Industrial Safety & Hygiene News

April 2018

ISHN

INSIDE this eBOOK:

Construction Industry Safety

- One fall can be traumatizing – and costly
- Implementing a dropped objects prevention plan
- OSHA silica standard for construction
- OSHA confined spaces in construction standard
- Hard hat innovations

Construction Industry Safety

ALL *NEW* CONTENT

VOLUME 3

introduction

Construction seems to be occurring everywhere in 2018 – condos, apartments, residential homes, bridge erection, roadway paving, excavations, demolitions, and large scale painting jobs. By 2021, U.S. construction output will total $10.1 trillion. Construction workers – there are 10.3 million in the U.S. -- face many high-risk hazards, such as falling from rooftops, unguarded machinery, being struck by heavy construction equipment, electrocutions, silica dust, and asbestos.

This exclusive *ISHN* ebook – Volume 3 – identifies the most serious construction hazards and provides protection tips and best practices. We pay particular attention to falls – the number one killer on construction sites. Fatalities caused by falls from elevation continue to be a leading cause of death for construction employees, accounting for 370 of the 991 construction fatalities recorded in 2016 (BLS data). These deaths are preventable, and *ISHN*'s ebook shows you how to save lives.

Other injuries common to the industry include welding burns, head injuries, injuries to the spinal cord, cuts and lacerations, broken bones, limb or finger amputations, loss of hearing, lifting and other repetitive motion injuries, heat stress-related illnesses and vision loss.

OSHA has recently issued two standards that significantly impact the construction industry – confined spaces in construction and preventing exposures to respirable silica. We devote articles to both standards to help you with compliance.

Construction site safety is challenging for several reasons: 1) There are always many new hires; 2) The workforce is transient and often short-term; 3) The workforce is diverse with many languages spoken on sites; 4) The construction site environment is in a constant state of flux, with conditions always changing and subject to weather extremes; and 5) Contractors, sub-contractors and "gig" economy temps must be effectively supervised.

I'm sure you'll find *ISHN*'s Safety in Construction ebook to be a value resource to address the industry's array of challenges, ensure regulatory compliance, and prevent serious injuries and fatalities.

Dave Johnson - *ISHN* Editor

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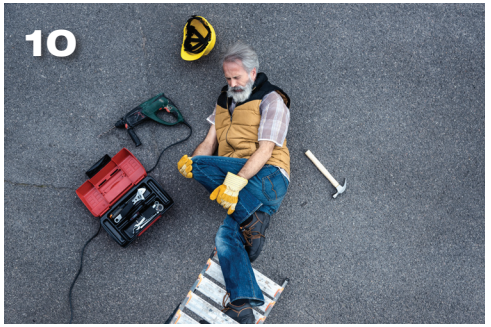

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Falls & fallen objects

Protecting workers from two persistent risks

By RAYMOND MANN and TRAVIS BETCHER

This article will look at two of the most persistent dangers to workers, illustrate the risks of each, and outline safety solutions and equipment to protect all workers on the jobsite.

Current regs

In the United States, workers at height are in most applications mandated by OSHA to wear a fall protection harness and be tied off. It is well understood across the general construction industry that workers must utilize a primary safety system to prevent a worker from falling, or an active personal fall arrest system (PFAS) to arrest a fall when it occurs. Currently, in regards to objects, protection is addressed with debris nets, toe boards and personal protective equipment (PPE) to eliminate or limit potential damage. Here is a quick comparison for how the two risks are addressed:

People are not designed to work at height: People don't have a natural connection point to tie off to, which is why they wear a fall protection harness—to provide a connection point and keep them at height.

Tools are not designed to be used at height: Tools also lack a connection point to tie off to, but are allowed to fall with hope that secondary safety measures—hard hats and debris nets—will prevent injury or damage.

While, currently, these risks are regulated very differently, the difference between a fall protection program for humans and a fall protection program for objects is only a matter of perspective: one helps save you; the other helps save others. The question to ask is—why the difference? Why do we allow anything to fall?

Dropped objects

According to the BLS, there were 157,490 "struck by object or equipment" cases in 2015 in the United States. That's nearly 18 injuries caused by a dropped object every hour. (Bureau of Labor Statistics (2016, November 10).

When an object falls from height it gathers energy and force. Heavier tools, some up to 80 pounds (36.28 kg) can

Falls & fallen objects *continued*

be particularly dangerous. Tools that have pointed attributes, like a nail, screwdriver or spud wrench, can also cause fatal injuries given their ability to penetrate upon impact. Even something as light and blunt as a nut fastener has the potential to cause damage, injury or death if it were to fall from a great enough height.

To better understand the potential danger, look at the speed at which a falling tool can travel. For example, a three-pound tool falling from 200 feet will travel at a speed of 80 miles per hour when it hits the ground. When this tool finally impacts, hardhats and drop zones are of little consequence when an object with this amount of speed makes a direct impact or deflects off another object.

Incidents and accidents proving the damage potential have made the news for at least a century. *The New York Times* published an article on August 2, 1903 about dropped objects where it was reported, "with a series of kerchunks extending over the three years during which the new East River bridge has been built, nearly $3,000 worth of tools have fallen from the hands of the workmen into the river." The equivalent of that financial loss today would be nearly $78,000. It's fortunate that these tools were dropped into a body of water.

In November 2014, FOX News reported that a 58-year-old man had died in Jersey City after being struck in the head by a tape measure that fell 50 stories on a job site. While the story was labeled a "freakish accident," the troubling reality is that this type of incident is more common than people realize. Workers who witnessed the Jersey City incident referenced an ongoing concern of equipment falling from height.

"Fall protection" redefined

Historically, "fall protection" referred to preventing people from falling. With the increased awareness of danger of "struck by objects" and the growing number of accidents and injuries that have been reported, the industry is shifting to a broader definition of fall protection. "Fall Protection" refers to anything that can fall, whether it's a person, debris, tool or piece of equipment. For all objects at height—including humans—it's not about catching the object (a reactive action), it's about preventing things from falling (a preventative measure).

Many manufacturers are working with regulating bodies such as OSHA, ANSI and ISEA to help create regulations and a product performance standard for dropped object prevention.

Currently there is an OSHA General Duty Clause (Section 5(a)(1) of a law requiring employers to maintain a workplace "free from recognized hazards that are causing or are likely to cause death or series physical harm" to employees. OSHA's criteria for issuing a General Duty Clause Violation include:

- There must be a hazard
- The hazard must be recognized
- The hazard causes or is likely to cause injury or death
- The hazard must be correctable

Additionally, OSHA requires that if you work in an environment

Falls & fallen objects *continued*

where you're at risk of being hit by something that falls, you must do the following:

- Secure tools and materials to prevent them from falling on people below
- Barricade hazard areas and post warning signs
- Use toe boards, screens on guardrails or scaffolds to prevent falling objects
- Use debris nets, catch platforms or canopies to catch or deflect falling objects.

Fall protection for tools

While the industry works toward enacting an official standard for dropped objects, there are many steps employers and safety managers can take to ensure their crew is protected. The most effective step is to add a dropped object prevention program for tools and equipment to their existing fall protection program. When creating a safety plan or outlining the safety needs of the worksite, a safety manager needs to identify and evaluate all potential dangers on the worksite. If fall protection is identified as a danger, they need to implement the ABCDEF's of Fall Protection:

ABCDEF's of fall protection:

- Anchors
- Body Harness
- Connectors
- Descent & Rescue
- Education
- Fall Protection for Tools

A positive first step toward implementing the ABCDEF's of fall protection is to conduct, or enlist a safety expert to conduct, a risk assessment. Personal Protection Equipment (PPE) works best when it compliments all other safety equipment used. An overall risk assessment will help identify all hazards workers must be protected against and the best PPE "package" to deploy.

Implementing fall protection for tools

With all PPE, it's vital that the activities of each worker be considered. If the PPE constricts or negatively impacts job performance it is less likely to be worn properly, or worn at all. This is especially important to consider when adding PPE to the tools that perform the work.

One of the more common methods to help prevent tools and equipment from falling is tethering tools and equipment with connectors, connection points, and anchors. Many tools today have built-in connection points placed by the manufacturer for tethering to help maintain the effectiveness and function of the tool. Additionally, tools and other equipment can be retrofitted with connection points. These tools are then connected to an attachment point via a lanyard.

Depending on the shape, size and use of a tool, they can either be connected to a worker through a tool belt, harness,

Falls & fallen objects *continued*

or wristband (recommended for tools under five pounds), or anchored to a fixed structure (recommended for tools over five pounds). Tools that weigh more than five pounds should never be tied off to a person. If a heavy object becomes uncontrolled, the weight and force could dislocate a wrist or shoulder, or even pull a worker over a ledge or off of scaffolding.

To ensure that the deployment and adoption of a broader, all-encompassing fall protection program succeeds in protecting and supporting workers, it's important to assign and train a competent person to manage the program and equipment.

Conclusion:

It is the responsibility of every safety manager, construction superintendent, overseer and worker to make sure they understand the dangers they face when working at-height. Fall prevention means preventing things from falling, whether they be people, tools or equipment.

Raymond Mann, QSSP, is a global technical services & regulatory/application engineer at 3M™ Personal Safety Division.

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One fall can be traumatizing - and costly

10,000 construction workers sustain fall injuries every year

By KRIS MANNING

Fall prevention and protection is a primary focus of construction industry safety programs for good reason. According to the Center for Disease Control and Prevention, falls are the number one cause of construction-worker fatalities, accounting for one-third of on-the-job injury deaths in the industry.

