social risks of exoskeletons in the construction industry
Omobolanle Ogunseiju, PhD
Georgia Tech

What comes around goes around: Understanding the value of reciprocity in research-to-practice partnership
Zhenyu Zhang, PhD
Texas A&M University

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CONTRACTOR ASSOCIATIONS

Associated General Contractors

The Association of Union Constructors

International Council of Employers of Bricklayers and Allied Craftworkers

Mechanical Contractors Association of America

National Electrical Contractors Association

National Roofing Contractors Association

North American Contractors Association

Sheet Metal and Air Conditioning Contractors' National Association

LABOR ORGANIZATIONS

NABTU and Affiliated Councils

International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers

International Association of Heat and Frost Insulators and Allied Workers

International Association of Sheet Metal, Air, Rail and Transportation Workers

International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers

International Brotherhood of Electrical Workers

International Brotherhood of Teamsters

International Union of Bricklayers and Allied Craftworkers

International Union of Elevator Constructors

International Union of Operating Engineers

International Union of Painters and Allied Trades

Laborers' International Union of North America

Operative Plasterers' and Cement Masons' International Association of the United States and Canada

United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada

United Brotherhood of Carpenters and Joiners of America

United Union of Roofers, Waterproofers and Allied Workers

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CPWR recognizes Linda Goldenhar, who recently retired after a career dedicated to improving worker safety and health, especially by strenghtening safety climate and safety culture in the construction industry.

Online Resources

cpwr.com — The first stop for information on our research, training, service programs, and related products and resources.

elcosh.org — An online library of safety and health materials for construction workers, employers, researchers, and other stakeholders.

nano.elcosh.org — An inventory of the use of nano-enabled products — those to which nanomaterials have been added or the nano-structure has been altered — in construction. Its goal is to inform workers about these products as a first step to protecting them from hazards.

nanosds.elcosh.org — This tool is designed to help manufacturers, distributors, and importers of construction products containing nanomaterials evaluate and improve their safety data sheets (SDS).

stopconstructionfalls.com — Visit our website and join the ongoing Campaign to Prevent Falls in Construction.

scsmis.com — Contractors can use the SC-SMIS free of charge to assess their safety climate, select and implement appropriate tools to strengthen it, and engage in continuous safety climate improvement.

cpwrconstructionsolutions.org — Find practical control measures to reduce or eliminate a variety of construction hazards.

ecd.cpwrconstructionsolutions.org — An interactive tool for the construction industry that helps predict exposure to workplace hazards using objective exposure measurements.

silica-safe.org — A one-stop source of information on how to prevent a silica hazard and comply with the standard, including a free online planning tool to create a silica control plan.

bestbuiltplans.org — Provides contractors and workers with practical tools and information to plan for safe materials handling while staying productive and profitable. Access the jobsite planning tool, training resources, and interactive coaching exercises created to reduce manual materials handling (MMH) and prevent sprain and strain injuries.

choosehandsafety.org — Find information on the risks and ways to prevent hand injuries, including what to look for when choosing hand tools and gloves.

safecalc.org — Evaluate the financial impact of a safer solution using this free online calculator.

safeconstructionnetwork.org — Use this site to connect with others interested in advancing construction safety & health, uncover new resources or share your own, and identify new research or community partners.

covid.elcosh.org —The COVID-19 Construction Clearinghouse offers a central resource for construction employers and workers to find the latest research, guidance documents, training and other resources to help prevent the spread of COVID-19.

covidcpwr.org —This free Planing Tool takes you step-by-step through developing your plan to protect employees from and prevent the spread of COVID-19, including what to consider when conducting a job hazard analysis, selecting appropriate controls, screening workers and visitors, training employees, and implementing the plan.

btmed.org — Learn about the Building Trades National Medical Screening Program and its goal to provide free medical screenings to construction workers who helped build our nation's nuclear defense sites.

esmartmark.org — Contact your international union to access this site created by NABTU to distribute the Smart Mark training curriculum.

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