Each year in the U.S., more than 200 construction workers are killed and more than 10,000 are seriously injured by falls. In addition to permanent injuries and lost lives as the result of falls, businesses lose billions of dollars each year from significant increases in insurance premiums, workers' compensation claims, product liability costs, and other related expenses.[1] Additionally, the low morale of seeing a severe injury to a coworker can be traumatizing and decrease productivity from the remaining workers. All of these factors make the impact of even one fall from a relatively short height extremely high, and their prevention extremely valuable.[2]

Leading construction companies that strive to eliminate all injuries — including those from falls — take a multi-pronged safety approach that focuses on:

- Eliminating construction safety risks during design;
- Building a strong safety culture that reinforces 100-percent compliance with fall protection measures, and
- Researching and implementing the latest in certified safety equipment related to fall protection.

Fostering a strong safety culture

Developing a strong safety culture has the single greatest impact on injury reduction. For this reason, creating a safety culture should be a core value for all businesses. Everyone feels responsible for safety and pursues it on a daily basis – whether it is committing to always tying off or being responsible for stopping unsafe actions of fellow workers – employees go beyond the call of duty to identify unsafe conditions and behaviors and intervene to correct

> "The onus is on the employer to ensure that safety values are translated into action."

One fall can be traumatizing – and costly

continued

them. It becomes engrained in who they are and what they do because safety becomes a natural element of their daily routine and planning process.

Companies that understand the true value of safety have embraced it to protect their workers; celebrating milestones and rewarding workers who are observant and keep the workplace safe. Organizations like these are building a culture of safety where every employee has a vested interest in being safe and is empowered to correct unsafe any unsafe action.

The onus is on the employer to ensure that safety values are translated into action. It requires consistent, demonstrable safety leadership whereby the entire management structure proactively and visibly shows its commitment to safety on a daily basis. It demands that nothing is placed at a higher level of importance, regardless of a potential impact to schedule or budget.

Eliminating construction safety risks during design

A safety culture is not only applicable to the on-site construction team; it can begin during the design phase of a project. Making safety an essential consideration as the team plans the job, the budget, and works with the design team allows preconstruction professionals and project managers to eliminate safety risks by designing safety into the job. Prevention through design techniques include constructability reviews, material equipment and selection, maximizing prefabrication opportunities, and utilizing building information modeling to identify safety hazards in a virtual environment before ever setting foot on a jobsite.

For example, when designing mechanical and electrical rooms in which (a) the ceiling of the room is above a single story; and (b) the installation of the equipment, piping, ductwork, and conduit make safely working at heights extremely challenging, the design should accommodate interim tie off points that can be accessible as workers begin to work above six feet. Another option to eliminate this risk is the installation of catwalks to avoid the need for extensive PPE.

Early efforts to find safer ways to build carry over from preconstruction through the submittal, procurement, and fabrication phases. A team's early and proactive focus on safety establishes a team commitment to safety from the beginning.

> "A forward-thinking company aims to create a higher standard of worker safety, particularly in regards to fall protection."

The latest in certified safety equipment

Forward-thinking companies invest in the latest technologically advanced safety equipment because they realize that traditional equipment is not the only preventive measure to protect workers from falls.

One fall can be traumatizing – and costly

continued

For example, head protection may not be the first thing that comes to mind when considering fall protection, but work-related traumatic brain injury (TBI) as the result of falls is a catastrophic event that leads to disabilities and high socio-medical costs. In a report from the National Institute for Occupational Safety and Health, construction workers sustain more TBIs than employees at any other type of workplace in the United States. Researchers recommend that safety interventions must be emphasized in the construction industry. To that end, new high-tech construction safety helmets with chin straps are being used by early-adopting companies.

The new helmets with chin straps — which look like helmets used in adventure sports such as cycling and rock climbing — protect employees from dropped objects, flying debris, and offer protection from falls. The helmet weight is evenly distributed across the wearer's head making the headgear more comfortable and offering more protection against impacts on the head. And most important, these new helmet designs include chinstraps that make it less likely to come off if a worker falls.

Conclusion

The need for innovative ways to prevent workplace injuries is crucial. Dr. David Michaels, former assistant secretary of labor for Occupational Safety and Health, stated, "OSHA believes advances in technology and greater flexibility will reduce worker deaths and injuries from falls."

A forward-thinking company aims to create a higher standard of worker safety, particularly in regards to fall protection. A multi-pronged approach that focuses on culture; elimination of risk; and adoption of research-based, innovative PPE, will lead to fewer injuries and a safer work environment.

Kris Manning is vice president of safety with Clark Construction Group, LLC and has been with the company since 1998. He has a bachelor's degree in civil engineering from the University of Delaware and a master's degree in business administration from the University of Maryland – Robert H. Smith School of Business. Clark Construction Group is one of the nation's leading providers of general building and civil construction services. For more information, visit www.clarkconstruction.com or follow @ClarkBuilds on Twitter and Instagram.

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Roadmap for reducing risks

Implementing a dropped objects prevention plan

By NATE BOHMBACH

Like climbing ladders or stairs, there are steps to take to implement a dropped objects prevention plan on your jobsite. Regardless of industry, the following steps lead to success:

Call to action

First, an "aha!" moment occurs, a bolt of recognition when a site safety manager or supervisor recognizes dropped objects as a potential hazard on their jobsite and decides to address them.

It could be reactive in nature, a decision made after an injury or incident (near-miss, equipment damage, etc.) on the job, or the potential for an accident/injury causes recognition of jobsite deficiencies that leads to a more proactive approach.

Identify risk & define scope

Once triggered, take time to identify the risk and define the scope of the hazard in your environment:

- ***Who:*** Think of your own crew and how its work may impact clients, customers, vendors, jobsite deliveries – even the public. Are any of those third-parties at risk when a tool or an object is dropped?
- ***What:*** The potential dropped objects or other unsafe objects (i.e., trip hazards) that should be managed.
- ***Where:*** The at-heights areas on the jobsite where these risks present themselves, or have the potential to present themselves.
- Defining your scope takes these elements and adds the "When" and "How" of your rollout plan.
- ***When:*** Determine a timeline, and set goals within that timeline.
- ***How:*** Consider what types of controls can be implemented through the Hierarchy of Controls (HOC).

Roadmap for reducing risks *continued*

Consider all the above and identify an area, site, and/or application where you want to start affecting change. This will be the pilot study for your program. If one specific area has a higher risk level or frequent incidents, start there. Communication and focus on the objects in that job/area are important.

- Notify the pilot area about the potential for dropped objects and the goals you have for a program. Ensure there is buy-in to be part of the pilot study.
- Think about the kind of work being done in that area. Are there sensitive operations underway or sensitive equipment being used or worked on?
- Complete an inventory for all at-heights tools in this area. This should include any object or item that can fall such as tools, personal items, PPE and more.
- Choose 6-10 tools from this inventory to be part of the pilot study. Pick the "usual suspects", considering frequency of use and potential severity of damage if dropped.

Observation/site assessment

To assess a worksite, spend time monitoring at-heights work in your pilot area to identify and analyze potential and actual safety hazards, which may vary from jobsite to jobsite.

Once that's done, work through the HOC to seek safety solutions for the pilot area. Consider tethering and topping solutions, anchor points, clearance, and other challenges/competing hazards that may complicate your efforts. Document your discoveries and ideas, and file those away for future reference.

Think about levels other than the one on which you're standing. Dropped object causes can originate on the ground before acceding to height or happen while at height. There are several factors that can lead to them, including:

- Elements like environmental conditions
- Worker-generated situations
- Poor housekeeping
- Improper equipment transport
- Site risks

Training

Hold initial OSH training and identify workers whom you may want to be involved in a pilot study and other safety managers. Next, choose two workplace safety champions: a tools and installations leader and a process and use leader. These should be responsible colleagues whom you trust to follow the rules and set a positive example for their co-workers.

Controlled implementation

Once you've observed your site and trained your workers, you're ready to roll out your dropped objects plan in your previously identified pilot area. Analyze your findings from the observation and assessment of your pilot area that you should have completed.

Determine whether any hazards can be fixed, substituted for, or outright eliminated. Utilize passive engineering controls, such as toe boards, netting or barricades, or active engineering

Roadmap for reducing risks *continued*

controls using the 3T's (trapping, tethering and topping) to address unsafe conditions that can't be "fixed."

Implement administrative controls like policies and procedures, training and spreading awareness. And though it is a last line of defense, establish PPE procedures.

Policy creation

After your pilot study has concluded, summarize your findings and freeze the processes put in place. This will be the foundation of your Objects at Heights Policy. A complete policy should include:

- Introduction
- Scope
- Responsibilities
- Hazard Analysis, Risk Assessment and Task Planning
- Worksite Inspection

Launch

Launching your new dropped objects prevention program will be a trial-and-error process, so anticipate that you will need to analyze and optimize the program once enough time has passed before you can expand it to the rest of your company.

Conduct safety training with your workers, per your documented objects at heights policy. Decide how many tools need to be tethered at height based on your tool inventory log and purchase these solutions. Under the oversight of your Tool & Equipment Champion, install the safety solutions for the tools (large and small) that you will be using at heights. Decide which should be trapped, tethered and topped, and make sure each crew member feels comfortable doing so.

> "If one specific area has a higher risk level or frequent incidents, start your pilot program there."

Review & expand

After a predetermined period, review how the program is working. Document changes and see if your goals are being met. You should expand it to other areas, jobs, tasks, tools, etc. only after you feel comfortable that any adjustments are modest in nature.

Remember, objects at heights controls must be implemented, maintained, and used correctly for them to be effective. Holistic management of an effective DROPS program means continuous assessment and improvement from safety managers and executives. Otherwise, people (and equipment) will remain at risk.

Nate Bohmbach is Associate Product Director at Ergodyne.

MCR Safety 360° Protection Program

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Evaluate: Meet with key stakeholders to gain an understanding of the current state of safety within the site(s). Perform a shop-floor "safety walk" to observe PPE in action at the various job functions.

Measure: Data will be collected regarding the type of injuries, costs and product lifecycle of current PPE being used.

Analyze: Analyze data to provide best option(s) for injury elimination, improving longevity of safety gear, and documenting anticipated cost savings. Provide samples for testing and validate actual results versus expected results.

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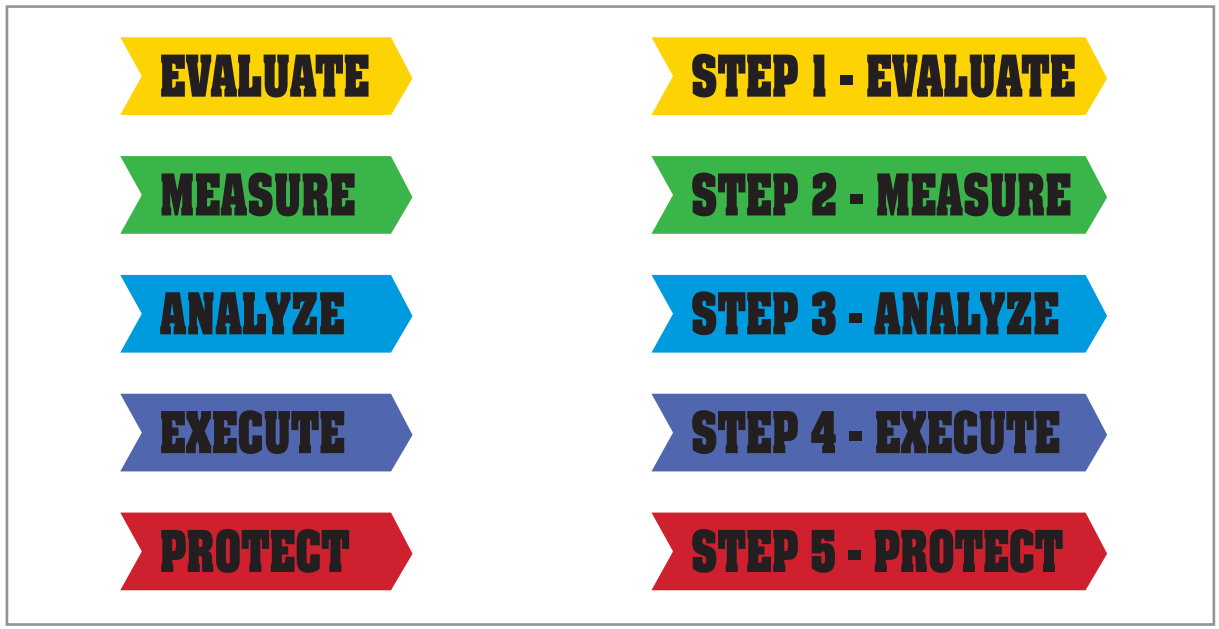

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Back to basics

Follow the hazards control hierarchy to reduce welding risks

By WESLEY MAERTZ, CSP, CET

Welding is the most economical, efficient and common way to permanently join metals in industry today. When welded, two or more pieces of similar metals are fused together by the use of a filler metal, heat, pressure or both to form a strong joint. Once completed, the welded joint is as strong as or stronger than the pieces from which the joint is formed. There are more than 100 different ways to weld metals together. With so many different ways to weld, types of metals, and filler materials comes many hazards such as flying particles, harmful dust, smoke, fumes, heat and light radiation.

According to the Bureau of Labor Statistics (BLS), in 2014 there were approximately 400,000 welders in the United States with a projected growth rate of 4.4 percent for the next ten years. With that number of welders and number of hazards associated with welding, the BLS has determined the rate of injuries and illnesses is higher than the national average.

According to OSHA, the best way to reduce the risk of injury and illness in the welding profession is to enact the philosophy of the hierarchy of controls. The hierarchy of controls is a widely accepted concept promoted by numerous safety organizations, and supported by OSHA. It is a way of controlling hazards in a preferred order from most effective to least effective.

Types of welding

According to OSHA, welding is classified into two groups: fusion (heat alone) or pressure (heat and pressure) to join two pieces together. OSHA further breaks fusion welding into three types:

1. ***Electric arc*** – Employs an electric arc to melt the base metals and filler metals and can be further divided into type based on amount of fumes produced (listed least to most): Flux Core Arc Welding (FCAW); Shielded Metal Arc Welding (SMAW); Gas Metal Arc Welding / Metal Inert Gas (GMAW

Back to basics *continued*

/ MIG); Gas Tungsten Arc Welding / Tungsten Inert Gas (GTAW / TIG)

2. ***Gas*** – Employs a flame from burning a gas (usually acetylene) to melt the base metal at the joint to be welded.
3. ***Thermit*** – Employs a chemical reaction to produce intense heat instead of using gas fuel or electric current.

Pressure welding usually involves heating the surfaces to a plastic state and then forcing the metals together.

Welding hazards

All types of welding produce hazards. The most common hazard is welding fumes. Welding fumes contain a variety of metals, including but not limited to aluminum, arsenic, beryllium, lead and manganese along with several other gases. Having an awareness of the most common welding hazards helps to target safety training to proactively avoid an injury/illness.

Electric shock – Electric shock is one of the most serious and immediate risks facing a welder. Shock occurs when arc-welders touch two metal objects that have a voltage between them (typically 20-100 volts), thereby becoming part of the circuit to ground.

Fumes and gases – Due to the high temperatures generated when welding, metal fume and gas hazards are produced that if inhaled or ingested can result in many health issues.

Fire and explosions – Welding can create heat, sparks and spatter that can serve as an ignition source of flammable and combustible materials.

Flash burn – Welding can create intense light that can cause extreme discomfort, swelling and temporary blindness if proper eye protection is not worn.

Thermal burn – The nature of welding involves extreme temperatures that require controls to be in place to prevent burns to the skin. This could be present in the form of sparks and spatter or direct contact with the welded surface.

Noise – Welding processes typically produce noise levels above 85 decibels. Additionally, welding is typically done in areas where it is not unusual for ambient noise to add to the decibel level.

Confined spaces – When the space or area where welding is taking place is small or confining the amount of ventilation is limited. This can serve as a multiplier to fume and gas levels making them much more concentrated. Shielding gases such as argon, helium, nitrogen, or mixtures of these gases can also displace oxygen creating an asphyxiation hazard.

Compressed gases – Welding involves the use of many gases under high pressure contained in cylinders. The cylinders can be a fire hazard if not stored properly. Cylinders can also be a physical hazard if not secured properly to prevent valve damage and resulting explosive release of the gas creating a deadly projectile.

Hazard controls

The best way to prevent injuries and illnesses posed by all workplace hazards is to follow the concept of hierarchy of

Back to basics *continued*

controls. This order is typically depicted as an inverted pyramid, with the most effective control starting at the top.

Hierarchy of controls

Elimination is designed to completely remove the hazard from the workplace. Example would be not performing welding in a confined space or eliminate the hazards in the space before welding begins.

Substitution is designed to prevent potentially harmful exposure. Example would be switching to shielded metal arc welding (SMAW) to gas metal arc welding (GMAW) with a solid or metal coated wire, or opt to use low-manganese filler metal to reduce the amount of hazardous fumes produced.

Engineering controls involve physical changes to the workplace. These can include isolation, such as enclosing the welding process, or ventilation, which includes capturing material at the source (local exhaust ventilation), and/or ambient collection.

Administrative controls require the welder or employer to do something. This is typically accomplished through training and policies. Example would be training the welder to, position their head and body to keep their body part away from the hazard.

Personal protection equipment (PPE) is only considered if the first four controls do not lower the exposure risk to the hazard(s) to an acceptable level or were infeasible. To maximize the benefits of PPE, users must be trained on use, limitations, and care of the PPE.

> All types of welding produce hazards.

Conclusion

Hazards change due to new technology involving how metals are joined. It may be a new base metal alloy, new filler metal, new process, or combination of everything. It is important welders, and safety and health professionals, continue to follow the hierarchy of controls to guard against traditional known welding hazards and also stay abreast of new and emerging welding technologies.

Wesley Maertz, CSP, CET, is a technical safety specialist at Grainger, a leader in safety services and solutions, offering technical support and training to help customers comply with workplace safety regulations and safeguard facilities.

A construction site challenge

How to maintain an effective hazcom program

By TROY SCOTT

The U.S. Department of Commerce, Bureau of Economic Analysis, reports that the construction industry contributed 4.2 percent of GDP in 2016, the highest amount since 2008. The first quarter 2017 construction outlook published by management consulting and investment banking firm, FMI, forecasts an increase of 6 percent overall for the construction industry in 2017 with the lodging sector leading growth at 9 percent.

But even with a more bullish outlook, there are concerns.

Regardless of the construction sub-sector polled, industry professionals indicate that there is a shortage of qualified construction workers to meet the demand for new projects. To fill the supply gap more workers will need to be quickly trained in specialty trades as well as the best practices to keep themselves and coworkers safe. Across industries, OSHA reports that, after workplace fall protection, improper hazard communications (HazCom) produced the most violations in 2015. In the next few years, it will be important for construction firms to invest in safe practices and effective HazCom programs at work sites.

When construction workers demolish, repair, or build, they can be exposed to a variety of chemical hazards.

Chemical hazards by construction phase

Each phase of a construction project is unique and involves a wide range of trade specialists, tools, and materials. Likewise, the potential chemical hazards are different at each phase, too. Workers and the job-site competent person must anticipate what chemical hazards may occur at each construction site.

The stages of construction can be portrayed in eight phases, each using a slightly different set of tradespeople, activity, and chemical hazards.

A construction site challenge *continued*

1. ***Mobilization Phase*** — construction tools and equipment are brought to the construction site. Work may include fencing the plot, or installing labor trailers and service facilities. Hazardous atmosphere in this phase can result from carbon monoxide exposure from gasoline and diesel engine exhaust.
2. ***Ground Phase*** — the plot is prepared for the sub-structure. The ground is graded for proper water runoff flow, excavated, trenched, paved, and surfaced. If the plot is a brownfield property then structures may need to be demolished and hazardous waste removed. Hazardous conditions can occur due to asbestos and lead from construction built before 1980, asphalt/bitumen emissions, or carbon monoxide from gasoline and diesel engine exhaust.
3. ***Sub-Structure Phase*** — the structure that contacts the earth is built. This includes foundation, ground floor, short/neck column, and grade/tie beam construction. Hazardous chemicals in this phase appear during drilling, welding, or concrete material handling, including crystalline silica dust, hexavalent chromium, and zinc, cadmium, and beryllium.
4. ***Super-Structure Phase*** — the structure above the ground is built. This includes column, slab, beam, staircase, and roof. Hazardous chemicals can exist in materials ranging from pressure-treated wood to roof tiles, and vary from arsenic to gypsum.
5. ***Masonry Phase*** — the wall, plaster, and tile work. Hazardous conditions can occur due to mortar/grout and sealants, including exposure to silica and plaster dust, or hexavalent chromium.
6. ***Service Phase*** — installation of mechanical, electrical, and plumbing. Chemical hazards can result from welding and soldering, and may include lead, zinc, cadmium, hexavalent chromium, and beryllium.
7. ***Finishing Phase*** — drywall installation, painting, wall hanging, wood or metal work, flooring and carpet installation. Hazardous chemicals may be present when using paints, carpets, pressed woods, and glues, including epoxy coatings and urethanes, formaldehyde, benzene, and xylene.
8. ***Completion Phase*** — touch-up and cleaning. Chemical hazards can be introduced by cleaning solutions and solvents.

Chemical hazard training emphasizes the variety of potential exposure routes. These hazards are often airborne and can appear as dusts, fumes, mists, vapors, or gases; exposure in these cases typically occurs by inhalation, although some airborne hazards like solvents may be absorbed through the skin. Chemical hazards can also occur in liquid or semi-liquid state (like glues or tar) or as powders (grout or dry Portland cement).

Workers in the construction trade may suffer from chronic conditions that result from years of exposure to hazardous chemicals.

A construction site challenge *continued*

A unique challenge

Implementing an effective hazard communication (HazCom) program at a construction site is uniquely challenging. Unlike a factory with a fixed location, construction sites change for each project. The plot site, environment, and accessibility are variable. Likewise, the workforce changes. The contractors and subcontractors change from job to job based on circumstances depending on the job bidding process, schedule availability, and degree of trade specialization.

Easing distribution of hazard information

Implementing a Hazard Communication Program, as described in the OSHA publication "Hazard Communication: Small Entity Compliance Guide for Employers That Use Hazardous Chemicals" (OSHA 3694 - 2014), can be time-consuming and error-prone. Safety managers at a construction worksite or an existing building are challenged to develop effective HazCom programs. They manage the chemicals being used by various contractor's work crews and communicate inherit risks like asbestos or lead that they know already exist within a facility.

With the GHS-aligned version of the standard — referred to as HazCom 2012 — now in full effect, OSHA requires that employers ensure that SDSs are readily accessible to employees. Even an inventory of a few dozen chemicals means that safety managers may spend dozens of hours annually to keep hardcopy SDS binders current for each contractor's foreman. And each time a chemical is added to the inventory or a chemical producer updates safety information, a revision needs to be made. Many facilities need better ways to efficiently manage their hazardous chemical compliance program.

One of the more time-consuming tasks is the design of hazard communication signs and labels to mark utility access areas, chemical storage, chemical/fuel containers, and machinery. To design a compliant sign or label means studying the text of each material safety data sheet along with locating appropriate hazard pictograms. Safety managers had to deal with lost or damaged labels due to the wear and tear from handling and outdoor exposure.

These problems have inspired new services that simplify chemical management and hazard communication. They speed up the SDS collection and HazCom label design task by providing online searches of comprehensive chemical databases, SDS cataloging, and label print features that ensure signs and labels are compliant with safety standards.

As the construction industry grows, the demand for skilled and safety-conscious workers is matched by a demand for effective HazCom programs. These programs will include hazard awareness training that accounts for all phases of a construction project or the hazards inherent at existing facilities. Programs will also benefit from the latest health and safety technologies that ease cataloging of safety data and produce signage that helps inform tradespeople.

Troy Scott writes on workplace safety and lean manufacturing subjects for Graphic Products.

OSHA silica standard for construction

Here's what you should know

History

Crystalline silica is a common mineral found in the earth's crust. Materials like sand, stone, concrete, and mortar contain crystalline silica. It is also used to make products such as glass, pottery, ceramics, bricks, and artificial stone.

Respirable crystalline silica – very small particles at least 100 times smaller than ordinary sand you might find on beaches and playgrounds – is created when cutting, sawing, grinding, drilling, and crushing stone, rock, concrete, brick, block, and mortar. Activities such as abrasive blasting with sand; sawing brick or concrete; sanding or drilling into concrete walls; grinding mortar; manufacturing brick, concrete blocks, stone countertops, or ceramic products; and cutting or crushing stone result in worker exposures to respirable crystalline silica dust. Industrial sand used in certain operations, such as foundry work and hydraulic fracturing (fracking), is also a source of respirable crystalline silica exposure. About 2.3 million people in the U.S. are exposed to silica at work.

Workers who inhale these very small crystalline silica particles are at increased risk of developing serious silica-related diseases, including:

- Silicosis, an incurable lung disease that can lead to disability and death;
- Lung cancer;
- Chronic obstructive pulmonary disease (COPD); and
- Kidney disease.

To better protect workers exposed to respirable crystalline silica, OSHA has issued two new respirable crystalline silica standards: one for construction, and the other for general industry and maritime. OSHA will begin enforcing most provisions of the standard for construction on September 23, 2017, and will begin enforcing most provisions of the standard for general industry and maritime on June 23, 2018.

Key compliance requirements

OSHA's Respirable Crystalline Silica standard for construction requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers.

OSHA silica standard for construction *continued*

The standard provides flexible alternatives, which OSHA expects will be especially useful for small employers. Employers can either use the control methods laid out in Table 1 of the construction standard, or they can measure workers' exposure to silica and independently decide which dust controls work best to limit exposures to the PEL in their workplaces.

Regardless of which exposure control method is used, all construction employers covered by the standard are required to:

- Establish and implement a written exposure control plan that identifies tasks that involve exposure and methods used to protect workers, including procedures to restrict access to work areas where high exposures may occur.
- Designate a competent person to implement the written exposure control plan.
- Restrict housekeeping practices that expose workers to silica where feasible alternatives are available.
- Offer medical exams-including chest X-rays and lung function tests-every three years for workers who are required by the standard to wear a respirator for 30 or more days per year.
- Train workers on work operations that result in silica exposure and ways to limit exposure.
- Keep records of exposure measurements, objective data, and medical exams.

Construction employers must comply with all requirements of the standard by September 23, 2017, except requirements for laboratory evaluation of exposure samples, which begin on June 23, 2018.

Frequently asked questions

Why can't silica-exposed workers wear respirators all the time?

Respirators are not as protective as engineering controls, and they aren't always as practical either, according to OSHA. Unless respirators are selected for each worker, individually fitted and periodically refitted, and regularly maintained, and unless filters and other parts are replaced as necessary, workers will continue to be exposed to silica. In many cases, workers using only respirators would also have to wear more extensive and expensive protection. Even when respirators are selected, fitted, and maintained correctly, they must be worn consistently and correctly by workers to be effective. Respirators can also be uncomfortable, especially in hot weather, and cannot be used by some workers.

What is the standard's Table 1?

Table 1 matches 18 common construction tasks with effective dust control methods, such as using water to keep dust from getting into the air or using a vacuum dust collection system to capture dust. In some operations, respirators may

OSHA silica standard for construction *continued*

also be needed. Employers who follow Table 1 correctly are not required to measure workers' exposure to silica from those tasks and are not subject to the PEL.

Table 1 Example: Handheld Power Saws

If workers are sawing silica-containing materials, they can use a saw with a built-in system that applies water to the saw blade. The water limits the amount of respirable crystalline silica that gets into the air.

What are alternate control methods?

Employers who do not fully implement the control methods on Table 1 must:

- **Determine the amount of silica that workers are exposed to** if it is, or may reasonably be expected to be, at or above the **action level of 25 µg/m3** (micrograms of silica per cubic meter of air), averaged over an 8-hour day;
- Protect workers from respirable crystalline silica exposures above the **PEL of 50 µg/m3**, averaged over an 8-hour day;
- Use **dust controls** and safer work methods to protect workers from silica exposures above the PEL; and
- Provide **respirators** to workers when dust controls and safer work methods cannot limit exposures to the PEL.

The Toolbox Talk: An Essential Tool for Construction Industry Safety

Every contractor that is responsible for safety on a construction site wants peace of mind that his or her workers will go home safe at the end of the day. To get your team focused on safety, ensure that one, indispensable safety tool is in your arsenal before the workday begins: the toolbox talk. Starting each day with an informal safety talk can make your job easier by simplifying compliance communication. Learn how to develop toolbox talks, what to cover, and how best to deliver them to improve on-the-job safety.

MSA The Safety Company

What are toolbox talks?

A toolbox talk, also known as a tailgate talk or tailgate huddle, is an informal safety meeting that forepersons and supervisors deliver to complement their organization's Occupational Safety and Health Administration (OSHA) and other safety endeavors. Formal training is still essential, but safety briefs get workers focused on safety before they begin work by calling attention to any number of topics like official regulations, common on-the-job risks, or a single safety issue.[1,2] Daily toolbox talks promote a culture of safety.[3]

Why are toolbox talks important in construction?

Toolbox talks are a good idea in any industry, but in construction, in which more than 20%—or one in five—of 2016's private industry worker deaths occurred,[3] this type of safety training is especially essential. The top four types of fatalities within the construction industry are

- Falling
- Being struck by an object
- Being electrocuted
- Being caught-in/between

These four fatality-types accounted for nearly 64% of construction-industry deaths, which translates to 631 lives potentially saved, if eliminated.[3] Toolbox talks involving these top four fatality-types, and other risks associated with a construction jobsite, help to keep safety at the forefront of construction workers' minds before they start the job. A focus on safety—and opening the doors to ongoing safety communication—may reduce the chance of injury or death.[4]

In addition, just because workers are experienced, skilled professionals does not preclude them from needing a regular

MSA *continued*

forum to discuss safety issues, especially on a new worksite or project or after a change at the jobsite—a frequent occurrence in construction.[4] Because toolbox talks are less formal than many types of safety training, they play an important role in allowing an exchange of ideas with workers, who can also use these opportunities to discuss their own safety concerns.

How can you prepare for a toolbox talk?

Toolbox talks can cover anything from recent trends or specific hazards that have been noticed on the job site, updates on standards and regulations, or basics such as equipment inspection. Once you have your topic, obtain or create the presentation.

Get Inspiration

Google "toolbox talks," and you will find previously created safety briefings on almost any topic you can imagine; free content is readily available.[5] OSHA, for instance, provides a number of free Toolbox Talks on topics including hazards, personal protective equipment, OSHA standards, fire prevention, emergency planning, tool and equipment safety, ladder safety, and electrical safety.[1]

Although many providers offer free—or paid—content for toolbox talks, be aware of potential limitations.[5] Vet material for accuracy and quality before presenting it to make sure

- Your source is reputable.
- Facts are correct.
- The content is relevant to your site.
- Length is appropriate.
- Presentation including visuals and storytelling elements for engagement are of adequate quality.

You can, of course, purchase content from a trusted source, but be sure the program is relevant to your workers.[5] A safety training provider with whom you have an established relationship is an excellent resource because the provider is familiar with your business and can help you appropriately tailor toolbox talks to your needs. Plus, any informal talks should reinforce the messaging in your comprehensive safety training.

Develop Your Own Toolbox Talks

You can also create your own talks. When designing a toolbox talk, use what you know best[5]:

- Select an immediately relevant topic based on your current site.
- Use anecdotes from this or a previous job.
- Encourage workers to focus on their state of mind and how it relates to safety.
- Discuss standards and best practices.
- Note that toolbox talks should be SMART, or "Specific, Measurable, Achievable, Realistic, and Timely."[5]

Also, although compliance with OSHA standards and other regulations is an appropriate focus of many toolbox talks,

MSA *continued*

engaging your workers in discussions about the issues that might make compliance challenging is imperative.[5] Are on-the-job conditions, organizational culture, or human factors making following the rules difficult? Are the rules themselves unclear or unrealistic? Tackling human factors in toolbox talks puts the focus on safety, and opening up communication via informal safety discussions helps workers speak honestly about the challenges they face so you can work with them to create solutions to increase worksite safety.

How should toolbox talks be delivered?

Safety managers or supervisors can deliver the toolbox talk, which should be brief, focused on one subject, informal, and presented in person. When preparing for, delivering, and evaluating your talk,

- Practice out loud before presenting to others to familiarize yourself with the content and delivery methods.[1,5]
- Lead the talk in a distraction-free area if possible.[1]
- Speak slowly and clearly.[1]
- Be demonstrative and use props1 to help as well as keep workers engaged.
- Encourage questions.[1]
- Solicit opinions from workers on how you can improve.[5]
- Keep records of your talk and who attended.[1]
- Vary your topics, format, and more to keep things interesting.[5]
- Stick to all safety protocols on the job to lead by example.[1]

Take charge of construction safety by making informal safety talks a regular part of your worksite. Turning to a third-party safety provider to help you deliver consistent formal and informal safety training will contribute to an improved culture of safety.[4] Visit http://us.msasafety.com/safetyevaluation to contact MSA for a safety evaluation, and we can help you to identify jobsite hazards that you could feature in future toolbox talks.

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OSHA confined spaces in construction standard

Here's what you should know

History

On May 4, 2015, OSHA replaced a training-only requirement for confined space work in construction with a more comprehensive standard that includes a permit program and training requirements. The new standard became effective August 3, 2015. On January 6, 2016, OSHA announced that it would not issue citations under the standard to residential construction if the employer is making good faith efforts to comply with either the training requirements of the standard.

Violation case study

On a sunny day in Key Largo, Florida, a utility worker removed a manhole cover and descended into a 15-foot-deep drainage hole that was just wide enough to accommodate him, unaware that years of rotting vegetation had filled the hole with a toxic brew of hydrogen sulfide and methane gas and had also left oxygen levels low. When a co-worker stopped hearing sounds from below, he realized that the man was in trouble and quickly followed him into the hole. So did a third worker. None of them wore respiratory protection. Neither did the firefighter who attempted to save the men after arriving on the scene, because an air tank would not have allowed him to fit into the hole. Other firefighters – wearing protective gear – were eventually able to pull the men out of the cramped space. The three utility workers died. The firefighter was hospitalized in critical condition, but survived. Three sheriff's deputies who were exposed to the dangerous fumes were also taken to a local hospital for treatment.

Key compliance requirements

- Before work at a site begins, a competent person must identify all confined spaces and permit-required spaces.
- Employees must be informed about the permit spaces through signage or other means
- The internal atmosphere must be tested.
- Workers must be provided personal protective equipment when engineering and work practice controls do not adequately control hazards.

OSHA confined spaces in construction standard *continued*

- Workers must be trained about the hazards.
- Employers must ensure that properly trained rescue and emergency services are available before entry into permit-required confined spaces.

Why this standard is important

Construction workers often perform tasks in confined spaces, which are large enough for an employee to enter but have limited means of entry or exit and are not designed for continuous occupancy. People working in confined spaces face life-threatening physical and atmospheric hazards including toxic substances, electrocutions, explosions, and asphyxiation - hazards that can be avoided if they are recognized and addressed prior to entering these spaces to perform work.

Enforcement Statistics

Enforcement statistics are unavailable for this standard.

Compliance Assistance

- Protecting Construction Workers in Confined Spaces: Small Entity Compliance Guide
- Asphyxiation in Sewer Line Manhole
- Is 911 your Confined Space Rescue Plan? (OSHA Fact Sheet)
- Confined Spaces in Construction: Sewer Systems (OSHA Fact Sheet)

Hard hat innovations

Improve comfort, safety in the construction zone

By TIM WOLSKI

Head injuries are among the most serious types of nonfatal injury a worker can sustain. Not only do their potential effects – such as long-term disability and reduced quality of life – significantly impact affected individuals, but they also carry the highest cost for employers.

Construction workers experience the greatest number of fatal and nonfatal traumatic brain injuries among U.S. occupations, according to the National Institute for Occupational Safety and Health (NIOSH).[1] From being struck by falling or moving objects, to striking heavy equipment, and suffering electrical shocks and burns, hazards to workers' heads abound in the construction zone.

Hard hats are designed as an individual's first defense against these hazards. Their rigid outer shell acts as a barrier to prevent penetration while the internal suspension dissipates energy upon impact to reduce the severity of the blow and the risk of injury. However, hard hats have traditionally been heavy, hot and uncomfortable to wear — factors that cause wearers to remove them to relieve pressure, cool down or make adjustments. Intentional or unintentional removal of head protection on the site though, even for seconds, leaves workers vulnerable to injury and can end in disaster.

Finding a hard hat that fits the entire workforce comfortably is a challenge because every individual has a unique set of dimensions, from head circumference, height and shape, to ear and neck measurements. But recent innovations in design and materials are paving the way for a new era of better-fitting – and therefore more effective – head protection. This article looks at advances that improve fit, comfort and retention, key factors in supporting safety and hard hat compliance among our nation's nearly 7 million construction workers.[2]

Start with the proper level of protection

Selecting a hard hat that meets the American National Standards Institute's Z89.1-2014 standard for industrial head protection is the first step to ensuring safety. Based on the hazards, employers must first determine whether they will supply Type I hard hats, designed to protect against impact to the crown of the head only, or Type II hats, for both crown and lateral head protection. Next, they should select a hard hat whose level of electrical protection corresponds to the hazards: Class G

Hard hat innovations *continued*

(general) hard hats are rated for 2,200 volts, Class E (electrical) are rated for 20,000 volts, and Class C (conductive) offer no electrical protection. Finally, employers should consider brimmed styles where added protection from the elements is desired.

Improve safety through comfort and fit

Fit and comfort are the next key attributes to consider. Uncomfortable hats are more likely to be removed, even in the presence of hazards, with potentially devastating consequences. Conversely, well-fitting hats sit securely and comfortably on the head, promoting all-day wear. When a hard hat fits comfortably, the wearer is able to conduct tasks without distractions from pressure points, pinching, headache and neck strain. Furthermore, a secure fit ensures the hat will not move out of place upon impact, and that the shell and suspension are where they need to be to help deter penetration and dissipate energy. It also ensures reliable retention: no matter how a worker moves or bends, the hat stays centered on top of the head, without falling forward, back or sliding to the side. In demanding or high-risk environments, hard hats with optional chin straps will deliver the greatest level of retention. Overall, a fit that is both comfortable and secure allows the wearer to keep the hard hat on and in a safe position all day, supporting both protection and productivity.

Look for easy-to-adjust suspensions

The hard hat's suspension is where advances in fit and comfort can best be achieved. While suspensions commonly feature a single pin lock, ratchet or tab lock adjustment in the rear, newer styles offer multiple adjustment points, allowing the wearer to fine-tune headband height as well as make front, lateral and rear adjustments for a truly personalized fit. Look for easy-to-use sizing and ergonomic adjustability features that allow individuals to quickly achieve a custom fit. Where reverse donning is popular, look for suspensions with one-step removal/replacement systems to ensure quick and easy switching. With the right combination of adjustment features, a single style can sometimes be worn across the majority of size ranges comfortably and effectively.

Consider suspension, sweatband materials

Suspensions are constructed of a wide variety of materials. Rigid plastic suspensions are more likely to pinch or cause pressure points when tightened, leading to unwanted hard hat removal on the jobsite. Consider instead suspension materials that are soft and pliable, which easily conform to the head's natural contours. The sweatband also plays a key role in wearer comfort and temperature regulation. As a worker's body warms with exertion, the sweatband can trap heat as well as sweat, dirt, salt, grime and debris. Choosing sweatband material that is proven to absorb higher volumes of moisture and evaporate moisture faster keeps sweat and grime from entering the eyes and creates a cooler feel for the worker, encouraging longer wear even in hot conditions. Opting for hypoallergenic

Hard hat innovations *continued*

sweatband material helps reduce dermatitis, while choosing a sweatband that can easily be removed, washed and replaced extends suspension life and improves hygiene.

Lower shell weight for greater comfort

The hard hat's shell contributes to its overall weight and bulk. Older, larger shells constructed of heavy material are more difficult to keep centered and balanced, and more likely to cause muscle strain. Today's lightweight models deliver the same impact protection far more comfortably, and those with a full brim provide added protection from falling objects, sun, wind and rain. If older hats prevail on your worksite, consider new, lighter-weight shell materials and hats with a low-profile design for improved comfort.

Increase brand visibility

Hard hats must appeal not only to the worker's sense of style, but also to the employer's brand strategy. Many companies promote their brands through logos, lettering and graphic design on hard hats. If customization is important to your organization, be sure to look for a shell with ample unmarked surface area on which to print.

Explore your options

Given the vital role hard hats play in worker safety and the myriad new fit and comfort features to consider, selecting the next hard hat for your workforce may seem daunting. Before placing a large-scale order, explore your options. Some manufacturers will honor requests for a product trial; alternatively, try placing a small order for use among a test committee. Once feedback is weighed, a confident and informed purchase may be made.

While hard hats have been used in construction for decades, their basic design has been slow to evolve. That's changing, though, and today's hard hats have much to offer wearers in improved fit and comfort. By selecting lighter-weight shells and suspensions with advanced features and materials, workers and employers alike benefit from all-day comfort, improved retention, and increased safety and productivity – key attributes of every successful construction zone.

Tim Wolski is product manager, Honeywell Safety and Productivity Solutions

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In a construction emergency...

Here's what your training should include

This article looks at five topics that you should train employees on in preparation for jobsite emergencies:

- Emergency action plans
- First aid/emergency response
- Bloodborne pathogens
- Hazardous Waste Operations and Emergency Response (HAZWOPER)
- Workplace violence

Emergency action plans

Certain emergency situations cannot be avoided. However, a written emergency action plan helps employees understand the correct way to respond to a specific emergency. It also establishes procedures employees must take during and after an emergency evacuation.

Only a few OSHA construction standards require employers to have an emergency action plan. These are:

- Hazardous Waste Operations and Emergency Response (HAZWOPER)
- Process Safety Management of Highly Hazardous Chemicals
- Ethylene Oxide
- Methylenedianiline (MDA) Standard

However, for practical purposes, all employers should develop a plan to ensure the safety of their employees should an

emergency occur, whether or not OSHA requires such a plan.

If you do have an emergency action plan, you must train workers:

- Upon initial assignment to a role.
- When their responsibility or designated actions under the plan change.
- When the plan changes.

An emergency action plan should address all possible emergency situations such as fires and severe weather. If a plan is required, OSHA indicates it must have the following elements:

- Methods for reporting a fire or another emergency.

In a construction emergency... *continued*

- Procedures for emergency evacuation, including exit route assignments.
- Procedures for employees who remain to operate critical equipment or perform functions before they evacuate.
- Procedures to account for all employees after evacuation.
- Procedures for employees performing rescue or medical duties.
- Names or job titles of individuals to contact for more information about the plan or an explanation of duties under the plan.

First aid/emergency response

First aid is the immediate care given to the injured or ill until trained medical help arrives. In case of a medical emergency, first aid must be made available as early as possible.

OSHA requires employers to adequately train selected employees to perform first aid if a hospital, clinic, or infirmary is not nearby.

If employees are not designated and trained first aid providers, they must not attempt to administer first aid. Instead, have them follow these steps:

1. Call for help. Tell employees where landline telephones (if available) are located and post the number to call in the event of a medical emergency. Calling 911 on a cell phone may not work on all jobsites.
2. Make sure they treat all blood and Other Potentially Infectious Materials (OPIM) as if it's infectious.
3. Have an employee stay with the injured person, and then step aside as soon as a qualified responder like an Emergency Medical Technician arrives.

Bloodborne Pathogens

Bloodborne pathogens are bacteria, viruses, and other disease-causing microorganisms that can only be detected by sophisticated medical tests. These pathogens live in blood and certain other body fluids.

Bloodborne pathogens can enter the body when an infected person's blood or OPIM comes in contact with a person's:

- Eyes
- Mouth
- Nasal membranes
- Blisters
- Open wounds

Being cut or punctured by a sharp object that is contaminated with someone's blood is another way workers can be exposed.

Instruct employees that if they injure themselves while on the job to call for help and request first aid as soon as possible.

HAZWOPER

In construction work the reality is that your employees could be exposed to chemical spills or hazardous waste.

Hazardous waste—discarded chemicals that are toxic, flammable, or corrosive—can cause fires, explosions, and pollution

In a construction emergency... *continued*

of air, water, and land. Unless hazardous waste is properly treated, stored, or disposed of, it will continue to do harm to living things that come into contact with it now or in the future.

The Hazardous Waste Operations and Emergency Response Standard, or HAZWOPER Standard, regulates hazardous waste operations and emergency response related to hazardous substances.

Much of the HAZWOPER standard applies to large hazardous waste cleanup operations and hazardous waste treatment, storage, and disposal facilities. Some parts of the standard apply to the emergency response to a release of a hazardous substance, wherever it occurs.

An important part of the HAZWOPER standard pertains to training, which is critical for employee safety and health.

Make sure that employees know that if they have not received training, they must not respond to a chemical spill. Instead, instruct them to follow your company's emergency action plan for reporting hazardous spills and evacuating.

Some workplaces have emergency response teams who are trained to handle chemical spills and releases, while others use outside emergency services to respond. Be sure your employees are aware of what resources are available to them in an emergency, and how to deploy them.

Workplace violence

Workplace violence can be defined as, "violence or the threat of violence against employees, customers, or vendors." It can occur inside or outside the workplace and can range from threats and verbal abuse to physical assaults and homicide.

Offenders can be anyone. Some examples include:

- Other employees;
- Estranged spouses, boyfriends, or girlfriends; or
- Acquaintances of an employee.

Workplace violence can be caused by personal or workplace factors. These situations rarely erupt into violence without warning. The key to controlling workplace violence is to identify and deal with potential problems before they get out of hand.

Instruct employees about the following potential warning signs:

- A good employee suddenly becomes a problem employee.
- An employee becomes increasingly frustrated, lashes out, or picks fights with coworkers.
- A coworker becomes obsessed with and carries weapons. A coworker becomes intimidating or begins bullying others.
- A coworker showing signs of physically aggressive body language.
- Employees have received threats or are intimidated by someone they know.

Employees should:

- Be alert to the warning signs.
- Know your company's crisis management or emergency response procedures.
- Know in advance how to respond to threats and violent acts.

In a construction emergency... *continued*

- Be on the lookout and report any physical security concerns.
- Inform management if they feel threatened or if they have a restraining order against another person.

Take away

Emergencies can occur on jobsites at any time. Fires, exposures to bloodborne pathogens, hazardous waste spills, and workplace violence are just a few of the types of events that employees need to prepare for and know how to react to. Training your employees to deal with emergency situations plays an important role in keeping them safe on the jobsite and able to go home at the end of the workday.

This article was written by J.J. Keller & Associates for *ISHN* magazine.

What Silica Sampling Instruments and Technology Meet My Needs?

Since the New OSHA Respirable Crystalline Silica rule was issued, many health and safety professionals have had to evaluate how they will achieve compliance. Those new to the silica sampling process, as well as those seasoned professionals, now need a variety of tools to achieve the appropriate exposure monitoring plan or as OSHA calls it, the Schedule Monitoring Option.

OSHA's Schedule Monitoring Option

A Schedule Monitoring Option is described in OSHA 's final rule as:

- A schedule for performing initial and periodic personal monitoring.
- If monitoring indicates:
  - Initial below the Action Level (AL): no additional monitoring is needed
  - Most recent at or above the AL: repeat monitoring within 6 months
  - Most recent above the Permissible Exposure Level (PEL): repeat monitoring within 3 months
- When two consecutive non-initial results, taken 7 or more days apart, are below the AL, monitoring can be discontinued
- Reassess if circumstances change

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Method No.	Analysis	LDL (1.7LPM)
OSHA ID-142	XRD, Redposition	12.0 µg/m3 (qtz)
NIOSH 7500	XRD, Redposition	6.12 µg/m3 (8 hr)
NIOSH 7602	IR, KBr Pellet	6.12 µg/m3 (8 hr)
NIOSH 7603	IR, Redeposition	12.24 µg/m3 (8 hr)
MSHA P-2	XRD, Redposition	24.48 µg/m3 (8 hr)
MSHA P-7	IR, Redeposition	24.48 µg/m3 (8 hr)

Air Sampling According to the New OSHA Standard

Six existing sampling methods are identified in the new OSHA standard with the goal of optimizing the methods to obtain a quantitative limit of detection no higher than 25% of the PEL (based on air volume). A large enough sample is required to reach the detecting limit down to 12.5 micrograms/cubic meter (25% of the new PEL).

The new standard recommends modifying current methods to lower the detection level by taking a larger air sample, this accounts for tasks performed for short periods of time. Applying the formula, *1.7 LPM x 60 x 8 hours = 816 L = 0.816 m^3*, you can reach the lower detection limit (LDL) on some of the methods utilizing the traditional 10 mm nylon cyclone at 1.7

Sensidyne *continued*

LPM in 8 hours. However, with a four-hour task it is necessary to double the flow rate by using a medium flow cyclone such as a 4.2 LPM cyclone. Tasks performed for two hours or less will require higher flow rates, such as 9 LPM to 11.2 LPM cyclones or impactors, to reach the LDL.

Silica Sampling Best Practices

- Draw a large enough sample to obtain a maximum limit of detection of 12.5 micrograms per cubic meter (i.e. 25% of 50 micrograms per cubic meter)
- Use the analysis by XRD or IR as described in the six listed methods.
- Observe the cyclone flow rate specification for meeting the ACGIH size selection curve (50% at 4 microns), or the European BMRC size selection curve (50% at 5 microns).
- Use a constant flow control pump that will keep the flow rate at +/- 5% of set flow.
- Companies that specialize in air sampling provide the best solutions, such as turn-key silica kits.

Application	Cyclone Model	Part Number	Filter/ Cassette	Pump Types	Overall Height (mm/)	Weight Approx. (Kg)	Flow rate ACGIH Respirable*	Flow rate BMRC Respirable†	Flow rate Thoracic††
Full Shift sampling, medium to high dust	10 mm Dorr-Oliver	800061	37mm, 5µm PVC, 3-pc Cassette	**Basic:** GilAir 5, **High Back Pressure:** Gilian 5000, **Advanced:** GilAir Plus w/ DL and Motion	160	0.08	1.7 LPM*	—	—
Full Shift sampling, medium to high dust	BGI-4L Aluminum Cyclone, HD style (US version)	811-9924-01	37mm, 5µm PVC, 3-pc Cassette	**Basic:** GilAir 5, **High Back Pressure:** Gilian 5000, **Advanced:** GilAir Plus w/ DL and Motion	105	0.8	2.2 LPM*	2.0 LPM†	1.0 LPM††
Full Shift sampling, medium to high dust	FSP-2 Aluminum Cyclone, HD style- (Euro Version)	811-9930-01	37 mm, 5 µm PVC, German Style Cassette	**Basic:** GilAir 5, **High Back Pressure:** Gilian 5000, **Advanced:** GilAir Plus w/ DL and Motion	130	0.14	—	2.0 LPM†	—
4-8 hours light dust, or 2-4 hours medium to high dust	GK 2.69 Aluminum Cyclone, or 37 mm Cassettes	811-9926-01	37mm, 5µm PVC, 3-pc Cassette	Gilian 5000 Gilian 10i (Use in higher dust areas)	125	0.1	4.2 LPM*	—	1.6 LPM††
2-8 hours light dust, or <2 hours medium to high dust	GK 4.162 "RASCAL" Aluminum Cyclone	811-9925-01	47mm, 5µm PVC, Plastic Filter Holder	Gilian 10i Gilian 12 (Use in higher dust areas)	170	0.26	8.5 to 9.5 LPM*	—	—
2-8 hours light dust, or <2 hours medium to high dust	HPEM Respirable 4µ Impactor	811-9925-01	37mm, 5µm PVC	Gilian 10i Gilian 12 (Use in higher dust areas)	—	—	9.0 LPM*	—	—
Task Samples <2 hours	FSP-10 Aluminum Cyclone	811-9931-01	37 mm, 5 µm PVC, German Style Cassette	Gilian 12	203	0.26	11.2 LPM*	10 LPM†	—

* (50% cut@ 4 µm) (US) † (50% cut@ 5 µm) (Europe) †† 50% cut@10 µm **ACGIH:** American Conference of Governmental Industrial Hygienists. **BMRC:** British Research Medical Council

Fulfilling the OSHA Silica Ruling Requirements

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Take a lift

Low-level access lifts & aerial work platforms are a safe alternative

By PAUL KREUTZWISER

As safety continues to be a focus on jobsites, companies are turning their attention to low-level access lifts and other aerial work platforms. In addition to offering a safer alternative to ladders, scaffolding and other forms of access, these versatile machines may also enhance productivity, ergonomics, and even green benefits that are increasingly of interest to building owners, facility managers, and machine operators. The following article provides an overview of types of aerial work platforms and some tips on what to consider when selecting a unit to suit the application at hand.

Growing popularity

Low-level access represents a growing category of access equipment, whose popularity rests in the fact that operator hands are free to do work safely at height. This is not the case with ladders, where workers are required to maintain three points of contact, leaving just one hand free to perform a task.

These same pieces of equipment also offer portability benefits. Unlike scaffolding, which takes time to assemble and disassemble, low-level access equipment can be lowered and moved simply from one location to another, making it easy to perform multiple tasks throughout a facility in less time.

Easy to move and store

And unlike scaffolding, low-level access equipment is available in a variety of shapes and sizes to maneuver through doorways. Personal portable lifts can allow the operator to work as high as 20 feet and provides a 360-degree range of motion, thanks to an enclosed work platform that allows the operator to work with two hands. Easy to move from one task to another, these lifts can be assembled and disassembled in less than 30 seconds and require very little storage space when not in use.

Take a lift *continued*

Non-powered low-level access lifts

The non-powered realm of low-level access lifts includes models that feature a patented stored power lift system that requires no batteries, hydraulics, oil, or controls. Because there are no hydraulics or motors involved, these eco-friendly lifts operate quietly, making them a preferred piece of equipment for finish work in schools, hospitals, and other institutions. In the interest of reduced environmental influence, these units also include non-marking wheels that minimize the impact on sensitive flooring.

Mast-style boom lifts offer over-and-around reach

When additional reach is required, operators may choose from multiple options, beginning with push-around electric mast lifts. These lifts use a jib to reach up, over, and around shelving, ductwork, and other obstacles to perform maintenance, repair, and inspection tasks. The machines have a lifting capacity as high as 500 pounds and a platform height of over 32 feet. They are powered by an environmentally friendly electric-drive system and feature non-marking rubber tires ideal for indoor use. In addition, these models are equipped with a 360-degree rotating mast.

Another option, the articulating boom lift, provides up-and-over access at heights from about 50 feet to as high as 135 feet. These lifts employ a joint or knuckle that enables the boom to bend and reach up, over, and around obstacles. The work platforms on these machines can typically carry up to 500 pounds to accommodate multiple workers, tools, and equipment. They are available in electric-, gas-, and diesel-powered models, as well as a hybrid model that uses electric and diesel or gas, making it suitable for work indoors or outside.

Scissor lifts offer additional capacity

Another option — the scissor lift — is a portable lift with a larger enclosed platform that can be raised straight up. These units are equipped with extensions that typically range from 36 to 50 inches in length for additional work space and the ability to work above an obstacle. With a working height of 21 to 46 feet, which goes beyond that of typical low-level access equipment, and a lift capacity up to 1,000 pounds, these machines are still compact enough to use indoors or outside without having to engage a much larger piece of equipment. For indoor use, electric-powered models ensure a quieter work area, less dependency on hydraulic oils, and zero emissions.

Compact crawler booms move inside and out

Compact crawler booms offer additional reach and a wide range of working heights. Like the scissor lift, the compact crawler lift is larger than true low-level access equipment. But

Take a lift *continued*

it is compact enough — some models measure just 2 feet 7 inches across — to easily fit through most standard commercial doorways, narrow aisles and hallways, gates, and other tight spaces. The compact crawler boom also uses non-marking treads and rechargeable batteries, making it a good choice for work indoors. Some models offer an optional Lithium-ion electrical system that does not produce emissions, increasing its value as an indoor machine.

> Low-level access equipment is available in a variety of shapes and sizes.

Making the right choice

With so many options, the choice of which machine to use for a particular task can be a difficult one for a building owner or facility manager to make. Asking and answering the following questions about the task(s) to be performed and jobsite conditions can help narrow the choices:

- Will the work be performed indoors or outside?
- What is the task, and will it require more than one worker?
- What materials and tools will the lift need to hold?
- What is the working height of the job?
- Does the machine need to go up steps or into an elevator to reach the jobsite?
- Does it need to fit through doorways or another narrow opening?
- What are the conditions at the jobsite? Is the surface uneven? Are there obstacles to work around?

Having answered these questions, it makes sense to explore the capabilities of each machine under consideration. Asking the following questions will help determine which machine is best equipped to handle the task at hand:

- What is the machine's vertical and horizontal reach?
- Does the lift offer up-and-over capabilities?
- What are the platform's dimensions and weight capacity?
- Is the machine self-propelled to maneuver around the job site?
- Is the machine available in electric or hybrid models for indoor use?
- Is the machine accessible in enclosed spaces? Can it fit through doorways and other narrow openings?
- Is the machine able to climb stairs? Can it fit in an elevator?
- What accessories are available to equip the machine for the task?

Take a lift *continued*

Those who are assigned a task that once required a ladder or scaffolding to complete, today have multiple options available to them, whether the work is to be performed inside or outdoors. A variety of low-level access lifts, along with larger scissor lifts and compact crawler booms, are designed to safely put operators in hard-to-reach spaces to accomplish simple assignments, like changing light bulbs and cleaning windows, or more complicated repair and inspections tasks. Selecting the right machine, will go a long way toward ensuring these tasks are accomplished safety, more efficiently and in ways that support sustainability goals.

Paul Kreutzwiser is global category director – aerial work platforms at JLG Industries, Inc.

Cooling down core temps

Body temperature must be stabilized and regulated

By MARY PADRON

We all learned in science class that homeostasis is the self-regulating process by which our bodies maintain stability. One of the most important functions of homeostasis is the regulation of body temperature, which is called thermoregulation. Thermoregulation is the homeostatic process that allows the human body to maintain its core internal temperature of 98.6 degrees Fahrenheit or 37 degrees Celsius.

All thermoregulation mechanisms, such as sweating and shivering, are designed to return the body to its internal core temperature. If a worker's internal core temperature is compromised while working in hot and humid working conditions, the worker becomes vulnerable to heat stress or heat induced illnesses. According to OSHA, thousands of workers are negatively impacted by heat stress each year and some even die from it.

What is heat stress?

Heat stress occurs when the body is no longer able to cool itself by sweating because the surrounding air temperature is close to or exceeds core body temperature. When the body is unable to cool itself by sweating, several heat-induced illnesses can occur, such as:

- *Heat cramps*—Muscle spasms associated with cramping in the abdomen, arms and calves often caused by losing large amounts of salt/ electrolytes and water through physical exertion
- *Heat rashes*—The skin's sweat glands are blocked and the sweat produced can't reach the surface of the skin to evaporate. This causes inflammation that results in a rash with tiny red blisters or bumps on the skin. Sometimes the bumps can be white or yellow as well.

Cooling down core temps *continued*

- *Heat exhaustion*—The body overheats when the body's cooling mechanism to maintain a normal core temperature begins to fail, usually from excessive heat and dehydration. Untreated, heat exhaustion can lead to heat stroke.
- *The often fatal heat stroke*—Heat stroke is considered a medical emergency where the core body temperature is greater than 104 degrees Fahrenheit causing complications with the central nervous system.

Heat stress risk factors

Any job site—indoors or outdoors—that can raise a worker's internal core temperature increases the risk of heat stress. High heat environments, high humidity areas, radiant heat sources, direct physical contact with hot objects, or strenuous physical activities can induce heat stress in employees. Other risk factors include weight, physical fitness and acclimatization, dehydration, metabolism, use of alcohol or medications, blood pressure, and age.

OSHA lists temperatures over 91° as a moderate risk and advises to implement precautions that reduce heat stress. When the heat index ranges from 103° and above, safety managers should be prepared to issue a heat stress alert and implement aggressive protective measures.

Prone to heat stress

Certain industries, occupations, and sports activities expose people to heat stress. These include but are not limited to military operations, moving companies, welding and metal forging, commercial laundries and bakeries, firefighters, boiler room workers, construction workers, and factory and automotive workers.

Outdoor operations in direct sunlight and hot weather, such as farming, construction, oil and gas well operations, and landscaping also increase the risk of heat-related illness in exposed workers.

Sporting and recreational events, such as 5K runs, marathons, fishing, even lying on the beach, can also induce heat stress, especially if the event takes place in a hot and humid climate.

Don't forget that excessive heat may increase the risk of other injuries at the jobsite resulting from a worker's sweaty palms, fogged-up safety glasses, and dizziness. Burns may also result when a worker accidentally comes in contact with hot surfaces or steam.

10 preventative measures

Take note of these preventative measures that every safety manager should practice to reduce the risk of heat stress.

1. Practice acclimatization, which is short work exposure early in the hot season, followed by gradual increases in intensity and duration.
2. Allow for frequent work breaks in an area that is cooler than the work environment.
3. Tell workers to drink plenty of water before, during, and

Cooling down core temps *continued*

after their shift and provide that water.

4. Tell workers to wear light-colored, loose-fitting clothing.
5. Tell workers to avoid sugar, alcohol and caffeine, especially during heat waves.
6. Provide a Hydration Station with easy access to cool air or shade, water, fans, etc.
7. Implement a heat advisory program when a heat wave is forecasted or the heat index reaches 103°. This can be as simple as putting an alert notice on a worker's locker, at the time clock, or at the water cooler. Another tactic is to send a text to your workers with the heat advisory alert.
8. Train employees about heat stress, its risks and symptoms. OSHA has a Heat Stress Quick Card pdf that is available at https://www.osha.gov/Publications/osha3154.pdf.
9. Formulate a buddy system where workers help monitor each other for the symptoms of heat stress.
10. Invest in PPE cooling products, such as cooling towels and neck wraps, head bands, and head shades, ice-packet vests, wetted over-garments, heat-reflective aprons or suits, and moisture-wicking apparel.

Cooling towels and neck wraps

Cooling products today are high tech and help accelerate the evaporative cooling process. The advanced technology allows for workers to stay cool for an extended length of time. Plus, when the coolness wears off, the cooling towel, neck wrap, headband or head shade can be quickly reactivated by submersion in water for two to three minutes and then twirling in the air to reactive the cooling technology.

In addition to keeping the worker cool during the work day, cooling towels and neck wraps also offer a convenient method to wipe away sweat from the face and eyes.

When specifying cooling products, ask these questions:

- Is the product made from materials that are anti-microbial?
- If the product is a headband or head shade, does it have a stretch-fit design which aids in comfort and a custom fit?
- If the product is a neck wrap, does it have a stretch loop feature that keeps the wrap secure around the neck?
- How long does the intense cooling experience last before it needs to be reactivated again?

Cooling products come in a variety of colors and patterns so they keep you cool, and they look cool too. Make sure your heat stress combat kit includes cooling products. They are economical, easy to use, and effective at reducing the risk of heat stress.

Mary Padron is a MarCom Specialist at Radians. Radians is a global leader in the PPE safety market and offers a comprehensive line of safety products, including its ARCTIC™ RadWear™ cooling products made with advanced ARCTIC™ Technology to combat heat stress and fatigue.

OSHA Silica Monitoring Compliance in Real-time

UNDERSTANDING, ACCELERATED

Protecting Construction Workers

Protecting workers on a job site is nothing new for the construction industry. However, when OSHA introduced a new Standard for Silica Exposure in construction on September 23rd, 2017 it established a new level of worker safety that has many construction safety managers moving into unfamiliar territory.

The new rule requires that companies incorporate plans, methods and policies to ensure worker exposure to crystalline silica is below the Permissible Exposure Limit (PEL) of 50 µg/m3 (micrograms per cubic meter of air) over an 8-hour period. Additionally, the standard requires that companies take action to reduce silica exposure if silica exposure is over the Action Level of 25 µg/m3.

Since respirable silica dust particles are typically too small to be visible, safety managers are forced to contend with a new level of unseen risk to workers.

The Challenge of Silica Exposure Monitoring

Following Table-1 of the OSHA standard eliminates the need for silica dust monitoring of most tasks. The table provides clear, actionable guidelines for reducing silica exposure to workers performing specific tasks in defined conditions.

However, tasks not covered on table-1 require following the Alternative Exposure Control Methods defined by OSHA, with rigorous exposure monitoring requirements remaining to reach and maintain compliance within the rule. The Alternative Exposure Control Methods require that an initial assessment must be done for each worker, performing each task on each work shift.

The initial assessment yields important information because it establishes a baseline of lab-verified 'reference exposure data' of silica exposure for each employee that is used to determine if corrective actions are needed and if additional exposure monitoring must be performed.

When the initial assessment is below the 'action level' of 25 µg/m3 monitoring can be discontinued until the risk of silica exposure increases. In cases where the initial assessment is above the 'action level' or above the PEL limit of 50 µg/m3, then corrective actions must be taken and exposure monitoring must be repeated on a 3 month or 6 month schedule as specified by the rule.

The repetitive monitoring required by the new silica standard is where the burden on a company's resources can be impactful. The trial-and-error process of repeatedly taking exposure

TSI *continued*

samples, sending them to a lab and waiting for analysis reports can prove to be time consuming and expensive.

Real-time instruments can help to overcome these challenges as they can be calibrated to immediately capture exposure data and streamline the process for reaching and maintaining compliance. The data contained in the lab report of the initial assessment is part of the data needed to calibrate real time instruments to lab samples so real-time readings are aligned with the expected results from a lab.

The Advantage of Real-Time Instruments

When calibrated, real-time instruments can provide instant exposure alerts and logged data so safety managers can quickly analyze exposure risk and take corrective actions. Corrective actions can then be immediately validated and additional engineering changes made the same day if needed.

Making engineering changes quickly and validating those changes can protect workers from excessive silica exposure, reduces the costs for laboratory analysis and significantly speeds up the process for reaching compliance.

With potential requirements for repetitively monitoring many workers on multiple shifts, it is easy to see a short payback on the investment of real-time instruments when monitoring silica exposure levels.

The OSHA requirement for reference data (collecting dust samples and sending them to a lab for analysis) cannot be eliminated. However, real-time instruments can dramatically reduce the time and costs of continuous and repetitive silica exposure monitoring for reaching and maintaining compliance to the new standard.

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